

Human Computer Interaction Doctors Surgery

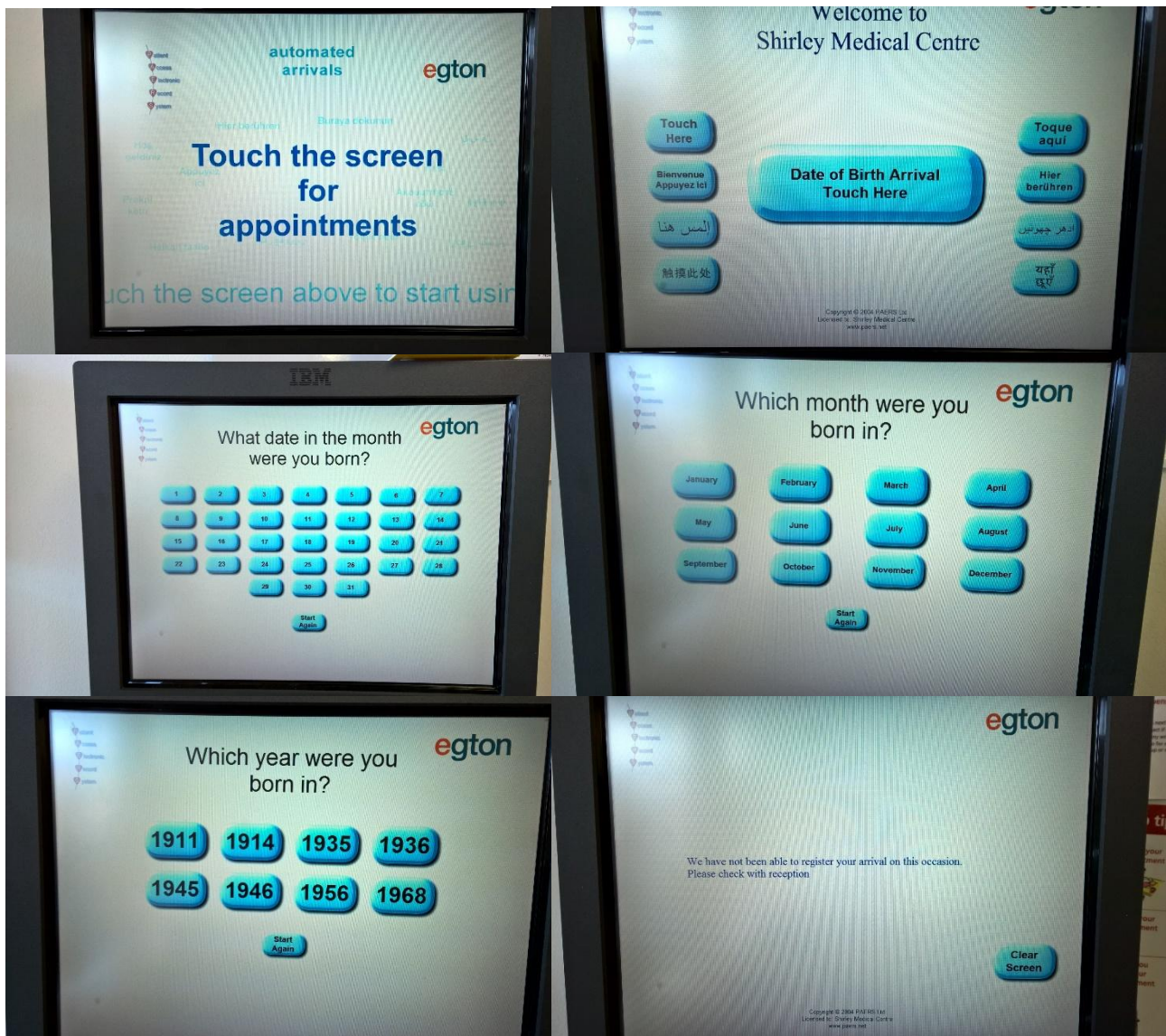
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Computer Science Year 1

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RESEARCH INTO TOUCH SCREEN INTERFACES

Doctors Surgery: Shirley Medical Centre



Elements of the Design

After primary research into touch screen interfaces, it was necessary to do further research into other check-in machines at doctor surgeries. This was very insightful for many reasons and allowed the consideration of many research directions in an effort to improve the design.

The most interesting thing that was found is the use of colour in the software. The software used combinations of white, blue and black. This prompted further research into colour theory to decide which colours would be best and which emotions they would convey. In addition to the colours it was noted that the use of font was a sans serif font. This was particularly interesting as a specialist font was thought to be more appropriate.

Button and text size was also looked at, on average it was found to have large buttons however on many screens the button size was much smaller, especially when there were many options.

The relationship between text and button size was also found to be inconsistent with buttons having larger text (relative to the button size) on some buttons and smaller text on others.

Another feature which was not considered until researched was the use of languages. The software had support for 8 languages. It was realised that this was a very important feature for the surgery, however it was also recognised that many different communities have different languages and that the machine may not support all languages spoken in one area.

It was observed that the interface had a very small number of buttons, such as only having a “Start Again” button instead of a back button. The doctor’s surgery had a very limited selection often keeping the interface to the necessary options without many other buttons or options. This was theorised to make the interface easier to use and stopped people making mistakes by clicking on the wrong button or trying to enact an incorrect plan.

Another important feature that was found was the use of sound in the machine. Although it was expected that sound would be used, the way in which it was used was unique to the surgery. The machine confirmed selections with a sound but did not use sound in any other way.

User Feedback

The next step was to speak to people using the machine about how easy or difficult found using it. It was found that in general older members found the interface difficult to use. Although they liked the simple steps and clear instructions, many complained about the button and text size-finding it difficult to read when there were too many buttons. One person replacing the simple sounds with the ability to have the instructions read out to them. Younger people did not have these issues although many found the buttons small but did not make mistakes. When asked about the colour choices, the majority said they either did not think about the colour or did not find it difficult to read – however one person suggested that the black text could be difficult to see, however they did not have a problem with it. A majority people spoken who did not use the machine said that it was because they didn’t trust it checked them in and found using the reception more trustworthy. Although it further research into the reasons why was not done, a receptionist mentioned that the machine did not give as much feedback – such as their name or the doctor, which caused many people to assume they were not checked in and go to reception.

From speaking to users various conclusions could be made. The first conclusion that was made was that users found that larger buttons was a priority, when asked in general what issues they had, this was the first and most common issue users cited. Another important conclusion was that the majority of people who found the machine difficult to use was older people, who both found it difficult to trust the machine and difficult to use. Although not mentioned by users it was also decided that colour was an important factor, as no people mentioned it or thought of it until prompted, it was thought that it played a larger role being very suitable for the environment. Finally it was decided, from the receptionist’s experiences, that the interface should have a large amount of feedback to ensure it was more found to be more trustworthy.

RESEARCH INTO DESIGN DECISIONS

After speaking and finishing the preliminary research into touch screens, it was decided that further research into the specific elements of both interfaces and feedback from the users was

required. Finding scientific reasons for decisions made and why people liked or disliked the touch screen interface they were using. In addition to this it was also necessary to find out more about what was important to consider when designing an interface and how to design for older members of the public.

Colour and Fonts

After research, colour was discovered to be very important for our designs. colours and human perceptions were researched, it was discovered that

After observing the font choices made by other touch screen interfaces it was decided that a more specialist font should be used to improve and speed up text recognition. Targeting our research at dyslexic fonts, a lot of research was found in support of a font called Dyslexie. After using this font, 72.2% of surveyed children answered that their reading speed had improved with a 66% of parents suggesting their child's reading speed improved in addition to this 69.4% of surveyed people and 64.3% of surveyed parents explained they or their child made less errors than before using it (Vrugt, 2012) . Although this research was aimed towards children, the research shows a strong correlation between fonts and reading speed, it was decided to use Dyslexie for the prototype.

From the research conducted at the doctor's surgery it was decided that a suitable colour scheme should be used in order to ensure that the interface could be used by members of the public easily. The WC3 suggestions for text readability was used to base our research, the WC3 suggests, for maximum accessibility, a contrast rating of at least 7:1 (WC3, 2008). After more research was conducted, looking at more of the WC3 suggested requirements, it was discovered that yellow on black is preferred among dyslexics (Rello & Baeza-Yates, 2012). From this research it was decided to use a yellow/cream colour with a higher contrast ratio for the background with black text. The colours decided upon were #000000 and #FFFFB4, these have a contrast ratio of 20.22 and meet all the WC3 recommendations (snook.ca, 2015).

Heuristics

A major area for research was to look into "Heuristics" for interface design. These include rules of thumb that an interactive system should follow. Importantly for this research were Visibility of System Status, Consistency and Standards, User Control and Freedom and Aesthetic and Minimalist Design (Nielsen, 1995). Many of these ideas were clearly demonstrated in the Doctors Surgery such as Minimalist Design and User Control and Freedom, however some such as Consistency and System Status were not, therefore the design could be improved upon. In order to implement some ideas certain design decisions must have been made. To meet the Visibility of System Status it was decided that a process bar or other option would show users how far they are from checking in, giving a clear direction and purpose to each action. For User Control and Freedom a "Start Again" or "Back" button would give users the option to exit or undo a mistake. For the others general design decisions were made such as consistent button size and element size, a simple design avoiding the use of buttons

Icons

After conducting research at the doctor's surgery it was decided that use of icons would help improve recognition of buttons without the need to read the text, minimising errors. To choose

icons the ISO standards were used, focusing on Function – the use of a back and sound button, Abstraction – the use of crosses and check marks and Generic Object – used a checklist for a check-in object, a doctor for making an appointment (ISO, 2011). A sample of which are shown below.



Keyboard and Formats

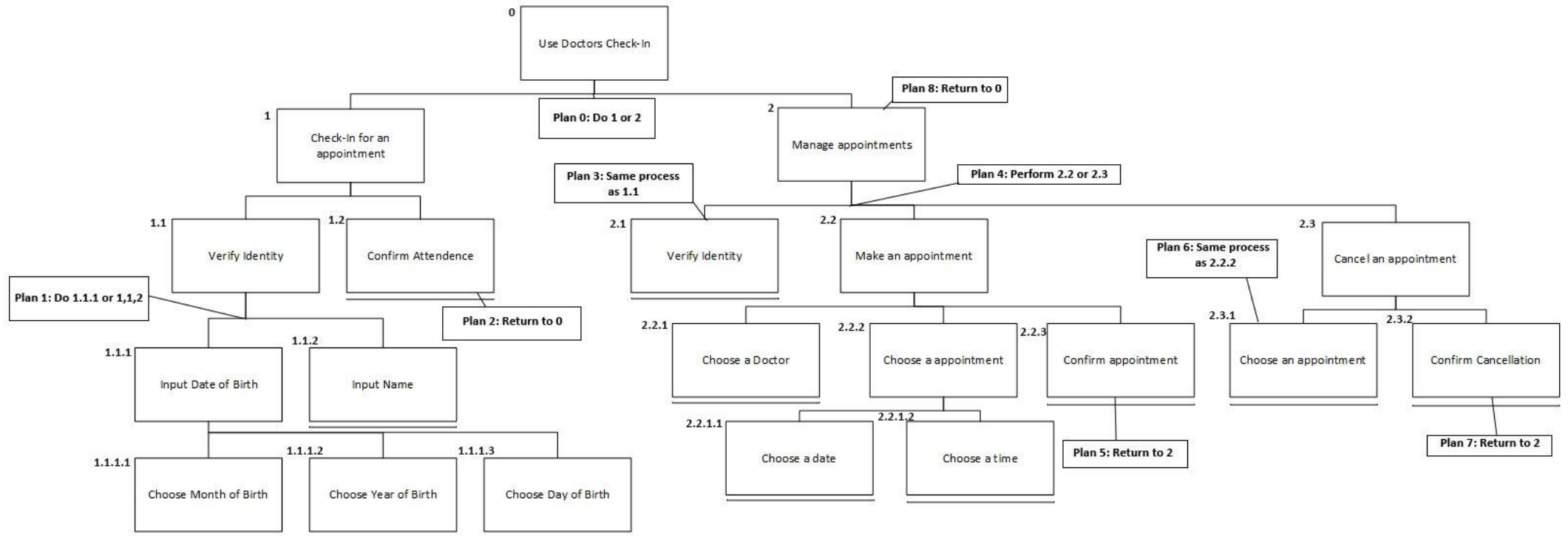
KEYBOARD

The decision on how to format the keyboard was very difficult. Research suggested a number of ways to tackle this problem including 2 fields including a Latin transcript and a native name, which characters should support and how they should be supported (W3C, 2011). The best approach discussed was believed to be, only having 1 field and not separating out each name, only allowing A-Z – not allowing special characters, allowing punctuation and allowing them to change their recognised name at reception – allowing them to use either their last name or first name.

DATE FORMAT

Date Format was considered very important to the design of the system. Due to the fact the system is most likely to be used in the United Kingdom the choice to use the date system DD/MM/YYYY.

HIERARCHICAL TASK ANALYSIS



ERROR ANALYSIS

Task	Error Mode	System consequence	Error recovery	Procedure implications	Design implications
1	O6 – User wished to Manage Appointment	The system starts to verify the identity for managing an appointment	Go back to the home screen and try again		Add another screen which shows which task the user is about to verify their identity too.
2	O6 – User wished to Check-In for appointment	The system starts to verify the identity for Check-In	Go back to the home screen and try again		Add another screen which shows which task the user is about to verify their identity too.
0	T1 – User does not understand due to disability	The system can't change	Someone must help the user		Add sound to help talk the user through the process
1.1	O1 – User took too long to decide on a method	The system goes back to task 0	Start process again		Add a timer to show how long a user has to complete a task
1.1.1	O6 - User wished to verify by their name	The system goes to the wrong screen	Go back to the input selection screen	Add a back button to allow the user to go back to the previous screen	
1.1.2	O6 - User wished to verify by their date of birth	The system goes to the wrong screen	Go back to the input selection screen	Add a back button to allow the user to go back to the previous screen	
1.1.2	O6 – User typed their name incorrectly	The system continues	The user must go back to the previous screen and try from scratch		Add a backspace button allowing the user to delete and change their input

1.1.1.1, 1.1.1.2, 1.1.1.3	O9 – User does not finish the date of birth process	The system goes back to task 0	Start process again		Add a timer to show how long a user has to complete their date of birth, ensure the screens are continuous
1.1.1.1, 1.1.1.2, 1.1.1.3	O6 – User makes a mistake selecting their Date of Birth	The system assumes the wrong information and cannot find the User	Start process again	Add a back button to allow the user to return to the previous screen	
2	O7 – User accidentally logs out of the Check-In system	The system logs out the user	Start process again		Add a confirmation before logging out a user
2.2.1	P2 – User does not know their doctor and picks randomly	The system assumes their selection is correct	User must cancel and rebook		Add a feature showing their most used doctor
2.2.2	O6 – User selects wrong date or time	The system logs the wrong appointment	Start process again	Add a back button to allow the user to return to the previous screen	
2.2.3, 2.3.2	T1 – User does not check their appointment details	The system logs the appointment	User must cancel appointment	User must press enter or confirm they understand	

FIRST DESIGN

Identity Verification: Using date of birth only HTA: 1.1.1

Icons chosen using ISO 11581 recommendations

Use of sounds to help the hard-of-hearing

Use of a back button for error recovery

Appointment Manager HTA: 2

Confirmation screens allow the user to correct mistakes

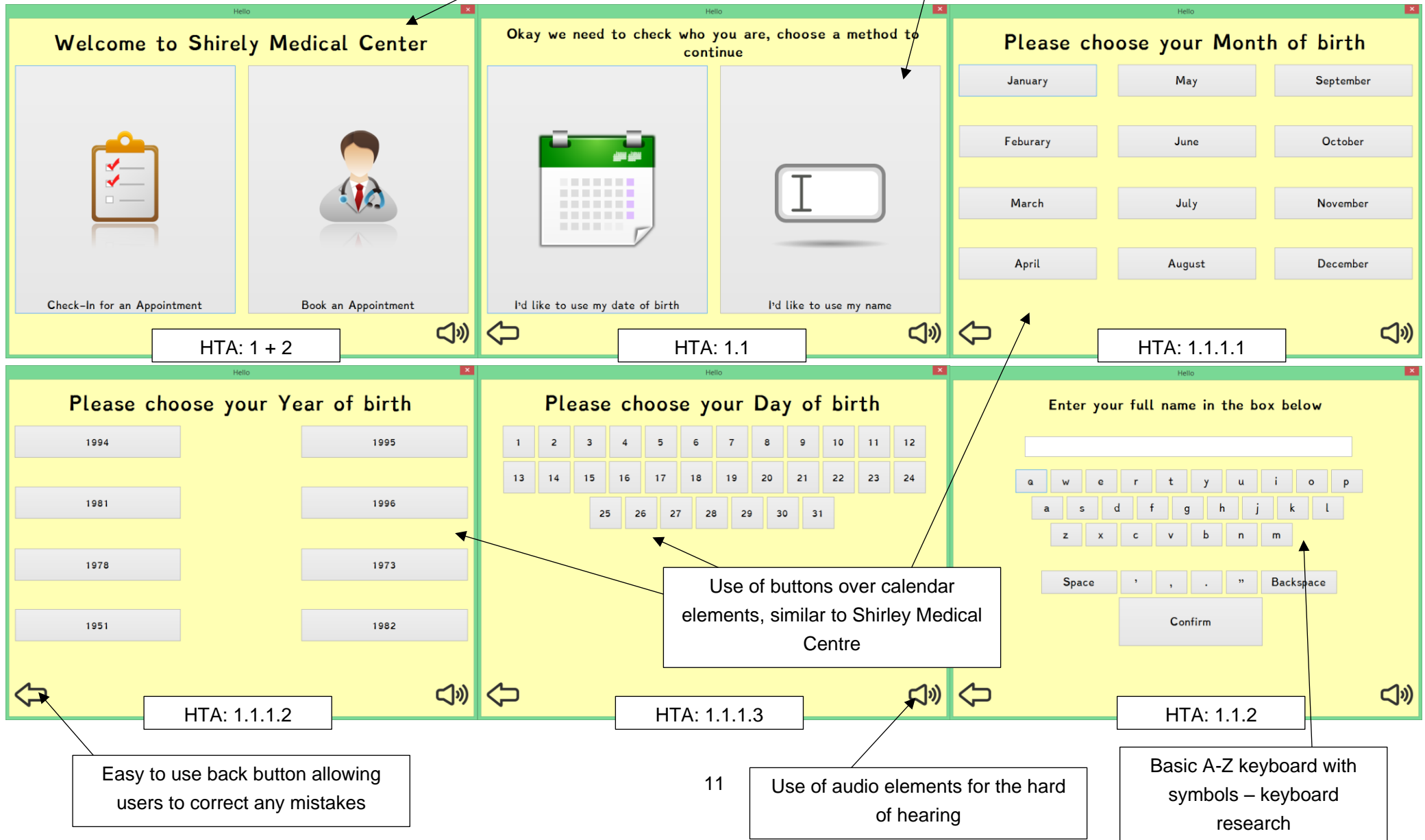
Users citing not trusting machines would have clear feedback on if they were registered correctly

Limited choice to avoid overwhelming

PROTOTYPE DESIGN

Yellow background colour and specialised font

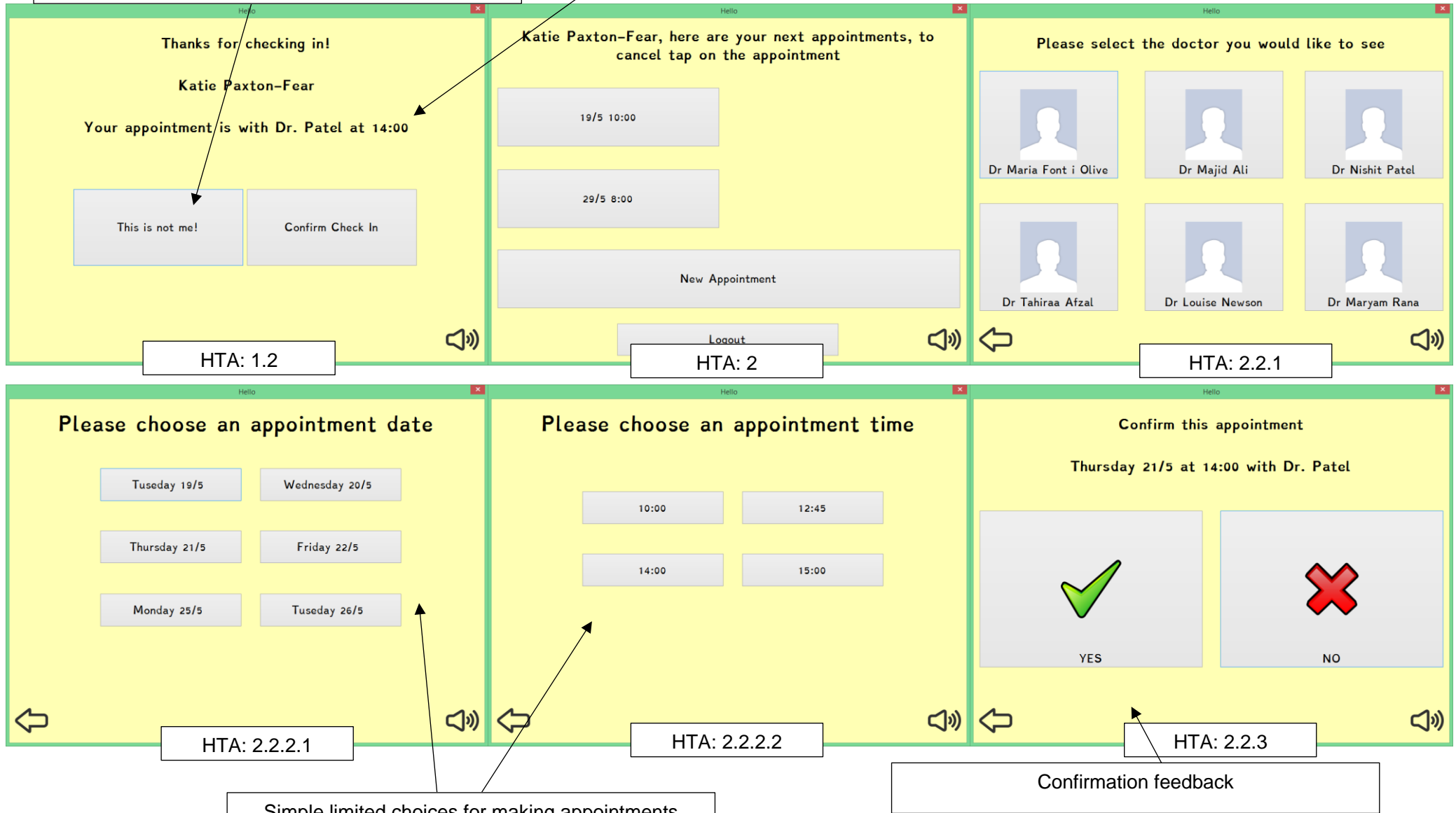
Large buttons with specialised icons describing the function

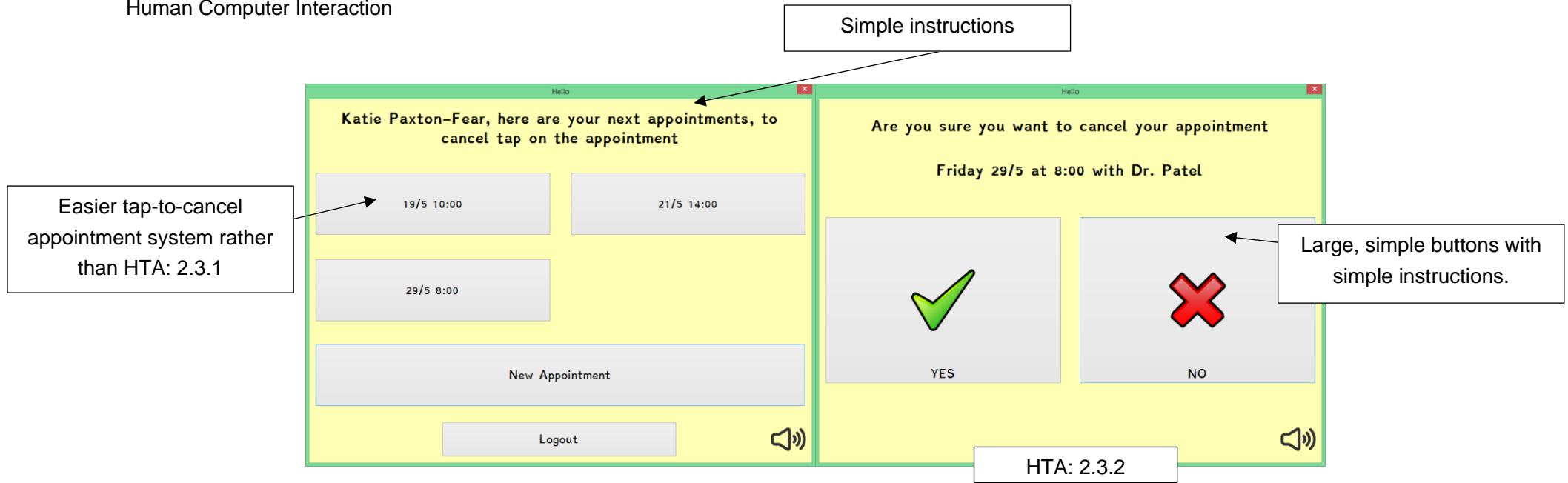


Human Computer Interaction

Emergency exit allowing the user to go to the desk

Feedback ensuring the user understands the system process

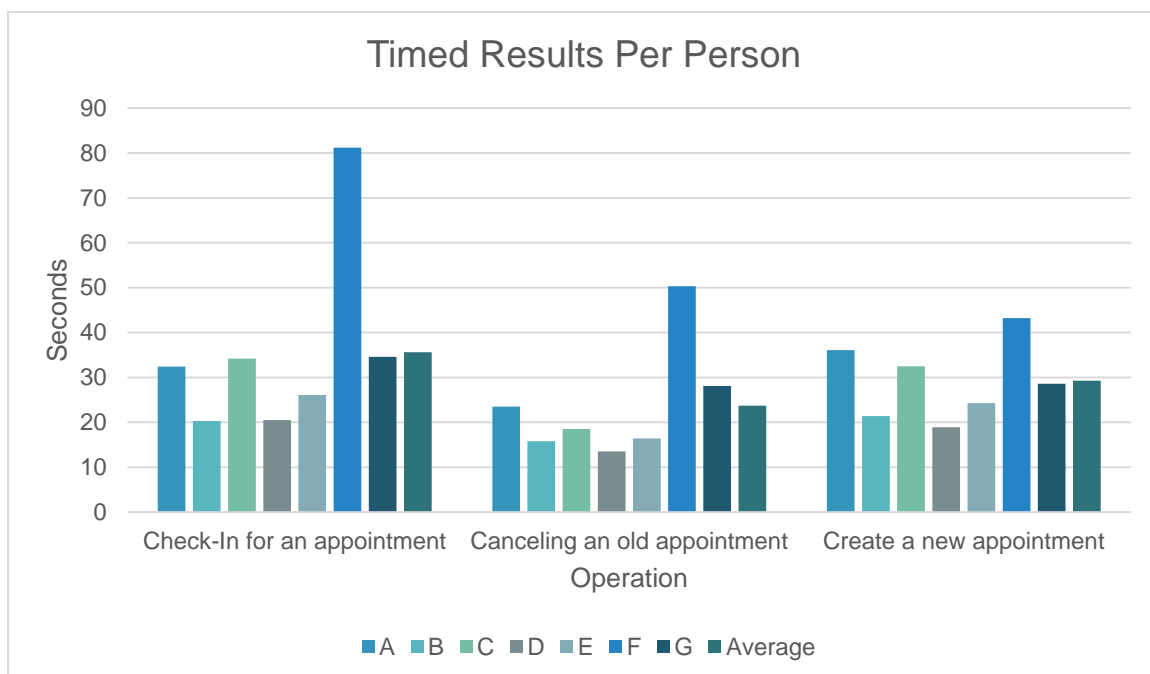




TESTING

Initial Testing

Due to the nature of the program the initial testing was decided to be conducted in the form of an observation and an interview with the user. It was also decided that a cross section of users should be asked to use the software. The following users were chosen: A - 45 year-old woman (1-2 visits each month), B - 18 year-old student (0-1 visits each month), C - 40 year-old man (4+ visits each month), D - 25 year-old young man with mental disabilities (0-1 visits each month), E - 23 year-old young man who immigrated to the UK (0-1 visits each month), F - 84 year-old woman (4+ visits each month) and G - a 50 year-old man (0-1 visits each month). Each user was asked to complete the following tasks, check-in for an appointment, cancel an old appointment, create a new appointment. These tests were timed and the user was interviewed about the experience after.



This data shows that the time taken to complete each task varied widely with age group. It should also be noted that F struggled to use the program and therefore needed help leading to outliers, however the data shows that she became more comfortable with each new operation. D was the fastest with each tasks, having used a similar system before and having a background in technology. E was found to be very efficient in using the machine, it was expected that it would take him longer but he picked it up very quickly. In general the data shows that younger members of the test were faster than older members, which was to be expected. A was slower than the other members of her group, however she considered herself to be a technophobe and did not like using machines and also asked for help.

During the interview they were asked about what operations they felt they found difficult and why? If they felt that the program was easy or difficult to use and why? If they had trouble understanding what to do? If they trusted the program was successful and if they had any other

comments to add to the research. Questions regarding the button sizes, text size, colour and icon use were not asked due to thoughts that this could bias the testers, however they were asked in the further testing survey.

Although F struggled the most she reported that she found the system easy to use, and thought it would be good for younger people, however she could not see herself using it on her visits to the doctor as she did not like to use computers. She mentioned how she understood what to do at each step but found using the computer quite difficult. When asked if a touch screen would make it easier she replied that it would. She found making a new appointment very frustrating as she would like more options and complained that she liked to speak to someone because they understood her requirements better. She also found inputting her name difficult, as she decided on this method and then went back to use the date of birth method. She complained that she found the keyboard very difficult to use and did not know where the letters were. When asked if she trusted the program she answered that she did not know and had no other comments to make.

B, D and E had very similar comments about the system as a whole. They found it easy to use, and D commented on how he found the font easier to read. B found the colour yellow to be 'ugly' and mentioned how he thought blue would be a better choice. B also mentioned how he did not like the colour of the buttons in contrast to the background. They all had no issues with any of the operations and had no problems understanding what to do. E reported back that he felt more buttons on the keyboard were needed to support accents – explaining that although his name did not contain any, people he knew in his community did have accents and would be confused and simply go to the counter. To elaborate on the answer he was asked if clearer instructions may be required, stating clearly that accents would be ignored, he felt this was a good solution. They did not have any of comments on the program. They all reported that they trusted the program and would be happy using it at any surgery.

A, C and G were very happy with the function of the system. G especially did not like waiting in line and loved the idea of using the machine instead. A and C weren't as enthusiastic but found no issues with the software. G reported that he did not find any operation difficult to do but mentioned how the text could have been larger and he could have been faster. A found using the machine for the first task quite challenging and did require help, however did not feel like she struggled. C reported that he didn't find any one task challenging but mentioned how he felt the check in could be laid out better, when asked for more detail he could not explain but explained that he found the UI on Facebook easy to use and to copy it. None of them found the program difficult to use, with A reporting that she liked the use of a Dyslexic font and coloured background. None reported struggling with working out what to do and found the instructions very clear and friendly. C and G reported that they trusted the program, however A said she would go to the counter because she did not like computers.

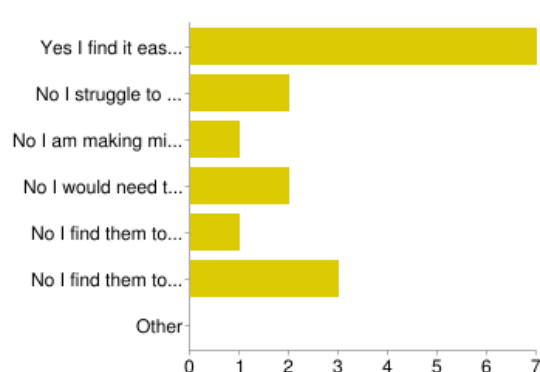
In conclusion this testing showed that more work must be completed to make the program more accessible to the elderly, she did not offer many comments on how to improve but further research must be conducted in order to meet her requirements better. Testing on young people showed that it was easy to use, but the design may need to be updated to better fit each surgery and look more appealing. Although not many people suggested that the instructions should be

clearer, it may be important to ensure that they are easy to understand when the user is not natively English. Finally a second look on the button and text size may be required to further see if this is an issue.

Further Testing

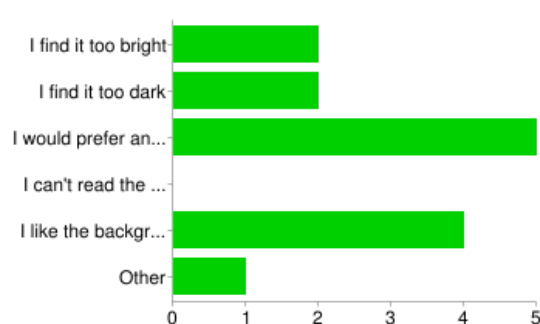
Once the initial interviews were complete it was decided that further testing on specific issues they mentioned would be required to get a broader understanding of the issues they felt and if a greater sample size would struggle with similar issues. This was done by allowing people to download the software and fill out a short form after using it about each operations, similarly to the first test. Many questions were multiple choice and allowed for no answer, the total responses were 12. They were allowed to comment on a range of issues the initial testing picked up as well as some other issues that we researched, such as font, colour choice and icon choice. This data showed the following.

Do you find the text easy to read?



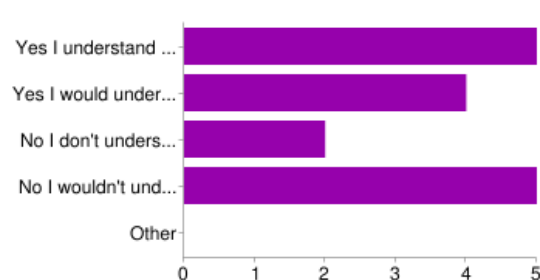
Yes I find it easy to read	7	58.3%
No I struggle to tell the difference	2	16.7%
No I am making mistakes	1	8.3%
No I would need to use sound	2	16.7%
No I find them too small	1	8.3%
No I find them too big	3	25%
Other	0	0%

Do you like the background colour?



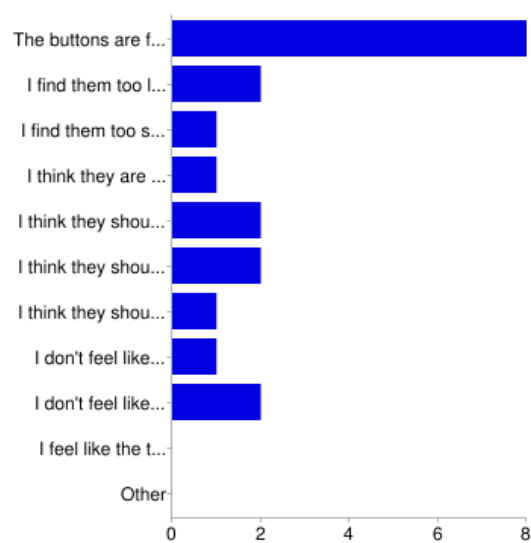
I find it too bright	2	16.7%
I find it too dark	2	16.7%
I would prefer another colour	5	41.7%
I can't read the text	0	0%
I like the background colour	4	33.3%
Other	1	8.3%

Do you like the icons?



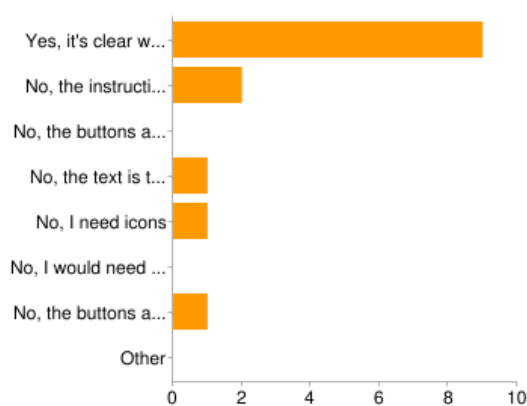
Yes I understand the icons	5	41.7%
Yes I would understand without the text	4	33.3%
No I don't understand the icons	2	16.7%
No I wouldn't understand without the text	5	41.7%
Other	0	0%

How do you feel about the buttons



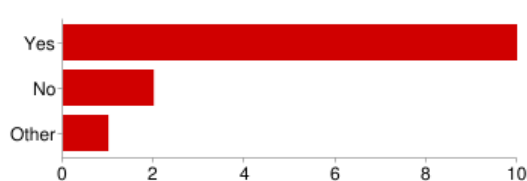
The buttons are fine, I like them	8	66.7%
I find them too large to use	2	16.7%
I find them too small to use	1	8.3%
I think they are too close together	1	8.3%
I think they should be closer together	2	16.7%
I think they should be a different colour	2	16.7%
I think they should be a different style	1	8.3%
I don't feel like the text is positioned correctly	1	8.3%
I don't feel like the text is big enough	2	16.7%
I feel like the text is too big	0	0%
Other	0	0%

Do you understand the check in process?



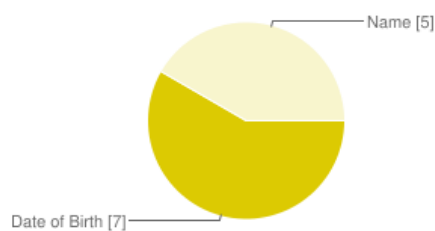
Yes, it's clear what to do	9	75%
No, the instructions are unclear	2	16.7%
No, the buttons are too small	0	0%
No, the text is too small	1	8.3%
No, I need icons	1	8.3%
No, I would need help	0	0%
No, the buttons are too close together	1	8.3%
Other	0	0%

Do you trust that the program was successful and you have been logged in?



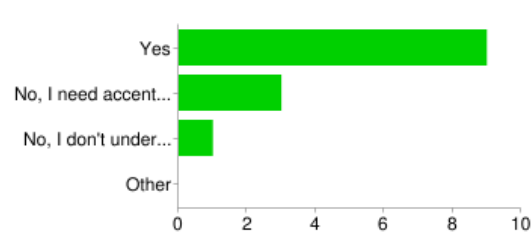
Yes	10	83.3%
No	2	16.7%
Other	1	8.3%

Would you prefer to use the Date of Birth or Name method?



Date of Birth	7	58.3%
Name	5	41.7%

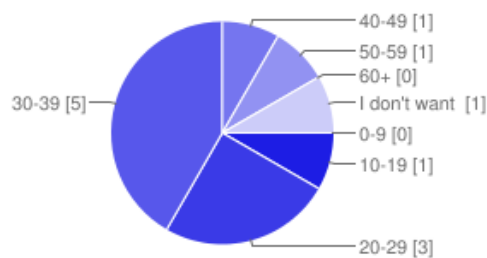
Do you understand how to type your full name?



Yes	9	75%
No, I need accents or another special character	3	25%
No, I don't understand	1	8.3%
Other	0	0%

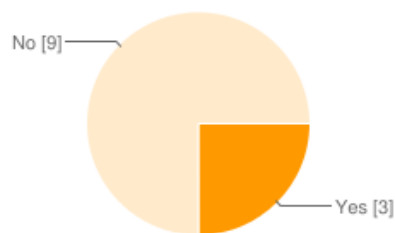
With the demographics of those surveyed as followed:

What is your age group?



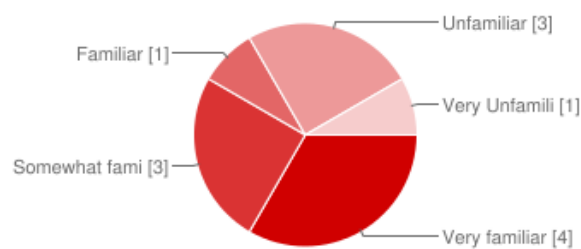
0-9	0	0%
10-19	1	8.3%
20-29	3	25%
30-39	5	41.7%
40-49	1	8.3%
50-59	1	8.3%
60+	0	0%
I don't want to disclose this	1	8.3%

Have you used an automated doctors check in before?



Yes	3	25%
No	9	75%

How familiar with touch screens are you?



Very familiar	4	33.3%
Somewhat familiar	3	25%
Familiar	1	8.3%
Unfamiliar	3	25%
Very Unfamiliar	1	8.3%

On average many of the issues that participants in the first test experienced were also experienced by this group. However some interesting data was collected regarding the choices of colours and icons. A majority found the colour displeasing, with 4 votes describing it as too bright or too dark and 5 votes asking for another colour, however 4 votes also said they liked the colour. The use of icons was similarly split with 7 votes positive and 7 votes negatively. The overwhelming majority found the button size to be appropriate with a few users citing a few issues, including their size, colour and style. Many people found the check-in process easy to

sue and described it as having clear instructions. Despite earlier worries a majority also suggested that they had trusted that they had been successfully logged in. However many of the sampled people said specific that they had a familiarity with touch screen interfaces. The survey further suggested the need for accents or special characters – which could be attributed to poor instructions on this screen.

Suggested Improvements

Before release onto the Windows Store the testing has showed the following improvements must be made to improve the interface.

Trial more appropriate colours. It was suggested that many people did not like the choice of yellow for the interface. More research should be done into colour choice and this should be changed to be more suitable for all people. However the contrast is very good with the majority of people not making many mistakes and being happy that they can read the text without making many mistakes.

Improved instructions on the screen asking for a patient's name. This is one of the largest issues which testing has revealed with many people finding the process confusing, especially if they have special characters in their name. I would also be helpful to have hints explaining the process for those with special character in their names.

Retest the icons. Although the majority of the initial tester were happy with the use of icons, the further testing suggested that people were split on the usefulness of these icons. A stricter test could be used and icons could brought before a group of testers before implementation.

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