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Deliverable B: Needs, Problem Statement, Metrics, Benchmarking and
Target Specifications

Lab Section A04 Team_18
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Lauren Poole - 300168350
Muiz Mustafa - 300163497
Azan Mubashar - 300175847
Patrick Meechan - 300161098
Kyle Jacob Dulce - 300169731

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Introduction:

Our client, Kim, is a person who has been fully blind since birth. Her problem revolves around using appliances such as a stove which operates with a heat-sensitive touch screen. In order to know which button to press to get the desired behaviour from the stove, braille locator dots must be felt and because of this, other unwanted options are activated on the touch screen. As a team, we interviewed Kim on September 21, 2021, asking her about her current solutions and their benefits and drawbacks and on her thoughts for how to approach this new problem. We are now working on translating her quotations into needs, coming up with a problem statement and benchmarking similar products. Following this, we will begin our ideation.

Client Paraphrased Main Ideas:

Kim

- Completely blind
- Works with Canadian council of the blind teaching youths who are blind to use technology
- Is adept at reading braille
- Contact: gtt@ccbnational.net

- Couple months ago
- Blind woman living independently
- New stove with touch screen activated not by pressure but with heat of hand, ability to use it was compromised
- Usually able to label appliances with locator dots or braille
- App did not exist
- Stove washer dryer microwave and other appliances
- Appliance beeps to let you know you've touched it
- Menu means you don't know what's on the screen even with pressure

- Locator above screen where you can push straight down didn't work
- Have to skype call with friends to use appliance
- Stylus didn't work because it wasn't hot

Smartphone: screen reader changes how you interact with screen

- Have to double tap to select
- Sliding fingers over screen reads what your fingers is on
- Pair braille display via bluetooth

Drawbacks of using locator dots for pressure sensitive appliances

- Getting someone to help you label pressure triggered appliances
- Losing dots off appliances
- People in public removing braille dots

Stuff we want to implement

- Beep corresponding to a press
- Every press should have a beep
- Different actions have different sounds

- Device works Ideally with a stove but would be interesting to use it with other appliances
- Control by voice, control remotely, control using the screen
- For home use mostly

- Weight specs don't really matter
- Easily cleanable
- Water proof
- Durable

Client Needs (translated and prioritized):

#	Quote	Need	Importance 1(least)-5(most)
1	"I like when there is a beep corresponding to a marker"	Each input has a corresponding sound or audio signal confirmation.	4
2	"If it was in the kitchen, if it was messy you could wipe it off"	Device is easy to clean.	2
3	"It was not activated by pressure but by the heat of the hand. When moving over the screen, it would activate other stuff"	The product is easy to navigate and involuntary contact will not trigger unwanted functionalities.	5
4	"Even with pressure, it puts you in a menu, and you don't know what's on the screen"	Structure and procedure to set up is chronological without a menu page.	3
5	"You have to get someone to help you label it, you can't use it until someone helps you put buttons/dots on for you"	The device can be set up independently.	1
6	"You were using some device you would know it would be around food and water"	The device can operate around water/heat/food spills.	2
7	"I had to do a video call to get things working properly"	The device can be used independently.	5
8	"Interesting to have this apply to other things"	The device is usable for a wide variety of appliances.	1
9	"You lose dots sometimes, sometimes moisture and heat makes locator fall off"	The device and related components will be durable and resilient to repeated contact and wear from time.	4
10	"When moved over to start, it would activate other stuff"	Options for different appliance features are independently activated.	5

Problem Statement:

A need exists for a device that operates an appliance with a heat-based touch screen interface. The device is engaged without looking at it, is durable, usable under kitchen conditions and has audio feedback to aid the visually impaired.

Metrics and Target Specifications:

Below we have outlined metrics derived from the client needs we previously specified. Each of these vary in importance; however, at this stage we feel it is important to outline all possible metrics across different solution sets to not limit ourselves.

We have decided for now to focus on stoves specifically as this is the example the client gave us. However if this product was eventually applied to other kitchen appliances (microwaves etc.), the device would have to change and other metrics may be included. Another constraint may be noise level in the area that the appliance would be operated, as this would affect if the device can have effective and efficient audio signals in addition to possible braille markings.

Functional, Non functional or Constraint	Metric Description	Unit	Marginal	Ideal	Comments
Non functional	Cleaning time (our product)	Time (s)	<120 s	<20 s	20s is ideal since the device is likely to be small and should not take too long.
Functional	Usability A): Time to locate an element of the interface	Time (s)	<120 s	<30 s	Time to locate an element is important to ensuring that the device is efficient to use.
Functional	Usability B): % of total usable stove functions while visually impaired	% of total functions	>60%*	=100%	* Ensure all necessary functions at minimum are usable without sight.
Functional	Usability C): Error rate of accidental triggers	% of accidental triggers per task	<30%	<5%	The error rate measures how likely another function can be accidentally triggered during use. It is important to keep this figure low to ensure the product is not difficult or annoying to use. This value will be calculated by running tests and counting how many accidental triggers occur.
Functional	Usability D): required	# of visual elements	<10 elements	=0 elements	Ideally, there would be no

	visual-based tasks for first time setup				visual aspect to the device as this would prove useless for a person who is blind (our primary audience).
Constraint	Setup time	Time (min)	< 10 min	< 2 min	The device should not be overly complex to set up in case it must be applied and removed frequently.
Constraint	Surface area	Dots/Area (mm ²)	>5,000 mm ²	>10,000 mm ²	This metric applies to solutions specifically involving braille and how the amount of space required to place accessible braille notes.
Constraint	Mass	Mass (g)	<200g	<100g	If the device must be handheld or portable, it cannot be excessively heavy or awkward to hold.
Constraint	Lifespan of device	Time (years)	>7 years	>12 years	The device should last a similar lifespan to a stove (so they can be replaced together). This can be important as different stove models may vary is the available

					application space.
Non functional	Resistance to spills	Waterproof rating (mm of depth)	>10mm	> 30mm	Stoves are primarily used in the kitchen which means the device may come into contact with food/water and should still operate normally. The test for this is a depth test in water.
Constraint	Functional Temperature	Celcius (°C)	<70°	<100°	For the classic case of boiling water on the stove, the device should it be close to the element would need to remain operational.
Non functional	Comfort (how it looks, how it feels)	N/A, subjective	N/A	N/A	The are no units to measure comfort however feedback from the client will be the main evaluator.
Constraint	Price	Cost (\$)	<=50\$	<=20\$	Our project allows a price of 50 dollars at the most so anything less than that would be good.

	Needs	Sound per function	Ease of cleaning	Not trigger unwanted functions	Structure and procedure without menu	Setup on own	Operate around kitchen	Use independently	Wide amount of appliances	Locating texture will not fall off	Options for different features independently activated
Metrics											
Cleaning time			x				x				
Usability A)				x	x						
Usability B)		x									x
Usability C)				x							
Usability D)								x			
Setup Time						x					
Surface Area						x			x		
Mass						x			x		
Lifespan of device										x	
Resistance to spills			x				x			x	
Functional Temperature							x		x		
Comfort								x			
Price											

Needs Addressed by Each Metric:

Cleaning Time:

- The cleaning time is as low as possible, so that the client's need of being able to easily maintain the product is fulfilled.
- This also caters directly to the client's need of the device being easy to clean, as a kitchen environment presents the risk of water/food contact frequently.

Usability (A):

- We also want to record how quick and easy it is to locate an element on the screen to cater to the client's need of making the product as easy to navigate as possible, given their visual impairment. Efficiency of use is important as cooking (on a stove) is a daily task.
- Making an element easy to find would also reduce the chances of other functions being triggered by accident, which was a problem the client specifically mentioned they had.

- This also caters to the need of the client wanting to be able to use the product without outside assistance, and making elements easy to locate would ensure that is possible.

Usability (B):

- We also want to record the amount of functions that are easily accessible, so that we can provide the client with as many functionalities as possible while keeping navigation at a low complexity. This fits the need of having the interface structured and procedural, so that it is easy to follow.
- Making an element easily accessible also reduces the chances of other functions being triggered by accident, which was a problem the client specifically mentioned they had experienced before.
- This also caters to the need of the client wanting to be able to use the product without outside assistance, and making functions easily accessible would ensure that is possible to do independently.

Usability (C):

- We want to make sure that the percentage of accidental function activations is as low as possible due to how this would solve their main problem, which is the fact that functions are accidentally triggered due to the touch-sensitivity of the interface.
- Similar to the other usability metrics, this caters to the need of the client being able to use the product without outside assistance and having the interface structured so that there is no confusion and the device is easy to learn.

Usability (D):

- We want to measure the amount of help the user would need in setting up the product as this would address the client's need of being able to set up the product on their own. This is important because outside help may not always be available.
- This also directly relates to the client's need for independence during set up and use of the device.

Setup Time:

- We want to ensure the setup time is as low as possible, as this would also address the client's need of being able to set up the product on their own.

Surface Area:

- We want to ensure that the device is an optimal size, neither too big nor too small. This will affect the client's experience while using the device. This may also depend on the appliance in question.

Mass:

- We want to ensure the device has a reasonable mass, since this will make it easier for the person who is setting up the device.
- Furthermore, the device must be easy to use and efficient, thus a clunky or awkward set up would not be suitable.

Lifespan of Device:

- We want to ensure that the device lasts as long as possible as this ties directly into the price metric in that we want to make the product as affordable as possible, and buying a replacement every few months does not satisfy the need of the client.

Resistance To Spills:

- We want to ensure that the product is resistant to spills, given that it will be used in the kitchen, which means it will likely be in contact with food and water. This will satisfy the clients need of making the product durable.
- Having the product be resistant to spills also implies water can be used to easily clean it.

Functional Temperature:

- We want to ensure that the product will be able to function in higher temperatures. This is due to how, as mentioned before, the product will be used in an area of cooking. This will also satisfy the clients need of making the product durable.

Comfort:




- This metric is fairly subjective, but it is so that we can ensure that the client will feel comfortable with the product in terms of usage, how it feels, how it sounds, etc. This would all cater to the client's need of the product being easy to use.
- To evaluate this metric, feedback and testing with the client is needed.

Price:

- The main goal of the product is that it is easy to use as it will play an integral part in the day-to-day life of the user. So, we need to ensure that the product meets the users need of being easy to use, while also being affordable.

Technical Benchmarking Results:

Product	Specifications	Comments/Concerns
Sticker Rubber Bump Dots	Bump Dimensions: 6mm x 2mm Material: Usually Rubber Can Stick to: Glass, wood,	- Common Complaint - Dots do not always stick or wear off certain surfaces.

	<p>metal, ceramic, etc Price: \$5-\$25 per small set of 100</p>	<ul style="list-style-type: none"> - Does not work with touch screens that are heat based
<p>Handheld Braille Labeler Label Maker</p> 	<p>Bump Dimensions : Braille Standard - 0.48 mm radius Material: plastic Can Stick to: Site claims most surfaces Price: \$10-\$30</p>	<ul style="list-style-type: none"> - Common Complaint - hard to work with, loading tape is slow, hard for sighted people to use for a blind person
<p>Slide Rule</p>	<p>Program: Objective-C program Devices: Runs on Apple iPhone or iPod Touch Price: N/A</p>	<ul style="list-style-type: none"> - This device currently only runs on Apple devices
<p>Screen reader app</p>	<p>Varies between phone devices</p>	<ul style="list-style-type: none"> - Client stated that it does not always work well
<p>Watvision</p> 	<p>Varies between devices used to present the options.</p>	<ul style="list-style-type: none"> - Relies on a larger set up (involving glove, ring and smartphone camera) - Relies on a quieter workspace to ensure the relayed voice overs can be heard

User Benchmarking Results:

This category would typically be evaluated by our own personal experiences. However this is slightly problematic as none of us have a severe vision impairment which impacts our

efficiency to use a touch screen effectively. Therefore, it is hard to relate to troubles caused by this situation.

Reflection and Conclusion:

Overall, this project took a different turn than we were expecting, as we had thought that the client would need help in using certain aspects of a smartphone or similar devices. Instead, the problem was centered more around home appliances and how products are leaning towards heat-sensitive touchpads.

We had gotten all of the information we were looking for, such as examples of when the problem has occurred, solutions they have already tried, any specific features they require, etc. This means that we have a much clearer idea of the kind of product and solution we want to deliver to the client, which allows us to move forward with the project.

Also, we will have to adapt the way we want to present our ideas and the product to the client for future meetings as they have informed us that they are completely blind. This means that we will need to be creative when presenting any of our work for feedback, especially considering that we will not be able to meet in person. This would mean that we cannot receive feedback on its usability from the client either, which hinders our ability to improve the product considering that we cannot adequately judge the usefulness of the product given that it is not designed for us as its target audience.