AP1107 User Experience Design

Project Report

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Introduction

The user design team was tasked with designing a technology led intervention that would raise awareness of energy consumption and sustainability and promote a positive change of behaviour. The goal is that once awareness is raised through the intervention, that energy consumption will decrease. The target audience were students who live at home or in shared student accommodation. The goal is to make the intervention engaging and easy to understand.

Understanding the problem space

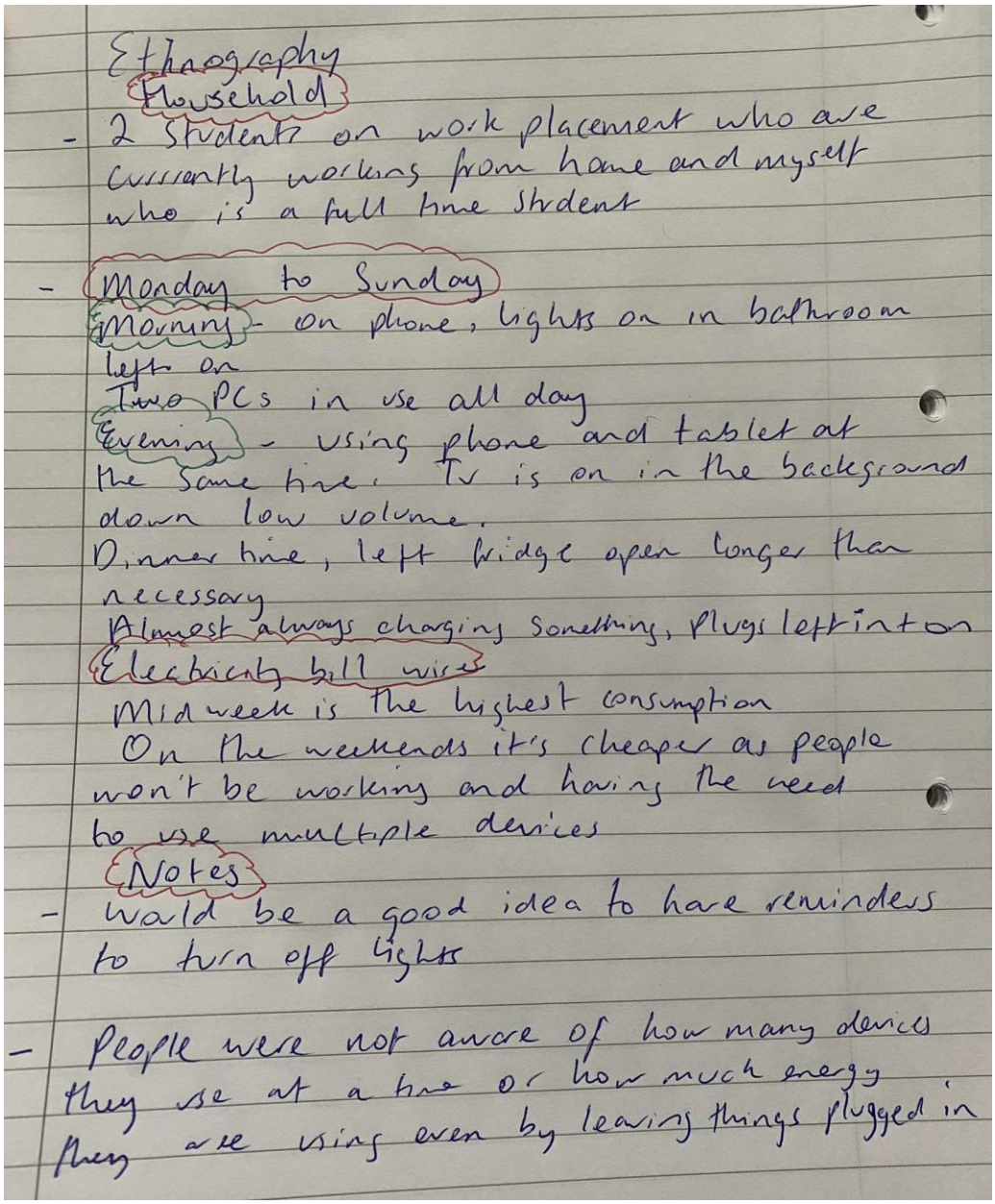
To understand the problem space, the initial cause must be addressed. According to Hanks et al., (2008) sustainability relies on the survival of our shared future which includes issues such as social and economic constructs and ecological/biological systems. Sustainable interaction design is more popular in recent years as researchers and designers are looking at how interactive designs and technology can be used to encourage sustainable behaviours and how sustainability can be used as a tool in the design of these interactive technologies themselves. DiSalvo et al., (2010) suggested that human centred interaction contributes to a user's behaviour and how a product is designed, or its purpose may have impact on sustainability. For example, a person may change their behaviour when they realise how much energy they waste, by using a technology led intervention application to help combat energy waste.

To do this, an understanding of how a user thinks or feels about the environment is an important first step. Various methodologies can be used to do this such as interviews, surveys, and ethnographies. In this design case, an ethnography was carried out to keep track of how people in the home interacted with technology and how much energy consumption they may use daily. This occurred for a week and can be seen in Figure 1. below. As there are two other students this household the findings suggested that there is a heavy dependence on technological devices and more than one may be used at the same time, resulting in faster drainage of battery thus having to be charged more often. The students were also not aware of how much energy consumption they use, as they have often left lights on in rooms when not in use or left the fridge doors open for a longer time than necessary. They also weren't aware of how many ways they could save energy so teaching and learning energy saving techniques can be incorporated into their daily lives. There were also suggestions from the

students that they didn't care to save energy. With this in mind, the team decided that there needed to be an incentive, competitive and reward aspect to the technological intervention.

Figure 1.

Ethnography



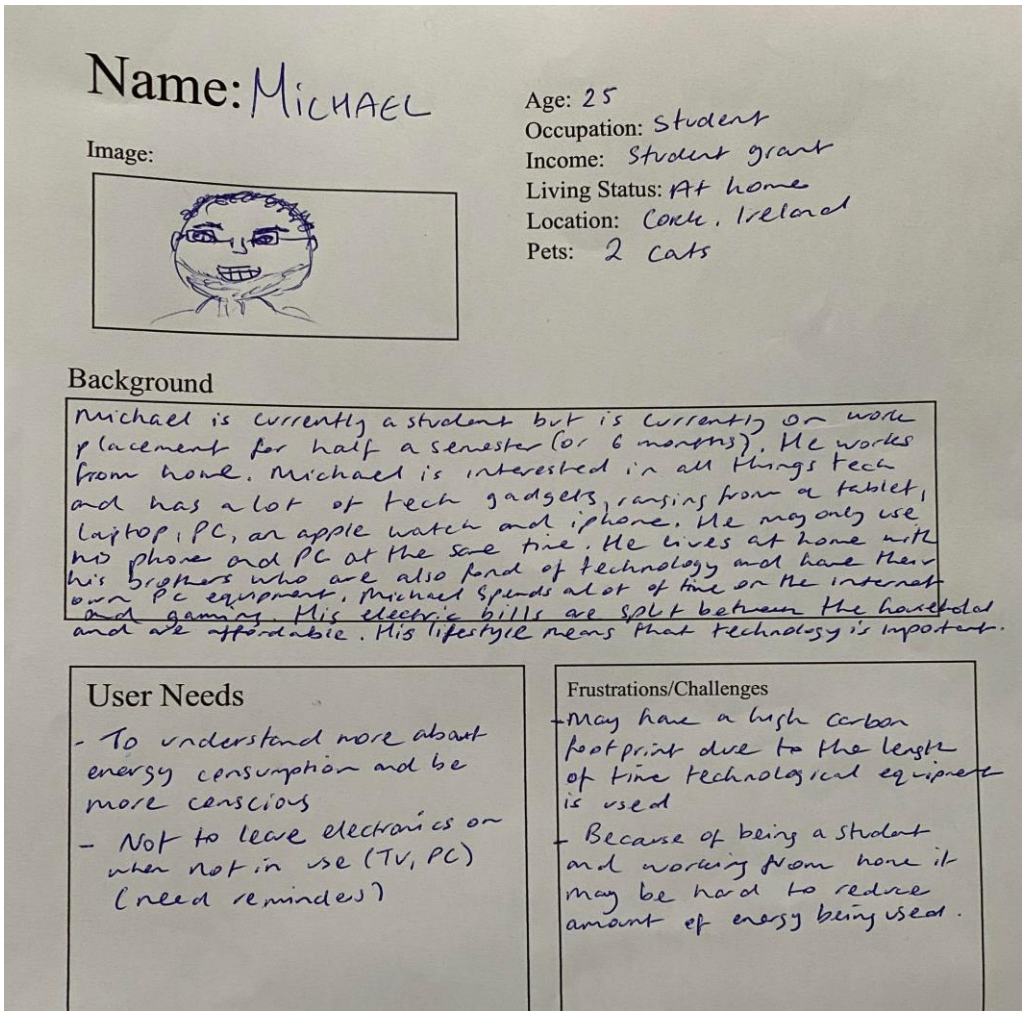
Conceptual design

Conceptual design tools are an important part of the research process as it has many benefits. They provide clarity on intended use and help towards creating a clear interface. Tools such as Personas and Scenarios were used in this design case. As reported by Chang et al., (2008) Personas help to define the users' goals and behaviour patterns. Personas are not just built upon the characteristics of one person, in fact they are built upon multiple characteristics of different people and are put into one user to provide wider coverage of user needs.

As stated by Yuille et al., (2008) Scenarios are used to enable the design process and can be drawn from data collected from surveys, interviews, or ethnographies. It is a tool used in the design process to help raise awareness of users needs and where or what situation is best to use the product. These methods helped to create a user for this design case as we took the data from the ethnographies to help create the scenario and persona as seen in Figure 2. From creating the personas and scenarios with the help of observational work, the research team found that the target audience were students who depend heavily on using a lot of energy, by using multiple technical devices at a time. A positive hope is that energy consumption awareness and positive behaviours will spread throughout the shared accommodation after using the created application, Energy Hero.

Figure 2.

Persona and Scenario



User requirements

As stated by Sharp et al., (2019) a requirement is a statement about the created product that relays what it is expected to do or how it will perform to the user. There are different kinds of requirements, non-functional and functional. Functional describe what the product will do and non-functional show the characteristics of the product. When creating user requirements again it is important to keep all previous data such as the conceptual tools and observations in mind. With the application Energy Hero, the requirements were tailored for everyone to be able to use and made with the needs of the users in mind. The functional requirements that were specified are as follows, there is a login page that requires a username and a password, there is a leader board, the users will be able to spin the wheel to win a prize, the household will be able to connect to a database or homepage to see weekly consumption and it will have software that will calculate how much energy is consumed and where it is consumed.

The non-functional requirements are that there is a reward and competitive system to motivate people to use the application and build a positive mindset around saving energy. A settings tab to set up reminders can be activated to turn off lights that are not being used and finally the application is Android/iOS compatible so that it can be easily accessed on a phone.

Prototyping

During this prototyping process it has been established of who the user is and what their needs are, allowing us to create functional and non-functional requirements. The next step is to create the prototype, which is an important part of the design process as it allows the designers to redefine, discover and build upon ideas. (Lim et al., 2008) For this design case Figma software was used to create the application. The team wanted to create an app which was easy to understand and easy to use. A rough layout was drawn on paper to give an idea of how it would look, seen in Figure 3. The first thing that was important was a Sign Up and Log in page, without this, people wouldn't be able to use the app, so it was important. Secondly the team wanted to let people know how much energy they are saving to act as a feedback tool resulting in a motivating system. There is also daily energy saving tips to help those save energy. At the bottom of the app the team put in a navigation bar so the user would be able to go to different layout options instead of going through each section to get to where they want to be. Here there would be headings of pages to navigate through such as analytics, which covered how much energy was saved and which room used the most energy. The next heading is the leader board, the smart meter, settings, and prizes.

Within the prizes tab the team thought it would be a great idea to have a spin the wheel animation, seen in Figure 4. so that it is interactive and engaging, almost like a game. Once they are in the top 5, they can do this animation to win a prize. There is a section where they can check all the prizes they have won. The aim was to use incentives or a reward system and competitiveness through a leader board as seen in Figure 5. to act as a motivator to change to positive behaviour. The positive behaviour thus being the use of the application and saving energy or being aware of energy consumption and waste. It has been proven that awarding individuals on their performance can be motivating and possibly cause habitual behaviours. (Bruni et al., 2020). A student who may have a high competitiveness personality

trait may also be more motivated by the app leader board resulting in higher performance and better results. (Baumann et al., 2021) The team decided a smart meter needed to be added into the household so that it can calculate and measure the amount of energy used, seen in Figure 6. This will be synced between the application and the meter to get accurate results. Each meter is different for each household and will have a unique ID and connected through Bluetooth. A small solar panel will be attached to it so that it can be solar powered. In the settings tab there were options to change name, password and to add reminders such as: Before college at 9AM turn off lights. The team changed the navigation bar a few times and what would be added as the main headings so that it would be easier to use. At first it was a swipe motion to only get to each section. A home tab was added so that it would be easier to go back to the beginning.

Figure 3.

Rough layout of prototype

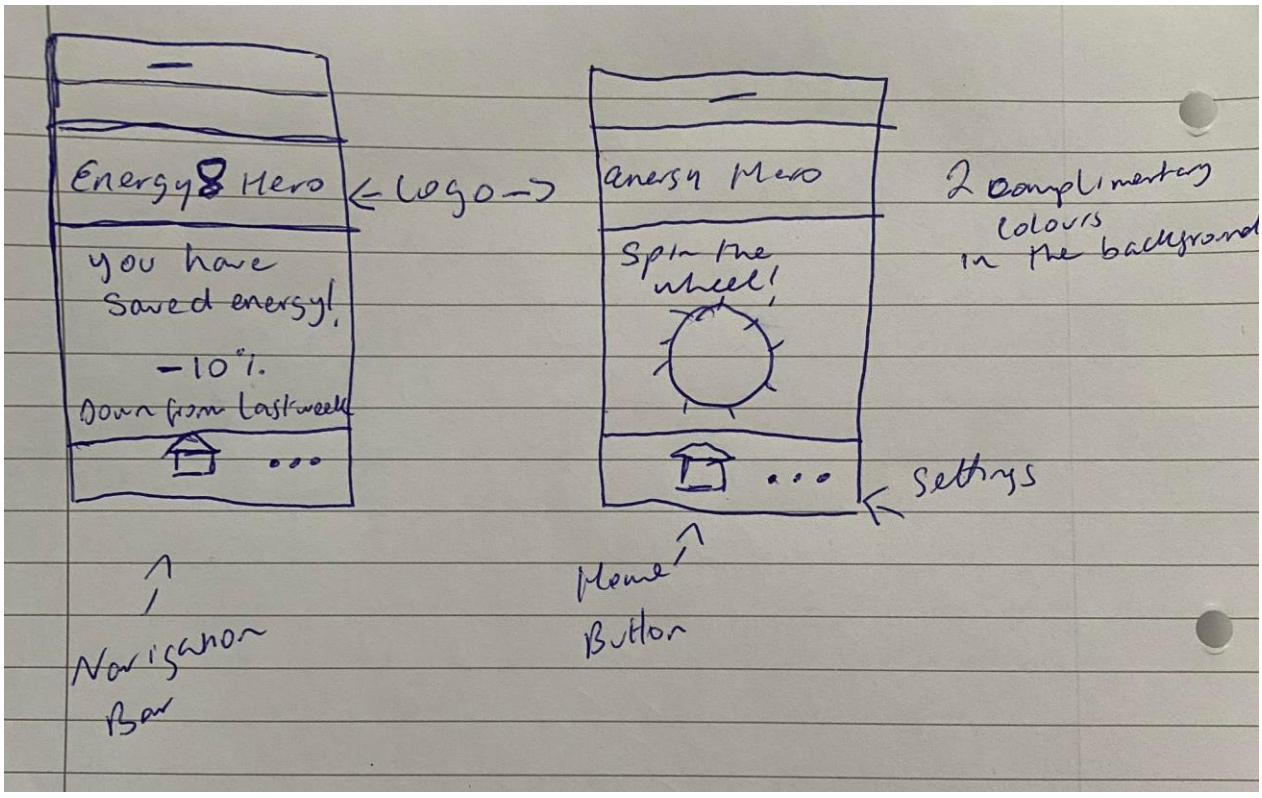


Figure 4.

Spin the wheel

Figure 5.

Leader board

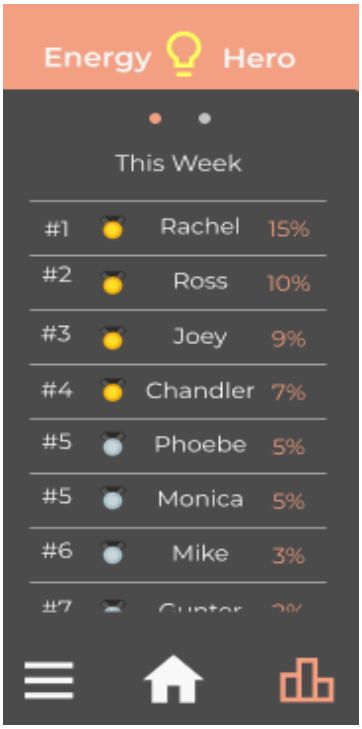
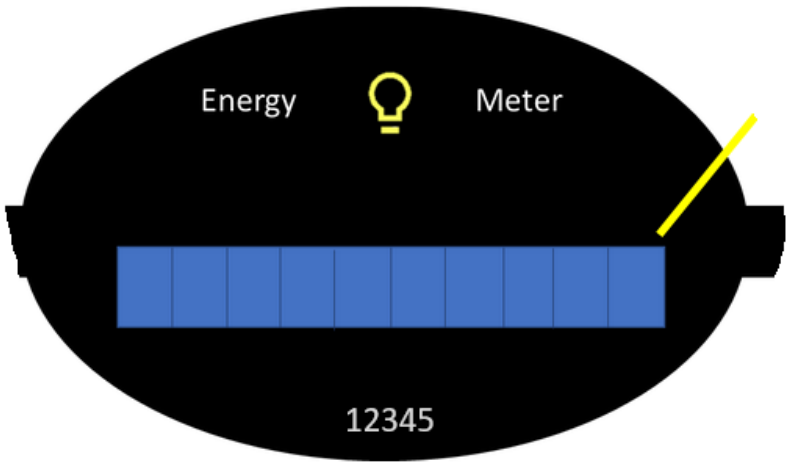


Figure 6.

Smart meter



Evaluation

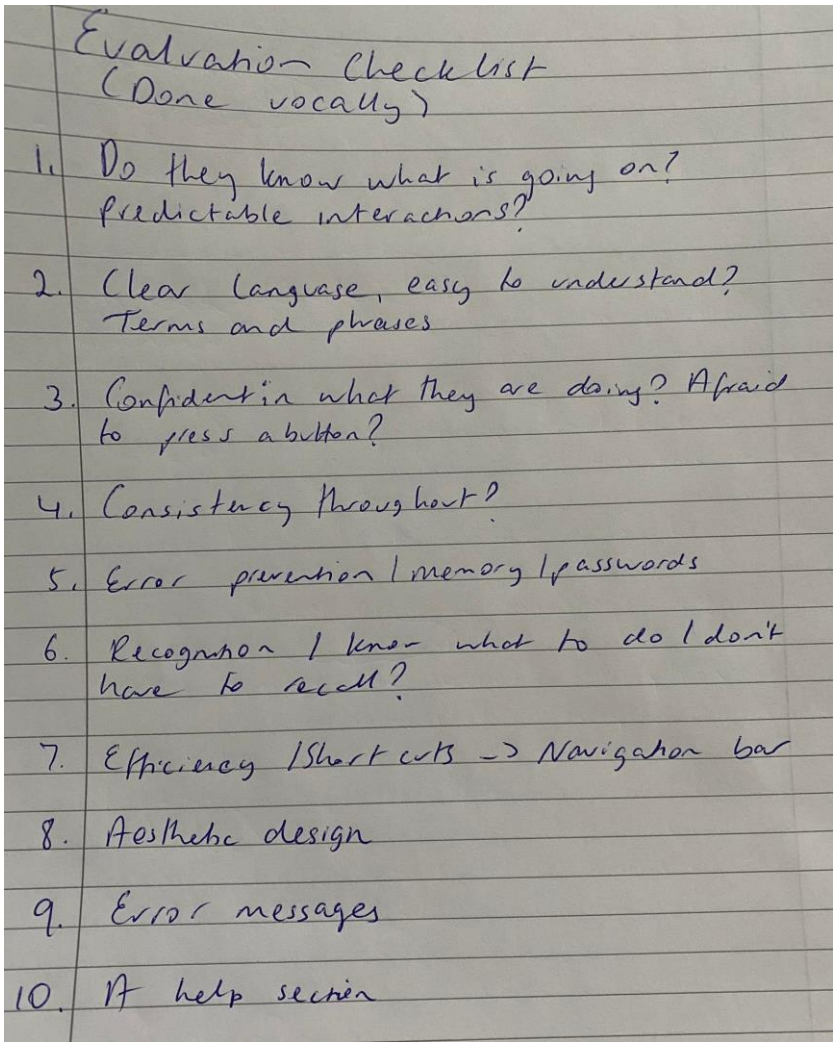
The aim of the evaluation process is to improve the design by retrieving user feedback from their experience of the prototype. It focuses on the usability of the system and how the user's experience is when interacting with the product. (Sharp et al., 2019) In this design case there are not actual users testing this prototype, but they are potential users nonetheless. A set of Heuristics, in particular Jakob Nielsen's 10 Heuristics (Nordin, 2012) and Schneiderman's Eight Golden Rules (Aottiwerch et al., 2017) were applied throughout this evaluation process, a checklist was used during evaluation as seen in Figure 7. Nielsen's and Schneiderman's guidelines such as visibility of system status, user control and freedom, consistency and standards, error prevention, consistency, shortcuts, informative feedback, error handling were important steps that needed to be tested or checked with the potential users that provided feedback on Energy Hero.

An analytical type of evaluation was mostly used as a cognitive walkthrough using a flow chart was created for the users to test the prototype with a set of heuristics to follow. There were three users to provide feedback. This provided a simulation of the app in how it would work, first page being the Sign up to the end of the app as the user was taken to the settings page. They were asked a series of questions as well as following the guidelines, such as colour scheme, the flow of the app, would they add or change anything, is it easy to use and so on. The feedback was mostly positive from the users as they had liked the colour scheme, font and thought it was clear and easy to use. The incentives and leader board were popular thoughts amongst the users and all of them said that it would be motivating to use the app. The analytical evaluation was the most ideal type as opposed to empirical as it is low cost, does not require much planning, the users do not need to have anything themselves, it is quick to do and is ideal for low fidelity prototypes. (Sharp et al., 2019) This feedback would

be useful information for the redesign process and as it is a low fidelity prototype it can be changed multiple times to get a good marketable product.

Figure 7.

Evaluation checklist



Reflection

The team played to their strengths and each person did their own task such as creating the presentation slides, coming up with the colour scheme for the app or creating the app on Figma. Different aspects of the design such as the meter was designed by an individual person as they felt more comfortable to design it as they had a lot of ideas about it. Another team member was well acquainted with Figma and didn't seem to have as much issues as using it. Figma was at times frustrating to use but once a team member would design a logo or a login page, the rest of the team would give constructive, positive feedback which would always be taken into consideration and changes were made, if necessary, by the whole team. A lot of the times each of us would individually take initiative to create the application, as this was done individually sometimes there would be a lack of communication. The observation stages and requirement stages went well as the team had a focused outlook and a set goal to create a good application.

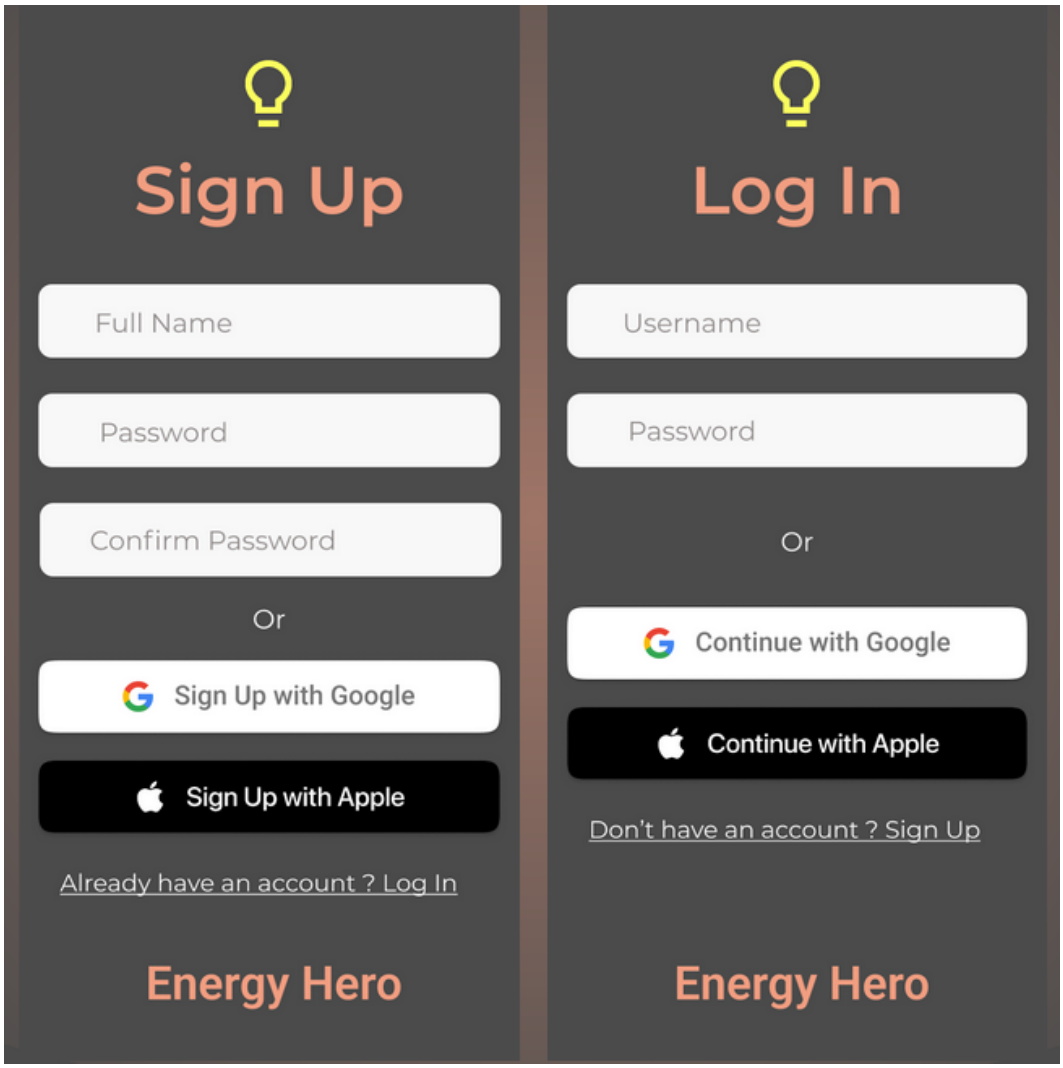
Redesign

The design process is iterative and has gone through many stages such as planning, requirements, analysis, design, and testing. During these stages there is opportunities for user feedback, analysing, refining, and testing. It can be done as many times as possible until it is right for the user. (Adams et al., 1999) To help the redesign process, methods of evaluation such as Nielsen's Ten Usability Heuristics, Schneiderman's Eight Golden Rules and the formative approach were followed. To improve upon Energy Hero and recalling from user feedback, The Signup and Login page need to be readjusted as the user found it slightly confusing and found that there were too many options on the page, this can be seen in Figure 8. One notable difference they found is that on the Signup page there is a 'Full Name', 'Password' and 'Confirm Password'. On the Login page there is 'Username' and 'Password'. The user was confused because they did not know if they were supposed to put in their full name or username here. It would be best in the Signup page if there was a 'Username' option. This will then avoid confusion when the user is signing in as they must sign in with their made-up username.

There was also no 'Continue' button on these pages once signed up, so the user was not sure what the next step was once they put in their details and did not want to use the 'Sign up with Google/Apple' option. There was also the suggestion of putting the 'Sign up with Google/Apple' option on a next page, so on the first page there would be input Full name, Username, Password and Confirm Password, and at the bottom of this there would be a Continue button or a 'Click here to sign up with Google/Apple' option. Again, this would follow Nielsen's Ten Usability Heuristics and Schneiderman's Eight Golden Rules, for example, error prevention, recognition rather than recall and offer informative feedback.

Figure 8.

Sign up and Login pages that needed to be adjusted



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