Design Criteria and Target Specifications

In this deliverable, we will define a list of prioritized design criteria, include a compilation of research on similar products that exist on the market, provide a list of technical benchmarks and determine the target specifications for these similar products. The information that was compiled during the research process for this deliverable will be vital during the design process for our project.

Translating the Client's needs into a list of prioritized design criteria:

Priority	Need	Design Criteria
1	The product can sense the presence of a child or animal in the car	Sensors - Motion? - Heat? - Noise? - CO2? - Heart?
2	The product can sense when the car is turned off/ when driver leaves	Electric circuit? Connected to car system?
3	The product should be compatible with all car models	- Dimensions of backseats in car models (in^3) - Weight capacity of backseats (lbs)
4	The product should be easy to use	- Simple design - Not too much technology for the parents who aren't as tech savvy
5	The product should be low cost	- Cost of designing($) - Cost of product on the market($) - Average income for families with children ($)
6	The product should be compatible with hot temperatures	- Avg. & Max. temperatures in the UAE (℃)

a. Functional requirements
    i. Sense a child or animal in a car through heat-sensing
    ii. Sense when car is turned off/ when driver leaves

b. Non-functional requirements
    i. Product life
    ii. Reliability
    iii. Aesthetics
    iv. Easy to clean
c. Constraints (and metrics, where appropriate).
    i. Cost ($): We want this product to be accessible to the masses so a low cost will ensure that families of all income levels will be able to afford this product
    ii. Size when installed (m^3)
    iii. Operating conditions (temperature °C)
    iv. Weight (lbs)

Benchmarking:

Specifications below:	**SensorSafe**	**Waze app**	**Driver's Little Helper Sensor System**
company	Cybex	KidsAndCars.org	Driver's Little Helper
cost	$88.00	Free	$79.99
form	Clip on car seat & app	App	Sensor under car seat & app
Additional needs	Cellphone, Cybex car seat	Cell phone	Cellphone, Bunny's convertible car seat or Baby Sister's infant car seat
Compatibility with cars	2008 or newer with an OBD2 port	Any vehicles	Any vehicles
Sense when driver leaves	No	Yes	No
Sense presence of child/animal	Turned on manually	No	Yes
size	1 x 4 inches	none (only on app)	8 x 6.5 x 1.5 inches
Where alerts are sent	Parents' phone only	Parents' phone only	Up to 3 cell phones
When alerts are sent	Temp. reaches 35°C or 7°C	Sends notification to check backseat when trip has ended	Temperature reaches programmed levels, child is left in vehicle for 5 mins, child leaves carseat

*Information from this table was taken from various sources [1] [2] [3].

Specifications	Weight	**SensorSafe**	**Waze app**	**Driver's Little Helper Sensor System**
Company		Cybex	KidsAndCars.org	Driver's Little Helper
Cost	4	1	3	2
Form	1	2	1	2
Additional needs	3	1	2	1
Compatibility with cars	5	1	3	3
Sense when driver leaves	5	1	3	1
Sense presence of child/animal	5	2	1	3
Size	3	3	1	3
Where alerts are sent	3	1	1	2
When alerts are sent	4	2	1	3
Total Points		49	64	75

Findings

The Driver's Little Sensor System is the best option out of the 3 options we researched because it scored the highest value in total points. From the tables and analysis we used to summarize our benchmarking information, we can determine the products that the users reacted the most well to. We can also identify the existing product that meets our design criteria the best and use it as inspiration for our own design as well as identify the factors that gave the other existing products a lower score to ensure that we improve on them.

User perceptions: user reviews of these products

The “child reminder” feature on the Waze app has, overall, fairly poor reviews from users. Firstly, the app requires a lot of data, which renders it useless in areas with no service [4]. Moreover, this feature can simply be turned off on the app, and only sends a single reminder notification to the owner’s phone; these could easily be missed. Our client would like a design which is persistent, and prioritizes the child/animal’s safety. This app is not strong enough to fill these needs.

Next, the Cybex sensorsafe clip receives mostly positive reviews from users [5]. The clip’s sensors are accurate, and the notifications are louder than the Waze app. However, this technology is less accessible to lower-income families, as it requires cybex’s expensive car seats to go with it. The price is a barrier for some families. Our client needs our design to be accessible for everyone around the world, so the price of this current technology is too high.

Finally, the Driver’s Little Helper System has very mixed reviews from users. Some report that the weight and movement sensors are unreliable [6]. Users write that they like the idea behind the product, however it is too inconsistent to use [6]. Our client requires dependability in our design, thus issues with quality such as this are unacceptable in our product.

Car Seat Specifications:

Vehicle Specifications:

-Weight range for the car seat: 20-80 pounds.

-The dimensions of a car seat ranges between: 17-21 inches width wise and 53-57 inches in height. (This standard size of a car seat can fit kids from infants to 12 year olds).

Vehicle Specifications:

-Length range: 160-200 inches Height range :60-70 inches width range: 67-75 inches

- Average speed of cars: 30Km/h.

-Maximum temperature reached: 49℃

-It takes between 10 - 30 minutes for the AC to cool down a car.

- The range of a motion sensor is about 960 inches . It's accuracy is about ±0.05%

-Carbon monoxide sensors can detect as low as 50ppm level of CO (level of carbon monoxide that can be deadly for humans 170-200 ppm, for children it is approximately half of what adults can handle about 90 ppm).

-Percentage accuracy for a weight sensor (load sensor) is 0.03%.

Mentioned above are measurements that are important to be taken into consideration when creating our design.

The client meeting helped us better understand the needs of this product. We now understand that we are creating a product to be used by anyone around the world. The meeting pushed us to think outside our own communities and consider the needs of everyone in all countries.

Conclusion:

In this deliverable, we compiled a list of design criteria provided by our client based on their perceived needs and wants. We conducted some technical benchmarking as well as determined the target specifications of similar products on the market. We also listed the best and worst aspects of each product and searched through the customers' perception of each product. Finally, we researched the specifications of motor vehicle seats to aid with the design process of our final product. The information found for this deliverable will be used to direct ourselves towards creating the ideal product that will meet the client's needs and specifications.

References:

[1]https://www.cybexonlineshop.com/sensorsafe.html

[2]https://worldofbuzz.com/this-waze-feature-reminds-you-that-your-child-is-in-the-backseat/

[3]http://allaboutbabysworld.com/drivers-little-helper-car-seat-monitor-review/

[4]https://www.autotrader.ca/newsfeatures/20170227/is-waze-worthwhile/

[5]https://www.t3.com/reviews/cybex-sirona-s-i-size-car-seat-with-sensor-safe-review

[6]https://www.amazon.com/Monitor-Drivers-Little-Helper-869188000116/product-reviews/B018WLTHTI?reviewerType=all_reviews