Plastic or Planet?

Drowning in plastic: Mobile communication for action against plastic pollution

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Abstract

Plastic pollution in oceans and freshwater sources is now considered one of the most significant environmental threats facing aquatic plants, animals, and humans globally. This research project aims to design a mobile application prototype to investigate the possibilities of technology to potentially communicate ideas in order to raise awareness. Experience design plays an increasingly substantial role in human-computer interaction. The project investigates human actions by providing gamification tasks, and it studies user feedback through a step-by-step building process. The research project studies the interface design and user experience design methods before designing Low-fidelity prototypes (Paper prototypes) and High-fidelity prototypes (Digital prototypes) to create an application design along with a step-by-step user feedback process. The project further studies the potential of a mobile application to identify, observe, and convey this issue with narrative gamification methods. It examines the behaviour impact through user feedback to help prevent plastic from affecting the planet.

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I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the Acknowledgements), nor material which, to a substantial extent, has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

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Introduction

Plastic is all around us. It is hard to imagine going to the beach and not finding a single piece of washed-up plastic waste as we walk along our shorelines.[1] My anguish and heartbreak as it relates to this situation drives the research project presented in this exegesis. My inquiry into this issue has made me acutely aware of the high volume of human-made materials strewn through our daily lives. Once I looked harder at the world around us, I found it impossible not to see the wrappers, containers, bags, and other detritus everywhere. One of the main aims of this project has been to discover ways to apply design methods that employ accessible technologies to communicate the impact of plastic on our world.

Plastic is reasonably new in terms of our historical timeline. The game Billiards became popular in the late 19th century. This popularity led to mass culling of elephants for the ivory used in the billiard balls. People would harvest the elephant's tusks to make high-quality billiard balls. To end this practice, John Wesley Hyatt looked for a solution, experimenting with various solvents to replicate the ivory. After six years of work, he stumbled upon something that would transform the world as we know it. The result, celluloid, became the first industrial plastic. At the time, this invention was a solution to many conservational and industrial problems. This invention also highlighted an opportunity for new business models.[2] In the current context of 2022, the high consumption levels of these chemical compounds are leading to be one of the many environmental threats to our planet's fragile ecology.

The impact of plastic on our planet is undeniable, particularly the amount of microplastic materials that now contribute to a sustained poisoning of our oceans. In the documentary, *A Plastic Ocean* (2016), Craig Leeson, award-winning journalist, filmmaker, television presenter and public speaker, said, "There is no floating island of plastic. What exists is far more insidious. What exists is a kind of plastic smog. These tiny pieces of plastic floating on the ocean's surface come from larger pieces. Over time, the sun's ultraviolet light, ocean wave action, and salt break it into smaller pieces called microplastics. Microplastics have rough, pitted surfaces. Waterborne chemicals from industry and agriculture stick to microplastics, making them toxic poison pills."[3]

Below are some thoughts I distilled from my reflective journal after watching *A Plastic Ocean*. From time to time, through the exegesis, I weave these thoughts through the document to identify milestone moments during the research timeline.

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[1] Diego Gonzaga, "Every single piece of plastic ever made still exists. Here's the story," *Greenpeace International* (6 January 2017). https://www.greenpeace.org/international/story/7281/every-single-piece-of-plastic-ever-made-still-exists-heres-the-story.

[2] Libby Peake, "Plastic was invented to save the environment, so beware of the next solution," *Green Alliance* (10 September, 2018). https://greenallianceblog.org.uk/2018/09/10/plastic-was-invented-to-save-the-environment-so-beware-of-the-next-solution.

[3] *A Plastic Ocean*, directed by Craig Leeson (Brainstorm Media, 2016), Netflix.

After seeing this film, I became invested in how I might contribute in my small way, actions towards saving the planet from the plastic pollution problem through creative design – and engagement with user feedback. With this research, I wanted to create something that would communicate the issue in a way that encouraged others to make positive contributions through accessible technologies – and then this might lead to personal lifestyle choices. I hoped my actions would inform and inspire others to engage in the bigger picture – In the app design, I want them to think about how to keep our beautiful planet alive.[4]

Figure 1: Hemangi Sharma, Documenting plastic container stuck in a plant, Auckland, New Zealand, 03 November 2021.

After identifying the key aims of the research, I turned to explore the potential of UX Design to negotiate my way through the project. UX Design methods support the designer-researcher in producing creative solutions that consider users' perspectives while maintaining the integrity of the project's aims. *Plastic or planet*[5] aimed to design a mobile application that showcases the severity of the problem. At the same time, it supports users with opportunities to do something about it. The research project applies User Experience tools and methods to provide users with the agency to take action to help solve this social-environmental problem that affects the world. The mobile application is information and task-driven. It involves user feedback and gamification techniques to provide agency to gain pride (kudos) in their task chart by reaching new heights in their scorecards as everyone does their part to save the planet from plastic.

[4] Hemangi Sharma Reflective Journal
[5] Name of the app prototype created during this research

Mobile and web applications are seeing a rise in use of gamification as a building user experience method. In the article, Climate change gamification: A literature review, the authors studied to find out to what extent gamification is successful in engaging individuals with climate change? They conclude by saying their method-based findings conclude gamification is an effective tool to enable behavioral change, engage in learning and collaborate with diverse targeted stakeholders.[6]

Plastic or Planet, positions its research question by asking: how might mobile app design, applying UX methods, lensed through a specific social issue (by means of methods such as urban pollution mapping and documentation), communicate and encourage collective action on plastic pollution? The project is a proof-of-concept proposal for the development of a mobile application that effectively communicates the plastic pollution issue. An aim of the project is to provide opportunities for users to engage positively with the problem through enhanced awareness and directed personal actions. The project further asks how haptic and distinct narrative qualities of gamification of a social topic make this aspect of climate action more present in users' consciousness.

The research presents a range of contextual and critical investigations that have influenced the direction of the creative project and outcomes of this practice-based study. The exegesis is organised across three chapters and ends with the conclusion.

Chapter One presents a range of contexts related to the issues around plastic pollution, provides an overview of the influence and importance of gamification in this research and contextually reviews other social impact/change app technology solutions. To serve the purpose of the project it has been essential to understand the different aspects of plastic pollution to get a clearer personal view of the problem. The first part of this chapter provides an overview of the issues and contexts that have informed the research project related to this particular social change problem of plastic pollution.

The chapter further discusses the influence of gamification in mobile applications and how it affects user behaviour and motivates the person using the app to engage better. The study of gamification impact was essential to bringing in the positive force this project needed for users to see an opportunity to act towards this ecological problem. This section further studies some of the existing applications focused on social change to understand how the current apps function with features, and it uses researched methods and tools to bring a focus-driven change through creative design.

By understanding the source of this environmental problem and studying different applications that support innovative solutions to solve social issues in other apps that include gamification features, I now have a solid foundation of knowledge to create a strategy for the app design prototype. The features addressed in the existing apps will contribute in an outstanding way to this project. The information in the contextual studies will allow me to create the mobile

[6] Rajanen, Dorina, and Mikko Rajanen. "Climate change gamification: A literature review." *GamiFIN* (2019): 253-264.

application prototype to provide users with the correct information and agency that will help bring about the change. Conducting a critical evaluation of this informative pool of contexts has helped me create a basic framework for my research.

Chapter Two presents the range of methods I selected to negotiate the research question and respond to the aims of the project. I critique a series of methods before selecting and describing the methods that I identified as appropriate for this research project. It is a Practice-led research project that harnesses UX Design methods to establish a methodological framework to address the research question and fulfil the project's aims. In addition to this framework, the project involved reflective journaling (written and Instagram). In the process of contemplating and applying my own belief systems, I interrogated the methods and the ensuing practice that emerged during the research journey.

Chapter Three: Documentation of Practice demonstrates these methods as mentioned above, in action, presenting the iterative processes of producing a paper prototype through to developing a proof-of-concept digital prototype, applying UX methods. This pipeline through the production of the artefact evolved alongside collecting user feedback through card sorting and focus group sessions, which informed the decisions made during critiquing and then refining the prototype.[7] The chapter then covers walking, framed as a contemplative collecting method, where I, the researcher, photographically documented plastic pollution in my local vicinity as a way of visualising, sensing, and recording the problem. I started walking as a method to experience the reality of the ecological problem in the real world. As a way of journaling my excursions, I set up an Instagram account (@plasticorplanet) and started sharing the photographs of plastics I encountered on my walks.[8] The DoP chapter further discusses my reflections and emotions as I made design decisions during the project's development. As a pleasant surprise, the Instagram account also connected me with other users concerned about the topic or made them more aware of it by engaging with my images.

In the conclusion, I discuss the hunches that drove the original idea and reflect upon the research outcome in relation to how the project transformed over the thesis timeline. I discuss the learning that emerged from the making and the shifts in my thinking that evolved as I travelled through the proof-of-concept development. I include, in this discussion, how engaging with the complex subject matter of plastic pollution and the process of conducting this research I changed as a designer, a researcher, and a person. In addition, I also speculate on the future potential of the research project and the transferability of the methods.

[7] The involvement of users, for feedback, required Ethics approval from the Auckland University of Technology Ethics Committee on 28 October 2021, AUTEC Reference number 21/311

[8] Plastic or Planet (@plasticorplanet), "Documenting plastic on planet" Instagram photo, November 21, 2021, https://www.instagram.com/p/CWhDGZ4v2nC/.

Contextual Review

"From knowing comes caring, from caring comes change."[9]

> *One day, while I was scrolling through Instagram, my fingers ran across the posts and paused to see particular ones that caught my attention. Moving further down the posts, my fingers stopped at one specific video. The movie showed an incomprehensible amount of plastic discovered inside a dead albatross's stomach. The poor bird had choked to starvation because of the celluloid in its body. I took a deep breath as I paused at the post, awakening to the reality of the current environmental situation showcased in the video. I could not help but wonder, "Are we choosing plastic over our planet.*[10]

If we imagine an Earth without oceans, we would have a planet that looks and feels a lot like (uninhabitable) Mars. Most of the oxygen we and other fauna breathe generates from the oceans. Our vast seas, alongside the forests, absorb the majority of carbon dioxide from our atmosphere to create the balance required to sustain life on our planet. Our ecosystem cannot operate without a healthy ocean. The more eco-diverse it is, the cleaner it is, the more we respect its value, the better it does its job to support life on our planet. In a way, we all are sea creatures. The whales, dolphins, and coral reefs need the ocean, as do humans.[11] Many ecologists and environmentalists have worked with designers to develop mobile applications to visually communicate a range of eco-emergency issues (digital activism) to engage people with the current threats to our planet.

Interactive design is present in our daily lives. As technology has become ever more portable and ubiquitous, the use of visual communication to create interactive user-driven experiences is a lot about designing impactful applications, which connect with audiences that are sophisticated in their relationships by communicating (the message) through technological interfaces.[12] This research project has developed a design prototype with this in mind. The aim has been to develop a potential user feedback loop in the app, to hopefully inform, connect, and shape positive social change around this ecological problem. In order to create this design framework, it was essential to gain some background information around using Gamification as a positive influence. This involved studying applications focusing on social change problems to answer certain questions regarding which features should be a part of this project.

This contextual review provides an overview of the issues and contexts that have informed the *Plastic or Planet* research project. The chapter is structured to communicate three critical contexts that have built a platform for the project to test the design choices made during its development. The first section, Plastic around us, highlights the sources, effects, and scale of plastic pollution on Earth's oceans. Section Two, Influence of Gamification, discusses the potential for Gamification to influence user engagement with mobile applications to communicate the central topic for this project and positively encourage individual choices to

[9] *A Plastic Ocean*, directed by Craig Leeson (Brainstorm Media, 2016), Netflix.
[10] Hemangi Sharma Reflective Journal
[11] *Mission Blue*, directed by Robert Nixon and Fisher Stevens, performed by Sylvia Earle (Netflix, 2014), Netflix.
[12]Michael Salmond and Gavin Ambrose, *The Fundamentals of Interactive Design (*Bloomsbury Publishing, 2013), 200.

help reflect on their daily behaviour and habits. The final section, Social problem-focused apps, presents best practice examples relating to a range of mobile applications engaged with social change.

Plastic Planet

Plastic pollution is a large-scale problem. Plastic has found its home in places humans cannot even reach, such as the deep ocean bed. Even if you do not eat seafood, plastic can find its way to you through drinking out of plastic bottles, eating food wrapped in plastic, or tiny plastic particles floating in the air, which then land on our food. There is plastic in us humans as well. Our planet is so saturated with plastic that it seems almost inevitable that it will reach our food chain somehow.[13]

Figure 2: Hemangi Sharma, Documenting plastic on the street waiting for the bus, Auckland, New Zealand, 15 November 2021.

Documentaries (such as *Our Planet* (2019), *Life in Colour* (2021), *Night on Earth* (2020)) were my primary sources to gain a better understanding of Earth's ecosystem. I was interested in how the Earth functioned and how plastic entering the ecosystem impacted its ability to sustain

[13] Gaby Hinsliff, "Even our own bodies now contain plastic waste. It's time to get drastic," *The Guardian*, (23 October 2018), https://www.theguardian.com/commentisfree/2018/oct/23/humans-contain-plastic-waste-drastic-banning-straws

life. Despite the human impact on the planet, it still provides us with the systems that support our life on it. These documentaries explain that the current impacts of a range of human actions will at some point render the ecology of our planet non-sustainable for life. This time we are living in is called the *Anthropocene.* Some apply this term in the global change research community to represent the quantitative shift in the relationship between humans and the environment. The term suggests that global-scale human actions affecting the environment on our planet are why the planet is moving out of its current geological epoch.[14]

The human brain is always conflicting between right and wrong. It tends to stay on a negative bias until and unless reminded frequently of what the positive side looks like. People need reassurance to make it more real and believable that a better future is possible and can be achieved; a positive picture needs to be painted and reminded that it indeed is possible.[15] Mainstream awareness now exists regarding the problems of climate emergencies and the impact of toxic materials, such as plastic, on our planet. A multitude of approaches and new ideas exist that will help create solutions for these problems. Still, it is a vastly complex situation. This research project aims to further enhance our awareness about the issue and, more importantly, help us find ways to reflect on our actions in tangible everyday ways. The framing of the Anthropocene suggests that human activities have a significant impact, enough to drive the planet into a new geological epoch. Our day-to-day activities alter the climate, carbon cycle, nitrogen, phosphorus, and sulphur, the fundamental aspects of life on Earth. The growth of humans could be projecting a change in the functioning of the Earth system that will result in the geological period switch.[16]

"The human enterprise switched gears after World War II. Although the imprint of human activity on the global environment was, by the mid-twentieth century, clearly discernible beyond the pattern of Holocene variability in several important ways, the rate at which that imprint was growing increased sharply at mid-century. The change was so dramatic that the 1945 to 2000+ period has been called the Great Acceleration."[17]

To understand the shift in the planet's system, I started from the beginning, that is, to understand how the Earth thrives and breathes and the fundamentals of its existence through viewing documentaries.

The aforementioned documentaries use highly rendered visual effects and filming across diverse locations in different parts of the planet to represent our changing ecology. Viewing these works helped me grasp the concept about our planet and what it looks like – and what it might look like if we do not take some preventative measures. The films I surveyed were: *Our Planet* (2019), *Life in Colour* (2021), *Night on Earth* (2020), *A Life on our Planet* (2020),

[14] Steffen, Will, Jacques Grinevald, Paul Crutzen, and John McNeill. "The Anthropocene: conceptual and historical perspectives." Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences 369, no. 1938 (2011): 842-867.
[15] Marianne, Elliott and Jess, Berentson-Shaw. "How to Talk About Climate Change: A Short Guide" (2019).
[16] Ibid.
[17] Ibid.

Animal (2021), *Tiny Creatures* (2020), *My Octopus Teacher* (2020), *Puff Wonders of the Reef* (2021), *Seaspiracy* (2021), *Chasing Coral* (2017), *Mission Blue* (2014) and *A Plastic Ocean* (2016). Viewing these works established the building blocks of my understanding of our complex and beautiful planet and how we are not taking care of it. The Earth is teeming with creatures that eke out survival in all the diverse parts of the globe. I remember getting lost in the calmness of the vast ocean while watching *Mission Blue* for the first time. Listening to Sylvia Earle talk about her life and how deeply she cares about the ocean painted a powerful picture of life in the deep blue sea.[18] At the same time, it was mesmerising listening to David Attenborough narrating *A Life On Our Planet* as Attenborough walked viewers through the existence of different creatures in different environments and how all of this diverse complexity evolved over time.[19]

> *For me, it was listening to someone's story and hearing them talk about the planet with so much passion, empathy and experience that made the world lively and feel so real. Meanwhile, 'A Plastic Ocean' was a documentary that made me think deeply about the wonders of the planet and the struggles affecting its survival. I have always been fascinated with marine life and how peaceful the underwater feels. I could feel the calm when I started watching the documentary – A Plastic Ocean, where the environmentalist and film director, Craig Leeson, is in the Indian Ocean trying to get a closer look at the blue whales. As the camera went down in the waters, it captured today's ocean's reality. The revelation revealed that the water body had more than marine life within its realms. It was a Plastic Ocean. Everywhere the camera went to study for marine life, the plastic followed. Watching what many consider the most peaceful place to turn into a plastic waste hub was heart-breaking.*[20]

Plastic lasts for a very long time. Every single piece of plastic made still exists and will continue to exist for many, many years to come.[21] More than half of the produced plastic is comprised of single-use items, for example, shopping bags, cups, and straws. Every year, at least eight million tons of plastic ends up in our oceans; 80% of all marine waste is plastic debris floating on the surface and distilling to deep-sea levels and everywhere in between. This scenario profoundly threatens marine species. In the documentary, *A Plastic Ocean*, talking about a video of Bryde's whale taking its final breaths onshore, Tanya Streeter said, "It is dying, taking its final breaths. It was found to have six square meters of plastic sheeting inside it. It could not eat, and it died of malnourishment. Its digestive system was blocked, and it died a terrible painful death."[22] Marine creatures are in danger as they mistake plastic waste for prey, and many, if not most, can die of starvation as their stomachs fill up with plastic debris. *I found this unbelievable and shocking to even think about. It made me want to scream!*

[18] *Mission Blue*, directed by Robert Nixon and Fisher Stevens, performed by Sylvia Earle (Netflix, 2014), Netflix.
[19] *David Attenborough: A Life on Our Planet*, directed by Alastair Fothergill, Jonathan Hughes and Keith Scholey (Altitude Film Entertainment, Netflix and Silverback Films, 2020), Netflix.
[20] Hemangi Sharma Reflective Journal
[21] *WWF-Australia*, "The lifecycle of plastics," WWF-Australia Newsroom, (02 Jul 2021), https://www.wwf.org.au/news/blogs/the-lifecycle-of-plastics.
[22] *A Plastic Ocean*, directed by Craig Leeson (Brainstorm Media, 2016), Netflix.

Figure 3: The Guardian, More than 14m tones of plastic believed to be at the bottom of the ocean, Graham Readfearn, 05 October 2020.[23]

About eight million tons of plastic are dumped in the ocean every year. More than 50% of this plastic debris sinks to the bottom of the water body. There is nowhere in the world where you cannot see the impact of plastic. This toxic material does not spare even the very depths of the ocean. Sunlight, water waves, and salt break down plastic bodies into microplastics. Since the plastic does not break down, it breaks up, making it more accessible, entering the marine food chain. If these microplastics are in their food chain, they eventually make their way to ours. Plastic in any creature leads it to starvation as it chokes them, leaving no room for food. The chemicals in microplastic find their way to the marine creature's muscle and fat – the part humans of the animal humans predominantly consume.[24] Plastic is everywhere. This problem is almost beyond comprehension. The position of the research project is that we must find ways and raise awareness to encourage everyone everywhere to reflect on their daily habits surrounding plastic, or by 2050, there will be more plastic in the ocean than sea creatures and fish.

[23] Graham Readfearn, "More than 14m tonnes of plastic believed to be at the bottom of the ocean: Thirty times more plastic on ocean floor than surface, analysis suggests, but more trapped on land than sea," The Guardian (5 October 2020), https://www.theguardian.com/environment/2020/oct/06/more-than-14m-tonnes-of-plastic-believed-to-be-at-the-bottom-of-the-ocean.

[24] Ibid.

It can take just one awakening moment to see things for what they are. A Plastic Ocean was the documentary that brought me as a viewer closer to the problem's reality and magnitude. The documentary made me look at things from different perspectives and drove me to do this research project. I needed to do something about the problem. Watching this was emotional. It made me think about how I feel about the environment. It made me question everything. As I looked harder at the world, I noticed I was trapped in the plastic cycle as a user of these products, the objects I used around me, the groceries I purchased, the food I consumed and the choices I made every day. I was a part of the problem without realising it.[25]

My initial hunch was to find a way to communicate this problem through designing an interactive mobile application. This involved engaging with the user via the app with easy and accurate information while providing helpful suggestions and actions they might take to change their habits. Initially, I looked at gamification strategies as a starting point to develop the mobile application prototype as a potentially effective change agent using readily available technologies.

Influence of Gamification

During recent years "gamification" has gained significant attention. Gamification is a process of enhancing a service with affordances for gameful experiences to support users' overall value creation.[26] *Gamification* is a design strategy that motivates users or target audiences to keep participating, which helps generate long-term engagement. These days, software applications and online communities utilise the gamification concept as a core context to maintain user relationships. The use of Gamification in health and fitness apps has become prevalent, as evidenced by the number of apps found in the Apple App Store with at least some components of Gamification.[27] Gamification is about providing agency to the people who want to take action. Agency is a term that refers to an individual, an organisation, network, or a community that can enact a process that drives change – either in the context of an individual who effects change within a community or a group that collectively does the same.[28]

To better understand the gamification feature, I researched apps focusing on plastic pollution problems (such as, *Recycle Coach, My Little Plastic Footprint, Plastic Bank*). My initial aim to study these apps was to get a better context of the existing apps focused on this social problem. As I studied these 25 apps focused on the plastic pollution problem that provided creative solutions in various logical ways, I noticed how the inclusion of Gamification appeared in different ways while I was comparing the apps.

These apps use a range of innovative features across a wide range of diverse solutions for the one problem - plastic pollution; however, they were targeted differently in different parts of

[25] Hemangi Sharma Reflective Journal
[26] Huotari, Kai, and Juho Hamari. "Defining gamification: a service marketing perspective." In Proceeding of the 16th international academic MindTrek conference, pp. 17-22. 2012.
[27] Lister, Cameron, Joshua H. West, Ben Cannon, Tyler Sax, and David Brodegard. "Just a fad? Gamification in health and fitness apps." *JMIR serious games* 2, no. 2 (2014): e3413.
[28] Ling, Christopher and Dale, Ann. (2013). Agency and social capital: Characteristics and dynamics. Community Development Journal. doi:49.10.1093/cdj/bss069.

the planet. The apps I surveyed include: *Recycle Coach, My Little Plastic Footprint, Plastic Bank, Plastic Identification Codes, Smart Plastic Recycling, PlastiCycle: Plastic Recycling, MyPlasticDiary: Reduce Your Plastic Footprint, Heave, Act Now Environment app to fight plastic pollution, Plastic Free Ocean Network, Hydria, AYACUP: Reuse – Return – Stop single-use plastic, Cleanwave, Ocean Heroes: Make Ocean Plastic Free, Plastic-Free-Earth, Plastic-Free-Earth, Think Plastic, Plastic Diet, Zero Waste: Plastic Bottle Ocean Cleanup, Plastic Hero, PlasticMukt, OceanHero, Clean Swell, The Ocean Cleanup Survey app* and *Ocean Heroes Network.* While learning about the features and design aspects of how these apps have been planned and constructed around the problem, I understood the various ways to present solutions to help solve this ecological problem. From a user point of view, I was also reflecting on what could have been in the apps that would make it easier to use and more complete to achieve the purpose.

One such application I came across is Clean Swell, a mobile application with 10,000+ installs. It is an application focused on social change working towards plastic pollution in the ocean. It allows users to clear plastic from beaches, underwater, or on a watercraft. The users can enter the details of the kind of plastic they collected and get rewarded with a badge for their positive effort in helping to save the planet.[29] Rewarding users with badges and reminding them about their importance and contribution by tracking the growth is a fantastic Gamification motivational technique used by the Clean Swell app team.

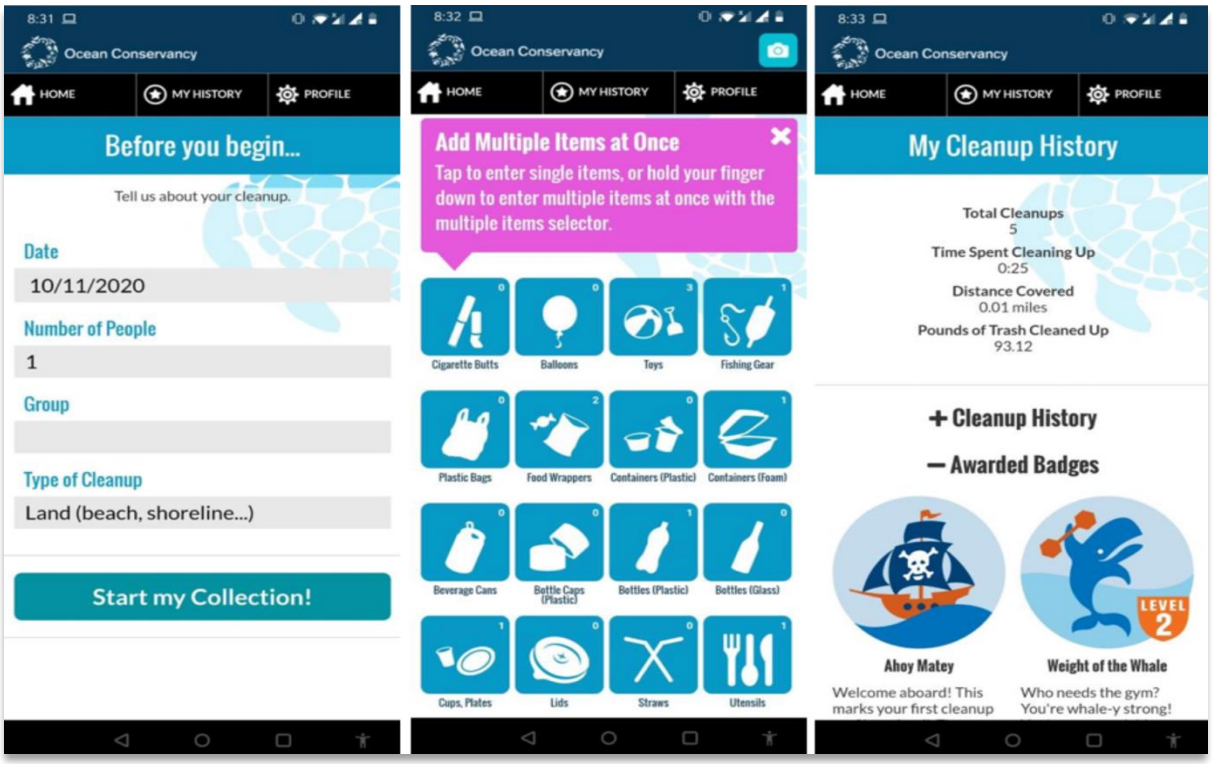

Figure 4: Clean Swell, Ocean Conservancy, Screenshot Collage of the Mobile Application, 12 October 2020.

[29] Ocean Conservancy. "Clean Sell." Apple App Store, Version 1.8.12 (25 November 2021). https://apps.apple.com/nz/app/clean-swell/id985692119.

OceanHero is another mobile application I investigated during this contextual study. This browser-based mobile application with 10,000+ installations offers a positive solution to the ocean's plastic problem. It is a search engine like any other search engine. Users recover one plastic bottle for every five clicks, so there is one less for the ocean. The application revolves around the concept of letting users browse and contribute on their behalf. This application also uses Gamification to track the number of bottles one saves and level them up each time they do a good deed. The people behind this concept get paid by advertisers for every user click. This amount is used to collect ocean-bound plastic.[30] Users only need to change their search engine and see the ocean cleaning up, all on their own. So these days, it is clear that if used positively, social media and the internet have more power than ever before and can make the shift from impossible to possible.

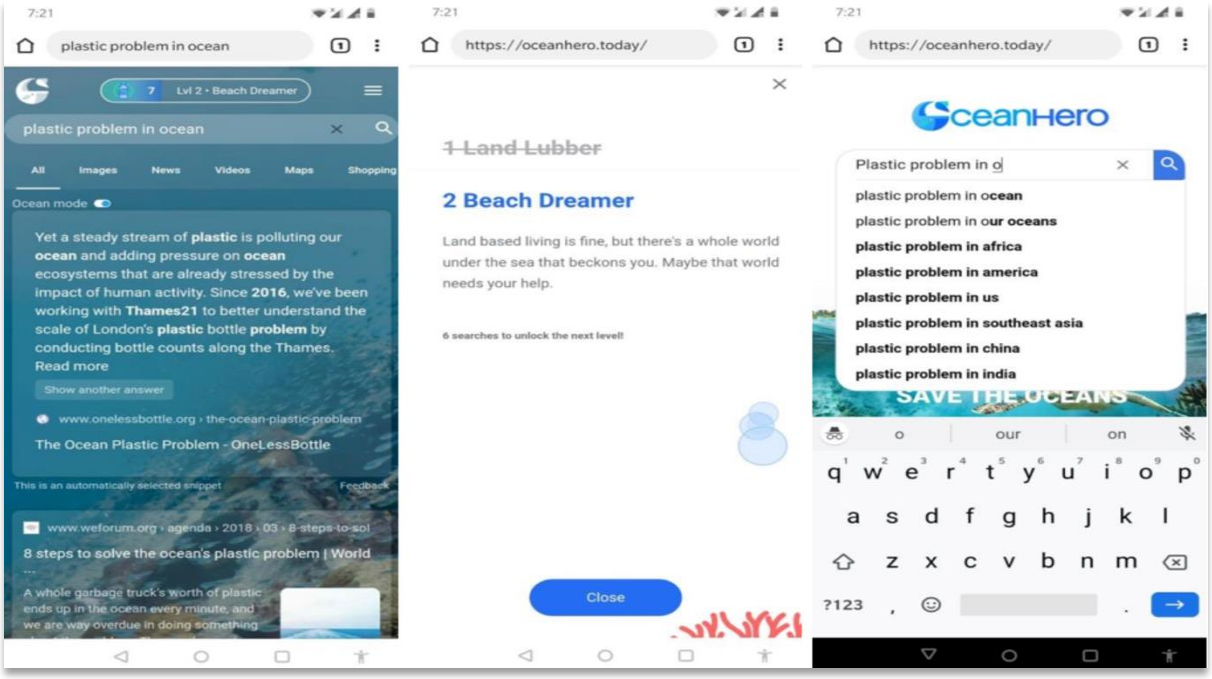

Figure 5: Ocean Hero, OceanHero GmbH, Screenshot Collage of the Mobile Application, 12 October 2020.

Closca Water's mobile application is another excellent example of Gamification influencing change for the good. Focused on individual contributions, it generates a substantial overall impact. The application shows a current location-based map and allows users to look for a refilling fountain nearby without buying plastic water bottles. It even allows them to add a fountain if they see one so others can be aware of it. They get rewarded as one walks towards the fountain and refills their bottle. The awarded amount can buy products from Closca, plus the added saving on purchasing a water bottle is a bonus point for the users and the environment.[31] This application uses the gamification concept by allowing users to use their

30 OceanHero GmbH. "OceanHero browser." Apple App Store, Version 1.1.1 (25 November 2021). https://apps.apple.com/nz/app/oceanhero-browser/id1536398518.
31 Closca Design, Sociedad Limitada. "Closca Water-Refill everywhere." Apple App Store, Version 1.14 (16 December 2021). https://apps.apple.com/nz/app/closca-water-refill-everywhere/id1455330949.

rewards like cash and tracks their impact on saving the planet. Every time someone refills their bottle, it is one less plastic bottle trapped in some marine creature.

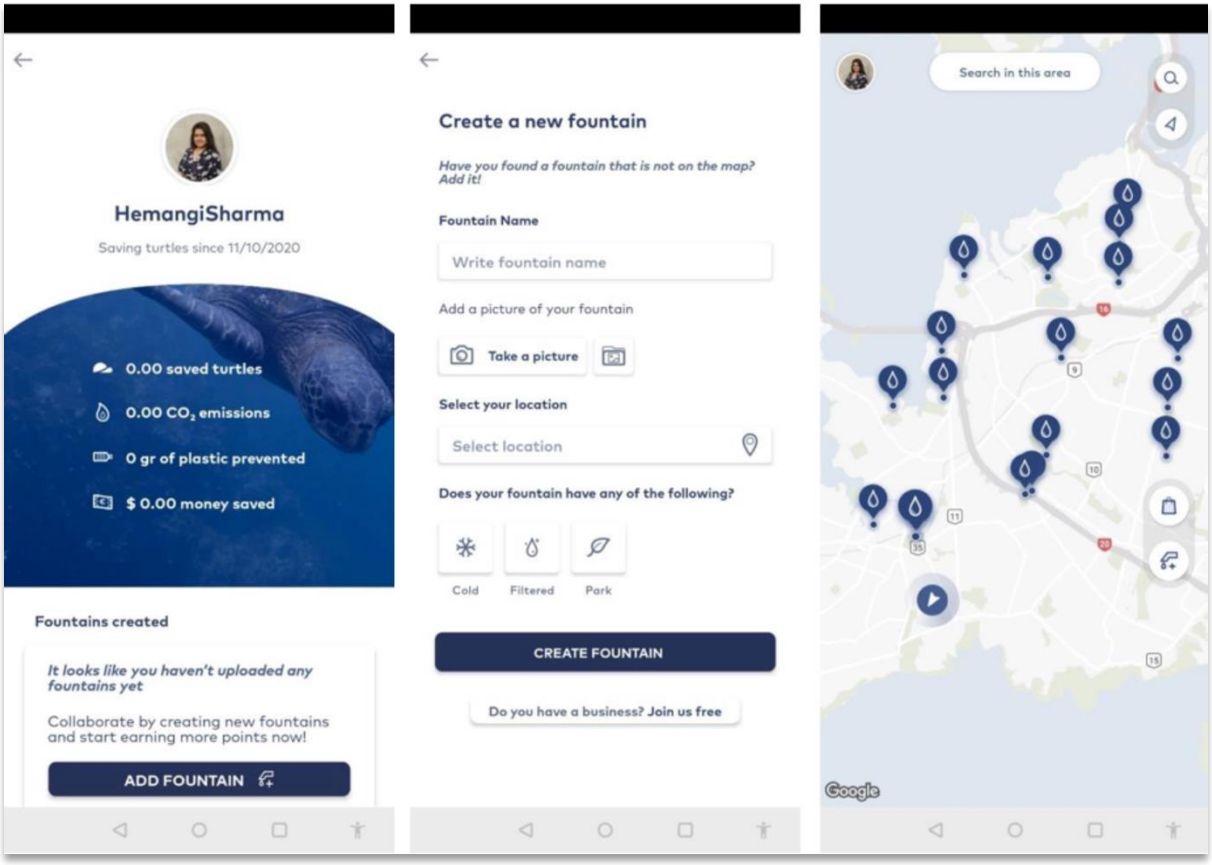

Figure 6: Closca Water-Refill, Closca Design, Sociedad Limitada, Screenshot Collage of the Mobile Application, 12 October 2020.

Investigating Gamification and its presence in existing apps painted a picture to use this technique as a creative design method with logical user-based frames to personalise it. From my research reviewing apps with this attribute, Gamification is one of those features that can build habits, keep users engaged, and keep them coming back to the app for more positive enforcement aimed toward helping to solve a severe environmental crisis. In this research, I will be using gamification techniques to create the app, including narrative and visual communication, to reach a broader audience to study user response and feedback by providing users with the agency to shift their day-to-day habits in favour of the planet.

> *It is a fun activity for me to explore these applications. This part of the study did not make me feel depressed about the problem I was addressing through my research. So I spent quite a reasonable amount of time going from one mobile application to another to get a better sense of what different mobile applications look like, what different ways they use to present a similar feature and what design aspects they ideally stick to in order to understand the common grounds within the apps and the differences at the same time. For the first time until this point in my study, I felt happy. It was exciting to plan and get on board to create a solution to this massive problem in the form of a beautiful design prototype.*[32]

[32] Hemangi Sharma Reflective Journal

APPs and Features

As keen as I was to learn about Gamification in existing apps focusing on plastic pollution, I also wanted to explore other active social applications to hopefully come across some exciting features that I could study before creating the base I wanted to include in my project.

I studied different mobile applications focusing on different concepts (such as *eGood, Feedie, One Today*) to study their features, contextual relevance, and overall user-oriented efficacy during this part of the contextual study. To gain a better understanding of the different features in mobile applications and the way they function to achieve the overall purpose of the application, I surveyed: *eGood, Feedie, One Today, Share The Meal, GoodGuide, We365, Forward, MaximusLife, Charity Miles, Fotition, Horyou, Scanner* and *WE Day*. I studied these applications as a user trying to understand the importance of each feature and what else the app could offer from the point of view and perspective of a user.

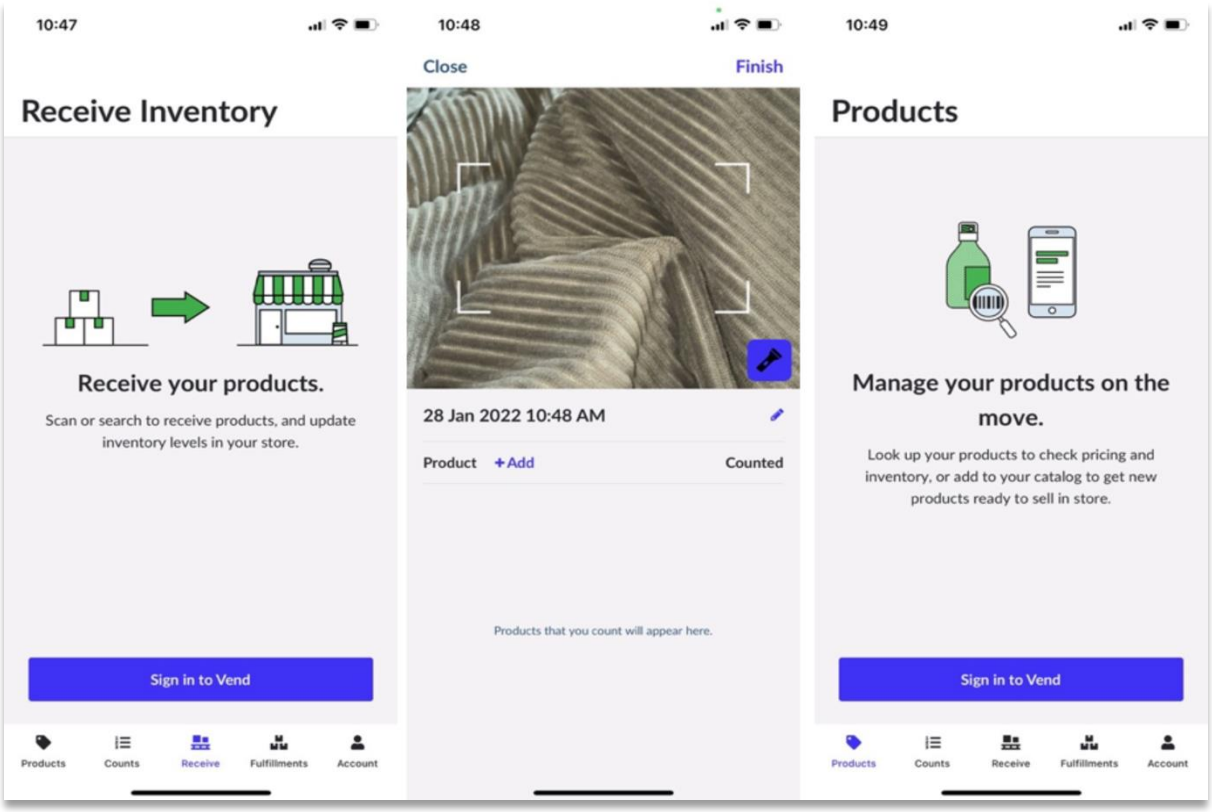

Figure 7: Scanner by Vend, Vend Limited, Screenshot Collage of the Mobile Application, 12 January 2022.

Scanner, a mobile application that uses your device's built-in camera to scan a barcode, was the first app I reviewed. This barcode scanner comes in handy for a user to stock orders, transfers, returns, stocktakes, and it helps with other possible situations where one needs to create a list of objects. I used the Scanner app to see how it works to create a list of products

using the barcodes.[33] Exploring this application made me wonder if a Scanner can read a barcode and save the data, if there is a database to support this function, it might also be able to present some information about the object scanned. *I thought, how great will it be to have a scanner scan and tell you what type of plastic is present in the object you scanned using its barcode?*

While I was sure to include the scanner feature in my project, I studied Maximuslife, another excellent mobile application promoting fitness and raising donations. Whenever users take a walk, goes for a quick run, gets on with a workout or even drink water, they earn sponsored donations to enter in challenges for good social causes. Gamification creatively allows users to earn rewards and use them for any social cause. The features in this app study that stood out the most include the *My Inspiration* section and *My Feed*. *My Inspiration* was an informative tool with articles promoting good health and its relation to the app's purpose. On the other hand, *My Feed* was a place for users to post their achievements for others to view and get inspired by the active participation of people for their good deeds.[34]

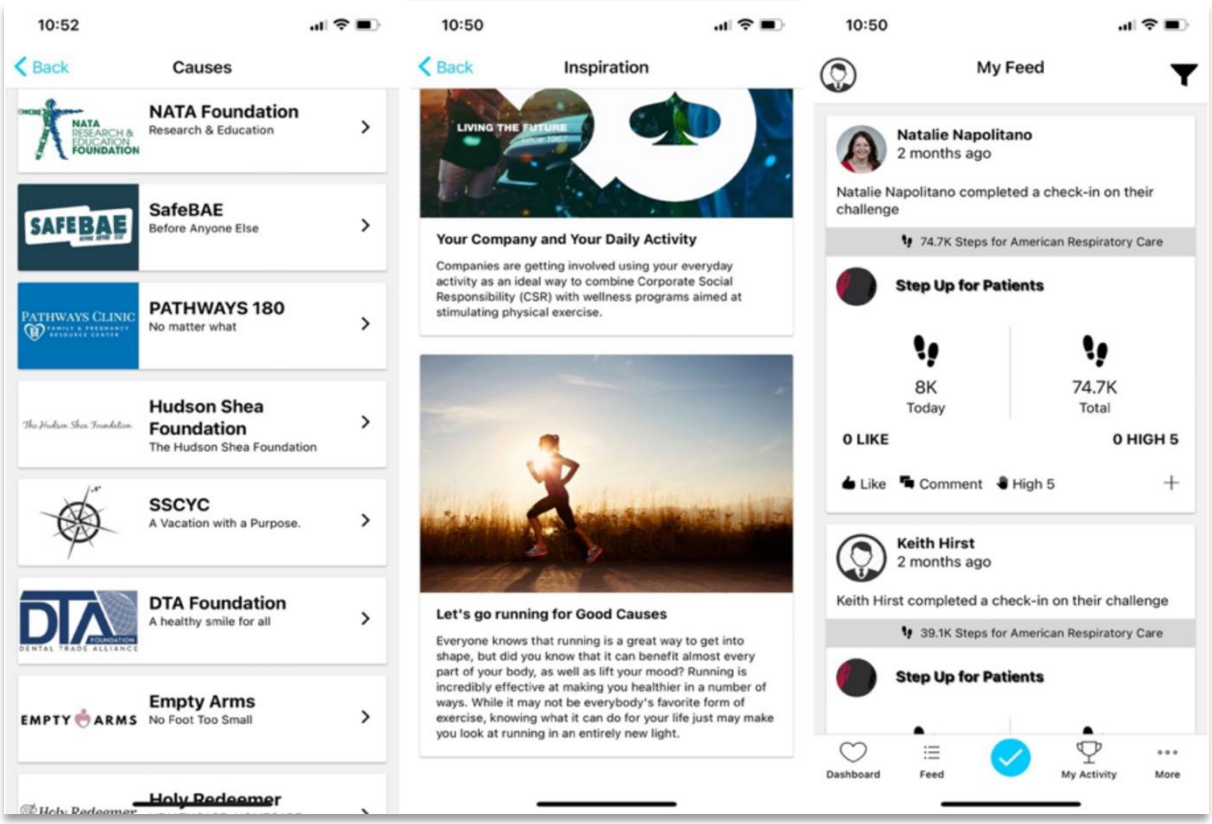

Figure 8: MaximusLife, MaximusLife LLC., Screenshot Collage of the Mobile Application, 22 January 2022.

These two features immediately correlated to certain aspects that were already in my mind as I was trying to figure out how to inform and inspire users through my app. Studying the features

33 VEND LIMITED. "Scanner by Vend." Apple App Store, Version 4.2.4 (18 January 2022). https://apps.apple.com/nz/app/scanner-by-vend/id1100131368.
34 MaximusLife, LLC. "MaximusLife." Apple App Store, Version 3.5.15 (4 December 2021). https://apps.apple.com/nz/app/maximuslife/id1042627073.

of this app made me think about the informative guide to plastic as a feature where users can read about the material, from the start of its existence to its presence and effects to date. I also thought about the inspiration part of the project while exploring this mobile application. Adding a networking space and allowing users to share inspirational thoughts through their acts seemed like a great feature to include in an app that aims to bring in user involvement to shift individuals' current ecological situation and collective efforts.

Reviewing these mobile applications provided information about how to address the issue of plastic pollution by developing innovative features promoting user involvement in a mobile. Studying these applications started the flow of ideas regarding which features to include while generating this project's basic framework.

Addressing Existing Gaps

By investigating my key contexts, studying plastic pollution in-depth and connecting to this worldly problem by creating a mobile application prototype, I found that several technical aspects could be developed and designed with logic and creativity to reach the purpose of this research. While I was looking at different mobile applications, I realised that apps focused on Gamification lacked certain information to create awareness for users, and the apps that were awareness and information-driven could have more ways to encourage users to take action. Furthermore, even though I was keen to know about applications that will bring different types of plastic to light, I could not find an app that focuses on this aspect of the problem. Also, while going through the second set of apps that are not plastic-focused, I came across features that led me to some creative ideas I could build on for this project. These features I found looked like the gaps I was looking to fill by separating the study of plastic focused apps and other social apps. I was keen to include features such as a scanner that can scan product barcodes for plastic information, an informative blog feature and a social networking feature to connect with other users who might have stories to share and ideas to inspire. The contextual study connected the dots required to include users and provide relevant information, making this *Plastic or Planet* project a complete guide for users so they can learn, take action, and inspire others by connecting all these context-driven features.

Conclusion

“No ocean, No life. No ocean, No us.”[35]

There is no "away" where we can put things and expect that they are away. No matter how much humans ignore it, the blue part of the planet is massive in every possible way and needs a little more help to heal back up.[36]

[35] *Mission Blue*, directed by Robert Nixon and Fisher Stevens, performed by Sylvia Earle (Netflix, 2014), Netflix.
[36] *A Plastic Ocean*, directed by Craig Leeson (Brainstorm Media, 2016), Netflix.

The research project highlights several vital contexts, and each context has been investigated and reflected upon in this chapter. Studying the plastic planet has been essential to understand the gravity of the problem and learn important information that will be key to creating the app and fulfilling the purpose of this research. It will be beneficial while designing several aspects and tasks of the mobile application. The influence of Gamification and studying social problem-focused apps became one of the most crucial aspects leading to addressing the gaps. It was a critical study to understand how other mobile applications address the social problems, which features they use to develop creative solutions and the design aspects of making the user experience more accessible. This collaborative evaluation of apps and the informative contexts in this chapter helped create a basic framework for the research design methods required to lead the project's creative process.

> *I could feel the empathy grow within me as I understood the toxicity and hard-to-get-rid nature of this man-made material that we depend on for basic day-to-day activities. The more I noticed and learned, the more it became visible and tangible. It was as if the planet had an invisible blanket of plastic over it all this time that slowly became imperceptibly visible to my informed eyes. I was excited to design a solution for the global threatening problem that is so huge yet invisible. I was surprised by the extreme ends of my emotions as this learning was depressing, but at the same time, it excited me to think about the project I was working on, the creative solutions cooking up in the back of my brain and the change I might be able to achieve if, moving forward, this app executes in the correct terms. However, my thoughts were confused about what I really felt. Although, I was convinced about one thing: to create a user-centred project by studying user feedback and evoking co-ownership, which will result in increased long-term user engagement. Furthermore, hopefully, take a few steps towards the big picture of the act of saving the planet.*[37]

Figure 9: Tampa Bay Times, Dunedin's Sylvia Earle is still on mission to save the oceans, Dr. Sylvia Earle dives in plastic floating at the surface near Cocos Island, Costa Rica, Kip Evans Photography.[38]

[37] Hemangi Sharma Reflective Journal

[38] Jan Larraine Cox, "Dunedin's Sylvia Earle is still on mission to save the oceans," *Tampa Bay Times* (14 January 2021), https://www.tampabay.com/life-culture/2021/01/13/dunedins-sylvia-earle-is-still-on-mission-to-save-the-oceans/.

Research Design

It is estimated that global cell phone penetration has reached 6.4 billion, based on worldwide smartphone subscription data. Currently, the global population is around 7.9 billion.[39]

The initial few cases of Covid-19 reported in December 2019 led to a pandemic with a series of lockdowns worldwide. Access to digital devices and technology was rising more than ever in these uncertain times. The need to focus on individual efforts to solve a social problem was much more significant than a collective in-person collaboration considering the involvement of viruses and variants. These days, even though we rely on technology in our everyday lives, it also affects our behaviour based on the content we consume while scrolling through our devices.[40] As a digital designer and researcher, in practice, I aim to build an app that harnesses technology to cope positively with our challenges. The positioning of the research focuses on designing a prototype app that allows users to engage positively with the plastic pollution problem through enhanced awareness and directed personal actions.

Figure 10: Hemangi Sharma, Documenting plastic on side walk, Covid impact adding plastic rubbish in form of disposable masks, Auckland, New Zealand, 03 December 2021.

[39] S. O'Dea, "Smartphone penetration worldwide 2020," (Dec 16, 2021) Accessed 18 January 2022. https://www.statista.com/statistics/203734/global-smartphone-penetration-per-capita-since-2005/.
[40] Garfin, Dana Rose. "Technology as a coping tool during the COVID-19 pandemic: Implications and recommendations." *Stress and Health* (2020).

A common means of framing these types of social action projects (particularly in design for health contexts) is applying a double diamond methodology suited to the project.[41] However, Plastic Planet was also interested in the interface between the researchers own social awakening to the issue and potential communication to users as a part of that awakening (more of a conversation across the maker and the user). Therefore, the project drew upon UX methods often found in DD approaches, and integrated these with more subjective autoethnographic approaches of thinking and making.

This research utilises a mixed-methods approach combining Design Thinking with Practice-led research to design a mobile application. My project is a proof of concept for an application that positively influences human behaviour through user experience and gamification. Gamification in this context means motivating app users to keep participating and maintain healthy long-term user relationships that can be part of the globally required shift to build positive everyday habits around these invasive materials.

"Up-front user research can benefit both new and existing apps, shedding light on prospective users' context of use, perceptions, pain points, language, and customs. Using this foundation, you can make informed decisions throughout the product development process. Moreover, research can reveal new app opportunities and inspire innovative solutions."[42]

A Mixed Methods Approach

Combining two methodological approaches enabled me to focus on prototyping the application design. Prototyping is a critical aspect of service design as it allows design testing with user feedback and requires design decisions to be verified prior to full-scale production. As this research assembles on the prototyping stage of production, I chose to combine Design Thinking with Practice-led research.

Design Thinking (DT) provides a solution-based approach to solving problems. As a design process, it is instrumental in tackling complex problems that are ill-defined or unknown. DT enables the designer to understand the human needs underpinning a service design project. Using DT, one can reframe problems using human-centric strategies, for example, brainstorming sessions that throw up multiple ideas reflecting the group's needs. The methods DT promotes [are] hands-on approaches to prototyping and testing.[43] At the same time, Practice-led research is a methodology that emphasises the advancement of knowledge about or within a practice. Joe Sharlip suggests, *"Such research includes practice as an integral part of its method and often falls within the general area of action research."*[44] Having a Practice-led methodology underpinning my research means the techniques I have used to investigate

[41] West, J., G. Meldaikyte, and E. Raby. "Developing the Double Diamond Process for Implementation-insights from a decade of Inclusive Design projects." *Seemann K and Barron D.(Eds.)*(2017): 308-310.
[42] Ginsburg, Suzanne. *Designing the iPhone user experience: a user-centered approach to sketching and prototyping iPhone apps*. Pearson Education, 2010.
[43] Sharlip, Joe. 2019. *Applying the Design Thinking Process in Qualitative Research.* January 8. https://www.qrca.org/blogpost/1488356/315846/Applying-the-Design-Thinking-Process-in-Qualitative-Research.
[44] Candy, Linda. "Practice based research: A guide." *CCS report* 1, no. 2 (2006).

the question have emphasised practical rather than theoretical methods. Practice-led research impacted my decision-making skills by allowing me to incorporate my creative practices into the research. It has been foundational in allowing me to look at the issue of plastic pollution in our streams, rivers, waterways, and oceans and understand different ways to learn about and communicate the problem.

Mixing methods has led me to explore knowledge and perspectives in novel ways (including walking as a method and Instagram journaling to project my reflections during this research). Combining DT with Practice-led strategies allowed observation and reflection to be a part of this design practice. Together these approaches have been instrumental in shaping the outcome of this project.

Research Methods

User Persona Creation

This method focuses on understanding the user. It involves a two-step method.
1. The creation of an Expectation map.
2. Creating personas and Storyboarding.

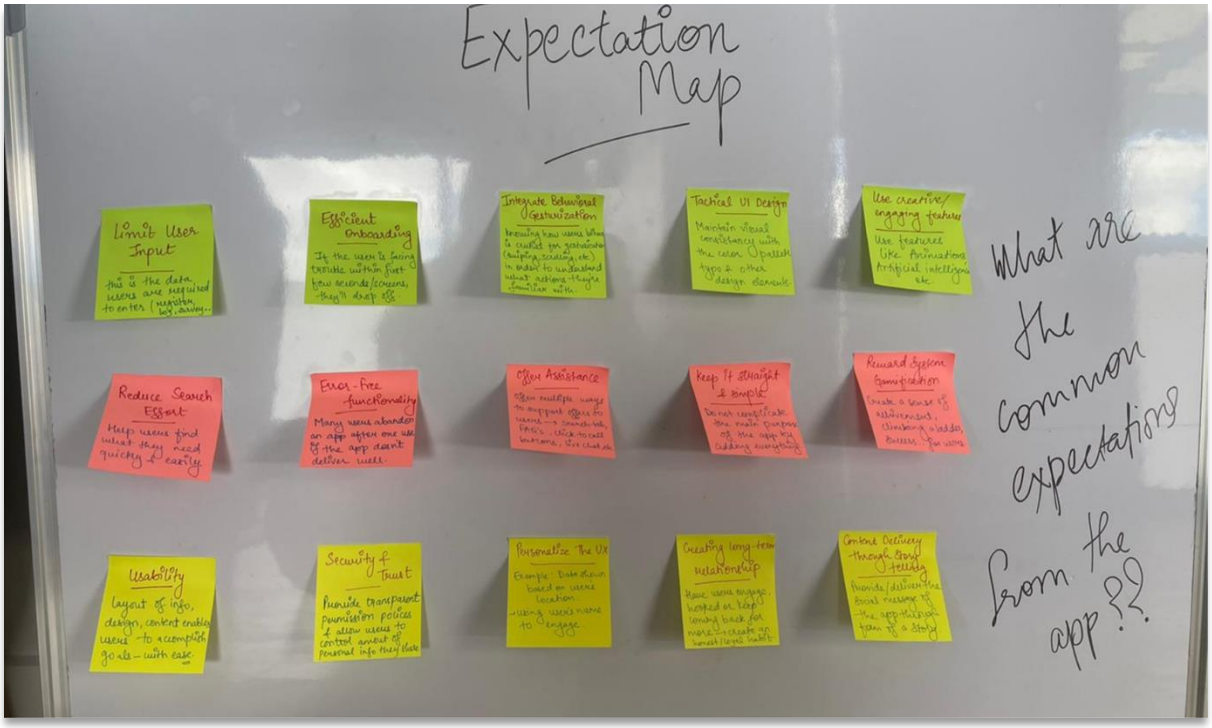

Figure 11: Hemangi Sharma, User expectation mapping, Auckland, New Zealand, 23 July 2021.

A User Persona map and sketches of user experience considering accessible goals-driven information is an essential first step in the design process. Creating a persona involves investigating and charting a user's expectations while interacting with a service. The material

employed to construct the expectation map for this particular project evolved by reviewing existing apps focused on fostering attitude change. From a customer-based perspective, this method drew out the service areas needing attention. After the initial survey, I created the personas. *Personas* are fictional profiles, often developed to represent a group based on the shared interests of those in the group. They offer a representative character that the designer can engage with throughout the creative process.

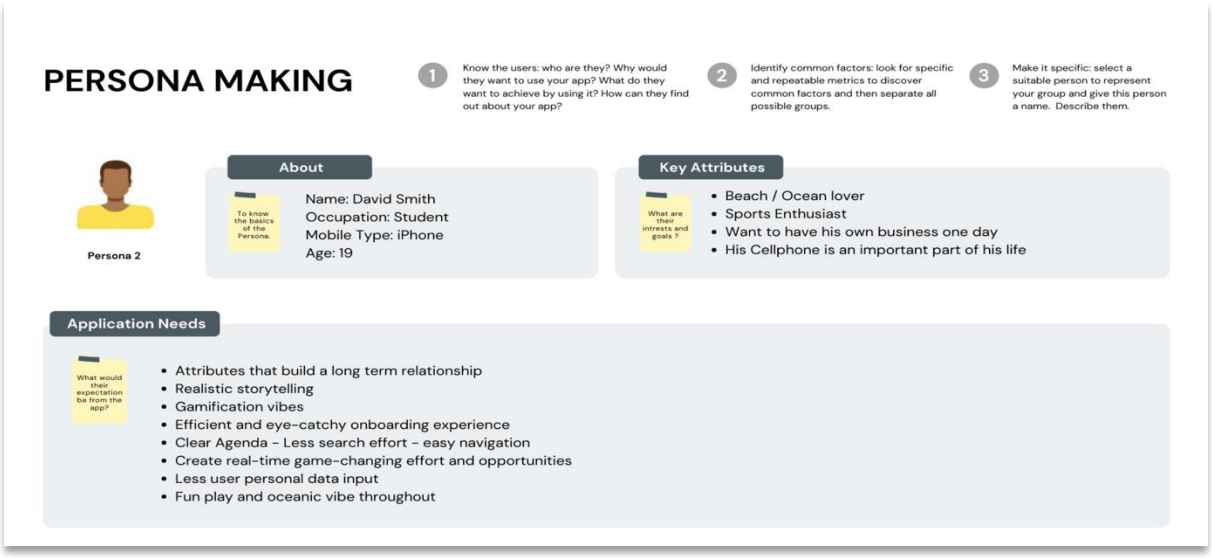

Figure 12: Hemangi Sharma, Persona creation 1, Auckland, New Zealand, 27 July 2021.

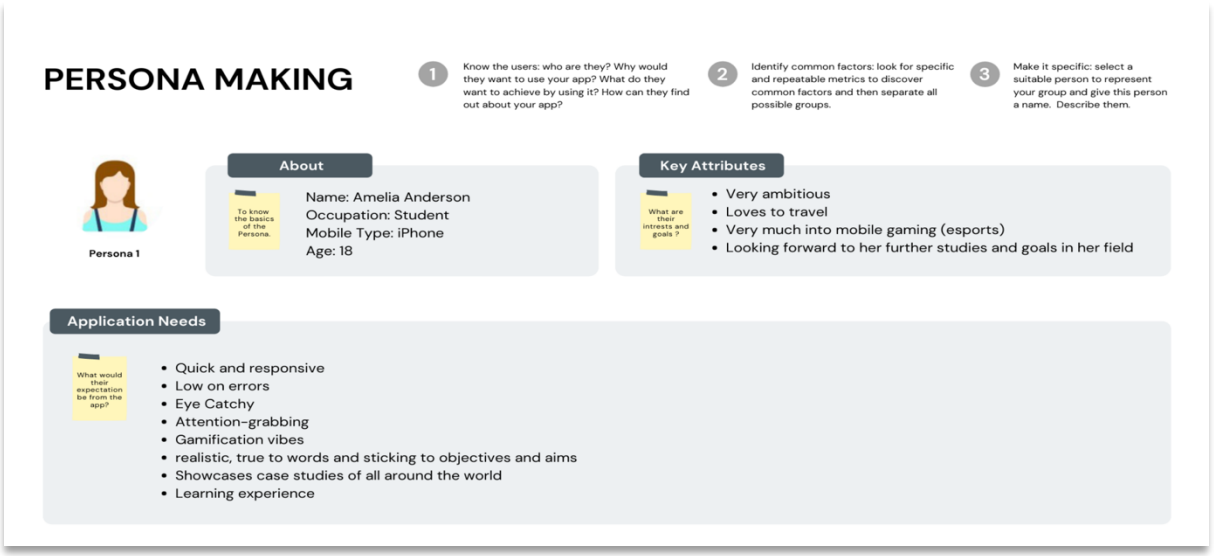

Figure 13: Hemangi Sharma, Persona creation 2, Auckland, New Zealand, 27 July 2021.

Using personas has proven valuable for designers to switch between a creator's perspective and a user's perspective in the design process. Building a persona helps designers focus clearly and

shape a consistent user interface by including 'the user' in the design work.[45] This method also includes creating scenarios and storyboarding to understand the target audience better.

Design scenarios combine DT with practice in creating hypothetical stories produced with sufficient detail to explore different aspects of a service offering. Research data helps construct a plausible situation around which the scenario can build. Personas can be incorporated into scenarios to orient the design around a clearly defined character. Each facet of a User Persona helps the designer create scenarios to review, analyse, and understand the driving factors defining a service experience.

Creators in any field have a process of exploring different hypotheses to organize their thoughts into visual narratives. Storyboarding is a visual layout strategy that summarizes specific events and allows to keep the creation process focused.[46] Storyboards are a method used in formulating scenarios. These storyboards are commonly a series of drawings or pictures that visualise a particular sequence of events. I adopted a comic-strip storyboarding format to illustrate the situation portrayed in the scenario. The stories provide perspectives vital to the service or prototype building phase. The process of creating these storyboards puts the creator into the shoes of the people using the service. This method helps to bring the users' perspective into the design process.

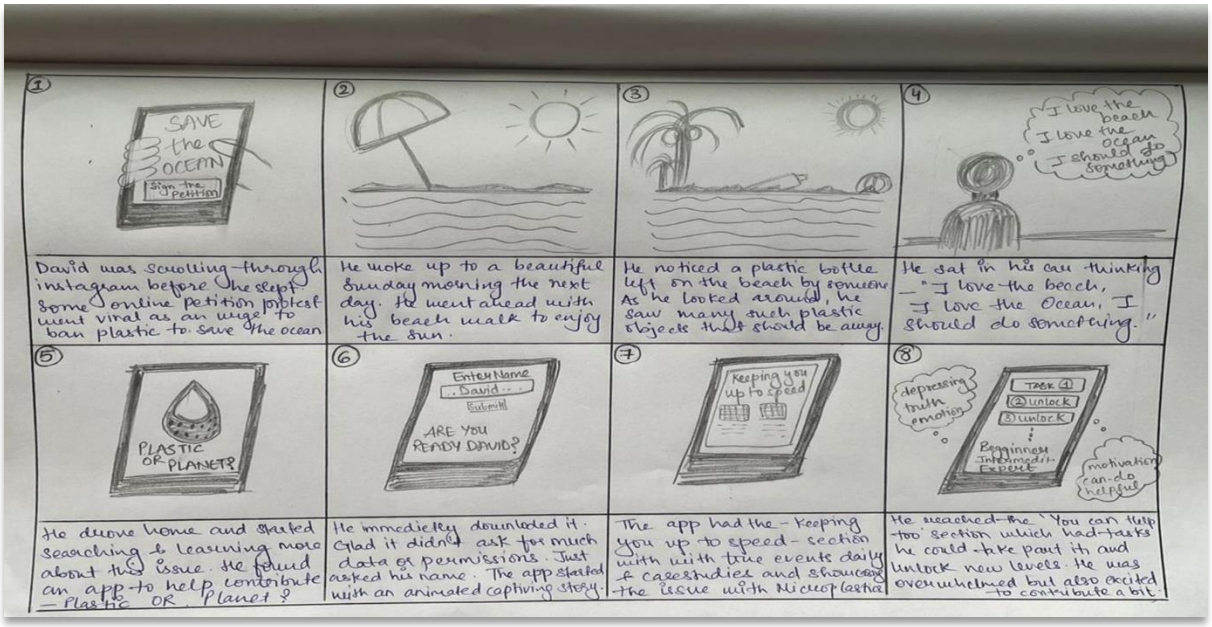

Figure 14: Hemangi Sharma, Storyboarding creation process using expectation mapping and persona creation, Auckland, New Zealand, 12 August 2021.

[45] Johansson, Martin, and Jörn Messeter. "Present-ing the user: constructing the persona." *Digital Creativity* 16, no. 04 (2005): 231-243.
[46] Walker, Rick, Llyr Ap Cenydd, Serban Pop, Helen C. Miles, Chris J. Hughes, William J. Teahan, and Jonathan C. Roberts. "Storyboarding for visual analytics." *Information Visualization* 14, no. 1 (2015): 27-50.

Card Sorting

Understanding the user and getting to know the target audience helped me refine the application (app). This research process requires involving users in the early stage of development to understand users and what they expect the app to deliver. Card Sorting is a valuable method in User Experience. It can be helpful if any element in the pre-creation stage of the mobile application needs clarification. This method enables the designer to test design ideas and prioritise features with users' assistance.[47] In this project, card sorting took place on a digital interface. Users accessed the space I had created online, moving and rearranging the features under different categories, creating a priority map.[48] This method enables user feedback before the initiation of the prototyping process. It was an essential part of the user experience-based research journey.

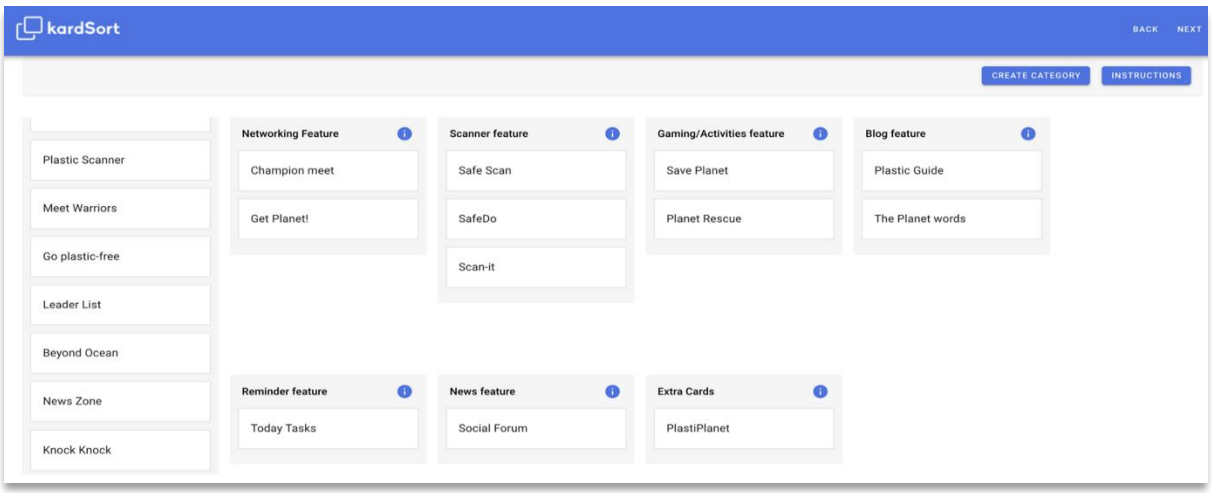

Figure 15: Hemangi Sharma, Card Sorting build in KardSort online tool for users to access, Auckland, New Zealand, 17 November 2021.

Prototyping

Low-fidelity (Paper) Prototype

A low-fidelity prototype (commonly known as a paper prototype) is iterative, continuously incorporating suggestions and refinements. It allows users to feel more comfortable while giving feedback by allowing on the spot changes to occur in the design process. Low-fi prototypes can help generate an in-depth understanding of service. This fast, flexible, and inexpensive method is easy to create with basic office supplies such as papers, sticky notes, scissors, glue, and marker pens.[49]

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[47] Spencer, Donna. *Card sorting: Designing usable categories*. Rosenfeld Media, 2009.
[48] Card Sorting Online Tool used: KardSort, https://study.kardsort.com/plasticorplanet.
[49] Nodder, Chris, speaker. 2017. *UX Design: 6 Paper Prototyping*. https://www.linkedin.com/learning/ux-design-prototyping/welcome?contextUrn=urn%3Ali%3AlyndaLearningPath%3A56dfbc9b92015a33b4908fdd&u=43761236.

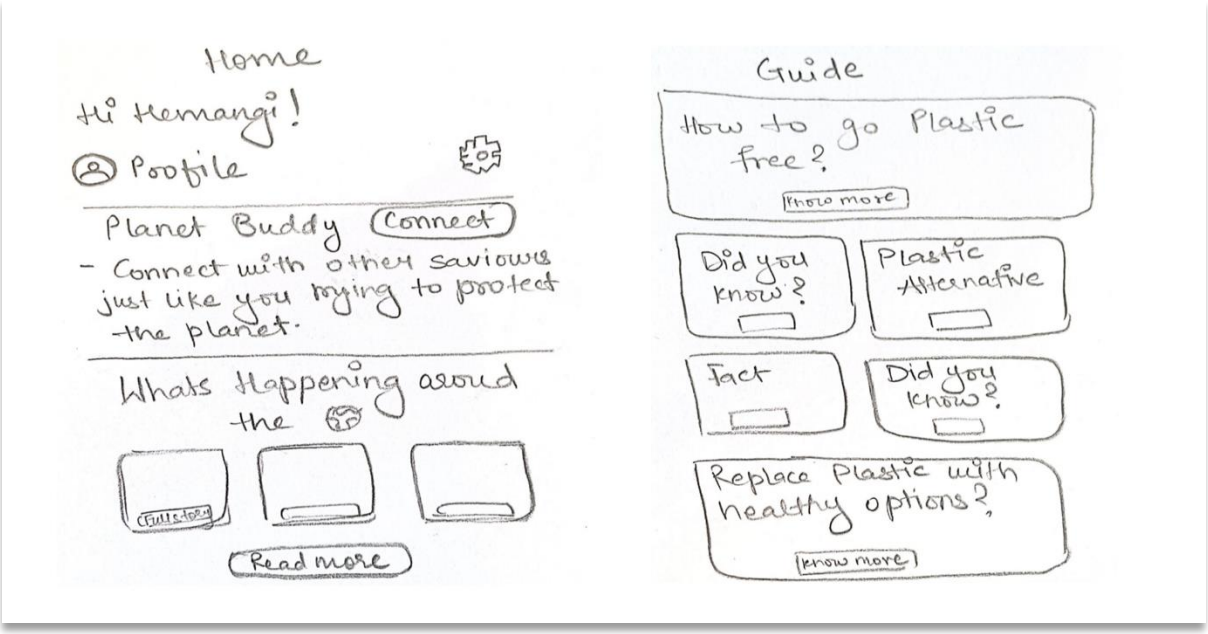

Figure 16: Hemangi Sharma, Paper prototype creation process, sketch of Home page and Guide page, Plastic or Planet app, Auckland, New Zealand, 12 November 2021.

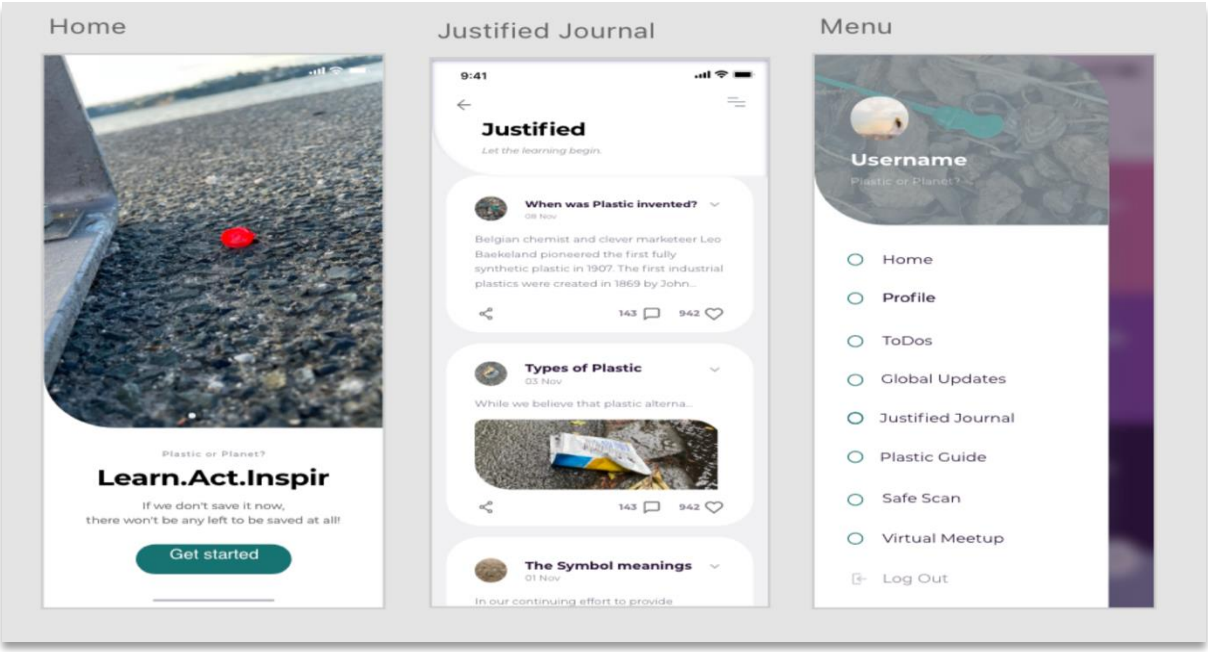

Figure 17: Hemangi Sharma, Digital prototype creation process, Home page and Journal page, Plastic or Planet app, Auckland, New Zealand, 30 November 2021.

High-fidelity (Digital) Prototype

For this research project, there were two user feedback sessions where users got to provide their views on the project's development. Initially, they reviewed the paper prototype and then rearranged the ideas presented in card sorting. Both sessions were noteworthy and considered during the development phase of the digital prototype. Once the prototype was ready, users authenticated it to see how their feedback had impacted the design. This two-step

inclusion of users in the design development process ensured the project results reflected user feedback. This method is implemented using Adobe XD software to create an interactive prototype of the *Plastic or Planet* app because it combines design and prototyping tools in a single app to improve their workflow and productivity.[50]

Walking

Personal reflection

In their book *Walking methods: Research on the move*, Maggie O'Neill and Brian Robert state, "There are interesting parallels to be drawn between walking and telling a story" – how we give an account of our past in 'retracting our steps' that others can follow while composing their own. In this way, a story is also a journey between locations and subjects, and our knowledge gained is part of that movement. Therefore, a walk can be given as an oral story or written by a writer.[51]

Figure 18: Hemangi Sharma, Documenting plastic bag strangled in a bush, Auckland, New Zealand, 09 December 2021.

Walking is an embodied connection of mind, body and the environment.[52] Walking was a transformative method for me as a researcher as it allowed me to understand the problems created by plastic waste in my local environment. Until this point, my research was based primarily on reading journals and articles about plastic pollution and watching documentaries on the impact of this toxic material on our environment. Walking brought with it a whole new

[50] Schwarz, Daniel. *Jump Start Adobe XD*. SitePoint, 2017.

[51] O'Neill, Maggie, and Brian Roberts. *Walking methods: Research on the move*. Routledge, 2019.

[52] Springgay, Stephanie, and Sarah E. Truman. *Walking methodologies in a more-than-human world: WalkingLab*. Routledge, 2017.

level of emotion. Stepping outside, I intended to have an open mind and look closely at the world around me. As I continued walking, I began to notice the problem was everywhere. The more I saw, the bigger the problem appeared to me. I was surprised by how walking with a purpose had changed my view of my local streets and beaches; before this point in time, I had never noticed the amount of plastic around me. *Now that I looked at the world closely, I could see how much plastic had invaded it!*

Instagram Journaling

Instagram, a popular visual (photos and videos) based social media platform with a vast global user base, allows people to share their thoughts through images and videos. As a way of journaling my excursions, I set up an Instagram account (@plasticorplanet) and started posting the photographs of plastics I had encountered on my walks.[53]

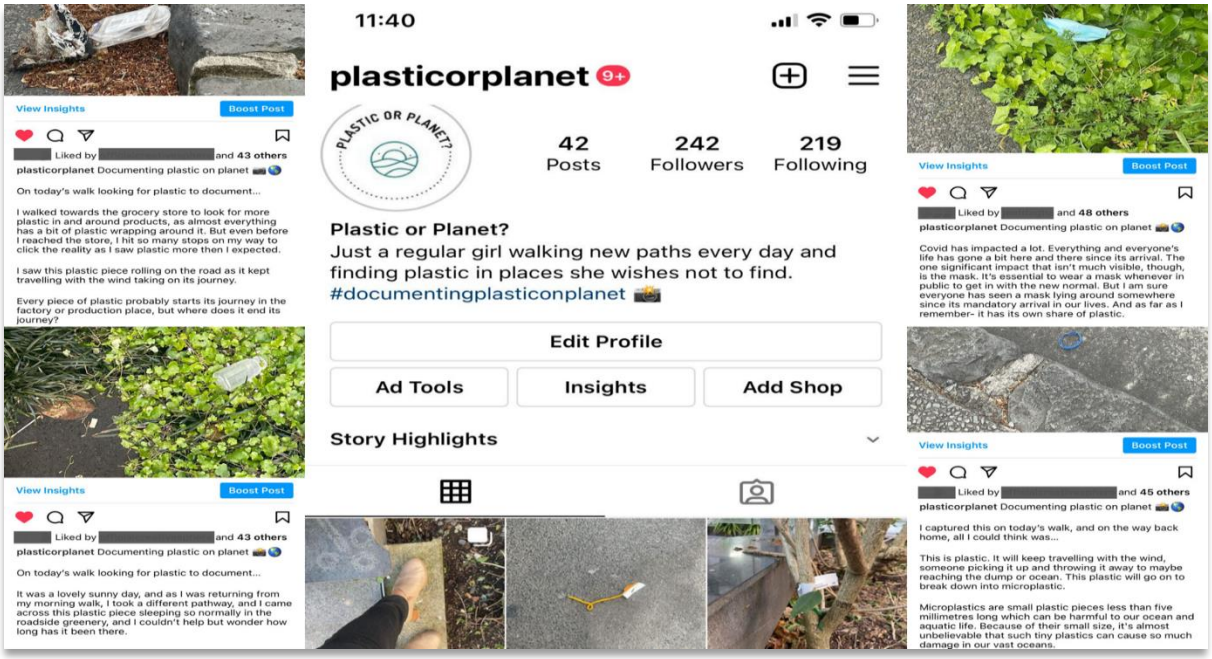

Figure 19: Hemangi Sharma, Screenshot Collage of Instagram account created by Hemangi Sharma to journal reflections, @plasticorplanet, Auckland, New Zealand, 26 January 2021.

> *Since the first day, I have been keen on including Instagram to achieve some part of the research. Although as ideas kept developing, the main focus shifted on creating a solid app with quality user feedback sessions, the idea of including Instagram Journaling as a method slipped away from my whiteboard. I started walking to look at the problem closely in the real world. As I kept noticing, I had an urge to document the reality of this ecological problem. While I was walking back home on the first day with my phone filled with images of plastic pieces and product scraps made of the same material, I started thinking about creating a space for storing these images. It was then that I circled back to Instagram as a way of reflecting my thoughts as I walked new paths every day. To my surprise, it connected me to people with similar mindsets trying to bring in the change this world needs.*[54]

[53] Plastic or Planet (@plasticorplanet), "Documenting plastic on planet" Instagram photo, November 21, 2021, https://www.instagram.com/p/CWhDGZ4v2nC/.

[54] Hemangi Sharma Reflective Journal

Documentation of Practice

“It's surely our responsibility to do everything within our power to create a planet that provides a home not just for us, but for all life on Earth.”[55]

As a researcher, I was curious to learn more about the contexts around the global plastic pollution problem. As a designer, I aimed to discover effective methods to develop a mobile application prototype using gamification and user experience fundamentals. As an environmentalist and eco-warrior, I have always been mesmerised by our ecology's beauty – and at the same time, I was devastated to learn about the destructive impact we humans have on our planet. My heart was determined, so driven by my anguish, I wanted to find (in my own small way) to help find a solution for this global problem. I wanted to communicate the issue and help people find simple ways to reflect on their daily habits and behaviours that gave them a sense of agency in what at times feels like an overwhelming problem. It also became a way for me to cope with my own sadness at what we have done to our world.

Figure 20: Hemangi Sharma, Documenting microplastic pieces mixed up with nature on side of the road, Auckland, New Zealand, 22 December 2021.

This section of the exegesis tells the story of how I selected my methods and applied them in action as a means to engage with my research question and achieve the aims of the project.

[55] *Planet Earth II*, directed by Hans Zimmer, Jasha Klebe and Jacob Shea, performed by David Attenborough, (BBC Natural History Unit; BBC Studios; BBC America; ZDF; Tencent; France Télévisions, 2016), BBC One.

Moana (2016) is one of my favourite animated films. In the movie, Maui's involvement hinders the natural functioning of the environment. Everything was suddenly turning grey and dying. Moana wanted to save her island and people from the situation. Everyone told her that it was her duty to stay on the island with her people and not look for a solution to save her surroundings. When everything seemed to be crumbling down, and she saw vanishing flora and fauna on the island, she got on a boat and took to the ocean to give her best attempt to find the solution. And guess what? She did it - she solved the problem. This movie always made me think about our planet's situation and the inclusion of human activities affecting the natural course of ecological functioning. I have always been inspired by Moana's dedication and courage to take action to save the beautiful living world around her.[56]

User Feedback, Ethics, and Prototyping

The inclusion of user feedback sessions in this research was essential to better understand the user's experience about the application prototype during its construction phase and after its creation. I created a step-by-step design process using UX design methods to achieve this.

The first step in creating the app prototype was to get ethics approval from the Auckland University of Technology Ethics Committee (AUTEC) to invite users to bring their valuable feedback into the development process of my user-centric application. Due to the Coronavirus situation in August 2021, Auckland, New Zealand, was again in a Level 4 lockdown. This change in the situation, along with the health guidelines and rules imposed by the government, necessitated a shift in the way I could conduct my user feedback sessions. It forced me to pivot to find alternate ways to do the sessions online. To respond to this new scenario, I had to resubmit my application. The Ethics Committee approved the application on 28 October 2021 (AUTEC Reference number 21/311), allowing me to seek out users to engage with me on the *Plastic Planet* app.

Initially, even though I thought getting ethics approval would be a battle, I was proven wrong when I moved to the next step of finding users. With changing times and everyone dealing with the lockdown and covid-impacts, finding participants willing to sign up was challenging. My ideal users were 18 to 25-year-olds who were reasonably familiar with mobile applications' current usage and had time to participate in video calls for two sets of feedback sessions. After a long period of on-and-off with a few users who dropped out of the study midway due to personal commitments, I finally was able to find four users eager to engage with my research, had time on hand and were willing to consent to the user feedback process.

While I negotiated the consent forms from the user group, I also developed a range of research tools, including Card Sorting and Paper Prototyping for session one. To create a paper prototype, I used a few pieces of paper and started scribbling the app's look as I visualised it. I envisioned several other features that can be on the Home page: one that could serve guide which would have all the information; another one that would explain the gamification aspect, which would include tasks for users and Scan-it, the scanner feature that could scan product barcodes to detect the type of plastic. It also included the reminder feature allowing users to set reminders; and Planet Buddy, which was the networking zone of the app connecting users with

[56] Hemangi Sharma Reflective Journal on the film Moana Directed by Ron Clements and John Musker. 2016.

other users. And lastly, the news feature with insights, possible settings, and premium feature pages. I got all the ideas on those paper rectangle pieces and sketched them out roughly.

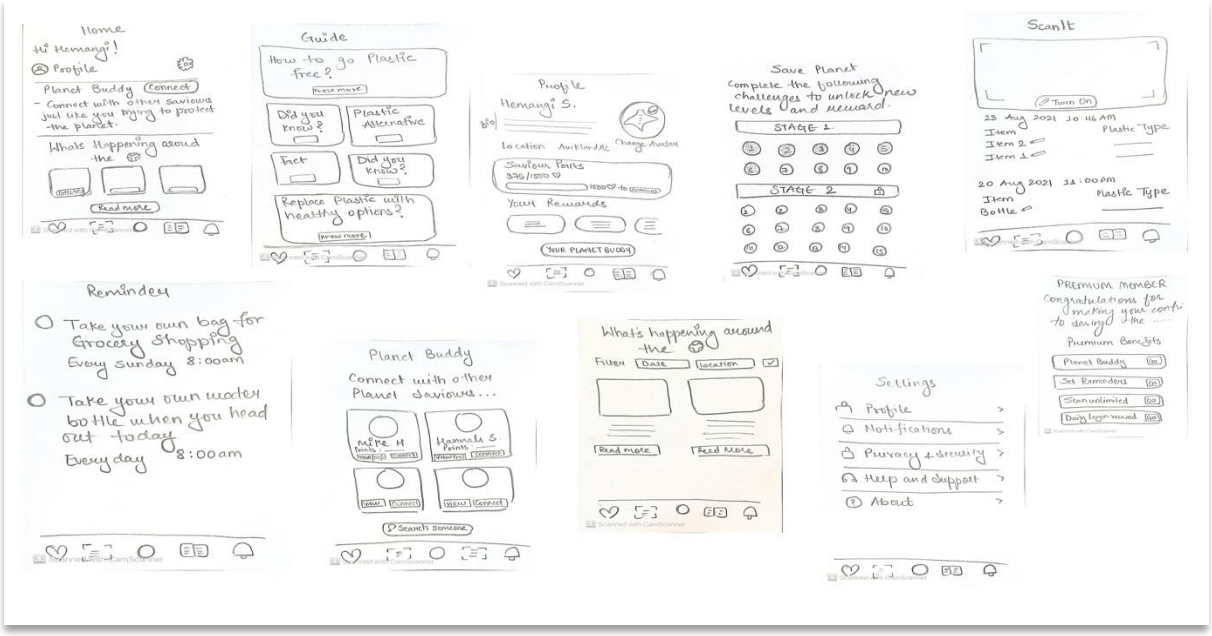

Figure 21: Hemangi Sharma, Paper Prototype Outcome, Auckland, New Zealand, 12 November 2021.

Even though I was happy with this draft of the paper prototype, I was still unsure about the names of the features. Using card sorting in this decision making of feature naming would provide users with the agency to feel welcome in sharing their honest opinions. I thought including users in the early stages of the creative process would help to take into account the suggestions. I created cards and categories in the *KardSorting* online tool, which allowed users to drag and drop cards into categories. This online tool also allows users to add their suggestions for categories if they want to suggest a name for a category for the features for the mobile application.

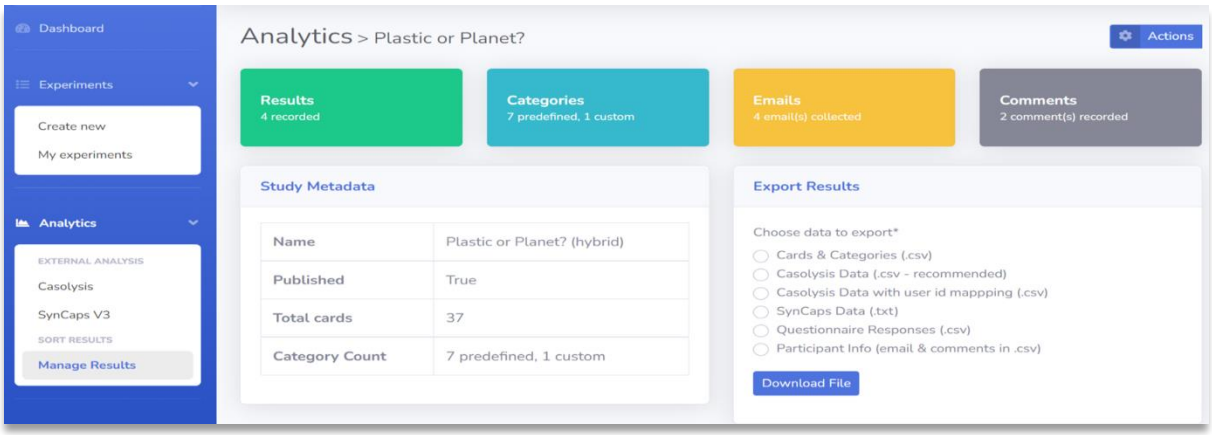

Figure 22: Hemangi Sharma, Card Sorting analysis report, KardSord online tool, Auckland, New Zealand, 15 December 2021.

In feedback session one, the users were generally positive when I introduced the concept and the aims of the app to them. The users enjoyed the card sorting process and expressed that they felt involved because I was interested in their suggestions about naming the features. Their feedback on questions about the Paper prototype was very positive in terms of the purpose of the app, its basic design and user approach. The participants were excited to see how the information collected in the card sorting and their feedback on the paper prototype eventually transformed into the digital prototype.

Walking and Journaling

"Walking methodologies privilege an embodied way of knowing where movement connects mind, body, and environment. Walking scholars typically describe embodiment as relational, social and convivial"[57]

Figure 23: Hemangi Sharma, Walking new paths daily looking for plastic, Auckland, New Zealand.

Although my step-by-step plan did not initially include Walking and Instagram Journaling, it became a significant part of my daily practice as soon as I started engaging in the process. It helped me reflect and channel my thoughts about how the research shaped my thinking, and it improved my skills as a researcher and a designer. It was a contemplation tool that opened my creative mind to think about the problem and how I might connect others with it. This method, in particular, was not easy to understand while I was reflecting on my genuine thoughts.

[57] Springgay, Stephanie, and Sarah E. Truman. *Walking methodologies in a more-than-human world: WalkingLab*. Routledge, 2017.

Once I started the practice of walking and looking for plastic rubbish wherever I was, whether it was on streets, curbs or beaches, or around commercial areas, i.e., grocery stores and shops, I found it in ways and in places I would not have expected. As a method, it really opened my eyes and I saw the world more clearly.

The first few days of my walking practice made me feel miserable. I would come back home exhausted and based on what I observed during my walks I was sad. After a few days of walking, it became routine. As time progressed and my research project developed, I engaged in longer walks, hunting for plastic rubbish to document. By this time, my senses became sharper, soo I noticed even tiny pieces of plastic rubbish. It was confusing as I started to weirdly enjoy the discovery process during my walks. As heart-breaking as this method was, after a few days, it became a creative practice for me as I went hunting for plastic rubbish to get the perfect shot to document and reflect on during the walk that day. A month later, I questioned if my empathy was shifting. After considering for a while, I understood that I was excited about this project's creation and creative process as it was now reaching its final stages. In terms of my emotions, I was still upset as I contemplated the plastic rubbish I saw everywhere I was walking and realised it reflects the world we live in now.

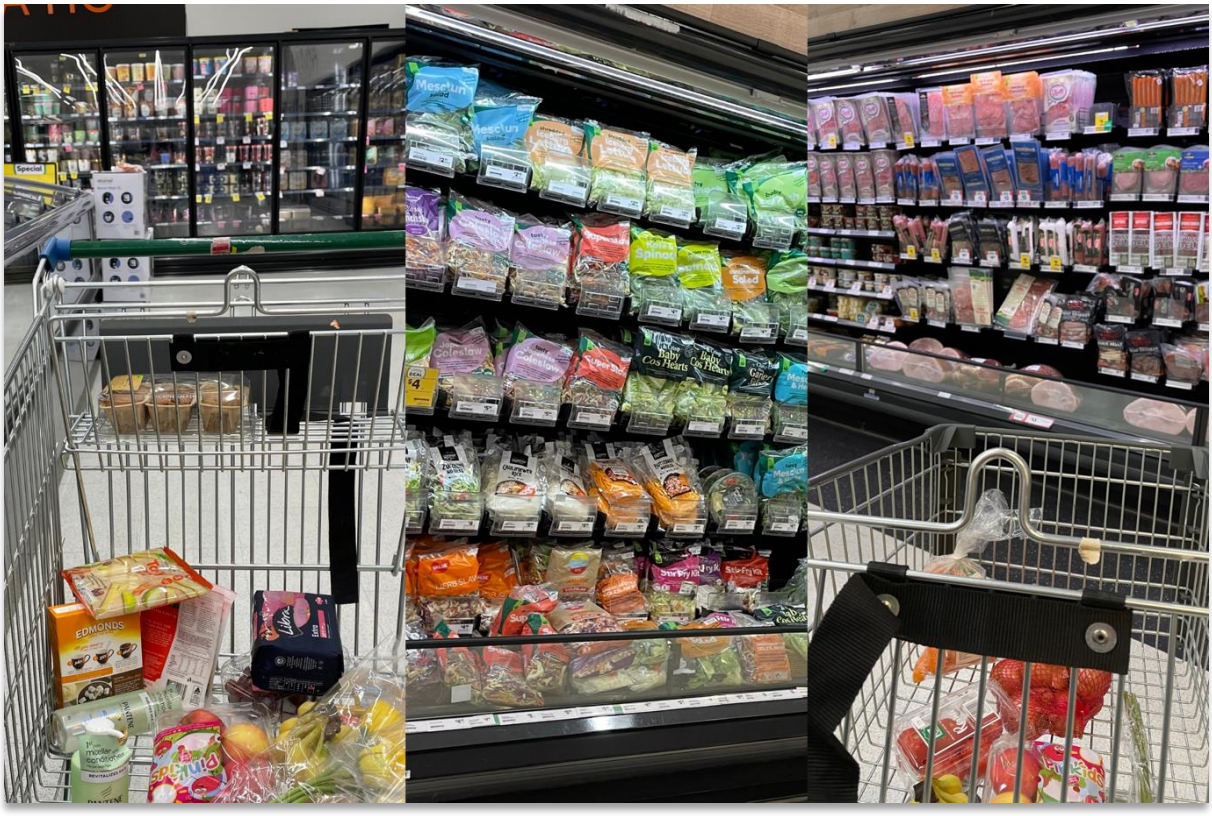

Figure 24: Hemangi Sharma, Documenting the use of plastic in maximum grocery store products, Auckland, New Zealand, 17 December 2021.

Today, social media is a potent and impactful tool for everyone. Social media creators use the most effective methods - known as algorithms - as a business module to increase users' screen time. Social media algorithms prioritise the content that a user comes across frequently. This priority viewing is a good strategy as the more user-related content the user views - the more time they are likely to spend on the particular social media platform.

> *The Social Dilemma (2020), a Netflix documentary, showed how these algorithms naturally go wrong and have more control over the users than the users themselves. After watching it, I thought about these social media algorithms and their influence on human mindsets. The documentary highlighted the negative side of social media and how life would be much simpler without it. My question was if the social media applications affect humans based on the content they view, why not post more enriching positive content instead of trying to vote against the use of such a great technological invention?*[58]

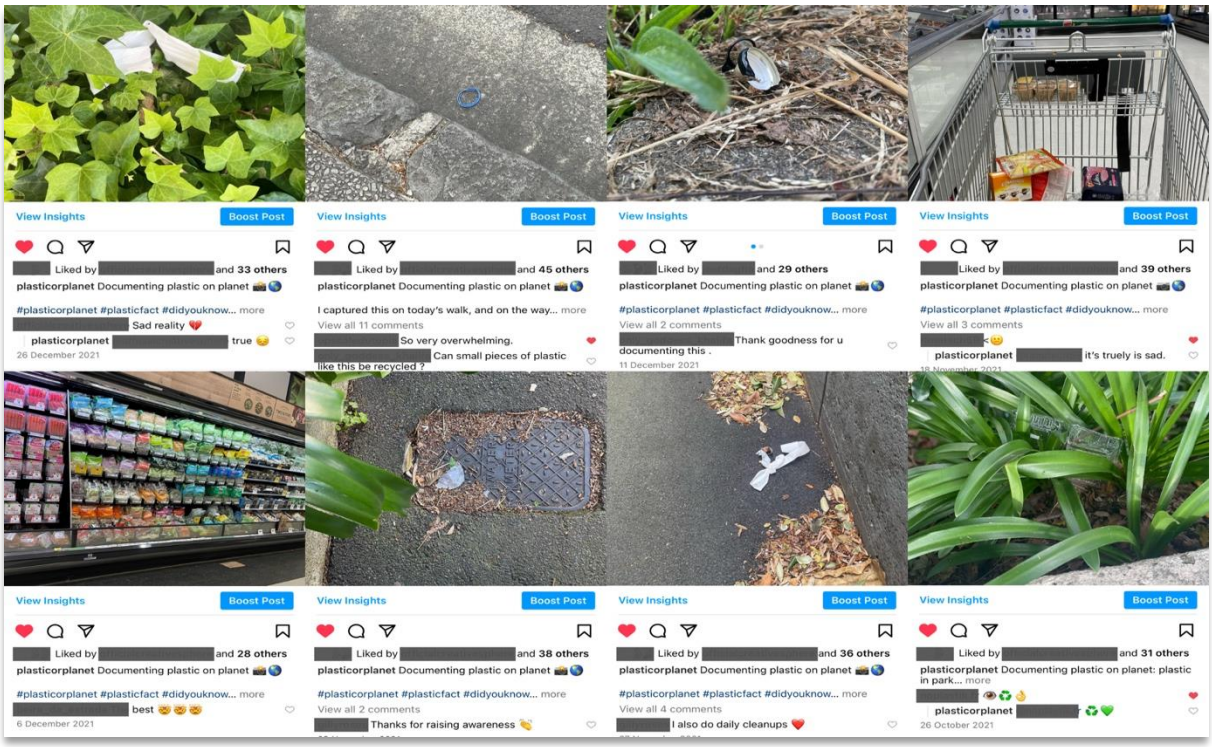

Figure 25: Hemangi Sharma, Screenshot Collage of Instagram account created by Hemangi Sharma and interaction with other users of the app, @plasticorplanet, Auckland, New Zealand, 28 January 2021.

My phone filled up with images of plastic I discovered and captured during my daily walks. Thinking about storing these images somewhere, I circled back to the idea of creating an Instagram account to allow my reflections to be out there in the world of social media. So, I created an Instagram account, *Plastic or Planet* (@plasticorplanet) and started sharing these images along with the reflections I wrote during my walks. I found this journaling practice as a positive bias on Instagram where I did my best, as a user of the social media platform, to express my documentation of the images with a positive emotional tone. This practice helped me channel my thoughts and generate general awareness around the effects of plastic rubbish on our planet. I was astonished to see other uses of the social application connect with

[58] Hemangi Sharma Reflective Journal on the film The Social Dilemma directed by Jeff Orlowski (2020).

my *@plasticorplanet* Instagram account, ask questions in the comment section and even message to learn more. My journaling practice also encouraged others on the app to share information about the plastic rubbish around their local areas and they posted those images.

Digital Prototype: Concept, Development and Feedback

I was excited for the next step of this creative process as I was now able to take the user feedback, contextual and methodological investigations, and apply what I had learned into the design of the digital mobile application. I aimed to create a working prototype that someone could click on and access as they could access an app on a mobile phone. The research sought to design a prototype mobile application (app) that communicates issues around plastic pollution in the ocean. The positioning of the research focused on designing a prototype app that allows users to engage positively with plastic pollution through enhanced awareness and directed personal actions that could be part of the globally required shift to reflect on day-to-day habits and actions taken around these toxic materials. To create this digital design, I selected Adobe XD software. This was the first time I had used this software, so it took me a little while to get familiar with how it could be deployed as part of the design pipeline to address the aims of the project.

"As users browse the App Store and consider what to purchase, your app's visual design will factor into the decision. Sure, there are reviews, text descriptions, and links to demo videos (sometimes), but users will naturally gravitate to the large, colourful screenshots. If users are not inspired or impressed, they may not download your app."[59]

The concepts driving the creative process of the app came through the contextual studies and my reflections throughout the research. The study of applications and user feedback in the first session helped me with the decision-making process while working on this project.

While I was thinking about the app's design, I contemplated the first visual page and its look like if users were to click on the app. I envisioned the app's purpose to portray creatively with an elegant (easy to navigate) design in the onboarding section of the application. I started by thinking about words that deliver the message of the application. The three words that perfectly represented the purpose of the application were: Learn, Act and Inspire. I separated these three words, and then I wrote more about the purpose of each of these words. Then I created a flow of four pages as the onboarding section of the mobile application. The first thing to open up would be a welcome page. As the users click on the Get Started button, they are likely to land on the Learn page that talks about the particular purpose of that word in terms of the app's aim. The Act and Inspire page follow, as users click on the forward arrow at the bottom right corner.

[59] Ginsburg, Suzanne. *Designing the iPhone user experience: a user-centred approach to sketching and prototyping iPhone apps*. Pearson Education, 2010.

I also added the back arrow if users had the urge to go back and navigate to a previous page in the onboarding part of the application.

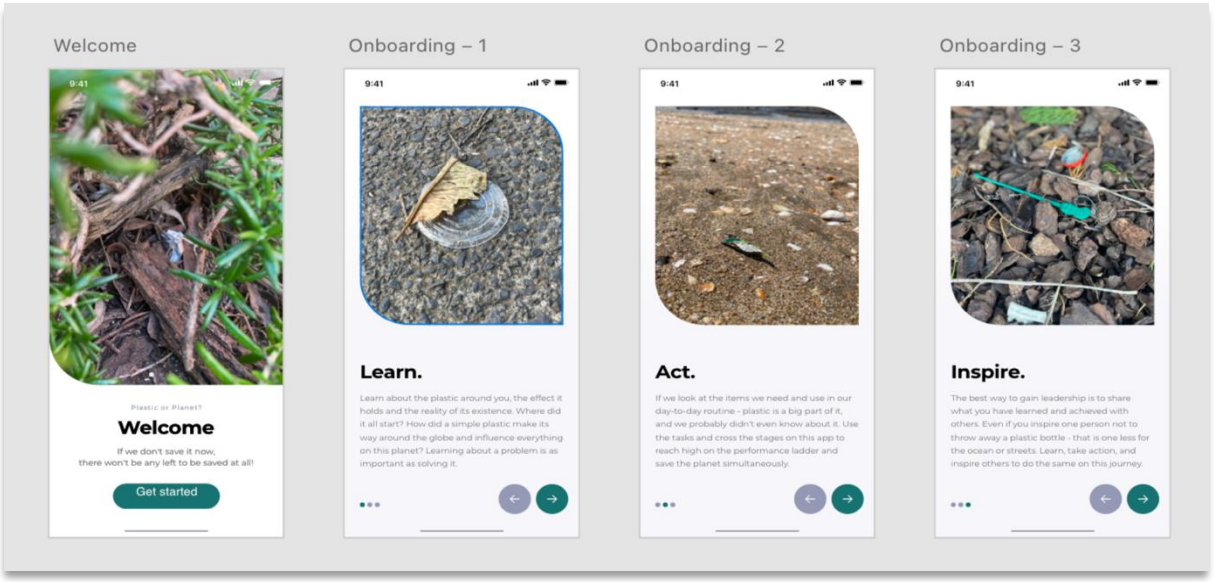

Figure 26: Hemangi Sharma, Digital Prototype creation process, Onboarding, Plastic or Planet, Adobe XD, Auckland, New Zealand, 17 December 2021.

Visual communication is a powerful way of representing a purpose using user experience methods. Visuals affect people cognitively and emotionally. Our attention draws towards visuals (such as images and videos) faster, and these visuals can stay in memory for a more extended period.[60] The onboarding looked a little empty with only written content in place. I imported images that could be clicked during my walking practice in this section of the app to describe the story of the situation through photographs. The images supported the texts and delivered the concept of its construction visually appealingly.

Brainstorming the content structure and information I wanted to present through this app, I thought about the overall style guide concerning the colour palette I would use. People associate colour with different meanings. There are a few standard psychological meanings associated with colours. As a blunt example (in Western culture), if people think about the colour red, some might visualise love while others think about its association with blood or violence. The meanings change as factors affect the psychology of different people based on the environment, culture and personal experiences.[61] While deciding on the primary colour of this app, I went back and forth with the ideas of blue and green, which represented the planet and the ocean. Even while deciding whether it is blue or green, the next question would be: which hue?[62] In terms of trying to juxtapose these two colours to understand specific climates and qualities, I decided to mix the colours instead of using one colour to either diminish or

[60] Scharf, Rüdiger E. "Pictures tell their own story." *Hämostaseologie* 37, no. 03 (2017): 181-183.
[61] Ginsburg, Suzanne. *Designing the iPhone user experience: a user- approach to sketching and prototyping iPhone apps*. Pearson Education, 2010.
[62] Hue: a colour or shade.

intensify the other to make a fair decision.[63] I decided my primary choice of colour would be teal. I decided on my primary colour at this stage of creative practice, and I added some other colours that would complement the primary choice. So now my palette was teal (#157272) for elements as the primary colour of the app, black (#000000) for textual content, white (#ffffff) as the peaceful background and shades of teal and grey used throughout in the elements.

"Teal combines the calming properties of blue with the renewal qualities of green. It is a revitalising and rejuvenating colour that also represents open communication and clarity of thought. For Tibetan monks, teal is symbolic of the infinity of the sea and sky, while it is the colour of truth and faith for Egyptians."[64]

As a designer, I have always found Montserrat to be a typeface that is versatile in its usage and suits all conditions of design creation because of its geometric and elegant simplicity so, I decided to use Montserrat throughout the app. I wanted to use just one typeface to keep the consistency of the application's design with variations in the styles supported (such as regular, semi-bold and bold) and different font sizes to separate different headings and content.

The next step of creation was getting users started with the app. I divided it into three pages – Sign up, Sign in and Home. This section included two sets of pop-up keyboard elements and the menu with all the other names of pages included in the app. The Sign-up and Sign-in would look like one single page on the application. Once users click on either the sign in or sign up tab, they navigate to the respective page. In order to build the design of this smooth transition between pages to make it look like one, I separated the design of the pages, and I had two elements of keyboards separately created as a pop-up. The keyboard would pop up only once a user clicked on any form sections filling up either the sign-up or sign-in page. Creating a database was necessary for this project because later, the app shows specific account-based information for users.

Similarly, while I was designing the application's Home page, I wanted it to look simple, not drag all the information on the first page. I understood that the app had different features, each with their individual purposes. I created a menu page designed to pop up only once someone clicks on the button. The menu would act as the navigation portal to all the other pages.

"Visual structure creates visual pathways that help users move through your designs. Without a clear visual structure, your app may be difficult to interpret, or it may be interpreted differently from what you intended."[65]

[63] Juxtapose: close together for contrasting effect.
[64] Canva, "Everything about the color Teal: The meaning of the color Teal and color combinations to inspire your next design." Canva, https://www.canva.com/colors/color-meanings/teal/.

[65] Ginsburg, Suzanne. *Designing the iPhone user experience: a user-centered approach to sketching and prototyping iPhone apps*. Pearson Education, 2010.

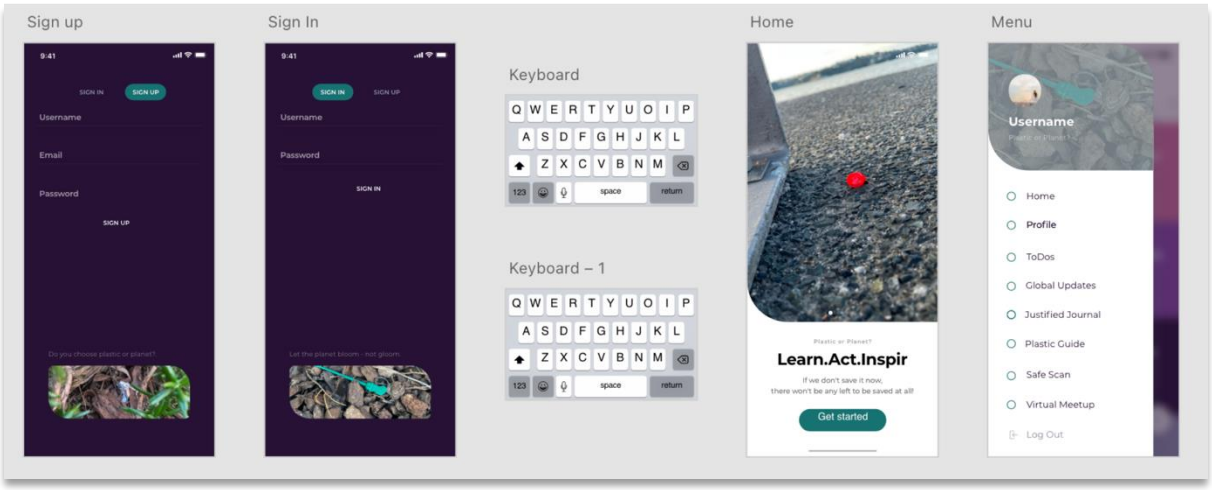

Figure 27: Hemangi Sharma, Digital Prototype creation process, Home page, Plastic or Planet, Adobe XD, Auckland, New Zealand, 18 December 2021.

Throughout the creation process, I kept going back to the basics of digital design. Fundamentals such as colour, typeface and design structure can affect the visual outcome of a project.[66] To maintain the standard visual structure as I kept creating more pages, I considered grouping, hierarchy and the alignment of elements creating a structure to keep the design consistent. My process involved grouping elements that would complement their purpose, establishing a proper reading sequence along with these grouped elements, and having a standard alignment that could be followed on every page to make the design easier to understand.

This basic structure and design style made the next steps of prototype creation much more manageable. After that, I started working on the features of the app. While creating this set of pages, I added more shades of grey and black in the colour pallet to highlight some aspects with colours that complement each other. I used rectangular shapes to separate sections in pages with smooth semi-curved edges. This outcome was achieved by mistake once I tried a new software tool, and even though it ended up changing the rectangular shape, it looked much better than my initial hunch, which was to use rectangles with an uplifted shadow.

At the same time, while creating the app, I often took time to take a step back and reflect on it as a user. This practice helped me with the decision-making process. At this point of creation, I thought about users going back to the Home page every time they accessed the menu to navigate to another feature page. I added the accessing menu on each page at the top right corner.

In the first feedback session, the users had already voted on the feature names through the card sorting method. The first one was the users' informative blog feature named Justified Journal. This feature included articles and guides about plastic and its impact to share information to generate awareness. The other feature was the reminder named *To Do* by the user group. The purpose of this feature was to let users create their own reminders. For example, if users go to

[66] Lupton, Ellen, and Jennifer Cole Phillips. *Graphic design: The new basics*. Princeton Architectural Press, 2008.

a grocery shop every Sunday, they can set a reminder for every Sunday morning to remind them to carry their own shopping bag instead of buying a bag from the store. The next feature I worked on was the Global updates, rightfully named by the users of this project. This section was the official news place of the app allowing users to consume news updates about plastic and its effects around the globe. The fourth page was the Plastic Guide, the gamification-based feature including tasks and stages for users to complete. The virtual meetup was the timeline feature with updates posted by users that other users could view. This section would allow users to share their thoughts and facilitate positive interaction with others.

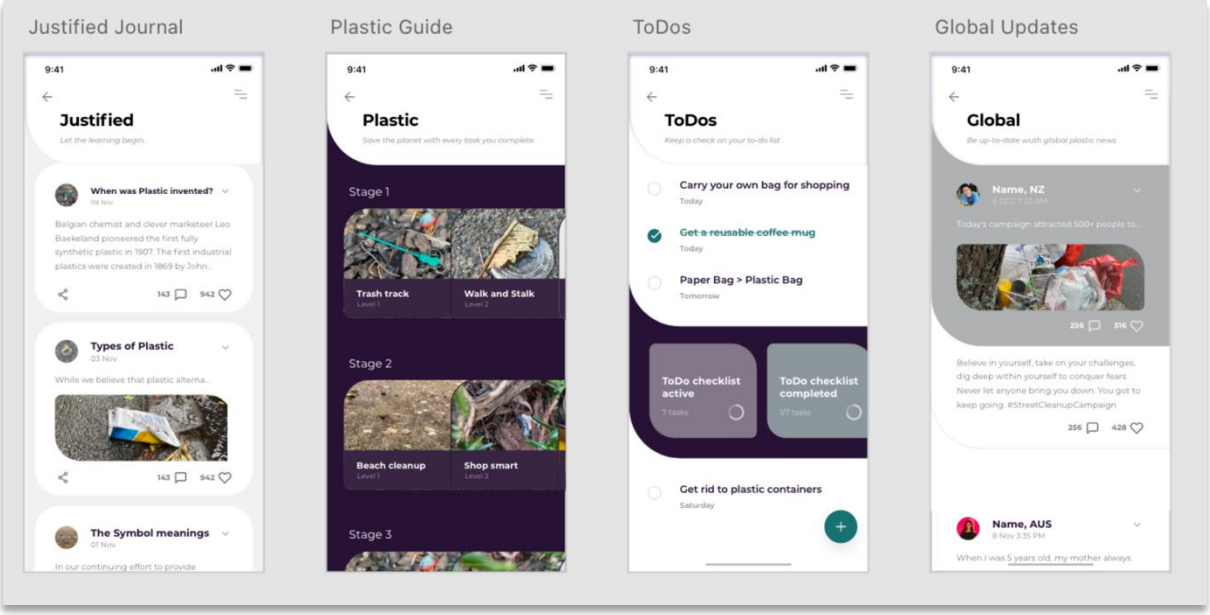

Figure 28: Hemangi Sharma, Digital Prototype creation process, Feature pages, Plastic or Planet, Adobe XD, Auckland, New Zealand, 19 December 2021.

All these five feature pages had similar elements and design choices while building them. The next feature was not easy to design. Creating the Safe Scan, which is the scanner feature of the application, allowed users to scan a barcode of any product to learn about the plastic material used in the product. The purpose of this feature was to generate awareness about different types of plastic materials used in products we purchase and access in our daily lives. Designing a scanner took a while to understand how it could achieve its *barcode reading laser movement function*. I created three pages to achieve this and a result pop-up element page. The feature would run a red straight line (representing the laser diodes used in barcode scanners) from top to bottom of the scanning rectangle area once a user clicks on the Scan Object button. After the scanner scans the object's barcode, the result would pop up from below and inform the user about the type of plastic used in that object and how to dispose of it safely.

The next and last section of the design process of this *Plastic or Planet* app was the profile section. This section explains why signing up details were required at the beginning of the application. With this personalised profile, users can post their thoughts related to this global problem or share their achievements by sharing their completed tasks or earned points. Users

can later view these posts through the Virtual Meetup feature designed earlier. This Profile section also had the navigation tab on points. Users can go to this part of the profile to check how many points they have earned and turn them into rewards. I created four different pop-ups linked to each of the points on the reward page, respectively. This point collection practice through actively engaging in tasks focusing on activities around plastic pollution and later converting these points into rewards that can be accessed to purchase genuine products was a form of providing agency to users through the concept of gamification.

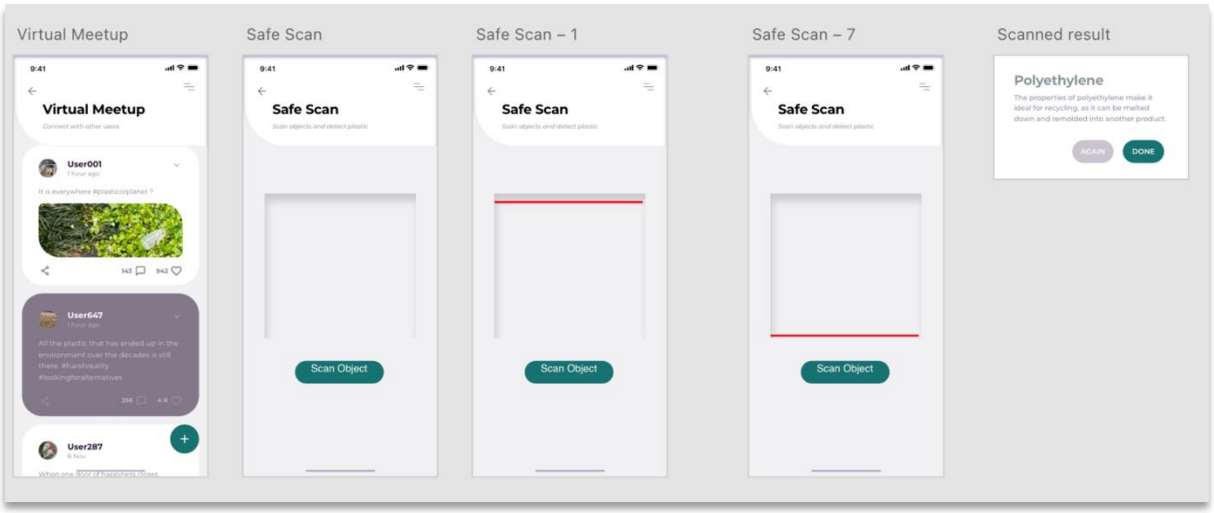

Figure 29: Hemangi Sharma, Digital Prototype creation process, Safe Scan , Plastic or Planet, Adobe XD, Auckland, New Zealand, 20 December 2021.

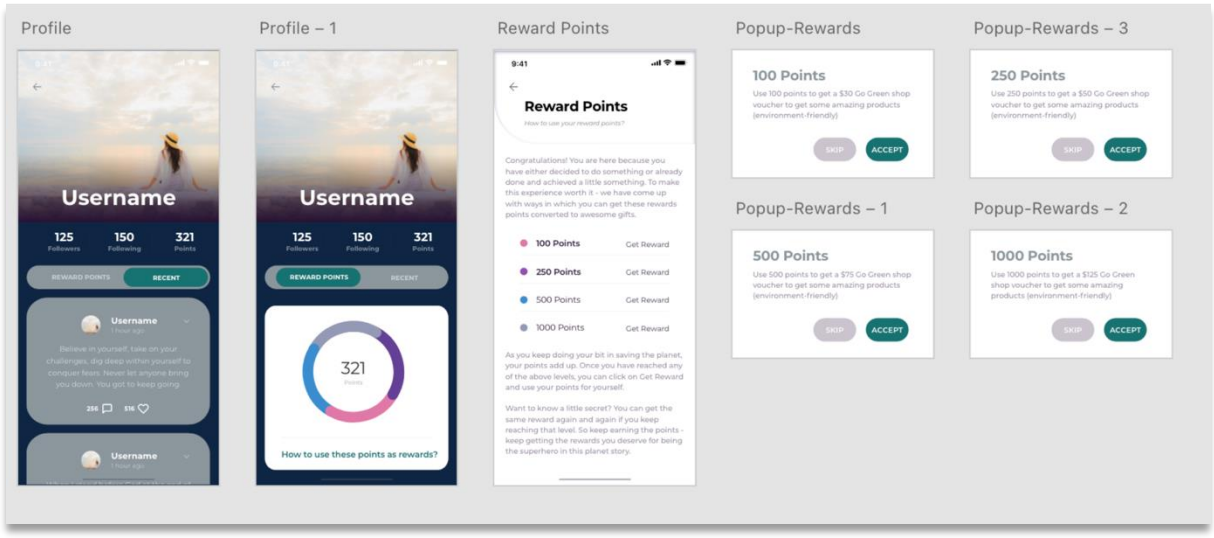

Figure 30: Hemangi Sharma, Digital Prototype creation process, Profile, Plastic or Planet, Adobe XD, Auckland, New Zealand, 20 December 2021.

After carefully planning and designing all the pages and their pop-ups, it was time to connect all these elements into a presentable working prototype. As opposed to showing still images of the design, the working, clickable prototype would present the app nicely and allow users to

give more accurate feedback on the overall functioning of the application. This process would have been highly complicated if I had not had a proper structure set in the early stages of the creation process. Maintaining the smooth navigation flow between the pages and their pop-ups was important. Then I tested the prototype several times to ensure every element links to its respective destination.

> *It was around 3 AM when I finished linking the last element – the rewards pop-up- and I was excited to see the outcome of this creative process. As a first time user, I found Adobe XD a user-friendly software. It was easy to understand, it did not take long to get used to the tools, and it was well-structured in overall layout and functioning. I tried positioning myself as a user at that moment, trying to shape the flow of this prototype before presenting it to the users. This design outcome was a meaningful milestone moment for me. I was looking forward to seeing what the users think about this design.*[67]

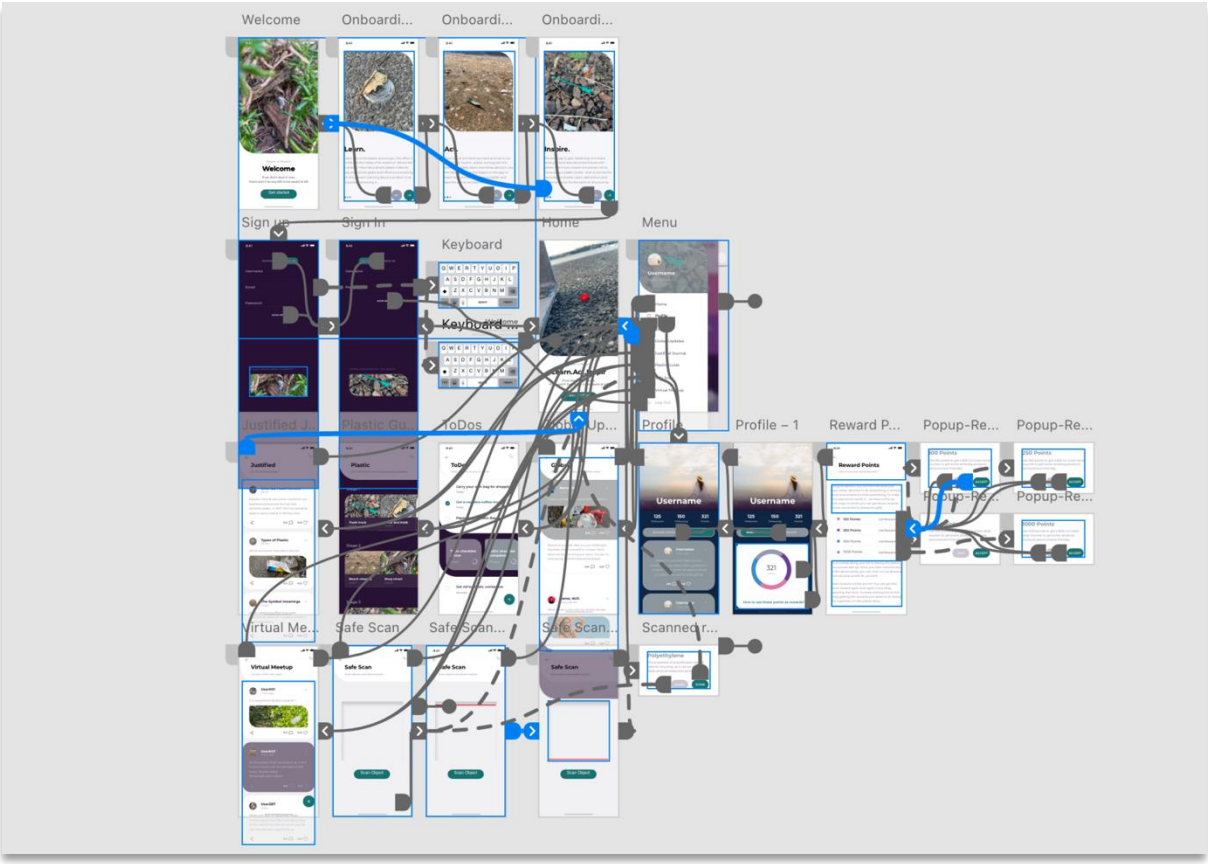

Figure 31: Hemangi Sharma, Digital Prototype creation process, Linking design elements, Plastic or Planet, Adobe XD, Auckland, New Zealand, 20 December 2021.

I reached out to the users and set up a time for the final feedback. For this feedback session, I prepared the flow for the prototype presented to the users and the questions to answer if they felt the outcome considered their ideas and met their needs, i.e., if the design was user-friendly, and to ask which feature was their favourite? Again, the response was positive. The feedback on the design and user-friendliness of the app was unanimously supportive. The users were excited, interested, and engaged in the gamification tasks. Their response to the questions about

[67] Hemangi Sharma Reflective Journal

these aspects of the app was optimistic. The feedback showed that they believed that the app would inform users and give them positive ways to reflect on their behaviour around their use of plastic if used over a period of time.
The following were their responses about their expectations for the app in the future:

User 1: I expect this app to hit the app store and people to start using it.
User 2: Let the app focus on plastic pollution as the primary focus as it grows.
User 3: It would be great to see more updates in the networking area between users.
User 4: Tasks in the gamification feature should not stop; let them keep coming.

At this stage, users feedback notes that the app is easy-to-use and it has a good variety of features that will help individuals contribute to achieving the project's aims. The feedback further says that the application is clean and aesthetic in design. Although the user feedback sessions felt successful at this stage of research and project creation, my hunch is to get a larger group of users for a more precise amount of feedback and data collection as my next steps after this phase of the research. The features and information included in the *Plastic or Planet* project can develop through further user feedback, allowing me to explore more ideas with a large set of suggestions.

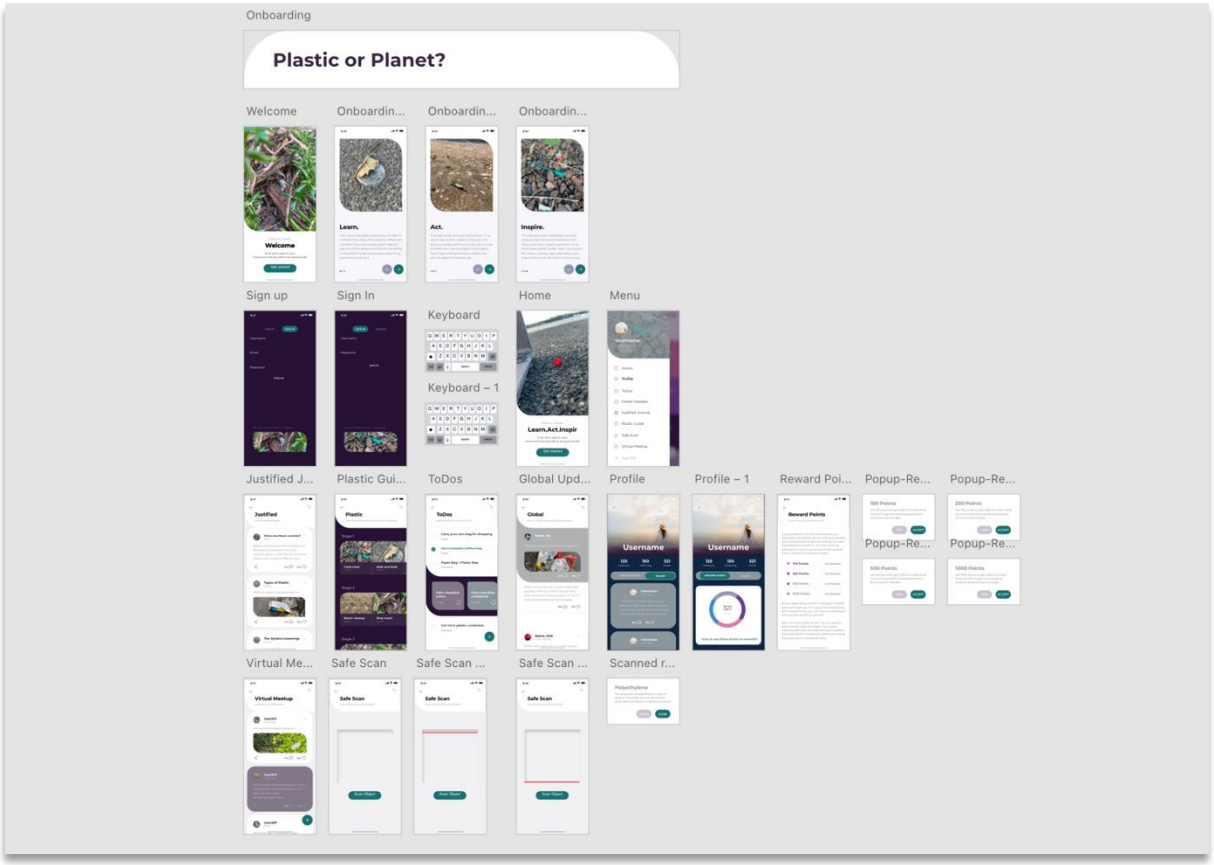

Figure 32: Hemangi Sharma, Digital Prototype Outcome, Plastic or Planet, Adobe XD, Auckland, New Zealand, 20 December 2021.

Conclusion

The world is changing - it will always change. It has been over two years since the first COVID-19 pandemic case was in the news. It was about the same time I had started my journey as a researcher trying to solve a problem through the fundamentals of digital design. Everything suddenly felt helpless, restless and out-of-hands. I felt trapped in my own bubble, and even that did not feel safe because of the effect of an outsider (the virus) in my life. Now think about a sea turtle trapped in its own oceanic world and still not feeling safe because something from the outside world (the plastic) has entered its bubble that may risk its survival. As helpless as the virus and its variants make us feel, we still have an option to speak up, access the medical facility and reach out to the organisations or government when the situation calls for it. This luxury is not that much available in the case of plants, animals, and various species all over the planet that are being affected by the imposed effects of plastic pollution.

This research helped me understand how important a role a mobile application plays in solving social problems and reaching a more extensive user base. The creation process of the *Plastic or Planet* project was amusingly a mix of emotions for me as a human and researcher. As depressing as it felt walking new paths every day to find the same toxicity around me and looking closely at the effects of this man-made material on our planet, I still felt a sense of joy while working on creating the project and interacting with the users. If I had to describe how I feel about concluding this research – I would say it is happy tears as I have created a basic working prototype of a mobile application but the fact that we need this application to exist still breaks my heart. In future, the app could use better feedback from a large group of users to understand and have more data to work with on improving the app design before taking it to the development and monetising phase. A large amount of work has been invested in creating this project, as articulated as it can be with the help of contextual studies and user feedback supporting its creation. At this stage of the creation process, users feedback notes that the app is easy-to-use, good in design and rich in its functions. The features and information included in the *Plastic or Planet* project can develop through further user feedback, allowing me to explore more ideas with a large set of suggestions.

This research journey was a learning experience for me overall. I learned there is no one way to reach an outcome, and as you read and explore more options, you keep finding different approaches to reach a destination. I learnt not getting the desired result is also a result in disguise; it helps you know what not to do when trying again. I learned about UX design tools in-depth and in relation to a social cause and how to communicate ideas through design in order to raise awareness.

While thinking about the things I could have done differently while working on this project, I cannot help but wonder about the social reach and networking impact of the app, building a community, and how can that impact the cause overall. Also, the feature study and design aspects of the app like the importance of sound and its impact on human behaviour or the inclusion of videos and illustrative storytelling and its psychological impact in creating awareness through the app. Based on the user feedback and my personal ideology on the

features of the app, I strongly believe that the gamification and scanner aspects are strong and, if developed correctly, can be a proven app assets in this fight against plastic pollution.

In the next stage, the app will include levels and tasks to have a complete step-by-step gamification plan for users to again try out and give their valuable feedback. As more and more data is designed into each feature of the app, the code will then be extracted from the software in order to develop a functioning app to further go through user trials before launching as a business model out in the world.

As I write this conclusion in January 2022, we are still living in a covid world, where there is no out. I long to go back to the old normal where designers and researchers could meet, brainstorm ideas and bring in solutions to worldly problems in the most creative ways. However, this pandemic does not have a specific departure date and might be around for longer than we humans expect it to be around. In these uncertain times, the world is relying on technology and digital devices more than ever now to stay connected to loved ones and stay updated with the global events just by clicking buttons. This is where the digital design solution to worldly problems can help designers, researchers, and users stay connected despite maintaining the distance this virus has dawned upon us. This is where I believe I can contribute to bringing in more solutions through my design practice starting with working on developing this one.

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Gallery of Images from Walking

Figure 33: Hemangi Sharma, Documenting plastic in local areas, Auckland, New Zealand, 23 October 2021.

Figure 34: Hemangi Sharma, Documenting plastic in local areas, Auckland, New Zealand, 05 October 2021.

Figure 35: Hemangi Sharma, Documenting plastic in local areas, Auckland, New Zealand, 05 October 2021.

Figure 36: Hemangi Sharma, Documenting plastic in local areas, Auckland, New Zealand, 15 November 2021.

Figure 37: Hemangi Sharma, Documenting plastic in local areas, Auckland, New Zealand, 15 November 2021.

Figure 38: Hemangi Sharma, Documenting plastic in local areas, Auckland, New Zealand, 22 November 2021.

Figure 39: Hemangi Sharma, Documenting plastic in local areas, Auckland, New Zealand, 07 December 2021.

Figure 40: Hemangi Sharma, Documenting plastic in local areas, Auckland, New Zealand, 09 December 2021.

Figure 41: Hemangi Sharma, Documenting plastic in local areas, Auckland, New Zealand, 12 December 2021.

Figure 42: Hemangi Sharma, Documenting plastic in local areas, Auckland, New Zealand, 28 December 2021.

Figure 43: Hemangi Sharma, Documenting plastic in local areas, Auckland, New Zealand, 14 January 2022.

Appendix

Ethics Approval

28 October 2021

Andrew Denton
Faculty of Design and Creative Technologies

Dear Andrew

Re Ethics Application: **21/311 Drowning in plastic: Mobile communication for action against oceanic microplastic pollution**

Thank you for providing evidence as requested, which satisfies the points raised by the Auckland University of Technology Ethics Committee (AUTEC).

Your ethics application has been approved for three years until 28 October 2024.

Standard Conditions of Approval

1. The research is to be undertaken in accordance with the Auckland University of Technology Code of Conduct for Research and as approved by AUTEC in this application.
2. A progress report is due annually on the anniversary of the approval date, using the EA2 form.
3. A final report is due at the expiration of the approval period, or, upon completion of project, using the EA3 form.
4. Any amendments to the project must be approved by AUTEC prior to being implemented. Amendments can be requested using the EA2 form.
5. Any serious or unexpected adverse events must be reported to AUTEC Secretariat as a matter of priority.
6. Any unforeseen events that might affect continued ethical acceptability of the project should also be reported to the AUTEC Secretariat as a matter of priority.
7. It is your responsibility to ensure that the spelling and grammar of documents being provided to participants or external organisations is of a high standard and that all the dates on the documents are updated.
8. AUTEC grants ethical approval only. You are responsible for obtaining management approval for access for your research from any institution or organisation at which your research is being conducted and you need to meet all ethical, legal, public health, and locality obligations or requirements for the jurisdictions in which the research is being undertaken.

Please quote the application number and title on all future correspondence related to this project.

For any enquiries please contact ethics@aut.ac.nz. The forms mentioned above are available online through http://www.aut.ac.nz/research/researchethics

(This is a computer-generated letter for which no signature is required)

The AUTEC Secretariat
Auckland University of Technology Ethics Committee

Cc: wky3991@autuni.ac.nz

Participant Information Sheet

Date Information Sheet Produced:

13 October 2021

Project Title

Drowning in plastic: Mobile communication for action against oceanic microplastic pollution.

1. An Invitation

Dear participants,

My name is Hemangi Sharma, I am a design student from AUT. For my master research project, I want to design a mobile application prototype to help prevent microplastic from affecting the oceans by studying user feedback. I would like to take this to higher-level research in the future and become an expert in User Experience and User Interface. This project will also contribute to my qualification in Master of Design at Auckland University of Auckland.

I (the researcher) invite you to take part in a research study. Before you decide, I would like you to understand why the research is being done and what it would involve for you. I am therefore providing you with the following information.

Take time to decide whether or not you wish to take part. Thank you for taking the time to read this.

2. What is the purpose of this research?

The purpose of the sessions is to collect user feedback through the card-sorting method and discussion and apply the contexts discovered around user-friendly design to create a strong digital mobile application prototype.

The findings of this research may be used for academic publications and presentations.

3. How was I identified and why am I being invited to participate in this research?

You are being invited to participate in this research because you are 18–25-year-old familiar with the use of Mobile Applications in daily life and you responded to the Facebook post expressing interest in this research. Your contribution would help this research develop a strong prototype that will eventually contribute to making a design that aims for better and safe environment. Feedback based sessions with you can produce a wealth of data about their thoughts as a user on the prototype design.

4. How do I agree to participate in this research?

After reading this, you will have two weeks to consider and decide whether you agree to participate. If you agree to participate in this study, please contact me with the contact information provided at the end of this sheet.

Next, I will email a Consent Form to you. You will receive the form before the Focus Group discussion session, and you can sign, scan or photograph, and return it to me once you agree and have filled the consent form. After this, we will organise a time suitable for all users.

Your participation in this research is voluntary (it is your choice), and whether or not you choose to participate will neither advantage nor disadvantage you. You can withdraw from the study at any time. If you choose to withdraw from the study, then you will be offered the choice between having any data that is identifiable as belonging to you removed or allowing it to continue to be used. However, once the findings have been produced, removal of your data may not be possible. You are also to keep the content of the discussion and fellow participants' identities confidential.

Consent Form

Project title: ***Drowning in plastic: Mobile communication for action against oceanic microplastic pollution.***

Project Supervisor: ***Andrew Denton***

Researcher: ***Hemangi Sharma***

- ○ I have read and understood the information provided about this research project in the Information Sheet dated 13 October 2021.
- ○ I have had an opportunity to ask questions and to have them answered.
- ○ I understand that identity of my fellow participants and our discussions in the focus group is confidential to the group and I agree to keep this information confidential.
- ○ I understand that notes will be taken during the focus group and that it will also be recorded and transcribed.
- ○ I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time without being disadvantaged in any way.
- ○ I understand that if I withdraw from the study then, while it may not be possible to destroy all records of the focus group discussion of which I was part, I will be offered the choice between having any data that is identifiable as belonging to me removed or allowing it to continue to be used. However, once the findings have been produced, removal of my data may not be possible.
- ○ I agree to take part in this research.
- ○ I wish to receive a summary of the research findings (please tick one): Yes○ No○

Participant's signature: .....

Participant's name: .....

Participant's Contact Details (if appropriate) :

.....

.....

.....

.....

Date:

Approved by the Auckland University of Technology Ethics Committee on 28 October 2021 AUTEC Reference number 21/311.

Focus Group Questions

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Paper (lo-fi) prototype Session:

1. How old are you?
2. What's your highest level of education?
3. What habits do you have? ("Can you tell me about your hobbies?" or "What does your typical day look like?")
4. How much time do you spend online/on your phone?
5. What APPS do you use on a regular basis?
6. How often do you use something made of plastic?
7. Can you name some APP you know which is similar to this?
8. What features do you find most valuable and why?
9. Can you give me a few examples of real situations when you would go plastic-free?
10. What do you think about this design?

Digital (high-fi) prototype Session:

1. What features do you find most valuable and why?
2. If you had to skip anything on the APP what would it be and why?
3. On the scale of 1 to 5 how easy to use was this application? (1=difficult, 5=very easy)
4. What would prevent you from completing a task in the APP?
5. What do you think about this design?
6. If you could change one thing in this app, what would it be and why?
7. How would you describe your overall experience with this app?
8. What do you expect to see in this app in the future?
