Charly

– A voice-controlled application that aims to improve quality of life for people in self-isolation.

Digital Studio Practice, CI7810
Group Design Report, January 2021
Group 7

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1. Introduction

1.1. Background

As the UK reached its "worst point" in the current Corona pandemic with more deaths than any other European country, there is little hope for the third lockdown to end in the foreseeable future. (CNN, 2021) News of hospitals being nearly overwhelmed reinforce negative feelings of anxiety or depression that many suffer from in these unsettled times.

The NHS is doing its best to help people. Yet while many feel like they know how to gather information about dealing with negative emotions in self isolation, they are struggling to apply the measurements and suffer from a lack of social interaction.

Our cross-disciplinary team of students from Kingston University tried to tackle this problem with a unique approach. The brief stated to prototype a "Human-like" Voice User Interface (VUI). Merging best practices from the fields of psychology and tech, CHARLY the virtual "quarantine buddy" was created.

Aim

CHARLY is a voice-controlled application that aims to improve quality of life for people in self-isolation.

Objectives

1. Determine the physical and emotional needs of users in self-isolation
2. Create a voice user interface that incorporates and detects emotions and enhances the mental and physical health of users
3. Develop a voice assistant that acts like a virtual friend, conveying the feeling of an own personality
4. Identify the appropriate medium/device for the assistant and create a working prototype

1.2. Team Members

Lorena – K1923699, *UX Research*

Led the primary research and investigated industry trends, competitors and tech related questions. Conducted a survey about user needs and pain points that led to the creation of the main user persona and user journey. Helped the overall project strategy by creating use scenarios and a project roadmap. The primary research ultimately served as a basis for secondary research and prototyping.

Tobias Abram – K1945310, *UX Analyst/UI Designer*

Led the project process by creating and running the Kanban board, ensuring the project followed the Agile methodology. Designed and tested the initial approaches and the low, medium, high-fidelity prototype. Implementing the conversational design into the high-fidelity model to make an interactive prototype. Showcasing the interactive prototype by creating a demonstration video. Worked closely with the Design Lead and Information Architect.

Annkathrin – K1936796, *Design Lead*

Led the design process and worked in close cooperation with UX Analyst/UI Designer, 3D Animator and programmer. Performed brand research, in order to create a visual identity and was therefore responsible for logo design and style guide. Created a system persona (voice assistant) and worked on low-, mid-, and high-fidelity prototype designs.

Hamza – K1910115, *Technical Lead*

Implemented the final prototype into a native mobile app. Worked with the conversation flow designer to produce a natural voice user interface and the design team to provide users with a satisfying user experience. Conducted research on the different emotion detection tools available and tested them to see if they matched our needs.

Christopher Giles – K2002462, *Information Architect / Conversation Designer*

Led the conversation design approach, interpreted user research and personas to develop user scenarios sample dialogues and conversation flows. Prototyped conversation dialogues.

Tanya – K2049134, UX Research

Led the secondary research by exploring how to reduce negative psychological impacts of self-isolation using a VUI, how to build trust and empathy through appearance and natural linguistics research. Conducted testing of conversation flow to discover feelings and opinions associated with experience of VUI. This secondary and primary research served as a basis to inform information architecture and prototyping.

Ankur – 3D Artist

Model and texture the 3D artefacts of the voice interface application CHARLY. Creating 3D models of the main character.

1.3. Project Process

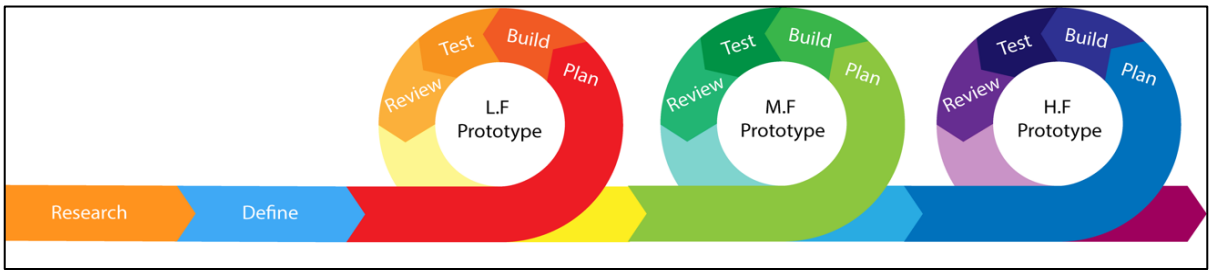

Figure 1 – Project Process Diagram

The project followed an Agile Kanban with an integrated UX method shown in Figure 1. The project plan starts very research-heavy and then evolved into many iterations. To keep track of the team's, progress, a Kanban board was created to analyse weekly objectives. The board was made in Trello (A web-based Kanban board), so everyone could access and adjust it (Appendix 2).

2. Research

2.1. Background Research - VUI's, more than a trend

Looking at the impact of the pandemic and its public health measures amongst younger people, a tremendous number of 83% say that they mental health deteriorated (*a bit or much). (YoungMinds, 2020)

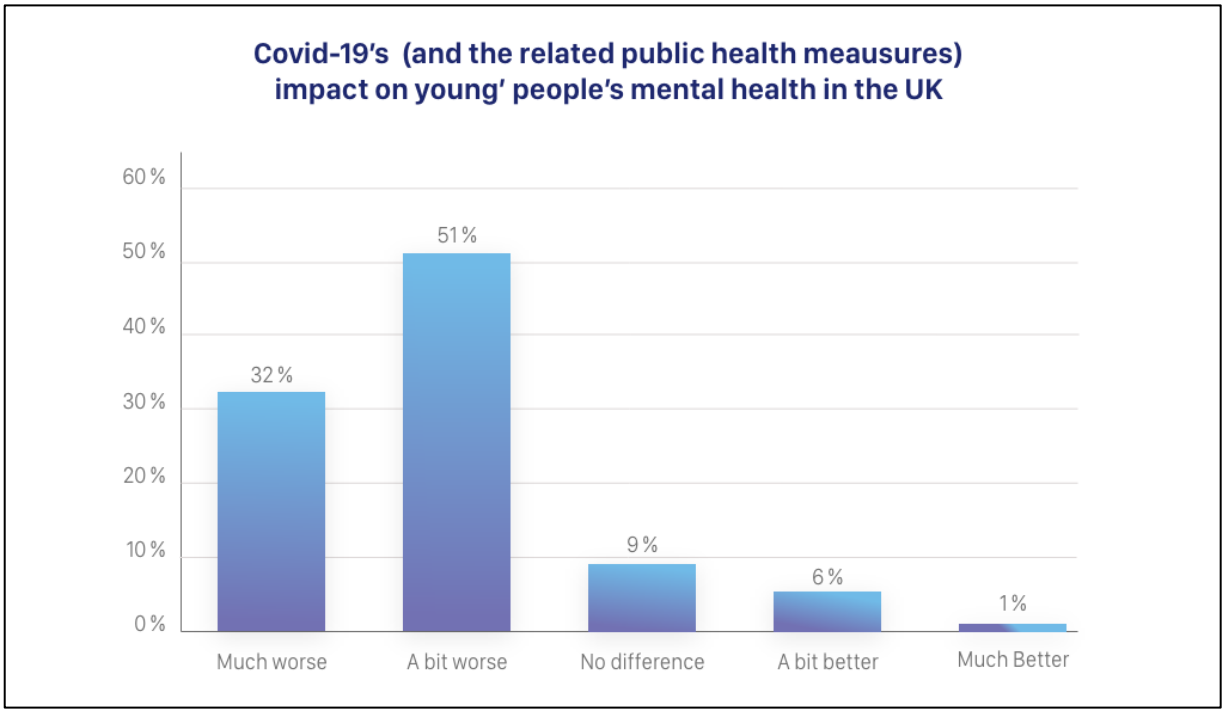

Figure 2: COVID-19's impact on young people's mental health UK (Statista, 2020)

Many of these people displayed symptoms similar to those of depression. The most common ways to help people with depression or low mood are e.g.: counselling, cognitive behavioural therapy or interpersonal therapy. What they all have in common is that they evolve around speech and are based on verbal communication.

That's why it would be interesting to see how technology, more specifically VUIs can use this advantage to help and reach users in ways that other mediums cannot. And even though our app won't replace talking to a qualified therapist in severe cases of depression, it was designed to help users get out of a rut.

The Voice User Interface (VUI) is forecasted to be the next step in the evolution of UX, due to its natural, effortless, fast and hands-free qualities of interaction.

Tech giants like Apple, Google and Amazon are investing 10% of their annual product research budget on voice technology, in total that's more than $5 billion! Their goal is to adapt the VUI to user needs and behaviours in a way, that enables a natural, training-free experience that is so easy and intuitive to use that it beats every Graphical User Interface (GUI).

Because of accelerated technological advances in the last decade, users are expecting a seamless experience and ask for maximized benefits with minimal input. (Reply Connect, 2019)

2.2. Market Research

When looking at the market and its competitors, the first names that one comes across are those of big tech brands like Apple, Amazon and Google that have established VUI for the mainstream.

But though they are without a doubt the unrivalled leaders in the field, they are not specialised in helping with mental health issues and only respond with generic phrases if you mention feeling depressed. However, these companies are currently working on making their assistants "seems more human" with AI features that can detect and respond to emotions. (Medeiros,2018)

Mental health support is not a pre-installed feature for the big 3. That's why I also looked at some VUI plug-ins (called "skills") that offer help. (Rabbit & Pork, 2019)

See Figure 3 and 4 below for the main findings.

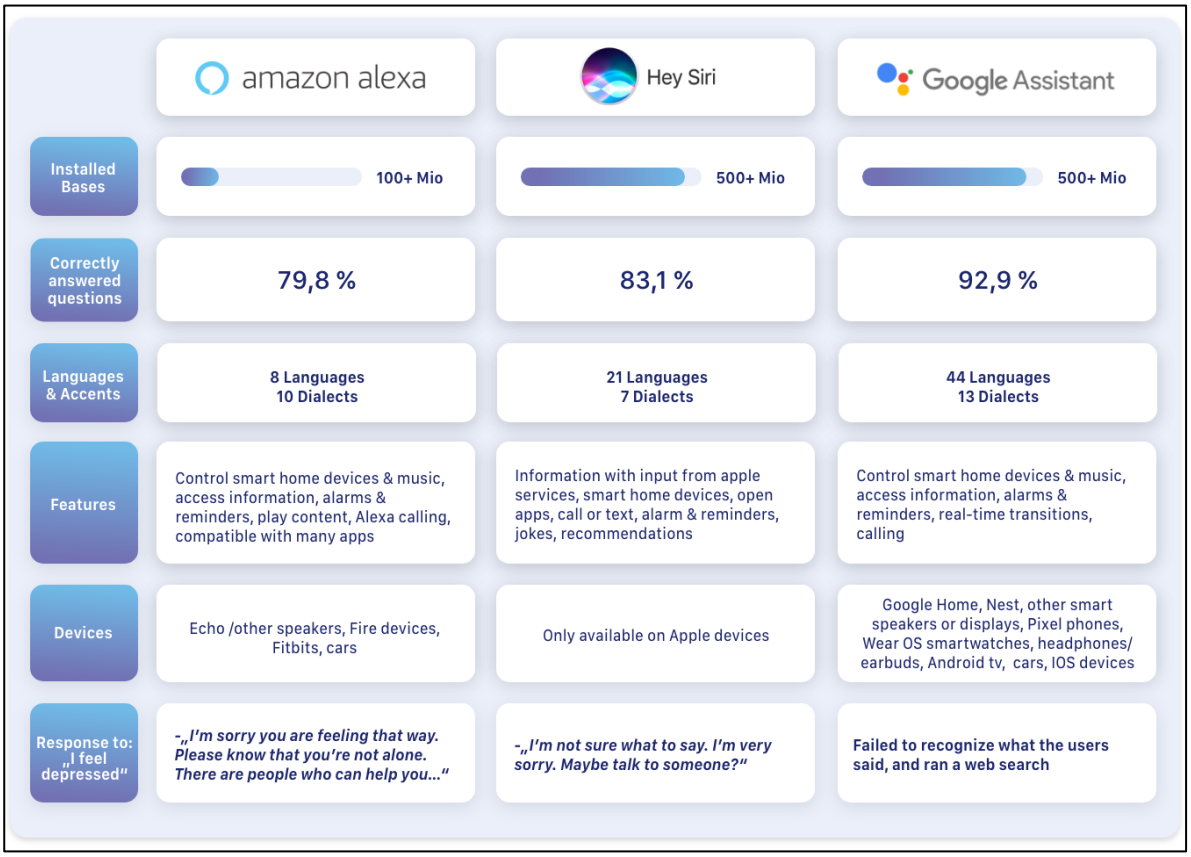

Figure 3 Competitors (Liam Tung, 201 9), (Voicebot.ai, 2019), (Globalme, 2020)

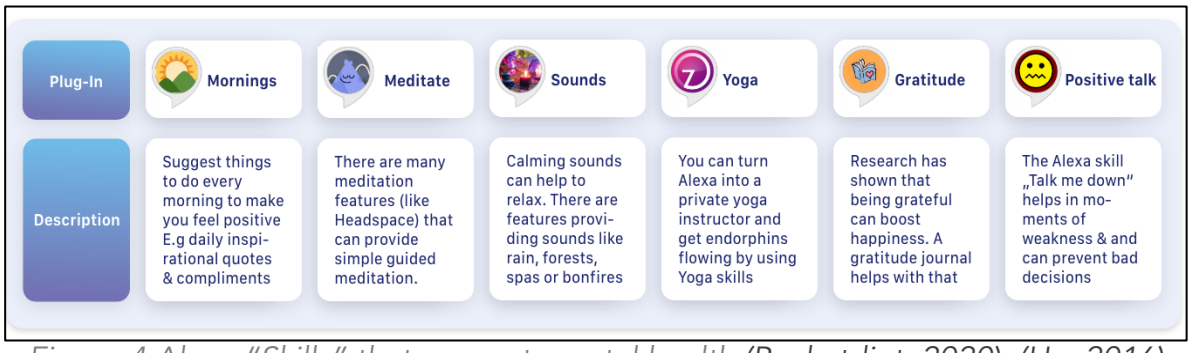

Figure 4 Alexa "Skills" that support mental health (Pocket-lint, 2020), (Ha, 2016)

2.3. Primary User Research

To find out about the emotion's users feel during quarantine, what difficulties they face and what could help them to feel better, I conducted an online survey with 40 participants. The key results are presented below. (See Appendix for full results)

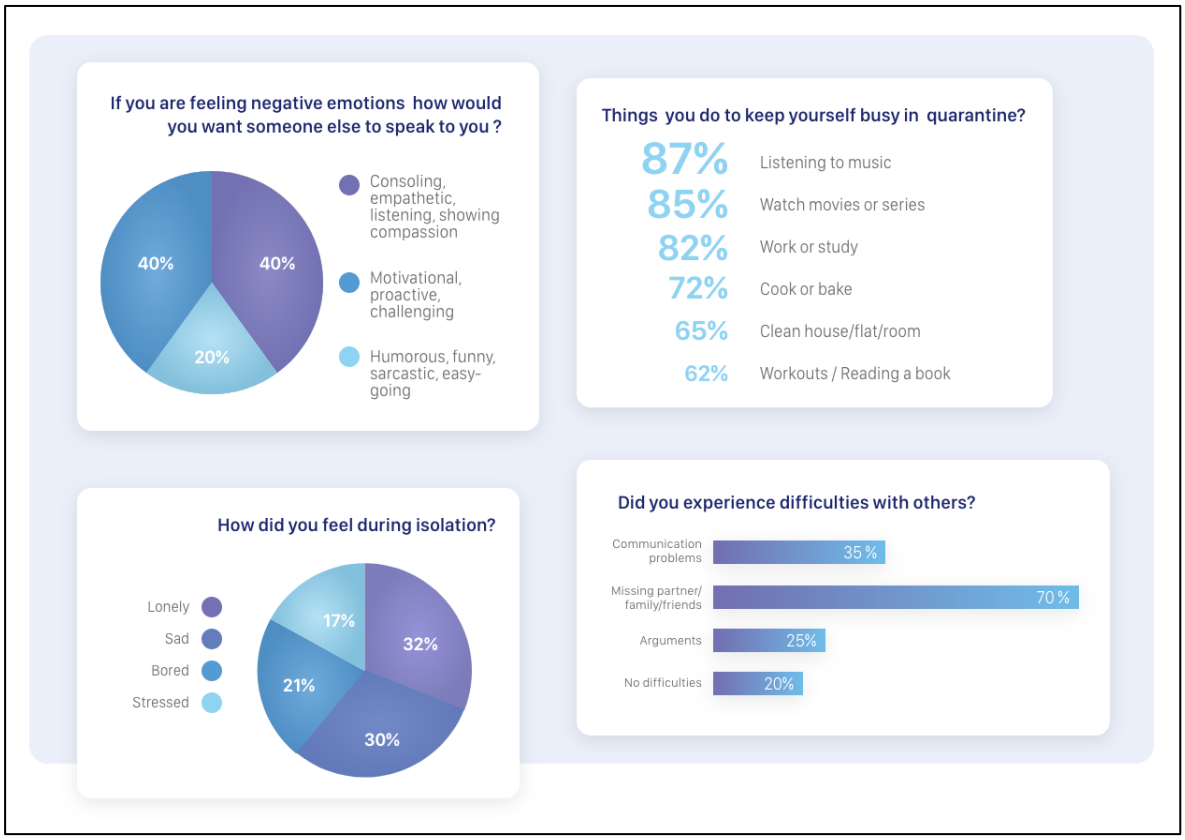

Figure 5 Survey results

2.4. Secondary User Research

With self-isolation having a detrimental impact on mental health, CHARLY aims to alleviate negative feelings associated with isolating and to make this time more enjoyable during the global Covid-19 pandemic. Brooks et al conducted a review of 24 studies investigating the psychological impact of self-isolation (Brooks et al., 2020). They found that most studies reported negative effects, such as PTSD symptoms: confusion and anger, along with other affects such as boredom and loneliness (Brooks et al, 2020). The World Health Organisation suggested that activities such as meditation, exercise and maintaining a daily routine alleviate these negative feelings (WHO, 2020). CHARLY therefore incorporated providing these activities to combat negative psychological impacts.

2.5. How to design human-like interaction

Having a visual display portraying a figure, such as a human or robot, to accompany the voice interface was important in producing a human-like interaction. This is because 74% of people who own a smart display would purchase a VUI if it had a

visual display (Young & Miller, 2019). There is also a positive relationship between facial expression and trustworthiness. The facial expressions of CHARLY were based on Ekman's seven universally recognized emotions (Ekman, 1972), as these are the most distinguishable emotions. Up-turned eyebrows and lips were used in these expressions, as they are the most trustworthy facial characteristics (Todorov et al., 2008). CHARLY was also chosen to be an animated robot with speech synthesis, as interfaces with inconsistent cues (human face with synthetic voice, or robotic face with human voice) are constantly evaluated as strange and upsetting (Brave et al., 2005).

The name CHARLY was chosen to bring life to our robot figure, as 81% of participants in a 300-participant study prefer the Amazon Alexa over any other VUI in the market. The reasons for this include that 'she has a personality and name', making the interface seem 'more human-like' (Young & Miller, 2019).

2.6. Natural linguistic research

Asides from making visual aspects of CHARLY human-like, natural linguistic research was also conducted to make voice interactions flow naturally. Naturalistic conversation design elements such as prompts, local/global intents and interjections were used in the design of CHARLY (Privat, 2018). Using a statement, for example 'you sound busy. ', is typically followed by a prompt, such as 'Shall we do it later instead? 'in a human conversation. A local intent is an expected reply such as 'yes' or 'no' in response to the prompt. Interjections are inputs that the user does not expect to hear, such as 'I see that something is not quite right. We're all in this together, remember'. These examples were used in the conversational design of CHARLY (figure 13) and aim to give them a personality to reinforce trustworthiness of the interface.

3. Define

3.1. User Persona

Normally it is important to keep in mind that the user group of VUI is very big and diverse and should be an inclusive design for everybody including different accents, speech impediments etc. But since we design a product to help a very specific target group in a very specific situation (isolation), the norm for us is slightly different.

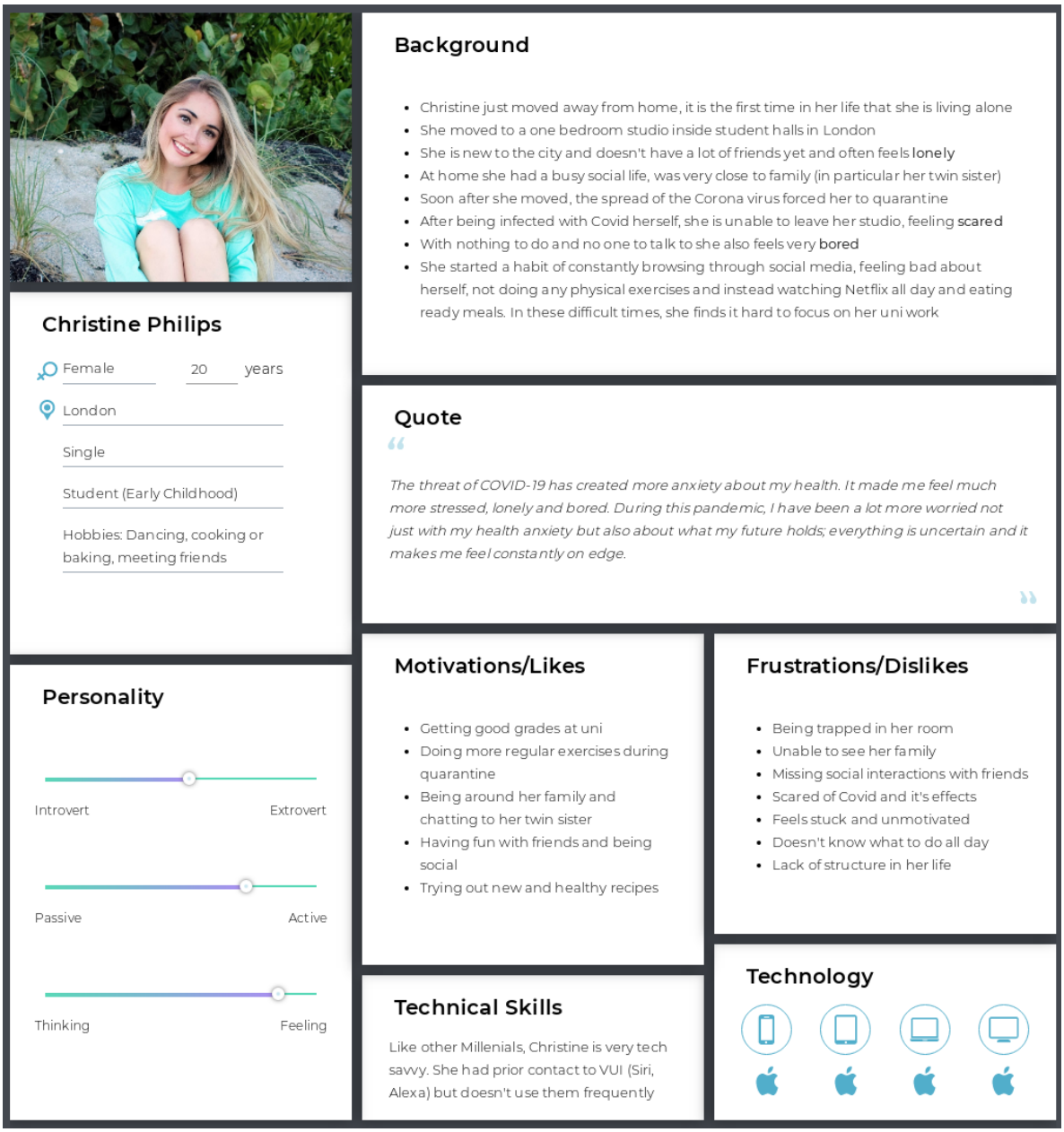

Figure 6 – User Persona

Elderly people or younger children who often don't own a smartphone or can't use it without the help of others were excluded from the target group.

Instead, we focussed on a "younger" user group age 16-30. Research has shown that these generations are the ones whose mental health suffers most from being in isolation. Meet Christine, our User Persona that faces many of those problems typical for our target group.

3.2. System Persona

Based on the insights of the previously defined user personas, the following system persona was developed.

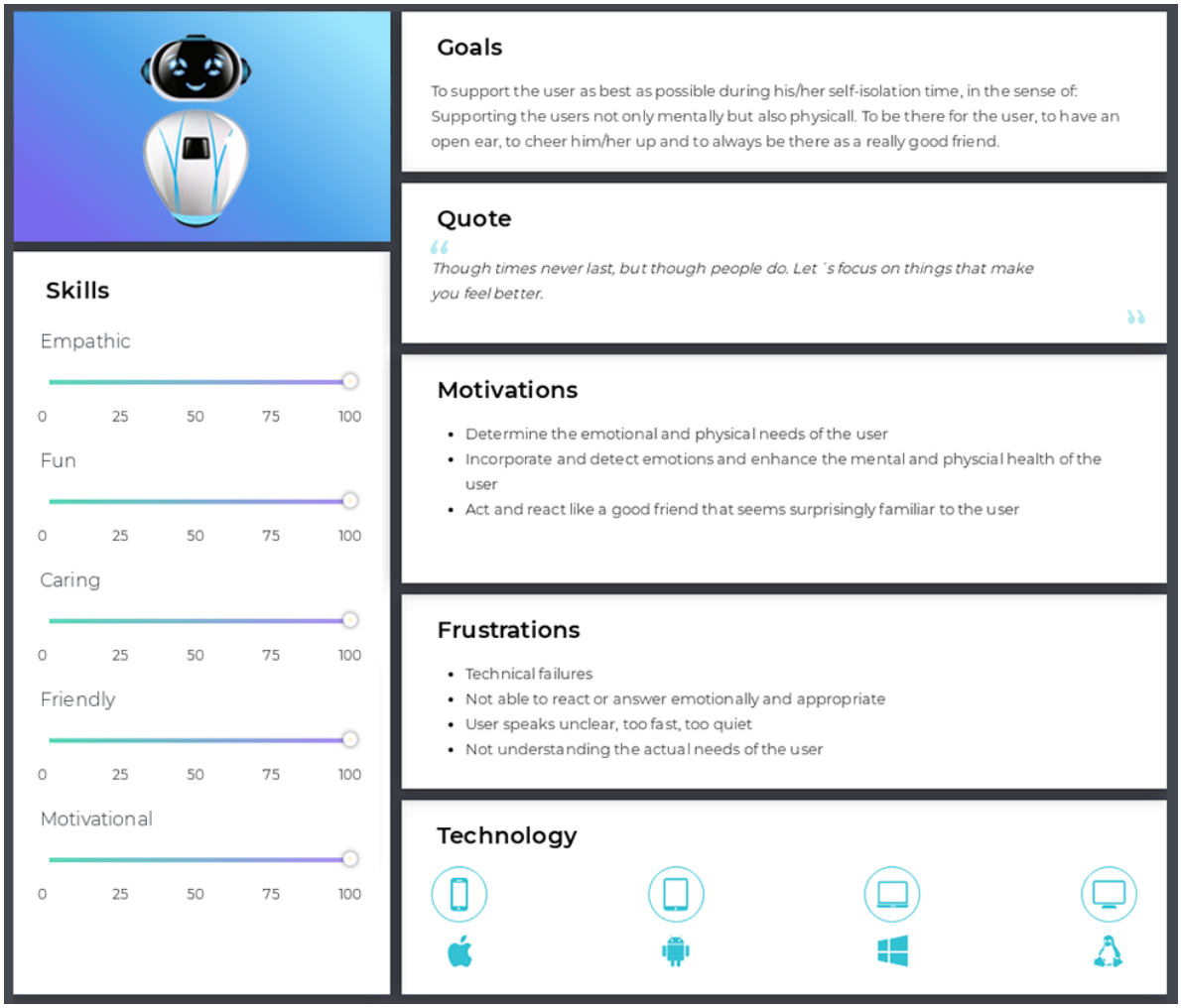

Figure 7 – System Persona

3.3. User Journey

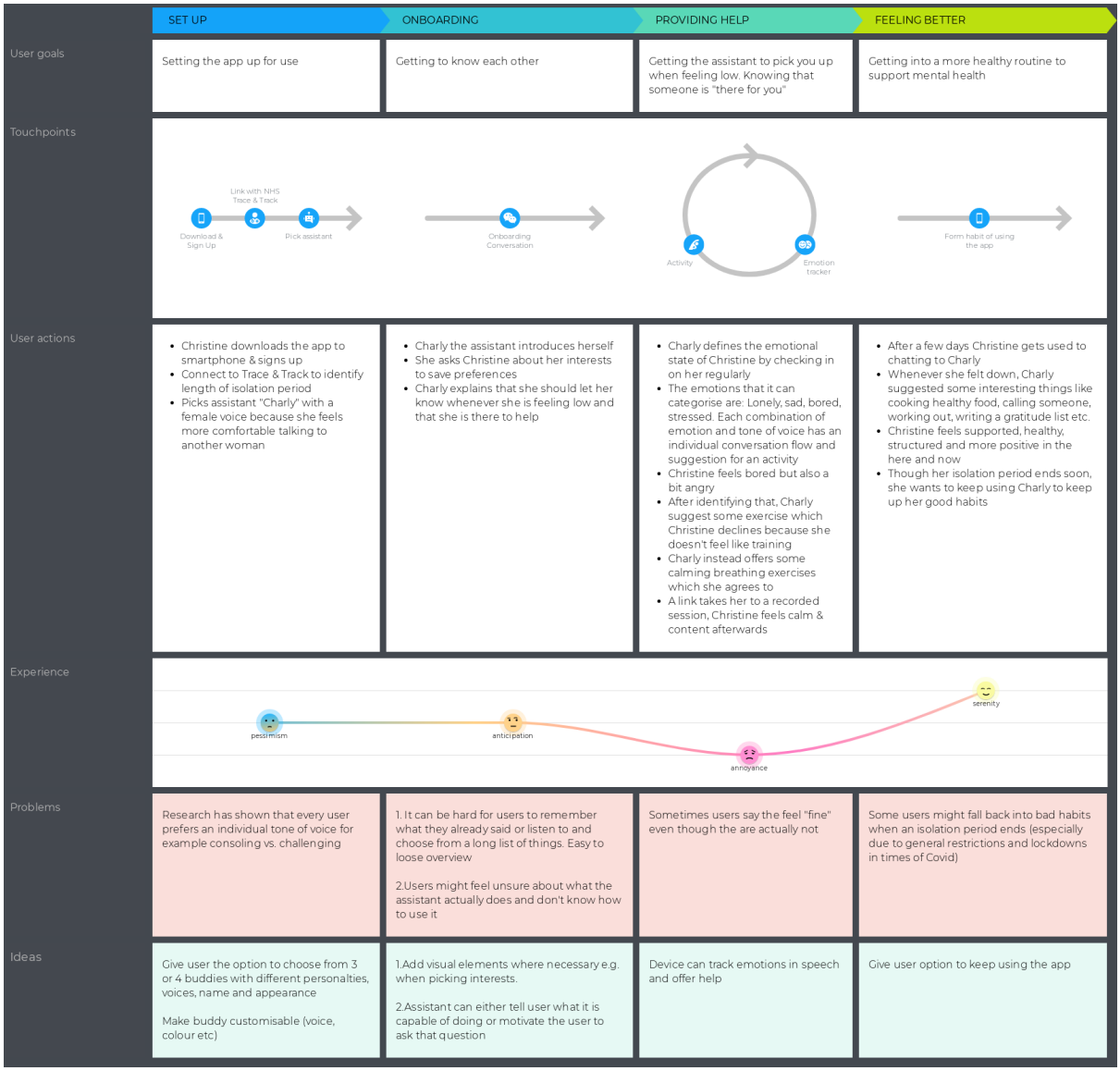

Figure 8 - User Journey

Based on our User Persona Christine, a User Journey was created to understand how she might feel and how our app can offer help.

3.4. User Scenarios

The app aims to improve the mood of those undergoing self-isolation by encouraging users to talk about their feelings and any negative emotions they may be experiencing, and by responding accordingly by encouraging the user to participate in activities that may improve their mood.

The prototype demonstrates a range of scenarios that were prioritised according to the likely goals and needs of the target users represented by the persona and the research conducted. The scenarios aim to address the four most common feelings experienced by survey respondents during self-isolation: boredom, loneliness, sadness and stress, with all four experienced by at least half of the respondents.

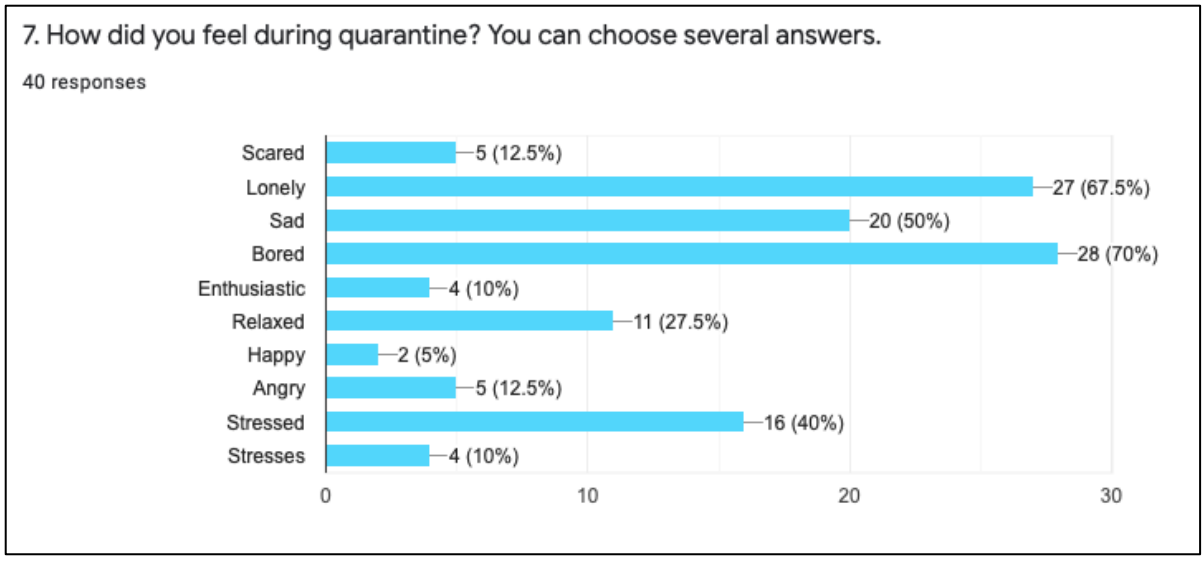

Figure 9 – How do you feel during quarantine?

The scenarios incorporated activities chosen based on NHS guidance (n.d.) for mental health that would be offered by the app in response to user emotions.

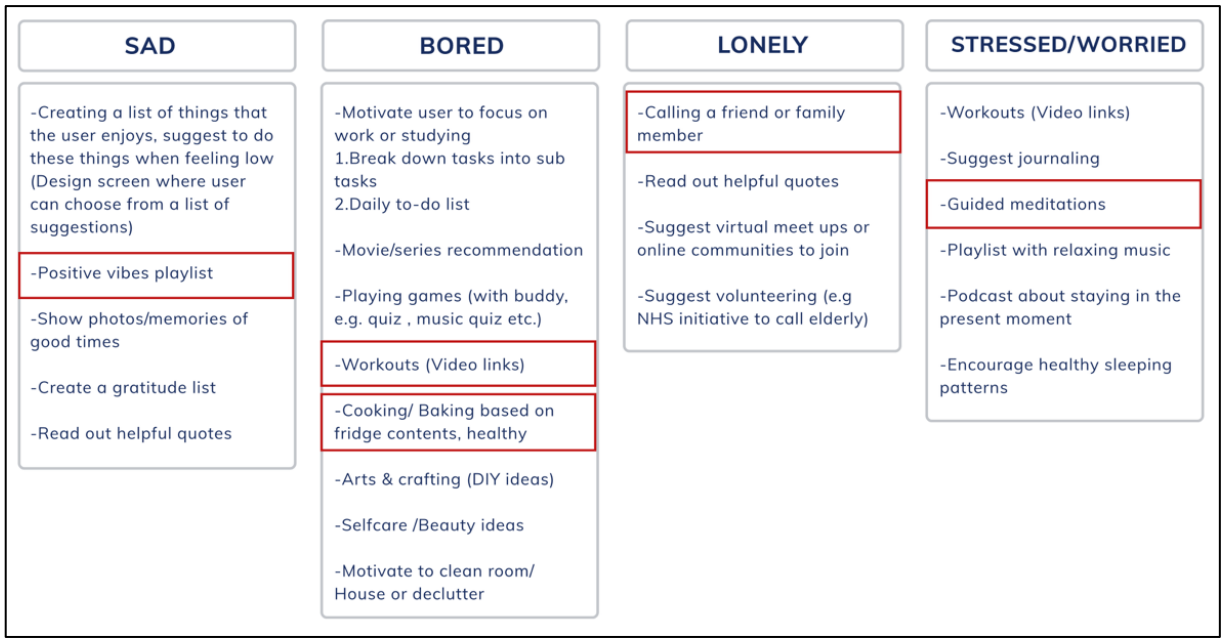

Figure 10 – Mental health guidance in relation to user's emotion

4. Design

4.1. Conversation Design

Three scenarios were fully explored through conversation dialogues. The two initial scenarios developed focused on how the virtual assistant could guide the user through different activities. To explore these scenarios, diagrams of conversational flows were developed, which also contained within them sample dialogues.

To get an initial sense of how conversations in these scenarios could sound, the scenarios were roleplayed so that ideas for prompts, responses and potential directions of the conversation flow could be considered.

These were then developed into sample dialogues that would help to give a sense of the feel of the interactions that the user would experience without any technical distractions, and before introducing the complexity of flow diagrams (Google, n.d.).

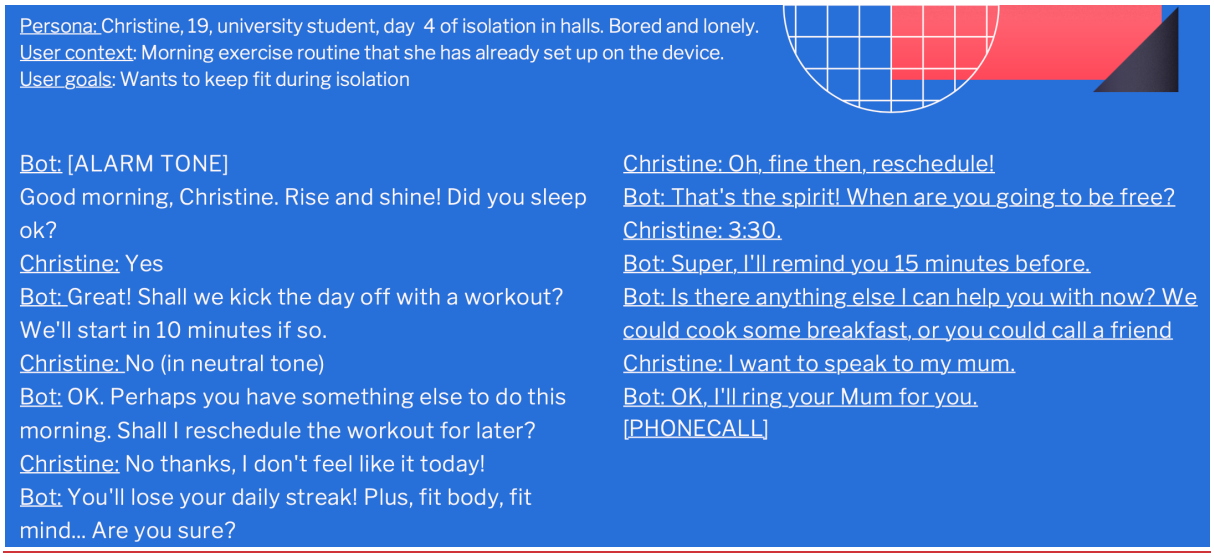

Figure 11 – Initial conversation dialogue

Conversation flow diagrams were drawn out, which would consider different possibilities of what the user and the voice assistant would say. This would ensure that different elements key to creating human-like dialogues would be covered, such as greeting, asking for information, informing, verifying, suggesting and handling errors or misunderstandings.

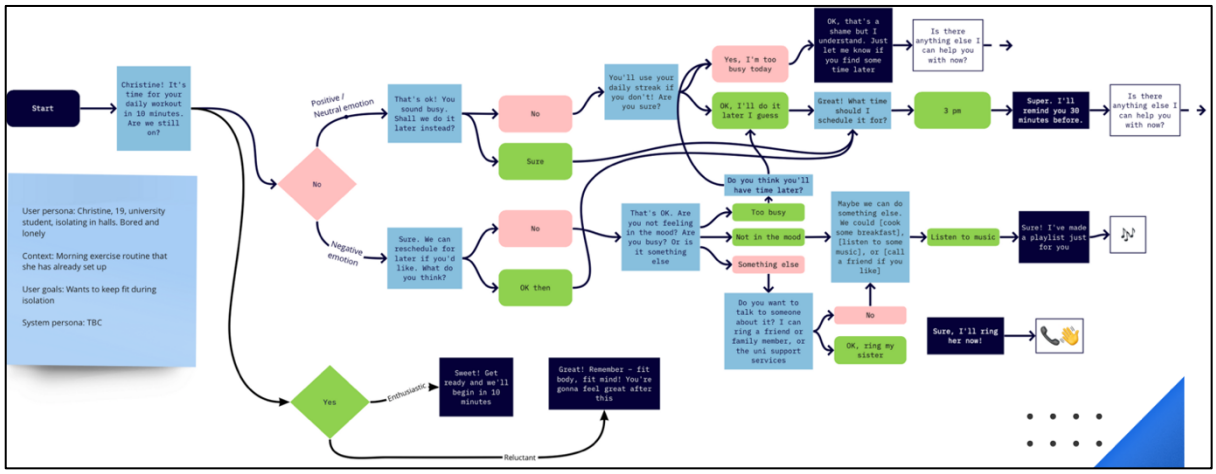

Figure 12 – Conversational flow diagram

These flows were also inputted into the software Voiceflow, a prototyping tool for voice interactions. This allowed the scenarios and conversation flows to be tested using voice and text input, allowing for a higher-fidelity representation of how the dialogs would work for real users. At this stage, detailed responses for behaviours in the cases of errors or unexpected responses were developed, and interactions were refined to ensure human-like qualities and natural interactions.

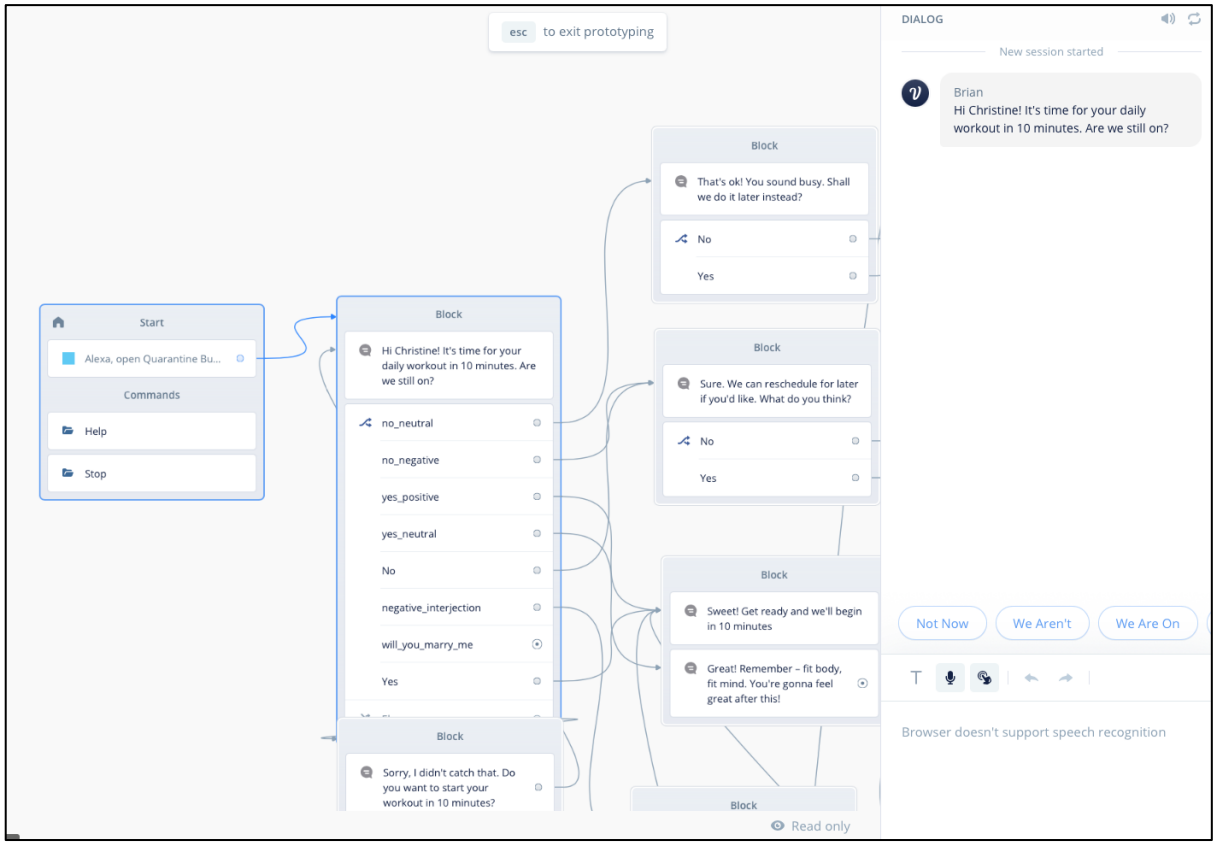

Figure 13 – Conversational prototype in Voiceflow

The third scenario developed for involved the voice assistant determining the user's feelings and emotions. This scenario ended up being the primary scenario demonstrated in the prototype. The aim of this scenario was to encourage the user to open up explain how they were feeling, and detect their emotions based on a combination of self-description and tone analysis.

The development process for this scenario was broadly the same as for the previous scenarios, whilst also incorporating the tone analysis capabilities of the IBM Watson tone analyser software used. This would involve developing different flows based on the tone of voice of user responses, with the assistant giving different responses accordingly. The result would be that the assistant would be able to offer appropriate activities to the user according to their self-described mood and their tone of conversation.

These voice flows were tested to gain insight into thoughts and feelings of potential users when interacting with them. Six participants, who felt an emotion of either sadness, boredom, loneliness or stress, were asked to engage with the voice flow. They were then asked about how they feel and think in relation to the flows. It was found that the VUI improved the mood of the participants. It was also found that they believed the VUI encouraged them to engage in activities and that they thought that conversation with the VUI was natural and human-like.

4.2. Design Process

4.2.1. Initial Approaches

Three design approaches were developed to understand which device would be most favourable for the quarantine buddy system. No market data suggests that a physical device (like Alexa and google home) is preferable than an app (Siri or Cortana). Before the project could focus on making the quarantine buddy, a better understanding was needed to know which platform would be most appropriate.

Approach 1

The first approach was an app. The app would contain a virtual assistant and link to the user's NHS test and trace app. Both the assistant and the NHS app would be able to access data from one another, allowing the app to keep track of the user's quarantine period.

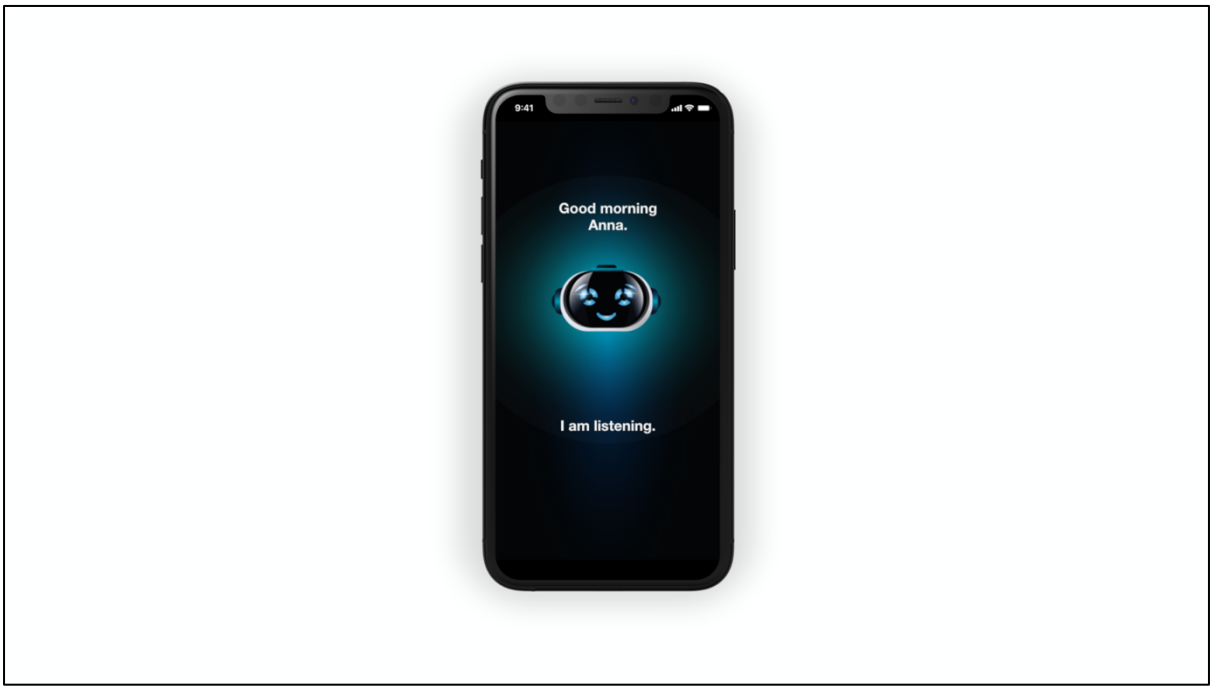

Figure 14: Approach 1 – Quarantine Buddy IPhone App

Pros

Easily accessible via the app/play/android store. A majority of people have a phone and will prevent waiting times upon release.

Cons

Having to open the app to talk to your quarantine buddy can be an irritating chore. This flaw can make your buddy seem like a service and less like a 'buddy'.

Approach 2

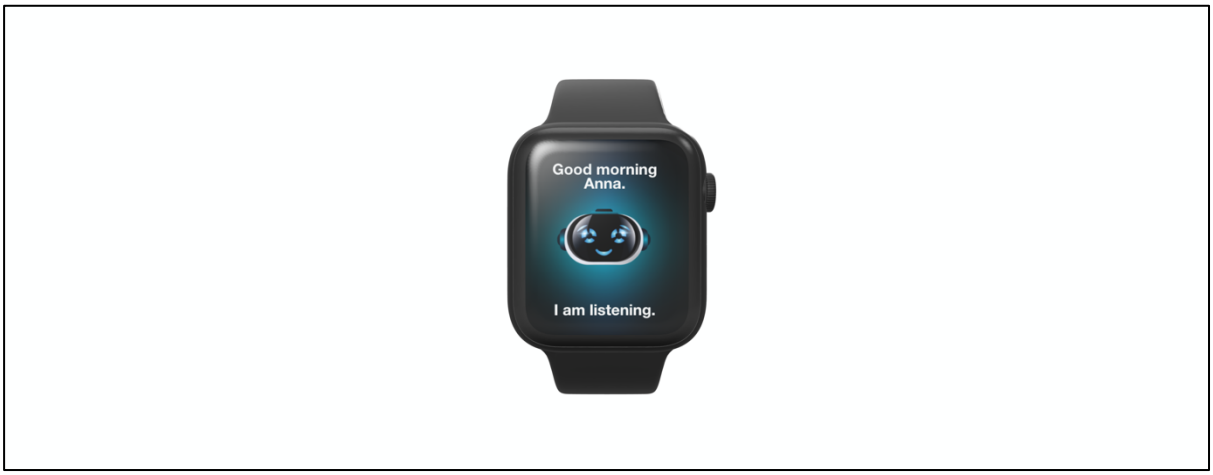

Figure 15: Approach 2 – Quarantine Buddy Smartwatch

Similar to Approach 1, this would be an application, but it would be on a smartwatch. Smartwatch applications are duplicates of the apps on phones,

meaning that users would still be required to have the application on their phones.

Pros

Just as accessible as the phone app. Will allow the buddy to be with you on standby at all times.

Cons

Not as many of the population have smartwatches. This service would need to be an additional product to an app.

Approach 3

Figure 16: Approach 3 – Quarantine Buddy Device

The last approach is a virtual assistant device. This assistant would still require a phone app for updates and setup. It would be utterly independent to other technologies.

Pros

A physical device can feel more like a buddy/pet (similar to the toy Tamagotchi) and would always be on standby ready to interact with a user.

Cons

A physical product would require manufacturing and shipping, which would cost the providers or the consumers money (depending on how the scheme would work).

Immediate demand would create long waiting times. The device is just not as accessible to everyone.

4.2.2. Design Approach Feedback

Twenty participants gave their feedback about the three approaches. They were asked to rate each design from 1 (I don't like) to 5 (I really like).

The average (mean) score from each approach was:

Approach 1 (IPhone App) = 4.35

Approach 2 (Smartwatch App) = 3.55

Approach 3 (Device) = 2.9

The iPhone app (approach 1) had a far greater mean which meant it was liked far more than the other Approaches. To expand on the participants opinions, they were then asked:

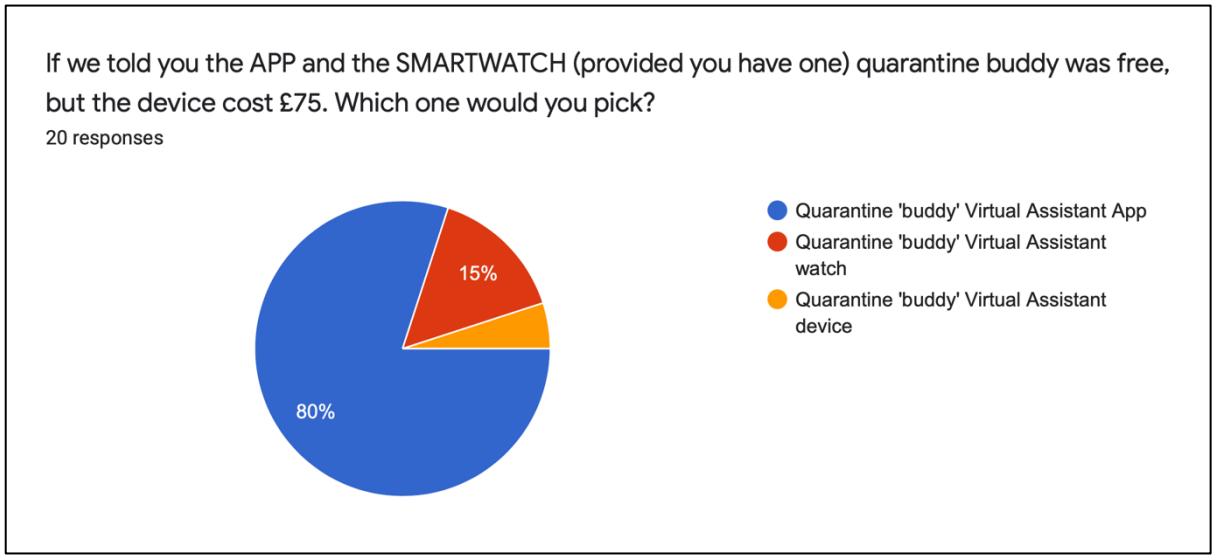

Figure 17: Feedback on the Approaches

The device would cost money to manufacture and ship. The results show that only 5% was willing to pay that price to receive a Quarantine Buddy (Approach 3 – Physical Device).

4.3. Prototyping

4.3.1. Low-Fid Prototype

The low fidelity prototype started with traditional pen and paper. Onboarding was the main focus of this prototype while the Information Architect and UX Researchers

worked on the conversational design. The link to the Low-fidelity prototype is in Appendix 2.

Both the Lead Designer and UX/UI Analyst did sketches which were uploaded into Figma (A digital prototyping tool).

Testing & Redefine

An informal feedback session was run with two willing participants. The general feedback was very positive, but they were only shown the onboarding scenario, which meant it was not entirely clear how the system would work. The participants also feared that the product might struggle against competitors such as Alexa, Google Home and Siri.

4.3.2. Mid-fid Prototype

The Mid-fidelity prototype plan was still to continue with the onboarding scenarios. The conversational design was being developed alongside prototyping to meet the deadline. The Mid-fidelity prototype would act as a template for when the conversational design was created, and it could then all be assembled. The medium-fidelity prototype link is in Appendix 2.

Testing & Redefine

Feedback was collected from two more willing participants in another informal feedback session. The overall feedback was very positive as the app looked closer to a finished prototype. The participants were fond of the futuristic theme, the system personas (the robots) and automatically understood how the onboarding process would work. This feedback was confirmation that the prototype was ready to implement the conversational design.

4.3.3. High-Fid Prototype Version 1

The high-fidelity prototype used the medium-fidelity prototype template, approved by the feedback participants. The conversational design was implemented in this version and brought the prototype to life. Adobe XD allowed the use of voice commands and speech playback, making the prototype very real. The link to the High-fidelity Prototypes is in Appendix 2.

Testing & Redefine

After making the high-fidelity prototype, no participants were needed for feedback as the group had many ideas on how to improve the interface. The first point was that we no longer needed the buttons on either side of the 'tap to talk' function. Making the interface more straightforward will make it easier for many users.

Another critical issue is that the prototype incorporates dark colours to contrast the characters/personas (the robots). These dark colours do not reflect the service's aim (improve users' mood during an isolation period) and will need to be adjusted accordingly.

4.4. Visual Identity

4.4.1. Brand Research

Therefore, a more detailed brand research has been conducted, especially in regard of the brands core values, how the business wishes to be perceived and how the visual identity can support here. In order to start the research, the following brand core values were defined: Trust, responsibility, reliability and empathy. Therefore, the brand needs to be perceived as trustworthy, dependable, clear, stable, calming and empathic. According to Winter, brand values as well as their desired perception can be communicated through “visuals (logos, typography, colours etc.), and messaging (tone of voice and brand identity)” (Winter, 2021). To this effect, the existing prototype was analysed in more detail and it became clear, that the dark colour palette was not reflecting any of the brand core values. Therefore, it was researched which colours other competitor apps use. Especially other voice assistance systems, mediation and healthcare/medical apps were analysed, as they all represent similar brand values which our application also stives for (Appendix x). It became clear, that their visual identities are mainly based on palettes with "cool" colours. According to Sherin, 2012, a colour is considered as “cool”, when the colour pigments are based on Blue and they are particularly “seen as calming and dependable” (Sherin, 2012, p. 95). According to Watson, 2015, especially the colour Blue as such, is perceived as “calm, stable, trustworthy and smart” (Watson, 2015). Based on this research the following mood board (Figure 19) has been created.

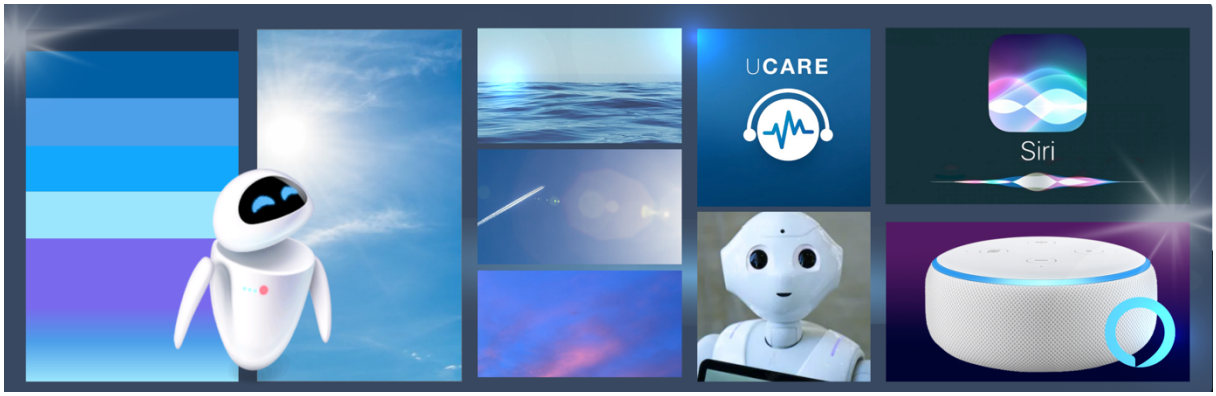

Figure 18 – Brand mood board

4.4.2. Look and feel of CHARLY

Three different buddies (robots) were designed, as the app was originally supposed to offer different buddies to choose from. However, an informal desirability test with one participant showed, that two robots did not evoke the desired emotions. Therefore, a survey with 34 participants has been conducted, in order to verify these new insights. The survey used the Microsoft desirability toolkit. The participants were asked to choose five out of 25 terms which best described the robots. The results showed that only robot number 1 was perceived, accordingly to the desired brand values (Appendix 3). Therefore, it was decided that the system would offer only one buddy and the app was renamed to "CHARLY".

4.4.3. Logo Design

After the brand name has been finalised, several logo designs were created and shared with the team in order to receive feedback. Most of the team members then voted for the following, final logo design (Figure 20.). This design particularly convinced because of its simplicity and clarity.

Figure 19 – Final Logo Design

4.4.4. High-Fid Prototype Version 2

In order to finalise the prototype, the design changes were implemented. This affected mainly the background of the app, the button colour as well as minor colour adjustments of the text fields.

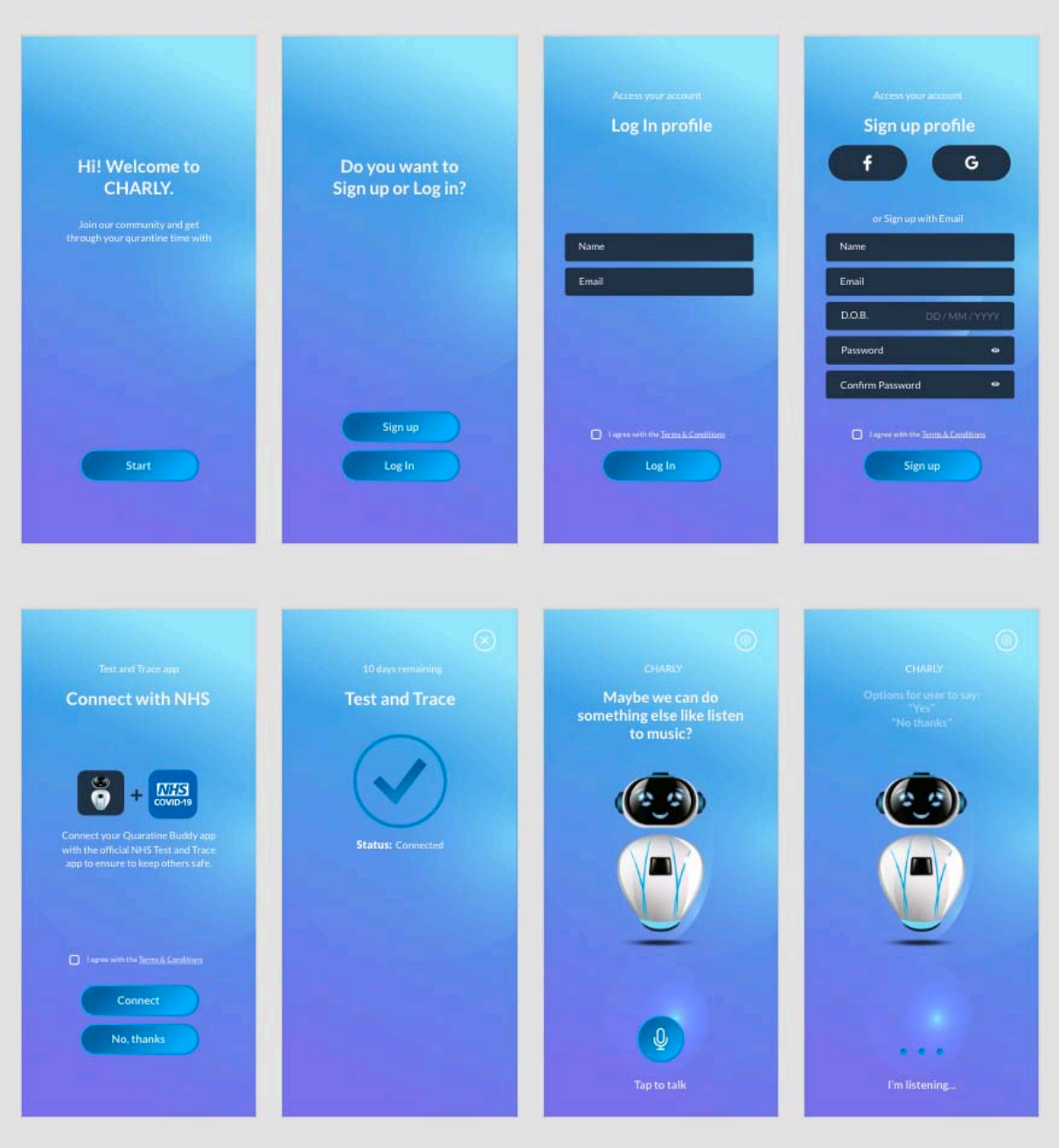

Figure 20 – Example wireframes of High-Fidelity Prototype

5. Style Guide

Especially for this cross-media project, with UI designers, UX experts, software engineers etc. involved, a style guide was of great benefit. The guide ensured consistency in the design and communicated changes and developments made (please see Appendix 5). The style guide includes general design principles, visual themes (colour scheme and typography), individual components (buttons,

iconography, background pictures etc.) as well as a grid system template. In addition, the style guide informs about the brand identity with the desired core values and presents CHARLY the robot.

6. Device Design

The role of 3D Artist in this project was to model and texture the 3D artefacts of the voice interface application CHARLY. The idea originally consisted of two robots, each having five expressions. The idea and design of these robots were created by the 2D designed which acted as a reference for the 3D Artist. The 3D Artist discussed the design with the group to better understand how the robots would loom (photo-real or stylised). The group decided that the app would require the models to be realistic for people to feel more connected towards it. The two models were then decided and handed over to the 3D artist to work on the modelling and texturing of the models.

Both of these robots were created from scratch by the 3D Artist including the five expressions.

Figure 21 – Robots

The process of creating a robot started with a simple sphere in Zbrush was the base model was created. The model was given a proper shape according to the reference, all the while taking care of its proportion. The 3D Artist worked on the details of the robot to exactly match the 2D concept and created hires model of the robot. As we know that working on high polycount would be a challenging task for the developer as well as artist to animate and render image sequences as it may require a lot of time. So, the model was then exported to Maya for low-res, clean topology and UV unwrapping. The FBX mesh was exported to Marmoset with decimated hires model for baking normal maps.

For the realistic output, the model was imported in Substance painter with FBX mesh and normal map. Hand-painted textures were used on the robots along with working on the base colour, highlights, roughness, metallic, emissive, noise and shadows. Five expressions were created during texturing and exported their base colour and emissive individually. These techniques were implemented to give the model realistic. The artist has worked on animation with the use of image sequences and Arnold to render final images.

The 3D Artist constantly stayed connected with the group to ensure that the models were developed according to the idea as well as suitable for the programmer to work with. After the completion of two robots, each having five expressions, the group surveyed to finalise one of them. The survey was done using Google forms through which CHARLY was finalised.

Following are a few images of the renders captured in Arnold:

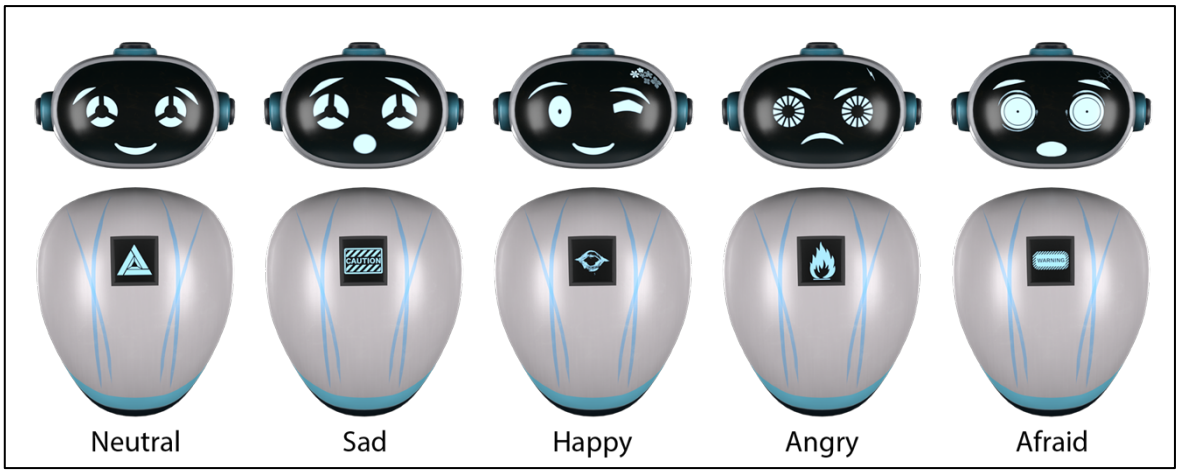

Figure 22 – Robot with facial expressions AOV Passes

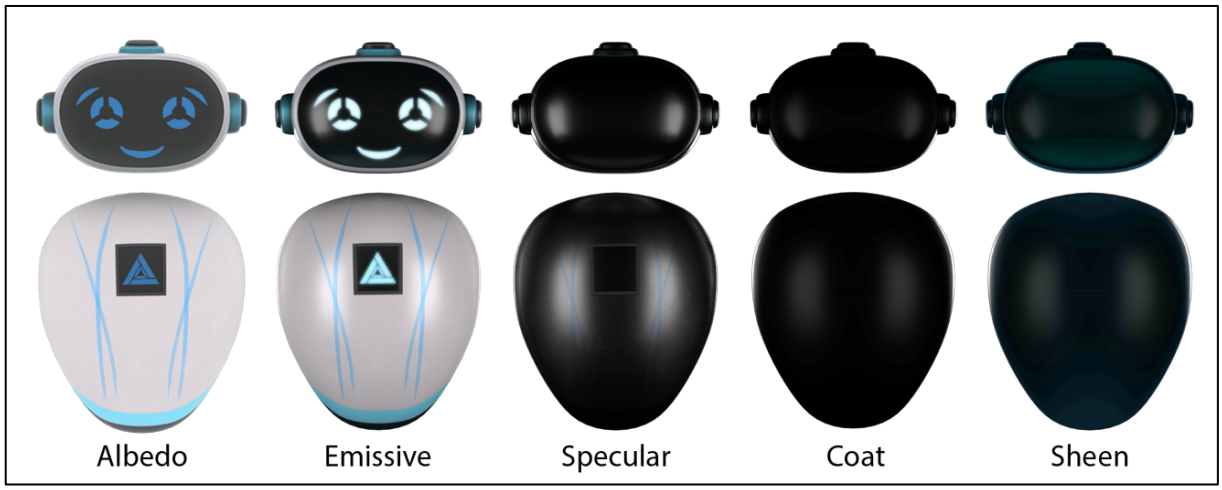

Figure 23 – AOV Passes

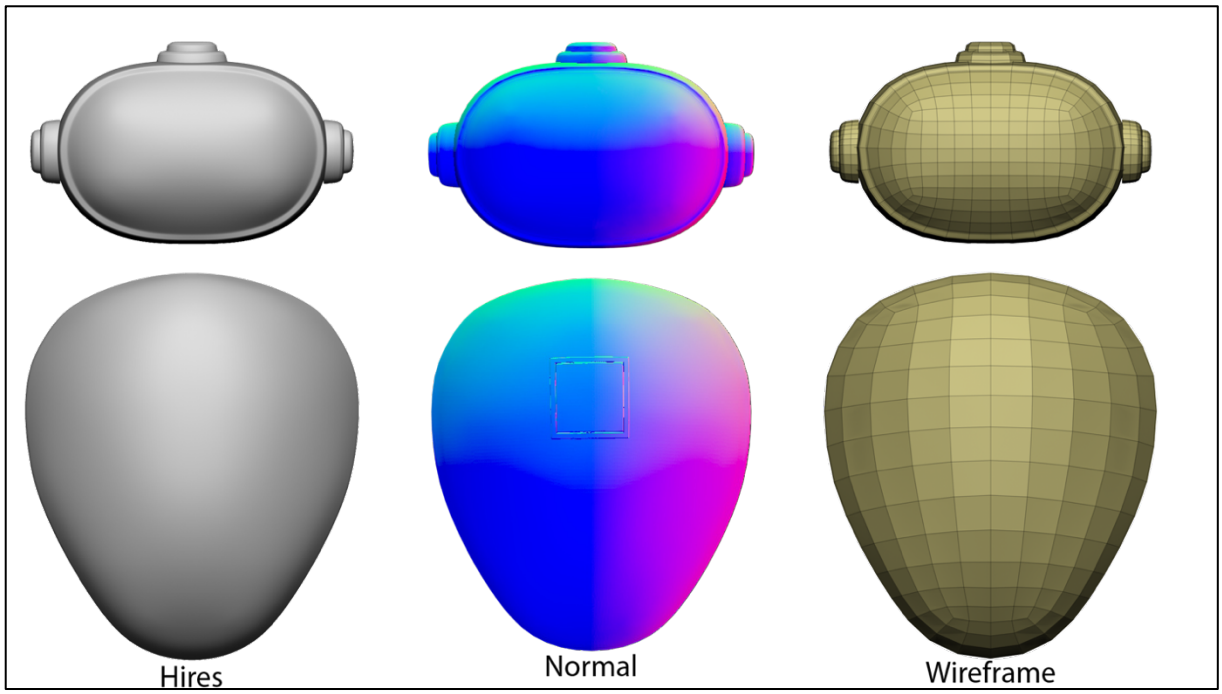

Figure 24 – Robot break down

7. Implementation

7.1. Choosing a platform

We had initially chosen to produce the app on Android but after many technical difficulties, the main one being that the voice tone emotion detection and speech recognition modules would not work simultaneously, we opted for the iOS platform.

The final deliverable was therefore implemented as a native iPhone application on Apple's integrated development environment XCode. The demographics of iOS

users are younger, with a higher level of education and greater engagement than Android. We agreed to target younger people since they are more likely to live alone and because older people are often not as tech savvy, therefore wouldn't show as much interest towards smartphone apps.

7.2. Emotion Analysis

7.2.1. Selecting an emotion detection method

We had initially chosen to implement emotion detection through voice, but after debating it further as a team we opted for text-based tone analysis. One of the main reasons was that the vocal tone emotion detection could be detecting one emotion when what the user is saying could be portraying a completely different emotion. Another reason was that the voice-tone analysis only had a 66% accuracy, whereas the text one was more accurate.

To implement the tone analysis, the IBM Watson tone analyzer was the most popular open-source API that came up in our research (Doerrfeld, 2015). Additionally, it has frameworks for both iOS and Android, allowing us to implement it with ease.

7.2.2. How the IBM Watson Tone analyzer works

The IBM Watson Tone Analyzer is built upon the theory of psycholinguistics, a subject that looks to match certain linguistic attributes to psychological states. The service uses linguistic analysis and the correlation between the linguistic features of text and emotional and language tones to assign scores for each of these various tones.

Emotional tone is extracted from IBM's work on emotion analysis, which is an ensemble framework that hypothesizes emotions from text. To derive emotion scores from text, IBM uses a stacked generalization-based ensemble framework, which is a machine-learning model that encompasses multiple smaller machine-learning algorithms, therefore leading to better predictive accuracy. The features that are fed into these machine learning algorithms are punctuation, greetings, emoticons and n-grams (selecting n words or n syllables to deduce information out of it).

7.2.3. Using the tone analyzer

To access IBM Watson's services, we had to create an account on the IBM Cloud, then sign up for the Tone analyzer service with the chosen server location of London. They returned an API key and an URL which was used as input for the authenticator. The authenticator was then used to create a ToneAnalyzer object that allowed us to send requests for analyzing the tone of a String object using a simple

method. That method returned a ToneAnalysis JSON object that contained the tone names and their respective scores, which was used to conduct the flow of the conversation.

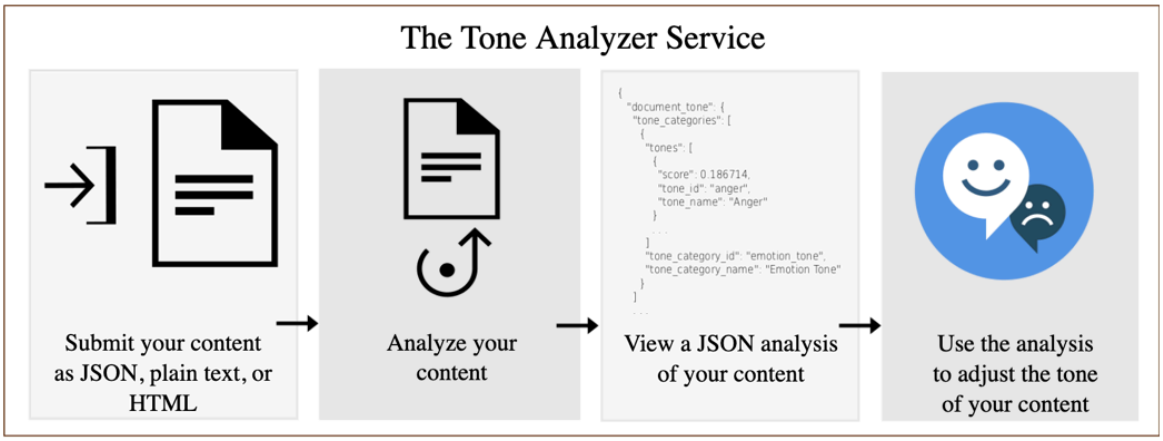

Figure 25 – The tone analyser service

7.3. **Realizing** the voice flow

The voice user interface had two different methods to guide the conversation flow. The first one was keyword detection, this was mainly used in parts of the conversation where a simple response from the user was expected (i.e.: Yes, No, Sure, etc.). This was implemented by analyzing the user's speech input to check if certain keywords were present in the string.

The second method was emotion detection, this was applied where the user's response was less predictable and more elaborate. Due to the nature of the tone analyzer being able to return multiple emotions when analyzing the tone of a sentence, we decided to order emotions by importance and check if they were present or not. The classification of these emotions was done on their prevalence: the more common they were the lower they were classified.

7.4. Testing the final prototype

Because the final prototype runs in XCode and requires a combination of voice and screen input for interactions, it was not practical to test the prototype remotely, as participants could not be expected to access the requisite software. Furthermore, due to the circumstances of lockdown, in-person testing opportunities were limited. Therefore, informal testing was conducted amongst three household members by the information architect, all of whom had undergone periods of self-isolation. Participants were asked to interact with the application and follow the interaction until its conclusion. Then, they were asked to answer a short questionnaire by indicating their level of agreement with 10 statements, and were invited to discuss

the design with the information architect. The following key qualitative insights and recommendations resulted from the sessions (Full data gathered can be found in Appendix 6):

Insight	Recommendation
All participants had to be guided to phrase their response in a way that the assistant would understand when giving their name.	More response types and syntaxes should be recognized by the assistant at this stage.
All participants had to be guided when asked how they felt.	At this stage does not indicate to the user specifically how they can respond in a way that it understands, asking only: "how are you feeling?"; in future iterations, this response should be updated to match earlier prototypes, which asked "are you feeling up or down?" This response more clearly offers the user two choices of response.
No participants agreed that the interaction was human-like, with two neutral and one disagreeing. This was perhaps largely due to the voice sounding too robotic-sounding.	Further research should be conducted into the possibility of adding a different sounding voice.
The robot design tended not to catch the participants' eyes in the dialogue screens.	The placement of the robot on the screens could be made more prominent, and the design more dynamic to better catch users' eyes.
It was not initially clear to participants how the voice recording button worked; however, once understood, it was generally seen as an effective way of triggering voice input.	The design of the button on and off states could be changed to make its behaviour in each state more obvious. A short tutorial could be added to teach the user how to use the controls.
All participants felt that the interaction was useful, easy to follow, and that the VUI might have helped their mood during self-isolation. Furthermore, they all indicated that they would like to use the device if they had to self-isolate again.	The overall concept was liked and understood, and warrants further general development.

Figure 26 – Testing insights and recommendations

It is important to note the limitations of the testing conducted; firstly, a small sample size meant that it was not possible to gather reliable quantitative data, and a volunteer bias effect may have affected results, as participants may have given more positive insights due to their relationship with the test moderator. Furthermore, the testing was not conducted in a true real-world scenario, as none of the participants were currently undergoing self-isolation. The recommendations given should therefore be seen as preliminary in nature. To gather more reliable testing data, further tests could be conducted with a larger, random sample of people currently

self-isolating, which would necessitate the development of a testing method that can be done remotely.

8. Reflection

8.1. Challenges and learnings

The project brought many challenges to the team. A majority of the team are UX designers and have never worked with VUI interfaces. This required us to alter our typical design process and develop the conversational design alongside the visual artefacts. The COVID-19 pandemic also meant that we had to adapt or typical design process. All the meetings and workshops meant that we had to work remotely. This was initially challenging but as the project developed it became easier with the use of tools such as Miro, Trello and Microsoft teams. As a group we worked very effectively providing the tough circumstances.

8.2. Project limitations

With current VUI giants such as Google Home, Alexa and Siri, bringing Charly into a commercial market will be incredibly tough. If one of these VUI brands were to release a similar service, it would be a large threat to Charly. The whole concept of Charly is to support people self-isolating by themselves. Once the COVID-19 pandemic is over, the service might struggle to fit into an everyday lifestyle.

8.3. Future outlook

If the project were to be taken forward, it may be beneficial to re-focus the target audience to older adults. This is because although the general population feel lonely now due to the pandemic (WHO, 2019), over one fourth of adults over 45 years of age are considered ‘socially isolated’. When the pandemic is over, CHARLY may still be useful to overcome these feelings of isolation. Adjustments of CHARLY towards this age group may include making CHARLY more accessible, by making colours on the interface more neutral with larger fonts, for example.

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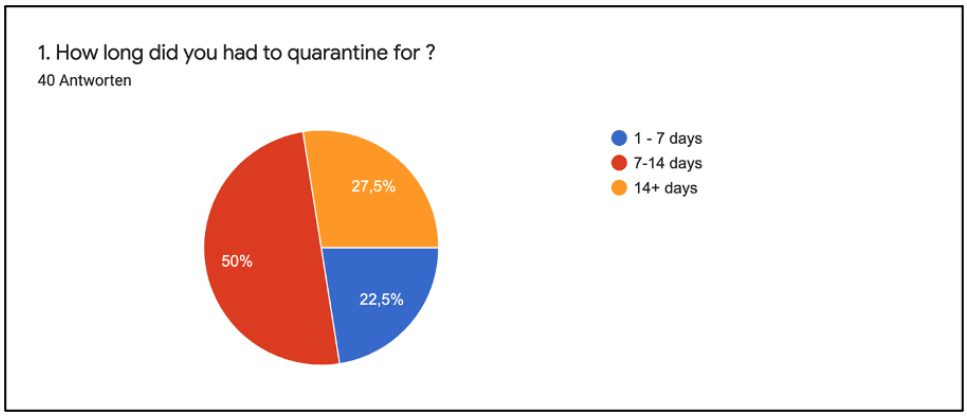
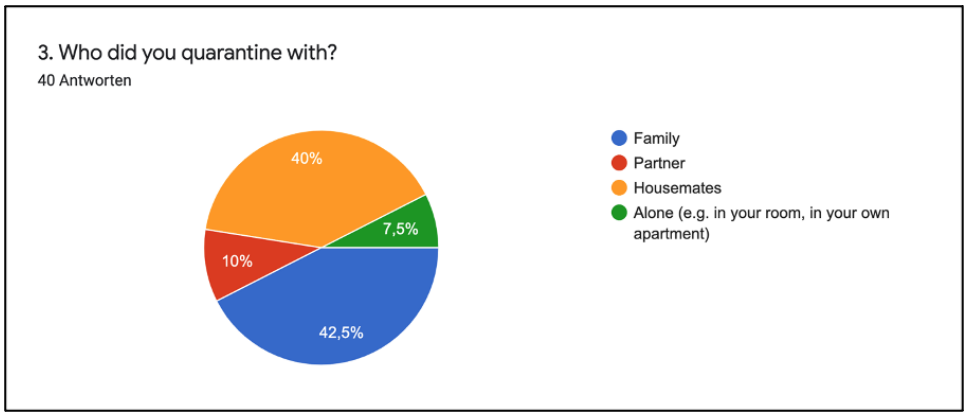
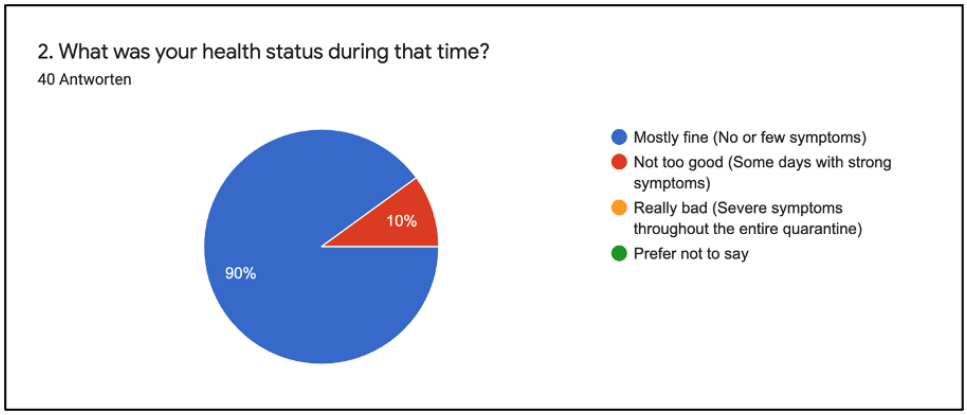
10. Appendix

Appendix 1 – Primary User Research Survey

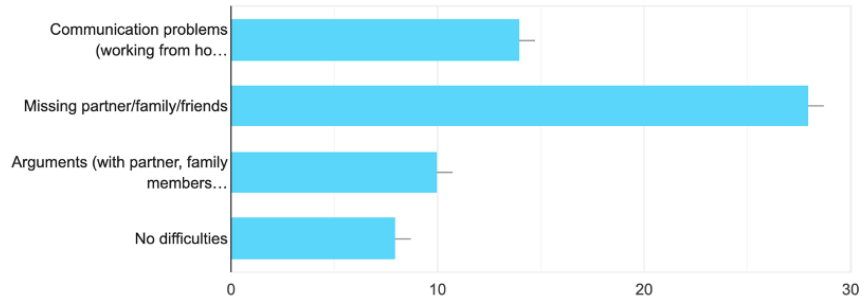






4. Did you experience any difficulties with other people while in quarantine? Tick all that apply

40 Antworten



5. If you experienced any difficulties, can you specify the nature of these difficulties in more detail? (All data will be displayed anonymously). Otherwise skip to the next question

19 Antworten

other off, it's important to get your own time and spend an hour or 2 a day on your own.

Overload of being stuck with the same people, same topics to talk

Difficulties with anxiety and mental health.

More mental health as had to go back to ireland

Not be able to go out and see people

I had difficulties in comunication with my class mades and teachers. Because of that i wasn't able to study. I am also unsed to be surrounded by people so it was hard to don't be able to meet them and stay by myself all the time..

Missing friends

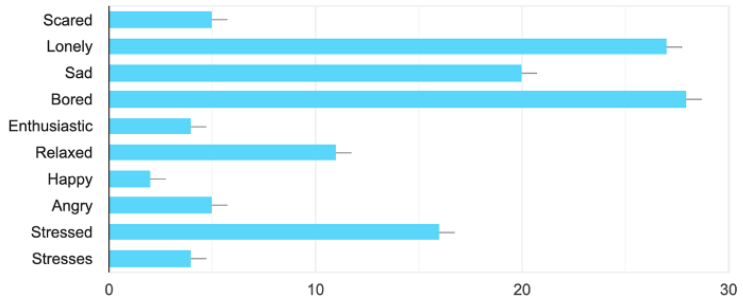
Verbal arguments with family member from being constantly around them
Issues with work servers and vpns

6. Do you feel like you got enough support during your quarantine (e.g. from friends and family or an NHS helper)

39 Antworten

7. How did you feel during quarantine? You can choose several answers.

40 Antworten

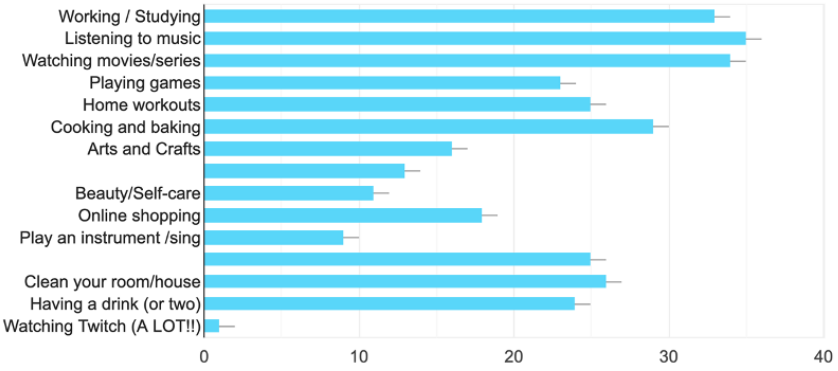


8. If you are feeling any sort of negative emotions (like loneliness, sadness, anger) how would you want someone else to speak to you in order to help you step out of this state?

40 Antworten

9. What things did you (or would you) do to keep yourself busy during the quarantine? You can choose several answers.

40 Antworten



Appendix 2 – Important Links

Trello:

https://trello.com/invite/b/vPIBKfiB/61aa446a01a9b20f39c17eb74d70fc23/dsp-group-7

Conversation flow diagrams:

- https://miro.com/app/board/o9J_lfw8Tjs=/

Voice interaction prototype example:

- https://kingston.box.com/s/h3j83ne8agf6tbcdu193et43a087f219

Low fidelity prototype link:

- https://www.figma.com/file/gMwaZz2XGg1rQChybqiTXs/Prototype-Quarantine-Buddy?node-id=0%3A1

Medium fidelity prototype link:

- https://xd.adobe.com/view/cbc434ca-e124-420d-9d59-a0acfe2aa12a-9e97/

High fidelity prototype link:

Scenario 1 - Onboarding:

- https://xd.adobe.com/view/dfd00141-1390-49a0-aa0f-47307598a2a8-8a83/

Scenario 2 – Exercise:

- https://xd.adobe.com/view/dc0a3ffd-25c8-4d60-8a78-f567ec582f27-8959/

Scenario 3 – How are you feeling?

- https://xd.adobe.com/view/17dcef72-f75c-4c5f-980c-b1e8555d299a-428f/

Scenario 4 – Cooking:

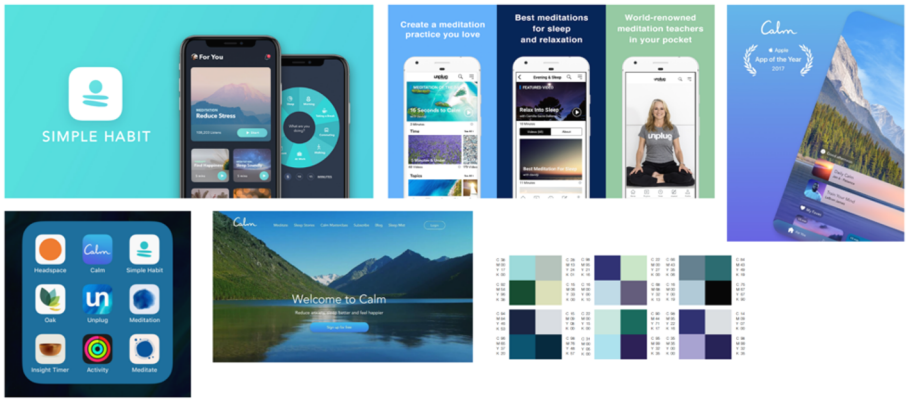
- https://xd.adobe.com/view/d5dc0233-caf4-43f8-a72d-c17801f3e011-808f/

Prototype demonstration video:

- https://web.microsoftstream.com/video/1f71dbd1-d2c8-4b01-9508-4aca2fb1a720

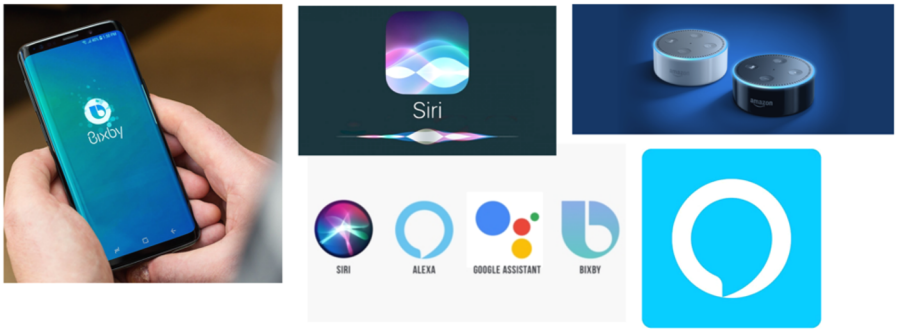
Appendix 3– Brand research on brand core values

MEDITATION APPS



HEALTHCARE / MEDICAL APPS

OTHER VOICE ASSISTANCE SYSTEMS

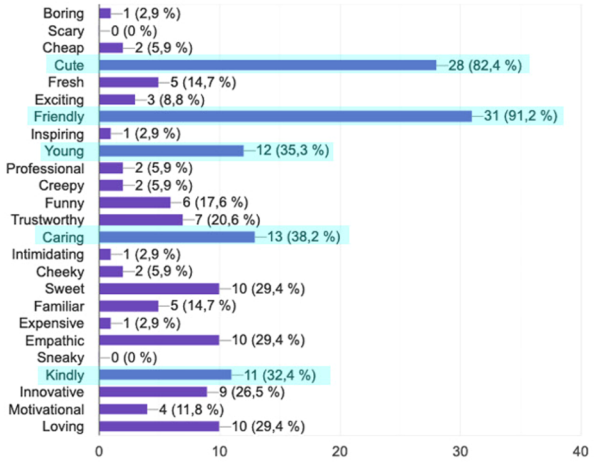


Appendix 4– Survey results

Survey results in order to test the user perception on the roboter design.
Taks: Please choose 5 terms which best describes this robot

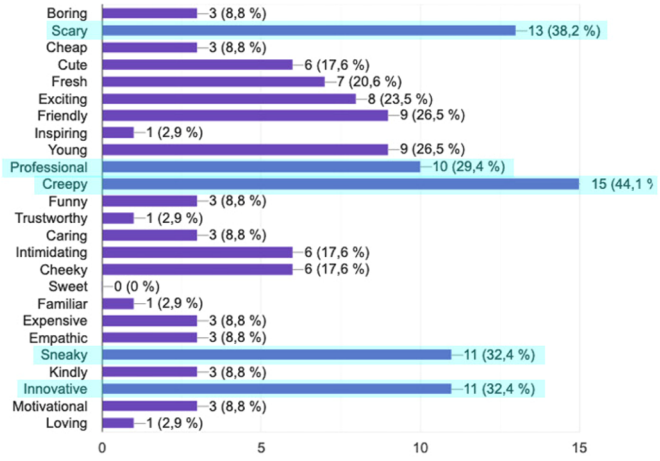
Roboter Nr 1

Cute, Friendly, Young, Caring, Kindly



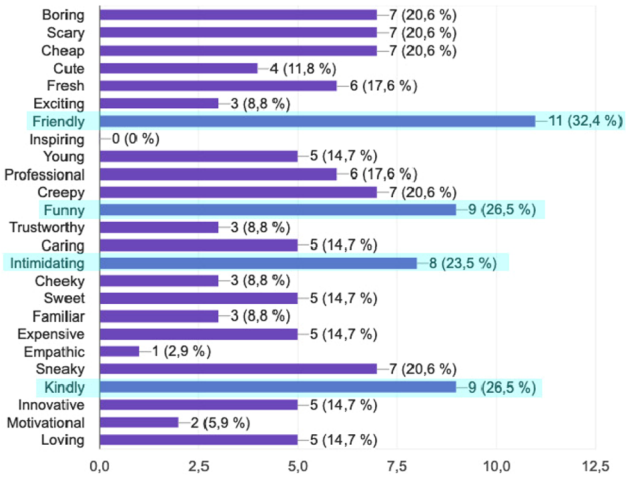
Roboter Nr 2

Scary, Professional, Creepy, Sneaky, Innovative

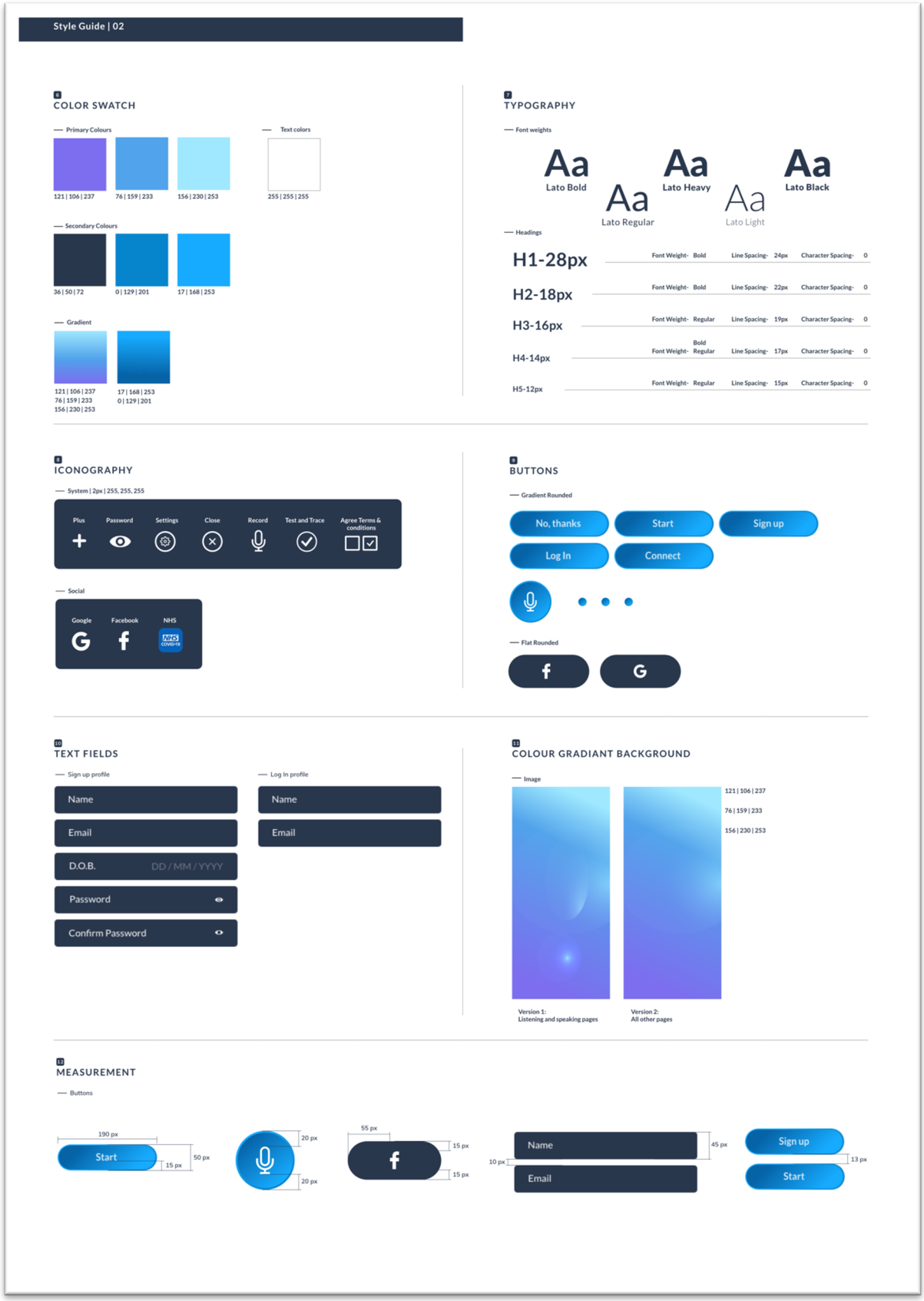


Roboter Nr 3

Friendly, Funny, Intimidating, Kindly, Boring/
Scary/Cheap/Creepy/Sneaky



Appendix 5 – Style Guide CHARLY



Style Guide | 01

1 LOGO

— Full Colour Version

— Dark Version

2 Brand identity

— Mission, vision, core values

The app Charly has one big mission: To accompany people through their quarantine time, to support them and make the time of staying home as bearable as possible. Therefore, the vision of Charly is to improve the quality of life during self-isolation. The values that the brand Charly represents are: Trust, responsibility, awareness and empathy.

The app user's permanent companion is Charly, the robot. He takes care of the user as best as possible. He is empathic, fun, caring, friendly and motivational. His goal is to support the uses not only mentally, but also physically. He is always there, day and night, and has an open ear for the users needs, problems and wishes. His motivations are to determine the emotional and physical needs of the users, to incorporate and detect them, as well as to enhance the health of the user and to act like a very good friend.

3 App / Widget Version

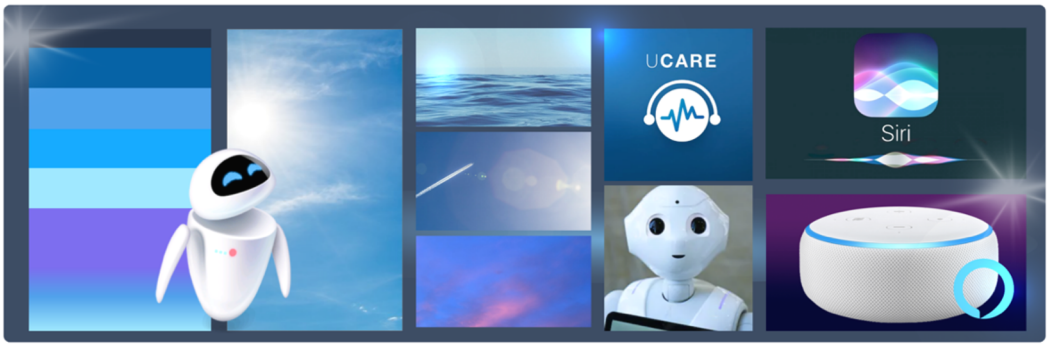
— Coloured version

— Bright version

— Dark version

4 VISUAL IDENTITY

— Moodboard



5 CHARLY - THE VIRTUAL ASSISTANT

— Character design

— Word cloud generated by users perception

— Face expressions and emotion

Appendix 6 – Prototype Testing Data

Questionnaire

	Question	P1	P2	P3
1	I found the interaction easy to follow	5	4	5
2	I found the interaction natural	3	3	3
3	I found the interaction human-like	3	2	3
4	I thought the interaction was useful	4	4	4
5	I felt the interaction helped me to express my feelings	3	4	3
6	I thought the voice interface listened to me	5	4	5
7	I thought the voice interface understood my feelings	3	3	3
8	I think the interface would have helped improve my mood during self-isolation	4	4	4
9	I would like to use this interface if I had to self-isolate again	4	4	4
10	I would like to use this interface even if I wasn't self-isolating	3	3	2
Key: Strongly Disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly Agree=5				

Discussion insights

Participant	Positive	Negative
P1	+ Design looks good + Understood interactions* + Button is easy to use, like using walkie talkie	- Design / placement of robot not eye-catching, head and body not connected - Voice was understandable but robotic-sounding
P2	+ Overall positive impression + Liked and understood flow of interaction + Liked the colours and design	- Did not really notice robot expressions - Did not like voice - Did not initially understand how button worked, tried to hold it down
P3	+ Liked how the assistant responded + Liked colours + Liked button once understood	- Did not like negative robot expressions - Robotic voice - Button not intuitive at first