

INTRO.

Smart Refrigerators

Goals of the Audits

Smart refrigerators account for only a small percent of the market but are gaining in popularity. The average cost of a Smart refrigerator is approximately \$3,600 in 2013.

Our team (2 members) decided to perform a 4 phase audit on the Samsung Family Hub Smart refrigerator.

Phases of Audit

- Phase 1: Characteristic and Functionality
- Phase 2: Product Controls/Touch Gesture
- Phase 3
 - Part 1: Satisfaction Analysis
 - Part 2: Proto-Personas
 - Part 3: Empathy Maps
- Phase 4: Customer Journey Map

We codified our results in multiple ways and built each phase using information and details we gleaned from the prior phases.

Source: [Research on Smart Refrigerators](#)

PHASE 1 AUDIT

Samsung Family Hub Smart Refrigerator

Overview

This phase was our first attempt to become familiar with the product and its features. We wanted to look at how easy and useful the fridge is to use for a family.

Usability Test Plan Dashboard

To help determine a framework for our overall audit, we initially answered questions using the Usability Test Plan Dashboard (Fig. 1.1). This dashboard gave us an initial framework for our testing. Although we could not answer all the questions it was still helpful.

We recorded and refined our information into a typed-out version (Fig. 1.2) and used annotation for each section.

AUTHOR		CONTACT DETAILS		FINAL USE FOR COMMENTS	
James Bailey + Heather Ellsworth					
A	PRODUCT UNDER TEST What's being tested? What are the business and experience goals of the product? User interface & voice assistant	B	TEST OBJECTIVES What are the goals of the usability test? What specific questions will be answered? What hypotheses will be tested? We want to see what it does & how well it does it. See how intuitive interface & voice assistant is	C	PARTICIPANTS How many participants will be recruited? What are their key characteristics? 2 participants New to product, possible consumers, students (non-technical)
		D	TEST TASKS What are the test tasks? - To test limits & abilities of voice assistant - Test camera & interface compatibility - test phone app integration with fridge	E	RESPONSIBILITIES Who is involved in the test and what are their responsibilities? James: tester & notetaker Heather: media & tester
F	BUSINESS CASE Why are we doing this test? What are the benefits? What are the risks of not testing? To see how it integrates into households. (e.g. Adults vs kids)	G	EQUIPMENT What equipment is required? How will you record the data? Notes, video, photos (observations)	H	LOCATION & DATES Where and when will the test take place? When and how will the results be shared? At UVA in CS-406
I	PROCEDURE What are the main steps in the test procedure? TBA				

Fig. 1.1: Usability Test Plan Dashboard

- A** **Product Under Test**
Q: What's being tested? What are the business and experience goals of the product?
A: User Interface and voice assistant.
- B** **Business Case**
Q: Why are we doing the test? What are the benefits? What are the risks of not testing?
A: We are testing to see how the refrigerator integrates into households (e.g., Adults and kids).
- C** **Test Objectives**
Q: What are the goals of the usability test? What specific questions will be answered?
What hypothesis will be tested?
A: We want to see what it does and how it does it. See how intuitive the interface and voice assistant is.
- D** **Participants**
Q: How many participants will be recruited? What are their key characteristics?
A: 2 participants. New to product, possible consumers, non-traditional students.
- E** **Equipment**
Q: What equipment is required? How will you record the data?
A: Notes, video, pictures.
- F** **Test Tasks**
Q: What are the test tasks?
A: Test abilities of voice assistant, camera, interface compatibility, phone app integration.
- G** **Responsibilities**
Q: Who is involved in the test and what are their responsibilities?
A: James (User testing, recorder), Heather (User testing, media)
- H** **Location and Dates**
Q: Where and when will the test take place? When and how will the results be shared?
A: User Interface and voice assistant.
- I** **Procedure**
Q: What are the main steps in the test procedure?
A: To be assessed later.

Fig. 1.2: Annotated version of Dashboard

Mind Mapping

We explored the product while taking notes and pictures of our observations of both the UI and Bixby voice assistant. Bixby is the virtual assistant that uses voice to access features on the smart refrigerator.

We gathered our observations on a white board (Fig. 1.3). Because we were interested in how the refrigerator is used by a household, we organized our information into two categories, kids and adults, of who would most value each feature. These categories were denoted by adding colored sticky notes (Fig. 1.4) on the whiteboard.



User Interface



Bixby

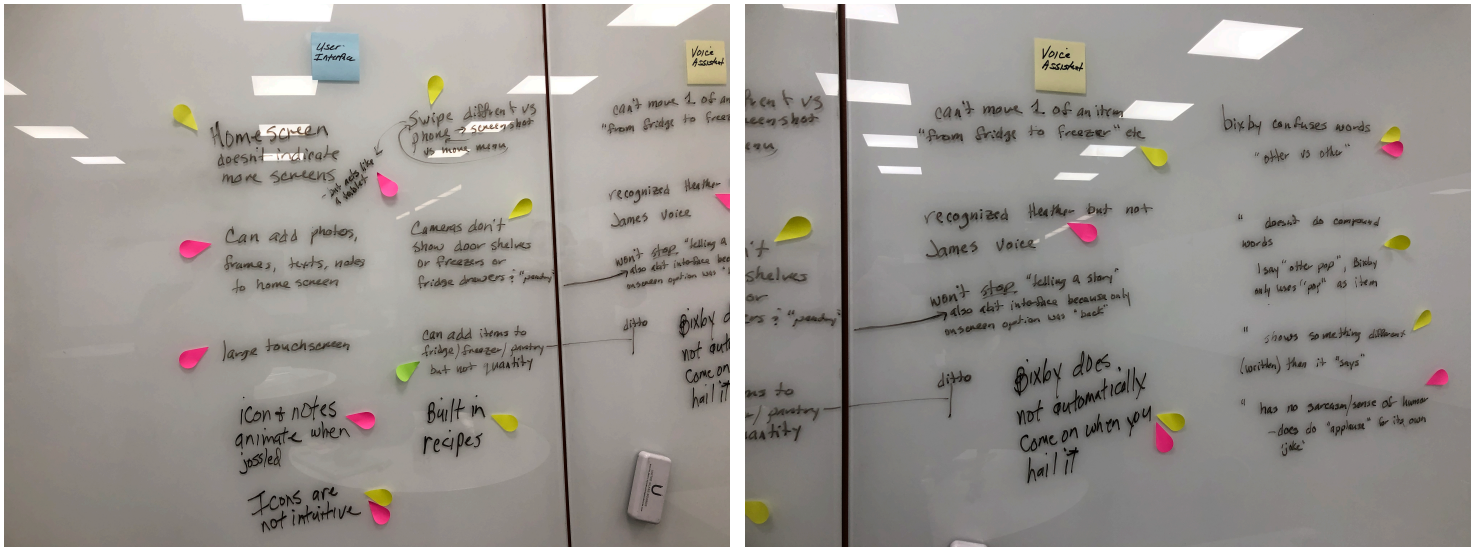


Fig. 1.3: Whiteboard mind mapping from classroom



Kids



Adults

Fig. 1.4: Audience Key

Our team created a matrix from our results to visually organize our observations into the two categories: the user interface of the refrigerator touchscreen and the Bixby voice assistant (Fig 1.5 and Fig 1.6).

Observations

- A** 1. Homescreen doesn't indicate more screens
- K** 2. Can add photos, frames, texts, notes to home screen
- K** 3. Large touchscreen
- K** 4. Icons and notes on touchscreen animate when jostled
- A** **K** 5. Icons are not intuitive (sometimes don't make sense for task)
- A** 6. Swipe is different on a Samsung phone vs. the refrigerator
- A** 7. Camera inside the refrigerator don't show door shelves, pantry or freezer
- A** 8. Can add items to refridgerator but not quantity
- A** 9. Built in app for recipes
- A** **K** 10. Will not stop telling a story, no intuitive icon to tap (on VA too)



User Interface

Fig. 1.5: Observations UI

Observations

- A** 1. Can't move one of an item from the refriderator to freezer, etc...
- A** **K** 2. Does not always recognize someone's voice but does others
- A** **K** 3. Will not stop telling a story, even if you ask it to (on UI too)
- A** **K** 4. Does not automatically come on when you hail it (on UI too)
- A** 5. Does not understand compound words (e.g., otter or other)
- A** 6. Shows something different (UI) than what is said (VA)
- K** 7. Has no sense of humor



Bixby

Fig. 1.6: Observations Bixby

PHASE 2 AUDIT

Samsung Family Hub Smart Refrigerator & Phone App.

Overview

In this phase, we catalogued, as much as time allowed, the gestures and controls of both the refrigerator touch screen and the phone app, SmartThings. In addition, we compared both user interfaces in our matrices to see the amount of correlation between them

Overview of touch screen on the refrigerator

Most apps, widgets and settings are accessible on the home screen (Fig. 2.1A). The task bar (Fig 2.1B) controls five Specific Family Hub functions: the Microphone, the Task Manager, Home, Return, and Notifications



Fig. 2.1: Home Screen Overview

Tapping the microphone icon (Fig. 2.2A) turns the microphone on and off. The Bixby voice assistant and some other features will not work when the microphone is turned off. Tapping the Task Manager (Fig 2.2B) displays any running apps. Tapping the icon at Fig. 2.2C opens the Home screen. Fig. 2.2D is the go-back icon to return to the previous screen. Tapping the icon at Fig. 2.2E displays a “Quick Panel” for instant access to various settings and current notifications..



Fig. 2.2: Task Bar Overview

Below (Fig. 2.3) are the whiteboards with the gestures used in the matrices for the refrigerator and phone app user interfaces

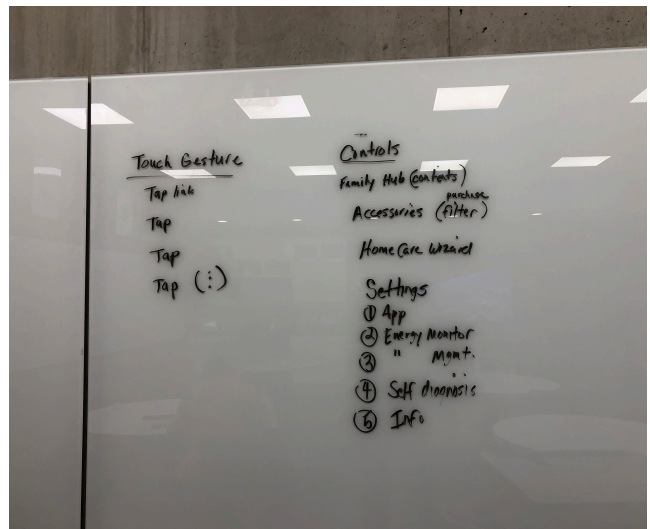
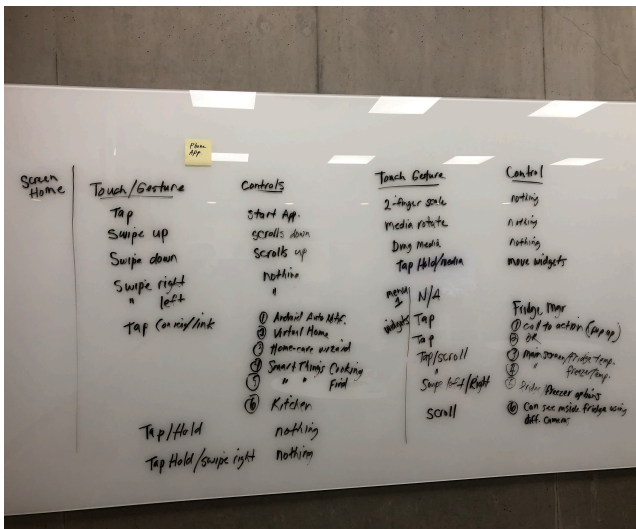
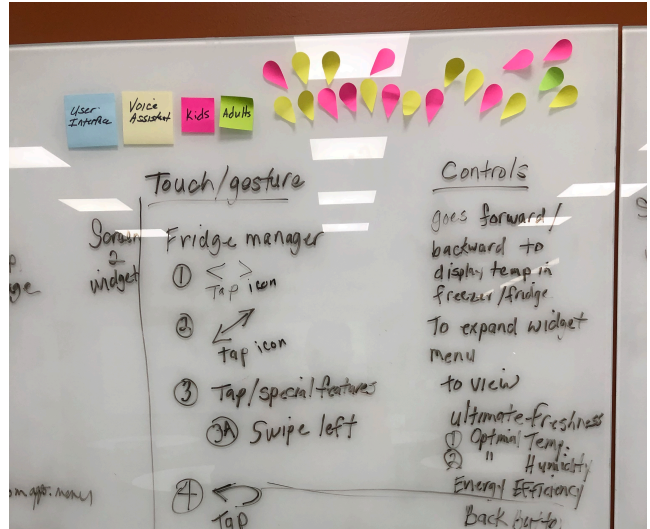
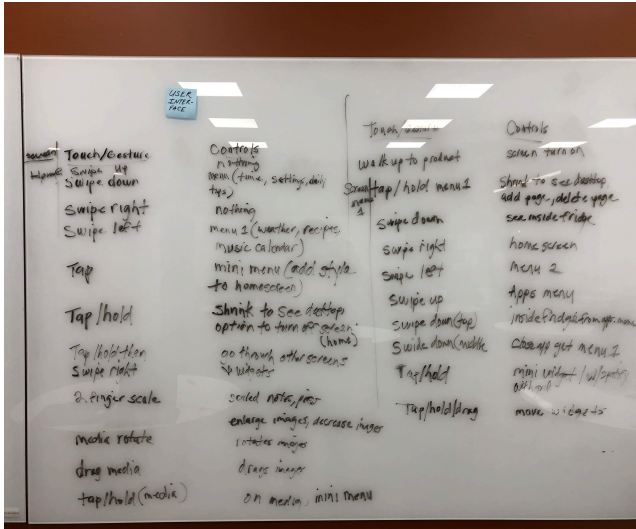


Fig. 2.3: Whiteboards of Gesture Audit

We took the white board gesture records and put them into a matrices (Fig. 2.5 and 2.6) that uses several categories to compare and contrast each of the user interfaces. This was done in order to analyze patterns between the two.

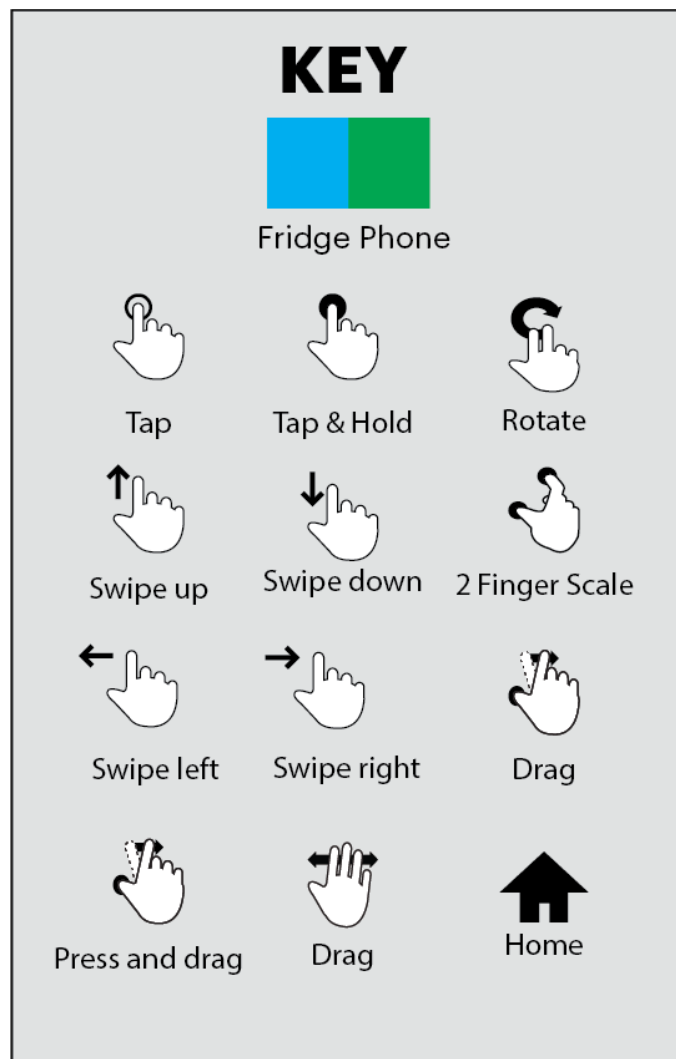










Fig. 2.4: Key for all the gestures, icons, and colors

Screen	Gesture	Controls	1	2
Home	Swipe Up	2. Scrolls Down	1	2
Home	Swipe Down	1. Menu (time, settings, daily tips) 2. Scrolls Up	1	2
Home	Swipe Right	2. Scrolls Up	1	2
Home	Swipe Left	1. Menu 1 (Weather recipes, music calendar)	1	2
Home	Pinch	1. Scale Notes/Pics	1	2
Home	Tap	1. Mini Menu (Add style to home screen) 2. Start App.	1	2
Home	Tap	1. shrink to see desktop; option to turn off home screen	1	2
Home	Tap (Media)	1. Rotate Images	1	2

Screen	Gesture	Controls	1	2
Home	Swipe Right	1. go through other screens & widgets	1	2
Home	Tap (Media)	1. Drags Images	1	2
Home	Tap (Media)	1. Mini Menu 2. Move Widgets	1	2
Home	Walk up to Product	1. Screen Turns On	1	2
Home	Tap (Icon/Link)	2. Android Auto notification, Virtual Home, HomeCare Wizard, SmartThings Cooking, SmartThings Find, Kitchen	1	2
MENU	Tap	1. shrink to see desktop; option add/delete page(menu page)	1	2
MENU	Swipe Down (Top)	1. See inside Fridge	1	2
MENU	Swipe Up	1. Application Menu	1	2

Fig. 2.5: Gesture Matrix (1 of 2)

Screen	Gesture	Controls		
MENU 1	 Middle	1. Close Back to menu1	1	2
MENU 1		1. Mini Widget/ w/spotify on grid	1	2
MENU 1	 Drag	1. Move Widgets	1	2
FRIDGE WIDGET		1. Goes forward/backwards to display temp on fridge/freezer	1	2
FRIDGE WIDGET		1. Expands widget menu	1	2
FRIDGE WIDGET (Special Features)		1. Opens Special Features Info. Page	1	2
FRIDGE WIDGET (Special Features)		1. Opens Ultimate Freshness > optimal temp., optimal humidity, Energy Efficiency	1	2
FRIDGE WIDGET (Special Features)		1. Go Back	1	2







Screen	Gesture	Controls		
FRIDGE WIDGET (Fridge Settings)	 Toggle	1. Ice Maker, Door Alarm, Energy Saver	1	2
FRIDGE WIDGET		1. Family Hub (Contents)	1	2
FRIDGE WIDGET		1. Accessories (purchase filter), HomeCare Wizard, Settings 2. Pop Up to buy new filter and close	1	2
FRIDGE WIDGET (Fridge Manager)	 Scroll	2. Main screen - fridge temp., main screen - freezer temp.	1	2
FRIDGE WIDGET (Fridge Manager)	 Scroll	2. See inside fridge via cameras	1	2
FRIDGE WIDGET (Fridge Manager)	 Left/Right	2. Fridge/freezer options	1	2

Fig. 2.6: Gesture Matrix (2 of 2)

PHASE 3 AUDIT-PART 1

Samsung Family Hub Smart Refrigerator & Phone App.

Overview

In this phase of the audit we researched and analyzed what customers are saying about the product. We structured the data we found to find patterns and connections in our matrices.

Types of research (4 different areas)

- Press Releases from the Samsung site
- Customer Reviews: Best Buy, Home Depot, Lowes, Costco
- Consumer Studies: Consumer Reports, CNET, Tom's Guide, Digital Trends, Best Reviews
- Patents filed by Samsung



Fig. 3.1: Customer using a Samsung Family Hub Refrigerator
Source: www.digitaltrends.com/appliance-reviews/samsung-family-hub-refrigerator-review/

We found keywords used in press releases by Samsung in 2018 and 2021 (Fig. 3.2). These keywords represent how Samsung wants customers to view the smart refrigerator. We rated each keyword or phrase “trusted” or “biased” by comparing what reviewers said (Fig. 3.3) to what customers said (Fig. 3.4).

Can such data be trusted or is it too biased? (Press Releases)

■ Trusted ■ Biased

Year	Key Word(s)	Trusted	Biased	Year	Key Word(s)	Trusted	Biased
2018	Connected Living			2021	Exciting Ways		
2018	Intelligent Connectivity			2021	Personalization		
2018	Hub/Digital Command Center			2021	Optimized		
2018	Embraced			2021	New Standard		
2018	Smarter			2021	Smart Functionality		
2018	Personalized			2021	Elevating Experiences		
2018	Redefine			2021	Notable		
2018	Pioneer			2021	Efficient Interactions		

Fig. 3.2: Press Releases

The customers who bought a Samsung Family Hub refrigerator enjoy their purchase but not for the reasons the company planned. In fact, in the end it seems that customers are more interested in the traditional features of a refrigerator like plenty of space or how it keeps food cool rather than the novelty of being the epicenter of the kitchen. The reviews only sometimes mentioned one or two (rarely up to three) things that could be done on the “smart” part of the smart fridge . They were things like “I like to listen to music in the kitchen” or “My kids like to play with the home display” or “I like having the recipe on my fridge screen instead of having to look at my tablet”. These quotes are indicative of what most of the customers meant when with their reviews they said the Samsung Family Hub is fun, which is contrary to the perception that Samsung is trying to portray - that the fridge becomes a “hub” of the household.

How do these affect buying decisions? (Consumer Studies)

Date/Website	Pros	Cons	Rating	Key Words	Rating Overall
2016/ CNET	1. Fully Featured 2. Easy to Use 3. Useful	1. Can't delete apps. 2. Integration with voice control & SmartThings is absent	★★★★☆ 4 out of 5	1. Fully Featured 2. High End 3. Smart 4. Futuristic	8.5
2019/ Tom's Guide	1. Best for early adopters 2. One of best refrigerators around	1. Bixby behind others	★★★★☆ 4.1 out of 5	1. Connected Features 2. Premium 3. Teched Out	
2018/ CR	1. Not a bad fridge 2. Quiet and energy efficient 3. Easy to use	1. Bixby behind others 2. Touch screen giant tablet stuck on 3. Apps don't run smoothly 4. Can't delete apps.	☆☆☆☆☆ 0 out of 5	1. Confusing 2. Buggy 3. Awkward 4. Nonintuitive	
2018/ Digital Trends	1. Plenty of space 2. Like Flex Drawer 3. Held temp. well	1. Ice Machine 2. Pictures of inside fridge a little creepy 3. Bixby behind others 4. Sound from fridge not great	★★★★★ 4.5 out of 5	1. Brain (of Kitchen) 2. Screen like big phone 3. Customizable 4. Personalize 5. Innovative	4.5
2021/ Best Reviews	1. Hands free w/Bixby 2. Flexzone	1. Expensive 2. Smart Features	☆☆☆☆☆ 0 out of 5	1. Epicenter 2. Brilliant 3. Dazzling	

Fig. 3.3: Consumer Studies

Can this data validate actual product design issues? (Customer Service Reviews)

Website	Pros	Cons	# Reviews & Rating	Key Words	Recommend
Bestbuy	Capacity (58) Design (40) Features (36) Family (33) Fun (22)	Icemaker (11) Doors (4) Shelving (4) Reliable (2) Set up (2)	995 ★★★★☆ 4.5 out of 5	1. Smart 2. Fun Features 3. Plenty of space 4. Great Technology	90%
Home Depot	Space (30) Freezer (21) Features (23) Family Hub (18) Music (12)	None	581 ★★★★☆ 4.6 out of 5	1. Great fridge 2. Plenty of space 3. Touch screen is unique	92%
Lowes	Satisfaction Features Capacity Enjoyment Large	Price Defect (Ice Maker)	414 ★★★★☆ 4.6 out of 5	1. Plenty of space 2. Family friendly 3. Finish is beautiful 4. Apps are cool 5. Tech is limited	92%
Costco	Capacity Design	Price Ice Maker Apps	197 ★★★★☆ 4.2 out of 5	1. Sleek 2. Fun 3. Customizable	

Fig. 3.4: Customer Reviews

Patents

Our team hypothesized that technological patents for the smart fridge would outnumber “fridge-type” patents. While there are a number of “smart-enabling” patents and a really cool patent for an in-fridge ice cream maker(!), there are far more “fridge-type” patents.

Usability Heuristics

Using the 10 Usability Heuristics for User Interface Design by the Nielsen Norman Group, we think Heuristic #3, User control and Freedom, applies. Samsung’s Bixby voice assistant was cited by the reviewers as not being intuitive or as good as it’s competitors (e.g. Alexa). We agree with that observation; in Phase 1, Bixby was difficult to work with and sometimes flat out did not work. In addition, referencing Heuristic #4, Consistency and Standards, in Phase 2, when we compared the touchscreen UI on the fridge and the SmartThings app on the phone, we found that both were not consistent in use or function and, in this audit, customers said the apps were confusing and awkward. Consumers seem to think that a connected household, or connected family, is a good idea but Samsung’s refrigerator is not there yet.

PHASE 3 AUDIT-PART 2

Samsung Family Hub Smart Refrigerator & LG InstaView.

Overview

In this phase of the audit we created proto-personas for customers of the Samsung Smart and LG InstaView refrigerators. These were based on information gleaned from the prior phases and not hard research.

We created a workshop to promote discussion and problem-solving from stakeholders. The format, intended to develop and challenge stakeholder assumptions, is a trading-card-styled workshop with different kinds of cards to pair with a basic proto-persona card. Each category of card has a different colored background to make it easier to tell which type of card has been collected. We made it so that the workshop could be done locally or remotely.

In-Person Workshop

We made 7 proto-personas (Fig. 3.5). Five are Samsung Smart personas and the other two are LG InstaView personas. These personas were based on our informed assumptions and are meant to be a starting point (i.e. ice breakers) for discussion and not an end in itself. The personalities range from a foodie, stay-at-home parent, working parent, and tech guru. Each stakeholder (or group of stakeholders) would get a proto-persona card.



Fig. 3.5: A Proto-Persona (Front/Back)

A facilitator would keep track of this card, make sure all stakeholders follow the rules, and generally guide the workshop. The stakeholder would have to choose one of seven quotes to pair with their proto-persona. The quotes are actual quotes taken from customer reviews. Five of the quotes are taken from our last audit and two are from LG InstaView reviews (fridge-identifying details have been edited so that the cards can be paired with any proto-persona).

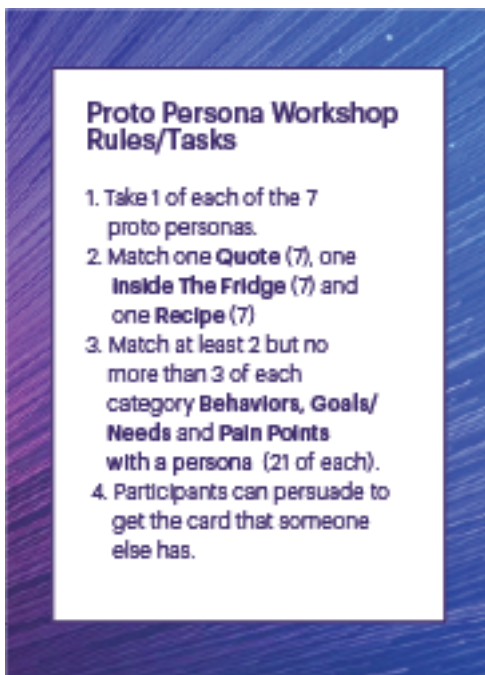


Fig. 3.6: Rules and Tasks Card

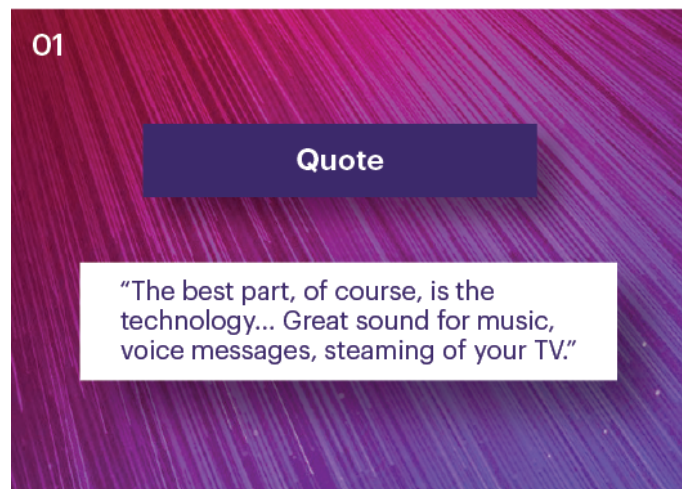


Fig. 3.7: A Quote Card

List of quotes

1. "The best part, of course is the technology...Great sound for music, voice messages, streaming of your TV."
2. "My dream is to open an Airbnb with the refrigerator being the star attraction/"
3. "Cool concept - yes. Worth the money? No."
4. "I upgraded from a 20+ year old side by side, so just having a fridge that cools properly is so nice."
5. "The refrigerator is beautiful & turns heads when guests/family visit."
6. "I love my new refrigerator! I did research, I read the reviews on different models & brands."
7. "This is the perfect refrigerator! My wife is in love with how it helps to modernize our kitchen."

Each stakeholder would choose 2-3 each of the following card groups that the stakeholder believes would match their proto-persona: Behaviors, Goals/Needs, and Pain Points

List of Behaviors

1. Likes to try new restaurants
2. Cuts coupons
3. Golfs
4. Builds custom computers
5. Keeps up with latest tech. news
6. Buys expensive things
7. Likes to do crafts
8. Listens to music
9. Visits with family
10. Likes to cook
11. Loves to play with kids
12. Creates items to sell online
13. Tech savvy
14. Resells items online
15. Meal preps ("batch" meals ahead of time)
16. Buys a lot of cat food (canned)
17. Grills all the time
18. Hunts
19. Gardener
20. Competitive eater
21. Cans/bottles/preserves food

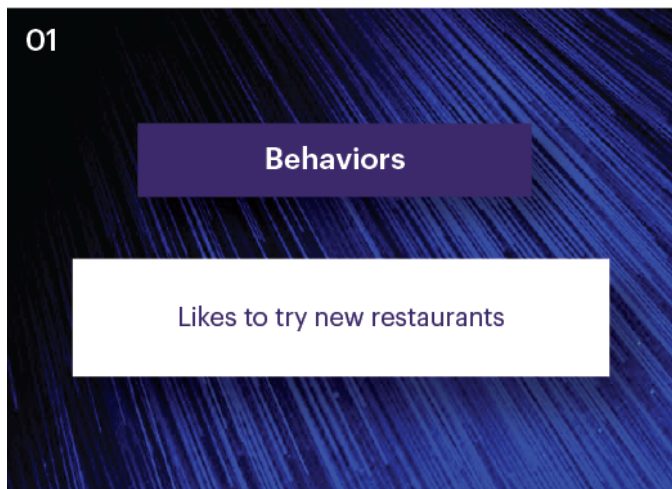


Fig. 3.8: A Behaviors Card

List of Goals/Needs

1. Remodel kitchen
2. Learn new recipes
3. Buy latest tech gadgets
4. Get entertainment for the kitchen
5. Keep up with the family
6. Socialize/entertain friends more
7. Cook more at home
8. Cook simple meals
9. Get latest kitchen gadgets
10. Streamline kitchen time
11. Have a reason to go into kitchen
12. More food space
13. Be more organized
14. Eat healthier meals
15. Keeping up with the "Joneses"
16. Make smoothies with fresh fruit
17. Graduate school
18. Teach kids to cook
19. More time to play with kids
20. Go back to school (self improvement)
21. Go to more music concerts

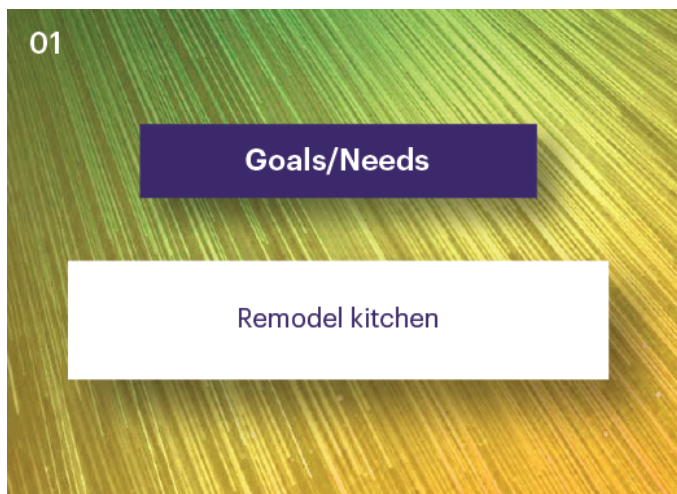


Fig. 3.9: A Goals/Needs Card

List of Pain Points

1. Limited disposable income
2. No time to cook
3. Not tech savvy
4. Grocery store (not knowing what to buy)
5. Spends too much money on food
6. Does not know how to cook
7. Has to entertain for work
8. Tired of the same old meals
9. Has a large family
10. Uses a wheelchair
11. Diabetic
12. Blind (or legally blind)
13. Doesn't like cooking
14. Has really picky family members
15. Family or friend has food allergies
16. Kosher
17. Loses things in back of the fridge a lot
18. Not at home much
19. Hosts large family gatherings
20. Medically-restrictive diet
21. Missing ingredients while making a meal

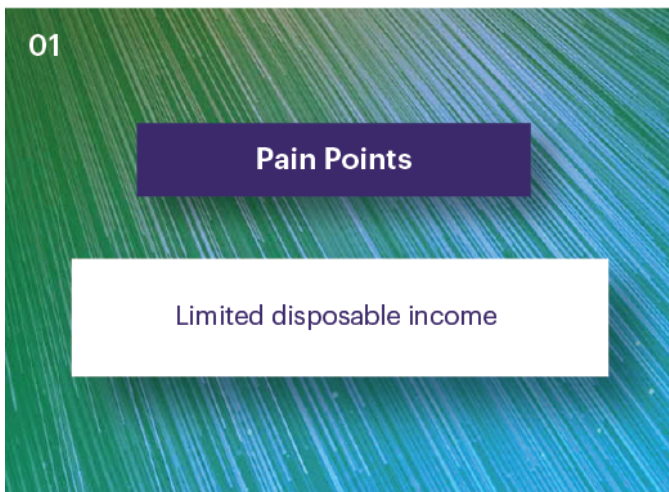


Fig. 3.10: A Pain Points Card

Additionally, the stakeholder(s) would choose one of each of the following to go with their proto-persona: Recipe and Inside the Fridge.

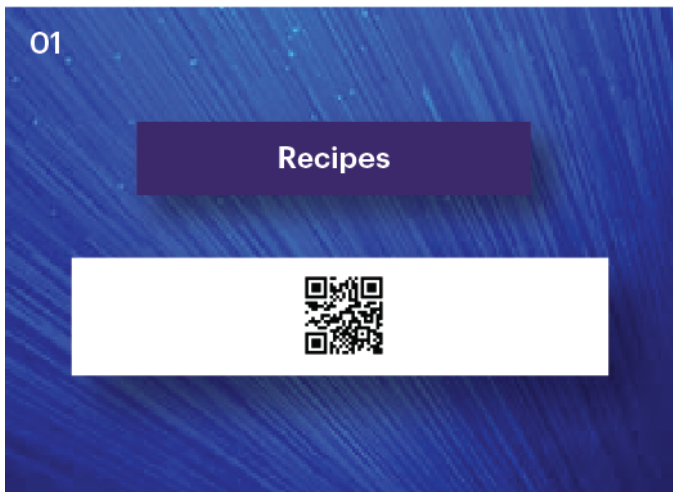


Fig. 3.11: A Recipes Card

List of links to recipes

1. Peanut Butter and Honey
<https://www.allrecipes.com/recipe/199631/peanut-butter-and-honey-sandwich/>
2. Cheesy Vegetarian Enchilada Casserole
<https://www.allrecipes.com/recipe/261536/cheesy-vegetarian-enchilada-casserole/>
3. Skillet Chicken Bulgogi
<https://www.allrecipes.com/recipe/240400/skillet-chicken-bulgogi/>
4. Mushroom Pork Chops
<https://www.allrecipes.com/recipe/14746/mushroom-pork-chops/>
5. Seared Ahi Tuna Steaks
<https://www.allrecipes.com/recipe/160099/seared-ahi-tuna-steaks/>
6. Speckled Trout in Capers and White Wine
<https://www.allrecipes.com/recipe/247285/speckled-trout-in-capers-and-white-wine/>
7. Simple Macaroni and Cheese
[Simple Macaroni and Cheese](#)



Fig. 3.12: An Inside the Fridge Card

After collecting the cards to go with their proto-persona, the stakeholder(s) would “defend” or rationalize their choices. By doing so, the stakeholder(s) will (theoretically) begin to think more about their customers.

Example of Workshop (Remote)

Our team also developed a remote workshop for stakeholders who could not make the in-person workshop (Fig. 3.13). We used mural.com. The stakeholder would be sent a link or QR Code to participate. There are instructions on how to use and share their contributions. After they have reviewed the porto-persona cards and rules card, the stakeholder would use the icons in the toolbox to indicate their selections. The “defense” of their choices remains the same as the in-person version.

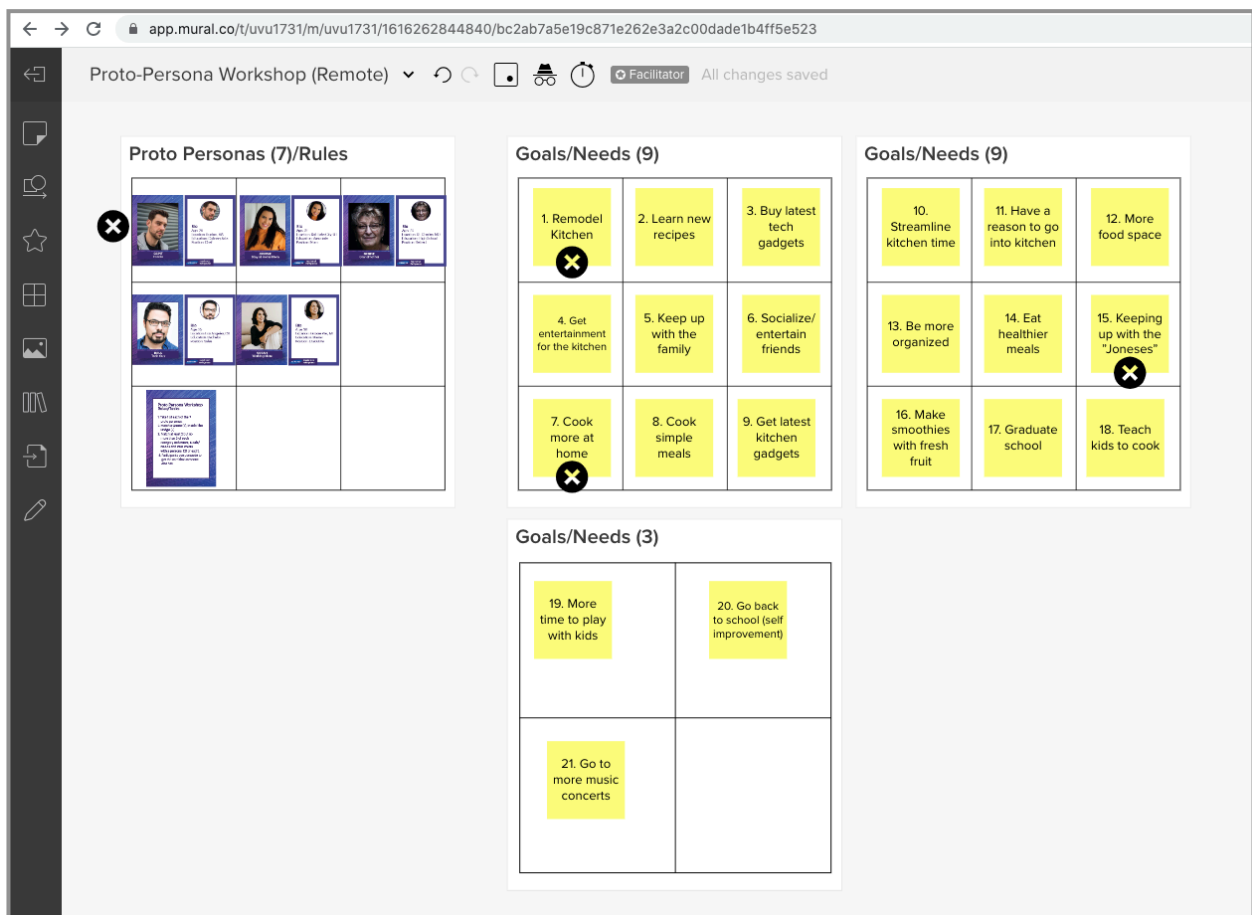


Fig. 3.13: Screenshot from Mural collaborative board

PHASE 3 AUDIT-PART 3

Samsung Family Hub Smart Refrigerator & LG InstaView.

Overview

In this phase of the audit, we created customer empathy maps.

Empathy is a critical skill that gives designers a way to understand their users with more clarity. This deeper understanding of the user is a way to "connect the dots" to solve a user-centric problem. On the other hand, without empathy, a solution to a user-centric problem can be much harder to discover.

Our team consists of two members. We did our empathy maps separately and then collaborated on final empathy maps

Screenshots of empathy maps on a white boarding app.

In our empathy maps (Fig. 3.14 and Fig. 3.15), we first used a map created by the Nielsen Norman Group for two proto-personas, created in part 2 of this phase of the audit: "Connie", a stay-at-home mom who is looking to buy a refrigerator, and "Melissa", a tech gal, who enjoys all things tech and is also looking to buy a refrigerator.

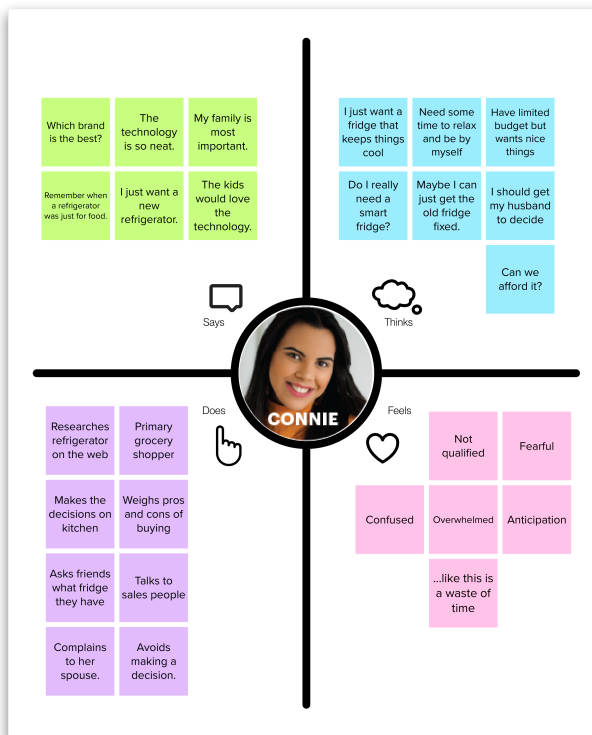


Fig. 3.14: James' Empathy Map

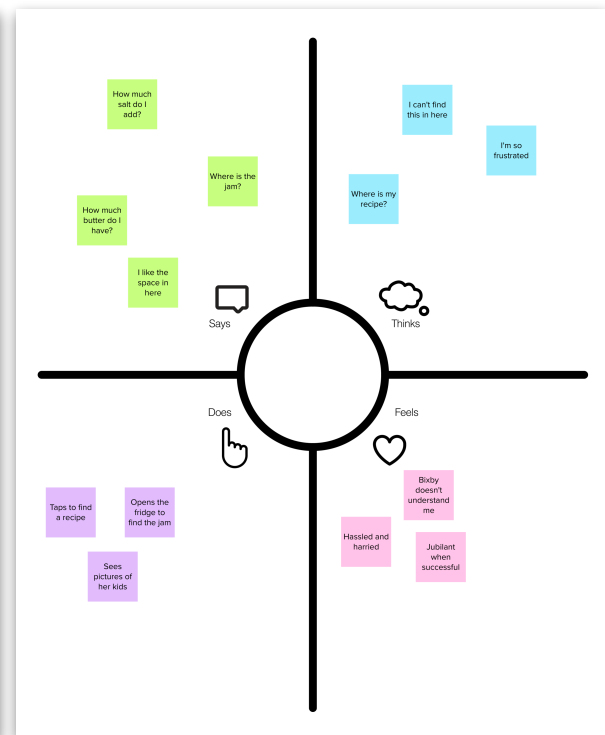


Fig. 3.15: Heather's Empathy Map

In Fig. 3.16 & 3.17 we used the same proto-persona but a different map, called an empathy map canvas, that takes a different approach that allows us to delve deeper into how these customers feel about their purchase.

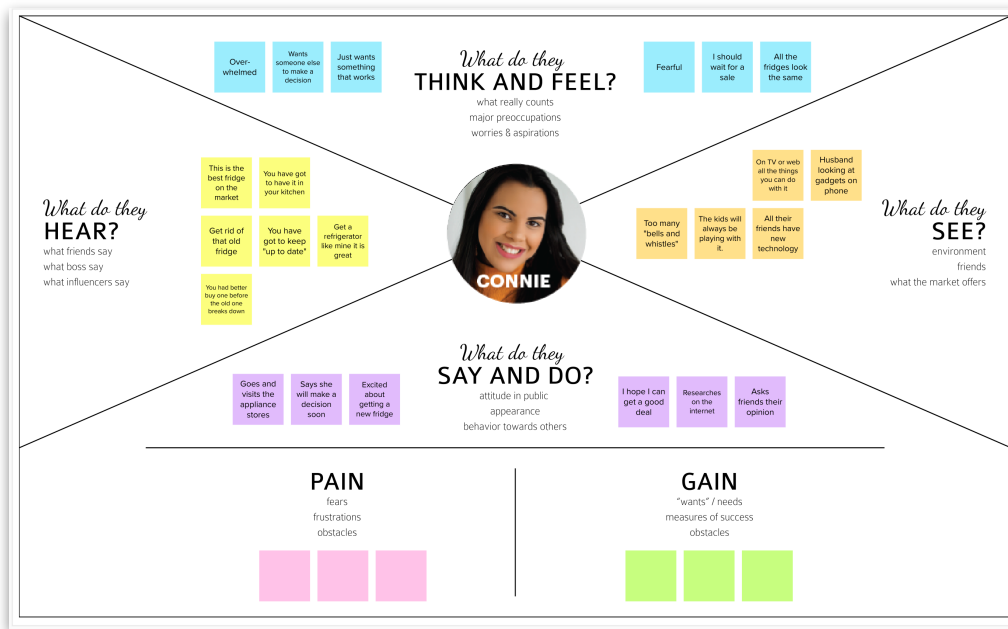


Fig. 3.16: James' Empathy Canvas

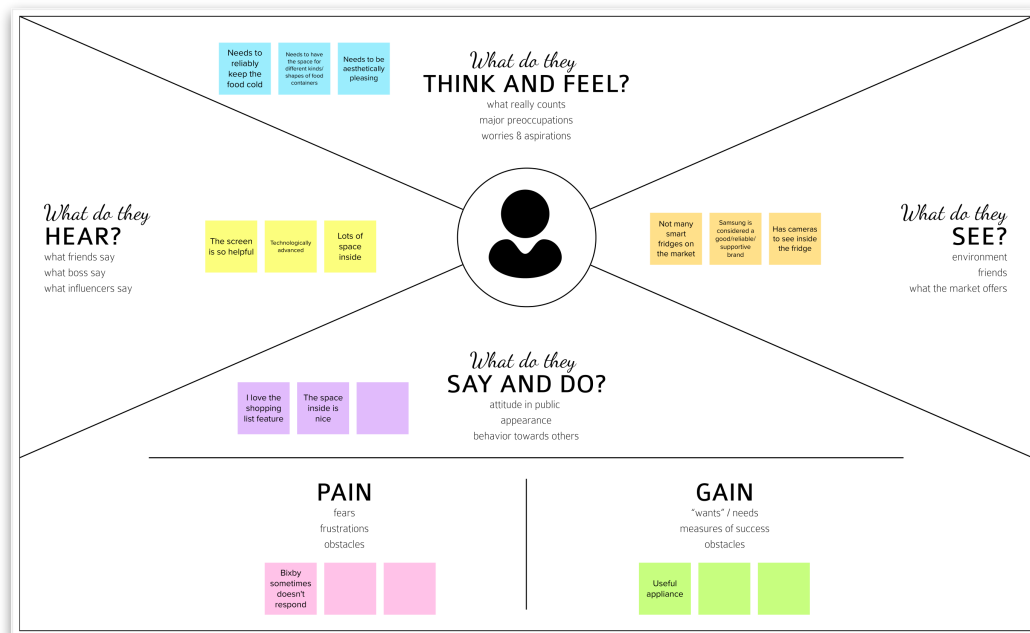


Fig. 3.17: Heather's Empathy Canvas

As said in the overview after working on our own empathy maps for a couple of days then we came together as a team and compared notes. We then proceeded to combine our efforts by creating another two maps for Connie and then 2 more maps from a persona from our last audit. Melissa is a tech gal, who enjoys all things tech and is looking to buy a refrigerator.

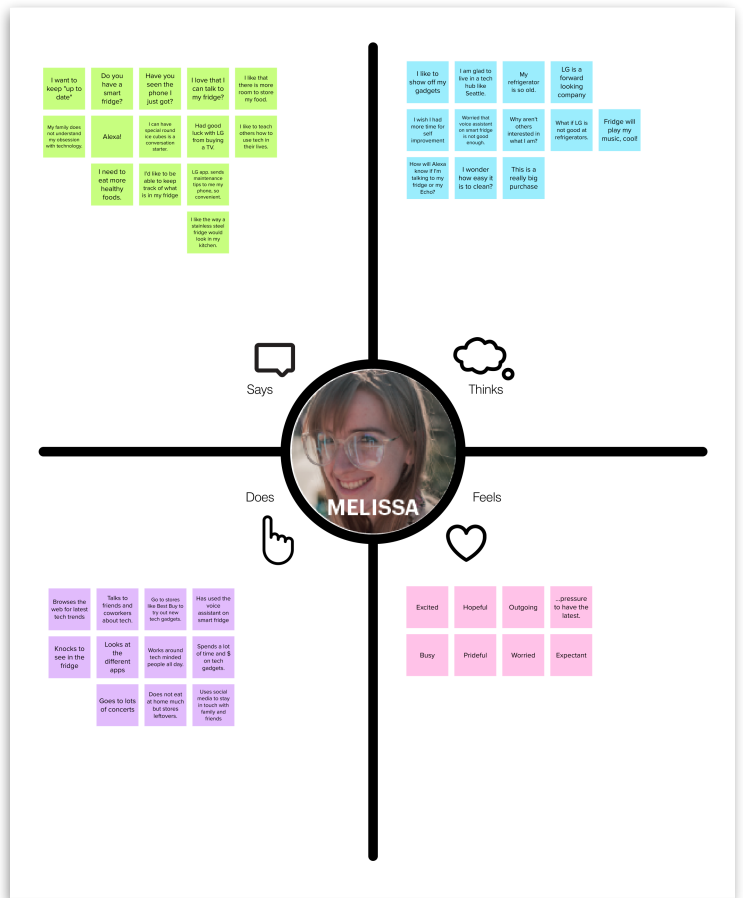
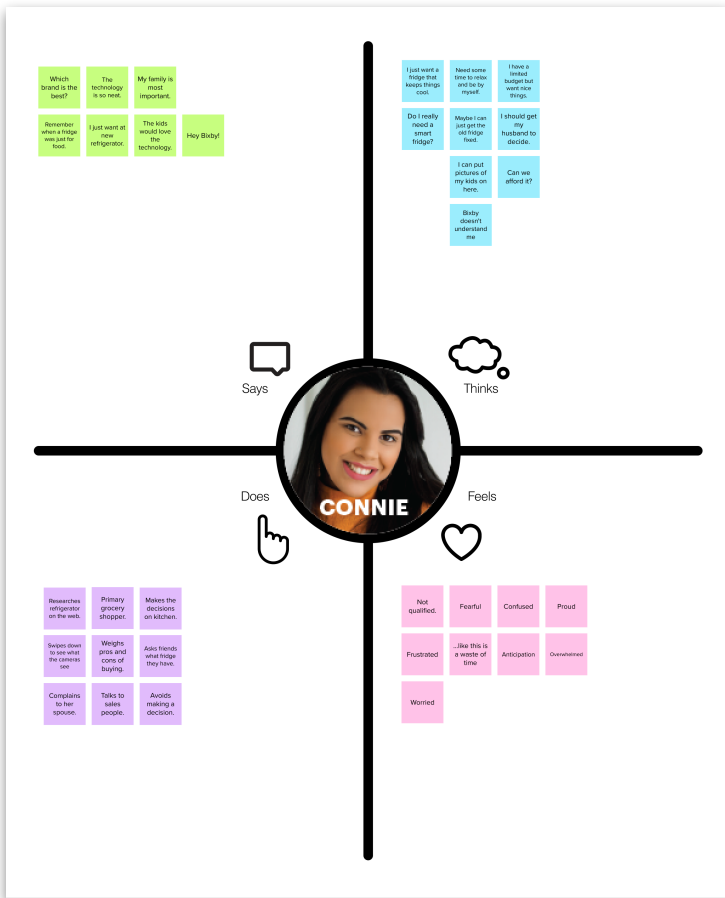


Fig. 3.18: Team Empathy Map (Connie)

Fig. 3.19: Team Empathy Map (Melissa)

In Fig. 3.18 shows the empathy map for Connie.

Says

1. Which brand is the best?
2. The technology is so neat.
3. My family is most important.
4. Remember when a fridge was just for food.
5. I just want at new refrigerator.
6. The kids would love the technology.
7. Hey Bixby!

Thinks

1. I just want a fridge that keeps things cool.
2. Need some time to relax and be by myself.
3. I have a limited budget but want nice things.
4. Do I really need a smart fridge?
5. Maybe I can just get the old fridge fixed.
6. I should get my husband to decide.
7. I can put pictures of my kids on here.
8. Can we afford it?
9. Bixby doesn't understand me.

Does

1. Researches refrigerator on the web.
2. Primary grocery shopper.
3. Makes the decisions on kitchen.
4. Swipes down to see what the cameras see.
5. Weighs pros and cons of buying
6. Asks friends what fridge they have.
7. Complains to her spouse.
8. Talks to sales people.
9. Avoids making a decision.

Feels

1. Not qualified
2. Fearful
3. Confused
4. Proud
5. Frustrated
6. ...like this is a waste of time
7. Anticipation
8. Overwhelmed
9. Worried

In Fig. 3.19 shows the empathy map for Melissa.

Says

1. I want to keep "up to date"
2. Do you have a smart fridge?
3. Have you seen the phone I just got?
4. I love that I can talk to my fridge
5. I like that there is more room to store my food.
6. My family does not understand my obsession with technology.
7. Alexa!
8. I can have special round ice cubes is a conversation starter.
9. Had good luck with LG from buying a TV.
10. I like to teach others how to use tech in their lives.
11. I need to eat more healthy foods.
12. I'd like to be able to keep track of what is in my fridge
13. LG app. sends maintenance tips to me my phone, so convenient.
14. I like the way a stainless steel fridge would look in my kitchen.

Thinks

1. I like to show off my gadgets.
2. I am glad to live in a tech hub like Seattle.
3. My refrigerator is so old.
4. LG is a forward looking company.
5. I wish I had more time for self improvement.
6. Worried that voice assistant on smart fridge is not good enough.

7. Why aren't others interested in what I am?
8. What if LG is not good at refrigerators.
9. Fridge will play my music, cool!
10. How will Alexa know if I'm talking to my fridge or my Echo?
11. I wonder how easy it is to clean?
12. This is a really big purchase.

Does

1. Browses the web for latest tech trends.
2. Talks to friends and coworkers about tech.
3. Go to stores like Best Buy to try out new tech gadgets.
4. Has used the voice assistant on smart fridge.
5. Knocks to see in the fridge.
6. Looks at the different apps.
7. Works around tech minded people all day.
8. Spends a lot of time and \$ on tech gadgets.
9. Goes to lots of concerts.
10. Does not eat at home much but stores leftovers.
11. Uses social media to stay in touch with family and friends

Feels

1. Excited
2. Hopeful
3. Outgoing
4. ...pressure to have the latest
5. Busy
6. Proudful
7. Worried
8. Expectant



Fig. 3.20: Team Empathy Map (Connie)

What do they think and feel?

1. Overwhelmed
2. Wants someone else to make the decision.
3. Just wants something that works.
4. Does not want to make the wrong decision.
5. "I hate my lettuce freezing in my old fridge."
6. The kids will always be playing with it.
7. This could make things like shopping and list making easy.

What do they hear?

1. Samsung Family Hub is the best.
2. This is the best fridge on the market.
3. You have got to have it in your kitchen.
4. Get rid of that old fridge.
5. You have got to keep "up to date".
6. Get a refrigerator like mine; it is great.
7. You had better buy a new one before yours breaks down.

Fig. 3.20 cont...

What do they see?

1. On TV or web all the things you can do with a smart fridge.
2. Husband looking at gadgets on phone.
3. Too many "bells and whistles".
4. Kids super vocal about wanting it.
5. All my friends have this new technology.

What do they say and do?

1. Goes and visits the appliance stores.
2. Says she will make a decision soon.
3. Excited about getting a new fridge.
4. This one has good space inside.
5. I hope I can get a good deal.
6. Researches on the internet.
7. Asks friends their opinion.

Pain

1. Bixby only sometimes responds to me.
2. I can't find [item] in the fridge.

Gain

1. This fridge would integrate a shopping list and my recipes.
2. Reliable appliance

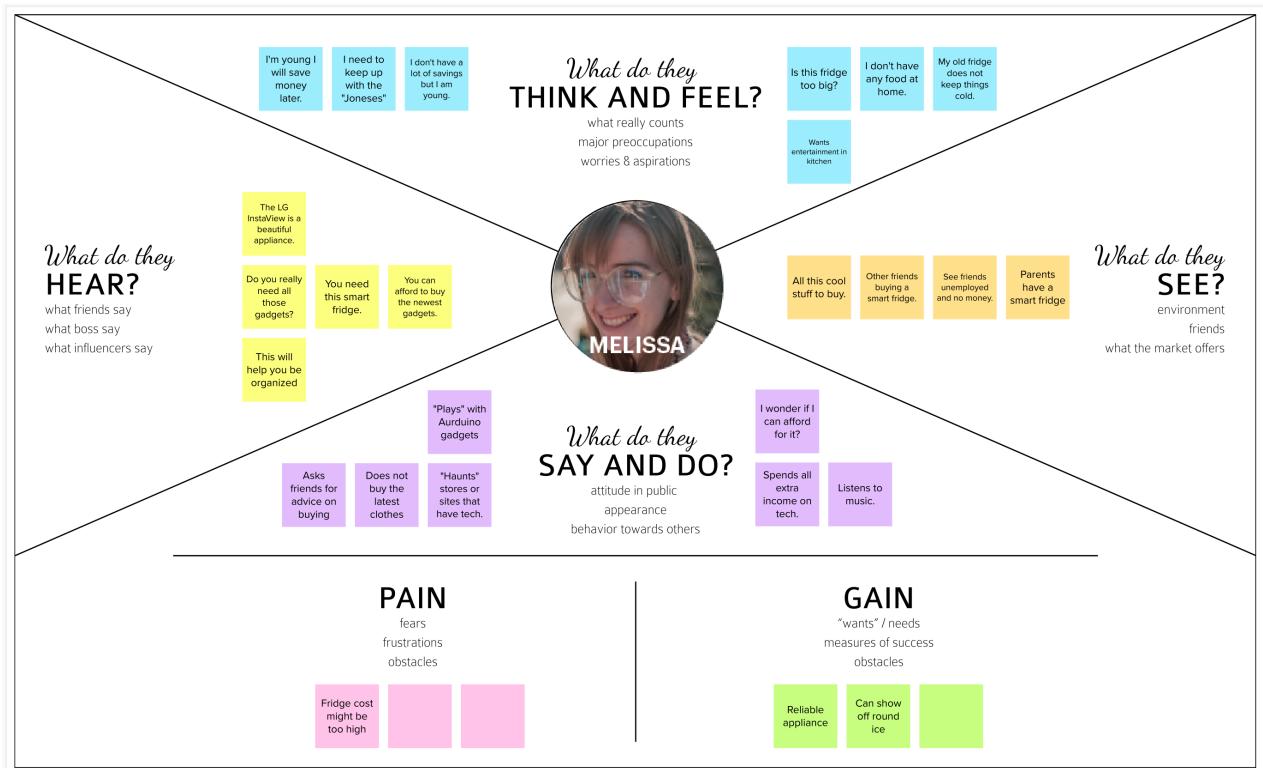


Fig. 3.21: Team Empathy Map (Melissa)

What do they think and feel?

1. I'm young I will save money later.
2. I need to keep up with the "Joneses".
3. I don't have a lot of savings but I am young.
4. Is this fridge too big?
5. I don't have any food at home.
6. My old fridge does not keep things cold.
7. Wants entertainment in kitchen.

What do they hear?

1. The LG InstaView is a beautiful appliance.
2. Do you really need all those gadgets?
3. You need this smart fridge.
4. You can afford to buy the newest gadgets.
5. This will help you be organized.

What do they see?

1. All this cool stuff to buy.

Fig. 3.21 cont...

2. Other friends buying a smart fridge.
3. See friends unemployed and no money.
4. Parents have a smart fridge

What do they say and do?

1. "Plays" with Arduino gadgets.
2. Asks friends for advice on buying.
3. Does not buy the latest clothes.
4. "Haunts" stores or sites that have tech.
5. I wonder if I can afford for it?
6. Spends all extra income on tech.
7. Listens to music.

Pain

1. Fridge cost might be too high.

Gain

1. Reliable appliance.
2. Can show off round ice.

Summary of findings for empathy maps

Differences:

Different work/home life

Connie is less interested in features than Melissa

Connie would like someone else to make the decision on what to buy

Different money concerns

Similarities: Similar ages

Both consult with friends

Both feel busy/overwhelmed

Both are concerned about money

Reflection on empathy maps

Q: What specific biases might you as a designer harbor that need to be realigned to better understand the customer in this study by using Empathy Mapping?

A: Confirmation bias, seeking out results that confirm our worldview, clustering bias, seeking out patterns in random outcomes and bringing order to chaos.

Q: How has the Empathy Map method assisted you to better understand customer interactions and needs?

A: Empathy maps have helped us to understand interactions/needs better by making our team think about the same issue but from different perspectives. I can't underestimate the fact that working in a team has given me also a different perspective than working alone. (in a bubble)

Q: Why might the Empathy Mapping method be so valuable when confronting customer pain points?

A: It highlights the fact that as human beings we are typically self centered and allows us to even for an instant become the customer. This will be valuable because if a product is not concerned with the customers needs/pain points then inevitably the product or service will fail.

Q: Do you feel that this assignment has better prepared you to understand customer needs better? Describe in detail.

A: Yes, because sometimes we have these assumptions/biases and empathy maps help to bring these out into the open to explain and justify them. Especially, when you narrow your focus to a certain task and not just your persona in general.

PHASE 4 AUDIT

Purchasing a Smart Refrigerator

Overview

In this phase of the audit, we created a customer journey map (CJM). The CJM is a valuable tool for visualizing a customer's experience and point of view on a task.

We chose to map the "journey" of "Connie", our stay-at-home mom, as she purchases a Samsung Smart refrigerator.

Templated Customer Journey Map

We collaborated together on a template for a CJM (Fig. 4.1) to gather our initial ideas on the phases, steps, feelings, pain points and opportunities that Connie experiences in the process of purchasing a fridge.

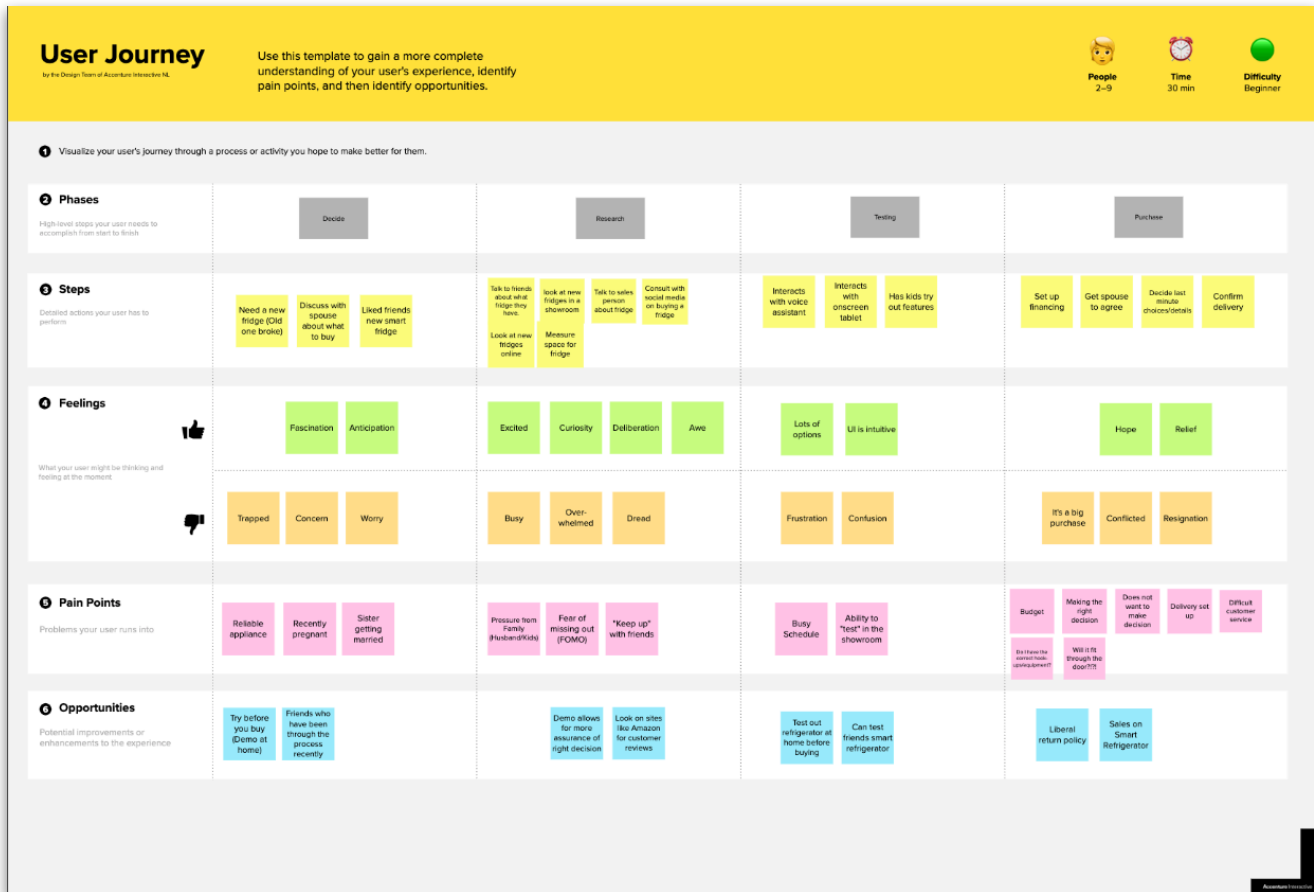


Fig. 4.1: Customer Journey Map (Mural)

Parts of the Mural Customer Journey Map

Phases

1. Decide
2. Research
3. Test
4. Purchase

Steps

- Old refrigerator broke
- Discuss with spouse on what to buy
- Liked friends smart fridge

- Friends refrigerator
- Fridges in showroom
- Talked to sales person
- Social media and online
- Measure space in kitchen

- Interacts with voice assistant (Bixby)
- Interacts with onscreen tablet
- Has kids try out features

Feelings

(Good)

- Fascination
- Anticipation

(Bad)

- Trapped
- Concern
- Worry

(Good)

- Excited
- Curious
- Deliberate
- Awe

(Bad)

- Busy
- Overwhelmed
- Dread

(Good)

- Many options
- UI intuitive

(Bad)

- Frustration
- Confusion

(Good)

- Hopeful
- Relieved

(Bad)

- Big purchase
- Conflicted
- Resigned

Pain Points

- Reliable appliance
- Recently pregnant
- Sister getting married

- Pressure from family
- Fear of Missing Out
- Keeping up with friends

- Budget
- Making the right decision
- Doesn't want to make a decision
- Delivery set-up, customer service, correct hook-ups, will it fit through the door

Opportunities

- Demo at home
- Friends have been through process

- Demo for more assurance of decision
- Look on sites for customer reviews

- Test refrigerator before buying
- Test friends fridge

- Liberal return policy
- Sales on a smart fridge

Sketch of Customer Journey Map

We expanded on our original map (Fig. 4.2) by adding the categories of gestures and thoughts, which gave more dimension and connections to our final map, and experimented with visualizing Connie's feelings.

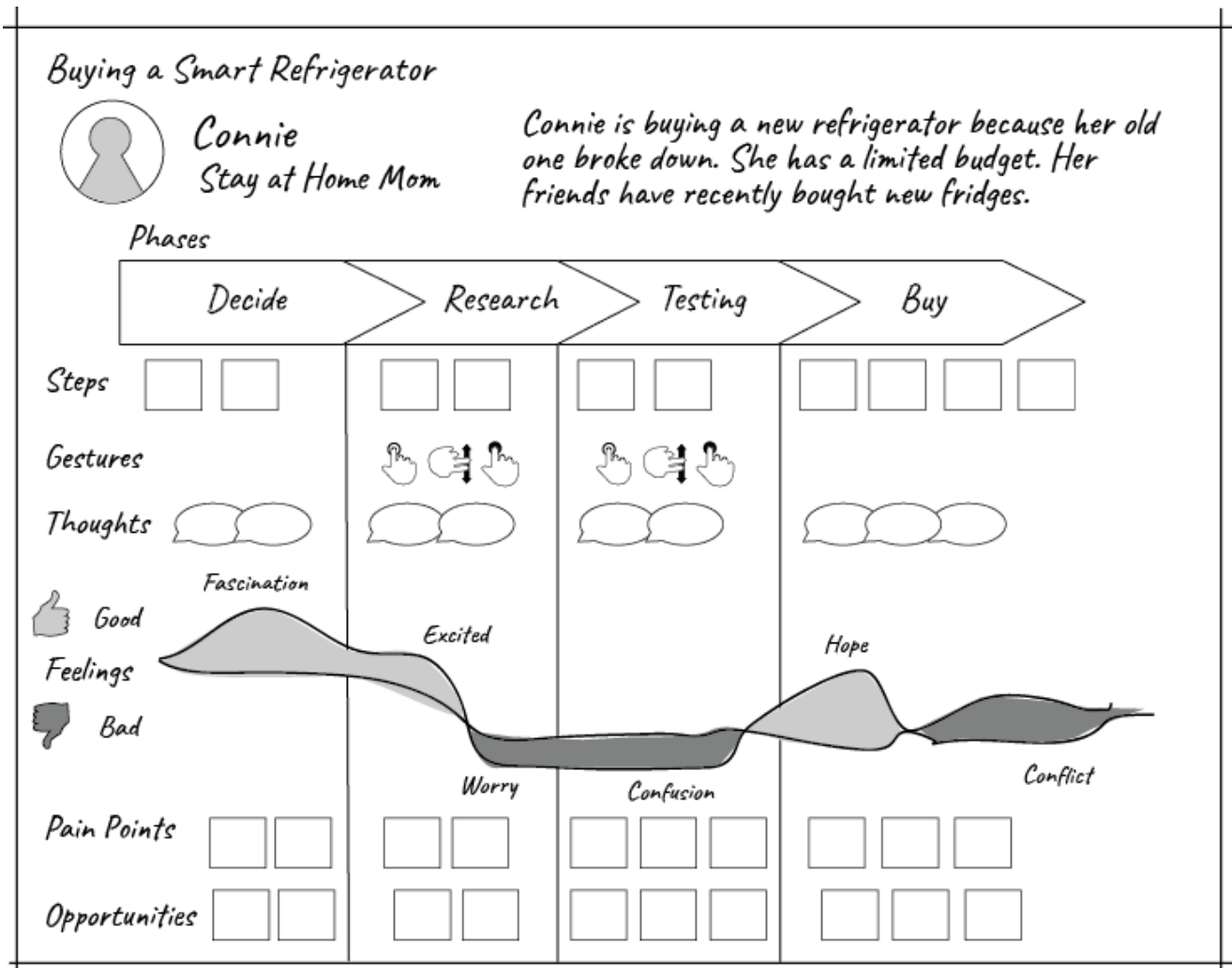


Fig. 4.2: Customer Journey Map (Sketch)

Final Customer Journey Map

On the final CJM (Fig. 4.3), we created the customer journey map in granular detail and added a wayfinding system

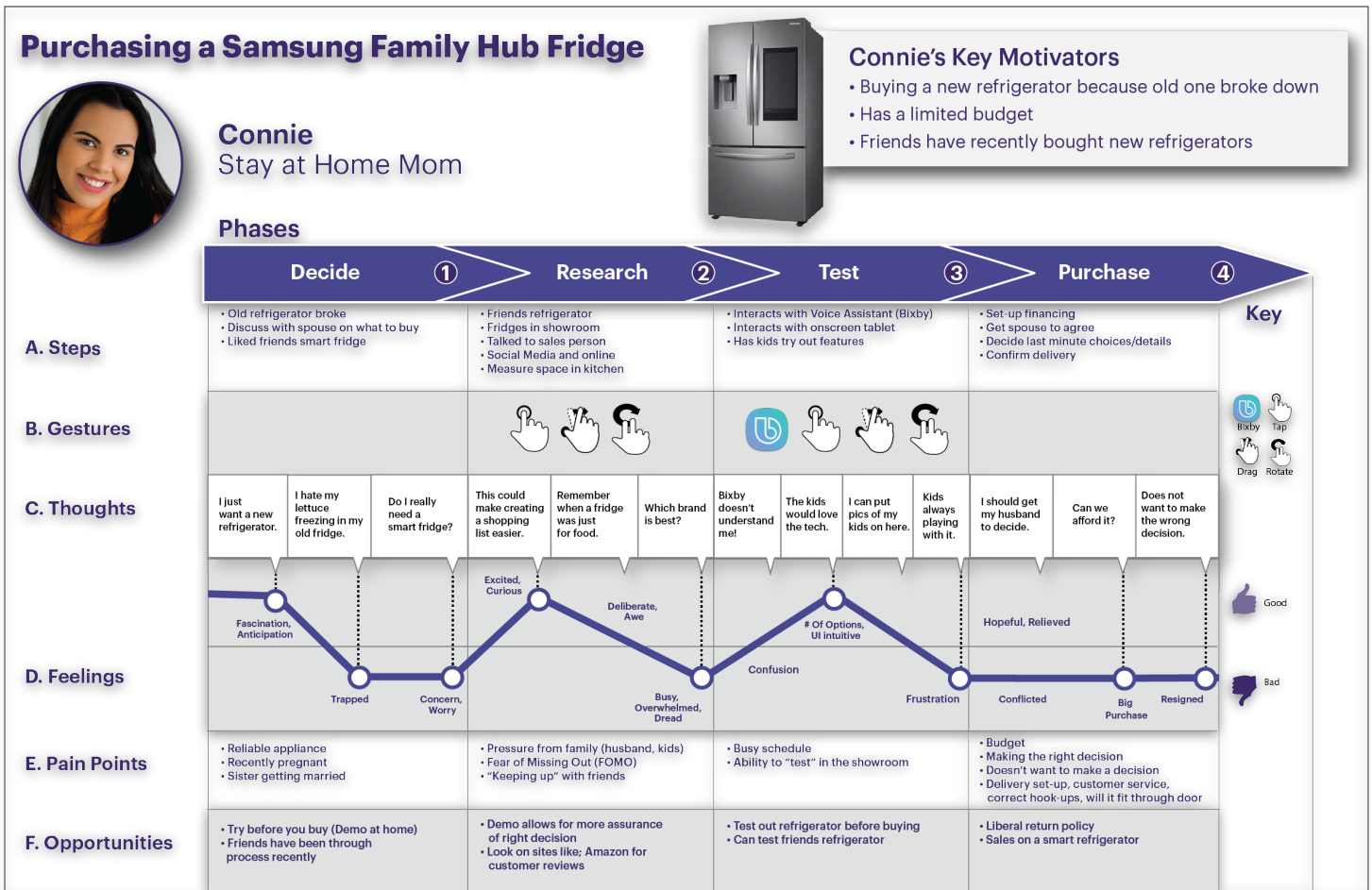


Fig. 4.3: Customer Journey Map (Final)

Parts of the Final Customer Journey Map

Phases

1. Decide
2. Research
3. Test
4. Purchase

Steps

- 1A.
- Old refrigerator broke
 - Discuss with spouse on what to buy
 - Liked friends smart fridge
- 2A.
- Friends refrigerator
 - Fridges in showroom
 - Talked to sales person
 - Social media and online
 - Measure space in kitchen
- 3A.
- Interacts with voice assistant (Bixby)
 - Interacts with onscreen tablet
 - Has kids try out features

Feelings

- 1D. (Good)
- Fascination
 - Anticipation
- 1D. (Bad)
- Trapped
 - Concern
 - Worry
- 2D. (Good)
- Excited
 - Curious
 - Deliberate
 - Awe
- 2D. (Bad)
- Busy
 - Overwhelmed
 - Dread
- 3D. (Good)
- Many options
 - UI intuitive

- 3D. (Bad)
- Frustration
 - Confusion
- 4D. (Good)
- Hopeful
 - Relieved
- 4D. (Bad)
- Big purchase
 - Conflicted
 - Resigned

Pain Points

- 1E.
- Reliable appliance
 - Recently pregnant
 - Sister getting married
- 2E.
- Pressure from family
 - Fear of Missing Out
 - Keeping up with friends
- 3E.
- Budget
 - Making the right decision
 - Doesn't want to make a decision
 - Delivery set-up, customer service, correct hook-ups, will it fit through the door

Opportunities

- 1F.
- Demo at home
 - Friends have been through process
- 2F.
- Demo for more assurance of decision
 - Look on sites for customer reviews
- 3F.
- Test refrigerator before buying
 - Test friends fridge
- 4F.
- Liberal return policy
 - Sales on a smart fridge

Thoughts/Feelings

1C.

- I just want a new refrigerator/Anticipation
- I hate my lettuce freezing in my old fridge/Trapped
- Do I really need a smart fridge?/Worry

2C.

- This could make creating a shopping list easier/Curious
- Which brand is best?
- Remember when a fridge was just for food/Dread

3D.

- Bixby doesn't understand me
- The kids would love the technology/Many options
- I can put pictures of my kids on here
- Kids will always be playing with it/Frustration

4D.

- I should get my husband to decide
- Can we afford it?/Big purchase
- Does not want to make the wrong decision/resigned

POST MORTEM

Some parting thoughts

Our team performed an extensive 4 phase audit on the Samsung Family Hub Smart Refrigerator. We explored the characteristics and functionality as well as the product and gesture controls. We used data from that exploration and a satisfaction analysis to create informed proto-personas and empathy maps. We created a customer journey map, which was a culmination of the information we gained in the previous phases.

We were very curious about the Samsung Family Hub Refrigerator and were even thinking about buying one. This product has potential, especially in the promise of making customers everyday lives better. For example, the Smart fridge promises to let you know at the grocery store what you need to buy and even has a grocery list function on the Smart screen as well as recipes.

After going through the 4 phases of the audit, we both agree that Samsung has a way to go to earn our purchases. In the gesture audit, we found that the phone app is not as robust or usable in the kitchen as the touch screen on the fridge itself. The cameras in the refrigerator, while innovative in connecting to the app, do not show all compartments or areas inside - and there aren't cameras in the freezer at all. In Samsung's "fridge contents" system, it seems impossible to "move" an item from the fridge to the freezer without having to delete the item from one and add it to the other by hand. The Bixby voice assistant ignored a member of our team more often than not.

As most of the customers said in the customer reviews, they still want a great refrigerator first and the extra features second. The Samsung is a great refrigerator even though it may not be an overall great experience yet.

If Samsung incorporates things such as thorough camera coverage, a more versatile inventory system, and a better voice assistant, their Family Hub Smart refrigerator truly would have the capability to be the Hub of not only our families but many others as well.

The customer empathy maps and customer journey map were poignant ways to step into the role of a customer and learn how to be able to pinpoint and solve a customer problem - the purchase of a Smart fridge. While the fridge itself may not have met our expectations, we loved learning how to audit and will be using these hard-won skills in our future audits.