Design of AI to prevent and counteract work-related mental illness

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Abstract

Artificial intelligence (AI) is an emerging technology with the potential to revolutionize the field of mental health. As the prevalence of mental health issues continues to rise, there is a growing need for effective and accessible interventions. This master's thesis is done in collaboration with Prevas South in Malmö at the UX department. The scope of the project was to investigate how AI can be used to prevent and counteract work-related mental illness and assess the barriers to AI. Several different data gathering techniques including literature review, questionnaire, interviews, and focus groups were used for analyzing the user's needs and requirements. The data was analyzed in detail and resulted in an extensive affinity diagram and the user needs were identified as key findings. Three main themes of the key findings were "Comparison AI and human", "Organizational" and "Design". This was followed by brainstorming, developing conceptual models, and generating a final concept: an AI-based system tailored to accommodate key findings with the Demand-Control-Support model as the foundation. The concept was prototyped and iteratively tested and evaluated through both user tests and with regard to the key findings and different design principles. When evaluated, the concept received positive results and was reportedly comfortable and easy to use while not compromising user privacy.

To summarize, when developing AI systems for preventing and counteracting mental illness at work, it is of importance recognizing the differences between AI and humans. Further, it is also important to consider the impact of organizational culture on user trust and attitude towards AI, and design for personalized and short interactions.

Keywords: Artificial Intelligence, mental illness, user experience, human-AI interaction, psychosocial work environment, Demand-Control-Support model, design thinking, interaction design

Sammanfattning

Artificiell intelligens (AI) är en växande teknologi som har potentialen att revolutionera området för mental hälsa. I takt med att psykisk ohälsa fortsätter att öka, finns det ett växande behov av effektiva och tillgängliga verktyg. Examensarbetet genomfördes i samarbete med Prevas South i Malmö på UX-avdelningen. Arbetets syfte var att undersöka hur AI kan användas för att förebygga och motverka arbetsrelaterad psykisk ohälsa samt identifiera barriärerna för AI. För att kartlägga användarens behov och krav nyttjades flera olika datainsamlingsmetoder, nämligen litteraturstudie, enkät, intervjuer och fokusgrupper. Datan analyserades noggrant och resulterade i ett omfattande affinitetsdiagram där användarbehoven identifierades som key findings. De tre huvudtemana från key findings var "Jämförelse AI och människa", "Organisatoriskt" och "Design". Nästa steg innefattade idégenerering och konceptutveckling vilket resulterade i det slutgiltiga konceptet: ett AI-baserat system framtaget för att uppfylla key findings med Krav-Kontroll-Stöd-modellen som grund. Konceptet prototypades, testades samt utvärderades iterativt genom både användartester och utefter key findings och olika designprinciper. Vid utvärderingen fick konceptet positiva resultat och ansågs vara bekvämt och lätt att använda samtidigt som användarens integritet inte kompromissades.

Sammanfattningsvis är det viktigt att förstå skillnaderna mellan AI och människor vid utveckling av AI-system för att förebygga och motverka psykisk ohälsa på arbetsplatsen. Vidare är det viktigt att belysa att organisationskulturen kan påverka användarens tillit och attityd gentemot AI samt att designa för personliga och korta interaktioner.

Nyckelord: Artificiell Intelligens, psykisk ohälsa, användarupplevelse, människa-AI interaktion, psykosocial arbetsmiljö, Krav-Kontroll-Stöd modellen, design thinking, interaktionsdesign

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Furthermore, thanks to the UX team and the employees at Prevas South in Malmö for contributing during the data gathering steps and prototype evaluations. Finally, we would like to thank everyone who participated in our questionnaire, interviews, focus groups, and usability tests. Without you, this thesis would not have been feasible.

Lund, June 2023

Jessica Chen and Emma Englund

Contents

List of acronyms and abbreviations

AI = Artificial intelligence.

AW = Artificial wisdom.

DCS = Demand-Control-Support.

EAI = Emotionalized artificial intelligence.

Hi-fi = High fidelity.

JCQ = Job control questionnaire.

Lo-fi = Low fidelity.

SUS = System usability scale.

UI = User interface.

UX = User experience.

WHO = World health organization.

Chapter 1
Introduction

This chapter introduces the subject of this master thesis, its purpose, goals, and the company which the thesis was carried out in collaboration with.

1.1 Artificial intelligence (AI) and mental health

In a constantly changing world characterized by aging populations, public health crises, and rapid digitalization, which leads to increased pressure and workload for employees, AI technology plays a significant role in many different fields, industries, and sectors. According to the latest UN data, around 1 billion people suffer from mental disorders, and the rates of depression and anxiety have gone up by more than 25% in the first year of the Covid-19 pandemic [1]. Mental illness such as work-related stress is a prevalent reason for sick leave lasting longer than 14 days [2]. Increased workload, indistinct organization, and low job influence can contribute to self-assessed work-related stress and impact employee well-being. The modern work environment, characterized by high job demands, performance expectations, and the shift to remote work, brings additional challenges such as blurred work-life balance and longer working hours. These factors can lead to work-related stress and mental illness among employees [3]. Mental illness and stress are closely interconnected, with stress being a significant contributing factor to the development and exacerbation of various mental health conditions. Stress responses vary from person to person, with anxiety and depression being common symptoms. Prolonged stress can lead to depression or exhaustion syndrome [2]. Therefore, preventive measures are essential to mitigate these consequences.

For decades, humans have been fascinated by bringing life to non-living objects, and many applications nowadays use AI widely. For example, chatbots can produce lifelike exchanges with people. ChatGPT, the AI Chatbot that launched in November 2022, has since then

been widely used and spread all over the world [4]. Today, AI has experienced widespread adoption and integration within various industries and fields, and will with a high probability continue to do so. In the field of mental illness, AI is still emerging and showing great promise. However, achieving trust and safety towards AI might be one of the biggest challenges, certainly within the field of mental illness [5]. New innovations in AI could improve the mental healthcare sectors by providing personalized treatments, increasing access to mental health resources, and diagnosing illnesses [6]. For AI applications in the fields of mental healthcare and mental illness prevention, characteristics such as transparency, fairness, and sympathy are crucial. Also, ethical concerns, privacy concerns, and the need for human oversight are critical [5].

As our world is constantly developing and digitalization is increasing at a rapid pace, mobility, flexibility, and sustainability have become core concepts to adapt to. In addition, the UN has announced 17 global goals to build a better world, some of which include "Good health and well-being", "Quality education", and "Decent work and economic growth", see Figure 1.1. Good health is critical for human workers to obtain their full capacity for contributions at work, and it is also a key to success and improvement for companies and organizations [7]. Due to increased awareness and deeper understanding of knowledge workers having mental health problems, our master's thesis can provide deeper knowledge and insights into these fields, which is essential for all kinds of companies and organizations.

Figure 1.1: Applicable global goals for our thesis [7].

1.2 About Prevas

Prevas, founded in 1985, is a global consulting company specializing in solving problems with specialist competencies in digital solutions, software design, project management, user experience (UX), and system solutions. Their primary customers are medium-sized companies in the Nordic countries that operate in the industrial, manufacturing, life science, and energy sectors. In Sweden, Prevas has approximately 850 employees, and around 50 of them are employed in Malmö. The different offices in Sweden focus on different customers, depending on their needs and expertise in a particular location. At the Malmö office, the expertise areas are mainly in UX, Product Development Solutions, and Life Science and Innovation [8].

1.3 Purpose and goals

This master thesis will exemplify how a concept for using AI could be designed in order to prevent and counteract work-related mental illness. For a deeper understanding, the following research questions will also be investigated:

- How is AI relevant in order to evaluate mental illness for knowledge workers?
- What is needed in order for humans to confide in AI when using it to prevent and counteract work-related mental illness?

The project aims to go through the design process steps of "Understand", "Explore" and "Materialize". The objective of this project is to develop a concept for using AI to evaluate and address mental illness in the workplace. Additionally, this thesis will serve as a foundation for Prevas to continue their work in AI. It is our hope that Prevas can benefit from and further develop this project in the future.

1.4 Delimitations

This study is limited to examining how AI can be used to prevent and counteract work-related mental illness, such as stress and anxiety, for workers whose main capital is knowledge, i.e. knowledge workers. It does not address more severe forms of mental illness such as psychosis or hallucinations. Due to time and resource constraints, the project cannot delve deeply into each phase, including "Understand," "Materialize," and "Explore." As a result, the study relies heavily on the primary users available, which may not represent the broader context of users. Also, the implementation of AI will not be performed.

Chapter 2
Theory

This chapter provides the reader with relevant theory. The Demand-Control-Support model is explained followed by relevant design theory.

2.1 Demand-Control-Support (DCS) model

Karasek [9] proposed a model to evaluate the predictive relationship between different aspects of the work environment and mental strain, specifically work-related stress. The original model included two primary factors: job demand and job control, which determine the type of mental strain experienced. Job demands can be assessed through various methods such as measuring workload, task complexity, and the level of stress and pressure impacting one's mental well-being. Job control refers to the extent to which individuals have control over planning, executing, and shaping their work tasks and activities throughout the day.

Based on the experienced levels of job demands and job control, individuals can be categorized into one of four zones: low strain, high strain, passive, or active zone [9]. The low strain zone is characterized by high control combined with low demand. In this zone, individuals commonly experience feelings of boredom and find the work non-challenging [10].

Moreover, the high strain zone is characterized by low control and high demand. From a physiological perspective, this zone is the most precarious as it is associated with high levels of stress. Prolonged exposure to the high strain zone can lead to burnout and necessitate sick leave. Studies have also found an increased risk of cardiovascular diseases in this zone [11].

The third zone, known as the passive zone, occurs when both control and demand are perceived as low. This is commonly observed in repetitive jobs. While employees in this zone have the lowest risk of experiencing stress and mental strain, they also exhibit minimal initiative, reduced problem-solving abilities, and overall passivity, aligning with the zone's name.

The fourth and final zone is the active zone, achieved when both demand and control are perceived as high. Despite the high demands, stress is not as prevalent due to the accompanying high level of control. The active zone is characterized by motivated and engaged employees who are willing to accept new challenges, making it the most desirable zone to be in [9, 10].

The model was then extended and a third component was introduced, social support. Social support is considered an important factor as it acts as a buffer against the negative effects of low control and high demands. While the four different zones remain, social support is now included as a third axis, rendering the model three-dimensional, as illustrated in Figure 2.1. Consequently, the combination of the high strain zone and low support represents the highest risk for developing exhaustion syndrome and other physical illnesses [11].

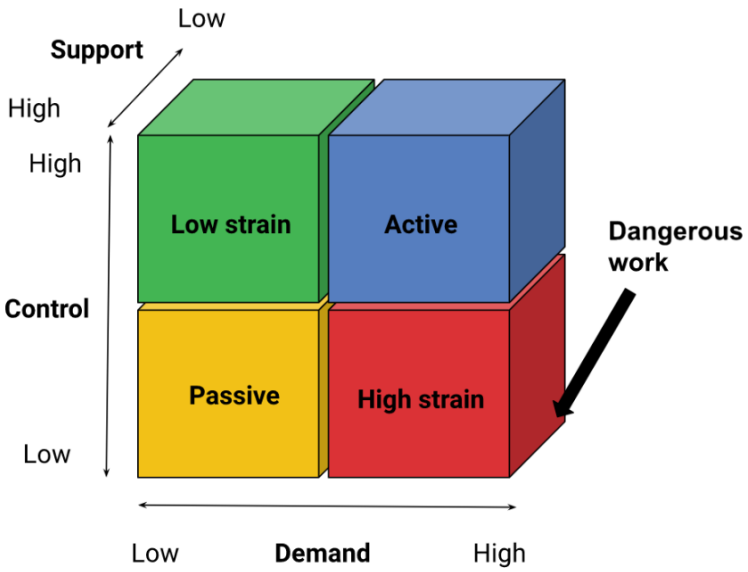


Figure 2.1: Visual representation of the DCS model.

2.2 Design theory

2.2.1 Interaction design and design thinking

The primary goal of interaction design is to develop products that users perceive as easy, effective, and enjoyable to interact with. Therefore, interaction design places a strong emphasis on usability and user-centered design principles when creating interactive products [12]. To achieve this, the design process should prioritize the user and their needs, and one approach that can be utilized is design thinking. By employing design thinking, the process becomes iterative and incorporates user needs throughout, increasing the likelihood of creating something innovative and valuable [13].

Design thinking encompasses several steps and phases, which can be broadly categorized as "Understand," "Explore," and "Materialize." These phases are illustrated in Figure 2.2.

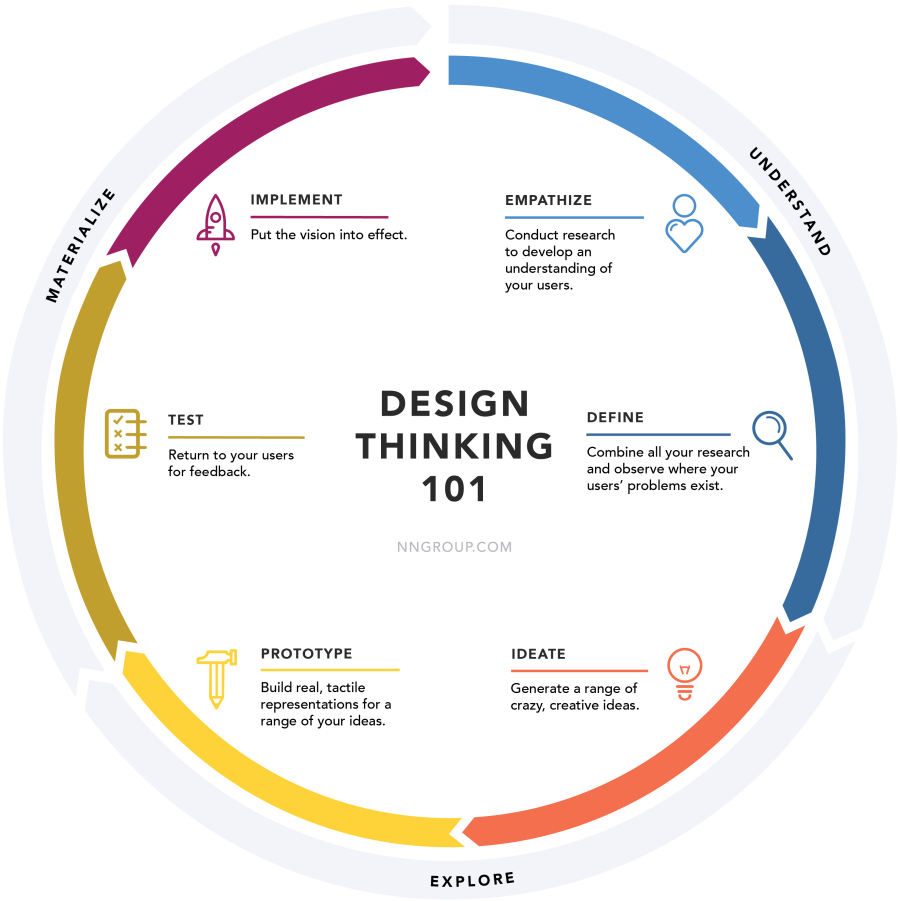


Figure 2.2: Visual representation of design thinking 101 [13].

2.2.2 Understand

The purpose of this phase is to understand the user, which involves the steps "Empathize" and "Define". Empathize focuses on gaining a deep understanding of the user in order to empathize with them. This requires conducting various types of research and gathering data to increase knowledge about the user's motivations, struggles, concerns, and attitudes [13].

The gathered data is then analyzed to identify common themes and define the user's problem and needs, hence "Define" is the name for this step [13]. An effective method for organizing and analyzing this data is the affinity diagram, which groups together data with similar thoughts and ideas [12].

Triangulation involves utilizing different methods and techniques to gather data from multiple sources, enabling a comprehensive examination and diverse perspectives. In this project, triangulation was employed to analyze data obtained through a literature review, questionnaires, interviews, and focus groups. The choice of each method presents its advantages and disadvantages [12].

Literature reviews are beneficial for acquiring quantitative data and gaining knowledge in

a specific field, without requiring user involvement. On the other hand, questionnaires heavily rely on user participation, where the quality of data is influenced by question design, response rates, and response content. However, questionnaires can provide targeted answers to specific questions and generate both quantitative and qualitative data. Furthermore, this method allows for reaching a large user group with limited resources. In addition, interviews enable the collection of more qualitative and detailed data. They offer the opportunity to explore multiple viewpoints and delve deeper into topics of interest. Interviews can be divided into structured, semi-structured, and unstructured. Structured interviews often contain closed and predetermined questions while unstructured and open-ended interviews are conversation-like around a specific subject and frequently delve into details. Most common are semi-structured interviews with a mix of features from both structured and unstructured interviews. Focus groups, in turn, facilitate the discussion of diverse and sensitive subjects, allowing for the development of opinions in a social context. They can highlight areas of consensus and conflicts among participants [12].

By employing triangulation and utilizing a combination of these methods, the project can benefit from a wider range of data, different perspectives, and a more comprehensible view and understanding of the subject matter.

2.2.3 Explore

When the user needs have been established, the next phase, known as "Explore," focuses on generating multiple ideas and concepts. The first step within this phase is "Ideate," which involves processes like brainstorming to create innovative ideas and concepts that address the user needs [13].

The second step in the Explore phase is "Prototype." Prototyping is the process of transforming ideas into tangible and tactile prototypes [13]. In the context of interaction design, not all ideas are physical objects; they can also be applications or digital systems. Therefore, it is important to explore different options and maintain an open mindset, particularly when developing a conceptual model [12].

A common approach in interaction design is to start with a low fidelity (lo-fi) prototype when developing a conceptual model. A lo-fi prototype does not aim to resemble the final product but serves as a quick and broad representation of an idea. This allows the creator to use inexpensive materials and develop several design concepts to determine which one is superior. Storyboarding is an example of a tool used in lo-fi prototyping, where a series of sketches are combined to form a narrative illustrating how the user might interact with the product and the tasks it could solve. When prototyping websites, applications, and similar digital products, using multiple sheets of paper with drawings representing screens or elements is a common method for lo-fi prototyping. On the other hand, a high fidelity (hi-fi) prototype aims to closely resemble the final product in terms of materials, design, and other aspects. Developing a hi-fi prototype is more time-consuming, but it allows for more realistic testing and evaluation [12].

2.2.4 Materialze

The last and final phase is called "Materialize," which consists of the steps "Test" and "Implement." As mentioned earlier, the design process should be iterative, and this aspect should be emphasized during the testing step. It is important to understand that testing should not be limited to the final phase alone. Conducting tests continuously throughout the process and testing both lo-fi and hi-fi prototypes with users are essential for developing a usable and satisfactory product that meets the user needs [12].

Nevertheless, testing and evaluation are also carried out at the end to ensure that the goals have been achieved before proceeding to the final step, implementation. This is where the idea and concept become a reality [13]. However, it should be noted that this specific step will not be included in this master thesis.

Testing and Evaluation

One commonly used and efficient method for evaluating a system is the System usability scale (SUS). Although this method may not provide detailed insights into specific problems, it offers general feedback on the usability of the tested system. SUS involves presenting the user with 10 statements for assessment, which occurs after testing but before any discussion takes place [14]. These statements, outlined below, encompass a wide range of aspects, thereby contributing to the high validity of the results [15]:

1. I think I would like to use this system frequently.
2. I found the system unnecessarily complex.
3. I thought the system was easy to use.
4. I think that I would need the support of a technical person to be able to use this system.
5. I found the various functions in this system were well integrated.
6. I thought there was too much inconsistency in this system.
7. I would imagine that most people would learn to use this system very quickly.
8. I found the system very cumbersome to use.
9. I felt very confident using the system.
10. I needed to learn a lot of things before I could get going with this system.

On a 5-point scale, ranging from 1 (strongly disagree) to 5 (strongly agree), users are asked to provide their stance on the statements. If users are unsure about how to answer a particular item, they are advised to mark the neutral point, which is 3. It is recommended to answer the statements instantly rather than spending excessive time contemplating each one [15].

The SUS score can range from 0 to 100. When calculating the score, the items are divided into two groups: 1, 3, 5, 7, and 9, and 2, 4, 6, 8, and 10. The contribution of odd-numbered

items is determined by subtracting one from the user's response, while the contribution of even-numbered items is determined by subtracting five. The total sum of the scores for all items is then multiplied by 2.5 to obtain the final SUS score [15].

An average SUS score is considered to be 68. A score below 68 may indicate the presence of design issues that need to be addressed, while a score above 68 suggests that only minor design issues exist [14]. For a more comprehensive interpretation of the SUS score, refer to Figure 2.3.

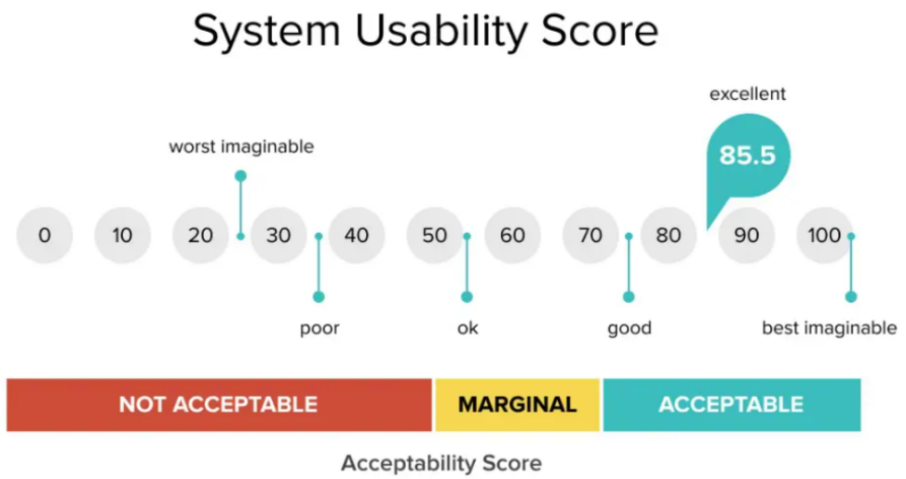


Figure 2.3: Visualizes how the SUS score should be interpreted [14].

Additionally, there are several other advantageous methods that can be used simultaneously during the testing process. Both think aloud and user observation are valuable techniques for conducting usability testing. Think aloud involves asking testing participants to articulate their thoughts and actions while interacting with the product. This allows developers to gain insight into the user's thought process and identify any difficulties they may encounter. To complement think aloud, user observation is used to observe and capture the behavior of the testing participants. By observing how users interact with the product, where they face challenges, and how they solve problems, valuable insights can be gained. Finally, interviews can be conducted at the end of the testing process to ask participants specific and general questions about their experience with the product [12].

2.2.5 Design principles

There are numerous design theories and principles that can be applied. In addition to design thinking, this thesis will also incorporate Norman's six most renowned principles (visibility, feedback, constraints, mapping, consistency, and affordance) due to their relevance in interaction design [12].

Visibility is emphasized because a more prominent function or element is more likely to be utilized by the user. Therefore, careful consideration should be given to elements that should capture the user's attention. Objects central to a system or product's function should be visible and easily accessible [12].

Feedback is crucial when the user performs an action. The system should provide feedback on the outcome of that action. Feedback can be conveyed through visual, tactile, verbal, or auditory means. Instant feedback assists problem-solving as users can see the consequences of their actions [12].

Constraints, the third principle, help users understand the limitations of a system or product. By restricting certain actions, users are prevented from making mistakes and are guided in the right direction [12].

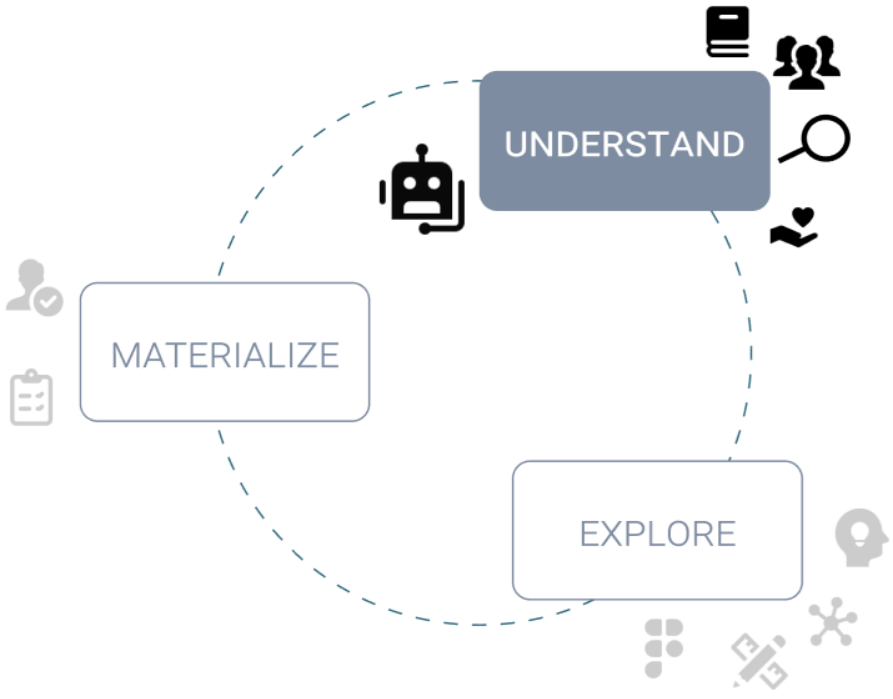
Mapping pertains to the relationship between controls and their results. It is beneficial for users to be able to anticipate the expected outcome when interacting with an interface. Designers can utilize icons with physical analogies to facilitate this understanding. Many symbols and icons have become universal, such as a thumbs-up indicating something positive and a thumbs-down indicating something negative [12].

To facilitate the user's learning of a system or product it is advantageous to have consistency. This means that one object always leads to the same outcome continuously throughout the process. This allows users to apply previous experiences to solve new problems [12].

The seventh principle, affordance, suggests that objects should provide clues regarding their use. For example, a button should appear clickable, and a coffee mug should indicate how it should be held [12].

Chapter 3
Understand

The data was gathered, analyzed, grouped, and themed which resulted in an extensive affinity diagram. The user needs consisted of the most essential insights from the affinity diagram, namely the key findings.



3.1 Triangulation

Methodological triangulation was employed to gain comprehensive insights into the various requirements for the thesis [12]. This approach involved combining multiple data gathering techniques that incorporated both passive and active participation from stakeholders, which were used in conjunction with one another.

Firstly, a literature review was conducted to assess the relevance of AI in evaluating mental illness among knowledge workers. Secondly, to understand the prerequisites for humans to trust AI, a questionnaire was created to reach a broader population. Interviews were also conducted to gather more in-depth qualitative data, and focus groups were utilized to obtain diverse perspectives.

3.2 Literature review

A comprehensive literature review was conducted to explore the application of AI in mental health, including its relevance in the prevention of mental illnesses such as stress. The review also examined the limitations of AI in this context and identified the requirements for effective human-AI interaction.

3.2.1 AI relevance for mental illness

Bromuri et al. [16] developed a deep learning model to investigate the ability of AI to identify stress levels in employees at a call center through speech-emotion recognition. The model achieved a balanced accuracy of 80% in predicting stress levels during calls, providing a discreet and non-disturbing means of continuously evaluating employee stress without the need for a therapist or physician.

Another study by Jagoo [17], involved 10 participants aged between 20 and 50 years old. The study used motion sensors and AI to detect anxious behavior, achieving an accuracy of over 90%. Behavioral signs such as nail-biting and knuckle cracking were identified, along with other verbal and non-verbal cues like rapid breathing, difficulty maintaining a regular conversation, and increased sweat production.

Graham et al. [18] provided an overview of AI along with its current applications in healthcare. The recent research in the specific field of mental health was reviewed and whether AI can supplement clinical practice was discussed. Furthermore, the limitations of AI were also considered as well as the additional research needed and AI's ethical implications. The results of reviewing 28 studies of AI and mental health records showed that AI has great potential in mental health with high accuracy. The development of AI in mental care was slower due to more soft skills being used in comparison with traditional healthcare. For example, many mental health practitioners formed relationships with patients and relied much on observation of behavior and emotions. Therefore, much clinical data on mental care was subjective in terms of patient statements and written notes. However, AI could be used for the development of improved pre-screening tools and for creating risk models for developing mental

illness more objectively. Also, personalized treatments based on the unique characteristics of individuals could be achieved. The result was that AI algorithms can manage to detect mental illnesses with 63-92% accuracy depending on the choice of technique and quality of training data.

Accordingly, the objectiveness of defining mental illness, the ability to identify early signs of mental illness and the possibility of personalizing treatments were also mentioned by Lee et al. [5]. They enlightened the success of using AI for the prediction, classification, or subgrouping of mental illness along with electronic health records, brain imaging, sensor-based monitoring systems, and social media platforms. However, ethical concerns such as biases, privacy, and transparency issues must be addressed in addition. Since AI cannot make compassionate, fair, and equitable decisions, the potential of artificial wisdom, AW, in the future was highlighted where AI self-reflects and corrects, but also takes into account the diversity among people and different perspectives as well as having ethics and morality in regard.

Mou and Xu [19] performed a study on 245 participants to investigate if humans displayed the same personality traits during human-AI interaction as in human-human interaction. It was found that the participants were more likely to use more words and invest more time in the conversation when it was with another human and not AI. Based on the big five theory, which states that the personality was built up by five traits namely, openness, extraversion, agreeableness, conscientiousness, and neuroticism, the human-human interaction displayed higher levels of the first four traits, which was desirable in conversation. Human-AI interaction only displayed a higher level of neuroticism. Thus, Mou and Xu suggested that humans reveal different personality traits depending on what type of interaction took place. Further, it was suggested that the lack of displaying personality traits in human-AI interaction ought to be explained by the lack of goals since the human-human conversation often was goal driven.

3.2.2 Tools and platforms

There are various tools, platforms, wearables, apps, and surveying systems available with the purpose of enhancing employee well-being and preventing mental illness in the workplace. These solutions can be software-based or embodied, and while some are widely adopted, others are still in the process of establishing themselves. One integrated platform that aims to prioritize employee engagement and well-being is Microsoft Viva [20]. It explores innovative approaches to fostering healthier habits, providing personalized data-driven insights and recommendations. It also offers features to track and enhance meeting efficiency. Microsoft Cortana serves as a virtual personal assistant, assisting with tasks such as schedule management, reminders, and information retrieval [21].

BioBase is another example, an AI-powered mental health app that monitors sleep patterns, movement, mood, and heart rhythm to reduce stress and improve overall well-being. It incorporates various approaches like mindfulness, biofeedback interventions, cognitive-behavioral therapy, and behavioral activation theory. Users are motivated and engaged through a "well-being score," which encourages their participation in lessons, activities, and exercises for mental health improvement. The score is generated from personal data, and a customized mental

health path is created accordingly. Additionally, the app can be paired with BioBeam, an arm wristband similar to a Fitbit, which captures real-time health data during sleep and physical activity [22].

Fiske et al. [23] suggest that embodied AI holds significant promise in the field of mental healthcare, particularly in the early stages of mental illness. The authors proceed to discuss various applications of embodied AI in mental health. One example mentioned is Paro, a therapeutic robot used to assist elderly individuals, often diagnosed with dementia, in mitigating feelings of isolation and anxiety. Another application is Tess, a mental health chatbot that provides chat functions and has demonstrated a reduction in depression and anxiety symptoms when used.

Fulmer et al. [24] conducted a study to examine the impact of Tess on college students and found that it alleviated symptoms of anxiety and depression. Tess can be integrated into existing communication platforms like Facebook Messenger, eliminating the need for users to download an additional application. However, it is emphasized that Tess should not replace real-life therapists and physicians but rather be used as a complementary tool. Among students, the most favored features of Tess were its accessibility and the topics it covered, while the least favored features were the chatbot's perceived lack of natural conversation flow and occasional misunderstandings of user responses. Interestingly, the study also found that individuals are more likely to share private information with a therapeutic AI than with a human-operated virtual therapist. Thus, there seems to be a conflict of consensus regarding whether to trust AI more than humans or not.

Fiske et al. [23] argue that using AI can help reduce the risk of embarrassment and shame as AI does not judge users. Similar to Fulmer et al. [24], Fiske et al. highlight the accessibility of embodied AI, exemplified by Paro and Tess [23]. While a therapist's time may be limited, embodied AI can be available whenever needed. Additionally, it has the potential to reach populations that are challenging to treat using conventional methods. However, concerns are raised regarding the possibility of individuals becoming overly reliant on these applications or robots. The lack of ethical guidelines regarding data management and related issues is also acknowledged, emphasizing the need for further research in this area.

3.2.3 Design guidelines

Amershi et al. [25] compiled over 150 design principles or design recommendations for human-AI interaction, which resulted in 18 design guidelines. Guidelines were necessary in cases of AI systems making unpredictable behaviors causing confusion, disruption, offense, or even danger. The guidelines, which could be grouped into four categories, provided recommendations on how controlled AI interactions and experiences could be achieved where the users' values, goals, and attention were respected. The categorization of when different guidelines applied depended on the phase of user interaction which were "Initially," "During interaction," "When wrong," and "Over time." In the initial phase, the users should understand what to expect and what the system was capable of as well as how well it could be performed. Hence, the ability to communicate honestly was an important requirement. The guidelines for the next phase, "During interaction," concerned the context, for example, large or small,

social and cultural. Regarding the guidelines for "When the system was wrong," covered the importance of providing explanations of why the system did what it did. In this way, the users could understand and empathize with how the system worked and feelings such as frustration could be avoided. Since AI systems continuously learned and improved over time, they should learn from user behavior. These guidelines for "Over time" encouraged the users to reach the system by giving feedback. The 18 guidelines were also validated through multiple rounds of evaluations. User studies were performed by 49 design practitioners that tested guidelines against 20 popular AI-infused products. The results showed that guidelines were very relevant for human-AI interactions and the authors revealed gaps in knowledge and also highlighted opportunities for further research.

It was of great importance to have the user's trust when working and developing a new AI system due to the fact that the user sometimes tended to be skeptical and distrusting of AI. One way of gaining that trust was through education and transparency toward the user. This could be achieved by informing the user about which information and conclusions were made by AI and which were not. Furthermore, the AI should present itself as flexible and it should be clear that the AI handled personal information safely and ethically [26].

Bærøe, Miyata-Sturm, and Henden [27] addressed the promises of AI regarding its benefit, accuracy, and effective prevention. In addition, the awareness of potential harm and other risks that could be created through the unregulated development of AI was also mentioned. In order to foster trustworthy development, different guidelines had been developed which could support developers and authorities to make decisions regarding AI. In 2019, "Ethical guidelines for trustworthy artificial intelligence" were published by the European Commission with the aim to contribute to reflection as well as discussion of the ethics of AI technologies. The following four ethical principles were stated:

- Respect of human autonomy
- Prevention of harm
- Fairness
- Explicitibiliy

These could then be translated into a framework for trustworthy AI with the following requirements:

- Human agency and oversight
- Technical robustness and safety
- Privacy and data governance
- Transparency
- Diversity, and non-discrimination and fairness
- Social and environmental well-being

- Accountability

The authors also highlighted the requirement of having control over the potential risks since the AI industry is driven by strong economic and political interests and objectives. Thus, WHO along with other UN bodies were suitable for leading globally trustworthy AI in health [28, 29].

3.2.4 Compilation of literature review

A compilation of the literature review was conducted using the digital tool Miro, as depicted in Figure 3.1. Areas and themes that required further evaluation in later project stages were identified. Several valuable findings, such as the 18 guidelines for human-AI interaction, emerged from the review and will inform the subsequent prototyping phases.

In summary, the prevention of mental illness is crucial for maintaining overall well-being in the workplace. AI offers numerous possibilities in this field, including enhancing the accessibility of mental healthcare, facilitating personalized treatments, and aiding in the prevention of mental illness. For instance, AI can serve as a pre-screening tool and assist in creating risk models for the development of mental illness. However, there are limitations to consider, such as the challenges associated with soft skills, difficulties in non-verbal communication, and the non-natural nature of AI-human interactions. In addition to the 18 design guidelines, openness and transparency in AI operations are also essential requirements. Many concerns regarding AI usage revolve around integrity, data utilization, and privacy issues.

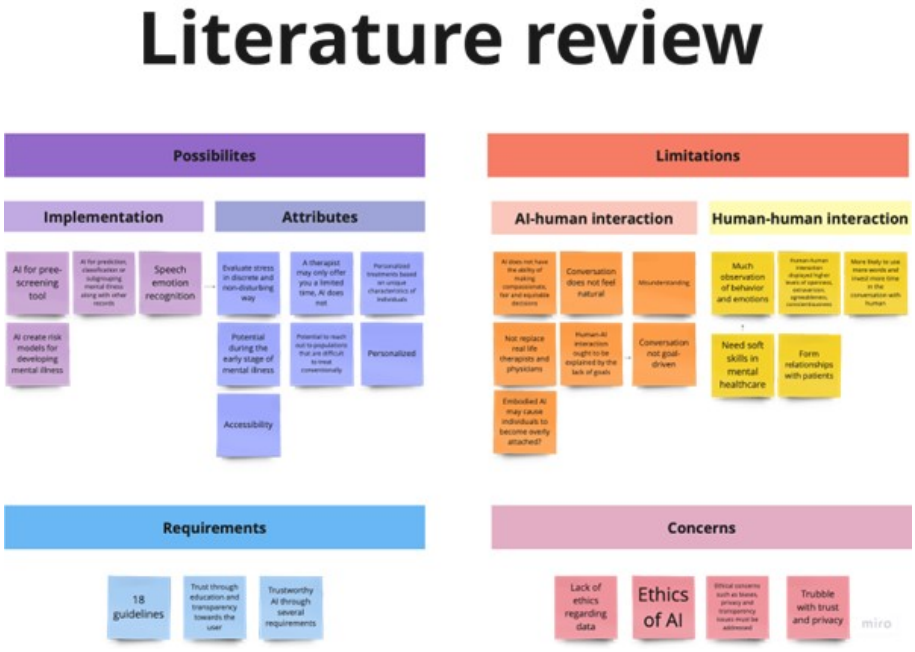


Figure 3.1: Compilation of the literature review. The figure gives the reader a schematic overview of the process where the details are not relevant to discern.

3.3 Questionnaire

The purpose of the questionnaire was to evaluate the general approach towards AI, which resulted in questions that were quite general, simple, and easy to answer. In this way, it was possible to reach out to a large population across a wide geographical area and receive the highest response rate possible. Another purpose of conducting the questionnaire was to confirm, verify and develop the findings from the literature review compilation. A questionnaire consisting of 12 questions in both Swedish and English was distributed electronically on different work-related platforms such as Slack and LinkedIn. The structure of the questionnaire was:

- Three introducing questions about gender, age, and occupation.
- Two broader topic-specific questions regarding the general knowledge of current AI applications and the willingness of testing new technologies.
- Two more specific questions about the frequency and duration a person would prefer interacting with an AI.
- Two questions with scales or multiple choice with belonging motivation in free text format. One question was whether the person found it easier to open up to an AI or human, and the other was whether the person was worried about how AI would handle and use their data.
- An ending short text answer question about other thoughts.

The questions were designed to elicit specific information from the target group [12]. Different response formats including ranges, scales, multiple choices, checkboxes, and free text answers were used. Range format was used for answering on age whereas multiple choice answers were provided in questions where the respondent could give one or more answers, for example answering on gender and which AI application a person was familiar with. Scales were used for measuring the attitude towards new technologies and whether a person was worried about how AI uses data. Free text format was provided on questions where the respondent could motivate a specific question. The questions in the questionnaire can be found in Appendix A.

The questionnaire was tested on three pilot subjects where two subjects tested the Swedish version and one the English version. A pilot study to test the plan before launching the main study was important to make sure the plan was viable, that the instructions were clear, and that the procedure worked properly. Hence, potential problems could be identified and corrected in advance [12]. The feedback from this pilot study was mainly some minor grammar corrections, phrasing, and change of words.

A total of 130 responses were collected from the questionnaires for further analysis. Of them, 39% respondents were women, and 61% were men. A majority of 56% stated they were between 18-29 years old, while the rest varied. An even larger majority, 73%, of the respondents were working full-time. The visual representation of the responses for three of the questions can be seen in Figure 3.2-3.4. The demographics among the respondents and other results can

be seen in Appendix A. In short, the majority of respondents were very willing to test new technology and familiar with several AI applications such as search engines, virtual assistants, and robots. The frequency of interactions with an AI application for preventing mental illness varied among the respondents from every day to as rarely as possible. However, weekly and monthly usage were the most popular answers and the large majority preferred a interaction length of a few minutes. In general, the respondents found it easier to open up and confide in humans and there were some skepticism of how AI would handle and use the data. However, a lot of qualitative answers were provided on the free text answers where the respondent motivated whether they found it easier to open up to an AI or human, as well as if they were worried about how AI would use their data. The analysis of these qualitative answers was done in Miro where different trends and patterns of the data were identified. The answers were grouped and themes were found.

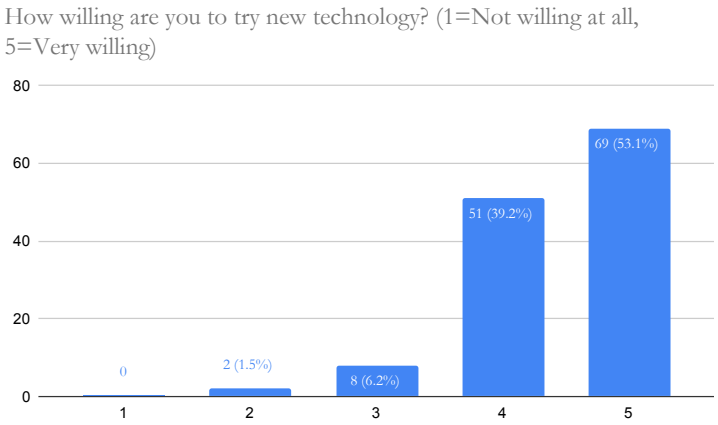


Figure 3.2: The distribution of the willingness of testing new technology among the 130 respondents.

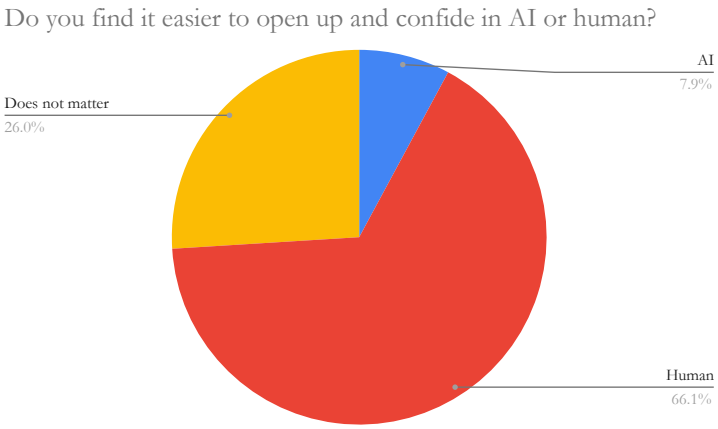


Figure 3.3: Responses regarding the respondents' to open up and confide in AI or humans.

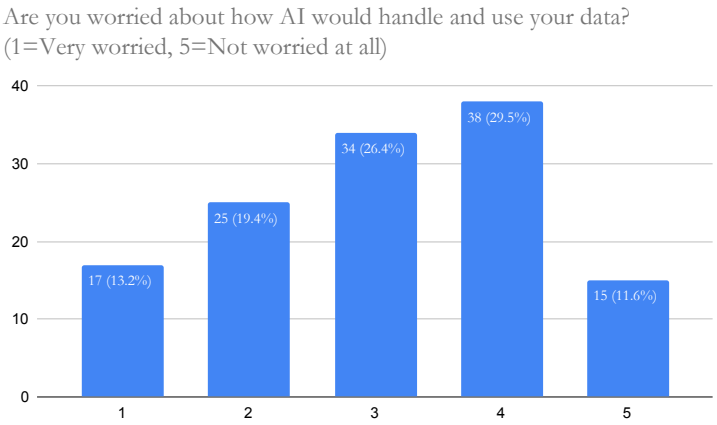


Figure 3.4: Responses regarding the respondents' worries about how AI would use the data.

3.4 Interview

From the questionnaire, two Prevas employees showed a great interest in the topic of the master's thesis and wanted to voluntarily participate in further discussions. Thus, the interviews were held informally open-ended for early eliciting scenarios. By conducting the interviews in this way, rich data was generated, and perspectives that have not previously been considered could be further explored [12]. Due to geographical distances, the interviews were conducted online over Teams. The interviews provided different viewpoints on the topic since one interviewee was also a safety representative at work and the other interviewee had several years of experience in leadership.

Since the interviews were kept quite unstructured, insights and rich discussions regarding how AI could be used for evaluating and improving mental health as well as preventing and counteracting mental illness were obtained. Interesting comments from the interview were the importance of communication from the management top and the power of employee engagement. Regarding the project topic, AI was discussed to be used for facilitating self-reflection, seeing patterns, and trends, and providing different tools. The results from the interviews were analyzed similarly as with the questionnaire and then merged into the affinity diagram in a later step.

3.5 Focus group

The purpose of conducting focus groups was to dive deeper into important themes where group discussion could outcome in important insights. One of the topics to approach in this stage concerned which type of AI the focus group would like to use and interact with. Until this point, no limitations regarding what kind of AI ought to be used have been made. Thus, it was of great importance to discuss what type of AI was preferred. Before having the focus groups, a short brainstorming session was conducted, with the literature review and the other performed data gathering as inspiration, which resulted in five different ideas of applications:

- A: Employee monitoring
- B: Mental health chatbots
- C: Mental health surveys
- D: Predictive analysis
- E: Structuring/optimizing work

The first idea, employee monitoring, is the thought of having tools that monitor and analyze behavior and in an early phase can detect warning signs of stress and anxiety. Thus, help can be provided before it escalates and becomes worse.

The second idea, mental health chatbots, can offer mental health advice, coping strategies etc. and an example is Tess which was mentioned in the literature review in Section 3.2.2.

The third idea revolves around mental health surveys. A majority of companies send mental health surveys to all employees which can vary in the amount of questions, completion time, and how often they are completed. They are often extensive since they generate a large amount of data. An example of such is the Job Content Questionnaire (JCQ) which consists of 36-49 questions and has a completion time of around 15-30 minutes [30]. Furthermore, AI can be used to analyze the results of these already existing health surveys, which can provide insights into employee well-being.

The fourth idea, predictive analysis, means that data collected from various sources such as HR systems, employee surveys, and absence records are analyzed by AI. This is done to predict which employees may be at risk of developing mental health problems. Based on factors such as job stress, workload, and absence patterns, information can then be used to provide targeted support to those who need it.

Lastly, optimize and structure work refers to an AI that can help with scheduling, turning off notifications during meetings and practical assistance to facilitate the employee to focus on the right work task.

Based on the results from the questionnaire, it was also desired to find other relevant and important themes which needed further evaluation, discussion, and analysis in depth. The

answers from the questionnaire served as a foundation for the topics that were chosen to be discussed during the focus groups. Since the questionnaire was kept quite general, it was possible to find some common themes among the large group of respondents. After analyzing the data from the questionnaire, it was found that a majority of those who participated in the questionnaire were worried about how AI would handle and use their data. Hence, integrity was set up to be the second topic. The purpose of discussing this topic was to gain more ideas surrounding how trust against AI could be built and understand the root of the worries. Due to fairly scattered responses regarding the preference for frequency and duration of the interaction with AI, motivation for use was decided as the third topic. By discussing this topic, it was possible to investigate further what really motivates the user and what kind of response the user wants from AI.

Two different focus groups were conducted. The first focus group consisted of six persons, all female students studying their fifth year in biomedical engineering at the Faculty of Engineering in Lund. The second focus group consisted of four knowledge workers at Prevas where three of them were men and the fourth a woman. Two worked with Life Science and Innovation, one with UX design, and one with Industrial Technology. All participants were given a pen and paper with some questions for idea generation for each topic, which were then collected after the focus group. The sessions were planned with a specified agenda including a set of pre-determined topics for the group discussion. However, sufficient flexibility was necessary and the interviewers kept the discussion on track by providing necessary redirection when appropriate. The questions were deceptively simple to enable the participants to put forward their individual opinions in a supportive environment. Besides obtaining valuable and new insights from the discussions, another purpose of conducting focus groups was to gain a consensus view and highlight areas of conflict and disagreement regarding the topics [12]. The agenda of the focus group was:

- Short introduction to the project, its purpose and goals.
- Main session where the topics were discussed. Each session began with a short inspirational introduction to begin the thought process. Then, each participant had a couple of minutes to individually write down their thoughts. Next, the group discussion began and each topic was held for approximately 10 minutes. If necessary, the moderators asked some leading questions to improve the discussion or keep to the topic. The order of the discussed topics was:
    1. Type of AI application
    2. Integrity
    3. Motivation for use
- In the end of the paper, two scales for rating the different suggested AI applications were provided, one scale for the comfortability of using the application and one for willingness to use the application.

During the focus group, the discussion was transcribed on a computer and afterward, the handwritten papers of the participants were collected. Both qualitative data in terms of rich discussions and quantitative data in terms of collecting the papers with the ratings of the

scales were received. The gathered data was then analyzed; Data was sorted, and categorized and patterns were found before merging with the other analyzed data from the questionnaire and interviews. The participants were quite agreed on which of the five ideas they were most comfortable with and would use, namely ideas E and C, and least comfortable and would not use ideas A, B, and D, which can be viewed in Figure 3.5. Interesting comments from the discussion were that idea A and D implied too much monitoring, surveillance and pressure of performance. The use of AI was preferably involved for practical things, whereas idea E of structuring and optimizing work was most favorable among the participants.

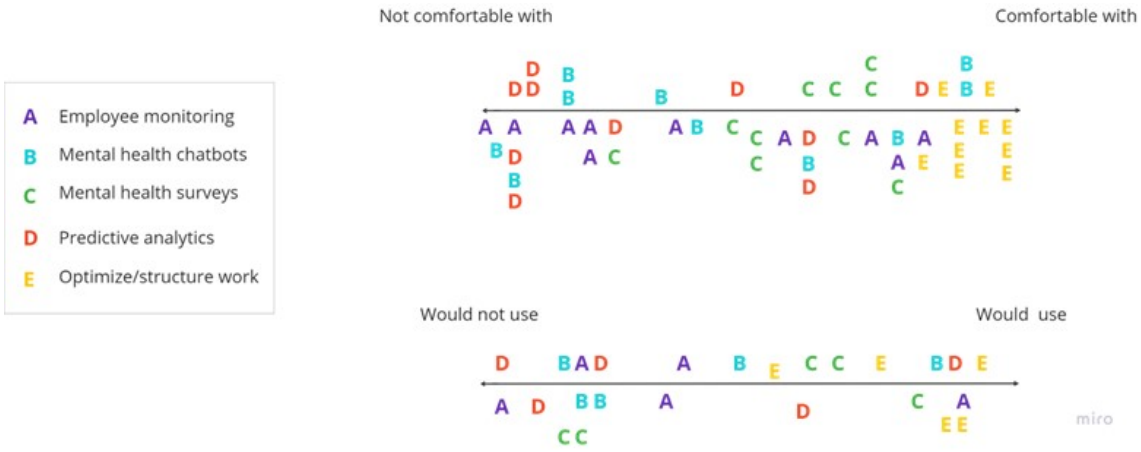


Figure 3.5: The scale ratings of the participants' comfort and willingness to use a certain AI application from the focus groups.

There was quite a difference regarding the discussion between the two focus groups. The first group was very homogenous and the second was a mix of participants regarding age, gender, work experience, and work field. The first group of engineering students was quite agreed and skeptical regarding how data could be misused by the employer. The other group of Prevas consultants discussed the importance of work culture and were more willing to share data since they believed it was for good intentions. They also mentioned having good relationships with the other employers, team leaders, etc.

The obtained data analysis from the focus group was then merged with the data from both questionnaire and interviews into an affinity diagram.

3.6 User needs

All the gathered data were carefully analyzed, and organized and similar notes were grouped and themes emerged as a result - an affinity diagram was created, see Figure 3.6. The affinity diagram consisted of a compilation of the questionnaire, interviews and focus groups. It was divided into three main themes with color-themed post-its; "Comparison AI and human", "Organizational" and "Design", where each theme contained several sub-themes. The section called "Color map" explains the color coding for the post-its which allows each post-it to be

traced back to the data gathering method it originated from. Regarding "Comparison AI and human", the different aspects of trust were addressed. In "Organizational"; Data leakage, anonymity or misuse of data but also relationship and support at work were frequently mentioned. Most sub-themes were found under "Design", which involved criteria of satisfaction, interaction time and frequency, AI types, the usage for both the employer and employees, and the specifications for individual use. Some examples are that it is required to not take up extra time and be a burden to use, having a simple interface, providing targeted advice for the user and AI can help to self-reflect.

The data and findings from the affinity diagram largely correspond with what was discovered in the literature review. For example, it was stated in the questionnaire, interviews, and focus groups that the handling of data is a major issue of concern, which was also brought up in the literature. Further, it was found from the questionnaire that the majority rather confide in humans than AI which corresponds with literature that emphasizes that AI should not replace human interaction, but rather be seen as a compliment.

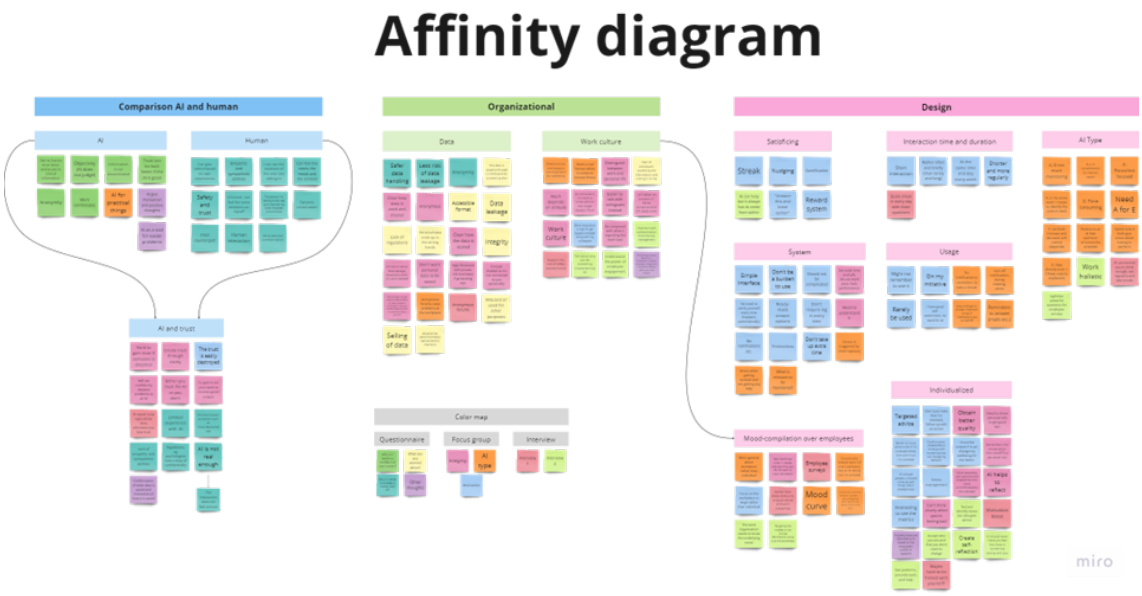


Figure 3.6: Affinity diagram of the data gathering. The figure gives the reader a schematic overview of the process where the details are not relevant to discern.

Another aspect of the data gathering phase was keeping the user involved in the development process since it is of great importance to have a user-centered approach which is mentioned in Section 2.2. Especially from the focus group, important insights were obtained which highlighted which applications the participants were comfortable and willing to use, see Figure 3.5. Even though many advantages and benefits were found for each idea concept, there was a consensus among the participants regarding which applications they were completely uncomfortable and unwilling to use. During the focus group, the user expectations of the application were also assessed which is important for keeping the expectations realistic and for avoiding misunderstandings or misinterpretations [12].

The user needs were defined by the most frequent and critical topics from the affinity diagram and were then identified as the key findings, see Figure 3.7.

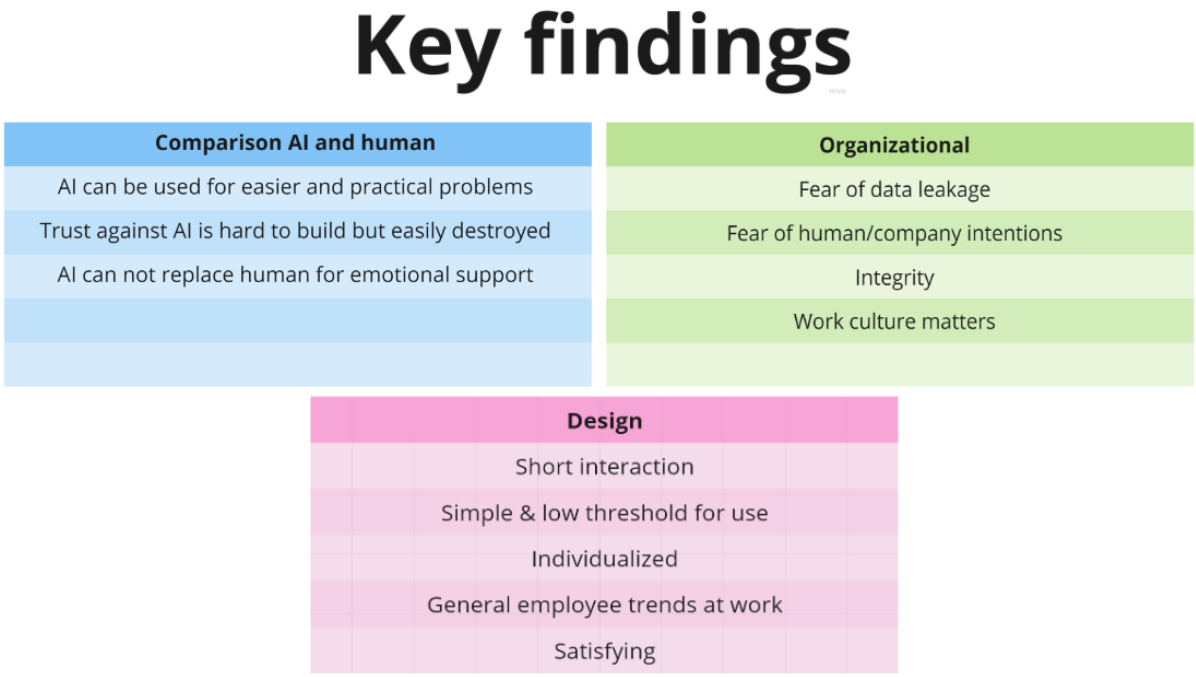


Figure 3.7: The key findings from the affinity diagram.

The key findings were categorized into three, with the first named as "Comparison AI and human". The analysis of the data gathered clearly indicated that AI could be used for easier and practical problems. Moreover, insights from the focus groups discussion revealed that trust against AI was hard to build but easily destroyed. This suggested that there could be a high threshold to start using AI and a very low tolerance for errors. Lastly, it was a common theme and therefore emphasized that although AI was great at solving practical problems, it can not replace humans when it came to offering emotional support. The reason people wanted AI to focus on practical tasks was because they understood that AI could not fully replicate human interaction and emotional connections.

The second main theme from the key findings were "Organizational". There seemed to be a major scepticism and mistrust against AI since integrity and privacy issues as well as fear of data leakage and how data is handled and used, were frequently mentioned during all the data gathering methods. Particularly the qualitative data from the free text responses from the questionnaire included statements regarding data breach or data used for other purposes. However, work culture seems to affect those aspects which was noticed during the focus groups where the discussion between the two focus groups was very different. The group of students were much more suspicious regarding company intentions while the group of Prevas employees had no disbeliefs against the company. Thus, there seemed to be a correlation regarding the trust towards the employer and colleagues, with a person's willingness to share information.

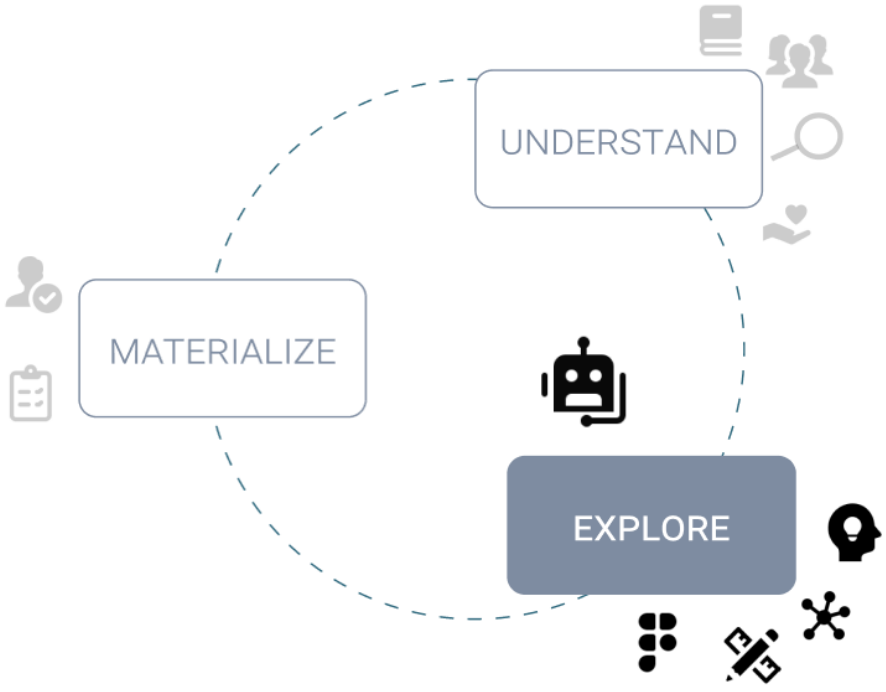
The third theme was "Design". When it came to using a solution, there was a strong de-

sire for a short and efficient interaction. The users did not want to invest too much time, especially when feeling stressed or anxious. Simplicity and ease of use were also important factors, as users wanted something that was not overly complex or complicated. The solution should have a low threshold, making it accessible and straightforward for everyone. Despite concerns about data privacy, individuals valued a sense of personalization and the feeling of a solution tailored to individual needs. In the workplace, existing tools like the JCQ often benefit the employer more than the individual. While individuals seek a solution that caters to their needs, they also recognize the value of the employer being able to utilize it. Lastly, the solution should leave users with a feeling of satisfaction. Users wanted to feel that their needs were effectively addressed and that the solution provided a positive experience overall.

These findings were critical for proceeding further with the project since it contains not only the user needs but also the different barriers and limitations of AI to have in mind when developing the concept.

Chapter 4
Explore

This section presents the process of developing the final concept and also the different phases of prototyping and the iterations leading up to the final hi-fi prototyping.



From the phase "Understand", see Chapter 3, a detailed affinity diagram was created and key findings were obtained. The next step was to proceed, converge, and develop certain concepts further.

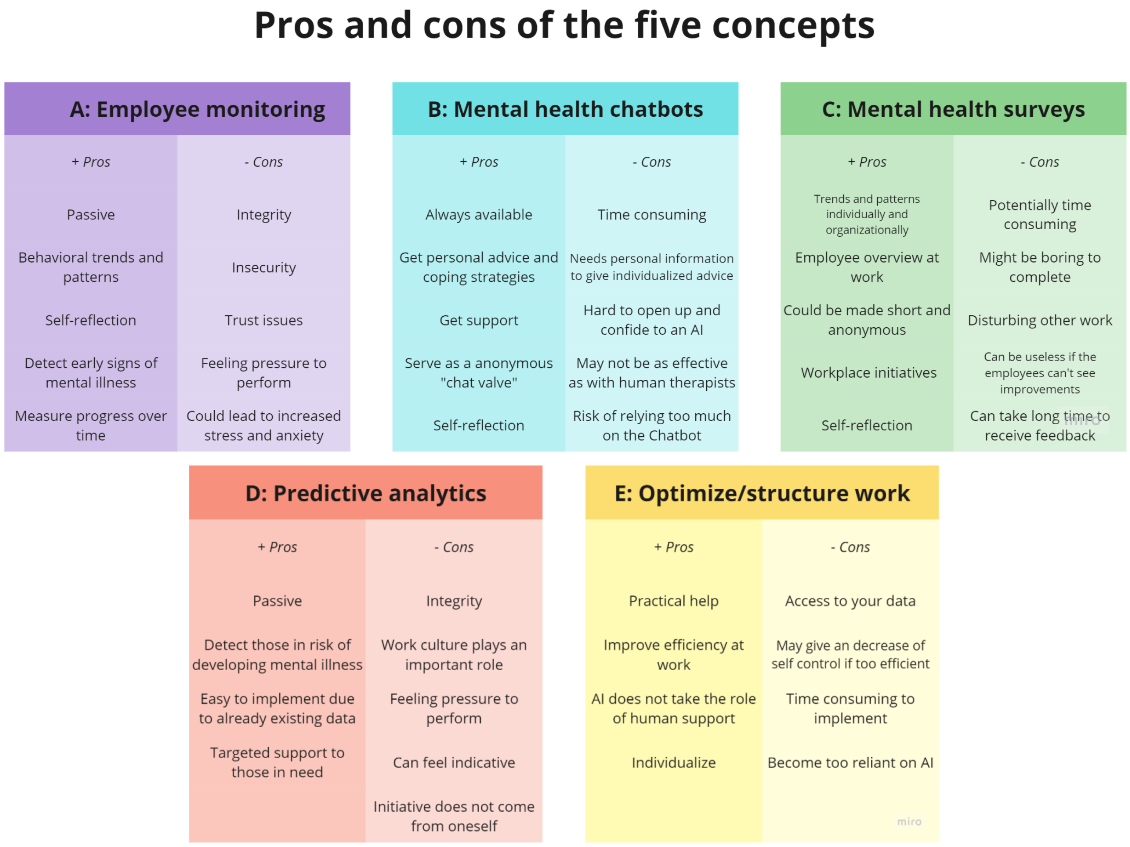


Figure 4.1: Pros and cons of the ideas that were developed before the focus group.

Pros and cons were developed for each of the five different concepts, see Figure 4.1, and in combination with the compiled scale ratings from the focus groups, see Figure 3.5, and key findings, see Figure 3.7, the five different ideas were evaluated. For example, integrity was frequently mentioned as an essential factor both in questionnaires and during focus groups and thus a key finding. Accordingly, employee monitoring, health chatbots, and predictive analytics were all badly scored and were therefore not proceeded for further idea development.

A new brainstorming session with the authors started, revolving around the highest-scored AI applications, namely mental health surveys and optimize/structure work, which can be seen in Figure 4.2. Since two of the key findings were short interaction time as well as a simple and low threshold for use, a traditional mental health survey did not fulfill the criteria. Therefore a third concept was added in the brainstorming session which instead circulates the idea of only having short questions.

The benefits and limitations of the ideas (short questions and optimize/structure work) were discussed and compared and due to none of the three concepts covered all key findings or felt completely satisfactional, an alternative idea emerged. The best parts of the three concepts were merged into one, thus creating the final concept in Figure 4.3.

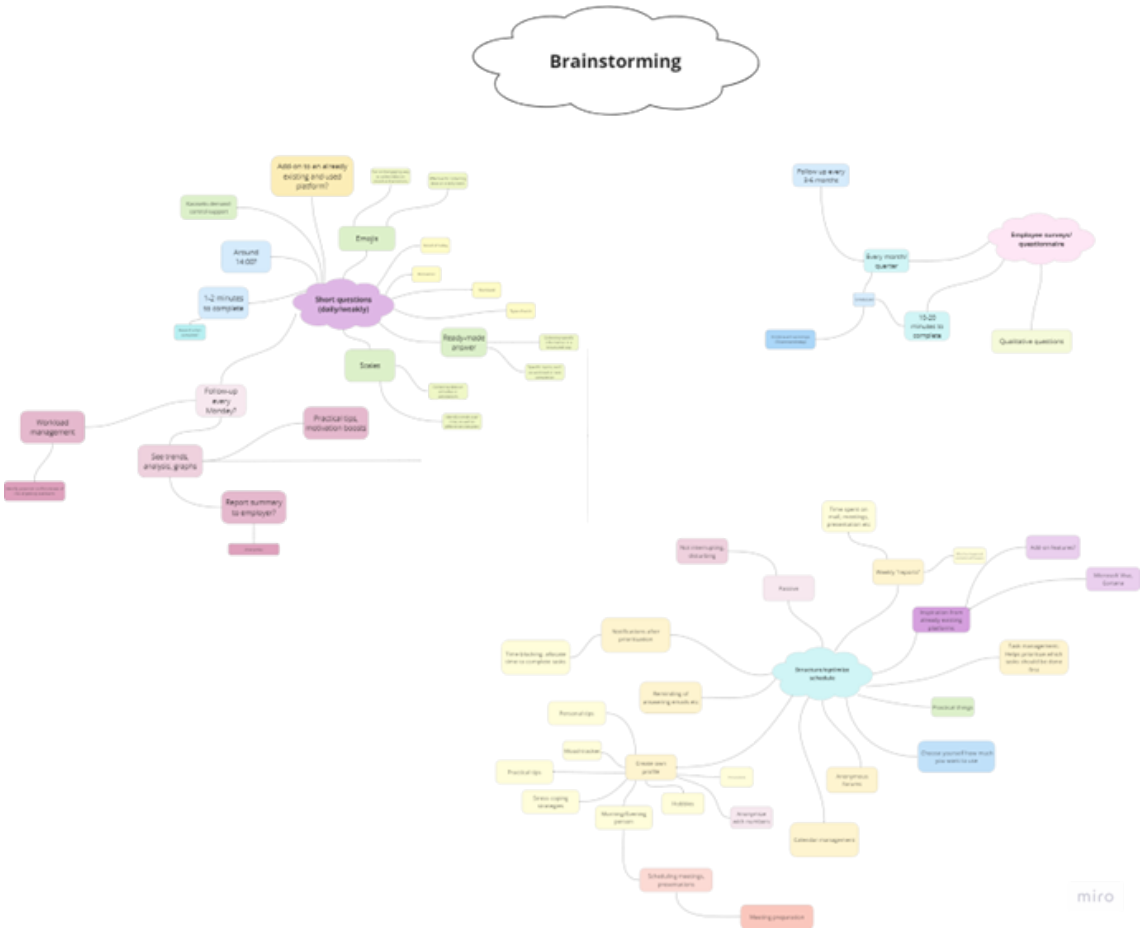


Figure 4.2: Brainstorming session. The figure gives the reader a schematic overview of the process where the details are not relevant to discern.

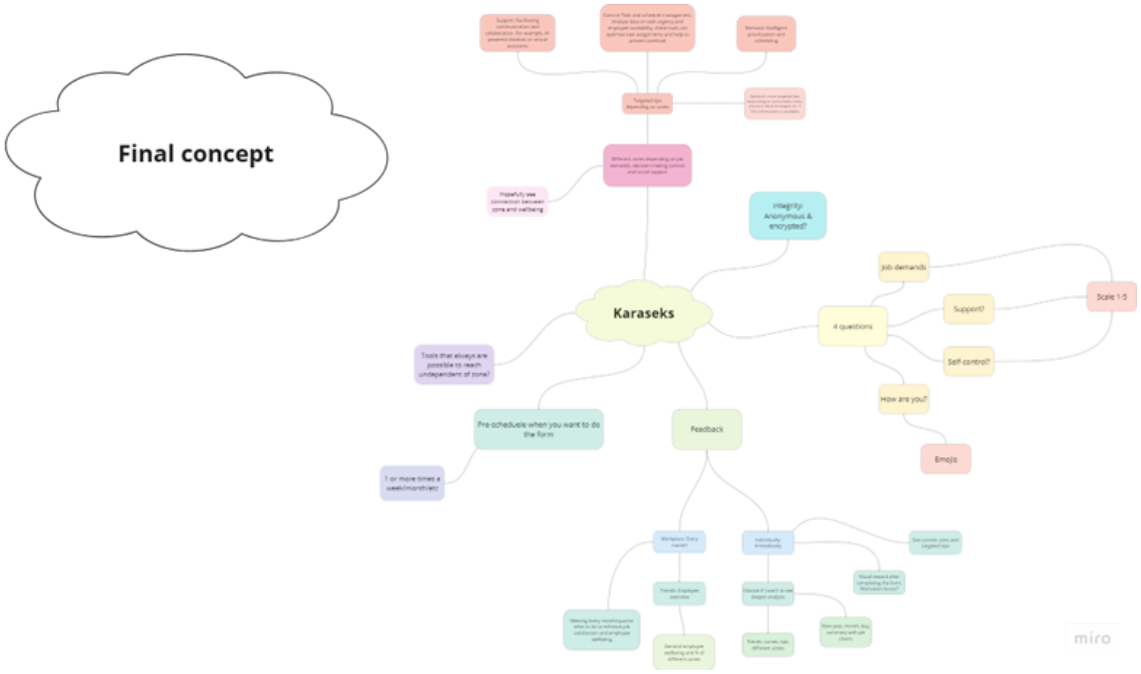


Figure 4.3: The final concept map. The figure gives the reader a schematic overview of the process where the details are not relevant to discern.

4.1 Final concept

The final concept is based on Karasek's theoretical DCS model [9]. Thus, the concept is an application where the user estimates the three factors, "Demand", "Control", and "Support", and with the help of AI, is assigned a work zone. In addition to estimating the three factors, the user also reports on their general well-being. In order to do so, well-being and work zones can perhaps be connected. When assigned to a work zone, the AI also generates recommendations and tips to help and support the user. Even though there are only four zones, the "Active", "Passive", "Low strain" and the "High strain" zone, the recommendations and tips should be specific for the user. For example, being in the active zone but close to the high strain zone should generate different recommendations than being in the active zone but close to the low strain zone.

The AI should also be part of analyzing the result to find patterns and trends. Not only between well-being and work zone but predict an up or downwards going trend, enlighten the user that their psychosocial environment is especially vulnerable a certain period during the year, etc.

Compared to traditional mental health surveys, such as JCQ, which involves 36-49 questions and requires 15-30 minutes to answer, the questionnaire only consists of four short questions, and therefore not as time-consuming, which was an important key finding. The ambition is to have the user frequently estimate their well-being and the three factors since this enables a more correct analysis. However, the concept should, based on the key findings, feel personal and individualized, therefore it should be possible to schedule yourself for when and how often the questionnaire is answered.

The concept provides the user with direct and individualized feedback and should provide a feeling of usefulness which motivates the user to continue using the concept. However, it is also beneficial for the company as a whole. Since the user is given the opportunity to anonymously share their results with the company, this would result in the company having data on their employees' psychosocial work environment and well-being. Thus, AI can suggest concrete ideas on how to improve e.g. social support in the workplace if that factor is found to be low across the workplace. Therefore the concept provides both personal and organizational development, which differs from many of the existing mental health surveys, but is desirable based on the key findings.

In summary, the roles of AI in this concept are:

- Analyze test results and assign a profile
- Personalized feedback based on the profile and what kind of advice the user has liked and used historically
- Learn what kind of tips the user likes and dislikes
- Analyze data to detect trends, patterns and generate insights
- Chat function

Before beginning the step of lo-fi prototyping it was of importance to identify and clarify how the user would interact with the final concept. A user journey map was therefore created which can be found in Figure 4.4. The purpose of the user journey map was for this project to get an understanding of how the user would behave before, during, after, and over a longer period of time when interacting with the concept. Thus, different needs and desired feelings could be identified as well as barriers and unwanted feelings. The user journey map is also useful and serves as a foundation in the creation of the conceptual design. Conceptual design is important to consider before creating a physical prototype [12]. Through identifying needs and desired feelings it is possible to develop an understanding of how the final concept could be prototyped.

User Journey Map

An overview of the user experience when interacting with an AI at work

PHASE	BEFORE	DURING	FEEDBACK	REPEAT	6 MONTHS
OBJECTIVES	Usual work tasks	Interact with AI	Receive response from AI	Repeat previous steps for a longer period of time	See trends and patterns over time and make behavioral changes
NEEDS		• Low threshold • Short interaction • Easy to use	• Easy to understand the feedback • Commit and engage in the interaction with AI	• Motivation to keep using • Reflecting	• Provide valuable insights both individually and organizationally
DESIRED FEELINGS	• Excitement	• Importance • Security • Fun • Excitement	• Satisfaction with outcome • Trust • Engagement	• Importance • Engagement	• Self-reflection and meaningfulness • Personal and organizational development
UNWANTED FEELINGS	• Anxious • Lack of motivation	• Annoyance • Stress • Insecurity • Boredom	• Disappointment • Irrelevance	• Boredom	• Waste of time
BARRIERS	• High workload and many deadlines • Non-supporting colleagues • Bad work environment • Lack of self-control	• Takes extra time and takes an effort to complete • Not being totally honest • Work culture	• Providing irrelevant output • Cannot comprehend output	• Stops using • Pointless • Lose trust	• Not seeing improvements

Figure 4.4: User journey map of the concept.

The user journey map could in some aspects make use of the key findings, for example, that the needs during use should be short interaction and easy to use. Additionally, it was found that the desired feelings over time should be meaningfulness, both personal and organizational development, and that it should create self-reflection. This is valuable to take into consideration when continuing forming of the conceptual model and beginning the step of lo-fi prototyping since it can provide ideas of specific content and design features.

4.2 Lo-fi prototyping

The next step was then to create a storyboard for visualizing a possible scenario using the application with some descriptive text. In this way, the proposed behavior of the concept as well as envisioning the interaction between the user and the system could be made. Therefore, storyboards serve as both a part of conceptual design and an early lo-fi prototype. First, two individual storyboards were created by hand, presented to each other, and then discussed in detail, see Figure 4.5.

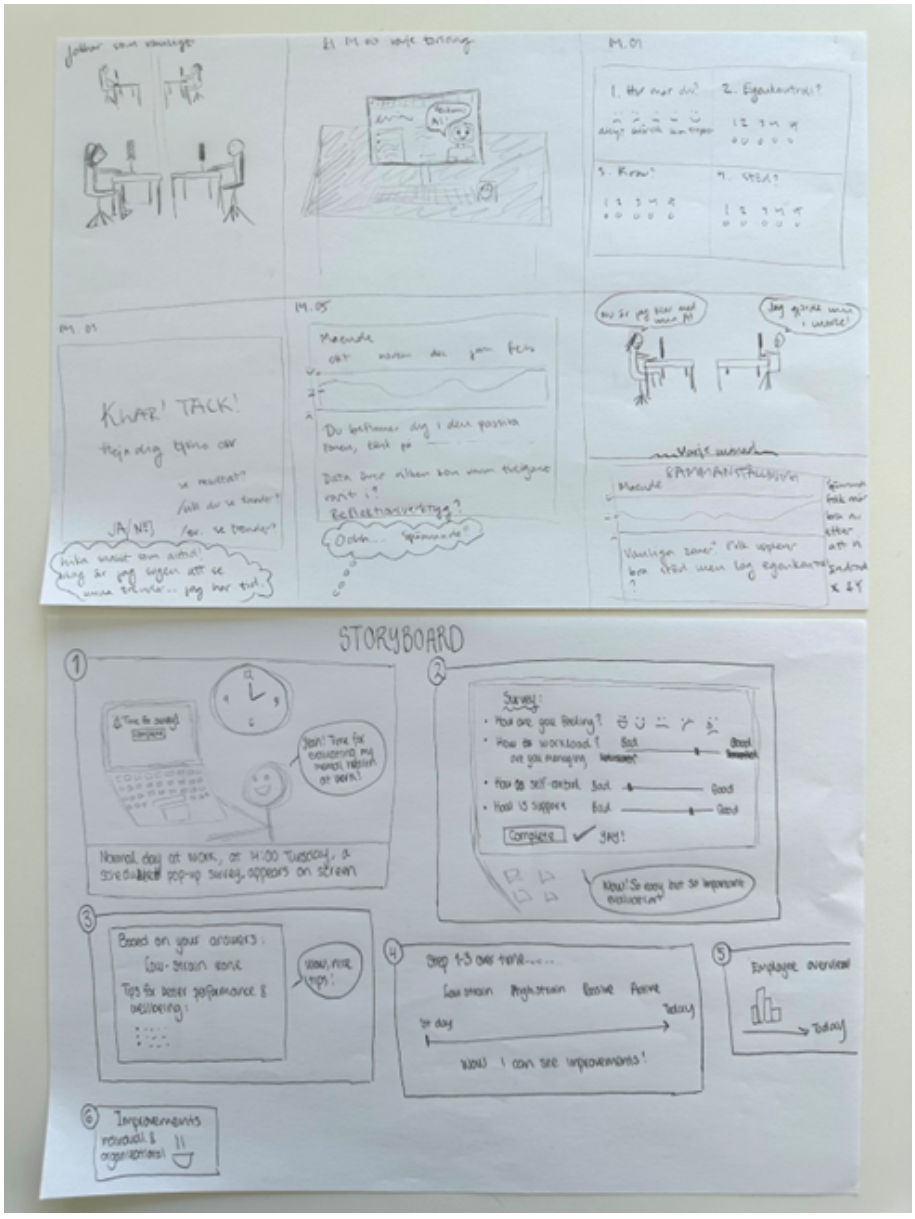


Figure 4.5: Individual storyboard of the concept.

Then, a common storyboard was created by combining the most beneficial ideas and features of the two individual storyboards to cover the users' needs. The final storyboards consisted of two different scenarios, one from the employee's perspective and the second from the employer's perspective, see Figure 4.6 and 4.7.

Figure 4.6: Storyboard of the concept from the employee's perspective.

The storyboard in Figure 4.6 exemplifies how the usage of the final concept might appear from the employee's perspective. An employee receives a notification that it is time to answer the four questions and then has the time to briefly look at his analysis. It is emphasized that the interaction can be very short if one does not have the time to analyze the results right away and that the employee should feel satisfied after usage.

The storyboard that can be viewed in Figure 4.7 describes how the employer would take advantage of the final concept. A compilation of the company is provided as well as AI-provided trends and suggestions for improvement. It is then emphasized that feedback is provided to all of the employees which allows them to see how their data is being used, and ensures that the company cares about their input and is consistently striving to improve.

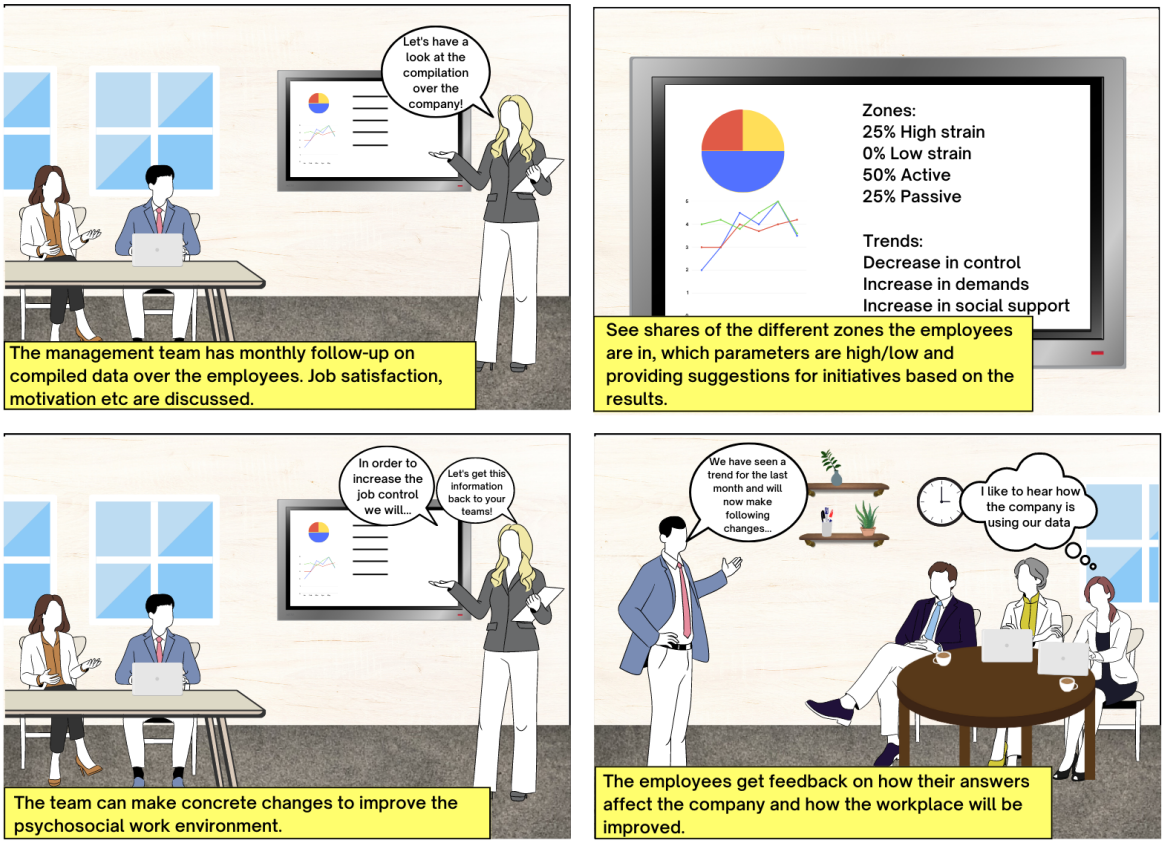


Figure 4.7: Storyboard of the concept from the employer's perspective.

After achieving a shared and increased understanding of the concept and its structure, a potential illustration of the concept and its functionality started to develop. A lo-fi prototype was created with paper, post-its, and a pen, which made it easy to make small adjustments and try out several different approaches. The paper served as screens while different parts of the post-it could be seen as "pop-ups" or additional information on the screen, which can be seen in Figure 4.8. The creation of the lo-fi prototype did however raise several questions. Decisions regarding what sort of graphs and information should be displayed and how it should be presented were difficult to make. Since the concept had not yet been confirmed with the users, it was time to evaluate both concept and questions regarding the lo-fi prototype.

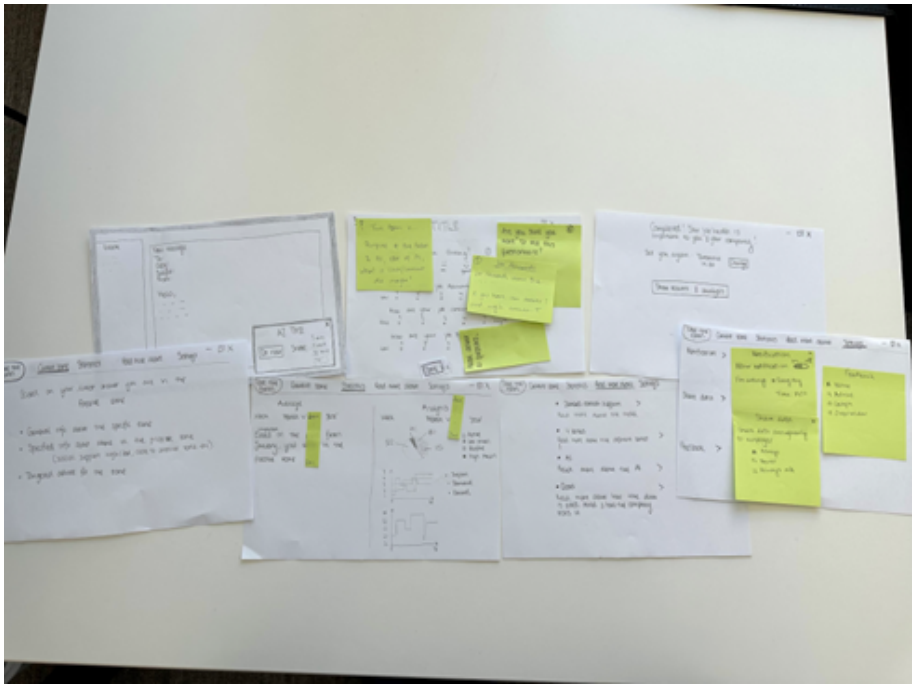


Figure 4.8: Lo-fi prototyping of the concept. The figure gives the reader a schematic overview of the process where the details are not relevant to discern.

4.2.1 Evaluation

The evaluations for the concept and lo-fi prototypes were conducted through an online questionnaire and six short interviews with Prevas South employees.

Questionnaire

The questionnaire was divided into two parts; The first part consisted of testing a small part of the concept and the second part was evaluating how it felt to perform the prior step. The main purpose of this evaluation method was to verify the concept with the users. In the first part of this evaluation, the four short questions for the concept were asked accordingly:

- How are you feeling today?
- How are you experiencing your work-related demands?
- How do you experience your self-control at work?
- How do you experience your social support at work?

Questions for the evaluation part included the frequency a person would prefer answering the questions and whether the user was comfortable with and/or would:

- Let AI analyze the answers for the questionnaire.
- Trust the provided advice based on the analysis of the response.

- Share the answers to let the employer see general trends in the workplace.

A total of 12 respondents tested and evaluated the concept. The responses were quite uniform where the majority of the users would prefer answering the questions 1-2 times a month, were comfortable with AI analyzing the answers, would trust the advice from the AI if they were reasonable, and would share their answers with the employer.

Interview

Six short interviews were conducted to obtain more detailed and qualitative responses regarding the concept. Of those interviewed, three were women and three were men. Following examples of what the features could involve were discussed with the interviewees, see Figure 4.9:

- Take the test
- Current zone
- Statistics
- More information
- Settings

Figure 4.9: Material when interviewing/evaluating the concept with users. The figure gives the reader a schematic overview of the process where the details are not relevant to discern.

The interviewees contributed with their feedback, insights as well as thoughts on improvements to the concept. The main focus for this evaluation was on the content to be provided

for each feature and also to verify the comfortability of the quiz questions. Since the participants consisted of a mixture of employees of different gender, ages, work fields, and work experiences, the discussions were very different from each other and extremely insightful. In summary, it was desired to provide an overall personalized experience during the interaction while keeping the settings standardized, having a simple interface and design of the concept, and being easy to use.

4.3 Hi-fi prototyping

After the phase of lo-fi prototyping and evaluations, the next iterative phase of prototyping began using the prototyping tool Figma. This phase could roughly be divided into three major iterations until the creation of the final hi-fi prototype. However, within each stage, it was a continuous process of performing minor adjustments, evaluating these, and then improving the prototype. The changes and improvements were also carefully documented for tracking the progress.

4.3.1 Iteration 1 - Content

The first stage of creating the final hi-fi prototype consisted of transforming the concept into an initial draft of the hi-fi prototype in Figma. Before, only the content of different features of the concept was determined and the "shell" was sketched as lo-fi prototypes. In this iteration, see Table 4.1 and Figure 4.10, the main focus was involving the desired content of each feature and taking the key findings as well as the design requirements from the literature review into consideration. However, the representation of the content was not involved until the later stages of the phase.

Table 4.1: The first iteration of the hi-fi prototype.

Menu	Content/function	Requirement
Menu bar	Consisting of "Quiz", "Current zone", "Statistics", "More information" and "Settings"	Contextually relevant information (**)
Test	4 short questions - Short descriptive text under each question if necessary	Short interaction (*) Simple & low threshold for use (*) Contextually relevant information (**)
	Response format - Scale 1-5 - Emojis	Short interaction (*) Simple & low threshold for use (*) Satisfying (*)

Nuvarande zon (Eng. "Current zone")	Summary of the quiz result	Clear how the system works, transparency (**) Encourage granular feedback (**) Show contextually relevant information (**)
	Visual representation of the specificity in zone	Satisfying (*) Show how well the system works (**)
	Provide targeted advice	Individualized (*) Learn from user behavior (**) Update and adapt (**)
Statistik (Eng: “Statistics”)	Line charts for mood, demand, control and support Pie charts for the proportions of different zones	Individualized (*) Remember recent interactions (**)
	Filtering functions	General trends at work (*) Provide global controls (**)
Mer information (Eng: “More information”)	How the AI works	Integrity (*) Transparency and clarity (clear how it works and how well) (**)
	How data is shared	Integrity (*) Fear of data leakage (*) Transparency and clarity (clear how it works and how well) (**)
	More information about the model	Transparency and clarity (clear how it works and how well) (**)
Inställningar (Eng: “Settings”)	Choose to share data with employer	Trust (*) Individualized (*) Provide global controls (**)
	Notifications	Individualized (*) Provide global controls (**)

(*) Key findings, (**) Design guidelines and principles

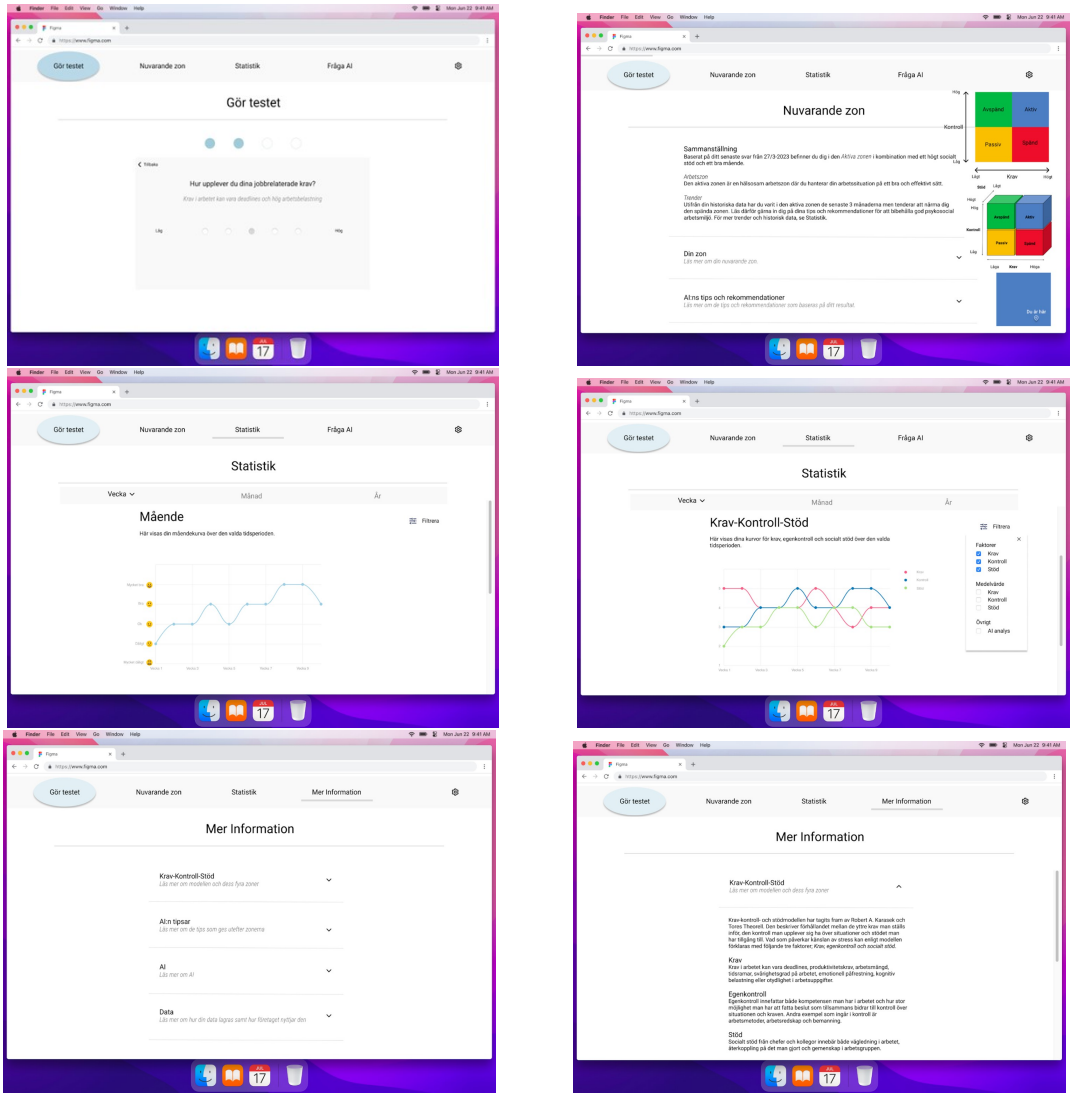


Figure 4.10: Screens of the first iteration of the hi-fi prototype. The focus of this iteration was to include the contents of the concept. The figures should visualize the overall prototype, details are not meant to be distinguished.

4.3.2 Iteration 2 - Functionality

During the second iteration, see in Table 4.2 and Figure 4.12, parameters such as representation of information, content and functionality of the feature were tested, evaluated and analyzed in depth. Adjustments for the concept such as using an AI chatbot instead of "More information", and having a filter for the average "feeling" over the whole workplace were implemented from the feedback of previous evaluations.

Changing the menu bar towards "Chat" instead of "More information" was a quite large adjustment. Since the content of "More information" was important regarding both the key findings and other design requirements, this was reformulated as questions that were displayed as example questions in the "Chat".

Between the first and second iteration phases, the main focus areas of improvement were functionality, understanding and simplicity.

One of the key challenges during this iteration was the visual representation of the specificity from the results of the quiz and providing targeted advice based on the result. Since the concept involves the use of four different work zones, it was desired to have four different colors representing these.

- Blue represents the active zone
- Yellow represents the passive zone
- Red represents the high strain zone
- Green represents the low strain zone

However, the challenge was to accurately visualize the user's specific position in a zone since it is possible to be in a certain zone but adjoin another. At first, the initial idea of representation of the specificity of the zone was on having some kind of 3D cube showing exactly where in the specific zone the user is. Although, while considering the importance of user experience, the abstractness of the idea was questioned and hence not preferred. With inspiration from 16 personalities, an online personality test based on the Myers-Briggs Type Indicator (MBTI) personality theory, and how a persona represents each personality type, having personas to represent the specificity of a zone, could possibly be a better alternative [31]. In this case, 32 different profiles could be created, eight different for each zone, to represent the complexity of the data in an easy way for the user. Being recognized as a profile would probably be a more fun, exciting and intuitive alternative. Therefore, four examples of the profiles, one for each zone, were created, see Figure 4.11.

Figure 4.11: Four examples of the profiles were created, one for each zone.

Table 4.2: The second iteration of the hi-fi prototype.

Menu	Change	Improvement
Test	Answering the quiz with a slider instead of a response range of 1-5	- Quiz button is different and larger in the tab bar Increased specificity for AI analysis → Clear how well the system works (**)
	Available to see the previous answer	Ability to compare and reflect against the latest answer Individualized (*)
Nuvarande zon (Eng. "Current zone")	Creating 32 different profiles representing different locations in a certain zone	Better visualization of placement in a certain zone and more targeted advice → Satisfying (*)
Statistik (Eng. "Statistics")	- The average mood of the workplace was added - Drop down menu for time periods is changed into selecting and scrolling between chosen time periods. (Inspiration from iPhone “Hälsa” app) - Pop-up with current zone and profile while hovering over the line graph	More individualized and personalized experience (*) - AI comments trends - Improved design interface and user experience
Chatt (Eng. “Chat”)	“More information” was changed to “Chat” in the menu bar	More individualized and personalized experience (*) - Increased functionality - Can help and provide both practical and personal advice
Design aspects	The profiles were color themed according to the color of the zone from the pie charts	Consistency (**), Satisfying (*)

(*) Key findings, (**) Design guidelines and principles

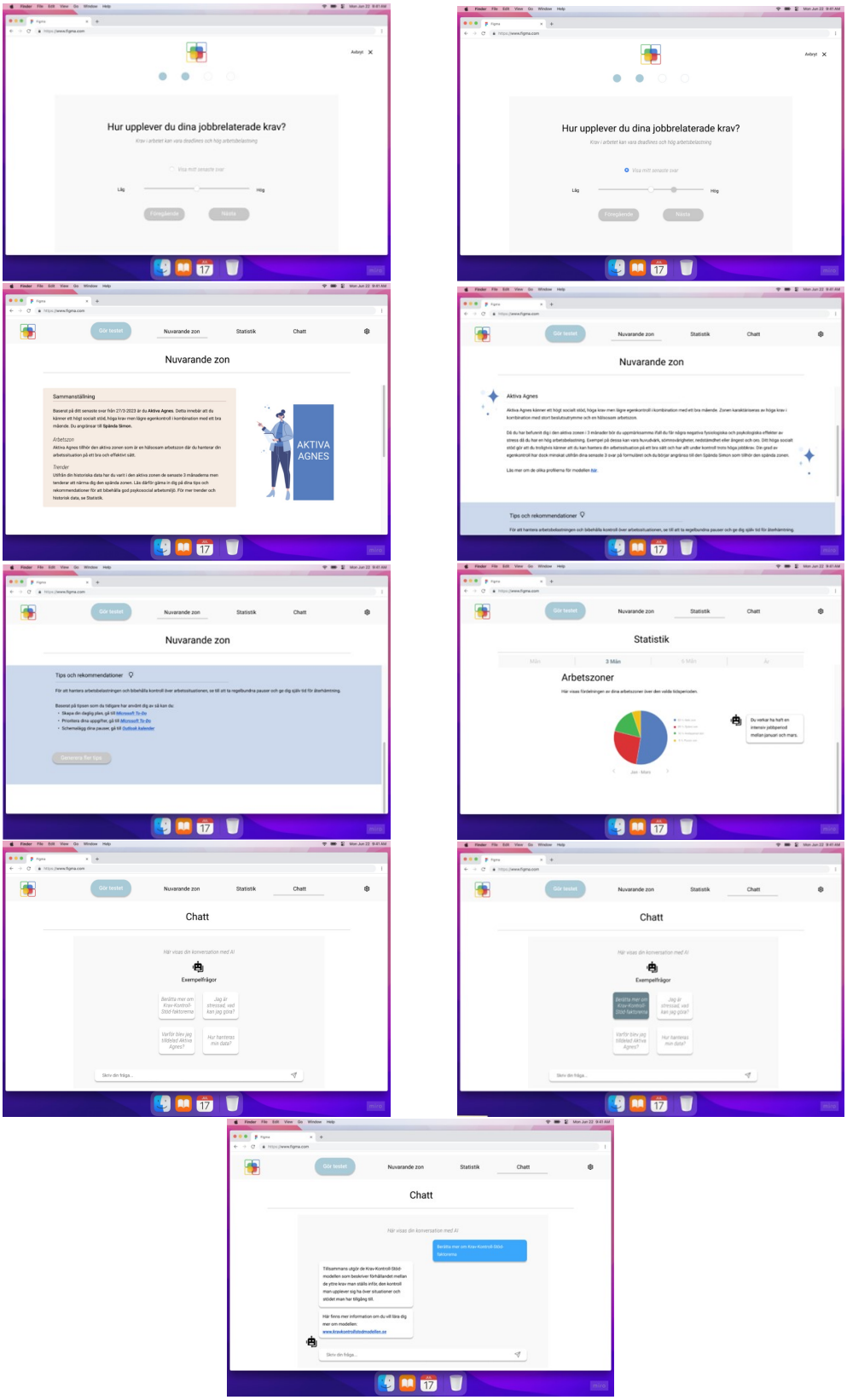


Figure 4.12: Screens of the second iteration of the Hi-fi prototype. The figures should visualize the overall prototype, details are not meant to be distinguished.

4.3.3 Iteration 3 - Design

The second hi-fi prototype from iteration 2 was evaluated during a feedback session workshop with eight of the UX team members at Prevas South. The main focus of this evaluation was on understanding the concept as well as the design. The workshop began with a short summary of the concept, showing screens of the main features of the concept and then the evaluation was done in Miro where all feedback could effectively be collected and analyzed. All participants accessed the hi-fi prototypes in Miro where all screens for each feature were grouped and collected. Some leading questions to have in mind when analyzing the prototypes were provided and the participants were then free to write their own post-its, see Figure 4.13.

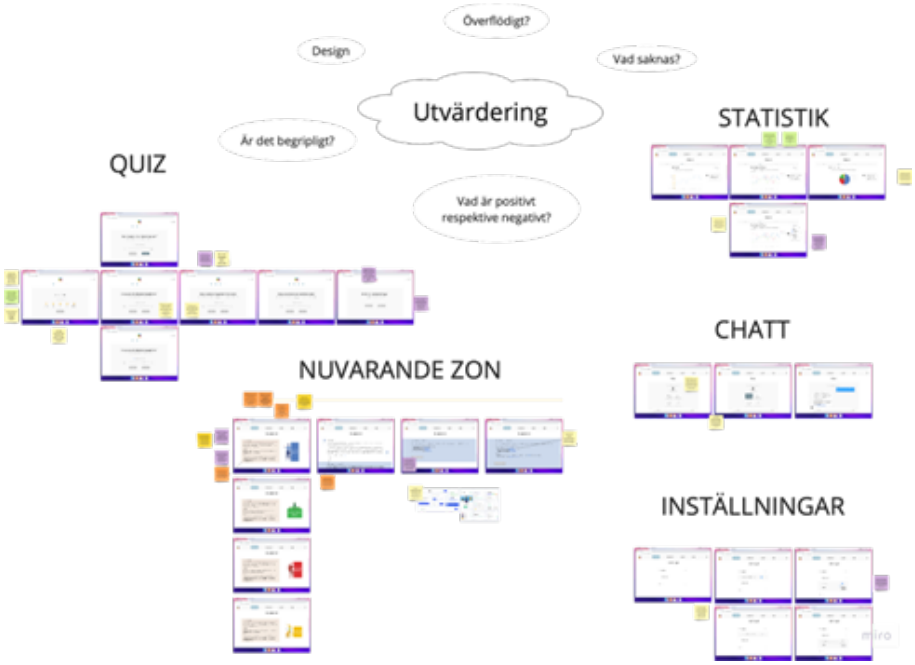


Figure 4.13: Feedback session with the UX team at Prevas South. The figure gives the reader a schematic overview of the process where the details are not relevant to discern.

A summary of the third and final iteration can be seen in Table 4.3. Since the UX team obtains expert knowledge regarding user interface (UI) and UX aspects, as well as great experience of prototyping in Figma, a lot of design aspects were considered and assisted for further development of the hi-fi prototype. For example, an improved design interface involved larger contrast of the prototype, increased size of the quiz, involved more icons, increased line space of the body text, putting text on cards, and taking colorations due to color blindness into consideration for the line graphs and pie charts, see Figure 4.14-4.16 and a demo of the final prototype demonstrated in Figma with following link: `https://shorturl.at/xyVW2`

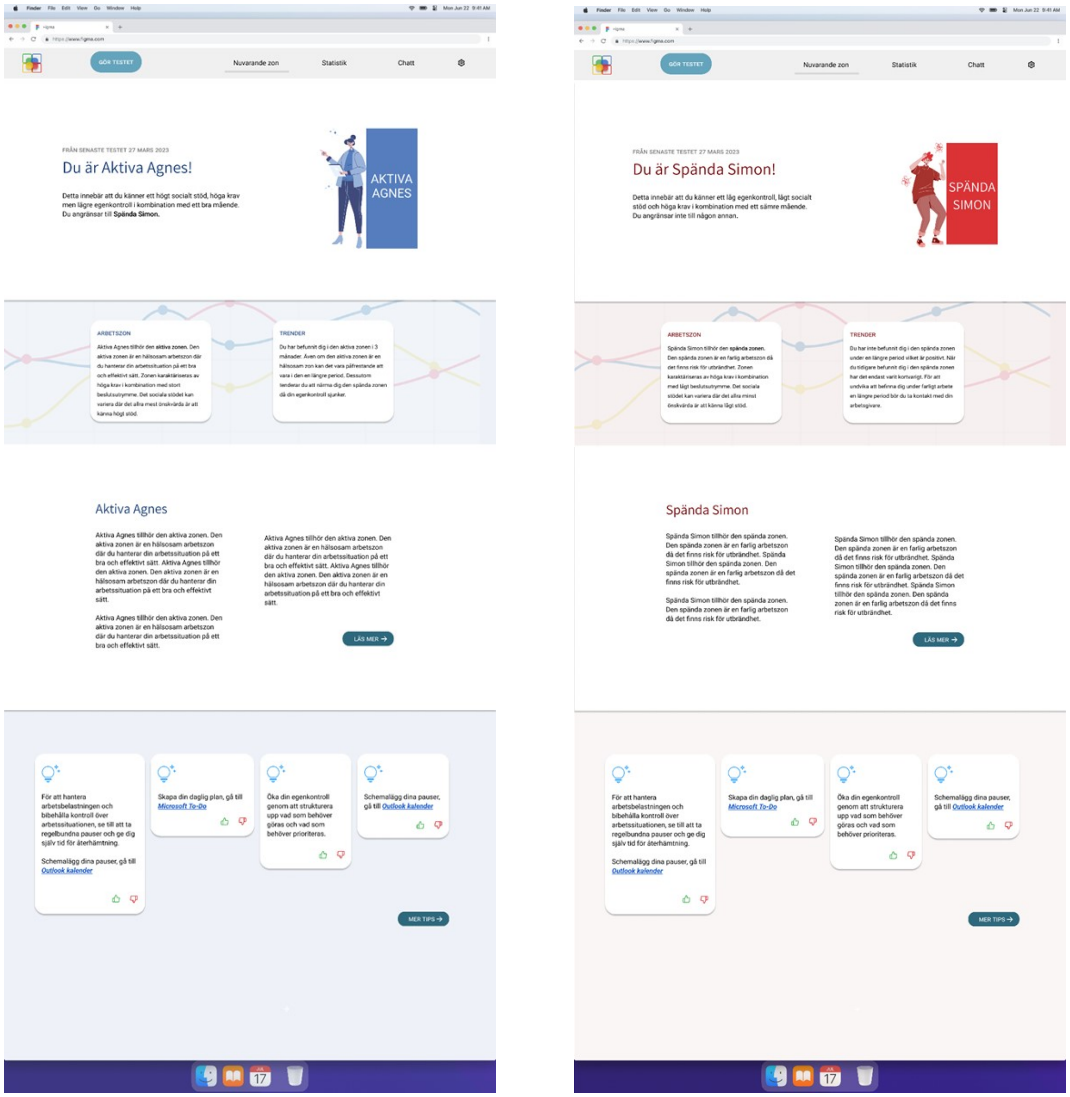


Figure 4.14: Screens of the third and final iteration of the hi-fi prototype. Note that much of the text content is not finalized (mainly applies under "Current Zone") and that the tips have not been developed specifically for personas yet. The figures should visualize the overall prototype, details are not meant to be distinguished.

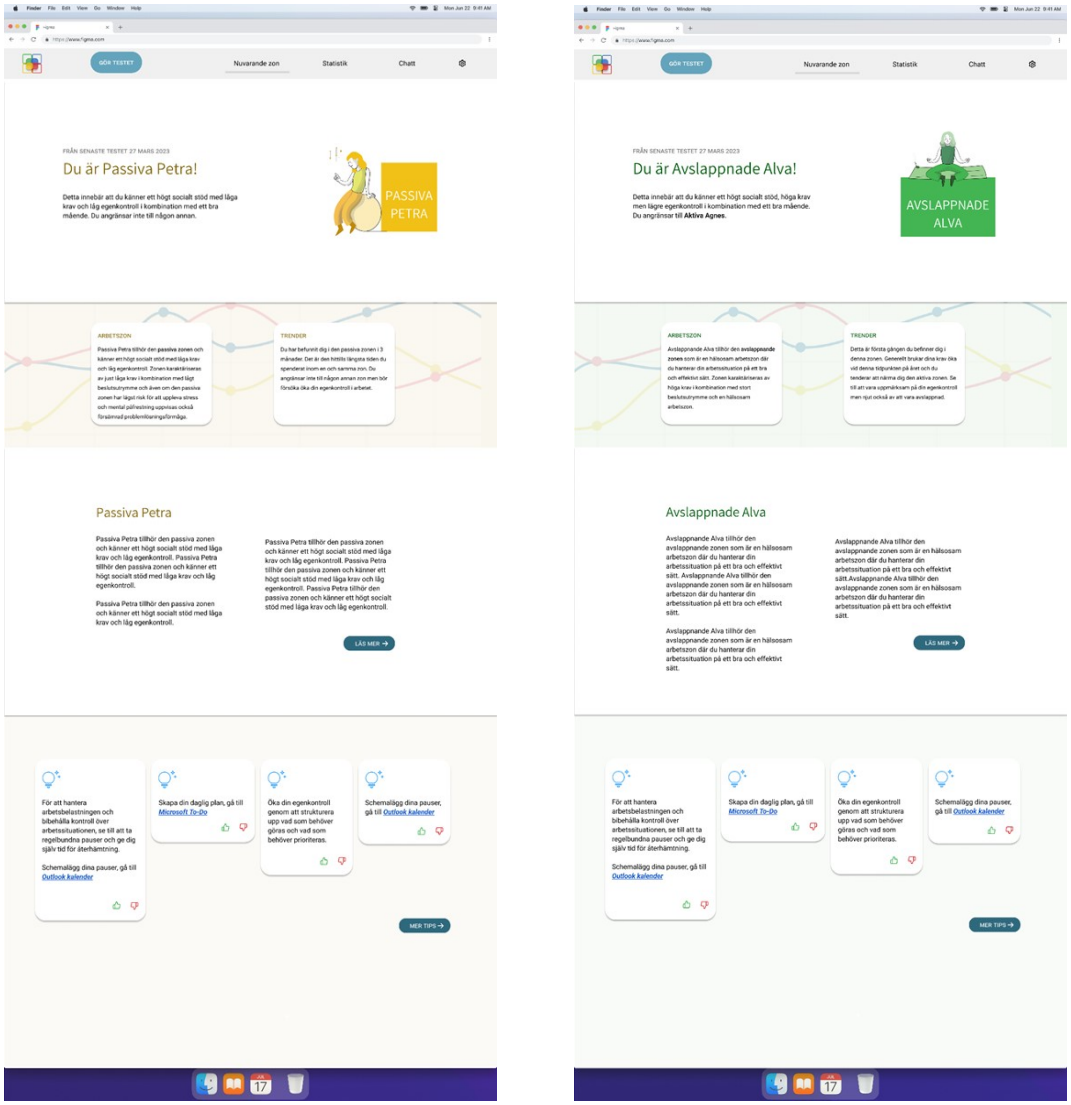


Figure 4.15: Screens of the third and final iteration of the hi-fi prototype. Note that much of the text content is not finalized (mainly applies under "Current Zone") and that the tips have not been developed specifically for personas yet. The figures should visualize the overall prototype, details are not meant to be distinguished.

Figure 4.16: Screens of the third and final iteration of the hi-fi prototype. Note that much of the text content is not finalized (mainly applies under "Current Zone") and that the tips have not been developed specifically for personas yet. The figures should visualize the overall prototype, details are not meant to be distinguished.

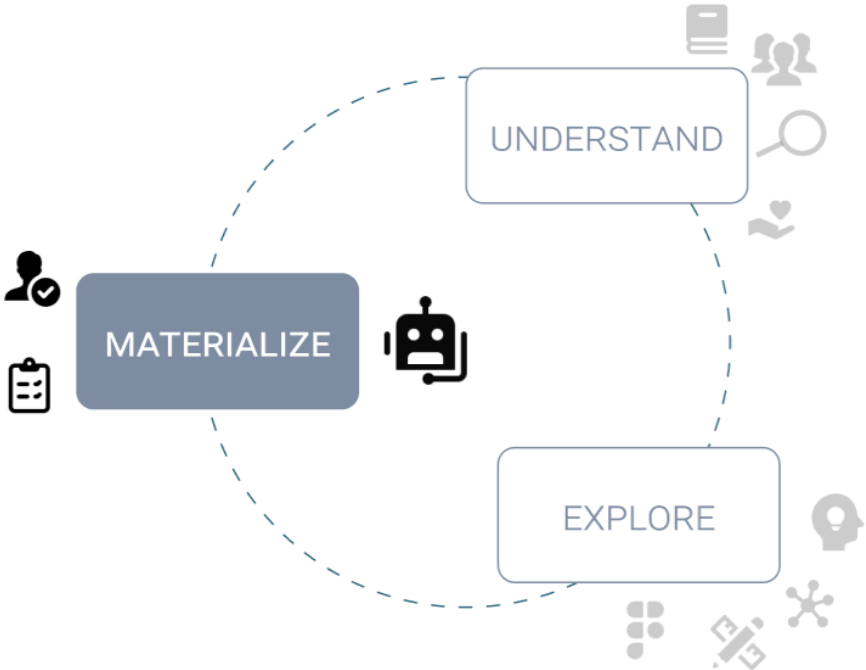
Table 4.3: The third and final iteration of the hi-fi prototype.

Menu	**Change**	**Improvement**
Menu bar	Moving the “Do quiz” button to the left and the rest of the feature to the right	Nudging the user to click on the “Do quiz” button since it stands out
Test	- Full screen when doing quiz - Increased contrast - Icons in progress bar - Not using gray buttons - Text “Good job” when completing the quiz	- Focusing on the quiz - Improved UI and UX - Satisfying (*)
Nuvarande zon (Eng. "Current zone")	- Shorter texts - Putting texts on cards - Increased line spacing	- Increased UI and UX
Statistik (Eng. "Statistics")	- Change of color to red, blue and yellow - Different styles in line charts (circles, triangles and rectangles) - Increase the size of legends - Larger divisions of pie charts	- Increased accessibility - Increased UI and UX

(*) Key findings

Chapter 5
Materialize

This section presents the final phase of the project, where evaluations of the final prototype were made. These included evaluation of the final prototype with users which involved both user observations, SUS, and short interview discussions. The final prototype was also evaluated against the key findings and also with the design guidelines.



5.1 Evaluation of prototype with users

The final evaluation of the hi-fi prototype was done using methods such as user observation, think aloud, SUS questionnaire, and short interview discussions. User observation and usability tests were performed to obtain a whole, detailed, and rich view of the interaction. Another advantage of evaluating in this way was to pay attention to details that have not been noticed earlier which could also evolve the user requirements. The purpose of this observation was to understand the context of task performance [12]. Pilot sessions were run in advance for testing the arrangement of the workshop and improving the experience.

In total, 13 user tests were performed, four of the participants were male and nine were female. Seven of the user tests were held with Prevas employees and six were held with friends and students. The age range was between 23 to 54 years old. The test user was provided three small scenarios to complete in Figma. Notes of the observation were carefully taken during the activity and during the whole activity, the user would also "Think aloud". The scenario began at the "Current zone" screen where the user was told to perform the quiz, send it, and see the results. After being assigned a new current zone, the user was told to explore more about the zone, profile, and targeted advice. Here the user could load more tips if they wanted. Next, the user was told to analyze the historical data and filtering functions. It was desired for the user to navigate to the "Statistics" tab and scroll around the different graph representations of mood, DCS factors, and work zones. The task was to filter away the "support" factor in the line chart of the DCS plot. Next, the user was told how he or she would navigate if wanting to ask a specific question or learn more about something. It was desired that the user would go into the "Chat" tab. Thereafter, the user was told to find out more about the DCS factors, and it was desired for the user to press on the example questions of "Tell me more about the DCS factors".

After completing the scenarios, the user answered the SUS questionnaire, and a short interview discussion with topics regarding the feeling, difficulty, and understanding of the prototype were addressed.

In summary of user observation, think aloud and interviews, the participants went through the scenarios without any major difficulties and experienced the prototype as simple, intuitive, and logical. The participants were very positive about being assigned a persona such as "Aktiva Agnes" partly because it makes the user experience more fun and partly because it feels easier to solve someone else's problem. The "Statistics" tab was the most difficult to comprehend. It consisted of three different graphs with the last one occasionally being described as difficult to interpret. This was due to the fact that all the work zones have not appeared before and thus became difficult to relate to. It was also brought up that the graph visualizing the DCS factors needed a more clear description. However, it was very appreciated to have an AI that provides trend analysis and interprets the three different graphs.

All participants stated that they would be comfortable with using the concept in their work life and that it did not intrude on their private life. It was stated that it was a great tool to create self-reflection. However, one participant indicated that they would be thorough when reading how the data is stored and used. It was also noted that one's trust in the employer

can influence.

The design of the prototype received very good feedback from the participants. It was described as nice and clear and the color coding of the "Current Zone" based on the work zone was appreciated. Having a slide bar in the quiz was preferable but it came as a suggestion to add numbers 1-5 in order to give the user something to relate to. The filter icon and text were easy to find but it was suggested that it should be closer to each graph. Further, the experience would be more satisfying if it was possible to hover over the DCS factors in "Statistics" and get information regarding them instead of having to go to the chat and ask. The "Chat" received positive feedback, the participants had no trouble locating it and thought that the example questions were helpful. However, it was discussed if the chat also should be located in the right bottom corner, where it can always be accessed. A few participants were also curious about if it should be possible to click on the logo in the menu bar and where it would take you.

5.1.1 SUS questionnaire

As a final step of the user evaluation, all of the participants answered the SUS questionnaire, see the compilation of the participants in Figure 5.1. The obtained results were within the acceptance range, which implies sufficient usability of the system. The average SUS score was 87.5, which is above the average SUS score of 68.

The participants were very agreed and concurrent with the following:

- The system is easy to use.
- Not needing the support of a technical person to be able to use the system.
- Imagining that most people would learn to use the system very quickly.

Of the ten questions, the statement with the lowest score among all participants was whether the person would like to use this system frequently. The frequency of use has also been verified earlier in the project which has been taken into account in the prototyping phase.

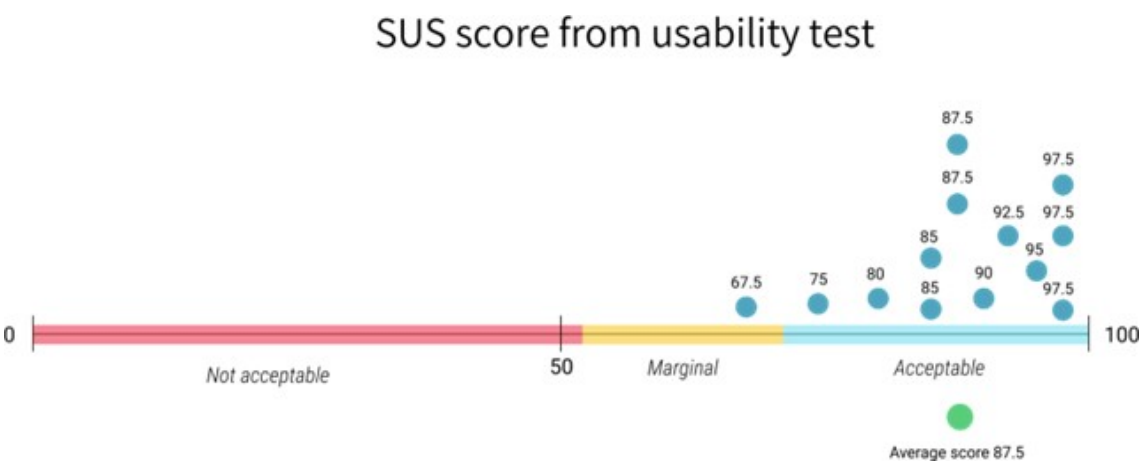


Figure 5.1: SUS score of the final prototype of the participants.

5.2 Evaluation of prototype with key findings

Throughout this project process, the trust in AI, fear of data leakage, and simple and low threshold for use are some of the most difficult challenges to overcome. Hence, a compilation was made of how the final concept fulfills the key findings from the design process. Much of the findings were tested in Section 5.1. Although, due to time and resource constraints, not all findings were evaluated with users and therefore some tendencies of subjectiveness will exist. However, these evaluations can be used to motivate how the final concept meets the key findings.

As viewed in Figure 5.2, the final concept was not aimed to replace human support. Instead, the AI should generate practical advice and suggest that the user seek human support if that ought to be needed. In order to build trust with the user the final concept should provide transparency and e.g. allow the user to not share their data with the employer. At the final evaluation of the prototype with users, all of them stated that they would be comfortable with using the concept and that it did not intrude on their integrity. Regarding the key findings within the design, the concept offered several individualized features and was overall designed to be simple and intuitive. For example, there were filtering functions, the user could choose their own settings, and like and dislike the tips.

Figure 5.2: Evaluation of the final concept and key findings.

5.3 Evaluation of prototype with design guidelines and principles

Design guidelines and design principles have been two central topics to have in mind when prototyping the final concept. Accordingly, evaluations of how the final concept fulfilled and motivated these were made, see Figure 5.3. Initially, guidelines regarding clarity of what the system can do and how well it does it were fulfilled by creating personas representing the specificity based on the quiz. During interaction, contextually relevant information was provided by having different tabs in the menu bar. When wrong, efficient correction was supported by having the possibility to edit answers before sending in the quiz. Over time, remembering recent interactions and learning from user behavior were fulfilled by the statistics page and the advice was based on previous advice. Providing global controls was fulfilled in terms of having the ability to cancel the quiz, choose whenever and the frequency of performing the quiz and decide the settings.

A great focus during the final adjustments when prototyping in Figma was taking into account the Norman design principles. For example, making the buttons clickable, changing color when hovering over objects, having smoothing transitions and the ability to scroll over the page and drag objects, see Figure 5.4-5.7. A compilation of how it fulfills the principles can be seen in Table 5.1.

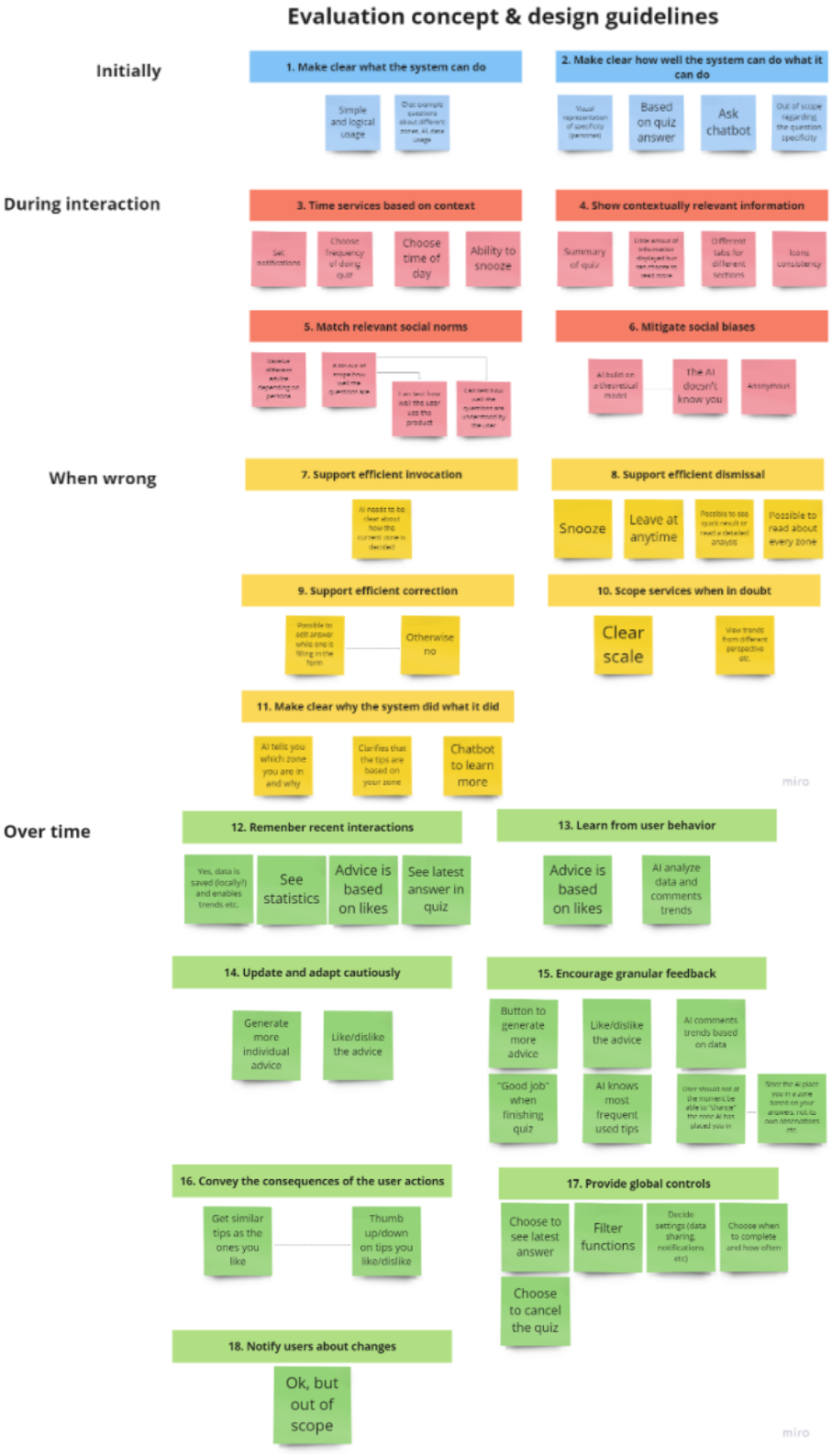


Figure 5.3: Evaluation of the final concept and design guidelines.

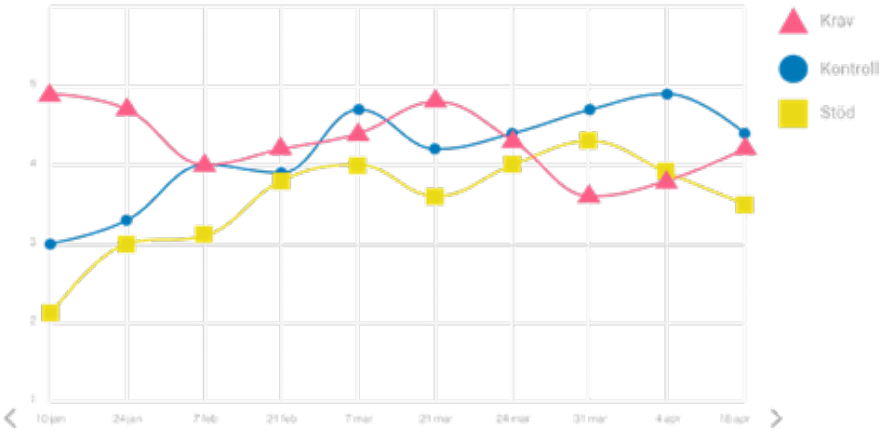


Figure 5.4: Example of visibility: Different colors and symbols for graph representation.

Figure 5.5: Example of visibility and mapping: Progress bar with icons when doing the quiz.

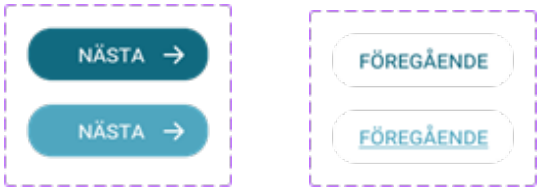


Figure 5.6: Examples of affordance and consistency: Different variants of buttons when hovering. The buttons have the same appearance throughout the prototype.

Figure 5.7: Example of affordance: Slider in the quiz.

Table 5.1: Compilation of final concept and Norman's design principles.

Design principle	Scope in project	Feature in concept
Visibility	The most essential features are visible	- Quiz button is different and larger in the tab bar - Different font size
	Clear where you are	- Underline the current tab to show where you are in the menu bar - Progress bar in the quiz
	Easy to understand and interpret the graphs and charts	Clear color coding and symbols of the plots and consistent choices of colors for the different work zones
Feedback	Receive feedback after every interaction	Scroll, drag and click functions
Constraints	Redundant functions	The pie chart can not be filtered and hence there is no filtering button for that chart.
Mapping	Take advantage of icons	- Arrow on the "Next" and "Send" buttons - Icons on the progress bar - Lamp bulb icon for tips and advice - Robot icon for AI - Cogwheel icon for settings - Thumb up/down icons for like/dislike
Consistency	Similar layout	- Quiz questions have the same layout - All buttons same size and appearances - Close/cancel "x" Button is always in the upper right corner - Chatbot icon both in "Chat" and "Statistics"
Affordance	Clickable buttons	Button and menu bar change color when hovering (nudge to click)
	Slidable slider	Drag the "circle" in the slider

Chapter 6
Discussion

This section discusses the different design phases "Understand", "Explore" and "Materialize" and also limitations as well as future work of the project.

6.1 Understand

In order to perform triangulation to empathize and understand the users, four different data gathering methods were used. Literature study, questionnaire, two interviews and two focus groups. This resulted in a lot of data, both quantitative and qualitative. Even though we are thankful for all the engagement and diversity in the gathered data, even more diversity, more respondents to the questionnaire, more focus groups and more interviews are of course desirable in order to get as representative data as possible. However, given the time constraints for this thesis and the desire to work through the three steps, understand, explore and materialize, we are content with the gathered data and the diversity of the participants.

Before the focus groups, a brainstorming session was held where five different AI concepts were developed. This was to be able to discuss what type of AI was preferable. However, this might have nudged the participants of the focus groups in a certain direction and even though it was possible and preferable to come up with their own idea of a concept, none of the participants did. On the other hand, it was necessary to start creating a discussion around different AI-concepts and what would be preferable in order to continue with the design process.

The data was analyzed in Miro and an affinity diagram was created. An affinity diagram can be created in many different ways. The resulting themes and grouped data are only one interpretation. Thus, other themes and findings could have emerged if another approach had been applied.

6.2 Explore

This phase was by far the most extensive and time-consuming part of the project involving several important steps until reaching the final prototype. In the beginning of this phase, we held a brainstorming session on the three most favorable ideas from the focus groups and decided to merge them into one general concept which covered many of the desired features. This resulted in proceeding with one very wide concept which was successively converged and refined throughout the time period. Another approach could be moving forward and developing two different concepts in parallel. In this way, it would be easier to evaluate the concept against each other with the stakeholder in a more comparable way. However, since we were not fully satisfied with either of the different ideas and concepts, it was preferable to merge the advantages and most favorable features of different concepts and then proceed. With this merged approach, we had all the desired features and functions which could be extended and implemented in many different ways. In other words, fewer limitations were experienced and the focus was on how we could fulfill the key findings from the data analysis.

The hi-fi prototyping phase required more time than expected due to limited experience and knowledge of the prototyping tool Figma. There was a long learning curve and we are very grateful for all the advice, assistance, help and support from our supervisor Moa and the UX team at Prevas in Malmö.

6.3 Materialize

6.3.1 Test evaluations

Since the participants for the final evaluations were Prevas employees and classmates, the responses achieved might be slightly biased, perhaps even too kind and generous. The average SUS score obtained was 87.5, which implies excellent usability and seems almost too good to be true. It would be preferable and interesting to have participants without any prior knowledge to test the prototype to provide a fully objective response. There is a possibility that the testers were given excessive guidance during the testing, which might have made the concept appear as simple and intuitive. Since the prototype was developed very horizontally, exemplifying a very limited amount on each tab without going into detail, the users were given straightforward and simple situations to work with. If the users had been encouraged to explore and understand the concept more on their own, the experience could have been different, and they might have given a lower SUS score.

However, we are very grateful for having the possibility and ability to easily reach out, get support and advice from Prevas employees, which are also the primary users, both locally at the Malmö office and also through the company's different distribution channels. Since Prevas is a quite large consulting company, the employees consist of a variety of gender, ages, expert areas and work fields. Thus, the diversity of the participants throughout the project has been very wide. Furthermore, our classmates have also provided very valuable insight and are in the near future also the primary users. Without them, it would probably be a challenge to reach and perform user tests and receive a good amount of quantitative and qualitative

data and evaluations.

The frequency of use was the area that scored the lowest on the SUS score. Even though it did not score low it has been a recurrent challenge throughout the process to find what motivates the user. It was stated in the questionnaire from the data gathering in Section 3.3 that the user would want to interact with an AI application weekly or monthly and that this interaction should be very short, which served as a foundation when developing the concept. From the user test in Section 4.2.1 the approximately same frequency of use was obtained from the questionnaire the participants answered. It would have been interesting to examine the frequency of use more in depth in the final user test to evaluate if it has remained the same, increased, or decreased. The statement "I think that I would like to use this system frequently" used in the SUS does not define how "frequently" is and can therefore not be directly compared with the earlier results.

According to the final prototype evaluations with key findings and design guidelines, there are some limitations since it was not possible to extensively evaluate all findings and guidelines. For example, one of the key findings was "Work culture matters" which can be interpreted more as an insight but is rather difficult to test. Regarding the design guidelines, there were some objective limitations since the specificity of each guideline could not be tested or did not apply to the scope of the project. For example, learning from user behavior, updating and adapting causally was therefore not tested in the final evaluation. Since the guidelines were quite vague and not concept-specific, it was of greater importance to evaluate the prototype with the key findings even though it was of interest to get an overview of how the final prototype fulfills the design guidelines.

The seven design principles developed by Norman were used continuously during the design phase of the prototypes and were highlighted during evaluation to exemplify features developed according to these principles. While there are many design principles available, the use of Norman's seven principles was particularly beneficial for this project because they were highly applicable and contributed to making the design feel easy and intuitive, which was a priority based on the key findings.

6.3.2 Final concept

With the rapid development of AI and the increasing prevalence of mental health issues, various existing models could potentially be applicable to this thesis. Among these models, the DCS model was chosen as the foundation for the final concept due to its ability to quickly capture three crucial aspects of the psychosocial environment but still not being too personal or breaching user privacy, as highlighted in the key findings in 3.7. Other models, such as those involving the measurement of physiological parameters, were not considered for the final concept based on feedback from the focus group, figure 3.5, which revealed user discomfort and reluctance towards monitoring systems or predictive analytics.

In comparison to similar existing tools like JCQ, which also originates from the DCS model, our concept distinguishes itself in terms of frequency of use, user roles (employee/employer), and the utilization of AI. Our concept offers benefits to both employees and employers,

allowing for individualized frequency of use and providing immediate feedback upon test completion. The AI component generates personalized profiles, offers targeted advice, and provides rapid in-depth data analysis.

Even though the final concept presents numerous benefits and possibilities, there are several important considerations when implementing such tools in a workplace. Firstly, the shift of responsibility for employees' well-being towards the individual can present risks, including dishonesty in test responses and a lack of motivation to use the tool. For instance, employees may be tempted to provide false answers in order to achieve favorable results and avoid revealing when they are feeling stressed. Secondly, it is essential that the company utilizes the collected data for ethical purposes. With this in regard, organizational culture plays a crucial role in ensuring that both individuals and companies can benefit from these tools. As indicated by the literature review, addressing issues of integrity and ethical concerns will pose significant challenges during the development and implementation of this concept. Furthermore, the size of the organization can also pose limitations on the potential use of this concept. In small companies, maintaining anonymity and preserving the integrity of employees may become more challenging.

6.4 Limitations

The development of the final concept is limited in several aspects. First, it has not been tested whether the profile and work zone based on the four questions would agree well and correspond to the user experience of his or her work situation. Accordingly, how well the targeted advice is received and suitable for the individual user is not addressed either. As it was not the focus of the thesis, these aspects were only assumed to be true.

Secondly, the construction of the four short questions was assumed to work well. However, it would be possible to analyze in depth which specific questions are most extensive and suitable and how they would be formulated in the best way, and also address different response formats of these and finally evaluate the time required for completing these. Due to time limitations, it was not as essential to evaluate the question specificity in depth. Even though our four questions are quite general and vague, they cover large areas within different work fields and the users were comfortable in answering them, which was verified multiple times in interviews and questionnaires throughout the process. In comparison with current tools used today, for example JCQ, having a quiz with 36-49 questions and requiring a lot of extra time for completing, our quiz consisting of four short questions could be a preferable alternative and significantly less time-consuming but still cover the same fields. Also, another benefit compared to current work content questionnaires is the immediate feedback generated when completing the quiz.

A third aspect is the difficulty of keeping the user motivated and enjoying the use of the concept. For the individual employer, there is a risk of getting bored in the long run when learning certain patterns and advice but also the lack of response as well as action from the employer would probably result in a decrease of use. Hence, initiatives such as workshops and teambuilding from the management team and employer will certainly be crucial for con-

tinuous improvement of the workplace and job satisfaction at work.

6.5 Future work

The next step would be to implement changes that were noted during the final user testing. It was stated that the slidebar in the quiz should have the numbers 1-5 for reference and that the filter icon should be slightly relocated, which are both easy to implement. It also became evident that the graphs should have more clear descriptions in order for the user to feel confident with what the graphs represent.

Further, more time-consuming, development of the concept involves implementing and testing more features such as how the general compilation of the employees could be presented to the employer, the possibility of saving conversations locally to the user's account and developing more personas.

It has been stated earlier that the concept should be beneficial for both employees and employers. A storyboard was made in order to visualize how employers could make use of the concept, however, it was never developed further into a hi-fi prototype or tested with users. Since this aspect of the concept is still considered important it should be explored in the future.

Saving conversations locally is a feature that could possibly enhance the user experience since it enables the user to look at historical conversations and evaluate already given information instead of asking questions that might have already been answered. Regarding whether the chat should be located only in the menu bar or also in the bottom right corner more user tests would be needed to evaluate if it would be favorable or not due to the fact that none of the testing participants had issues locating it.

Due to time limitations, only four example personas were developed, one for each work zone. To complete the entire concept, 32 personas should be developed and implemented so that one can navigate and read about the four work zones and their respective personas. A possible idea for this could be that when clicking on the logo in the menu bar, the four different work zones and their corresponding personas will appear. This allows the user to create an understanding of the 32 different ones instead of only having the possibility to read about the one in the "Current Zone".

Another future work would be deciding how the concept could be integrated into software, for example in Microsoft Outlook, and how notifications could be presented to the user either through the calendar or e-mail.

Lastly, the concept is AI-based but it is never explored how this type of AI should be implemented. How AI should be programmed was never in the scope of this thesis but in order to make the concept reality, it has to be explored further.

Chapter 7
Conclusion

The final section of this thesis presents the conclusions that have been established during the process. They are intended to answer the questions that were stated in "Purpose and Goals".

AI has found to be a useful and relevant tool in the field of mental illness, with great potential for application in various ways. The literature review identified several areas where AI demonstrated promising potential for evaluating and addressing mental illness. Five different AI-based concepts were developed for this thesis namely, employee monitoring, mental health chatbots, mental health surveys, predictive analytics and optimize/structure work.

In order to know what is needed for humans to confide in AI when using it to prevent and counteract work-related mental illness, one must understand the barriers. While these barriers vary between individuals, our key findings revealed that a majority are concerned about how data is handled, stored, and potentially misused. Additionally, it was emphasized that AI should not replace human support and should be used for more practical problems. 18 design guidelines were found for human-AI interaction that highlighted transparency and clarity towards the user in order to build trust.

Given these considerations and drawing inspiration from the concept of short questions and optimizing/structuring work, a final concept was developed and exemplified that effectively incorporated the DCS model. When evaluated, a high SUS score was obtained and all of the test participants reported that they were comfortable using the system without experiencing privacy issues.

In conclusion, three key aspects should be considered when designing and using AI to prevent and counteract work-related mental illness:

- Understand the differences between AI and humans in terms of capabilities and limitations.

- The organizational culture can influence the level of trust and integrity that users have towards AI.
- Design aspects such as short and simple interaction with an individualized user experience and high transparency.

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Appendices

Appendix A
Questionnaire questions and results

Questionnaire questions:
1. Which gender do you identify with?
2. How old are you?
3. What is your main occupation?
4. How willing are you to try new technology?
5. Which AI applications are you familiar with?
6. How often would you imagine interacting with an AI application that will prevent and counteract mental illness at work?
7. How long do you think this interaction should take?
8. Do you find it easier to open up and confide in an AI or human?
9. Why? (Do you find it easier to open up and trust an AI or human)
10. Are you worried about how AI would handle and use your data?
11. If you chose 4 or 5 on the previous question, what are you worried about?
12. Do you have any other thoughts? Write below

Questionnaire results:
1. Which gender do you identify with?

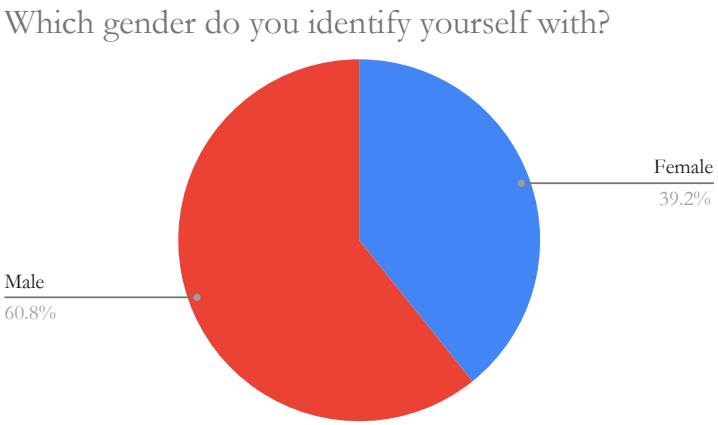

Figure A.1: Gender distribution among the respondents.

2. How old are you?

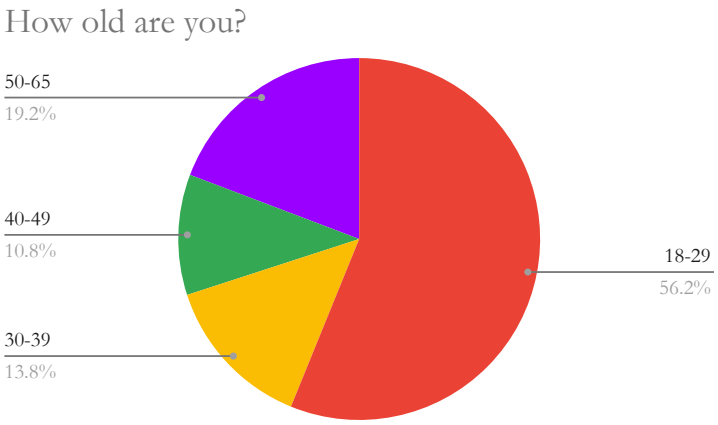

Figure A.2: Age distribution among the respondents.

3. What is your main occupation?

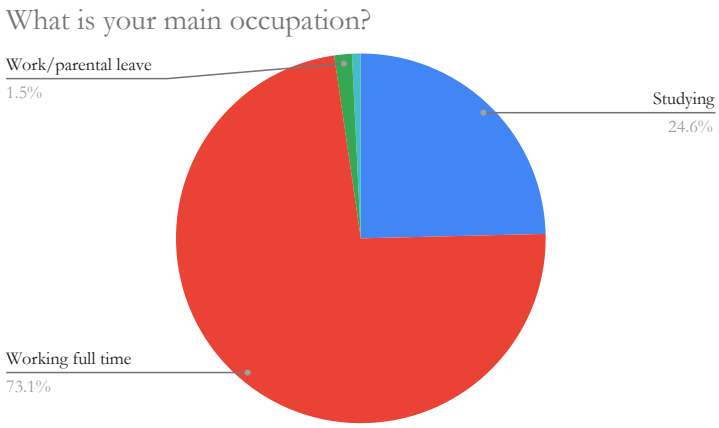

Figure A.3: The main occupation among the respondents.

4. How willing are you to try new technology?

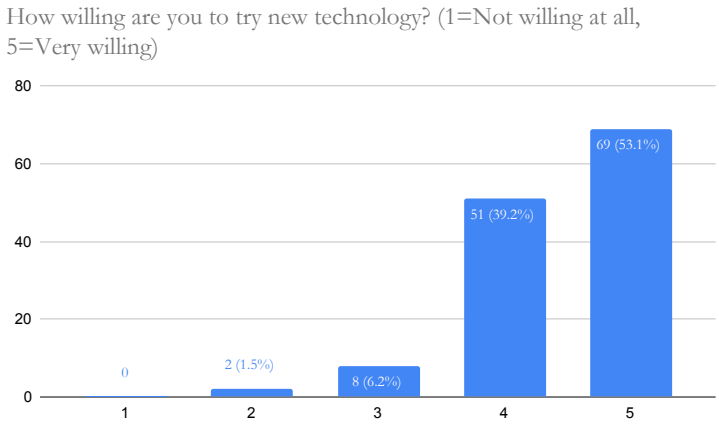

Figure A.4: The willingness to try new technology among the respondents.

5. Which AI applications are you familiar with?

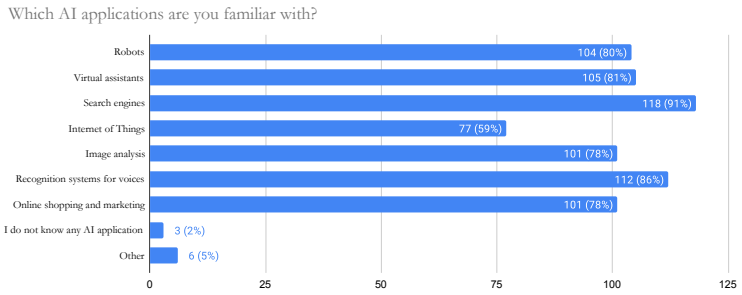

Figure A.5: The AI applications which the respondents are familiar with.

6. How often would you imagine interacting with an AI application that will prevent and counteract mental illness at work?

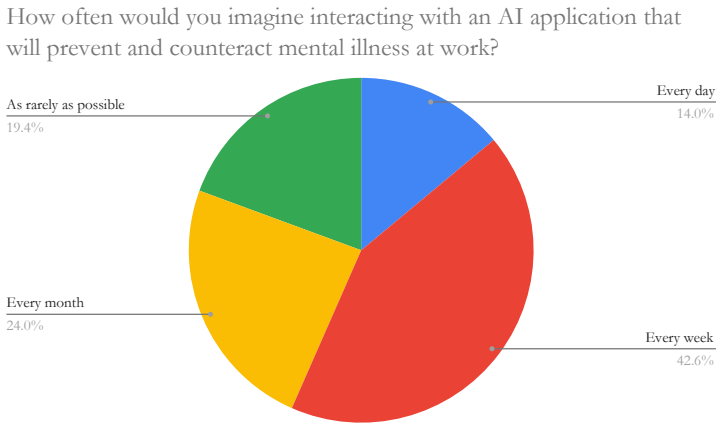

Figure A.6: The frequency of interacting with an AI application among the respondents.

7. How long do you think this interaction should take?

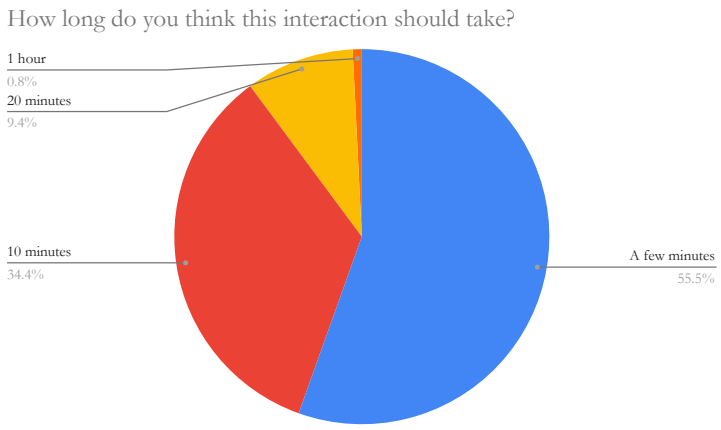

Figure A.7: The interaction time preferred among the respondents. The two options "40 minutes" and ">1 hour" were not selected.

8. Do you find it easier to open up and confide in an AI or human?

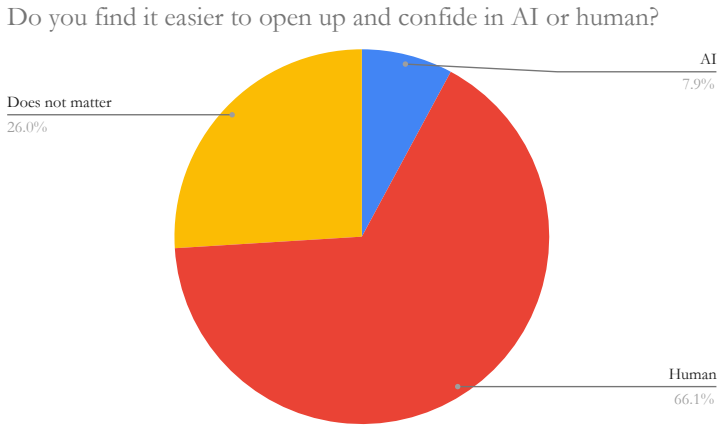

Figure A.8: Responses regarding the respondents' responses to open up and confide in AI or humans.

9. Why? (Easier open up and confide to human)

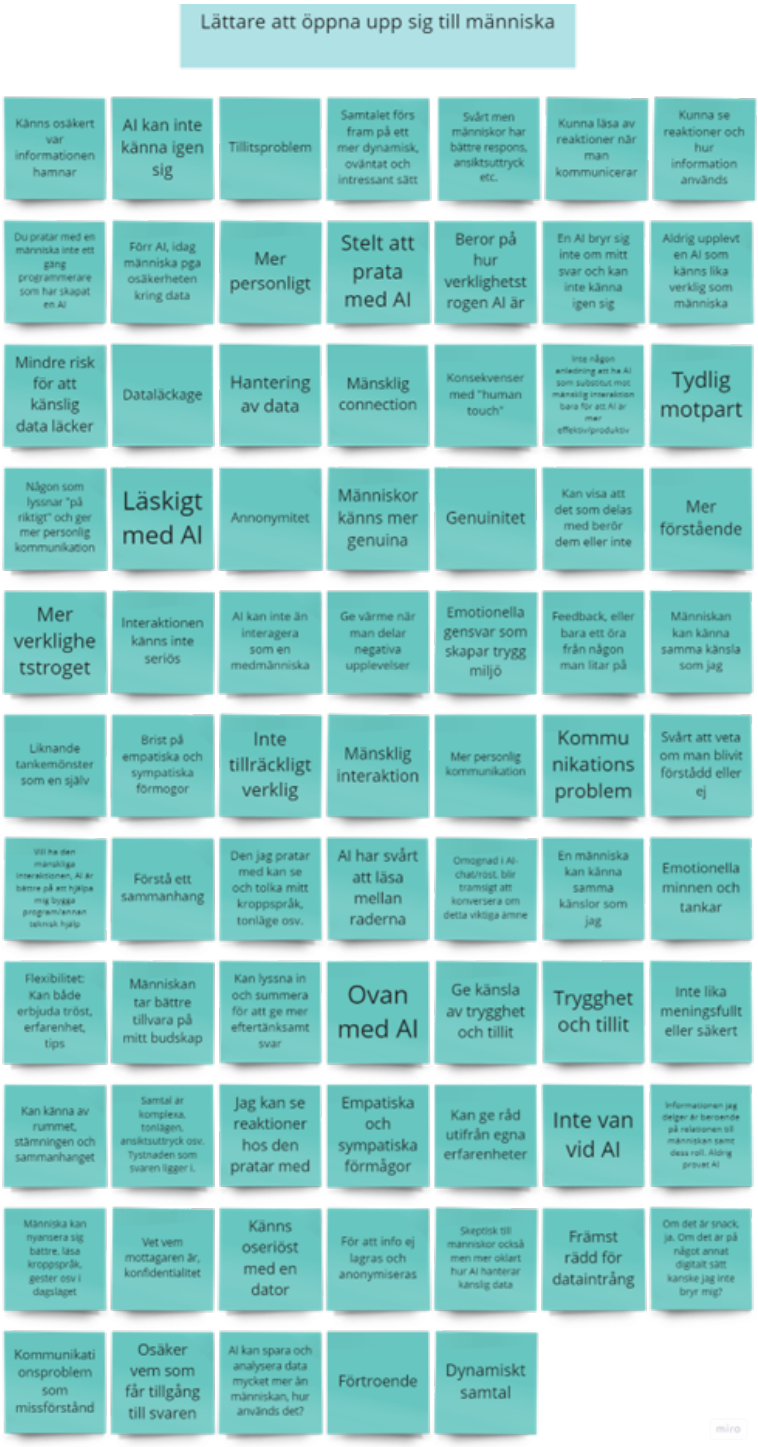

Figure A.9: Free text answers regarding question 8.

9. Why? (Easier open up and confide to AI)

Figure A.10: Free text answers regarding question 8.

10. Are you worried about how AI would handle and use your data?

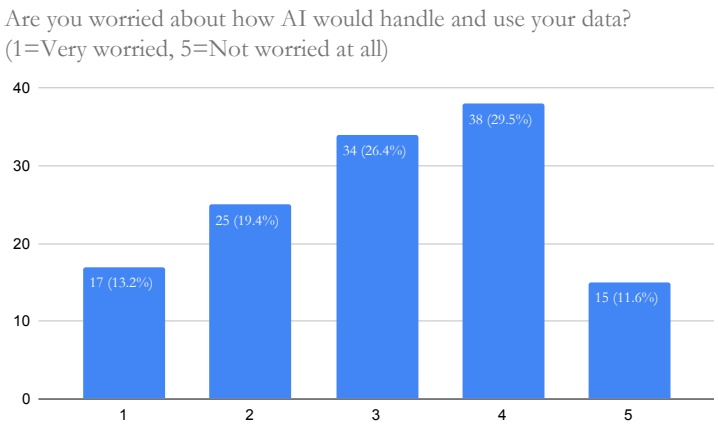

Figure A.11: Responses regarding the respondents' worries about how AI would use the data.

11. If you chose 4 or 5 on the previous question, what are you worried about?

Figure A.12: Free text answers regarding question 10.

12. Do you have any other thoughts? Write below

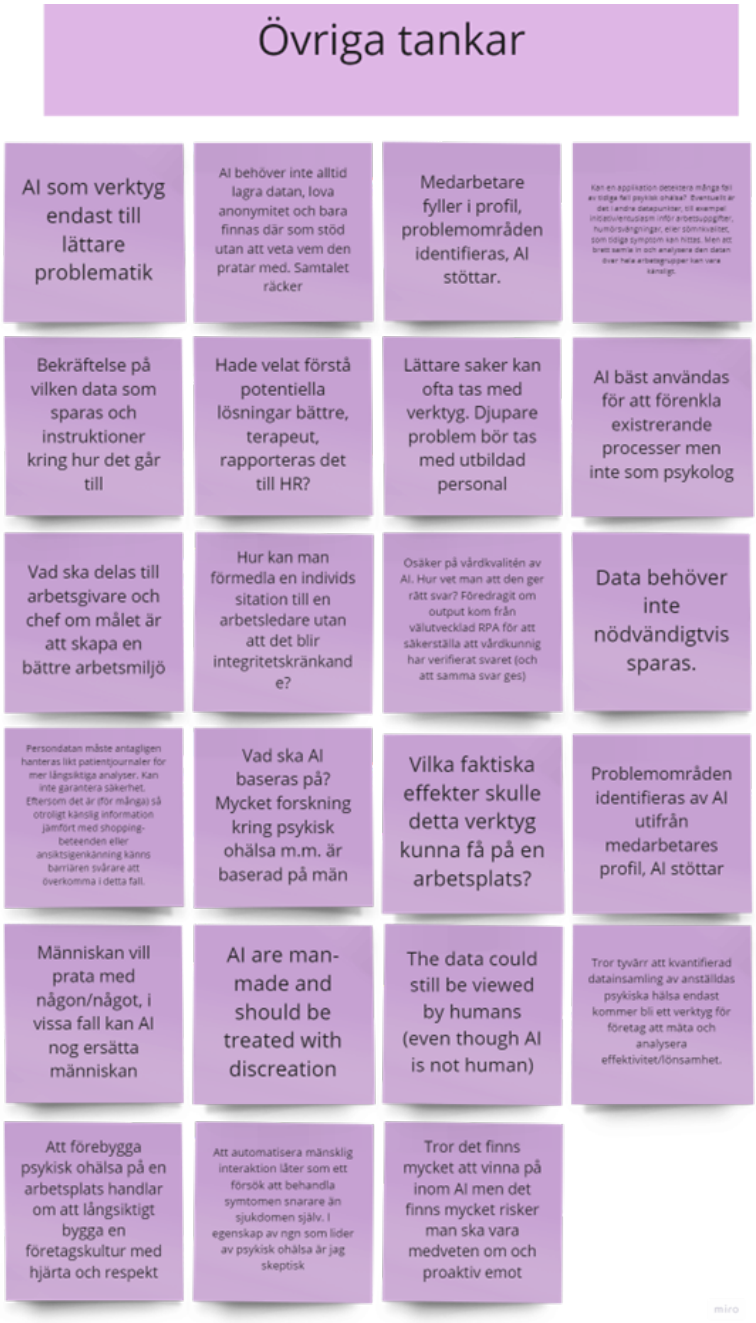

Figure A.13: Free text answers regarding other thoughts.