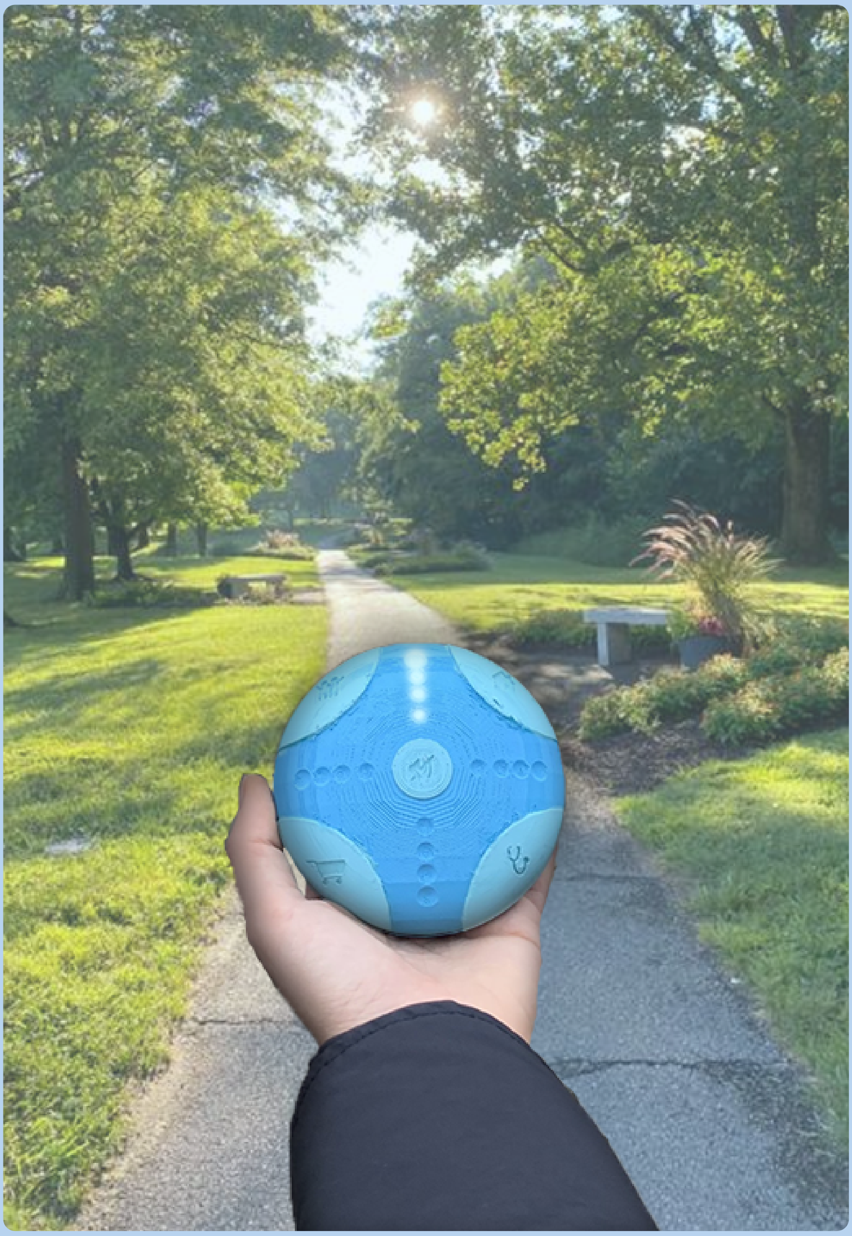
NAVI MATE



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health inclusive design

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Abstract

One of the difficulties people with dementia already face in the earlier stages of dementia is getting lost on their way to destinations. This results in wandering and feeling scared and dependent on other people. As people with dementia move from their home to the care home, this disorientation increases during the transition phase, because they need to adapt to a new environment.

This report outlines the creation of NaviMate, a navigation system that empowers people with dementia to find locations on their own, through lights, voices, and haptic feedback. Through this device, the team aims to highlight the following values: trust, worthiness, responsibility, and user-friendliness.

The device will be introduced to the user in the beginning stages of dementia, to familiarize them with the system. This way they are most likely to remember the functionality in later stages, to comfort them in their transition period.

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Introduction

This Project 2, the assigned design was brief in the Health squad: “Customer Journey and innovation opportunities to take the care home to the home”. The team focused on this customer journey of people with dementia, since they need to tackle different problems. The transition process from home to care home is a crucial moment in their life, since they need to adapt to a different environment. Living in a new location is confusing and people with dementia might forget where they are which results in wandering [12].

The team wants to make the transition process more comfortable. To aim this, the team focused on developing a product which people with dementia could be able to take with them from their home to the care home. Therefore, NaviMate is designed. NaviMate a navigation system that empowers people with dementia to find locations on their own, through lights, voices and haptic feedback.

NaviMate is made with the following values in mind: worthiness, responsibility, trust and user-friendliness. The team wants to highlight the importance that people with dementia need to trust NaviMate, feel responsible and worthy while using it, all in an user-friendly way. NaviMate fosters trust, by introducing people with dementia to its functionality during the early stages, allowing them to familiarize themselves with the product, when they are in the care home.

This report intends to provide clear and structural documentation of the creation of NaviMate. It shows the user-centered design process and the developmental journey of NaviMate. It encompasses the variety of all iterations, insights and conclusions involved.

Project Goal

People with dementia face many difficulties in their daily lives. A difficulty that can already occur in the earlier stages is losing the way to their home or other locations [11]. People with dementia often wander around, because they feel lost or don't know where they are. This results in feeling scared and dependent on other people [12].

Later on, people with dementia have to move out of their home to a care home. This is intense since they need to adapt to a new environment with different people. Living in a new location is confusing and they might forget where they are which results in wandering and walking away. In these cases, it is hard for people with dementia to find their way back to the care home since this is something from their short-term memory. This resulted in the following goal statement:

"Our goal is to empower people with dementia to find their way to locations independently and reduce the feeling of being lost."

Moreover, the team wants to make a product that they can adapt to in earlier stages of dementia so they are most likely to remember it in later stages.

Within the topic of dementia, the team wanted to empower people with dementia and make them feel worthy and independent. This to make sure the people feel responsible by finding the way on their own instead of having to ask people for help. In addition, the team shared another value which is user-friendliness.

Finally, personal goals are discussed within the team. The team talked about our professional identity and vision as designers and what the team wanted to achieve within the project. The team is very user-centered and wants to incorporate potential users and experts throughout the entire project. Furthermore, doing user research such as interviews and field studies makes sure the product fits the needs and values of our target group.

Design Process

Figure 1 Visualization of TRDP

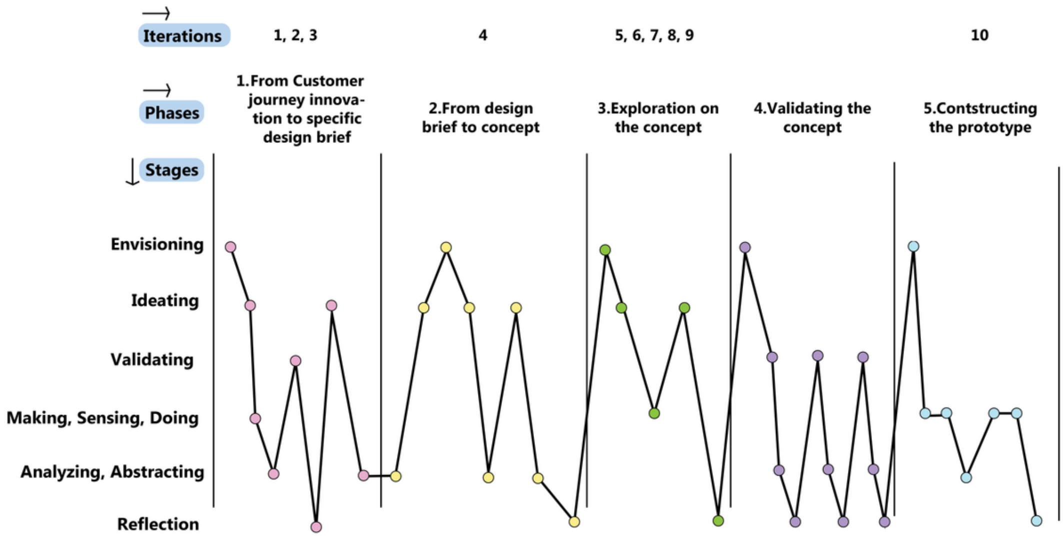


Figure 2 Visualization of TRDP during different phases and iterations

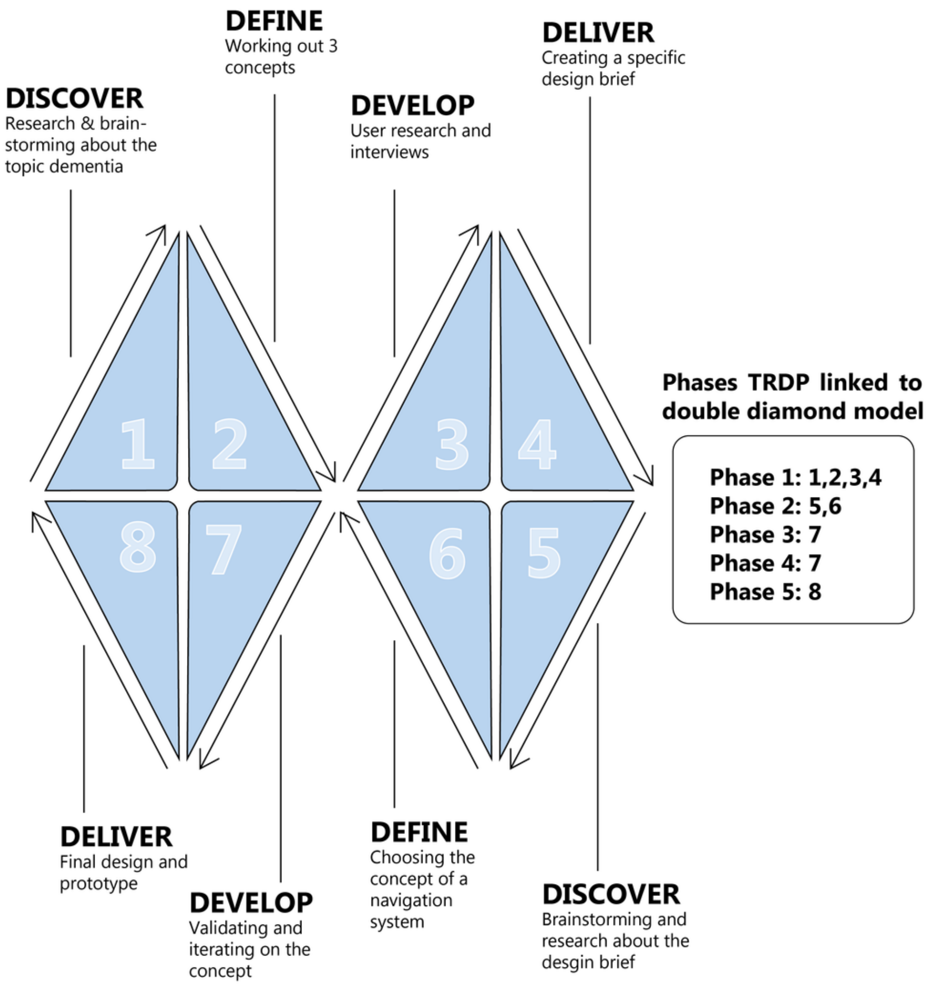


Figure 3 Visualization of Double Diamond and connection with TRDP

During the project the Reflective Transformative Design Process was followed. *Figure 1* shows the global overview of this design process and *Figure 2* shows how the different phases and iterations of the design process came back throughout the project.

Moreover, the double diamond model was followed twice, as can be seen in *Figure 3* Therefore, the process was an interwoven representation of both models, the connection of those is shown in *Figure 3*.

During the process the following iterations were made:

1. Including family voices
2. Defining the project’s goal within the transition period
3. Deciding on the final design goal
4. From a technical to a simplistic design
5. From pointing to one direction to four LED strips
6. Adding haptic feedback
7. From a single button with text, to four replaceable buttons with symbols
8. From light to a button for voice
9. The size of the product
10. From concept to prototype

Iterations

Including family voices

From the beginning of the project, the team highlighted the importance of making a product that is user-friendly, familiar, and comfortable to use for people with dementia. The team researched implementing family voices in the final concept to achieve this.

Implementing the family voices helps people with dementia feel less alone and makes them feel more confident and comfortable. Feeling accompanied and connected with family members is one of the most important factors in reducing anxiety for individuals with dementia [15].
During the pressure cooker, the team implemented family voices into the routine planner map, see *Appendix B*. Besides, two out of three concepts at the midterm of the project contained a communication function, see *Appendix C*. Feedback of the pressure cooker and midterm demoday showed the importance of implementing family voices to improve the comfort level and trust of the product. Moreover, participant 1 mentioned: "Adding the family voices is important. It will help the people with dementia to trust the device and to find the location easier."

In the final concept the team implemented family voices as extra guidance support. When pressing on one of the locations buttons the voice of a family member automatically switches on. The voice introduces itself, by saying its name and its relation to the person with dementia. Moreover, the voice kindly suggests in what way the person with dementia should go, so it is less cognitive demanding [7]. The voice can be muted with the button in the center of the device.

Iterations

Defining the project's goal within the transition period

For stating the project's objective, it was important to choose on which phase of the transition period, of people with dementia, the team wanted to focus on.

The team started off with contacting the organization 'Precies!'. This organization has various projects related to the transition from living at home to moving to a care facility, focusing on the elderly and individuals with dementia. The team had a meeting with 'Precies!' and got insights on how to approach the project. One key piece of advice was to create a customer journey map, outlining crucial moments during the transition phase for individuals with dementia.

Before using this method, the team developed a persona, to gain a better understanding of the user, exploring their behavior, preferences, and needs. Moreover, the persona helped to prevent misunderstanding within the team, since it served as a reference point when communicating about the target audience. See *Figure 4* for the persona.
The customer journey map, see *Figure 5* , sheds light on the crucial moments in the transition phase. However, the team decided that focusing on one moment in this phase would not make the transition period more comfortable. This ensures solving one problem at that time, but not long-term. Consequently, the team focused on making a product that people with dementia can adapt to in the early phase, allowing them to carry it into the care home. All to ensure that they can familiarize themselves with the product at a later stage, aiming for more comfort during the transition phase. Throughout the transition period, the individuals can acclimate to the product, fostering a sense of trust in the device.

Employing these user-centered approaches clarified the team's intention of wanting to make a device which people with dementia can familiarize themselves to in the early phase. Allowing them to take it with them to the care home, ensuring that they can still benefit from the product.

Persona: Henk

Henk is 74 years old and has a partner named Maria. They live together in an apartment for almost 50 years. However, Henk has been diagnosed with dementia. Henk likes to have social contact, but he recognizes that this contact is lacking when the dementia gets worse. Maria helped him to go to social activities and kept Henk active in the way he could.
Since the moment Maria passed away, Henk is very demotivated and stays at home more often. This results in less social contact.
Since his wife passed away, he needs more care from other family members. Eventually the moment came that the informal care is not enough for Henk. The family feels like Henk needs more care then Henk recognizes. During the regular check-ups the hospital also sees the dementia is getting worse. Henk falls in the bathroom, and is admitted in the hospital for his injuries. This was the moment the hospital recognizes Henk needs to go to a care home.
However, family members feel like they have failed doing their job and Henk is very in denial. Therefore, this process is very hard for both parties.
When Henk went to the care home he had a hard time adjusting to his new home and to live with the other people. Henk has some confusion about why he is in the care home and forgets where he is. His symptoms are getting worse and he is in the last stage of dementia, so communicating becomes very difficult for him and he has difficulties with expressing his emotions.
Unfortunately, Henk passes away at the age of 84 in the care home, due to the severity of his symtoms.

Figure 4 Persona of Henk [10]

Customer Journey Map

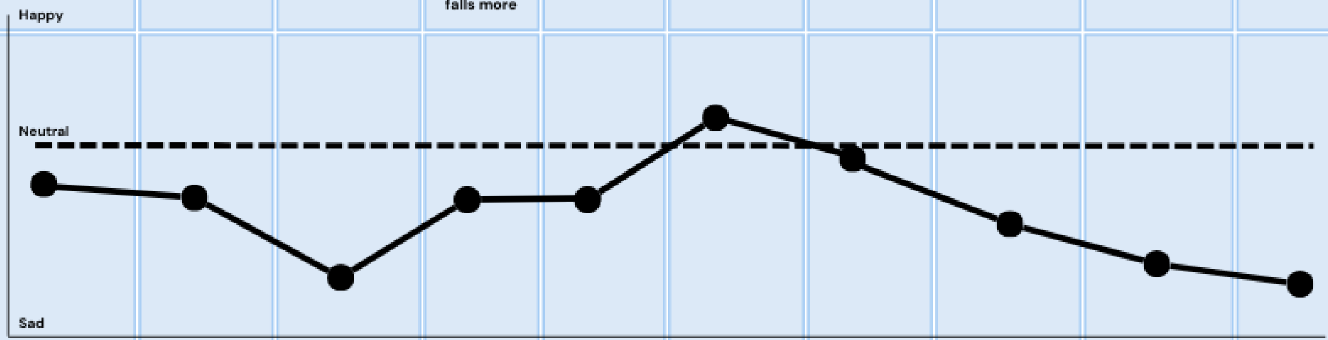
	Getting diagnosed with dementia	Short term memory loss	Partner dies	Person lives alone	Admission to hospital	Choosing a nursery home	Preparing to move to a nursery home	Going to the nursery home	Last stage of dementia: more symptoms and infections	Person dies
Products and services		Pill dispenser	Complimenten -spel	Tinybot Tessa	The future of Geriatric Rehabilitatio n	Precies! Project 8 – STERK samen beslissen		VITA pillow		-
Location	Home	Home	Home	Home	Hospital	Home	Home	Nursery home	Nursery home	Nursery home
Emotions	Stressed, unhappy, frustrated	Frustrated, confused	Disappointed, sadness, frustrated, hopeless	Lonely, worried, confused	Confused, terrified	He does not want to leave his home. He feels like he is feeling left out, while making decisions	Afraid, feels forced to move out	Overwhelmed, fear, confusion, social anxiety (is not used to this much contact anymore), relief (since he now gets more care)	Feeling useless, confused, hopeless	-
Stakeholders	Family members Hospital: doctor	Family members Informal caregiver	Family members	Informal caregiver	Doctor	Informal caregiver Family members	Informal caregiver Family members	Informal caregiver Formal caregiver Family members Residents of nursery home	Formal caregivers	Family members
Pains	The realization	Daily tasks become harder	Gets less help with daily tasks	More and more struggles with taking care of himself: forgetting stuff, cooking, falls more	Having to leave his home. Realization that the dementia is becoming worse	Family does not know were to look for the right information. What is the best for them?	Having to let go on personal stuff. Don't know what to take with them	Has a hard time adjusting to this much social contacts, misses his home	More difficulties with communicating and mobility	-
Moodmeter										

Figure 5 Customer Journey Map

Iterations

Deciding on the final design goal

The team is going to focus on making a product that people with dementia can adapt to in the early phase, allowing them to carry it into the care home. To narrow this down, a specific design goal had to be formulated.

A user-centered design approach was taken to achieve this goal. First of all, the team visited the care farm Grootenhout. On this field trip, two team members went on a walk with two people with dementia. The caretaker mentioned that they walked every day to the horses. However, they could not remember how to get there, while it was only a one-minute walk. During this walk, they were only on the grounds of the care farm. After a few minutes of walking both persons with dementia did not know the way back to their building. Other insights from the field trip can be found in *Appendix D*.

Moreover, interviews were conducted with (in)formal caregivers. During the interview Participant 1 said: “I think one of the biggest problems is people with dementia having difficulties with wayfinding. They walk away from the building and don't know the way back. In these situations, we must go on the bike to find them.”. Participant 2 mentioned: “One of the first things I noticed when my father got dementia was that he struggled with wayfinding. He got lost on his daily walks. After moving to the care home his disorientation increased since he needed to adapt to a new environment.” Moreover, the field trip and interviews with participants 3, 4, and 5 showed the importance of empowering people with dementia to be independent and give them a feeling of responsibility. The team wants to combine this with the problems regarding wayfinding. See *Appendix E* for more insights.

After the user research, the team found that wayfinding was a big problem for people with dementia. Benchmark analysis was done to see what already existed. The team found that there are already compass systems for people with dementia, however there are still possibilities for improvement [2]. Therefore, the team decided on the following design goal: empowering people with dementia to find their way to locations independently and reduce the feeling of being lost.

Iterations

From a technical and complex design to a simplistic design.

After the final project goal was stated, the team started brainstorming for possible design solutions. From these brainstorming sessions, an initial concept was created. However, this concept contained complex technologies. Feedback sessions and more brainstorming were needed to make this design more simplistic.

The initial concept was a smart compass device that contained Augmented Reality (AR), see *Figure 6* AR makes wayfinding easier since the device shows the users' view and the route via arrows. Besides, the family voice was added as an extra tool. After talking with students and coaches the conclusion was made that using AR would be too hard for people with dementia. Besides, a study found that most people with dementia need assistance while interacting with AR [4]. The team wants to make a product that they can use without help so this would not be a great fit.

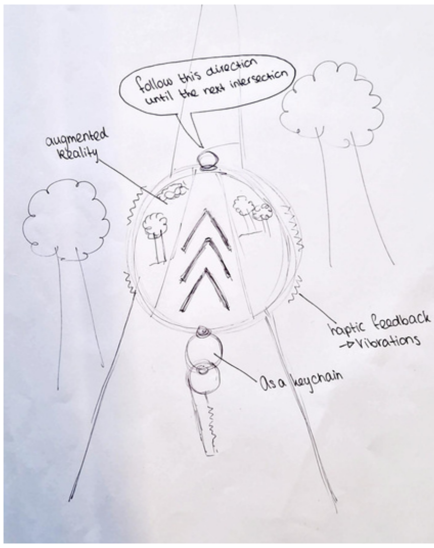


Figure 6 Design with Augmented Reality

Through brainstorming, a new concept was made that is less technical and complex. The new design shows the route via four LED strips that all represent a direction, with family voices as extra guidance, see *Figure 7*. There is no ON or OFF switch so there are fewer actions required to use the product. This makes the product more user-friendly for people with dementia [6].

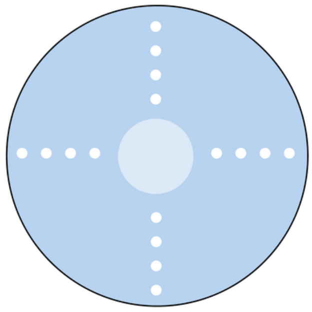


Figure 7 Design with LEDs

The team became more aware of how simplistic designs should be for people with dementia. In the end, a new improved design was created which guides people with dementia via lights and instructions of family voices.

Iterations

From pointing to one direction to four LED strips

There are studies about designing tools that help people with dementia with wayfinding, which were analyzed by the team.

Research on navigation systems for people with dementia mentioned that users found navigating "as-the-crow-flies" difficult, and it was rated as more mentally demanding [7]. Also, it mentioned that it was hard to know whether a route was safe.
Moreover, another study about a compass device for people with dementia found that the users got confused now and then [2]. These moments occurred at places where the choice of direction was not obvious. For example, standing at a T-junction while the device points straight ahead. Therefore, a typical compass system would not be a great fit and turn-by-turn navigation would be less cognitively demanding.

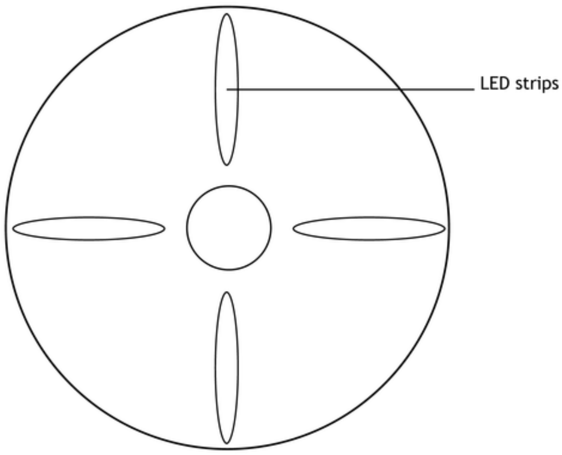


Figure 8 Device with LED strips in 4 directions

Based on this research it was decided to use turn-by-turn navigation in a simple way. The team came up with a concept that consisted of four lines with lights (each in a different direction: North, East, West, South) as shown in *Figure 8* The direction that the user has to follow will light up. The navigation system knows the exact route and will thus follow the streets, unlike the existing compass devices. With this system, the design will keep its simplicity and be less cognitively demanding.

Adding haptic feedback through vibrations

The team wanted to implement a feedback method to trigger an extra sense, next to sight and hearing. When multiple senses are engaged the likely hood of someone remembering it will increase. An extra sense of feedback would remind the individual to check NaviMate during a walk [9].
The team decided on using touch as an extra sense. The device will vibrate to let the user know they need to make a turn. This way the user will not have to check NaviMate the whole time, which increases the safety of the individuals [7].

Iterations

From a single button with text, to four replaceable buttons with symbols

The initial concept of NaviMate was to guide people with dementia back home. However, they also face challenges while going to other destinations. Therefore, adjustments were necessary in refining the different locations and determining how to add them on the device.

The first idea involved a single button that leads to ‘home’, presented with text, see *Figure 9*. By evaluating the design’s purpose, the need for usability during the transition period of people with dementia became apparent. To make sure the individuals will use the device in an early stage of dementia and facilitate familiarity with the product in a later stage, in the care home, the team expanded the device’s functionality by incorporating more locations. This allows users to utilize the device for various purposes, such as navigating to the grocery store.

In addition, text was an option as a way of presenting the destinations. However, when naming a specific store like ‘Jumbo’ it might not resonate with everyone. The team explored the use of symbols since this offers a more understandable approach, see *Figure 10*, and it solves the problem that language matters when using text, as said by participant 3 in the interview.

Lastly, keeping the users’ preferences in mind, the team decided to add an app where caregivers can modify the addresses, so it can also be changed when moving to a care home.

After evaluating, the following locations are presented by symbols: home, grocery store, general practice, and a friend’s house. These are chosen since they are the most common places people go to.

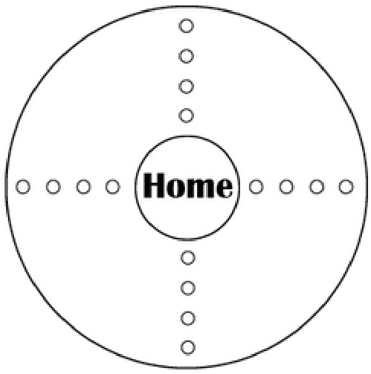


Figure 9 Design with one button with text

Figure 10 Design with four locations and symbols

Iterations

__From light in the middle to a button for voice__

When designing the final prototype, the team had to decide whether the center 'button' should be a light or a mute button for the voice.

At first the team thought of making a light in the center of NaviMate that lights up when arriving at the destination. The team did not decide to include this function, but to add a button for (de)activating the voices. This decision was made because users will not always need the extra support of family voices in the beginning of dementia. In later stages the family voices are more helpful, but the user might not always remember to turn on these voices. Therefore, the family voice will automatically go on when clicking on a destination button. The center button is used for muting the voice, see *Figure 11* By pressing the button again, the voice will go on.

Figure 11 Design with the mute button

Iterations

<u>**The size of the product**</u>

During the prototyping phase of the project, considerations revolved around determining the optimal size for NaviMate.

In determining the size, two factors were important to keep in mind; prioritizing user-friendliness and accommodating the size of the electronics. The functions on the device needed to be clear and readable. Therefore, the size of the product should not be too small. When shrinking the device, less lights can fit in there, which potentially hinders the goal of effective wayfinding.
However, the device cannot be too big either, considering users needed to hold and carry it while walking. To explore suitable dimensions, the team made 3D prints to see how different dimensions look and feel in hand. The first attempt, featuring a 10 cm diameter, shown in *Figure 12* , showed user dissatisfaction while user testing, since the device was not able to fit in their pocket, see *Appendix F* . User testing from another study of wayfinding also showed that people preferred the product being smaller than 10 cm [2].

Figure 12 The two different sizes of 10 cm and 6 cm diameter

Subsequently, a smaller design was printed. This time with a diameter of 6 cm, shown in *Figure 12*. However, this prototype was too small, since this led to the symbols being unclear on the device.

Since the designs the team made were not the optimal sizes, a future decision should aim for a dimension between 6 and 10 cm. This ensures a balance where the device remains clear for the user, fits comfortably in the hand and accommodates all electronics.

Iterations

From concept to prototype

3D model
The main body of the prototype was predefined as a spheroid, a sphere with the axis compressed. This shape allows for the electronics to be hosted more securely, due to the flatter surface, compared to a sphere, and provides a suitable surface for external buttons.

After planning the configuration of the buttons and functions of each individual button, a 3D model of each button component was created. To develop an aesthetic prototype, the shape of the button was manipulated into a unique curved fold which wrapped around the corners of the front of the device. Next, the symbol of each location and the central mute button was engraved into buttons. Shown in *Figure 13* below.

Creating the dents for the LEDs to shine through was a strategic decision since it reduced the thickness of the material at the points where the LEDs were attached, allowing the light to shine through brighter than from the surrounding area. Additionally, holes were added on the backside where the speakers were planned to be mounted.

The overall thickness of 3D model's walls was designed to allow the parts of the device which had buttons underneath to be more flexible and hence easily pressable. This was also done for the central button. This resulted in a symmetrical thickness distribution across the device, which while being a complex shape was easy to 3D print, see *Figure 13*. The 3D print texture increased traction, improving the overall grip. This was initially not anticipated, however due to its benefits it was adapted into the prototype.

Figure 13 Button components & shell thickness of the prototype 3D model

NAVI MATE

Iterations

Spray-painting the prototype

Discussions and research have been done to determine the preferred color for the 3D-printed prototype and the method used.

Research showed that the color blue represents trust, loyalty and confidence. Light blue is associated with health, healing and softness [1]. The team has chosen to stick to a blue theme, since these reasons fit within the team's values.

Since the 3D-print is from TPU the team had to consider how to color it. A wide range of paints will stick to TPU, if the correct primer or adhesion promoter is used, this includes the following paint types:

- Latex based house paints
- Acrylics
- Solvent based aerosol paints (aka hardware store spray paint)
- Enamels
- Automotive Paints [3]

Spray-painting was chosen because of its benefits such as efficiency, speed, versatility, smooth finish and customization [8], see *Figure 14*.

Figure 14 Spray-paint colors on the 3D-print

Iterations

Charging
Since the navigation system runs on a battery some charging system needs to be added.

One thing to keep in mind is that the system needs to be simple and convenient for people with dementia. Furthermore, questions were raised as “Does the person with dementia need to charge the device on their own?” and “Do they get reminded when it needs to be charged?” by participants 1 and 3. To combine those two aspects the team came up with a wireless charging system. The charger functions as a holder and automatically starts charging. This way, the chance of the person with dementia forgetting to charge the device will decrease. The charger should be placed in a logical space in their house, such as next to their keys or close to the front door, so they are less likely to forget the device when going on a walk. Eventually the function of a notification, on the app of the informal caregiver, was added to let them know if the device is almost empty. This way, they know the user forgot to charge it and they can remind the user.

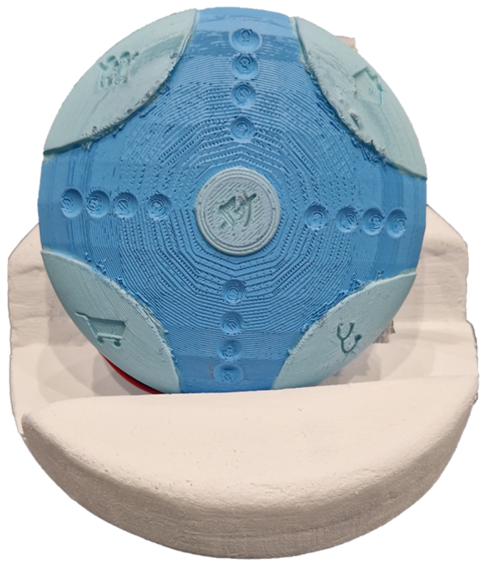


Figure 15 Prototype of charging system

For the prototype of this charging system, no electronics have been used. The prototype has been made from foam, see *Figure 15*.

App
Next to the physical prototype, an app was made for the informal caregiver via Figma, see *Figure 16*. In the app, the caregiver can see the exact location of the device. This can be useful in case the person with dementia cannot find the way to their location independently. Besides, the (in)formal caregiver or other family members can add or change voice recordings. They have to read sentences out loud and AI will generate this. This way, NaviMate can say anything using the voice of the family member. Moreover, the caregiver can change the four locations of the product via the app. Lastly, the app contains a help desk with frequently asked questions and a live chat to answer other questions.

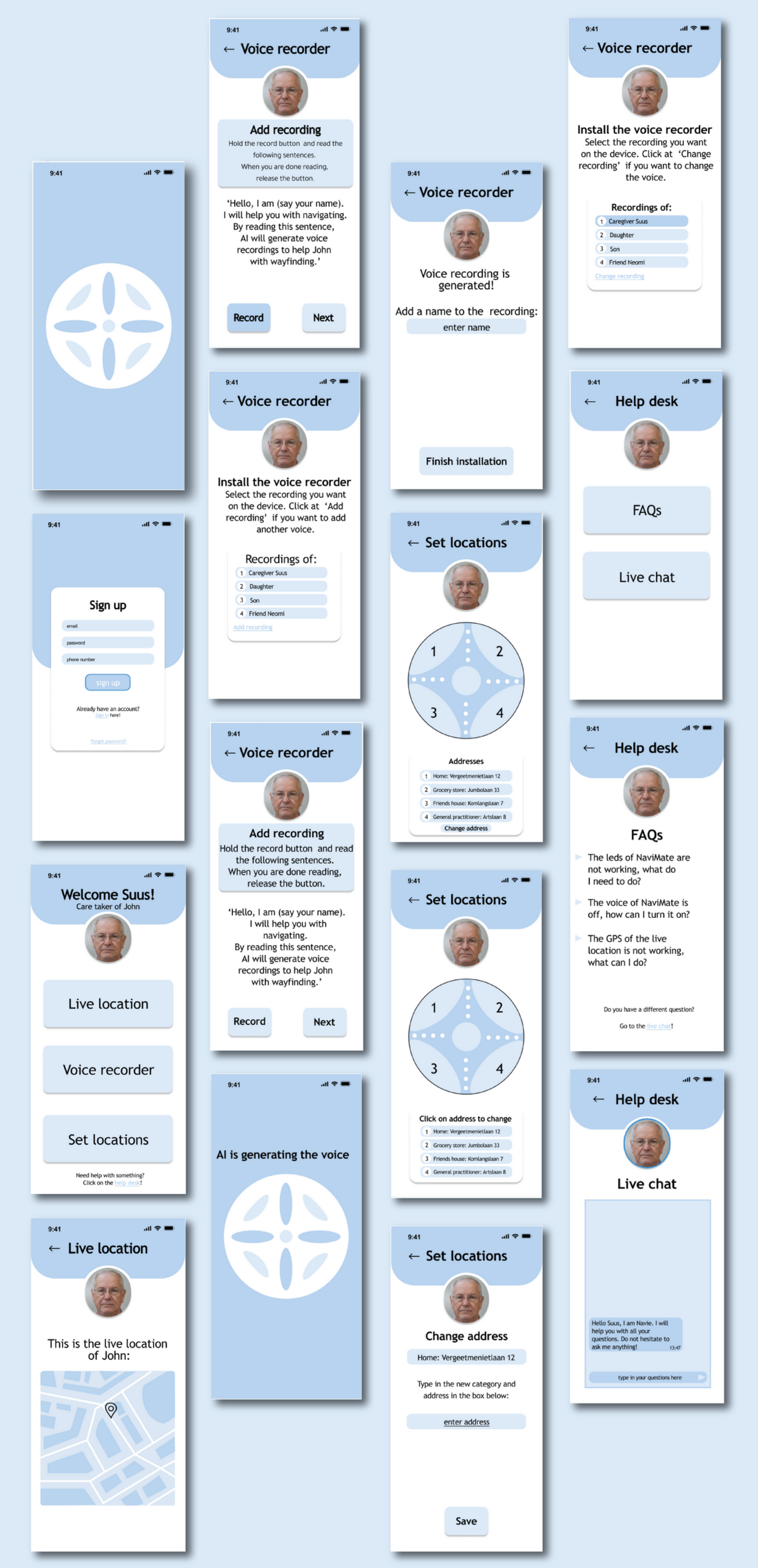


Figure 16 Overview of the app

Validating concept

User testing with relatives

After elaborating on the concept, the team created a prototype through 3D-printing, see *Figure 17*. This was used for user testing involving relatives but not people with dementia. The goal was to evaluate the understandability of different functions of the device, such as the light direction indicators and the buttons.

The team started off by giving the prototype to the participants and asking them to describe their interpretations of the device. Subsequently, the team provided additional information about the project; clarifying the design is intended for people with dementia and explained the relation between the buttons. After having some discussions with the participants about the prototype and the functions of it, the participant got the prototype and 'interacted' with it, by 'pressing' a button. The team then applied tape with dots on it, mimicking an imaginary light, representing the lighting directions, shown in *Figure 18*.

Observations were made and most people immediately walked in the direction of the lights. Further observations and details can be seen in *Appendix F*.

Figure 17 The 3D print which is used for user testing

Figure 18 User test with tape with dots to show the light of the device

Validating concept

User testing with person with dementia
The team did a Wizard of Oz user test with an individual with dementia. The goal was to find out if a person with dementia would know how to use the product with little explanation, and hence if the prototype had an intuivative design. Meanwhile, also seeing if the product is user-friendly as well as receiving feedback from the person.

The team gave the person with dementia NaviMate, without any explanation. Unfortunately, the prototype did not fully function. Only one line of LEDs worked, so the voices and haptic feedback were off, see *Figure 19*. The lights only worked when one of the teammates would connect the prototype to a power source. The participant did not understand the device with little information. Explanation of the whole device was needed to let the person understand its functions. When the participant understood it, she stepped in the direction the light was pointing in. The prototype's limited functionality might have led to the increased confusion. Due to the severity of the participant's dementia, using the prototype was much more difficult than anticipated. Ideally, at this stage of dementia, the participant would have adapted to using the device by using it from the early stages of dementia.

After observing the behavior of the participant, the team member and participant discussed some functions of the device. The participant thought combining the lights with family voices will make the guidance more understandable. Furthermore, the symbols were too small, and suggestions were made to use more contrast, so they stand out. Eventually, the participant thought it would be convenient if NaviMate is able to put onto a mobility scooter for when individuals are not that mobile anymore. For further insights, see *Appendix G*.

Figure 19 Team member holding NaviMate

Validating concept

Business Model Canvas

The business model canvas (BMC), shown in *Figure 20*, has been filled in to think about the future perspective of NaviMate. Besides, it helped in developing the product in more detail. The BMC gave the insight that it is most effective to target the (in)formal caregivers instead of people with dementia, because people with dementia often deny their memory loss in the early stages [13]. Logo's have been created for branding NaviMate, see *Appendix I.* for details.

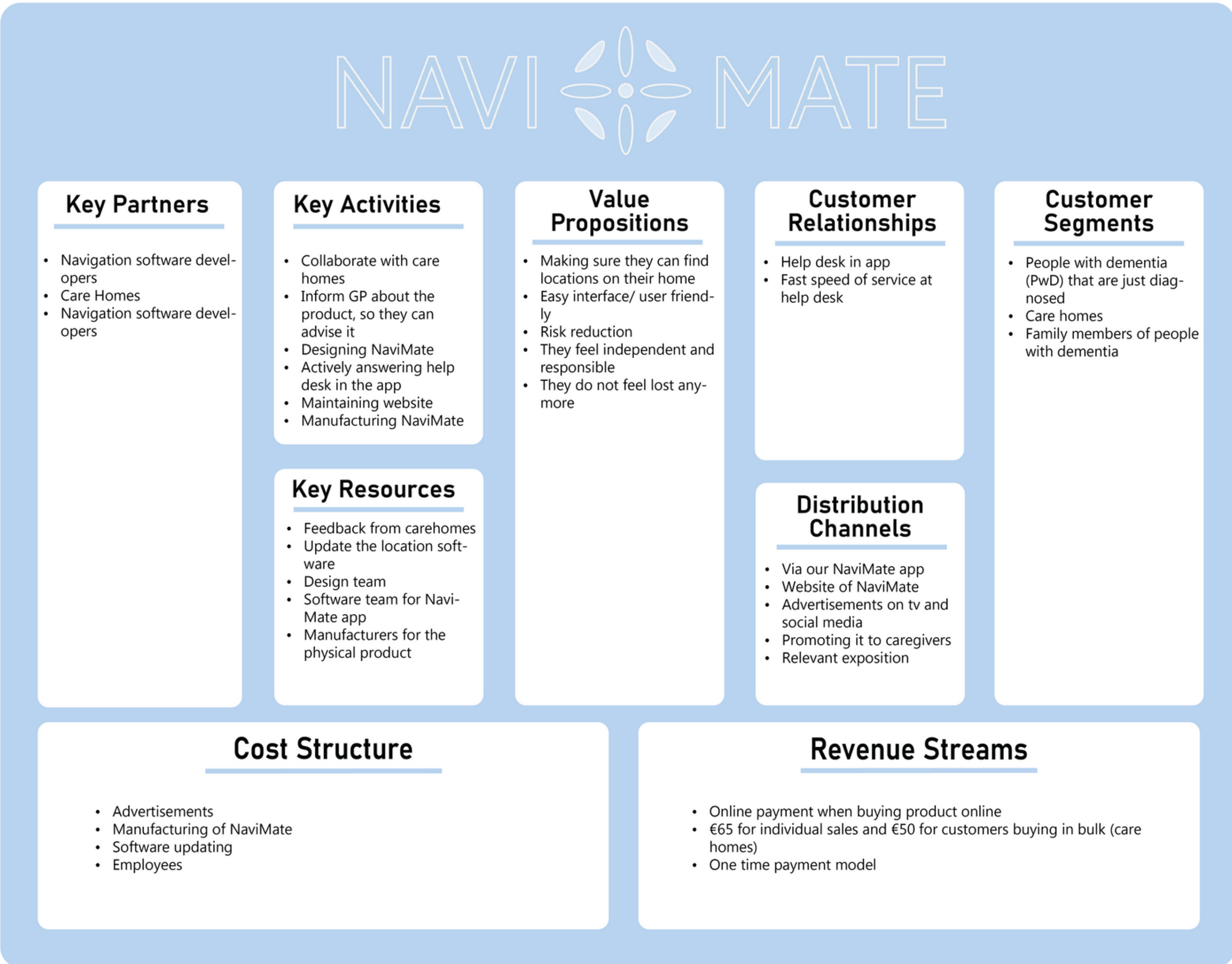


Figure 20 The business model canvas

Final Result

The final prototype consisted of electronic components soldered to a perfboard, an empty circuit board, running an elaborate Arduino code. The electronics included four sets of four LEDs, each set representing one of the direction indicators on our prototype. Additionally, there were also five buttons, two small speakers, two haptic feedback vibration motors, DF miniplayer (speaker controller), 3.7V li-po battery, solid core wires, 10k & 1k resistors, MPU6050 gyroscope and an Arduino nano microcontroller as the processor of the electronics.

The button modules were used as the location buttons and the mute button in the center. These were connected through the Arduino nano to the speakers, vibration motors and LED sets shown in *Figure 21*. Through the Arduino nano code, when a certain button was pressed, the designated actions were conducted by the circuit, when the home location button was pressed, a haptic feedback signal was triggered and the respective direction indicator turned on, along with a corresponding voice file. The LEDs were programmed in an animated manner, running in the direction indicated, maintaining the same pace, repeating for as long as necessary. The gyroscope allowed the device to understand and adapt its orientation so that when the device was rotated, the respective LED set would turn on to avoid misdirection. The device was powered using the internal battery and the Arduino nano was powered through an external power bank due to space constraints.

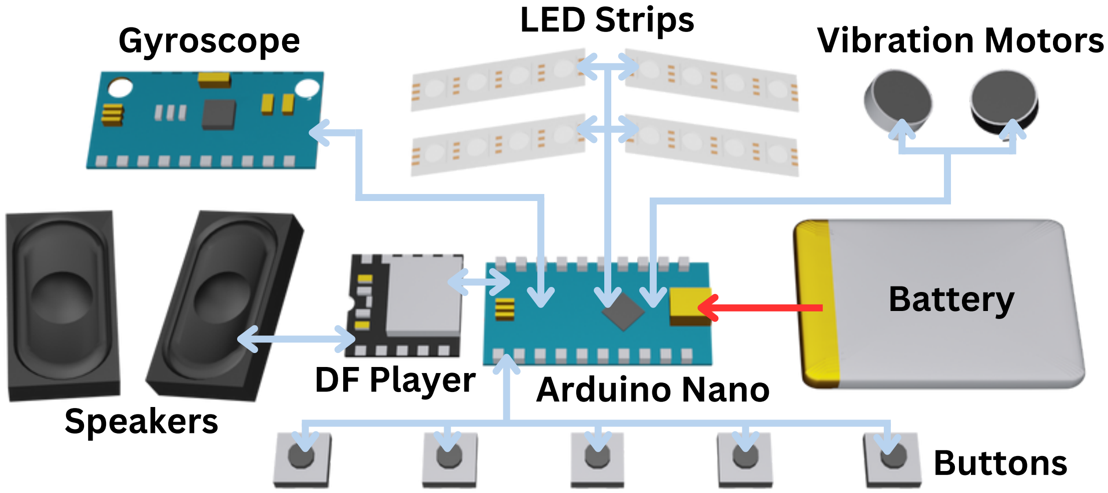


Figure 21 Simplified schematic of electronics and connections

The Arduino code defined all the electronics to a certain pin and then using if loops conducted a specified list of actions, a button loop, shown in *Figure 22*. For example, if the home location button was pressed, it would run the relevant voice file, turn on the respective LEDs and give a haptic feedback signal. The code also waited until the button was released so as to not startle the user by starting before the user is ready. The whole Arduino code is shown in *Appendix H*.

```
if (digitalRead(button1Pin) == LOW) {
  while (digitalRead(button1Pin) == LOW) {} // Wait for button release
  Serial.print("Button 1 Pressed");
  player.play(3); // Play chosen voice file
  haptic(motorPin); // Give a haptic feedback signal
  animateLEDSet(stripD9, button1Pin); // Turn on respective LED set
  delay(1000);  // Wait for a moment
  delay(500); // Debounce delay
}

if (digitalRead(button2Pin) == LOW) {
  while (digitalRead(button2Pin) == LOW) {} // Wait for button release
  Serial.print("Button 2 Pressed");
  player.play(2);
  haptic(motorPin);
  animateLEDSet(stripD10, button2Pin);
  delay(1000);  // Wait for a moment
  delay(500); // Debounce delay
}
```

Figure 22 Sample of code - button loop

Final Result

Persona:

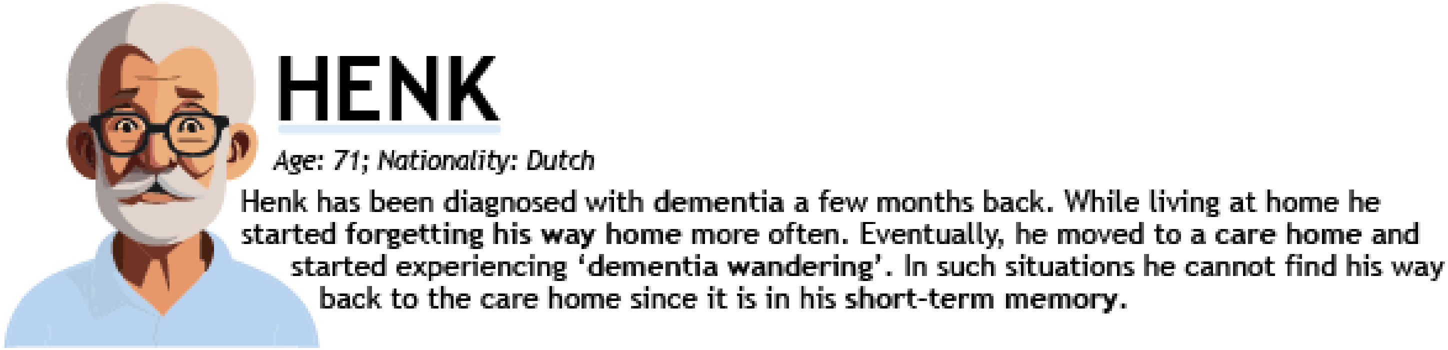


Figure 23 Persona Henk

Customer journey map:

The initial customer journey and persona shown in *Figures 23 and 24*, were improved on and after demoday. For demoday deliverables, see *Appendix J*. This customer journey map also contains the usage of NaviMate on the crucial moment in the life of Henk and the duration of those moments. This to get an even better understanding of the value of NaviMate at those moments.

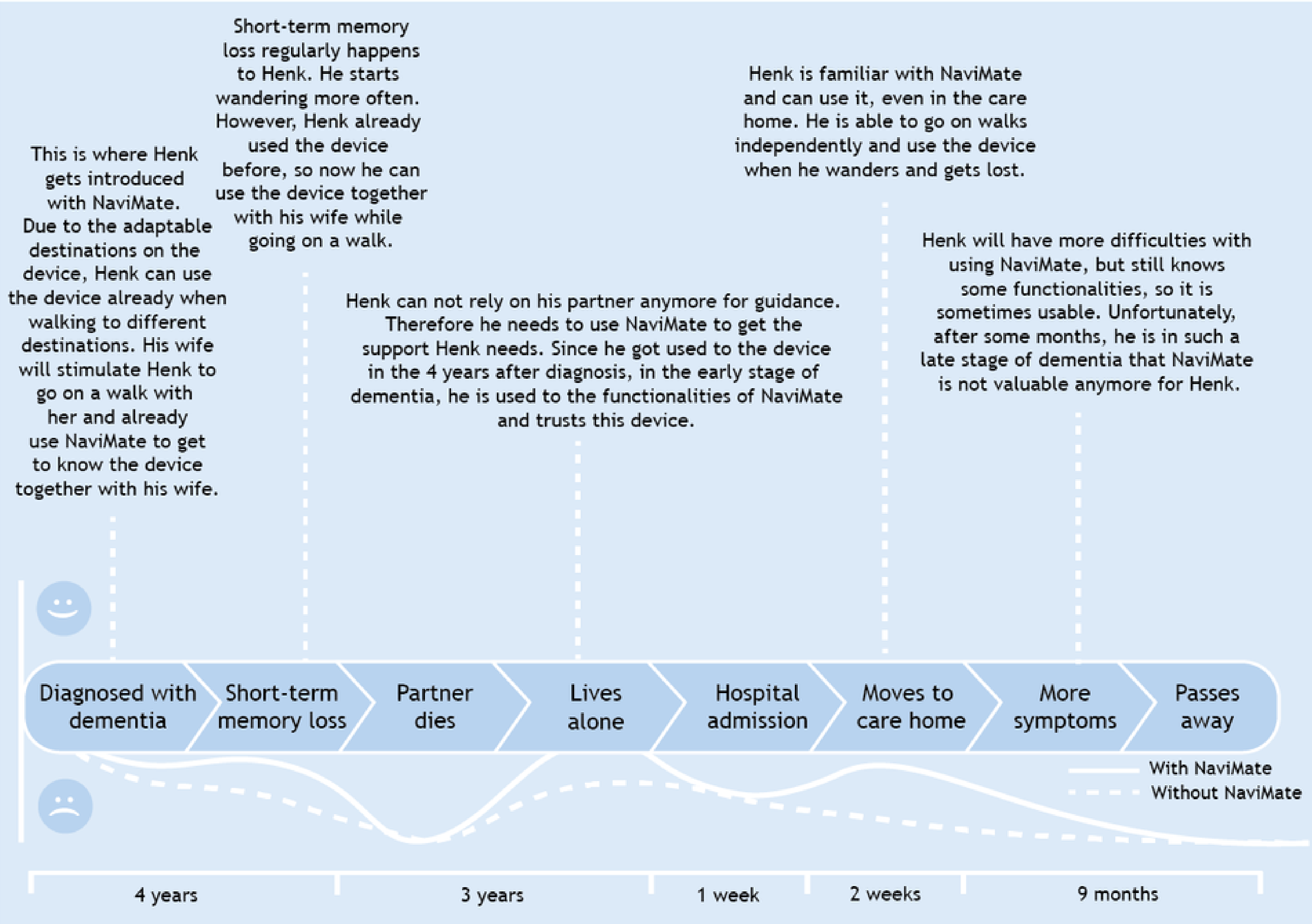


Figure 24 Customer Journey Map

Discussion & Future Plans

In the future, to solve Navimate's current limitation of guiding people to locations within a building, an Indoor Positioning System (IPS) will be added to the prototype. Adding this feature will benefit the transition phase even more, since wandering in care homes leads to malnutrition, resident-to-resident violent incidents and stress for caregivers [14]. A future rendition can also implement interchangeable buttons so after moving to the care home, the four location buttons can be changed to for example the care home itself, their room in the care home, the toilet etc. The users will benefit more from these interchangeable buttons since they are often not allowed to leave the care home on their own anymore [5].

During demoday, an expert who works closely with people with dementia highlighted that people could forget which voice belongs to whom and what that person looks like. Therefore, his feedback suggested adding a picture of the family member whose voice is used on the device. In the future, the center button that is used for muting the voice can contain a small screen that displays an image of the person who is talking as shown in *Figure 25*. The team wants to do more research and user tests to see whether this adds value to the device. Interviews and visitors on demoday questioned why NaviMate was not a wearable device. This is an interesting perspective on the device and hence will require future exploration. In the current prototype, this idea was not included since it could potentially lead the user to feel restricted and observed similar to an ankle monitor.

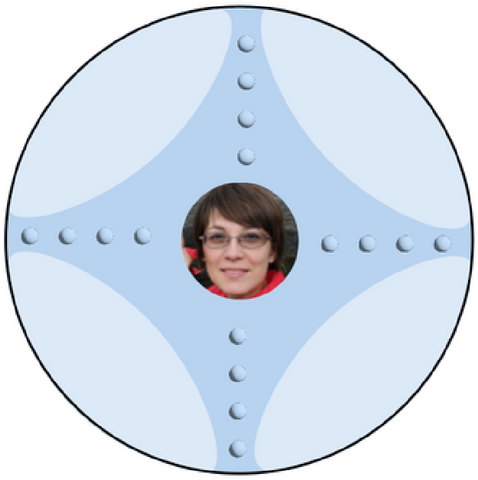


Figure 25 NaviMate with a picture of a family member [10]

Other feedback from demoday was that it could be an option to connect NaviMate via Bluetooth to either earphones or a hearing aid. This way the device becomes more user-friendly in crowded areas or for people who have difficulties with hearing. To add this feature, NaviMate should contain Bluetooth.

Conclusion

Shining light on the aforesaid, it can be argued that Navimate is an innovative solution to take the care home to the home, positively affecting the customer journey and improving the transition period to an extent. People with dementia are dependent on family and caregivers. By introducing NaviMate some independence is given back to individuals with dementia. Using a user-centered approach contributed largely to the development of the project as it allowed NaviMate to tackle challenges directly relevant to the target user, such as adapting the size of the device, better grip, larger icons etc.

The team tackled the challenge with a user-centered approach. By doing user testing and conducting interviews. Talking to experts and people that work closely with people with dementia, the team received a lot of insights and understanding in the subject of dementia.
The double diamond and the transformative reflective design process were used as design methodologies and guidance to develop the final concept. Despite the thorough development of NaviMate there are still aspects that have to be further explored, in the future the previously mentioned future plans can be researched. Implementing the device into reality will require elaborate discussions with industry experts and ensuring that the device passes various medical requirements, such as getting CE verified and approval from the EMA.

Overall, NaviMate takes the whole dementia customer journey into account to ease users’ stay in their own home, where they spend majority of their time after having dementia, and their transition phase into the care home.

Acknowledgements

First, we want to thank our coach Joost Liebregts, for giving insights during the project and for developing our PI&V.

Next, we want to thank the Health squad for the workshops given. Also, all coaches for giving feedback while working on the project. A special thanks to the coach Maarten Houben for his help and expertise.

We also thank the employees at Innovation Space and e-Lucid for giving advice.

Moreover, we thank Zorgboederij Grootenhout for their hospitality during our visit to their care home.

Besides, we thank everyone who participated in our interviews and user testing.

Lastly, we thank Precies! for their time and insights from their customer journey map.

Figure 26 The team at demoday

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Appendix

Content

Appendix A

Planning and organization of the project

Logbook	Date	What	Who
	08/Sep	Start of pressure cooker: empathize and define phase	
	13/Sep	Ideate, prototype and testing phase of the pressure cooker	
	15/Sep	Presenting pressure cooker idea, coach meeting, organize information	
	20/Sep	Making interview questions, ideation (switching papers with topics), make brief project description	
	22/Sep	Theme critic, and we filled in the ERB form for 2 experts	Neomi, Yash, Sanne
	27/Sep	Send ERB and informed consent form, communicating your concept workshop	
	02/Oct	Call Peter v Heesch and got information	

Figure A.1 First few rows of logbook table

Planning	Week	Tasks	Deadlines
	4-10 sep	Pressure cooker	
	11-17 sep	Finish pressure cooker. Contact experts, more research	Pressure cooker
	18- 24 sep	Ideating	Peer review PDP (20), Team Critic (22
	25-1 okt	Choosing concept and defining design, reflect on process	Workshop (27), Day off (29)
	2-8 okt	Work on prototype + ideating	Field trip (6)
	9-15 okt	Finalize work for demoday, report, pitch, posters etc. + meeting Precies	**Midterm Demoday (13)**
	16-22 okt	Reflect on midterm, ERB forms (interviews and co-creation), contact 4 people, start customer journey	Theme Critic (20)

Figure A.2 First few rows of planning table

Exercises	Date	Task	Who
Homework	20-09	Making a list with personal goals	Everyone
	27-09	More ideating, working out a concept, research about what is already made	Everyone
	23-09	Interview questions for Peter v Heesch and Colette de Vries	Everyone
	27-09	Research the files Maarten sent and ideate	Everyone
	02/Oct	Suus brings snack to meeting	Suus
	02/Oct	Ideate, Try to think of concepts at home. Understanding the problem	Everyone
	04/Oct	Yash (1+2), Neomi (3+4), Sanne (5+6), Suus (7+8), Everyone research process	

Figure A.3 First few rows of homework table

Reflectin	Date	Reflecting on work	Colum
	15/Sep	good: organizing information, time schedule helped with making decisions. More focus on user testing	
	20/Sep	take more breaks > more effective meetings, way of ideating worked well (paper go around the table)	
	22/Sep	we made a good overview of what and who we want to interview, which is great for structure. Think process wise, think also broader so not only daily tasks etc.	
	27/Sep	Prepare meeting before hand to have more effective meetings. divide tasks more often	
	02/Oct	It was a good decision to just make the call to Peter, since we now have a starting point again,	
	04/Oct	It was good that we made a to-do list at the start of the meeting, good ideation session, be a bit more specific during ideation, liked the open discussion about ideas	
	09/Oct	We learned to say no and follow our own expectations, we sticked to our opinion during the meeting with Precies. It does felt like we wasted time. We need to have a different mindset on this and see what we learned from the meeting.	

Figure A.4 First few rows of reflection table

Sanne	Suus	Neomi	Yash	Group
Gain confidence while presenting	Involving users/stakeholders through the whole pr	Conduct more user tests	Prototyping in high quality	Involving users
Get to know more about the ethics of designing in the health squad	Having a co-creation session	Become less passive, more active	Creating brand identities	Risks / Decision making
Learn to work with illustrator and create aesthetic poster > graphic de	Improve graphic design skills	Discovering/ get cofidence in what skills I have to contribute to a t	Professional results	Prototyping in high quality
Learn more about user testing, and designing with and for the user	Making a branding and aesthetics	Get out of comfort zone	More literature backed project	Professional result (substant
Learn to take risks and make decisions during the project	Learn 3d modelling	Learn more technical skills	Start physical work timely	
	Improve exploratory sketching skills			
	Decision-making / less perfectionism			
	Final prototype where the technical aspects work			

Figure A.5 First few rows of goals table

Appendix B

Pressure cooker

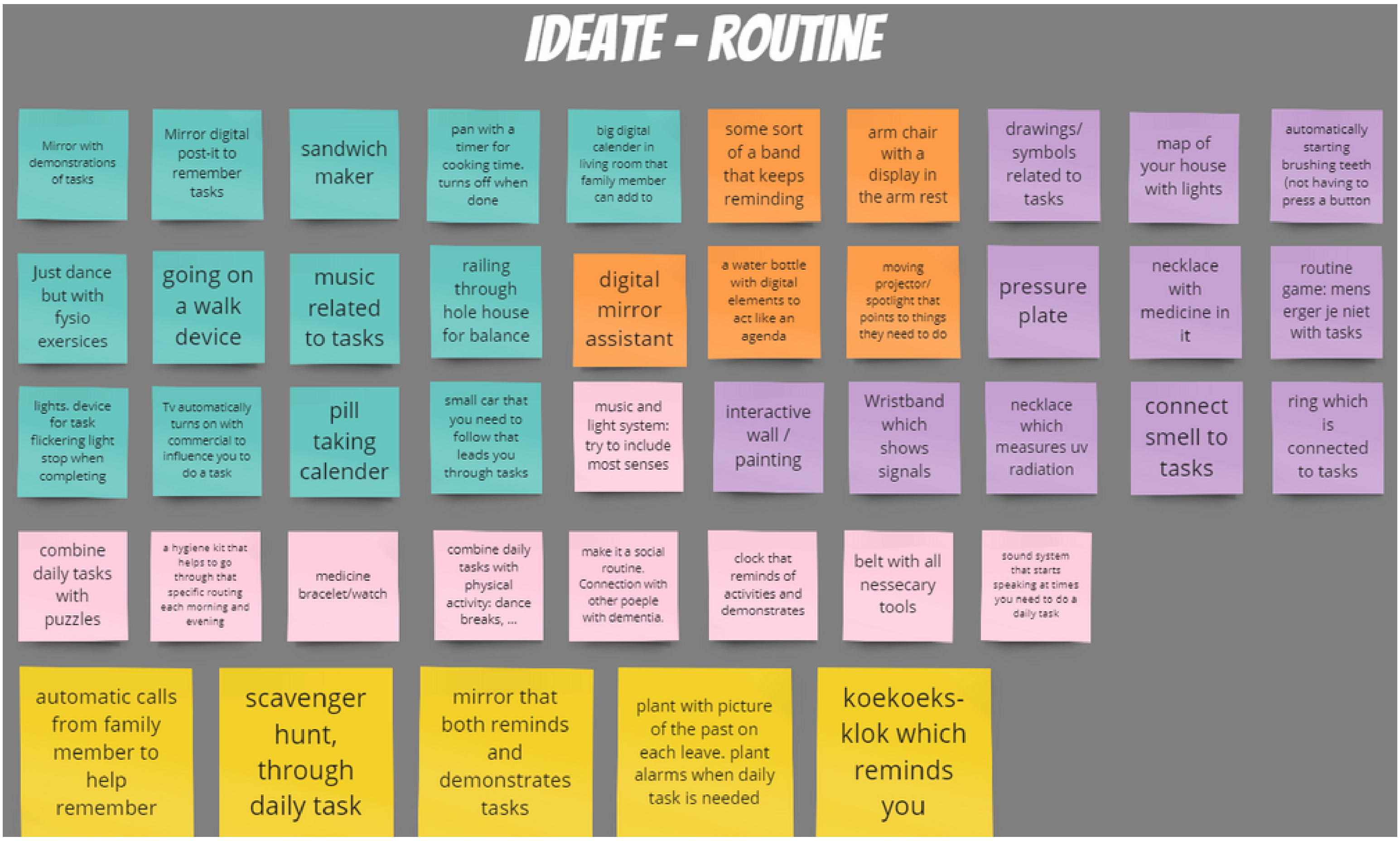

Figure B.1 Pressure cooker ideation

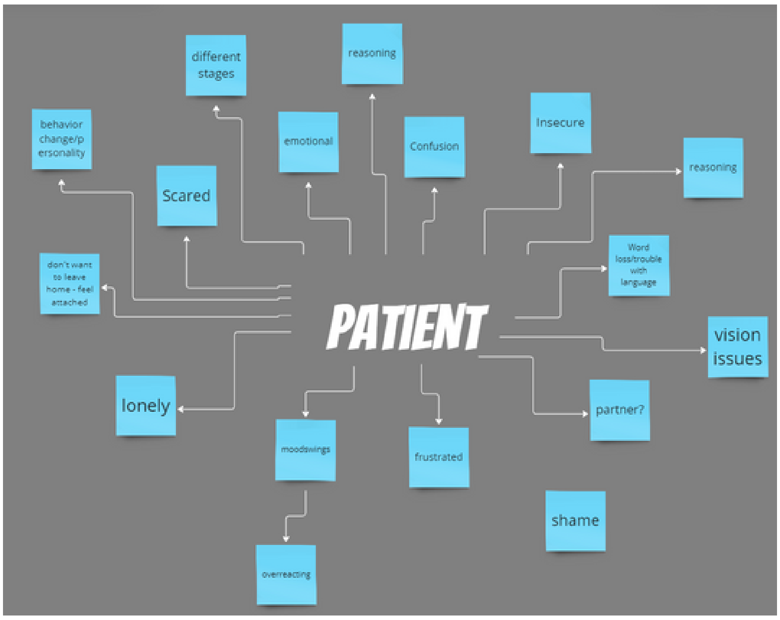

Figure B.2 Pressure cooker

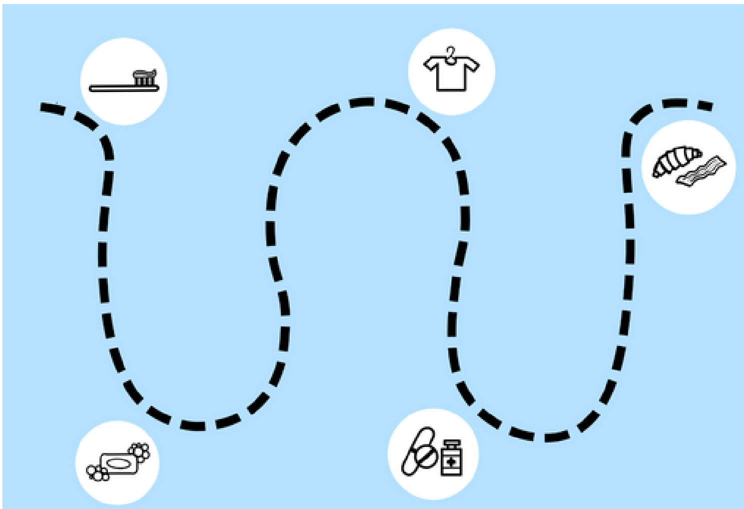

Figure B.3 Pressure cooker prototype

For the pressure cooker the idea of a scavenger hunt through daily tasks was chosen, see Figure B.3. The prototype shows the morning routine through icons. The activity that has to be done lights up, after finishing the task the light of the next activity will go on. Besides, family voices are added to explain activities.

Appendix C

Midterm demoday

Figure C.1 Poster Care Chair Cover

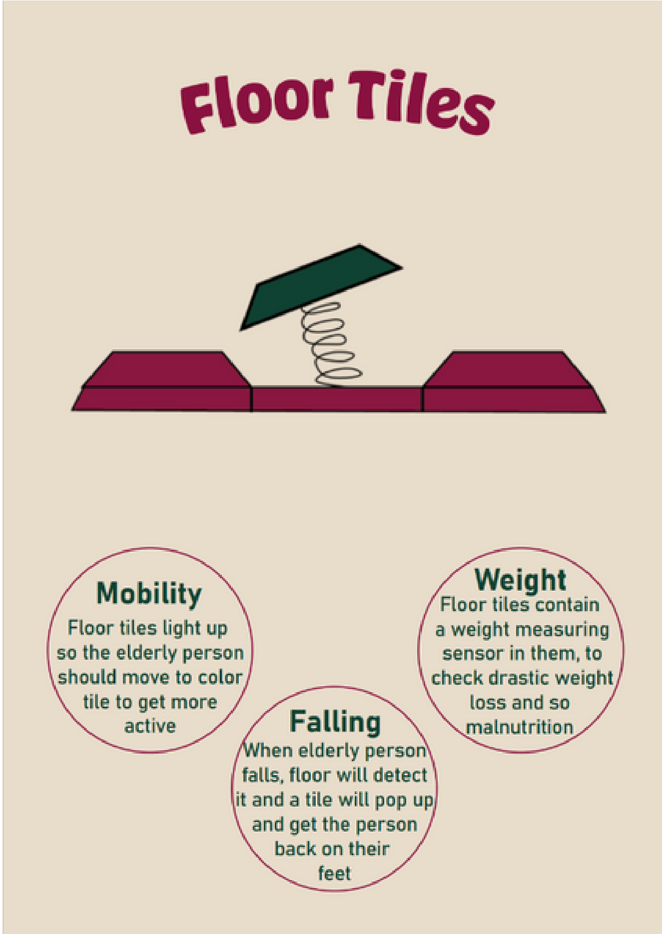

Figure C.2 Poster Floor Tiles

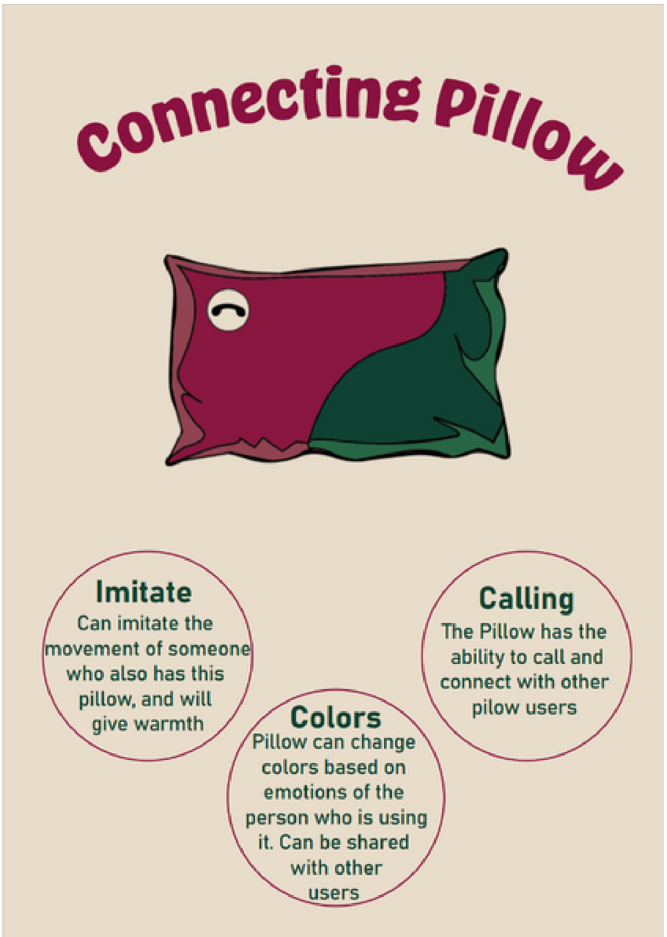

Figure C.3 Poster Connecting Pillow

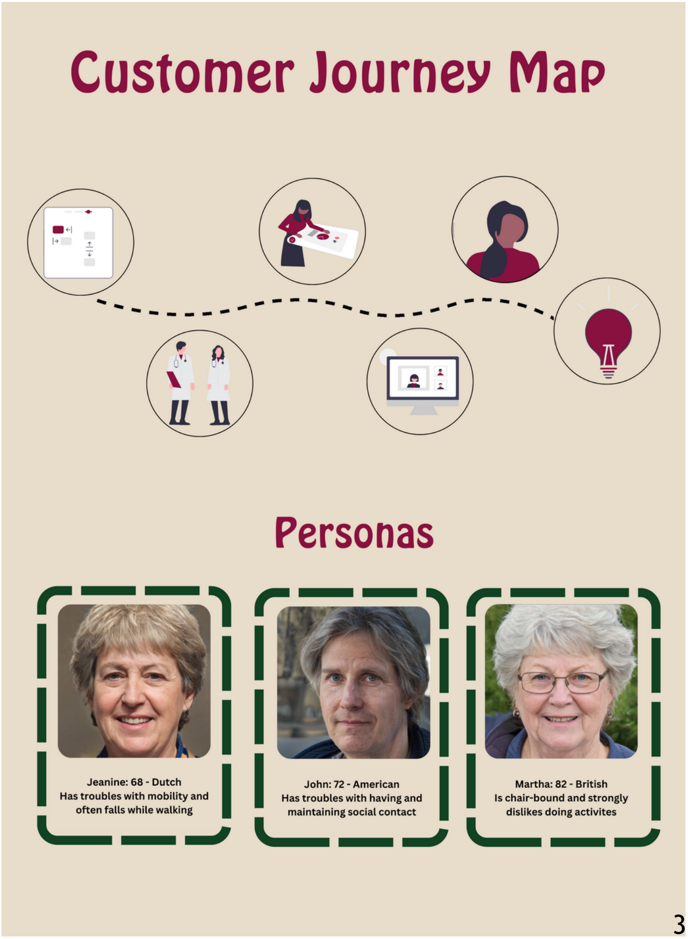

Figure C.4 Poster Customer Journey Map and Personas [10]

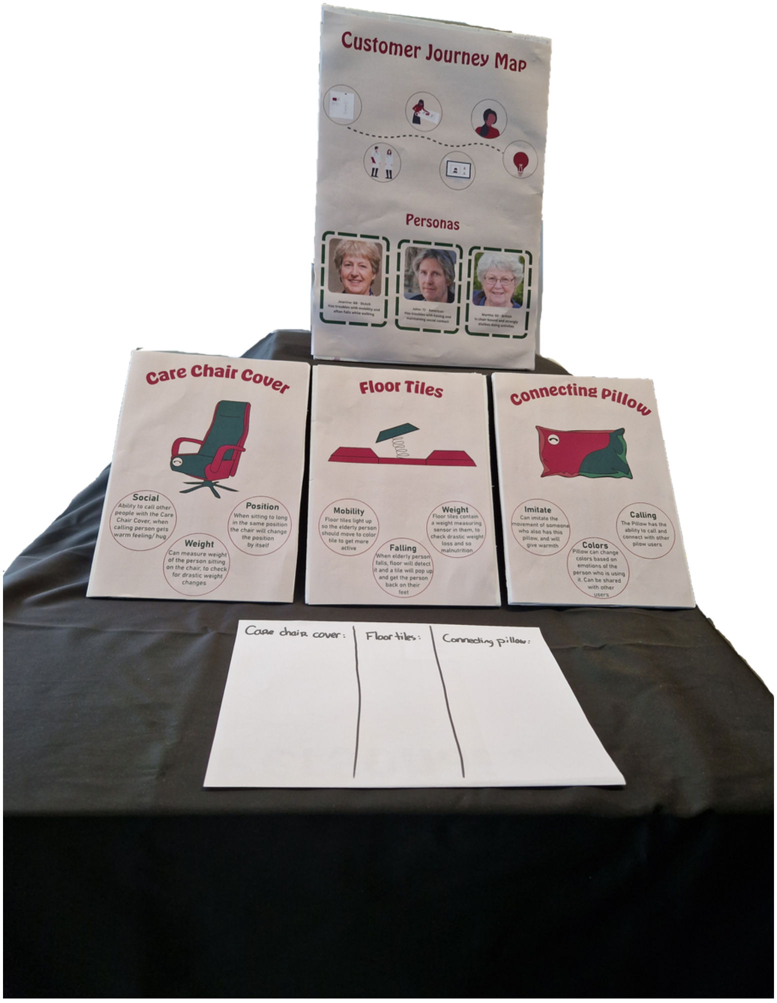

Figure C.5 Midterm demoday table layout[10]

From the midterm demoday the team got feedback to focus more on the target group; i.e. what distinguishes people with dementia to elderly. The customer journey needs to be clear, what are the crucial points of impact. Interesting to make a product were the individuals get used to. Eventually, it could be interesting to look into the differences with the care farm and other care facilities. The use of layers in the presentation added depth to the overall aesthetic.

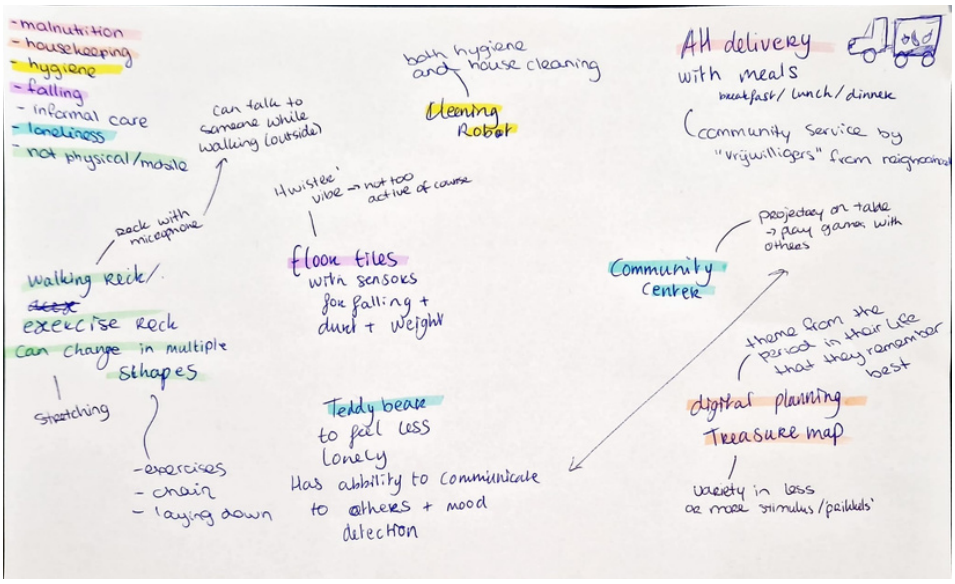

Figure C.6 Brainstorm session for midterm concepts

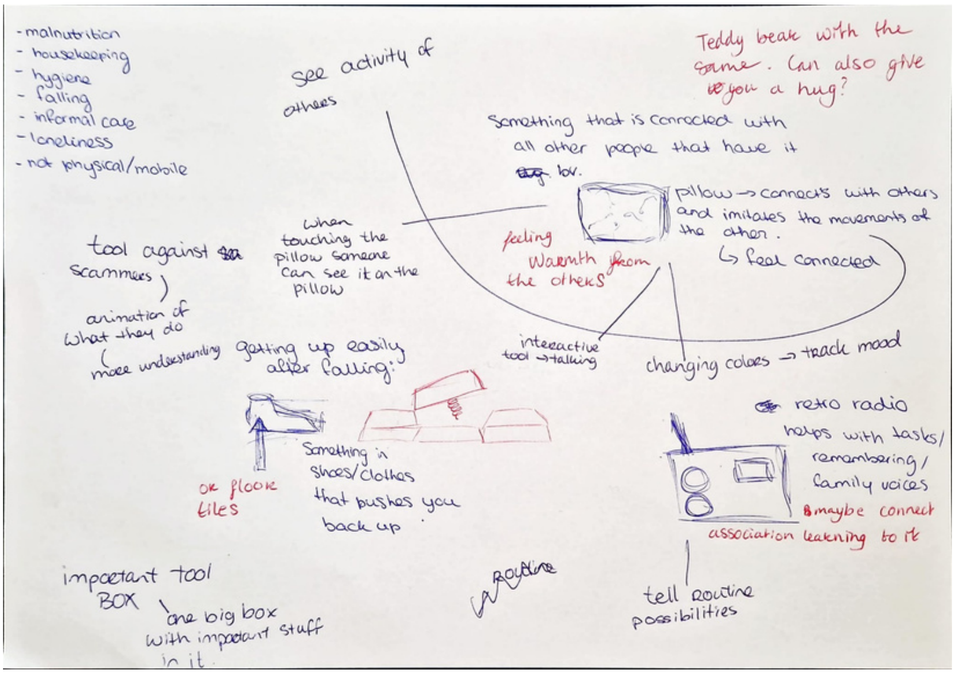

Figure C.7 Brainstorm session for midterm concepts

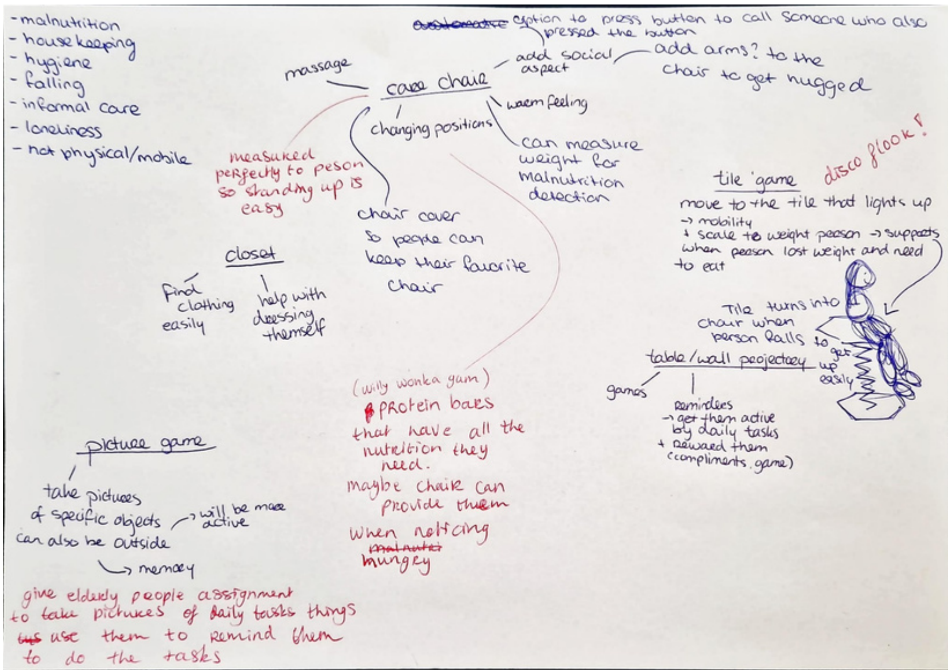

Figure C.8 Brainstorm session for midterm concepts

Appendix D

Insights from field trip: care farm *Grootenhout*

General information gathered from the care farm

- After people get diagnosed with dementia they live around 8-10 years. They live around 7 years at home and approximately 9 months in a care home.
- There is often friction at the start of the stay at the care farm.
- There is a lot of freedom at the care farm, which allows the individuals to try things.

Observations of the care farm

- There are more locations on the care farm. During the day they switch from location, so at one location there is an active activity, while at another location a more quite activity occurs. This switching from locations creates a 'coming home' feeling at the end of the day, when do arrive at their regular location.
- At this care farm there are also people who only come there for daily activities. One reason for this is when people consider to move to the care farm, they can already adapt to the environment.
- The individuals are allowed to take things with them from their home, so they familiarize themselves with objects.

Observations from the bahaviour of the individuals with dementia and the caregivers

- Caregivers want the individuals feel useful, therefore they let them do different tasks.
- Welcoming people with dementia is important. A good start and end of the day will often make people with dementia feel better.
- It is difficult to distinguigh people with and without dementia.
- Sometimes hard to keep everybody happy in the group for caregivers, since everybody prefers a different communication and guidance.
- Two individuals could not find their way back to their building after an one minute walk

Appendix E

Interviews overview

Participant 1

Gathering information
- As a caregiver it is hard when an individual walks away. They often get lost.
- The people are quite dependent on the caregivers in a care home.
- Family voices sound trusted.
- Stimuli in the room incluences the bahavior of the individuals.
- Games are social. Get compliments from others during the game, which results in a worthy feeling.

Feedback on the concept
- Wearable device is nice, however making a string for around the wrist will not be convenient, since they will pull on it.
- Have a standard place to put the device.
- Important that the voice is from a trusted person, it is a good support.

Participant 2

Gathering information
- Give the product as early as possible, since they can not learn things in a later stage.
- Person with dementia got lost often, also in their own house.
- Before going to the care home, person went to daycare at that care home for some days in the week.
- Transition from home to care home was scary, insecure and person felt left out.
- In care home, person gets lost at the end of their regular walking route. Hard to find to way when just moving to the care home.
- Important that a care home looks like home.
- Device needs to be simple and person needs to feel useful while using it.

Participant 3

Gathering information
- When people with dementia get guidance, they are more likely to do different tasks.
- When there are familiar things around people become less scary.
- They forget daily tasks often.
- Let the people do tasks by themselves.
- Do not approach people with dementia very differently from others, but be respectful.
- Communication differs per person. Some people get aggressive, while others don't.

Feedback on the concept
- Put a live location in the device for checking when something goes completely wrong.
- Make the device waterproof.
- Think of how to charge the device.
- Is it convenient to make the device wearable?
- Symbols are clear and also convenient for people with another language.
- The family voices are a good support for the guidance of navigating.

Participant 4

Gathering information
- People with dementia are scared of unknown things and people.
- They prefer routines, they are more likely to remember daily tasks in their routine
- The individuals remember most from before their diagnosis.
- It is good to give the individuals responsibility.
- The people with dementia have a low attention span.

Participant 5

Gathering information
- People with dementia have difficulty taking care of themselves, the daily tasks become harder.
- They wander outside.
- Let the people feel responsible, let them do specific tasks.
- When helping people with dementia, look at what they are used to
- Caregivers sometimes need to say no to help, because they do not have that much time. The waiting lists are long.
- Alarm buttons can be improved, since people with dementia sometimes not remember that they have the button.

= what corresponds with other interviews

Appendix F

User testing results with relatives

Reactions of the participants when handing over the prototype

- Recognition of buttons
- There are three locations and one person (Sanne) on the device
- Device for your memory, remembering things
- Look-a-like of an alarm, ufo, soap (because of the 3D-printing) or a compass.
- The size of the device fits nicely in your hand, however it might be too big to put it in your pocket.
- User needs to interact with the device.

Reactions of the participants when describing the target group

- The circle in the middle looks like a button, next to the four buttons on the side.
- There are messages underneath every button.
- Due to the buttons the user will remember the important things in their live; in this case their home, grocery store, general practicer and their friend/family member Sanne.

Discussions of the prototype

- The device will give signals;
  - Signals through lighting
  - Pointing system
- The user will use it when they are scared or freaked out.
- Press buttons to ask for assistance.
- Give signals to the things assigned on the device.
- Dots/lights will lead the user.

Observations of the interaction with the prototype

With testing the interaction the family voices were not implemented, so only the light 'went on'.

- Participants said that voices would make the guidance even more clear.
- When participants turned towards the direction of the lights they reacted in two ways:
  - Some participants turned their body to face the direction indicated by the device, as well as rotating the orientation of the device. Therefore, the same direction light is on.
  - Other participants didn't rotate the device, but only their body, so the light of another direction.
- When lighting up the lights of the direction to walk backwards, participants reacted in two ways:
  - Some people turned and walked in this direction.
  - Other participants didn't turn and just walked backwards.

= what corresponds with reactions of other participants

Appedix G

User testing with person with dementia

User test with person with dementia

- Direction guidance with light in combination with the family voices is a clear.
- The user turned the device in the direction of the light when not knowing fully how the device worked.
- When walking in public with the device the person would not feel ashamed
- She thought that implementing wayfinding within the care home would be beneficial to her.
  She mentioned an example of the care home that she will go to and that there are multiple buildings.
  Some guidance to go to different buildings would really be helpful.
- She suggested to only implement one or two family voices. So that it will be less confusing, and you do not get a different voice everyday.
- She said that she liked the haptic feedback, because then she knew that the device was on.
- She suggested a NaviMate holder for her mobile scooter. With this holder the chance of her using the device in an early stage of dementia would be higher.
- The symbols were not clear to her. They were too small and hence she suggested to make them in a different color.
- The weight of the device and the size of the buttons were perfect in her opinion.
- She validated that the size of the device is preferred to be between 6 cm and 10 cm diameter.

= most important insights from for deveolping NaviMate

Appendix H

Arduino code

```
#include "SoftwareSerial.h"
#include "DFRobotDFPlayerMini.h"
#include <Adafruit_NeoPixel.h>
#include "Wire.h"
#include <MPU6050_light.h>

MPU6050 mpu(Wire);
unsigned long timer = 0;

static const uint8_t PIN_MP3_TX = 3; // Connects to module's RX
static const uint8_t PIN_MP3_RX = 2; // Connects to module's TX
SoftwareSerial softwareSerial(PIN_MP3_RX, PIN_MP3_TX);

const int button1Pin = 4; // Connect one button to this pin
const int button2Pin = 5; // Connect another button to this pin
const int button3Pin = 6; // Connect another button to this pin
const int button4Pin = 7; // Connect another button to this pin
const int button5Pin = 8; // Connect another button to this pin
const int motorPin = 13; // Haptic motor Pin

#define LED_PIN_D9  9 // Defining LED connection to Arduino
#define LED_PIN_D10 10
#define LED_PIN_D11 11
#define LED_PIN_D12 12

#define NUM_LEDS_PER_SET 4

Adafruit_NeoPixel stripD9 = Adafruit_NeoPixel(NUM_LEDS_PER_SET, LED_PIN_D9, NEO_GRB + NEO_KHZ800);
Adafruit_NeoPixel stripD10 = Adafruit_NeoPixel(NUM_LEDS_PER_SET, LED_PIN_D10, NEO_GRB + NEO_KHZ800);
Adafruit_NeoPixel stripD11 = Adafruit_NeoPixel(NUM_LEDS_PER_SET, LED_PIN_D11, NEO_GRB + NEO_KHZ800);
Adafruit_NeoPixel stripD12 = Adafruit_NeoPixel(NUM_LEDS_PER_SET, LED_PIN_D12, NEO_GRB + NEO_KHZ800);

DFRobotDFPlayerMini player;

void setup() {

  Serial.begin(9600);
  Wire.begin();

  // byte status = mpu.begin();              //// Gyroscope component, the gyro was faulty so it didn't work, hence the code was blocked out
  // Serial.print(F("MPU6050 status: "));
  // Serial.println(status);
  // while(status!=0){ } // stop everything if could not connect to MPU6050

  // Serial.println(F("Calculating offsets, do not move MPU6050"));
  // delay(1000);
  // // mpu.upsideDownMounting = true; // uncomment this line if the MPU6050 is mounted upside-down
  // mpu.calcOffsets(); // gyro and accelero
  // Serial.println("Done!\n");

```

Figure H.1 Arduino code part 1

```
  pinMode(button1Pin, INPUT_PULLUP);
  pinMode(button2Pin, INPUT_PULLUP);
  pinMode(button3Pin, INPUT_PULLUP);
  pinMode(button4Pin, INPUT_PULLUP);
  pinMode(button5Pin, INPUT_PULLUP);

  pinMode(motorPin, OUTPUT);

  stripD9.begin();
  stripD10.begin();
  stripD11.begin();
  stripD12.begin();

  stripD9.show();  // Initialize all pixels to 'off'
  stripD10.show();
  stripD11.show();
  stripD12.show();

  Serial.begin(9600);
  softwareSerial.begin(9600);

  if (player.begin(softwareSerial)) {
    Serial.println("DFPlayer Mini online.");
    player.volume(30); // Set volume to maximum (0 to 30).
  } else {
    Serial.println("Connecting to DFPlayer Mini failed!");
  }
}

void loop() {

  // if (Serial.available());
  // {
  //   Serial.print("works");
  //   int animateLEDkey = Serial.parseInt();
  //   if (animateLEDkey == 1)
  //   Serial.print("Button 1 Pressed");
  //   player.play(1);
  //   haptic(motorPin);
  //   animateLEDSet(stripD9, button1Pin);
  //   delay(1000);  // Wait for a moment
  //   delay(500); // Debounce delay
  // }

  // mpu.update();
  // if((millis()-timer)>10){ // print data every 10ms
  // Serial.print("\tZ : ");
  // Serial.println(mpu.getAngleZ());
  // timer = millis();
  // }
```

Figure H.2 Arduino code part 2

```

  if (digitalRead(button1Pin) == LOW) {
    while (digitalRead(button1Pin) == LOW) {} // Wait for button release
    Serial.print("Button 1 Pressed");
    player.play(3); // Play chosen voice file
    haptic(motorPin); // Give a haptic feedback signal
    animateLEDSet(stripD9, button1Pin); // Turn on respective LED set
    delay(1000);  // Wait for a moment
    delay(500); // Debounce delay
  }

  if (digitalRead(button2Pin) == LOW) {
    while (digitalRead(button2Pin) == LOW) {} // Wait for button release
    Serial.print("Button 2 Pressed");
    player.play(2);
    haptic(motorPin);
    animateLEDSet(stripD10, button2Pin);
    delay(1000);  // Wait for a moment
    delay(500); // Debounce delay
  }

   if (digitalRead(button3Pin) == LOW) {
    while (digitalRead(button3Pin) == LOW) {} // Wait for button release
    Serial.print("Button 3 Pressed");
    player.play(1);
    haptic(motorPin);
    animateLEDSet(stripD11, button3Pin);
    delay(1000);  // Wait for a moment
    delay(500); // Debounce delay
  }

  if (digitalRead(button4Pin) == LOW) {
    while (digitalRead(button4Pin) == LOW) {} // Wait for button release9
    Serial.print("Button 4 Pressed");
    player.play(4);
    haptic(motorPin);
    animateLEDSet(stripD12, button4Pin);
    delay(1000);  // Wait for a moment
    delay(500); // Debounce delay
  }

}

void animateLEDSet(Adafruit_NeoPixel &strip, int breakButtonPin) {
  while (true) {
    // Turn on four LEDs smoothly
    for (int i = 0; i < NUM_LEDS_PER_SET; i++) {
      for (int brightness = 0; brightness <= 255; brightness += 5) {
        strip.setPixelColor(i, strip.Color(brightness, brightness, brightness));
        strip.show();
```

Figure H.3 Arduino code part 3

```
        delay(3);  // Decreased delay for faster animation
      }
    }

    delay(1000);  // Wait for a moment

    // Gradually switch off all LEDs
    for (int brightness = 255; brightness >= 0; brightness -= 5) {
      for (int i = 0; i < NUM_LEDS_PER_SET; i++) {
        strip.setPixelColor(i, strip.Color(brightness, brightness, brightness));
      }
      strip.show();
      delay(4);  // Adjust the delay as needed
    }

    delay(400);  // Wait for a moment before starting the animation again

    // Check if a break button is pressed
    if (digitalRead(button1Pin) == LOW ||
    digitalRead(button2Pin) == LOW ||
    digitalRead(button3Pin) == LOW ||
    digitalRead(button4Pin) == LOW) {
  delay(100); // Debounce delay
  while (digitalRead(button1Pin) == LOW ||
         digitalRead(button2Pin) == LOW ||
         digitalRead(button3Pin) == LOW ||
         digitalRead(button4Pin) == LOW) {} // Wait for button release
  break; // Exit the loop if any of the specified buttons is pressed
    }
  }
}

void haptic(int vibrationMotor) {
  digitalWrite(motorPin, HIGH); // Turn the motor on
  delay(300); // Adjust the duration of the pulse as needed (1 second in this case)

  digitalWrite(motorPin, LOW); // Turn the motor off
  delay(200); // Adjust the duration of the off state as needed (1 second in this case)

  digitalWrite(motorPin, HIGH); // Turn the motor on
  delay(300); // Adjust the duration of the pulse as needed (1 second in this case)

  digitalWrite(motorPin, LOW); // Turn the motor off
  delay(50); // Adjust the duration of the off state as needed (1 second in this case)

  delay(1000);

  Serial.print("Vibrating");
}

```

Figure H.4 Arduino code part 4

Appendix I

Logo iterations

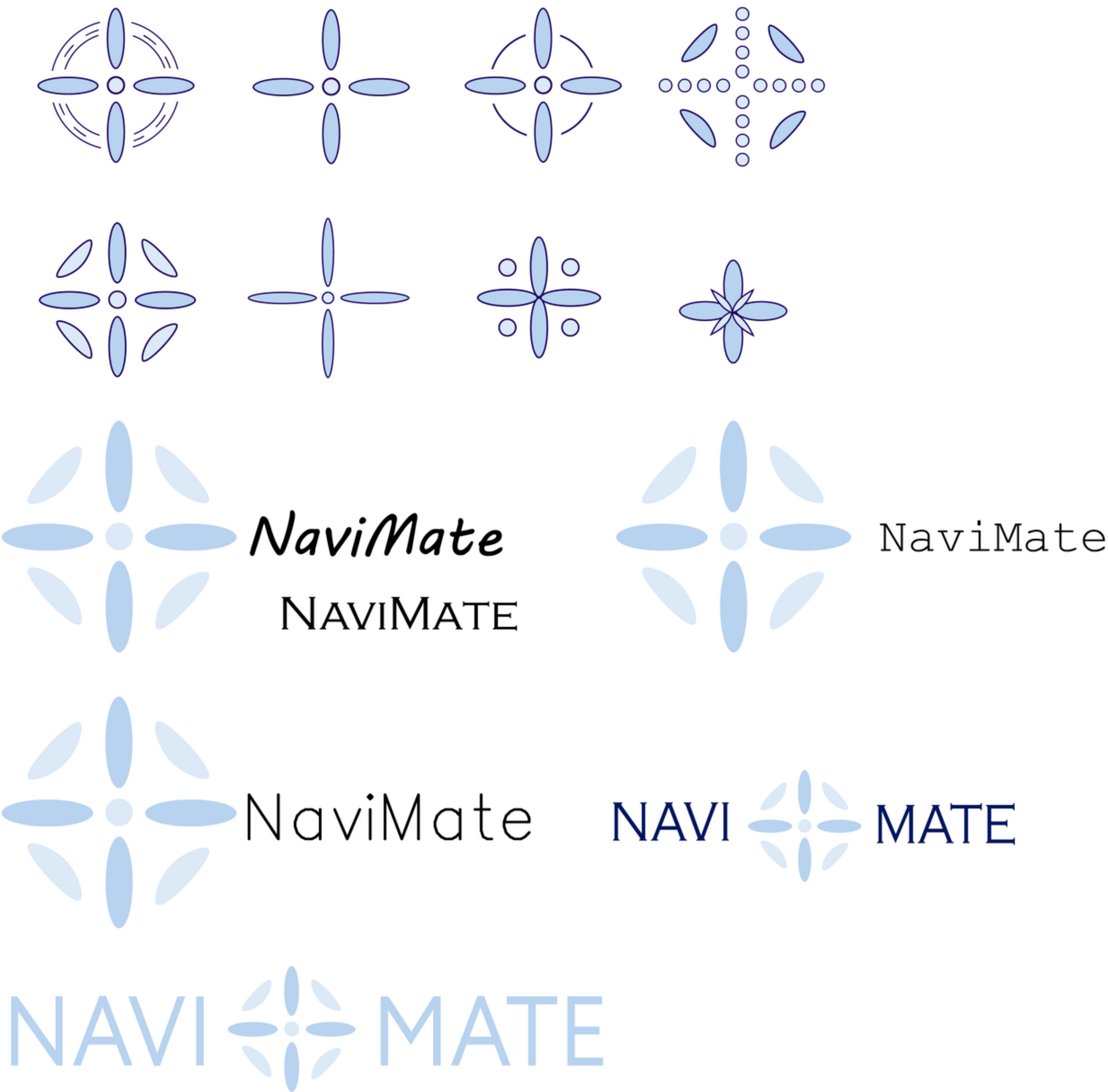

Figure I.1 Logo iterations

Appendix J

Final demoday

Figure J.1 Demoday table layout

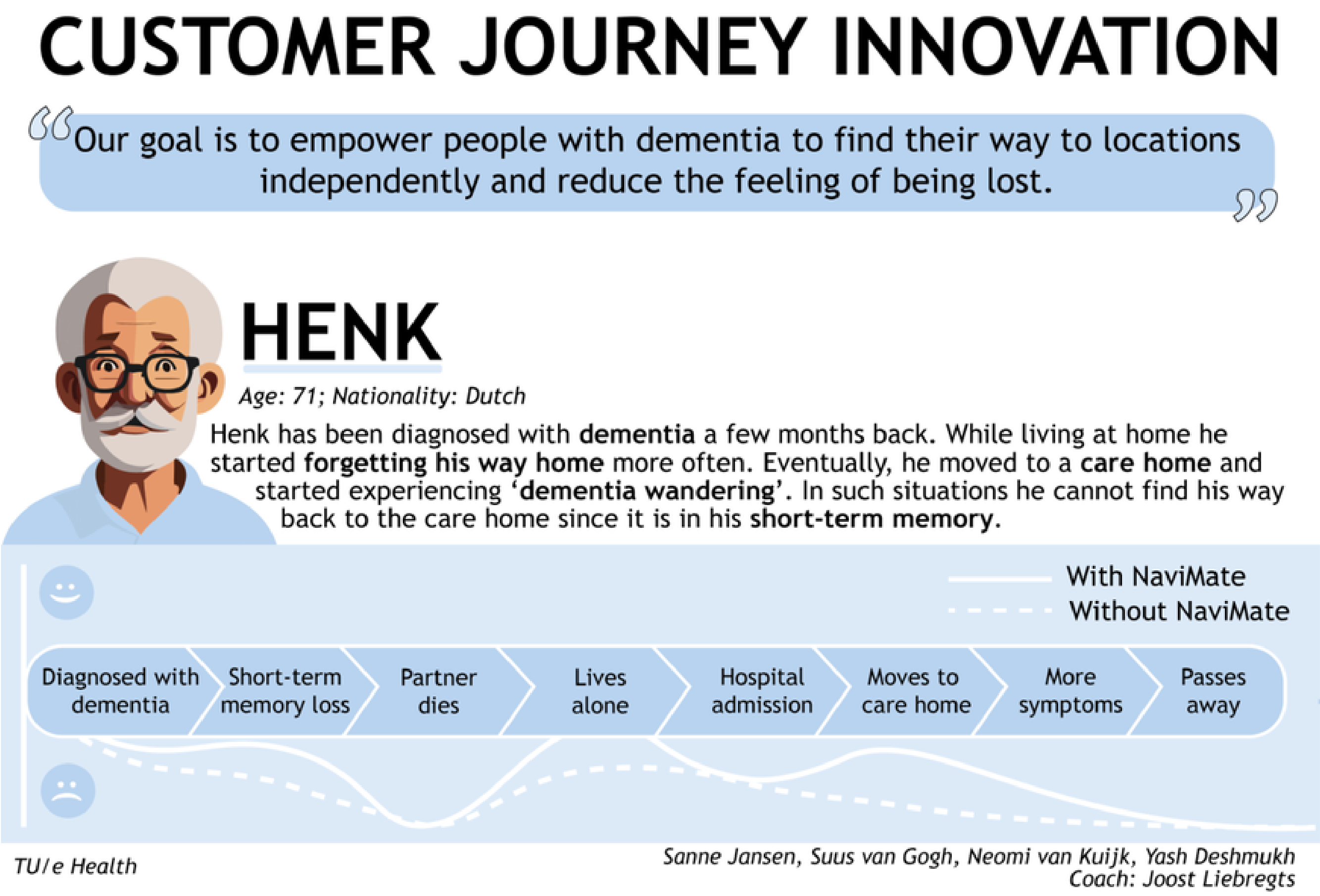

Figure J.2 Demoday poster persona and customer journey

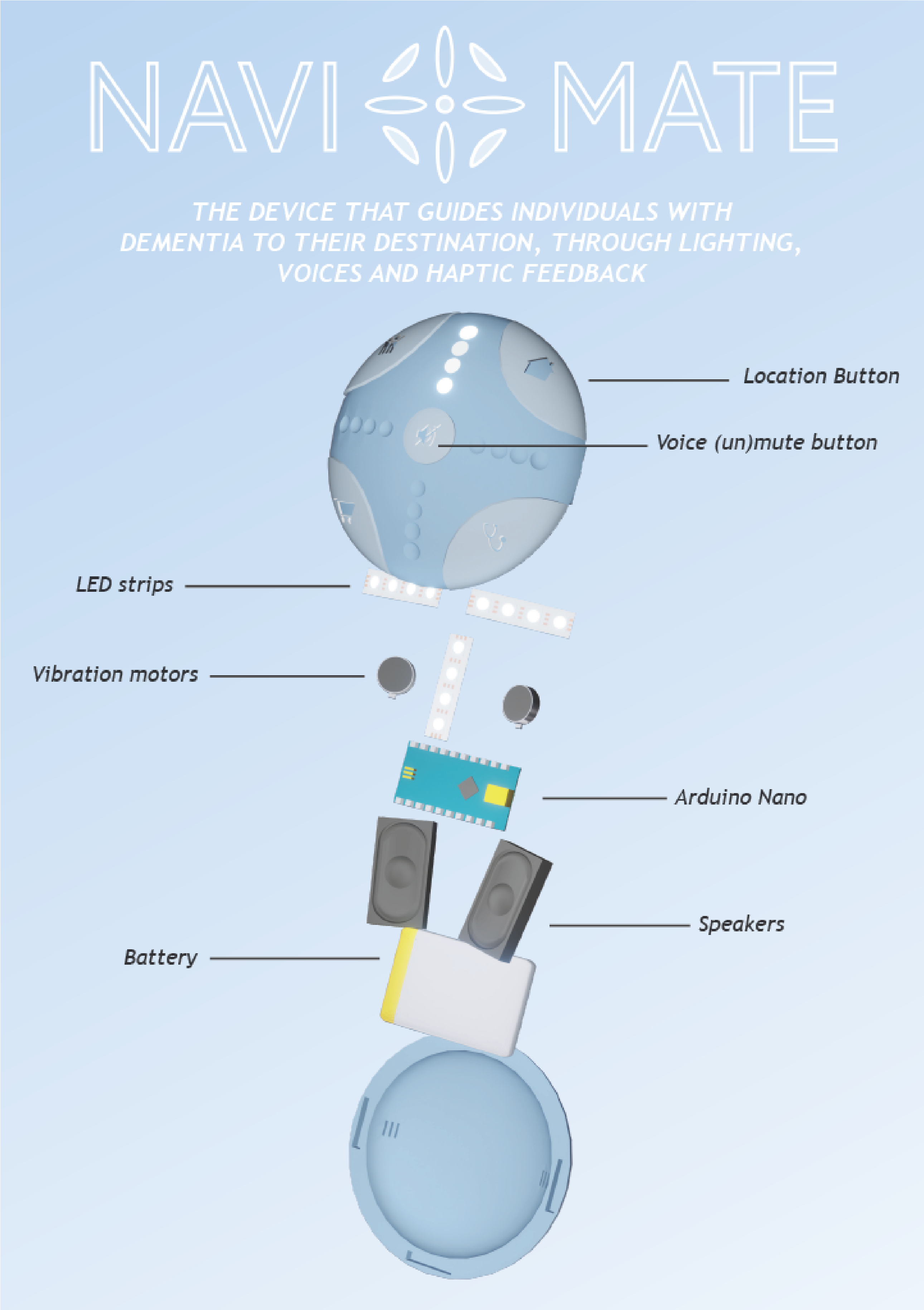

Figure J.3 Demoday poster exploded view NaviMate

Appendix K

Individual contributions

<u>Yash Deshmukh</u>

- Research + Brainstorming + Customer Journey/Persona
- Interview + Field Trip
- 3D Model & Video Components
  - Designing + Creating 3D model in Blender
  - Animating model functionality
  - Exploded view for poster
  - Electronics schematic
- 3D Printing
  - Initial Prototype
  - Intermediate Prototypes
  - Final Functional Prototype + Final Aesthetic Prototype
- Electronics
  - Developing a schematic of electronics
  - Electronics design & placement (circuit)
  - Soldering components
- Arduino Code
  - Individual component functionality
  - Final combined code
- Final prototype
  - Assembly of prototype + Components design & placement
- Report
  - Iterations
    - From concept to prototype: Code + Electronics
  - Discussion & Future Plans
  - Visuals
  - Conclusion
- Demoday
  - Prototype
  - Pitch
  - Set-up Ideation

<u>Suus van Gogh</u>

- Research + Brainstorming + Customer Journey/Persona
- 3 interviews + Field trip
- Logo and color scheme
- Prototype:
  - Spray-painting
  - Charging system
  - App in Figma
- Demoday
  - Table set-up
  - Poster A2 + Poster A3
  - Script video + Pitch
- Report
  - Summary
  - Acknowledgements
  - Project goal
  - Design Process
  - Iterations:
    - From concept to prototype: app and charging system
    - From complex design to simplistic design
    - From pointing to one direction to 4 LEDs
    - Deciding on final design goal
  - Discussion & Future
  - Shorten the text
  - Visuals
  - Business Model Canvas

Neomi

- Research + Brainstorming + Customer Journey Map/ Persona
- Interviews
- User test person with dementia
- Demoday
  - Video filming
  - Video editing
  - Table set-up
  - Business cards
  - Pitch
  - Spray-painting
- Report
  - Visuals
  - Iteration
    - Including family voices
    - Adding haptic feedback through vibrations
    - From light in the middle to a button for voice
  - Validating concept
    - User testing with person with dementia
    - Business Model Canvas
  - Conclusion
  - Overview of user test with person with dementia

Sanne

- Research + Brainstorming + Customer Journey/Persona
- 2 Interviews + Field trip + user tests with relatives
- Prototype
  - Soldering some parts
  - Spray-painting
  - App in Figma
- Demoday
  - Assistance on posters
  - Table set-up
  - Script video
  - Pitch
- Report
  - Visuals
  - Introduction
  - Summary
  - Iteration
    - Defining the project's goal within the transition period
    - From single button with text to four buttons with symbols
    - Size of the product
    - From concept to prototype: spray-painting
  - Validating concept
    - User testing with relatives
    - Business Model Canvas
  - Overviews of interviews, field trip and user test with relatives (appendix)
  - Final Result: customer journey map and persona
  - Shorten the text