

anusha narayan

human-centred design engineer

about

I am a fourth year design engineering student at Imperial College London with a passion for designing data-driven, human-centred solutions for enhancing the health and wellbeing of vulnerable populations, particularly children.

education

Imperial College London

MEng Design Engineering

2020 – 2024

experience

MathWorks

UX Design Intern

July 2022 – September 2022

MathWorks

UX Design Intern

April 2023 – September 2023

skills

R&D skills

user research
literature review
technical writing
human-centred design thinking
designing for children & families
futures thinking
system design
app design

technical skills

data science
machine learning
mechanics
electronics
fea
python
javascript
matlab
arduino



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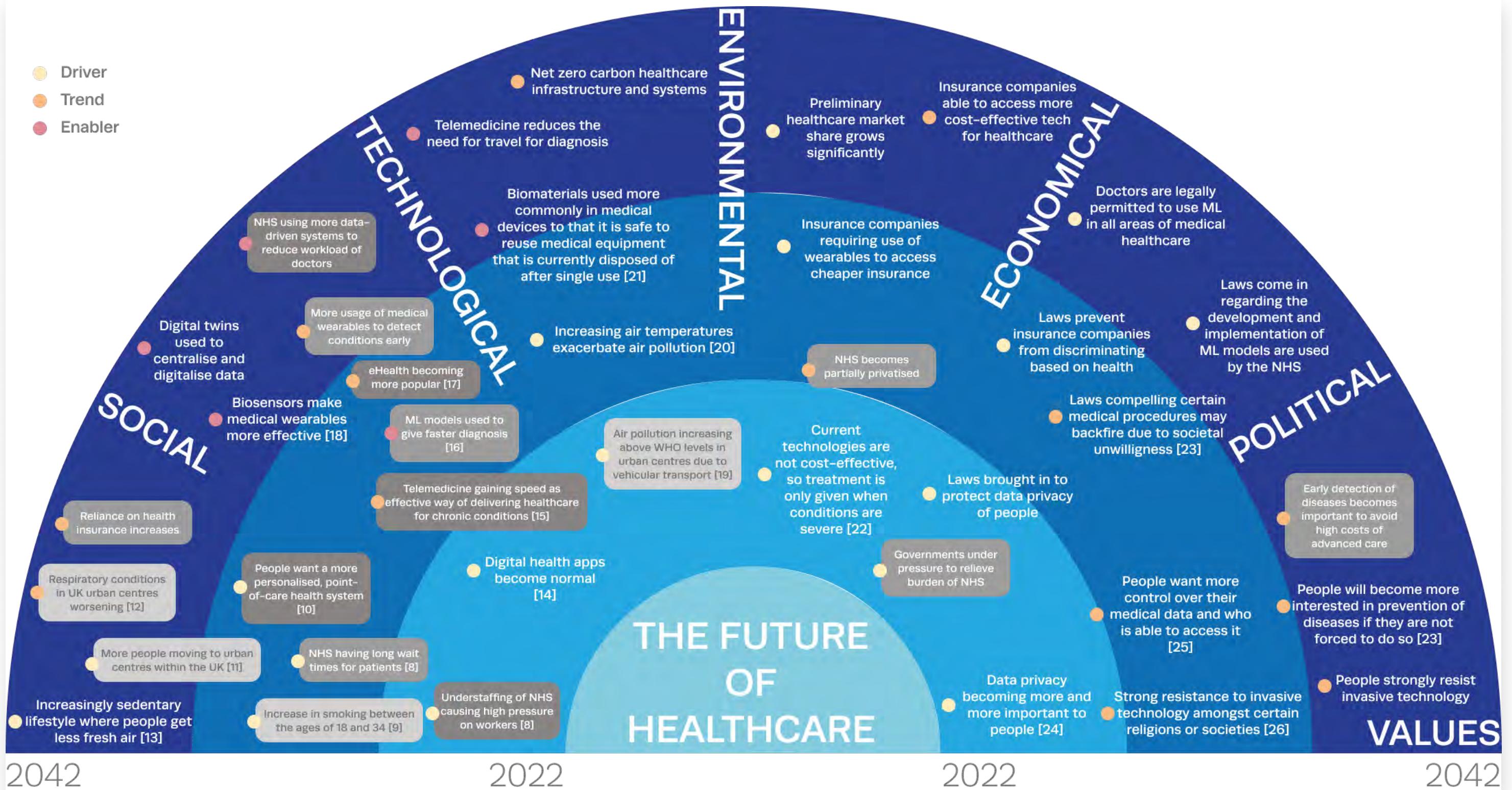




Pulmo

By 2050, 75% of the world's population will live in cities, leading to heavy overcrowding in urban centres. Indoor air quality in the UK is poor, and the increase in vehicular transport will damage outdoor air quality further. The combination of these three factors spell a bleak future for lung health, especially for those in urban centres. It will therefore become increasingly important for respiratory problems to be detected early, so that patients have a greater chance of improvement. Effective containment of lung disease is dependent on an early diagnosis, which is often difficult in healthcare systems worldwide.

future contextual studies



To envision a future scenario, a STEEPV Wheel was employed. Within the "Healthcare's Future" theme, key drivers, trends, and enablers were pinpointed, including telemedicine growth, personalized point-of-care solutions, preventive models, and data-driven system integration in healthcare, alongside NHS partial privatization.

The diagram illustrates the Pulmo app's features and data analysis process. It shows a user interface with a smartphone displaying a graph labeled "PULMO" and various icons for oxygen levels, heart rate, lungs, and sound. A dashed line connects the phone to a person's torso. The torso has sensors on the chest and abdomen. A callout box on the left lists "Cheaper Insurance" (with a policy icon) and "Taking Control of Personal Health" (with a person icon). The right side shows a human torso with internal organs. Three circles on the left map specific health conditions to monitoring methods:

- Airway Diseases: Wheeze Detection
- Lung Circulation: Oximetry
- Lung Tissue Diseases: Lung Imaging

Other monitoring methods shown include Heart Monitoring, Validation, and Chest Expansion. Below the torso, a network of nodes represents Data Analysis and Interpretation, leading to a doctor viewing a tablet.

Cheaper Insurance

Health insurance companies are offering lung monitoring devices to their policyholders, in exchange for a cheaper insurance rates.

Taking Control of Personal Health

Because people are interested in monitoring their own lung health (due to the general worsening air quality [4]), this is an attractive offer. They obtain Pulmo from their insurance company, and set up an account on the accompanying app.

Data Analysis and Interpretation

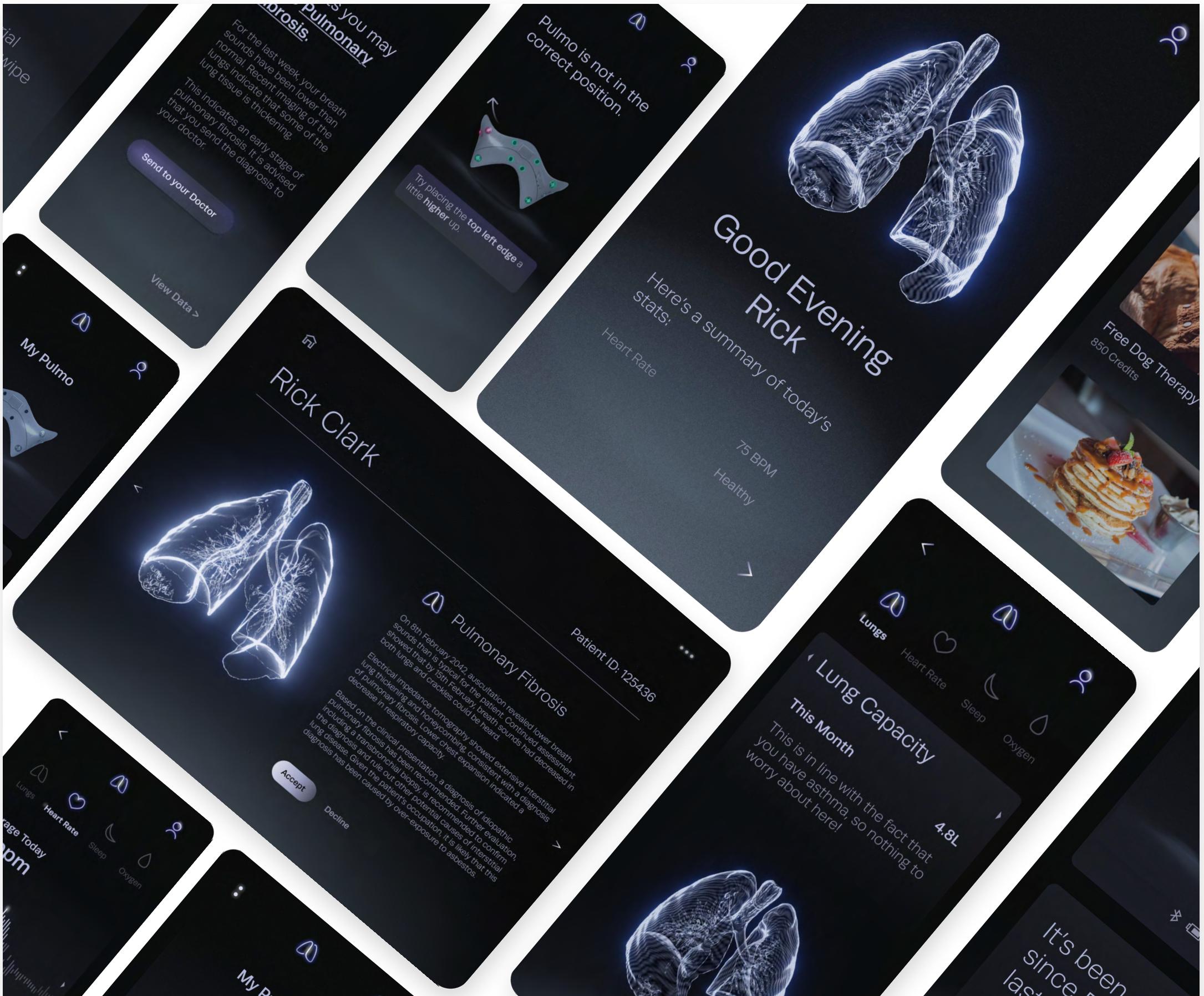
The data collected will be analysed using machine learning algorithms. Any inconsistencies can be detected early and used to suggest potential respiratory conditions.

An alert of the suspected condition will appear on the app. The user can take the diagnosis to their doctors, who can view the data and validate the diagnosis.

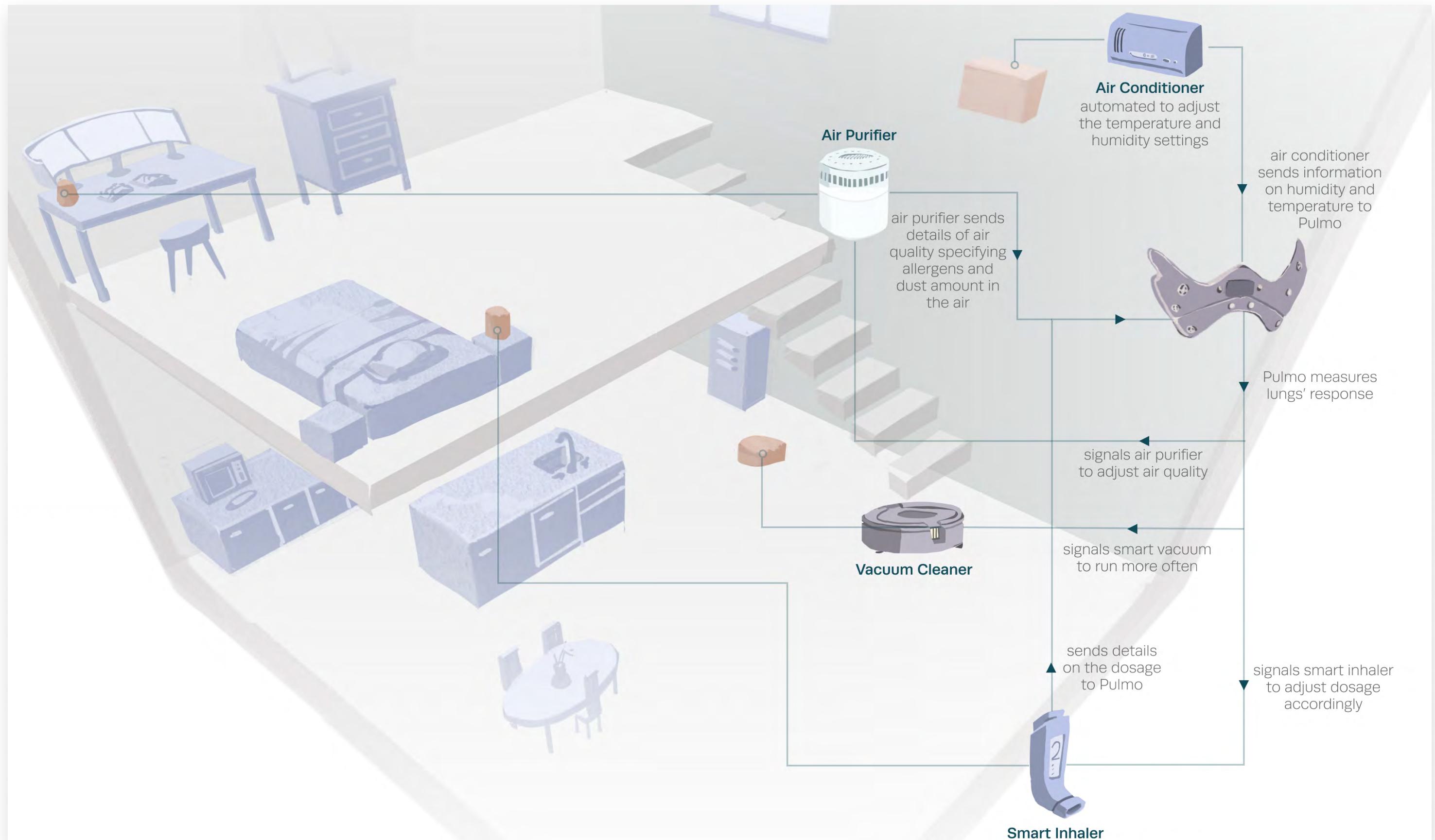
the pulmo app



The trend of personalised healthcare means that users will want autonomy over their own pulmonary health. Giving this data to the user in the form of an app will help them to gain that autonomy. If a problem is detected, a preliminary diagnosis can be sent to a doctor, with the accompanying data, so that they can confirm it.



pulmo and iot



As home IoT systems become progressively more utilised, Pulmo can be integrated in to ensure optimal user lung health.

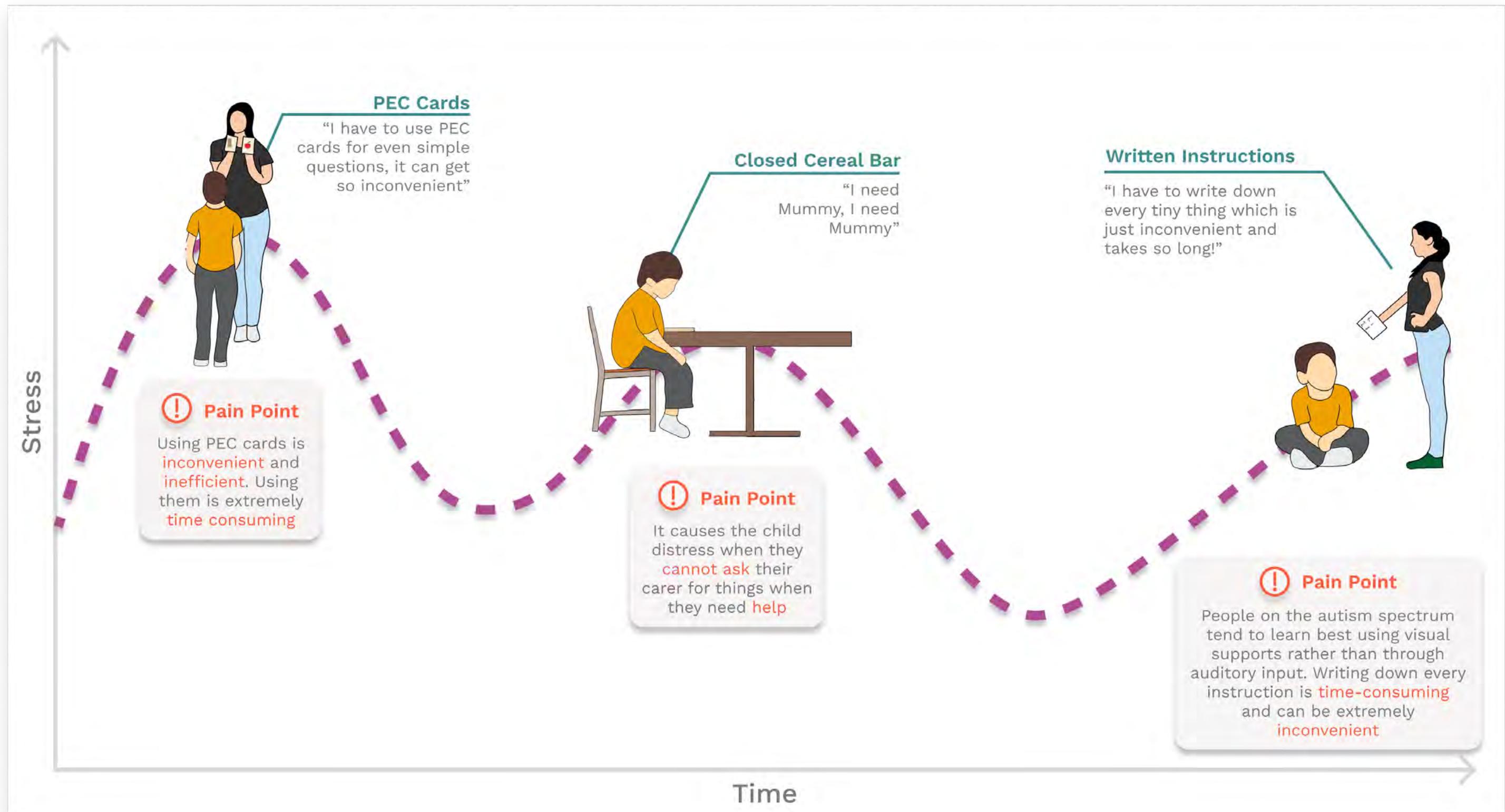




U Me

40% of children who are diagnosed with autistic spectrum disorder are non-verbal. Not being able to communicate their wants and needs is a daily struggle for children with severe autism. This causes frustration, as they struggle to communicate to even the people closest to them, such as parents or carers.

empathy mapping



I carried out an exercise of empathy mapping, to produce a user journey, detailing the stresses that both the child and carer go through on a daily basis. From this, I developed a concept of a two-way communication device, designed to address the pain points identified above.

concept development



pros
cons



The shape is uniform meaning it could easily be held the wrong way



Easy to distinguish between buttons and instruction lights

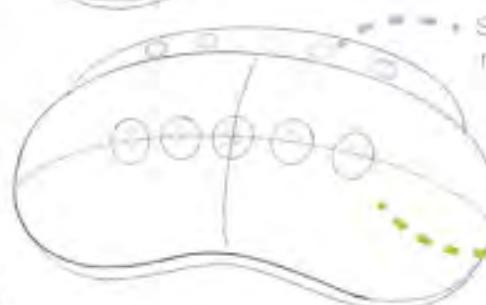


Joystick is harder to use for children with dexterity issues

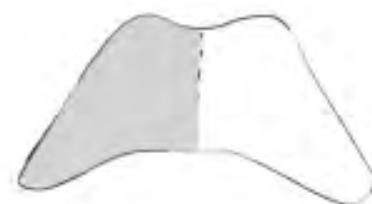
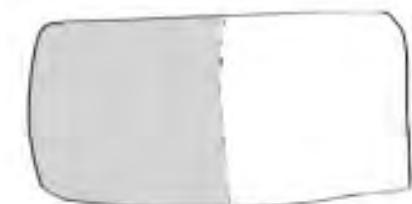
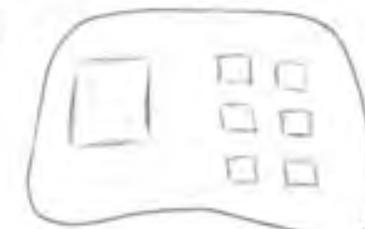
The shape is not uniform meaning it is more intuitive to hold it the correct way



Separation between buttons of carer/child are not as clear



Small buttons - may not be large enough for images
Clearer separation between buttons and instruction lights



product assembly process



The U Me works in conjunction with an accompanying app on the carer's phone. They communicate using Bluetooth. When the child presses a button on the device, they will receive visual and tactile feedback, through an RGB LED, and vibration motors. If the carer sets an instruction on the app, an icon will then show up on the pixel display of the U Me. The device will also vibrate, letting the child know that they have a task to complete.



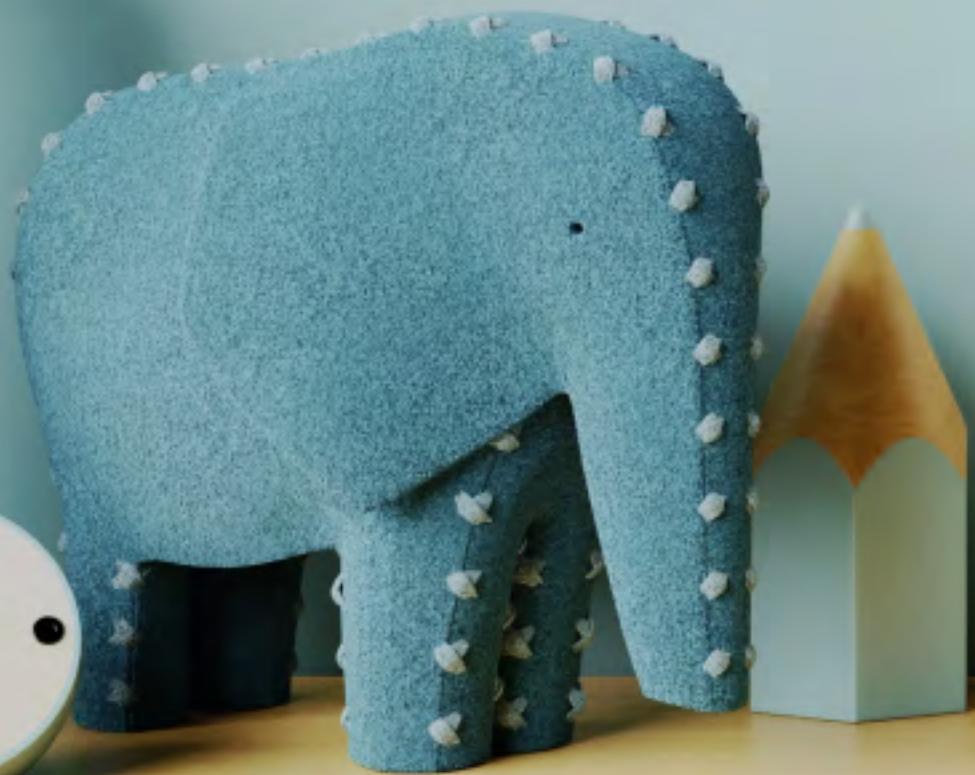
product usage



The booklet is divided into four main sections:

- 1 Charging a U Me**: Shows a power adapter connected to a wall socket and a USB-C cable being inserted into the U Me device. Step 1: place plug in socket. Step 2: place USB - C end in U Me.
- 2 Link a U Me**: Displays the "Link a U Me" screen of the app, showing account creation and linking options. It also shows the "Settings" screen where the device can be added.
- 3 Using the U Me**: A series of eight numbered steps illustrating how to use the device:
 - Download the U Me App
 - Navigate to Settings
 - Click on Link a U Me
 - Click Add New Device
 - Wait until U Me appears in options
 - Click U Me option
 - Wait for 5 seconds
 - U Me is now pairedIt also includes a diagram of the device with labels for its buttons and a note about its low weight.
- 4 Safety**: A red section containing safety instructions and regulatory information.
 - INSTRUCTIONS FOR SAFE USAGE**:
 - Do not operate if broken and/or damaged.
 - To avoid malfunction/damage or water whilst in operation, if it does need to be cleaned with liquids, be sure to disconnect the USB-C cable and power off the U Me.
 - Do not expose it to extreme temperatures - It is designed for reliable operation at 10°C to 40°C.
 - Do not expose it to heat from any source - It is designed for reliable operation at 10°C to 40°C.
 - Do not drop or handle roughly to avoid mechanical damage to the unit.
 - REGULATORY COMPLIANCE INFORMATION**:
 - The Voto U Me complies with the relevant provisions of the RoHS directive and EU directives and CE/UKCA statement for Radio Equipment. In common with all Electronics and Electrical Products, Radio Equipment in common with all other components may apply in other jurisdictions.
 - After selling this device subject to the following conditions: FCC warning: This device complies with the following conditions:
 - this device may not cause harmful interference received, including RF EXPOSURE INFORMATION
 - this standard during product certification, the highest SAR value reported under this standard separation distance of 15 cm. The transmitter must not be transmitted in the EU in conjunction with any other general or specific test methods and procedures specified in IEC 62209 and IEC 62209. This equipment should be installed and operated with a minimum distance of 3 mm between the radiator and your body. This device and its antenna(s) must not be colocated or operating in conjunction with any other antenna or transmitter.

U Me



the period product steriliser

500 women and girls around the world live in period poverty – without adequate access to menstrual hygiene. They are forced to resort to unhealthy alternatives that can have severe consequences on their physical and mental health.



ideation



I ideated, using a variety of design techniques such as brainstorming and SCAMPER, to come up with a number of ideas that would fit the brief – to provide women and girls with a long lasting, hygienic supply of period products. I subsequently ranked them based on feasibility, impact and desirability, and decided to develop a form of period product steriliser. This would allow period products to be reused multiple times.

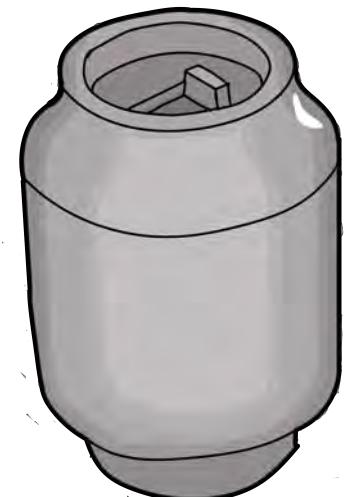


functionality development



- 1** the problem: some water must remain cold so that the product can be effectively soaked

An insulative material must be chosen for the entire steriliser. An icebox-style system will be in place in the walls of the steriliser. The walls, and subsequently the water will stay cold and allow the period product to soak effectively.



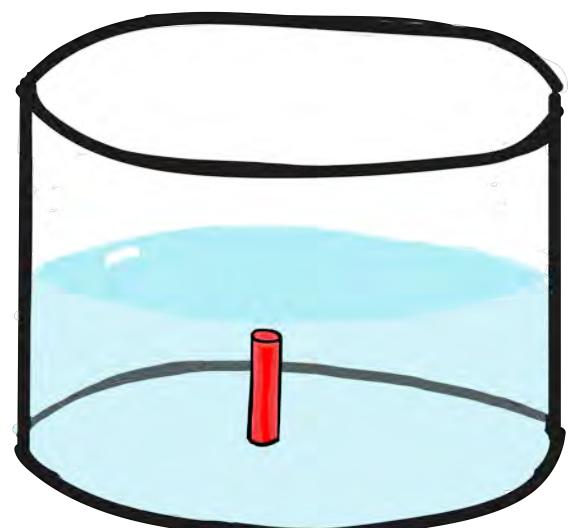
- 2** the problem: water is not readily available so it must stay inside the steriliser

A latch across the top can be opened by the user and the period product dropped in. Water will not splash out, extending the life of the product.



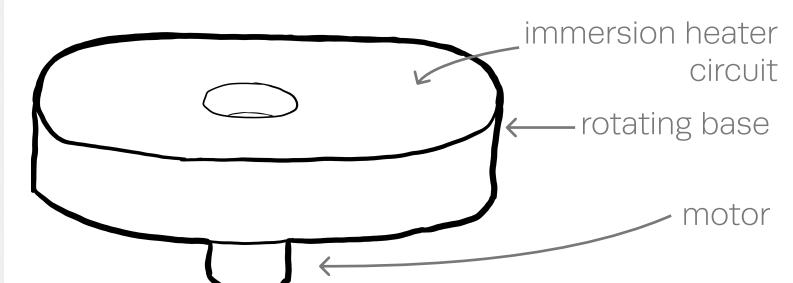
- 3** the problem: some water must remain hot, in order to kill any bacteria

An immersion heater in the water will heat up the water when required, meaning that an electric circuit will be needed. The material of the steriliser must therefore be carefully chosen to be sturdy and impermeable, so that no water can touch the electronics.



- 4** the problem: rotating the product whilst it is in hot water will kill bacteria more effectively

The container can be put on a rotating base, the base can also hold the electronics for the immersion heater.



how it works



long-lasting

The product must be able to provide a **long-lasting supply** of period products to the user.

The steriliser cleans period products so that they are ready for reuse, making a normal supply last much longer.

hygienic

The product must be **hygienic** and not cause any detriment to the user's health.

The steam that is injected into the steriliser kills any bacteria, meaning that the products that are reused are hygienic and healthy for the user.

discreet

The product must be **discreet** so as to avoid the girls and women being shamed (some cultures consider periods to be unclean).

The steriliser is completely plain from the outside, thus meaning that it will not draw attention to itself, meaning that it is discreet.

easy to use

The product must be **easy to use** so that girls and women are able to use it alone without requiring external help.

The user simply has to open the top latch to put the period product in, and open the bottom latch to remove it, meaning that they are able to use it on our own.



Storyboard

