1. Introduction

Smart home objects are technology-enabled objects often designed with the aims to create utilities, to reduce energy consumption, and to improve personal healthcare. In personal healthcare aspect, people can use smart health devices to healthcare. The device is supposed to enable people to take an electrocardiogram (ECG) using sensors on either another device or via a wearable that can be connected to a smartphone. People could be able to record an ECG and also have access to ECG's they have recorded in the past.

The focus of my work is to identify and prototype suitable interactions on how people can use such a device.

2. Cognitive Psychology and the User

2.1. Audience target

According to statistics from Statistic, the proportion of smartphone users aged from 25 to 64 in the UK increased sharply from 2012 to 2017 (see figure 1).

The audiences target will be those aged from 25 to 70. For people under the age of 25, their main goal is to get a job and have a stable income. People between the ages of 25 and 70 are people who are stable about work, financially amenable, and in their need of healthcare. For people over the age of 70, the number of people is small (see figure 2). On the other hand, at this age, they will encounter elderly's diseases such as dementia and osteoarthritis that make using smartphones difficult.

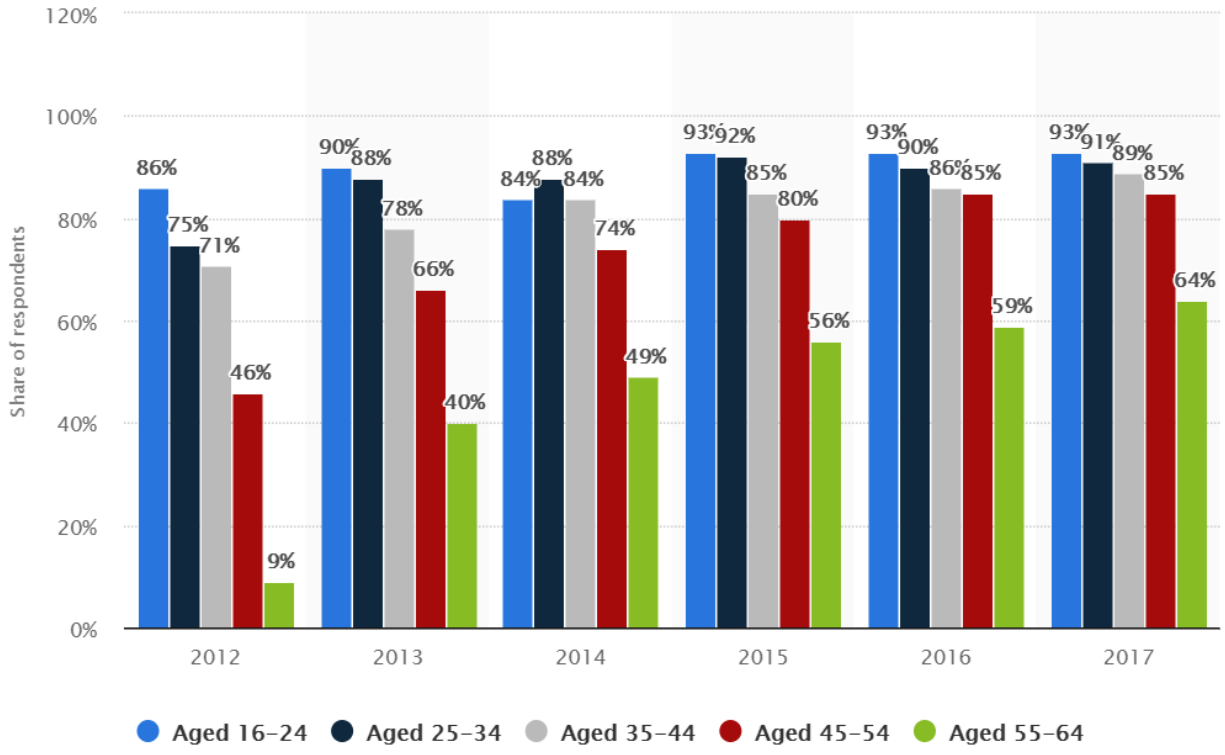

Figure 1 - Statistic of smartphone users by group aged in the UK [1]

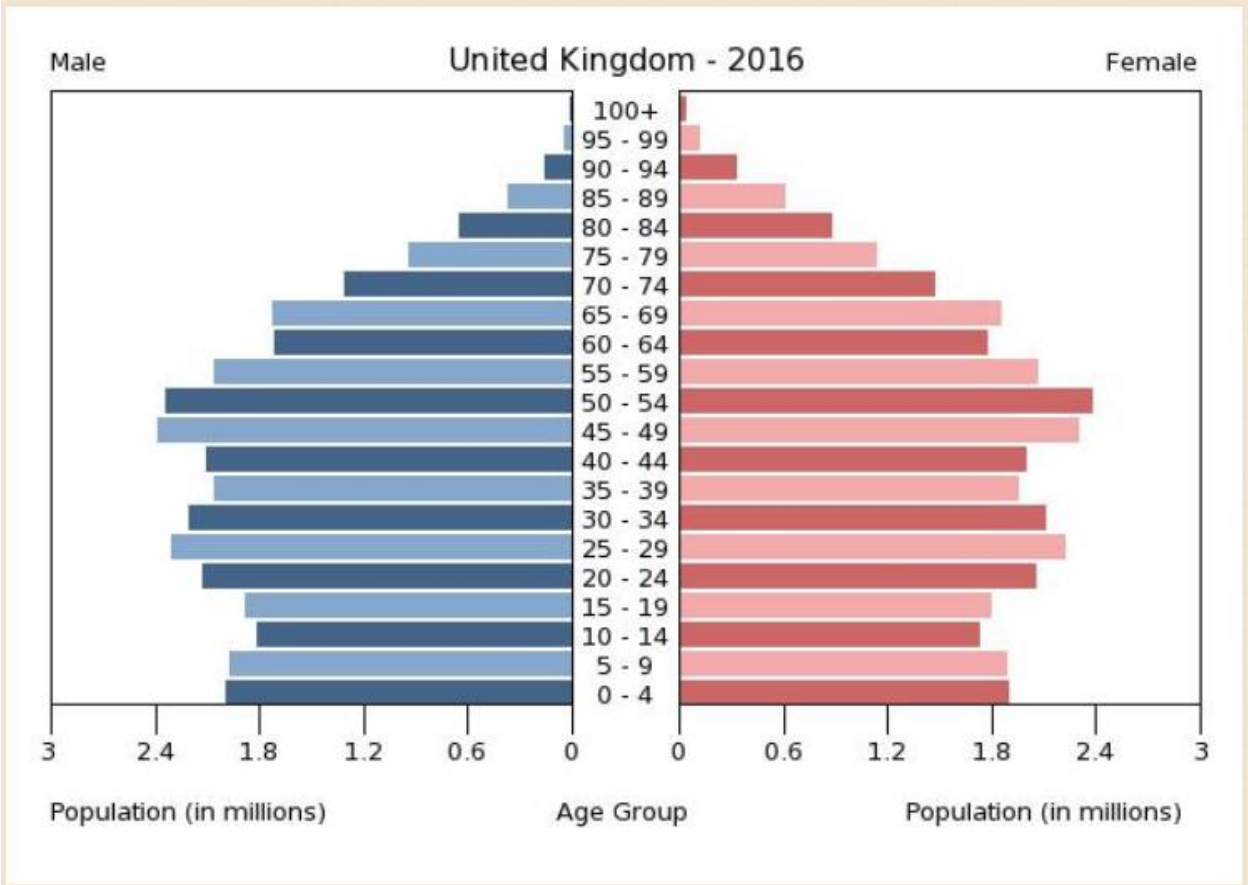

Figure 2 - Age structure chart in the UK[2]

2.2 Cognitive psychology affects users

Cognitive psychology can be understood in a simple way that studies involve human awareness such as attention, language usage, memory, problem solving and creativity.[3] The process of human awareness and information processing is affected by many factors. Have two types of perception are experiences and reflective.[4] When you are a phone user using the qwerty key (Blackberry old version) and the first time you switch to using a smartphone, you will encounter some difficulties and advantages. You will adapt quickly to the qwerty virtual keyboard because you used that type of key. This is experience. When you receive a call, you will have trouble not knowing how to accept or reject the call. Usually, you will touch a button on the smartphone to accept or reject a call (like the habit of pressing a button). If you touch but can't accept/reject, you'll react by finding a physical button or swiping on the screen. This is reflective.

To form a cognitive, it includes many processes, but I only focus on a few below processes:

Attention

When users interact with the interfaces, we can indirectly control their actions by drawing attention. For example, the interface layout is neatly designed and has a button with special effects and the words "Touch me" will make the user pay more attention to it than the rest.

Perception

Perception is the process of receiving and processing information from the senses. In order for users not to misinterpret information from interacting with the interface, it is necessary to create a familiar design with users and the interactions with interfaces are not too complicated. For example, when the "+" symbol representing "add" is replaced by " ↓" (see figure 3) the user can understand it as a download icon.

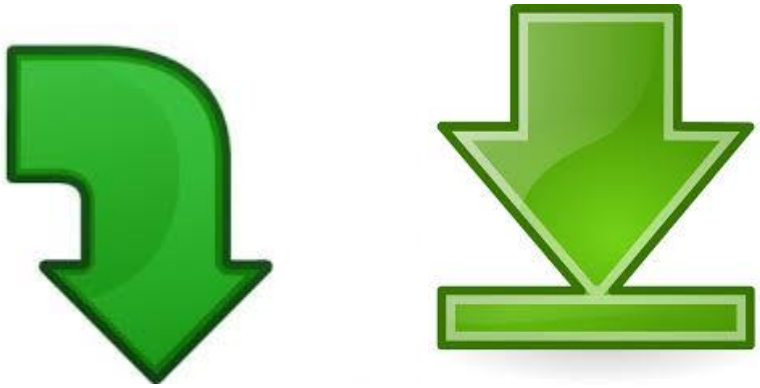

Figure 3 - Add icon (bad design) and Download icon

Memory

Fast or slow interaction with the interface depends in part on the memory. When users interact with the interface several times, they will remember the operations. In the next interacts, they may not need to see the screen but their operation can be fast and accurate. Old people's memory may not be as good as that of young people's memory, so the interactive interface needs to be designed simply.

Language usage

Human handles language usage through reading and listening. Audience target may include people with eye diseases and people with ear diseases. The interact interfaces must have easy-to-read fonts, reasonable contrast, and sound functions should be accompanied by vibration function.

Conclusion

The interactive interface will be designed based on the following factors:

- Simple design
- The icons will follow the standard

- The number of interactions with the interface will be little
- Easy-to-read fonts, reasonable contrast, and sound functions should be accompanied by vibration function

3. Framework Definition

Conceptual Design

When a user uses a medical device, it will create a record. The smartphone will retrieve data from these devices or connected wearable devices. Data will be displayed through the interaction interface.

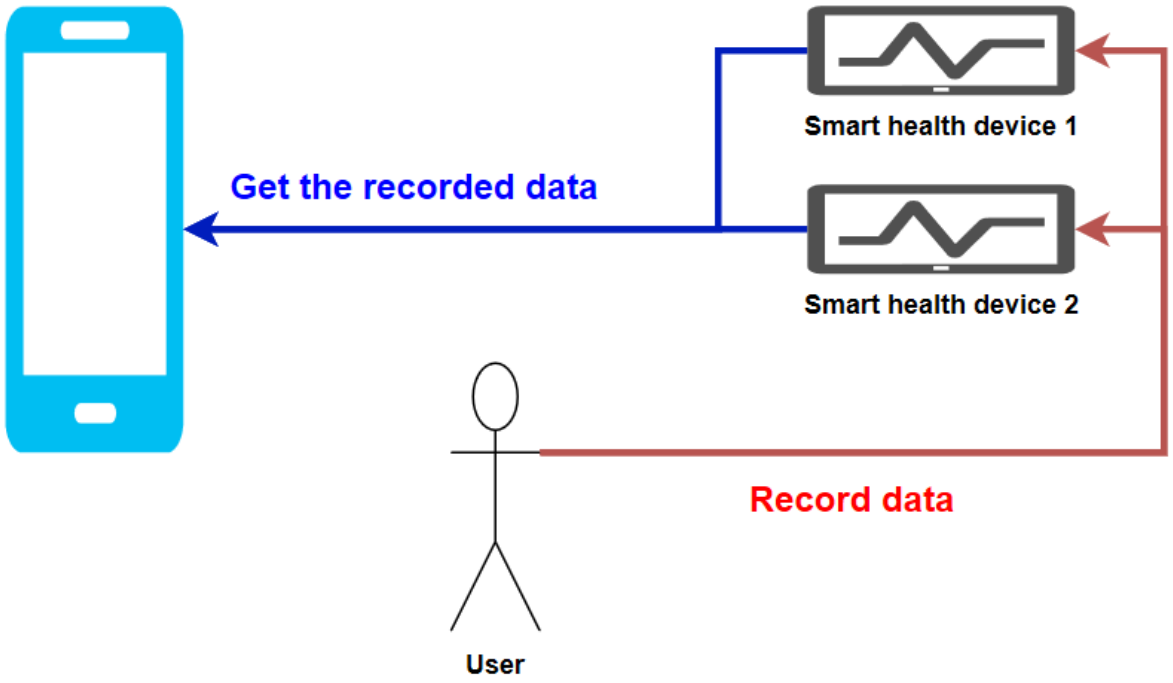

Figure 4 - Concept diagram

Low-fidelity prototyping

- **Sample A**

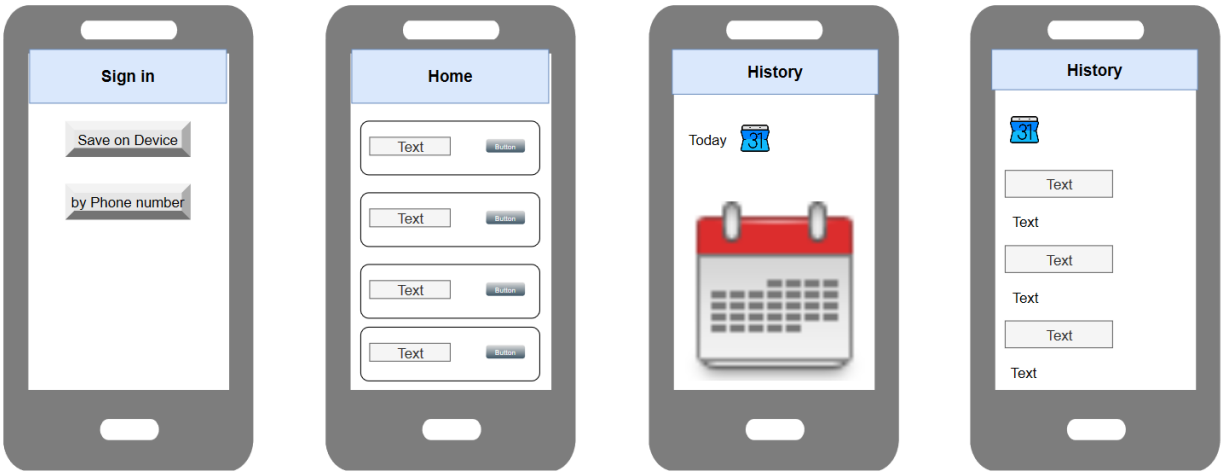

Figure 5- Sample A

- **Sample B**

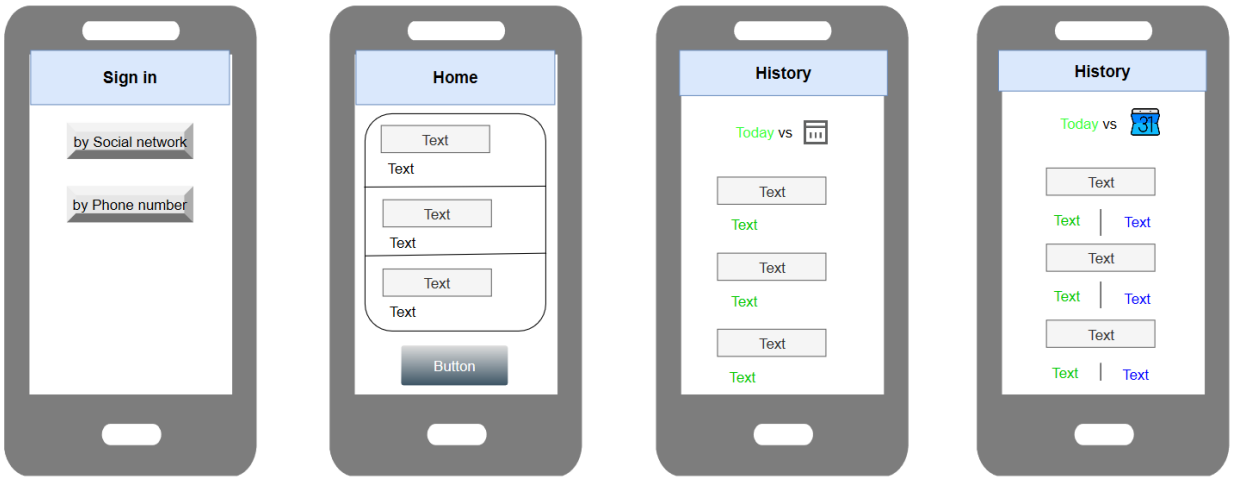

Figure 6 - Sample B

Evaluation

Interfaces	Sample A	Sample B
Sign in	- Advantages: "Save on device" helps users create a new profile quickly. - Disadvantages: When the user's device is damaged or the user wants to replace it, the user profile is lost.	- Advantages: User profiles cannot be lost. - Disadvantages: Some people cannot use social networks.
Home	- Advantages: The components are clearly distributed with specific parameters.	- Advantages: Only one button will record all the parameters of the user

	- Disadvantages: There are many buttons that easily make the user touch the wrong button.	
History	Easy to choose days to view	Users can view comparisons of today and a day in the past

I choose Sample B for my design because it has fewer disadvantages than Sample A.

4. Detailed design

4.1 Design principles

5. References

https://www.statista.com/statistics/300402/smartphone-usage-in-the-uk-by-age/ [1]

https://www.cia.gov/library/publications/the-world-factbook/geos/uk.html 2

3 *"American Psychological Association (2013). Glossary of psychological terms"*.

4 - Sharp, H., Rogers, Y. & Preece, J., 2007. Interaction design: beyond human-computer interaction. 2nd ed. Chichester (West Sussex): John Wiley & Sons