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Author	Bourgeois, Stephanie Josee Marcotte(Inakage, Masahiko) 稲蔭, 正彦
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Master's Thesis
Academic Year 2021

Sidekick: Designing a Robot for Anxious Solo Travellers to Assist in Cultural Mistake Avoidance

Keio University
Graduate School of Media Design

Stephanie Josee Marcotte Bourgeois

A Master's Thesis
submitted to Keio University Graduate School of Media Design
in partial fulfillment of the requirements for the degree of
Master of Media Design

Stephanie Josee Marcotte Bourgeois

Master's Thesis Advisory Committee:

Professor Masa Inakage	(Main Research Supervisor)
Senior Assistant Professor Chihiro Sato	(Sub Research Supervisor)

Master's Thesis Review Committee:

Professor Masa Inakage	(Chair)
Senior Assistant Professor Chihiro Sato	(Co-Reviewer)
Professor Kazunori Sugiura	(Co-Reviewer)

Abstract of Master's Thesis of Academic Year 2021

Sidekick: Designing a Robot for Anxious Solo Travellers to Assist in Cultural Mistake Avoidance

Category: Design

Summary

After the COVID-19 global pandemic, international travel is expected to return in full force. However, there is likely to be an increase in the anxiety felt by many travelers. Furthermore, we may see an increase in solo travelers. This paper outlines a speculative and ludic design project inspired by these factors. The proposed design, Sidekick, is a companion robot for anxious solo travelers with the goal of helping them avoid making cultural mistakes while abroad. Sidekick communicates primarily non-verbally, using a unique language of beeps and vibrations to give the users clues about what they should or should not do in a variety of situations. This paper outlines the design process of this innovative product. The goals of this project are to 1) determine what would be an appropriate design for the robot, with regards to the target user's needs as well as the proposed functionality, 2) establish if the intended communication style could be understood by the target audience 3) clarify if the proposed interaction style would be enjoyable for users, and 4) ascertain if the design would be likely to decrease the user's anxiety in the intended use-case scenario. The thesis begins with an extensive outline of related works, continuing on with detailing the ideation stages which included iterative prototyping and various forms of user testing, and concluding with a recap of a video-based prototype test. Results of the final user test indicate that 7 of the 10 participants (70 percent) were able to correctly understand what cultural mistake Sidekick was warning them about in more than half of the scenarios presented to them. Furthermore, when asked if they felt this product would reduce their anxiety while traveling alone, 70 percent of participants responded yes. Finally, 80 percent of participants said they would be interested in having a Sidekick while traveling, depending on their destination.

Keywords:

design thinking, speculative design, ludic design, innovation, culture

Keio University Graduate School of Media Design

Stephanie Josee Marcotte Bourgeois

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Chapter 1
Introduction

1.1. Design Introduction and Contextualization

In 2020, the world was rattled by the devastating COVID-19 pandemic. This would change humanity in several ways, with countless long lasting consequences. One effect which could be clearly noted was the need for people to practice social distancing and to isolate themselves (CDC 2020). For many people, this would be the first time in their lives that they would spend extended periods of time alone. The coronavirus also correlated to an increase in the number of people experiencing serious or even debilitating anxiety (Wang et al. 2020). Yet another impact of the global pandemic was the widespread closing of international borders. Travel for leisure ceased almost entirely throughout 2020. At the time of writing in 2021, many borders are still closed, prohibiting international tourists from entering. These three elements - isolation, anxiety and travel - play a key role in the following research project. My proposed design, named Sidekick, is a small, portable robot whose aim is to assist anxious solo travellers in avoiding making cultural mistakes.

The aim of this project is to design a framework for a robot which could help reduce the number of cultural mistakes a tourist makes while they are abroad, and simultaneously decrease the level of anxiety the user feels while traveling solo, in a fun and novel way. Traveling alone, regardless of the COVID-19 pandemic, can be very anxiety inducing for certain people. In particular, without any companions, any mistakes made in a foreign country may feel particularly embarrassing as there is no one there to "share the blame" with. Sidekick's goal is to help reduce this anxiety by limiting the number of cultural mistakes a tourist may make. In theory, Sidekick communicates with it's user through its own language, which is primarily non-verbal. This design choice is explained at length in Chapter

3 (Concept), but essentially this functionality was chosen to increase the ludic aspect of the design and to foster more playful and game-like interactions between Sidekick and the user. Sidekick's language consists mostly of a variety of beeps, chirps and vibrations in specific patterns, which the users learn as they interact with Sidekick.

In the context of this project, the term "cultural mistake" refers to any actions which a tourist or foreigner might do (or not do) while abroad which could be perceived as rude by the local people. These are actions which the people of the region learn through their own local community or national culture, but which are likely unknown to tourists and may not be noted in guidebooks. An example of a cultural mistake in Vancouver, Canada would be to not hold the door for the person behind you when entering a building. Another similar example would be to not leave a monetary tip, or to tip an inappropriate amount, after dining at a restaurant in either Canada or the United States.

The name Sidekick was chosen for this project as its main goals are to act as a fun, playful robotic assistant. It should have more personality than a standard, run of the mill smartphone app - while at the same time being less authoritative or intimidating than a humanoid robot. Ideally, it's social hierarchy as compared to its user should be that of a pet, as opposed to a colleague.

Sidekick is a ludic and speculative design research project. Ludic here meaning that the design aims to be playful in nature[1]. In this case, it is more important for the final product to be fun as opposed to simply being efficient. To clarify the definition of ludic design, one may consider the highly popular footwear trend from the early 2000's known as "Heelys" [2] . Heelys are a type of shoe with a small built in wheel in the heel, allowing for the user to roll instead of walk by shifting their weight to their heels, much like they would on roller skates. While Heelys are arguably less efficient than standard footwear (for example, the American Academy of Pediatrics released a study on how children could injure themselves using Heelys or similar products (Vioreanu et al. 2007)) they were considered more " fun " than a standard shoe. Speculative design, on the other hand, aims to hypothesize about what kind of product could exist in the future[3]. Therefore, Sidekick as a product is designed under the assumption that certain technologies would become more readily available or more affordable for the general public in

the future, approximately five to ten years from now. More detailed information about Sidekick's proposed technology is provided in Chapter 4 (Proof of Concept).

1.2. Scope of Research

As previously stated, this design project is speculative in nature. Therefore, the end goal is not to design a fully functioning prototype fit for the commercial market. Instead, the aim of this project is to create prototypes of varying fidelity levels to determine if the proposed design would have the potential to achieve the aforementioned goals. Early design stage work such as target user surveys, affinity diagrams, and user personas were created to validate initial design decisions. Based on the collected data, low fidelity prototypes were built, and subsequently higher fidelity versions were created. With these prototypes, several different tests were conducted to determine the efficacy of the design in relation to its intended goals. Some prototypes aimed to establish the design's physical form, while others were entirely digital and aimed to test the proposed functionality.

In other words, this project will focus on establishing preliminary target audience research, research into what functionality would be needed for this device to be useful, and designing and prototyping the form of the device. Details about the software coding requirements such a device might require will not be investigated during the course of this project. Therefore, a fully functioning prototype is beyond the scope of this document. Instead, this paper will be laying the foundation for the functionality and physicality of the product, allowing for future research to focus on the coding and software, as well as more substantial hardware recommendations. I believe even though this project will not result in a self-sufficient functioning product, the research conducted will nonetheless be beneficial and essential for future development.

1.3. Research Objectives

The purpose of this design project was to create a framework for a product which would assist anxious solo travellers by helping them to avoid making cultural mistakes while they are abroad. Therefore, the objectives were: Ascertain if the

design would be likely to decrease the user's anxiety in the intended use-case scenario.

- Determine what would be an appropriate design for the robot, with regards to the target user's needs as well as the proposed functionality
- Establish if the intended communication style could be understood by the target audience.
- Clarify if the proposed interaction style would be enjoyable for users
- Ascertain if the design would be likely to decrease the user's anxiety in the intended use-case scenario.

1.4. Relevance

Cross-cultural interactions have been a topic of interest to the global community for as long as international travel has been possible, and even more so since it became widely accessible to the middle class population. On the topic of tourism, there is plenty of data to show that up until the COVID-19 crisis, tourism around the world was continuing to grow annually. In the World Tourism Organization's yearly highlights report for 2018 they stated that international tourist arrivals had increased by 5 percent since the preceding year, and equalled 1.4 billion arrivals. Furthermore they revealed that earnings from tourism (based on international tourism receipts and the money spent by tourists on international transportation) was valued at 1.7 trillion dollars USD (World Tourism Organization 2019).

For the sake of this research, the user testing was done in the context of tourists in Japan. This was selected for a variety of reasons. First, tourism is a major industry for Japan. Only 2 percent of Japan's resident population in 2018 was made up of non-Japanese people or ‘foreigners’ (Okada 2018). However, Japan received over 31.8 million visits by overseas residents in 2019, prior to the pandemic (JTB Tourism Research & Consulting Co. 2019).

On a personal note, I myself have been fortunate enough to experience being a tourist in Japan on three separate occasions prior to becoming a resident here. Therefore, I can empathize with foreigners making cultural mistakes in Japan.

Moreover, as this research was conducted in Yokohama at Keio University, it seemed best suited to researching from the perspective of someone visiting Japan. This research was also inspired by the 2020 Tokyo Olympics which, at the time of the commencement of this project in September 2019, were expected to bring a massive influx of tourists to the country. Nonetheless, despite the global COVID-19 pandemic devastating Japan's plans for a tourism surge in 2020, many believe tourism will increase once borders reopen, as travellers are eager to resume their world voyages once more after spending nearly two years in quarantine. However, because of the pandemic and consequent quarantines, border restrictions and the potential requirements for "COVID-19 Passports"[4], it is not hyperbole to predict an increase in solo travel. Therefore I believe this is an ideal time for this specific research and innovation to be done in this field. Studies in the domain of cross-cultural understanding, and how technology can be used to create positive experiences both for foreign tourists, but also for the local Japanese people, is indeed timely. Miscommunication and a lack of understanding on the tourists' part can have negative effects on the local population and their perception of tourists. For example, in recent years many local Japanese residents were upset that foreign tourists were damaging cherry blossom trees during their blooming season, which is a celebrated time in Japan (Xie 2016) . The tourists were tugging on the tree branches to pose with them in their photographs. However, this kind of behaviour is considered rude in the local culture, and casts a negative light on tourists during the season. These kinds of unfortunate incidents can be avoided by helping tourists be better informed about the etiquette, customs and culture of Japan.

While there already exists several tools for tourists such as smartphone applications (apps), websites, travel television shows and printed guidebooks, there are still some aspects of visiting a new country and a foreign culture that can remain daunting to a tourist. In particular, navigating the nuance of the culture combined with addressing the sometimes not-so-obvious or unspoken societal rules can be challenging. There is currently no device which can seamlessly and playfully assist tourists in real time to avoid making cultural faux pas. Therefore there is a notable lack of competitor devices in this domain.

In summary, while the tourism industry is currently at a standstill due to the

global pandemic, it will likely return in full force once international travel resumes. Said global pandemic is also likely to result in an increase in solo travel as well as anxiety while travelling. However, there is currently no device on the market with the functionality that I propose for Sidekick. Therefore, this project is not only novel and unique in it's design, but highly appropriate in its timing.

1.5. Overview of Dissertation Structure

The remaining content of this paper is divided into the following chapters. Chapter 2 provides an overview of relevant research which has already been conducted on this topic. It also explores current commercial products which are similar to Sidekick. Chapter 3 elaborates further on Sidekick as a design concept and highlights the intended target user. It also details some early-stage prototyping and user testing. Chapter 4 focuses on proof of concept and design validation. It explores in detail the higher fidelity prototyping which was done as well as the associated user testing. Chapter 5 includes concluding remarks as well as recommendations for future research.

Notes

1 https://www.collinsdictionary.com/dictionary/english/ludic

2 https://heelys.com/

3 https://www.collinsdictionary.com/dictionary/english/speculative

4 https://www.japantimes.co.jp/news/2021/04/29/national/japan-vaccine-passports/

Chapter 2
Related Works

To begin the design process, academic works from relevant fields were studied to form a solid base of understanding. While attempts to find studies specifically relating to social robots teaching cultural knowledge to humans were unsuccessful, there were several interesting works in a variety of other domains that could tie in closely to the current design project.

2.1. Cultural Perceptions of Politeness

For example, one such related topic is the concept of "politeness" and how it may be perceived differently depending on one's culture. Studies have been published on the fact that different nationalities perceive certain other cultures as being more prone to being impolite - for example, many people have the stereotype that certain European nationalities are particularly impolite (Sifianou 1992). However, these related studies focus primarily on language differences, as opposed to committing cultural mistakes. Some studies suggest that impoliteness, as perceived by foreign cultures, might be connected to how children are reprimanded for rude behaviour. This would also tie in to the topic of how humans learn new behaviours, which is also very relevant for Sidekick. One article researching a stereotype of impoliteness pertaining to a certain Asian culture found that there was a significant difference in the way that children from said culture were corrected by parents and teachers for rude behaviour compared to children from western countries (Lee 2011). This is relevant to the current proposed research because the Sidekick essentially aims to teach tourists how to be polite, and correct previously used rude behaviours. Also in the field of cross cultural differences, there have also been studies about how different cultures have a tendency to help or ignore

strangers in need of assistance. Some studies suggest there is no dependable way to predict if a person from any given cultural background will be inclined to assist a stranger, for example studies have shown even highly exclusionist cultures do still help strangers at times (Minkov and Hofstede 2011). Essentially this means that tourists have no dependable way to predict if locals will teach them about any cultural mistakes they may make. Instead, it can be assumed that though a tourist might be making the same cultural mistake repeatedly throughout their travels, they may have little chance of being informed about it.

The topic of cultural differences also applies to the Sidekick project in another way as well. Different cultures may have opposing stereotypes about robots in general. A study involving a robot security guard found that a majority of participants were willing to follow instructions given by a robot (Agrawal and Williams 2017), however a separate study showed that participants tended to be against using robots relying on robots in emergency situations but were generally in favour of using robots to supply information (Webster and Ivanov 2020).

2.2. Non-verbal Notifications from Devices

As Sidekick primarily uses its own non-verbal language consisting of beeps and vibrations, it was also highly relevant to review what studies have been done in the field of music perception. One study found that major chords are generally perceived as positive and minor chords as negative-sounding (Bakker and Martin 2015). Another study found that the inversions and register had a large impact on the perception of a sound's emotion, both for musicians and non-musicians. Furthermore, it showed that participants clearly preferred mildly dissonant chords over consonant chords. The instrument being used also had a significant impact. For example, the major seventh chord played on the strings was perceived as being ‘nostalgic’ for most research participants (Lahdelma 2017). There have been several studies on how humans perceive different sounds as being ‘happy’ or ‘sad’, as well as a range of other emotions. This information will be very beneficial for creating Sidekick's unique set of sounds.

Relating to the topic of Sidekick's non-verbal communication, it was essential to investigate what research had been done into how humans perceive non-verbal

notifications from their digital devices. One study found that users were able to follow non-verbal vibration-based navigation instructions given by their smartphone with an error rate of only 4 percent (Azenkot et al. 2011). Also worthy of note, researchers developed a software called SCAN which, when installed in a smartphone, can defer notifications until ‘breakpoints’. I.E. , in the context of dining with friends, it would withhold notifications until the user left the table, or other people at the table were checking their phones (Park et al. 2017). This technology could be useful for Sidekick, as in some scenarios a user may not want to be immediately interrupted with an audible notification. Another study found that users prefer vibration as the best method of notification for smartphones, with visual cues (i.e. blinking LED light) being the least useful (Exler et al. 2017). Furthermore, researchers also discovered that shorter gap lengths between vibrations (200 ms vs. 600 ms), combined with a vibration pattern using only one gap and shorter vibration made the user perceive the alert as more urgent (Saket et al. 2013). Finally, it has also been determined that “both vibrotactile and auditory smartphone notifications induce skin conductance responses [and] that the induced responses differ from that of arbitrary stimuli” (Fortin et al. 2019) and that by using certain sensors, they could determine if a user had perceived a notification or not. Therefore, Sidekick could adjust it’s vibration feedback strength based on if it’s user had failed to perceive the notification.

2.3. Robots

As this project aims to design a technological, digital device which can assist tourists, it was deemed appropriate to research a brief history of robots specifically in Japan (as this is the location of my research), and how readily available and advanced they currently are. Furthermore, Japan has a very long and extensive history with robots, and in particular social robots, especially in comparison to western countries.

2.3.1 Historical Notes

The earliest, most basic robots in Japanese history are considered to be the karakuri mechanical dolls, which were particularly popular during Japan’s Edo

Period which spanned over two centuries, beginning in the year 1600 and ending in 1867 (JapanGuide 2020). These dolls were powered by clockwork, and some of the most popular dolls were designed by watch-makers. These dolls also incorporated other components, depending on the function of the doll. For example, the popular dangaeri ningyō (stair-walking doll) contained a compartment filled with mercury which would shift the doll's center of gravity once in motion, allowing it to descend a flight of stairs by doing back handsprings. Another popular doll, the chahakobi ningyō (tea-serving doll), would bow its head and move forward when a full teacup was placed on it's tray. When the tray was empty the doll would stop, and when an empty cup was returned to the tray it would rotate and move away from the recipient (Sato 2012). Over the centuries, robots have remained popular in Japan, featuring in many movies, comics, and television shows, such as the world renowned Astro Boy (" Mighty Atom ") series.

Japan's long history with robots could be one of the reasons it seamlessly integrates them into everyday life. For example, 2018 was the 37th year in a row where Japan had a decrease in its national birth rate - consequently, robots are beginning to fill the gaps caused by the shrinking workforce. This workforce is said to be shrinking at a rate of 500 thousand workers per year. An example of this phenomenon is how in the Yaskawa robot factory based in Fukuoka, the company had to install robots to automate it's assembly lines. Essentially, it is a factory where robots build robots. This was due to the factory not receiving enough job applications from human applicants (Huffpost 2018).

2.3.2 Robots in the Workforce and at Home

In Japan, robots have been an important part of the manufacturing industry for decades. Since the 1970s Japan has been considered to be at the forefront of robotic technology. Moreover, in more recent decades, Japan has been the world's top exporter of industrial robots. In 2012 it was responsible for 50 percent of the global market share of exported industrial robots, which was equivalent to 3.4 billion yen's worth of robots (University of Tokyo 2016). Robotics is a lucrative field to be in, with this industry predicted to be valued at 67 billion USD worldwide by the year 2025 (Huffpost 2018).

While robotics grew from a need to alleviate manual work demands for human

labourers, in recent years there has been an increase in demand for robots in the private sector as well. As robotic technology advances and becomes more readily available to the average consumer, more and more human needs are being met by robot assistants. From Tamagotchis[1], Furbies[2] and Poo-chis[3] entertaining children to Google Homes[4] and Alexas[5] helping adults with their shopping lists and scheduling their calendars, robots have seamlessly seeped into everyday life for regular people all over the globe. Even the elderly, who are often stereotyped as being inept when it comes to using technology, are embracing personal robots. For example, in Japan robots resembling cute animals such as puppies and seals are being introduced into old age nursing homes to help residents increase their daily socialising (University of Tokyo 2016). Thanks to the Internet of Things (IoT), or the wireless interconnectivity of all our devices, these everyday robots interact with us in almost any number of ways, with new applications and technology advancing daily.

Of course, robots are also being developed for less trivial things than recommending what to buy on Amazon. With global warming and increasing societal turmoil around the globe, more and more robots are being designed to work in disaster zones which may be too dangerous for their human counterparts. For example, after the 2011 Great East Japan Earthquake and Tsunami, robots were used to decontaminate radioactive sites in and around the Fukushima Daiichi Nuclear Power Station (University of Tokyo 2016). Robots are becoming more capable than humans in a growing number of fields, meaning they are also becoming highly valuable outside of high risk, dangerous situations. For example, the "Rock Paper Scissors" robot created by the Ishikawa Senoo Lab at the University of Tokyo has a 100 percent win rate at his titular game, because its vision chip allows it to identify and process targets (in this case, human hand motions) in as little as 1 milisecond (NeoScribe 2018).

2.3.3 Humanoid Robots

The Miraikan National Science Museum[6] located in Odaiba, Tokyo features a permanent exhibit on how robotic technology has advanced over the years. There, visitors can learn about perhaps one of the most famous robots Japan has produced: Honda's Asimo. Asimo first appeared in the year 2000, though research

for this robot originally began in the 1980s. In his current form, he can complete a wide range of tasks, including hopping on one foot and using his hand dexterity to serve a glass of water poured out of a thermos. He can also recognize faces and voices, even if multiple voices are speaking simultaneously (Honda Motors Co. 2011).

The exhibit also features many robotic androids, such as Kodomoroid, which resembles a human child and recites world news. Another android in the exhibit is Otonaroid which resembles an adult female human, and can be used as a kind of telephone with a body (Hiroshi Ishiguro Laboratories 2011). However, these robots might be repulsive to some museum visitors, as they teeter dangerously close to the edge of the Uncanny Valley - a phenomenon some people experience when viewing a robot or computer generated image which highly resembles a human, which causes a strong sense of revulsion for the individual viewing it. Several of the androids featured at the Miraikan museum, including Kodomoroid, Otonaroid and Telenoid (a limbless “baby” robot) were developed by Hiroshi Ishiguro Laboratories[7]. This same lab also developed other androids with photo-realistic human appearances, including their Geminoid series (DK, Hi-4 and F to name a few) which strongly resemble the real people their appearances were based off of (Hiroshi Ishiguro Laboratories 2011). Some of the androids from this lab are autonomous (meaning their programming allows them to move and communicate on their own), while others are tele-operated (meaning they are remotely operated by a human from a distance).

Odaiba is also home to the giant Unicorn Gundam statue (which is capable of moving it's head and part of it's helmet). It is a 1:1 scale replica of the robot suits from the famous Gundam media series (which boasts a wildly successful collection of anime TV series, manga comic books, video games, and merchandise). This is another indication of the popularity and prominence of robots in Japan - not only in their realistic, practical uses but also in the popularity of fiction works featuring robots, such as Gundam.

2.3.4 Robots in Public Spaces

There are a wide number of places where one can witness robots in the Japanese service industry. For example, in 2016 Honda's Asimo greeted guests arriving at

Tokyo's Narita airport where Panasonic's HOSPI robots also assisted in waiting on restaurant tables in 2017 (Bagette 2018). Japan also hosts the Japan Robot Show and the International Robot Exhibition (iREX) [8] - which claims to be the largest robot trade show in the world. These two shows alternate every year.

Another place to interact with robots popular among tourists in Japan is the internet famous Henn-na Hotel[9] located in Chiba. When it opened, it claimed to have 140 robot staff members, including dinosaur robots who would check guests in at the front desk. It originally had approximately seven human staff on site at all times, to handle tasks the robots could not (Bagette 2018). However, the hotel later had to "fire" half of it's robot staff because there were too many instances where they couldn't meet customers' needs. For example, they would reportedly struggle with answering customer questions and frequently get stuck in the hotel's hallways while trying to deliver suitcases to customer rooms (Liao 2019).

Yet another common robot the general public can meet in Japan is Softbank's Pepper[10] robot. Pepper can often be seen greeting customers in front of Softbank stores, and according to the Softbank website Pepper is also "employed" by over 2,000 companies, as well as stationed in some schools to assist with teaching. Pepper can be described as a "semi-humanoid robot" as it has humanoid features (i.e. a round head adorned with two eyes and a mouth, a neck, torso and two humanoid arms with hands) though it's aesthetic is decidedly not human-realistic - unlike an android, it makes no attempt to pass off as a human. In this way, it completely avoids the aforementioned 'uncanny valley effect'. Softbank touts Pepper as "the world's first social humanoid robot able to recognize faces and basic human emotions" (Softbank Robotics 2018). Softbank also states Pepper has 20 degrees of freedom with its joints, allowing for smooth and natural looking movement. It is also reportedly capable of omnidirectional and autonomous navigation.

Government offices are also incorporating robot assistants. In Gifu, Ogaki city hall recently had a pilot program where autonomous robots would guide visitors to information windows and elevators, as well as verbally help them fill out forms and documents. The city hopes to fully implement the new guide robots by 2020 (KYODO 2019).

Robots are also proving themselves useful in care centers for elderly citizens.

Paro the seal robot was designed as a therapy robot and provides users with a sense of companionship, similar to having a pet dog but without any of the responsibilities. This makes it ideal for the elderly who may be unable to properly take care of a living animal. It has been particularly well received by patients with dementia and Alzheimer's (Paro Robots 2018).

Androids and robots are popping up in more and more surprising locations. For example, another android robot with a public-facing job is Mindar, which is modeled after Kannon Bodhisattva. Mindar was designed to explain Buddhism to tourists at the Kodaiji temple in Kyoto for a 2 month trial period. The addition of the android to the temple is said to be in part to increase interest in Buddhism and the temple among tourists and people who are unfamiliar with Buddhism (JIJI 2019).

Robots in Japan are also assisting in other fields outside of hospitality. For example, the HRP-5 Robot by the National Institute of Advanced Industrial Science and Technology (AIST)[11] is capable of doing basic tasks on a construction site, such as stapling drywall sheets to a wooden frame (NeoScribe 2018).

While some robots are being designed to take over jobs from humans to help with the impending worker shortage, other robots are helping more humans be able to work. Telepresence robots are helping people who are too far to commute to work, or are physically unable to work with their own bodies. For example, OriHime is a prototype telepresence robot which can be used by people with serious physical disabilities to experience life in a far away location. Equipped with a camera, microphone, speaker, wheels and a moveable head and arms, it can be operated remotely by anyone with a computer. In a pilot project, different versions of the OriHime robot staffed a cafe (Hegarty 2019).

2.3.5 Robots for Personal Use

Robots are also becoming more and more available for personal use. For example, Robohon is a small, portable robot with similar functionality to a cell phone. It is too large to fit in a pocket and considerably clunkier than any modern smart phone and so the likelihood of Robohon actually replacing cell phones is unlikely. However, according to its developers, its main purpose is to provide a sense of companionship. Robohon is capable of transmitting phone calls, taking pictures,

and displaying images thanks to a projector built into its head (Saiidi 2017)

Some personal robots are also being released to help with education. Musio was designed as a personal robot to help those wishing to improve their English skills. Its designers are particularly proud of its Pronunciation Checkup and Grammar Correction abilities. Musio is particularly special because it can have conversations with humans on a variety of topics. It uses a Wi-Fi connection to access information about different topics, and its programming includes inference abilities, which means it is capable of remembering what questions a user has already asked and infer what the user is talking about without overly simplified or direct speech. Because of this it is able to have natural-sounding, fluid conversations. Musio can also be partnered with another device known as Sophy to incorporate learning materials (Musio 2017).

Some personal robots are now being designed primarily for companionship as opposed to serving any other function. For example, Groove X's Lovot - a robot whose name consists of the words “love” and “robot” - was designed solely to provide companionship. It's creators have stated that it was not designed to be entertaining or helpful in any other way. Lovot has a soft, plush exterior and large LCD screen eyes. Consumers are encouraged to pick it up and cradle it like a baby, and they can also buy clothing to outfit their Lovot (Lovot 2021).

Yet another personal robot designed to provide companionship is NEC's PaPeRo (which is short for “Partner-type-Personal-Robot”). PaPeRo is particularly popular because of it's cute, round appearance. It utilises cameras, microphones and ultrasonic sensors to interpret its surroundings and to help it navigate. It is autonomous and is capable of rolling around on its own (PaPeRo i 2017). The original PaPeRo stands approximately 38 cm tall and weighs 5 kg, though NEC has since released a Mini version which is half the size of the original. It has a continuous run time of 3 hours, but also takes 3 hours to fully recharge it's internal battery. PaPeRo recognises about 3000 words and can obey basic commands including “dance”. Its eyes are twin cameras which are used for its face recognition system (English 2015).

Toyota's Kirobo Mini, based off of Toyota's Kirobo astronaut robot, was designed as a driving companion for humans on earth. It's small size (no bigger than an apple) makes it highly portable and its cartoonish aesthetics make it appear

very family friendly. It can have basic conversations, but what sets it apart from other companion robots is that it can interpret the driver's mood and suggest places to visit or music to listen to, as well as assist in navigation and traffic avoidance (Toyota 2019).

Some old classic personal robots are also being upgraded thanks to advances in technology. For example, Sony's newest Aibo robot dog comes with a security package which uses the robot's on-board face tracking and 3D mapping technology, as well as other sensors, to keep its owner's home safe (Heater 2019). This latest 4th generation model, released in 2018, is significantly more advanced than the original 1999 Aibo.

Perhaps the reason robots have integrated well into Japanese society is because of the highly choreographed routines that are particularly present in the Japanese hospitality industry. For example, how staff on Shinkansen bullet trains elegantly bow before leaving a train car, every single time without fail. Similarly, staff at high end department stores often do a "greeting chorus" when the store first opens every morning (Bagette 2018). These routines are easy to program for robots to do, which makes them "conform" in Japan as opposed to being viewed as "robotic" in Western cultures.

Another hypothesis as to why Japan is particularly open to robots is the country's Shinto roots. Animism, or the quality of seeing life or a spirit in inanimate objects such as trees and mountains, is a traditional aspect of historic Shintoism. Therefore, being open to the notion that a stone may have a spirit could potentially allow for a readiness to perceive positive or benevolent life, spirit or personality in other inanimate objects, such as robots (Yamaguchi 2017).

To summarize, robots have existed in Japan for centuries and their popularity only seems to be increasing. They are currently being implemented in a wide range of sectors, and innovation provides new possibilities for their functionality on a seemingly daily basis. They can generally be divided into two larger categories: autonomous and telepresence robots, and two sets of aesthetics - realistic or cartoon. Much like sushi, sumo and cheery blossoms, high tech robots have become a symbol of Japan around the world, and foreigners appear to have a growing fascination with Japanese robotics. For these reasons, I believe Japan would be the ideal place to design and test a travel buddy robot for tourists,

as the technology available in Japan is advanced, and the local culture embraces them. Moreover, foreigners would likely feel that having a robot companion would be a very “Japanese” experience.

2.3.6 Summary of Findings Relating to Robots

For my preliminary research, I thoroughly studied the history of robots in Japan, as well as notable examples of working modern robots and where they are currently being used. This research showed that robots are used in a wide range of industries in Japan, both for commercial and personal use. Because my project would fall under the personal use category, I chose to focus on examples in this section.

Moreover, I learned that modern robots can generally be divided into two categories: autonomous and telepresence. Autonomous robots are able to function on their own; their programming, software and hardware allow them to move and make decisions on their own. In contrast, telepresence robots require a human user to make decisions for them. They are remote controlled, and generally act as a kind of vessel or second body for their users. Based on these distinctions, my project will aim to be an autonomous robot, as having a telepresence robot would consequently require a human work force equal to that of the tourist population, which is unfeasible.

Next, I found that there seemed to be two main categories in terms of aesthetics for modern robots. They seemed to either aim for hyper-realistic, human-resembling androids, or almost cartoonish and round - often with a minimalistic white and black colour scheme. Flashy patterns or prints were highly uncommon, though in some cases the designers provided clothing or accessory options to customize the robots. This being said, the more a robot resembles a human, the higher the amount of weariness or repulsion it seems to have on viewers, particularly those from western countries. In many of the interviews and films reviewed for this project about androids resembling humans, interviewers seemed visibly disturbed by how “human-like” the robots seemed to be. On the other hand, robots which had a more cartoonish and minimalistic appearance were often described as “cute”. Because my project aims to develop a robot to be used by a wide range of people, I believe it is best to aim for the aforementioned cartoonish aesthetic, as opposed to trying to make the robot resemble a real living creature.

Several examples I explored also proved that robots can be small - in the case of the Kirobo Mini, as small as an apple - and still have a wide range of abilities and functions. This means that robotics technology has reached a point where a small size does not necessarily mean a reduced capacity for functions. This will be essential to my design process, as a successful travel robot must be highly portable, and being restricted to a large or heavy form would be highly detrimental to its usability.

Finally, I was able to find different existing robots with many functionalities I think would be very useful in my project's robot. For example, many robots had the ability to interpret conversations with their users. Others also had GPS and location identification abilities. Others still displayed the ability to interpret human emotions, and with the inference abilities were able to make suggestions based on their interpretations of situations or conversations. Finally, many robots displayed highly accurate facial and object recognition abilities, which I also believe would be very useful for a travel companion robot.

Notes

1 https://tamagotchi.com/

2 https://furby.hasbro.com/en-us

3 http://www.theoldrobots.com/smallbot34.html

4 https://support.google.com/chromecast/answer/7071794

5 https://developer.amazon.com/en-US/alexa

6 https://www.miraikan.jst.go.jp/en/

7 http://www.geminoid.jp/en/index.html

8 https://biz.nikkan.co.jp/eve/irex/

9 https://www.hennnahotel.com/ginza/en/

10 https://www.softbankrobotics.com/emea/en/pepper

11 https://www.aist.go.jp/index_en.html

Chapter 3
Concept

3.1. Overview

As previously stated in Chapter 1 (Introduction), this design project is titled "Sidekick". This name was chosen as it signifies endearingly someone's assistant, which is exactly the perspective I hope the target user will have on the final product. Sidekick is a small, portable, discreet companion robot for anxious solo travellers. It's purpose is to help travellers avoid making cultural mistakes by warning them before said mistakes occur. As this is a ludic design project, the process of warning the user has been gamified. Instead of always speaking in human language, Sidekick primarily communicates with its own vocabulary of beeps, chirps and vibrations. The user must learn and decipher these noises to determine what Sidekick is warning them about. If the user is completely unable to guess the "right answer" for the situation at hand, Sidekick is capable of explaining the correct behaviour for the scenario in human language. Sidekick provides spatially relevant notifications. For example, if Sidekick tries to warn the user about something specifically to their left, the notification sound or vibration will happen on the user's left side.

3.2. Interactions

When Sidekick is in use, it constantly analyses it's surroundings to determine what situations the user is in. When Sidekick determines the user is in a scenario in which tourists often make cultural mistakes, it will warn the user using it's unique language of beeps and vibrations. The user has the ability to change the frequency of Sidekick's notifications. More anxious travellers may choose to have

Sidekick at the highest settings, where they will be notified of almost any mistake they may make. However, less anxious travellers may choose to have Sidekick notify them only if they are about to make a very grave mistake. In either case, over time Sidekick will gradually warn the user about fewer small scale mistakes they may make. This will slowly adapt the user to making mistakes and learning from them. This is not unlike how some parents may allow their child to fall from the jungle gym so that they learn how to use it properly, but also to not be afraid of falling. Users communicate with Sidekick in two ways. First, they can speak with Sidekick, as it has the ability to understand conversations. Second, they can show Sidekick through their actions, as Sidekick would have an ultra wide angle camera to be able to perceive what the user is doing at all times. For example, if Sidekick provides the user a warning at a shrine, trying to notify them to wash their hands and mouth at a water basin, the user can either guess aloud by saying "am I supposed to wash my hands there?" or they can start walking over to the basin. In either case, Sidekick will respond with either an encouraging or discouraging chime to inform the user if they are getting closer or further from the answer. If the user gives up, they can either say so aloud, or press a button on Sidekick to ask it to provide them with the correct answer in a human language of the user's choice (i.e. English).

3.3. Target User

- Young adult between age 20 and 35
- Some disposable income
- Any gender
- Interested in travel
- Prone to anxiety

This age group was selected for a number of reasons. It is important to keep in mind that the goal for this project is to design a companion robot for solo travellers. Therefore, people above the age of 20 are more likely to solo travel

as compared to teenagers. They have finished high school and have more control over their schedules and finances. They have likely begun working in their career fields but are unlikely to have large financial responsibilities such as car loans or house mortgages, and therefore are more likely to have some disposable income for travel. However, people above the age of 35 are more likely to be in long term relationships or may already have their own family, which decreases the likelihood of them travelling on their own. Travellers who are not prone to anxiety do not fit the target audience as they would likely not feel the need for a companion robot to assist them in avoiding cultural mistakes. People who are not easily embarrassed, or give little thought to how others perceive them, are unlikely to find value in a product such as Sidekick, and are therefore unlikely to use Sidekick in the real world.

3.4. Technology

The following is the minimum technology I propose Sidekick should have to be able to have the desired functionality.

- Multi-Array Microphone: A microphone would be required to receive audio input from the user. It should be able to clearly pick up the user's voice, and be able to distinguish it from background noise. For example, if the user is talking to the robot while walking down the sidewalk, the sound of passing cars should not interfere with the robot's ability to understand the user's commands.

- Speaker: The robot must have speakers so that it can relay audio information back to the user. It should be able to provide crisp, clear sound.

- Vibration motor: If the user is in a quiet space (i.e. a train), Sidekick should be able to notify them silently through haptic feedback.

- Camera: Sidekick must have a wide lens camera to help it understand where it is, and what the user is looking at, so that it can provide relevant cultural information. For example, if the user is visiting a shrine and is facing the

water basin where guests should wash their hands and mouth, Sidekick should be able to recognize what it is from multiple angles.

- GPS: Sidekick requires a highly accurate GPS to help it understand what kind of situations the user is in and provide relevant warnings about potential cultural mistakes.

- WiFi/Data Connection: The robot would also need to connect to the internet. This will allow Sidekick to connect to an online database with information about the most common cultural mistakes tourists make in that country. This way, Sidekick will not need to store this information internally. Furthermore, it will be easier for the database to be updated without Sidekick having to upgrade its software.

- Bluetooth connectivity: Sidekick should be able to connect to wireless headphones to provide the user with audio information in a more discreet way than using it's built in speakers, for situation where the user must be silent (i.e. on public transportation).

3.5. Preliminary Research

At the beginning of this project, two methods of preliminary research were conducted. The first was deploying two multiple question surveys. The surveys were done using Google Surveys and participants were able to complete it digitally via smartphone, tablet, or computer. The survey covered general questions about users' travel habits, travel goals, and anxieties they have while traveling. It also asked personal questions such as age, gender and nationality to narrow down what target audience would be interested in this product.

Key findings from the surveys include that, when asked to report how concerned they were about making "cultural mistakes" abroad, 77.7 percent of participants responded with moderate to high levels of concern. Moreover, over 51 percent of respondents admitted to having made cultural mistakes in the past. Over 70 percent of participants also claimed they had witnessed tourists being rude in their home countries. However, a majority of respondents stated they would likely not inform a tourist that they were being rude. All participants reported doing

at least some research on the local culture prior to travelling to a new country. When presented with three fictional scenarios describing situations where they made cultural mistakes while traveling, the majority of participants reported they would feel negative emotions such as “embarrassment”, “feeling ashamed” and “feeling guilty (about their ignorance)”. In one scenario where a local informs them of their mistake, several participants indicated they would be very grateful and thankful to have been informed. When asked how they would feel if they had a Sidekick robot which prevented them from making cultural mistakes while traveling, the majority of participants responded with positive emotions such as “relieved” and “thankful”. Finally, a majority of participants indicated they would be interested in using Sidekick if it were to become available, and they also indicated they felt it would be beneficial for travelers.

The second method of preliminary research was target audience interviews. Once the target audience had been narrowed down, I explored the data to create an archetype target user. With this archetype in mind, I performed user interviews to get more specific information from participants who matched the archetype. Interviews were conducted digitally, and participants were given 3 days to provide written responses to the questions.

3.5.1 Affinity Diagramming

Based on the user interviews, I created affinity diagrams to better understand the overlying wants and goals of my target audience (see appendix). An affinity diagram is a tool used in conjunction with brainstorming. It is the process of taking the results of a brainstorming session and finding connections or similarities between them, and consequently categorizing them into groups. This helps researchers have a clearer picture of the overarching themes in their results. These are the functions most users deemed to be essential for a useful travel companion robot:

- Cultural advice
- Translation
- Navigation

- Budgeting

The survey showed that the target audience had many goals for their ideal travel companion robot. Upon further review it was determined that many of these functions are already available in the form of smartphone applications, such as Google Maps or Google Translate. While these applications do not fit in the scope of ludic design, because they are so readily available, and the majority of people in Sidekick's audience would already be familiar with them, it is unlikely that users would prefer to use a gamified new version of the same function they already have access to. Therefore it seemed redundant to include them in Sidekick's functionality. After further consideration, it was decided that Sidekick should focus on one specific function, and that this should be something novel that is not already available in a smartphone app. In conclusion, while several functions were deemed useful by the survey respondents, it was decided that Sidekick's primary function would be to give cultural assistance in the form of helping users avoid making cultural mistakes. Sidekick would provide this in a novel and seamless way, making it unique in the market. Furthermore, because this is a unique function, introducing it in a gamified ludic design would be less likely to be perceived as annoying by the user.

3.5.2 Persona

The next step in the design process is to create personas to guide the product development. Personas are a design tool which helps designers step outside themselves when creating a product. They are fictional characters which represent the archetype of the product's target audience or users. This way, designers can ask themselves "what would my persona want this product to do?" as opposed to "what do I want this product to do?", which consequently helps designers avoid creating a product that only meets their own needs or goals as opposed to those of the intended audience (Dam and Siang 2021). For my project, I have chosen to create goal-based personas, or personas which help me answer "what does my target audience want to do with my product?" (Nielsen 2012). This will be based off of the initial user research I conducted.

For this project, the persona "Anne" was created. A full persona biography page is available in the appendix. To summarise, Anne is a 25 year old female

from Canada who currently works as a graphic designer for an athleisure company. Throughout the COVID-19 pandemic she has developed some social anxiety and now feels hyper aware of how others perceive her when she is in public. Nonetheless, she is determined to use her two weeks of vacation to visit Japan for the first time. Unfortunately, her work schedule does not align with any of her friends', and so she will be travelling alone. She is very concerned about embarrassing herself in public, and so she decides to rent a Sidekick companion on her trip.

3.5.3 Persona Scenario

Anne has just arrived in Japan. It is her first time here and she is very excited. She will be here for only ten days, as that is all she could afford to take off from work. At the airport, she spots a counter for robot rentals. She has seen them advertised on Instagram and already decided she would like to rent one. She already visited the product's website where she watched a free tutorial about how Sidekick works, which helped ease her anxiety about being able to use it properly. She finds the price suits her budget and she rents one for the duration of her trip. She turns the robot on and accesses the registration website from her smartphone. On the website, she selects her desired language and, more importantly, sets her comfort level for making mistakes. Anne decides she would prefer to be notified of all mistakes, as she is very anxious about being considered rude. After the quick and easy initial set up, Anne wears Sidekick around her neck and leaves the airport, already feeling less alone with her new companion.

On the train, Anne decides to call her family to tell them she has arrived safe and sound. When Anne takes out her phone however, Sidekick makes a gentle 3-note beeping noise. Anne pauses to think about what Sidekick is trying to tell her. She looks around the train. Suddenly it dawns on her that everyone else on the train is completely silent. She whispers to Sidekick "should I not talk on the train?" and Sidekick immediately replies with a happy sequence of notes, notifying her that she guessed correctly. Anne puts away her phone and decides to call her family once she is off the train instead.

After dropping off her bags at her accommodations, Anne decides to visit at tourist attraction nearby. She asks at the front desk and is advised she should go there by taxi. The staff calls a taxi for her and she waits for it outside the

building. When the taxi arrives, Anne begins to reach her arm out to open the door, but suddenly Sidekick gives her another notification. Anne is puzzled. “Do I...have to sit in the front seat?” she asks Sidekick. Her companion replies with a negative set of beeps, letting her know that is not the answer. While she thinks some more, the taxi arrives in front of her and the back door opens automatically. “Wow!” says Anne, “I suppose I wasn’t supposed to touch the door myself.” Sidekick plays its happy congratulatory notes once again confirming her guess.

Once Anne is done visiting the tourist attraction, she decides to pick up a snack at a nearby convenience store. After selecting what she wants to purchase, she lines up for the cashier. While waiting in line, Sidekick gives her another notification. “Is it about what I am buying?” Anne guesses. Sidekick replies in the negative. “Hmm. Then, is it about how I pay for it?” Anne attempts. Sidekick gives her an encouraging set of beeps, helping her narrow down the scenario. “Do I have to pay with exact change?” Anne guesses again, but Sidekick’s response tells her no. After a few more failed guesses, Anne gives up. As Anne has her Sidekick set to the highest level for warnings, Sidekick explains the situation to her in English, briefly informing her that she should place the cash in the small blue tray on the counter instead of trying to hand the money directly to the staff.

After an exciting first day exploring her new surroundings, Anne returns to her hotel where she plugs in Sidekick for the night. She is excited to bring Sidekick with her again tomorrow, as she feels it has already helped her avoid several embarrassing situations in just the first day.

3.6. Early Stage Prototyping

The next step in the design process was brainstorming for possible forms the robot could take. This information was highly influenced by the user research performed, particularly the user interviews. The following points are based on the most common responses in the interviews.

The robot must be highly portable. It should be no bigger than 9.7” / 24.6 cm and weigh no more than 3 lbs / 1.3 kg. Some respondents replied stating they always travel with a backpack or purse, but others claimed to only travel with their phone and wallet in their pockets. For these reasons, the robot should

be highly portable, with or without the user carrying a bag to put it in. It's aesthetic should be modern and stylish but minimalist and inconspicuous. Survey respondents said that the design should be appealing, as they did not want to look unfashionable while using it. At the same time, it was important that the design did not look flashy or overly expensive, as this could make the user a target for theft. The robot should also work primarily on audio controls, as the robot should be able to notify the user at any time, even when their hands may be full - for example, when the user is holding a camera or a shopping bag.

3.6.1 Form Prototypes

Prototypes were built to study the ideal form for this device. These prototypes were all for form ideation only, meaning they did not contain any software or hardware to make them actually function as a robot. Form prototyping was done in three stages. The initial stage was for creating the lowest level fidelity prototypes. These prototypes were based off of the sketching done in the brainstorming phase. Not all sketches were prototyped - only those that seemed to have some potential based on the research previously conducted. These low fidelity prototypes were built quickly and crudely; their primary purpose was to test out the size, shape, and other basic elements of form. They were built using a variety of materials: primarily construction paper, styrofoam, toothpicks, clear tape, and craft foam. Prototypes were shown to people fitting the criteria for the target user base, to get their initial opinions on the forms.

The feedback on the first prototypes was helpful in many ways. The most common feedback was that these initial prototypes were too big. Despite the user research results claiming that the robots could be up to the size of a regular iPad, when actually built this sizing proved to be too large to use comfortably or to carry around in a small travel bag. Moreover, designs with wheels or drone components were proven to be too clunky and would likely not be used. This narrowed the design down to something that would be carried around by hand, be a wearable device (i.e. a bracelet or necklace), or be attached to a shirt or bag by some means.

From the group of prototypes built in this first stage, those with the most positive feedback were selected to be tested. These were advanced to the second

Figure 3.1 Early stage low fidelity prototypes built to test different form factors for Sidekick.

stage of prototyping. The second stage was medium fidelity prototypes, where the forms were slightly less crude and adjustments were made based off of initial feedback from the first stage prototypes. Most notably, their size was reduced from their initial design, and ways to attach the prototype to a shirt or bag were further explored. These prototypes were built with Styrofoam and used magnets and metal clips to attach them to fabric. The idea of a modular device was also explored in this stage. The idea behind a modular device would be that there would be one main device which would house all the software necessary for its functions, and then there would be separate pieces the user could choose to attach - for example, a detachable clip to hang the device from a backpack strap.

3.6.2 Early Prototype User Testing

Ideally, user testing would have been done with multiple different test users in a variety of situations with different prototypes to be able to compare and contrast them. Due to the COVID-19 pandemic, this was not possible for this project. One of the more promising prototypes was selected for a user test with a single

user. The user tester was a 26 year old male with average experience with technology, but little experience with wearable devices. The tester was asked to carry around the prototype for an afternoon and interact with it at a few predetermined locations (a restaurant, a train station, and a shrine). The tester had not been to these locations before the test. During their interactions, the robot's responses were given by the designer (myself) as the prototype was for form only and did not contain any working technology. The tester was instructed to wear the robot on his backpack strap. At the end of the test, the tester was asked general questions to get their impression of the form prototype. Their comments are summarized as follows:

- It was an appropriate size, but it would have to be sturdy so that it could get thrown in a backpack with other things.
- It should have a long battery life as tourists usually spend the whole day out exploring.
- If the robot can have a bit of a personality it would make it a more unique user experience

3.6.3 Summary of Findings from Low Fidelity Prototyping

The low fidelity prototyping stage was very informative and the insight obtained had a considerable impact on the final design (to be discussed in Chapter 4 Proof of Concept). The key findings were that the robot's form should be very small and lightweight. Any excess weight or form-factors that exceeded the minimum required for the desired functionality were deemed a hindrance. Furthermore, the shape itself should be minimalistic and subtle. While user testers initially commented that they would enjoy a small robot companion which would look unique or intriguing, upon further discussion it was concluded that this kind of appearance would likely only make the user a target for theft. It was also established that while fun, fashionable colours would be eye-catching and aesthetic, it would be much more practical to use a subdued colour palette. Ideally, the colour scheme would easily pair with any kind of clothing or fashion choices the user would have

at their disposal, as tourists often do not pack excessive options for their day to day wear.

In terms of functionality, as Sidekick uses a camera to determine what the user is doing at all times, it is therefore essential that it not be stored in a backpack and instead be in the open air. This leads to another design requirement: Sidekick must be able to support itself in some way, so as not to encumber the user's movements. Asking the user to carry Sidekick in their arms, for example, would be highly undesirable. Therefore, it was determined that Sidekick should be able to " perch " on it's user in some way. This " perching " should also be possible regardless of what the user is wearing, and whether or not they are using a backpack, sling bag, or any other accessories. Furthermore, because Sidekick communicates through sounds and vibrations, it would be ideal that it remains in the vicinity of the user's head. This way, it would not need to project it's volume to a degree that could bother others near the user. While a work-around solution for this could be to require the user to wear wireless earbuds, this could potentially be a safety risk in some situations, as the target user is solo travellers. Consequently, allowing the user to be completely aware of their surroundings if they deem it necessary is essential.

3.6.4 Second Stage Prototyping and Design Inspiration

Based on the findings from the low fidelity prototyping, an updated form prototype was created. As shown in figure 3.2, this prototype used a flexible camera tripod as a base and was worn on the user's shoulders. With a cellphone attached to one of the tripod's arms, it was able to send a live video feed to a computer, while also providing a voice call connection between the prototype and said computer. A user test was conducted, where the participant wore the prototype and walked around freely, while the researcher viewed Sidekick's perspective from the computer. The researcher spoke via the voice call and acted as Sidekick, to give the user a sense of how the product would function.

Based on the findings from the low fidelity prototyping, an updated form prototype was created. As shown in figure 3.2, this prototype used a flexible camera tripod as a base and was worn on the user's shoulders. With a cell phone attached to one of the tripod's arms, it was able to send a live video feed to a computer,

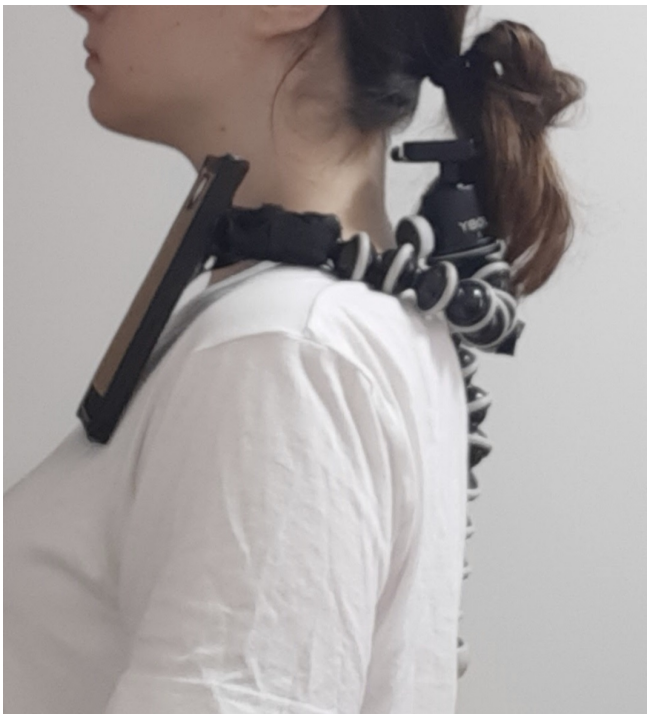
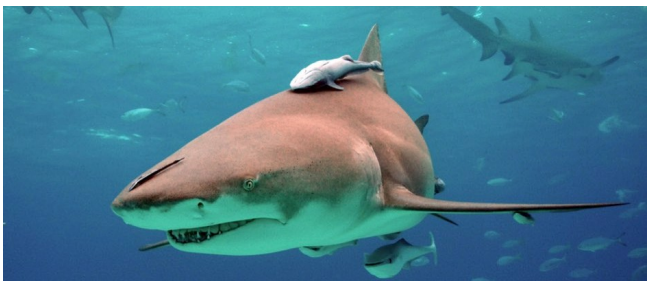


Figure 3.2 A shoulder-mounted prototype.

while also providing a voice call connection between the prototype and said computer. A user test was conducted, where the participant wore the prototype and walked around freely, while the researcher viewed Sidekick's perspective from the computer. The researcher spoke via the voice call and acted as Sidekick, to give the user a sense of how the product would function.

Based on the positive feedback from this user test, a more refined shoulder-mounted prototype form was designed. To strengthen the design aspect of the project, research was done into sidekick-like relationships in the wild. Inspired by this, the shape of the new prototype took inspiration from remora fish. This design research led to an investigation into mutualistic symbiotic relationships in nature, as the goal for Sidekick is essentially to form this type of bond with the user. A mutualistic symbiotic relationship is one where both parties benefit from pairing together. In Sidekick's case, Sidekick provides useful information and advice, and the user provides Sidekick with a purpose. Sharks and remora fish are an excellent example of this kind of mutualistic relationship. Remora are small fish which attach themselves to sharks with suction cups, as seen in figure 3.3. The remora fish consequently gets to move without expending any energy. Remora fish also eat parasites that bother the shark, which benefits the shark, as well as scraps of food left over from the shark's meals. I felt that not only was the symbiotic relationship metaphor a good connection between Sidekick and a remora fish, but moreover the way in which the fish travels with the shark by attaching itself to it was also an excellent parallel between the two.



(Source: Science Focus Magazine) [1]

Figure 3.3 A remora fish attached to a shark.

Based on this new design inspiration, brainstorming in the form of sketches (as

seen in figure 3.4) and low fidelity clay prototypes (figure 3.5) were produced to test and validate the concept.

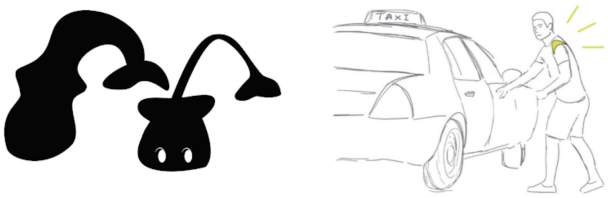


Figure 3.4 A shoulder-mounted prototype design inspired by a remora fish.

Figure 3.5 A form prototype made of clay to test wearing Sidekick on one's shoulder.

3.6.5 Vibrotactile User Test

After establishing that Sidekick will use vibration to communicate and also need to perch on the user's torso, a vibrotactile user test was conducted to determine the most comfortable place for Sidekick to be in contact with the user. The term vibrotactile refers to how we perceive vibrations through touch. For this test, two participants were asked to hold a vibrating FitBit Versa[2] at different points on

their upper body and evaluate the comfort or discomfort of feeling vibrations at that location. The locations tested were:

- Neck
- Collarbone
- Shoulder
- Bicep
- Wrist
- Back of their hand

The two participants both reported that the shoulder and wrist were most comfortable. They both felt that receiving vibration notifications on their mid-neck and the back of their hand caused a tickling sensation. They also both agreed that feeling vibrations on their collarbone was uncomfortable. Of the two participants, one claimed the vibration on their bicep was too easy to ignore, while the other claimed it was noticeable but not particularly pleasant.

Based on these results, it was determined that the ideal place for Sidekick to sit would be on the user's shoulders or the base of their neck, where the collar of a shirt might sit. While the wrist was also a potential option, it would be less practical as many users may already wear jewelry or wearable technology on their wrists. Furthermore, depending how the user moves or holds their arm while walking, a Sidekick placed on a wrist may be unable to receive clear input data from it's camera, which could result in inaccurate notifications.

3.6.6 Sound-based Notification User Testing

To test the target audience's perception of various non-speech based audio notifications, another user test was performed. For this study, participants were asked to listen to 10 different notification sounds. After listening to each sound twice, they answered survey questions about their perception of the sounds' meaning or implication. For example, participants were asked to explain if they felt a sound seemed happy, angry, sad, or another emotion. Another question asked which

sounds seemed like error messages, and which ones sounded like they were notifying the listener of good news. Participants were also asked to discuss if any sounds felt annoying or frustrating to listen to. While some sound effects received fairly consistent descriptions from participants, others were more varied. Based on the feedback received from this user test, as well as the insight collected by studying previous research in this field (as examined in Chapter 2 Related Works), 5 sound effects were finalized to be used in the final prototype for this project. As a reminder, Sidekick will communicate with the user when they are about to make a cultural mistake. The interaction between Sidekick and the user is that the user will guess either verbally or through their gestures what they should or should not do next, in order to be polite. Sidekick will notify them if they have guessed correctly, or if they are getting closer or further away from the correct answer. Consequently, one sound and vibration pattern each for the following scenarios was finalized:

- When the user makes a guess which is not exactly the right answer, but is close to it: One note, repeated twice. Two short vibrations.
- When the user makes a guess which is not the right answer and also not close to it: Two descending notes. One short and one long vibration.
- When the user guesses the correct answer: Three ascending notes. One long and two short vibrations.
- When the user gives up. Two descending notes doubled. Two short and one long vibration.
- A sound to indicate Sidekick is about to explain the correct answer: Two ascending notes. Two long vibrations.

These sounds were created using Ableton Live with a KORG MIDI keyboard. The sounds were used in the final prototype user test, discussed in Chapter 4 Proof of Concept.

3.6.7 Proposed Final Form Digital Rendering

For this project, Sidekick's final proposed form was illustrated through digital 3D renderings created using Adobe Dimension. A physical model of the final form was not created. The final proposed form can be seen in Figure 3.6. In Figure 3.7, the method for wearing Sidekick is illustrated. Sidekick is designed to be worn around the neck, similar to a necklace. It has a flexible yet solid body which makes it easy to slide on to the user's neck. It's minimalistic colour scheme makes it blend in well with whatever the user chooses to wear. It features a subtle laser cut scale design on its body, reminiscent of a remora fish, which also helps the material remain flexible. On one end of the body, the "tail" piece houses one vibration motor as well as the charging light. On the "face" piece, there is a small screen with two "eyes" which are in fact distance sensors for the built in ultra wide angle camera. It also houses the charging port. Small speakers are built into Sidekick's body, appropriately spaced so that one will be on the user's left and the other on the user's right when worn around the neck. This, along with the two aforementioned vibration motors, allows Sidekick to provide spatially relevant notifications. For example, if Sidekick tries to warn the user about something specifically to their left, the notification sound or vibration will happen on the user's left side.

Sidekick has the option for either sound-only, vibration-only, or combination sound and vibration notifications. Sidekick is able to connect to Bluetooth earbuds, should the user prefer to have sound notifications but not want them to be played through the built in speakers. Due to Sidekick's situational awareness, it is also able to adjust it's sound volume according to the ambient noise and also social situation the user is in. For example, if the user is in a quiet museum, Sidekick will adjust it's volume to an appropriate level so as not to draw unwanted attention to the user. Furthermore, Sidekick would make use of skin conductance detection technology which would allow it to determine if a vibrotactile notification had been perceived by the user, as discussed in Chapter 2 Related Works. A small sensor at the back of Sidekick's body would come in contact with the base of the user's neck and would read the skin conductance data. If the user did not perceive the notification, Sidekick could increase the strength of its haptic feedback. This feature could be disabled in Sidekick's settings, and would auto-

matically be disabled if the sensor was not in contact with the user's skin (i.e. if they were wearing a shirt with a high collar).

Sidekick's form is unique yet subtle, and lends itself to implying Sidekick is more of a creature or companion than simply a gadget. At the same time, by straying from a humanoid form, Sidekick's playful non-verbal language can be more intuitively understood as a concept by the user. It's two glowing eyes give it a sense of liveliness and personality, giving it a cute and playful appearance without being gaudy or gimmicky.

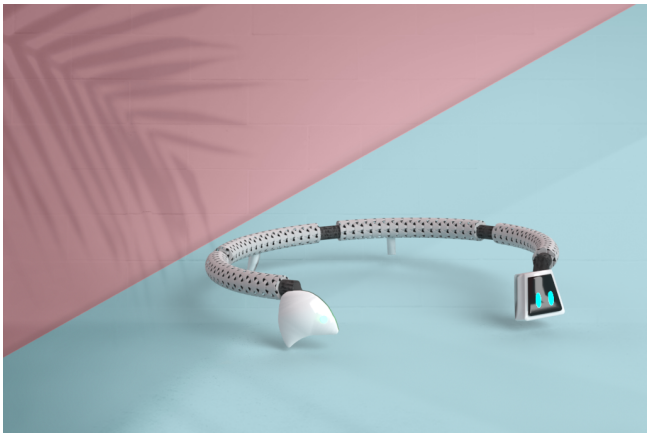


Figure 3.6 A 3D digital rendering of Sidekick's proposed physical form.

Notes

1 https://www.sciencefocus.com/news/remoras-reveal-how-they-stay-stuck-under-the-sea/

2 https://www.fitbit.com/global/us/products/smartwatches/versa

3 Original portrait retrieved from Adobe Stock https://t3.ftcdn.net/jpg/02/10/89/48/360_F_210894869_VJzaX6N1Uy8gauTcbi4BU1sjJKeeQAql.jpg

Figure 3.7 An example image showing how Sidekick would be worn by the user featuring a 3D digital rendering of Sidekick.
[3]

Chapter 4
Proof of Concept

4.1. Final User Test

For the proof of concept stage of this project, I developed a video-based prototype. This was necessary due to the definition of my target audience. For this project, I chose to focus on tourists visiting Japan. That is because this is an experience I have had myself, and so I was better equipped to design a user test for it. Moreover, as I am currently physically based in Japan, and due to the world-wide travel restrictions caused by the COVID-19 global pandemic, this was the only country in which I could film content for my prototype video. As my target user is someone travelling to a new country, this meant that my user test participants could not be Japanese residents. Therefore, all user testing for this phase had to be done remotely. For this reason, I needed a completely digital user test. The goal of this testing was to determine if the target user would be able to understand Sidekick's non-verbal language and correctly guess the appropriate behaviour for a variety of scenarios. Furthermore, the aim was to determine if the target user would find Sidekick fun to use, and useful in lowering their anxiety about travelling in Japan alone.

4.1.1 Participants

This user test had 10 participants, as shown in table 4.1. This table shows the participant's number (in the column titled “participant”), their gender, age, cultural background (“culture”), and experience being a tourist in Japan (“experience with Japan”). The requirements for participants were that they be between the ages of 20 and 35, and self-evaluated that they would have moderate to severe anxiety at the thought of traveling around Japan alone. They were also

required to have less than 2 weeks of experience in Japan. Ideally, participants would have had no experience visiting Japan, however this limited the number of participants I had access to too greatly.

Participant	Gender	Age	Culture	Experience with Japan
1	M	23	Sweden	0
2	M	28	Canada	0
3	M	28	Canada	0
4	F	27	Canada	0
5	M	28	Canada /China	3 days
6	M	27	Canada	0
7	F	27	Canada /Slovakia	2 weeks
8	F	27	Canada /Slovakia	2 weeks
9	M	28	Canada /Sweden	2 weeks
10	F	26	China	0

Table 4.1 Participant Data

4.1.2 Designing a Video Prototype for Remote User Testing

As previously stated, the target users for this product and user test are new tourists to Japan. Because of the global COVID-19 pandemic, Japan's borders have been closed for a considerable amount of time and tourists have been prohibited from entering the country. Therefore, all user testing had to be done completely remotely, with participants being outside of Japan. This is because anyone currently in Japan would be a Japanese resident, and therefore would have a deeper understanding of Japanese culture than a typical tourist. In that sense, they would be much more likely to correctly guess Sidekick's hints, and therefore not provide accurate data in the user test.

Figure 4.1 A screen capture from the prototype video showing paying at a cash register in a grocery store.
[1]

Figure 4.2 A screen capture from the prototype video showing the wash basin at a temple.
[2]

Hence there was a need for a digital, remote prototype to provide user test participants with a sense of what travelling around Japan as a tourist with Sidekick could be like. For this reason, the video prototype was created. The video was split into two parts. In the first part, viewers were given general information about Sidekick and Sidekick's purpose. Information was shown with white text on a plain black background. They were also introduced to Sidekick's sounds and non-verbal communication, with corresponding audio samples being played. Finally, they were also shown the 3D digital render images of Sidekick's proposed form, including an image depicting how Sidekick would be worn by the user.

In the second part of the video, viewers watched 5 different scenarios. These scenarios used a mix of footage from various YouTube channels, as well as footage filmed by myself for this project. The scenarios filmed by myself were the "taxi" and "restaurant" scenarios, described in the next section. In all cases, the footage was filmed from a first person perspective, to give the viewer a sense of immersion and that they were actually in Japan themselves. Footage filmed by myself was captured using a Nikon D5200, either handheld or mounted on a flexible tripod. Footage sourced from YouTube channels was likely filmed using mounted GoPro cameras or similar devices, though the specific equipment used was not disclosed. In both cases (where footage was sourced or filmed by myself), the videographer did not have a physical Sidekick prototype with them. Videographers from the sourced YouTube channels created their videos independently from, and were not aware of, this project.

Each scenario, outlined further in the following section, depicted a common situation a tourist may find themselves in while visiting Japan. In each scenario there was a moment where Sidekick's notification sound played. This was added by myself during the video editing process and was not present at the time of filming. A few seconds after the sound played, a pause screen would appear, prompting for the video to be paused and for the discussion period to begin. During the discussion, various Sidekick sound effects were used. However, these sounds were not embedded in the video and were played in a separate music application. This was because the sound being played and the timing was dependent on the user test participants' discussion and guesses about the scenario, which could not be predicted ahead of time. After the discussion ended, the video was resumed and

played a narration of what Sidekick would have told the user for the “correct answer” of the scenario if they had been unable to guess it themselves. While this audio played, the screen showed a plain white background with simple black text explaining what the audio was. The narration was done by myself using a Zoom H4N audio recorder. The audio was digitally altered in Adobe Premiere Pro to have a higher pitch. This was to help the user differentiate between my voice during the Zoom call and “Sidekick's voice” in the prototype video. The higher pitch was also chosen to remind the viewer that Sidekick is a cute robot companion and not humanoid. After the narration ended, footage of the conclusion of the scenario was shown.

4.1.3 Test Procedure

The user tests were conducted over Zoom, which is a free video calling service. Tests were done one-on-one between myself and a singular participant. Prior to taking the test, all participants were asked to read and sign consent forms.

At the start of the call, I would explain to the participant the outline for the test and what they should expect, including time duration estimates. I would ask the participant some opening questions. These can be found in the appendix of this paper. One of the key questions included asking participants to self-evaluate how anxious they would feel if they were to travel around Japan alone for two weeks. Another was asking participants if they had any experience making cultural mistakes while traveling. After completing the introductory questions and discussion, we would then move on to the video-based prototype.

As previously stated, the video was divided into parts. In the first part, participants were given information about Sidekick. This included a brief overview of its purpose, as well as an introduction to Sidekick's unique language of beeps and vibrations. In the second part, the audience was introduced to five different scenarios. Two of the scenarios used footage filmed by myself, while 3 scenarios used footage sourced from various YouTube channels. Each scenario represented a situation a tourist would likely find themselves in when traveling to Japan. In each scenario, the viewer watched a first person perspective video representing them going through the situation, as seen is figures 4.1 and 4.2. Then at one point in each scenario, “Sidekick” would notify them via beeps and vibrations

that they were in a situation where many tourists would make cultural mistakes. Then a screen with instructions to pause the video would appear. After pausing the video, I would discuss with the participant what they guessed Sidekick was trying to notify them about. The scenarios and correct answers were as follows:

- Taking public transportation. Common tourist mistake: Answering their phone while on public transit.
- Shopping. Common tourist mistake: Handing the cash directly to the staff instead of placing it in the tray on the counter.
- Taking a taxi. Common tourist mistake: Opening the door by oneself instead of waiting for the automatic door to open on its own.
- Visiting a shrine. Common tourist mistake: Not washing their hands and mouth before entering the shrine.
- Eating at a restaurant. Common tourist mistake: Not using the "oshibori" (wet hand towel) to clean their hands before starting their meal.

If they were on the right track, I would play Sidekick's "getting closer to the answer" sound effect. Similarly, if their guess was not in the right train of thought, I would play Sidekick's "getting further from the answer" sound effect. If the participant guessed correctly, "Sidekick" would congratulate them. On the other hand, if they chose to give up, Sidekick would give them the correct answer in English. After completing all five scenarios, the video would end. After watching the video, I would have another round of questions and a brief discussion with the participant. Key questions included if they felt that Sidekick would improve, worsen, or have no effect on their anxiety about traveling to Japan. They were also asked if they would rent Sidekick if it were available in the future.

4.1.4 Results

As previously stated, the goal of this testing was to determine if the target user would be able to understand Sidekick's non-verbal language and correctly guess the appropriate behaviour for a variety of scenarios. Furthermore, the aim was to

determine if the target user would find Sidekick fun to use, and useful in lowering their anxiety about travelling in Japan alone. With this in mind, the video prototype provided many useful insights. A list of participant comments is available in the appendix. First, it is noteworthy that all participants were able to correctly guess at least 1 of the 5 scenarios' answers. 7 of the 10 participants (70 percent) correctly guessed more than half of the scenarios. However, no participants correctly guessed every scenario. When asked if they felt this product would reduce their anxiety while traveling alone, 7 out of 10 participants (70 percent) responded yes. 2 out of 10 participants (20 percent) believed it would worsen their anxiety, as the notifications would make them panic. They explained they felt they would be unable to guess what the potential mistake would be before it happened, and so the notifications would simply tell them they were about to be rude but they felt unable to prevent it. 1 participant (10 percent) felt that Sidekick would neither improve nor worsen their anxiety while travelling. This is likely due to the fact that nearly all participants cited fears over language barriers and miscommunications being a major factor in their travel anxiety, though these issues would not be remedied by Sidekick as it is not a translation device. In a similar vein, 8 participants (80 percent) said they would be interested in trying it while traveling, although they commented that they only felt it would be necessary when visiting a country with a vastly different culture than what they were used to. While the majority of participants stated they felt the current notification sound design worked well, multiple participants felt the sounds were very similar and would take a lot of practice to be able to differentiate them instantaneously.

Of all the scenarios, the first (taking public transportation - not answering a phone call on public transit) was deemed the easiest to guess by participants. In fact, all 10 participants (100 percent) correctly guessed said scenario. On the other hand, the vast majority of participants struggled with the second scenario (in a store - not giving the payment directly to the staff and instead placing it in a tray) was only correctly answered by 1 participant (10 percent), with 2 participants (20 percent) having no guesses as to the correct answer whatsoever. Therefore, more research into which common scenarios are easier to guess and why would be beneficial for this project. It can be assumed that some scenarios, such as the store one mentioned, may benefit greatly from additional guidance on

Sidekick's part.

In terms of Sidekick's functionality and purpose, all participants felt that having a tool to assist them in avoiding making cultural mistakes was an appealing concept. The majority of participants also felt that the interaction style between the user and Sidekick felt playful, with some participants commenting that it "felt like a video game" and one participant asking if Sidekick was keeping track of their score. After the user testing, two of the participants who knew each other also contacted each other to compare their "scores" (though the user test itself was not graded and there was no explicit point system). This led to the idea that perhaps adding a score keeping function where users could compare scores with other tourists or friends might be a good addition to the design. One participant also commented that the current design did not provide enough "pay off" for the work the user had to put in to find the information. They suggested that some kind of incentive system could help with this issue. This could also potentially be solved by the addition of a score keeping functionality.

When asked if they felt that Sidekick should have an option to only notify users of potential mistakes in "low stress" situations or situations where no bystanders would be watching them (for example, visiting a park as opposed to buying something in a store), the majority of participants said no. They explained they felt it would defeat the purpose if Sidekick only warned you that you were being rude when no one else was around. While participants agreed that some situations (namely the store scenario) were much higher stress than others, most participants agreed it would be best to simply have a function for Sidekick to only provide vibration notifications and to "back off quickly" if a user did not want to participate due to stress or time constraints. Most users felt that trying to decipher what Sidekick's beeps meant while at the same time trying to do currency conversion and not hold up the line in a grocery store would be too frustrating and they would quickly give up on guessing in such a scenario.

Another interesting note from this study was that some users were much more likely to make multiple guesses as compared to others. Some users would spend multiple minutes guessing what the solution could be, while others either did not guess at all for some scenarios or gave up after one incorrect guess.

Another insight, which was contrary to my previous assumptions, was that the

participants with Asian cultural backgrounds did not guess more scenarios correctly as compared to participants with strictly western backgrounds. It would appear that despite some similarities between various Asian cultures, especially when compared to European cultures, there were enough unique differences that no participants had any particular advantage over the others based on their nationality. However, the four participants who had visited Japan previously all correctly guessed over 50 percent of the scenarios. Therefore, it can be assumed that any kind of experience with the culture, even if very brief, could potentially increase the user's likelihood of correctly guessing Sidekick's hints.

On the topic of Sidekick's communication, multiple participants mentioned concerns over if Sidekick's beeps could be heard by bystanders and could potentially annoy them. While most participants appreciated the option for a vibration-only mode, a few preferred the idea of connecting Bluetooth earphones instead. However some participants, notably mostly female participants, felt that travelling alone with earbuds in would be a safety risk and they would consequently never be inclined to use an earbud-based mode.

Finally, some participants suggested that Sidekick may be more useful if it could provide visual hints as opposed to only auditory ones. They suggested a form reminiscent of AR glasses could potentially be easier for users, as it could use arrows or pictures as hints to guide the user towards what in particular they should or should not be interacting with in any given situation.

In summary, this user test was very informative and also provided a substantial amount of positive feedback and insight. It established that this product and design is considered useful by its target audience, and that there is a current need for this kind of product in the current market. It also confirmed that the majority of users should be able to understand Sidekick's hints in multiple different kinds of situations. Furthermore, it determined that the proposed interaction style for Sidekick is indeed ludic and playful, and that some users would enjoy using it as a kind of competitive game. Therefore it can be concluded that this research has been validated and provides a unique contribution to the current ludic and speculative design fields as well as the tourism industry.

Notes

1 Original footage used in prototype from Bump of Kevin on YouTube. `https://youtu.be/nlBBn9JzokU`

2 Original footage used in prototype from GlimpseJapan on YouTube. `https://youtu.be/B1cFdlcFW30`

Chapter 5
Conclusion

5.1. Discussion of Limitations

As with many studies, this project met with several hurdles. It is important to note and acknowledge some of the limitations of this research study.

First and foremost, due to time restraints, the number of participants in the final user study was quite limited. Ideally, a greater number of people matching the target audience description would have participated to provide a greater pool of data.

Furthermore, participants' cultural backgrounds and ages were not sufficiently varied. For example, 8 participants (80 percent) were Canadian. This undoubtedly has an impact on their thought process in terms of comparing and contrasting their own culture to Japanese culture when attempting to guess Sidekick's hints. Ideally, participants from many different countries with substantially different cultures would participate in such a study so as to minimize the impact of one particular country or culture's effect on the overall data collected.

5.2. Future Recommendations

There are several ways this project could be advanced in the future. First, as discussed previously in Chapter 4 Proof of Concept's results, several participants expressed an interest in the addition of a score or points system to the product. Establishing what the most enticing way to award points and how to compete with other users in the most incentivising way would be an excellent update to Sidekick's current design.

In terms of further testing, as mentioned in the preceding subsection, the most recent user test was limited in the scope of it's participants. Therefore, organiz-

ing a larger scale test with a more varied group of participants would be highly beneficial for this research.

Developing video prototypes depicting more scenes, or scenes in various countries, would also help establish what scenarios Sidekick excels in. As previously discussed in Chapter 4 Proof of Concept, some scenarios had a much higher rate of being correctly answered by participants as compared to others. Consequently, many participants felt that some types of situations would require more detailed hints from Sidekick. Determining what factors dictate the “difficulty” of a situation, as defining in what ways Sidekick could provide more concrete clues, would be essential for the future success of this product.

Finally, developing a physical prototype that participants could use in an offline user test would be crucial for valuable insights into the real-world pacing and timing of interactions with Sidekick. While the video prototype did an excellent job of providing feedback, participants may have different comments or opinions when they are presented with situations in the real world where they cannot pause the video to contemplate their answers, and are also not limited to the field of view presented on the screen. Therefore this step would be a clear progression of the current research.

5.3. Summary

While the COVID-19 global pandemic has put the international tourism industry at a stand-still, with the end in sight it can be assumed that in the near future the travel industry will once again be booming. However, this global health crisis will undoubtedly leave long lasting social and psychological effects on mankind. Early research has already shown that the coronavirus may have lead to an increase in the number of people experiencing serious or even debilitating anxiety (Wang et al. 2020). Traveling alone, regardless of the COVID-19 pandemic, can be very anxiety inducing for certain people. For example, without any companions, if an already anxious tourist commits a cultural faux pas while in a foreign country, they may feel particularly embarrassed as there is no one there to “share the blame” with. Sidekick’s goal is to help reduce this anxiety by limiting the number of cultural mistakes a tourist may make. Moreover, due to the nature of the

pandemic, it is reasonable to assume that in the future solo travel may become more popular, but also that the number of travelers experiencing moderate to high anxiety will also increase. For these reasons, now is the ideal time to develop a tool to help anxious solo travelers feel more comfortable while abroad. Although there are many tools such as smartphone applications on the market to assist with translation, navigation, and itinerary planning, there is currently no real-time companion robot available to help travelers avoid making cultural mistakes in a novel and fun way. Therefore, Sidekick is a unique and innovative project which has the potential to provide a valuable learning experience for its users.

This thesis has outlined the design process taken to lay the foundation for Sidekick's development. As a speculative project, it has taken insight from research in relevant fields as well as data from new prototypes and user testing to determine the potential for this project, should it become a commercial product in the future. Information was gathered on recent research on the topic of smart phone notifications as well as fundamental studies on how humans learn new behaviours and information. Moreover, an analysis of relevant historical data pertaining to the development of social robots in Japan was conducted. All of this information was influential in the iterative prototyping design process.

In Chapter 3 Concept, the preliminary research, prototyping and early stage user testing process was outlined. Multiple surveys were conducted to determine what functions tourists would want in a companion robot as well as how potential users may prepare for a trip. Following this, a solid target audience was defined, allowing for an accurate user persona and persona story to be developed. These design tools were essential in guiding the further development of Sidekick's functions and goals. Based on these established functions, several low fidelity prototypes were created to determine was sizes and shapes would be most appropriate for Sidekick. User testing assisted in establishing what constraints the optimal design would have. For example, it was concluded that due to the nature of Sidekick's camera requirement, it would need to remain outside of a bag at all times, and would thus necessitate a hassle free and convenient way to attach itself to its user.

Further testing to determine how the target audience would respond to various notification sound styles as well as vibrotactile feedback was combined with

the relevant design metaphor of a mutualistic symbiotic relationship (the famous example of sharks and remora fish) to establish Sidekick's most recent proposed form.

Following this, another user test was conducted using a video based prototype. This testing yielded highly useful and positive results. Key findings from this testing included that all of the participants were able to correctly guess at least 1 of the 5 scenarios' answers, with 7 participants (70 percent) correctly guessing more than half of the scenarios. Moreover, 7 of the 10 participants (70 percent) felt that Sidekick would reduce their anxiety while traveling, and 8 participants (80 percent) said they would be interested in trying it while traveling should it become a commercial product in the future. All participants agreed that having some kind of tool to assist them in avoiding making cultural mistakes was an appealing concept, and the majority of participants also commented that the interaction style between the user and Sidekick felt playful.

Therefore, all goals for this project were successfully met. The goals, outlined in Chapter 1 Introduction, were as follows:

- Determine what would be an appropriate design for the robot, with regards to the target user's needs as well as the proposed functionality
- Establish if the intended communication style could be understood by the target audience.
- Clarify if the proposed interaction style would be enjoyable for users
- Ascertain if the design would be likely to decrease the user's anxiety in the intended use-case scenario.

While this design process was not without limitations and hurdles (as previously discussed), and there is still much room for further work (stated in the subsection Future Recommendations), it can nonetheless be concluded that this project was highly successful and all objectives initially outlined were attained.

References

Agrawal, Siddharth and Mary-Anne Williams (2017) "Robot Authority and Human Obedience: A Study of Human Behaviour Using a Robot Security Guard," in *Proceedings of the Companion of the 2017 ACM/IEEE International Conference on Human-Robot Interaction*, HRI '17, p. 57–58, New York, NY, USA: Association for Computing Machinery.

Azenkot, Shiri, Richard E. Ladner, and Jacob O. Wobbrock (2011) "Smartphone Haptic Feedback for Nonvisual Wayfinding," in *The Proceedings of the 13th International ACM SIGACCESS Conference on Computers and Accessibility*, ASSETS '11, p. 281–282, New York, NY, USA: Association for Computing Machinery.

Bagette, Aaron (2018) "Five Places to Meet a Robot in Tokyo," URL: `https://tokyocheapo.com/entertainment/five-places-meet-robot-tokyo/`.

Bakker, David Radford and Frances Heritage Martin (2015) "Musical chords and emotion: Major and minor triads are processed for emotion," *Cognitive, Affective, & Behavioral Neuroscience*, Vol. 15, No. 1, p. 15–31.

CDC (2020) "Social Distancing," URL: `https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/social-distancing.html`.

Dam, Rikke Friis and Teo Yu Siang (2021) "Personas – A Simple Introduction," URL: `https://www.interaction-design.org/literature/article/personas-why-and-how-you-should-use-them`.

English, Philip (2015) "NEC PaPeRo Robot," URL: `https://www.youtube.com/watch?v=gZSXiV3AbJA`.

Exler, Anja, Christian Dinse, Zeynep Günes, Nadim Hammoud, Steffen Mattes, and Michael Beigl (2017) "Investigating the Perceptibility Different Noti-

fication Types on Smartphones Depending on the Smartphone Position," UbiComp '17, p. 970–976, New York, NY, USA: Association for Computing Machinery.

Fortin, Pascal E., Elisabeth Sulmont, and Jeremy Cooperstock (2019) *Detecting Perception of Smartphone Notifications Using Skin Conductance Responses*, p. 1–9, New York, NY, USA: Association for Computing Machinery.

Heater, Brian (2019) "Aibo learns to be a better watchdog," Jan, URL: https://techcrunch.com/2019/01/23/aibo-learns-to-be-a-better-watchdog/.

Hegarty, Stephanie (2019) "My date with a robot," Jul, URL: https://www.bbc.com/news/av/world-asia-48871392.

Hiroshi Ishiguro Laboratories (2011) "Robots," URL: http://www.geminoid.jp/en/robots.html.

Honda Motors Co. (2011) "Honda Global: ASIMO," URL: https://global.honda/innovation/robotics/ASIMO.html.

Huffpost (2018) "Robots Are Taking Over As Japan's Workforce Shrinks," URL: https://www.youtube.com/watch?v=5gx_YYdzqRY.

JapanGuide (2020) "Robots in Japan," October, URL: https://www.japan-guide.com/e/e2328.html.

JIJI (2019) "Kannon Bodhisattva robot unveiled at Kyoto temple to share Buddha's religious teachings," Feb, URL: https://www.japantimes.co.jp/news/2019/02/23/business/tech/robotic-kannon-unveiled-kyoto-temple/#.XU-6IugzbIX.

JTB Tourism Research & Consulting Co. (2019) "Japan-bound Statistics," URL: https://www.tourism.jp/en/tourism-database/stats/inbound/.

KYODO (2019) "City hall in Gifu Prefecture is first in Japan to deploy autonomous robots to aid residents," Jan, URL: https://www.japantimes.co.jp/news/2019/01/15/national/city-hall-gifu-prefecture-first-japan-deploy-autonomous-robots-aid-residents/.

Lahdelma, Imre (2017) "At the interface between sensation and emotion: perceived qualities of single chords."

Lee, Yu-Cheng (2011) "Cultural Expectations and Perceptions of Politeness: The " Rude Chinese " ?" *Asian Social Science*, Vol. 7, p. 11.

Liao, Shannon (2019) "Japan ' s robot hotel lays off half the robots after they created more work for humans," URL: https://www.theverge.com/2019/1/15/18184198/japans-robot-hotel-lay-off-work-for-humans.

Lovot (2021) "Lovot: Powered by Love," URL: https://lovot.life/en/?_ga=2.142089019.80101216.1624554234-1519044125.1624554234.

Minkov, Michael and Geert Hofstede (2011) *Cultural differences in a globalizing world*: Emerald, first edition edition.

Musio (2017) "Brave New Beginning: Musio X," URL: https://themusio.com/home.

NeoScribe (2018) "Japan ' s Awesome Robots," URL: https://www.youtube.com/watch?v=r3GMGkFZFzI.

Nielsen, Lene (2012) "Personas," *The Encyclopedia of Human-Computer Interaction, 2nd Ed.*

Okada, Yutaka (2018) "Japan's Foreign Population Hitting a Record High," URL: https://www.mizuhogroup.com/binaries/content/assets/pdf/information-and-research/insights/mhri/mea180913.pdf.

PaPeRo i (2017) "PaPeRo i Introductory Leaflet," URL: https://www.necplatforms.co.jp/solution/papero_i/.

Park, Chunjong, Junsung Lim, Juho Kim, Sung-Ju Lee, and Dongman Lee (2017) "Don't Bother Me. I'm Socializing! A Breakpoint-Based Smartphone Notification System," in *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing*, CSCW '17, p. 541–554, New York, NY, USA: Association for Computing Machinery.

Paro Robots (2018) "PARO Therapeutic Robot," URL: https://www.softbankrobotics.com/emea/en/pepper.

Saiidi, Uptin (2017) "Why is Japan obsessed with robots?," Mar, URL: https://www.youtube.com/watch?v=601KhGSZtH0.

Saket, Bahador, Chrisnawan Prasojo, Yongfeng Huang, and Shengdong Zhao (2013) "Designing an Effective Vibration-Based Notification Interface for Mobile Phones," in *Proceedings of the 2013 Conference on Computer Supported Cooperative Work*, CSCW '13, p. 149–1504, New York, NY, USA: Association for Computing Machinery.

Sato, Narumi (2012) "The Dolls that Sparked Japan's Love of Robots: Karakuri Ningyo," *Nippon Communications Foundation*.

Sifianou, Maria (1992) *Politeness phenomena in England and Greece: a cross-cultural perspective*: Clarendon Press.

Softbank Robotics (2018) "Pepper the humanoid robot," URL: https://www.softbankrobotics.com/emea/en/pepper.

Toyota (2019) "The Small Robot with Big Possibilities: Introducing Toyota's Kiribo Mini," URL: https://www.toyota-europe.com/world-of-toyota/articles-news-events/introducing-kirobo-mini.

University of Tokyo (2016) "Japan: the Land of Rising Robotics," URL: https://www.u-tokyo.ac.jp/en/whyutokyo/wj_003.html.

Vioreanu, Mihai, Eoin Sheehan, Aaron Glynn, Noelle Casidy, Michael Stephens, and Damian McCormack (2007) "Heelys and Street Gliders Injuries: A New Type of Pediatric Injury," *Pediatrics*, Vol. 119, No. 6, pp. e1294–e1298.

Wang, Cuiyan, Riyu Pan, Xiaoyang Wan, Yilin Tan, Linkang Xu, Cyrus S. Ho, and Roger C. Ho (2020) "Immediate Psychological Responses and Associated Factors during the Initial Stage of the 2019 Coronavirus Disease (COVID-19) Epidemic among the General Population in China," *International Journal of Environmental Research and Public Health*, Vol. 17, No. 5, p. 1729.

Webster, Craig and Stanislav Hristov Ivanov (2020) *Robots in Travel, Tourism and Hospitality: Key Findings from a Global Study*: Varna: Zangador.

World Tourism Organization ed. (2019) *International Tourism Highlights, 2019 Edition*: World Tourism Organization.

Xie, Qin (2016) "Japan wants 'Chinese-only' zones at tourist attractions," April, URL: https://www.dailymail.co.uk/travel/travel_news/article-3539730/Japanese-presenter-calls-Chinese-zones-tourist-attractions-visitors-seen-picking-flowers-shaking-trees-cherry-blossom-season.html.

Yamaguchi, Adam (2017) ""CBSN: On Assignment" explores Japan's future of humanoid robots," Jul, URL: https://www.cbsnews.com/video/cbsn-on-assignment-explores-japans-future-of-humanoid-robots/.

Appendices

A. User Testing Results

Video Prototype User Test Notes and Comments
Participant 1
Anxiety about traveling to Japan solo: 7/10
Reason: Not knowing directions, not knowing culturally what is right/wrong.
Have you made a cultural mistake before: Not sure
Noticed tourists in your home city being accidentally rude: People keeping shoes one when they enter a house
If you did see a tourist making a mistake would you confront them: Yes
Guesses for each scenario:
Scenario 1: Do not answer your phone on public transit.
Scenario 2: Do not bag your own groceries. Related to cash. Not having the right change. Give up.
Scenario 3: Is it related to the pamphlet stands. Give up.
Scenario 4: Do not open the door by yourself.
Scenario 5: Do not eat with your hands. Clean your hands before you eat.
Score 3/5
Would it help: Yes, it would make me less anxious
Would you use it: Yes but only countries that have a very different culture
Other: “Its a bit like a video game”
Hard time grasping the mistake had not happened yet
The haptic spatial feedback is good
It would defeat the purpose if you used it only in situations with no one around, but silent mode option would be good
Sound design was fine
Maybe have the option for two bracelets instead of one necklace

I like the product

Participant 2

Anxiety about traveling to Japan solo: 7/10
Reason: Communication
Have you made a cultural mistake before: I did not know i was supposed to haggle in Mexico
Noticed tourists in your home city being accidentally rude: No. In Vancouver it is hard to tell who is a tourist and who is a local
If you did see a tourist making a mistake would you confront them: No, unless it was hurting someone
Guesses for each scenario:
Scenario 1: Something to do with your phone. Silence your phone or mute it. Give up.
Scenario 2: Do not try to give them money until they ask for it. Do not pay with big bills. Give up.
Scenario 3: Go towards the pamphlets first. Give up
Scenario 4: Do not touch the car, they will open the door for you.
Scenario 5: Clean your hands first.
Score: 3/5
Would it help: Yes, it would make me a little less anxious
Would you use it: Yes depending on the culture of where I was going
Other: When I travel I hate to be “that guy” that does things you’re not supposed to do
Might make you more self conscious
Turning it off in high stress situations might defeat the purpose
I have tinnitus in one ear so the sounds seemed kind of similar but with some practice I could get it
The negative answers could sound a bit more negative
I like the idea of only using the vibrations
Have different sounds for “ do something ” versus “ don’t do something ”

Participant 3

Anxiety about traveling to Japan solo: 7.5/10
Reason: Communication issues, embarrassing yourself
Have you made a cultural mistake before: Yes, I held the door for people in Brazil
Noticed tourists in your home city being accidentally rude:
If you did see a tourist making a mistake would you confront them:
Guesses for each scenario:
Scenario 1: Don't answer the phone on the bus
Scenario 2: Put away the basket yourself. Give up.
Scenario 3: Take off your shoes. Something about being respectful. Do not make any noise. Make an offering before entering. Give up.
Scenario 4: Do not walk up to the taxi but alert them some other way. Knock on the window first. Take your shoes off before entering the taxi. Give up.
Scenario 5: Give the waiter a tip when they bring you your food. Put a napkin on your lap. Sit very close to the table. Drink before you eat to cleanse your palate. Wash your hands. Use the hand towel to clean your hands.
Score: 2/5
Would it help: Yes, it would make me less anxious
Would you use it: Yes, depending on the price
Other: It would work.
If someone saw me with it they would know that I'm at least trying
It could make you more anxious in high stress situations but being able to control the volume or have a vibrate-only mode would help
I would be able to differentiate the notification sounds with a little practice
It is playful and fun
" It's like I'm talking to R2D2 "

Participant 4

Anxiety about traveling to Japan solo: 8.5/10
Reason: Communication, getting lost, understanding the currency, culture shock
Have you made a cultural mistake before: Yes, visiting religious sites in foreign countries and not knowing how to behave
Noticed tourists in your home city being accidentally rude: Yes, trying to feed the

wildlife (raccoons), standing in the middle of the escalator
If you did see a tourist making a mistake would you confront them: Only on escalators if they are blocking the way, otherwise no.
Guesses for each scenario:
Scenario 1: Do not answer your phone on public transit
Scenario 2: Position of where to stand at the till. Give up.
Scenario 3: Something to do with the water basin. Give up.
Scenario 4: Which door you should approach. Where the queue starts. Let the driver come out and open the door for you. Give up.
Scenario 5: Wash your hands with the hand towel before eating.
Score: 2/5
Would it help: Neutral. The notifications would increase anxiety but the correct answer would decrease anxiety.
Would you use it: Yes, but only if the culture is very different from what I am used to.
Other: It would be good to have an option not to be notified in high stress situations, at least at first. Once you understand all the sounds perfectly it could be less stressful
Really cool
Maybe AR glasses would be more useful because it could use an overlay with arrows or drawings to help you guess.
It being non-verbal is playful but also frustrating
Could be fun replacement for a museum or cultural site audio guide
Some sounds were slightly too similar, but you would get used to them
Nice sound design
As an anxious person, before going on a trip I do so much research and I write everything down, its a lot of work
Having an app would be boring, a wearable device is much more fun

Participant 5
Anxiety about traveling to Japan solo: 9/10
Reason: Language barrier, getting lost
Have you made a cultural mistake before: Yes, drinking a beverage in the middle

of the sidewalk in Japan, pushing your way to get off a bus
Noticed tourists in your home city being accidentally rude: Yes, people taking the whole tray of food at a buffet back to their table
If you did see a tourist making a mistake would you confront them:
Guesses for each scenario:
Scenario 1: Don't answer your phone and chat on public transit
Scenario 2: Bring your own shopping bag. Don't use certain forms of payment. Put the money in a tray or plate and don't give it directly to the staff
Scenario 3: Pay respect to the shrine before entering. Cleanse yourself with the water
Scenario 4: Do not signal the taxi by waving your hand. Enter the taxi from the opposite side. Give up.
Scenario 5: Clean your hands first
Score: 4/5
Would it help: Yes, I would feel less anxious because it feels like a safety net
Would you use it: Yes
Other: If I embarrass myself in public I think about it over and over again
Might make some people more anxious because they would realize how many mistakes they are making and panic to try and correct it
It would be helpful to avoid making mistakes
It would defeat the purpose if it only notifies you when no one is around, even though it is more stressful in situations with people watching you
Lets the local people know that you're making an effort to be polite and learn about the culture
Because it has a camera and a microphone, would it make people weary of you?
The sounds were cute, even the ' wrong answer' ones didn't sound too negative and wouldn't hurt your feelings, though they did sound similar and would need practice to differentiate
Wouldn't want to use earphones long term so not needing earbuds is good
The non-verbal communication might get frustrating after a long day, but if it was always speaking to you n English it could also be annoying, like a GPS when driving (turn left in 300m...200m...100m⋯)
I liked the design (and the remora fish metaphor)

Participant 6

Anxiety about traveling to Japan solo: 7.5/10
Reason: Don't know the culture, don't know the language, wouldn't be able to ask for help if I needed it
Have you made a cultural mistake before: Yes, in the Dominican Republic not greeting people warm enough (hugs and cheek kisses, etc)
Noticed tourists in your home city being accidentally rude:
If you did see a tourist making a mistake would you confront them:
Guesses for each scenario:
Scenario 1: Don't answer your phone on public transit.
Scenario 2: Bag your groceries before you pay. Give up
Scenario 3: Pay your respects by bowing. Use the ladles to spread water somewhere. Make an offering. Clean something. Silent contemplation. Clean your shoes. Give up.
Scenario 4: Tell them your destination before entering the car. Give up
Scenario 5: Don't take pictures of your food. Something about leaving a tip. Give up.
Score: 1/5
Would it help: No, it would make me more anxious because the notification sound would make me feel like I would definitely make a mistake
Would you use it: Not as it is now, yes if it was more for educational sites
Other: Sounds are fairly similar, could be easy to get confused
A lot of these answers I would never be able to guess, Sidekick would have to explain it to me
I'm a Canadian, I am not okay with making a fool of myself
The interaction is fun and playful but not enough payoff for the effort, maybe could benefit from some kind of incentive like a points system
I might look silly making guesses in public
I wouldn't feel embarrassed wearing it in public because even now wearable tech is fairly common
I would like it more if it had another element to help me focus in on what specifically is the key element of the mistake (for example at the shrine, something to

point out the water basin specifically). Maybe a screen that you can look at for clues
Maybe would be a good competitor for an audio guide for a museum or historic site
In high stress situations it would be frustrating and stressful, it would be good to have an option only to have it notify you in a passive situation.

Participant 7
Anxiety about traveling to Japan solo: 7.5/10
Reason:
Have you made a cultural mistake before: Yes, I didn't know that in Europe waiters at a restaurant won't check in on you at your table and bring you the cheque unless you flag them down, wearing shorts while visiting religious sites
Noticed tourists in your home city being accidentally rude:
If you did see a tourist making a mistake would you confront them:
Guesses for each scenario:
Scenario 1: Don't be loud on the train
Scenario 2: Greet the staff before paying. Don't bag your groceries yourself. Something about paying. Don't pay by card. Give up.
Scenario 3: Wash your hands
Scenario 4: Don't open the door for yourself
Scenario 5: Use the hand wipe before you start your meal
Score: 4/5
Would it help: Yes
Would you use it: Yes but only in places where the culture is very different from my own.
Other: I care a lot about not embarrassing myself in public, I think about embarrassing moments over and over again
How would Sidekick react if you did the right thing but then made a mistake right after. For example washing your hands and mouth at a shrine but then spitting the water back into the basin.
It's good that it warns you before so that you have time to fix it
I prefer to not use headphones while I'm walking alone for safety reasons, so I

appreciate the vibrate or speaker options

Participant 8

Anxiety about traveling to Japan solo: 8.5/10
Reason: Language barrier, cultural insensitivity, getting lost
Have you made a cultural mistake before: Yes, not being chatty with the taxi driver, not greeting people correctly/formally enough
Noticed tourists in your home city being accidentally rude:
If you did see a tourist making a mistake would you confront them:
Guesses for each scenario:
Scenario 1: Don't be loud on public transit
Scenario 2: Something about where you have to stand. You should greet the staff before paying. Give up.
Scenario 3: Wash your hands before entering the temple
Scenario 4: Get the driver's attention before getting in the car. Go to the last car in line instead of the first one. Give up.
Scenario 5: Wash your hands with the towel before you start eating
Score: 4/5
Would it help: Yes
Would you use it: Yes, depending on where I was travelling and especially on my first visit to a new country, and depending on the price
Other: I try to be considerate
Sound design was good, didn't sound too scary, though some sounds were quite similar
Some people might prefer to figure out what they did after the mistake has happened instead of in the moment
I think it is a good product and there is a need for it
I would be more concerned about cultural mistakes in Asia compared to North America or Europe because the two are more similar
Just warning you with beeps might be too vague, especially in situations where you can't just stop and think, like the store scenario
I would be concerned about the sounds being too loud and people getting annoyed with me

Participant 9

Anxiety about traveling to Japan solo: 8/10
Reason: Hard to tell the appropriate way to react to things
Have you made a cultural mistake before: Not that I can remember
Noticed tourists in your home city being accidentally rude: Yes but I don't know if they were tourists
If you did see a tourist making a mistake would you confront them: Only if it was going to stop a conflict
Guesses for each scenario:
Scenario 1: Don't answer the phone on public transit
Scenario 2: No guesses. Give up.
Scenario 3: Something to do with the ladles and water. Wash your hands.
Scenario 4: Talk to the driver before getting in. Something related to payment. Give up.
Scenario 5: Clean your hands with the towel before you eat.
Score: 3/5
Would it help: Yes. Less anxious but maybe hyper aware at first
Would you use it: Yes I would use it to make sure I'm being respectful, but I wouldn't need it in a Western culture.
Other: The sounds might take some getting used to in order to be able to differentiate them.
It would be important that when using the speakers the sound isn't too loud.
It's not running your life it is just giving you tips, so you can always just ignore it if you're in a situation where trying to guess would stress you out.
It's good that it warns you ahead of time instead of just "throwing you under the bus" after you've made a mistake

Participant 10

Anxiety about traveling to Japan solo: 7/10
Reason: I would be uncomfortable being alone because I always travel with friends, language barrier, worried about safety in Japan, Japan has a unique culture so I might make many cultural mistakes

Have you made a cultural mistake before: Yes, I was standing on the wrong side of the escalator and people behind me wanted to walk up.
Noticed tourists in your home city being accidentally rude: No but I don't spend my time in tourist areas.
If you did see a tourist making a mistake would you confront them: No because I don't want them to feel embarrassed.
Guesses for each scenario:
Scenario 1: Don't talk on your phone on public transit
Scenario 2: No guesses. Give up.
Scenario 3: Don't go off the main path. Don't touch the papers on the table. Show respect in some way. Give up.
Scenario 4: Don't walk up to the taxi directly and instead wait for it to pull up to you. They will open the door for me.
Scenario 5: Use a bell button to call the waiter. Don't keep the menu at your table. Something about napkins or tissues. Clean your hands with the tissue before you eat.
Score: 3/5
Would it help: No, it would make me more anxious because the notifications would make me panic and feel like I wouldn't be able to figure the mistake out. If it spoke in sentences instead of beeps it would be less stressful.
Would you use it: I might use it to try and avoid mistakes but even if I know there is a mistake that might happen it doesn't give me enough information to make good guesses.
Other: The sounds are too similar and people might confuse the "getting closer" and "getting further" sounds, people might spend too much time trying to decipher which sound is which.
I personally don't like exploring things, I prefer receiving information directly.
Maybe this could be better as Smart Glasses because then we could get visual feedback like arrows or pictures that would be much easier to guess than just sounds.
It is an interesting product, it could be useful even for people from other Asian countries because the cultures are very different.

B. Design Process Tools

The following are artifacts from the iterative design process.

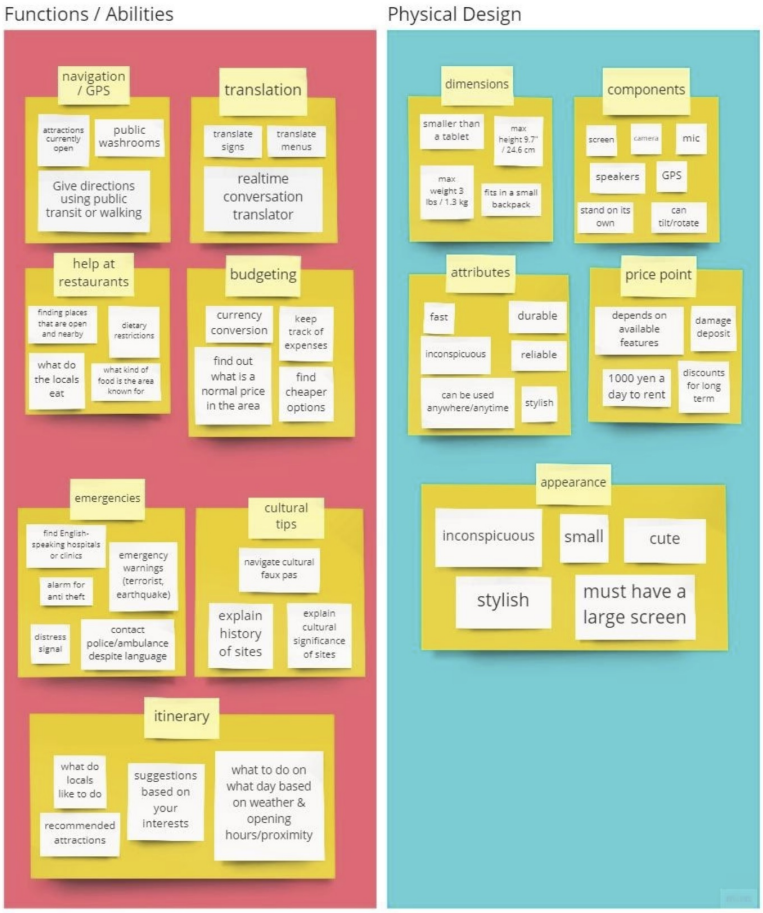


Figure B.1 Affinity diagram from preliminary research showing common functions as well as physical attributes that the target users would want in a travel robot.

Persona

Anne Peters

A young, determined yet anxious solo traveller.

Name	Anne Peters
Age	25 years old
Nationality	Canadian
Occupation	Graphic designer at an athleisure clothing company
Education	Graduated from college with a diploma in design
About	Likes to travel, but always on a budget. Only gets two weeks of paid vacation time per year. This year, all of her friends work very incompatible work schedules, unlike in previous years where they could vacation together. When traveling, she likes to visit tourist attractions and trendy restaurants. Doesn't spend much time in museums or art galleries. Relies on Google Maps for directions and Instagram for activity inspiration. Wears a fitbit to count her steps and measure her sleep quality. Takes lots of pictures with her cell phone. Travels with a purse
Goals and Tasks	Stay on budget, find good deals, find cool and beautiful places to post on her social media
Anxieties and Motivations	Worried about embarrassing herself in public, doesn't want to perpetuate a negative stereotype for tourists, but still wants to travel the world and experience new things.
Frustrations and Concerns	Concerned about accidentally offending the locals.
Needs and Expectations	Needs reassurance she isn't making any mistakes, expects her devices to be reliable, expects she will be able to understand new technology without reading a manual
Story	As a young professional, Anne has a limited number of vacation days and a small budget for her travels. She will be traveling alone for the first time in her life. Through the COVID-19 pandemic she developed slight social anxiety and has become hyper aware of how people perceive her. She tends to get very embarrassed when she comes across as a "dumb tourist". She needs a travel robot companion that will reassure her and act as a safety net.

(Image source: C. Ferrer on Unsplash)
https://unsplash.com/photos/aK5Dt6L6_hQ?utm_source=unsplash&utm_medium=referral&utm_content=creditShareLink

Figure B.2 A user persona based on Sidekick's target audience