Wellness design challenge

Group 6
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The Basic Plan

The main design approach we implemented throughout this project was the user-centered design (UCD) cycle. We implemented each stage of the UCD cycle using different methodologies to better define what we wanted to accomplish and find the right solution for our area of wellness. Most of the slides in this portfolio correspond to a specific stage of UCD, and we make this clear on the top right of each slide.

While the slides presented in this portfolio progress in a line parallel to the UCD cycle, we want to stress that there were times when we had to move backwards in the UCD cycle, and times when we stayed stuck on a particular stage. The slides may not show this, but an iterative design process was implemented in our project.

Brainstorming

Our initial problem conception was done through a group brainstorming session. At this session, we first discussed and wrote down areas of interest regarding the topic of wellness on a mind-mapping app. We wanted to explore areas of wellness that went beyond health and physical wellbeing and explored ideas of financial wellness, pet wellness, workplace wellness, systems wellness, and more. We first developed different areas of wellness before then exploring general ideas related to that area.

At this stage we wrote down all the ideas, regardless of feasibility, in their specific area branches. Our ideas primarily focused on: “what issue related to wellness do we want to address?”, “what concerns are present in this area of wellness?”, and “can we discern a solution for this concern?”

Our Mindmap: https://www.mindmeister.com/beta/2040996159?t=Q8Et3GqGLG

Brainstorming Evaluation

Brainstorming allowed us to explore many concepts related to wellness in a relatively quick manner. We found it effective in establishing a baseline which allowed us to explore a breadth of ideas easily.

During our brainstorming session, we also tried to approach ideas from a product viewpoint. This was quite helpful as we could think of a piece of software / device, add functionalities to it, and debate which areas of wellness this design could fit into.

A specific problem we encountered during our brainstorming session was conceiving ideas beyond the areas of healthcare and physical health. We found that these were the areas that first came to mind when one thought of wellness and we tended to stick to this area when brainstorming.

One way we tried to overcome this problem was to continually mention other areas that could possibly relate to wellness, regardless of a clear connection. This resulted in us exploring areas such as community wellness and happiness wellness, but we were simply not able to conceive ideas related to these areas.

Understanding The Problem

After exploring all the different ideas of wellness, we were especially captivated with the problem of managing the care of non-emergency patients in hospitals. Our initial believe is that there was a lack of attention in improving the care of non-emergency patients. We initially thought of improving non-emergency patient care by focusing on reducing patient waiting times and improving the time for patient diagnosis.

We decided to further research this topic in order to gain more information on the current situation, and conducted field research where we interviewed specific key workers in this field with basic questions in order to gain a better understanding of the area.

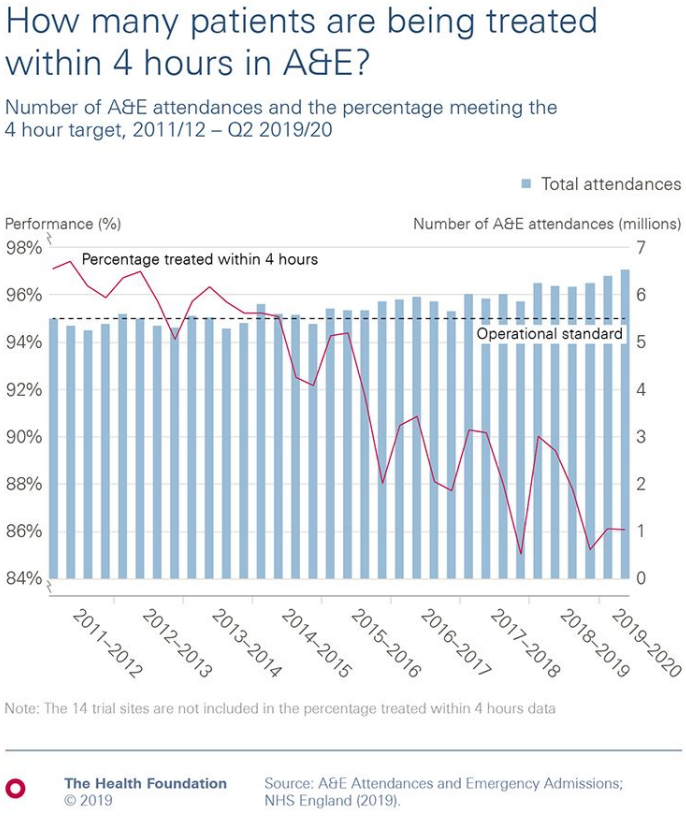
Research

We first verified our premise about patient waiting times. According to NHS statistics on waiting times, with results summarized in this article:

https://www.health.org.uk/publications/long-reads/nhs-performance-and-waiting-times

the waiting times at the emergency department (A&E) do not meet the target standards (95% treated in 4 hours) and are getting longer. The same observation can be done when looking at the waiting times to see a general practitioner (GP) as they average at 2 weeks.

We concluded that our assumption was verified and that there really is a problem to tackle here. We decided that general waiting times, not extreme emergency cases, could be a better lead to follow as the medical system is already geared towards caring for the most urgent cases faster.



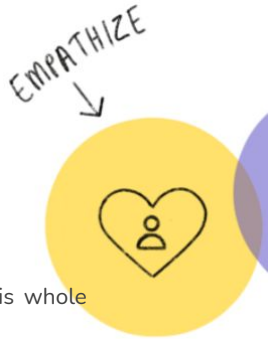
Research

As for the reason behind these long waiting times, according to the same article, the number of qualified permanent GPs and practice nurses dropped between March 2016 and March 2019, especially in general practice (by 5% for GPs and 2% for practice nurses). We can add to that the fact that the population has grown by 1% in nearly the same time frame.

So we are in a situation where there are less human actors than necessary. We decided to gear our technologic solution towards reducing the time spent by healthcare professionals to conclude on diagnostics and what treatments to give to patients, in order to be able to treat more patients without exhausting the staff.

Resources:

- Poole ES. HCI and mobile health interventions: How human-computer interaction can contribute to successful mobile health interventions. Transl Behav Med. 2013;3(4):402-405. doi:10.1007/s13142-013-0214-3 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3830022/
- https://hbr.org/2019/02/to-reduce-emergency-room-wait-times-tie-them-to-payments
- https://www.statista.com/statistics/488211/average-minutes-waiting-in-accident-and-emergency-nhs-united-kingdom/



Field Research I

To understand the problem in more detail we undertook a visit to the Queen Elizabeth Hospital Birmingham.

We kindly asked if it was possible to observe the environment for a couple of minutes as this is for a university project.

We were able to gain a deeper understanding of the entire flow of people, information and the relation between the two.

Individuals would come in and queue for the reception desk. At the desk, they would present to the receptionist what problem is affecting their health. The receptionist would ask a few additional questions mainly in regards to what the problem seems to be with their condition, moments after which they would be given a waiting time to be consulted by the right doctor. After being given a waiting time, the patients would take any available seat in the waiting area.

As it would seem with such a big hospital, the number of people coming in was increasing every couple of minutes. It was noticeable on the receptionist's face that she was dealing with a lot of stress. Nonetheless the sentiment in the waiting area was of worry. People nervously scrolling through their social media feeds and bouncing their legs up and down was a clear sign that something was bothering them.

We decided to delve even deeper and interact with one of the persons that was waiting:

US: "You alright miss? I see you are pretty nervous about this whole thing."

THEM: "I'm ok, thank you! Though I would be better if they would admit me already, I've been waiting for 45 minutes even though she (the receptionist) said it would be 20 minutes and I fear my allergy will get worse.

US: "Oh, I'm sorry to hear that. Is it always like this here? (busy)"

THEM: "I don't know really, this is my first time but I hope it's the last. The queue coming in doesn't help either. I would probably try any other clinic than this if I were you but for me, I didn't have the means to travel that far."

US: "Yeah, I get you but would it really be that much different, do you think, since the measures would be the same? I'm guessing every uk hospital/clinic has kind of the same system."

THEM: "You are right but we can only try"

US: "Indeed, thank you and good luck!"

Field Research II

On our way out we noticed one of the nurses that was assisting at the reception desk was taking a smoke break a couple of meters away from the entrance.

US: “Busy day today miss?”

THEM: “More like an every day today and it’s not even the usual peak times.”

US: “Has it always been like this or is it because of the pandemic that it’s gotten this busy”

THEM: “Oh no it’s been like this for a couple of years now but the pandemic definitely made it worse.”

US: “Are they (the system) not doing anything about it? I see the patients are also feeling stressed due to this.”

THEM: “Not anything I know of. We can only hope people stop getting ill, haha!”.

US: “Haha, hopefully”.

Further Understanding the Problem

After exploring the research, and interviewing some of the key actors in this problem space we found that the problem was indeed present in the real world, and that we were on the right track. At this stage, we proceeded to create some personas and scenarios in order to explore multiple designs of a solution. We attempted to vary these personas to different characters in order to explore a large number of personalities that could interact with our proposed solution.

At this stage, we had an abstract idea of a potential solution and proceeded to use the personas and scenarios to better define our potential users.

The next few slides are some of the personas and scenarios that we created.

Persona 1

The stockbroker was our initial idea of a user that would benefit our system.

We identified that our system would be beneficial for individuals that had to visit a doctor for non-urgent care but was time restricted. Hence, we decided to base his characteristics, biography, motivations, and personality on this key feature. We had no problems in depicting a persona for this personalistic feature, but this might have been a problem as although we could clearly identify his goals and frustrations, as we based his character on that primary feature, we believe that we might have explored a user that would be ideal for our system rather than a typical representative of our user base.

Dave Wellington

"I have to analyze our forex positions in the morning, and then conference call with our traders in Singapore. A checkup? Is that a new start-up?"

Age: 28
Work: Investment Broker
Family: Single
Location: London
Character: Efficient and Restless

Personality

Introvert	Extrovert
Thinking	Feeling
Sensing	Intuition
Judging	Perceiving

Goals

- Maximize his time efficiency when it comes to tasks.
- Minimize his time outside of the office's trading floor.
- Minimize his time at the hospital reception area, and quickly get his diagnosis
- Find a quick-fix medication for his chronic carpal tunnel.
- Cure his carpal tunnel by any means necessary.

Frustrations

- Waiting in the reception area longer than an hour.
- Spending too much time meeting to the doctor just to get a prescription for his chronic carpal tunnel.
- Flare-ups of pain in his wrists in the middle of his work.

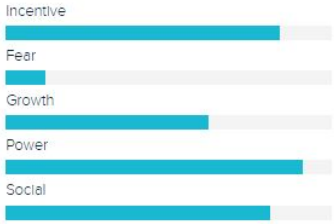
Bio

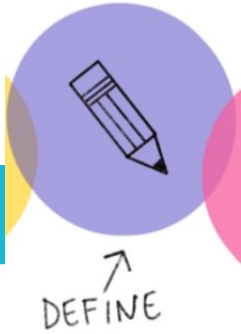
Dave is 28. He spent his entire university life trying to enter a well-known investment bank, and after years of hard-work, he's finally managed it. Although, all the time spent sitting in front of the computer studying MATLAB, and R resulted in him developing carpal tunnel, which he has to get checked out every 2 weeks, and refill his medication every week.

He has spent waiting a minimum of 1.5 hours every week at the hospital, and he knows because time is money. He wishes he could get his diagnosis and medication and be out the door in less than 20 minutes, but with the current health system he knows this is impossible.

He is willing to try anything to get his waiting time decreased.

Motivation





Persona 2

It is essential to meet a doctor regarding the health care problems. He is a very ambitious and empathetic doctor who wants to be a lead of the hospital. However, he can't manage enough time to sleep correctly due to his excessive enthusiasm causing more stress on his work.

Anthony

"I am a doctor - it's a profession that may be considered a special mission, a devotion. It calls for involvement, respect and willingness to help all other people."

Age: 32
Work: Doctor
Family: Married
Location: Birmingham
Character: Archetype

Personality

Introvert	Extrovert
Thinking	Feeling
Sensing	Intuition
Judging	Perceiving

Ambitious | Empathetic | Curious | Collaborative

Goals & Tasks

- Has to both diagnose and treat the pacient
- Wishes to become lead doctor of the Queen Mary hospital

Frustrations

- Often times finds it very difficult to work under stress when the number of patients to treat is very high
- The long diagnosis time takes away from the joy of treating patients
- Wishes he would get more sleep since time management during the day is pretty hard with all of the overtime work he needs to undertake due to lack of staff during the COVID 19 pandemic

Bio

Anthony has studied most of his life to become a doctor and work for the NHS but he would have never imagined that being assigned to the A&E room will prove to be such a difficult task. At first coping with the stress was decently embraced by Anthony, however, over time, experiecing this everyday has proved to be draining both mentally and phisically. If only there would be a certain technology that will speed up pacient diagnostic he would desperately lean towards it and adopt it in his everyday working time.

Motivation

Incentive
Fear
Growth
Power
Social

DEFINE

Persona 3

Analysing the stakeholders from an article from MEDGEN (the healthcare recruitment), we decided to create an A&E Nurse who is often the first point of contact for patients as they enter a hospital setting. She was really stressed with the current A&E triage and long waiting due to the great number of patients

Vicky Hall

objective | organised | resourceful | rigorous | deliberate

"I am an A&E Nurse - I do care for patients and ensure the patients are relaxed throughout their visit to the emergency department right up until they are discharged or moved to a different ward."

Age: 30
Work: A&E Nurse
Family: Married
Location: Redditch
Character: Calm & Stern

Personality

Introvert	Extrovert
Thinking	Feeling
Sensing	Intuition
Judging	Perceiving

Goals

- Quickly assess the level of severity of a patient's condition to determine the order and priority of emergency treatment with a corresponding wait time for attendance
- Communicate effectively with the patients visited the A&E
- Minimise the time patients spend in the emergency department.

Frustrations

- Takes quite a long time to explain all the experience that the patient had and the current situation
- Patients don't know when they are treated and the Nurses also don't know the waiting time
- Some of patients wait over 4 hours for their treatment in the A&E department

Bio

Victor was an actress who has starred as a nurse in some TV shows. She has regularly appeared on the screen as a nurse but now, she swapped her profession as an A&E Nurse at Alexandra Hospital. She had plenty of complaints about the waiting time for treatments from the patients in A&E department. Also she was really stressed with the current A&E triage that there is a long waiting time for patients with the low level of severity. She hope that the new triage will make the patients waiting time short and less time of face to face work between the nurses and the patients.

Motivation

Incentive
Fear
Growth
Power
Social

DEFINE

Persona 4

Pharmacist is a necessary character in our wellness senario. Oscar is a hardworking pharmacist who is looking forward to increase opportunities of clinical collaboration. He also wants to expand the scope of pharmacists' and pharmacies' service.

Oscar

"I am a pharmacist - The expanding scope of pharmacists' service and increasing clinical collaboration illustrate key trends and opportunities facing health system pharmacies in the coming year."

Age: 38
Work: pharmacist
Family: Married
Location: Birmingham
Character: Careful and Diligent

Personality

Introvert	Extrovert
Thinking	Feeling
Sensing	Intuition
Judging	Perceiving

Hardworking | intense | organised | punctual

Goals

- Reducing risks of medications and technical error.
- Efficient communication with prescribers and also patients
- Expanding scope of pharmacist' service

Frustrations

- Patients are frustrated with the long wait
- No opportunities to face the health system.
- Hard to increase the clinical collaboration

Bio

Oscar is a pharmacist working at a busy community pharmacy. Oscar's assistant dedicates an hour everyday expanding scope of pharmacist' service but no progress due to not cooperative clinical staffs. After he comes home, his mind often drift away thinking about work. He still looking forward to increase clinical collaboration with medical staffs though.

Motivation

Incentive
Fear
Growth
Power
Social

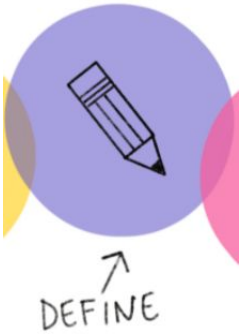
Brands & Influencers

Preferred Channels

Traditional Ads
Online & Social Media
Referral
Guerrilla Efforts & PR

DEFINE

Personas Evaluation

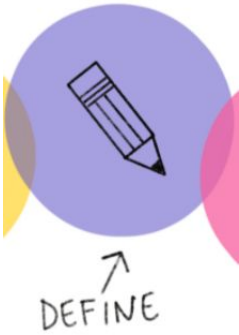


We found that creating personas helped us in adding details to our solution and understanding how different stakeholders would utilize our system. But most of all, we found that the biggest benefit of creating these personas was getting all our understanding of the problem, system, and solution to be on the same page.

The personas also allowed us to question each other on how the system would work, this then built-up conversation on how we could better the system, what functionalities are unclear, how would different stakeholders be affected and, in the end, clarify certain aspects of the design.

However, we may have fallen to the trap of creating a persona of the ideal person for our system rather than the persona of a typical individual using our system. Furthermore, our lack of knowledge regarding the practices of individuals in the medical field may have led to imprecise descriptions of a persona in that area.

Scenarios (based on our second solution)



Vicky (A&E Nurse), Anthony (Doctor)

Vicky's at the reception in the A&E department and waiting for patients. Right after a patient has arrived, she can concentrate on that severe patient directly because most of mild patient went to the pharmacy via the NHS app Pharmacy booking system. Also the doctor Anthony working in the A&E department felt more laid-back atmosphere than before due to the reduction of mild patients.

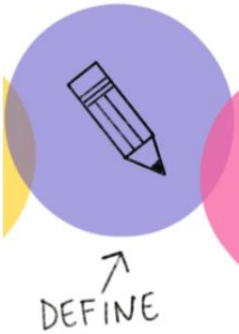
Dave (Patient)

Dave's at work estimating the volatilities of forex by using Deep Neural Network. After lunch time, he felt dizziness and it was different than just headedness because he stayed all two nights performing the DNN models forecasting the forex value. He booked a pharmacy appointment nearby and started the basic diagnosis in the pharmacy right after checking his booking using QR code. After the diagnose, Dave can see his status on the monitor with kind explanations and he can also hear from the Oscar the head pharmacist that he need rest and take paracetamol.

Oscar (Pharmacist)

Oscar works at the busy community pharmacy as a head pharmacist. He deals with the patients who booked the basic diagnosis due to mild symptoms. After finishing the diagnosis, he gives the patient his medical advice on how to proceed with his professional knowledge and his experience based on the results made by the Neural Network. The patient can then just take a medicine or book a GP or rush to an A&E Centre based on the pharmacist's advice. Oscar thinks this system should make his pharmacy more income and busier. Thanks to the NHS booking system, he can also manage the foot traffic of customers.

Scenarios Evaluation



We believe that the scenarios we created were more reflective of our views on what the flow of the system would look like at that point in time.

We do believe that the scenarios helped in allowing us to visualize how users would interact with our system. In some cases, it allowed us to foresee a problem that would occur with a user interaction and change the flow of the system or modify the system in some form to prevent this issue. An example was when a user would struggle to use the machine (e.g., due to low technological skill) that would automatically determine their vital signs, the scenarios helped us in determining that this was a potential event and we adjusted (a helper located near the machine) to overcome this.

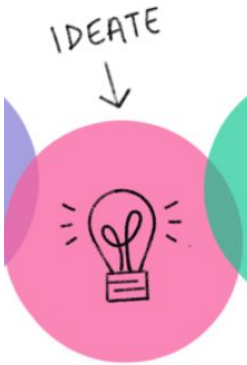
We felt that the scenarios were more of a description of how our system would work. Thus, the description was clearly understood by us as we devised the system, but due to the lack of an outsider's consultation on this area we were not sure of whether the scenarios helped in understanding our system better.

Our First Solution

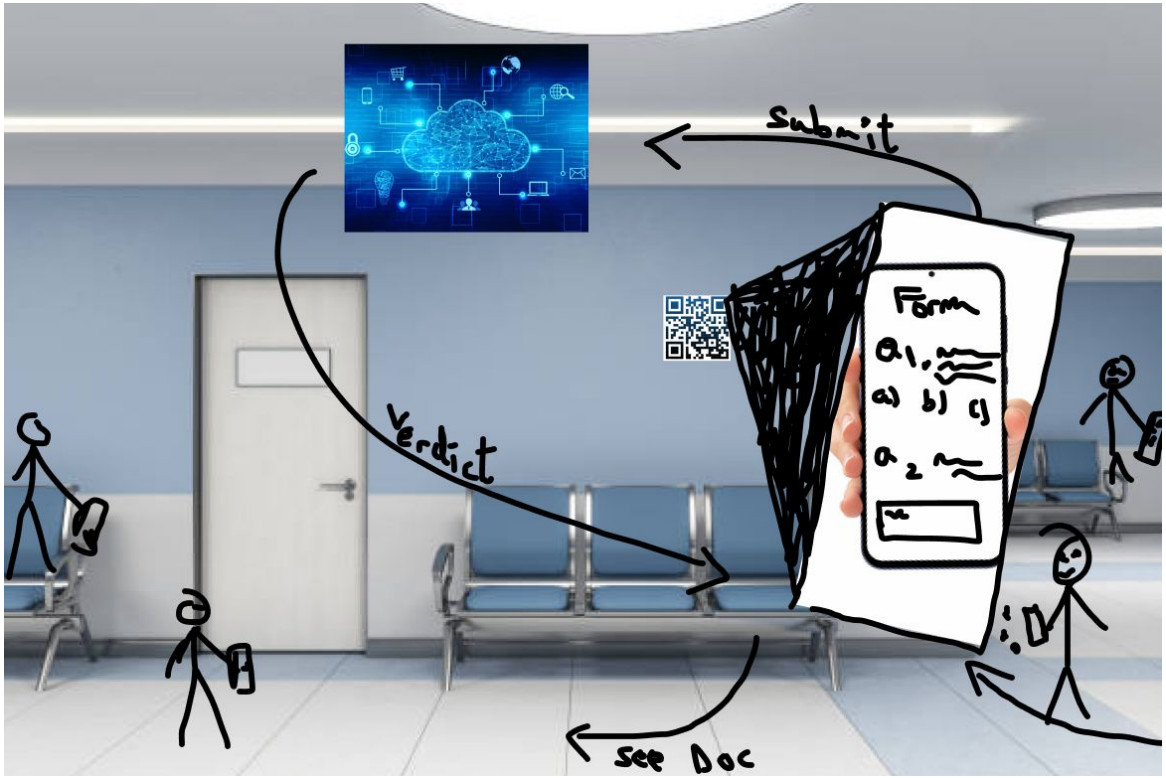
After we had researched and verified that this was a present problem in healthcare, we started to design our first solution. Our thoughts led us to a system that would reduce patient wait times through an AI-derived questionnaire that would occur before the doctor's meeting. A formal description of our first solution can be seen below:

The aim of our product is to reduce the patient waiting time in hospital and to facilitate the work of the caregivers. For this purpose, the patient will have to fill in a questionnaire about his state of health on his arrival and will be asked about his medical condition and the reason for his visit. He will be asked to fill in its symptoms and, if necessary, to submit to an automated collection of their vital signs. Based on the results, our product will use artificial intelligence to determine the most likely causes of the patient's suffering. The patient can then be immediately directed to the appropriate care unit. He will be guided through the hospital by our product. There, he will meet the caregivers who had been already warned by our product of the patient's state of health as well as his symptoms. The doctor will also save time because he will know in advance the patient's vital signs and will therefore not have to take them again. This system will reduce the waiting time for patients and increase the number of patients treated.

A visualization of this solution can be seen in the next page



Visualization of First Solution



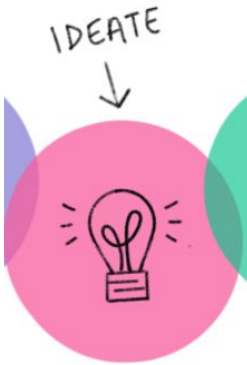
Questionnaire

After getting a deep understanding of what we need to know in order to solve this problem, we started putting together a questionnaire which would help us explore the different degrees of the user's issues.

We've decided to split this questionnaire into two parts since the problem is faced by both the patients and the medical staff. This way we would be able to understand both sides of the issue and maybe find a common solution which will benefit both.

Here is the link of the questionnaire draft/planning: https://docs.google.com/document/d/1_wksfPCqAicspSvZUV_QQ65_6puFDx2RALvSl5jXgco

Questionnaire Deployment



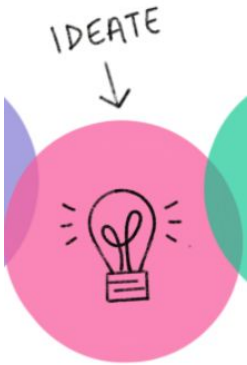
To deploy the questionnaire, we have uploaded the two separate sections (one for patients, one for medical staff) on google forms and went back to the hospital.

We've brought in a tablet on which people would be able to answer the questions and asked the people in the waiting room if they would answer a couple of questions about the service offered, and the staff about the number of patients coming in.

Patient Form: https://forms.gle/NJvjaEActntpQ7bM6

Medical Staff Form: https://forms.gle/npXhjc2ZQTrvKdM8

Questionnaire Evaluation

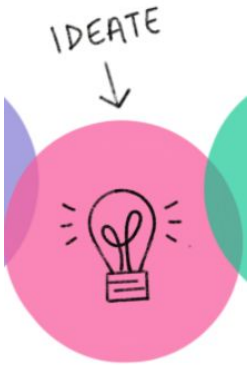


We decided that a questionnaire would be the best method of receiving first-hand feedback from the users who would best utilize our system. We also believed that the questionnaire would be the best way to check if our solution was on the track in solving our focused problem.

However, we found that attempting to get in contact with our targeted users (medical experts) was relatively hard as we did not have the social connections to get in contact with them. Furthermore, the few responses that we did receive were relatively unhelpful in improving our design. We believe that this was because we did not make certain prompts in the questionnaire mandatory, and this resulted in the few respondents that we did get to skip over these questions.

After we had reviewed the responses from our questionnaire, we weren't completely sure that our solution was on the right track. As a result, we consulted an expert during one of our physical support sessions.

First Solution Expert Feedback



Our consultation with an expert proved to be quite valuable. The expert described to us that our system was correct and had merit in its design. However, the expert explained to us that we were on the problem definition stage of the double diamond design model where we had designed the right thing (the system), but the problem definition and the solution was not in the right area.

Our expert also explained that the problem that we were trying to solve was a very real and present problem. However, the system and machine that we presented was not the correct solution in solving the problem. The expert advised that we should brainstorm further solutions that would solve this space and consult with stakeholders in this area to get a better understanding of what a solution would look like.

Double Diamond Design

The expert feedback was extremely helpful as they made us aware of the double diamond design model. What we didn't know was that we were inadvertently completing the Discovery stage by identifying a certain problem space (non-emergency patient care) and researching potential solutions on how to improve this problem space.

We were also inadvertently completing the Define stage by filtering different non-emergency patient care solutions and deciding to focus on improving patient waiting times.

Apparently, we were on the development stage of the double diamond design model when we thought of our first iteration solution, and the realization that we were closely following the double diamond design model made us research and implement this into our project.

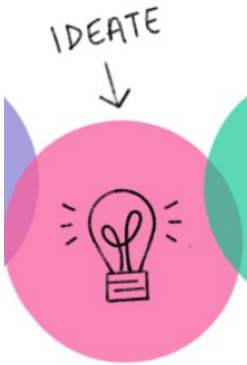
After we were made aware of the double diamond design model and that our first solution was not on the right track to solve our area of focus, we stepped back to the problem definition stage in order to come up with a new solution.

Double Diamond Design Evaluation

We found that the double diamond design model was helpful in guiding the nature of our design as it gave us a set of guidelines to follow. The design model's guidelines were relatively clear in determining the best approach to finding the right solution. We found that it gave us explicit tasks to complete such as: creating a prototype, taking the time to research, and filtering through the information. This was extremely helpful as we used it as a checklist on what to do and what to add for our design.

We also found it helpful when we couldn't think of further additions to our design, as the different stages of the double diamond model also correlates to some of the methods we learned, e.g., visualization, scenarios, and brainstorming. As a result, we referred to each stage of the double diamond design model and made the appropriate additions to our design.

SCAMPER



After our expert feedback, we had realized that our initial design was not on the right track in attempting to solve our problem. Consequently, we turned to the SCAMPER technique to think in new directions and explore different solutions.

The SCAMPER technique allowed us to explore designs of solutions that we did not think of before, and unlike the brainstorming session whenever we were stuck in coming up with an idea, we simply switched to a different prompt of SCAMPER. This allowed us to continually generate new ideas and look at unexpected places for answers which led to alternative forms of solution for our problem. Although it helped us produce a range of ideas, we believe that the openness of SCAMPER may have allowed contributions that were out of the realm of reality. Also, while SCAMPER kept us going when we were coming up with new solutions, this did not prevent obstacles from appearing altogether, and at some points we still found ourselves lost in thinking of new ideas.

The results of our SCAMPER session can be seen in the following slides

SCAMPER

S

Substitute the diagnosis machine with a facial scan of the user to determine the probability of an illness. A specific camera located on different parts of a city, e.g., bus stops, lamp posts that would be able to determine the vital signs of an individual, forward the information onto a shared database, diagnose the possibility of an illness, and contact them if they were likely to have an illness. This would ensure public wellness is always monitored and maintained. There were more questions and concerns here than answers. Some of the concerns were: the security of communications? the reality of a diagnosis from a facial scan? how to communicate to the user? But most of all, the privacy of the user.

C

Integrate the functionality of the machine with the NHS healthcare system. The machine would act as a non-emergency diagnosis tool for doctors, and medical expertise to quickly determine the illness of a patient. The system could be advertised to the public as an extension of the NHS system to help lower the workload of A&E medical professionals by lowering the number of patients visiting A&E. This ensures the confidence in the system by the public, and a potential solution to our stated problem.

A

Adjust the machine to become a tool in the A&E department. Re-shape the functionalities of the machine to cover the needs of the A&E medical professionals. This will require further in-depth research into the operations of an A&E department, which may not be the best idea during the pandemic. Also, anything that the A&E department critically needs would already have been identified and solved.

M

Scale down the size of the system to be usable with smartwatches. The system would take the basic vital signs measurements given by a watch and form an illness probability report. This report would then be used by the system's AI as a recommendation basis for the patient to either visit the A&E department or seek their GP. The prevalence and non-invasiveness of smartwatches made this idea thoughtworthy, and this made the final shortlist of potential solutions.

SCAMPER

P

Change the setting of the machine to be in pharmacies, and other healthcare locations not including the hospital. The machine would act as a filter for patients who are unsure on whether they need to go to the A&E department. The pharmacist would use the machine to form a judgment call and act as a ‘bridging point’ between the patient and a visit to the A&E department of a hospital. This would minimize the number of potential patients in hospitals and lower the workload of medical professionals.

E

Eliminate the unnecessary modules, training, and practices in becoming an MD to ‘fast-track’ medical professionals to cover the shortage of medical expertise. Further training could be supplemented during work experience.

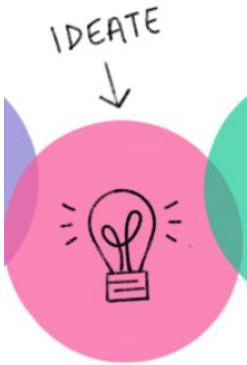
Simplify the MD pathway into specializations from the on-set. Specific medical expertise in areas such as geriatrics, infectious disease, dermatology, and others would be learned at the start of the medical school programme. This would lead to a shortened timeline to becoming a medical expert. Again, further training could be supplemented during work experience and summer programs.

R

This was the hardest area to conceive ideas in, as we believed that the medical system had been constructed in the most efficient manner possible and any reversal/re-arrangement would prove more detrimental than helpful.

However, we endeavored to try and thought that maybe the medical professional could visit the patient. The medical professional would be assigned a caseload of patients to visit during a given day and make a quick diagnosis and recommendation on whether the patient should visit A&E or not. The main motivation being that the expert could diagnose the patient faster at their home than at the hospital. But we thought that the medical expert would not have the right instruments to perform a diagnosis, and there was also a safety concern and travel time to take into consideration. We also thought of conversing with a medical expert through a video call, and having the patient explain to the medical professional about his symptoms, but we believed that the patients may incorrectly describe their symptoms, incorrectly diagnose themselves and be prone to bias.

A QOC Approach



We also thought to expand upon our SCAMPER session by implementing the QOC approach to some of the solutions.

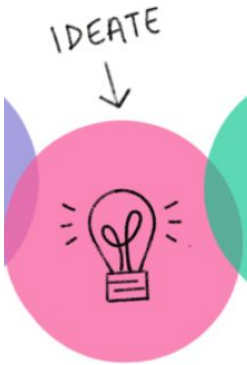
We created a set of criterias that our solution should satisfy, and we derived these criterias from our main problem of “how can we improve non-emergency patient care?” and, “how can we improve patient waiting times?”

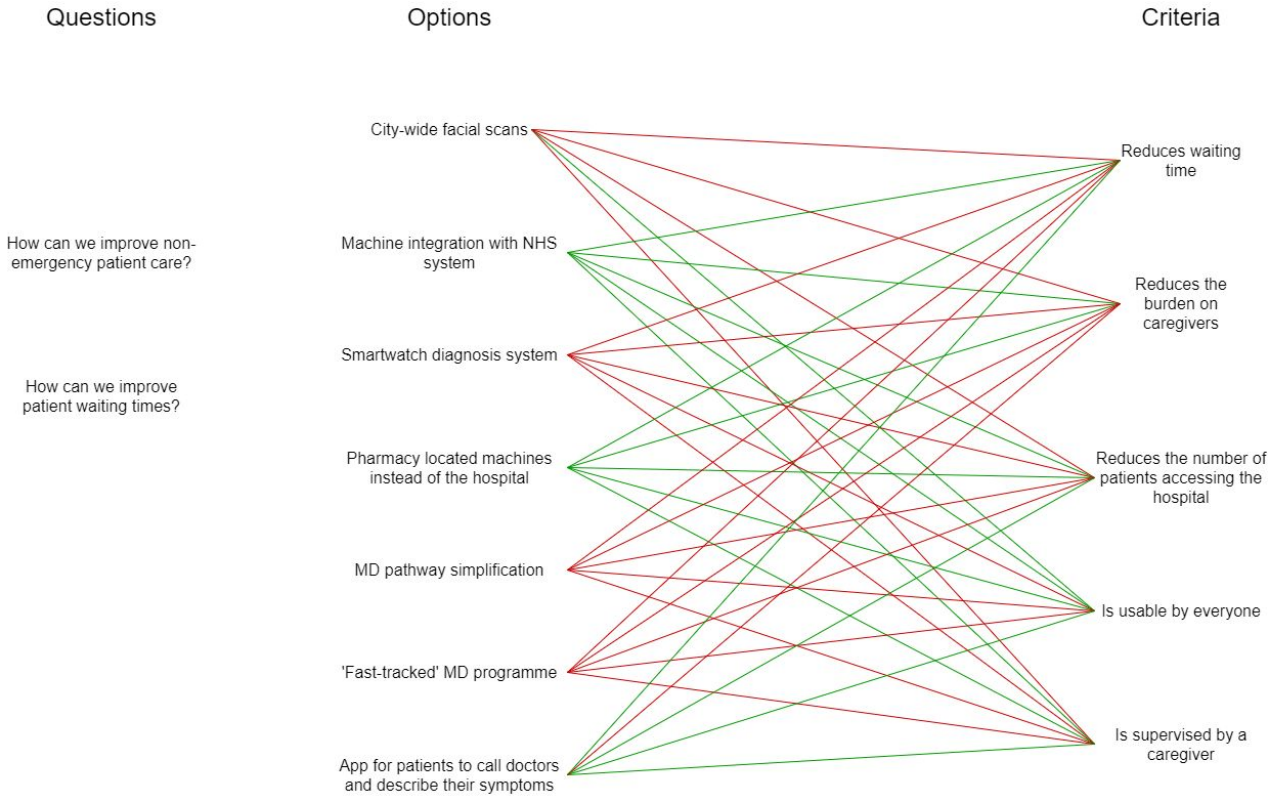
Our focus on improving non-emergency patient care led us to focus on the different characters of the medical healthcare system (e.g., patients and doctors) and how we could improve non-emergency patient care by modifying their roles. These modifications can be clearly be seen in some of the options that we explored.

In the end, we decided to combine different solutions that we thought of in the SCAMPER sessions and created a formal definition of this new design.

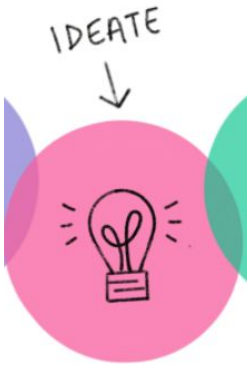
Our QOC method can be seen in the following slide

A QOC Approach





A QOC Evaluation



We found that the QOC approach was helpful in visualizing the practicality of all the potential solutions. We could clearly see that a solution was impractical due to all of the red lines that connected it to our set of criterias. To add to this, we found that one of the biggest benefits to the QOC approach was letting us see which options had merit; this helped us in creating our next design iteration as we took different parts of different solution in order to form, what we believe to be, the ideal solution to solving our problem space.

On the other hand, we found that although a solution might satisfy all of the criterias we created; the solution might still not be practical in solving our problem space. We believe that this was because of the openness of SCAMPER and some of our more unconventional designs, as a result, we removed some of the more outlandish options on the QOC.

Product Definition

The results of our SCAMPER were particularly helpful, and we took certain parts of different ideas in order to create a new system design that would solve our problem space:

Our product will take the form of an extension of the NHS mobile application.

This application allows the patient to know if he has to go to the hospital or not. Having entered their medical information into the application, they can then quickly book an appointment at the nearest pharmacy to have a full health check-up with a professional.

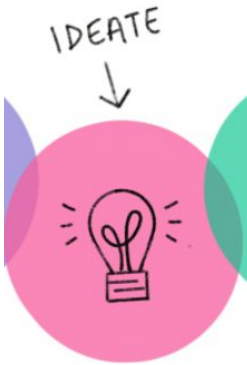
Once in the pharmacy, he presents the QR code generated by the application to the pharmacist, which the pharmacist uses to find out the patient's details. An automated machine then proceeds to check many of the patient's vital signals, such as blood pressure and heart rate.

Finally, using the patient's medical records provided by the NHS and the measurements taken, an artificial intelligence machine diagnoses the patient by outputting the diseases that the patient may have with their probability.

Finally, depending on the results, the pharmacist makes the decision whether to send the patient to hospital.

The aim of this product would be to improve non-emergency patient care by lowering the total number of patients that visit the hospital through a ‘screening’ process that would filter those that do need to visit the hospital and those that do not. A successful implementation would lead to lesser non-emergency patients visiting the hospital, and overall improvement in their care due to the medical professional’s lower caseload.

Criteria Matrix

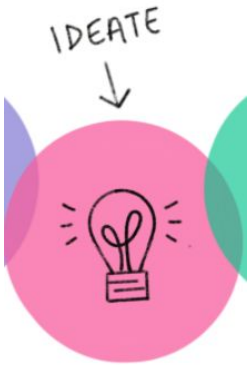


We took the criteria that we focused on in the QOC and transformed it into a criteria matrix. We attempted to remain as unbiased as possible and collaboratively evaluated our first design iteration to this criteria matrix. Based on our own self evaluation, we found that our first design iteration would only satisfy 3 of the 5 criterias.

We then collaboratively evaluated on whether our new design iteration would satisfy a given criteria on the matrix. Based on our self-evaluation, we believed that this new iteration would satisfy all of our criteria. However, we knew that we had to explore this new design iteration further, and chose to further visualize the system through a storyboard and UML diagram.

Our criteria matrix can be seen in the following slide

Criteria Matrix

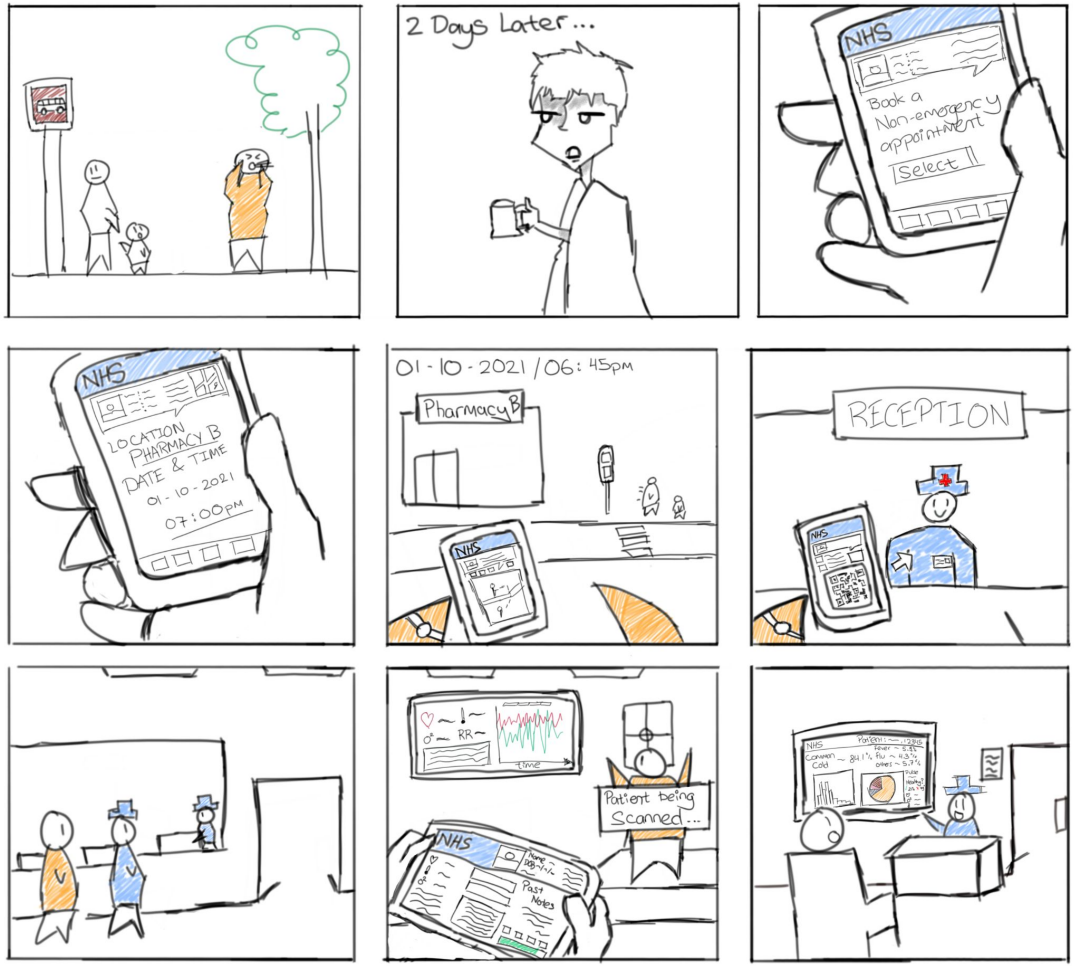


	First solution	Second solution
Reduces waiting time		
Reduces the burden on caregivers		
Reduces the number of patients accessing the hospital		
Is usable by everyone		
Is supervised by a caregiver		

Storyboarding

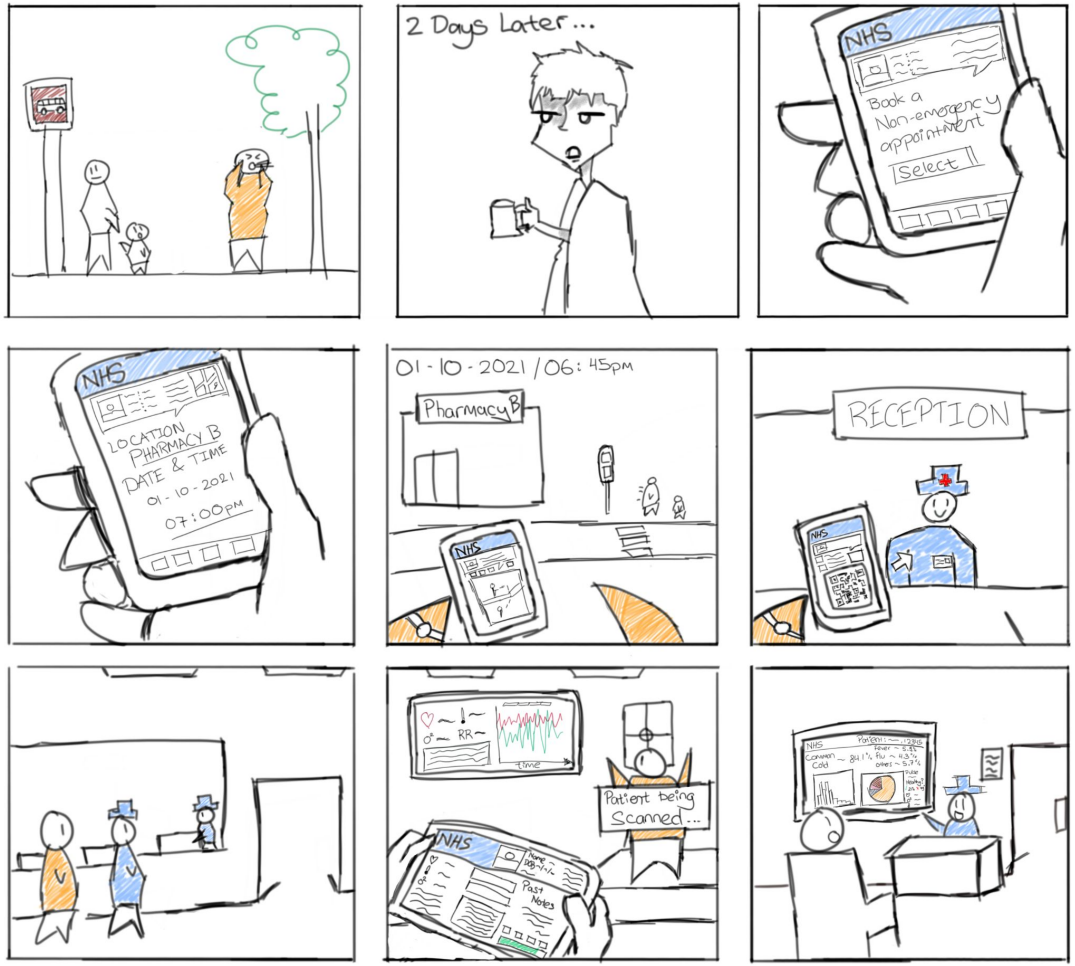
In order to create a solution for the problem, it's essential to look at the user interaction with the system. For this reason, we employed the use of a storyboard as we believed that a realistic story of human-computer interaction could only be conveyed in this format.

The storyboard allowed us to visualize a user's interaction with our system and collectively determine a solution for the problem we focused on. It also forced us to think in the perspective of the user and design a system with the priorities of the user in mind. But one of the greatest benefits was that it allowed us to "pitch and critique," where we critiqued certain scenes and user-interactions and pitched new ideas for the improvement of the system.



Storyboarding

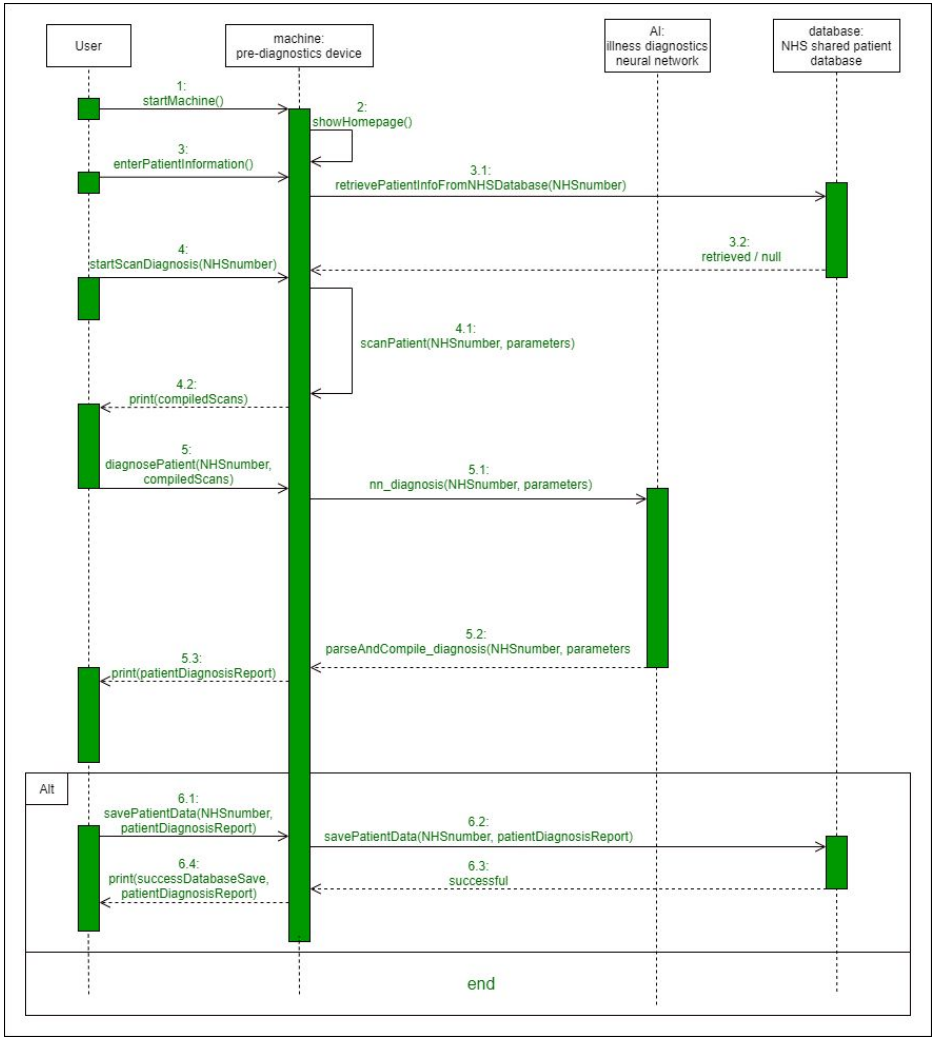
The storyboard starts with a user becoming ill and deciding to book a non-emergency appointment through the NHS website. The user enters his information and books the appointment. The appointment is scheduled according to the user's preference and the user goes to the pharmacy at the selected day and time. At the pharmacy, the user displays a QR code containing his appointment details to a pharmacist. The pharmacist scans this QR code and retrieves the details of the user's appointment. After confirming that all the details are correct, the pharmacist guides the user to the diagnosis room where the patient is scanned using the machine. After completing the patient scan, the pharmacist submits the details of the patient's scan into the neural network and waits for a report to be outputted. After the work is completed, the neural network outputs a report and illness probability determination to the pharmacist, who respectively presents this information to the patient. Using the information provided by the neural network and patient scans, the pharmacist makes a judgment on whether to recommend the patient to visit the hospital regarding his illness, prescribe medication, or explain that the symptoms that the patient is going through are minor.



UML: Sequence Diagram

After considering the perspective of the user, we believed that a flow of the system and its interaction with the user needed to be described. For this reason, we created a UML sequence diagram in order to depict a high-level workflow between a user and the system.

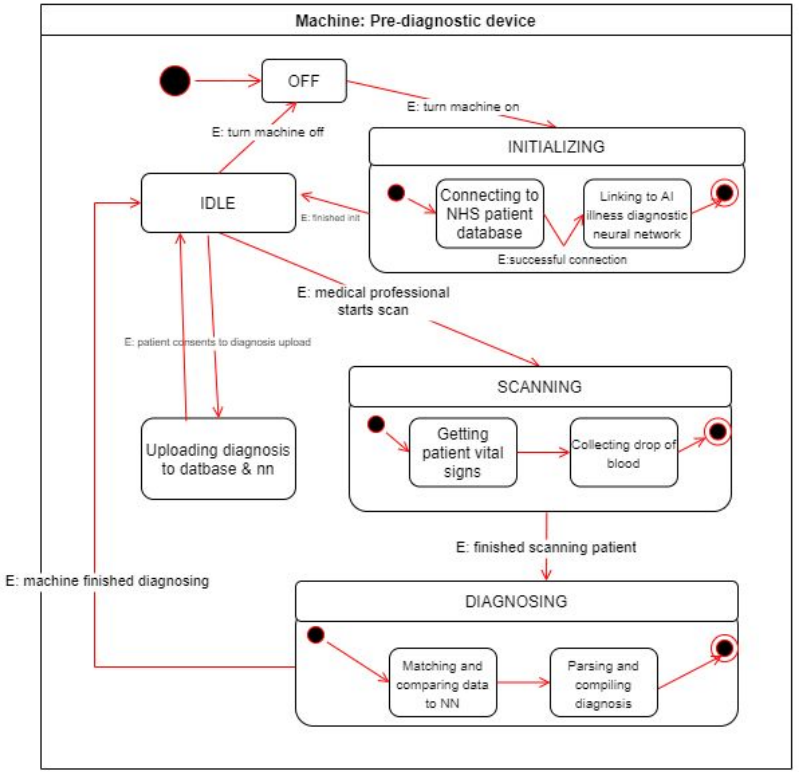
The sequence diagram allowed us to visualize the architecture, interface, and workflow our system would have without the necessary implementation. It also allowed us to collaboratively design the interaction between different entities that our system would include, and easily make corrections for any incorrect interactions. But most of all, it allowed us to define a framework of necessary interactions at the system level that was key to designing a system that would best solve our problem.



UML: State Diagram

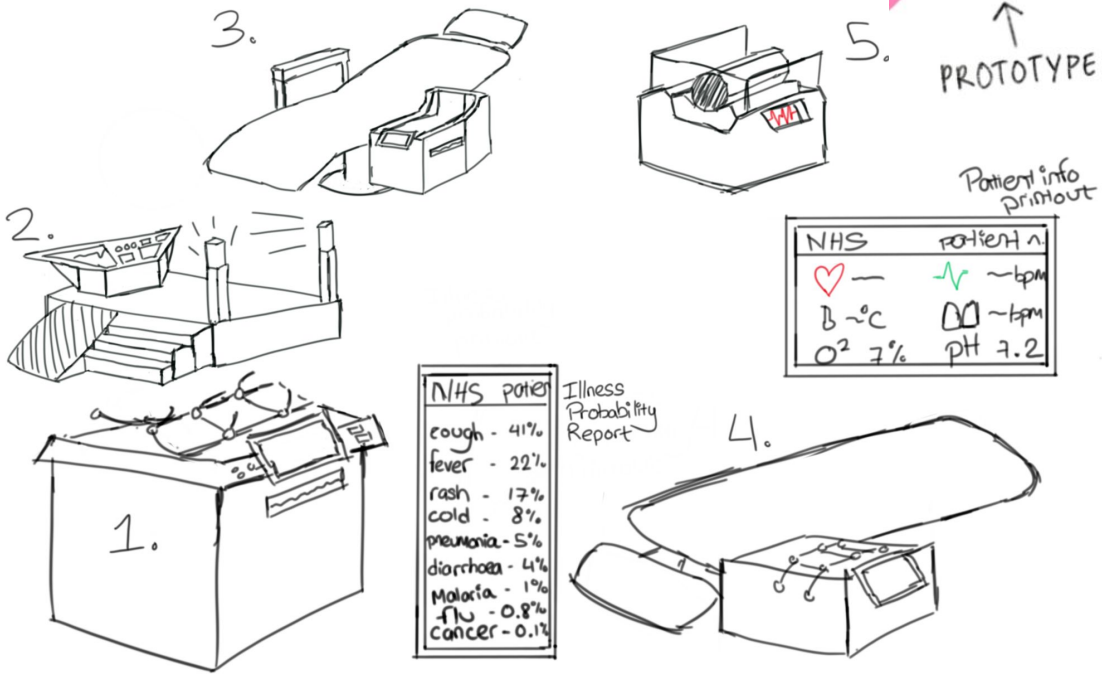
Combined with the sequence diagram, the state diagram offered us a deeper understanding of the more intricate functionalities the system might have.

It allowed us to observe the key states the system might be in, thus, enabling us to further elaborate and design a first version of the prototype.



Lo-Fi Prototype - Sketches

At this stage of our design, we wanted to search the design space as much as possible and focused on generating a multitude of designs that would cover different concepts. We knew that our machine would require access to a user's arm in order to measure all of the vital signs necessary for a diagnosis. As a result, our designs focused on the prevailing concept of a user's body and arm position relative to the machine. We focused most of our design around this as we wanted specific goals for our main design: the user must be comfortable while being scanned, the machine should be as unintrusive as possible, and the arm of the user must be accessible to most on the machine.



An explanation of all the designs we came up with is presented in the following slide.

Lo-Fi Prototype - Sketches

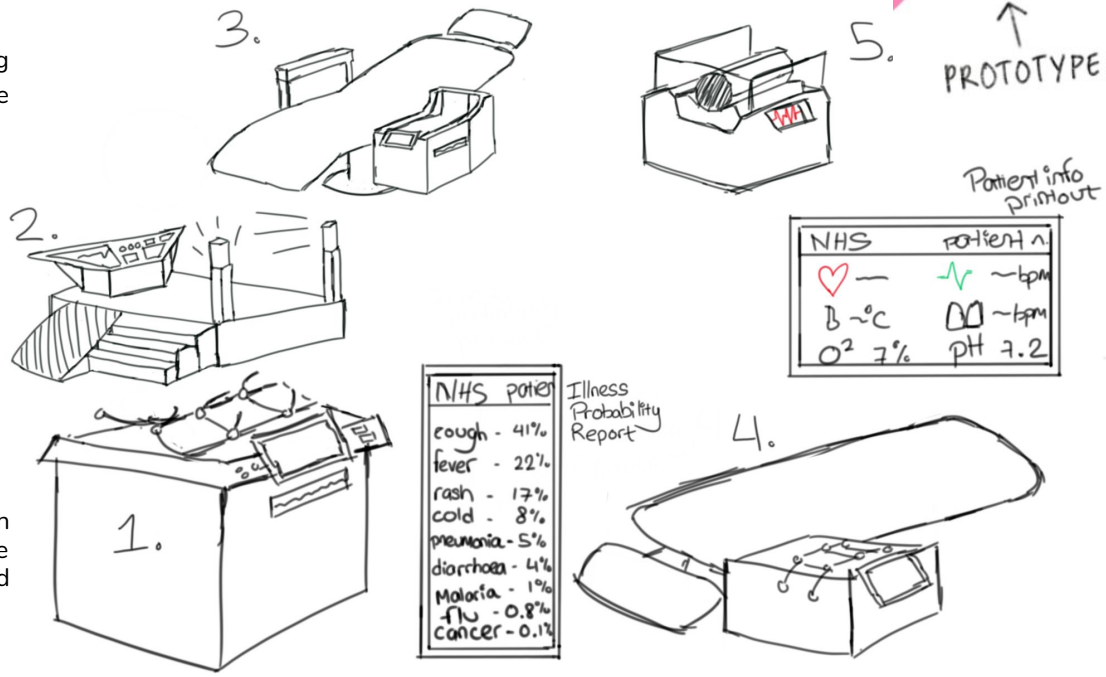
1. The first design focused on the user standing while putting their arm inside a machined sleeve with sensors on the sleeve inputting information into the machine.

2. The second design was made to be as unintrusive as possible with the user standing / sitting on the platform and being scanned using rays located on the corner poles of the machine.

3. The third design focused on the user sitting on a reclined chair while putting their arm on a machinery located to the side. The machine would act as the sleeve and processor for the system.

4. The fourth design had the user lay down on their stomach and place their arm on to an arm sleeve located on the side of the bed. The machinery would act as the table and processor for the system.

5. The fifth design had the user standing and placing their arm into a cylindrical covered hole located on the machine.

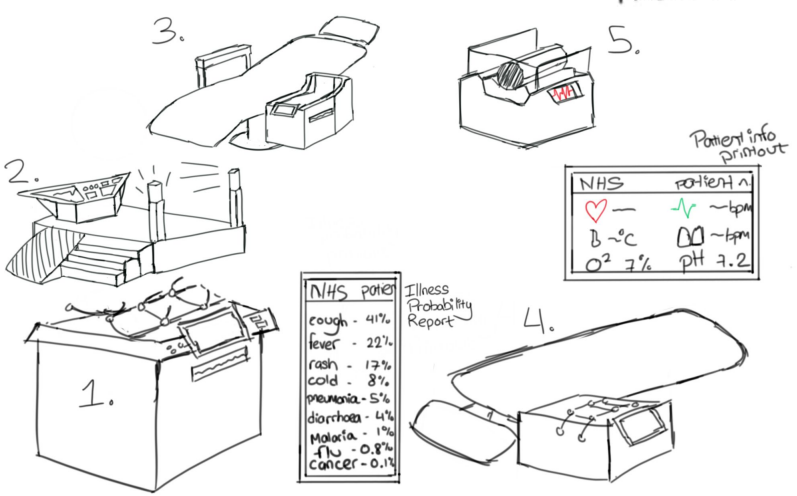


Lo-Fi Prototype - Sketches Evaluation

When we thought about designing a machine that would best solve our stated problem, we quickly concluded that a sketch was the best possible way in depicting it.

A sketch allowed us to visualize all the possible design concepts for our solution and explore alternative routes of features in a very quick manner. We found it invaluable when discussing features that our machine needed as we had a foundation to work with, this also allowed us to explore implementations such as adding a feature here, modifying the ergonomics there, and more in a relatively cheap and quick manner. The sketches also allowed us to visually explore the anatomy of a human and their relative position on different designs of our machine. This was crucial as one of our goals was to ensure patient comfort and exploring the ergonomics from a patient's perspective was relatively easy when we had a sketch to reference to. We found that the greatest benefit was that it was quite effortless to communicate ideas to each other, as the availability of a visual cue ensured that we were thinking from the same baseline. We could simply enlarge the sketch and think through ideas in an unrestrained manner as we knew that we always had somewhere to fall back to if our new explored design didn't turn out well.

However, one issue we did encounter was that sketches were somewhat determined by the underlying concept, and in our case, it was the focus of patient comfort. We found that there was only so many ways to explore a person's position in our machine and got stuck in sketching new designs after the first few.



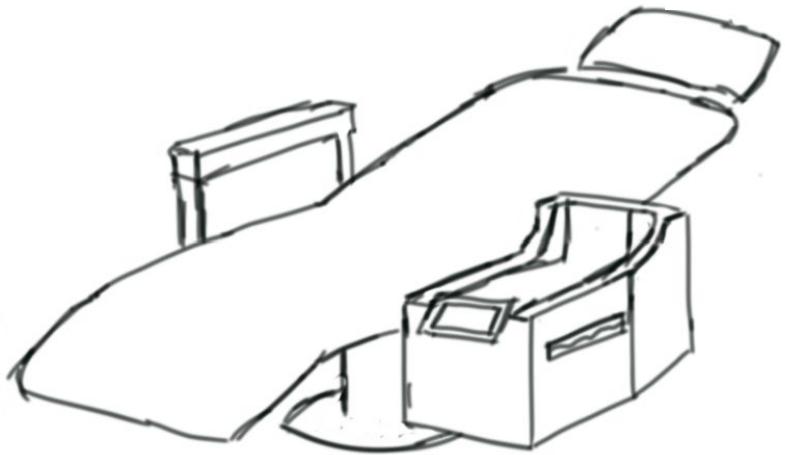
Chosen Prototype Design

After conferring together in one of the physical sessions, we chose this design as our main prototype due to a multitude of reasons.

Firstly, we believed that the reclined chair design was the most ergonomically comfortable for people of different shapes and sizes.

Secondly, we believed that this design had the most ‘natural’ link for a person’s arm and the machine. The person would place their arm onto the sleeve of the machine which would naturally hold their arm in place for the various devices needed to measure their vital signs.

We also preferred this design as latches that constrict a person’s arm, or a cylindrical covered hole would be uncomfortable. This design also allows access for the entire length of the person’s arm, and various devices can be attached at both ends (hand and shoulder) of the machine for a wide range of measurements.

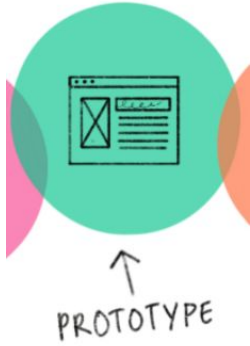


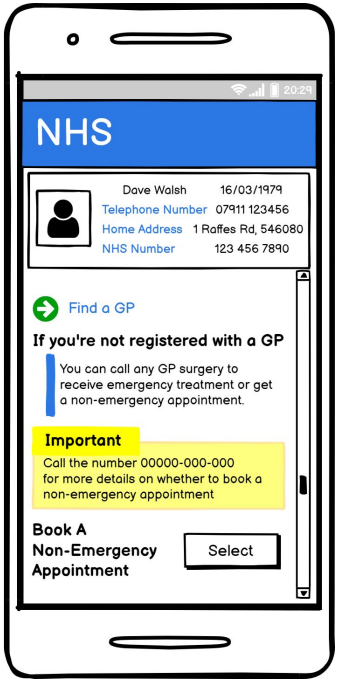
Lo-Fi Prototype - User Booking

In order to aid further visualization of our system, we also decided to make screens of every stage of our system cycle. We attempted to follow Norman's 6 Design Principles, and Apple's Human Interface Guidelines in creating an interface that would prioritize the user experience at its heart.

The next few slides represent the screens that a user would encounter when booking a non-emergency appointment on our system.

Lo-Fi Prototype - User Booking





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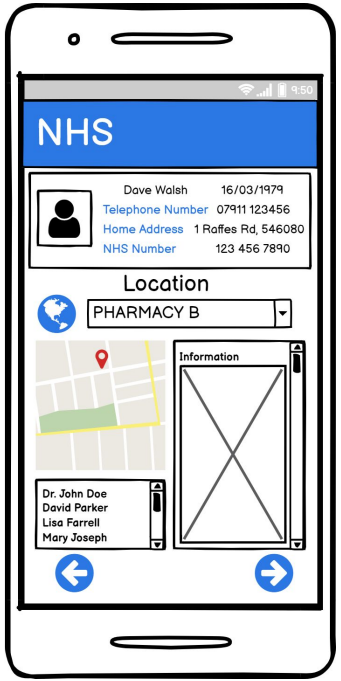

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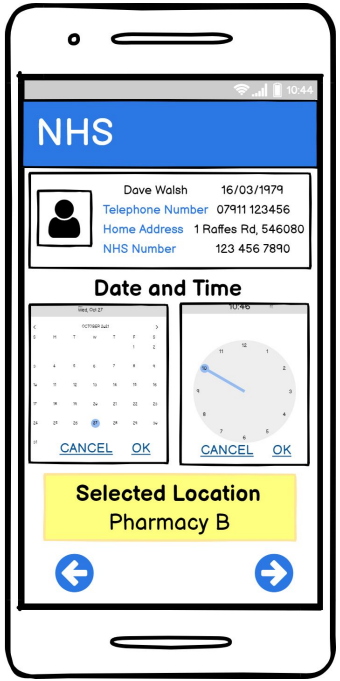

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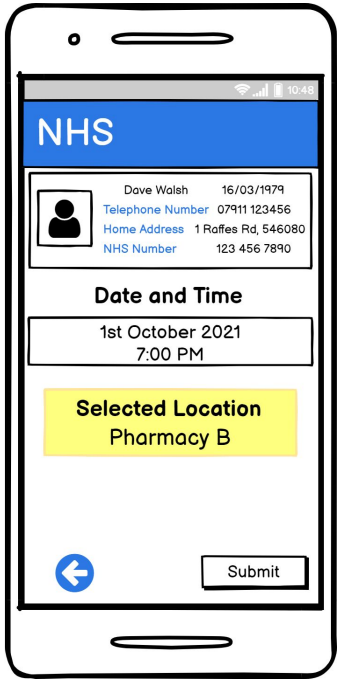

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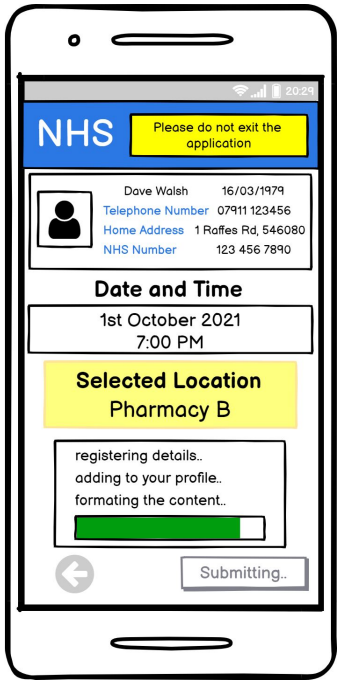
Lo-Fi Prototype - User Booking



5.

1. The first image displays the user visiting the NHS book a non-emergency appointment webpage. There are several prompts and guidelines in order to help the user should they get stuck in attempting to book an appointment

2. The second image displays the user having selected to book a non-emergency appointment, and viewing the information for all the possible locations they may book the appointment at.

3. The third image displays the user having selected a given date and time for the selected location of the non-emergency appointment. The user confirms that it is correct and clicks on the right arrow button.

4. The fourth image displays the final screen before submitting the details of the appointment. The screen contains all of the key information that the user has selected. The user is still able to return to the previous pages by selecting the left arrow button.

5. The fifth image displays the appointment request being submitted by the system. The system is undergoing processes to ensure that the appointment is booked, and refrains the user from selecting anything.

Lo-Fi Prototype - User Booking Evaluation

We found that creating lo-fi screen prototypes helped immensely for our understanding of the system. It allowed us to depict the user's perspective as they go through our system, and make the changes needed for a better user interaction. A key improvement that we thought of while making these screens was to match the color scheme of our application to the color scheme of the NHS website. This would add to the trustability of our application and build a consistent interface across the system to aid to the user experience.

We also found that following Apple's Design Guidelines gave us a set of themes to focus on when creating these screens. Two principles we found especially helpful were Aesthetic Integrity, and Depth. Aesthetic integrity helped us create an app interface that would maximize information awareness but through subtle, unobtrusive graphics: the soft yellow notifications and minimization of features at every screen in our application was our take on this. Depth helped us to focus on creating a seamless hierarchy of flow without the loss of context in our screens: the consistency of certain content such as the user's details, and simple tacit screen transitions was our take on this.

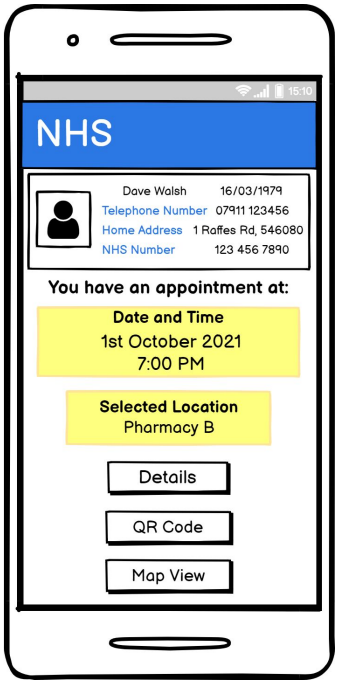
Lo-Fi Prototype - User Details

As the most complex user interaction part of our system finishes, we endeavored to make the details section of the user's appointment as clear and intuitive as possible. For these screens we followed Apple's Design Guidelines in order to create a simple user experience in keeping track of the details for their appointment.

For these screens, the specific design principles that we tried to incorporate were Consistency and Clarity. Apple describes consistency as implementing familiar standards, uniform terminology and incorporating features and behaviors in ways people expect. In our case, we kept the implementation of the user's details at the top of the page to maintain a familiar standard in our application, made intuitive redirect buttons that would bring the user to a page where they expect the information to be, and maintained a consistent wordage through all the pages. Clarity was described as keeping adornments, graphics, and interface elements subtle, but highlighting important content. Our take on this was maximizing the negative space (white space) on our screen, and sparingly highlight crucial user details (appointment location and time). We believed the soft yellow highlight complemented the NHS blue while subtly capturing the attention of a user.

In the end, we found that Apple's design principles were so thorough in guiding design that we based most of these screens on these principles. This was good for us as using one of the world's most successful design companies' principles as a foundation would ensure that we were on the right track for designing our product, but it may have been helpful to also look at other design principles.

Lo-Fi Prototype - User Details



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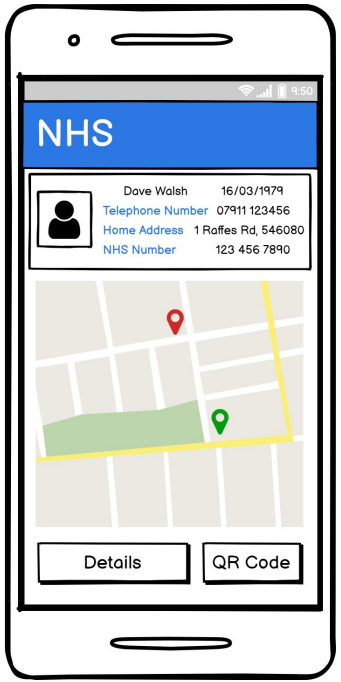

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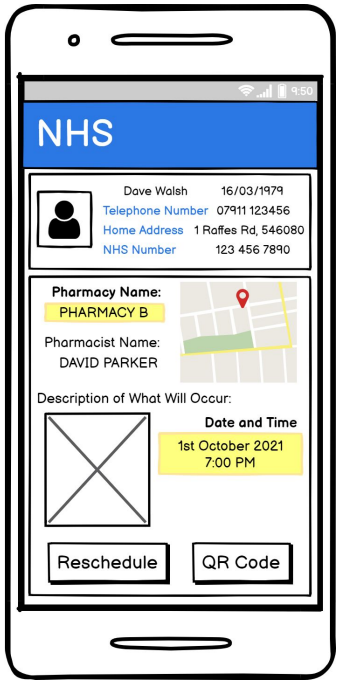


8.

9.

Lo-Fi Prototype - User Details

6. The sixth image displays the user's booked appointment homepage, where they may access the other pages related to their booked non-emergency appointment. The homepage also displays the key details of the user's appointment.

7. The seventh image displays the map view of the location the user selected for their appointment. It can also show the location of the user and directions to get to pharmacy should the user turn on this setting.

8. The eight image displays the in-depth detail of the non-emergency appointment. Key details are highlighted to ensure visibility for the user. There is a selectable button should the user wish to reschedule / cancel their booked appointment.

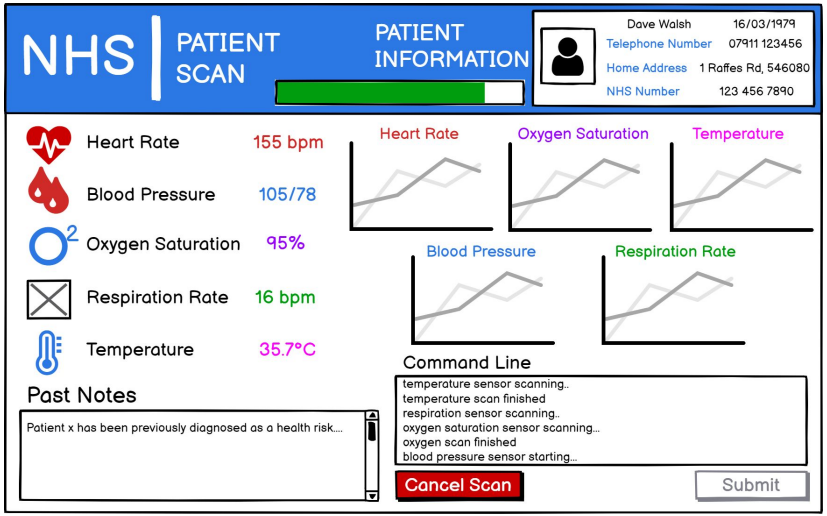
9. The ninth image displays the QR code that the user should show when they meet the medical professional assigned to their appointment. There are clear warnings to the user to keep this information private as it contains the details of their appointment.

Lo-Fi Prototype - Machine Screens

The machine screens were without a doubt one of the most important screen to nail down. These screens would contain a lot of the information that would shape the pharmacists' judgment call. However, we knew that we had to design an interface that was not only medically inclined, but also technologically straightforward as we knew we had to cater to patients and pharmacists' who may not be technologically inclined.

For these screens, we focused on implementing Jakob Nielsen's 10 Usability Heuristics in order to create a great human interaction, regardless of patient or pharmacist.

Lo-Fi Prototype - Machine Screens



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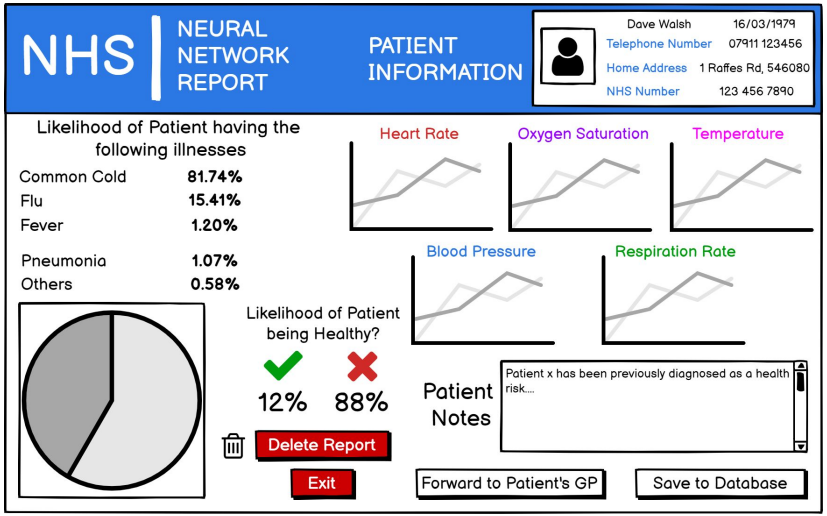


11.

Lo-Fi Prototype - Machine Screens

10. The tenth image displays the vital signs of the user as they are being scanned by the machine. There is a trace of the vital signs and sections of past notes related to the user's medical history. There is also a console outputting the current stages that the machine is undergoing and a progress bar so that the pharmacist may have a feel on how the machine is doing. There are buttons that the pharmacists may select to either cancel the scan or submit the scan, of course, the submit button is unavailable until the scan is fully completed.

11. The eleventh image displays the illness probability report outputted by the artificial intelligence. The artificial intelligence would take the patient's scans and create a likelihood probability for the probable illnesses that the patient may have. The report also displays the AI's recommendation on whether the patient is healthy or not. There are graphs and charts to display to the user in order to explain the nature of their health. The pharmacist may delete the report if they find the scan faulty, forward to the user's GP, or save it to the user's account on the NHS database.

Lo-Fi Prototype - Machine Screens Evaluation

For these screens, we decided to follow a different design guideline lest we have all our interface designed using Apple's Human Interface Guidelines.

We found that there was a lot of overlap in principles between Jakob Nielsen's heuristic, and Apple's guidelines which helped us by keeping a similar sense of thought when creating these interfaces. Also, the guidelines were extremely helpful in ruling out certain additions as when we thought about adding a new feature, we consulted whether this addition would breach the guidelines, and if it did then don't add it. In essence, it also acted like a requirements list for adding a feature. Furthermore, as we kept reading and implementing the principles of these guidelines into our design, we learned that the design principles were created with specifically the user in mind. Of course, we suspected that this was the case, but it helped to reassure us that we were on the right track to creating a great user experience in our design.

However, one issue we did encounter was that it was extremely hard to create a design that abided by every guideline / heuristic, we learned this when we had to sacrifice certain aspects of our design that we thought would be great but would go against a certain guideline.

Lo-Fi Prototype - Neural Network

We figured that for the purpose of our machine. Our illness probability neural network would have to be a classifier.

Our input layer would consist of 5 nodes as this corresponds to the same number of features (heart rate, blood pressure, oxygen saturation, respiration rate, temperature) that our machine would measure.

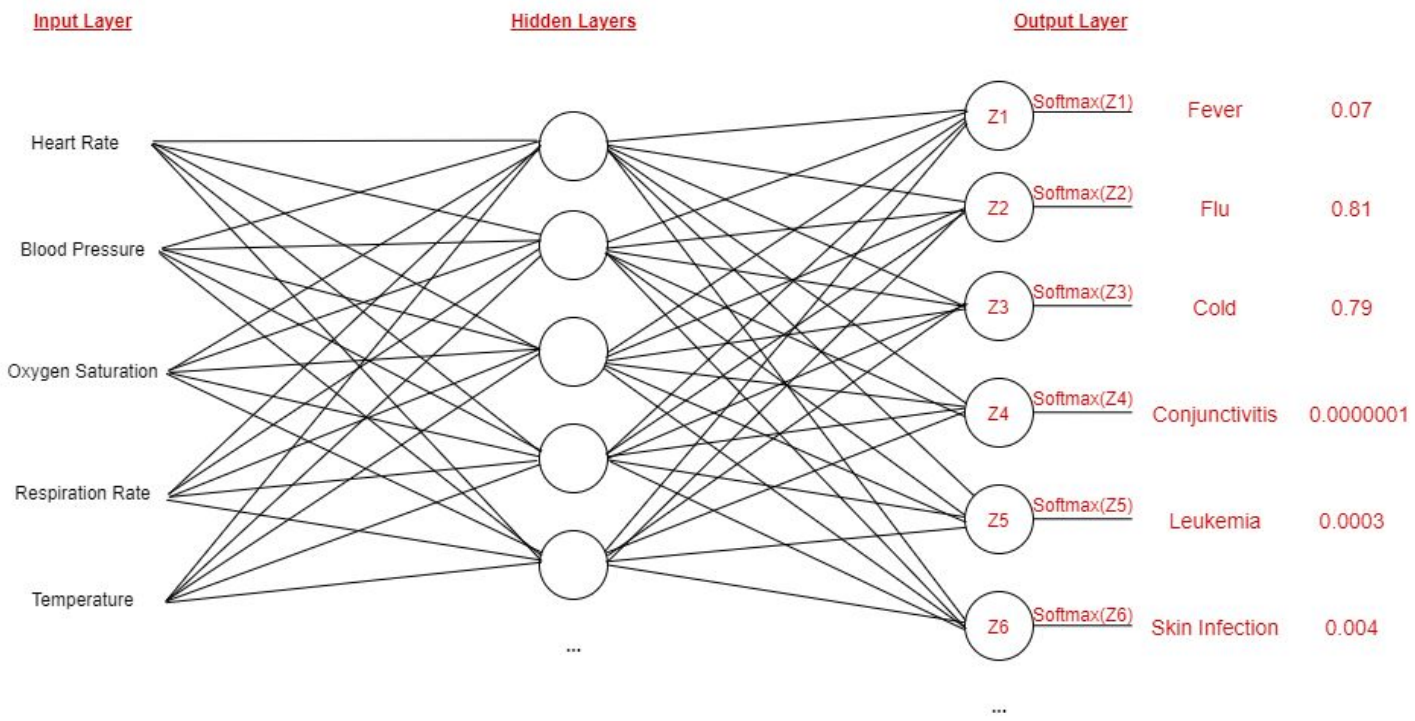
Our hidden layers would be kept as small as possible to maximize the performance time of the machine but will still consists of quite a few layers as our data will likely not be linearly separable. We would aim to keep the number of neurons in the hidden layer to be between the size of the input layer and the size of the output layer as that is the general rule-of-thumb we found when determining this.

Our output layer would consist of N number of nodes where N would be the programmed number of illnesses the machine would predict. In this case, N could be self-determined by the most prevalent illnesses in a certain area, or through a factory setting of say N = 50. This 50 could be a representation of the most common illnesses.

We also believe that a softmax activation function would be best in the output layer due to the multi-class classification nature of our problem. The softmax function's ability to calculate relative probabilities is, what we believe, perfect for our design as the output of a probability of each class (illness) would be relatively simple to manipulate into the final report, and mentally processed by our users.

A simple visualization of what our neural network would look like can be seen in the next slide.

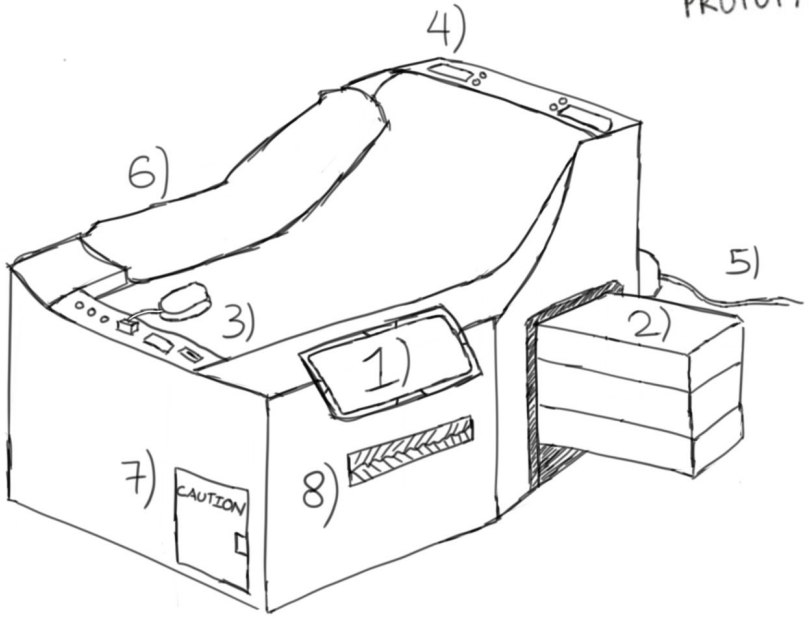
Lo-Fi Prototype - Neural Network Visual



Hi-Fi Prototype - Further Designs

We endeavored to further improve the design of our chosen prototype and added specific features to the machine in order to improve upon the user interaction.

We added features such as: **1)** a detachable screen/tablet to ensure maximum control and freedom of movement for the pharmacist, **2)** a tools drawer embedded in the machine for storage of devices that could be plugged into the machine, **3)** a forward mounting port for devices that require access to the fingers and hand, **4)** a back mounting port for devices that require access to the shoulder and upper arm, **5)** a power cable located on the back of the machine to ensure the safety of the user by keeping electrical wiring away from them, **6)** an armrest so that the patient do not feel uncomfortable when placing their arm onto the machine, **7)** a machine control panel located as far away from the user for their safety, but open enough to be easily accessible for maintenance, **8)** a printout slot for the machine to output a printout of certain documents should the pharmacist deem it.



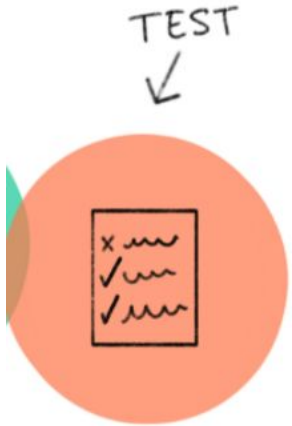
Emphasizing the Pharmacist's Role

We would like to clearly emphasize that this designed machine of ours IS NOT the decision maker for the best course of action of the patient.

All these tools (machine, neural network, and the report) are instruments that the pharmacists may use to form an informed judgment call for the recommendation of the best course of action for the patient. These tools would help the pharmacist decide between a range of actions such as: recommending the patient to visit the hospital, prescribing medication, admitting him to A&E, sending the patient home with a recommendation to rest and many more.

In the end, it is still up to the pharmacist to provide the best medical recommendation and the patient on whether to take the pharmacist's recommendations or follow their own judgment.

Heuristic Design Evaluation

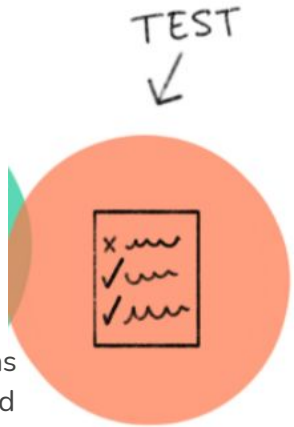


We want to note that throughout the design of our system, we have kept the following design heuristics in consideration:

- Effective to use (effectiveness)
- Efficient to use (efficiency)
- Safe to use (safety)
- Having good utility (utility)
- Easy to learn (learnability)
- Easy to remember how to use (memorability)

We believe that some of the rules are clearly depicted in the design, and the next slide explains how some of the rules are satisfied.

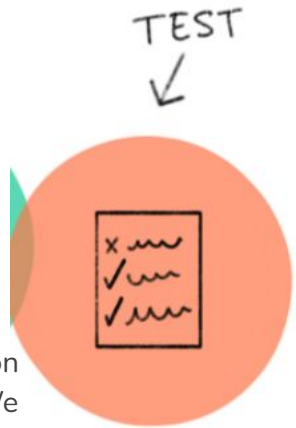
Heuristic Design Evaluation



In our system, we attempted to implement Nielsen's first heuristic by clearly communicating the actions of the system through the machine screen progress bar, and console print statements. We believed that the progress bar was an essential requirement for individuals with little technological savviness to understand the state of the system. The console print outputs also help in directly communicating to the user the stages the machine is undergoing. We evaluate these two features to be an example of learnability and effectiveness implementation as the progress bar is a relatively common tool to convey the state of the system. We believe that the console print outputs is an effective tool for the user to learn the functions of the machine, and understand the every step of its progression. We also evaluate that the progress bar is the simplest and most effective way to convey progress to individuals who aren't technologically savvy.

We had also attempted to implement Nielsen's second heuristic, by keeping the terminology as simple as possible such that a person wouldn't have to look up a word they saw in our system in the dictionary. We evaluate this to be an example of memorability implementation as the terms expressed in this screen is consistent to the naming conventions of other applications.

Heuristic Design Evaluation

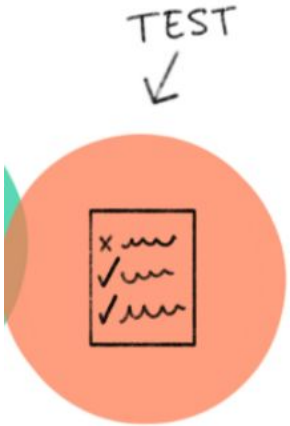


For the third heuristic, we created a cancel scan button during the scanning process and an exit button in the NN report to provide the user control of the system and prevent them from getting stuck. We evaluate this to be an implementation of utility. We believe that a user should always have control over a given system, this means that the user will always able to stop or reverse an action that they have committed. The cancel and scan buttons directly convey to the user that they are able to stop the current action in a naming convention that most users can understand.

There are more design heuristics that we attempted to cover in our interface design, but for the sake of space on this slide, we believe that these three heuristics were some the most evident in the design of our interface.

We want to clearly note that although we kept these heuristics in mind when designing our interface, a further external evaluation is needed in order to fully determine whether our implementation satisfied the design heuristics we aimed to achieve.

Evaluation Involving Users/Experts

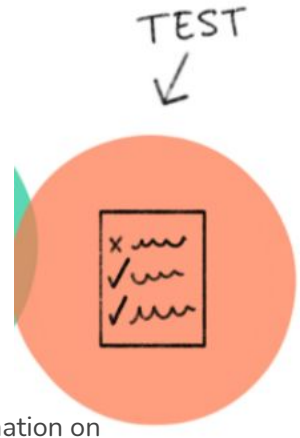


Think Aloud Evaluation: In order to test our design, we presented the lofi interface to computer science students while asking them to comment out loud about their thought process. No major difficulties were highlighted there but this could be biased by the fact that they already are tech savvy. We would have to ask patients in hospital to have more exploitable results.

There results from this test allowed us to improve our original design for the app interface, that is shown on the slides above.

Expert Evaluation: Confusion about choosing time slots were highlighted so in further designs we would need to only provide the slots that available for the user to choose from. The expert highlighted that the system should check availability first, before making it available to the users and we noted this down in further iterations. We would also have to get rid of impractical elements like search bars, superpose biological data to not have to jump from one representation to another and find a less confusing way to display the final result.

Accessibility Principles - Color Impairment



One of the key areas that we focused on when designing the screens was accessibility. We wanted the information on the screens to be easily comprehensible for our users, but also accessible to those with disabilities.

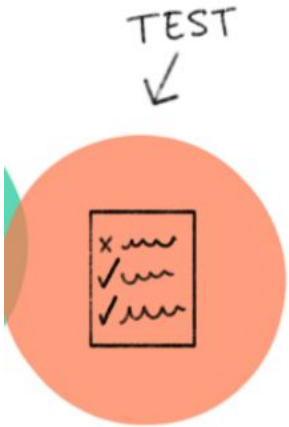
One area of disability that we heavily focused on were those with color impairments. We found that this was relatively easy to evaluate as we could simply download a disability simulator (SilkTide) and turn it on in our screens. We ran one of our appointment booking screens through all the possible color impairments and evaluated that most of the text was still relatively legible and quite understandable.

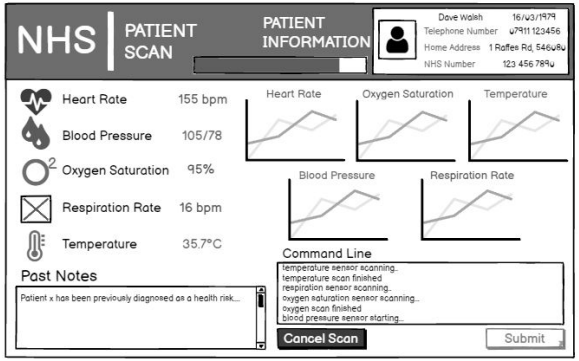
We then ran one of our machine screens with all possible color impairments and evaluated that all the ‘color-coding’ we implemented for the visual signs was futile as it would just be in different colors for different color impairments. However, outside of the difference of colors, we didn’t feel that the information on the screen was harder to understand, and evaluated that the visual experience wasn’t great, but the underlying information was still there.

This evaluation conveyed to us that our system should make the necessary changes to minimize the effects of color impairment. We thought an implementation of screen settings in similar fashion to light mode vs dark mode but for different color impairments could minimize the amount of information and visual experience lost due to the disability.

A visualization of our screens in the perspective of different color disabilities can be seen in the following slide.

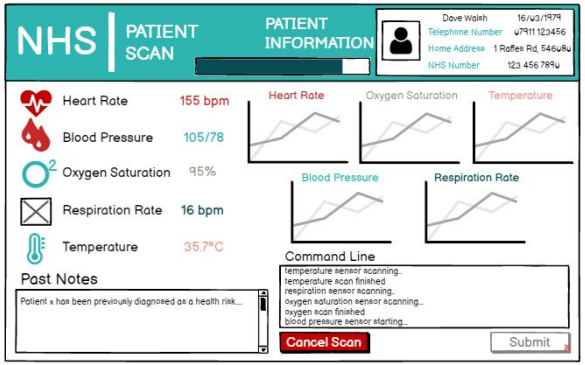
Accessibility Principles - Color Impairment



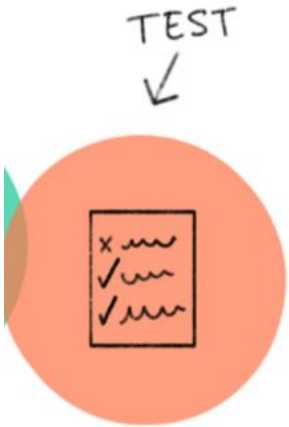


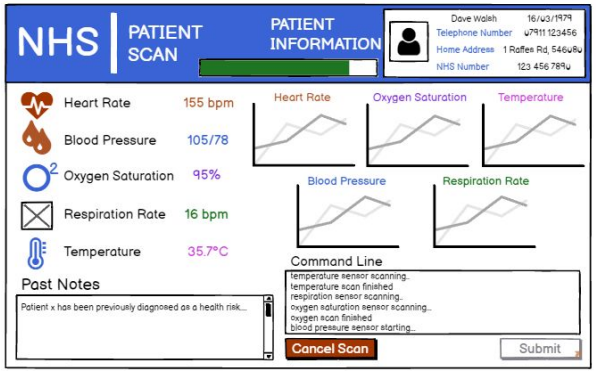
Color greatly reduced
(1 in 10,000,000)

Blue greatly reduced
(1 in 100,000)



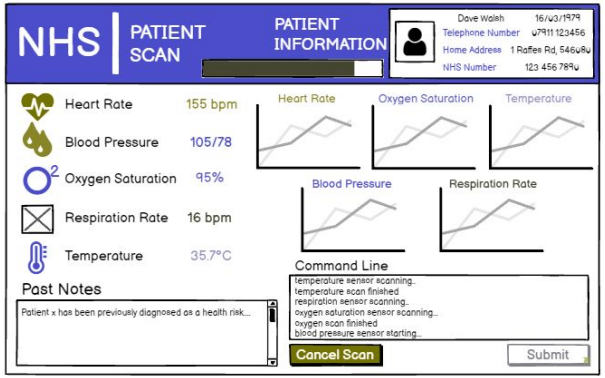
Accessibility Principles - Color Impairment



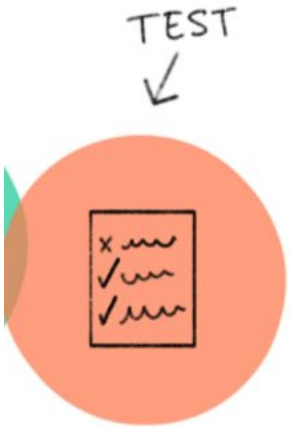


Green appears weak
(1 in 20)

Red greatly reduced
(1 in 100)



Accessibility Principles - Dyslexia



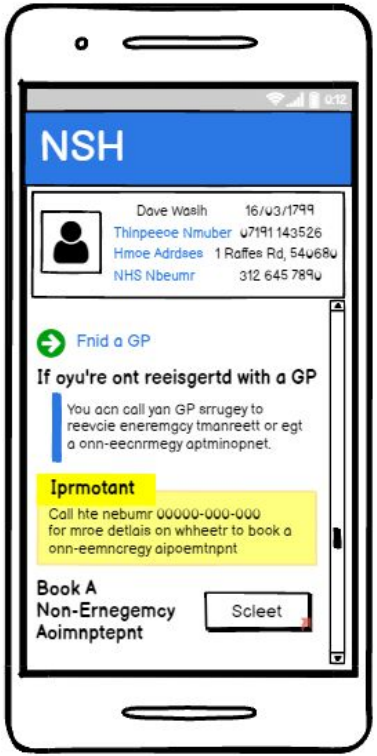
We also attempted to evaluate our screen in the perspective of someone with dyslexia and in order to recreate this, we used Silktide's Dyslexia simulator at a severity of 30%. We found that the information was completely illegible for both the appointment booking screen and machine screen. We simply couldn't understand the words when looking at it from this perspective and spent a long amount of time trying to make sense of what the prompts said.

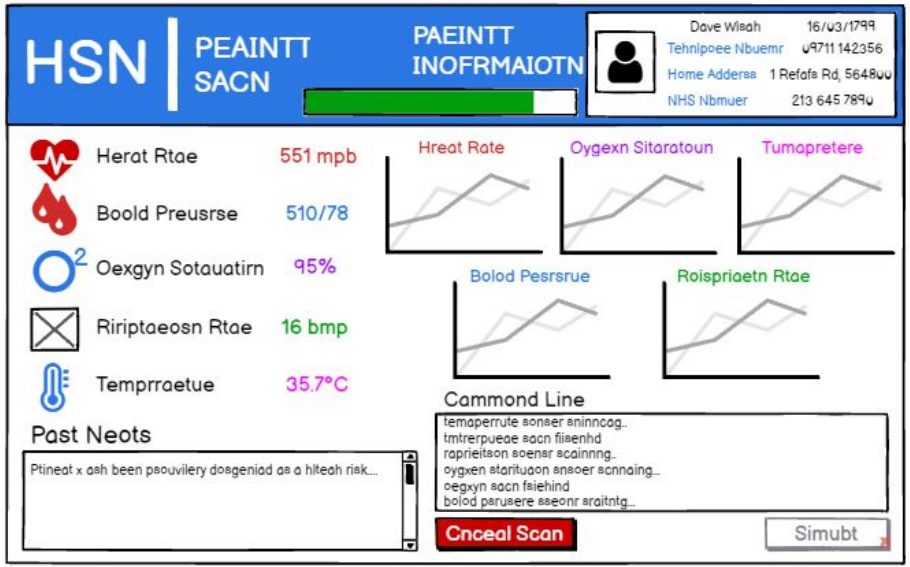
Furthermore, we found that the numbers on the machine screen continued to change, and it was extremely hard to derive the real vital signs from the dyslexia changed vital signs. We also evaluated that if a person didn't know what a normal vital sign looked like (e.g., 105/78 bpm for blood pressure) then this could be potentially dangerous as the person might misread the number leading to a bad diagnosis, and potentially life-threatening situation.

This evaluation conveyed to us that our system should make the necessary changes to minimize the effects that dyslexia would have in understanding our system's information. We thought of implementing features such as a text-to-speech function on key pieces of information in order to bypass this information miscommunication, but we were too late in the project timeline to implement this.

A visualization of our screens in the perspective of dyslexia can be seen in the following slide.

Accessibility Principles - Dyslexia





Silktide's Dyslexia Simulator
(severity = 30%)

Project and Team Management

Project Planning Approach

Our approach to this project was content development at a week-by-week basis. We figured this approach would be best as we went through the weeks learning more about user-centered design and applied the week's material of content to our design.

At the start of the project, we planned out which direction of wellness that we wanted to go by performing individual research on a topic of wellness that we found interesting. This research was transformed into a proposal which was voted on by the members of the group, and we decided that the one with the most votes would be the topic going forward. We discovered later that the results of this research planned the entire design of our solution.

Furthermore, we always attempted to plan out the work that needed to be done a week early and found that this was relatively easy to do in the earlier parts of the project but was increasingly difficult near the end as it was hard to articulate every type of work that we should have for our design.

We found little difficulty in communicating with each other on the plan of the project, as the user-centered design approach highlights the process in a straightforward manner. An example of this is when we received feedback that our design solution wasn't on the right track: we went back a stage on the UCD approach and knew exactly what needed to be planned out during that stage as the module made it clear what each stage of UCD should focus on.

Team Management - Physical Meetings

One of the greatest tools we had for project organization, and team management was the ability to physically meet with all members of the group.

We underestimated this at the start of the project, but as we continued through the weeks, we learned that the ability to physically meet was invaluable for the project. A physical meeting allowed us to easily get ideas across, present sketches and drawings, consult with each other, and set up a timeline of what needed to be done. It allowed us to communicate without all the unnecessary hassles of time zone differences, faulty audio equipment, and scheduling meetings.

We also found it helpful that the module scheduled a weekly physical support session and scheduled our physical meetings to coincide with this. We used these physical meetings to not only collaborate with each other, but also speak to our experts. We found that we always learned something new when we met with the experts and their recommendations shaped a large part of our design solution. We suspected that there would be no way for us to clearly convey the concerns we had and receive this level of feedback from the experts through an online meeting.

Team Management - Discord

- Early in the process, we settled on using the group messaging software Discord as our main form of communication. We decided on Discord for our main form of communication as it had a multitude of features that were essential for group work and was the most popular choice among the group.
- Discord was essential during Covid as we had to have a backup method of meeting in case an in person meeting would not be possible. It also allowed us to create different text channels such as a “to-do” channel for a list of weekly ongoing activities that need to be finished or channels for managing the project such as “ideas”, “important-stuff” and “resources”.
- One key feature was the ability to ping everyone in the group which allowed prompt or urgent communication for tasks that required attention quickly.
- We also found that Discord was crucial in allowing us to contain all the workings of the project in one area and was a handy quick reference/link for different parts of our work.
- One possible misgiving is that as we used Discord for both our main form of communication and project management, some of the text channels did get messy, and there were some points where we had to rearrange and rewrite the texts into their respective channels.

Team Management - Google Slides

When we learned that the final submission would be a portfolio of slides, we knew that we had to have a tool that allowed us to collaboratively work on the slides together.

We instantly decided on Google Slides as everyone in the group had experience working with it, and it was also the simplest tool for our purpose.

We utilized Google Slides as a container for all the content related to the project. In essence, we simply wrote, and put everything that we completed onto a set of slides. Our approach was to have all the content written and sort it at the final week before submission. We found that this helped quite a bit in getting the content down, but we discovered at the start of the final week that our initial set of slides was a mess. As a result, we created a new set of final slides with the reformatted content of the initial set of slides.

Google Slides was a crucial tool in that it gave us a place for all the content we produced without all the unnecessary frustration of organizing group work. It also allowed us to easily add new information, in the form of slides, as we learned more about user-centered design.