

Designing for the Home: Applying the Interaction Design Praxis

The Full Report

James Hsueh (yuanh@sfu.ca), Angela Ma (hwm@sfu.ca), and Robert White (rwhite@sfu.ca), under the instruction and guidance of Ron Wakkary.

*Simon Fraser University Surrey
The School of Interactive Art and Technology
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Abstract

Following techniques and processes put forth by leaders in the field of interaction design and innovation, we explored and executed interviews, cultural probes, scenario forming, informances, journey frameworks, participatory design workshops, video scenarios, prototyping, and user feedback gathering in an attempt to understand a target audience and arrive at a final product design. Our goal was to design a product for the home of a Chinese immigrant between the ages of 25 and 35. We believe we successfully achieved and developed a solution that is effective, innovative, practical, and beautifully simple.

1. Summary of Interviews

Once we defined the group of people we were designing for, we looked around for real individuals to interview and participate in our study. We then interviewed each individual in a public space to increase the comfort level, and asked a series of questions about their concept of “home”. Questions included, “Do you think you have a home?” “Where do you consider home?” “What does ‘home’ mean to you?” and, “What or who do you want in a home?” as well as others, in an attempt to establish a conversation rather than a strict question and answer interview.

This comfortable, open interview concept provided us with a number of interesting responses that

we believe may not have presented themselves had we asked more direct questions. Also, this technique set the stage for the rest of our project, allowing us to focus on more conceptual ideas, and work with our curiosity regarding the mindset of these participants.

Lily

Lily lives in a rental apartment with her son. She is not content with this apartment, and she is looking for a more interesting job because she likes to experience new things. Her friends are very important in her life, and she enjoys inviting them over whenever she can. To Lily, the perfect home is a townhouse where she can experiment with decorating and do what she wants without restrictions. She would love to have nice, comfortable furniture to enhance a peaceful, home environment and to help her relax after a busy day: consisting of work, housework, raising a son, spending time with friends, cooking, watching TV, and many other activities.

David

To David, home is the physical place, a house he lives in, and his family members who live with him, his children and/or parents. It should be a place where he can feel safe, relax, and go for advice and suggestions. It’s “something you can hide in and be protected,” explains David. Right now, he lives with his wife, daughter, and his parents-in-law who are visiting. Inside the house, he watches TV with them, and shares stories with family value. Outside they go on shopping trips, buy new furniture, flowers, or paint and decorate

their house so it has an atmosphere of home. As much as David stresses about physical presence of a house for home, “home is not equal to house” at all, and he does not care about the location of the house. He says that home is personal; it’s the feeling; the atmosphere that creates “home” for him.

Anne

Anne just moved into an apartment with her husband. She believes she has a home wherever she is currently living; “For me, it’s the feeling,” she says. Because she moves a lot (she has lived in China, Singapore, Australia, and now Canada), she has learned to customize her home environment to create a relaxing atmosphere. She values her personal time, and it is a requirement for any home she creates. She must have a personal space to rest, to study, and to improve herself, but she also enjoys having a larger social space to entertain friends. When asked about her husband, Anne says, “I think I’m getting better with another person sharing your life. That means you have responsibility. That means you need and be needed, you love and be loved, so that’s good.” In her perfect home, Anne would live in a small, single-family house with her husband and future children, with a garden she could look after, and a house that makes housework quicker and easier so she has more time to spend with her family and friends.

Mike

Mike lives with his wife and son at a townhouse they own. He believes communication with family members is important. He enjoys socializing at home most of his free time, his food of preference is traditional noodles, and he does not listen to very much music. Though family and shelter are very important elements of a home, neither equates to a home to Mike. It doesn't have to be a house he owns, it's his family he lives with. It is a warm place where people who care about each other live together. It is the feeling that makes a place home - as long as he feels warm and comfortable, he's home. If you feel it's your home, then it is your home. Mike thinks that even country and community can be called home, as long as there is a feeling of belonging.

Linda

Linda lives with her husband and son in a full house in the suburbs. She enjoys practicing yoga before going to sleep, spending time with friends during the day, and entertaining family in her home. She is quite uncomfortable with her knowledge of English, and attends ESL classes frequently to help increase her knowledge. Linda enjoys walking, swimming, and biking for physical exercise, and she would love to go to Paris. To Linda, home is a place where healthy

relationships can flourish. It does not matter whether it is in a small apartment, townhouse, full house, or any other form of shelter.

2. Cultural Probe Documentation

In order to understand our participants on a deeper level, we deployed a set of cultural probes. In each of our probes, we included a disposable camera, a handmade scrapbook, a small Canadian flag, and a few carefully designed postcards. Each of these items were included in a simple, pearl textured, pastel gift bag with a few pieces of white tissue paper to resemble a gift and excite the participant while also making the contents easily revealed. Because we were meeting our participants in public spaces to avoid any intrusion into their private homes, we did not want them to be required to carry a box back to their car/bus/home. A bag is easier to transport, large enough to hold our probe items, and acts as a reminder in the home of the participant. A photo collage of the probe items and descriptions are available in Figure 1.

Camera

Stripping away the commercial label, we taped handwritten instructions on the back of the disposable camera instructing the participant to take photo of anything after waking up, and before sleeping, “transportation”, “entertainment”, and “family”.

We wanted to see how these participants live, and to understand what these individuals consider important in their lives through their unique photographic perspectives.

Scrapbook

A scrapbook was included in the probe kit with a number of empty pages, where the user was given the direction to sketch, write, or include images of something that remind them of home, as well as a few more specific outlined tasks:

1. Family Portrait, asking the participant to circle a member of the family they would most like to be, and answer why.
2. Collage (2 parts), asking the participant to cut out images from daily newspapers and assemble them into a story.
3. House Layout, asking the participant to draw a simple layout of the home, and identify favorite or least favorite areas.
4. Media Diary, asking the participant to write down some forms of media they were exposed to during a particular day.

provided a picture of his bedroom when it was in a clean and organized state.

He tried for the whole week to uncurl the flag from its packaged form by laying it under heavy objects. His son grew fond of the flag and was afraid it would be taken away at the end of the probing period. On Monday, he placed it in a lamp and took the photo.

In the scrapbook, Mike drew a detailed photo of his childhood home in China, which he said reminded him of home. He circled the man he felt was the most kind and knowledgeable in the family portrait. He drew a detailed layout of his condo, including furniture and outdoor landscaping, and did not have any favorite or least-liked rooms. He did not know about the media log, and provided cutouts of celebrities from the newspaper.

In response to the postcards, he answered that he misses his family members, he spends time with old friends and he likes sunny days, and so on. The answers seem quite surface level and safe, and do not reveal too many details about his private life. A couple interesting findings were his response to the purchased post card – he wrote his house address. Also, one of the postcard drawings motivated him to describe the picture on the reverse side.

Linda

In response to the instructions to photograph objects after waking up, of transportation, of family, and of something before going to sleep, Linda took photos of a clock, herself in the mirror, a car, her kitchen, and her CD player on which she plays yoga music.

Linda was unsure of what to do with the flag and so she left it in the bag as it was. This is what her photo depicts.

The first page of Linda's scrapbook is a drawing of the living room table she would most like to buy for her house. She circled the happy, new mother in the family portrait. In the layout of her house, she indicated the living room to be her favorite place, and the garage is her least favorite. In her media log she listed Martha, Seinfeld, Everybody Loves Raymond, and Chinese News. Additionally, she cut out a sudoku game and an article about fine restaurants from the newspaper.

Linda responded to her post cards in a more descriptive manner. She described the purchased post card as a bird's eye view, of Vancouver, portraying freedom, and she drew a simple yet respectable portrait of her mother, who is important to her. She said she would like to go to Paris because she has heard many things about the city. She also enjoys shopping, spending time with friends, and quiet time when the family is asleep. Interestingly, she feels alone when there's no one she can talk to who would understand when something is bothering her.

In general, both participants responded to the probe quite differently, yet we do see some similar concerns present in the probe results. Mike values his privacy and, when necessary, shares his privacy in a positive way. He is responsible to his family and cares about them in many ways. As opposed to Mike, Linda enjoys a relaxed social life in a clean and healthy setting, and her interests are centered around a healthy lifestyle. Both of their daily routines, however, are intertwined with their family's schedules. From the camera results, and based on knowledge gained from the interviews, we might assume that our target population values physical objects and memories more than recorded artifacts. Also, both of them encounter some degree of a language barrier. Mike didn't understand the operating instructions on the camera, and Linda was worried about her English during the interview.

As for the participants who were too busy to complete the probes, we were able to extract some useful information and achieve a greater understanding about the lives of our participants; Recognizing the delicacy of accepted and unaccepted invasions into the regular pattern of life, we have been awakened to the importance of design on a more emotional level. The tangibility of this realization, when combined with the interview findings, will be invaluable to us when we attempt to develop a way to improve the homes of this segment of the population.

Through this process, we experienced our participants' curiosity regarding our probes. We empathized with those who were too busy to complete the tasks we gave them. We have learned that introducing a probe into the private life of a recent Chinese immigrant is not to be taken lightly. These participants, although willing to help, are perhaps not comfortable with sharing personal space, information, thoughts, emotions, or even their personal time. This has given us something to work with.

4. Personas and Foundation Documents

Through the analysis of our interview and probe results, we learned a great deal of information about our participants. We analyzed the individual parts and drew correlations between each person. This process led to the creating of foundation documents, where we grouped similar qualities or characteristics of participants were together. These groupings allowed us to have a concrete archive of personalities, and with this archive, we developed two distinct personas: Alice Chen, and Judy Li (Figure 2).

Alice

Alice contains many of the qualities shared between our participants Mike and Anne, with a little bit of influence from Linda as well. We developed Alice's character following five keywords: confident, self-assured, rational, ambitious, and perfectionist. It is important to note that these keywords by no means describe every aspect of Alice, however they allowed our team to simplify our understanding and guide the results that would match Alice when we were looking at other qualities present in the participants.

In our development of Alice's foundation document, which describes her persona in detail, we opted to keep it simple. We did not want to hide the information in blocks of fictional text. However, after completing this simple document, we formed a "day in the life" description based on the points we accumulated earlier. In doing so, Alice became a real person.



Figure 2. Persona Posters

Judy

Judy is primarily based on Linda and Lily, with parts of David drawn in. Her character keywords are as follows: rational, considerate, protective, caring, and cautious. Similar to Alice, these keywords were meant to guide our formation of Judy, while not being stereotypical.

Judy's foundation document followed the same form as Alice's to keep it consistent; with simple descriptions of her goals, fears, leisure activities, household activities, education, technology experience, transportation, values, and so on. Her "day in the life" description shows us what Judy is really like, and it is not all that different from Alice. This was interesting to find, especially when knowing that during our process we created a contrast document – a spectrum ordering the characteristics of both personas in terms of how similar or how different they were. In the end, an appropriate balance was found to help us create two unique individuals, archetypes of our participants.

With this information, we created our Persona posters, and attempted to design them in a clean and fun style. Although bulleted points weren't ideal, we found that for our personas, it was the most appropriate structure to follow at that point in the project. We formed a compare and contrast poster to showcase the differences between the two personas, as well as highlight the similarities.

5. Informance Summaries and Analysis

Morning Routine

Judy is packing up her stuff and ready to run to her ESL class in the morning, but she just realized that she forgot something important after she closed the door.

This informance is primarily based on Judy, although it can be applied to Alice or practically anyone. The morning routine is often a very chaotic period of time for many people. In Judy's case, she must take care of not only herself but her children too. Judy must prepare breakfast for the family, take care of the children, wake them up, get them to settle down and eat and finally get them dressed and out of the door; in between these things, she also needs to get herself ready and try not to forget anything important. However, this can be hard; especially if she had to pack all the things she needs in the morning.

As mentioned in the early brainstorming processes, we thought of idea by defining a potentially problematic time frame or event and brainstormed on annoyances we usually encounter. In this case, the time frame is chosen at morning before leaving and the annoyance that particularly interested us was the fact people tend to forget important things when they are in a hurry to leave. Knowing what we were interested in, we stripped away other tasks of the morning routine and focused on the last few minute before leaving. This allowed us to explore all the fine details we otherwise couldn't discover by just thinking about. For example, during the performance, I found that it was a difficult task to try to wear coat and shoes and juggle bag the same time. As well, I must take off the shoes when I came back to grab something else inside the room. Those details may not have apparent use to us at this stage. However, they allow us to be in Judy's shoes, take her view and consider things in her position.

Of course, Judy might be more organized more often than was shown in the informance; the

informance was more like worst-case scenario, and a stripped down version of it. She probably will pack her bag the night before; gather most of the things she need next morning at one place. However, Judy is not a robot, she doesn't always do what's "right"; she can be too tired to pack the night before; there could be large items she can't put in her bag, things she still needs to use in the morning that she can't pack, and so on. The informance can only cover one possibility, one small section of time we choose to look at the worst-case scenario; if we could solve that, we can solve all others.

The problem in this informance is the tendency to forget to take things needed for the day because morning is a chaotic time. Although, this problem we defined fits for many people, both persona and even beyond our targeted users. We feel that we need to be careful when designing the solution so it will make our primary user, Judy, satisfied first. Design directions may consider how to remind Judy or ease her mind under the pressure of time and solve her forgetfulness.

Calling China

For this particular information performance, we focused on the situations that occur across different time zones. The main character, Judy, has lived in Canada for six years, but still has a tendency of forgetting or miscalculating the time difference between Canada and China.

The scene started with Judy phoning her friend in China; however she wasn't aware that the time in China is the middle of night. Her friend was rudely awakened by the telephone, and Judy was uncomfortable and embarrassed for calling at such a late hour. The common problem for Judy, and possibly for Alice as well, is being able to calculate the exact time difference efficiently when they need to know it – like when making a long distance call to China. This is made slightly more difficult considering the changes in daylight savings time.

We could see there is a space for us to explore; however, how wide was the space? Were there any unexplored opportunities? Were there any hidden potential issues? The answers for those questions were unknown at the beginning. We went through several steps and situated possible annoyances, inconveniences, and we looked for various directions to make the experience better. To help empathize with the persona better, we improvised and acted out moments of the events several times. We made use of surrounding tables, white boards and the lighting to indicate the bed, environment, and light in different time frames to help us imagine the experience realistically. After a series of action vs. reflection, and a short discussion, we realized

that the problems seem way more complicated than we expected; yet the situation we were dealing with became clearer. The problem is people don't want to be disturbed when it is not necessary; more precisely, our task here was not just to let people know the exact differences of time, but knowing what benefits people get from having this knowledge, and transform this routine into a more fluid and humanized function. Having two clocks set in different time frame would be too traditional and obtrusive, and a response like this does not consider the problem in terms of the social or human context.

We wanted our solution to be practical, but also integrate well into the lives of our personas. Based on this goal, we analyzed the problem with more in-depth thoughts, created a video of our informance for future reference and analysis, and considered a variety of potential solutions such as ambient light displays, restrictions on calling certain numbers at certain times of the day, as well as a few other less-developed concepts.

Unloading Groceries

In the third scenario, Alice was arriving home after shopping for groceries and had quite a load to carry into her condo. She could not carry everything at once, and she couldn't leave the car open or unlocked because someone could steal her purchases. So what might happen under this situation? While spouses or children are often available to help, there is often a time when she has to carry a load of groceries through all the doorways and steps until reaching the kitchen table or countertop.

The situation in this informance is more general and may not only apply to our target users, but many to many people. It is mainly focused around those who live in an apartment, because it is often troublesome when there are bags of groceries or other items that need to be delivered from the parking lot, through the elevator, or possibly stairs, and finally to their room.

To us this journey had many potential possibilities that we could explore and experiment on. During the process of analysis, we immediately jumped into the discussion with various blue-sky ideas. From a portable, cardboard, shopping cart, public locker, and speedy public wheelchair, to a personal delivery system, or personal assistant - our ideas went wild and unbound, however we still considered alternative issues laterally with the discussion.

As the discussion become more settled, we wanted to ground our analysis in a more precise way. Our thinking process was written on a whiteboard, which made concepts easier to refine and review. In order to widen the range of our responses to the situations of varying complexity, we reconsidered our issues and refocused our scope from grocery unloading, to the

situations within the community, centered on experiences like this. One interesting issue we came up with is the fact that nowadays people who live in apartments are more distanced compared that to the old days or the situation in China. Even people who live next door to each other may not necessarily know their neighbour, or they rarely have a chance to converse with him or her.

From there we saw a problem, and direction begin to emerge. The question in this informance was how to make the delivering process less annoying and more convenient, reduce the heaviness of groceries, or fewer trips to and from cars. From our experience of role-playing the character, our direct response was usually “I hope *someone* can help me,” rather than, “I hope *something* can help me.” Hence, people are needed, and there are many people in the community. We got an idea, and the design direction for this informance was in part, determined by this point.

Although the product solutions may also address the problems well, we believe by sticking with the idea that inspires us the most, helps us to maintain our passion and interest to this project. At this stage, we believe our starting point is very encouraging.

6. Journey Framework Summaries

Unloading Groceries: Journey

In the journey framework, we continued the conversation of the unloading groceries informance, and tested out possibilities for our solution. We wanted to define the situation with our solution in a more precise and effective manner. This, and the following journey framework, is present in Figure 3.

Upon arriving home from grocery shopping, Alice needs to unload all the purchases she bought. At the same time she needs to estimate if the purchases are too much for her to carry. If they are, then she must call someone for help. In the journey framework we focused on two possible outcomes from this decision. Even if people come, the person may not necessary be willing to help her, but if the person dose help Alice, there will be less decision for her to make and less labor for her too. Meanwhile, the interaction between the helper and Alice may enhance their connection and both of their social networks are increased. As opposed to another possibility, if there is no one helping Alice, then she will end up doing everything herself. The process of unloading goods will become non-liner and more complicated as she needs to deliver the perchance separately. The whole journey could have had more options (such as Alice calling different people for help, her spouse, children or friends), but we wanted to show our principle rather than being realistic.

Through this we developed a sort of solution in the form of a service Alice could call to ask for help. People in the building who may or may not already know Alice would receive the message, and go down to help her. Alice might be afraid of the person, or she might be grateful to have a kind person come to help her. Both situations were explored in the journey framework, leading eventually to the successful delivery of the groceries to her apartment in one way or another.

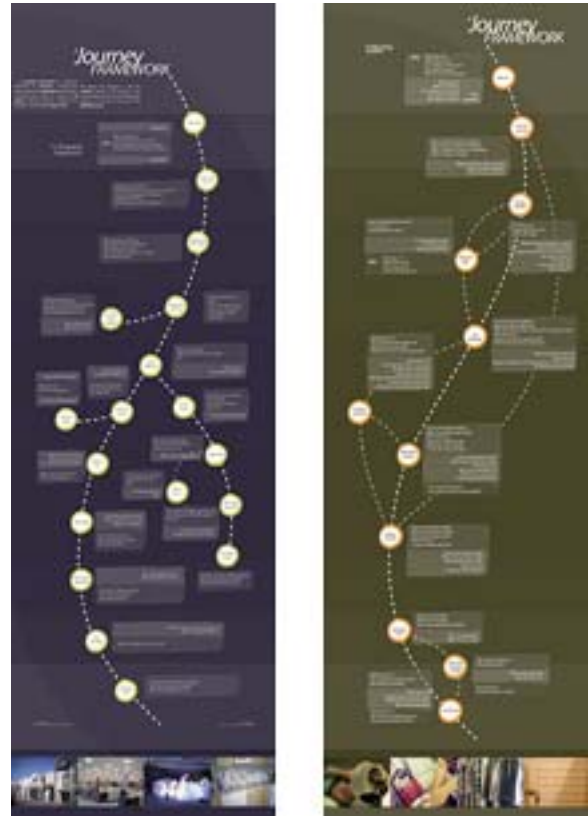


Figure 3. Unloading Groceries and Morning Routine Journey Frameworks

Morning Routine: Journey

This journey framework was based on the earlier informance of Judy forgetting things when she prepares to leave in the morning. In the journey framework, we expanded the scenario to begin from the moment she gets up in the morning, to the moment she leaves home. Unlike in the informance, where we were trying to capture every small details of the moment, the journey framework allows us to expand our view and open up more possibilities of how problems develop in the morning.

In Judy’s case, she must take care not only of herself but of her children as well. Judy must prepare

breakfast for the family, take care of the children, wake them up, get them to settle down and eat and finally get them dressed and out of the door; in between these things, she also needs to get herself ready and try not to forget anything important. It's not simple and linear. Her husband could help her with some tasks and reduce her pressure, or he and the children could leave home before her, providing her the time to prepare herself, or it even could be that she got up just to prepare breakfast for her children and husband and go back to sleep after they are gone. There are a lot of possibilities how things could work. In the journey framework we tried to address that; there are alternative paths we could go around things. By doing this, we hoped to find more possibilities and opportunities for solutions to the problem we defined earlier: it is easy to forget things in the morning.

Finally, we picked, out of our brainstormed solutions, the most plausible to implant into the framework to see how it might work out. However, the time frame of this journey framework doesn't allow us to explicitly include many issues of the around these solutions. It didn't address how and when the item tracking sensors are tagged to the items, whether or how to retrieve the tags, although the purpose of this framework is concentrated on finding opportunities for solutions rather than testing those solutions.

7. Ranked Journey Frameworks

Looking at the journey frameworks we formulated earlier, we decided that the morning routine should rank above the unloading groceries experience. Our main rationale behind this was the fact that the process of getting ready in the morning is very different for every individual. Some people have no problem getting prepared for the day and ensuring that any important items are taken with them. Other people have a horrible time getting out of the house so as not to be late for work or school or any other requirement.

As well, we found that more of the proposed solutions for the morning routine scenario are product based rather than service based, and therefore lend themselves more option to prototyping and observation. This also means it will be slightly more feasible to create the product and hold design workshops to find a solution that matches expectations, but also looks good.

Finally we decided to rank the morning routine above the other scenario because it can provide us the opportunity to fully explore our defined subject group and design a product that is targeted towards them. The home has so many products with a wide target range, and cell-phone services, as partly mentioned in the proposed solution to the grocery problem, are not the solution we want to develop.

8. Summary of Design Proposal

Throughout the latter half of this course, we worked through participatory design workshops and several scenarios of use to keep exploring the concept of a home and the nature of interaction within the home. This part of design process had a strong influence, and contributed greatly to our final design. One of the most important moves was the decision that we made during two participatory workshops, where our end-users had the opportunity to express their thoughts and opinions on our design process, and the direction in which we were headed. This resulting design proposal moved a long way from our early drafting of the device, and progressing through iterative design stages in both concept and direction.

In the early stages, we developed a prototype of a keychain device to carry and use outside the home. Sensors in the door would detect when user left the house, and if the gas detector found that the stove was on, the keychain would tell the user.

The idea of a portable keychain reminder was based on providing secure information about the stove, and its functionality heavily relied on technology. We refined the purpose of our initial ideas and decided to combine reminding function with timer. We wanted our reminder/timer to be an ambient feature in the home. Our thinking shifted to create a device that did not have an obvious function, but was very easy to use, had real benefits, and integrated well with an already established daily routine. These were infused into the design proposal of our product, named "**remindMe**".

remindMe is a home-based reminding device that serves as a second assurance, and allows the user to form a habit when used consistently. It is designed with a wearable bracelet timer placed on a simple, yet elegant base station. On top of the base station, a light-diffusing dome acts as a button, providing a simple and intuitive way for the user to turn on the device. The user turns on the device when they are using the stove and if they want to leave the kitchen for a while, they set the

bracelet timer, put on the bracelet, and when the designated time is reached, they will be reminded via lights and sound from the bracelet.

9. Rationale

The path to our final design was a winding one. We changed our problem space many times throughout the course of the design process, through concrete design decisions that guided our process throughout the entire project. All the decisions we made, including, and especially in terms of the problem space, were made around the needs and wants of our persona. Our top priority and goal was to design a solution that wouldn't be technology-centric, require complicated installation, or modification of the living space.

We created a number of informances, as reviewed in the midterm report, and chose the morning routine informance situation, which centered around reminding our persona remembering and bringing everything she would need for the day. However, we found through the participatory design workshops that our persona already developed strategies and formed habits to counter this problem. Staying with the theme of memory and reminding, we explored the areas of the home in which people often forget things, and we found that forgetting to turn off the lights, closing the windows, locking the door, or turning off the stove, poses security problems as well as significant safety problems. We decided to narrow down our problem space to the oven or stove because we found it was the area that was the most open to disastrous outcomes if forgotten. Knowing that our personas value security and reliability aided us in this decision, and we received corroborative results from our participatory design sessions.

After defining what we thought to be the proper problem space; using a keychain to remind the user to turn off the stove when exiting the house, we found that trying to design a product our persona could trust was becoming too technical and complicated. We found that, rather than reminding the user, similar to pre-existing security systems, our solution could work with them to help remember or even time the stove whether they're outside or inside the home. This naturally led the design into the direction of a standard kitchen timer, with one main difference: Instead of the portable keychain we originally had, we moved to a more wearable and physical reminder, similar to how many people tie a string to their finger to remember something. This solved a number of design problems

we faced, such as designing a standalone product that does not require installation or modification of existing appliances. To maintain the reliability and safety that we focused on earlier, we decided to mix the physical reminder with a simple, hidden technology-based reminder system on the bracelet and a base station in the kitchen. In order to remember to set the timer/reminder before leaving the kitchen, the user manually illuminates the base station. The user can then, at any time, use the bracelet as a key to set the required time, remove the bracelet from the base, and put it on. The bracelet form is appropriate because it is readily visible by the user, and easily noticeable. It can also be worn outside of the home while remaining inconspicuous to the people the user would come into contact with so the user doesn't have to feel like she is wearing an ugly piece of technology. In addition, the user doesn't need to find places, like in the pocket or in her hand, to carry the bracelet, because she's wearing it. This solution allows the user to complete her tasks without the product getting in the way, and affords her the ability to go anywhere and do anything she would normally do, unlike traditional timers. The bracelet then lights up and plays a gentle tone when the time is up, and can easily be turned off, just in case the user has not yet returned to the kitchen, or if she is in a setting that requires silence. When finished, the bracelet can be returned and is clicked into the base station in order to turn the base off; otherwise the user might remove the bracelet and leave it in another part of the home, thereby rendering our entire product useless until the bracelet is returned.

For the form, we wanted it to be small enough to sit on the counter, but not so small that it would be overlooked. It needed to glow gently and provide a sort of ambient pulse to remind the user when it is turned on. We wanted to design a form for our product that would act as a piece of decoration that our persona would like to keep in her kitchen. We looked at various forms, taking inspiration from gourds and other traditional Chinese forms, before settling on bamboo. A short bamboo cup with a simple opaque dome to diffuse the light ended up being the most practical, functional, simple, and desirable form.

10. Prototype of Design

Our first prototype was a very crude low fidelity prototype, made out of coffee cups, a clicking ballpoint pen, cardboard, masking tape and a glowing bracelet. Our goal while making it was to identify the main functions and the product use cycle, rather than focus on the configuration and the form of the design. This prototype helped us to explore the scenario of use

in detail, as well as depict and explain its use to others for feedback. In the second week of prototyping, we refined the structure and constructed a more realistic form to portray our concept. We had at first, decided to construct our second prototype in foam; however, we decided to find more refined materials from vendors in the area, so that the prototype would more closely resemble our desired form in dimensions, weight, texture, and so on, and look more like a finished product. We had hoped this would help our persona to view it as a product instead of a prototype, and concentrate on critically evaluating the functionality and usability of our solution.

Many refinements and decisions were made regarding our design, simply by going through the process of making the refined prototype. For example, we realized that we didn't need the whole base structure to give off because we wanted an interesting visual texture, and light can't shine through thick bamboo. We ended up with a short bamboo cup containing an opaque dome to softly diffuse light, to meet our practical and functional needs, and still be an attractive form. In addition, when we tried to turn the bracelet, the entire base turned with the bracelet because the underside was too slippery to grab the table surface; so we simply added resistance to the bottom of the base station to help to maintain its stability, by using a small, textured pad.

We made two physical prototypes in total for our product. With another week, we would have held more user feedback sessions, and made quite a few more prototypes to continue evaluating and improving the form, functionality, and product as a whole. As well, we would have implemented some of the functions, even if in basic form, to further realize the product. For example, during scenario testing, it would have been useful for the light to turn on, and we would have seen if it did create the user response we intended.

11. Results of Evaluation

The goal of our user feedback session was to test out our original design with our participants, and in a more expressive and definable way, evaluate what and how the next iteration of our design could be improved. We planned usability testing for our two participants from the second PD workshop, Sonja and Linda, and conducted a scenario to contextualize the workshop. The workshop took about 30 minutes in total.

Questions/Activity

We asked two questions before providing the concept, functionality, and reasoning of our design, in order to examine the level of intuitive use of our prototype, and the result was quite positive. The two participants immediately noticed the light bulb-like button on the top of the base station and expected certain feedback after they pushed it. They also mentioned that although they did not know how the prototype should work, it appeared to be a sort of decorative item, base on the shape, size, and general appearance. The two questions we asked at this stage were:

*What does it looks like?
How would you use it?*

However, what we really wanted to know was how they would interact with our prototype, and would there be any confusion or disturbance during this interaction. With this goal, we then presented brief questionnaires. Based its form, practicality, possible improvements, and use cycle, we designed three relevant questions:

*How do you like the design?
Would you want to have this in your home?
What improvements, if any, would you make?
Where would you put it when not in use?*

How to portray the concept

Following that, we gave them a brief but precise explanation about what the prototype does and how it functions. Our original plan was to act out a scenario we designed and see how they would respond to our design. Surprising, one of the participants immediately started to describe how she might use this design under different settings and she did so with vivid body language. The other participant was intrigued and started to join in improvisation. With this process, the answers of "How would you use it?" were extended. One thing they mentioned was that they would not just use it for the stove, but might also use it while the heater was on or when washing clothes. This was very encouraging to us, because having a device that reminds people not to forget whatever it is they're doing was a starting point and direction for our design. It was great to see that we were one step closer to our goal.

However, there were also several issues we discovered. One such issue arose when one of the participants said the bracelet was uncomfortable, and she often wanted to take it off. During the post-workshop interview, she also pointed out that she doesn't wear bracelets very often, and that made the discomfort of wearing a large, hard bracelet, even more

noticeable. Although we purposely designed the bracelet not to be too comfortable for our users so they would forget they were wearing it and pay no attention to it, this response from the participant was very useful. How would we make the bracelet comfortable enough to wear, while still ensuring the users would feel it? Meanwhile, both participants agreed that they did not want to see another electrical cord show up on their countertops. This prompted further investigation into alternative, long-lasting power sources.

To summarize, our participants were satisfied with the functionality and general form of our prototype. They encouraged us to situate our design in various contexts rather than contain it in the kitchen. In terms of the material, they expected a softer, more comfortable and yet durable and strong material for the bracelet.

12. Final Scenario of Design

Since one of the purposes of creating a video scenario was to portray the use of the product to our audiences, persona, client, peer designers, and other stakeholders, we wanted to make the scenario as real and believable as possible, carefully considering many details. We opted not to create a detailed, written script for the scenario to avoid being constrained while acting, so instead we followed a simple outline of what we wanted to depict. This was based around our Judy persona cooking something in the oven for dinner. Certain aspects of Judy presented themselves by taking this approach; for example, in the scenario, Judy put the computer to sleep and turned off the light before leaving the desk area to finish preparing dinner, because we have learned that she doesn't want to waste electricity while she is not using the computer. When considering the setting for our scenario, we wanted to find a home atmosphere in which to film, in order to interact with the kitchen appliances, and see what other observations we could make that rely on the appropriate setting. This helped to give our scenario a defined, grounded context consisting of the stove and kitchen area, as well as to make the final scenario video more believable.

Learning from the earlier video scenario we filmed, we shot close-ups of the hand while using the device to show details of the product and user interaction, and to consider blocking and placement in order to maximize the view of the product. In addition, we included a gentle music track to give the video a relaxing feeling, since we know that our persona does yoga every morning, and generally appreciates relaxation.

During the filming of the scenario, one important point we noticed was that the bracelet needs a switch to turn off the alarm, otherwise it would greatly frustrate the user if she was far from the kitchen when the timer went off.

As for the editing and post-production, we wanted to give the base station a simple yet subtle glow that pulsed on and off when activated. The bracelet required a similar light feature, but it needed to be a little more noticeable so the user would immediately recognize it. We considered a number of different sounds the bracelet could emit, and found and recorded the song of a wind chime blowing in the breeze, after becoming aware of its soft, yet recognizable sound. This provided the prototype with a realistic visual and audio alarm, while not being overwhelming.

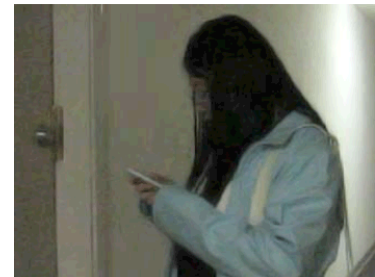
13. Description of Design Process

User Scenario 1

Judy finished her cooking and packed up to leave her house, but as she was about to lock the door behind her, the alarm on her keychain beeped to remind her that she forgot to turn off the stove. Then Judy goes back to the kitchen to turn off the stove.

User Scenario 2

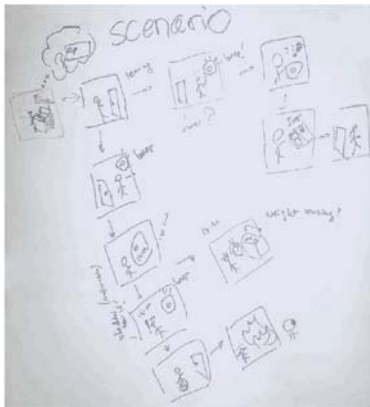
Judy is going out grocery shopping. As she was about to lock the door behind her, the alarm on her keychain beeped to remind her that the stove was still on.



She remembers that she wanted to leave the soup on the stove to cook for another two hours. She stopped the alarm, and set 2 hours on the Reminder, and left. However, before two hours were up, Judy's husband arrived home, and his Reminder on the keychain went off as he entered the house. He went to the kitchen to find the soup, and decided that it was fully cooked, and turned off the stove.

Our goal when shooting these scenarios was to explore the interaction when using the product. So before shooting the video scenario, we drew schematics of possible interactions and different outcomes, and picked the two that we felt could cover the issues of almost all other interactions. However, because we hadn't decided what our product look like or how

exactly it would function, many parts of the interaction were very vague. For example, since we didn't have a prototype of the device, the prop we used was probably



too large to be a keychain. Also, we couldn't specify the interface or how Judy would turn on/off the device or set the alarm. Reviewing the scenarios made us realize that our design solution was perhaps becoming too technical, which allowed us to go back to rethink the

solution and come up with better, simpler and not so technologically centered design.

Participatory Design Workshops

Our goal in holding participatory design (PD) workshops was to maximize the level of participation of potential end-users into our design process, and result in new ideas, or new understanding of use.

PD Workshop One: 50 minutes

For our first attempt, we set up a workshop in the home of one of our participants. Recognizing that our persona is a recent Chinese immigrant, we made the conscious decision to hold the workshops in Chinese, to allow for richer responses. There were four participants in total, including Linda, who served as the base for our Judy persona. Due to time constraints, we planned, organized, and executed the following two activities:

- Discussion
- Concept Model

We opened the workshop with pizza, drinks, and small gifts to thank each of the ladies for their participation. Because each participant was so similar to our Judy persona, they began chatting and getting to know one another before we formally began. And when it was time to begin, we were not formal. We gently moved the conversation into a light discussion on their morning routine, their experiences with forgetting or remembering, and how they deal with the problem in their own lives. It was reassuring to hear that each person responded with common things they forget, and it turned out that everyone had their own way to deal with it. Although the discussion went off topic a few times, it was interesting to see the thought patterns and correlations between topics. A few direct

questions successfully moved the discussion back on track.

In the second phrase of the workshop, we had the participants use their own imagination and creativity to describe concepts through a collage activity. Although we provided pens, paper shapes, scissors, cardboard, glue, and a few other tools, most of the participants were more comfortable simply writing down ideas in point form, while others responded slightly confused. After all, it wasn't too often that these women were asked to create graphic collages that portray emotions or ideas, so we let them do what was comfortable. This also helped support a finding from our cultural probe package early in the semester, where we found that unless the participant had a specific task, with a rational and defined purpose, the response was minimal at best. This also allowed us to consider alternatives in planning the second workshop.

PD Workshop Two: 80 minutes

For our second attempt, we had experience to build on, and we knew what we wanted to achieve after the workshop. We brought our participants down to two ladies; one similar to the Judy persona, and the other more closely resembling the Alice persona. During the workshop, we wanted not only to focus on what they say and do, but also on what they make. The workshop was arranged with four activities this time:

- Icebreaker
- Discussion
- Concept Model
- Scenario

Since the two participants did not know each other, we organized a simple game to act as an icebreaker at the beginning of the workshop. The game was to pass an everyday object around the table, where two researchers and two participants sat, until the background drumming stopped. Whoever had the object at that time, would need to present a new way of using that familiar object. This game not only allowed them to become more involved with the workshop, but it gave us as designers, an opportunity to observe our participants' reactions to products they are constantly in contact with.

From the first participatory design workshop, we found that our persona types are more responsive to using conversation rather than an artistic approach to convey their ideas. To build on this, we limited our discussion to the brainstorming of ideas. As in the first workshop, we asked provoking questions and raised points we felt important through the duration of the conversation; however, this time we felt more in control

and knew how to better attract their interest in order to keep them engaged in the conversation. We then introduced a large photograph with a number of sticky notes, and a few blank pieces of paper. We instructed the participants as follows:

Please write down what you think about the setting shown in the photo. Which things/objects/actions do you often forget, or are constantly unsure if you have done it or not?

Are those things important to you?

Does that bother you if you forgot or don't remember?

Based on what we have discussed in the photo collage, what are the possible solutions you have tried?

Or what kind of solutions would you prefer?

The level of involvement was not at the level we had hoped for, but with some encouragement and suggestions, we ended up with a result much more defined than that of the first workshop.

One of the participants conceptualized an idea of having a button installed beside the stove. When they turn on the stove, they push the button. When they leave or turn off the stove, they push the button again. The main idea of it is to provide a second level of assurance that the stove has been turned off, so that every time they push the button, they remember to turn off the stove. Our logical next move was to go into the scenario portion of the workshop, and ask the participants to act out how they would use such a solution. This gave us a solid understanding of functionality, while also allowing the participants to become excited and active in the portrayal of their idea. Once in the kitchen, they quickly started discussing how such an idea would be implemented; “The button should be obvious but not on somewhere you might accidentally push it,” then, “I agree. I prefer on the fan or somewhere near the counter.” Linda and Sonja were having a close interaction with each other, and with the physicality of the home, which helped us to understand their concept in a concise and thorough manner.

Results of PD Workshops

Throughout these two participatory design workshops, we found that focusing on reminding individual objects or items was not appropriate, because our users were generally more organized than we had previously thought, and for the few items they do

forget, they have already created individual strategies to solve the problem.

However, we also found a common problem: they usually cannot remember whether the stove was turned off or not, and they would often be so concerned that they would return home from wherever they were, in order to check. Although this interrupted whatever they were doing at the time, the safety of their home was more important.

Design Process

Our general design process relied heavily on the information gained during the first half of the project. With a solid foundation and understanding of our personas, scenarios, and possible problems, the design process developed on its own. It was quite an interesting experience, actually. The final prototype that we designed was an accumulation of all the knowledge accumulated and applied to the project. Working with the participants in the PD workshops and user feedback sessions further enhanced our design, while also providing a level of confidence in where we were with the project. It was a confirmation of everything we had worked on since the beginning of the project, and showed that our process was successful despite a few discouraging results along the way.

14. Discussion of What We Learned

Design isn't a straight path; we, as designers, made a few mistakes on the way to designing the best solution, or even to find the correct problem space for our design. Throughout the design process, we needed to a design a direction to go in, and a direction in which we could make real design decisions. For instance, for this design project, our persona was our direction, and we needed to check and recheck with the persona's needs and wants, define problem spaces, and create appropriate solutions around it. This archive of information we had, ranging from the persona definitions, to scenario situations, journey frameworks, and user feedback or PD workshops, were a great contribution to the project. They gave us a context to work in, and a natural progression for our designed solution. We were able to recognize the value of these tools, and use them to our advantage.

We also learned that designing without the ability to communicate is almost like finding a safe without a key: there's something in there, but only the owner knows what it is. For this reason, we found that our weekly presentations and progress reports were necessary, and very beneficial to our process. They allowed us to critically consider the direction we were

going in, the decisions we were making, whether we knew it or not, and receive feedback from the instructor and fellow classmates. This feedback, from the perspective of other designers, was very much appreciated, and was a positive contribution to our final product design. In the end, we learned that design is not simply a job, or even a tool. Design is a process, and it involves real people, real situations, real research and relationships, and a lot of sweat and caffeine. And the final result is what makes the entire process worthwhile: If we can create a design that truly enhances the lives of individuals, then we have achieved our goal. We believe we have done this,

while at the same time, gaining applied knowledge and experience to look back on, and build upon in the future.

15. Appendix

For a library of posters, videos, and other artifacts or documentation that we created throughout the duration of this project, please visit our project website at:

<http://www.sfu.ca/~rwhite/1057/iat333/>