Project Deliverable C

Design Criteria and Target Specifications

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1. Introduction

Many lives are lost every year due to children being locked in the back of cars. This is a problem that our team plans on solving; by implementing a device that can detect when a child is locked in a car, a distress signal could be sent to the parent or guardian, or nearby people that are willing to help. In our product, we plan to create an affordable child detection and notification system that is robust and can easily be installed in any vehicle. We researched some products in the market and benchmarked them to determine what functions would be the most important. And lastly, we will decide what features are necessary and add extra features that would enhance the user experience.

2. Translating Needs into Design Criteria

After the first client meeting, six main interpreted needs were listed. For each need, we have defined specific design criteria, which can be applied to more than one needs. *Table 1* shows the needs from the most important to the least, along with their design criteria. Since the child/pet detection and notification system are of the utmost importance, we have carefully chosen the design criteria which involves motion, CO2 and temperature monitoring systems. While ensuring compatibility and universality as design priorities, we have also included aesthetics, two-way audio system and speaker as design criteria to entertain and calm children.

Table 1: Client Needs and Their Design Criteria

#	Need	Design Criteria
1	Child detection and Notification system	Alerting system (push notification), Motion detection, CO2 detection, Temperature monitoring
2	Compatibility with any vehicle	WIFI or Bluetooth system, width and length, backup battery, weight
3	Easy to install without engineering background	Quick set-up time
4	Durability of material in extreme weather conditions	Type of material, stability, operating conditions, product life
5	Reasonable sale cost	Cost
6	Entertain and calm children	Aesthetics, two-way audio system, Speaker

3. Benchmarking

3.1. Researching Existing Products

This step is searching helpful products as references (Benchmarking) and list the specifications of each for better progress.

Table 2 : Metrics and BenchMarking Properties

Device / Specifications	Laxihub M1	KINGMELL BABI	Rbicor	Elepho Eclip
Company	LAXIHUB	Kingmell	Rbicor	Elepho
Alerting system (push notification)	Yes	Yes	Yes	Yes
Motion detection	Yes	Yes	Yes	No
Wifi/bluetooth	Yes (limited)	Yes	Yes	Yes
CO2 detection	No	No	No	No
Temp. Monitoring	No	No	No	Yes
Size	9 x 16 x 9 cm	23.9 * 21 * 2.1 cm	18* 10*10 cm	6.53 x 3.81 x 1.27 cm
Weight	80 grams	187.1 gram	400 grams	190 grams
Cost	$39,98	$59.99	58.99	$49.99
Type of material	Plastic	Wetsuit material	Plastic	Hard plastic
Set-up time	<5min	< 5 min	<5 min	<5min
Backup battery	No	Yes	No	No
Product life	>5 years	2 years	3 years	Depends on battery
Two-way audio system	Yes	Yes	Yes	No
Aesthetics	White	Black or Grey	Black	Silver

3.2 Product Score

This step is marking each specification we found (3 to 1), and calculating the total mark to find the best product as reference of our own design.

Table 3 : Comparison of Importance Given by each Plug-in

Device / Specifications	Importance/ Weight	Laxihub M1	KINGMELL BABI	Rbicor	Elepho eClip
Company		LAXIHUB	Kingmell	Rbicor	Elepho
Alerting system (push notification)	5	2	3	3	3
Motion detection	4	2	2	2	0
Wifi/bluetooth	4	1	2	3	3
CO2 detection	4	0	0	0	0
Temp. monitor	4	0	0	0	3
Size	2	3	1	2	2
Weight	3	3	1	1	3
Cost	2	3	2	2	3
Type of material	2	1	3	2	2
Set-up time	3	3	3	3	3
Backup battery	2	0	3	0	0
Product life	2	1	2	2	2
Speaker	2	2	0	2	0
Aesthetics	1	2	2	2	2
Total points		60	67	69	77

4. Product Specifications

After our processing of Design Criteria and Benchmarking. We summarized our estimation of each Design specification based on Functional Requirements, Constraints, and Non-Functional Requirements.

Table 4 : Design Specifications

#	Design specifications	Relation	Value	Unit	Verification Method
Functional Requirements					
1	Alert system	=	Yes	NA	Test
2	Motion detection	=	Yes	NA	Test
3	Mobile connectivity	=	Yes	NA	Test
4	CO2 detection	=	400-10000	ppm	Test
5	Temperature monitoring	=	400 - 10000	ppm	Test
Constraints					
6	Cost	≤	50	$	Analyze
7	Weight	≤	1500	gm	Estimate
8	Length	≤	30	cm	Estimate
9	Width	≤	20	cm	Estimate
10	Operating Conditions (Temperature)	=	-40 to 60	℃	Test
Non-Functional Requirements					
11	Quick Installation Time	>	5	minutes	Test
12	Durability	=	Yes	N/A	Test
13	Aesthetics	=	Yes	N/A	Test
14	Product life	>	5	years	Test
15	Speaker/Audio system	=	Yes	N/A	Test

The client was very open and helpful in providing and discussing with us their needs which in return made it easier to navigate through this serious matter. An alarm system was developed which relies heavily on a motion and CO2 detectors, since the motion detector won't be able to detect the temperature nor the CO2 level in the car. The two-way audio system will be helpful in calming the children and being able to monitor him closely while interacting with them.

The main purpose of this device is to notify drivers as soon as possible and keep the child or pet safe as much as you can. Design Criteria well-organized problems and issues in different aspects. Benchmarking marks all opinions and helps the designer to find the highest score solution. CO2 detection detects the temperature and CO2 concentration inside the car. The Alert system sends a message to the driver or other emergency contacts since danger happens. Therefore, the invention of a life-saver device with quick set-up time and easy understanding is important.

5. Conclusion

Out of 4 different products, we learned that all of them have a mobile alert system with wifi or bluetooth, and 3 have motion detection. With this in mind, our product specification has these required features as well as other complementary features, including ease of use, durability, and a child entertainment system for a more sound end-product. Our team aspires to deliver the best possible experience for the end user, and hopefully, this will save the lives of many forgotten children.

References

“Elepho Clip 3”. Baby car seat alarm,

https://elepho.com/products/eclip-baby-reminder-for-your-car

“Laxihub.” *M1 Indoor Mini Wi-Fi Camera*,

https://www.laxihub.com/products/laxihub-m1-indoor-wi-fi-camera.

“Rbicor.” Motion detector,

Indoor Security Cameras Rbcior 1080P Smart Home Camera, Night Vision Two-Way Audio IP Camera Baby Monitor with App for Elder Nanny Dog Cat, 2.4GHz Wifi Camera Compatible with Alexa : Amazon.ca: Electronics

“SCD30”. CO2 and Temperature detector,

CO_2 Humidity and Temperature Sensor - SCD30 - SEN-15112 - SparkFun Electronics