

Managing Child Safety - Assignment 1

Jiaxin Fang
Systems Design Engineering
j45fang@uwaterloo.ca

Ece Sancar
Systems Design Engineering
aesancar@uwaterloo.ca

Shuchita Singh
Department of Computer
Science
shuchita.singh@uwaterloo.ca

Pierfrancesco Cervellini
Cryptography, Security, and
Privacy
pcervell@uwaterloo.ca

Noshin Nawar Sadat
Department of Computer
Science
nnsadat@uwaterloo.ca

1. MANAGING CHILD SAFETY

Everyone can develop an intuitive understanding of the old quote "it takes a village to raise a child", but after becoming a parent, most will wish that it had been coined as "it takes a village to raise a child - safely". Minimizing the harm that may come to a child has always been challenging. It is such a preeminent concern that entire businesses and charities such as the Canadian Center for Child Protection exist to support and provide services to children and parents, and the Canadian federal and local governments both have printed literature and web sites dedicated to the topic.

As the responsible parties, parents devote a lot of time to consider the threats their children face as they go about their daily activities, and must consider the dangers of a multitude of environments kids spend time in: the home (e.g. electrical plugs), outside the home (e.g. backyard and park playgrounds, street cars), in the car, at school, etc. Things are made worse by the fact that each ecosystem not only presents challenges that are unique to itself, but also to the age group of the child. An example is sleep time in infants: during the first 4 months of a baby's life the primary concern is Sudden Infant Death Syndrome (SIDS)[16] while after the baby has learned to roll over (on average between 4 and 6 months) [4] the primary concern is to minimize the risk of falling from the bed.

The example above is one of many that illustrates how the issue of managing child safety is not one that can be addressed by a single solution. A solution to teach kids about the rules of the road for instance, would have fundamentally different designs based on the target age group, and still be entirely different from a solution trying to tackle sleep monitoring.

In this work we focus on aspects of child safety that we can

improve through the use of a mobile application. This choice of medium curtails us from aspects of safety more closely linked to physical dangers (e.g. a toddler learning to climb up and down stairs inside the home), but mobile devices are ubiquitous and familiar to both children and parents and afford us the flexibility to consider applications geared toward either group.

We hope the outcome of this project will be an easy to use application that will enhance children's safety and will have a positive impact on the lives of parents and their kids.

2. GOALS AND HYPOTHESIS

Our first priority is to center the focus of our work around a specific safety concern that we believe can be solved with a mobile application.

To this end we plan on interviewing parents of different socioeconomic backgrounds who have kids of age up to 18 years old. This will help us expose common safety concerns from parents and explore safety precautions that can be applied to these issues to reduce the risk of safety hazards. In order to better examine and categorize safety-related concerns, we start with dividing parents and children into different groups based on the age of children: infants (0-1 year), toddlers and preschoolers (1-6 years), grade-schoolers (6-12 years), and teenagers (12-18 years).

The main reason for this age based categorization is that we expect to discover that parents anxieties about safety change as their children grow up. Our personas were designed to cover all age groups except for infants, and we also aim to interview participants from all age groups in the exploratory study to examine the difference between hypothesized safety concerns and actual safety concerns.

The following sections briefly summarizes what we expect to be safety concerns for each age group.

• Infants (0-1 year)

Infants are very vulnerable so parents need vigilant monitoring of almost all details when taking care of a baby. For instance, sudden infant death syndrome (SIDS), which

is defined as a sudden, unexpected death of an infant before 1 year of age [6], is usually associated with sleep and environment. Plus, when carrying infants around for outdoor activities, the reliability of strollers and infant seats in vehicles also has an impact on infant safety. A correctly installed infant safety seat can effectively reduce severe life-threatening injuries by 71 percents [2].

- **Toddler and preschooler (1-6 years)**

After kids learn how to talk, walk and run, they gain increased curiosity about almost everything. But their awareness of danger can be very poor and they will need guidance and instructions from parents to stay away from potential hazards. As kids in this group are actively moving around, the primary concern for this age group will be both indoor and outdoor safety. According to a research conducted in Ireland [13], falls, choking and suffocation, burns and scalds, drowning and poisoning are top factors contributing to child injuries and death in this age group.

- **Grade-schooler (6-12 years)**

Children in this age group gain a higher degree of freedom and also participate in activities much farther from home compared with the previous group. Therefore, the main source of safety hazards is the external environment such as street hazard, stranger hazard and sports injury. A survey conducted by National Highway Safety Traffic Administration (NHTSA) shows that every year about 500 students (aged 5 to 18) die in car accidents travelling to school, and one fifth of them were killed while walking or biking [9]. Further statistics from Stanford Children's Health reveals that more than 3.5 million children ages 14 and under are injured annually in sports or recreational activities in the US [7], and in 2009 more than 400,000 children ages 5 to 14 were treated in hospital emergency room for football and bicycle related injuries. [7].

- **Teenagers (12-18 years)**

As children grow more independent, we think driving and sex can become common issues parents care about for this age group. Getting a driving license is an important milestone for teenagers, and a major leap for their independence. Williams et al. [17] found that parents favour night driving curfews and conditional driving licenses for teenagers to reduce their exposure to traffic hazards.

Besides, a research study by Ellis et al. [3] shows the absence of a father figure can be a risk factor for early sexual activities and teen pregnancies. Additionally, suffering from abuse in childhood also leads to a higher risk of adolescent pregnancy [15]. However, a good connection between parents and children, as well as the parent supervision and monitoring, both contribute to a lower risk of adolescent pregnancy [11].

Although each age group has unique safety concerns, we still expect to discover safety-related concerns that are ubiquitous among all age groups. Olsen et al. conducted a study investigating safety concerns for kids with a variety of health conditions (i.e with disabilities or chronic diseases) [12], from

this study we generalized three key general aspects of child safety concerns:

1. child's level of understanding about hazards;
2. child's physical interactions with the environment;
3. child's social interactions

Olsen et. al mention in their research that parents find it challenging to appropriately communicate hazards to kids with disabilities and chronic conditions, and the child's lack of awareness of dangers needs to be addressed by verbal instruction and vigilant supervision from parents [12]. Besides, hazardous movements and hazardous food ingestions, which is categorized to the physical interactions with the environment, can also result in harm to children's safety as voiced by parents [12]. Additionally, unsafe social interactions are proposed by parents as a major safety concern for kids. Overall, we would like to explore whether the actual safety concerns drawn from interviews for different age groups are closely tied to these three aspects and whether these generalized safety concerns also apply to all kids.

3. TARGET USERS

In order to have a better understanding of our potential target users and participants for the study, we have created five personas. These personas represent people from different walks of life, each of them raising kids and facing various concerns regarding their children. Our aim is to find out what concerns they have in regards to the safety of their kids.

While creating the personas, we had the following points in mind:

- Parents should vary widely in terms of personality, work, financial background, and origin. This is important because the concerns of a stay-at-home mother will be very different from a full-time working, single mother. This will allow us to gain insight into the mindset of parents/guardians from various perspectives.
- The children our personas deal with are from different age groups, gender, or physical disability etc.

We have created the following five personas as our potential target users (Appendix A contains the full Personas and Empathy Map descriptions) :

1. **Jennifer Smith**

Jennifer is single mother with a 2-year old son. In order to support the family, she works as a biology teacher at a middle school. Due to her work she has to spend time away from her son, which is a big concern for her as she is forced to leave her son with a baby-sitter. Apart from her son's safety, she would like to find a life partner for herself, someone who can be a father figure for her child. One of her major frustrations is to not be able to be more dedicated to her career. Fig 2

2. **Alice Monroe**

Alice is a stay at home mother with a 3-year old son and an 8-year old son. She used to be a ballet dancer but gave up a very promising career to raise her kids. Sometimes, even

today she imagines what her life would have been had she not quit. Her husband works a stable 9 to 5 job but business and sometimes pleasure extend past regular working hours, keeping him from time with the family. She has gotten used to the mundane routine of her life but wishes to teach ballet dancing again in future. She is a disciplinarian when it comes to her kids and their safety. Despite her frustrations she is happy with her life and is mainly concerned about her children's well being. Fig 4

3. Jenna Stark

Jenna is a mother to a 3- year old son, whom she had with her ex-husband. Currently, she is married to Jack, whom she met two years ago while working in the hospital. Her ex-husband remarried and has two kids with his new wife. This is cause of concern for Jenna as she feels her son now does not get the needed affection and attention from his father. Even though Jack is very supportive of her, she still feels he might not have a very strong bond with her son. As they are both working, the child's safety is the biggest concern she has on her mind. Fig 6

4. John Monroe

Husband of Alice Monroe, he is a devoted employee in the company but not a devoted parent. His priority in life is work and success which comes at an expense of the time spent with his family. His wife, Alice is a home-maker and spends her entire time taking care of the family. Even though he admires the dedication of his wife towards the family he sometimes wishes that she was more invested in her role as a woman and wife. He loves spending his time with his friends and co-workers rather than family, and because of how much Alice has taken charge of things at home, he no longer feels the need to be *overly* involved with them as long as he can provide stable living and a safe environment for them to live. Fig 8

5. Rita Guerres

Rita is originally from the Philippines but was forced by circumstances to move to Canada. She herself has two sons who now live with their grandfather in the Philippines. She currently works as a nanny for a family of lawyers with three kids and is responsible for everything regarding the children such as feeding, dropping them safely to school and taking care of them etc. From her monthly salary she sends some amount back home to support her family. Her main goal is to ensure her family immigrates to Canada. As a nanny, the well being and safety of the children is her primary concern. Fig 10

Creating these personas enables us to identify the various characteristics we are looking for target user. In order to get a deeper understanding of the problem at hand, we want the participants of the study to be different from each other in various aspects, such as:

- Financial status: lower middle class to higher middle class
- Education level: at least a high school degree
- Employment: full time or part time, well paid job to average pay

- Ethnicity: different ethnic background
- Background: family background i.e. supportive in-laws or friends
- Marital status: single, divorced, widowed or married
- Age group: early 30's to 40's

Interviewing people with a mix of these characteristics will help us understand various child safety issues from different angles.

4. PLAN FOR THE EXPLORATORY USER STUDY

Our exploratory user study will contain two phases: in the first phase, interviews and observation will be used to understand target users' concerns about their children's safety and challenging aspects of creating a safe environment for raising a child. In the second phase and in light of these initial results we will create an online survey to determine the specific focus of the application.

Interview

The interview will be done with 5 parents with children of age up to 18. At the beginning of the interview, the participants will be informed about the aim of the interview and provided background about the study. Then, participants and their families' demographic information will be collected. The main content of the interview is to discover participants' opinions, experiences and feelings about child safety. The interview has three parts: the first part is to get to know the participant, his/her family's life, routines and relationships with extended family. The second and third parts aim to dig deeper into their opinions and experiences in the context of child safety. Our questions try to cover the following points (full questionnaire included in Appendix B):

- parents' concerns about their children's safety,
- their approaches to activities in terms of safety (such as climbing stairs, walking through a school),
- their way to keep children safe (such as warning them frequently, rules),
- activities that are perceived as dangerous (such as playing at the street, walking to school alone)
- specific concerns related to a child's disability.

Each interview will follow the same main line of questions for all participants, but interviewers are free to ask some instant follow ups to learn more about interesting points that come up.

All interviews are limited to 15 minutes and will be done on the grounds of the University of Waterloo campus. All interviews will take place between May 14th and 28th.

Observation

Observations will be done in public areas as non-participatory observation to minimize the Hawthorn effect. We considered at-home observations but concluded that even passive participation would be too invasive and being aware of the

observer may change the participants behaviour as well. The observation is aimed to understand three main points in child safety:

- the target group's concerns which may not be stated during the interview sessions,
- children behaviors which can create a dangerous situation,
- the environments' potential for a hazardous situations.

We will target parks, school gardens and a few streets which are proper to make these observations. Parks and streets are perfect places to make observation about all points which are specified above. Even the school gardens are not suitable to observe children and parents together, it offers great opportunities to observe children and environment's itself. To make an observation at a school garden, an administration department of schools will be contacted to get a permission.

All observations will be done in the same time period with the interviews.

REFERENCES

1. Plotz D. 2012. Yes, I Ignore My Kids To Text and Email. (2012). Retrieved May 11, 2018 from Slate: http://www.slate.com/blogs/xx_factor/2012/07/12/parents_on_phones_in_support_of_ignoring_your_kids_to_text_and_email.html.
2. Ediriweera BR Desapriya. 2008. Infant injuries from child restraint safety seat misuse at British Columbia Children's Hospital. *Pediatrics international* 50, 5 (2008), 674–678. DOI: <http://dx.doi.org/10.1111/j.1442-200X.2008.02635.x>
3. Bates J. E. Dodge K. A. Fergusson D. M. John Horwood L. Pettit G. S. Ellis, B. J. and L. Woodward. 2013. Does Father Absence Place Daughters at Special Risk for Early Sexual Activity and Teenage Pregnancy? *Child Development* 74 (2013), 801–821.
4. Heidi Murkoff et all. 2018. Baby Rolling Over. (2018). <https://www.whattoexpect.com/first-year/roll-over/>.
5. Center for American Progress. 2010. Strengthening the Middle Class: Ensuring Equal Pay for Women. (2010). Retrieved May 11, 2018 from Center for American Progress: <https://www.americanprogress.org/issues/economy/news/2010/03/11/7420/strengthening-the-middle-class-ensuring-equal-pay-for-women/>.
6. Tatum. Michelle Gelfer. Polina. 2014. Sudden Infant Death Syndrome. *Journal of Pediatric Health Care* 28, 4 (2014), 470–474. DOI: <http://dx.doi.org/10.1016/j.pedhc.2014.04.007>
7. Stanford Children's Health. n.d. Sports Injury Statistics. (n.d). Retrieved May 14, 2018 from Stanford Children's Health: <http://www.stanfordchildrens.org/en/topic/default?id=sports-injury-statistics-90-P02787>.
8. Joanna. n.d. Why I Chose to Be a Stay-at-home Mom. (n.d). Retrieved May 11, 2018 from MakingMine: Hands-on memories for the modern mom: <http://makingmine.com/chose-stay-home-mom/>.
9. Lee Katherine. 2017. School Bus Safety for Children. (2017). Retrieved May 14, 2018 from VeryWellFamily: <https://www.verywellfamily.com/teach-your-child-school-bus-safety-620521>.
10. May. n.d. Nanny in Aberarder. (n.d). Retrieved May 11, 2018 from Canadian Nanny: <https://canadiannanny.ca/filipino-nanny-currently-working-in-hong-kong-wish-to-find-an-employer-canada-canadian-provider-aberarder-on>.
11. Benson B. Galbraith K. A. Miller, B. C. 2001. Family relationships and adolescent pregnancy risk: A research synthesis. *Developmental Review* 21, 1 (2001), 1–38. <https://search-proquest-com.proxy.lib.uwaterloo.ca/docview/62257632/7071EE1AEEA74C46PQ/1?accountid=14906>.
12. Miller AR Brussoni M. Olsen LL, Kruse S. 2016. Safety-Related Concerns of Parents for Children with Disabilities and Chronic Conditions. *Journal of Developmental Behavioral Pediatrics* 37, 2 (2016), 121–131. DOI: <http://dx.doi.org/10.1097/DBP.0000000000000256>
13. Grainne O'Sullivan. 2017. Childhood injury in Ireland and the risk factors. (2017). <https://www.hse.ie/eng/health/child/childsafety/publications/inj-risk.pdf>.
14. Garcia P. 2015. Why Millennial Working Mothers Are Leaning Sideways. (2015). Retrieved May 11, 2018 from Vogue: <https://www.vogue.com/article/working-mothers-lean-sideways>.
15. Murillo V. Pallitto CC. 2008. Childhood abuse as a risk factor for adolescent pregnancy in el salvador. *Journal of Adolescent Health*. 42, 6 (2008), 580–586. DOI: <http://dx.doi.org/10.1016/j.jadohealth.2007.11.148>
16. Haas E. A. Kinney H. C. Stanley C. Krous H. F. Trachtenberg, F. L. 2012. Risk factor changes for sudden infant death syndrome after initiation of Back-to-Sleep campaign. *Pediatrics* 129, 4 (2012), 630–638. DOI: <http://dx.doi.org/10.1542/peds.2011-1419>
17. Allan F. Williams and Adrian K. Lund. 1986. Adults' Views of Laws That Limit Teenagers' Driving and Access to Alcohol. *Journal of Public Health Policy* 7, 2 (1986), 190–197. DOI: <http://dx.doi.org/10.2307/3342256>

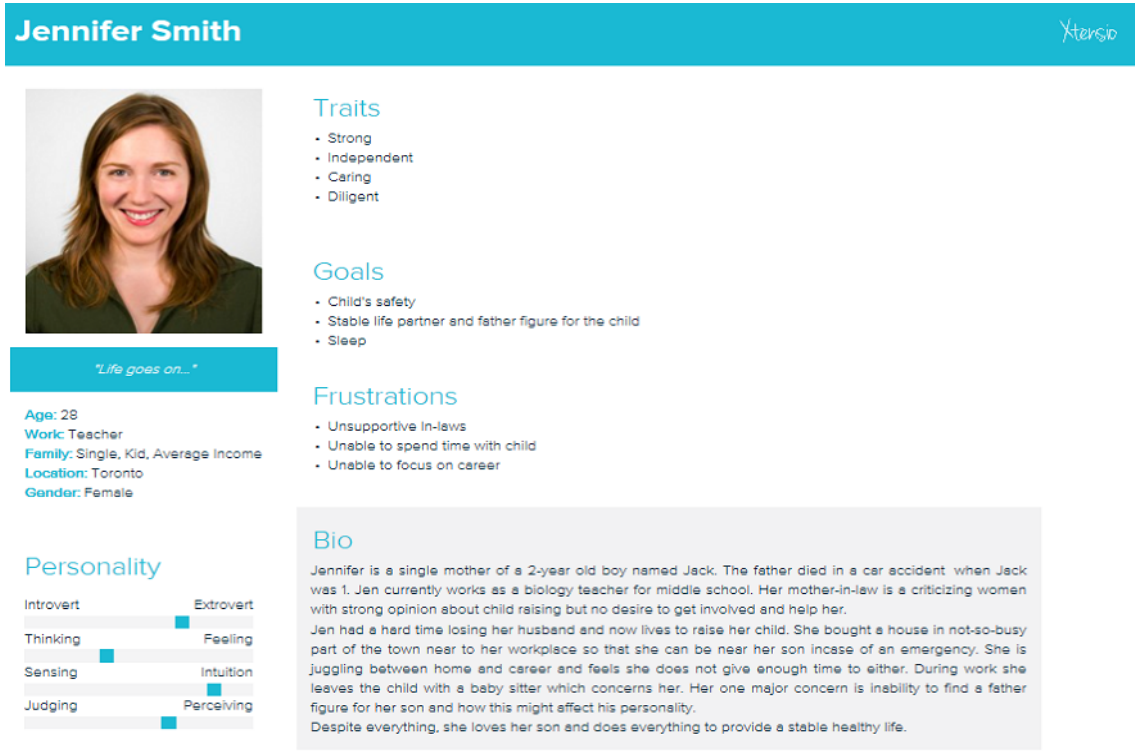


Figure 1. Jennifer Smith's Persona



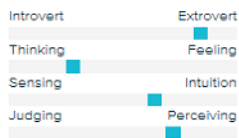
Figure 2. Jennifer Smith's Empathy Map



"We all have regrets, but they do not define us."

Age: 35
Work: Stay at home mom
Family: Married, 2 Kids, High middle class
Location: Ottawa
Gender: Female

Personality



Traits

- Strong
- Strict
- Cheerful
- Industrious

Goals

- Watching her kids become responsible mature adults
- Teach ballet at a dance school
- More time to invest in herself

Frustrations

- Alice is always tired.
- Her schedule is inescapably tied to her kids activities.
- Her husband does not spend enough time at home.

Bio

Alice has two sons, a 3 and a 8 year old They are very active and troublemakers most of the time. They like to play pranks on each other, and are generally very high energy. Alice has found that her life is easier if she takes them outside to play, and run around. Her loving husband works at a steady 9-5 that brings good income to keep their mind off of money issues, but the frequent overtime prevents him from spending much time with the kids. As a consequence, Alice is the house maker, and she like to keep things under strict control. She had to give up her career as a ballet dancer to raise the kids, and though she wouldn't change anything about her life, sometimes she wishes she had stuck with it. Her dream is to teach dance after her kids become independent enough. Her own mother is older and though very supportive, Alice fears to much work for her might become its own problem. By now her days are routine and she is looking for ways to push the kids further out of their nest in a safe, controlled way. That would make room for some much needed me-time.

Figure 3. Alice Monroe's Persona

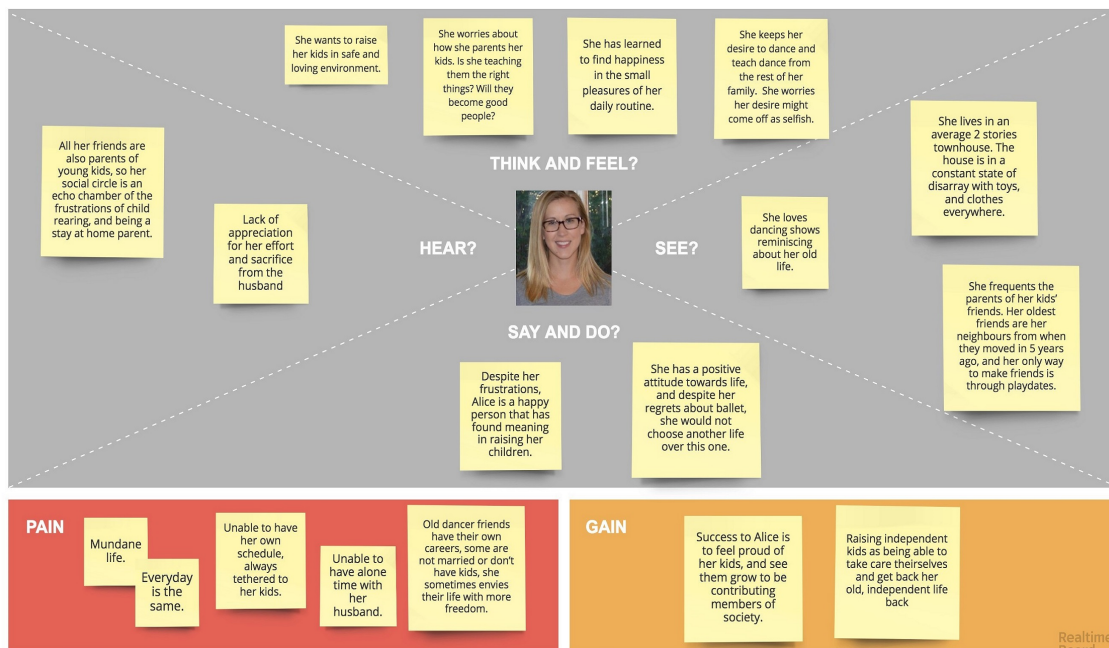


Figure 4. Alice Monroe's Empathy Map



Traits

- Strong
- Independent
- Teaching
- Health

"The most important kind of freedom is to be what you really are."

Goals

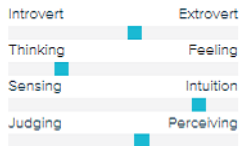
- Financial independence (still carries some student debt)
- Professorship at local university dietitian program
- Wants her new husband Jack to develop a close relationship with the son

Age: 37
 Work: Dietician
 Family: Married, Kid,
 Location: Northern Ontario
 Gender: Female

Frustrations

- Co-parenting frustration as ex-husband's less strict and enforcing of rules and routine
- Fear that cannot get pregnant with new husband Jack

Personality



Bio

Born and raised in Northern Ontario, 1 sister, both parents alive. Married high school sweetheart and had a child (Robby) together when 27 years old. Divorced at age 30 due to husband's heavy drinking. Met current husband (Jack) 2 years ago at work in the hospital and married to him last year in a small ceremony. Jack is 5 years younger than Jenna and has not been married before. Ex-husband remarried, has 2 kids with his new wife. Jenna co-parents with her ex-husband, Robby alternates weekly between his parents' houses. She graduated dietary school in Winnipeg and is currently working at the local hospital's ICU as a dietician. She is passionate about teaching and involved in research and supervision of dietician students.

Figure 5. Jenna Stark's Persona

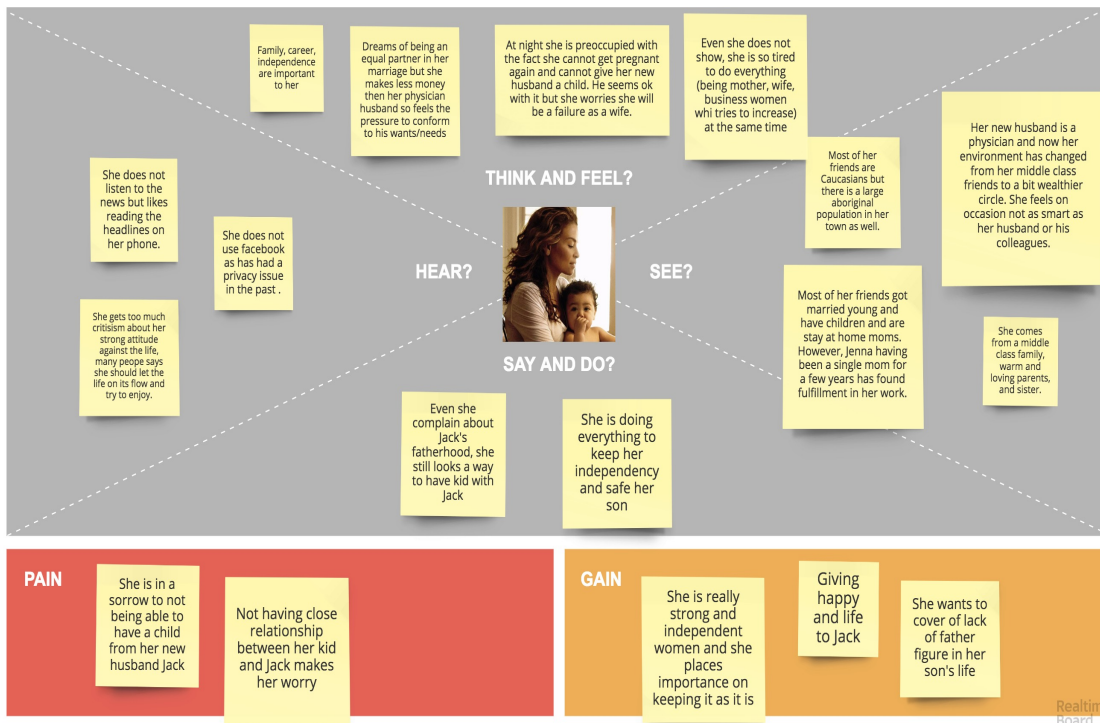


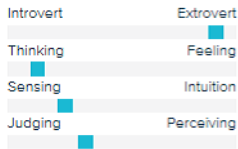
Figure 6. Jenna Stark's Empathy Map



"One life is not enough to do everything"

Age: 36
Work: Engineering Sales
Family: Married, 2 kids
Location: Ottawa
Gender: Male

Personality



Traits

- Easy Going
- Focused on Work
- Selfish

Goals

- Provide a stable living for the family
- Become VP of Sales
- Enjoy his life

Frustrations

- He wants his wife Alice was more invested in her role as a wife than just fully devoted to their kids.
- He wishes he had a closer relationship with his kids

Bio

John has a bachelor in Biology from a respectable university, but he never worked in the field. After marrying Alice he found a job as a B2B sales person for Cisco. Over the following years he climbed the corporate ladder to the position of engineering sales on one of the company's largest accounts. His drive at work has come at the expense of time spent with his wife and children. Over time, his role of low responsibility in the daily lives of his family has created a distance between them and his relationship is with his wife got weaker, because her wife turned a motherof his child in his eyes. These days he enjoys a guilt-free drink at the bar with colleges after work rather than running home to spend time with his kids. He sometimes regrets this, but he finds validation and satisfaction in his work, so he figures he can just down the guilt in more work.

Figure 7. John Monroe's Persona

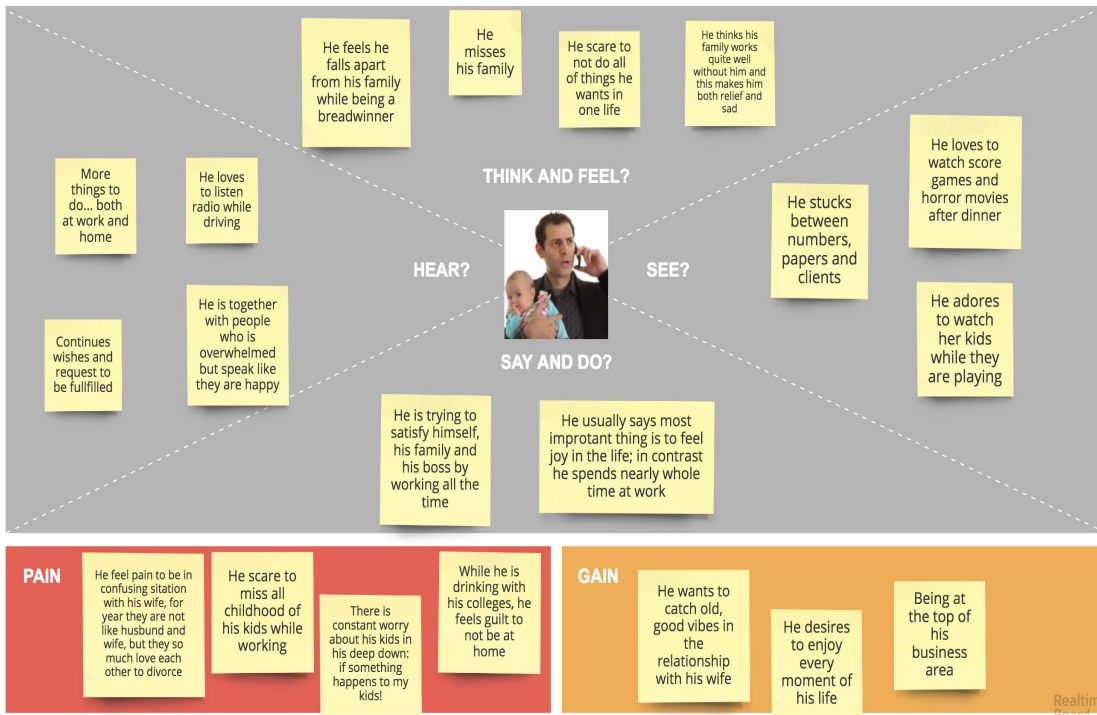


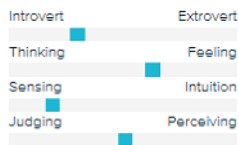
Figure 8. John Monroe's Empathy Map



"My family is my strength and my weakness."

Age: 45
Work: Nanny
Family: Widowed, 2 kids
Location: Toronto
Gender: Female

Personality



Traits

- Home sick
- Loving
- She has a strong personality to survive in a hard life

Goals

- Help family immigrate to Canada
- Save money to buy a house in Canada
- Some vacation time to go visit family back home

Frustrations

- Own children growing without their mom, under care of grandfather
- Language and cultural barrier with employers
- Fears of losing job before able to sponsor family to Canada
- Sick father in Philippines requiring private nurse at home

Bio

Rita is originally from Philippines and has 2 sons. She was mostly stay at home mom while her children were young but financial hardship and her husband passing away from cancer got her to apply to be a nanny in Canada. She came to Canada in 2017 to look for a job to support her kids back at home. Currently she lives with a family of lawyers in Toronto, look after their 3 kids, cook, tidy up the house and do laundry. Her salary is \$1720/month from which \$570 sent home monthly. Her father died when she was 19 and so as the eldest girl in the family, she started taking care of her 4 siblings while her mom worked. After finishing university (health sciences) in Philippines she got married and has 2 boys who are now 14 and 16 years old.

Figure 9. Rita Guerres's Persona



Figure 10. Rita Guerres's Empathy Map

APPENDIX B

Interview questionnaire for the survey consist of the following questions:

Parent and child background

- Tell me a little bit about you and your child? [Profession, age, Number of kids, age, gender, school]
- How would you describe your partner's involvement in raising the child ? [number of hours spent with child, type of activities, level of responsibility]
- What kind of activities do you enjoy with your child?
- Does your child have interests that he pursues independently?
- What role does your family, extended family and friends play in your and your child's life.

What are your biggest worries with regards to child safety?

- What would you say are your biggest worries in your/your child daily routine?
- What do you worry about when your child is alone at home?
- How about when they are outside?
- If you are doing an activity with the child either inside or outside the house, how do these worries change?
- How do you think your worries have changed over time as your kids become elder?

Parent's worries and measure taken to ensure child safety

- You mentioned you/ your child enjoys [ACTIVITY X]. What kind of safety considerations play in your head when you/they engage in that activity.
- What strategies have you adopted to keep your child safe?
- Are there some safety consideration that have remained the same as the child has grown older? And are there some that have changed? In what way?
- What have you found to be effective in establishing safety guidelines with your child?
- Have any of the safety measures you used in the past backfired because the child did not accept/ comply/ or enjoy the way the rules were established? What would you say are the most common reasons these rules fail to work?