User-Centred Design for team mood:
The design of a digital dashboard.

Human-Computer Interaction and Design

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Abstract

Work environments are becoming increasingly collaborative, but team management applications typically lack features that focus on the team mood and employees' emotions. The purpose of this thesis is to design a tool that helps employees share their feelings and team managers create a positive work environment.

Current market analysis and emotion theories were identified during an ideation phase. A user-centred design method is used to gather contextual data about the needs of employees at Philips, a large health technology company, design prototypes of a team dashboard for emotions and conduct two user studies to evaluate the prototypes.

Interview and survey results were analysed to find that study participants preferred moving images rather than text to select emotions, were generally favourable toward inputting emotions and had various suggestions about privacy, the importance of face-to-face meetings and new features.

This thesis describes the motivations behind the project, the design of a unique team management solution and potential benefits and advantages of a final system.

Resumen

Los entornos de trabajo son cada vez más colaborativos, pero las aplicaciones de gestión de equipos generalmente carecen de características que se centran en el estado de ánimo del equipo y las emociones de los empleados. El propósito de esta tesis es diseñar una herramienta que ayude a los empleados a compartir sus sentimientos y que los gerentes de equipo creen un ambiente de trabajo positivo.

El análisis de mercado actual y las teorías de la emoción se identificaron durante una fase de ideación. Se utiliza un método de diseño centrado en el usuario para recopilar datos contextuales sobre las necesidades de los empleados en Philips, una gran empresa de tecnología de la salud, diseñar prototipos de un tablero de equipo para las emociones y realizar dos estudios de usuarios para evaluar los prototipos.

Los resultados de la entrevista y la encuesta se analizaron para encontrar que los participantes del estudio preferían imágenes en movimiento en lugar de texto para seleccionar emociones, en general eran favorables para introducir emociones y tenían varias sugerencias sobre la privacidad, la importancia de las reuniones cara a cara y las nuevas características.

Esta tesis describe las motivaciones detrás del proyecto, el diseño de una solución única de gestión de equipo y los posibles beneficios y ventajas de un sistema final.

Gratitude

This project closes one of the stages of my life, showing all the knowledge and skills I obtained in the last two years. During this process, I got the help and support of the people who have accompanied me along this path. Because of this reason, I want to dedicate this page to thank for all the support and help they have given me.

First, I would like to thank my parents and sister, for their guidance and support for all my decisions, since I started this new journey, without their help, this would not be possible. On the other hand, I feel very grateful for all my friends that I made during these years and family that encourage me to give the best of me. Also, I was able to share great moments with all of them, helping to disconnect from the pressure of my studies or job.

During the Eit Master, I got the opportunity to study in two different universities. Due to this reason, I am grateful to Aalto University, the University of Twente and EIT organization for all their support and organization. Finally, thank Jamy Jue Li and Jelte Bijkerk for guiding me during this project and getting the best result from me, also for supporting the idea of this project and allowing it to present it as my final thesis.

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1 Introduction

Digital work environments are becoming increasingly essential and collaborative. While existing work support applications such as Slack may assist with communication, there is still a lack of technologies and solutions that feature emotion capture or reporting. This thesis addresses this opportunity and a new challenge to develop workplace applications that include emotion to the potential benefit of companies' management and employees.

1.1 Research purpose and motivation

The purpose of this thesis is to design a tool that helps a team manager to create a positive work environment and helps employees share their emotions. The motivation for studying the general topic area of team management is its recent popularity in the modern economy [1][2]. As evidence of its popularity, new team management applications and solutions have been developing. Many of the current solutions related to team management focus on improving content communication and showing the status of different processes. However, there is still a lack of solutions that combine team performance with a focus on creating and monitoring emotions in a positive team environment.

Accounting for emotions could be a huge way to improve current systems. A recent corporate study by Google (discussed in [1-4]) shows that team performance has a high dependency on how the team communicates. Past work states the importance of teamwork [5]. This thesis explores whether a solution that combines emotions with team management would have a significant impact on how a team communicates.

This research is also motivated by an educational interest in using technology to analyse and collect people's emotions. Specifically, to learn how to use technology to use people's emotions to improve the team environment and performance. This research will analyse related work in team management applications and go through all the steps of a user-centred design process, to then evaluate the result, a prototype, with employees at a company.

1.2 Research question

This thesis proposes to answer two research questions:

1. How can a team management application help employees share and identify their emotions in a way that the employees feel is suitable and would regularly use?
2. How can a team management application allow team members to indicate and track negative emotions or changes and how could this be useful for a company to help team members improve their performance?

A team management application that addresses these questions may have a positive impact on the work environment and results.

1.3 Industry purpose and motivation

This work was done at the design department in an Amsterdam health technology company for over six months. The first step was to identify the exact context of the project, the problems that need to be solved and the current solutions. The methods to gather this information were contextual inquiry focused on the current situation of the company and its team feedback application, plus online research.

The second step was to do a competitive review to see what exists, and novel solutions could be used by the company and the current market, doing research and comparison between all the current technologies. These steps can help the final result better address the needs of an existing team and identify problems that may be common for different contexts, scenarios or companies.

1.4 Structure of the thesis

The structure of this thesis is divided into six chapters. Chapter two describes the data collected from workplace interviews, a literature review and a review of existing applications. Chapter three describes an overview of the design methodology used for the designs created for the Lo-Fi prototype. Chapter four shows the methods and results of the Lo-Fi study with managers and employees. Chapter five describes an overview of the design methodology used for the designs created for the Hi-Fi prototype. Chapter six shows the methods and results of the Hi-Fi study with managers and employees. Finally, chapter seven is a discussion of the results and conclusion of the overall thesis.

2 Context and related work

This chapter discusses the context of internal challenges and problems faced by a health technology design team and past work or corporate projects that try to solve team management or emotion communication. It is divided into four sections: company context, emotion theory, team management and team management dashboards. It explains the designs as a final section.

2.1 Company context

Method

I observed and participated in the daily working life of a design team at Philips, a multinational health technology company's Amsterdam office. I used an indirect observation process during the weekly meetings where the team had to share their work status and their mood using Mentimeter (https://www.mentimeter.com); it is an online solution that helps to make interactive presentations. I observed 4 sessions of approximately 1 hour each attended by 14-18 members.

I also sent a survey (22 team members participated) on people's opinions about emotions and team management applications (sample questions: "How important is you sharing your emotions or mood in the team?"; "Are you willing to try new methods or applications to measure team mood?" on 5-point Likert scales). The survey is shown in Appendix A.

Finally, I interviewed 4 team members with open-ended questions (e.g., "Would you use an app to share your mood or be able to see the team mood? Why?" "Which is the best way to share your mood at work?"). Please see Appendix C for a list of all questions.

Current practices

At the start of each meeting, all the team members have to upload three words on Mentimeter that represents their state of mind. Figure 1 shows Mentimeter's question interface to upload words and the cloud of words that Mentimeter generates. Anonymously these words are displayed in the screen so people can see the team mood and after that, the manager asks for who wrote specific words that he considers relevant.

Using the app, a second time, the employees can write if they have an announcement to say to the team, show their work status, or ask for advice or recommendations. Additionally, each week the meeting has a central topic so some people can share their work around that topic. An example is the failure week, the teammates share their failures of the last month.

Figure 1 - Mentimeter before and after uploading the words.

Other methods the team used included stickers on a physical dashboard. Also, other options for feedback on team emotions or other topics are annual feedback meetings and the possibility to talk directly to your manager. However, these solutions face a lack of daily emotion or team mood feedback, tight scheduling without room for alternative topics like team mood, require participants to upload slides and lack an interface where managers can follow the team mood history.

Low participation issue

Most of the active participants in the meeting were a group of 4-6 people, while the rest listened, making the distribution of speaking time imbalanced. Also, not all people upload words or participate in a team activity, so making them upload may help avoid low participation in the meeting.

The meetings are only one hour, so not everyone can participate or take the time they need. As a consequence, introverted people will have less interaction during team meetings due to the lack of time. In an interview, an employee highlighted "[as a manager in some meetings, I have the feeling I don't spend enough time with each person.]"[1] (please see Appendices A and C for additional quotes).

Motivation to share issue

People's motivation during the reunion is low and 55% of the team do not like Mentimeter. Therefore, the meeting environment is affected, making people less likely to share their feelings. An employee added: "A Mentimeter does not motivate me to share my emotions or mood".

People do not have the freedom to choose to be anonymous or skip that week the option to share their emotions and have to evaluate their feelings in a particular moment. Some mentioned they preferred "[talking face to face to people I am close to, so I can be more open.]" During a meeting, an employee complained saying: "Why do we always comment the words we put, isn't the platform anonymous?" Nevertheless, 10 (45%) out of 22 respondents said it is important to share emotions.

Notes:

1. Square brackets are used when quotations come from researcher notes during interviews instead of verbatim transcripts.

Issues to using existing mood management applications

The team currently has a significant interest in getting a solution that combines team emotions and organization. However, the company has limitations on the use of external software or tools because of internal regulations.

Given that the obtained data in an emotion-tracking application are the emotions of their employees, any data collected would face strict data management restrictions under the company policy. Additionally, all external applications have to be approved by Philips, sign a contract with the company and meet data security regulations. Similarly, the team faces a significant restriction on using existing online and cloud solutions for mood communication. Due to security and data privacy, the team cannot access via the company network online applications such as Google cloud services. Taking into account all the previous information is harder to implement some of the current market solutions in the team.

2.2 Literature review on emotions

This section reviews emotions and different ways to organize and understand emotions. This review can help assess how an application can obtain team emotional sentiment and how emotion interpretations can be made by the software.

Emotion definitions and importance

A common use of the terms emotions, feelings and moods may not match or differentiate between their definitions [6][7]. The following definitions can help specify an application’s focus:

- **Emotions:** Normally quite short-lived, but intense. Emotions are also likely to have a definite and identifiable cause. [6]
- **Mood:** Usually much milder than an emotion, but longer-lasting. In many cases, it can be difficult to identify the specific cause of a mood. [8]
- **Feelings:** Combination of an emotional experience with a physical sensation. [9]

A consumer research company CEO writes that “psychology and neuroscience recognize an emotion as one of the, if not the primary drivers of human behaviour” [10]. Another public website states emotions exist because they serve an adaptive role and understanding the emotions of other people plays a crucial role in people’s actions [9]. Emotion researchers state that emotions are the reflection of what people have learned from external stimuli evaluated as positive or negative [11] [12]. This evaluation process repeats generating hundreds of emotions in a day, affecting our mood. Behavioural development researchers [11] found children can learn emotions in faces by categorizing pleasure or arousal stimuli, showing that emotions are important in child development.

Primary emotions and dimensions

One of the most famous past works on primary emotions is by Paul Ekman. In his study, he identified six primary facial emotions that can be universally recognized. These six emotions are anger, disgust, fear, happiness, sadness and surprise [13]. His study also suggests that face to face interaction gives more detail of the emotion of the other person than a remote survey without face contact.

The identification of primary emotions set the foundation for future investigations that seek to classify complex emotions and better understand the range of human emotions. One of these investigations is by Robert Plutchik, who uses the primary emotions to construct other emotions people can have [14][15].

He identifies eight primary emotions with three different intensities, then constructs additional emotions from the combination of the primary emotions (Table 1). Another main point of the study is the division of the primary emotions into two categories, half of them positive and the other half negative as represented by an emotion wheel [15].

Other researchers have developed alternative emotion wheels such as the Geneva Emotion Wheel [16] that uses 20 emotions to measure emotional reactions to events, objects, and situations. These emotion theories extend primary emotions using a dimensional approach to add intensity and range

Primary emotion combination

Joy	Trust	Trust	Fear	Fear	Surprise	Surprise	Sadness
Love		Submission		Alarm		Disappointment	
Sadness	Disgust	Disgust	Anger	Anger	Anticipation	Anticipation	Joy
Remorse		Contempt		Aggression		Optimism	

Secondary emotion combination

Joy	Fear	Trust	Surprise	Fear	Sadness	Surprise	Disgust
Guilt		Curiosity		Despair		Unbelief	
Sadness	Anger	Disgust	Anticipation	Anger	Joy	Anticipation	Trust
Envy		Cynicism		Pride		Fatalism	

Tertiary emotion combination

Joy	Surprise	Trust	Sadness	Fear	Disgust	Surprise	Anger
Delight		Sentimentality		Shame		Outrage	
Sadness	Anticipation	Disgust	Joy	Anger	Trust	Anticipation	Fear
Pessimism		Morbidness		Dominance		Anxiety	

Table 1 - Robert Plutchik emotions combination.

Other theories of emotions

Some past works categorize emotion into responsive elements rather than dimensions. For example, Cherry et al. [6] note that an emotion experience has three key elements: the subjective experience, the physiological response, and the behavioural response. Other past work categorizes the theories of emotions themselves.

One author [9] identifies three categories of theories of emotion: Physiological theories, Neurological theories, and Cognitive theories [9]. The first category explains that feelings come from a physical stimulus, the second category describes how our brain leads to emotional responses, and the third explains that feelings come from our thoughts.

Sentiment & Emotion Analysis Methods

Sentiment or emotions analysis methods can help record the feelings and emotions of team members. Sentiment analysis is defined as analyzing someone's opinion or view of a piece of content or an item, whereas emotion analysis is assessing a stronger and deeper feeling based on the person's mood. Usually sentiment analysis outputs positive or negative valence only, whereas emotion analysis can output a wider range (e.g., disgust).

Currently, there are a large number of studies and techniques that try to obtain the best result in measuring people's emotions. Table 2 shows potential methods that could be used by a software application to measure team mood, collected from an emotion analytics company's blog [10].

Method	Description
Implicit association	Detect a person's subconscious and automatic emotions using fast reaction time or priming
Metaphor elicitation	Measure conscious and unconscious thoughts by writing or speaking about it metaphorically
Projective tests	Person interprets words or images (e.g., Rorschach Inkblots) to measure their unconscious emotional response
Text analytics	Translating unstructured text into quantitative data to uncover emotional value
Self-report survey	Respondents read the question and select a response by themselves without interference.to indicate their emotion

Table 2 – Techniques to capture people's emotions.

Although these methods let us measure emotions, my final application also needs to determine what categories of emotion to capture. An emotion analytics company recommends first to define the level of emotion to capture [17] and then apply a specific theory of emotion that defines their nature [18][8]. They write, "Clarifying these issues will direct selection of the most appropriate ways to measure emotion". [10]

Past methods that combine human-computer interaction (HCI) with emotions are referenced by Crane et al. [19], who suggests researchers workshop the topic.

Self-report emotion measurement tools

An interesting method that tries to measure people's emotions in a quantitative and qualitative approach is Desmet's Product Emotion Measurement Tool known as PreMo [21]. Desmet describes the process to measure specific emotions for product evaluation purposes and evaluate the emotional impact on users. Laurens and Desmet [20] further developed 14 animated characters to represent each emotion, shown in Figure 2.

Seven of the animated illustrations represent a positive emotion, like joy or attraction, and the other seven a negative emotion, like sadness or fear. PreMo tries to help people identify themselves with the pictures and give a more reliable answer. It is a clear example of a tool to measure and visualize people's emotions.

Figure 2 - PreMo 14 animated characters [20].

A similar visual tool for capturing emotion is Betella and Verschure's Self-Assessment Manikin (SAM) [22][23]. Figure 3 shows an example of SAM implemented in a questionnaire, where the user has to choose one of the pictures in each row. The images try to help the user identify with the emotion and at the same time, represents the intensity of that emotion, helping to have more qualitative data and a better experience for the user.

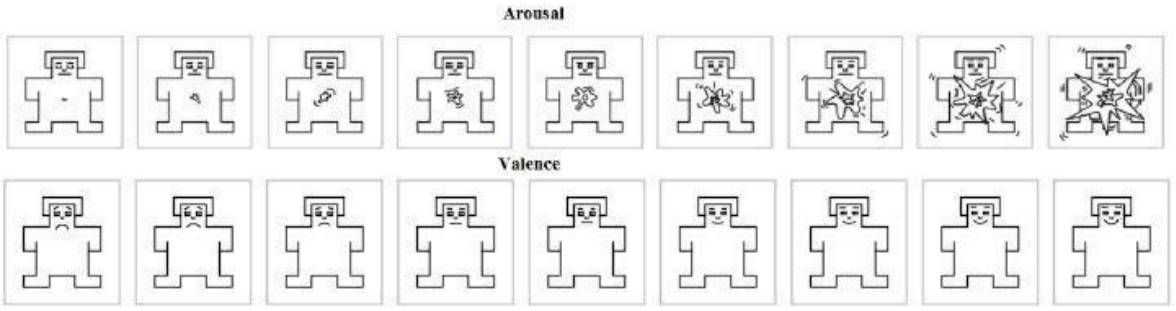


Figure 3 - Self-assessment Manikin (SAM) 2 emotions example [22].

2.3 Managing teams

This third section will focus on the management of team responsibilities and evaluations of team outcomes.

Team performance and emotions

In the last decade, how teams organize and manage has been a hot topic with a considerable number of studies, knowledge sources and articles. A notable study is Google's Project Aristotle [1][4], which is a two-year study related to the performance and management of 180 teams inside the corporation. The initial hypothesis of the study was that the main conditions for team development were previous relationship and process management.

However, the study concluded that team development depends on the balance of two main conditions: the team psychological safety and emotional intelligence of each team member. Psychological safety signifies that the employees inside a company can be themselves, without the fear of negative consequences [24][25]. While emotional intelligence means the ability people have to understand the feelings of other people and control their own emotions [26]. Project Aristotle argues that these conditions can help a team perform better.

A book based on Project Aristotle argues that achieving the two conditions is not enough to guarantee a change in the performance of a team [3]. The authors discuss the team must establish common goals and combine motivations with an open environment, to develop a "learning zone" [3]. These new conditions not only improve team performance also improve team energy.

Team performance collaboration, stress and sharing

To be able to manage and evaluate team performance, a company's management needs to define a standard to measure team performance. Past work found the entire team should participate during the process to define such a standard [27], to guarantee that the team members understand and agree with the process. This group process is crucial to improve management feedback, avoid frustration and reduce stress [27]. The study also recommends the creation of personal and team goals.

Unfortunately, adding team performance management methods to a team can bring additional problems. Past work by Ellis shows that such methods can wreck team performance due to the stress it can generate on the team [9]. Creating goals and deadlines generate time pressure that can increase psychological arousal and stress [28]. Companies that use team management methods can, therefore, benefit from also managing team stress or state of mind to improve team performance.

Another method to measure and improve team performance is sharing and communicating the status of each person's work with the rest of the team. As an example, Mesmer-Magnus and Dechurch found that open and high uniqueness organizations have better team performance, as is represented in Figure 4 [29]. Similarly, "individuals who are open to a broad array of experiences, ideas, and opinions and people who are naturally emotionally stable are ideally suited to foster the benefits of task conflict in teams" [30]. Being able to communicate freely and discuss with the team helps to solve project difficulties and generate new ideas.

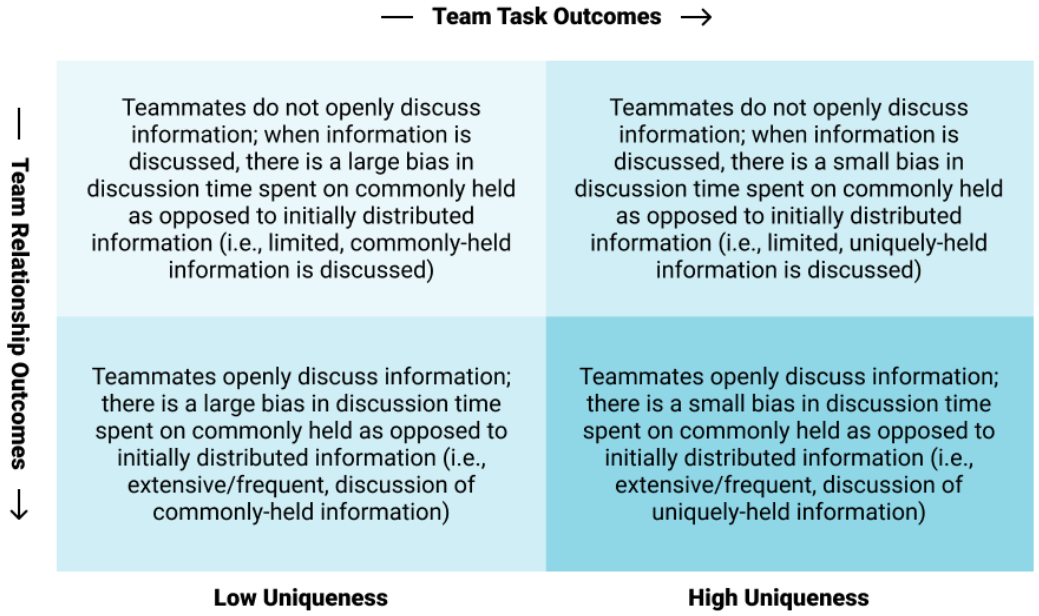


Figure 4 - Two-dimensional typology of team information sharing and team task outcomes.

However, a company where people share their work status could also generate new conflicts, for example, when people disagree or criticize others' work statuses. A meta-analysis by De Dreu and Weingart explained that teammates satisfaction and performance are negatively correlated with task and relationship conflicts inside a team [31]. Thus, the impact of work status sharing on performance may depend on how and what people share.

What and how to share within teams

Team managers should foster an open environment but also control internal disagreements. A potential solution is to implement cross-training, "described as an instructional strategy in which each team member learns the duties of his or her teammates" [32][33]. With this technique, each teammate knows each other better, reducing the number of conflicts inside the team. Another solution is to focus on positive emotions because "positive emotions lead to improved conflict management" as Barsade explains [32].

2.4 Dashboards

This fourth section is related to past work on how team management information is displayed on dashboards. This past work can inform how the thesis' proposed solution can develop the display elements of a dashboard to improve team performance. The final user interface needs to take into consideration two main cases: gathering user information and the representation of the information.

Strategies to gather and display emotions on dashboards

For information display, general dashboard design principles suggest content and colour are important. Past studies suggest red, for example, is associated with danger of failure [30]. A study by Elliot et al. [34] also shows how colour can have an impact on the performance of the people. Colour is associated with emotion, as shown by emotion wheels' [15][16] use of colour. Likewise, Craen et al. [35] found that "colour psychology" can have a big impact on people's perception of actions. One operationalization of colour psychology is from the website Verywell.com [36], shown in Table 3.

Colours psychology

Black	White	Red	Blue	Green
Positive: Efficiency, sophistication, glamour, security, emotional safety, substance. **Negative:** Oppression, coldness, menace, heaviness.	**Positive:** Hygiene, sterility, clarity, purity, cleanness, simplicity, sophistication, efficiency. **Negative:** Sterility, coldness, barriers, unfriendliness, elitism.	**Positive:** Physical courage, strength, warmth, energy, basic survival, 'fight or flight', stimulation, masculinity, excitement. **Negative**: Defiance, aggression, visual impact, strain.	**Positive:** Trust, intelligence, communication, efficiency, serenity, duty, logic, coolness, reflection, calm. **Negative:** Coldness, aloofness, lack of emotion, unfriendliness.	**Positive:** Harmony, balance, refreshment, universal love, rest, restoration, reassurance, environmental awareness, equilibrium, peace. **Negative:** Boredom, stagnation, blandness, enervation.

Yellow	Purple	Brown	Orange	Pink
Positive: Optimism, confidence, self-esteem, extraversion, emotional strength, friendliness, creativity. **Negative:** Irrational, fear, emotional fragility, depression, anxiety, suicide.	**Positive:** Spiritual awareness, containment, vision, luxury, authenticity, truth, quality. **Negative:** Introversion, decadence, suppression, inferiority.	**Positive:** Seriousness, warmth, Nature, earthiness, reliability, support. **Negative:** Lack of humour, heaviness, lack of sophistication.	**Positive:** Physical comfort, food, warmth, security, sensuality, passion, abundance, fun. **Negative:** Deprivation, frustration, frivolity, immaturity.	**Positive:** Physical tranquillity, nurture, warmth, femininity, love, sexuality, the survival of the species. **Negative:** Inhibition, emotional claustrophobia, emasculation, physical weakness.

Table 3 - Primary colours psychology [35].

Past mood dashboards for team management

A company team dashboard to capture mood or emotion information is a new field of study, so the number of projects related to this is limited. Fortunately, the number of projects is increasing for the last few years, and there are studies very similar to this project. I was inspired by these solutions' use of a line chart of sentiment valence vs time and an area plot of emotions (on a spider chart) [37] as well as how differently coloured icons can be used to represent emotions [7].

One of the most relevant papers is work done by Vivian et al. [37], who developed a dashboard tool for visualising online teamwork discussions. The project considered the emotions and internal interaction of the team by implementing text sentiment analysis, used techniques for interface visualisation and discussed the benefits for managers. Another relevant work is the master thesis from Anna Wiederkehr, who designed an application to record emotions, and people can reflect on their sentiments. As she describes, "the aim is to provide a channel for a user to engage in and reflect on their emotion experiences" [7]. Wiederkehr details the implementation of the emotions and techniques to generate a new visual vocabulary.

Market solutions

Current market solutions for team management and/or emotion capture are shown in Table 4, to get inspiration from other ideas and find their pain points and advantages.

Application	Advantage
Jira	Jira offers an online platform that lets the team manage and design their workflows.
MOODBIT	Moodbit offers an online mood tracker that applies AI to predict team mood and helps the manager.
monday.com	Monday offers many customization possibilities and has great integration with other applications.
TEAM MOOD	Team Mood offers a simple and visual online platform that supports the manager to view the team mood, guaranteeing anonymity.
slack	Slack offers an online channel for team communication that gives the option to add extensions that add more value to the platform.
Mentimeter	Mentimeter offers an anonymous online survey easy to share at any presentation, showing the data on real-time.
Microsoft Teams	Microsoft teams offer a well-known platform that facilitates its implementation and has a high integration on the Microsoft platform. Also, the platform offers the possibilities to create automated actions.
ADOREBOARD	Adoreboard is an emotion analytics platform that turns text data from customer and employee feedback into business answers.
Polly	Polly is an online chatbot that helps teams that have to handle remote work. The solution let the team create pools in Slack or Microsoft teams, have interactive games and tools to manage the team mood.

Table 4 - Market solutions for team or emotion management currently available.

One notable existing solution is Adoreboard [38], a software that uses customer and employee feedback to analyse and measure their emotions automatically. The company says its product "measures and improves Human Experience (HX) by using Emotion AI to unify the experiences felt by both employees and customers." [22] Adoreboard's automated emotion analytic tool brings a great proposition to the market. Still, it may have some limitations for employees to input their emotion, due to the unreliability of only using text analytics.

Also, Philips is limited to use only the output given by the application, and does not have access to the raw data stored on the servers of another company. Additionally, to these two limitations, the current solutions use traditional and mechanical surveys to obtain employees emotions. This kind of questionnaire makes employees feel less motivated to answer or give an imprecise response on how they are feeling.

3 Lo-Fi Design

Method

From the collected information related to the previous works, I collected ideas and points; and conducted ideation exercises, including affinity mapping [39], personas (Table 5) and customer journeys (Appendix D and E) to collate main ideas and brainstorm solutions for the team emotion dashboard. I followed user-centered design (Roth [23]; Geissdoerfer [40]) and showed concepts with an expert user prior to the Lo-Fi usability testing.

Three created personas summary
Naima (38 years old) team manager from the design department. The main concern for Naime: "Wants to know better the employees".
John (33 years old) employee from the design department. The main concern for John: "He works in several teams, so he doesn't have time to know the people well."
Manuel (25 years old) Intern from the design department. The main concern for Manuel: "He does not have time to meet all the people of the team, so he feels disconnected from the team."

Table 5 - Extent that the personas affected the design (Appendix D)

Design Ideas

Five design features resulted from the affinity map ideation exercise done at the beginning of the project (Appendix F):

1. A real-time interactive dashboard that shows team members' mood
2. A personal, subjective, quick emotion survey that lets people choose how to share

3. Manager can see participation and employee emotions, including history
4. The tool shows project management information about tasks
5. Attention-grabbing features such as gamification or social media qualities

Initial design concepts discussed with an expert user (manager) are shown in Figure 5 (a design to display team emotions, employees are represented with a letter, displaying real-time data and using colours to display their feelings) and Figure 6 (a display for an employee to enter his or her emotion, using a spider-plot to display employees and team mood). The display to enter emotion was based on the theories of the Emotion Wheel [16] and the Six Facial Expression of emotions [11]. Each of the six facial expressions has a representation with one icon and colour, with the colour determined by the Emotion Wheel.

By using the colours, emotions could be perceived as something more personal and subjective, making people feel less evaluated than picking emotions with numbers or words. Using icons could help to identify the feelings faster and naturally, creating a more user-friendly interface.

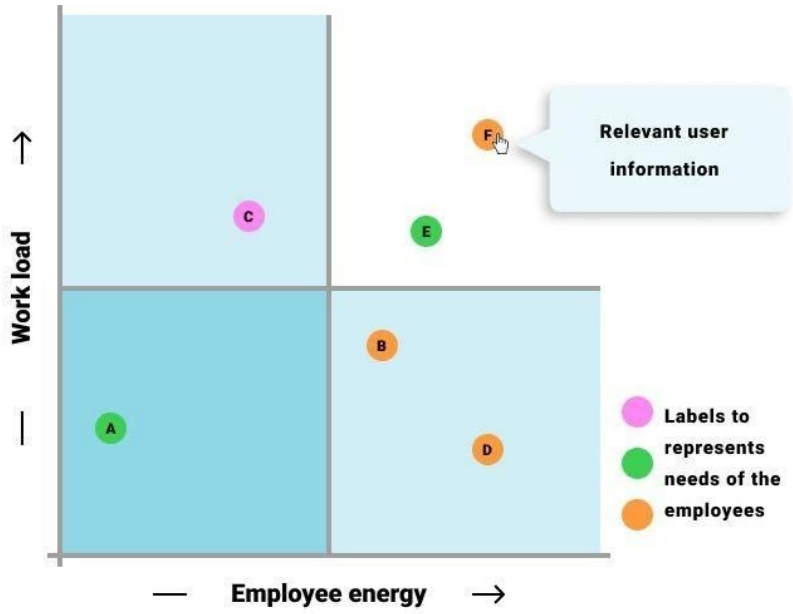


Figure 5 - First interface and interaction concept design

Figure 6 - Six facial expressions concept.

Low-fi Prototype

Low-fi prototype screens were developed in FramerX, designing two different concepts and evaluating two different approaches. The low-fi prototype aims to gather feedback related to general user experience [41][42]. Information architecture wireframes (Figure 5) were made for three key functions in the application for displaying and gathering emotion data:

- **Mood board:** Showing the team mood to help management and for team motivation (Figure 7).
- **User mood:** The user mood will help the employees and team to understand better their feelings and each other (Figure 8).
- **Survey:** The daily employee emotion questionnaire has to guarantee the accuracy of collecting emotion data and be user friendly (Figure 9).

Figure 7 - Mood board from prototype A and B (Complete wireframes in Appendix H.)

The images of Figure 7 show the employees in three groups, that represent employees with the same labels, with different emotions represented by colours (colour not shown). This approach may help the manager check the team mood. By applying colour theory to the circles and combining the labels, the user interface attempts to make understanding visualization of team emotion as fast as possible.

Figure 8 - User mood from prototype A and B (Complete wireframes in Appendix H.)

The images of Figure 8 show the employee mood profile that represents the history of his answers and development. This screen may help the employee to check his/her mood and compare with the rest of the team, by using the time-plot that represents their mood evolution. By understanding the personal and the team mood, helps to create a better environment in the company and understand each other better.

Figure 9 - Survey design from prototype A and B (Complete wireframes in Appendix H.)

The images of Figure 9 show the two different survey designs to compare in the testing process. Prototype A (left) is a more mechanical and traditional interface, while Prototype B (right) is a more dynamic and unusual interface.

4 Study 1: Lo-Fi user evaluation

The purpose of going through user testing is to validate the concept of the designed idea, plus possible design variations, to come up with a final design. This section will describe the method and results obtained during Study 1, consisting of a user evaluation of the low fidelity prototype.

4.1 Method for Study 1

The objective of this study is to validate two different low fidelity concepts with users to evaluate their preference. Results are used to motivate the design of the high fidelity prototype.

Participants

In the text participated eight employees of a design team from a large Netherlands organization, Philips office based in Amsterdam. To guarantee data privacy, personal information from each participant is limited. One of the participants was a manager, two interns and the rest employees from the same team.

Design

Prototype A will represent all the information concentrated at the left part of the screen, making most of the interface clean and helping the user to focus on the team dashboard. This sidebar may help use the application on tablets to make the interaction static and faster. This prototype is more traditional. Please see Table 5 for sample screenshots and Appendix I for the complete wireframes.

Prototype B will represent information such as filters and labels at all sides of the interface and will include photos, icons and slider bars rather than labelled emotion buttons and numeric buttons. This prototype is designed to be playful and interactive to make the user more engaged or entertained. This prototype is more subjective in its interpretation, letting the user answer using photos and layout. Please see Table 6, Table 7, and Appendix I.

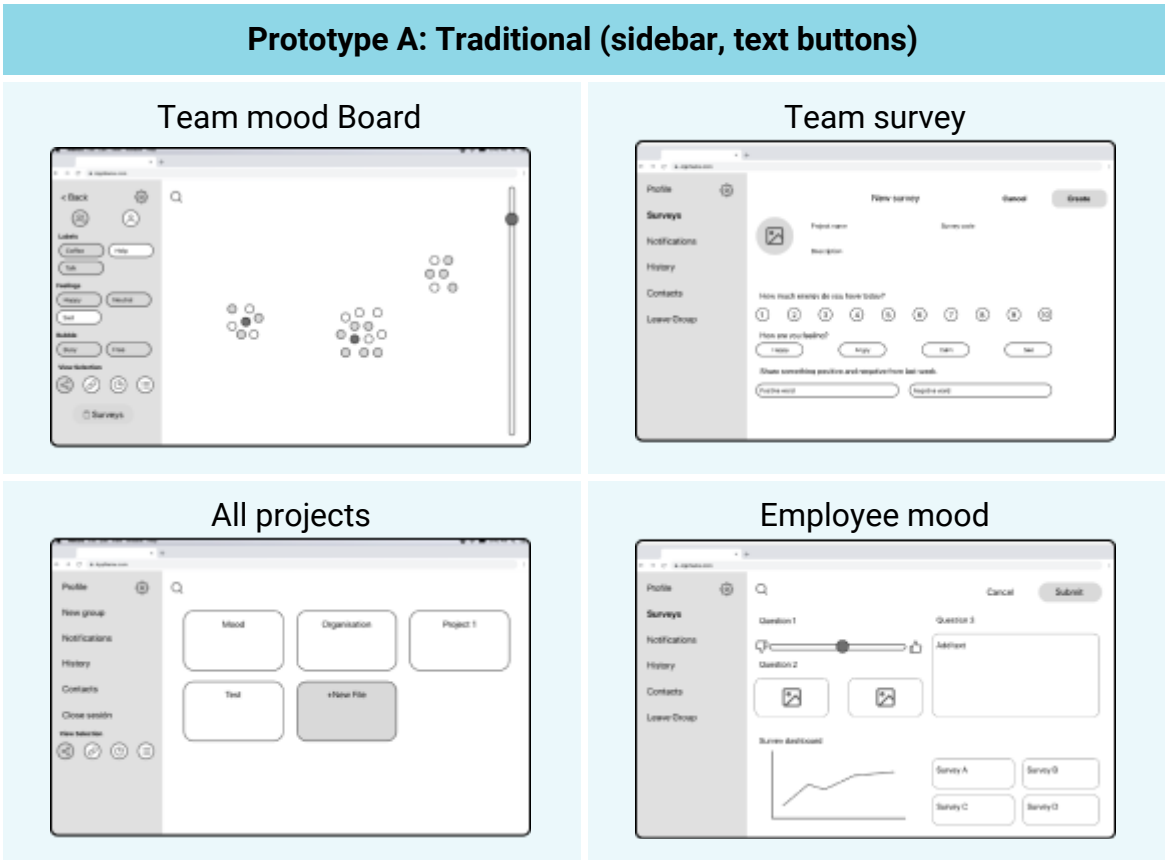


Table 6 - Low-Fidelity prototype A (traditional with sidebar and text buttons).

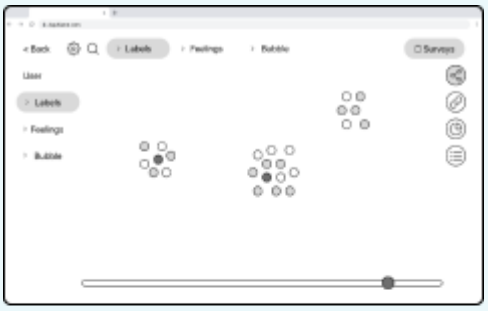
Prototype B: Playful (multiple areas, photo buttons and sliders)	
Team mood Board 	Team survey 
All projects 	Employee mood 

Table 7 - prototype B (playful with distributed UI elements and photo buttons).

Procedure

Due to the conditions of working from home and social distancing, all the interviews had to be done by video call using Microsoft Teams, and the abridged time spent was around 45 min per test. The experimenter focused on making sure that the user feels comfortable all the time (not exclusively interested in collecting data). To facilitate an online interview, each participant had a link to the questionnaire and the prototypes. Each participant was asked to use a speak-aloud protocol during the test. The five steps of the testing process were the following:

1. Navigate on the interface of the prototype and get inside the survey to answer it. In this case, half of the participants start with prototype A and the other half with B.
2. Inside the survey, fill it in and submit their response.
3. Change to the other prototype and repeat task 1 (navigate on the interface of the prototype and get inside the survey to answer it).
4. Inside the survey, fill it in and submit their response.
5. Finally, the participants were allowed to compare the two prototypes.

I also asked the participant semi-structured interview questions at the beginning and end of the experiment. The interview questions at the beginning were to validate and understand better the user needs I derived from the initial contextual inquiry studies done in the pre-design phase, collected at the first affinity mapping (Appendix F). The interview questions at the end were to reflect the user needs and the overall impression of the prototype.

I found the user looked comfortable during the online, remote testing process, so I believed that the obtained information was relevant for the study and used it to improve the design idea.

4.2 Results of Study 1

The following section discusses the more significant findings. (Interview notes and survey data are shown in Appendix A, B, and C). Results are categorized into three main groups. The first category shows the data from the user needs validation (i.e., interviews before and after the experiment), the second category evaluates the user interface (i.e., general findings during the experiment), and the last category collects the findings specifically from the comparison between prototype A and B during the experiment.

4.2.1 User needs validation

After going through the eight semi-structured interviews conducted before and after the experiment (analyzed together), the findings related to idea validation are divided into observations, explained below.

Added value of application

The first relevant finding related to the validation of the idea was the coincidental mentioning of one answer during the interviews.

During the experiment, several interviewees affirmed that there has to be an added value to use this application. An interviewee said: “[The solution should give some benefits in the short term or have a positive value.]”. In reflecting on the application’s value, participants mentioned its usefulness for employees to communicate with managers and its timesaving element for those managers. Some interviewees found it interesting that the manager could access information that previously was not possible and understand it better. An example is the limitation that managers in a large team struggle to spend the required time with their teammates. In addition, other interviewees were concerned about the use of the information they upload to the platform. Considering this knowledge, as long as employees approve it, the application should allow managers to access all the information to achieve this value.

Interviewees also said the application should help the physical interaction. They requested a tool that encourages the start of a face to face conversation, where employees can share and help each other in person. This is a suggested feature to add value in the future.

Conditions for sharing emotions

Another result of the semi-structured pre and post interviews was that all the employees mentioned they are open to sharing their information and working with the team. However, the eight interviewees change their point of view on sharing their emotions with all the company. All the interviewees claim to share their feelings with people just in specific conditions:

- When the other person listens to me, cares about what I am saying and tries to help or give some feedback; for example, an interviewee said: "[People should listen and understand inside a team.]".
- To know, have confidence or improve a relationship among people who work together closely; for example, one person said: “[It is more important to consider the person than the channels or filters.]”.
- To share emotions in person through having a conversation, so that it is possible to see their reaction and socialise; for example: "[Seeing the other reactions helps during the conversation and to know how they feel.]".

The interviewees were open to sharing their mood with any employee given the above considerations. This shows how important the interaction is inside the team and that people take care of each other. However, some participants proposed to make it optional, giving the option to react to emotion status and be free to share any content (not only emotions).

4.2.2 User interface validation and improvements

User testing tasks were used to validate the prototype interface would work for participants and gather feedback. All the interviewees liked the idea but suggested interface improvements.

After analyzing the eight user testing interface process, including speaking aloud comments, the findings related to the user interface design are divided into three groups, explained below.

Performance

During the testing process, eight (100%) of eight participants complete all the requested tasks successfully (details are shown in Appendix K). Additionally, the time spent on tasks was not overly high. For example, one participant took a few minutes to read and understand the emotion gathering survey of concept A, while taking a few minutes (slightly longer, 2.2 vs 1.5 minutes) to review concept B. These learnings suggested it is simple and easy to use.

Participant suggestions: cleaner, “human”, neutral interface

The first modification is to make a cleaner user interface, to guarantee that the user does not get distracted during the survey answering or looking at the team mood board. Although each of the areas on the screens were designed to be simple, the combination makes the user interface more complicated. It is required to simplify the interface to solve the problem, an interviewee suggested "[Creating a clean interface helps the user, and I recommend to split the questions in different screens.]".

The second modification is to make the solution more human because people don't want to share their emotional data with a machine --- instead, they want to share it with others. A more human interface helps the user to be more relaxed when giving their answers and encourages the use of the application. A user added: "[That the interface should be like talking with a human, so I can be myself when I answer the survey.]".

The third and last modification is to keep the interface neutral, to make people calm when they answer the survey or use the application. Using words like “enraged” or “terrified” could harm the user experience. Additionally, using a more neutral approach could help obtain more honest responses.

Team mood board

Another finding related to the user interface and design is related to the dashboard and how the team mood is displayed. The design of the dashboard presents all the users as dots, helping to see all the team at once. Each of the dots represents the feelings, labels and names of each teammate. On the other hand, to avoid the representation of teammates feelings as a number, the emotions are represented using different colours.

Additionally, the interface groups the teammates with the same labels, making faster the analysis of the team mood. The goal of this design was to make the interface more user friendly and personal, but as the results suggest that it can still be improved on it. With all this information, the final design should try to make a representation of the data as human as possible, taking advantage of the colours, text, sound and images.

The last design modification is related to the surveys that the teammates answer during the week. This survey should be no longer than five minutes, to encourage people to reply more often, having closer real-time progress of the team. This finding comes from the answers during the interview, where all the interviewees agree on spending no more than five minutes answering the survey.

4.2.3 Comparing Traditional vs Playful Interface

The last main finding of this part of the project is the comparison between the prototype A and prototype B. The main difference is related to how each prototype collects the answer of the users, prototype A is more traditional in its sidebar and buttons, while prototype B is more “playful” in using distributed controls and photo buttons.

The prototype A used a more objective survey design and with a traditional structure, making the entire process more familiar. By having this design, the goal is to make the user feel more comfortable and have a quicker answer. During the experiment, all the interviewees agree on these two assumptions, but at the same time, it is the main reason why they did not like it. Only one of the eight highly prefered this option, due to the advantage of avoiding confusion with the answers.

The prototype B used a more subjective survey design and with a playful interface, making the entire process distinctive. By having this design, the goal is to make the user feel more engaged with the process and make them think more about the answer. During the experiment, all the interviewees were very positive with these two assumptions. Seven of eight highly prefer this option, due to the advantage of being more open with their responses, and encourage people to be more honest. On the other hand, another two interviewees were sceptical, because the images could end up being confusing, perhaps the same picture has a different meaning for two teammates.

Testing prototype A vs B

At the end of the testing, the participants prefer the pictures over text because it’s more playful and exciting, choosing prototype B. Table 8 shows a representation of the differentiation between the two prototypes highlighted by the participants.

Despite the positive feedback with prototype B, there is still room of improvement with the ambiguity of the answers. Improving the accuracy of the user response will help the manager to understand better the team. By implementing emoticons or moving images, similar to PreMo proposed solution [20], the accuracy of the survey will improve.

Prototype A	Prototype B
Objective answer	Subjective answer
Mechanical interaction	Intuitive interaction
Takes less time	Takes more time
Familiar questions	Distinct questions

Table 8 - Prototype A vs B, participants answer summary.

Furthermore, the last finding during this experiment is related to one of the answers from one interview, where "[People are not just a number, but they also have a story behind them, that can represent them better than a number.]". When someone needs to listen or share something personal, people can't put a limit of time or communication barriers. So, the solution does not need to focus on measuring people's responses; it has to take care of what people have to respond to and help them to communicate in the most suitable way to the team. With this premise, the final solution has to focus on creating an interface that helps the team understand each other better and consider the impact of the solution not only on the team results but also on the users.

5 Hi-Fi Design

Method

From the collected information related to the low fidelity prototype user evaluation, I collected ideas and points; and conducted ideation exercises, including a second affinity mapping [39], to collate main ideas and brainstorm solutions for the team emotion dashboard. I followed user-centered design (Roth [23]; Geissdoerfer [40]) and showed concepts with a Lo-Fi user evaluation before the Hi-Fi usability testing.

Design Ideas

Four design features resulted from the affinity map ideation exercise done after the Lo-Fi user testing (Appendix M):

1. Create a more clean and fast UI, keeping each of the screens simple, principally the survey screens.
2. Encourage the team to interact more and help to understand each other better.
3. Make more relevant the images and use them to give more information to all the team.
4. Create a solution that adapts to the user's needs, and it is flexible.

Initial design concepts after considering all the feedback from the low-fi evaluation are shown in Figure 10 (a cleaner mood board design and survey structure). The displays for the survey were structured in three-step; each step complements the previous one. The first step asks the current emotions to the employee, the second the intensity of this emotion, and third to add positive or negative information related to their mood.

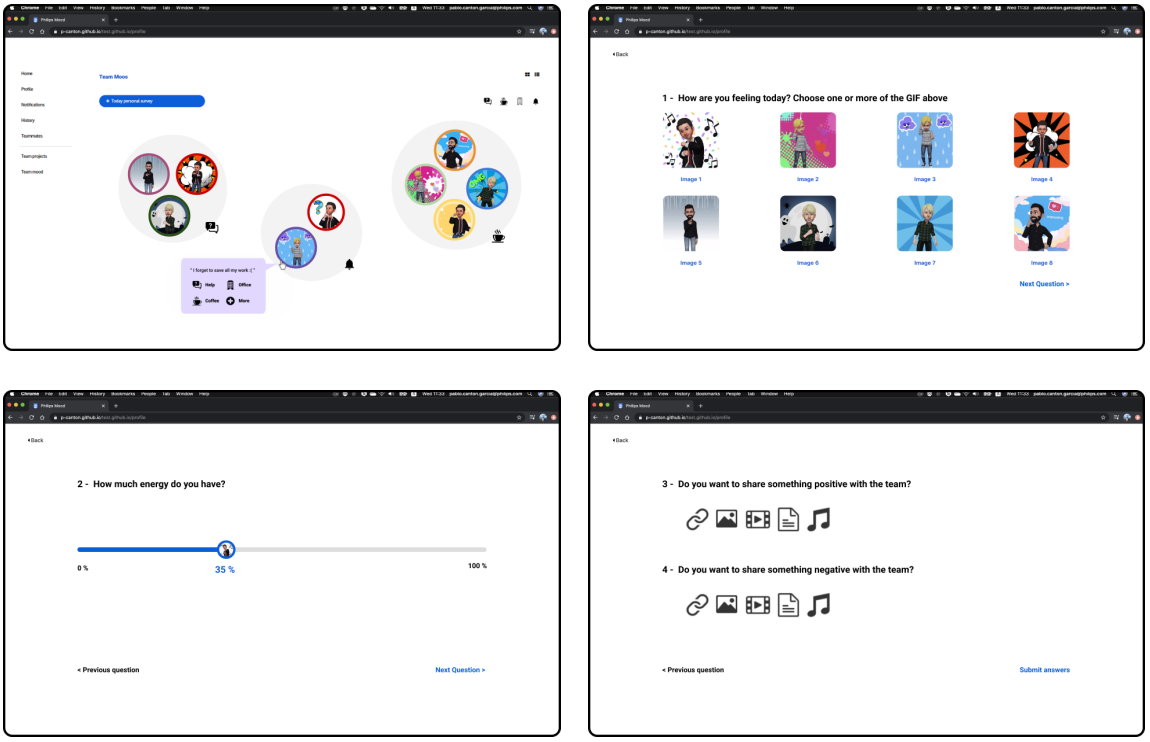


Figure 10 - Concept screens of the team mood board and survey structure.

By using the images, emotions could be represented much better and be perceived as something more personal and subjective, it is easier to see how each employee is feeling and their current mood. Using images that move could help to identify the feelings faster and naturally, creating a more user-friendly and human interface. This concept is explained at the PreMo theory, where moving images increase the reliability of the obtained information and helps people to identify and familiarise with the emotions represented in the animated image [20][21].

High-fi Prototype

The high-fi prototype was developed using React. It implements an interactive solution comparable to the final product [41]. By adding more details, the hi-fi prototype can test whether participants react positively with this concept in case employees' reactions were neutral with the more abstract wireframes.

The high-fidelity prototype contains the same functionalities as the low-fi prototype but with interviewee feedback from the first user test (Figure 11 and 12). The high-fidelity prototype does also display GIF/animated images using an extension for the emotion survey.

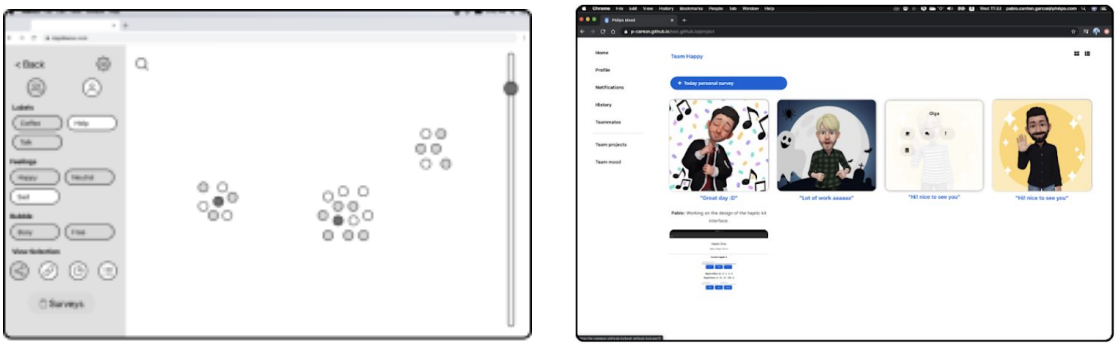


Figure 11 - Lo-Fi vs Hi-Fi prototype “Team mood dashboard” screens.

Figure 11 represents the evolution of the team mood dashboard screen, adding the GIF and a cleaner design, compared to the Lo-Fi. Meanwhile, Figure 12 describes the changes on the user profile screen, removing the irrelevant information and adding a more direct comparison in the graphic, comparing the employee mood with the team mood.

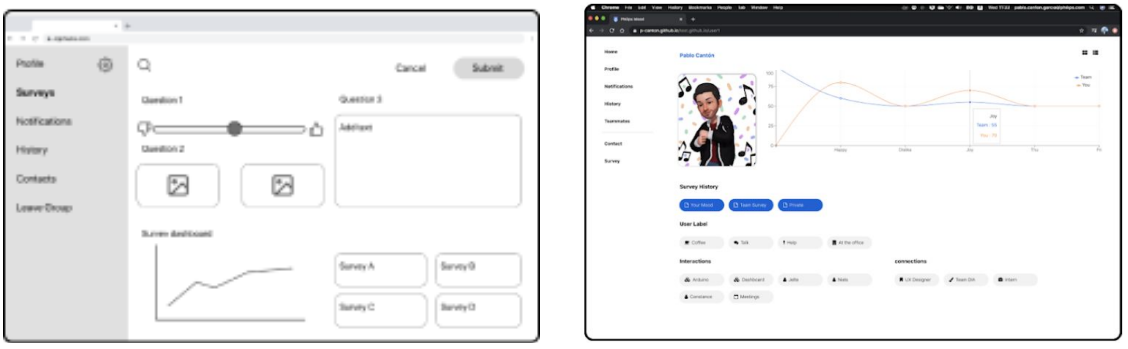


Figure 12 - Lo-Fi vs Hi-Fi prototype “User profile” screens.

6 Study 2: Hi-Fi user evaluation

The purpose of going through user testing is to validate the concept of the designed idea, plus possible design variations, to come up with a final design. This section will describe the method and results obtained during Study 2, consisting of a user evaluation of the high fidelity prototype.

6.1 Method for Study 2

The objective of this study is to validate the high fidelity concepts with users to evaluate their preference. Results are used to motivate the design of the final prototype.

Participants

In the text participated four employees of a design team from a large Netherlands organization, Philips office based in Amsterdam. To guarantee data privacy, personal information from each participant is limited. One of the participants was a manager, one interns and the rest employees from the same team.

Design

The Hi-Fi prototype will follow a design similar to the Lo-Fi Prototype B, adding moving images to the concept. This prototype is designed to be playful and interactive, but at the same time guarantee the reliability of the information using the GIF. Please see Figure 13 for sample screenshots and Appendix J for the complete wireframes.

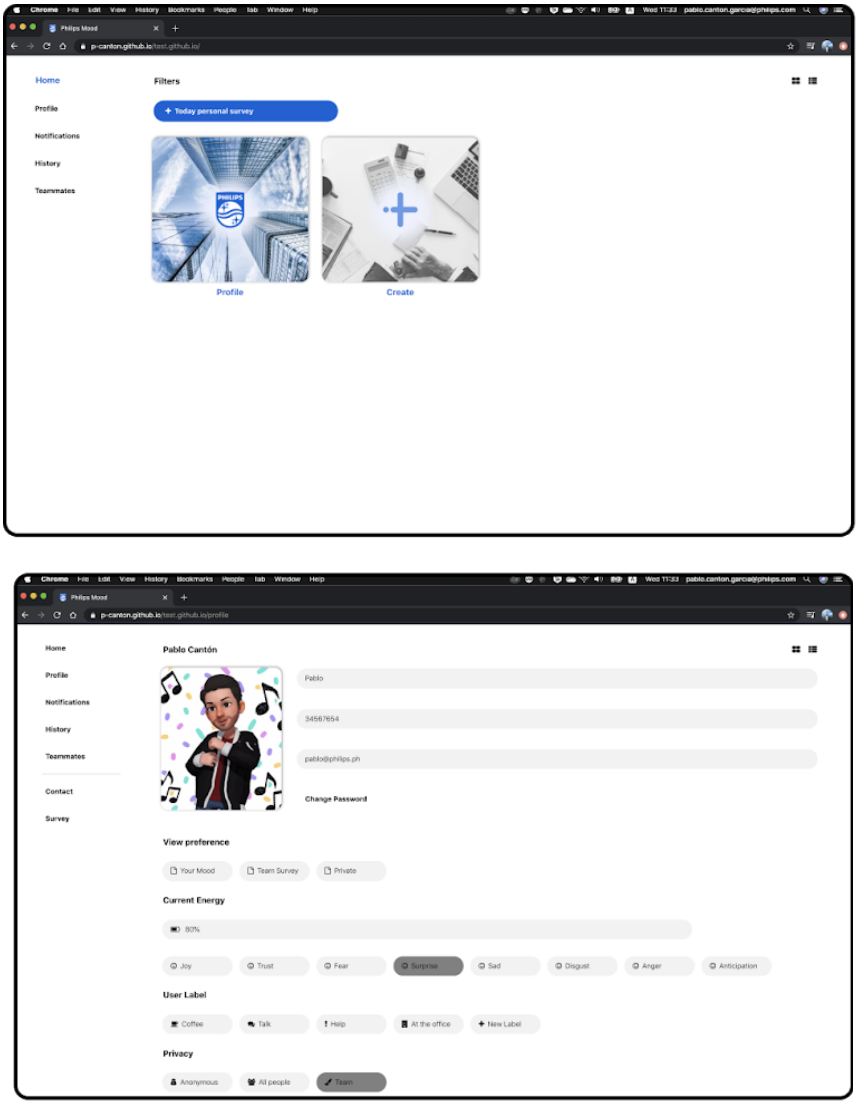


Figure 13 - High-Fidelity prototype “Home projects” and “user screens” screens.

Procedure

Due to the conditions of working from home and social distancing, all the one-week pilot testing had to be done via a digital connection. The chosen period of one-week has the objective to test the Hi-Fi prototype into a similar to a real case scenario. The experimenter focused on making sure that the user feels comfortable all the time (not exclusively interested in collecting data).

Each participant could contact me at any moment and was not forced to use the platform all day, to facilitate the week examination. The five tasks were the following:

1. Answer the survey display on the website. In the survey, they can share their emotions, any news or give feedback about the survey.
2. Use the platform to see the team mood and react to it, in case they feel like doing it.
3. Connect to the testing controller in case of any problem or question or take notes during the week to give better feedback at the end.

I also asked the participants to semi-structured interview questions at the end of the experiment. The interview questions at the end were to reflect on both the user's needs and the overall impression of the prototype, understanding better the one week process the users went through. I found the users looked comfortable during the online, one-week testing process, so I believed that the obtained information was relevant for the study and used it to improve the design idea.

6.2 Results of Study 2

The following section discusses the more significant findings. (Interview notes and survey data are shown in Appendix L, and N). Results are categorized into three main groups. The first category shows the data from the user needs validation (i.e., one-week study results and the interviews after the experiment), the second category evaluates the user interface validation (i.e., general findings during the experiment), and the last category collects the findings specifically from the manager feedback.

6.2.1 User needs validation

After going through the one-week testing and the four semi-structured interviews conducted after the experiment, the findings related to idea validation are divided into observations, explained below.

Added value of the GIF

The first relevant finding related to the validation of the idea was the coincidental mentioning of one answer during the interviews. During the experiment, the four interviewees agree on the idea that the pictures speed the process to look at the entire team mood, adding more value to the app. An interviewee said: “[I like the images to represent my emotion and it is really fun to see my other teammates’ emotion in the menu as a moving image.]”.

In reflecting on the value added by the GIF, participants mentioned its usefulness for employees to communicate their emotions in a more subjective and accurate method. Some interviewees found it interesting to be able to see all the team at the same time and understand better the mood of the team just in a few minutes. An example is a limitation that to know how your teammates feel you need to go one by one asking how they feel.

Also, the interviews agree that the team mood is harder to visualize, and the user labels settings screen was tricky to find and interact with. Considering this information, as long as the interface is more clear, the application should help to improve the communication of the team mood. Interviewees also said the application should have direct access to the team mood screen. They requested a team dashboard that shows the general team mood, not only inside the profiles. This is a suggested feature to add in the final solution.

Increase the information

Another result of the one-week pilot testing and post interviews was that all the employees mentioned they look forward to understanding the origins of the teammate's emotions. However, the four interviewees suggested possible solutions to understand each other better by adding these simple changes:

- Increase the number of emotions to choose, not only eight of them; for example, an interviewee said:"I would like to have more options related to the emotions to pick. I have the feeling that eight emotions sometimes would not be enough.".
- Give the option to pick more than one option when the employee chooses their emotions in the survey; for example, one person said: "I do not like the limitation of only one Gif; I prefer to choose more.".
- Make it possible always to add additional information in the answer or share a project; for example: "I like the question of 'why?' this helps to give more information about the gif I choose.".

The interviewees were open to giving additional information related to their mood to help the team understand better the origin of their feelings. This shows how important it is to make the correct question inside the survey. However, some participants proposed to make it optional, giving the option to share any emotion and be free to share any content.

6.2.2 User interface validation and improvements

A questionnaire at the end of each survey (done each day of the one-week pilot testing), was used to validate the survey structure and interface would work for participants and gather feedback. Table 9 represents the five surveys that the participants answer and their structure.

All the interviewees liked the idea but suggested improvements in the survey. After analyzing the four pilot testing questionnaire answers, including the interview, the findings related to the user surveys design are divided into three groups, explained below.

	Survey 1	Survey 2	Survey 3	Survey 4	Survey 5
Question 1	GIF	Image	GIF	Words	GIF
Question 2	Energy number slider	Insert words	Ask why	Grade with a number	Energy % slider
Question 3	Insert a positive and negative word	Insert a text to say something new “+ or -”	Insert a positive and negative word	Share a failure or achievement	Insert a “+” and “-” image/video/ audio/text

Table 9 - Hi-Fi five survey structure done during the pilot testing.

Positive parts of the surveys

The sections of the survey with better feedback were those that implement an interactive or visual element. The results of the most **positive aspect** of the survey are the following:

- All the users agree that having a personal animated image that changes depending on their emotions makes the platform more interesting. It not just helps to understand, identify and share your feelings with the team, but also helps the method to be more comfortable and pleasant to use.
- Related to user interaction, the user always prefers to use solutions that involve a more natural and dynamic interaction. Due to this reason, the interviewees chose the slider and the images. One of the participants said: "[The slider looks good, but maybe make the GIF change with it. Also, I would like to create my own GIF in the future.]".

- Finally, the survey 3 that included a why question and ask the reason to the answer, had better feedback. The main reason for these results is related to the desire to know more from your teammates and help a user comment: "[I like that the survey includes the question 'why?', helps me to understand better my teammate's answer.]".

Negative parts of the surveys

The sections of the survey with negative feedback were those that implement more traditional and mechanical solutions. The results of the most negative aspect of the survey are the following:

- All the users agree that trying to evaluate themselves using few words was confusing. Some of the interviewees consider that the words are a close answer, missing a lot of relevant information. Additionally, others consider that pictures were a better option. A clear example is survey 2, where a participant said, "I do not like to insert random words to talk about my feelings; it makes it harder to describe my emotions.".
- Survey 1 that asked to upload something positive and negative did not succeed. Some people did not have something to share or were not sure what to upload. The feedback was, "The part of inserting something positive or negative is confusing; what is it related to? or is it something random?".
- Also, answering with a number did not bring positive feedback by the interviewees. They were not sure how to self-evaluate or they felt uncomfortable treating their emotions just as numbers, without taking other factors into account.

Additional changes to surveys

Another finding related to the survey structure and design is related to the possibility to keep using the evaluation of the survey at the end. By testing the surveys, the manager can find how the team reacts to them and make the necessary changes to the survey structure.

A clear example is the questions to upload a positive and negative document, song, or video, where the interviewees agree that they will like to have this question with a more direct explanation. Adding this survey evaluation helps the employees to give feedback to the manager, helping to improve the survey. In this case, the question can be changed and ask the employees to upload something positive or negative from recent projects or past events.

6.2.3. Manager feedback

One of the participants In the pilot test was one of the current managers of a team, giving the opportunity to have feedback from a different point of view. The principal advantage of having a manager during the study was to compare his feedback with the employee perspective. On the other hand, having a manager in the study makes the experiments more similar to a real case scenario and analyse the interaction between employees and managers.

Manager start

The first relevant finding related to the validation of the idea was the method used by the manager to start a conversation with the team and know more about their day and emotions. The manager said, "[The most common approach as a manager is to start sharing something positive or negative, work related or personal life.]".

By doing this method a link with the teammates is created and it encourages the team to be more open and empathize with the manager. This finding means that the only way our solution works if the first person to start using, and promoting the platform is the manager. By making this simple first step, the team will find the platform a relevant channel to communicate with the manager and the team. Additionally, during the experiment, the manager agrees on the idea that the dashboard speeds the process to look at the entire team mood, helping to manage the team more efficiently.

Manager modifications

Another significant finding during this interview was how important the surveys are for the manager. Despite the positive feedback, there is still some modification that was recommended by the manager.

In the first place, having automated surveys saves a lot of time, but on the other hand, can be out of context or not relevant for a specific moment; as the manager said: "[I would like to be able to change some of the questions or add a new one, depends on the moment.]". Due to this finding, the surveys could be a combination of a predesigned structure plus the modifications of the manager. By adding this feature, the platform helps the manager to save time, but at the same time provides the needed flexibility to keep the surveys reliable and related to the context of the team. A possible case scenario is adding a new question after an event to see how the team feels after it.

Manager requirements

Another result of the one-week pilot testing and post interviews with the manager was the principal value and advantage that this solution brings, that the manager resumed into two complementary categories.

The first category is associated with the amount of time that the platform saves, and the second category is related to the relevant information that the manager can monitor with a simple process. To understand this better, the manager explained two usual case scenarios he faces every day.

- Managers do not have enough time during the day, seeing themselves pressured to limit the time they spend with each employee in their team. Or in other cases, he can only focus on work performance or mood performance, but not the two at the same time; the manager said, "[It's impossible to know how the whole team feels in an hour-long meeting.]".
- When the employees have meetings with their manager, the conversation focuses on the relevant topics and recent events. As a consequence, the manager misses a lot of information that could help to have better management of the team and help the employee; the manager said, "Using this platform, I can see some information that previously I was missing.".

Regarding all this new knowledge, the solution needs to concentrate on helping the manager in two different aspects. The final solution has to give access to the manager to all the data from the team. Also, provide a solution that takes little time of their daily work, without affecting the reliability of the information.

Ultimately, the interview with the manager shows how important physical interaction is. Similar to the answer of the employees, the manager agrees that face to face conversations are the best way to manage the team and help the employees that need it. This answer reinforces the importance of creating a platform that encourages physical interaction inside the company, preferably than only encouraging digital interaction.

7 Discussion

7.1 Summary of Results

New prototype

A new design idea and React prototype of an emotion team management dashboard was designed. The design idea was based on combining existing emotion theories, color theory and team performance strategies. The design focused on capturing and displaying team emotions and making the interface look more human-like with GIFs.

Emotion visualization

One of the main findings of this thesis is the importance of representation of emotional information on how users perceive inputting their emotion. Representation of emotions in a more human way than text by adding moving images improved users' perception of the data gathering experience. It was feasible to gather the feelings and mood of the team using personalised moving pictures.

This finding is related to the PreMo study [20], where moving images help to give feedback, but implements it in a team management dashboard. A GIF can be used to encourage the team to share emotions. It may also be implemented to display people's mood to maintain consistency; however, that is left as future work.

Besides, to make the employees identify with the data in the dashboard, the project found it essential to design a more human interface and avoid an entirely text-based solution. To achieve this resolution is required the use of PreMo guidelines and theory, to make an interface more human; making the employees feel more comfortable sharing their emotions. As a consequence, the interaction between the teammates may improve and be more natural.

Data collection

Collection of users' emotional data can be made more reliable based on past methods, such as PreMo [20] and the emotion wheel [19]. Using the combination of these two last methods, this work demonstrated a broad range of feelings that could be used in a dashboard. The results showed some employees like the idea of having more options for emotions to pick from.

The added option to control who sees employees' emotions was a feature that was well-received during the testing periods. This last experiment shows how important surveys could be, and the use of different survey structures help to make people more interested in using the platform. Also, letting the manager change the surveys helps to have more relevant and reliable information.

Work environment

There is some evidence that the main goals of improving communication and emotional intelligence in the team [1, 2, 21] could be achieved by the team management tool. Based on the interviews, some employees commented that it would help the team connect, for example: "This will help to improve the team environment, but also to make the team connect in a more personal way".

However, interviewees stated that the team management tool must encourage physical interaction and avoid making it all digital. One of the interviewees added, "Do not substitute real interaction with a digital tool". This finding may be because people can better identify people's emotions looking at their facial gestures. The answers of the interviewees show how significant face-to-face interaction with other employees is. This confirms the final solution should encourage the face-to-face interaction inside the team.

The last finding about the work environment is related to the manager's point of view. The manager made some comments suggesting the platform can help by saving time and understanding the entire team. Additional work is needed to help the manager to reach all relevant information and be able to spend the required time with each employee.

Design methodology implications

This project used user experience prototyping and analysis methods. The ideation phase consisted of reviewing and analyzing models of emotion, team management principles (like psychological safety and team communication) and primary colours psychology. Design phases occurred after the ideation phase and after each user testing phase. Each ideation and user study analysis phase helped to understand user needs and to create the final design of the mood board.

7.2 Relevance to Company

One way to summarise this work and the final design idea is by creating a Value Canvas Model (VCM). The following table 10 shows a preliminary Value Canvas Model related to the final design of this project.

The Value Canvas Model represents how the final solution solves the main problems presented at the beginning of the study. The designed solution is one possible approach to solve these problems inside a team and manage team performance.

Value proposition canvas

<table>
<tr><th colspan="2">Value proposition</th><th colspan="2">Customer segment</th></tr>
<tr><td rowspan="2">Product/Service

Manage employees and team emotions.

Take care of the security and privacy of the data.

Create relevant information for the manager and employees.

Create surveys that the team has to answer.</td><td>Gain creators

Understand better the company/ employee’s situation.

Improve the work environment and have better results.</td><td>Gain

Don’t have to wait for help, reach all the company departments at once.

Free to talk and understand team emotions, plus equal participation</td><td rowspan="2">Customer Jobs

Answer a survey that takes less than 5 min.

Interact in the platform and share.

Use the platform to help each other.

Management can see the team and help if it is required.</td></tr>
<tr><td>Pain reliever

Mood board sharing emotions and important events/info.

Employees/team real time analysis.</td><td>Pain

With team communication.

Not sharing emotions.

Management overload.</td></tr>
</table>

Table 10 - Value proposition canvas model.

7.3 Relevance to Other Projects

One of the most relevant projects was Google's Project Aristotle [1][4]. This project explains principles and challenges to improve team performance. The main goal of this project was to use this new knowledge in a solution that combines team performance with the team mood. The emotion selection and representations developed in this work can be compared to other projects on emotion such as Fine [7], a master thesis that explores how to visualise and represent emotions.

7.4 Future Work and Requirements

Future work related to design includes the following:

After all the interviews, the idea of creating a fully digital solution was not possible. Additional design work is needed to support in-person interaction within the team. Some user testing participants wanted a focus on users' feelings and not consider them only numbers. A final solution has to focus on telling the history of the employees and helping to develop a more complete picture.

The most important of the findings in this process was the concept to create a more human interface, to make people more open and sincere answering the surveys. Additional options to display emotion information on an interface can be explored other than moving images. Surveys via an application can collect all the required data, but future design studies can discover different methods that are more precise than surveys (such as artificial intelligence and affective computing).

Future work related to implementation includes the following:

Create a functional application. A general diagram is presented in appendix O, but future work must identify what technologies to use. The minimum hardware and software development required to implement the final idea is likely to be similar to popular solutions in the market. The process of getting and processing the data from the user requires additional considerations such as privacy and data quality. Develop an artificial intelligence agent or similar solution to generate automatic surveys or the moving images, saving time for the manager and employees.

7.5 Study limitations

Despite the positive reception of the project by multiple participants, there are still some limitations to consider. The following list shows some of the most significant limitations:

I only had access to one department of the company, not being able to consider the requirement from teams that work in a different environment or projects. This limitation presents the opportunity in the future to test the final design in another department or teams.

The project only went through two testing rounds, which brought a lot of information about user impressions. Nevertheless, the two experiments were done online, missing useful information that can be collected in a physical usability session. Additional testing also needs to be done to solve the new limitations obtained in the second user testing, gathered at the interviews (Appendix L) and third affinity mapping (Appendix N).

The development of the final product is still pending. This limits the understanding of the total potential of the design and possible modifications that the team needs. The solution focused on improving the work environment, so the project has a shortage of validation in non-work environments. To solve this problem it is required to start the project in a new environment with users.

Despite the listed limitations, this work presents the opportunity to keep working on the project or start new studies that solve these limitations. Additionally, the findings and work are accessible for future studies that can take advantage of the information, and improve the knowledge related to these solutions and their design.

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APPENDIX

Appendix A - Indirect observation notes

Every Monday, the team has a meeting in the morning, to update each other and start the week sharing our goal and energy. The meeting structure is divide into the following structure:

1. The team shares 3 words anonymously on Meentimiter and displays them on a presentation. After that, the session leader asks for the words that he thinks are more important. 5-10 min
2. Next step is to share using Mentimeter any relevant information with the team, optional. Example: vacations, help or news. 5-10 min
3. Start with the topic of the meeting (each week is one different), the goal is to encourage sharing and interaction inside the team. 30-40 min
4. End of the meeting, usually the manager uses this part of the meeting to give an important announcement: ~5 min

The following tables show all the collected information from the team meetings:

Meeting 1 - Pechakucha turbo			
Asistentes: 18	**Total time:** 1h	**Participated:** 16	**Listeners:** 2
Topic:	The team member has to upload one slide where they explain their latest project and their role in it. The amount of time per person is 1 min and it is mandatory to all.		
Positive:	All the teammates can present their work and share something important to them. The team can give some feedback or guidelines to that teammate. People know better the situation of everyone and understand better how they can feel or how much work they have.		

Negative:	Some teammates took more than one minute, while others forgot to upload the slide or took a short time. Some people did not get feedback, or the feedback was not helpful. Some teammates´ attention was very low or they were doing other things while another teammate presented.
Notes:	Most of the participation was between a group of 4-6 people, while the rest listened, making the distribution of time irregular.

Meeting 2 - Epic fail			
Asistentes: 15	**Total time:** 47 min	**Participated:** 8	**Listeners:** 7
Description:	The team member has to upload one slide where they explain their latest fail in the month and what they learned from it. The amount of time per person is 3 min and it is not mandatory to all.		
Positive:	All the teammates can present their lates fail and share something about their frustration or learning to the team.The team can give some feedback or guidelines to that teammate, and learn from the situation. Help people to don't be afraid to fail.		
Negative:	Some teammates took more than three minutes, and the participation was not that high. Some people did not get feedback, or the people did not pay attention to their presentations. The people that did not upload a presentation did not participate that much in the meeting.		
Notes:	Important to make people upload something, to avoid low participation in the meeting.		

Meeting 3 - Collaboration Time			
Asistentes: 16	**Total time:** 55 min	**Participated:** 11	**Listeners:** 5
Description:	The team member has to upload one slide where they explain their latest collaboration with another team. The amount of time per person is 3 min and is not mandatory to all.		
Positive:	All the teammates can present their latest collaboration and share/learn from other teams. The team can be interested in other projects and offer their help. The aim is to encourage people to collaborate with other teams.		
Negative:	Some teammates took more than three minutes, and the participation in the meeting was low. Some teammates' attention was very low or were doing other things while other		

	teammates presented.
Notes:	The collaboration time could be a topic that some people do not find interesting, making that their attention is much lower. Also it is similar to other topics, but not everyone participates.

Meeting 4 - Team Initiatives			
Asistentes: 14	**Total time:** 47 min	**Participated:** 8	**Listeners:** 6
Description:	The team member has to upload one slide where they explain their latest new initiative they work on or initiative they have. The amount of time per person is 3 min and it is not mandatory to all.		
Positive:	All the teammates can present their initiative and or an initiative inside the company. The team can give some advice, or find a new project to collaborate. Encourage people to get out of their comfort zone and start new projects.		
Negative:	Some teammates took more than three minutes, and the participation was not that high. Some of the presentations were not related to the topic, but still present to have something to do. The people that did not upload a presentation did not participate that much in the meeting.		
Notes:	Find a topic that is none work-related. Additionally, some teammates do not like Mentimeter and the fact that the anonymous thing is not real.		

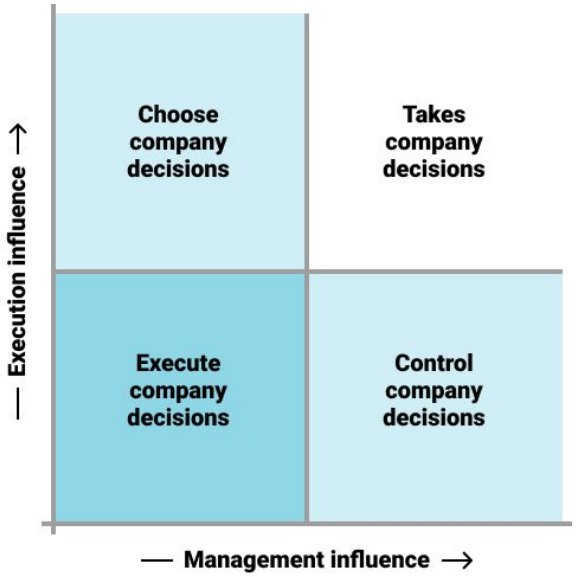
Appendix B - Stakeholder analysis

Analysing the entire company structure these are all the stakeholders and their role in the company.

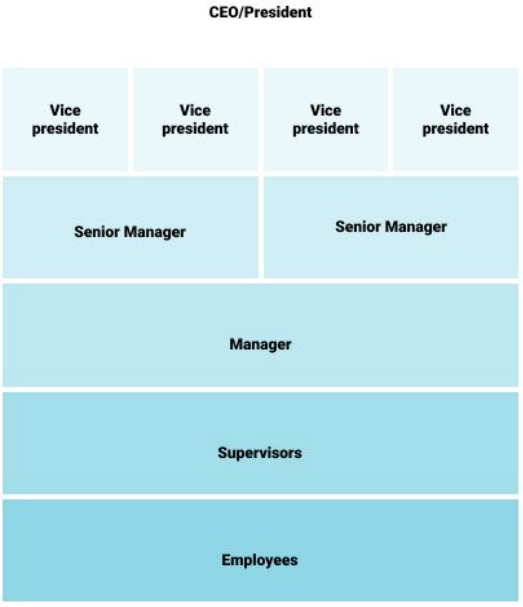
1. Two categories, the people that work inside the company as normal employees or those that are external but collaborate with the company. The second category has less power or influence in the company.
2. The supervisors can be divided into two, depending on their years of experience and the size or number of team to manage. They start to choose their main responsibilities in the company.
3. The managers are similar to the supervisor, divided into two categories due

to their experience and number of teams. Also, the manager is already specialized in one specific team section.

4. Senior managers are divided into different departments of the company, managing several teams at the same time. They have a lot of experience and knowledge.
5. The CEO is the main figure of the company and the one that takes charge to make all departments work together and choose the final decisions.



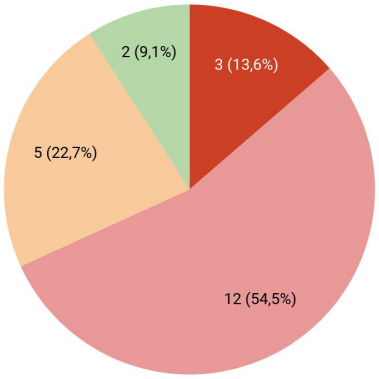
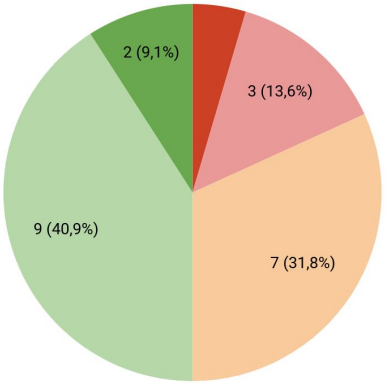
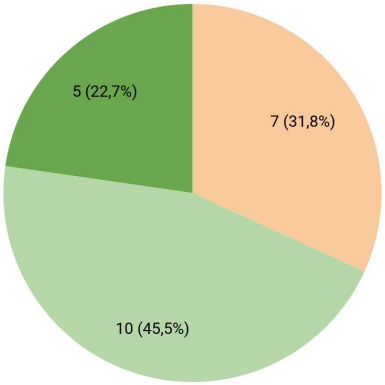
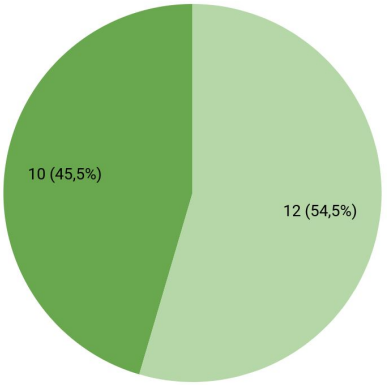
Company influence graphic.

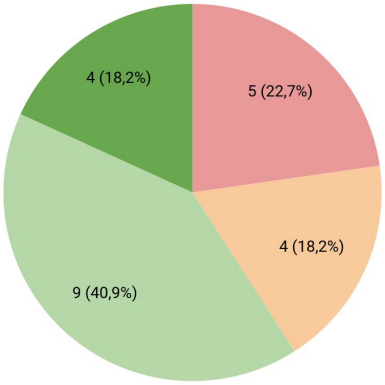


Company structure pyramid.

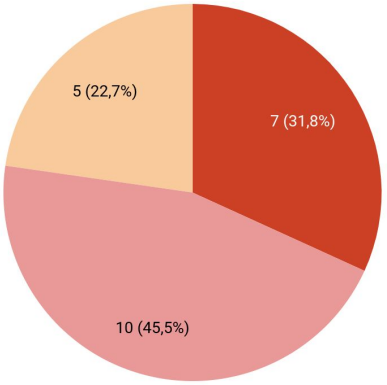
Appendix C - Quantitative & qualitative survey results

The quantitative data was captured by doing a survey where all the team participated. The structure of the survey is 10 questions evaluated from one to five, where one strongly disagrees (red colour), and five strongly agree (green colour). In the end, 22 teammates participated in the survey, the following table shows all the answers and some comments they added to some questions.

I really like to use Mentimeter at the beginning of the meetings to share my state of mind.	Sharing my emotions or mood in the team is one of the most important things.
	
"Mentimeter does not motivate me to share my emotions or mood". "Why we always comment the words we put, isn't the platform anonymous".	"Maybe emotions sound really extreme".
The position of the person in the company I have to communicate affects the information you share	**Having good communication in the team is one of the most important things for team development.**
	
-	“If you don’t communicate it is impossible to work in a team”
I will like to try new methods or applications to measure team mood	**I will share, to a person you don't know well, my emotions or thoughts.**



“yes, but i don't want to learn new tools that takes a lot of my time”



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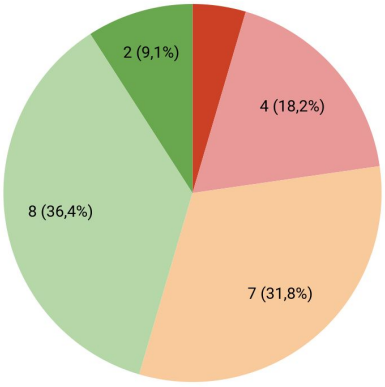
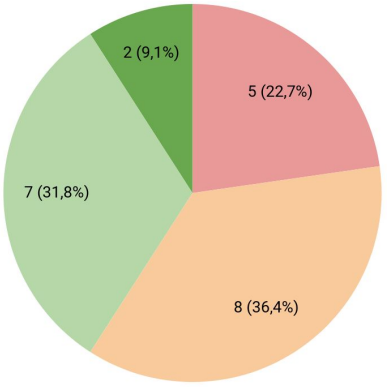
Sharing my emotions with other teams is something very important.	**I will use an application to share your emotions and feelings inside the team or company.**

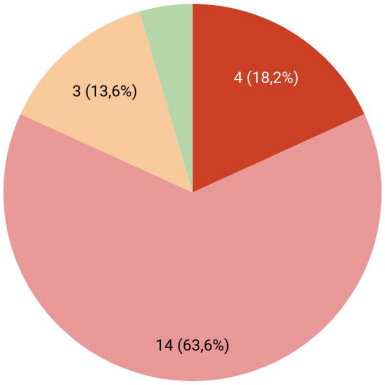
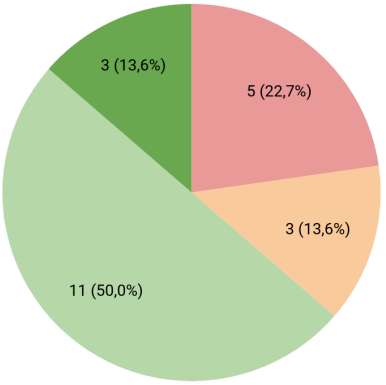


“I will only share if I have the feeling that it will help the project”



“yes, but taking into account the privacy of the people”

“Just if the manager ask for it or I feel that benefits the team”

I would like to have a digital solution to record teammates' emotions and team mood.	I would like to have all combined in the same channel or application.
	
"Making all digital is a big mistake, people interaction is the most important thing inside the team work".	"Maybe different applications, but connected between them".

The qualitative data was recapitulated by doing a semistructured interview where four teammates participated. The structure of the survey is 7 questions evaluated to understand better the point of view from the different teammates, the interview took about 30 minutes. During the interview, the user saw and interacted with a concept to understand better their preference with the final application. One manager, two employees and one intern participated in the interviews, the following table shows all the answers and some comments they added to some questions.

Ist important for you to share your mood or be able to see the team mood? Why?
Because that makes the environment more humanely, moving with our feelings, part of how we perform. If you only focus on the performance and the output of the work we become like machines, something that is not positive for the team results.
Truthfully I don't particularly care. Between the back and forth and caution that comes with being open about your mood is a daunting thing to worry about. Sometimes being honest means people judging you or creating problems that are not necessary to have at work.

Is good to know how all team members are feeling and understand people. Helps with your work, because at the end the result of the work influences how we feel. On the other hand, knowing how people feel helps to organise better and support each other.

It is difficult to define how I am feeling. Sometimes I would like to share my feelings, but not always. But also it is important to have that communication and know that you have a place or people where you can share how you are or feel.

Would you use an app to share your mood or be able to see the team mood? Why?

Is good to know how everyone is and is a nice and playful app. It is nice to interact with other colleagues and check and share, a good way to interact with the people in the team. Maybe have a platform where people share and comment on each other's work.

If the app is managed in a sense that allows people to not manipulate the response to their gain at work then I would think an app like this would be beneficial. Also, guarantee that you are anonymous and you can say what you really feel and do not have negative consequences.

Make sure that is anonymous but at the same time being able to go back to them. Because if someone says that they are bad or sad, it does not make sense to not be able to help them, it is important to me how I manage the team and support them.

Would be nice to see the team mood and create a more open environment, where people can know each other a little bit better and not only work. Sometimes disconnecting from work helps to have a better result or be more positive during the week.

Which is the best way to share your mood at work?

Definitely talking is my first choice, have the possibility to see the person and move around the office, so I disconnect from work and not spend all that sitting in a chair working. In case I can, I also have a call with people I know from work.

Team stand-ups because then no one can critique your current feeling or mood. In a more private way, I also share my feelings with the people I am close to at work.

Anonymous or face to face, depends on the person and security to know what will happen with my information. Also, depending on how important is the

Talking face to face to people I am close to, so I can be more open and I am sure that they care about what I am saying. Sometimes when I talk to all the team I

have the feeling people do not listen or care that much.

Which benefits do you think that would bring to use a solution or app that helps you to share your mood with the team?

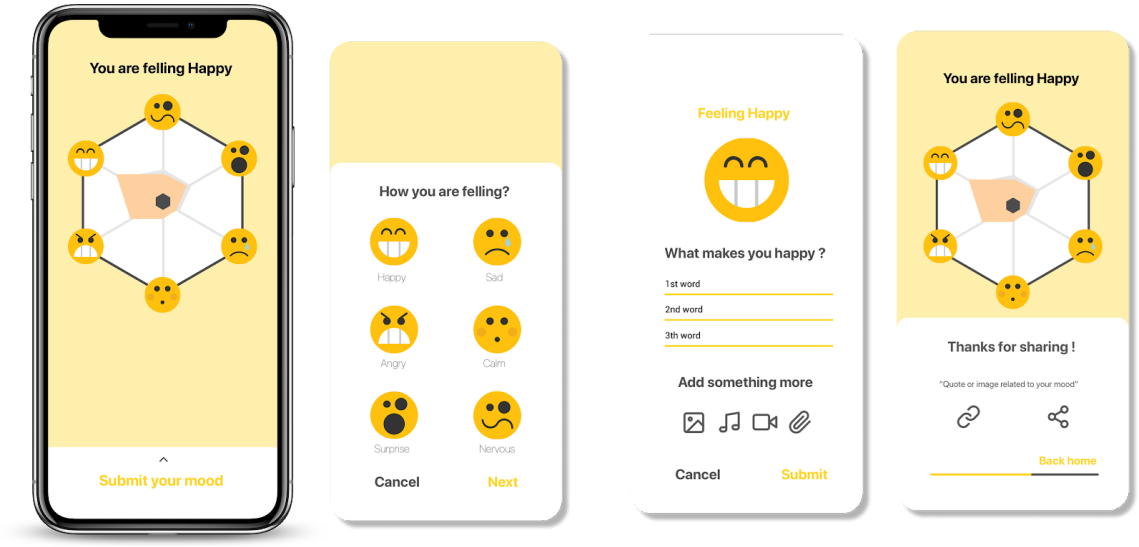
Connect with people more emotionally and know which people need help, not only with their work, also on a personal level. This will help to improve the team environment, but also to make the team connect in a more personal way.

Anonymous, being able to comment on how you feel and the team know it, but they can judge you. This can help to know that something is wrong or good and at the same time the team can adjust to it.

Is a good approach to share your feelings in an application, and can make people less alone and connect with the team. Empathy is something very important and more when you have to manage a team and people that you don't know that much.

Share how you are feeling release stress and maybe someone can help you, improving the team connections and improving the results. Also, for people that start inside a team, this kind of application can help them to introduce themselves faster in the team.

Concept



Did you like the concept? Why?

Allow people to know how they are doing and a nice way to talk and communicate, at an emotional level and not work topic. On the other hand, the application can be used in a personal way, to know how you feel and doing during the week.

It's an easy and understandable application, helps to give feedback fast and let the team know how you feel. Also, the application interface looks nice, encouraging to answer and see what other people put.
Choose the moment to use the application, because talking about my feelings is not that easy all the time. I consider that for me it is difficult to open and define myself and how I feel.
It's quick to use and looks simple, maybe being this simple does not help to give a lot of information on how I am feeling.
What would you improve or add to the prototype?
Make it interactive, being able to react to something and give your ideas. This can help to start a conversation and improve communication in the team.
Everyone can see it so make it public, where all the people can see it and interact with it. On the other hand, add a slider for the emotions, not only buttons.
Have it more abstract so the feedback can be more complex and help people to share their feelings in a fast but curated process. An example could be the implementation of images or pictures.
Bring more detail to the response, but still keep it simple. Ask people why or to add a piece of extra information, so people can understand better why they feel that way.
Any idea that could help to improve the team mood?
See how people react as you have in current social media. Being able to see the impactive of the team and interested in how you feel, so you not only talk about your feelings, but also topics that people have in common. This helps to build the team and improve communication.
None bias towards people's current moods and feelings. Maybe find an application that helps to avoid this and make people feel interested in the feelings of others.
Not use words or text that make the application more boring. Use a picture or video, so people have to think their answer and give more information about their feelings.
Make a physical solution so people have to interact with it and do not have the feeling of using an app that no one cares, but still have an app to make it accessible all time.

Appendix D - Personas 3

The created personas work all together in the same team inside the design department of a big multinational company. The team is around 20 people, working in a different project at the same time, and having a lot of meetings, with the team and external teams. The company environment is very positive, but everything goes so fast that they do not have time to have long conversations and know each other better. In the end, all employees meet with the people they are in the same project and that's all. On the other hand, there is a lot of work that people end up having a lot of different feelings and moods that most of the time they can't share. Finally, the organization has different channels to communicate these frustrations or meetings every 6 Months. But unfortunately, the communication goes slow or when the problem is detected it is already too late. The nest tables represent the created personas that work inside this team.

Naima Bijkerk

Team manager

38 years old. Amsterdam, Netherlands.

Information	About
Gender Female **Status** Manger **Department** Design	Naima is the manager of the design department of a big international company. She is an excellent manager and always looks forward to trying new methods to manage all the team she has to manage. She has been working in the company for several years, so she has the required experience for her position. Despite that, she still struggles on managing the amount of time she spends for team and teammates and sometimes she can't have

	the required attention to everyone.

Frustrations

- Can't have enough time with each of her employees, and sometimes that affects the team.
- The company took too long to communicate, making some processes slow.
- Wants to know better the employees, not only start to know from them during the HR meetings or complaints.
- Too many different tools to manage the team, and some of them can't share the information.

Goals

- Improve her knowledge and skills as a manager and have better results for the company.
- Take more responsibilities for the next year but also have time for her personal life.
- Try new methods and tools with her teams to increase the performance and improve the team environment
- Take more time with her teams and know more about them, not only work and their results.

John Smith

Employee

33 years old. Amsterdam, Netherlands.

Information	About
Gender Male	John is the employee of the design department of a big international company. He is an excellent employee, works hard despite all the work he has and has a lot of

Status

Employee

Department

Design

collaboration with other teams. He has been working in the company for several years, so he has the required experience for her position and to start moving to bigger projects. Despite that, he still struggles to communicate with his team members and more after a few months of hard work and stress that makes his daily day more stressful. As a consequence of that and his frustration with being in the same position, he is starting to have more negative behaviour.

Frustrations

- Can't have enough time for himself, working a lot of different projects.
- The company took too long to communicate, making some processes slow and his work hard.
- He works in several teams so he doesn't have time to know the people well. Due to this problem, he doesn't have strong bonds inside the company.
- He shared with his manager that he needs some vacations, but is still waiting for a response, the process of the company goes slow.

Goals

- Do not work in a lot of projects and focus more on his personal life, family, and hobbies.

Manuel García

New employee

25 years old. Amsterdam, Netherlands.

Information

Gender

Male

Status

Employee

Department

Design

About

Manuel is a new employee in the design department of a big international company. He is really happy to start a new job, for him it is a great opportunity to start his career and at the same time keep learning. He has been working in the company for a few months, so he is still getting used to the company and starting in a few projects. Despite that, he still struggles to understand the company structure and meet people, because most of the people have their groups. As a consequence of that he is not able to meet a lot of people, but the few people he meets he is having a great time with them.

Frustrations

- He does not have time to meet all the people of the team, so he feels disconnected from the team.
- He is still confused about how everything works and does not know where to ask for help or communicate his problems

Goals

- Meet more people from the company and know more about their works, projects and personal life.
- Demonstrate his work to the team and show that they made the good choice to let him work with them.
- Working in a new project, he feels that he has the energy to start a different project, where he will learn a lot.

Appendix E - Customer journey

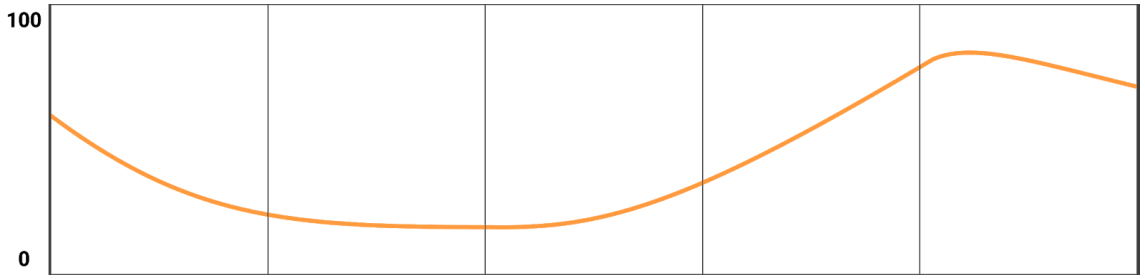
The customer journey tries to recreate a possible scenario of the application and the benefit that the customer obtains. In this case, the journey has five steps:

1. All the team and managers will answer the survey, displaying the answer in the mood board of the team.
2. The team can check the different answers, understanding better how the team is feeling.
3. The teammates can react to the different information, improving communication or contact those people that ask for help or are in a bad mood.
4. In this case, teammates will be encouraged to have a physical interaction to help or know more about each other. Also, they can communicate with HR or the manager to help another teammate.
5. The team and the user can self evaluate to see what is going wrong and try to improve it.

The next table represents the customer journey, considering the five previous steps.

Step 1 >	Step 2 >	Step 3 >	Step 4 >	Step 5
Actions				
Answer survey	Check	React / Contact	Meet / Help / Support	Evaluate

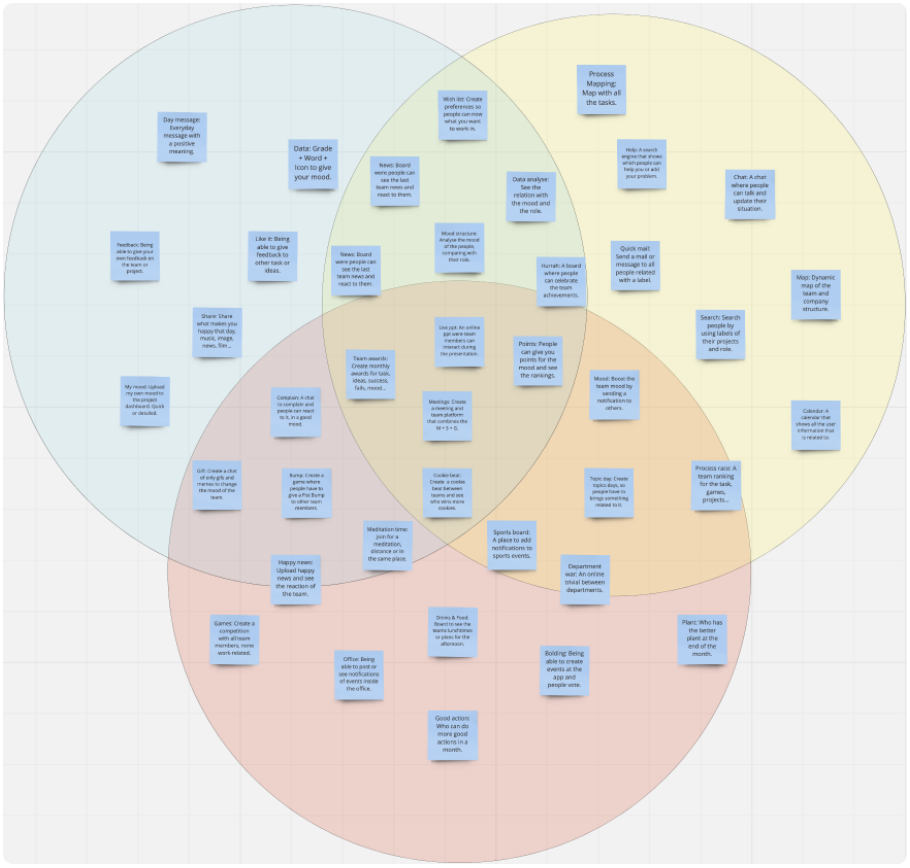
Team emotions/energy evolution:



Employees				
Share their feelings with the team and information	Can check how their teammates are doing and compare.	Contact teammates that need help or feel bad.	Meet to help or just talk, improving communication	See how was your week and also the team evolution
Manager				
Share their feelings with the team and information	Check the team situation and evaluate it.	Contact teammates or HR to give help and support.	Being able to meet the employees that need help	Analyze the team to make better decisions and new changes
Benefits				
People know each other better and there is no role differentiation in the survey.	Improve the communication inside the team and have more empathy.	The reaction is faster and you have more people to rely on.	Improve communication and focus on the people that need help	Help to make better decisions for all the team and guide the team together.

Appendix F - Affinity map 1

The following image represents the affinity mapping process made during the ideation process. The used software was Miro, an online whiteboard that helps to display all the ideas using post-its.



The following table represents the last 5 (from an initial number of 40) findings that I decided to keep after the entire process of collecting information, creating new ideas and keeping the most valuable.

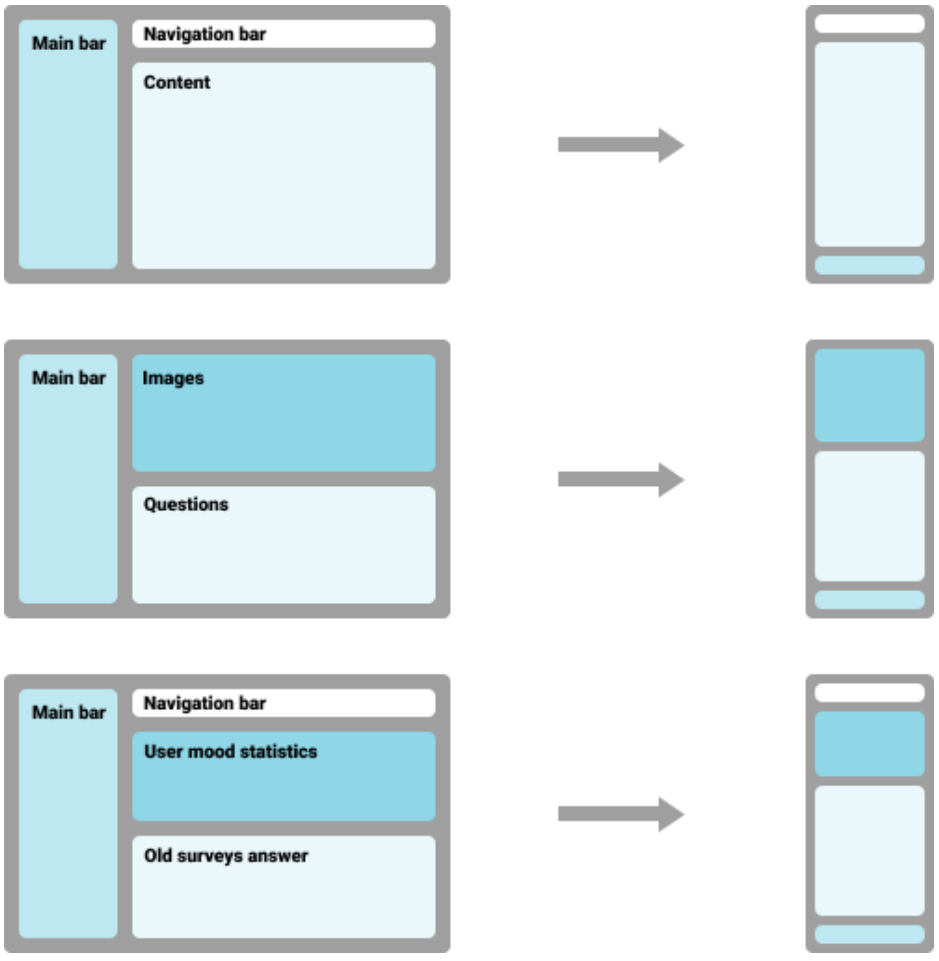
Real-time interactive dashboard that shows the team and people mood, to understand each other better. By the creation of the labels, people can communicate faster their need to all the teammates and save time.
An emotion survey that lets people choose when and with whom they share their mood, plus a more subjective and personal method.
Managers can see the way people interact, participate and their emotions, in real-time and the recorded history. All in a friendly interface to understand their employees better.

A tool that shows all projects people are working on, so people know more about the rest and promote the idea of asking for help or opinion.

Grab people's attention by generating compensation/feedback processes. Similar to current social media, creating a community and gamification process.

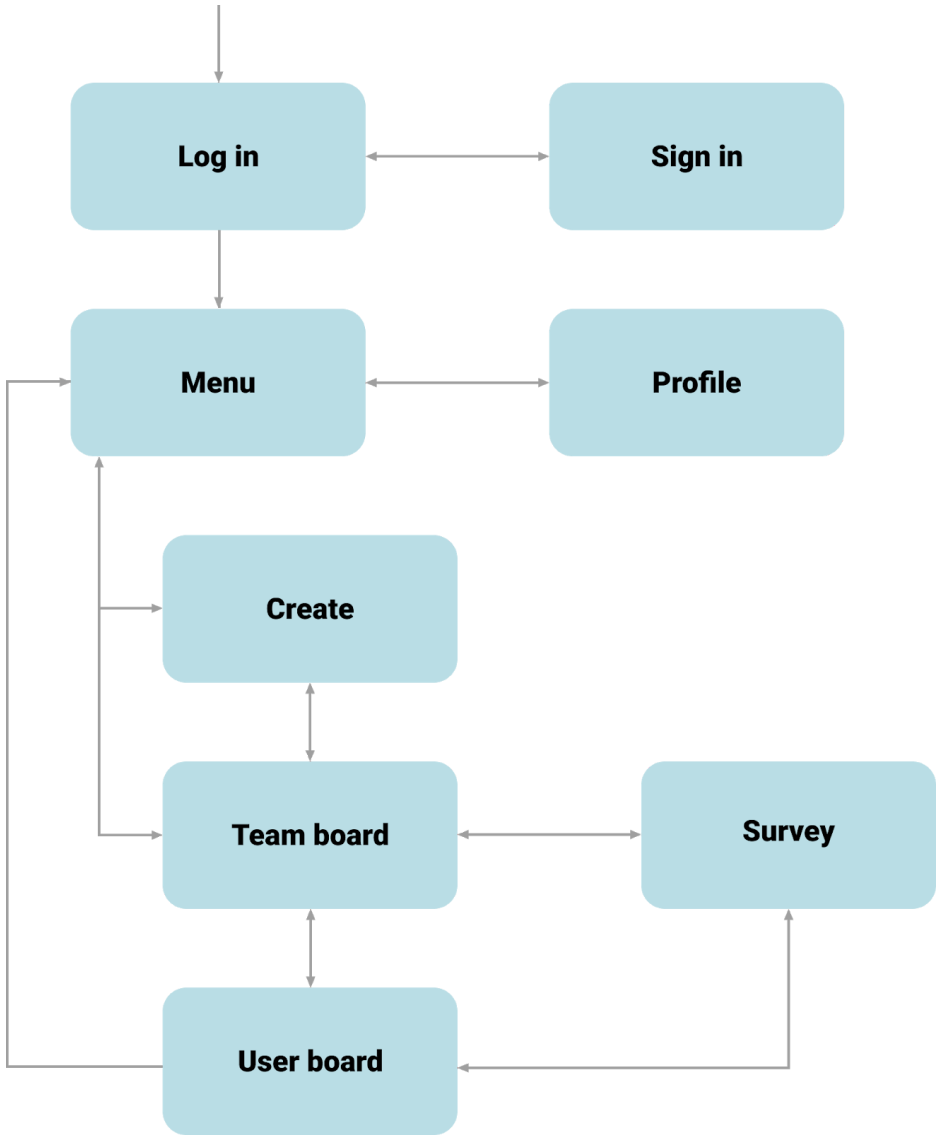
Appendix G - Wireframing

Wireframing represents the different parts of the screen that contain information and the responsiveness of this information. The final result was the following:



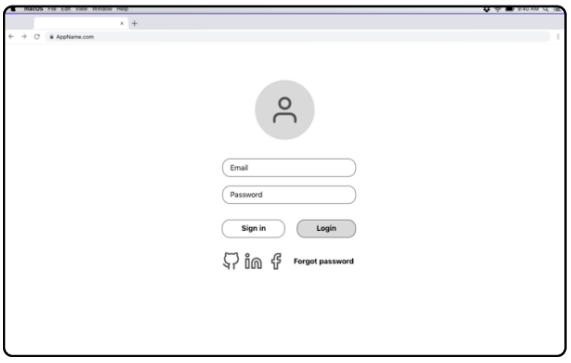
Appendix H - Content interaction

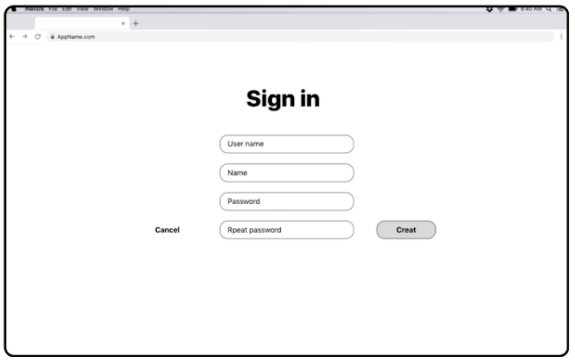
The content interaction represents the different screens that the application has and how they communicate. The final result was the following:

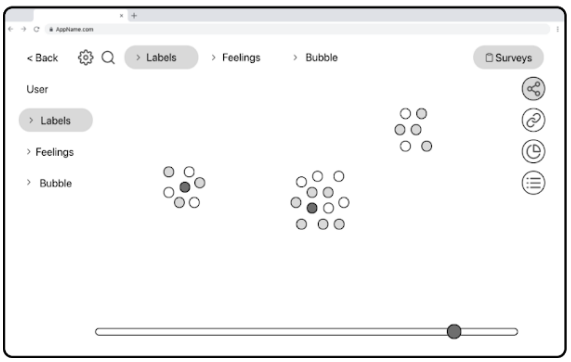


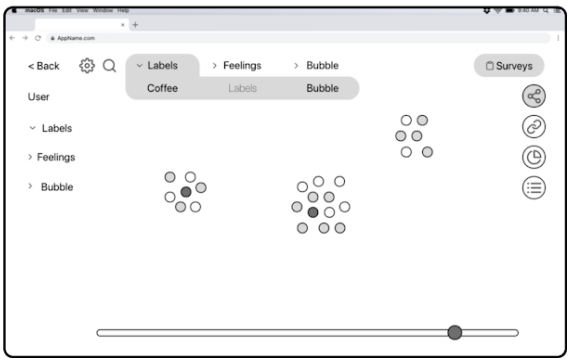
Appendix I - Low Fidelity prototype

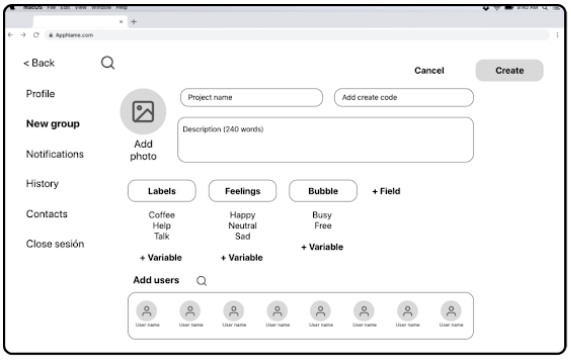
These are all the screens done for the low fidelity prototype:







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Cancel
Create
Profile
New group
Notifications
History
Contacts
Close sesión
Project name
Add create code
Add photo
Description (240 words)
Labels
Feelings
Bubble
+ Field
Coffee
Help
Talk
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Neutral
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Busy
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+ Variable
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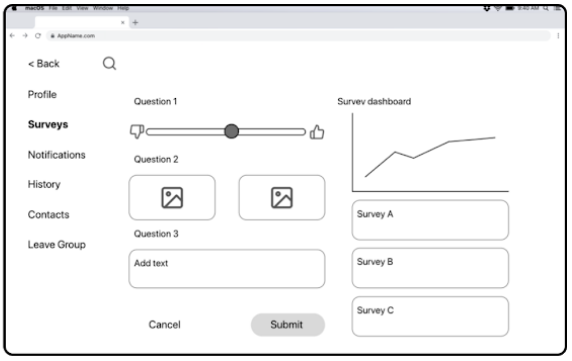
Add users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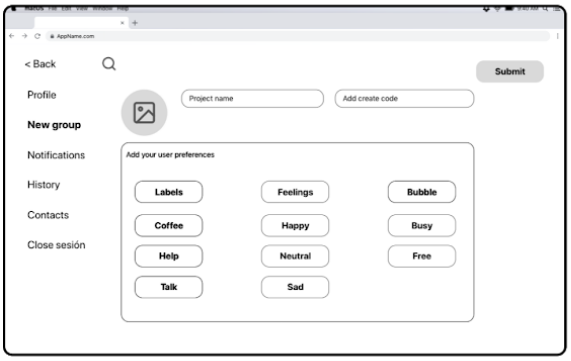
Profile
Surveys
Notifications
History
Contacts
Leave Group
Question 1
Question 2
Question 3
Add text
Survey dashboard
Survey A
Survey B
Survey C
Cancel
Submit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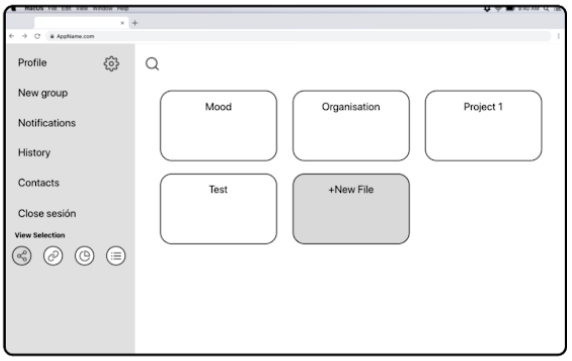
Submit
Profile
New group
Notifications
History
Contacts
Close sesión
Project name
Add create code
Add your user preferences
Labels
Feelings
Bubble
Coffee
Happy
Busy
Help
Neutral
Free
Talk
Sad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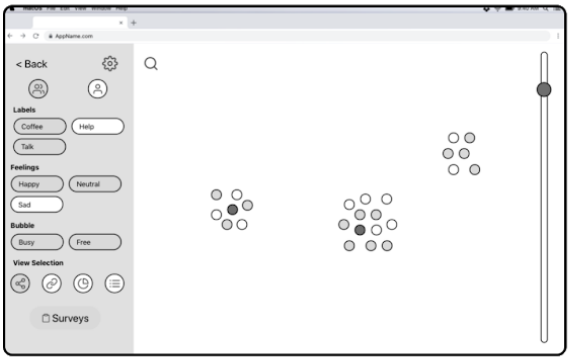
New group
Notifications
History
Contacts
Close sesión
View Selection
Mood
Organisation
Project 1
Test
+New File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Coffee
Help
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Feelings
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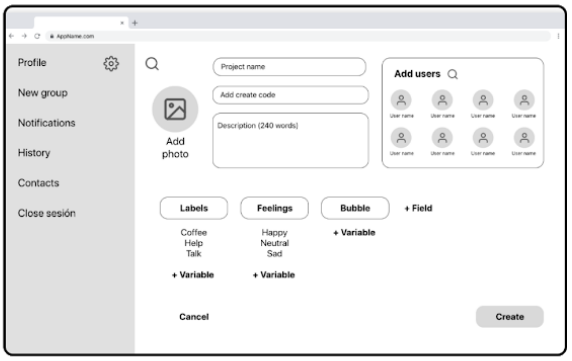
Sad
Bubble
Busy
Free
View Selection
Surveys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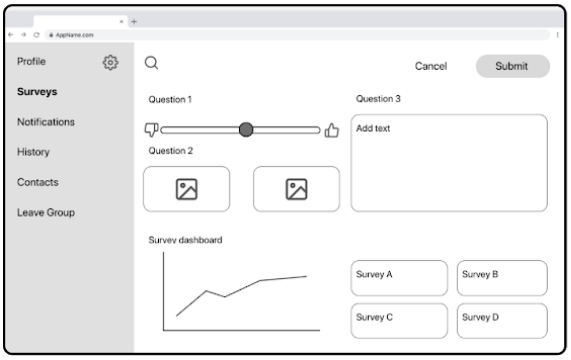
New group
Notifications
History
Contacts
Close sesión
Project name
Add create code
Description (240 words)
Add photo
Add users
Labels
Feelings
Bubble
+ Field
Coffee
Help
Talk
Happy
Neutral
Sad
+ Variable
+ Variable
+ Variable
Cancel
Create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Surveys
Notifications
History
Contacts
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Cancel
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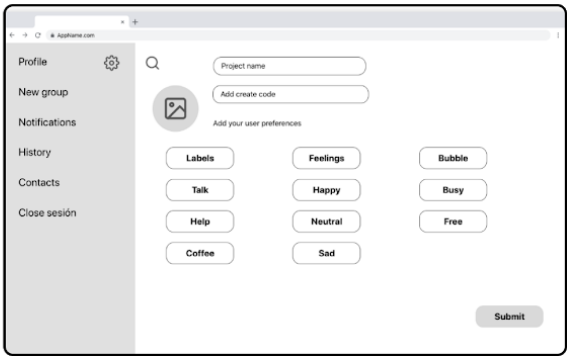
Question 2
Question 3
Add text
Survey dashboard
Survey A
Survey B
Survey C
Survey D


Profile
New group
Notifications
History
Contacts
Close sesión
Project name
Add create code
Add your user preferences
Labels
Feelings
Bubble
Talk
Happy
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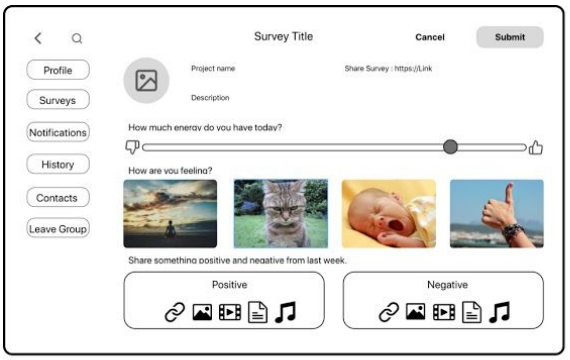
Help
Neutral
Free
Coffee
Sad
Submit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Submit
Profile
Surveys
Notifications
History
Contacts
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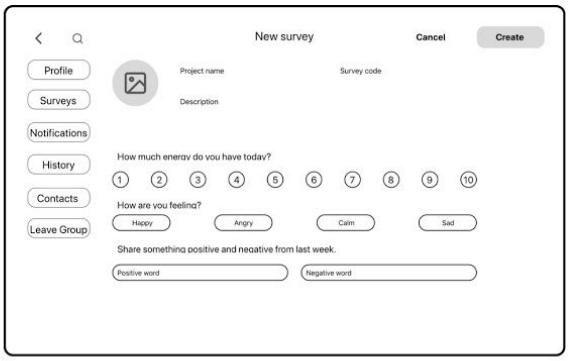
Project name
Share Survey : https://Link
Description
How much energy do you have today?
How are you feeling?
Share something positive and negative from last week.
Positive
Negative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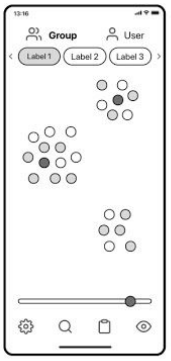
Profile
Surveys
Notifications
History
Contacts
Leave Group
Project name
Survey code
Description
How much energy do you have today?
1 2 3 4 5 6 7 8 9 10
How are you feeling?
Happy
Angry
Calm
Sad
Share something positive and negative from last week.
Positive word
Negative word


Email
Password
Login
Sign in
Forgot password


Sign in
User name
Name
Password
Rpeat password
Cancel
Creat


Mood
Organisation
Project 1
Test
+New File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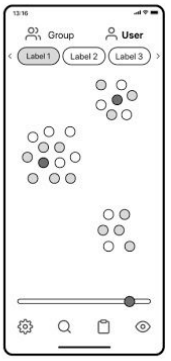
Label 3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User
Label 1
Label 2
Label 3


Labels
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Talk
+ Add new
Feelings
Happy
Neutral
Sad
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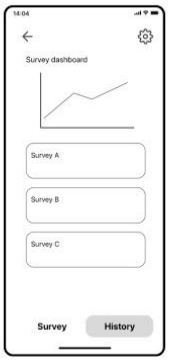
+ Add new
+ Field
Add users
Cancel
Create


Cancel
Question 1
Question 2
Question 3
Add text
Submit


Survey dashboard
Survey A
Survey B
Survey C
Survey
History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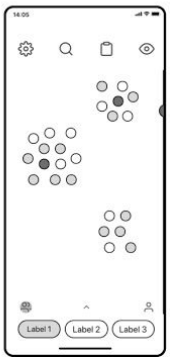
Project name
Add create code
Description (240 words)
Cancel
Continue


Add photo
Project name
Add create code
Description (240 words)
Labels
Feelings
Bubble
+ Field
Busy
Free
+ Add new
Add users
Cancel
Create


Mood
Organisation
Project 1
Test
+New File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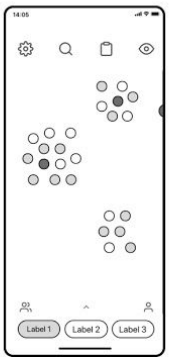
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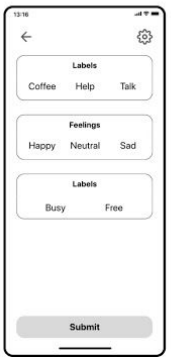
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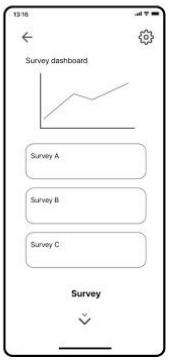
Survey dashboard
Survey A
Survey B
Survey C
Survey

Appendix J - High Fidelity prototype

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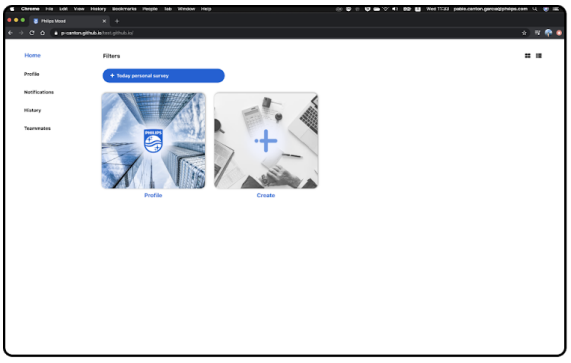
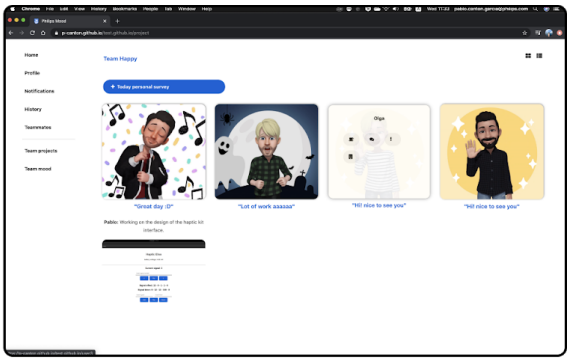
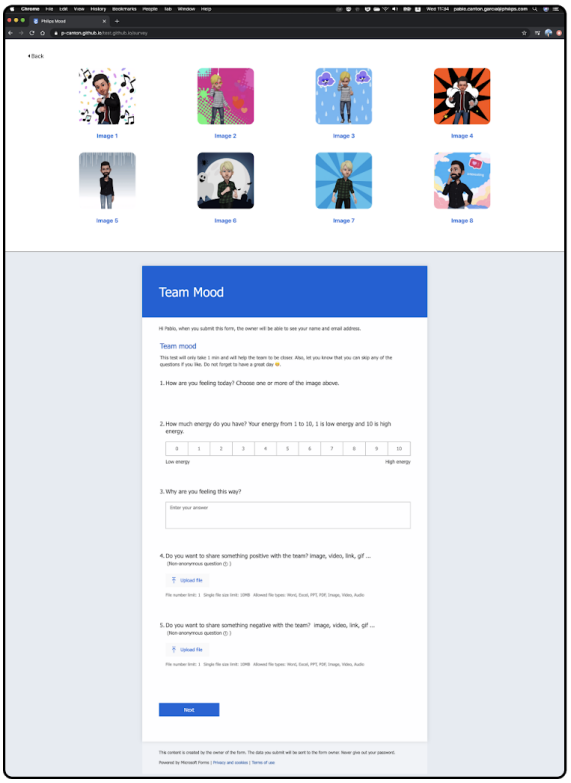
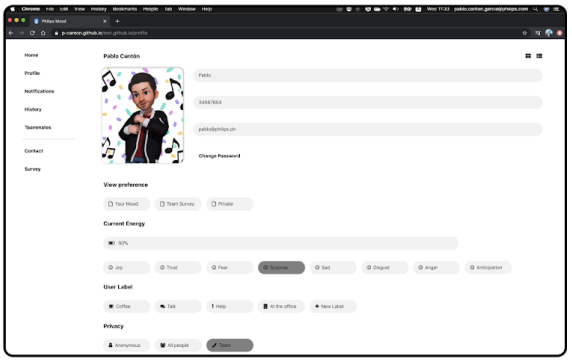
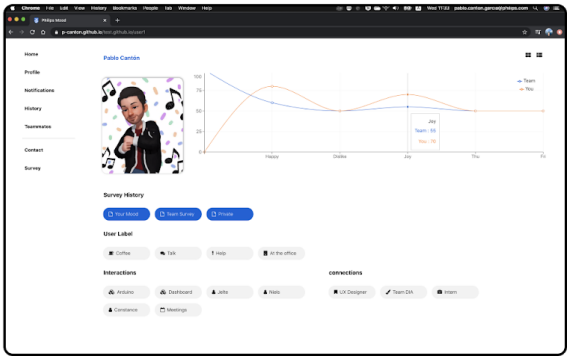










Appendix K - User testing

The first part of the user testing was an interview to understand the user better and see the preferences and opinion related to their current solution to manage the team mood. The following table represents the questions of this section and the most relevant answers to them.

At work, what is your interest in the mood of the people or sharing your state of mind? Why?
It is important to understand people's feelings and what they are struggling with; more now with the situation of working from home. This does not necessarily mean that I want to share my mood all the time, sometimes it is irrelevant, maybe I am still in the same mood. I'm interested in sharing my feelings. It is not a problem for me, not only if that helps me also if I can help others. Maybe that's why I am between the two options, b and c. I think that I am a person that likes to understand other people's feelings. I have preferences to share my state of mind with people I work closely with, like team members or collaborators. With more external people you end up missing a lot of contacts, important to have a lot of trust.
Do you have a mood dashboard at work? Which one do you use?
The more similar tool we are using is Mentimeter, but I still prefer to have a physical interaction with the people. Despite that, I prefer to meet after a team meeting, to share how it is going, talk about the situation and know more about my teammates' day. Currently working from home I try to keep my team updated by having video calls or chatting with them. In the end, I have a weekly meeting with each project manager asking how I am, updating my personal life and my work situation.
How many days per week would you share your state of mind?
I think that would be nice to have an everyday solution that asks how I am feeling. Maybe do it like a game, so is more fun to use, and adapts depending on your mood. Also being able to decide if the answer is anonymous and what I have to answer. I would like that my answer could be seen by other people and this brings an interaction inside the team, the answer affects the people and the goal of the app. Also, ask the question why at the end of the week. Thinking of all my week changes my state of mind, makes me remember the good moments and my achievements. My mood changes a lot, maybe in a day it changes several times, so the solution should have that into mind.

Which is the most comfortable way to share your state of mind?

The most comfortable is to have a normal chat, talk directly with my closest friends or teammates. These days working from home I do not share that much, also I currently work on a project by myself, and just talk with the people that manage my project. Before that, I share everything at lunch and have a conversation to know how my team feels.

What is your priority when evaluating yourself?

Depends on how the day goes, but usually, I look at the output of the day. My mood changes if everything goes right and if something goes wrong my mood could be affected at the end of the day. Unfortunately, I do not have a way to measure it or analyse myself to know exactly how I feel. Maybe I just look at my general mood at the end of the day, considering all the things I have done.

And what is your priority when you communicate with other team members?

Any kind of topic works to start a conversation or talk about your personal life. This builds empathy, because people like to listen and lets people know that they can share with you. I am an open person and do not have any limit about sharing my opinion with any colleague. Work should be a place where you can be free to share with the team and talk about your problems, hobbies or any topic. As an example my work helped with my depression, I had the opportunity to talk and be open, people give you advice and share. That's why I think that it is important to share your feelings. It's important to develop a sense of empathy towards all my colleagues, whether it is about work or personal related issues.

The second part of the user testing was a user testing of the two prototypes where the user had to go through five tasks. The following table represents the results of this section and the most relevant answers to them.

Concept A: You will see some screens from the interface. What is your opinion about the concept? What will improve the value of the idea?

Very good to improve the environment at work and team communication. I am not sure if I will look at the feelings of the people, I think that is more important what they suffer from and connect people that have experience with those problems. Sometimes I have too many meetings, so it would be nice to have a tool that makes it more simple to say no. Another problem is that at the end of the day I have a lot of workloads, maybe using this tool I can ask for help. Also with this solution, someone can help with my frustration or complication at work. I would like to put a dashboard where people update with the things that they suffer. On the other hand, it is important to share how people are doing during the week and share to help each other, because if I have problems, some

people can help with the experience. Once I was having problems with my landlord and one day I shared it and people gave me help and that was something positive.

Survey A: One teammate has uploaded a new survey for the team. Take your time to see and analyse the screen. What do you feel about this kind of survey? Can you bring the positive and negative points of it? And what will improve the value of this kind of survey?

Time: ~ 1.5 min	Errors: 0	Actions: 5	Success: 100%

Nice to have someone asking for a question, question 1 and 2 are tricky to answer. Because of that, my answer is not the most honest, I feel that it is out of context. I will always answer the same, need more context or information to give more details of my feelings. Number 3 has more context, you can start a conversation with this kind of answer and discuss it with your team. Is more important a question that makes people think about their feelings, not just about today. Thinking can make me feel better because I remember something positive or reflect about me. I will avoid closed options that do not represent me and try to quantify how you are feeling. For the people it is difficult to know how they feel, and the closed answer may not find the one that fits them. I think that would be better to connect to the people with their answers and ask more open questions. People are not only numbers, but also have a story behind that they can represent them better than a number.

Concept B: You will see some screens from the interface. What is your opinion about the concept? What will improve the value of the idea?

It is a nice concept, similar to a community or social media platform, being able to see all the team states. I think that is an important tool for the manager if all the people share a negative mood they can see what is happening and make better decisions. Taking actions to help the team is a good idea and like the idea to be anonymous, good to have the possibility to be comfortable sharing. I am not a person that is scared to say that I am sad, people have to be honest and hope that the team has the correct reaction, so people can help, this thing is important, should not be ignored. People that ignore teammates with problems is not something good, the company should encourage people to help each other and support. People have to be open and share their ideas and how they feel and the team have to listen and try to understand each other.

Survey B: Another teammate has uploaded a new survey for the team. Take your time to see and analyse the screen. What do you feel about this kind of survey? Can you bring the positive and negative points of it? And what will improve the value of this kind of survey?

Time: ~ 2.2 min	Errors: 0	Actions: 5	Success: 100%

This concept looks good, but the images can be ambiguous in some situations and bring some confusion to the people. Maybe for someone, an image is

positive and for another person it means something negative. Maybe because that reason the word can be more direct and avoid problems with the interpretation of your answers. The picture can be subjective and this makes it more difficult to choose, because pictures say a lot of things, maybe use pictures that are more direct like an emoji happy or sad. Like, the idea to share things like an image or video and not only a word. The only change maybe would be on sharing only positive things, because negative looks a little bit more difficult. On the other hand, the slider does not have a score, it is easier to put 1-10, so you are not confused how much did you put with the slider.

Concept comparison: Now you will see the two concepts together. What is your opinion about them? What will improve the value of the idea?

Solution B is much better and interesting than the solution A. Like the idea to give feedback using images and makes me think more about my answer, with the images I need to focus more on what I see and do, so my answer is more honest than a word that I have to pick. On the other hand, the only thing that maybe I will take from survey A is the collocation of all the information in the left part of the screen. If you use the application on a PC it is much easier and faster to move if everything is in the same part of the interface.

The third part of the user testing was an interview to understand better the user point of view related to the two prototypes and evaluate which is the best option. The following table represents the questions of this section and the most relevant answer to them.

What are the main problems you have encountered when doing task A and B?

The main problems I find could be related to the idea that images could have a different meaning for each person. Maybe using words is a better option, so the output is not that suggestive. On the other hand, I will use words that are less aggressive, use more calm and familiar words and softer (angry -> upset). In the case of the pictures, this could be solved by using emojis, like making a combination of the options A and B. This is more similar to how people communicate in social media, and maybe easier for the people to answer this way.

Of the two models, which one do you prefer? Why?

From 8 participants 1 prefers model A 6 prefers model B.

Option B is the best option for me, I think that looks more clean and much more dynamic to use, making it more appealing to use the application. Despite that,

the differences on the interface are not that big, so I can get used to the interface of prototype B, despite my preferences. I think that it is more important to have an application that displays useful information and is easy to understand, more than the interface of this one.

Of the two surveys, which one do you prefer? Why?

From 8 participants 2 prefer survey A 6 prefer survey B.

I prefer option B, but it is true that this may depend on the kind of work it is related to, and the output people are looking to obtain. Also, option B looks faster and easier to use, obtaining an outcome that looks more interesting for me. Despite that may for a developer it is harder to have a more clear output of the answers because of the different interpretation of the images.

Would you like to use the chosen concept frequently? Why?

Depends, I would like to test it and give it a try inside the team, and if I have a benefit I will use it more. I think that the solution will help to manage the different projects better, and I feel that will help the team. Also, I would like to have a better overview and knowledge over the team, being able to help my team members. Use the solution to share energy and get the energy back from my teammate, by solving the problem they have or having a conversation. I think this platform will help people to be more open and avoid keeping their problem with them. Help is the best value for me and will develop the team synchronization and performance.

What did you like the most about the concept (in case you liked something)? It was easy to use and learn how it works?

I think that the solution is really easy to use and get used to. Like the idea that I can share my positive and negative things or experiences, helping to connect with people and see if we have the same problems or similar. It Would be nice to have a place to add all the experience and previous work of the people. I think that sometimes people are working on the same thing or I can ask help from someone that works on something similar. Sharing what people are doing or what they did may help to help each other or avoid having two people working on something similar.

How well do you think this concept would work inside your work team?

I think that people will find it useful because all the projects try to share their mood in one way or on another. In a week I have several meetings just to share how you are feeling or update about your work. Having this digital tool would be super easy to share your state of mind and decrease the number of meetings or time of the meetings. There are a lot of meetings of how you are doing, around 4-5 meetings per week to update the team and you lost a lot of time. It would be nice to have a function to share everything with all the team and to not repeat the task several times. The time you spend repeating yourself could be useful to

work more, relax, have more time with your friends or family...

Appendix L - Hi-Fi testing

During the Hi-Fi testing after each of the surveys, the users were asked to evaluate the emotion surveys and add any comment they thought that was important. The following table represents the answers to each of the surveys.

Survey 1 (GIF + Energy number slider + Insert a positive and negative word)

Total grade: 7.75 **Total Time:** ~1.3

"The part of inserting something positive or negative is confusing, what it is related to? or is something random"

"I like the images to represent my emotion and it is really fun to see my other teammates' emotion in the menu as a moving image"

Survey 2 (Image + Insert words + Insert a text to say something new "+ or -")

Total grade: 6.25 **Total Time:** ~1.3

"The previous survey was better, I like the images moving, this makes it faster to recognize the emotions"

"I do not like to insert random words, it does not make sense to talk about my feelings"

Survey 3 (GIF one choice + Ask why + Insert a positive and negative word)

Total grade: 8 **Total Time:** ~1.5

"I like the question of why, this helps to give more information about the gif I choose"

"I do not like the limitation of only one Gif, I prefer to choose more"

Survey 4 (Words + Grade with a number + Share a failure or achievement)

Total grade: 5.5 **Total Time:** ~1.1

"Grading my feelings with numbers is confusing, I do not feel comfortable doing it, not sure what to put."

Survey 5 (GIF + Energy % slider + Insert a “+” and “-” image/video/audio/text)	
Total grade: 8.5	**Total Time:** ~1.25
“Really interesting to share an image, video or song, it makes that question more interesting, but maybe sometimes it is hard to answer, maybe attach the answer to a topic”	
“The slider looks good, but maybe make the GIF change with it. Also I would like to create my own GIF in the future”	

During the pilot testing after each of the surveys, the users were asked to evaluate the surveys and add any comment they thought that was important. The following table represents the answers to each of the surveys.

How was your experience using this tool during the last week?
I learned that it can be tricky to engage with the tool daily, because of the strict timing of the day. Despite this inconvenience, I find really interesting the use of the application. First of all, I was able to see the rest of the team and know how they feel and take some time to see how the team was doing. On the other hand, I feel that this application can be useful to add at the beginning of team meetings.
Was it nice to use the application and see how the rest of the team share their emotions and work. I can see the potential this application has and how a big team can benefit from it. More during these days that we are working from home, that you are not able to see your teammates. Also, this could improve collaboration with a team in another region or country.
Which is your less favourite part of the platform? Why?
I find it difficult to find different descriptions of each user or how to change mine. In the profile, I have the feeling all the descriptions/labels look really similar, make them look different so the interface is more appealing and easy to use. With the rest of the prototype, I am happy.
The first day I found it difficult to find the survey that I had to fall in, I was not sure how to find it and it took me some time. Additionally to this problem, I find it more relevant to see first my principal team, more than all the projects I am working on. Not only to save time but also to not miss important information when I open the application.

Which is your favourite part of the platform? Why?

The best part of the platform is how the gif represents the mood of each teammate, making it easy and fun to look at them. On the other hand with the surveys, the gif helps with the answer and also the simplicity makes it easier to do. The best thing with the survey is how short it is, but at the same time, the amount of information you give.

I like the mood expressed with pictures, it's fun and fast to do. Uploading your own can be great in the long run. If you find something funny and you think 'oh, I'm gonna share that with the guys tomorrow!' is a really interesting thing to do. I very much liked the pictures of the team members in the tool, very cute approach and gives possibilities for making great GIFs of each other or yourself to share etc. Not only help to share your feelings but also to interact with the team.

Which screen or process of the platform required to be changed or improved? Why?

In my case, I think that the question of asking something positive or negative looks good but at the same time very confusing. The first day I did not answer it because I was not sure what to put on it. Maybe I suggest adding a more precise question or adding a topic or similar, doing this I think is less confusing and encourages people to add something.

Maybe add a screen or option to also see your work situation together with the mood of the people. If I can see that someone is sad and has too much work, it helps me to understand his situation better. On the other hand, I will add a shortcut to move to another project, because despite the prototype only having one project, I imagine that if I have several of them, I don't want to take a lot of time changing from one project to another.

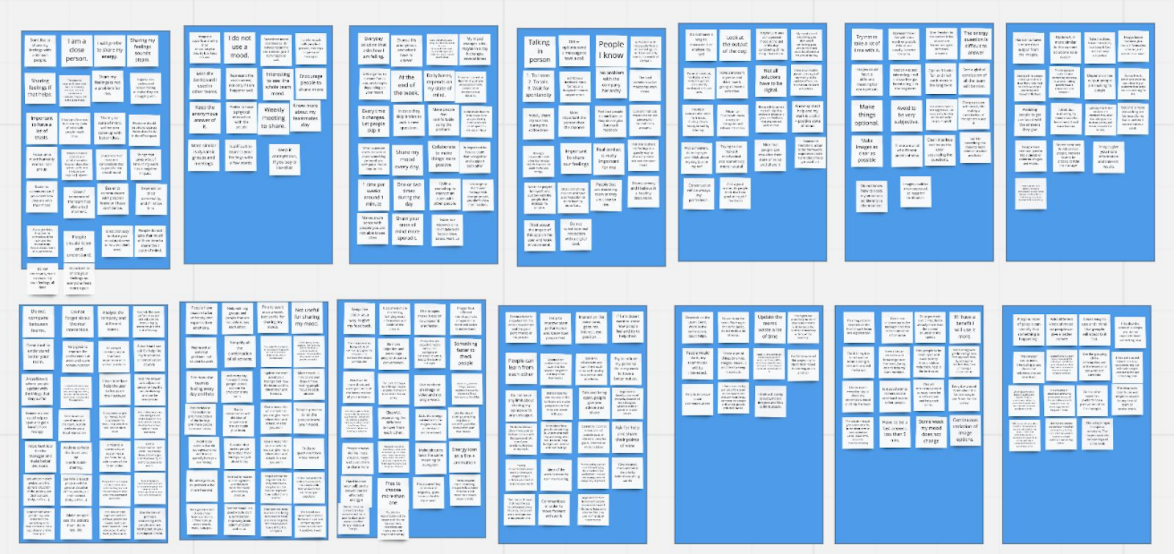
Any idea that could help to improve the team mood?

As a manager, I like the idea to have automatic surveys that save me time, but on the other hand, this can end up in giving irrelevant information. Maybe I would like to be able to change some of the questions or add a new one, depending on the moment. Also, have the option to add new surveys or that the tool learns from me to choose the best survey and adapt to the team mood.

Maybe I will make a button to stop the animation, sometimes it was a bit stressful to see them moving all the time. Also, the screen looks good because we are only 4 people, maybe if the team is really big the interface is not that clear. I recommend finding a solution to make the GIFs smaller and easy to see, like zooming to see the gif.

Appendix M - Lo-Fi user testing affinity map

The following image represents the affinity mapping process made after the user testing process with the low fidelity prototype. The used software was Miro, an online whiteboard that helps to display all the ideas using post-its.



The following table represents the last 20 (from an initial number of 285) findings that I decided to keep after the entire process of collecting information, creating new ideas and keeping the most valuable.

Share my mood: Everyday, >5 min and freedom. Adapt questionnaire	Like: Share memes, mood, help, see all team, simple, feedback
Encourages people to interact, build trust inside the team, helps people to talk, and be more open. But depends on the team	Peopleself evaluate by looking at their process and outcome + feedback of people. Make more easy to start a conversation
People that are inside, my team or people close to me. Keep the personal interaction	Important for mood: trust, know people, interact, listen, express free and understand.
Share and collaborate, will help too: better ideas, environment, interaction, more together, positive, communication and results.	Work should be a place where you can be free to share with the team and talk about your problems, hobbies or any topic.

I like to see the big picture of the team and company, see the common things between the people and to help people with their mood. Learn from each other and see our experiences and share energy (+/-) add context of people, team or projects	In general communicating in person is important for the work environment and the good performance of the project. All people had this as a preference, not everything has to be digital.
Important to develop a sense of empathy towards, whereas work or personal related issues. Person more important than the channel, look the feelings, no the numbers	Pictures have a lot of information, can be used as storytelling, not only a word, easier to answer and being more honest. But make sure that the images are not confusing and a more clear output and change during time
Add value: People know they can share, more time, know people, team, share, game, fun, transparency, communications, empathy	Clean UI: split, more visual, add reasons, icons energy, slider, add moods, keep labels, neutral words and no confusion. Represent context.
Sharing my feelings can have negative consequences: People do not care, mood change, bad representation or misunderstood	People are not the only number, but they also have a story behind that can represent them better than a number.
Important for managers: compatibility, +info, Increase interest, teams, company, find faster the problem and understand	People are open to share their feelings or what happens to them. But it is hard to know how they feel
Encourage: Anonymous, skip, fast, compensate subjective / objective, comfortable, more human, respect, intelligent/interesting and freedom	When someone needs to listen or share something personal, you can't put a limit on him. Think about the impact of the solution

Appendix N - Hi-Fi pilot testing affinity map

The following image represents the affinity mapping process made after the pilot testing process with the high fidelity prototype. The used software was Miro, an online whiteboard that helps the team to collaborate.

The following table represents the last 9 (from an initial number of 87) findings that I decided to keep after the entire process of collecting information, creating new ideas and keeping the most valuable.

Create a team notification to meet with people in a place, to reinforce the physical interaction. Also, have a real-time meeting label, so people can see who is meeting and join.	Add a team mood bar, to represent the current mood of the team, with a percentage and colour related to the emotion. Improve the label of the user, creating a direct button related to labels.
Let the manager share global messages in the platform to create events or try to talk about the team. On the other hand, add real time surveys to add during a presentation or meeting.	Understanding the origins of the teammate's emotions by adding some quotes of the teammate's below their gif, so the team can see what is related to their emotion, also, add more why questions.
Adding more sentiments, or ways to show their emotions, not only eight of them. Show the user the possibility to merge emotions, so they can express more feelings to the team.	Change the main screen to be the principal team, so the user doesn't spend time searching for the teammate's mood or looking at the survey button.
Make notification or show how the manager cares about the use of the platform and encourage the team to use it. Notify the manager if he did not contact someone for a long time.	Gives possibilities for making your own gifs of each other or yourself to share etc, this has the goal to make the application more personal and increase the team interaction. Using the images speed the process to look at the entire team mood and encourage users to use the app more.
Keep automated surveys to save time to the manager, but on the other hand, let the manager change it, to make the survey more reliable to the context.	

Appendix O - Implementation

The following image represents a possible solution to the implementation of the solution and how the data will be implemented.