ENERGY SAVING EMILY

PROPOSAL REPORT

Negative Nancies

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Semester 1, 2020

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The Team Domain

Problem Space and Context

Energy efficiency in Australia has taken a significant hit in recent years. In 2018, Australia was recognised as the worst-performing major developed country in the world for energy efficiency (Australia Ranks Worst For Energy Efficiency In Developed World, 2018). Household energy consumption was regarded as the second-biggest consumer of energy, with only 15% of Australians believing their home is extremely efficient (Mitsubishi Electric Australia, 2019). As environmental issues continue to grow, there is a large opportunity for Australian families to minimise their energy consumption and implement better energy-saving practices.

As a team, we explored interactive ways in which we could create an innovative concept that would help in trying to reduce household energy consumption through the theme of implementing change through discomfort. Through initial user testing, we deduced ideas involving areas that users wish to save energy, as well as responses that users deemed uncomfortable and annoying. Based on these responses and collaboration of the team, this led to the concept of Energy Saving Emily.

Concept

Energy Saving Emily is a household device that encourages users to minimise energy consumption within their own home. To do so, Emily uses annoying tactics to alert the user when they are being inefficient with energy. Emily assesses the surrounding environment and then provides a set of physical responses to annoy the user. Through this tactic of discomfort, Emily hopes that the user will get annoyed with her response and take action to be energy efficient in order to turn her off.

Approach to Project

We have all decided to use the concept of Energy Saving Emily, but tweak various aspects depending on where our interests lie. Each team member will focus on a different household audience, will implement a form of their own choice using various outputs they would like to explore, and explore a variety of habits that users may have ie. one team member may explore saving water during showers, while another might try to work on reducing air conditioning usage. The team has no restrictions on whether there are any overlaps, and we are all very encouraging of using each other to share knowledge and ideas.

Response to Feedback

After our initial pitch, we received a lot of feedback that could be categorised into three main sections: the physical form; the behavioural responses; and potential issues we may encounter. Our team has decided to develop the main idea together but make decisions around Emily's form and her responses individually. This section will discuss the feedback and some key considerations our team needs to make, but with detail around how we are implementing this found in each team member's individual sections.

Form

Our initial concept was an orb that lit up and had an LCD screen to provide facial expressions, allowing an emotional connection to be formed with the user. Some feedback suggested adding more 'animal' or 'human-like' characteristics to either its responses or the physical form to further strengthen this connection.

Our initial concept also had little interactivity with the user, with its main interaction being alerting the user when they are being inefficient with their energy consumption. The feedback questioned how our physical form could be justified over a regular mobile phone app - what are some things Emily could do that an app isn't able to do as well? Some suggestions were having the orb chase you around, much like Sphero (Sphero, 2013), rubbing her belly or performing a hand gesture to ask Emily to turn off the alarm and the energy source (e.g. air conditioner).

Key considerations:

- We need to add features that will encourage an emotional connection with Emily.
- We need to include more interesting interactions with Emily by shutting her off.
- We need to enhance the physical interaction with Emily as a whole.

Responses

As our domain was "Change through discomfort" we really focused on encouraging a behaviour change through negative reinforcement and annoyance. However, a lot of feedback noted the importance of having a balance between positive and negative reinforcement so that the user has some sense of accomplishment to motivate their long term change.

Other suggestions also include having the interaction with Emily change based not only on the data but your long term habits and interaction with her. For example, if you respond to her complaints by yelling at her, then she will shut off all the power or make your next

shower freezing cold. Or if you have been making an effort at reducing your energy consumption by having the number of times she complains on a downward trend, she might be nicer to you, play nice music, or release a calming scent.

A majority of the feedback also discouraged the use of alarms and beeping noises to discourage their behaviour. Instead suggesting to really make use of passive-aggressive comments or further encouraging the emotional connection by giving her a personality so they want to keep her happy.

Key considerations:

- We need to find a balance between positive and negative reinforcement and think about giving the user a reward for long term behaviour change.
- We need to think of more interesting responses from Emily.
- We need to again consider the emotional connection through Emily's responses.

Potential Issues

A final area that was made apparent through the feedback was the consideration of how Emily will respond if several bad habits are being conducted at the same time. Our team has acknowledged that this will be an issue in the future, and a solution will need to be explored individually.

Related Work

"Emily" is a smart device/home installation in the home and it allows everyday people to become more aware of their impacts on energy usage. Our team would like to draw on a few different aspects to ensure our concept takes into consideration technology, social and human behaviours and interactions as well as corrective measures that can be implemented to change behaviour. Below there are three subcategories of the research areas and what was found.

People & Technology

Many Australian homes have moved to smarticiation. On average in 2015, the Australian household will have nine connected devices and this number keeps increasing with all the new gadgets coming to market every year (How to create your own smart home: the basics - CHOICE, 2020). Most of the devices or smartification that can be found in the home are apps, smart assistants and automation.

An article called "Benefits and risks of smart home technologies" looked at the use of smart home technologies (SHTs) and how the users are able to perceive clear benefits with the

acceptable levels of risk (Wilson, Hargreaves and Hauxwell-Baldwin, 2017). They conducted a study in the UK of 1025 homeowners to find out consumer confidence on data security and privacy. It was found through a number of surveys that customers would make decisions on buying products based on the marketing of the product if it's easy to use and robust. Customers would purchase products if it helped control their environment, proved convenience and showed some energy savings. But the impact of the SHT would depend on energy demand and how the product is designed and used. It was also interesting to see the graphs for the survey question: "The main purposes of smart home technologies are…" See Figure 1 below.

It was mainly seen that the purpose of the smart home was dominantly seen through an energy management lens, which meant making life at home more convenient, providing security and enhancing communication. When thinking about the form of "Emily", as a team we need to consider the form (shapes, colours and textures) of it to ensure users can relate to it and feel comfortable using it in their home. We are considering using "Emily" for energy saving purposes and in the main concern areas of: water usage, electricity, air-conditioning and shower water saving/times. As a team, we have definitely hit the areas where people want to control these energies in their home and want to improve them. As per the survey 86% of people strongly believed the purpose of SHTs is to improve and make life more convenient at home.
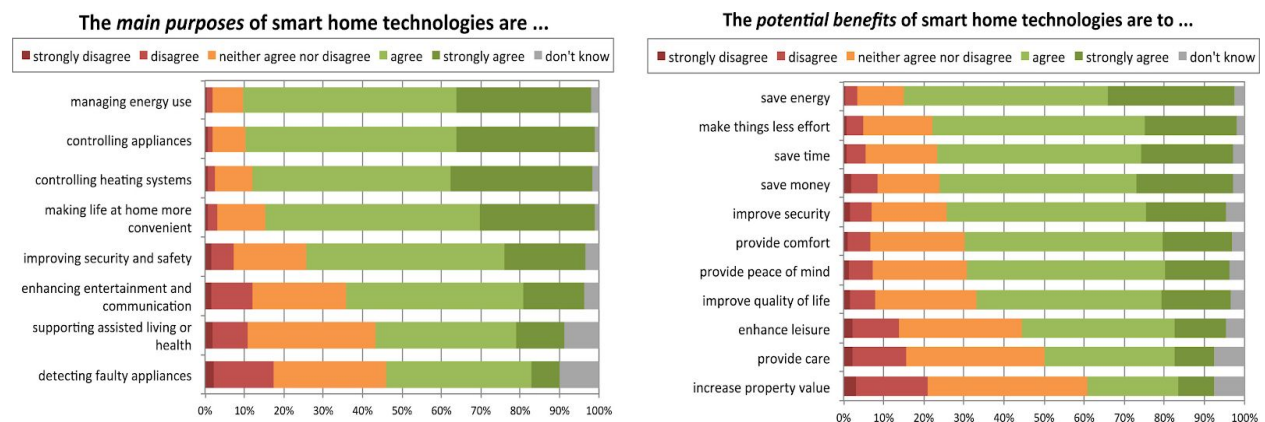

Figure 1: Prospective users' perceptions of the purpose & benefits of smart home technologies

Some of the risks identified from the survey below in Figure 2, showed concerns around dependencies on technology and electricity networks. When designing "Emily", it will be important to consider these interactions and ensure that the user still has control over how often they can use this. But since "Emily" is a behaviour/habit changing product the user will have to rely on this product to ensure they are making change. Additionally, it would be important to consider privacy and recording of this information. "Emily" will be tracking daily movements and energy consumption around the house, and it should take privacy and

security into consideration to ensure trust between the users. This trust can also be formed by making the product easy and reliable and showing good performance.
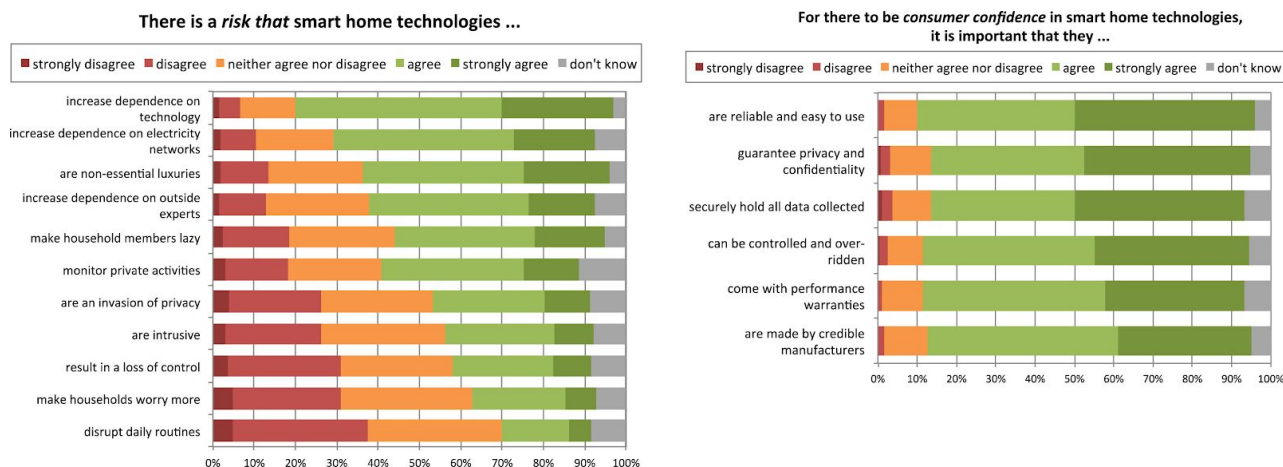

Figure 2: Prospective users' perceptions of the risks of smart home technologies

Saving Energy in the Home

Most people these days are trying to be more energy conscious and are trying to reduce their energy consumption not only for the environment but by it can save them money. Such techniques are already being used in the average household: energy-efficient light bulbs, using cold water to wash clothes, tinted windows, and water-saving showerheads. An article called "Children, parents and home energy use: Exploring motivations and limits to energy demand reduction" looks into the children's perspective on home energy use. An interesting outcome from the study showed that parents showed greater inclination to pay attention to energy saving when framed as supporting their child's learning rather than a financial or environmental concern (Fell and Chiu, 2014).

In the area of learning and teaching it was established that children can hold a measure of influence over their parent's purchasing or behavioural decisions. Children are taught in school to consider the importance of energy usage and the impact it has on the environment and this showed great influence on their thinking. For example in the focus group conducted in the study, a group of children had quite strong pro-environmental views. This was shown strongly when they were asked to discuss the effects of having a TV on at home or the difference between leaving it on standby versus completely off.

"Emily" will need to be highly children focused and encompass interactions for all family types and individuals in the home environment. Considering energy saving is driven by children at home primarily from this study, it would be ideal to encourage children to use "Emily" in the home to make more of an influence of the energy saving in the home with

their parents. Additionally, ensuring the energy-saving features in "Emily" is something that all people know of, for example, water-saving, lights, TV, air-conditioning etc. This ensures it's more relatable for children and households.

Human Behaviours and Attitudes

Human behaviours are a fascinating thing and there can be so many factors that affect how we behave as humans. "Emily" has a habit-changing focus and this can be a challenging thing for most humans. When we set out intentions to change our habits, we signal to our minds that it needs to change, and our brains then feel a kind of discomfort (Changing habits hurts., 2020).

Cognitive Dissonance — is the mental stress or discomfort experienced by an individual who holds two or more contradictory beliefs, ideas, or values at the same time; performs an action that is contradictory to one or more beliefs, ideas, or values; or is confronted by new information that conflicts with existing beliefs, ideas, or values (Changing habits hurts., 2020). The article talks about we must embrace discomfort and lean into the cognitive dissonance humans feel. This will be something "Emily" will need to take into consideration as it is a natural structure of humans to feel discomfort but to what level, we as a team will have to decide when it comes to implementing technology, actions and implications for not successfully conducting any energy savings at home.

An article called "Intervening to change behaviour and save energy in the workplace: A systematic review of available evidence" talked about the difference in people's behaviour at home versus in the office (Staddon et al., 2016). It was interesting to read that whilst employees are in the workplace they feel a sense of influence and increase in motivations to save energy whereas in the home people felt there were barriers stopping them from having this environmentally conscious behaviour. The main outcomes and differences between being in the workplace or at home was coercion, restriction, training and incetivisim. We intend to use "Emily" along with negative reinforcements to ensure there is a direct consequence to change the behaviour. We understand that being in a home can have from 1 person to upto 4 for an average family, thus influence from others in the household can vary. Negative reinforcement occurs when something already present is removed (taken away) as a result of a person's behaviour, creating a favourable outcome for that person.

So in utilising people's discomforts and challenging them, we can negatively reinforce good behaviours in the household and hopefully the household being more energy efficient and conscious.

Audience

Energy Saving Emily is at a broader level intended for anyone who wants to decrease their energy consumption in their households. Our team has categorised this into two more descriptive groups: a family (see Figure 3), and an individual living alone (see Figure 4). Although these groups are quite different, they are connected through their care for the environment. Due to the playful nature and immediate feedback from Emily, the device can be used easily by both audiences, meeting both their needs. Both user groups will encounter Emily in their homes, with the living room being the prominent location for interaction.

The Hansens

★ Characteristics
- Lives together in a suburban house
- Large age range (ages 2-35)

★ Attitudes
- Cares about the environment
- Want to educate their children about their power use

★ Behaviours
- Children are easily bored
- Want a fun way to show their kids when they are inefficiently using power
- Want something easily integrated in their everyday life

Figure 3: Persona 1

Alexandria (30 years old)

★ Characteristics
- Lives alone

★ Attitudes
- Cares about the environment
- Wants to reduce her impact on climate change

★ Behaviours
- Busy lifestyle (works 9-5, has active social life)
- Needs something that can be easily integrated into her daily life

Figure 4: Persona 2

Although user testing will be somewhat limited due to social distancing measures, we will be able to engage with both demographic groups through either zoom sessions or discussions with our family members. We will then be able to incorporate their feedback into our design decisions, ensuring our final delivery is aligned with their needs.

Intended Experience

Emily is intended to assist the user in changing their energy-saving habits in a playful manner. In order for Emily to be effective in doing so, the user needs to have the desire to change. The product is placed around a commonly used part of the user's house. Whilst Emily responds to the user's energy consumption using light, sound, vibration etc, the user will feel a sense of discomfort. The user will not feel so uncomfortable that they don't trust her or avoid the device yet enough to make them notice the device and want to alter its outputs. Emily will put the user in a negative position. This will create a desire to change within the user which then creates a positive effect on their next energy consumption decision. Emily will encourage the user to alter their habits, whether that be because they want Emily to stop harassing them, they dislike seeing the negative outputs or they are trying to show their kids the right things to do. This will create a reaction by the user to Emily's negative responses. The user will feel frustration and discomfort and will remember these reactions and the negative outputs Emily produces when using engaging with their energy consumption. The user will begin to discontinue their bad habits and start creating nee, energy-efficient habits. After repeatedly continuing to practice energy-saving practices, the user's long term behaviour will have been changed.

Relevance to Theme

The product's theme is 'change through discomfort'. Negative Nancies have designed Emily to produce a playful version of discomfort when interacting with her. The product is intended to annoy the user in a lighthearted manner rather than in a serious way. Emily's visual and audible outputs are easy to recognise, which through constant interaction, is intended to create change through discomfort. The user will need to continually interact with Emily in order to feel frustrated with the outputs thus encouraging them to change their inputs. Whilst there is no direct physical interaction implemented into the actions between Emily and the user, the product is influenced by the user's direct actions which in turn influences the user's emotion towards Emily.

The product is designed to be placed in a position around the user's house where they frequently encounter. This provides the users with the daily interaction that is needed in order for Emily to effectively assist users in changing their energy consumption habits. For instance, in a typical household, Emily can be placed in the lounge room or kitchen where

the members of the household continuously walk past and communally sit in. This allows all members of the family to recognise when there is a waste of energy occurring and can narrow down which user is causing such and encourage that user to discontinue their waste. Whilst Emily's focus is to educate users on their energy habits, this then can make an influence on global warming with the larger number of users becoming energy conscious.

Whilst there are apps that users can use to view their energy consumption, they are simply just numbers on a page. There may only be one member of the family who views this data or acts on this data. Energy Saving Emily brings personality and emotion to these numbers in a way that any member of the family can understand.

Rhea

Introduction to You

I am in my final semester of university and I have worked in many group projects throughout my years studying. I have always been a consistent and organised team worker. When starting a project it is important to have goals discussed and ensure milestones are set in place. For DECO3850, I hope to bring a fun and upbeat attitude towards my work as we are creating something fun and interactive for all to enjoy.

With our entire course being run online, I hope to engage with my team regularly and ensure all my work is complete prior to any team meetings online. My strengths for this course would be coding and design, I like to tackle large problems by breaking them down and completing them step by step. Some of my weaknesses sometimes are thinking outside of the box for a solution and asking for help from others. I hope through this course my team will help keep me on track and aid in thinking creatively.

My aims for this course is to be able to create a working prototype for my concept area. I hope to be able to learn some new prototyping techniques whilst utilizing recycled materials and doing new and exciting DIYs. This whole experience will be all new to everyone doing the course and I hope to make the most of it as it's a uni first!

I endeavour to make use of the full teaching team to gain advice, learn new skills or alternate ways to do things. While we are in lockdown, I want to get used to using Zoom and making it a part of the norm. For my project delivery, I intended on completing it on time and to the best standard I can with the resources and supplies I have at home. I will also make good communication with the team and try and support them as much as I can with my skills and knowledge.

Your Focus

A lot of the research and context of the team's original idea was aimed towards households with children and the average family. Based on the background and related work for this problem space, I would like to focus my exploration on homes and households with just adults. So this relates to partners, couples, or housemates living together. It was found through research that children have the most influence on their parents within the home as children learn about being environmentally friendly and sustainable in schools. I want to take the perspective that adults have forgotten or are now too busy with their work lifestyles that they have forgotten the basics of being energy conscious and the Energy Saving Emily device will assist with that.

My focus is to "*create an Energy Saving Emily device that has interactions to annoy the user whilst positively change their behaviours and mindset to become more efficient in the home*". I intend to still create a device that animates, illuminates and provides feedback to the users but it will be in a different form to what was described initially by the team. I want to create something that is a more physical fixture in the home and something that cannot be put to the side by the users. I picture Energy Saving Emily to be an essential fixture in the home that continuously monitors, interacts and improves the energy efficiency in the home.

My goals for my implementation and exploration:
1. Create something that adds an extra voice (conscience) in the house to ensure you are saving energy
2. Focus on one energy area of the household initially
3. Create something that primarily adults can interact with in the household
4. Positively change the behaviour and mindset of those in a household that are ignorant to energy efficiency
5. Create something that is playful but annoying in the household

Response to Feedback

Based on the feedback received from the pitch I will take some key things into consideration, to improve the focus and direction of Energy Saving Emily. A lot of the feedback was aimed towards the physical shape of Emily and how it was presented. Based on this feedback I have decided it will not be a sphere shaped orbe, rather it will be an installation in the home. The installation will require all sorts of physical interactions to turn off the annoying gestures, sounds or lights Emily is making.

Another key bit of feedback from the pitch was the kinds of annoyances and discomforts Emily will make when the household is not being energy efficient. I am going to work with sounds, lights, vibrations and movement to portray the annoyances and ensure the user can identify these as an annoyance or discomfort. A bit of user research and testing will need to be conducted to find out what particular things will annoy a user and hence create a change in behaviour through negative reinforcement.

Discovery

There are a few unknowns and new discoveries I will have to make towards my project. .

1. **Ability to test and receive feedback for the physical interactions of the prototype**

   I have decided to proceed with a target audience of adults living at home in the environment with a partner, couple or housemates. Testing and gaining feedback in this type of environment will be difficult but I think applying it to my target audience will be a little harder as I am living at home with a family of 4. I could potentially video chat some of my friends who are living out of home and are within my target

audience considerations. My methods of testing will also need to change and be modified for the online environment. I am still yet to figure out what I can use instead but this should come after talking to others in the course. An example method of testing could be to potentially use a method of user testing but I am the tester and my target audience can instruct me to do some of the tasks.

2. **Creating a prototype that will implement all intended features**

   At this point in time I have not thought out in detail each component of my prototype and this will have an impact on what I can apply as features. Since the prototype is intended to be used in a home, I have the ability of designing and building it to fit in a particular room in my house. Due to the timeframe, restriction and resources of other team members it will be difficult to implement all features but I intend on creating a prototype that will be working for one energy saving element in the home. This particular element will be mastered and hopefully can then be easily translated to other energy saving elements. This way I can ensure there is a working prototype for say "saving water use in the shower" and this can successfully show all the features of the prototype, this gives users a feel for how the prototype will work and interact with them. .

3. **Drawing on resources to construct and build the working prototype**

   Due to social distancing restrictions I am somewhat restricted to what shops and resources I can access to build my prototype. Over the last week, I have created a box to collect useful items that can help me build my prototype. I have also been bookmarking some useful DIY YouTube videos that are useful for creating prototypes out of recycled materials, arduino tutorials and interesting projects. If it comes to that I do not have a particular material or item to make my prototype out of, I will try and rethink of an alternative or see if my team members are building something similar and draw and their resources or collaborate if possible.

4. **Creating a prototype that meets the "playful" component of the criteria**

   As a team we have decided to go with "playful interactions through discomfort" as our modified criteria. I am a bit worried that my prototype will not meet this criteria as I will be restricted on resources and my coding ability to make something more interactive. I hope to work with my team to collaborate on the coding to ensure we are helping each other to create something engaging. I still need to do more research and surveying of what annoys someone with technology.

5. **Research into discomforts/annoyances adults feel through technology**

   I will have to conduct some user testing and surveying with my friends to figure out what can potentially annoy them or create a discomfort for them through

technology. I hope to possibly create a few demos for them based on some prior research and then allow them to test these demos. I will then take on this feedback to further improve and apply to my prototype

6. **How to apply touch sense into my prototype**

   I want the user to be able to physically touch the prototype and allow this to give them feedback. With this responsive attribute, I need to find out how to apply this with an Arduino and to a physical object. This will require me to test and play around with different online tutorials and possibly different materials that may conduct the feeling of touch.

Project Constraints

Whilst proposing my concept, there are a range of different constraints that may theoretically restrict my progress or methodically restrict the development of the concept. The following address my project and what I need to consider:

1. Ability to obtain required resources and materials to construct the prototype to a working standard and for its main objective
2. Access to people who can assist in coding and debugging of my prototype
3. (hopefully unlikely) but in the case that I fall ill, the project cannot complete
4. Ability to test the prototype on the identified target audience and gain useful improvement suggestions to benefit the main goal of the project

With some of these points in mind, I do not want them to impact the progress of my project and hinder my goals. I want to be able to adapt and improvise to complete this project successfully whilst learning new Arduino, prototyping and coding skills.

Plan for Completion of the Project

The diagram below (Figure 5) displays the major milestones for this project however detailed in Table 1 below are the key tasks involved along with time allocation (hours), resources and costs.
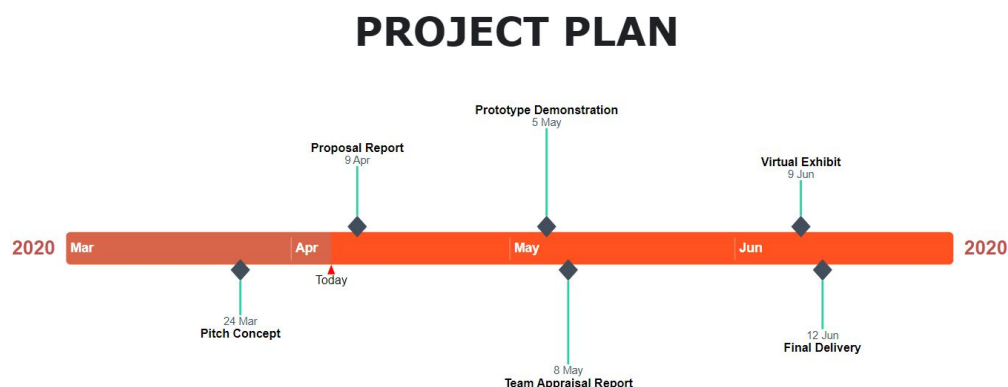
PROJECT PLAN

Figure 5: Project Timeline and Major Milestones

Table 1: Project Tasks

Milestone	Tasks	Time	Resources	Cost
Proposal Report	1. Complete research for the project context (Team Component)	10	UQ Library for Journal Articles Google	N/A

	2. Write up individual section
	  a. Brainstorm and map out my take on the theme
	  b. Outline my direction and the goals for prototype
	  c. Note and explain any constraints
		10	Google Notepad	N/A

Prototype Demonstra-tion	1. Research & Planning
	  a. Plan out the key annoying features
	  b. Select technology to be included
	  c. Initial surveying and data gathering of target audience
	  d. Select which Energy Saving element to develop
		15	Google Notepad	N/A

	2. Developing Features & Functions
	  a. Coding
	  b. Build
		30	Computer Arduino and kit Art & Craft Supplies Room in house	<$100

	3. Initial Testing
	  a. Conduct testing on people
	  b. Review results and see what modifications can be made
		15	Target Audience to test Survey materials Low-Fi prototype Computer	N/A

	4. Prototype Revision
	  a. Review testing data and feedback
	  b. Make changes as necessary
	  c. Create prototype demo video and post to Miro
		20	Computer Arduino and kit Art & Craft Supplies Room in house	<$50

Team Appraisal Report	1. Team Component - post comments as a team on allocated concepts (Miro)	2	Computer Miro Team	N/A

Final Delivery	1. Final Prototype
	  a. Review feedback and comments from Miro
	  b. Add/remove/modify features
	  c. Building of parts
		35	Computer Arduino and kit Art & Craft Supplies Room in house	<$50

	d. Coding of Arduino e. Testing of features			

	2. Portfolio Website
	  a. Design & Develop HTML website
	  b. Organise content (images, text, videos) for portfolio
	  c. Publish
		15	Computer
			Blog Posts
			Camera
				N/A

	3. Virtual Exhibit a. Film a live demonstration of prototype in use	10	Camera Computer Prototype	N/A

Final Report	1. Team Component - collate all the individual discoveries and collective knowledge into a report
	  a. Outline how each individual project as contributed to the overall theme and problem space
	  b. Future plans and exploration for concept
		10	Computer
			Miro - feedback/comments
			Team
				N/A

Lucy

Introduction to You

I am in my final semester studying BInfTech/BBusMan (Marketing). I really enjoy group collaboration and am excited to work with my team members to further improve our initial idea. My strengths are in UX design, user testing, video editing, construction, and content creation. Due to studying a double degree, I have only been able to participate in limited programming courses so my weaknesses definitely lie in programming and electronics. However, through the Arduino project book and tutorial, I hope to advance these skills before and during the development of my prototype. Although we are deciding to work on a lot of the project individually, I hope to continue to work with the team by collaborating on our code and any suggested advancements to the concept. I also want to ensure I still make use of the teaching team in order to create a high quality product, even though we are working externally this semester.

I work best when I understand the task completely and plan out how I will approach the problem. My best work is created when I have enough time to iterate through the design process so I plan to work consistently on the project, rather than cram it into the final weeks. Hopefully I can follow the delivery schedule I have created below in order to achieve this (see Table 2).

Your Focus

Our target audience is quite broad, so I have decided to target the user group of families with school-aged children. I think this user group is quite interesting as I will need to ensure that Emily is playful enough to keep kids interested but also bring out the playful nature of adults. She needs to be simple enough for the kids to understand but also not too simple, such that the adults lose interest.

My aim is to make it a team effort to minimise energy consumption through something like a leaderboard, to show the family's best and worst performing areas. As the key method for change in our concept is negative reinforcement, I need to encourage an emotional connection between the user and Emily so the user starts to change their behaviour not only because of the immediate annoyance, but also because they don't want to disappoint Emily. The film JEXI, explores this idea in a comedic way where the main character gets a new phone that has a virtual assistant that has a personality and overrides his decisions to try to make his life better (Jexi, 2020). Of course in this film, it all goes wrong, but the main character does start to have an emotional connection with JEXI and feels bad if he disappoints her. I want to continue to research this idea to try to make my concept as

emotionally interactive as I can, to use a long term connection to mitigate her short term annoyance.

The goals for my individual project are:

1. Make Emily act as an artificial conscience for the user.
2. Make Emily fun to use for both children and adults.
3. Make the output annoying enough to encourage change but not so annoying that it would lead to discontinued use.
4. Make the interaction as intense as possible without interfering with the users' life too much.
5. Focus on one input and output initially in order to maximise the interaction and experience the user has with Emily.

I think this will be an interesting focus for my individual project as it can be applied to my other team member's projects through the inputs and outputs I decide to use as well as how my prototype interacts with such a broad target audience.

Response to Feedback

Our team has decided to explore Emily's physical form and behavioural responses individually making sure we each align our design with the key considerations raised by the feedback process. The key changes I have made as follows:

1. **Encourage an emotional connection with Emily**

   Emily will have "catch phrases" that she says when the user walks past that vary based on her assessment of their behaviour. These will include complaints about the bad behaviour as well as passive aggressive comments about the user. Her personality will adjust based on the family's track record. For example, if they have been consistently ignoring her, she will become more rude and complain more when they walk past. This will be assisted by displaying facial expressions on an LCD screen or LED board.

2. **Include more interesting interactions with Emily through shutting her off**

   Emily will have different methods for being pacified after she has been agitated by bad behaviour. For example, if the user has showered for too long then she will need to be covered in a towel/blanket for 10 seconds before she goes back to normal. When the air conditioner is left on, her belly will need to be rubbed in order to warm her up. When the heater has been left on, she will need to be cooled down by blowing on her face. These methods still need to be explored through user testing to

determine the most appropriate ones. Testing also needs to be conducted on whether this makes it too complicated to memorise each individual action.

3. **Enhance the physical interaction with Emily as a whole**

   If a negative behaviour is occuring, Emily will complain to every person that walks past her. If everyone ignores her, Emily will chase the user around the house, continuing to complain, until someone does the "shutting her off" behaviour. This feedback builds on the response to the previous question.

4. **Respond appropriately to multiple bad behaviours that are happening at the same time**

   I still need to conduct more research and user testing but my current idea is for Emily to complain about a different thing every time someone walks past and then they have to do all the different actions to turn her off for each individual bad habit. However, this may be too overwhelming for the user so I will undertake further user testing once a basic prototype has been developed.

Discovery

There are many crucial aspects of my project that are yet to be resolved. The following are some of my concerns and how I intend to approach the inquiry.

1. **How will I make Emily something that people want to continue to interact with?**

   A major concern I am having with our concept is ensuring continual and everyday interaction with Emily as this is the only way to promote the long term change in behaviour. I need to continue to research ways to keep users engaged through user testing and interviews, as well as through studying the literature. At the moment I am thinking of having the leaderboard at the end of the week to show the areas of greatest and least success. I think this concern will also be assisted with the research into making Emily annoying but still likable.

2. **How will I ensure there is a balance in the output of Emily so that she is annoying but still likable?**

   I think this will be the most difficult question to answer through my project and may require A/B testing of different levels of annoyance, asking the testers to decide which they prefer. However, as this will require a somewhat complete prototype, I need to perform further research into negative reinforcement and search for literature or other existing projects I can utilise.

3. **What is the most effective way to annoy most people?**

Through initial user testing, I have found that loud and constant noise, vibrations and bright lights are the most effective ways to annoy people. However, this may change based on Emily's everyday context of use. I want to continue to research this area by conducting some user interviews to my target audience to provide them with information about the concept and ask them their thoughts on my current ideas, and to provide any suggestions.

Project Constraints

As we are currently working through a pandemic, there are many obvious constraints that exist surrounding the project. However, there are also many theoretical constraints that also may limit the outcome of our concept. The following are a list of my current risks and constraints and how I aim to alleviate them.

1. **Programming ability constraining my implementation within the timeframe**

This is a major constraint that has the potential to vastly change my project, however I aim to prioritise the improvement of my programming skills to ensure that I can create a high quality prototype. I will do this through continuing to maximise my time with teaching staff; use my proposed delivery schedule to stay on track - allowing more time in the areas I am not as confident in (programming and electronics); and have continued discussion with my team members to ensure we can provide ongoing assistance to each other.

2. **Inability to work due to illness**

We have already discussed this concern with Lorna but the same measures will be in place for normal extensions. Due to the individual nature of the project, we should be able to continue if a team member gets sick - even if it results in the project being of a lower standard. In this situation, we will aim to help each other out as much as possible.

3. **Isolation resulting in limited access to resources**

If the rules surrounding social-distancing results in confining everyone to their households, I would have no access to any new materials. This may require my form to change, utilising something else I do have at home. I already have an array of options (3D printer, Protoputty, laser cutter) so if I do end up running out of the ingredients to make Protoputty, I should be able to either use previous iterations of my prototype or make it out of another material. If I don't have a sensor I need and

are unable to acquire it, I can implement dummy programming to simulate what it would be like if I did have it.

4. **Social distancing measures restricting access to participants for user testing**

Luckily my family does fit into the chosen target audience, so I will still be able to receive some feedback and be able to identify pain points in my prototype. Although I may be limited in the feedback that can be received on the physical prototype, I can still conduct user testing on video chats. This will ensure the concept is appropriate and I am targeting the user's needs through the inputs and outputs chosen. I can use this method to test potential voice recordings and phrases Emily will say, as well as other outputs such as colour change, vibrations, and chasing the user around the house. I can also create printable paper prototypes for other friends and family to complete user testing on.

Plan for Completion of the Project

The following table outlines how I will approach each milestone and its associated tasks. Although the design process is iterative, I have outlined the latest completion date for each activity to ensure that I have enough time for testing and revisions.

Table 2: Project Delivery Schedule

Milestone	Tasks	Time	Resources	Cost	Due Date
Prototype Demonstration **Due:** 4 May 2020	**Planning** 1. Research annoying features 2. Conduct initial user testing with target audience to understand their needs more 3. Select few inputs I want to focus on 4. Select best output based on chosen input and research	15	Google UQ library Target audience (user testing)	N/A	12 April 2020

	Development
	1. Programming
	2. Building
	   a. Physical structure
	   b. Electronics
		30	Computer
			Arduino kit
			Protoputty (silicone, food dye, corn starch)
			3D printer
			Laser cutter
			Extra materials (e.g. glue, paint,
				<$50	22 April 2020

			wood etc.)		
	Testing & Analysis 1. Determine appropriate test to conduct 2. Create testing plan 3. Conduct user testing 4. Analyse results	10	Target audience Prototype Testing plan	N/A	24 April 2020
	Revision 1. Make any changes based on user testing analysis	15	Prototype Computer Arduino kit Protoputty (silicone, food dye, corn starch) 3D printer Laser cutter Extra materials (e.g. glue, paint, wood etc.)	<$50	1 May 2020
	Content creation for demonstration 1. Document write-up 2. Create video 3. Post to Miro	10	iPhone/Camera Computer Prototype Miro	N/A	4 May 2020
Prototype Appraisal **Due:** 8 May 2020	**Team comments to Miro** 1. Post comments for allocated concepts	5	Computer Miro Team	N/A	7 May 2020
Final Delivery Report **Due:** 12 June 2020	**Collate all of the team's work (discoveries and collective knowledge)** 1. Brief description of individual project and intended outcomes 2. How individual explorations have contributed to broader project 3. Future exploration	15	Computer Miro Team	N/A	12 June 2020
Final Delivery Prototype **Due:** 12 June 2020	**Prototype** 1. Revision from feedback 2. Adding/deleting/modifying features on Arduino 3. Revising/polishing up final build 4. User testing 5. Any final revisions	55	Computer Arduino kit Protoputty (silicone, food dye, corn starch) 3D printer Laser cutter Extra materials	<$50	5 June 2020

			(e.g. glue, paint, wood etc.) Target audience		

	Portfolio Website
	  1. Design website
	  2. Collate content
	  3. Create and publish website
		15	Computer
			Blog posts
			Camera
				N/A	12 June 2020

	Virtual Exhibit
	  1. Plan video
	  2. Film and edit video
		15	Prototype
			Computer
			Camera
				N/A	12 June 2020

Critical Reflection Essay **Due:** 22 June 2020	**Essay**	20	Computer Blog posts	N/A	22 June 2020

Piyumi

Introduction to You

I am in my final semester of my studies, completing a Bachelors of Business Management and Information Technology, majoring in Marketing and UX Design. Over the course of many years I have been in predominantly group based assessment so I find myself very comfortable working in teams, particularly in IT based subjects. That does make me a little nervous with the current COVID-19 affecting the course, as I am not able to collaborate with people of differing backgrounds and skills in a way that this course would have initially been conducted. I hope to be able to bring my creativity to the project and my enthusiasm to the team to develop an exciting concept.

My strengths involve working within teams, implementing design, and document reporting from my business background. Weaknesses that worry me include having no experience with an arduino or physical construction and having very little programming skill . I'm hoping to explore unfamiliar territory, such as coding and physical constructing, to break me out of my comfort zone a little more as I know I can be quite hesitant and nervous to undertake new unfamiliar tasks.

I work best when I set myself deadlines to complete projects. With all these restrictions in play, I am keen to make use of the many resources that are currently available online, and become more familiar and comfortable with Zoom as a method of communication. With the tools and resources I have at home, I endeavour to complete my individual project on time and to the best of my ability. As a team, I want to be able to share my knowledge with them freely online and hope that I can make use of any skills and knowledge they may also have, through communicating clearly as a team.

Your Focus

From initial user research, the concept of Emily was originally created to be positioned within a household. This remains as both an appropriate and convenient area to explore based on the context of Emily and the restrictions that we are currently having to face. I have chosen to focus on an adult environment, specifically focusing on parents or young adults using Emily. As areas of concern arise in sustainable practices and conserving energy, I believe it is very important for adults to educate themselves on ways that they can save energy around the house, particularly as this topic is something that has only gained the majority of its attention recently. I think adults will be more perseverant with annoying and uncomfortable situations, therefore I intend for Emily to add a suitable level of

discomfort into their lives. To offset this level of discomfort, I hope to inject a bit of personality into Emily, so that users will still find her engaging.

By exploring the audience of adults, I hope to gain an insight into how they will be affected by an object that induces discomfort to make a change in their habits, as well as whether this device may be perceived as something that adults would be interested in. I am also excited to see what my teammates come up with and compare our findings to learn about the differences between the scopes we have each selected.

My goals for the development of Emily are:
1. Create a functional prototype that covers or simulates the tasks I set out to complete
2. Ensuring Emily is relevant to the theme of 'change through discomfort'
3. Develop Emily in a way that users experience discomfort but also continue to use her without being discouraged

Response to Feedback

There were a few forms of feedback that have changed the direction of the initial concept of Emily. A few points of feedback really stood out to me, and are ideas that I would like to explore through the development of the project. These are listed below:

1. **There is a difference between being annoying and discomfort - it would be interesting to explore causes of physical discomfort.**

   Originally, Emily was intended to be playfully annoying, however some of the comments liked the idea of exploring discomfort even further, eg. shutting power off or making the air conditioner too cold to waste more energy. I am hoping through research and user interviews that I can find ways to induce discomfort to my target audience, in a way that they still want to interact with Emily.

2. **It's meant to be annoying, but is there a reward system when the user's behaviour has changed?**

   This bit of feedback was something that none of the team had really thought of prior to the presentation, and is definitely something that I would like to address and incorporate into Emily. Current ideas that I have include the implementation of a reward system or positive feedback reports. I'd really like to dive into the theme of 'change through discomfort' and explore ways to ensure that adults do not get overly annoyed with Emily that they stop using her. I'm hoping that through some sort of 'reward' system, they are motivated to continue using Emily and save energy.

Discovery

As the project advances, there are still many things that I am exploring about the concept and its development. Some key concerns I have regarding the concept are listed down below:

1. **Developing a prototype that adheres to the theme of 'Change Through Discomfort'.**

    The original idea of Emily that we came up with as a group was intended to be playfully annoying, however based on feedback from peers, many people said that we can play even further with the use of discomfort. I am still unsure of how Emily should induce discomfort to a user, however ideas I have include creating physical discomfort through wasting more energy, with the additional use of lights and/or sounds. With more research and user interviews I am hoping to gain more of an insight on ways to do so.

2. **Incorporating all intended features within the prototype.**

    I have currently not fleshed out all the specifics of the approach I would like to take. Most realistically, I understand that I will not be able to implement all the features that I plan, particularly with the restriction to access of resources and limitation of team interaction. However I intend on developing my form of Emily to target one particular energy saving aspect. By doing this I will be able to centre all of my focus into creating a polished version of Emily that functions successfully, and that users can understand and interact with.

3. **Ensuring that users continue to use Emily and are not dissuaded from her annoying aspects.**

    As Emily is intended to create discomfort and be annoying to the user, I am still exploring aspects that ensure users do not get overly discouraged to use her. The possibility of implementing some sort of reward system, encouragement or feedback based on their energy usage is something that I would like to conduct user testing and interviews on, as well as conduct further research. As previously mentioned, I would also like to inject some personality into her, that makes my target audience still interested in interacting with her. I think it is going to be quite a challenge to balance Emily and her annoying antics, along with ensuring the user still wants to interact with her.

4. **Incorporating a novel interaction into Emily.**

   As Emily is an item that is situated within a household who emits outputs such as sound and light etc., it is quite challenging to incorporate a novel aspect to it. Ideas that have popped up include incorporating movement or inputs from the users, however I am still in the process of seeing how it is possible to implement such ideas within the concept. With further research I am hoping to explore some interactions that I can incorporate into Emily that will suit her function and intention.

Project Constraints

There are a few constraints that may limit the scope of my project and what I am able to access. I have listed work arounds to these where possible to ensure a smooth process of development. The constraints are listed as follows:

1. **Conducting user testing and collecting feedback due to social distancing rules.**

   With the restrictions that we currently face during this situation, it is going to prove challenging to do user testing with a variety of people. However, I currently live at home with my family, and as Emily is intended for household usage, and my target audience is adults, I believe this is somewhat fitting with the current environment I am in. I hope to make the most of my parents and their feedback and opinions during this time, while also doing my best to interact with other friends online to conduct appropriate user testing.

2. **Use and implementation of resources during restrictions.**

   I am a bit worried about the limitation regarding access to resources that is slowly emerging during this situation. However I have been scouting out any items around the house that may be of use during the development of the project. Should I come to the issue of not having a particular item, I will do my best to try and be creative with materials or think in a new light about what other resources could be used. If I find that I'm really struggling to do so, I will seek out help from my teammates or other friends regarding collaborating or borrowing items.

3. **If myself or someone on the team becomes unwell.**

   Unfortunately there is not much that can be done if I become unwell during this time other than getting some rest and focusing on my health. Should any of my team members become unwell, I would hope they do the same and should they be well

enough to come back to complete the project, I would offer as much support and help as I could.

4. **Lack of programming ability.**

Having only completed one or two programming courses due to a dual degree, I have some worries surrounding my confidence in programming. To work on this I plan to access any programming tutorials that I can find online and use helpful teaching videos to gain some confidence and improve my coding skills. Should there be anything that I'm stuck on, I will seek the help of my team members.

Plan for Completion of the Project

In order to organise the coursework for the project, I have designed a table that outlines how I plan on approaching the project, and the resources, time and cost that I should expect to commit per milestone.

Table 3: Project Schedule

Milestone	Tasks	Time	Resources	Cost

Prototype Demonstration
 	
Due: Monday May 4th
	Research:
	  a. Conducting surveys and interviews of intended audience
	  b. Exploring features that induce further discomfort
	  c. Choosing energy consumption focus area
	  d. Selecting most appropriate outputs
		15	Google
			UQ Library
			Youtube
			Target audience
			Laptop
				N/A

	Development:
	  a. Programming
	  b. Building and construction
		30	Laptop
			Arduino Kit
			Supplies at home
				<$50

	Initial User Testing:
	  a. Conduct testing on target audience
	  b. Write down observations and feedback
		10	Target audience
			Prototype
			Laptop
			Plan for testing
			Observation document
				N/A

	Revision of Prototype:
	  a. Implement feedback from testing
	  b. Further programming and construction
		15	Prototype
			Laptop
			Arduino Kit
			Supplies at home
				<$50

	c. Document concept progress d. Film and post accompanying video to Miro			
Prototype Appraisals **Due:** Friday May 8th	**Critiquing and Feedback:** a. Reflecting on other teams concepts and selected domains b. Offering feedback for improvement/exploration	3	Miro Laptop Team	N/A
Final Delivery Prototype **Due:** Friday June 12th	**Final Prototype:** a. Review feedback from Miro b. Final revision of prototype c. Complete final testing of features	40	Laptop Camera Prototype Supplies Arduino Kit	<$50
	Website Portfolio: a. Designing and creating HTML website b. Collate and incorporate necessary works c. Publish content	15	Laptop Camera Blog posts	N/A
	Virtual Exhibit: a. Record demonstration of prototype	10	Laptop Camera Prototype	N/A
Final Delivery Report **Due:** Friday June 12th	**Documentation:** a. Analysing findings from individual outcomes b. Explore future possibilities	15	Laptop Team Miro	N/A

Jessica

Introduction to You

I am in my final semester of my Bachelor of Multimedia Design with an added interest in advertising. I have undertaken many design courses as well as a few programming courses. I have thoroughly enjoyed participating in the design courses and further progressing my knowledge. I enjoy creating an idea and then reiterating through the design process. I work most effectively when I am under pressure but have the motivation to succeed or a deadline to meet. With this in mind, I work well when I have smaller deadlines to complete. Whilst I haven't worked on building a physical product since my first year, I used to build products in a workshop with wood or metal using equipment such as a band saw, belt sander, hammers, handheld saw, chisels, soldering iron and on occasion a laser cutter. When working on a project that I am highly interested and invested in, I divert my energy and attention to completing such, which can be both a strength and a weakness. I am yet to work with Arduino and have limited programming skills. I enjoy the creative aspects of the courses I have taken previously over the logical parts, such as object-orientated programming.

As it is in my last semester, I hope that I can implement everything I have learnt from previous courses into this project. I plan to make use of the teaching staff to gain more knowledge and take advantage of the access to resources provided by the university. I am excited to work with my team and to provide and work in a supportive, cooperative environment. It is important to keep open communication within the team, especially considering the current circumstances, and to ensure that support, knowledge or motivation is provided when it is needed. Facebook Messenger is the best means of communication for our team to do this, with my phone or laptop typically in range for constant communication. Google Drive is another platform that I will utilise to share work instantly and being able to comment and interact with certain parts of work

Your Focus

My team has decided to continue Energy Saving Emily as a team but alter the project to what we want to focus on. Whilst we are all working on targeting Emily for a household, I am interested in focusing on a technologically advanced household. This will alter the research I will need to do to understand how the target audience reacts to new technology and understanding and interacting with products. This decision is also due to my access to this target audience as my family works in the IT industry and is interested in new technology and creating a smart home. I am interested in implementing a form that will allow the development of an emotional connection and comfort within the form. I am

interested in creating a form that has relevance to 'energy consumption' or its impact on the world. This includes a snowman, sun, lightbulb or a tree. I want to incorporate elements that can have a direct impact and correlation to energy usage. In relation to these forms, the use of a temperature sensor is suitable as well as a light sensor. This is intended to allow a visual representation of the energy that is being used. I wish to use lights, sound and vibration as some of the outputs from Emily.

Response to Feedback

There is no additional response to feedback that is not included in the team section.

Discovery

During project development, there will be issues that will arise that will need to be addressed. In preparation for this, I have identified the main concerns that have already come to my attention. I have listed these below as well as how I plan to approach these issues.

1. **What if I don't have access to a certain resource required to complete what I envisioned?**

   In this situation, I will need to decide how detrimental this resource will be to the success of my project and what I would need to do in order to gain access to such. If there is no possibility of gaining access, I will need to reassess my form and alter the design to be completed with the resources I do have access to. Whilst brainstorming for substitutions, I will take advantage of the knowledge and advice of both the teaching team and my team who may have experienced a similar situation.

2. **How will I complete the project if the current restrictions or situation worsen?**

   As the current situation with COVID-19 is changing frequently, it is very difficult to tell how life will be over the next two months. As everyone in the course is facing similar situations, I believe that we will all have to continually alter our approach as things change. If a member of my team or myself become ill we will work with each other and Lorna to discuss if an extension is needed and what is the best course of action to continue.

3. **How will I program a feature I'm interested in with limited knowledge/experience with such a feature?**

   If I am unaware of how to implement a certain aspect but have a great desire to, I will conduct research into previous attempts and the knowledge of the teaching team. If the feature is too advanced or I don't have the equipment to complete it, I will create a 'smoke and mirror' prototype of the feature.

4. **How will I keep biased opinions from affecting the project when completing user testing within the family that I have access to?**

   With the limit to social interactions, the closest target group I have access to is my own household. It will be easy to conduct observations and interviews or other

face-to-face user testing methods with them however I fear that they will become biased opinions and not completely organic. I could try to locate similar data online or conduct interviews online with another family in my target audience.

5. **How will I be able to gain users' trust?**

   In order to gain users' trust, I will first need to understand the users and how they respond to certain devices as well as new technology. I will conduct contextual inquiries with my target audience in order to grasp a better understanding. This will be done using video chat to replicate the interactions that would typically be present. This is intended to give me an insight into how the users first perceive and start to trust other products and implement that information into my project.

6. **What if there are errors in communicating between the sensors and device and which sensor/output takes precedence?**

   If there is communication failure or interference, I will first conduct an investigation into these issues and attempt to resolve it using my own knowledge. If that is unsuccessful, I will attempt to find a solution using online platforms such as forums and Stack Overflow as others may have experienced these issues. If this fails, I will contact the teaching staff to help me to solve this issue or assist me in creating an alternative depending on time constraints.

Project Constraints

Although it would be preferable for there to be no limits or constraints on this project, in this environment it's unfeasible. There are constraints that I and the team will encounter that will change the outcome of the project.

1. **Access to limited supplies**

   Whilst we currently only have access to equipment at home, there becomes a limit on what is able to be built. I have a hand saw, hammer, nails, silicone sealant, hot glue gun and other various craft equipment at home. However, this does, unfortunately, limit the scope of what I can build and the form I do it in. Whilst I can still be creative and look into alternatives, I do not have access to extra equipment that would typically be available in a workshop, such as a laser cutter.

2. **Working with limited safety equipment and guidance**

   When working in a workshop, there are many safety equipment and policies in place to prevent injuries. Whilst working at home, those same policies and equipment are not in place and injuries can potentially occur. This also comes with limited guidance that can be given when working at home. In the workshop, it is easier to consult teaching staff on how to work with certain materials and how to assemble the product as well as being observed. Whilst common sense can still be used at home, there are some practices that I may not realise are indeed dangerous. Extra precaution can be taken at home and I can limit all work with materials that I am

familiar with or perform further research into materials that I have limited experience with.

3. **Limited experience with Arduino and programming**

   In my previous courses, I have enjoyed taking part in the design aspects and focusing on those whilst others who prefered to do the programming did so. I have never found it my strength and always struggled to understand the logistics of languages such as Java. I am concerned that my limited ability and desire to program will limit my product. I need to make use of my team and the tutors and their knowledge and support. I also need to continue exploring Arduino and the basic features and tutorials in order to learn skills to incorporate into my project.

4. **Working in a pandemic**

   Under the current restrictions, students are not allowed to attend classes on campus or the workshops. All work is being completed at home with social distancing and isolation being encouraged and enforced. At this current point, Bunnings and Officeworks are still open but it is uncertain whether they will remain open for the duration of our project. I have basic equipment that might be useful for my physical form however if I require a certain product that I don't have, I won't be able to acquire it.

5. **Time and collaboration constraints**

   Due to the social distancing restrictions in place, we are unable to collaborate as a team in person. Whilst we are able to make use of platforms such as Zoom and Facebook Messenger to communicate, we are unable to work together to produce one physical form. This would have allowed for the addition of more features and more hours to be implemented into the one form. There are also time constraints in place as this project has to be completed within the semester, requiring a shorter time frame than may be implemented in the workforce.

Plan for Completion of the Project

A plan has been created to identify major milestones for this project and how they can be achieved. The resources and steps required for completion have been identified in Table 4. All milestones will require the use of a laptop and for this reason, is not specified under the resources that are required.

Table 4: Project Schedule

Milestone	Due Date	Key Steps	Resources Required	Cost ($)	Time (hrs)
Prototype Demonstration	4th May	Research ● Discover techniques to persuasive technology ● Investigate target user group	UQ Library Note-taking equipment	-	4

		● Gaining users trust ● Energy-saving techniques			
		Establish Plan ● Break down features ● Create implementation plan ● Refine concept with research incorporated	Google Docs	-	8
		Build ● Experiment with equipment ● Create form	Craft & workshop materials (yet to be decided) Arduino kit	~70	20
		Test ● Test product with user group and note results	Camera Note-taking equipment	-	3
		Refine & Reiterate & Document ● Refine prototype according to feedback ● Reiterate if necessary ● Document results ● Create video	Google Docs Camera Physical prototype Adobe Premiere Pro	-	15
Prototype Appraisals	8th May	Observe Prototypes ● Watch allocated prototyping videos ● Read relevant documentation	Miro	-	1-2
		Critique ● Reflect on effectiveness of the demonstration ● Suitability and creativity of the interactions ● Speculate on the ability of the individual to produce product ● Provide suggestions for overcoming concerns	Google Docs/ Notebook	-	1
		Collaborate ● Discuss similar and different opinions with team members to collectively write a collaborative critique	Google Docs Zoom	-	2
		Communicate ● Comment critique on team's Miro board	Miro	-	0.25
Final Delivery	12th June	Respond to Feedback ● Acknowledge feedback given by peers on Miro ● Alter project as needed	Miro Note-taking equipment	-	2

		Build & Test ● Build/alter the form ● Conduct user testing	Craft & workshop materials (yet to be decided) Arduino kit Note-taking equipment	< 30	35
		Reiterate & Refine ● Refine product and concept based on testing ● Reiterate through process	Google Docs	~20 - if needed	15
		Portfolio Website ● Document achievements ● Create the website	Brackets Google Docs	-	20
		Exhibit Product ● Record video to exhibit	Camera Adobe Premiere Pro Physical prototype	-	5
Final Delivery Report	12th June	Document ● Document project and outcomes ● Note individual project and explorations	Google Docs	-	15
		Collaborate and Collate ● Combine discoveries and knowledge gained with the team ● Identify challenges and gaps	Google Docs Zoom	-	8

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