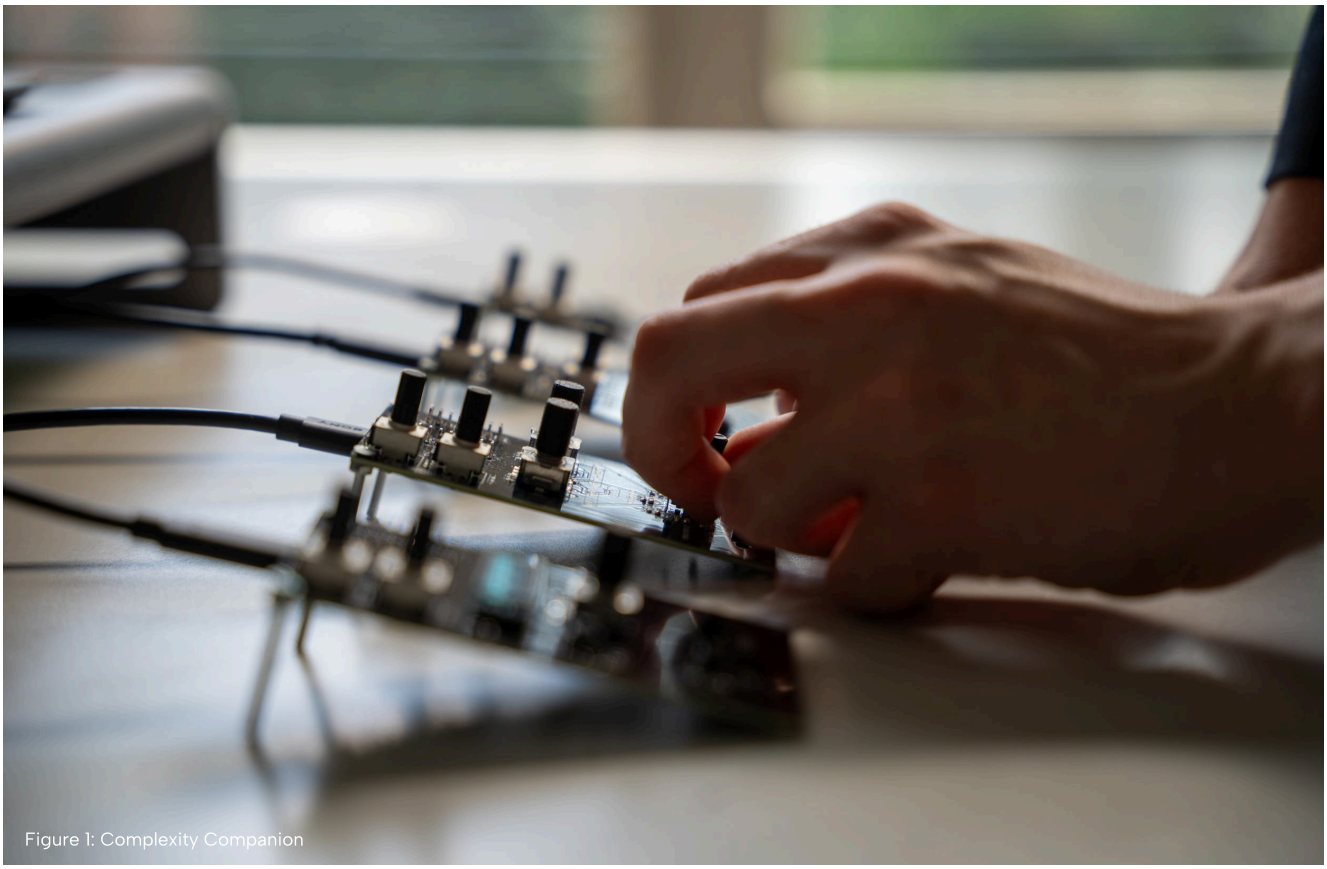

Figure 1: Complexity Companion

The Complexity Companion

Discussing Complex Topics with Broad Prosperity

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11 June 2025

Executive Summary

Broad Prosperity is an approach that can be used to better understand the multitude of factors, effects, side-effects, and possibilities that are relevant to societal issues. It can be used in politics, audit, and daily life to get a grip on such issues by embracing the fact that they can never be fully understood. It stands for everything we value in society and in life, and it is being used by Dutch governmental organizations to discuss important problems and opportunities.

Design can play a role in supporting people to make sense of Broad Prosperity as well as the complex problems Broad Prosperity discussion might try to approach. It is especially important to support groups in doing this collaboratively, as societal problems are rarely solved by individuals. Instead, they can be slowly transformed by acting locally and collaboratively.

This report describes the process of designing the Complexity Companion, a collaborative discussion tool that allows stakeholders in complex situations to co-create a visualization of this situation while they discuss relevant elements collaboratively. Together, they make sense of each other and the issue at hand.

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Prologue

I chose to do my Final Bachelor Project in Transforming Practices because I believed I could still benefit from taking a more social or systemic perspective in my bachelor education. Previously, I mostly had experience with the more technical sides of industrial design. I have, however, always been interested in systemic change, and since I believe engaging in a variety of design experiences contributes to becoming a good all-round designer capable of handling all aspects of the design process, joining this squad would be the ideal final touch to complete my bachelor education. Working with Broad Prosperity using Transforming Practices approaches confirmed this expectation as it was a great learning experience that allowed me to combine my existing expertise, interests, and new ways of working into a final project I am deeply proud of.

Introduction

The world is full of complex and societal problems. In the Netherlands, the government attempts to improve on some of these situations through law and policy. The Netherlands Court of Audit (in Dutch: Algemene Rekenkamer) checks if this policy is well-designed, effective, and efficient (Algemene Rekenkamer, 2021). They do audits on government spending, and look at the broader effects of governmental action. They have embraced the concept of 'Brede Welvaart', for which this report will use 'Broad Prosperity' as translation. Broad Prosperity stands for everything people value in society and in life, and is an inherently complex topic that can be understood in multiple ways. In the design project described in this report, Broad Prosperity is seen as a way of thinking and an approach that can be taken. It resembles looking further, thinking long-term, and considering as many perspectives as possible.

This report describes the design process of the Complexity Companion, a collaborative discussion tool that allows groups of stakeholders to co-create a visualization of the complex situation in which they hold stakes. The tool prompts the groups to continuously reflect in terms of Broad Prosperity, and requires collaboration between multiple people to be used. The project was completed in the Transforming Practices (TP) squad at Eindhoven University of Technology: Industrial Design, and in collaboration with Martin Dees and Linda Meijer-Wassenaar from the Netherlands Court of Audit (NCA). The goal of the project was to promote Broad Prosperity as a concept by making it experienceable.

The societal aim of promoting Broad Prosperity is to slowly make this concept an inherent part of the way policy-makers work, shifting their approach to one that is interdisciplinary and more considerate of social effects of policy; and to make Broad Prosperity the standard way of discussing societal problems among civilians, which could be advantageous in accepting different opinions and perspectives while moving towards collaborative solutions. This is in line with the theoretical concept of participatory sensemaking, which describes interaction processes where people collaboratively come to new insights on each other without necessarily reaching consensus or compromise (Jaasma, 2018, p. 36). The final design aims to achieve this type of interaction between its users, and could be used as a design research probe in future studies to gather further design knowledge on practices that might support this way of interacting and sensemaking.

Background

Literature review

In order to design for Broad Prosperity experienceability, it is important to understand the different ways the concept of Broad Prosperity is understood. Broadly, there are two main ways of looking at the concept. The first aims to find ways to measure Broad Prosperity as much as possible in order to get an understanding of the broader progress made within multiple dimensions of, for example, a country or region. For this, there is often made use of indicators that should together showcase Broad Prosperity. By measuring these indicators over time and in different places, Broad Prosperity can be methodically analyzed. This is most directly found in the recurring Broad Prosperity monitor, which yearly presents graphs for a range of indicators (Centraal Bureau voor de Statistiek, 2025). Others use less measurable approaches but still identify indicators for Broad Prosperity, such as the eleven categories specified by Sander et al. (2024), or the five areas and eight themes used by the Netherlands Institute for Social Research (Sociaal en Cultureel Planbureau, 2024). These five areas (optimal experienced wellbeing, righteous wealth distribution, sufficient social cohesion, sustainable growth, and effective policymaking) together make up the “quality of society”, which is used as a key to understand Broad Prosperity and used in government reports.

The other main perspective towards Broad Prosperity is seeing it as a way of thinking or an approach. Here it could be argued that Broad Prosperity is not meant to be measured. Instead, it is a highly complex concept that is symbolic for going beyond thinking only in terms of GDP growth, and one that proposes a means or framework for discussing complex topics. Nagelkerke and Janssen (2025) describe in Van Meer Waarde how Broad Prosperity can be practically used in policy-making, and lay out four main changes: looking, choosing, working, and learning differently. To them this means looking for change and possibilities; choosing in ways that take into account the here and now, but also the future, and possible side-effects elsewhere; working, financing, and monitoring projects together and interdisciplinarily; and learning with complexity and regular reflection. The book also notes the importance of practising Broad Prosperity at a regional level, as this poses opportunities for close collaboration and initiatives. Kim Putters, professor in Broad Prosperity even aims to transform our society to one where Broad Prosperity is the central way of interacting, innovating, and governing (Putters,

2024). The way Broad Prosperity is interpreted in the design process is in line with this second perspective.

There are a few places where Broad Prosperity is already integrated in policy practice, such as shortly in the Beleidskompas, which is the central way of designing policy (Kenniscentrum voor beleid en regelgeving, 2024); the Miljoenennota (Ministerie van Financiën, 2024); and Verantwoordingsdag (Kaag, 2022). These cases mostly take a measured approach to understanding Broad Prosperity.

A number of resources have been essential to understand the TP approach. Firstly, Designing for Transforming Practices: Maps and Journeys gives a broad introduction to TP approaches and attitudes (Trotto et al., 2021). My main take-aways from this include that TP stands for embracing complexity, and for working with global challenges by acting locally. Achieving paradigm shifts can take many forms: this design project shows individuals new ways of collaborating and thinking in terms of broader societal values, and reflecting on this in-action. Another important resource was Economy as a Transforming Practice, an essay on theories for TP (Hummels, 2021). The main takeaways from this include viewing designing for complexity as actively strengthening differences instead of compromise, and enabling people to make sense of complex systems. This aligns well with this design project, as it is directly intended for people to accept and make sense of complex systems while opening them up to Broad Prosperity ways of thinking. For this, the theory of participatory sensemaking is highly relevant, which is beneficial from a design perspective as it explains how people "participate in each other's sensemaking". These interaction processes can change individuals while leading to new collaborative understandings without a need for consensus (Jaasma, 2018, p. 36). Finally, the ways of regular reflecting and activity switching as proposed in the Reflective Transformative Design (RTD) process have been central to the design process as will be further outlined in the Method section (Hummels & Frens, 2011).

My personal perspective to the design project as follows from these readings is that there are design opportunities to promote accepting the complexity of Broad Prosperity in government projects and policy, in companies, and in the daily lives of civilians, and also to design methodical tools to support policymakers in analyzing situations or their work in terms of Broad Prosperity. The first of these two opportunities has been the focus in this project, although influences of the second may be noticeable.

Method

From beginning to end of the process I have written structured weekly reflections to understand my process and decide on the best next steps. Each reflection included an activity list, reflection on activities, reflection on goals, and reflection on expertise areas. The activities were compared to the eight activities for transforming practices (immerse & empower, continuous orientation, reflect & learn, envision & create, collaborate & organize, collect & analyze, communicate & engage, act & experience) as presented in Designing for Transforming Practices: Maps and Journeys (Trotto et al., 2021). The reflections were a check-in if I did the right things, what I should do in the next weeks, if I was not neglecting one of the expertise areas, if the goals I set were still in line with my expectations and if I was doing the right things to achieve those goals. From the RTD Process, mainly the regular switching between activities, and basing this switch on reflection in- and on action were integral to the process (Hummels & Frens, 2011). The

activities proposed in the RTD process were not directly inherited, and instead the eight activities mentioned above were taken as a structure to understand my design behavior over time. Even more practically, the next activity was usually based on what seemed fit based on reflection, intuition, and coach discussion. Decision-making was based on intuition, design knowledge, and personal goals. It was understood that not all decisions would be the right one, which is integral to the RTD Process. The visualization in figure 3 presents my process in terms of the RTD Process, for which I used the following (personal) interpretations to understand the different elements of the RTD Process:

- Envisioning: designing for transformation, dreaming, thinking in terms of possibilities
- Information gathering: validating, literature review, experiencing prototypes
- Design action: making, synthesizing, concretizing, using design intuition, sometimes going for quantity
- Analytical thinking: analyzing, deep thinking, developing theories, considering viewpoints
- Integrating: finalizing, decision-making, integration.

To be more descriptionate towards activities that were central to the process, one of the main recurring ways of working that became an inherent visual style of communication throughout the process has been zine-making. I started this practice during a workshop on zine-making in the squad by Andy Dockett, and kept using this way of working as it seemed to support creative behavior and working in a consistent style, and it allowed me to keep careful track of my creative work.

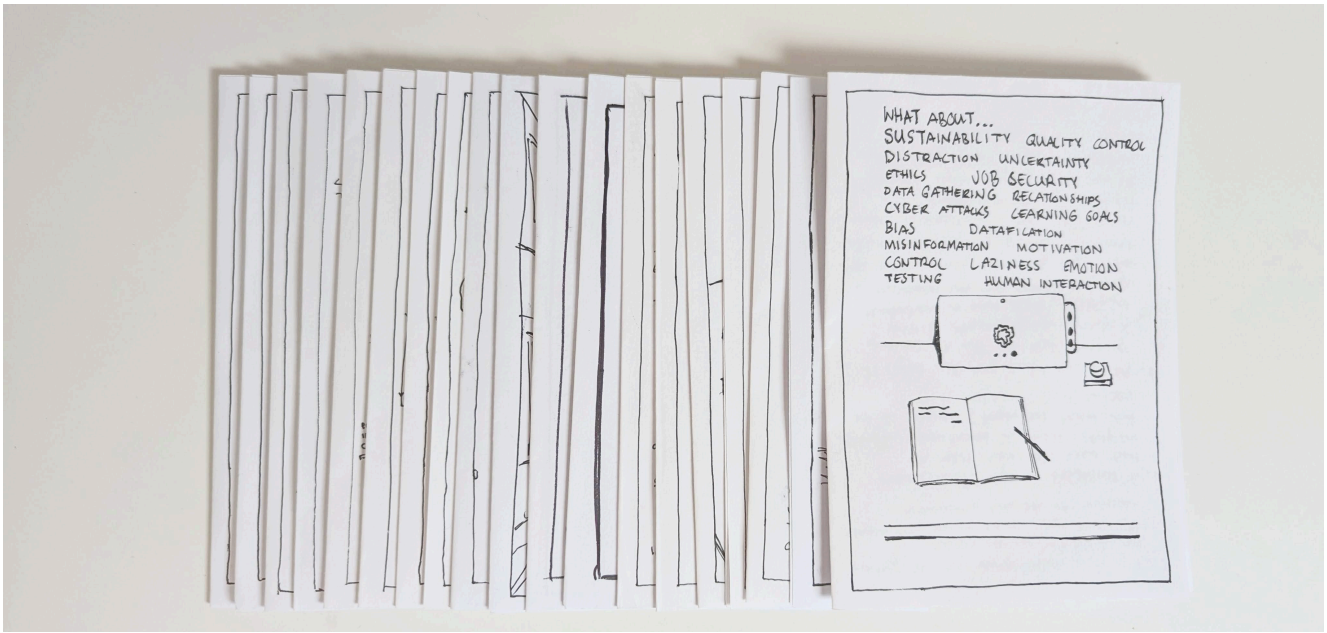


Figure 2: Zine collection

Throughout the process, I used these zines to regularly engage in prolonged creative explorations in which I envisioned opportunities for design and sketched ideas or iterations. The process was backed by careful literature review during the initial stages of the process that helped me understand the field, and supported by intermediate smaller literature review sessions that helped me understand the TP approach (see literature review). When the design concept got more clear, I spent more time concretizing and testing through interaction exploration, finalizing the design project with user testing for validation. Still, these final stages were usually backed by exploration sessions.

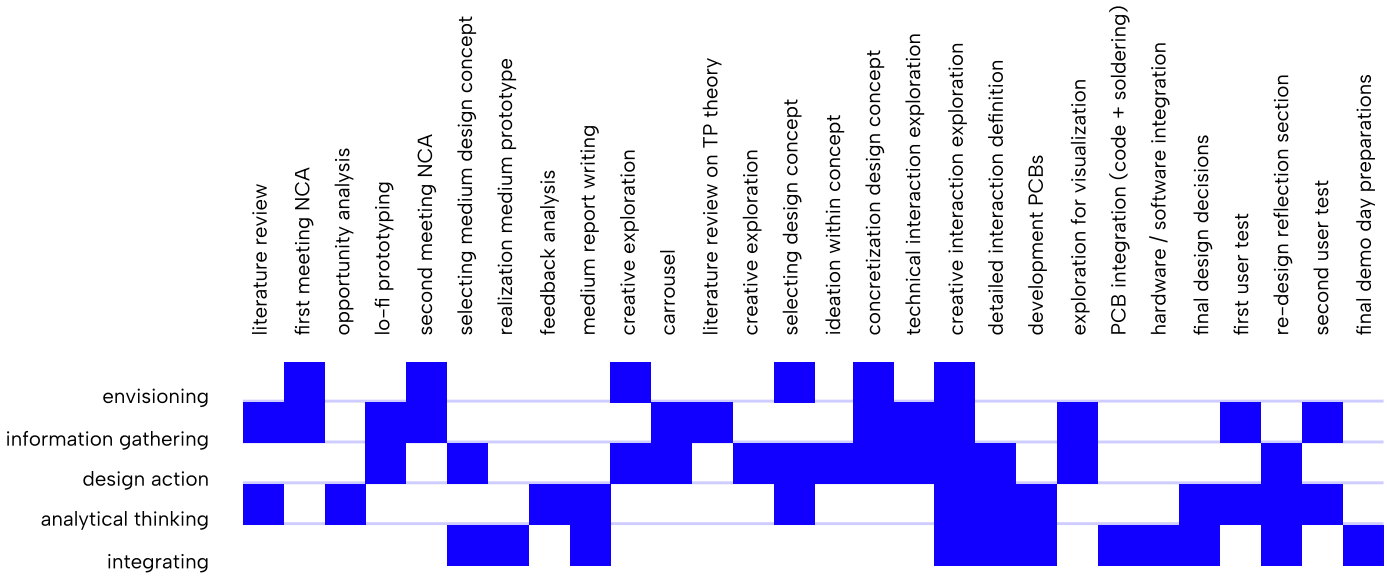


Figure 3: Process visualized in terms of the RTD Process

Approach to client collaboration

In my collaboration with the NCA I was balancing three sets of goals. Firstly, I wanted to design directly for the needs of the NCA and provide them with an interesting product to use internally and externally. Secondly, I wanted to represent TU/e Industrial Design and the TP squad by showing the NCA what design can mean for them, and how the TP approach can transform their way of looking at problems and complex situations. Thirdly, I wanted to develop as a designer by learning new approaches, balancing my process individually, and learning new skills – while also showcasing my existing expertise.

In my meetings with the NCA I often let the conversation flow as it naturally would with just a few points that I wanted to achieve during the meeting. Martin and Linda were very enthusiastic and would often speak about projects they found interesting or valuable. Each meeting I showed some of my work, explicitly focussing on exploration and unfinished concepts, as I believed this would both allow them to take a constructive stance (which I quickly found out they did not need any support for) but also to inspire them with my many ideas that would never be realized and to share the design process. What I wanted to get out of the meetings was often a bit of feedback on concepts as they had much more knowledge on the possibilities and perspectives of the possible target audiences (like auditors and policymakers), and additional inspiration to continue with. This approach was very successful and the collaboration turned out to be very pleasant and effective throughout. More details on specific takeaways from certain client meetings can be found in the design process descriptions.

Results

Figure 4: Using the Complexity Companion

The Complexity Companion offers a product-service system that allows for participatory sensemaking of complex political or social situations. It supports groups in taking a broader perspective in their collaboration by allowing them to co-create a visualization that represents a systemic view of the situation they are discussing. The product-service system can be used in sessions organized by the Netherlands Court of Audit or other parties wanting to take a Broad Prosperity approach in stakeholder discussions. The manual in Appendix B supports the organizer in hosting successful sessions, and explains the features of the devices in detail.

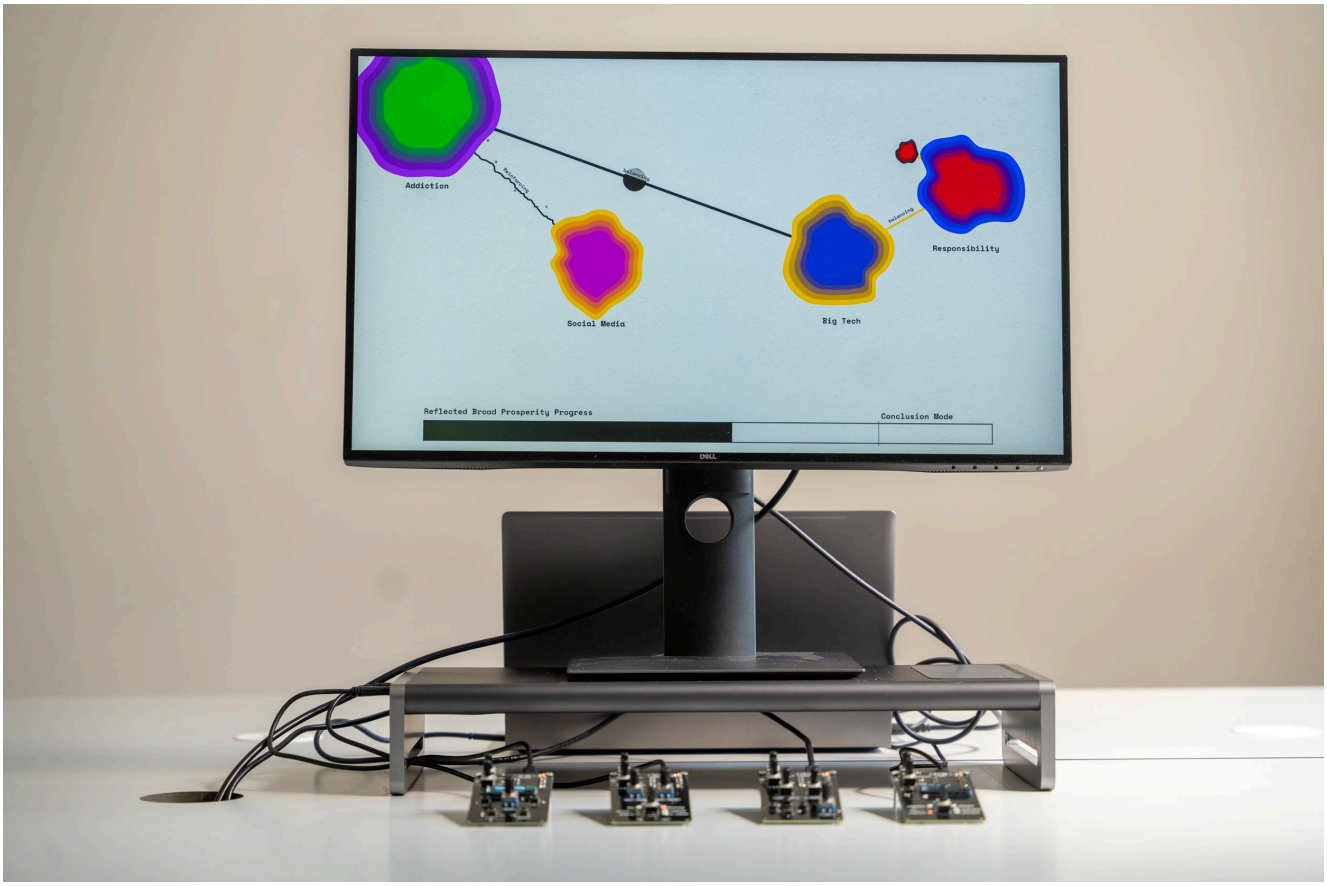


Figure 5: Impression of complete final result

The session starts with an introduction to the topic to find common grounds, followed by an explanation of the devices and visualization. During the user tests presented in the Design Process section a five minute explanation was sufficient. The participants are then asked to start visualizing their interpretation of the situation that was introduced.

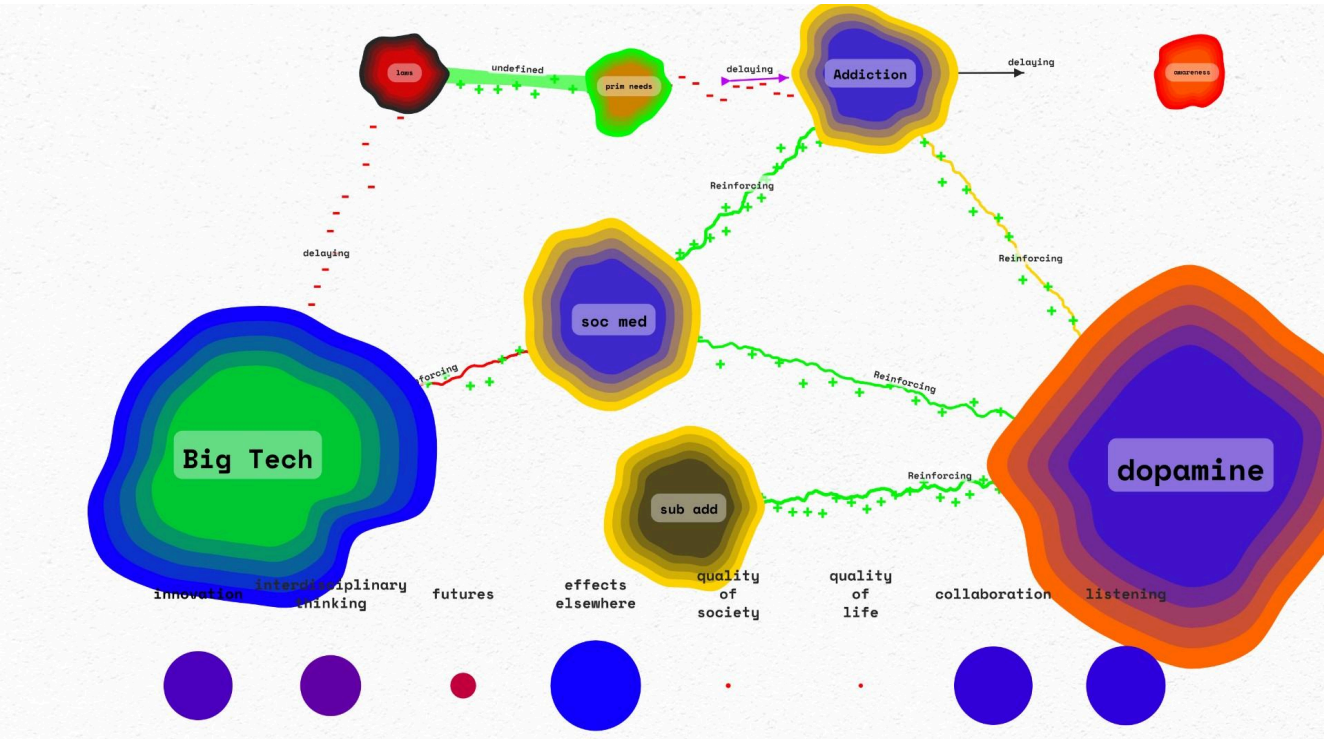


Figure 6: Visualization created during one of the user tests discussing social media addiction

The visualization shows elements on screen that are relevant to the situation. If we take Dutch medicine shortages as an example situation, we might see elements such as pharmaceutical companies, measured shortages, financial incentives, and experienced shortages. The organizer can prepare the visualization in advance so the group has a few elements to start with. The group can also assign relations between elements, for which they can choose between different types: delaying, resonance, flow, reinforcing, and balancing. If the group cannot choose or prefers not to add specific types to relations, they can also choose to assign the 'undefined' relation type. Each relation type has its own look and behavior in the visualization. What each type could mean is explained in the manual but can be interpreted in multiple ways. To go back to the example situation: the group might believe that the status quo is strengthened by the financial incentives that drive pharmaceutical companies, for which they could add a reinforcing relation between 'financial incentives' and 'pharmaceutical companies'. The behavior of the visualization as a whole can also be adapted: the group can input to what extent they are uncertain about their understanding of the situation, and how much they believe the situation is prone to change (vitality). These two factors influence how much the visual moves unpredictably, and how many elements are added independently from the group.

The physical part of the product consists of four devices that are to be distributed among a group of users. No single device (module) can successfully change the visual on its own, so collaboration between users is an inherent requirement for use. While interacting with the devices, users must discuss what changes they collaboratively want to make, meaning they must have a deep discussion on the content of the situation that is being visualized. The first module adds, removes, and selects elements in the visualization. Holding 'add' allows the group to speak the name of the element they want to add, which

will be transcribed and appear as text. By switching to typing mode it is also possible to type the elements. The second module changes the relation type between two selected elements, and can change its strength and positivity (which both have visual effects). The third module moves a selected element and changes its size. It also changes the uncertainty and vitality of the situation. The fourth module displays AI messages, for which the group can choose between six different modes. An example of a message in criticism mode could be: 'Consider why there is no relation between measured shortages and experienced shortages.' The prompt used to control this AI is presented in Appendix D. The design result supports both local AI models and Google's API.

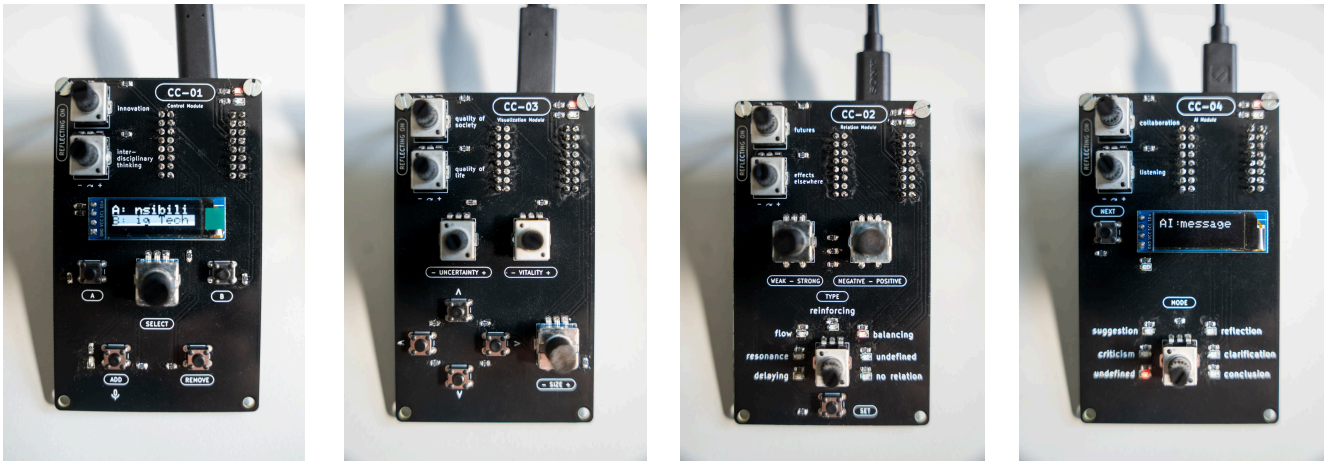


Figure 7: Physical modules

The top part of each module is dedicated to two reflective questions. A total of 8 reflection points are communicated on screen, where for each reflection point a visual representation shows how well the group has been incorporating this element of Broad Prosperity in their discussion. This way, users constantly have insights in their Broad Prosperity thinking at their fingertips, which they can use to better understand any complex situation they care about.

When the group is content with their discussion and the created visual, they can use the AI's conclusion mode to move towards a shared conclusion, but they may also quit without this. The reflection knobs can act as indicators that the group has incorporated a sufficient breadth in their discussion. The organizer will formally end the session, and will export the visual, which will return a pdf that also includes a short AI-written summary that can act as a reminder for what the visual conveys (see Appendix C).

Responses

The user tests showed the product-service system is successful in supporting discussion, enjoyable to use, and sufficiently clear in its tangible interactions. The design led participants to continuously reflect in terms of Broad Prosperity, although the concept of Broad Prosperity is not directly promoted by the design as it is never mentioned. The limitations and tangible interaction promoted creativity. Participants did mention that some features were slightly annoying, and some specific interactions behaved differently than expected. Also, after prolonged use, some technical issues became noticeable for the participants. More information about the user tests can be found in the Design process section. The client had not yet responded to the final design but has been very enthusiastic throughout the process and about the final design proposal.

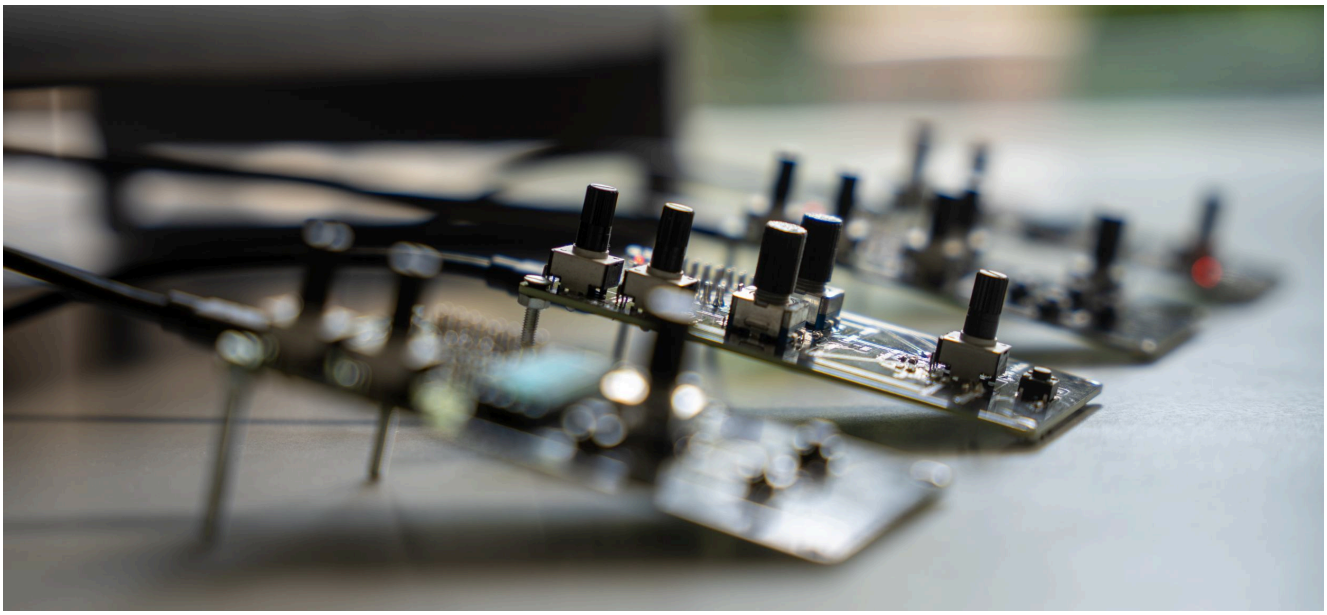


Figure 8: Self-standing PCB modules

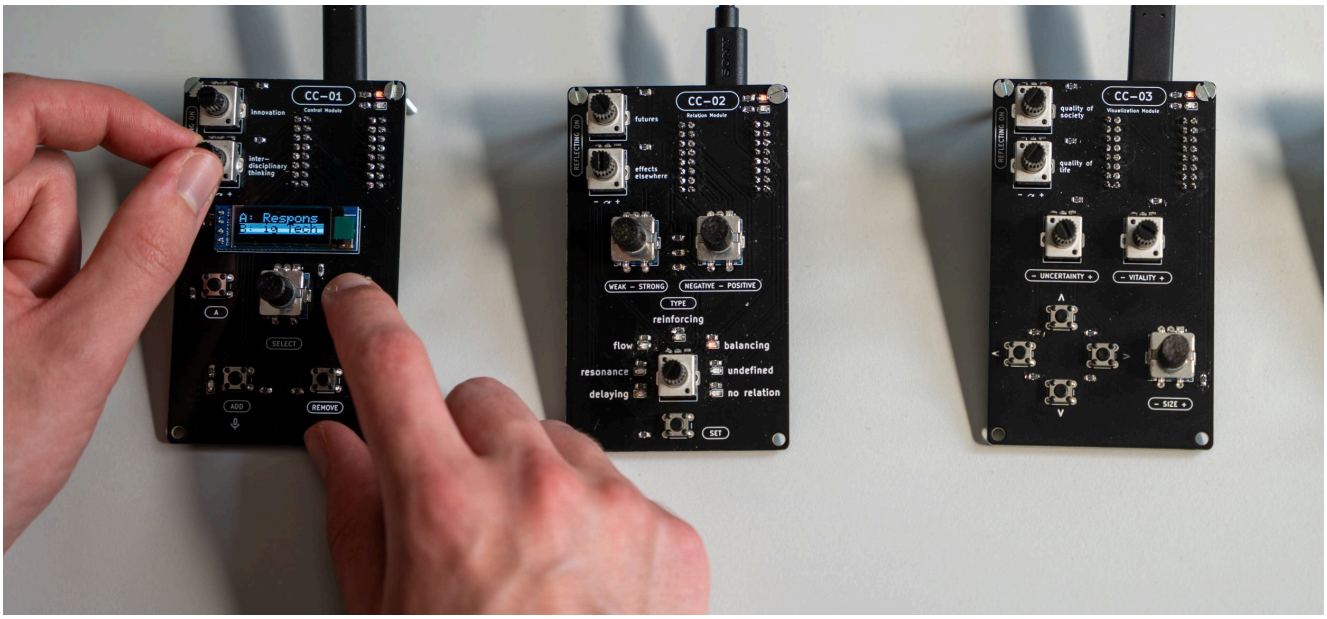


Figure 9: Tweaking the reflection point on interdisciplinary thinking

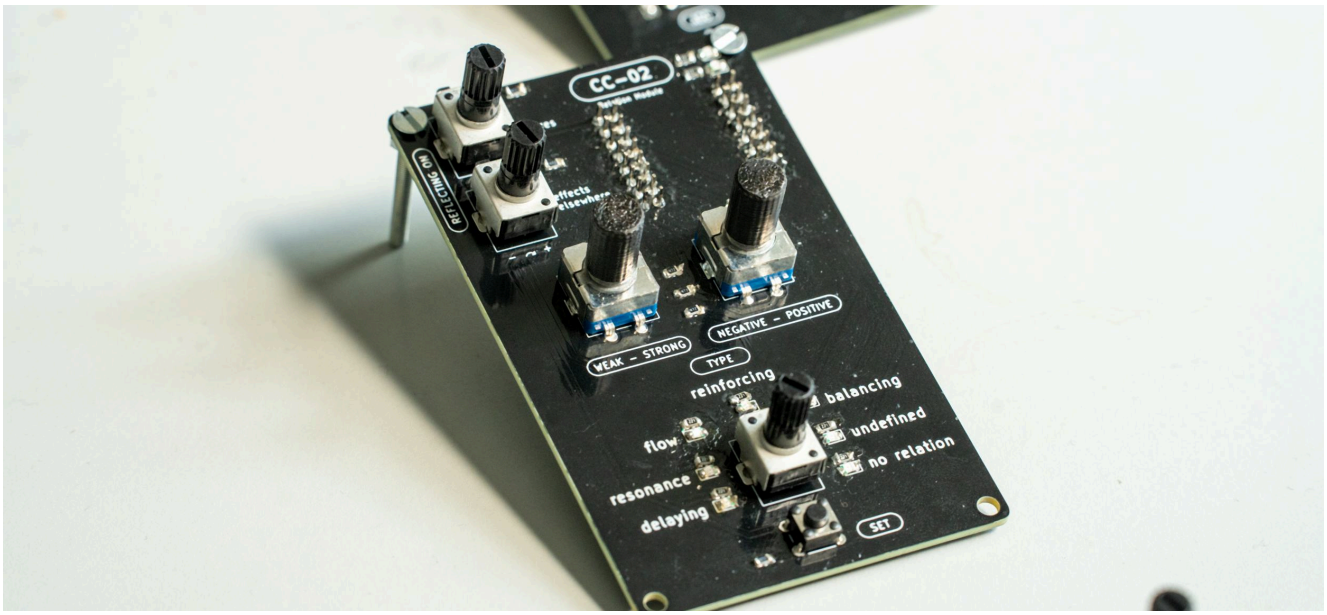


Figure 10: Module 2

Design Process

Understanding the design space

The project started in week 3 with literature review to get an understanding of the design space and the topic of Broad Prosperity. The results of this phase are integrated in the literature review. The goal for the reading was to develop a model for what Broad Prosperity could mean to me, and gain understanding of what it means to others. The first meeting with the NCA (online) supported this, as after setting expectations for the collaboration we held a thorough discussion on the topic. I synthesized the findings for this first phase into design opportunities for Broad Prosperity that are presented in the literature review.

In parallel to this phase of reading, I took up the approach of zine-making that was explained in the Method Section. Any ideas for design directions that came up during reading would be sketched or written in this style. When I had gained sufficient topic knowledge, it was time to leave analysis and orientation behind temporarily to make room for creativity, making, envisioning, and experiencing. A week was spent exploring multiple contexts through lo-fi prototyping. Specifically, paper prototyping, sketching, writing, and acting (on camera) were used as techniques for lo-fi prototyping. Because the different ideas were all targeted to a different audience, I made a stakeholder map to understand the different levels of the Dutch government, and placed my ideas on this map to eventually be able to choose one target group.

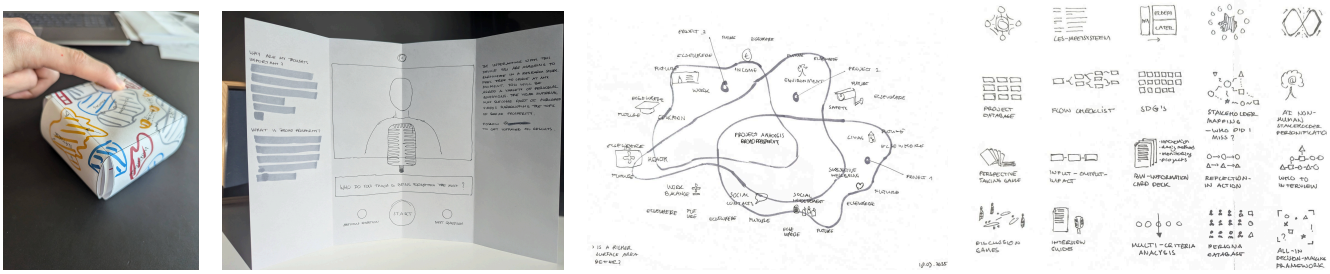


Figure 11: Impression of exploration

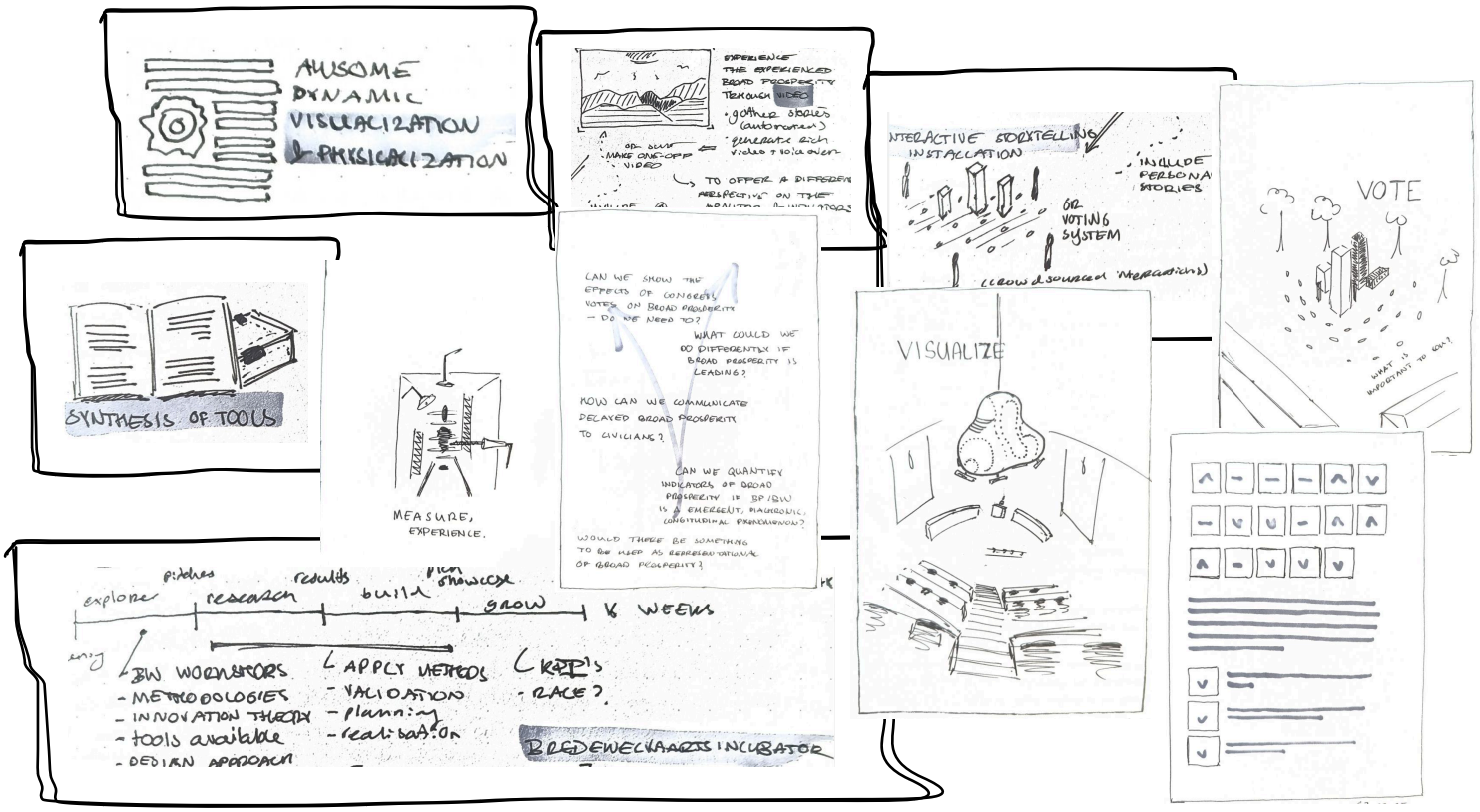


Figure 12: Exploration as result of literature review

During creative exploration, the first physical meeting with the Netherlands Court of Audit (Martin and Linda) was being prepared. This was seen as a moment to (1) inspire the client and have them think in terms of opportunities and (2) to get feedback on the lo-fi possibilities created in order to choose one direction for further development. The following ideas were presented:

- Analytical instruments to analyze projects or situations in terms of broad prosperity
- A Broad Prosperity incubator / accelerator: program to help launch and grow Broad Prosperity initiatives
- Discussion probes to promote Broad Prosperity thinking
- Expressing broad prosperity in film
- Qualitative data / story gathering station that would be placed in public spaces (which could be combined with the previous point by incorporating film or sound recording in these stations)

Since the NCA seemed enthusiastic about all of the proposed possibilities, I based my concept to work out for Medium Demo Day on what would suit my current expertise, what would best support my future development, and what would best involve Broad Prosperity.

Figure 13: Discussing lo-fi prototypes and explorations with client. Image by Linda Meijer-Wassenaar

Figure 14: Discussing functional prototype with client. Image by Linda Meijer-Wassenaar

Towards medium demo day

After this meeting, only three days were left until Medium Demo Day. I spent this time building a functional and interactive prototype of a discussion probe to promote Broad Prosperity thinking that also included an analytical instrument. The prototype was made digitally, although it represented a physical design, using HTML and JavaScript as well as P5.js to create a visual interface, PicoCSS to speed up the digital prototyping process, and the Local AI Functionalities available in Data Foundry to integrate AI analysis into the prototype. The functions and interactions of the prototype were adapted fairly directly from one of the lo-fi prototypes made a week earlier.

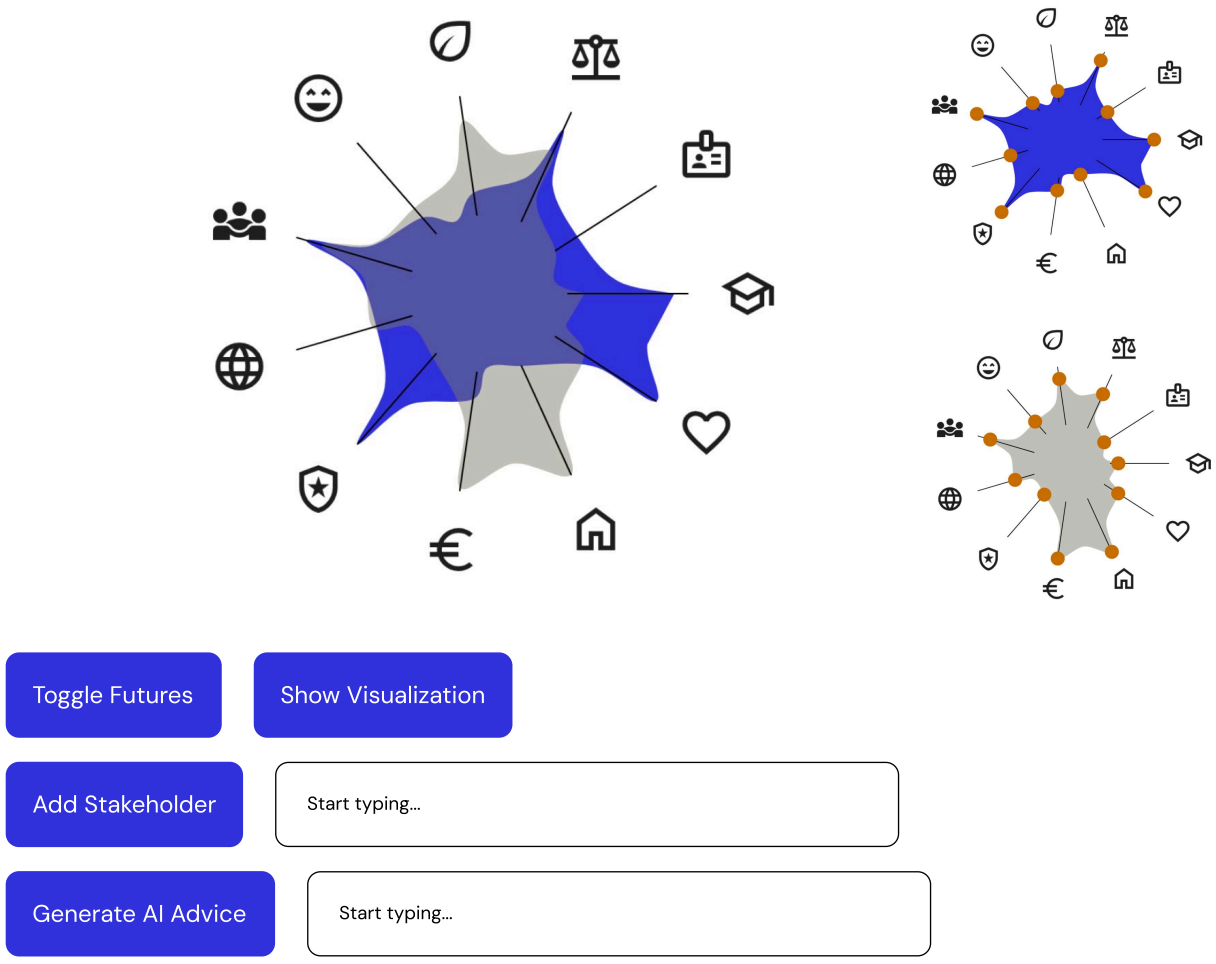


Figure 15: Medium demo day prototype

The Medium design result is a physical discussion probe targeted at regional government officials and auditors, that can be used to rethink a project or policy proposal in terms of broad prosperity. Eleven sliders are provided to rank the project's effects on each of the eleven categories of Broad Prosperity as specified by Sander et al. (2024). Two visualizations can be created with those sliders: one for the current and short-term effects of the project, and one for the future. Multiple project members can discuss those effects together and visualize their differences. In addition, the probe can be given to external stakeholders to also show their interpretation of the situation. It is on purpose that the sliders do not have clear values attached to them, as the complete situation is interpretable, situated, and relative. In addition to the central visualization, different

stakeholders can be added to this visualization during discussion to highlight how specific effects on areas of Broad Prosperity relate to specific or multiple of the stakeholders.

An analysis of the Medium Demo Day feedback can be found in Appendix F.

Back to exploring

After Medium Demo Day, I initially planned to work more directly with my target group, which at the time was officials working at regional or municipal governments. Based on coach discussions I instead decided to go deep into creative exploration. After all, I had already completed extensive literature research and multiple client meetings, and the target group was still prone to changing. For the creative exploration, I planned to truly let go of all design or client requirements. During this stage I surrounded myself with inspirational imagery, books, texts on Transforming Practices (to get in the right mindset), and all of the creative work I had worked on so far during this project. I engaged in continuous creative sessions where I spent my time sketching, drawing, reading, looking at art, listing all ideas that came up, listening to music, and taking some time to rest in between to truly allow my mind to remain creative. Figure 17 shows results of these creative sessions, and figure 16 shows work created during the zine-making session I hosted during the TP Carousel. During this 30 minute session, I asked my peers to draw visualizations of complex social situations. This is a fairly difficult task, but I reminded them to draw whatever came up while thinking about this prompt without checking if it would actually fit the prompt logically. I combined this drawing with my zine-making style as well as an adaptation of 6-3-5 brainwriting, where we switched zine every 3 minutes and could either continue with somebody else's work or start on a new page.I took one concept as the result of the creative exploration that was in line with my development goals, Medium Demo Day feedback, and my interpretation of TP approaches at that point. From there, I started making this concept more and more concrete in order to continue with this.

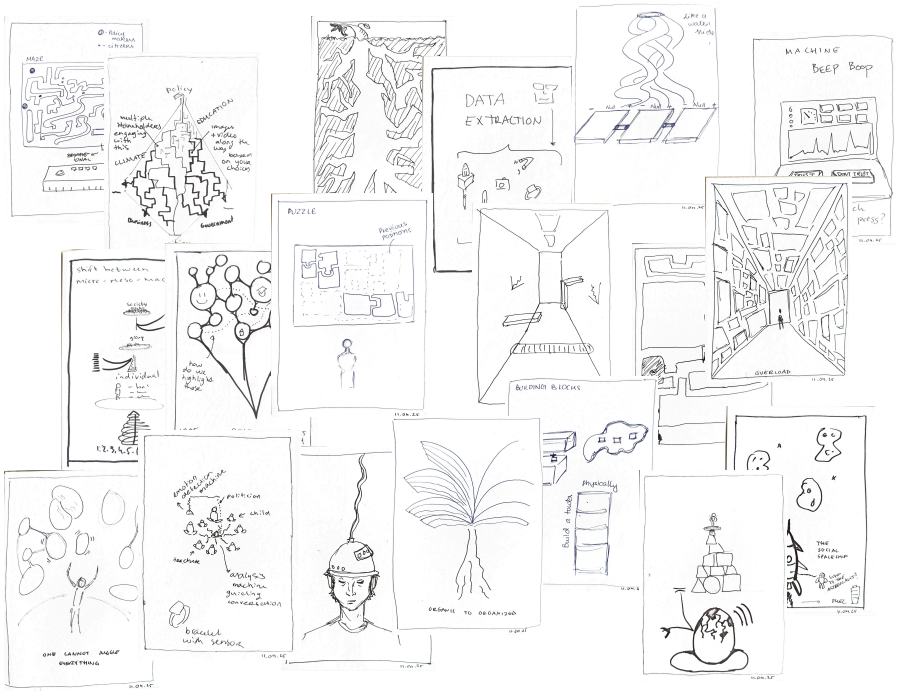


Figure 16: Carrousel outcomes

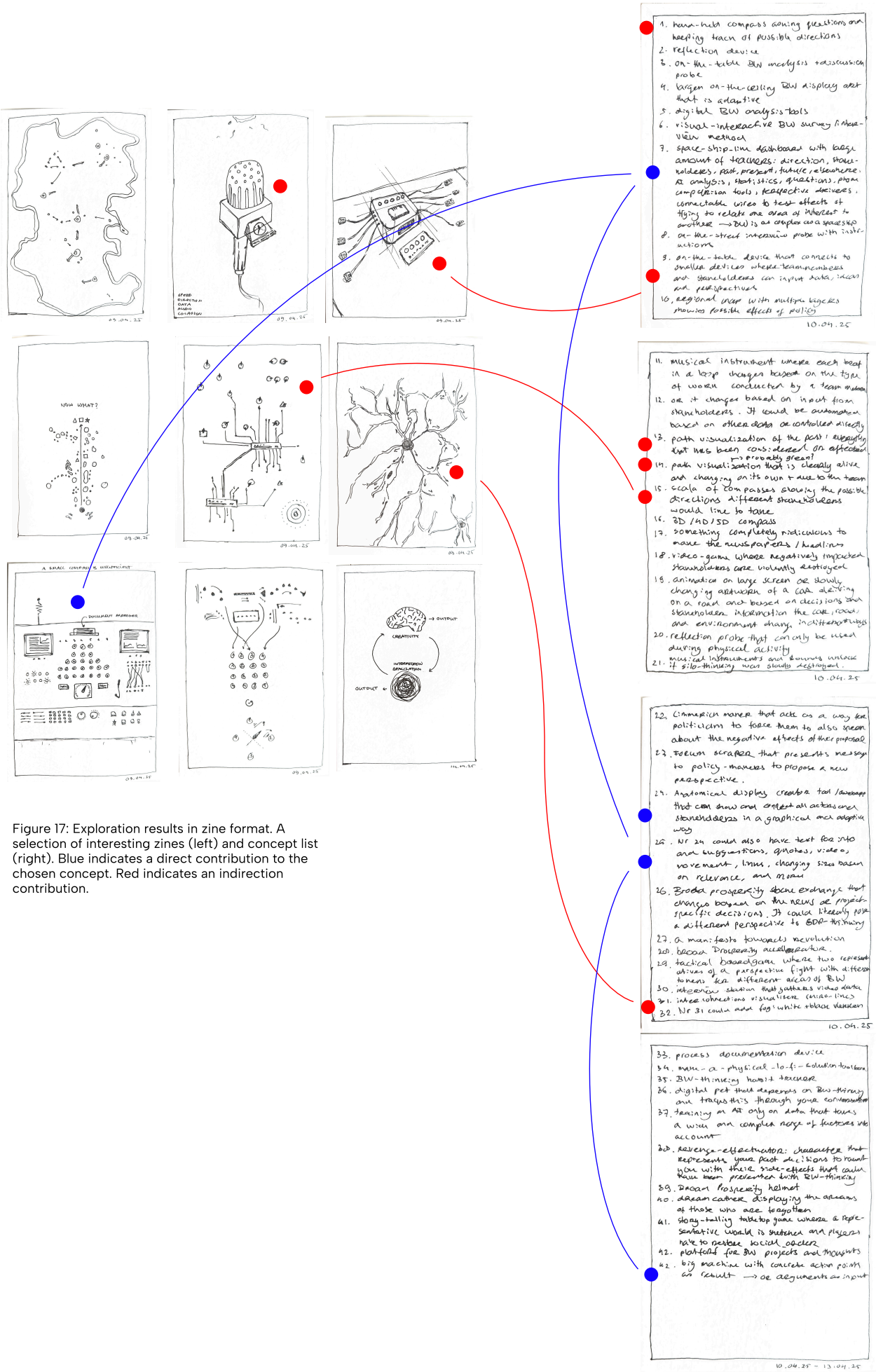


Figure 17: Exploration results in zine format. A selection of interesting zines (left) and concept list (right). Blue indicates a direct contribution to the chosen concept. Red indicates an indirection contribution.

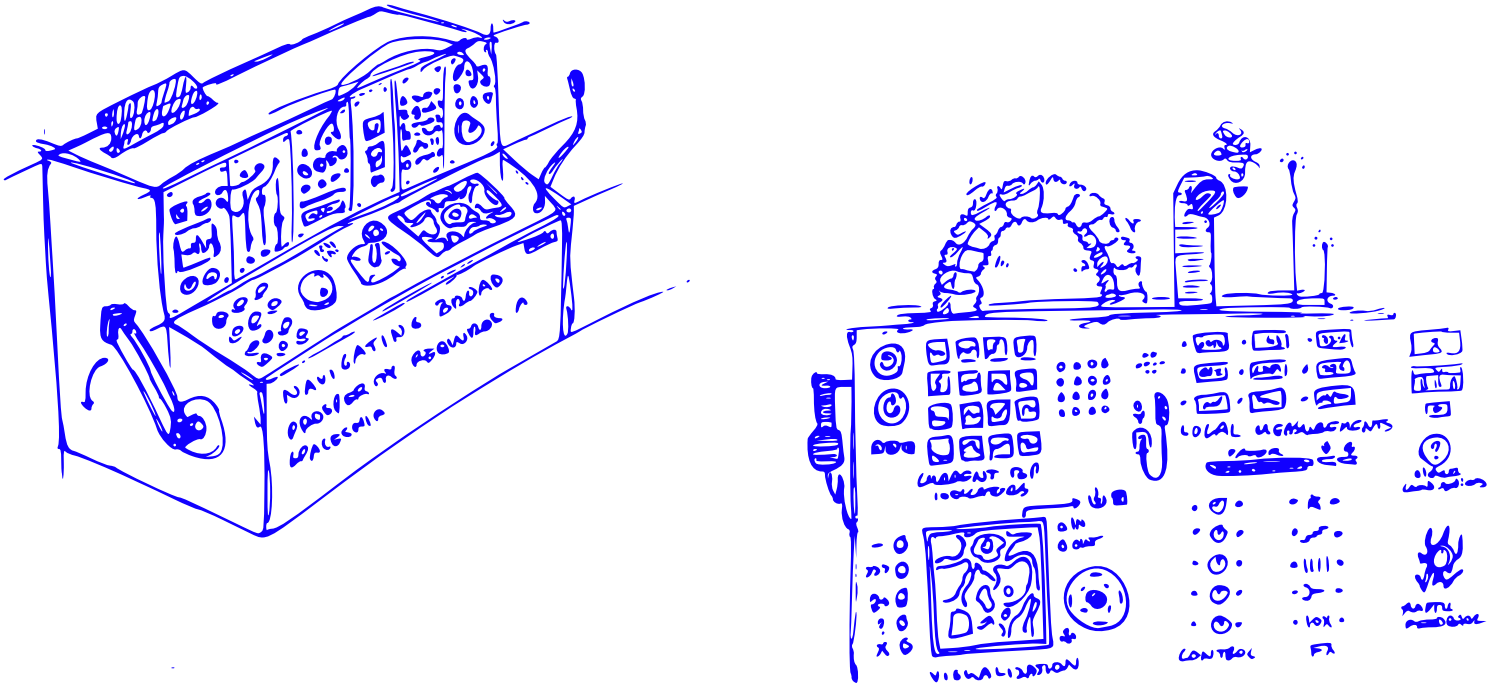


Figure 18: Drawing of design concept

From idea to design

The concept that followed from the creative exploration was based on the combination of a number of ideas. It was based on the metaphor of a space-ship. “You would need a space-ship’s cockpit to navigate Broad Prosperity. A compass would never be enough.” This refers to the policy compass (“beleidskompas”) that is a guideline to designing policy amongst Dutch officials (Kenniscentrum voor beleid en regelgeving, 2024). The concept should have a lot of dials, switches, and buttons, would be designed to support users in their Broad Prosperity-related discussion, with focus on actionable plans; visualization of the social situation; choosing goals, perspectives, and stakeholders; and offering inspiration with statistics, local data, Broad Prosperity indicators, AI support, video testimonials, and difficult questions. That is quite a lot for one product, and none of the functions were very clear. After all, I tried not to consider any restrictions during the creative exploration.

In order to make this concept more concrete to be able to discuss it and build upon it, I did three things:

- I looked at existing work that I thought could relate to this (e.g. Xchanging perspectives)
- I did some literature research to understand what I was trying to accomplish and which TP methods would make sense to use in this case. Understanding what I was doing would help me be more deliberate in my design action and reflection (give examples of what exactly I read)
- I worked out the idea further, did ideation within this concept, and worked out the interaction.

I especially read about Participatory Sensemaking as it seemed applicable to what I was trying to accomplish. I took inspiration from Jaasma’s (2018, pp. 123-136) [X]changing Perspectives which took shape in my design by placing more focus on designing for the crossing of stakes between multiple users. This is perfectly in line with Broad Prosperity and would suit the client needs, and it would also fit within my own concept. This helped

me define the actual use-case for the proposed concept, and supported me in designing a session around the product, moving towards a product-service system.

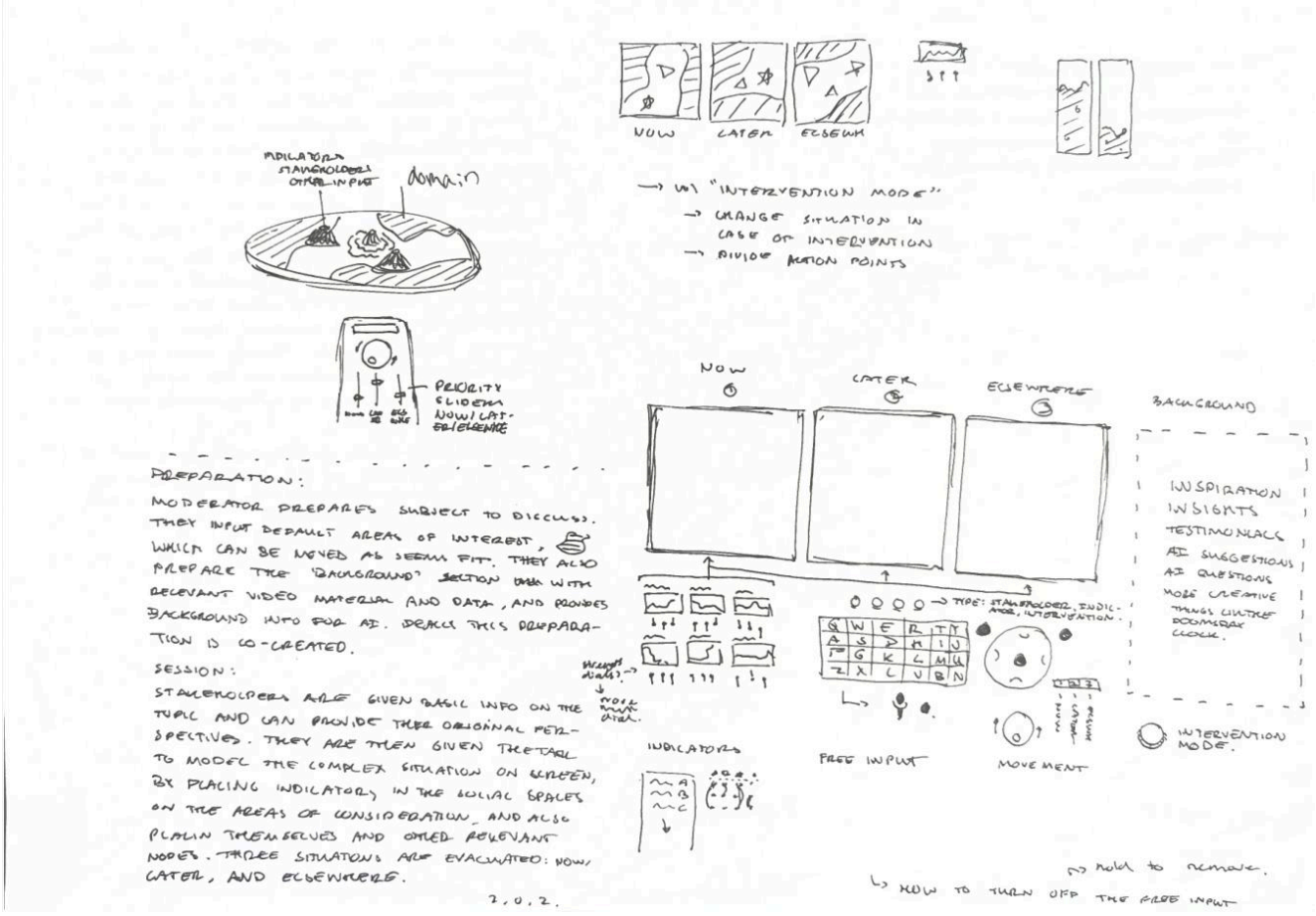


Figure 19: First description of session around product-service system

I slowly started to add actual purpose to features, and removed those that did not fit (e.g. using wires to make connections between various parts of the prototype which was originally inspired by modular synthesizers). By having a service built around the product, it was easier to make decisions on specific features. I ended this phase with a relatively clear idea for a product-service system that allowed for participatory sensemaking between stakeholders and that resembled a highly complicated space-ship-like machine with an enormous amount of features. Most of these features, however, I had not yet thought out in detail, and the interactions were purely based on assumptions. I included three visualizations (one for each of the present, the future, and situations elsewhere) in the design that I had not thought out yet. What I did have was a clear direction, a concept that I was excited about and that would be a good challenge, and one that was based on thorough creative exploration and one TP theory that sparked my interest. This concept was very well in line with my PI&V, as it allowed for the integration of technical realization and social goals. It also fit the client goals and my own goals in approaching the client (to surprise them).

Aesthetics of interaction

In order to design the interactions that would be central to the upcoming prototype, it was essential to test if the interactions I had in mind at that point made sense, and also to explore a wider range of possible interactions. To do that, I acquired a variety of sensors. I was then able to explore various working interactions, which I combined with an exploration of how these interactions would make sense in the visualization the sensors should allow control to. By placing paper with notes below my breadboards and attaching the joystick with capacitive touch sensors to a piece of plastic, I was able to prototype a controller for my test visualizations. The results of this phase were valuable both in terms of aesthetics of interaction and technicalities. The main insights include that the interaction for selecting things on screen and creating relations (or lines) between them was difficult to make intuitive without using a mouse-style cursor and clicking, that assigning meaning to specific locations on screen would be unpleasant and too complicated, or that allowing users to set relations between things on screen using physical wires (as is done in modular synthesis) was both highly tedious for the user and to write the back-end logic.

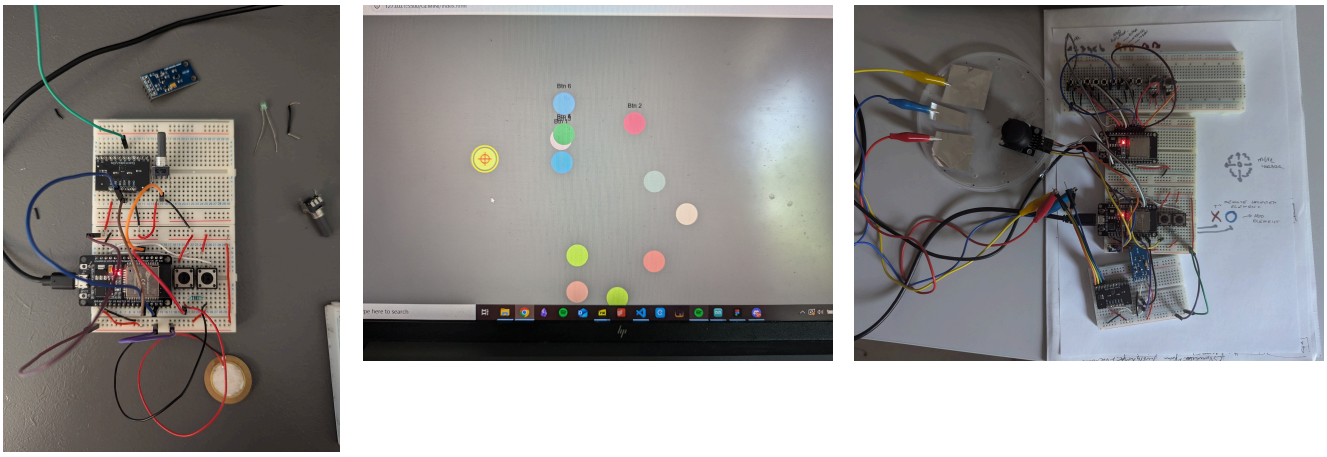
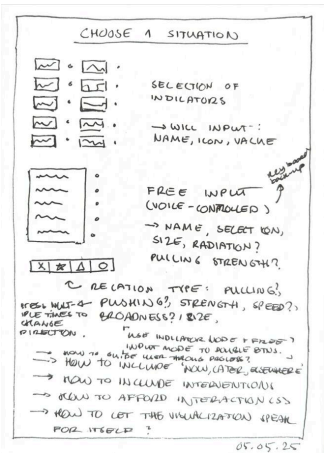


Figure 20: Technical exploration

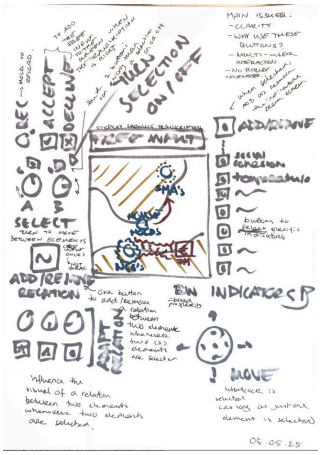
I took these insights as design knowledge into a new design activity that started when the technical exploration stopped leading to new insights and instead required lots of coding for just tiny details. At this point I had a clear idea of the goals that the final prototype should achieve; I had a clear design concept that was backed up by extensive creative exploration, discussions with the client, and literature review; and I had gained an understanding of the technical feasibility for different aspects of the concept. It was time to design the final demonstrator.

The goals for this design phase were to work out a detailed plan for the final design that would be ready for implementation. The design should support multi-person interaction, promote Broad Prosperity and make it experienceable, surprise the client while remaining within the boundaries of what they would be willing to present elsewhere, be a product that would realistically be used by the client, allow for the development of my technical competencies, and present a ‘complicated’ style as a metaphor for the complexity of Broad Prosperity. For the realistic use-case for the client, the design must be a tool that can support complex discussion around Broad Prosperity topics, in line with participatory sensemaking.

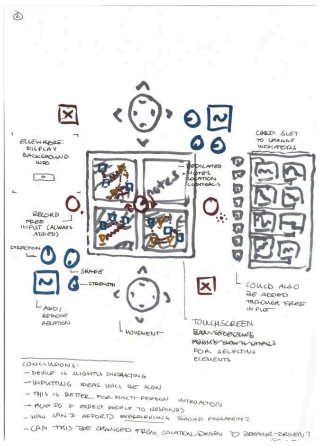
The approach I adopted for this involved making rapid iterations on paper, where I sketched out a design for a new prototype iteration in detail, with detailed descriptions of how each element would behave and reflective notes commenting on the design. This phase of iteration was inspired by the collection of zines I had built throughout the project and based on designerly intuition as well as design knowledge gained during the previous technical exploration. As I moved through the iterations, I reflected on how well the latest version achieved a multitude of goals, mostly focusing on the aesthetics of interaction.



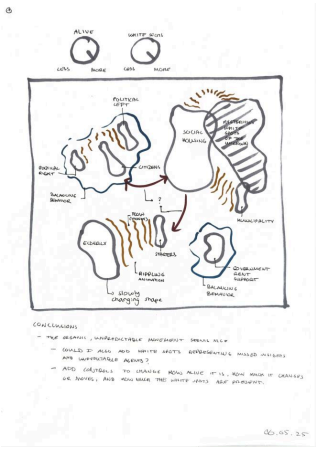
Initial feature list with unanswered questions. Visual centered around behavior of elements as well as relation types



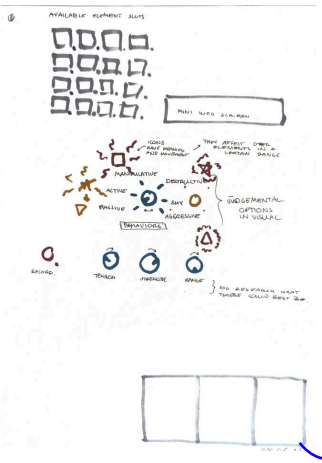
Physical buttons to add Broad Prosperity 'indicators'. Two knobs to cycle through elements. Using location (see orange areas) to show meaning



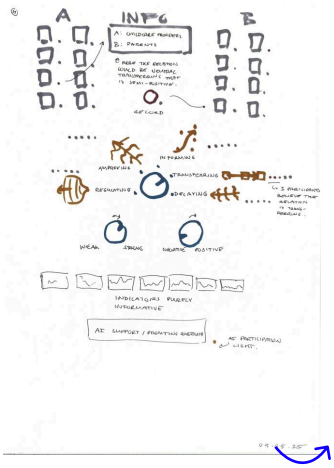
Card slots to keep indicators modular, duplicate features for multi-person interaction, inspirational video testimonials, separate visuals for present, future, and elsewhere which must be switched between with central knob



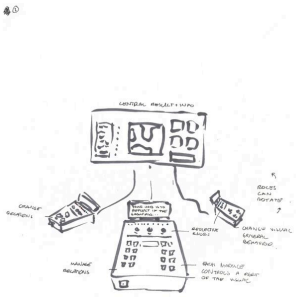
Experimenting with relation types, unpredictability, and element clustering. First versions of what became vitality and uncertainty



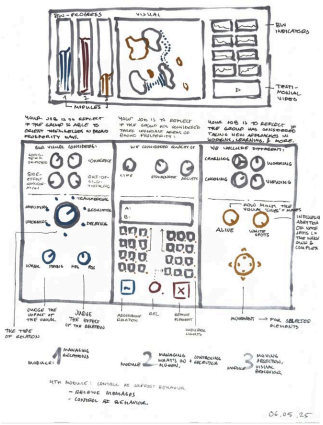
Dedicated buttons for each element. Press two to add relations. Press one to change element type, experimenting with element settings: tension, strength, and range



Two dedicated buttons for each element to support easy relation changing. First introduction of specific relation types. Still partly data driven. Integrated AI support



First time splitting up features across devices. Still data driven. Shows a list of all elements that are on the visual.



Integration of best ideas and directions. Added Broad Prosperity reflection knobs to each module. Style inspired by Teenage Engineering (n.d.). Still data driven

Figure 21: Rapid iterations

This stage is one of the most critical phases of the project, covering all five parts of the RTD process (Hummels & Frens, 2011). The phase involved C&A as it was centered around the aesthetics of interaction of the device and visualization; U&S as I was designing for usability in interaction, experienceability of Broad Prosperity, and multi-user interaction; B&E as I was combining the squad, client, and personal goals as described in the Background section; and T&R as I was constantly working out how each proposed interaction would work with knowledge from the previous design phase. Due to the integration of multiple competencies, rapid improvements to the design were possible.

The design plan for the final demonstrator was to create four self-standing PCBs in the style of Teenage Engineering's Pocket Operators, that would together control a visualization (Teenage Engineering, n.d.). This visualization would consist of 'elements' and 'relations' between these elements (see the Results section). The purpose and features for each PCB was worked out as presented in figure 22. It seemed that this style would present the metaphor well, would showcase a sense of being unfinished while remaining high-fidelity, and would invite physical touch and experimentation in the same way the Pocket Operators do. This design proposal was discussed with the client, who responded positively and shared some recent projects from their side. They also invited me to join the civilian briefing on this year's audit research, which led to the example case on medicine shortages that I used on Demo Day.

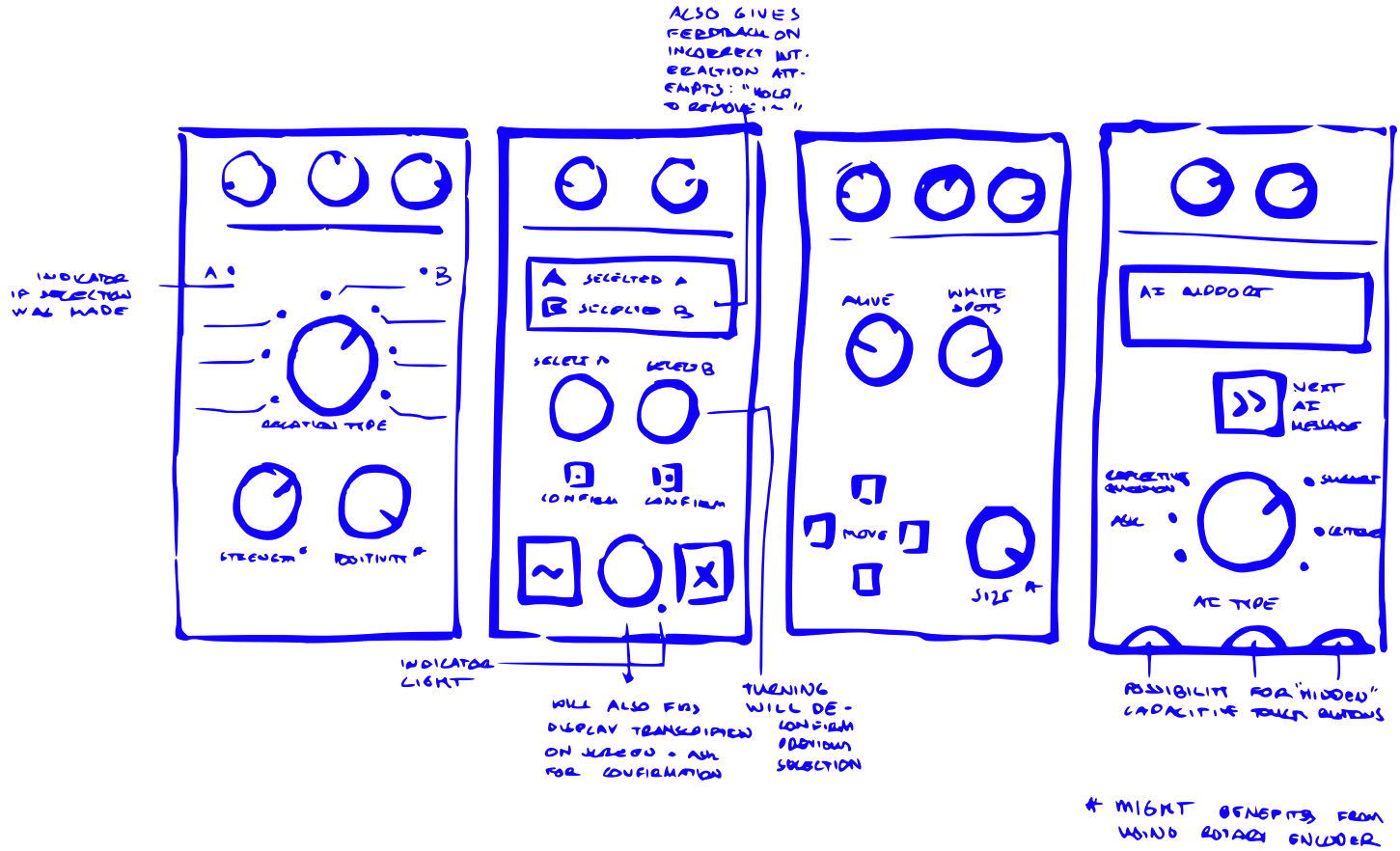


Figure 22: Worked-out design plan

Finalizing the design

Having reached a clear design proposal with worked-out interactions and a plan for the physical appearance of the prototype, it was time to make a range of final design decisions to be able to start making the PCBs. This involved knowing the exact location and behavior of all the buttons, knobs, and screens; but also all of the labels. The most difficult parts of this process involved choosing the exact relation types, and understanding the interaction for selecting elements. The latter could be solved with careful design planning and considering multiple options, the first would ideally be based on literature from systems thinking. I did not have the time to truly read deeply into systems thinking to be conclusive towards this. Therefore, I read bits and pieces, and allowed the design to be inspired by systems thinking literature, specifically Thinking in Systems by Donella Meadows (2008). I did not strive for complete understanding, and instead allowed myself to interpret the work in a way that seemed to spark creativity as well as understanding of the system. This meant that the relation types were also more open to interpretation by the users, which turned out well.

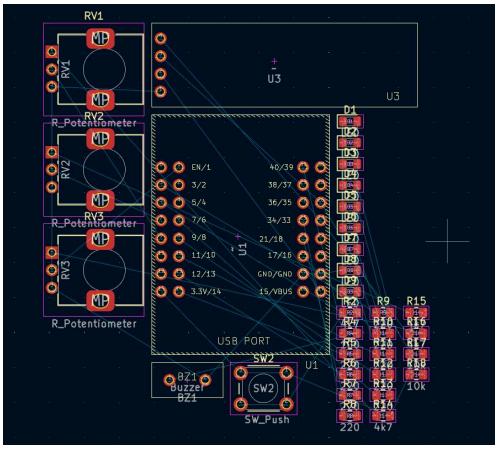


Figure 23: The 'rat's nest'. All parts before getting a location and internal connections

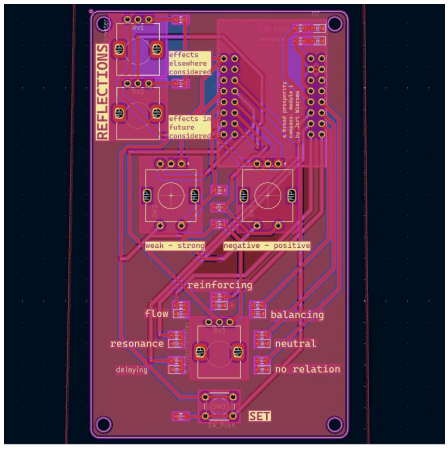


Figure 24: Design drawing with routing. Here, the routing was far from optimized

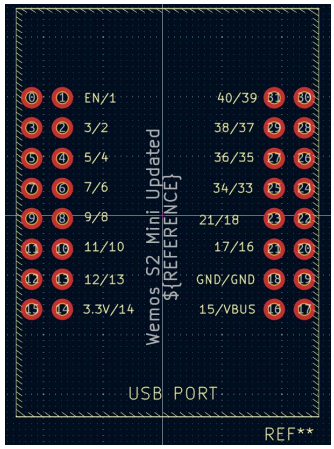


Figure 25: Designing custom footprints for my specific part

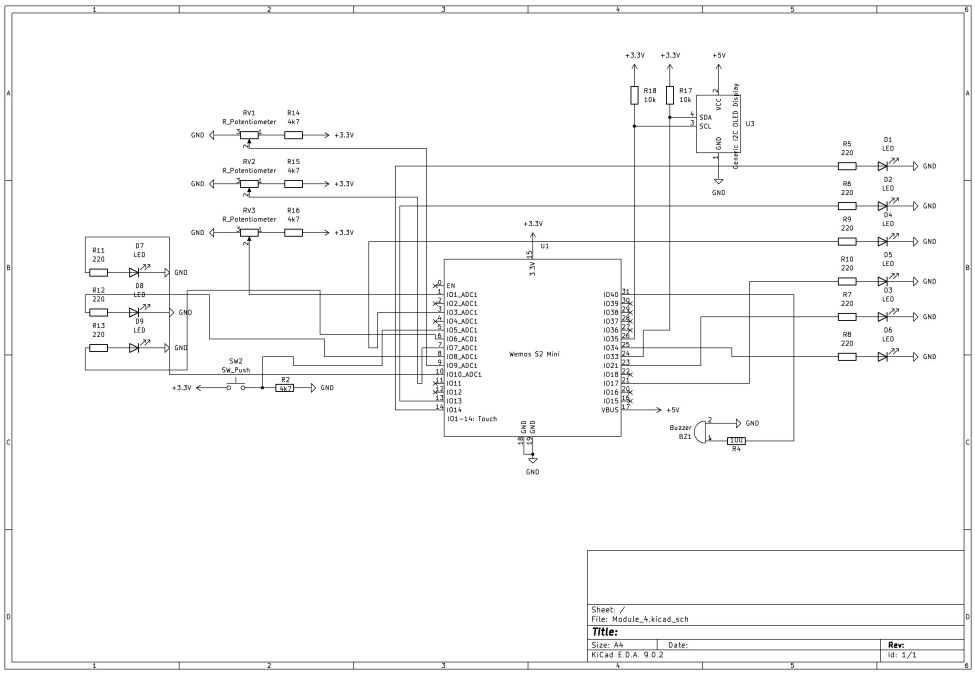


Figure 26: Schematic drawing for one of the PCB modules. This is the first step op PCB design.

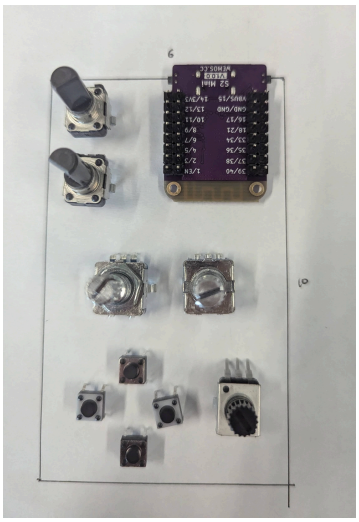


Figure 27: Planning the location of parts

Regardless of very careful preparation, the PCB design process did pose some surprises that shaped the final design. For example, on the chosen size, only two potentiometers realistically fit on the top of each module as more could lead to routing issues. Having made decisions on dealing with these surprises, the technical realization process of PCB design began, which involved schematic-making, track routing, placing via's, parts selection, footprint design, writing and placing labels, solving electronic or design errors, understanding KiCad, and preparing for manufacturing. When the PCBs arrived, this process was followed by soldering, testing, and coding the hardware functionalities.

During the production and delivery time of the PCB's, I conducted another creative-technical exploration (see next page) for the visualization, where I looked into the behavior and looks of elements, relations between elements, and the visual as a whole. I also explored multiple techniques to show organic behavior especially for the 'uncertainty' and 'vitality' options on the PCB's. I was forced to make some of the design decisions based on technical feasibility. For example, learning GLSL to reduce the load on the CPU that P5.js created was not possible within the timeframe and also did not fit my development goals. Decisions towards the looks of the final visualization were mostly based on how well they showed the meaning behind the different relation types, and how well they were able to present organic movement to show the visualized situation can be unpredictable and organic.

After testing and adding all parts to the PCB, it was time to integrate software and hardware. This involved making design decisions towards a large number of details (such as the exact behavior of the integrated AI support) and tweaking parameters. One part that remained left open until this moment was how the reflection knobs on each module would play a role in both the visualization and the session as a whole. It ended up being represented as a progress bar that shows the cumulative reflection of all eight knobs. At 80 percent progress (meaning the knobs were together at 80 percent of their maximum) the AI conclusion mode would unlock, prompting the users and organizer to start concluding on their discussion. This implementation was changed after the first user test.

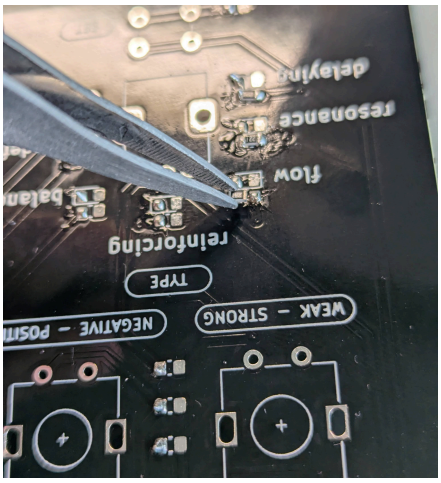


Figure 28: Soldering SMD components requires careful handling

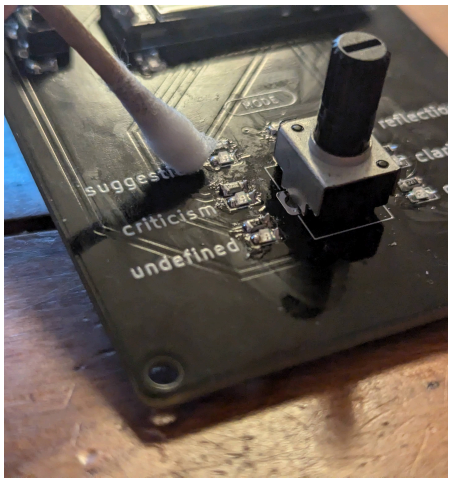


Figure 29: Cleaning with isopropyl alcohol

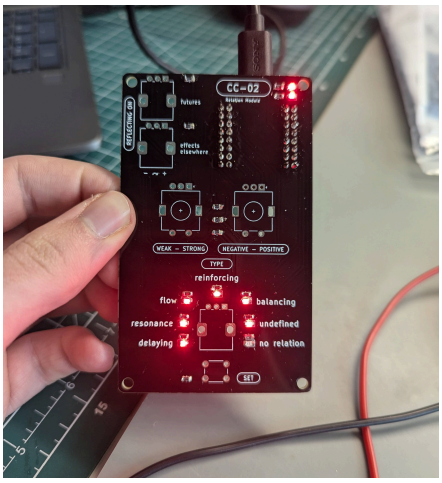


Figure 30: Slow progress: one LED disfunctional

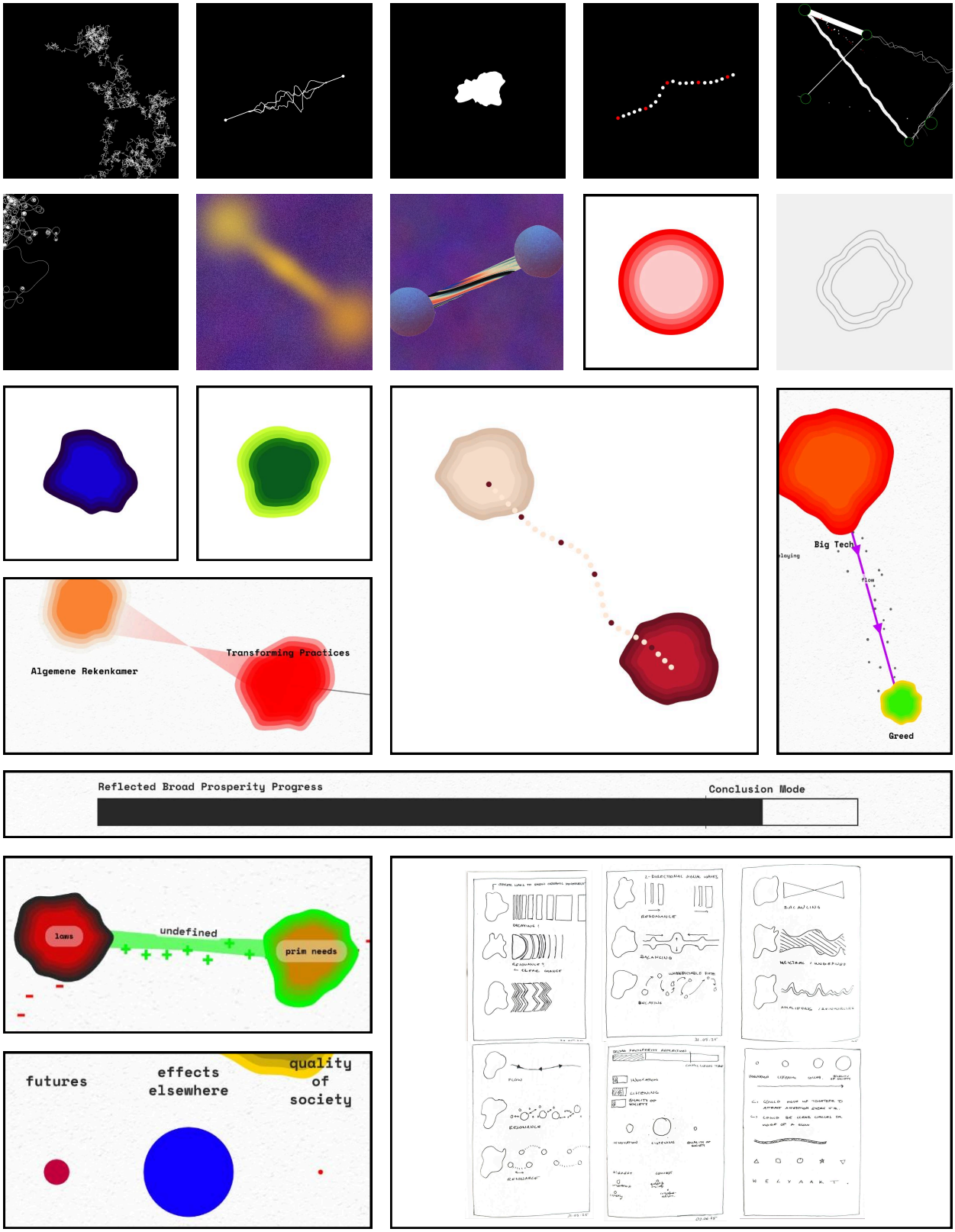


Figure 31: Highlights from the exploration for the visual. Specific attention was given to the different relation types, as they would preferably convey their meaning through their behavior.

Validation

The resulting prototype was tested in two separate user tests, with sufficient time between them to make minor changes to the design. The first group consisted of three people from my personal network with different backgrounds. The second group consisted of two students. In these user tests, I explained the devices and prepared three elements in the visualization that I believed were relevant to social media addiction, which would be discussed and visualized. During the session, I kept a close track of time and noted the behavior, human–computer interaction, and interaction between participants that I deemed relevant. After the session, I left a few minutes for participants to share their experience.

In both user tests, participants engaged in collaborative discussion on both the use of the design and the situation. Multiple participants reported that by slowly adding elements and relations to the screen, they automatically discussed various parts of the situation. Although for some features the use case was not immediately clear, all of them were eventually used and reported on positively. Regularly, participants disagreed on the content of the situation, which sometimes occurred as a result of discussion on how the situation should best be visualized. In the first test, participants did not feel incentive to use the reflection knobs, and only used them after their visualization was complete and seemingly only because I requested them to do this. This prompted me to add more communicative value to this feature, changing the progress bar to individual indicators for each reflection knob, with positive results during the second test where the participants continuously reflected on their discussion using the different reflection points. In both tests, participants clearly showed and actively reported feelings of joy due to the interaction with the device. It was also clear that participants were continuously taking a Broad Prosperity approach in their thinking, which was mostly passive behavior due to the designed stimuli rather than a deliberate action. The groups did seem to engage in participatory sensemaking as they gained understanding of the situation and each other's perspectives without needing to reach consensus on problem solutions, but having to make a decision on the looks of the visual did slightly decrease this effect. More research is needed to be conclusive towards this.

Detailed notes on each user test can be found in Appendix A.

Discussion

Experiencing Broad Prosperity
The final design supports groups to take a Broad Prosperity approach in their thinking, discussing, and collaboration. Together, the users discuss a complex situation, and make sense of this situation as well as each other's perspectives through limitations and tangible interaction. Broad Prosperity is intended exactly for such complex situations, as it sets the tone on how these issues can be approached: in a way that accepts that not all aspects of the problem can be understood, which is conveyed visually through the movement and unknown elements ("white spots") on screen; in a way where a range of perspectives are taken and effects elsewhere or in the future are considered; and with continuous reflection-in-action. By interaction with the Complexity Companion, users work directly with Broad Prosperity. Taking from Participatory Sensemaking, we can hope that this way of interacting also changes the individuals involved post-interaction, but this has not been proven. Whether the design result promotes the concept of Broad Prosperity in the sense that it will take a more important role in daily discussions depends on how an organizer uses the design, as they would have to dedicate specific attention to this promotion, using the design as an example of how different perspectives might be taken.

The research field
Although this report does not describe a design research project, there are possibilities for further research that can be highlighted. Mainly, there are opportunities to host empirical studies that focus more directly on the participatory sensemaking that is being provoked. In such sessions, the participants should be discussing a situation they are stakeholders to, and one the group holds different perspectives towards. With more extensive post-session interviews we can evaluate if participants report increased understanding of each other's perspectives, and if they co-created innovative solutions that neither compromise nor contradict, but instead pose benefits to both parties as follows from a possible new collaborative understanding of the complexity discussed.

Design process
The process could be classified as explorative, usually using zine-making as a medium or material. This proved to be very successful, as a body of work was built that shows the process from a different perspective and that was used throughout the process as reference material or inspiration. It could be argued that more physical means of exploration, such as paper prototyping to better test interaction, could have been a useful

addition to this way of working. From a more general perspective, repeatedly returning to the drawing table allowed for continuous re-evaluation of the design direction and concept. This did take away time that could have otherwise been spent on literature review around TP approaches or more dedicated user interviews before settling on a design concept, which in hind-sight seems fit as the main goals were the promotion and experienceability of Broad Prosperity as a concept rather than offering a solution to a problem. Still, a deeper understanding of concepts such as Participatory Sensemaking and Systemic Design could have been valuable to take a more academic approach. As mentioned in the Method section, the RTD Process was taken as a guide to direct the design process, which turned out well. Reflecting during and after each design activity supported good decision-making. Also, using alternative design activities (see Method) to understand the RTD Process was valuable in making the approach less abstract and applying it to the specific design phases.

Final design and features

The final design result was received positively in many ways, and the user tests showed the product-service system is successful in supporting discussion, enjoyable to use, and sufficiently clear in its tangible interactions. There were, however, a few features that would have benefited from either extended exploration or more careful testing before implementation. Firstly, while the vitality and uncertainty knobs did support reflection and openness to other perspectives, they were not used as an accurate representation of the uncertainty and vitality of the complex situations, as they were too chaotic and led participants to lose track of their sensemaking. The AI support was clearly useful but just slightly too unpredictable to play a key role in the interaction. In addition to these points, there were a number of interaction- and technical issues that would need to be improved on for a future iteration, such as little feedback or feedforward in element selection and unpleasant scrolling behavior in the OLED displays. Nonetheless, the design as a whole was enjoyable to use, supported Broad Prosperity thinking, and presented a clear metaphor for complexity in its aesthetic and behavior. In addition, the multi-person interaction worked out very well as it was clear that the design supports collaboration and discussion through tangible interaction.

Conclusion

Overall, the project achieved most of its goals. If used actively, the Complexity Companion could make small and local contributions to greater societal transformation by promoting the concept of Broad Prosperity. It also was a great learning experience for me as a designer, while being an opportunity to show my existing competencies. Finally, the collaboration with the Netherlands Court of Audit was a great success for both sides.

Acknowledgements

I would like to thank my coaches Daisy Yoo, Sam van der Horst, and Jeroen Peeters for their extensive support throughout the project. Their different perspectives and feedback allowed me to get a grip on the design process. I also express my regards to the Transforming Practices squad for being an amazing environment to work and learn in, and to Euwe de Wilde for answering all of my questions on PCB design. Finally, I want to thank Martin and Linda from the Netherlands Court of Audit for their enthusiasm in our collaboration.

AI statement

AI was not used to write any part of this report. For some lo-fi prototypes the AI model deepseek-r1-distill-llama-8b was used. This model was accessed and hosted locally at Eindhoven University of Technology through Data Foundry. To help with writing the software for the final demonstrator, to ask questions about technical problems, as well as to a small extent as inspiration during exploration the AI models gemini-2.5-pro-preview-03-05 and gemini-2.5-pro-preview-05-06 were used. For the integrated AI support in the final demonstrator, two AI models are available. Firstly, the local deepseek-r1-distill-llama-8b, and secondly gemini-2.5-flash-preview-05-20 in case better performance is needed and no sensitive matters are discussed.

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Appendix

Appendix A	Detailed notes on user tests
Appendix B	Manual
Appendix C	Exported result example
Appendix D	AI Prompt used in prototype
Appendix E	Link to Github page
Appendix F	Feedback analysis medium Demo Day
Appendix G	ERB Form
Appendix H	Confirmation email ERB
Appendix I	Consent form

Appendix A: Detailed notes on user test

User test 1

About the participants

- Age difference between oldest and youngest should be at least 20 years
- Different backgrounds
- Did know each other, so collaboration can be expected to be fairly smooth

Structure:

- Explanation took about 12 minutes, which was a bit too long. It can be structured better to take less time, reminder cards may be advantageous. The explanation was mostly clear though, except for the relations and some details (adding strength to relations)
- Three elements were already present in the visualization beforehand: Big Tech, Addiction, and Social Media.
- Device interaction took about 45 minutes

Observations

- One participant requested to use pen and paper to make notes, but did not end up making many
- The group started adding elements, then moved on the relations and added some elements when they realized they missed some elements, then finished up reflecting.
  - To support more regular reflecting, the reflection knobs should be more rewarding to use, and they should be better distinguished between each other, and they should be a way to communicate the reflections with other participants on screen which might spark further discussion
- Relations were not immediately clear but after some discussion they were, although they were interpreted by the users without focusing on their “correct” meanings
  - Adding reminder explanations might be advantageous
- Great collaboration between participants. Listening to each other both in terms of content and in terms of controlling the devices and visual
- When participants did not entirely understand the device they helped each other and always figured it out
- They really discussed the situation in depth and really seemed to benefit from interacting with the tangible device and seeing they agreed upon the visual situation. This showed both from their actions and their words. The device really worked well as a discussion probe and provided things to discuss for the users, which would not have been the case if I just asked them to discuss a topic
- Each change was discussed well and in-depth, which is not a problem but a bit less discussion would also be fine to speed up the process
  - Can anything be done about this?
- Slowly started using more and more of the possible interactions / functions
- Sometimes asked me if certain things were possible to do (add importance to relations), it was always possible, except adding multiple relations between two of the same elements
- When I asked after 15 minutes if they would like to do a little reflection with the reflection knobs, they first wanted to finish their whole visual
- Started adding relations after 20 minutes
- It was very clear that adding the relations led to real discussion
- export a result to be used later or just to enjoy the created visual

- One of the participants seemed to be less involved in the discussion which reportedly was due to being tired. Other participants asked for their opinion to incorporate them too
- Strength and positivity knobs were only used later on, when details became more important
  - I think this is fine, not all functions need to be used
- While the different relation types were a bit daunting, they were all used eventually and I heard no comments about them being unclear or too difficult to understand
- It was clear that there were real differences in perspective and opinion when adding the relations, and the act of adding the relations truly sparked discussion on content, but also on the visual. E.g. current Dutch politics were mentioned, different interpretation of recent news, and own opinions, such as “if I stop using social media it won’t matter [to society / the big tech companies]”
- It seemed that the participants were also actively thinking in solutions, but not due to the reflective knobs
- Participants took a democratic approach when they disagreed on the visual
- It was clear they were proud of the visual they created
- When the visual was done, they reflected with the knobs, and they were very critical, but did not decide to make any more changes (also because I told them the time was up)
  - It might be advantageous to reduce the “conclusion” threshold, or rework this entirely. After all, this test made clear that changes are required to the reflection section
- Uncertainty and vitality knobs were not used
  - Not a big issue, this would be ideal when the group gets stuck, but it is a bit sad because it is a big part of the unexpected nature of complex situations
- One participant wanted to continue using the device after the session to experiment with adapting the visualization in more creative ways.
- Participants did not seem to care that they missed some functions of the device

Things mentioned by participants:
- By discussing elements and relations they started discussion naturally
- It would be pleasant to see in the visual also which elements (primary and secondary) are selected
- Dutch comment: “Hele goede gespreksstoel” (English: Very good discussion supporter)
- “cool device”
- They mentioned a diverse group would be advantageous: this group had one social type, one very technical type, and one mixed type, which seemed ideal to them
- When they asked me for an explanation of the resonance relation, one participant enthusiastically realized that was exactly what they were looking for, and explained this in detail to the others, upon which one agreed and one did not.
- One participant mentioned they wanted to use this in the next team “intervention” session in their organization
- They did not understand the positive / negative visual
- The tool directly promoted starting the discussion. It also supported allowing all opinions to get their say.
- One participant suggested adding gamification elements for the reflection. E.g. setting goals with rewards.
- One participant expected that the AI mode would be best when the group gets stuck

Technical issues:
- No light when typing

- Crash: positivity knob crashing if one element is selected twice
- The delaying relation LED did not work
- It was slightly difficult to see where the potmeter points
- It is possible to have a gradient between two of the same colors, which looks out of place
- Sometimes there is no visual when the resonance or delaying animation resets
    - Speed this up

Ideas that I came up with while I observing the interaction
- It would be great, both for participants and for me, to be able to export a summary, video, or other result
- Would be pleasant if elements added accidentally with no name would get “unnamed 1” so they can be differentiated between

Changes planned due to insights from this test:
- Fix the technical issues
- Rework the reflection knobs implementation in the visual
- Rework positivity visual
- Provide e.g. cards to support explanation of the prototype
- Have a way to

User test 2
About the participants:
- Two students of about the same age
- They had little specific topic knowledge, but likely more than the average citizen

Structure:
- Explanation this time took only 5 minutes, I had more experience
- Did not bring manual, which could have been advantageous for participants as reference

Observations:
- There was a slight initial misunderstanding because one of the relation at first seemed to have a direction, and one they did not want
- One participant accidentally removed an element
- After just a few minutes they started experimenting with vitality and other features
- Participants looked for meaning behind changed that occurred due to their unpredictability settings – which is intended
- Just a little bit later they did their first reflection using the Broad Prosperity reflection knobs, which they seemingly used to change their discussion a bit
- Discussed changes in unpredictability and actively used unpredictability for inspiration
- They quickly used all features available. Some features were used more, such as adding elements and relations, which can be expected. This is still good to realize as the participants ‘in charge’ of these modules have more to do, and possibly even more power over the discussion → that would need further research
- Also relation positivity and strength was changed a lot
- Second reflection moment occurred after about 10 minutes. The participants took responsibility for the reflection points and agreed to try to increase ‘innovation’ for now
- The participants very regularly gave each other instructions to best control the device
- Added more elements and relations compared to user test 1

- Especially relation types led to discussion on the options with special attention to the content / situation that was being discussed
- It seemed that participants wanted to use ‘their’ modules, which led them to use all available functions
- The closer to the end of the session, the more the supportive AI was used.
- It occurred that the AI gave a prompt to reflect on a specific part of the situation, which led to changes, which led to a moment of reflection using the reflection knobs
- Both participants held the modules with two hands while using them
- The participants finalized their discussion by using conclusion mode

Things mentioned by participants:

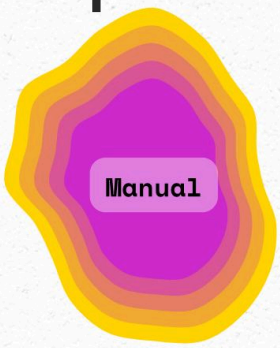
- When discussing increasing unpredictability they used the phrase (translated to English) “Let’s see what he thinks”, referring to the device/computer
- The AI seemed to be inspirational for the participants. After getting a message, they thought together about what it could mean, and then acted upon it. Once a participant reacted with “oooh!” when they suddenly got an idea due to the AI message
- The teleprompting was reported to be unpleasant on the little OLED screens
- They reported the tool to be “way to fun for such a serious topic” (translated)
- They reported a clear learning curve, but they did think this was manageable
- Personal interpretation of the relation types was reported to be fine – they did not need official meanings
- They reported that they missed being able to add directions to relations
- The chaotic movement of vitality was reported to be annoying
- One participant reported that by working physically with limited functions, they were prompted to think changes through better

Technical issues:

- Typing text seems to be influenced by element size, which should not be the case
- Would be ideal if one could directly name the added white spots
- There is white label even if elements (such as white spots) do not have names
- The teleprompting was reported to be unpleasant on the little OLED screens
- The direction the potentiometers were pointing towards was often unclear
- The effects of the strength knob were too subtle

Appendix B: Manual

Complexity Companion



Discussing complex topics with Broad Prosperity

By Jort Wiersma

Introduction

The Complexity Companion might seem complicated at first glance. That is intentional. Talking about complex topics is not easy. It requires time, self-reflection, and the right people to truly highlight different perspectives. The Complexity Companion offers support in this regard: it provides tools and principles for self-reflection, helps to externalize your shared or argued-upon views, and encourages collaboration and discussion. It will never provide answers, but rather support you in reaching conclusions yourself.

Use the Complexity Companion within your organization to discuss a significant investment, during a debate within your political faction, or in conversations with the users of your product. Thanks to its modular design, the Complexity Companion is suitable for 1 to 8 people and fosters collaboration and consultation among users. The tangible interface is used to influence a digital visualization that depicts a complex situation. Add elements relevant to your situation, and establish connections between these elements. But note this: you will never have complete control, as you can never fully grasp a complex situation!

Preparation

As the organizer of the upcoming complex discussion, you are responsible for the smooth running of the session. This includes preparing the digital visualization, explaining the physical interface to others, and introducing the discussion. It is also up to you to share the results with others after the session, should you wish to do so.

The Complexity Companion can also be used without preparing the visualization, but it can be advantageous to add default elements to help participants get going and to provide the AI system with background knowledge so it can serve you better. To do this, simply adjust the text in the USER.js file: you add the names of your desired default elements to the list you find there, or you change the background information text. Of course, you can also manually add starting elements using the physical interface.

The Session

During the session, you will jointly discuss and visually represent a situation of your choice using the physical interface. In this guide, we use a discussion about social media addiction as an example. Other possibilities include: a discussion on how your company can retain employees longer, a conversation about a relevant political topic, or your annual team reflection.
You will add elements relevant to your conversation to the visualization, such as in our example: social media, big tech, addiction, power, peer pressure, or responsibility. You will then establish connections between these elements. Perhaps you believe that many people experience peer pressure to use social media, and that this reinforces the situation. You can then choose to create a 'reinforcing' connection between these two elements. This will then be visually represented on the screen. You might also find this connection to be negative and highly relevant. Less relevant, for instance, than the connection between peer pressure and responsibility. Therefore, you make this connection more negative and stronger, which is also visually represented. You can move elements and their connections, and you can also make elements larger or smaller, for example, if you believe an element is more or less important to the situation.

Furthermore, you can also influence the visualization as a whole. Perhaps you think you haven't fully grasped the situation, and you turn up the dial for 'uncertainty'. Or perhaps you think the situation can change quickly. In that case, you turn up the 'vitality' dial. You can play and experiment with all these values during the session. Of course, you might be uncertain about your interpretation, but dislike how the corresponding dial changes the situation. In that case, you can simply leave it alone. The final module controls the AI system, which can help you if you don't know how to proceed or to find missed insights for further discussion.

Each module also has two self-reflection dials based on concepts from 'Broad Prosperity' thinking. You use these repeatedly during the session to guide your conversation and to assess yourself. For example, at the beginning of the session, you likely haven't extensively discussed how the situation influences the quality of society, but after a while if you feel you've covered this in your conversation, you can turn the dial further to the right. This provides guidance: if you realize that you haven't thought about solutions at all (the 'innovation' dial), you can bring that up in the conversation. Each reflection point is also communicated in the visual to others, so they can easily note any missed perspectives they might want to take up.

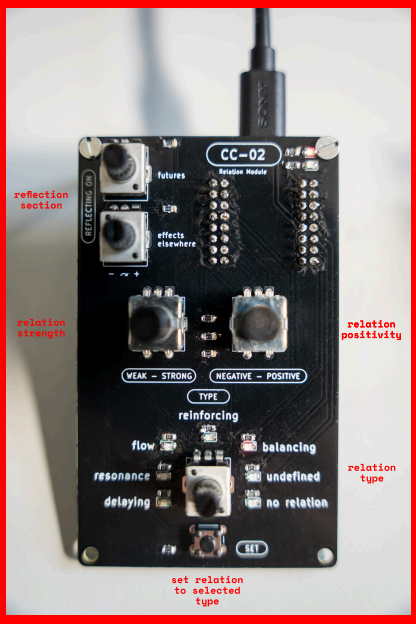
Once the users feel they have discussed the situation sufficiently, the organizer can prompt the group to share some concluding statements or to note any innovations or changes that the group would like to propose. If needed, the conclusion mode on the AI module might be helpful in gathering such insights. The organizer that exits the visualization and exports a short report to be shared with the group. The report shows the final visual and a short summary of the session.

Control Module

The Control Module is responsible for adding and removing elements to the visualization. Add elements that you together agree are relevant to the discussion and the situation. This module also determines which elements are selected, so the relation module can change the relation between these elements, or the visualization module can move or change the size of the elements. Note that there is always a primary selection and a secondary selection. The primary selection is highlighted on screen. This is the element that can be moved with the visualization module. The secondary element is the one that the relation module draws a relation to from the primary selection.

Within Broad Prosperity, it is valuable to consider perspectives that are broader than those that follow from your own background and ideas. Therefore, you might want to use the reflection knob on interdisciplinary thinking to communicate with others how this perspective-taking is going in the discussion. They can use those insights to change their part in the discussion.

A reminder of the functions of the module is on the back of the device.



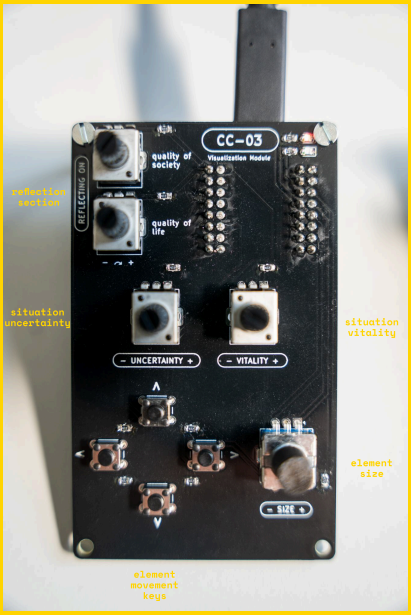
Relation Module

The Relation Module changes the relation type between the two elements selected by the Control Module. It can also set the strength of the relation based on how relevant the relation is to the situation or the discussion, and it can set the positivity of the relation that the users agree on. The different relation types can be interpreted in different ways, but the following is one interpretation:

- Delaying: the elements slow down each other or the situation
- Resonance: the elements indirectly change the behavior of each other
- Flow: there is a transfer of information, money, or physical material between elements
- Reinforcing: the elements strengthen the current state of the situation or each other
- Balancing: the elements change the situation or each other to a state that is different from the previous state
- Undefined: there is a relation but it cannot be explained with other relation types or the users choose to not assign types

Within Broad Prosperity, it is important to consider future effects or effects that might occur elsewhere due to decisions made here or now. Therefore, this module allows the users to communicate to each other how well they considered these effects in their discussion of the situation.

A reminder of the functions of the module is on the back of the device.



Visualization Module

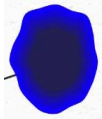
The Visualization module adapts the looks and behavior of the visual as a whole. The uncertainty knob is used to depict how certain the users are that their discussed situation is complete. On screen this affects unnamed elements being added that represent missed insights. The vitality knob is used to show how much the users believe the situation might change in the near future. This is represented as an organic movement of the elements. Feel free to experiment with these knobs, as they can lead to insights but can also be distracting.
With the arrow keys and the size knob, it is possible to change the location and size of an element selected by the Control Module. You might collaboratively choose to do this if this better represents your idea of the discussed situation.

A reminder of the functions of the module is on the back of the device.

AI Module

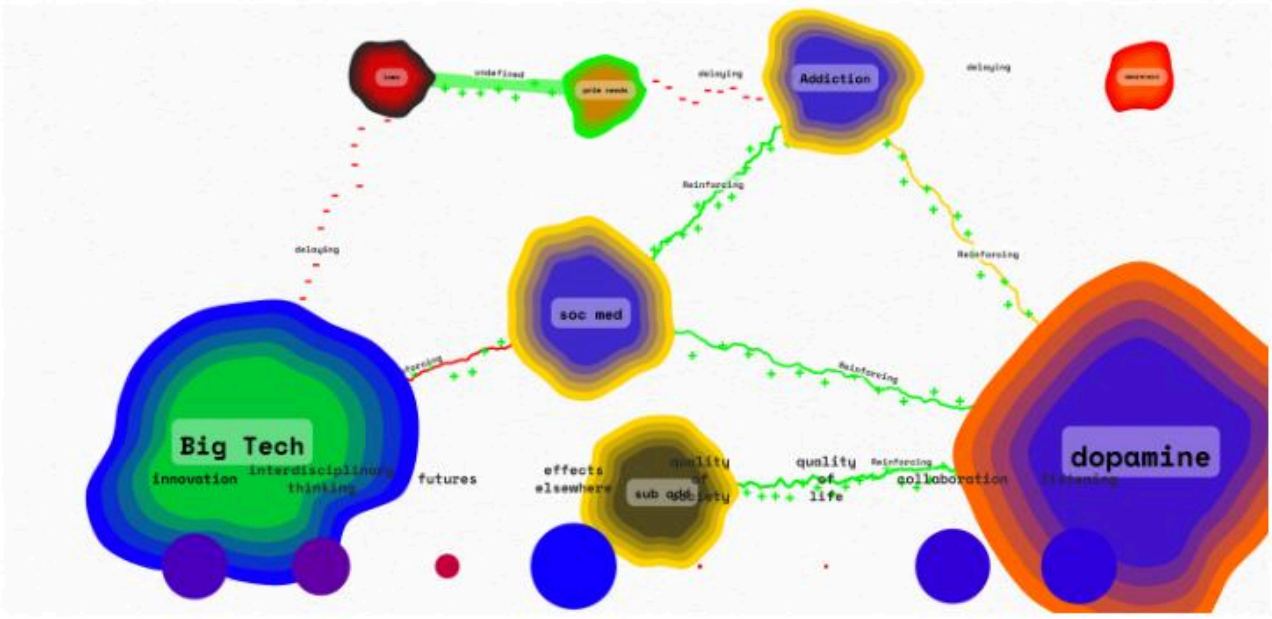
The AI module is in charge of asking for and interpreting AI messages. To ask for a new message, press the next button. You can interpret this message in any way you like, and you can choose to communicate the message with other users if that feels beneficial, but you can also choose to think about the message first, and then communicate insights with the team. Different AI modes are available, and it is recommended to experiment with their differences.

A reminder of the functions of the module is on the back of the device.



Transforming Practices

Appendix C: Exported result example



Comlexity Companion Session Report

Short summary::

During this session, you collaboratively visualized the complex topic of Social Media Addiction, viewed through the lens of Broad Prosperity.

You identified key elements including Addiction, Big Tech, soc med, dopamine, prim needs, laws, awareness, and sub add. You then explored the relationships between these elements. You noted amplifying relations between Addiction and soc med, Big Tech and soc med, Addiction and dopamine, soc med and dopamine, and dopamine and sub add. You also identified delaying relations concerning Addiction and prim needs, Big Tech and laws, and Addiction and awareness. One relation, between prim needs and laws, remained undefined.

Your reflections on the discussion indicated high scores for effects elsewhere / side-effects (1.0), collaboration (0.9), and listening to each other (0.9). You also rated innovation at 0.8 and interdisciplinary thinking at 0.7. Scores for futures (0.2), quality of society (0.0), and quality of life (0.0) were lower.

Appendix D: AI prompt used in prototype

The following function was used to generate a prompt, each time an AI request was made.

```
function getAiInput() {
  let aiInputList = returnAiInputList();
  return `
  PROMPT: ${aiInputList.prompt}
  ---
  SITUATION ANALYSIS: ${aiInputList.situationAnalysis}
  ---
  USER REFLECTION: ${aiInputList.usersReflection}
  ---
  TOPIC INFORMATION: ${aiInputList.topicInformation}
  ---
  BEHAVIOR: ${aiMode}
  `;
}
```

The function makes uses of this other function:

```
function returnAiInputList() {
  let includeRelations = "";
  for (let i = 0; i < relations.length; i++) {
    if (relations[i].type != "null") {
      includeRelations += `There was a ${relations[i].type} relation between
${relations[i].e1.name} and ${relations[i].e2.name}. `;
    }
  }

  return {
    prompt: `
     GIVE A VERY SHORT SUPPORTIVE STATEMENT. MAX 1 SHORT SENTENCE!!!! THIS IS
EXTREMELY IMPORTANT. DO NOT INTRODUCE THE TOPIC OR GIVE COMPLIMENTS.
     CONSIDER YOUR READER TO BE INTELLIGENT AND KNOWLEDGEABLE. IT IS A BIG
PROBLEM IF YOUR RESPONSE IS TOO LONG. DO NOT USE LISTS, NO INTRODUCTION.
NO ACKNOWLEDGEMENTS.
     You help the readers to collaborate and discuss a complex topic. Change your
reaction according to the specified behavior.
     Take into account your own behavior, the topic information, the reflections provided
by the users, and the situation analysis provided by the user.
     Help the users by provided missed opportunities or insights, by asking smart
questions,
     by asking them to reflect on certain ideas, or by helping them conclude on their
thoughts.
     In this discussion the users are visualizing how they think the elements in the situation
relate to each other, you can help them.
     YOU DO NOT GIVE ANSWERS, YOU ARE ONLY HERE TO SUPPORT.
     IGNORE THAT THE REFLECTIONS ARE GIVEN VERY SPECIFICALLY, AND USE THIS
INFORMATION AS A SUGGESTION.
     IGNORE ALL TEXT THAT IS NOT ENGLISH OR DUTCH!!!!!!
```

EACH RESPONSE MUST BE SPECIFIC TO THE INFORMATION YOU HAVE ABOUT THE TOPIC, ANALYSIS, and USER REFLECTIONS. SIMPLE AND GENERAL COMMENTS ARE NOT ALLOWED.

Example responses:
- Reflect on how you could think outside your own disciplines.
- Would it be a good idea to add "Education" as an element?
- Do you fully understand the mechanisms of the relation between "Housing" and "Elderly"?
- Reflect on how you could innovate more together
`,
situationAnalysis: `
Important elements though of by the users: ${getElements()}.
${includeRelations}
The users rate the uncertainty of their situation on a scale of 0 - 1 a: ${
sensorData.knob_uncertainty
}.
The users rate the vitality of their situation on a scale of 0 - 1 a: ${
sensorData.knob_vitality
}
`,
situationAnalysisWithoutUncertaintyAndVitality: `
Important elements though of by the users: ${getElements()}.
${includeRelations}
`,
usersReflection: `
The users rated their discussion and situational analysis on the following scales from 0 - 1:
innovation: ${sensorData.reflecting_innovation},
interdisciplinary thinking: ${sensorData.reflecting_interdisciplinary_thinking},
futures: ${sensorData.reflecting_futures},
effects elsewhere / side-effects: ${sensorData.reflecting_effects_elsewhere},
quality of society: ${sensorData.reflecting_quality_of_society},
quality of life: ${sensorData.reflecting_quality_of_life},
collaboration: ${sensorData.reflecting_collaboration},
listening to each other: ${sensorData.reflecting_listening},
`,
topicInformation: `
Information that is relevant about broad prosperity:
Broad Prosperity is used as a framework for reflecting on the situation. It includes everything that people value in life.
Promote thinking in terms of broad prosperity, meaning thinking differently, regular reflection, learning, innovating, considering all perspectives,
and especially considering effects elsewhere and effects in the future.

Topic information: ${backgroundInformation}
`,
behavior: `
${aiMode}. Really take this mode seriously and completely adapt your behavior to this behavior mode. THIS IS REALLY IMPORTANT!!
An explanation of the different behavior modes:
undefined: say anything relevant.
criticism: give criticism to the work created by the users or note their reflections that

```
 could improve.
      suggestion: give a specific suggestion for a specific change or addition.
      reflection: ask the users a question that helps them reflect on their own behavior, not
on the situation.
      clarification: ask for clarification on something in the situational analysis
      conclusions: ask a question that helps the users conclude on their analysis.
    `,
  };
}
```

As you can see, the function retrieves data from the sensorData object, that contains data about all user input. Therefore, it is aware of how the users have reflected. It is also given background information, the AI mode that was selected, the relations between elements, and elements in the visualization.

Appendix E: Link to Github page

The prototype was open-sourced and publically available here:

https://github.com/jortwi/BredeWelvaart-ComplexityCompagnion

As is often the case in open source project, the documentation could still use some improvements.

Appendix F: Feedback analysis from medium demo day

It seems to me that the project was successful in switching between different activities of the RTD process. It was difficult to test assumptions properly, but expert contact with the Netherlands Court of Audit has been a great tentative solution to this, and a pleasant experience for both parties in general. The medium final design has not been thought through perfectly well, but this can be expected. The literature review has been sufficiently deep relating to the topic of Broad Prosperity, but could benefit from further understanding towards Transforming Practices approaches. Some of the feedback that was received during Medium Demo Day was:

- The design could benefit from further promotion for reflection, argumentation, and action points for project members
- The chosen eleven areas could be considered static and thus somewhat limiting
- Stakeholders could be further involved
- The “policy compass” tentative project name could be taken further to develop a tool to navigate the abstract world of policy in a social way
- The chosen visualization is one of many possibilities. The selection of visualization requires more thought
- The current design could challenge the status quo in policymaking even further. It could even be much weirder to challenge the Netherlands Court of Audit to think further out of the box
- It was argued that a similar tool could be used by organizations and NGOs to convince the government to change certain policies by giving a complete picture of the effects of this policy
- The tool could remain digital and sent out to stakeholders as a way to ask for feedback on proposed policies

Appendix G: ERB form

TU/e EINDHOVEN UNIVERSITY OF TECHNOLOGY

Ethical Review Form

(Version 2.2)

This Ethical Review Form should be completed for every research study that involves human participants or personally identifiable personal data and should be submitted to ethics@tue.nl. For more information about how this process works please click here. Please check if you are using the correct form: Ethical Review Form (version 2.2). Please click here to obtain this latest version.

Part 1: General Study Information		
1	Project title / Study name	Experienced Broad Prosperity
2	Name of the researcher / student	Jort Wiersma
3	Email of the researcher / student	j.wiersma@student.tue.nl
4	Supervisor(s) name(s) *Additional explanation: Please write down the name of your direct supervisor. You can mention several supervisors if appropriate, but at least one supervisor should be mentioned.*	Daisy Yoo
5	Supervisor(s) email address(es) *Additional explanation: Please give the email address of the supervisor(s) mentioned in question 4.*	d.yoo@tue.nl
6	Department / Group *Additional explanation: Please specify group if relevant e.g. JADS or HTI*	Industrial Design
7	What is the purpose of this application?	☐ Scientific study ☒ Bachelor education. Course: DEP004 ☐ Master education. Course:…… ☐ Other (e.g. external, following external regulations):……
8	Research location *Additional explanation: Where will the data collection take place? On campus, in a company, in public space, online, etc.*	☒ Eindhoven University of Technology campus ☐ Other, name organization(s):…… ☒ Public space ☐ Online
9	Start date data collection *Additional explanation: Please state when your data collection will start. Please note that you do not have to provide information about your complete (PhD) project, but only on this particular sub-study that you are submitting for approval in this form.*	05/05/25
10	End date data collection	31/06/25
11	Does your project receive external funding (e.g., NWO, relevant for special regulations from funders)?	☐ Yes. Name Funder: ☒ No
12	Which internal and external parties are involved in the study? Think about sharing data or information between TU/e and other universities, commercial companies, hospitals, etc. *Additional explanation: Describe all internal and external parties that are involved in the study or project, including:* • *researchers or research groups at the TU/e who participate in the study;* • *(Researchers at) other universities/institutions that provide data/services, help analyzing the data, etc.;*	Internal parties • Researcher(s): Jort Wiersma • Supervisor: Daisy Yoo • Additional internal coaches:

Ethical Review Form

		Sam van der Horst Jeroen Peeters

Ethical Review Form

	• *(commercial) partners, companies, government bodies, municipalities, consultancy firms, hospitals or care institutions that provide data (e.g., contact details of participants, data for further analysis).* *Indicate which role each party plays: who defines the means and purposes in the study, who will supply the data (external parties?), who will process/handle the data, who will be able to access the data during and after research (only researchers at TU/e or also others)?*	• External parties: Netherlands Court of Audit (de Algemene Rekenkamer)
13	Have any special agreements already been made with an external party, such as a Non-Disclosure Agreement (NDA) or a data sharing agreement?	☐ Yes, namely: ☒ No
14	Has your proposal already been approved by an external Ethical Review Board or Medical Ethical Review Board? *Additional explanation: For example, when you are collaborating with another university and the project has been approved by their Ethical Review Board, or when you received a WMO-waiver from a Medical Ethical Review Board.*	☐ Yes ☒ No
15	If yes: Please provide the name, date of approval and contact details of the ERB. Please also include the registered number for your project approval. Additionally, please send in the Ethical Review Form upon which ethical approval was granted together with this form.	
16	If you process personal data that are likely to result in high privacy risks for participants, you need to perform a Data Protection Impact Assessment (DPIA). Have you done this for this or a very similar project? ***Please read the information below: a DPIA is not the same as a regular privacy impact assessment. More detailed questions on privacy will follow in the section below.*** *Additional explanation: A Data Protection Impact Assessment (DPIA) is a formal document that must be drafted under the guidelines of the General Data Protection Regulation (GDPR). Think of research with vulnerable people, high-risk medical research,* *The Dutch DPA (Autoriteit Persoonsgegevens) and our website provides more information about a DPIA.*	☒ Not applicable (no high privacy risks) ☐ Yes (the form is attached to the application) ☐ No
Part 2: Medical study		
1	Does the study have a medical scientific research question or claim? *Additional explanation: Medical/scientific research is research which is carried out with the aim of finding answers to a question in the field of illness and health (etiology, pathogenesis, signs/symptoms, diagnosis, prevention, outcome or treatment of illness), by systematically collecting and analyzing data. The research is carried out with the intention of contributing to medical knowledge which can also be applied to populations outside of the direct research population. If your research contains questions about health and health related parameters (such as well-being, vitality, feelings of anxiety or stress) but your research question is not primarily medical, then you can answer 'no' to this question.*	☐ Yes* ☒ No *If yes or in doubt, please contact Susan Hommerson via s.m.hommerson@tue.nl

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Ethical Review Form

Part 3: Use of (medical) devices in the study		
1	Does your research include a device? *Additional explanation: A device is a complete piece of physical hardware that is used to compute or support computer functions within a larger system. Devices can be divided into input-, output-, storage-, internet of things-, or mobile device.*	☐ Yes, not self-made ☒ Yes, self-made ☐ No
2	Please describe your device or link to an online description of the device	☐ ☐ The device is a physical-digital prototype using a computer combined with ESP32-powered technologies. Power levels used are completely harmless. No batteries are used, as the device will be powered by adapter. The device is designed to allow participants to collaboratively visualize a complex social situation using a physical interface that resembles the complicatedness of a spaceship's cockpit as a metaphor for the complexity of the social situation. The device will have a range of buttons and knobs that can be used to add elements to or adapt elements on the visualization (which will run on a computer screen). The visualization will be a 2D visual of moving elements added to the screen by participants, and relations between the elements (such as lines).
3a	Will you use a device that is 'CE' certified for **unintended use** (meaning you will use existing CE certified devices for other things than they were originally intended for) or use a device that is not 'CE' certified? *Additional explanation: You can find more information about CE certification here*	☒ Yes ☐ No
3b	If no: Please explain to what extent the device was assembled according to relevant standards and provide a risk assessment *Additional explanation: You can find more information about a risk assessment here*	
3c	If yes: Do you use a device or software that has a medical purpose such as diagnosis, prevention, monitoring, prediction, prognosis, treatment or alleviation of disease or injury?	☐ Yes, my device or software currently has a medical purpose ☐ Yes, my device or software could have a medical purpose in the near future ☒ No ☐ I'm not sure
Part 4: Information about the study		
1	What are your main research questions? *Additional explanation: You need to provide at least one clear research question.*	The research will involve validating whether the designed prototype is successful in making the Dutch concept "Brede Welvaart" (Broad Prosperity) more experienceable, and if the

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		prototyped product-service system is able to support stakeholders to innovate on a specific social issue, which will be a non-sensitive issue that stakeholders will have different perspectives on. To give a general example: discussing the development of the Lelylijn, a proposed new railway between Groningen and Lelystad. The prototype is designed to allow the invited stakeholders to collaboratively visualize their interpretation of the social situation around the chosen issue. • *Are stakeholders of a specific issue with different views more inclined to think of, innovate on, or work towards solutions when they together map the complex social situation visually while discussing their differences and perspectives?* • *Are these stakeholders experiencing the complexity of the Dutch concept "Brede Welvaart" (Broad Prosperity) while interacting in this way and with the probe designed to accommodate this experience?*
2a	Please check the box that indicates the relevant study population *Additional explanation: Please select which persons are eligible for your study.*	☐ Students ☐ General healthy population ☐ General population with specific feature, e.g., pregnancy, specifically ..... ☐ Patients, specifically ……..... ☒ Other, specifically healthy stakeholders of the same project or situation.
2b	Age category of participants	☐ Younger than 12 years of age ☐ Older than 11 and younger than 16 years of age ☒ 16 years or older
3	Description of the research method (select all that applies)	☐ (Semi-structured) interviews ☐ Surveys

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	Additional explanation: Please specify your research method. Note that you need to provide information about the research method in an additional file that you attach to the ERB form. E.g., for interviews you provide the interview questions, for surveys you provide the survey questions, etc.	☒ Group workshops/roundtable discussios ☐ Diary studies ☒ Behavioral observations ☐ Building sensor data ☐ Wearable device (e.g. Fitbit watch, on-skin sensors) ☐ User testing ☐ Pilot study ☐ GPS tracking/location data ☐ Living Lab ☐ Other, namely .....
4	Description of the measurements and/or stimuli/treatments *Additional explanation: Think about your outcome measures and the variables you will be collecting and describe them in a way such that another person understands what the participant will experience. For example: Participants will perform task A and see pictures from database B, and we measure validated Scale 1.*	• Participants will be asked to interact with a prototype or design concept that allows them to model a complex social situation (see research question for example) • Participants are selected to be stakeholders to the same social situation. They will be asked to discuss this situation together, sharing their perspectives and noting crossing stakes in order to innovate on possibilities to improve the current situation
5	Describe and justify the number of participants you need for this study. Also justify the number of observations you need, taking into account the risks and benefits. *Additional explanation: Think about if you need 3 or 30 participants for example, and why? Do they need to provide their input once, or several times, and why? If relevant, specify the duration of the study per participant and the compensation that is needed for the study.*	3-7 A small group of participants can interact with the probe at a time. One or two of these small groups will be sufficient to gather rich qualitative data on the interaction and effects of the probe on the discussion
6	Explain why your research is societally important. What benefits and harm to society may result from the study? *Additional explanation: What benefit will the results of your study have to society in general?*	The research will contribute to promoting thinking in terms of Broad Prosperity, which will benefit society as important decisions will be taken based on the consideration of a broader range of factors. The probe itself might have a similar affect, and might also stimulate stakeholder collaboration on such complex social issues, depending on the results of the study.
7	Describe the way participants will be recruited *Additional explanation: How will you recruit participants for your study? For example, by using flyers, personal network, panels, etc.*	☐ Survey link posted online, e.g., social media platforms ☐ On campus flyers ☒ Personal network ☐ Via a company, namely ☐ Via a hospital, namely …….. ☒ Via an organization, namely Netherlands Court of Audit / de Algemene Rekenkamer ☐ By a Consortium Partner, namely …….. ☐ Other, namely …
8	Provide a brief statement of the risks you expect for the participants or others involved in the study and explain. Also take into consideration any personal data you may gather and associated privacy issues. *Additional explanation: Risks for the participants can be anything from risk of data breach to risk of safety or well-being (think about stress, extreme emotions, visual or auditory discomfort). Describe these possible risks and describe the way these risks are mitigated.*	Low risk of political debate between participants No data will be gathered that can be tracked down to specific participants

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Part 5: Self-assessment checklist

	Note: answers in the blue boxes indicate that your research is eligible for fast-track approval	Yes	No
1a	Does the study involve human material? (e.g., surgery waste material derived from non-commercial organizations such as hospitals)		x
1b	Will blood or other (bio)samples be obtained from participants? (e.g., hair, sweat, urine or other bodily fluids or secretions, also external imaging of the body)		x
2	Will the participants give their consent – on a voluntary basis – either digitally or on paper? Or have they given consent in the past for the purpose of education or for re-use in line with the current research question?	x	
3	Are the participants, outside the context of the research, in a dependent or subordinate position to the investigator? Additional explanation: Think about doing research on your own students or on your own employees. When there is a dependency or power imbalance between you and the research participants, you need to answer 'yes' to this question.		x
4	Does the study involve participants who are particularly vulnerable or unable to give informed consent? (e.g., children (<16 years of age), people with learning difficulties, patients, people receiving counselling, people living in care or nursing homes, people recruited through self-help groups)		x
5	Will participating in the research be burdensome? (e.g., requiring participants to wear a device 24/7 for several weeks, to fill in questionnaires for hours, to travel long distances to a research location, to be interviewed multiple times)?		x
6	May the research procedure cause harm or discomfort to the participant in any way? (e.g., causing pain or more than mild discomfort, stress, anxiety or by administering drinks, foods, drugs, or showing explicit visual material)		x
7	Will financial inducement (other than reasonable expenses and compensation for time) be offered to participants? Additional explanation: For an explanation of what is considered a reasonable compensation, see the topic participant fees from the HTI group		x
8a	Will it be necessary for participants to take part in the study without their knowledge and consent at the time? (e.g., covert observation of people)		x
8b	If yes: Will you be observing people without their knowledge in public space? (e.g. on the street, at a bus-stop)		x
9	Will the study involve actively deceiving the participants? (e.g., will participants be deliberately falsely informed, will information be withheld from them, or will they be misled in such a way that they are likely to object or show unease when debriefed about the study)		x
10	Will participants be asked to discuss or report sexual experiences, religion, alcohol or drug use, suicidal thoughts, or other topics that are highly personal or intimate? Additional explanation: Think about your research population. For some participants, particular topics can be considered sensitive or intimate, whereas the same topics will not be perceived as such by other participants.		x
11	Elaborate on all boxes answered outside of the blue boxes in part 5. Describe how you safeguard any potential risk for the research participant.		

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Part 6: Self-assessment on privacy

The following questions (1-11) concern privacy issues, as laid down in the General Data Protection Regulation (GDPR). The Data Stewards and – if necessary – privacy team of TU/e will assess these questions. In some cases, more information is required to assess the privacy risks. If this is the case, you will be notified that the Data Stewards team will contact you.

The GDPR defines 'personal data' as any information relating to an identified or identifiable natural person ('data subject'). Personal data also includes data that indirectly reveals something about a natural person. Personal data can lead to the physical, physiological, genetic, mental, economic, cultural or social identity of a natural person. There are two main categories of personal data: regular personal data and special category personal data.

If you are not sure whether some of these questions below should be answered with a Yes or No, please contact a Data Steward first through rdmsupport@tue.nl.

	Note: answers in the blue boxes indicate that your research is eligible for fast-track approval	Yes	No
1	Will the study involve discussion/collection/processing of **regular** personal data, or will you collect and (temporarily) store video or voice recordings for the purpose of conducting interviews? *Additional explanation: For example, name, address, phone number, email address, IP address, gender, age, video or interview recordings? If you are not sure whether your data contains personal data, please contact the Data Stewards Team (rdmsupport@tue.nl).*		X
1A	If yes: Please describe which regular personal data you will collect in this study?	-	
2	Will the study involve discussion/collection/processing of **special category** personal data or other **sensitive data**? *Additional explanation: Examples of special category personal data are race, religion, health information, political views, genetic or biometric data for the unique identification of a person, sexual preference, etc. Health information concerns personal data of the physical or mental health of persons, including the provision of health care. Examples of other sensitive data is information such as communication data, financial records or credit scores, camera surveillance data, location/GPS data, internet-of-things data, employee monitoring, observing or influencing behaviour, criminal records, data of vulnerable persons (children, people with disabilities, refugees), BSN number etc. Please be aware that the use of special category personal data in research requires extra security measurements in order to safeguard the privacy of data subjects and to comply with the GDPR. Processing of this special category data is prohibited, except for specific purposes and under certain circumstances. If you need to process special category data, please consult the data stewards at rdmsupport@tue.nl.*		X
2A	If yes: Please describe which special-category personal data and/or sensitive data you will collect in this study?	-	

If you answered yes to either question 1 or 2, please answer the questions below. If you answered no to both questions, you can skip this part and continue onto part 7. Also, if an answer to any of the following questions is 'yes', please contact a Data Steward at rdmsupport@tue.nl

		Yes	No
3	Will your project involve the processing of personal data on a **large scale**? *Additional explanation: In general, any processing that involves more than 10.000 data subjects should be considered "large scale". However, if the data of approximately 1000 persons (or more) are involved, the data processing may still be considered large scale. In that case, besides the number of persons involved in the study, one should also assess (i) the amount of data collected from these persons taking into account the type/risk level of the personal data, (ii) the duration of the data processing, (iii) the geographic scope or extent of the processing. For example, if you would collect and process data across several European countries with 10+ socio-economic data items of 1200 individual persons for several years in a row, that is likely "large-scale processing". Other examples of a large-scale processing activity are:* • *Monitoring driving behavior of road users on Dutch highways* • *Collecting data of Covid patients* • *A hospital that processes patient data as part of its usual operations*		x

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	• *A transport company that processes travel information of people who travel by public transport in a certain city. For example, by tracking them through travel maps.*		
4	Does this processing activity involve the use of new or innovative technologies? *Examples of a new technology: combining fingerprints and facial recognition for physical access control, the use of bodycams in public spaces, the use of new technical methods in conducting research such as AI. This question also refers to new technologies that have not been deployed by TU/e so far.*		x
5	Does your study involve systematic (c.q. automated) monitoring of persons? *Additional explanation: Consider data processing activities that have the purpose of observing, monitoring or controlling individuals, for example in circumstances where the individuals are not aware by whom their personal data is collected and how it is used. Examples of such activities are using camera systems to monitor driving behavior on highways, monitoring email inactivity or employee phone use, certain applications of machine learning and artificial intelligence.*		x
6	Does the study involve collaborations (with third parties) in which data are shared or exchanged in order to link or combine data? *Additional explanation: This may often apply in a collaboration between the university and a commercial party, contract research, etc. It is important to assess this for all data in the entire project, not just your own data.* *An important consideration in this situation is whether the person whose data is involved could have expected that data from these different databases or sources of information were to be combined. For example, it is less likely for data subjects to expect that databases from different parties will be combined and the results are used for different purposes than one could reasonably expect; this may apply for example in a collaboration between the university and a commercial party.*		x
7	Will the study include data processing activities that prevent data subjects from exercising their rights or using a service or contract? *Additional explanation: Examples include processing operations carried out in public places that people cannot avoid (train station, airport, shopping mall, public university premises, etc.) or processing operations whose purpose is to allow or not allow data subjects to use a service or enter into a contract (examples: by refusing to pay a benefit, not being able to apply for a loan, etc.).*		x
8	Will the study process personal data to score, rank or profile persons? *Additional explanation: Examples: monitoring (highway) roads to give road users a "score" based on their detected driving behavior, a bank assessing its customers based on their creditworthiness, or an organization building behavioral and marketing profiles based on use of their website or navigating their website.*		x
9	Does your data processing include activities that involves composing "**blacklists**" – and, in particular, in relation to sensitive or special category data, such as communication data, financial records or credit scores, genetic data, biometric data, health data, camera surveillance data, location/GPS data, internet-of-things data, employee monitoring, observing or influencing behaviour, etc. *Additional explanation: This situation will not be a common occurrence in research, but you may indirectly be involved in this. In general, this typically concerns processing operations involving personal data relating to criminal convictions and offences, data relating to unlawful acts, data concerning unlawful or annoying behaviour or data concerning bad payment behaviour by companies or individuals are processed and shared with third parties (blacklists or warning lists, as used, for example, by insurers, hospitality companies shopping companies, telecom providers as well as blacklists relating to unlawful behavior of employees, for example in the healthcare sector or by employment agencies, etc.).*		x
10	Will personal data be transferred or shared outside the EU/EEA? EU data protection rules apply to the European Economic Area (EEA), which includes all EU countries and non-EU countries Iceland, Liechtenstein and Norway. *Additional explanation: The GDPR has drafted additional requirements for transfers data outside of the EU/EEA. Typically, additional safeguards must be implemented to protect the personal data of residents in the European Union. For example, if you collaborate with an American, Indian or Chinese university or other third party outside the EU/EEA, you must first check whether this is allowed and under which conditions this is allowed. Another typical example is storage of data on American providers of cloud (storage) services. Please contact the data stewards first to discuss this.*		x
11	Will any raw or anonymized personal data or any other sensitive data or research results from the project possibly be transferred to a high-risk country*? ***High risk countries**: China, Russia, Iran, Turkey, and North Korea.* *If personal data or other potentially sensitive data is exchanged with one of these countries, or if part of the data processing takes place in one of these countries: **an advice from the Data Protection Officer, the kennisveiligheidsteam (Knowledge Security team), and the CISO (Chief Information Security Officer) is ALWAYS required.***		x

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Part 7a: Processing of research data

1	Is consent your legal basis for processing the personal data in your study? *Additional explanation: What is a legal basis? One of main principles in the GDPR is to ensure that personal data is processed lawfully, fairly, and transparently. To comply with this principle, the processing of personal data also requires that you have a valid legal basis for the personal data processing activity.* *In research projects, the legal basis is often but not always consent. However, it is possible that it is not clear or not possible to establish whether to use consent as a legal basis.* *Some examples where consent may not be applicable as legal basis are covert research, data collection in public spaces, secondary data analysis of existing data, data that are transferred to you by a third party, consent is not possible or would require disproportionate effort, etc. In that case, please indicate which legal basis you think that applies or (preferably) contact a data steward first.*	☒ Yes and it will be obtained via an informed consent form. An informed consent template* is attached to this application. ☐ No, I will use another legal basis to process the data. Namely, …….. * You can download a suitable template **here**.
2	Where will the data come from?	☐ Data obtained from another party (secondary data use) ☒ New data collected only by my research team ☐ New data collected together with collaborators
3	Which of the following tools will you use to process personal data?	**Surveys** ☐ Qualtrics ☐ Limesurvey ☐ MS Forms ☐ Other, namely …….. **Interview/workshop recordings** ☐ Voice/video recorder ☐ Phone in a flight mode ☐ MS Teams ☐ Other, namely …… **Transcription** ☐ Manual transcription ☐ Microsoft Office software (e.g. Word, Teams) ☐ Other, namely …… **Statistical analysis** ☐ SPSS ☐ R ☐ Other, namely …… **Other tools**, specifically……
4	Where will the data and in particular the personal data be stored during and after completion of the study? If you have already uploaded your Data Management Plan, you can refer to your Data Management Plan.	☐ Onedrive ☐ Research Drive ☐ Network Drive

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	Additional explanation: University supported-storage facilities are SURF Research Drive, Ceph, departmental drives (this includes BE Project Drive), and the TU/e instance of Microsoft OneDrive. For most personal data, the use of SURF Research Drive or departmental drives (including BE Project Drive) is required.	☐ Research Manager ☐ Other, namely ……
Part 7b: Safety and security measures		
1	Will you pseudonymize/anonymize the data? *Additional explanation:* *Anonymization: remove all direct identifiers (name, address, telephone number etc.) but also indirect identifiers (age, place of birth, occupation, salary) that, linked with other information, can lead to a person's identification. Anonymization to the point that a data subject is no longer identifiable means that the anonymized data is not considered to be personal data anymore.* *Pseudonymization: replacing the unique identifier of a data subject with an artificial pseudonym. This means that identification is still possible with the identification key. The identification key needs to be stored securely and separately from the pseudonymized data. If the data subject can be identified by combining data with additional information, the data is also called pseudonymous.*	☒ Yes ☐ No If yes, describe how: No data will be collected that can be linked to specific participants
2	Is access to (personal) data restricted? (Select all that apply)	☐ No ☐ Yes, via access control ☐ Yes, via password protection ☒ Yes, access only given to TU/e research team ☐ Yes, access only given to research team, including non-TU/e collaborators ☐ Other, specify……
3	Who will have access to the data during and after completion of the project? (Select all that apply)	☒ Main researcher ☐ TU/e supervisor(s) ☐ External supervisors ☐ TU/e research team ☐ Other, specify……
4	Will you store data for future research?	☒ No ☐ Yes, in a public data repository ☐ Yes, in a public data repository under restricted access ☐ Yes, in a TU/e-recommended storage (SURF Research Drive, Network Drive)
5	Will you share data outside the TU/e?	☒ No ☐ Yes, in a fully anonymized form ☐ Yes, raw or pseudonymized data* *If you selected this box, make sure that a suitable data agreement is put in place. You can contact the Data Stewards for support in preparing such an agreement
6	How long will data be stored after the end of the project?	<7 days

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Part 8: Closures and Signatures		
1	Enclosures (tick if applicable and attach to this form):	☒ Informed consent form ☐ Informed consent form for other agencies when the research is conducted at a location (such as a school) ☐ Text used for ads (to find participants) ☐ Text used for debriefings ☐ Approval other research ethics committee ☐ The survey the participants need to complete, or a description of other measurements ☐ Data Protection Impact Assessment checked by the privacy officer ☐ Data Management Plan checked by a data steward
2	Signature(s)	Signature(s) of applicant(s) Date: 07/05/2025 Signature research supervisor Date: 13 May, 2025

Appendix H: Confirmation email ERB

RE: ERB approval request

E Mulder, Maartje on behalf of Ethics
To: Wiersma, Jort
Cc: Yoo, Daisy

Reply | Reply all | Forward
Tue 5/13/2025 12:52 PM

Start reply with: Thank you for your confirmation. | Great, thank you so much! | Thank you!

Dear Jort,

Your application (ERB2025ID264) has been approved by the ERB.

We assume that you have answered all questions correctly.
We will perform regular spot-checks so you need to keep your documentation (ERB form, informed consent forms, surveys/interview questions, description of experiment/prototype etc.) available for at least 6 months.

Good luck with your research and have a nice day!

With kind regards,
Maartje Mulder
TU/e

040-2475032
Secretary Integrity and Ethics Office
Secretary BoE EngD

Appendix I: Consent form

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Information sheet for research project "Experienced Broad Prosperity"

1. Introduction

You have been invited to take part in research project "Experienced Broad Prosperity", because you are a stakeholder to a dynamic social problem that may benefit from Broad Prosperity thinking.

Participation in this research project is voluntary: the decision to take part is up to you. Before you decide to participate we would like to ask you to read the following information, so that you know what the research project is about, what we expect from you and how we deal with processing your personal data. Based on this information you can indicate via the consent declaration whether you consent to take part in this research project and the processing of your personal data.

You may of course always contact the researcher via j.wiersma@student.tue.nl if you have any questions, or you can discuss this information with people you know.

2. Purpose of the research

This research project will be managed by Jort Wiersma.
The purpose of this research project is to test if stakeholders to a social issue can benefit from collaboratively making a map of the dynamic social space while reflecting in which ways they are thinking broadly about the situation. The research data will be used in a report on the design of the discussion probe that will support the stakeholders in mapping the dynamic social space.

3. What will taking part in the research project involve?

You will be taking part in a research project in which we will gather information by:

- Observation of the interaction between the discussion probe and the participants, as well as the interaction between the participants.

This study will be completely anonymous, and the data obtained from the study will not be traceable to you.

For your participation in this research project you will not be compensated.

4. Potential risks and inconveniences

Your participation in this research project does not involve any physical, legal or economic risks. You do not have to answer questions which you do not wish to answer. Your participation is voluntary. This means that you may end your participation at any moment you choose by letting the researcher know this. You do not have to explain why you decided to end your participation in the research project. Ending your participation will have no disadvantageous consequences for you.

If you decide to end your participation during the research, the data which you already provided up to the moment of withdrawal of your consent will be used in the research. Do you wish to end the research, or do you have any questions and/or complaints? Then please contact the researcher via j.wiersma@student.tue.nl

5. Confidentiality of data

The raw and processed research data will be retained for a period of 2 months. Ultimately after expiration of this time period the data will be either deleted or anonymized so that it can no longer be connected to an individual person. The research data will, if necessary (e.g. for a check on scientific integrity) and only in anonymous form be made available to persons outside the research group.

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This research project was assessed and approved on 13/05/2025 by the ethical review committee of Eindhoven University of Technology.

***** Scroll down for the consent form *****

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Consent form for participation by an adult

By signing this consent form I acknowledge the following:

1. I am sufficiently informed about the research project through a separate information sheet. I have read the information sheet and have had the opportunity to ask questions. These questions have been answered satisfactorily.

2. I take part in this research project voluntarily. There is no explicit or implicit pressure for me to take part in this research project. It is clear to me that I can end participation in this research project at any moment, without giving any reason. I do not have to answer a question if I do not wish to do so.

Name of Participant:

Signature:

Date:

Name of researcher: Jort Wiersma

Signature:

Date: