

# Sensation of data B2.1

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# MEEBA

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MEEBA B2.1 Sensation of Data

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#### ABSTRACT

MEEBA is designed to explore and improve personal contribution for congenial cadence meetings. Through reflecting on personal behaviour during meetings, it initiates users to become and remain aware of their own meeting style. This can initiate change and help those who find it difficult to find the right group balance.

The office environment has a significant impact on one's quality of life. Having an unbalanced group to work with may lead to displeasing feelings after a group meeting. Data & intuitive body interaction is used to ensure that the balance of discussion in a meeting feels fairer which can improve productivity and a positive work environment. An added side-effect is that when employees feel heard, it may also improve their wellbeing and can even result in an improvement on their mental stress levels.

#### Keywords

Teamwork, Meetings, Balance, Office Vitality, Feedback



Figure 0: MEEBA; Bring all voices to the table

#### INTRODUCTION

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While working in a collaborative environment, finding the right group balance can be quite difficult sometimes. One tends to speak up more than the other, while someone else is too shy to even make a comment about it. Groupwork difficulties can really demotivate and result in the loss of productivity for a project or degradation of mental health of the participants, according to Ansio, H., Käpykangas, S. and Houni, P. (2020), adopted from Carnevale 1992, Clements-Croome 1997.

According to Gettysburg College (n.d.), most people spend roughly around 90,000 hours working in an indoors working environment. With almost one third of your life dedicated to the office, the working environment has a huge impact on one's quality of life. Therefore, a healthy group balance is crucial when working regularly in a group setting. Ansio, H. et al., (2020) stated that a stressful atmosphere can have a toll on office workers mentally at cost of office vitality, with reduced productivity and efficiency as a result. Yet, this can be improved by actively supporting intercollegiate values, while collaboration and a feeling of community will only be fostered within a workspace through emphasizing its importance (Ansio, H. et al., 2020). This is beneficial not only for the company, but for both employers as employees. Workers tend to be more efficient and able to finish their tasks thoroughly given that the worker's well-being is valued and cultivated in their workspace. In Australia, mental health problems- single-occasion but particularly recurring -is an important contributor to sick leave days (T Lallukka. et al., 2021). So, fostering this will also reduce the number of employees that call in sick, which could benefit the entire workforce, resulting in a healthier company environment.

In order to encourage improvements regarding

groupwork in the office, MEEBA was designed which gives office workers insight in their individual input during a meeting to foster groupwork balance.

Several iterations lead to a portable device consisting of a central station and individual elements (Meebits). Individual (active) contribution of all attendees is encouraged by making use of intuitive proactive behavior: One has to adjust his/her stance to reach MEEBA when placing the Meebit to indicate one's wish to verbally contribute to the meeting. Consequently, MEEBA measures one's contribution while simultaneously making the other group members aware that one has something to say. This participation is also encouraged by a seemingly random roulette light in the MEEBA to give someone who hasn't participated in a while a chance to add to the current conversation. The scannable NFCs in the Meebits provide information to the participant about personal contribution, which allows for individual reflection and adaption to improve the future meeting balance.

Fostering this intercollegiate engagement in meetings could develop a healthier and more pleasant teamwork experience in the office setting. In turn, this can potentially lead to more passion in the work of the employees, making the work environment nicer and more efficient.

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Figure 1: MEEBA Logo

Figure 2: MEEBA in context

#### **RELATED WORK**

#### **Office Vitality**

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#### Why is office vitality important?

Finding a balance between work and life is a struggle for many people. Nowadays it's becoming increasingly normal to be up-to-date twenty-four hours a day, which can result in overwork for employees who spend more time working than they may realize. This affects employees' energy and health. (Mancini, S., & Mancini, S. et, al 2018)

As mentioned above, vitality at work is very important for the employees work experience. Office vitality is not only related to the office building, but also determined by the office workers themselves. To visualize this, vitality at work can be divided into five different aspects (see **figure 3**). (Home, et, al 2020)

Not every company has the same working strategy . Every company works differently, which is why there are various challenges in creating a more vital space. It is very important for an approach that goes hand in hand with the values and situation of the company, while assessing vitality risks.

Different methods to create more vitality at the workplace have been designed already. One example of a method that had positive results, is the 5-month intervention method. 'This method included activities at management, team, and individual level targeting self-management to perform healthy behaviors: a kick-off session, vitality training sessions, workshops, individual coaching, and InterVision.' As result, many aspects were improved. These results were defined through surveys, health checks, databases, and sickness absence.

The outcome of comparing the outcome before and after the intervention. It can be concluded that working for a better working environment to create a better vitality at the office can seriously have a positive impact on the work results, atmosphere, health, etc. (Hendriksen, I. J., Snoijer, M., De Kok, B. P., Van Vilsteren, J., & Hofstetter,H.et al., 2016) [1].

One of the solutions that is recommended by many different studies and researches is the use of bright light. This is a method that is also used in homes, but it can also be used at the workplace and it will help to improve the office vitality eventually. It is mainly used in the winter because there is much less light then. Light has a very positive influence on human well-being. It is not for nothing that many people often feel better in the summer than in the winter. Andersson, H., Sutton, D., Bejerholm, U., & Argentzell, E. et, al 2020)

#### Teamwork

#### Types of teams

In the past twenty years, teams developed far more diverse, dispersed, digital and dynamic (Haas & Mortensen, 2016).

There are 4 different types of teams you can find in an organization. The first and most common type is called a 'Functional Team'. Functional teams are permanent and include members of the same department who take on different responsibilities.

The second type is a 'Cross-Functional Team'. These teams include individuals from various departments. Their goal is to tackle specific tasks that require various inputs and expertise.



Thirdly, a 'Self-Managed Team' consists of individuals who are employed at the same organization, yet operate without a manager and are autonomous, sharing responsibility and leadership.

The last type of team is a 'Virtual Team'. Virtual teams include individuals who work in different locations. They use technology and collaboration tools to achieve the same goal. This type has become more common because of the COVID-19 pandemic (Pragmatic Thinking, et al., n.d.).

#### Engagement

Engagement is the state in which individuals are emotionally and intellectually committed to the organization. High employee engagement is important for a successful business. A company will strive to improve the productivity of the employees by improving their engagement during a project. Improving this will also increase employee loyalty towards the business (Ravikumar, et al., 2013).

To create employee engagement, employers should strive for a work culture in which employees can develop themselves and reach their career goals. A flexible working environment will help employees to find time to develop themselves in skills they find interesting (GLINT, 2021). Another effective way to assist employees to reach their career goals is by providing access to workshops (Maximized Human Potential, 2020).

Besides benefits for companies, engagement also has advantages for the employers themselves. Being engaged during a project creates less frustrations with more positivity for the work they are doing as a result. Being positive about your project can also increase passion for the project. Having passionate members in your team will also motivate other team members, and grow a more balanced experience between the group members, which is the main goal of the project (Chitra Reddy, et al., n.d.).

Figure 3: 5 aspects of Vitality at work.

#### Belonging

The sense of belonging in a team is a feeling that helps to enhance teamwork. According to a study by Maximizing Human Potential (MHP) about the state of human experiences in the workplace, over 60% agree to perform better when having a sense of belonging.

There is a price to pay when team members have a feeling of loneliness and a feeling of not being connected to their organization. It is a human need to feel connected, not only with the work you do but also with the people you do your work with (Maximized Human Potential, et al., 2020).

#### **Influence of Colors on Human Behavior**

Color can be of influence in different settings. It can be a communication tool, but can also affect somebody's mood and reactions to certain situations (Elliot, 2015). The project MEEBA works with different colors and these can be linked to certain behavior and personalities.

MEEBA works with four different colors; yellow, green, blue, and red. These colors can be chosen as how someone identifies with different personalities (Insights Discovery Part 1: The 4 Colors | MudaMasters, n.d.).

In **figure 4**, there are two axes that identify different personality characteristics. The first axis that is described by Carl Yung, is extrovert or introvert. Introverts like to spend their energy thinking about concepts and ideas. Extraverts, on the other hand, get more energy from other people and like to spend energy doing things and spending time with people. The second axis is thinking versus feeling, this axis determines what uadrant your personality fits in. Thinkers are the people who start their thinking from logic. Feelers on the other hand base their decisions rather on their gut feeling (their heart) and take their relationships into account when communicating (Insights Discovery Part 1: The 4 Colors | MudaMasters, n.d.).

Based on the two axes, each color has its strengths and weaknesses.

- Red people tend to be the extravert thinkers, they have a strong desire to win and are so competitive. These people are motivated to get things done. Having control is very important for them.
- Yellow is mostly chosen by the people that are extrovert feelers. They feel like doing this together and they know how to motivate others with their enthusiasm. Yellows are thoughtful and are willing to help everyone when needed.
- Green people are the most introvert feelers. These people are calm even in the most stressful situations. They are very logical in their thinking, they can often read people's emotions.
- Blue is for the task-oriented introvert thinkers. These types of people are perfectionists, they seem emotionless from the outside looking in. Blues like to organize and analyze.

These facts about different personalities matched with colors became clear from (Insights Discovery Part 1: The 4 Colors | MudaMasters, n.d.; Which Color Personality Are You: Red, Blue, Green or Yellow?, n.d.)

A team can consist of all four different personality types. These types can reinforce each other which helps as a positive effect on groupwork. In addition, it is also very good to be aware and take note of which color matches a person the most. When people are aware of their actions, there is an earlier possibility of improvement and better recommendations. This has a positive effect on the final team balance which is also the goal of MEEBA.



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### BENCHMARK

While the current market does contain products and services that stimulate teamwork, products that focus on a more balanced groupwork are explored more notably within the Industrial Design department. A benchmark was created (see **figure 5**) that mostly targeted ID projects found on Airtable to highlight their core principles and compare those to our proposed concept MEEBA. The following paragraphs illustrate two of the most notable projects comparable to MEEBA.

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Figure 5: Benchmark

VITALITY

#### Debatable

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DebaTable is a technologically enhanced meeting table that mediates discussions wherever people come together to discuss ideas and make decisions, such as brainstorms or project meetings.

Like MEEBA, the main input comes from measuring each participant's speaking time. Yet, the amount of input is visualized in the middle of the table with lines pointing to each of the seats. This makes the design more public – and thus confronting - in comparison with MEEBA, which keeps the feedback private for personal reflection. Additionally, a slowly expanding circle in the middle of the table shows the discussion time left, which is determined by the participants input.

Unlike MEEBA, DebaTable is not that portable. A static table was chosen instead of a smaller modular object. This makes for less adaptability in different kinds of offices, as MEEBA is a lot easier to carry with you if you change your meeting space.

In the end, the core principle of both MEEBA and DebaTable is achieving neutrality and balance during team meetings. The value of the presented data is decided by the participants themselves. Change is initiated through self-reflection and group discussion.

## THE TABLE THAT SPARKS DISCUSSION, WHILE RESPECTING YOUR SCHEDULE



# VITAL MEETINGS DEBATABLE STUDENT NAME ZENO KAPITEIN CARINE LALLEMAND ID A DAMEN ILLUSTRATION ADAPTED FROM B32

Meetings can be a pretty frustrating experience. Some people start oversharing, while others fall back and don't contribute as much. DebaTable is here to gently remind you of yourself, the others, and the meeting you should be having.

Each participant's percentage of speaking time within the past few minutes is measured and visualised in the middle of the table. An expanding circle shows how much time is left for the discussion. Each participant "votes" on the allotted discussion time with discreet personal sliders on the edge of the table. Through self-reflection, DebaTable aims to mediate discussion by simply letting us have our meeting and change ourselves.

Figure 6: DebaTable

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DYNAMIC MEETINGS VERTO

STUDENT NAMES: SANDER DONNINGER ALEX HORTON

would offer. During a valiking meeting, attendees usually end up walking side-by-side in pairs of two, resulting in an unequal social dynamic. Verto addresses this problem, by encouraging group COACHES experience, Verto subtly prompts meeting participants while sustaining the flow of the meeting. It also offers participants IDA DAMEN CARINE LALLEMAND SEMESTER B21 an easy way to take notes, by recording audio when needed,

does not provide the same practicality a regular meeting

making it the perfect tool for your walking meeting.

Figure 7: Verto

#### Verto

VITALITY

Verto stimulates team building on a whole new level, focusing on walking during meetings, and making sure there is a balanced social dynamic and equal input during the group interaction.

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The tactile experience of Verto allows for personal input, utilizing functions that make it easy to take notes (e.g. by recording audio). The accessibility and ergonomic form are better explored than the opportunities for tactile interaction of the current MEEBA design. It is therefore even more portable than the MEEBA, which is still a rather static object besides the personal Meebit remotes.

Because of its simple and portable design, the Verto is ahead of MEEBA on portability. The design of Verto and their choices made could help the design of the Meebits further, as the tactile experience is guite important.

#### **DESIGN PROCESS**

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This sections describes the entire design process and the different phases that the team went through. The phases during the design process are based on the widely known Design Thinking Model as described in Dam and Siang (2021). The Design Thinking Model states that each design process consists out of the 5 following phases: empathize, define, ideate, prototype, and test. These phases are not always chronologically followed, as each design team naturally follows and creates their own unique process based on insights and design choices made along the way. This is also recognized in this design team's process.

To give a clear overview of the entire design process, a diagram on the design process with color coded phases has been developed. Similarly, two more detailed diagrams have been made that describe 1) the process from the start of the project until the midterm evaluation, and 2) the process from the midterm evaluation until the final evaluation. These are found at the start of each section.



Figure 8: Diagram of the entire design process divided up into color-coded phases based on the Design Thinking methodology, as described by Dam and Siang (2021).

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## **PART 1: PROCESS START -> MIDTERM EVALUATION**



Figure 9: Diagram of the design process from the start of the project until the midterm evaluation, again divided up into color-coded phases based on the Design Thinking methodology as described by Dam and Siang (2021).

**Initial design direction - Empathizing** 

As a first step in the design process, the team discussed the personal development goals for each team member in order to acknowledge each other's visions as designers and find common ground on an initial design direction. Multiple mind maps were created to explore the different interests of the group members (**figures 10 and 11**). These interests took inspiration from personally experienced struggles, such as unbalanced team work in projects, and thus opportunity for improvement. The team envisioned an ultimate design to be multisensory, interpersonal, and pleasurable, which resulted in one design direction:

"Enhancing groupwork during collaborative, creative working sessions."

#### Ideate to define a first concept – Defining & ideating

After deciding upon an initial design direction, the team decided to ideate on some quick and initial ideas that were associated to the design direction in order to boost the team's creativity. Lo-fi prototyping and sketching resulted in one concept with two versions that appealed to everyone's interest: a device that stimulated groupwork through multisensory design. The first Lo-Fi prototype (figure 12) was a scent dispenser - of which the form was inspired by an air humidifier - that measured individual speech input and gave feedback on the overall teamwork through LED lights and scent. The second Lo-Fi prototype (figure 13) was a more self-explanatory device that depicted balance within groupwork by ascending and descending rods. Although the two ideas illustrated the design direction of the team, neither of the two felt like it would really add value or be usable in a meeting setting. Therefore, the team took a step back to develop a clearer group vision. Simultaneously, to maintain the creative spirit of the team, ideation was progressed by committing to the 100-sketches challenge.



Figure 10: Mind map on 'themes about highlighting senses' in order to identify interesting design opportunities



Figure 11: Mind map on 'things you normally wouldn't sense' in order to think outside of the box 0



**Figure 12**: First Lo-Fi prototype – inspired by an air humidifier – that measures individual speech input, and dispenses scent and lights up as feedback on the overall teamwork.



Figure 13: Second Lo-Fi prototype that also measures individual speech input, but provides feedback on the balance of group through ascending and descending rods.

#### 100-sketches challenge - Ideating

The 100-sketches challenge is quite self-explanatory; a team of designers commits itself to sketching out 100 ideas before a deadline as an ideation technique. During this sketching challenge, all kinds of ideas were explored with the predefined design direction in mind. Ideas ranged from entire office interior redesigns, to brainstorm furniture, to portable devices that enhanced meeting progression. Once every team member had sketched 25 ideas, a discussion took place to reflect on the ideas and pick a selection (**figure 14**).

There were certain aspects in the sketches that overlapped and appealed to everyone's interest. First off, the use of individual elements frequently came back, as individual data could be measured in a group environment. Consequently, improving teamwork (in meetings) took a prominent role in the sketches, which originated from the struggle of unbalanced group work affecting working performance. Moreover, the sketches frequently tackled the office area, as the members associated teamwork with an office environment. Before concluding on the idea for a new (second) concept, a clearer group vision had to be established.

#### This vision together with the concluded discussion on the 100-sketches challenge resulted in the idea for a second major concept:

#### "A product in the office area that enhances teamwork through individual input and multisensory feedback"

However, after meeting with the project coach, it became known that the vision and description of the new concept missed a specific context and user; a clear design goal. This meant narrowing down on the important terms used in the group vision. Therefore, the next step was defining a focus area by dissecting the group vision.

#### **Design goal – Defining**



Figure 14: Working on the 100 sketches challange

#### **Group vision – Empathizing**

The ending of the 100-sketches challenge went hand in hand with the creation of a new group vision. A new vision was necessary in order to establish clearer design opportunities. This vision would be a more holistic goal of the design that the team would be making. The personal design visions of each team member were mapped on a MIRO board to be assimilated into a 1-sentence group vision, which resulted in the following vision:

"Creating a joyful experience that enhanced (inter)personal well-being" The group vision was dissected in 5 key words that made up the group vision, namely 'create', 'enhance', 'joyful experience', '(inter)personal', and 'well-being' (**figure 15** for dissection method). Everyone was tasked to critically consider the sub questions that arose from these words. For instance, the word 'enhance' implied that there was a problem that needed to be solved. However, it was unknown to the team if there was a real need for solution or improvement to an existing problem. The term 'foster' would not imply a problem, thus narrowing down the focus area of the team. After everyone individually questioned the meaning of these key words, the 4 perspectives were combined to create a carefully formulated design goal. This design goal of the team was to design:

"a product that fosters interpersonal engagement in activities at the workplace"



#### Second iteration – Ideating

The team decided to ideate on and realize the concept of "a product in the office area that enhances teamwork through individual input and multisensory feedback" that would "foster interpersonal engagement in activities at the workplace". The idea existing, but how would it physically take shape?

Through brainstorming, sketching and lo-fi prototyping, a design came to life. The design would consist of a central charging hub with individual elements (**figure 17**) for each participating member of a meeting. The device aimed to improve collective contribution of a project team by communicating the individual contribution of each participant for a moment of reflection on their meeting contribution. Individual feedback was provided through the individual elements, and collective feedback would be provided via the central charging hub.

The form of this device took inspiration from a meeting microphone (**figure 16**), as a centrally located, dome shaped product that advocated equality. Equality became an important virtue for the team and the product, as all members of a (creative) meeting should be equal. This unsubstantiated decision had to be later supported by literary evidence.

The aesthetic and material expression of the entire design were also explored after two workshops on the aesthetic importance of a prototype emphasized this. The individual elements would incorporate a LED screen. For the midterm evaluation, one of these individual elements was to be realized to solely simulate and communicate the intention to users in the real world.

#### Benchmark & literature research – Defining

A benchmark was performed on this yet nameless concept. Previous projects of team within the Vitality Squad of the Department of Industrial Design at the TU/e came close to the concept of the team. Especially the DebaTable would be a big contestant, as it also aimed to improve meeting balance for more effective meeting collaboration through speech recognition. The team ensured a unique selling point through its focus on individual reflection and the portability of the device, contrary to a full-sized table.

Simultaneously, literature research was performed on effectiveness of collaboration, meeting collaboration, and office vitality. Reason for this is that the design's purpose remained rather unsupported by literary evidence. Due to time constraints, this search was cut short and no ground-braking sources were found on the topics. Fortunately, the literature research did result in the name of the current concept, namely MEEBA, being a composition of the words 'meeting' and 'balance'.

#### Midterm prototype MEEBA – Prototyping

MEEBA fosters groupwork by giving office workers insights in their personal input during collaborative working sessions. The following piece of text briefly summarizes the idea behind MEEBA:

MEEBA is a modular device positioned in the middle of a meeting table. At the start of a meeting, all present participants can take out one of the individual elements, called Meebits and place them at their side of the table. Through targeted speech recognition, the Meebits measure how much everyone talks during a meeting.

A LED screen in the Meebit visually shows one of three levels of verbal input of the individual. This feedback shows them that they either talk sufficiently (yellow colored LED's), do not participate enough in the conversation (blue colored LED's), or if they verbally dominate the meeting (purple colored LED's). Participants can reflect and perhaps adapt accordingly to create a more balanced meeting.

The individual elements were called 'Meebits', as this communicated the idea of the individual elements inside MEEBA more clearly. Both the individual and collective feedback are realized by using light (LED's), as light would be the most attention grabbing stimuli to work with.

Through a 3D model and an impression sketch (**figure 22 and 23**), the team was able to decide on the final form of MEEBA before the midterm evaluation moment. Although simulated to get the intended effect, MEEBA would have the material expression of black wood, as it would radiate formality within an office setting (black), yet also express a feeling of invitation and coziness (wood). Soft textile on the top of MEEBA would invite tactile modality; a center 'hole' at the top of the dome could facilitate the different kinds of meetings (e.g. holding pens for regular meeting, or post-its and markers for brainstorm meeting, etc.).





as an inspiration for our midterm prototype. Coolblue. (n.d.). 3 tips voor zakelijk contact op afstand [Photograph]. https://www. coolblue.nl/advies/tips-voor-zakelijk-contactop-afstand.html

Figure 17: Electronics for semi-working prototype

#### Midterm user testing – Testing

The midterm evaluation moment enabled the team to user test the prototype MEEBA in a real life context. Although not presented in an actual meeting environment, the team deliberately presented MEEBA on a table surrounded by chairs to afford the context of a meeting in the best possible way. The user test resulted in much feedback, which could be classified in the following categories: **shape, feedback method, meeting type, technology,** and **interaction**.

Figure 18: Midterm design of MEEBA

#### Shape

With regards to the aesthetics and shape of the design, the team mainly received feedback regarding size. The Meebits were experienced as too big to be a tactile utensil. The size of the midterm Meebits was mainly a result of the bulkiness of the technology incorporated into them. So, to make the Meebits smaller, it was advised to consult a technical expert on implementing smaller electronics more efficient.

Positive feedback was received regarding the central location of MEEBA. This placement location made it more easy to get an overview of the feedback given by MEEBA. However, when a team would work with laptops, it became hard to see MEEBA (**figure 19**). To solve this problem, either the shape, purpose, or placement of MEEBA would need to change or a meeting type where laptops would be less important would have to be clearly identified.

#### **Feedback Method**

The midterm design of MEEBA gave feedback to the users by light. However, user testing this feedback method made the team aware of the fact that this choice of medium to communicate personal feedback was intrinsically flawed for 3 reasons. Firstly, using light to communicate personal feedback is distracting for all participating members. Secondly, the reflective character of light completely diminishes the privacy of the personal information (**figure 20**), which left users exposed and confronted with a feeling of shame and guilt. Lastly, the choice of colors that indicated the level of contribution of the individuals was not substantiated. This left users confused, as they could not recognize meaning in the colors.

Instead of using light, it was therefore advised to 1) implement (a) metaphor(s) so users could more easily link the feedback to a next action, and 2) explore different feedback media and stimuli for the tactile sense. If the team would determine to still use light, it would be 1) crucial to substantiate the choice of colors and 2) make the implementation of light as a feedback medium more subtle to make feedback private.

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Meeting type

The midterm design of MEEBA focused on meetings where a team should have an equal contribution (which was not yet substantiated). However, talking with users during the user test made the team aware that there are a lot of meeting types in which the contribution of the participants is different. This made MEEBA incompatible with many types of meetings e.g. a presentation meeting.

To solve this problem, MEEBA had to be designed for one specific meeting type or have modes to indicate which kind of meeting it is. For instance, if the team would have a meeting where a lot of discussing takes place, MEEBA would need to be switched to 'discussion mode'. This would make MEEBA useful for various types of meetings or would make MEEBA more meaningful for one single type of meeting.

#### Technology

There were 3 major obstacles in light of the technical realization of MEEBA.

First off, the midterm design of MEEBA required both the central product as well as the individual components to be charged, which resulted in a rather bulky prototype. This was especially a problem for the Meebits, as these had to be no larger than a hand palm in order to be pleasantly handheld.

Secondly, the midterm prototype of MEEBA was not able to capture a participant's contribution rightfully. Hypothetically, the prototype would make use of microphones with targeted speech recognition in order to measure the proactivity, and thus individual contribution of each participant. However, it intrinsically measured quantity of speech, not quality, which shaped a blurred image of meaningful contribution if communicated back to the participants. Moreover, this method was technologically simply too complicated for the team to realize. Lastly, the idea of producing more than 4 Meebits for the final design would be far too unrealistic. If the Meebits were to be made fully functional, more than 4 Meebits would result in a program that have a lot of delays and make the feedback less relevant. Therefore, 4 Meebits was advised to be the most realistic amount of individual elements which could facilitate a real-life meeting.

The team got advised to set-up a technological realization plan and discuss this with a technical expert, once another prototype phase would be encountered.

#### Interaction

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Users suggested that the interaction possibilities of the Meebits could be enhanced for a more richer experience with the product and therefore the entire meeting. The midterm design of the Meebits solely appealed to the visual sense, completely omitting the tactile sense. In hindsight, this had been a very illogical design choice, as the Meebits have been designed to be handheld, and thus should not neglect the tactile material experience. Therefore, the team was advised to ideate on opportunities for more richer tactile experiences for the Meebits.



Figure 19: Laptops make it hard to see MEEBA



Figure 20: Meebit light reflecting on user



**Figure 21**: Material expression of MEEBA; black wood for the frame – soft grey textile for the top side.



Figure 22: The final result of the 3D model



Figure 23: An impression sketch of the functionalities of MEEBA.



Figure 24: Diagram of the design process from the midterm evaluation until the final evaluation, again divided up into color-coded phases based on the Design Thinking methodology as described by Dam and Siang (2021).

#### **Introduction part 2**

The midterm evaluation moment resulted in useful insights and enough points for improvement. The gathered feedback called for a new iteration of MEEBA. The following section describes the phases the team went through from the midterm evaluation until the final evaluation, as seen in **figure 24**.

#### Scoping meeting context – Empathizing & Defining

One of the major issues of the midterm design of MEEBA was its incompatibility with different types of meetings. MEEBA was designed for brainstorm meetings in a casual environment where equality and proactiveness were major virtues. However, the choice for this meeting type could not be backed up by any theories or models. This confused outsiders on the exact type of meeting which MEEBA could be used for. Therefore, it was crucial to more clearly scope the (meeting) context and target user of the design intervention.

Literature research was required to solve this problem. A brainstorm with the project coach was the key to this issue, as he referred the team to "The Taxonomy of Business Meetings" model. "The Taxonomy of Business Meetings" is a model that described 16 different meeting types based on 1) the meeting intention, 2) format, and 3) participation profile. A meeting type analysis was performed with this model to clearly substantiate what meeting types are targeted with MEEBA as seen in **figure 25**. The meeting type analysis concluded that the current design of MEEBA targets Congenial Cadence Meetings, e.g. weekly team meetings, working sessions, team brainstorms, etc. As these types of meetings are usually performed in smaller groups, the team decided that MEEBA should target meetings with a maximum of 4 members. Timewise, this was also far more technically realizable. The participators can be anyone who makes use of these types of meetings. With this analysis, the context and target audience has been narrowed down, rounding up a crucial part in the emphasizing and defining phase of the design process.



**Figure 25**: A meeting type analysis was made to find the most suitable meeting type(s) for the design intervention MEEBA. The visual is divided into three columns: 1) meeting type differentiators; 2) MEEBA meeting type parameters; and 3) Congenial Cadence Meetings parameters. The three meeting type differentiators are found in the first column. In the second column, the differentiators are divided into parameters for which the colored boxes answer this parameter for MEEBA. The third column shows the description of the parameters of a Congenial Cadence Meeting type according to "The Taxonomy of Business Meetings".

#### **MEEBA iteration 2.0 – Ideation**

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By narrowing down on the specific meeting context, the team could move onto the problem of the shape and dimensions of MEEBA. During the midterm evaluation, it became noticeable that the presence of MEEBA would disappear once everyone would use a laptop in a meeting. Additionally, the shape could use a revision for two other reasons. First off, MEEBA did not facilitate the chosen meeting type, as it simply targeted far larger meetings then intended (up to 12 participants). Secondly, the complex and fragile shape of the midterm prototype could be simplified to better suit easy (mass) production while simultaneously maintaining its function.

To initiate the ideation phase, sketches were made to explore the shape. The shape exploration was heavily influenced by how collective feedback would be communicated to MEEBA's users. Reason for this is that users in general can more intuitively and clearly understand feedback if they can associate it to already existing knowledge. Therefore, a good metaphor assimilated into the shape and the medium for providing collective feedback was deemed important.

The best explored concept included a beamer that would project the level of balance on the ceiling. However, this shape and its metaphor were still not intuitive enough to easily understand. As the team struggled with progression on the shape, a meeting with the project coach was required.

The best explored concept included a beamer that would project the level of balance on the ceiling. However, this shape and its metaphor were still not intuitive enough to easily understand. As the team struggled with progression on the shape, a meeting with the project coach was required.



Figure 26: Studio Tast's GROOW. StudioTast. (z.d.). Groow | Studio Tast. studiotast.com. Retrieved on 7 January 2022, via https://www.studiotast.com/groow

#### **Three principles of MEEBA**

The project coach emphasized a couple of important principles for the design of MEEBA that the team lost track of during the process.

He stressed the importance of **tangibility** as a way to communicate thoughts that are clear for everyone. This can be seen in playful, educational products similar to the idea of MEEBA, such as Tast Studio's products 'GROOW' and 'UNBLOK', and as advocated in Michael Michalko's 'Thinkertoys: A Handbook of Creative-Thinking Techniques' (2006).

**Natural mapping**, meaning that an action and its perception are directly coupled, was also named as important in order make the actions and perceptions absolutely clear for the users, as described by S. A. G. Wensveen, J. P. Djajadiningrat, and C. J. Overbeeke (2004) in the Interaction Frogger Framework.

Also, MEEBA should be **enjoyable** to use. This means that the product should positively encourage someone to participate instead of confronting a participant on his or her 'unwanted' inactivity during a meeting.

#### Creative explosion transforming MEEBA

After this refresher of some of these three important principles, the team experienced a creative boost, drawing a lot of inspiration from pre-existing knowledge or the direct working environment. This resulted in a complete transformation of the idea of MEEBA exceeding the intent of only iterating on its shape. As this creative boost suddenly happened, bodystorming and quick sketching were tools that were used to ideate (seen in figure of the sketch and the bodystorming).

The new idea took a far more playful approach drawing inspiration from a central brainstorm toolkit such as the aforementioned Studio Tast's 'GROOW'. In this new and more tangible idea, users would actively 'possess' one object to hold (Meebit) which they could place on a centrally positioned plate (MEEBA) to indicate that they had something to say, closely resembling the act of raising your hand to get a turn. By acting out this behavior and interaction, the team noticed that one would naturally take on a more active posture (leaning in towards the table to place the object in the center of the table, see **figures 29a & b**) contrary to merely raising your hand (**figures 28a & b**). Assumably, this would make far more sense for users to understand due to more intuitive and natural mapping of action and perception.

At the same time, a new shape for MEEBA was inspired by a fruit bowl that was laying around and was further explored by sketching. This resulted in a plate shape with a thicker, elevated rim. This shape allowed for the idea of a LED ring to be placed inside the rim that could give the least-contributing participant a turn to speak through a roulette-like feature. This seemingly random choice of the device would not confront any disbalancing meeting behavior, but rather encourage participation.

The new idea transformed MEEBA from a device that highlighted disbalanced caused by a participant into a device that would give a less-contributing participant the turn to speak. This replaced the negative, confronting functionality of the design into a positive, encouraging one. This would assumably lead to a more enjoyable product.



**Figure 27**: Bodystorming the new idea of MEEBA. A fruit bowl has been used as the plate-shape of MEEBA and the idea drew inspiration from a tangible brainstorm toolkit

#### **Planning technical realization**

The only bottleneck in this concept was the technical part of measuring the proactivity of the participants, or in other words how often a person indicates to wish to speak. Gathering such data was crucial to ultimately communicate any feedback to the users on their meeting contribution.

A technical colleague was consulted on the possibilities to realize this. NFC technology would be the solution. The combination of NFC readers connected to a microcontroller (Arduino) inside the MEEBA and NFC tags inside the Meebits would allow the device to count the number of times someone puts down his/her Meebit and thus wishes to verbally contribute. This counter could then be connected to the LED ring in the outside ring of the MEEBA to program a system that visually gives a turn to speak to the least active participant.

The new idea of MEEBA also transformed the purpose of the Meebits from a constant feedback-giving device (that incorporated a microphone, LED's, microcontroller, and a Bluetooth transmitter) into a passive object that users use to indicate if (s)he wants a turn to speak. This eliminated the both the technical charging problem (as NFC technology doesn't need electricity) and the large housing problem of the Meebits encountered at the midterm evaluation. However, this did call for more intricate thought behind the tactile experience of the Meebits.

 


Figure 28a: Posture before asking for attention in a regular meeting.



**Figure 28b**: Posture while raising hand for attention grabbing attention in a regular meeting. Posture nearly doesn't change.



Figure 29a: Posture before asking for attention in a MEEBA meeting.



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**Figure 29b**: Posture while putting down a Meebit to ask for attention in a MEEBA meeting. Posture changes to a very active posture.



Figure 30: Exploration sketch of the new shape of MEEBA

#### **User test – Defining & Ideation**

See appendix B.

The midterm evaluation highlighted opportunity for richer tactile interactions in order to enhance the meeting experience. With the new idea of MEEBA, the aesthetic and tactile experience of the Meebits has become more important. However, assumptions were made on the tactile preference of such small objects that people could hold during a meeting. To understand and / or confirm these assumptions, a research-through-design inspired user test was set-up.

#### **Tactile preference of handheld objects**

The aim of the user test was to understand the tactile preference of users while holding a small, handheld object in a meeting setting. What characteristics of an object make it enjoyable to hold during a meeting? How do shape, size, and materiality influence this preference? What material and shape do people prefer to hold during a meeting?

For this test, the team selected a collection of small, handheld objects on their shape, size and materiality. This was grouped in size and laid out on a table. Users were asked to explore the objects, explain what material characteristics they liked and disliked, and finally select a top 3 preferred objects to hold.



Figure 31: Set-up of the user test



Figure 32: The collection of handheld objects grouped in size and shape selected by the team



Figure 33: The top 3 most preferred handheld objects in a meeting from the predefined selection made by the team

According to the participants, objects that were the most enjoyable to hold in a meeting setting were soft, squishy / elastic, or small-sized. Reason for this were that they afforded fidgeting behavior e.g. squeezing, pulling, rubbing, etc. The objects that were most preferred to hold were respectively a beauty blender, stress ball in the shape of a brain, and a spiral hair rubber band (**figure 33**).

These insights confirmed that palm-sized, soft and squishy objects that afforded fidgeting are preferred to hold in a meeting setting. This knowledge could be translated into the form and function of the Meebits.

#### **Realization and assembly – Prototyping**

#### **Material selection of MEEBA**

For the majority of the housing, MDF was chosen as a low-budget and easy to manipulate material (by laser cutting). A black, soft fabric would overline the housing in order to invite touch and radiate a feeling of formality and coziness in a meeting environment. The rim of MEEBA required a material that would let LED light through, but diffuse it to an extent where it would not be too distracting for the meeting participants. White spraypainted plexiglass was a suitable contestant due to its inexpensiveness and seemingly premium aesthetic.

#### Production of the LED ring

A unique 20-piece LED ring has been produced for MEEBA for two reasons. First off, no preproduced LED ring existed with the diameter of the rim of MEEBA. Secondly, all LED's had to be separately controllable in order to make the roulette-feature work. Therefore, although quite cumbersome, 20 LED's have been soldered together to form one LED ring.

#### **Production of the Meebits**

The results from the user test implied that the Meebits should be palm-sized, soft and squishy in order to afford fidgeting during a meeting. Four stress balls – similar in dimensions, different in color – fitted this description perfectly and were inexpensive for the production of

MEEBA. However, a ball shape for the Meebits introduced problems. First off, the Meebits had to have a fixed position corresponding to each seating position at a table, and secondly an NFC sticker had to be assimilated into the Meebit to protect it from being damaged.

Therefore, it was suggested that the stress balls would be cut in half into a dome shape. The NFC sticker per Meebit would be pasted on top of a small plexiglass, which was then attached to the dome-shaped stress ball. This would protect the NFC sticker while maintaining the favorable tactile feeling of the Meebit.

A plexiglass ring with a slightly larger diameter than the puck would be mounted on the central platform to indicate the fixed positions of the Meebits. This design choice enabled the Meebits to remain in place.

The colors of the Meebits, red, blue, green, and yellow solely had the purpose to differentiate the 'players' from one another. The Multiple people mentioned the opportunity of connecting the DISC personality theory, a method of identifying predictable actions and personality traits within human behavior (Marston, W. M. 1928), to the Meebits was later proposed by multiple people, but was moved to future works.



Figure 34: Laser cut MDF structure and housing of MEEBA



Figure 35: White spray-painted plexiglass rim of the MEEBA



Figure 36: Self-produced 20-piece LED ring used for the roulette feature of MEEBA



Figure 37: LED ring assimilated into the ring of MEEBA

#### **Providing feedback – Defining**

During the realization of the final prototype, a burning question remained unanswered; how could users privately gain insights in their own data for individual reflection? To conclude, three conditions for responsibly gathering and communicating personal data have been set up with the aim of safe individual and collective reflection. Firstly, the data should be private, thus only be accessible to the respective participant. Secondly, this personal data should be untraceable to the user. Lastly, a safe space should be generated by the design itself, so the team can openly share their data and reflect on their meeting balance for further improvement.

#### The problem

There was data to be processed, namely the level of proactivity of a participant measured in the amount of times the Meebits was placed down. MEEBA could count this level of contribution and based on the statistics give the least-active participant the chance to speak up. The current design of the Meebits did not yet incorporate any way of providing feedback to its user due to its rather passive nature as a mere handheld, fidgeting object. Therefore, the problem was that there was not yet a way for participants to gain insights in their own data for individual reflection.

Nowadays, privacy of personal information is important more than ever before due to the global digitalization. With the design of MEEBA, it was therefore important that data should be responsibly gathered, stored, and communicated. Thus, before finding a solution to the problem, the team took a step back to set up some conditions.

#### **Three conditions**

Before finding a solution to the problem, the team took a step back to set up some conditions. Nowadays, **privacy** of personal information is important more than ever before due to the global digitalization. With the design of MEEBA, it was therefore important that the data was only **accessible** to that person **and** that data could **not be traced back** to an individual. It was assumed that other participants could get insights in other's personal data with the permission of that participant. This permission is important in reflecting on the entire meeting balance in order to improve future meetings. This means that participants need to trust each other enough to share their data. Therefore, some sort of **safe space** or collective moment of reflection should be generated by the design.

#### **1. PRIVACY**



2. ACCESSIBLE & UNTRACEABLE

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2. SAFE SPACE

#### **Providing feedback – Ideating**

After a quick brainstorm, a system was established that enabled safe individual and collective reflection of the data, which also met the conditions identified in the defining phase.

#### The idea

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The data gathered by MEEBA is processed by an app that creates a profile of a participants personal meeting style during that specific meeting. The profile is made user-friendly by personifying each profile and adding easy to read characteristics of that profile. Improvement points are also presented based on the data of other participants, so the user can collectively reflect on the meeting balance.

#### Private

At the end of a meeting, a user could personally access their data by scanning the NFC tag inside the Meebit. This would allow for private communication of data, as each participant 'owns' their own Meebit. Of course, this would only hold true assuming that participants would not scan each other's Meebit without permission.

#### Untraceable

In order to make the data untraceable once a meeting has ended, the data would simply be deleted. Not only does this eliminate the tracing problem for the time being, it would also solve another problem: the team would not have time to substantiate the profiles based on a psychological theory or model. This means that no profiles could be fixed to one person, as the ground of this information could not be validated. On the contrary, discarding the data after each meeting would create the opportunity people to explore different profiles in upcoming meetings to best fit the team. It was assumed that this would result in more balanced meetings.

#### Safe space for data sharing

A safe space would be created if all members of a team would acknowledge a moment of reflection after each meeting session. The team assumed that facilitating such a reflection moment with the developed profiles would give users a common topic to openly talk about. In turn, this would assumably encourage trust among the participants and lower the threshold to talk about each other's contribution.

#### **Developing the app – Prototyping**

Timewise, the team would not be able to develop a functioning app. Communicating this struggle with the project coach resulted in the use of Figma to develop a mock up of the app. This Wizard of Oz technique would allow people to experience the intended effect of the app and the reflection moment.

To strengthen the reliability of the profiles, characteristics of existing profiles adopted from Taylor (2020) were used to make two mock up profiles 'The Wallflower' and 'The Commander'.

The final mock-ups were uploaded to the NFC tags of the Meebits to simulate the full experience.





#### FINAL DESIGN

#### **Design of MEEBA**

MEEBA consists of a centrally positioned device and individual elements called Meebits. At the start of the meeting, each member picks one of the colored Meebits to work with. During the meeting, users can indicate if they wish to receive the turn to speak by placing the Meebit on the central station. NFC technology in the Meebits allows MEEBA to measure each participant's contribution. The MEEBA collects all participants' information and gives people who have participated relatively less a chance to speak up through a seemingly random roulette light feature. NFC tags inside the Meebits allow users to scan them and read about their meeting style at the end of the meeting. This reflection can help them to compare different meetings, become aware and adapt accordingly to create a more balanced meeting dynamic. After all the Meebits are placed back at the end of the meeting, the data on the NFC chips are discarded to protect the privacy of the participants. This way, only the participant who scanned the chip can reflect and their data is protected from judgement of others. Subsequently, a safe space is created for the participants to share their data and collectively reflect to improve meeting balance in the future.

#### **Underlying Design Principles**

#### **The Form**

#### MEEBA

Equality was an important virtue for the chosen meeting types, which is advocated by the round shape of MEEBA. The plate-like form was chosen to hold the Meebits in place and have a central place to gather them. The choice of wood overlined with fabric was done as it radiates formality and uniformity within any office setting, yet also expresses a feeling of invitation and coziness. The soft textile on the sides of the MEEBA also invites tactile modality; an important aspect for a portable device. The top and inside of the plate are made of white matted plexiglass, making it possible for the light to softly shine through. Slightly elevated white matted plexiglass rings on the main plate indicate the dedicated areas of the Meebits in order to connect to the NFC scanners. The main plate here is also elevated and not on surface level, so the NFC scanners and the microcontroller can be placed underneath this area.

#### Meebits

The form of the Meebits was decided after a user test, where the tactile preference of handheld objects during meetings was tested, as can be read in the 'Process' section. As the ordinary stress ball came to be liked the most, it was decided to be incorporated in the Meebits. The Meebits afford a set of fidgeting activities during meetings, such as pinching, squeezing, bouncing. In total, MEEBA facilitates a meeting of a maximum of 4 participants. With regards to the Meebits, this was the best technical feasible amount as well as the fact that most congenial cadence meetings are hold in a small group (of about 4). In bigger group settings, the MEEBA should therefore possibly need more Meebits that can be added, or a design that features more Meebits in general.

#### Roulette-like light feature

With the current design, MEEBA points out a user, seemingly random, by a roulette-like light feature. The white matted plexiglass lets through a warm white color which is not too distracting for the progression of the meeting, but just visible enough to grab attention from the group members to realize that maybe they should give others a chance to speak up during the meeting.

By collecting the data from the Meebits, MEEBA will give someone a turn to speak when they have not put their Meebit on the central plate for a while. This is not to provoke them to participate, but just to make the group members aware and provide this person with a chance to add to the conversation. They can still decide not to take up the opportunity if they don't want to. The integration of this feature was mainly added to help some people with less dominant meeting styles to get their chance to speak, while making more dominant speakers aware to sometimes take a break.

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Figure 39: The MEEBA in context



Figure 40: The Meebits

#### Technology and Realization

#### LEDs

The LED ring that can be found in the groove surrounding the plate of MEEBA consist of 24 LEDs with resistors that can be individually programmed. This was chosen so each light pattern can be created separately. The LEDs share a common ground, yet are all powered by different pins of an Arduino Teensy (see **figure 41**). By programming the LEDs to be off and on with delay, the roulette like light circle was created. The choosing part is done by grouping an area of LEDs to be on simultaneously. The code can be found in **appendix A**.

The current program consists of 6 different options: All lights on, circling around (the roulette-like light feature), and highlighting a participant (one option for lighting up the 6 LED's that are at each quartile of MEEBA).

#### NFC

Note that the following technological aspects of MEEBA are written as if MEEBA was fully functional; the ideal technological image of MEEBA. These aspects have not yet been developed or are not fully functional due to time constraints.

To make the gathered information personal, the tags inside the Meebits should be linked to a personal reader, positioned inside the MEEBA, which keeps track of the behavior of the participant (by counting how many times s(he) has put down his/her Meebit). To communicate this personal information measured by MEEBA, a specially developed app stores this information per participant per unique tag in each Meebit. Based on how proactive a participant has been, a meeting style profile will be set up by the app that shows characteristics of that participant's meeting style. This gives individuals insight in their own meeting style during that specific meeting and a way to reflect on their own contribution. In order to effectively be able to reflect on the group balance as an individual, improvements are also presented in the app based on the meeting style profiles of the other participants.

A logical moment to end the meeting is when everyone has had the time to scan their Meebits, read and reflect on their contribution, and places their Meebits back onto MEEBA. Therefore, MEEBA 'ends' the meeting if it reads all the Meebits' tags at the same time. The current demonstrator is not yet equipped with this NFC principle. Being a Wizard of Oz prototype, the NFC tags in the Meebits are programmed with a static link upon scanning, so it does not yet detect and send through the meeting information. The LED strip is therefore also still hand controlled, with a program that simulates the different choices MEEBA can make by pressing keys on a laptop (done by an observant).

#### **Powering MEEBA**

The central part of MEEBA should be powered in a way, because of the NFC readers, LED lights and the microcontroller. The current design is powered with a wire, which does mean that MEEBA can only be used when there is an electronic socket nearby. While it can be made cordless, it will mean that it has to be charged and have enough space to hold some form of battery.



Figure 41: The schematic of the electronic circuit of the 24-piece LED ring.

#### VALUE PROPOSITION

MEEBA is a modular, physical device that fosters balanced team dynamics for teams that meet regularly with equal importance of their input. It is likely to be used by companies looking to improve the team dynamics of their employees.

#### **Customer Jobs**

If you work in a meeting environment, it can be challenging to find the right team balance. While the right balance is crucial to gaining varied and critical insights, it can be difficult to confront each other about the fact that this balance is missing. Therefore, a team and its individual members can be helped by reminding the participations of their team contribution, politely provided with useful feedback that leads to a balanced team dynamic.

#### **Customer Pains**

An unbalanced team dynamic can lead to various frustrations. Dominant team members tend to speak up frequently without noticing that other participants need to have their say. This can lead to important comments being lost and team members becoming annoyed. Shy speakers, on the other hand, tend to move into the background during a meeting. This too can lead to the loss of valuable remarks. These different speakers can have a negative impact on team dynamics. Members may feel that they cannot show their best, which leads to a lack of self-satisfaction.

#### **Customer Gains**

Promoting balanced team dynamics supports equal commitment. When all team members are equally engaged, this results in an improvement in team productivity. The feeling of equality can also create a sense of belonging, which improves team relationships. By challenging your team to achieve this team balance while providing feedback, you create a working environment in which members can develop. Not only will this create a sense of accomplishment, but members will remain interested in working in this environment and become more loyal to the company and the project.

#### **Products and Services**

By collecting and comparing the individual contribution of team members, MEEBA is able to make decisive decisions to help the team achieve team balance. MEEBA uses its rotating light to translate these decisions into a proposition regarding which person should be speaking to foster a equal contribution. When these propositions are followed up, they lead the team to team balance.

After the meeting has concluded and MEEBA has collected and compared all the data of the individual contribution, the Meebits can tell each team member what type of team member he/she is. In this explanation, MEEBA informs the user of his/her characteristics with regard to a meeting. It also informs them about points of improvement and how to improve them, so that the next meeting is more balanced.

#### **Painkillers**

By comparing the data, MEEBA is able to discover dominant speakers by their amount of participation. When it sees that these speakers do not notice the tendency of other team members to speak, it uses its rotating light to suggest to give the turn to these other participants. For these participants, MEEBA in turn lowers the threshold to speak up. By detecting and informing these types of team members, MEEBA ensures that all comments are heard, and lowers the irritation level of team members. Because all members are heard, team members feel respected and satisfied with their own contribution.

#### **Gain Creators**

By helping teams foster a balanced meeting dynamic, MEEBA improves the engagement of team members. As all team members become engaged, productivity increases. In addition to increased productivity, an engaged team can also result in a better team bond where people have a sense of belonging with more enthusiasm as a result.

In the end, MEEBA creates possibilities for a working environment in which people can develop themselves. Because of this, it is more interesting for employees to stay with the company, which results in higher loyalty to the company.



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Product member and Services -Incr -Propose which person should be talking to foster a equal contribution -Inform users about their meeting characteristics -Inform users about points of improvement and how to improve

#### **Customer Pains**

-All members become engaged -Productivity increases -Create a working enviroment in which team members receive feedback that helps them to develop themselves -Increase the loyalty of employees to the company

#### **Customer Pains**

-Suggest that the dominant speakers should give the turn to the other members

-Lower the threshold for members to speak up -Lower the irritation level of team members -Make members satisfied with their own contribution

Figure 42: Value Proposition MEEBA



#### Hi, my name is Dirk I am going to my meeting right now.



I take the MEEBA with me, I got this product from my boss. I place in the middle of the table.



My other teammates have arrived we can start the meeting, We all take one Meebit from the Meeba.

The meeting is in on and my teammates are talking for a while now. I want to make an urgent announcement, but I don't want to interrupt the conversation of the other two. I put my Meebit back on the appropriate place on the MEEBA. This makes my other teammates aware, that I want to say something, so they now know that they need to conclude their discussion.



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It takes a really long time before I get the turn, MEEBA sees it and point the light to me so I am in turn automatically. After this, I said what I wanted to say, so I take my Meebit again with me. It is so soft and nice to hold!



## **USER ROADMAP**



In this way the participation of each person in the group will be roughly the same and there is created a meeting balance due to MEEBA, this was really nice working!

I fidget a bit with my Meebit while the meeting is going on. One of my teammates doesn't take any action at all en doesn't say something. MEEBA concludes a low effort in the participation of this person because this person doesn't place their Meebit back on the MEEBA to say or do something. In this case, the LED ring will point to that person, so this person gets the turn.





 Companies that own the equipment needed to produce MEEBA. Related companies to receive advice and use examples. Partners who specialize in

forming a new brand.

improve the productivity in

Companies/ organizations

with teams that regular meet,

in which the contribution of

every employee is important.

Key partner is the distributor.

their team in meeting.

of the created products

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#### **Key Activities Key Partners** Customers who want to

 Branding of the product for different companies Building brand identity. Maintain customer contacts to receive valuable feedback The delivery of MEEBA Production of all different parts of MEEBA and putting all the parts together.

#### **Key Recources**

 Product developers for production MEEBA Customers who have used MEEBA contribute to continuing to improve the product Visualization of the materials. Partnerships with companies as intellectual resource.

#### Value Propositions

Raising awareness on the team contribution Provide feedback to teams to improve their dynamic Show individuals their characteristics with regard to the meeting Inform individuals to points of improvement and how to improve them Lowers the threshold to speak up Lower the dominance of dominant speakers by suggesting them that they should give the turn to the others members. Engage members Increase productivity Create sense of belonging between team members Create a working environment in which people can develop themselves Create a higher loyalty to the company.

### Customer

Relationships Provide a website which makes it easy for customers to buy the product (self-service) Provide a website page on which users can exchange their experiences, so other users can get inspired (community) Provide a mail and phone number which customers can contact for questions regarding buying the product (personal assistance)

#### Channels

 Provide trade shows in which customers learn about the potential of the product (marketing) Use e-commercials via YouTube to inform potential customers about our product (sales) Provide a phone number and mail on which users can contact after buying the product to ask questions (support)

#### Customer Segments

 The customer base is a segmented market. Companies/ organizations with teams that regular meet, in which the contribution of every employee is important Companies/ organizations who want to encourage and/or help the members of their teams to reflect on the individual contribution the members have in the team dynamic Companies/ organizations who want to equalize the engagement of team members Companies/ organizations who want to create a challenging work environment that makes the employees satisfied about their learning and/or contribution

#### Cost Sturcture

Business is cost driven The materials for the products, these are low-priced. Research and development costs. The branding of the product with different companies. Generating online publicity through advertising Maintenance of the product

#### Revenue Streams

 Customers will be charged per asset (Asset approach) The customers will pay for the product Fixed volume pricing approach with standard price per amount of Meebas that are bought, so organizations can buy more Meebas for a lower price Meeba including four Meebits will cost X euro A separate Meebit will cost Y euro

Figure 44: The bussiness model canvas of MEEBA

#### ETHICAL CONSIDERATIONS

#### **Designer intention**

While working in a cadence congenial meeting environment, it can be difficult to find a balanced team dynamic. This is partly caused by the variety of meeting personalities in a team. As a result, important insights may be lost and/or team relationships may deteriorate. MEEBA assists teams in changing these team dynamics into one in which all members are equally present. MEEBA is designed to improve these team dynamics and thus the ambiance of the working environment. The intention of the design is to promote a balanced team dynamic for teams that meet regularly with equal importance of their input.

To arrive at the design of MEEBA, a number of basic rules/standards were established. First of all, MEEBA is based on the idea that all team members are equally important. This means that the needs of all types of members must be included in the design. Second, the data collected by MEEBA is private. This means that the personal data about the individual team member should only be accessible to the person from whom the data is collected. Finally, although all team members have different meeting personalities, none of these types is should be considered as better than tin comparison to the others. This means that MEEBA should not give negative or positive feedback to members, but only neutral feedback during th e meeting.

#### **Potential unethical situations**

Although MEEBA is designed on the basis of standards, there may be situations in which Meeba can be used wrongly, according to the rules/standards set up for MEEBA.

After scanning the Meebits, team members receive personal feedback on their contribution. This feedback is intended only for the person whose data has been collected. It may happen that people compare their personal feedback with each other. In that case, peer pressure can lead to people sharing their data without really wanting to. In that case, the individual data is no longer private and members can judge each other based on the feedback they have received.

Another situation could be that bosses ask users to share their personal feedback so they can see and easily monitor the individual contribution of the team members. In that case, the privacy of the data is again in jeopardy as their data can be used against themselves.

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#### Visuals

- <div>Icons made by <a href="https://www.flaticon.com/authors/dinosoftlabs" title="DinosoftLabs ">DinosoftLabs</a> from <a href="https://www. flaticon.com/" title="Flaticon">www.flaticon.com</a> a></div>
- 2. <div>Icons made by <a href="https://www. freepik.com" title="Freepik">Freepik</a> from <a href="https://www.flaticon.com/" title="Flaticon">www.flaticon.com</a></div>
- <div>Icons made by <a href="https://www. flaticon.com/authors/ilham-fitrotul-hayat" title="Ilham Fitrotul Hayat">Ilham Fitrotul Hayat</ a> from <a href="https://www.flaticon.com/" title="Flaticon">www.flaticon.com</a></div>

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Dp	Demoday prototype
®	Report
mDρ	Midterm prototype
m®	Midterm Report
@	Every group member

m⊅₀	Midterm prototype assembling	Jeannette, Jelle, Thom, Milou
m₯	Video edit	Jeannette, Milou
mDρ	Storyboard	Jeannette
mDe	Material expression for prototype	Jeannette, Thom
mDp	3D model of midterm MEEBA	Milou, Jelle
mDρ	Working prototype electronics	Jeannette
mDρ	Working prototype aesthetics /housing	Jelle, Milou
mD <sub>ρ</sub>	3 – 5 high quality picturesof your prototype	@
mDρ	Pitch of 90seconds	Thom
m⊅ <sub>₽</sub>	Preparatory questions / topics to gain explicit feedback on	Thom, Jelle, Milou, Jeannette
m⊅₀	Poster A2format	Thom
mĎ <sub>ρ</sub>	Video shots for 90 sec video	Milou, Jelle, Thom, Jeannette
mDρ	Benchmark themes, visual & argumentation	Jeannette
m®	Abstract	Jeannette
m®	Introduction	Jeannette
m®	Design case	Thom
m®	Design goal	Milou
m®	Usertests lowfidelity prototype	Jeannette
m®	Design process	Thom
m®	Diary process & design choices	Thom
m®	Internal Research	Milou, Jelle
m®	Research office vitality &senses	Thom
m®	Data visualization	Jelle
m®	Midterm feedback conclusion	Milou
m®	Impression sketch midterm MEEBA	Jeannette

Task type Task name	Performed by
Do MEEBA lasercut parts	Jelle
Do Meebits assembly	Jelle & Milou
Do User-test tactility set-up	Thom, Jeannette
Do User-test tactility Meebits	Jeannette, Thom, Jelle
Do Figma app development & improvement (delete timeline, develop icons per, 4 typ	<sup>bes)</sup> Milou, Jelle
D <sub>p</sub> 3 - 5 pictures editing	Thom, Jeannette
Do MEEBA lasercut illustrator	Jelle
De MEERA asstratics	Jelle, Milou
Do Professional pictures with Thom's camera	Jeannette, Jelle
Do Results and conclusions user-test	Thom, Jeannette
$\mathcal{D}_{\rho}$ Video editing	Jeannette
Do Prototype Demoday assembly	Jeannette
D <sub>p</sub> Pitch writing	Jelle, Thom
De Technology: NFC tags +reading	Thom, Jeannette
De Technology: Led ring +coding	Jeannette
De Poster Demoday	Jelle, Jeannette
$\hat{\mathcal{D}}_{p}$ Shot for video according to new user roadmap	Jeannette, Thom, Milou, Jelle
D <sub>P</sub> Filming	Jeannette, Thom, Milou, Jelle
Appendices	Jeannette, Thom, Milou, Jelle
R Archive to Airtable	Jeannette, Thom
R Table of contributions	Jeannette
R Related work	Milou
R Final Design	Jeannette
B     Design process	Thom
B     Design process visuals	Thom, Milou
R Value proposition	Jelle
R Tactile experience literature research	Milou
Business model	Jelle, Milou
R User roadmap	Milou
R Abstract	Jeannette
R Introduction	
R Acknowledgement	Jeannette
	Jeannette Milou
® Benchmark	Jeannette Milou Jeannette
Benchmark           Report aesthetic style MEEBA	Jeannette Milou Jeannette Thom
®         Benchmark           ®         Report assthetic style MEEBA           ®         Report assembly	Jeannette Milou Jeannette Thom Jelle

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Figure 45: Tabel showing each contribution per teammember

## **INDIVIDUAL REFLECTION - JELLE BUNT**

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During my second bachelor design project, I participated in the Vitality squad, working on the theme Sensation of Data. While working on this project, I improved my prototyping and user testing skills. I also learned to create digital 3D models, an app demo, a business model canvas and value proposition, and edit photos in photoshop.

In my professional identity, I explain that I design "tools and spaces that use physical and playful/reassuring interactions to create an enjoyable experience". To be able to build such designs, I needed to improve my prototyping skills. Therefore, I took the main responsibility of the building process of the physical and high fidelity prototype of MEEBA. In order to create a high fidelity prototype, I chose to learn laser cutting. I chose this technique because it is capable of accurately cutting many types of materials. To learn which materials were most suitable for the prototype, I asked the experts at the Vertigo Workshop for their knowledge. Although I received a lot of information about the materials available in Vertigo, I think this is a very limited knowledge because there are many more materials available. Therefore, I will read the book Material Science and Engineering by William Callister. I will use this knowledge for the material choices in upcoming designs.

Before project 2, I was not able to present digital 3D models of my designs. I think this is important because it gives the best possible representation of the final product before making it. I decided to learn to create 3D models in the program Blender. I chose this program because it allows you to create detailed animations. Because you can adjust the colors, texture, material presentation, shape and size of the design, I found the program useful for material and shape iterations. However, using Blender can be time consuming. That is why I would only use this program for in-depth, aesthetic explorations so that I can improve the aesthetics of one particular design. For presenting, 3D models proved to be useful. We could show the design of MEEBA and receive feedback on the aesthetics.

During the design process, we decided that we needed to make an app. Because my professional identity is focused on physical design, I never bothered to learn how to design an app. However, project 2 showed me that apps can make a positive contribution to physical designs. Therefore, I offered to design the app together with Milou van Gompel. Our project coach showed us a program called Figma in which you can easily create an app that allows you to interact. Although this program is useful for communicating an app design, it is not a real working app. However, because my identity is focused on physical designs, I find it not important to be able to program a real app. Knowing how to use a program like Figma to illustrate the concept will be enough for my development in app designing.

In my vision I describe my ideal world, in which designs help us to 'respect each other's lifestyle and help us to have a sense of unity'. I believe user tests can help us understand the different lifestyles and by learning their behavior, we can make designs that suit at least most of these life styles. That's why I want to keep improving in user testing. To get a better understanding of the user's tactical preferences, we conducted a user test. I got interesting insights on how to get usable images by learning from Thom Smits, who placed cameras tactically in the room. Although the

user test gave us useful insights, I still think we could have gotten more relevant insights by conducting the user test in a real meeting setting. This would be close to the setting in which MEEBA would be used. For upcoming user tests, I want to go out of my comfort zone (testing on the university) and do my tests in the setting that is more suitable for the design.

After we took pictures of MEEBA, we edited them to make them look more professional. Since I was eager to learn this, I asked Jeannette if she could teach me the basics. After a clear lesson, I had enough knowledge to practice. Now that I have practiced, I am able to edit a photo to make it look more professional. I enjoyed improving the aesthetics of the designs and found it interesting to explore the potential of Photoshop (such as changing the light incidence). I think designers should be able to present their design professionally, and Photoshop is a great tool to do so. However, it takes a lot of time because I did not do it often. By using these skills often, I will train myself to be faster.

Since I was less developed in the business side of design, I decided to take the main responsibility for the Business Model Canvas and the Value proposition. To learn how to create them, I watched the Business Model Canvas tutorials made by StartupSOS. I also looked videos made by Due to limited time, I was only able to understand the basics of these models. To learn more about how to launch and grow a new business, I will read 'The Harvard Business Review Entrepreneur's Handbook: Everything You Need to Launch and Grow Your New Business'. By reading this book, I want to learn more about what tools and techniques are useful to help you start a new business.

## INDIVIDUAL REFLECTION - MILOU VAN GOMPEL

To begin my reflection, this was my first official project, so I learned a lot about how to go through a design process. I learned a lot about the important steps and phases of a design project. I learned from all the mistakes and can apply this new knowledge to the next project.

A big area of improvement for me for this project was improving my presenting skills. I think it's difficult to do this because I often get way too nervous. In this area I have improved, during the demo days I presented in front of people, but I did not reach the official set target. In fact, I did not present the official presentation. So, this is something for the next semester to work towards.

In this project, I learned to use new programs. For example, I worked with Blendr, Illustrator, InDesign, Notion, Shapr3D, and sketchbook. These programs are very useful for a designer and were new for me in this project, I can practice and develop these new skills in the next project.

In general, the cooperation in the group went well. Everyone was very motivated and that is a very important basis for a good project. Everyone has different qualities, and we were able to complement each other well. For example, I learned more about using technology from another team member. That was also one of my goals for this project. This goal is half achieved I have thought and looked along, and a lot of techniques have become clear, but I have not succeeded in fully realizing the technique for this product. That's something to take in mind for the next project.

In a few areas, there were differences of opinion within the group, which is good because that's how you learn to deal with it. I learned to visualize my opinion, which was also one of my goals. I did this through sketching and elaborating my opinion with these sketches.

A big aspect I learned in this project is how to act when you get stuck. Every project has its times, but before, I often procrastinated when we got stuck. In this project, I learned that at such a time you should go ahead, start regardless of whether it is in the desired way. From this, you then automatically gain new insights that you can use again.

#### **Professional Identity**

In this project, we adopted a structured approach. Each meeting a chairman and minute taker was designated in advance, this ensured that each meeting was prepared. In addition, there was a complete planning of what needed to be done in order to get everything done on time. This links to my professional identity, I am by nature a structural worker and find planning very important. This project has come in handy.

I think it is very important that I can learn from other students, in this project my teammates have taught me a lot each had his qualities and we complemented each other well, but in this way also learned a lot from each other.

A quote from my identity and vision suffers 'I want to design for people who are struggling with something'. Again, this fits with the project I have been working on for this half-year. In this case, MEEBA helps to form a group balance and thus helps groups who have difficulty with this to create it themselves.

During this project, I also found out that I find designing the product and getting involved in the final phase a lot more interesting than the initial phase of the project where a lot of research and investigation is done. That makes me a step closer to what kind of designer I eventually want to become.

#### **Professional vision**

My vision tells me that I am interested in how technology affects people's behavior. This is involved in our projects. Our project is also concerned with people's behavior, how this is influenced by colors for example. But also, how different types can work well together. So, this aspect or my vision is something that I still fully support, because for me this remains interesting.

My vision says it's important that products are helpful to the customer, this has also been taken into account with this product. MEEBA helps groups to find a balance while working together.

One aspect of my vision is a little less applicable, this product is easy to use, but it still requires some explanation. Possibly this could have been given more attention. My vision is that my products must be accessible to everyone and the product itself must speak for itself and not be too complicated to use.

To conclude, I am very satisfied with the progress of this project. I learned a lot and developed myself further as a designer. The vitality squad was a very good choice and I also found out that I find the wellbeing of a person a very interesting subject. I am ready for the next project and especially curious about what it can bring me.

## INDIVIDUAL REFLECTION - JEANNETTE STEKELENBURG

The Vitality squad has given me a lot of growth the past two quartiles. My main focus as a designer is to create, improve & better everyday life through design. By working towards improving group work by personal feedback, I feel that with MEEBA I have worked towards my vision of making this accessible through design. The coaches and my group pushed me just in the right direction, which helped me realize new techniques to go through the design process. By doing a lot of iterative sketching, prototyping and brainstorming, I already felt I had achieved more insight in project work when the midterm arrived compared to my last project.

After going through this experience, I want to highlight two things especially that I want to take with me in future projects.

The first is about being critical about you direction and allowing yourself to make decisions early on, having in mind that you can always go back. Throughout the project there were often moments were goals were unclear, too broad or problematic in different areas. I wanted to focus on more involvement with users and developing my competence with technology, as mentioned in my PDP goals. While I did an user test and made most the technology for MEEBA, the time and current situation (due to Covid-19) unfortunately didn't allow us to use our final prototype in a design, as well as finish up our

NFC system. Looking back, the latter could maybe have been reachable if we had decided to take some design choices sooner. Unsure about design directions, we wasted a lot of time too afraid to act. Yet, through squad activities like the 100-sketches challenge and helpful coach meetings, I gradually felt more confident to actually act upon decisions. After the midterm gave a lot of (positive) feedback, we acted a lot guicker with design choices, which resulted in more realizations, understanding and re-designs. Because this development made our final result so much more advanced and thought-through, it would still be nice to see if we can actually realize the technology if we could continue this project next semester with Ahrend. This could also evolve my competence with usertesting and understanding of technology as a part of design, as these are still my points of interest as a designer.

The other learning point for me was that, however the nice group balance, you still have to think through the planning and task division in time. As for my group, everyone seemed to work on their areas personally within the group context, making for a nice balance. We faced some difficulties that we needed to overcome, but we improved evidently over time as we had a great environment together were we openly discussed our issues. The obstacle we mostly faced was due to switching a lot between different meeting methods. In the beginning, we made agenda's for each meeting, switching responsibilities and noted

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what we had done. It proved to be really nice to look back on what we did, yet we couldn't maintain this organized after a while. In the end we switched to Notion to create an overview of our tasks, but even that was not checked and updated regularly. So, it was a bit all over the place. We did manage, yet with all these methods I think it is best to agree on one in the beginning, and try to stick to that till the end to prevent chaos or losing overview.

Throughout this course, these important experiences not only learned me a whole lot to deal with uncertainty, it also was this uncertainty that brought me closer to the other group members, resulting in a new group dynamic experience and better results because of it. I am thankful for the experience, my lovely group and the raised awareness about the importance of these aspects for me as a designer.

#### **INDIVIDUAL REFLECTION - THOM SMITS**

In this reflection, I reflect on the learning moments during design project 2 and the influence of the project on my professional identity and vision. In light of structure, I firstly reflect on three of the five most relevant SMART goals I set up for myself as described in my Personal Development Plan B2.1. I begin each paragraph with a one-sentence description of my goal. In each paragraph I first explain why this goal is important to my professional identity and vision, followed by a reflection on that goal. A separate section is made on the project's influence on my design vision. Lastly, I reflect briefly on my cooperation.

#### **Evaluation SMART goals**

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With the design project 2, I wanted to lower the threshold of working with coding and electronics, so I would feel less uneasy by implementing electronics in my prototypes.

I worked on the task of creating a circuit connecting 4 NFC readers to an Arduino, so the product MEEBA could measure the pro-activity levels of the participants. Due to time constraints and my lack of knowledge in technical realization, I was not able to make this circuit fully functional (connected up to 2 NFC readers to the Arduino). Nevertheless, working on electronics and coding independently did make me feel more comfortable with quickly working with electronics. Moreover, I have independently soldered for the first time, lowering the threshold to solder a next time for other prototypes. The threshold to work with electronics and coding has been lowered a bit, but could be further lowered by also focusing on developing a functional design to perform research with in the research project 3.

#### I wanted to improve my practical prototyping skills during design project 2, so I could explore my attitude on stimulating different senses.

I find rich sensory design important, as it really makes the experience of using a product. For me, this means being able to develop good aesthetic prototypes with rich interactions. I explored opportunities for (uncommon) multisensorial interaction and design through the 100-sketches challenge. Examples are 1) the scent dispenser idea that dispenses a pleasant smell if teamwork goes well, and 2) stair walking stimulant through pleasant smells. Moreover, I contributed strongly in the design choices of the material expression e.g. choice of black fabric on the sides. Physically experiencing the exploration for nice, yet functional materials made me feel more connected to the design. Although I would've liked to participate more in the actual hard-skills assembly of the prototype, I feel satisfied with my newly gained insights on multisensorial through hands-on material exploration. Persisting such an attitude will make me more mindful of the aesthetic quality of my designs.

#### I wanted to involve the user more actively throughout the design processes during the project, so I would design with the user, for the user.

I believe in the power of collaboration and co-creation as a way to progress an idea or concept, as I value the insights and perspectives of others. I was able to setup and perform a user test on the tactile preference of people while holding a handheld object during a meeting. Talking to the participants and asking them thorough questions on their behavior and perspective provided answers to assumptions that I and the team made on people's tactile preference. Subsequently, I could make design choices on the materiality and shape of the handheld Meebits to improve the entire product experience. For next times, I would like to also perform

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an evaluative user test to see if my product actually works as intended. Persisting this attitude will improve the user experience of my designs later on in my design career.

#### Vision

#### I want to design ways to unite people to start working together towards a sustainable future.

I believe that a big societal transition to a sustainable future can only be realized when people collaborate. During design project 2, I was able to partially realize my vision by designing MEEBA, which aims to enhance meeting collaboration. I am especially happy with the fact that MEEBA allows for personal reflection as well as collective reflection, as I believe that people first need to acknowledge a problem first in order to collectively act upon it.

MEEBA is not only a design that unites people, but lets people reflect to make a transition to a more desired state (i.e. better meeting collaboration). This project has shown has allowed me to make a first real step to implement my vision in the real life world. Additionally, the office furniture company Ahrend has given us the opportunity to user MEEBA in a real meeting setting. This allows me to further implement my vision in the real life world. Me and the team are making plans to continue improving this tool by taking it to the research project 3 to research meeting collaboration. In any case, in the future, I hope to work on designs that incorporate (part of) my vision and bring people together with the intend to work towards the transition of a sustainable future. Cooperation

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I value a constructive collaborative environment, which is why I actively contribute to one. As a third year Industrial Design (ID) student, I share past knowledge, skills, and attitudes with my second year ID teammates, so we can collectively work towards a better realization of a concept. Also, I advocated moments of reflection after each working session, to 1) actively evaluate the strengths and weaknesses of the team, and 2) facilitate a safe space for constructive team reflection. This resulted in a healthy and complementing group atmosphere.

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#### **APPENDIX A**

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#### Appendix A

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Code of the MEEBA Wizard of Oz prototype: String command; int input; int A= 0; int B= 1; int C= 2; int D= 3; int E= 5; int F= 4; int G= 6; int H= 7; int I= 8; int J= 9; int K= 13; int L= 14; int M= 15; int N= 16; int O= 17; int P= 18; int Q= 19; int R= 20; int S= 21; int T= 22; void setup() { // put your setup code here, to run once: pinMode(A, OUTPUT); pinMode(B, OUTPUT); pinMode(C, OUTPUT); pinMode(D, OUTPUT); pinMode(E, OUTPUT); pinMode(F, OUTPUT); pinMode(G, OUTPUT); pinMode(H, OUTPUT); pinMode(I, OUTPUT); pinMode(J, OUTPUT); pinMode(K, OUTPUT); pinMode(L, OUTPUT); pinMode(M, OUTPUT); pinMode(N, OUTPUT); pinMode(O, OUTPUT); pinMode(P, OUTPUT); pinMode(Q, OUTPUT); pinMode(R, OUTPUT); pinMode(S, OUTPUT); pinMode(T, OUTPUT); Serial.begin(9600); 3 void loop() { // put your main code here, to run repeatedly: if (Serial.available()> 0) { //recieve the information input of your Arduino input = Serial.read(); Serial.println(input);

switch (input){ case `5': on(); delay(5000); off(); } switch (input){ case '6': looping\_lights(); //delay(500); } switch (input){ case `1': delay(500); chose1(); delay(5000); } switch (input){ case '2': delay(500); chose2(); delay(5000); } switch (input){ case '3': delay(500); chose3(); delay(5000); } switch (input){ case '4': delay(500); chose4(); delay(5000); 3

void chose1(){

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digitalWrite(A, HIGH); digitalWrite(B, HIGH); digitalWrite(C, HIGH); digitalWrite(D, HIGH); digitalWrite(E, HIGH); delay(2000); digitalWrite(A, LOW); digitalWrite(B, LOW); digitalWrite(C, LOW); digitalWrite(D, LOW); digitalWrite(E, LOW); } void chose2(){ digitalWrite(F, HIGH); digitalWrite(G, HIGH); digitalWrite(H, HIGH); digitalWrite(I, HIGH); digitalWrite(J, HIGH); delay(2000); digitalWrite(F, LOW); digitalWrite(G, LOW); digitalWrite(H, LOW); digitalWrite(I, LOW); digitalWrite(J, LOW); } void chose3(){ digitalWrite(K, HIGH); digitalWrite(L, HIGH); digitalWrite(M, HIGH); digitalWrite(N, HIGH); digitalWrite(O, HIGH); delay(2000); digitalWrite(K, LOW); digitalWrite(L, LOW); digitalWrite(M, LOW); digitalWrite(N, LOW); digitalWrite(O, LOW);

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## **APPENDIX B - RAW USER TEST DATA**

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Raw data of the user research and evaluation https://tuenl-my.sharepoint.com/:f:/g/ process: personal/j\_a\_stekelenburg\_student\_tue\_nl/Ei7JigEUX\_ xAmOhEW3UtdqYBdttlin-ZnqID47wVd2fj5A?e=cGiwoy

#### **APPENDIX C - DEMODAY** DELIVERABLES

Poster of demo-day and link







VITALITY



SENSATION OF DATA MEEBA

STUDENT NAMES: JEANNETTE STEKELENI JELLE BUNT MILOU VAN GOMPEL THOM SMITS

While working in a collaborative environment, finding the right group balance can be difficult. Meeba is a modular device po ion and

sed of a central station and individu its). Meeba is able to recognize partici-with light to give all participants a chance I mough the scannable NFC chips in the Me and about their collaboration style thro: This reflection are hold those to advant poration style through

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