Final Project Report – CERN Bootcamp 2022

Sustainable Development Goal 3:

Ensure Healthy Lives and Promote Well-being for All at All Ages

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1   Introduction

Ensuring good health and well-being is essential to sustainable development. Therefore, CERN Bootcamp team SDG3 (team SDG3) focused on searching for innovative technological solutions for Sustainable Development Goal 3 (SDG3): Ensure healthy lives and promote well-being for all at all ages. In recent years, there has been increasing acknowledgment of the important role mental health plays in achieving global development goals, and in 2015 mental health was included in the Sustainable Development Goals. In this historic step, the United Nations (UN) acknowledged the burden of disease in mental illness and defined mental health as a priority for global development in the next 15 years (2016).

We initially discussed potential challenges during the CERN Bootcamp kick-off meeting and shared the desire to help improve people's well-being and happiness. After the kick-off, we divided tasks within our group and researched the theme in more detail. To facilitate the research, each member of the team concentrated on researching either general info or a certain age group for the mental health and happiness-related issues and challenges they typically encounter. We noticed quickly that there is an extensive amount of materials, reports, publications, and research available both online and offline relating to mental health and statements of happiness.

We spent initial two weeks researching the topic, which helped us to confirm that improving mental health and happiness is the challenge we want to tackle in our project; it became apparent that it is a complex area with an urgent need for new innovations. We decided to focus especially on improving emotional awareness, which was identified as one of the key factors in happiness. We realized that by increasing emotional awareness, we could also improve some other key factors to happiness, such as resilience and meaningful relationships. Going through one hundred and seventy research projects in ATTRACT, we found that those involving neuroscience, biology, machine learning, healthcare, software, and electronics might be the most relevant to our project. In the second stage of information gathering, we did more in-depth research and interviewed experts from different competence areas to gain inspiration and identify the main pain points to solve.

It became clear that implementing any solution on a global level would only be possible with extensive cooperation among all the countries that have adopted SDGs, wholeheartedly aiming to achieve the goals. Gaining impact requires an affiliate group composed of not only healthcare professionals, but also other professionals in science, technology, government agencies, and more. If our intended impact was to increase people's awareness of their emotional state, then we needed to investigate existing ideas and programs to address this, as well as to explore ideas outside the usual social and healthcare sectors.

In this report, we will explain the research and sprint process conducted both prior to the Bootcamp and in CERN. Within our team, we have nurtured confidence in ourselves and cherished the happy moments all through the journey.

2   Development Approach

In CERN Bootcamp, we utilized different approaches and methods throughout the process. We got to implement big frameworks such as sprint design and service design thinking, as well as more specific service design tools like affinity diagram, how might we -method, and brainwriting. In this chapter, we first present the methods and frameworks shortly and describe then how they were implemented in our design process.

2.1   Sprint Methodology

In the CERN Bootcamp, we followed loosely the design sprint methodology created at Google Venture. A sprint is a five-day brainstorming-prototyping-testing session and the definitive strategy to determine whether ideas are worth further development and launching. This rapid-fire development period applies the necessary pressure to get a clear picture of an idea's potential in no time at all. Sprint helps teams to find new approaches to various types of problems. While this approach can be adapted to fit any recipe, it is primarily geared towards development and product design. The concept of five days shows activities for each day and the pace of the sprint. At the end of each section of the Sprint Book, there are recommendations and performance tools for moderators including problem-solving tips and checklists (Knapp, Zeratsky & Kowitz 2016, 14 -16).

The authors offered practical advice to stay organized and to keep the team working. Even experienced operations credentials will likely appreciate the work included in note-taking. There are countless details to consider when consolidating a project like a sprint and having reminders of all the aftermarket needs to be sure is helpful. On the first day, Monday, teams focus on mapping out the problem they want to solve and selecting their focus. On Tuesday, teams sketch out solutions. On Wednesday, teams need to make decisions and transform ideas into a hypothesis. Thursday is the day a prototype is created and Friday is about testing the prototype with real potential customers (Knapp & al. 2016, 17-18).
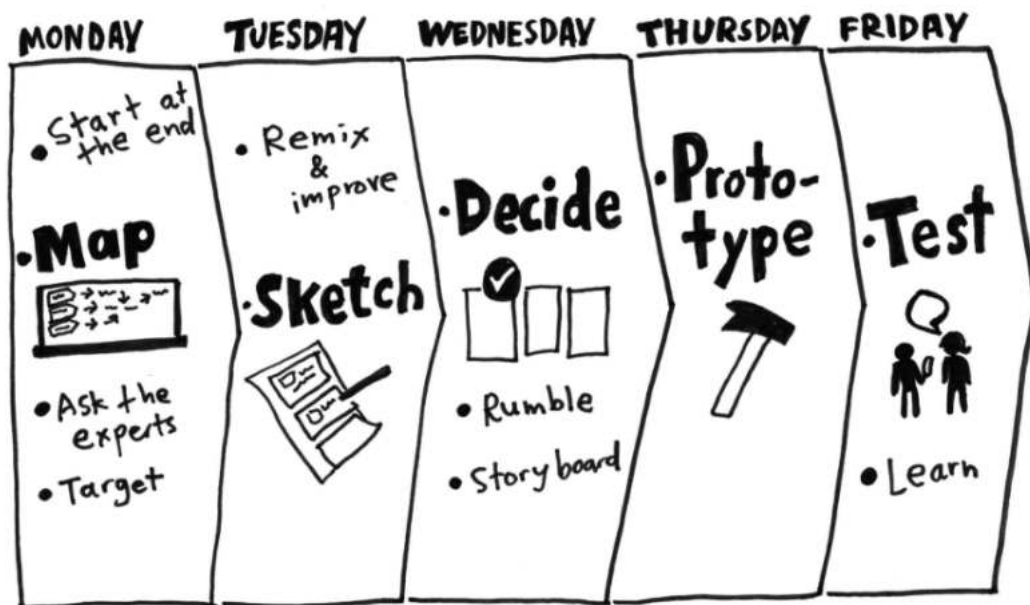
Figure 1: Sprint's five days' work progress (Cheung April 2016)

The authors indicated that before any team considers starting a sprint, they should make sure they have the perfect challenge and suitable team members. A perfect sprint team should have seven members, not more or less. Knapp also emphasized the importance of diversity in people's professions and strengths. It is strongly recommended not to have more than one or two people with the same expertise or role, otherwise conflict may arise. A team needs to set a deadline of 5 days to be able to complete their sprint and choose an ample space in which they can work. A sprint can be used to tackle anything, as Knapp himself said, no matter how big a problem is (Knapp & al. 2016, 33–37).
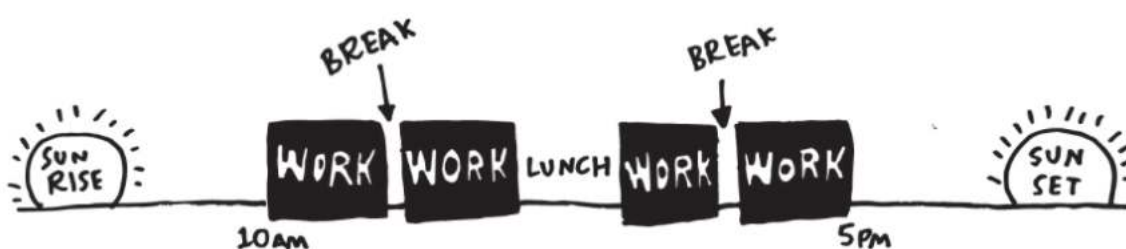

Figure 2: A Sprint's workday routine (Cheung April 2016)

A typical sprint day is a bit shorter than a workday. It is recommended to start at 10.00 and finish at 17.00. This also includes a break for lunch. The lunch break is important to replenish everyone's energy and refresh their minds throughout the half-day. Knapp emphasizes the idea that working longer hours will not yield better results. It's much better if everyone is productive in fewer hours and gets more done. A sprint should be completed if the whole team commits to working five days (Knapp & al. 2016, 40 - 42).

2.2

2.3   The Double Diamond

The Service Design thinking is based on the Double Diamond process by the Design Council. Launched in 2004, the Double Diamond has become well-known as a comprehensive and visual description of the design process. The two diamonds in figure 3 show the process of exploring the challenge more widely and deeply (divergent thinking) and then concentrating on action (convergent thinking) (Design Council 2019).
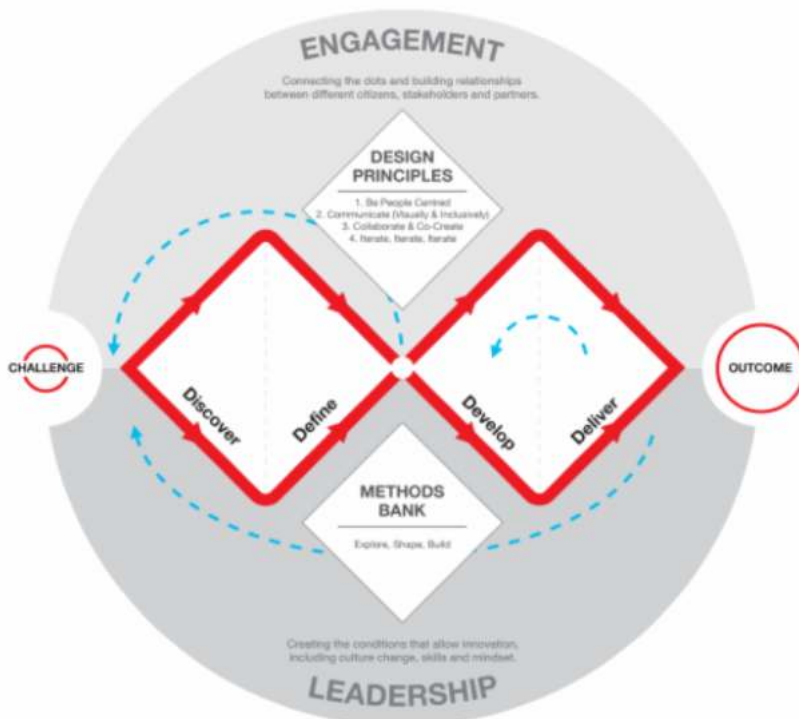

Figure 3: The Double Diamond by Design Council (2019)

The first step in the model is Discovery. It helps us understand the problem, without assuming what it is. It requires speaking and spending time with issues affecting people. The insights gathered from the Discovery phase will be used in the second step, Define. Moving on to the next diamond, the phase starts with Develop, where exploring different answers to the defined problem is encouraged. The final step Deliver involves testing out different solutions briefly, eliminating those that do not work, and improving those which do. (Design Council 2019.)

The Double Diamond is not a linear process. The designers can learn something more about the problems and go back to the previous step. For example, making and testing early-stage ideas can be

part of the discovery. In the end, the process will repeat as service designers constantly get feedback and tune the solution to become better. (Design Council 2019.)

2.4 Affinity Diagram

An affinity diagram (AD) is used to solve key problems. This is a very effective tool for problem analysis in a padded condition. It is a methodical choice and problem-solving when the situation is very vague. For example, when the problem is related to future events or unknown circumstances, the method helps the team to figure out the key matter. This is done by collecting data, opinions, and different ideas in descriptive data formats and aggregating them into a property-based co-chart, such as Miro, Mural, or Google Whiteboard. (Moritz 2005, 202.)

To start with, the team should decide on a clear statement or goal. Then each person writes down their insights, findings, observations, comments, and ideas in post-it notes individually. After that, they attach all post-it notes to the board. Team members begin to read aloud the content one by one, while one person looks for similar or related ideas and starts categorizing them together in small and well-defined groups. After this, the groups are given descriptive names on post-it notes with different colors. Groups can be combined into larger entities as "super headers". Afterward, another member will break the created groups and make new ones, thus forming the final Affinity Diagram. (Moritz 2005, 202.)

2.5 How-Might-We Method

Challenges are often opportunities in disguise. The "How Might We" (HMW) methodology creates an atmosphere for creative solutions by reframing known challenges around a product, service, or initiative. After identifying design challenges through topic expert interviews and user research, the designers can turn these problems into aspirational questions aimed at creating a welcoming space for innovative thinking. (NN/g Nielsen Norman Group 2021.)

In the Double Diamond, writing HMW notes is often practiced by teams as a collaborative exercise at the end of the Defining phase to transit to the Develop phase. The HMW method is a design thinking activity where participants simply rephrase known challenges as a question that begins with "How Might We…". Steps to conduct HMW include identifying and mapping out the insights or pitfalls of the current design challenge or new initiative. In addition, it's advisable to make sure the questions are broad enough, focus on the desired outcome, and don't suggest a solution. The team should write down as many HMW questions as possible; the more HMW questions are created, the more opportunities they provide for discovering solutions. (NN/g Nielsen Norman Group 2021.)

2.6 Brainwriting

Brainwriting is a tool used during the Ideation phase or the Develop step of the Double Diamond. The group members write down their ideas about a particular question or problem on a piece of paper for a few minutes. Each participant passes their idea on to another person, who will read the idea and add new ideas. After a few minutes, the group coordinator asks the participants to pass their work on to another person, and the process repeats. After 10 to 15 minutes, notes are collected and posted for immediate discussion. (Moritz 2005, 64.)

The number of ideas generated from brainwriting often exceeds what the team expects from direct brainstorming because the participants experience some anxiety reduction, in a parallel process in which dozens of people can add items simultaneously and reduce the amount of extraneous talk that occurs during brainstorming, which takes time away from generating ideas. (Moritz 2005, 64.)

Brainwriting is recommended in situations where the team has a short budget of time; the group is too large to have effective brainstorming; there are many shy team members, or there is a worry about loud or forceful individuals influencing others. The aforementioned are situations that might affect traditional brainstorming. Brainwriting can be used to understand how different groups view an issue. The team might try to conduct separate brainwriting sessions with different internal groups. (Moritz 2005, 64–65.)

2.7 Rapid Prototype

During the Service Design process, the crucial step between ideation and solution is prototyping. A prototype is a simple version or a portion of a system that is built up in a short period, tested, and developed in repetition (Moritz 2005, 181). For user-centered designers, prototyping is an effective method to make ideas and concepts tangible, to learn through the process, and to get fast feedback from the users. Rapid prototype delivers quick results to test with the users and identify improvement ideas at early stages. Therefore, the prototype will help minimize the risk of failure of development projects and prevent waste of resources (Design Kit 2022).

There are many prototyping methods. One of them is making mock-ups – models, illustrations, or groups of photos that explain the concepts, ideas, and visions. In addition, mock-ups can be dummies that demonstrate the principles and ideas when creating models (Moritz 2005, 180, 227). While digital tools such as Figma, Sketch, or even Powerpoint are used widely nowadays to illustrate the prototype, some traditional methods such as paper and cardboard mock-ups are considered fairly easy and fast options.

Paper prototyping is a raw and fast prototype method, which requires papers and other stationeries or objects available at that current time and location. These materials are used to simulate the service components and support the idea's visualization for a better concept or product explanation. Similar to

paper prototypes, cardboard prototypes can be actual size, smaller or bigger mock-ups compared to actual products. They illustrate the 3D prototypes of service settings or touchpoints out of inexpensive paper or cardboard. Cardboard prototyping is an excellent tool for trying out smaller versions of service touchpoints before switching to full size. (Haaga-Helia 2022.)

2.8   Adapting methods to CERN Bootcamp week

Service design is the practice of planning and organizing an enterprise's resources (people, props, and processes) to directly improve the employee experience and, indirectly, the customer experience (Stickdorn, Lawrence, Hormess 2018, 26). During the CERN Bootcamp project, the SDG3 team partially applied Sprint as the main methodology together with the Service Design thinking and tools mentioned above. Because the schedule was different compared to the recommendation in the book, the team had to twist the methods and process differently to be able to reach the deadlines. In addition, the team considered the preparation time between Kick-off days in March till before Bootcamp as the Discovery phase.

Monday was regarded as the kick-off day for the Bootcamp week. We voted for two deciders and chose a main facilitator for the week. As the workload was huge, the facilitator had assigned an assistant for each day to help share the responsibility as needed. We also divided the assignments among different members to complete in time. The homework for Monday was to write down ideas, insights, and thoughts on sticky notes for data gathering and analysis. On Tuesday, we began the Define phase with Affinity Diagram. Although there was not enough time to use the tool properly, we managed to define the challenge to focus on. We started Wednesday with How-Might-We and sketched out possible solutions with Brainwriting to complete the Develop phase. We were able to choose the solution to focus on before we finished, and on Thursday we split the team to focus on prototyping along with other assignments. Finally, we finalized our presentation on Friday with the completed prototypes, poster, and teaser video.

Our time slots were limited as we had short introductory lectures on service design topics and visits to CERN properties during the week. However, these lectures and visits were inspiring and provided us with inspiration and more detailed guidelines. We also had some warm-up exercises and fruitful discussions with the ESADE students participating in the ATTRACT CERN Ideasquare Summer School (ACISS). All in all, it was useful for our team to learn how to adapt the sprint methodology to a specific real-life context and choose together which methods would be the most suitable for our purposes. We found the whole Bootcamp intense, but thoroughly inspiring.

3   Evolution of the design

Before participating in the five consecutive working days at CERN Bootcamp, we had two months to prepare our knowledge and skills. From March till the end of May 2022, we focused on in-depth research on topics including the goal of SDG3, true individual happiness, the perception of individuals in different life situations and ages, and the difficulties that individuals or groups face in taking care of their mental health and emotions. In addition, we strengthened our teamwork skills and methods in service design to be ready for a week of intensive work in Geneva. When approaching this project, we determined there are three important stages to cover; discovering, defining the challenge, and searching for a solution.

3.1   Challenge Discovery

After the kick-off days in Laurea, our group started to gather data about challenges and happiness, which we wanted to focus on. We divided the collecting data work among team members and created a research wall with happiness among Children (from 0 to 14 years old), Youth (from 15 to 24 years old), Adults (from 25 to 64 years old), and Seniors (from 65 years old and above). We also added sections for general Information and technologies (including ATTRACT technologies). We used diverse data sources to gather general information about our challenge, related factors, happiness frameworks, different viewpoints and perceptions presented in public, as well as the latest research knowledge. To name a few data sources, we gathered studies, articles, reports, and target group interviews. These were summarized, presented, and sorted on our Miro wall as shown in figure 4 below.
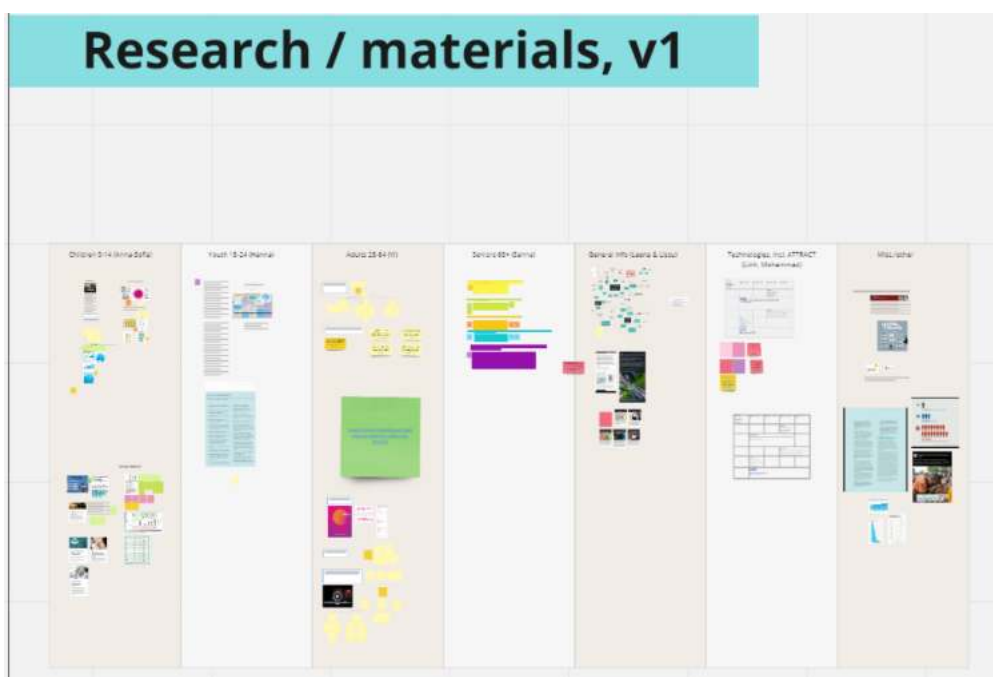
Figure 4: Research wall during Pre-Bootcamp

We studied different ATTRACT technologies, two group members specializing in this task, and searched for technologies that could be relevant to our project. There are many interesting projects in the 170 projects of ATTRACT, but within a limited time, we decided to focus on learning about projects related to health care, diagnosis, and treatment of diseases, microbiology, and machine learning. For example, these include projects promoting imaging brain activities such as RPMD3 and Nano-Meg from ATTRACT. RPM3D technology aims to combine magnetic sensing technology and neuroimaging system design for investigating the health and diseases of humans. The technology is using nano-fabricated high critical temperature junctions that produce superconducting quantum interference devices (SQUID) which are easy to fabricate and are more sensitive to magnetic fields (ATTRACT 2020).

Nano-MEG technology on other hand uses the approach of the recently developed high Tc SQUID fabrication process which consists of patterning of a single high-Tc film. The technology also achieves low noise capabilities which are a limitation in state of art approaches (ATTRACT 2019). Neuroimaging uses moderate temperatures in the range of 77K for the highly-sensitive SQIUDs used in this technology and it takes only one millimeter of the head surface where neuromagnetic signals are stronger which improves resolution too. This is worth mentioning that this technology also helps to replace expensive liquid helium with cheap liquid nitrogen. In short, this technology will help achieve a big cost-effective leap in neuroimaging (ATTRACT 2019).

These technologies can be used to provide a mathematical description of the movements made by individuals, reflecting the behavior of their neuromuscular system. To simplify, these technologies provide accurate information about human emotional statements by analyzing brain activities. We also had an online sparring session with a coach and students from TUDelft on 17th May related to these themes. Since the topic we chose is quite broad, it allows the whole team the opportunity to be creative and come up with new ideas without worrying about being too narrow.
To expand our knowledge in the field of our challenge we reached out to twelve specialists and requested an interview, of which six responded to us. Most of the interviews were conducted in Finland. The interviewees are listed below in Figure 5.

Name	Christoph Barrington-Leigh	Hannah Metzler	Miguel Reyes
Title	Associate Professor	Postdoctoral Researcher in Computational Social Science lab	Team Manager
Company	McGill's Institute for Health and Social Policy and the School of Environment	Complexity Science Hub Vienna	Sekasin Chat, Mieli ry
Method	Online interview	Online interview	Email interview
Status	✓ Completed	✓ Completed	☼ Waiting for response

Name	Ea Suzanne Akasha	Sophia Achab	Katia Schenkel
Title	Technical Advisor	Psychiatrist and psychotherapist	Psychologist
Company	Red Cross and Red Crescent (IFRC) Reference Centre for Psychosocial Support	University Hospital of Geneva	CERN Medical Service
Method	Email interview	Face-to-face interview	Online interview
Status	✓ Completed	📅 Coming up (on Tue 7th of June)	📅 Coming up (on Tue 7th of June)

Figure 5: List of confirmed interviews and their status before Bootcamp

3.2 Challenge Definition

As we arrived at CERN, we started re-familiarising ourselves with the research data as well as all the insights through the interviews we had collected in Finland. At the beginning of the process, we discussed with the teachers who gave good feedback about the pre-assignment report. The positive feedback consisted of e.g. our preliminary ideas as well as interview insights, as the teachers felt they were excellent. This further motivated our group and confirmed that we truly were on the right track.

The process started on Monday with preparation for the data analysis. Everyone wrote down their parts of the analysis from research and interviews on Monday evening to Tuesday morning individually. Each insight was written on one sticky note as a full sentence. On Tuesday, we gathered all the data written to our sticky notes on a big research wall (figure 6). The ATTRACT technologies information was set aside as we decided to process it separately.

Figure 6: Research wall during the Bootcamp week

At this stage, we divided the team into two smaller teams of 3–4 for data analysis using the Affinity Diagram. Within 15 minutes, each team took turns to search for connections and reoccurring themes and sort them out in a group. The other team continued the process without knowing the ideas behind the sorted group. Both teams were free to move the sticky notes to other groups according to their judgment. When we were just finishing the diagram, some ESADE students walked in, and we asked them what happiness meant to them on a personal level. The answers they provided took us by a surprise, as we were able to place them well within the different groups that had formed in our diagram, thus supporting our findings. As we were analyzing data and discussing the themes we found, two group members held the last scheduled expert interview on Teams and came back with ideas that validated, even more, the data we had already collected.

We continued the process until the point where we all felt satisfied with the saturation of our data. Once similar answers started to repeat themselves, we started to name each group with a headline that would highlight the group's main topic. When the conversation started to overtake the process of moving forward, our facilitator was efficient in bringing our focus back to the task at hand. We disregarded themes from our focus, that was not as saturated or that could be implemented into the existing themes already. For example, diversity came up in our research, but was implemented into the mindset, education, and social connections, and did not need a headline of its own. We started to twist the Affinity Diagram a bit differently, compressed our data, and chose five main headlines out of twelve. We discussed the main ideas of the themes and how they connected by describing each theme with a few short sentences as thoroughly and concretely as possible.

The first of the five headlines was "mindset". The data collected showed that smaller, but more frequent experiences of happiness keep people happier than one major happy incident over a long period.

Further, people who can recognize happy moments and engage in those are happier than people who cannot find joy provided by the "little things" in life. Gratefulness was also included in the mindset needed to experience happiness, as was the humane need to feel valued, or valuable to someone or something. It causes people stress and negative emotions if they have to hide their thoughts and dreams, or in the worst case, who they truly are. Living up to one's own values is an important part of the mindset theme.

The second theme was education and guidelines, where we composed the theme into a curriculum of emotional first-aid, emotional and social skills as well as acknowledging that learning and growth happen in a social and emotional context. We also learned that emotional skills can be developed all through life and that the roots of lifelong emotional awareness are rooted back in childhood.

This theme was followed by social connections, where the carrying ideology was that all humans need to have a sufficient amount of quality relationships, and loneliness in itself can lead to mental and physical problems. Further discussion established that extreme changes, such as losing a loved one, can lead to emotional damage. The factors which can influence one's happiness were also added. These factors acted as guidelines to eventually develop our understanding of the topic. Some of the key findings in this theme were that resilience is crucial to maintaining happiness, or hope of it, and positive emotions come from love, friendships, or other meaningful relationships as well as from personal growth when learning new skills and competencies. Habits were also a key finding that contributed to the factors that affect the experience of happiness, and its frequency.

Last, but definitely not least, we had a theme of technological solutions. The consensus of our research was that even if apps might be useful in some cases, they do not save the world as such – a fact the IdeaSquare team highlighted also. Further, fast-developing technology can cause inequality and increase stress instead of well-being. Our research advocated strongly the sharing of good knowledge and the free reproduction of knowledge.
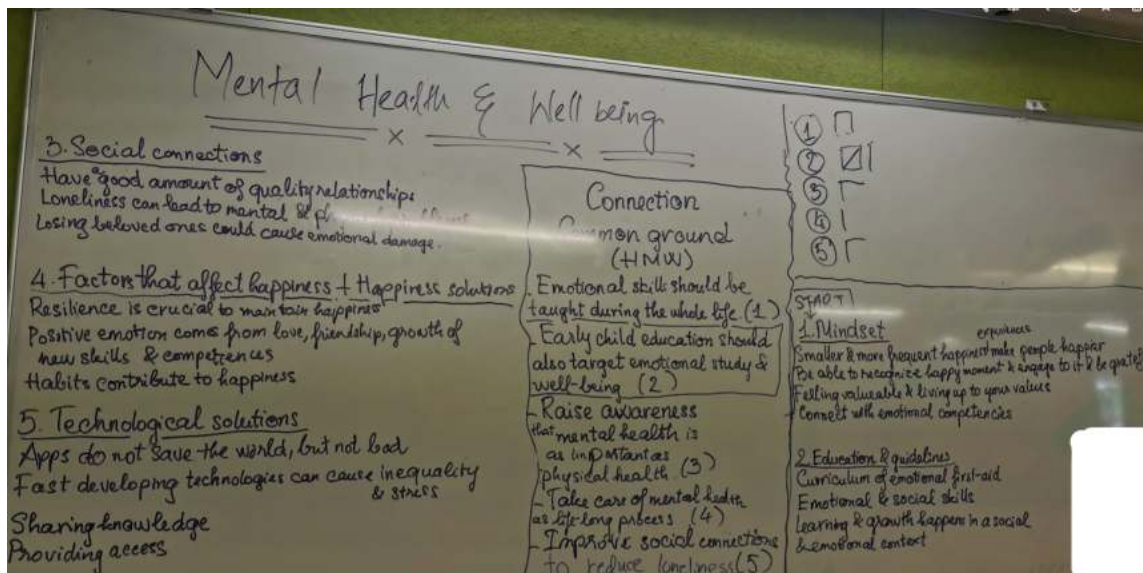
Figure 7: Main ideas from five main headlines and the connection between them

Figure 7 above illustrates the main ideas we collected from each main headline and the connection between them. Five insights derived from these five themes were that emotional skills should be taught during the entire course of life; early childhood education should also target emotional skills and wellbeing; raising awareness that mental health is as important as physical health; taking care of mental health is a life-long process, and improving social connections is needed to reduce loneliness. At this stage, we voted on one insight as to the challenge we wanted to focus on. Each team member had two votes to use. In the end, we were quite unanimous, as each of us voted to focus on the childhood development phase, as the biggest impact on our future solution could be done by influencing the youth at an early stage and so bringing forth a change that is sustainable as well as free of stigma. This became our sprint challenge to solve by the end of the week.

3.3 Solution Search

Since our challenge was still quite extensive, we wanted to explore new perspectives and narrow down the challenge with the help of the How Might We - method on Wednesday (figure 8). As an individual exercise, each team member wrote down their HMW ideas on post-its, introduced them to others, and hung them on the wall. In the HMW exercise, quantity is more important than quality, and we were truly impressed by the variety of ideas we were able to produce in such a short time.

We tried to approach different aspects of our sprint challenge on childhood education on emotional competencies and wellbeing. As a team, we took two rounds of 10 minutes to further define and discuss our HMW questions. Whereas some of the team focused on pinpointing questions to define the goal, some had a more abstract, questioning approach. This made our HMW questions versatile, covering a large array of viewpoints. During this phase, we did not forget to question our motivation and

keep in mind the user groups that could easily be overlooked when trying to design an idea that would suit the most. We knew it would not be a "one size fits all" solution, but the aim was to find a way to include marginalized groups as well as different socio-economic backgrounds and cultures.

A few insightful HMW questions that the team came up with were: "How might we teach children to understand that feeling different emotions is normal?", "How might we also teach parents through educating their kids?", and "How might we create a solution that could help children in low and middle-income countries?" Examples of the variety of questions include "How might we make sure we are adding to well-being not another stressor to our target group?", and "How might we make emotional skills a part of people's everyday lives?".

After the members had presented their notes, the facilitator together with one decider started to sort out the questions into related groups for visibility. One noticeable theme was tackling different aspects of education. Other important aspects were providing sustainable well-being answers, keeping in mind the inclusivity and culture aspects, and creating playful solutions for children. The team discussed how to move forward from this step and which factors should be considered in this sprint.

Figure 8: HMW notes after sorted into groups
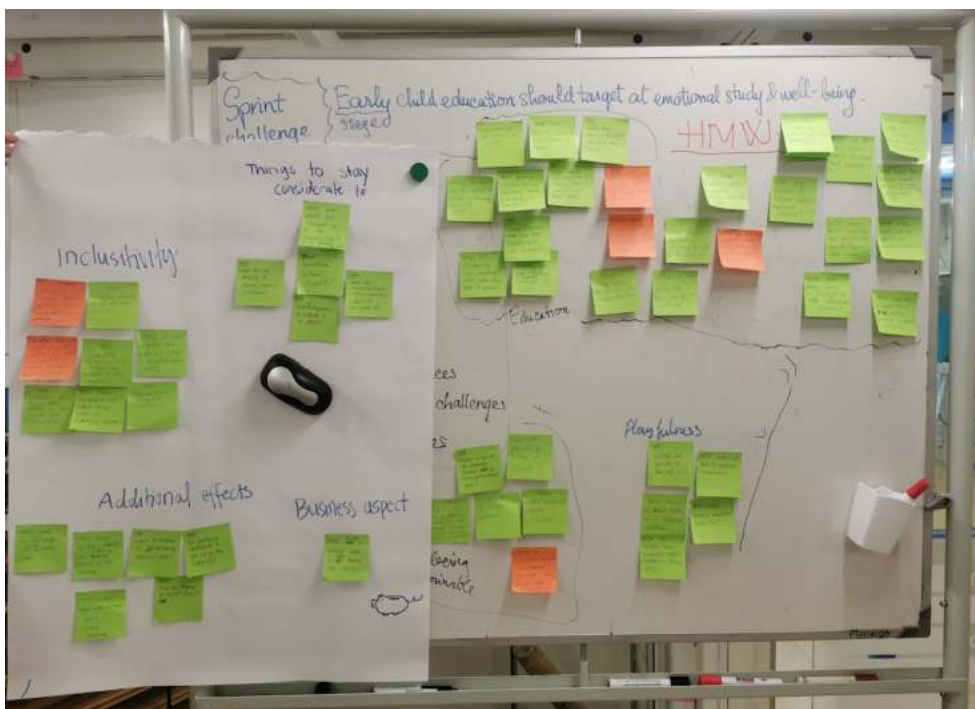
Before moving on to Ideation, we did a brief Value Network Mapping to understand the different stakeholders involved and their relationships in producing values. The map helped to define who we brought most values to with our challenge and how. At this point, we did not define what age range to focus on, but kept it open for the ideation phase instead. We acknowledged that the relevant

stakeholders were caretakers, teachers, and classmates. We also mapped different stakeholders such as government and related organizations, but decided not to focus too deeply into these at this point.

The ideation lecture we had during that day gave us some useful insights on how to achieve our goal. We used the Brainwriting tool with some adjustments to fit the timeline. We divided our team into pairs to write down and sketch the ideas in 20 minutes. Working in separate rooms gave us some silent moments to concentrate better on brainstorming. In addition, discussing with the other partner helped to build-up and visualize the thoughts. While the team was focusing on searching for solutions, the facilitator summarized the process to get some advice from the tutor. After that, she listed down the key notes from each theme of HMW in figure 9 below. This was made as a reference to reflect when choosing the idea for the final solution.
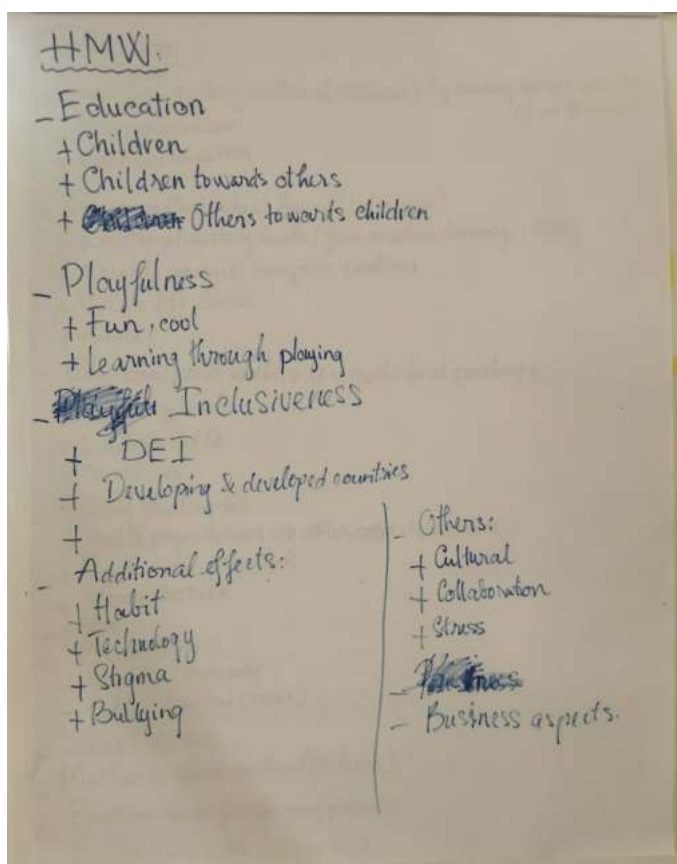
Figure 9: Key ideas from HMW notes

In only 20 minutes, the three pairs generated plenty of ideas. We decided not to do another round but come back to the main room and stick the ideas on the same wall. Each member had a chance to pitch out their ideas without limited time. The rest of the team listened quietly and wrote comments about the presentation on sticky notes. We aimed not to cut out the train of thought during the presentation while still being able to give feedback later on. We kept in mind that we had licenses to dream from

Ideasquare. No ideas were unintelligent nor should be judged at this point. In the meanwhile, the facilitator took notes of the ideas for others to follow.

Figure 10: Ideas generated during Brainwriting activity

The team came to realize that many solutions were similar or complementary to each other. Therefore, we started to sort out the suggestions into relevant themes. We reviewed the HMW main ideas (figure 9 above) before casting our votes for the most appropriate idea in this context. Each person had 3 votes as stickers. Voting was done simultaneously.

The most voted idea was to create an emotion toolkit for children, inspired by the maternity package in Finland and the "Emotion First-Aid kit" suggestion from an interview. The kit would include various tools to educate the children about emotion awareness during their first days at school. We did not fully decide on specific items, but intended to combine other useable solutions as tools under this one big kit.

4   Final Solution

Before we clearly defined what problem our team needed to solve, we were vague about whether we could find a viable and suitable solution. However, after understanding the challenge the group was facing, as well as understanding the factors that had a direct or indirect impact on that problem, we became much more confident and the group made a very good decision, fast and efficiently. Here is our coverage of the fourth and fifth working days in the CERN Bootcamp.

4.1   Develop the solution

Thursday was packed with the arranged visit in the morning as well as lectures in the afternoon. After the tour and prototype lecture, we discussed the solution and mapped out different features to consider as shown in figure 11. We also agreed which items should be included in the kit. These were the starting point to assist determine the prototype ideas and other assignments such as product posters and videos.
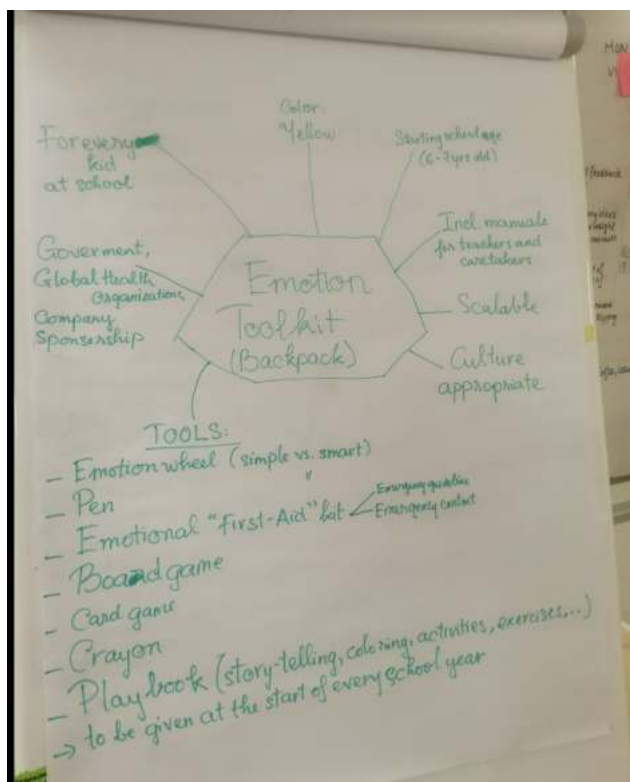
Figure 11: Preliminary ideas of our solution

During our research and sprint process, we discovered how the roots of lifelong emotional awareness stretch back into childhood. Recognizing and understanding one's own and other people's emotions is an important life skill that can be developed all through life. Nevertheless, children are not regularly taught emotional awareness and wellbeing in the early education they attend to. This not only results in

signs of depression and fear in later ages, but also affects personal lives and relationships built throughout life.

Our solution for this global challenge is the Emotional Awareness Kit - EAK. Aiming at early child education as the described challenge, it is a tool designed to help every child starting primary school to learn about their own and other people's emotions through play, together and individually, with the support of their caretakers and teachers.

The kit will be distributed to every child on the first day at school. At the first stage of implementation, the kit will include age and culturally appropriate content designed for children approximately 6-7 years old. Some of the tools can be used individually, others in interaction with other children, teachers, and caretakers. The tools are scalable, which means that there is an easy-to-produce and low-cost alternative for every technological solution included in the kit to fit the needs of different countries and cultures around the world.

The estimated cost of a single package is comparable to the Finnish maternity package. While estimating the cost, hardware, technology, possible local and global training, research and development, advertisements, logistics, and production costs were considered. To reduce and cover the estimated cost of the mental health crisis, governments, and NGOs including UNICEF and WHO can be targeted to get the possible subsidy and implement the solution in smaller regions, for example, Europe. Gathering data on the impacts of the kit and improving it with iterations can help to convey the benefits so that the kit could eventually be implemented on a global level.

4.2   Prototype with the possibility to implement ATTRACT technology

We had set roles for all team members in the beginning based on their interest in learning or skill development, and the tasks on each day and assignments were flexibly assigned to certain people. If someone had free hands, they would pitch in their time and effort to make sure we kept the schedule to finish all the tasks. The prototyping process was relatively easy, as in the ideation phase we had collectively been thinking about how we could communicate the findings and develop our solution.

The group aimed for low fidelity and rapid product prototypes during Bootcamp. From the guidance of the instructor at IdeaSquare, the focus areas were concept visualization, sketching, and quick and rough mock-ups. Based on the illustration during Brainwriting, mock-ups were used during the Prototype process. Modeling clay, paper charts, cardboards, color pens, and transparent plastic sheets were used to make the prototypes. We also visited the workshops in Ideasquare to pick out potential materials, learn the process in reality and get inspiration from the coordinator.

The prototype of the emotional awareness kit "EAK" is in the form of a backpack with tools inside. It could be utilized in different ways by both adults and children to increase their understanding and ability to cope with all kinds of feelings that life brings. In addition, as we wanted to be inclusive of all socio-economic backgrounds and nationalities around the world, the kit was designed to be easily scalable to suit different cultural needs.

Figure 12: Various prototypes visualizing our solution for the selected and defined problem.

The prototyped kit consists of a Board Game, Pens, Emotion Wheel, Manual, Taggies, and a Card Game as shown in figure 12 above. The kit also includes a Manual that explains how to use the kit, in a physical copy as well as an optional app form. All the tools aim for the same goal but can be used in various ways as every child is unique and learns in different ways.

The pens in the simplest form have short sentences embossed on them that give tips and hints on how to deal with a situation that causes for example anxiety, or how to address an emotion. Furthermore, they could carry a national child and youth hotline number for easier reachability even in places without Internet access. The pens provide a great example of how the solutions could be transformed to fit each country's specific needs. Some developed countries might opt for more high-tech pens, where they utilize the RPM3D and NanoMeg technologies. The technology's sensors would be added to the pen at the part where the child holds the pen with their fingertips. The sensor would sense the child's feelings while writing or drawing. Emotion would be shown on a small indicator screen near the top of the pen, by a small emoticon globally known, such as a smiley face or a sad face. To add to the inclusivity of the items, all items could also be written in Braille, to cater to individuals with visual impairment.

The buildable Board Game includes the base and cue card boxes. The game is played at schools with teachers and classmates and also at home with the caretakers if the child chooses to. The game is designed to increase the sense of community and inclusiveness as well as increase interaction between the children. Cue cards include exercises on emotional awareness, both subjective as well as taking into consideration the feelings of others. Game and role-playing increases mental and social resilience. As learning about emotion awareness is a long-lasting process, expansion of the board game could be sent out every new school year or a more mature game could be introduced at a certain age.

Similarly, the card game was made as a cooperative educational game. The game is intended to teach different emotions to the kids through card collecting. Each pupil would have a starting deck that contains basic random cards about the emotions or feelings. To gain more cards, the learner would need to discuss with other classmates, and teachers or trade the cards. The complexity of the deck would increase every school year. Add-ons can be introduced once or twice a year, together with special cards during national holidays or celebrations, such as Christmas or International Children's day.

When using Emotion Wheel and Taggies, users get to define themselves what emotion each color symbolizes. There is a list of emotions, and the user connects each color to one emotion, for example, red to happiness, and purple to sadness. As mentioned before, the beauty of this kit lies in its scalability as there is a simple and high-tech version of each product. Here it means that a simple version of the Emotion Wheel and the Taggies can even have Do-It-Yourself versions: users get to build their product out of the parts included in the kit. The manual gives instructions on how the tools can be used to present the user's feelings. There can be a scale of how strong certain feelings are at the moment and the user chooses the color combination. In the high-tech version, the technology can show the results of the measurements that the sensors give and are shown in color combinations that the user has chosen. The producer could even create more complex versions applying brain activity imaging technology from the ATTRACT project (such as RPM3D). They could record the user's emotional statement to an emotion bank that could be used as a personal diary. By using machine learning, the devices can gather data for an individual's future mental health service needs as well as to benefit future health interventions. The Emotion wheel was aimed to create a routine for the kid by using it at the end of every day, while Taggies are portable devices that the child can carry everywhere and gradually become a habit.

While some of the team concentrated on prototyping, others worked on the posters and video editing. These were great tools to demonstrate the team's ideas and prototype to the public. We wanted to ensure that the poster evoked emotions. For that reason, we started by creating a short description text that was paired with atmospheric photographs of children. To cover a wider range of moods, we decided to make a campaign and use two posters instead of one, thus being able to use images with different

moods. Pictures of the prototype were also included on the poster to showcase the content of the solution but in a relatively smaller size (figure 13). For the teaser video, a few storyboards were made to mutually discuss how the script would explain the problem, purpose, and solution. After a couple of rounds, we came up with the best possible script. We utilized royalty-free video footage and music alongside our own video clips. One and a half minute video was made that acted not only as a teaser but also as a summary for our project.

Figure 13: In the posters, we aimed to showcase the content as well as to reach the reader on an emotional level.

4.3   Impact

The mental health and well-being of people are rapidly decreasing. According to The Lancet Commission report (2018), we're facing a mental health crisis that could cost us 16 trillion dollars by 2030. Mental Awareness Kit has the potential to decrease this number significantly, thus saving governments money despite being distributed to children with no cost. We could increase well-being and happiness by teaching people tools to cope in the current world – and to build a better one while at it.

In his article Our World in Data, Max Roser (2021) calculates that there are 787 million children of primary school age around the world (figure 14). Our prototype has the potential to reach all those

children, along with their families and teachers. By implementing EAK in the current education system worldwide, our solution could eventually reach and benefit every person on Earth.

The toolkit could be piloted for example in Finland, where similar government-provided solutions such as the maternity package are already in use and proudly praised. At the first stage, the kit could be distributed to a pilot group, whose emotional skills could then be tested and compared to a control group. If the results would be as remarkable as we expect, the kit could be improved and then imported into a national-level implementation, thus reaching 60 000 school starters along with their families and teachers annually. From there, the kit could be further developed to suit the needs of different governmental systems, areas, and cultures, by partnering with different organizations and iterating the contents with different stakeholders. Figure 15 below illustrates the initial plan to implement EAK.

FIRST STEPS TO GET THERE

2022
including & interviewing stakeholders (kids, caretakers, early education teachers...)

developing & testing the prototype

2023
pilot the kit within a limited area in Finland

test the results and compare them to the contorl group

iterate the content

2023-25
turn it into a national program in Finland

collaboration with WHO

2025-2027
expand to the Nordic countries

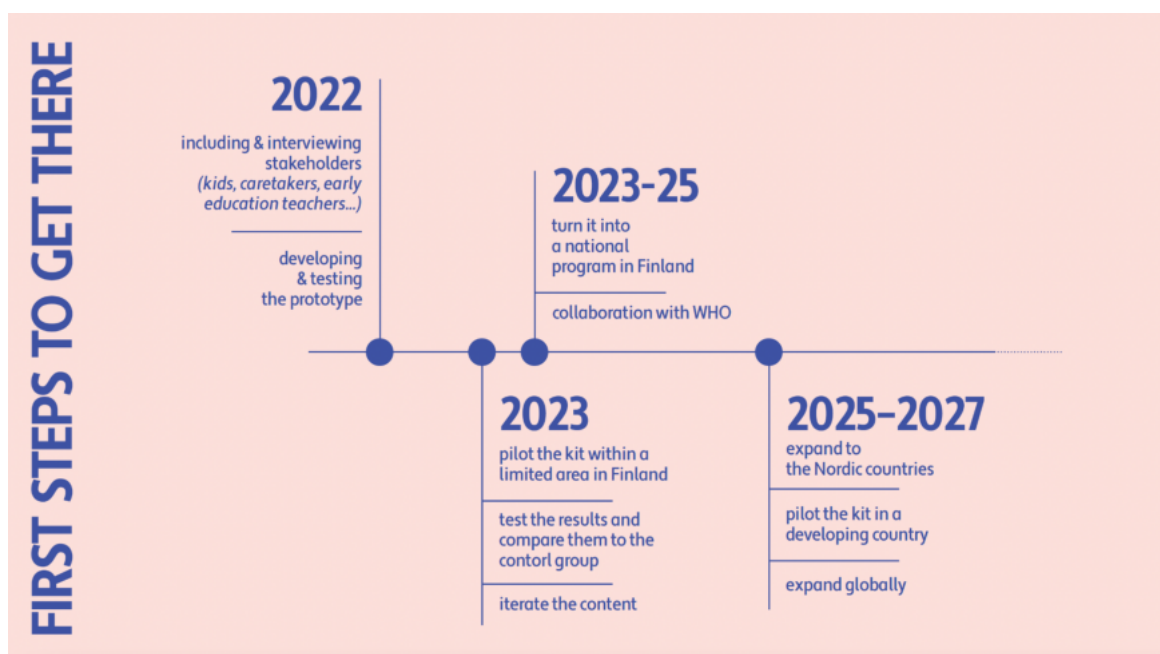pilot the kit in a developing country

expand globally

Figure 15: Possible roadmap

The great thing about our solution is its scalability. Our prototype is aimed at kids of age six or seven, but the kit can be developed further to reach different user groups in an inclusive and culturally sensitive manner. While advanced technology can be used to further boost the learning capabilities, track and monitor emotions, and collect data, the simpler solutions ensure that the kit can be produced at low cost and used anywhere, regardless of access to the internet or even electricity.

Depending on the context, suitable and sustainable partners can be identified to support the implementation. In developing countries, global health-related organizations such as the UN, the WHO, and the Red Cross movement could support the introduction of the kit into more vulnerable

communities. With some iteration, the kit could for example be used at refugee camps when offering psychosocial support to children suffering from traumatic experiences.

5   Conclusion and Reflection

The CERN Bootcamp project has been a great opportunity for us to learn and practice service design thinking methodically and systematically. Students from different universities and programs gathered at the IdeaSquare to work together through the steps described in the Sprint book, and to test service design tools in practice. Although the experiences we had from theory to reality did not completely coincide, we found them to be valuable. In addition, the trip to CERN was an opportunity for the group to have an access to the cutting edge of science, specifically quantum physics. Time spent discovering and working on ATTRACT projects has inspired us a lot to believe that science and technology, if used properly, will improve the lives of humankind to an incredible extent.

Figure 16: SDG3 team photo at Idea Square entrance

In addition to the professional knowledge our whole team has achieved in CERN, our soft skills related to teamwork have improved. Some members were introduced to new work support tools, and others learned more about public presentation skills and team leadership skills. Overcoming the obstacles of time constraints, different knowledge bases, and cultural differences, our team achieved the ultimate goal of finding workable innovative solutions to the group's common challenge with intense focus. Each member of the group has made an equal contribution. Due to the experiences gained from this course, we understand more about our responsibility to society: building a healthy, safe, and sustainable living environment for humankind's present and future.

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