Deliverable C: Design Criteria and Target Specifications

Introduction

After establishing all user needs, organizing them in terms of importance, and formulating a problem statement, it is necessary to set up specific design criteria based on these needs, and to determine target specifications for our product, following the data acquired through technical benchmarking. The goal of this report is to document the aforementioned tasks.

Design criteria

Translating needs into design criteria

Number	Need	Design Criteria
1	The system can detect a child/pet in the car	Movement detection
2	The system can detect the temperature and carbon monoxide levels in the car	Temperature detection, Gas detection
3	The system can communicate with the driver/caregiver and passerby	Physical communication, Digital communication
4	The system is compatible with all car/bus models	Car compatibility, Volume (mm^3)
5	The system can work in extreme conditions	Durability
6	The system does not distress the child or animal	Amount of sound heard inside the car
7	The communication system can accommodate all users	Smartphone OS compatibility, Ease of use
8	Easily installable	Ease of installation
9	Low cost	Cost (CAD)
10	Offers optional customizable features	Ease of use, Aesthetics

Benchmarking

Below are listed products which partially or almost completely meet our client's needs:

- Elepho eClip Car Seat Alarm: https://elepho.com/products/eclip-baby-reminder-for-your-car
- Steelmate Baby Car Seat Reminder: https://steelmategroup.com/products/steelmate-smbsa1u
- Itomoro Baby Car Mirror: https://www.amazon.ca/Itomoro-Mirror-Crystal-Baby-Easily-Observe/dp/B07VFWLRLS

Rescue System Specifications	Importance (5 › 1)	eClip Car Seat Alarm	Baby Car Seat Reminder	Baby Car Mirror
Company		Elepho	Steelmate	Itomoro
Cost	3	USD 49.95 (approx. CAD 62.68)	USD 37.99 (approx. CAD 47.67)	CAD 53.99
Extreme temperature resistance	4	N/A	N/A	N/A
Volume	1	717cm^3	314cm^3& 0.98cm^3	2980cm^3
Alarm system	5	Yes	Yes	No
Alarm activation distance (if applicable)	2	25 ft	In the car	N/A
Digital communication system	5	App	Warning flash and beeping sound	Screen display
Detection system hardware	5	Temperature sensor and alarm activation distance sensor	Pressure sensor pad and belt detachment sensor	Camera
Power source	4	Lithium Battery	Cigarette Lighter	Cigarette Lighter
Location inside the car	1	Seat Belt mount	Cigarette Lighter and Seat	Dashboard

Installation difficulty	3	Easy	Easy	Moderate
Weight	1	190g	130g	599g
Total		**86**	**79**	**44**

Legend: Green = 3 pts Yellow = 2 pts Red = 1 pt

Target Specifications

	Design Specifications	**Relation**	**Value**	**Units**	**Verification method**
	Functional Requirements				
1	Detect a child or pet's movement inside a car	=	yes	N/A	Test
2	Detect temperature and gas levels inside a car	=	yes	N/A	Test
3	Physical communication	=	yes	N/A	Test
4	Digital communication	=	yes	N/A	Test
5	Car compatibility	=	All cars	N/A	Research, test
6	Smartphone OS compatibility	=	All phones	N/A	Test
7	Child/pet friendliness (non-distressing)	=	yes	N/A	Test
	Constraints				
8	Cost	<	47.67	CAD	Materials List
9	Operation in extreme environmental conditions	=	-40 to 60	°C	Test
10	Size	<	0.1	m^3	CAD parameters
11	Detection area: inside the car	=	yes	N/A	Test

12	Objects detected (children and pets only)	=	yes	N/A	Test
13	Weight	<	1.00	kg	CAD parameters
14	Distance until activation (User to vehicle)	=	5	m	Test
	Non-Functional Requirements				
15	Material reliability	=	yes	N/A	Test
16	Product life	>	3	years	Test
17	Aesthetics	=	yes	N/A	CAD parameters
18	UV resistance	=	yes	N/A	Test

Reflection

The client meeting was crucial in the development of our design, as the goal was to empathize with the client and design a product that meets their specifications and requirements. In terms of product appearance, weight and size, the client showed strong flexibility, provided that the main needs were met. Thus, in the list of related specifications we developed to benchmark our product, these were attributed the least importance, valued at 1. However, it will be important to verify with the client whether this flexibility changes in the future. The client also expressed during the meeting that the product's main purpose is to save lives, and he even gave statistics on the number of hot-car deaths in Dubai and around the world. Therefore, our specifications were chosen with the primary goal of saving the child/pet in the car; they include extreme temperature resistance and power source, both attributed an importance of 4. Adding this first specification to our product will ensure that the device can work in tougher conditions, in other words do its job in different environments to save a child/pet. Additionally, using the most common in-car power source for the system would allow optimal compatibility for our product with user vehicles. The most important specifications include movement, temperature and gas detection, an alarm system, detection system hardware, a physical communication system, including but not limited to sound and visual alerts, and a digital communication system. All these factors will contribute to fulfilling the client's request. Most of these have been given an importance of 5 to meet the client's need of

priority, being to bring immediate attention to the child/pet. Nonetheless, cost could potentially influence how many of these specifications are added to the product and how they are implemented, meaning we will have to check-in with the client about this subject during the next development phases. More specifically, the client wanted a product that can be available worldwide. The cost was given an importance of 3 in our design criteria to ensure the product is affordable to people of different incomes across the world. Therefore, we are seeking the best quality-price option for our product components. In terms of availability, our product's criteria also include compatibility with all cars and cellular devices to ensure it's available to most people across the world. The client also stated in the client meeting that he would like a product that is user friendly. In our design criteria, the importance given to the installation difficulty was 3 (moderate) to ensure that users can install the device without much trouble to enhance user experience as desired by the client. The remaining product specifications include material reliability, product life (3 years), aesthetics and UV resistance. These are not essential, but they may also enhance the user experience. The client's feedback and/or our evaluation of component costs may compel us to abandon such specifications.

Finally, as we move on to creating design concepts, new requirements/criteria/specifications may be added if the client expresses relevant new unheard-of insights during our future interactions.

Conclusion

The focus in this deliverable was to analyse the needs of the client and connect each of them to design criteria. These criteria were categorized into functional and non-functional requirements and constraints inferred from the client's needs. Using these three types of design specifications, we were then able to benchmark various similar products, enabling us to be better oriented in terms of the standards and quality our product needed to meet. Comparing the three chosen competing products—the Elepho eClip Car Seat Alarm, Steelmate Baby Car Seat Reminder and Itomoro Baby Car Mirror—would allow us to have a better idea of the strengths/flaws and average cost of such products presently on the market, enabling us to have the most optimal design and features for our product. Globally, following the steps mentioned above led to a clearer definition of the norms we should follow, what we have to do, and how we can execute the project while respecting the outlined constraints. We can now move on to brainstorming and creating various design concepts.