Chapter 2

Conception and Design

Due to the nature of this project, I could not start coding immediately. Instead, attention had to be paid at the conception and design of the app itself, including gathering and analysing user requirements, creating mockups and prototypes, and planning how it would work on a technical level.

2.1 Conception

2.1.1 Finding an Idea

This project's only initial indication was to make a simple assistive piece of software, so coming up with a worthwhile, useful, and original idea was the first step of the process. While other third year projects available are much narrower in scope, this proposal offers much more freedom to the student in defining the project's ambitions and goals. However, this freedom also meant that I needed a clear idea of what I wanted to focus on, as a not well-defined enough concept would harm long-term development. As such, I started this project with multiple brainstorming sessions to determine what shape it should take.

The first ideas I came up with were all centred around improving the accessibility of digital products and devices. However, coming up with an original way to do so was proving to be a challenge. Many digital products still do not assess accessibility properly in their design or development phase. Indeed, Yan and Ramachandran (2019) found that

only 1.7% out of 479 popular Android applications presented no accessibility issues. Accessibility issues persist in a variety of other digital products too, like online libraries (Spina, 2019), video games (Yuan et al., 2011), and MOOCs (Iniesto et al., 2016). Therefore, my first concepts attempted to tackle some of these issues. Some examples included making a browser extension that would allow users to change a website's layout to make it more accessible or advanced screen tinters to reduce eye strain. Despite having multiple ideas, there were already existing products that accomplished the same functions. Although I could have developed a complete and useful product based on these ideas, I wanted my project to be unique and not a simple imitation of other programs. Therefore, I shifted my focus away from improving the ease of use of software.

Instead of trying to improve the accessibility of technology, I changed my approach to target ways physical products and real-life situations could be made more accessible through technology. This change was inspired by my HCI course and general knowledge. Technology can help make the real world more accessible for people with disabilities and impairments. For instance, Google's Lookout app helps people with blindness explore the world around them by recognising objects using computer vision (Clary, 2019). I took inspiration from this example to try and find accessibility and access issues in real life that technology could provide a novel solution for. This approach of tackling real world problems without already existing, complete, and adequate solutions permitted me to create a project that was fully unique and original.

I finally settled on building an app that improves the accessibility of nutritional labels for people with dyslexia and visual impairments by scanning them and presenting them in a more accessible manner. Nutritional labels include important information about the food we eat every day, like calorie count, sugar quantity or proteins. Knowing these values can be crucial for a wide variety of people, including those on a diet, athletes, or people with diabetes. However, many nutritional labels

have not been designed with accessibility in mind, as people with impairments like low vision and astigmatism may struggle reading the usually small and cramped text. If text legibility was not an issue, people with dyslexia could still have difficulties understanding purely textual information. As computer vision and text recognition has become feasible even on low-power devices, I decided to attempt to solve this issue through an app that scanned the label itself and presented the information present in an accessible style.

2.1.2 Improving previous solutions

There are many existing applications that can display a product's nutritional information, but their underlying design do not make them apt for making products accessible. For instance, many of these apps rely on scanning the barcodes to identify a product, and then access a database where the nutritional information has been stored beforehand. One of the most popular Android apps for calorie counting, MyFitnessPal (2021), uses this method to provide nutritional information to its users. However, for products that have not been logged by any user, a common issue in countries where the app is not as popular as in the United States or the UK, the app won't be able to display any nutritional information. Instead, it will ask the user to input the information themselves. Furthermore, as this information is mainly user-obtained, input errors may make the application less reliable. As such, this barcode- and database-oriented method does not work if we want to make all nutritional labels accessible.

Furthermore, accessing a database requires internet access, which creates another barrier to access. While 97% of the population in developed countries are covered by a fast-speed 4G mobile network, only 40.5% of the population in the least developed countries enjoy the same level of coverage, with only 19% using the Internet due to unaffordability (International Telecommunication Union, 2020, pp. 4,

13). Furthermore, internet in developing regions is constrained by 'slow speed, low computational power, [and] reduced bandwidth', creating 'digital exclusion' (Harper, 2020). Therefore, requiring online access would create a barrier to usability for a large part of the world's population, which is to be avoided when developing an app that is focused on improving accessibility of food products.

To avoid these issues and improve the accessibility and effectiveness of current nutrition apps, I decided to have the app perform the nutritional label scan on-device. This ensured that the nutritional information was as accurate as possible, instead of relying on user-provided information. Doing this scanning offline also guaranteed that users in areas with no internet access could use the app and access the same information as all other users. With this design decision, a better and more efficient user experience could be built when compared to previous solutions.

2.2 User Experience Design

When building an app meant to improve accessibility, good user experience design is key. Indeed, following key principles of user experience will result in an app that is user-focused, effective, and accessible. However, great user experience can't be retroactively fitted once the core development has finished, but it must be a consideration in the design process from the very start, and throughout the entire development. As such, special attention was given to the user experience design.

2.2.1 Gathering User Requirements

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