

Ideation and Evaluation

Student Name: Aaron Lowe

Student Number: 15819199

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Tutor: Dr. Eddy Elton



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User Requirement Specification

A1. The product must help to relieve some of the psychological distress experienced by the parents when they are separated from their baby.

The main theme that kept coming up in the secondary and primary research was how this psychological stress was in some cases crippling (see pages 6-8, or 3.1-3.10 in the appendix), it affects some people worse than others, but it seems like most parents feel this stress in some form or another and it can creep into their minds and negatively affect their work and sleep at any time.

A2. The product must allow parents to remotely check their baby's vital information within 5 seconds.

During the primary research it became clear that the most effective way of quelling the parents anxiety was to give them reassurance that their child is alright, by allowing them to check quickly they can make sure the baby is ok whenever they start to feel anxious, this should help with the parents fear of not knowing their baby is healthy and fine. It also helps to keep the baby safe and prevent serious injuries because the parent will be able to see if something is happening that could be a sign of danger.

A3. The product must be able to alert the parents if something is wrong even when they aren't monitoring their babies, for example when they are asleep or at work.

All the participants in the study made it clear that one of things that causes the most stress is that something might happen while they are asleep/ are not around (see page 6, or 3.1-3.10 in the appendix). Injuries are bound to happen as babies get themselves into trouble regularly, however if the parent is alerted when something is happening/ happened they can give the baby the help required as soon as possible preventing serious injuries.

A4. The product must alert the parents if their child stops breathing for 10 seconds or more.

A massive risk to babies is suffocation and choking, and the number one thing all the parents were worried about most was if their baby suffocates while they are asleep, on average a baby cannot breathe for up to 6 minutes before they are classed as medically brain dead, so after 10 seconds they will have ample time to get to their child and perform the necessary actions if required. This is one of the biggest concerns with current baby monitors (see page 7, or 3.1- 3.10 of the appendix), that it does not tell the parents if the baby is suffering in silence. Having this feature will not only minimise the number of children that sustain serious injury due to choking and suffocating but it will also help unburden the parents mind because they will know that they will be alerted and will have enough time to help in most situations.

A5. The product must relay live and accurate data of at least one of their baby's vital statistics to the parent within 2 seconds of it happening.

It is important that the data the parents receive is as close to live time as possible, if something happens to their baby they will want to know as soon as it is happening/ happened, so they can go to help as soon as possible.

A6. The product must work 100% of the time without fail in alerting the parent's in case of an emergency.

This was one of the biggest flaws with current baby monitors, their unreliable nature due to connectivity issues and not alerting parents properly monitors (see page 7, or 3.1- 3.10 of the appendix), means parents will still constantly be on edge that the baby monitor has stopped working or they would not see if something happens, so by ensuring they will be alerted the psychological weight should be at least slightly lifted.

B1. The product should not restrict the babys movements, and they should be free from discomfort.

Some parents had not tried certain monitors such as a heart monitor simply because they thought it could cause their baby discomfort (see 3.1- 3.10 of the appendix), the product should aim to be unnoticeable to a baby.

B2. The product should be usable 24 hours a day, there should be no time the child is not being monitored.

This comes from parents concern that if at any time the baby is not being monitored that they are more susceptible to a problem occurring and the parent not getting notified in anyway.

C1. The product could store data on the baby and be personalised to their specific needs.

The primary research showed that each parent has their own specific wants and needs that will help put their mind at ease, and that some children with problems such as asthma might need the parents to be alerted sooner if they begin struggling to breathe.

Idea Generation

How Might We Statements

The first method used to help the creative process was 'How might we', considering the URS and the project ahead each member of the group came up with 3 how might we statements and as many idea statements as possible were made for each question. This was extremely useful because the idea statements generated at this stage were then used throughout the rest of the process as a reference when creating new ideas.

Brainstorming

Brainstorming was completed in a group of 4 people instead of individually, this was done in order to get a much greater range of concepts that could potentially be implemented into the design, the concepts that came from the brainstorm were very rough but at this stage that was good to show a large selection of things that could later be inspiration for an idea. At stages throughout the brainstorm the 'Yes and...' method was used to maximise the creativity of ideas, piggybacking off of another person's idea proved very useful.

The concepts that came from the how might we statements and the brainstorming session were then grouped and bundled to try and find key themes that could help the product develop in the future of the idea generating process.

Assumptions

A lot of the ideas coming from the earlier methods were very incremental and there wasn't any radical or disruptive ideas and concepts. In order to combat this, assumptions were made about the product, if the idea matched with an assumption it was removed from the pool of results that had been collected so far, and then ideas were created that didn't meet any of these assumptions in an attempt to prompt more disruptive ideas/ concepts.

6-3-5

6-3-5 was the first time the form was being considered in every idea, this method was used to generate a bunch of rough but unique ideas, this was done in silence, it allowed each member to focus on their own ideas and create without the input of other people. The process was repeated with another group, joining with the other group was fantastic because not only did it mean more ideas would be generated in the same amount of time but it allowed fresh eyes to look at the project and come up with new ideas without having heard the things already covered. Random word association was also used in order to try and get radical and disruptive ideas, one idea of the three had to be related to the word randomly generated.

Design Charrette

Still combined with the other group a design charrette was conducted, unlike the other methods used this allowed for more time to be spent on each person's ideas, after the time expired and people got moved around they were then able to build off of the other people's ideas. The initial sketching was done in silence, this allowed everyone to put down their ideas and think about each concept, then by using piggybacking the idea became more sophisticated and creative.

Using all the ideas that came from these generation methods, 107 ideas have been sketched.

Evaluation

NUF- New Usable Feasible and Negative Selection

NUF was the first method used to cut down the 100+ ideas, it gave a quick understanding of what ideas were completely impossible and those that are new and could potentially be made into even better ideas. The main issue with using NUF was that some of the ideas that got eliminated were unique disruptive ideas, so to counter this slightly negative selection was used on all the ideas. Using negative selection allowed the amount of ideas to very quickly be reduced to the best of the bunch, however some of the ideas that were removed or taken out by NUF weren't completely disregarded, and by having them in mind the concept could be adapted into the designs that went forward allowing for potential synergies between the ideas.

Idea Advocate

The group was informed about all the details of the design before they made any decisions, by trying to sell the product to them they were able to consider all the positive points and see if the idea was strong enough to be taken forward or not. Approximately 30 ideas were shown to the group and the strongest 14 were taken forward and the rest were ruled out.

PINC

PINC was chosen as the evaluation method of the final 14 ideas for a couple of reasons; having the positives and the negatives next to each other allowed for an easy evaluation of the pros and the cons to see if the positives outweigh the negatives. By looking at the; positives, negatives and the concerning allowed for many interesting ideas in the intriguing section, if something was good it was made better, and anything bad had a counter measure, it allowed for creative ideas for the next stage. Looking at the PINC for each idea, all the positives and negatives were weighed up and considering how much it could be developed 8 ideas were removed leaving the best 6.

Development

PINC/ SCAMPER

Using the PINC evaluation from the previous step, certain elements of each design was changed, the weaknesses were designed out and the strengths were made even stronger. Any interesting areas the design could go were explored and the best option was taken forward allowing the all of the designs to drastically change from the initial concept.

Development Evaluation

Pugh Matrix

A Pugh matrix was used at this stage to find the weaknesses in each of the current designs allowing the weaknesses to be designed out as much as possible in the following development stage.

Final Development

Using the Weighting Matrix to Eliminate Weaknesses and Client Meeting

The Pugh rating clearly shows parts of each design that need improving, anything that scored low was improved. The designs were shown to a stakeholder to get their first impressions on the designs, this led to small changes but they were important because it puts the designs one step further to being a viable product.

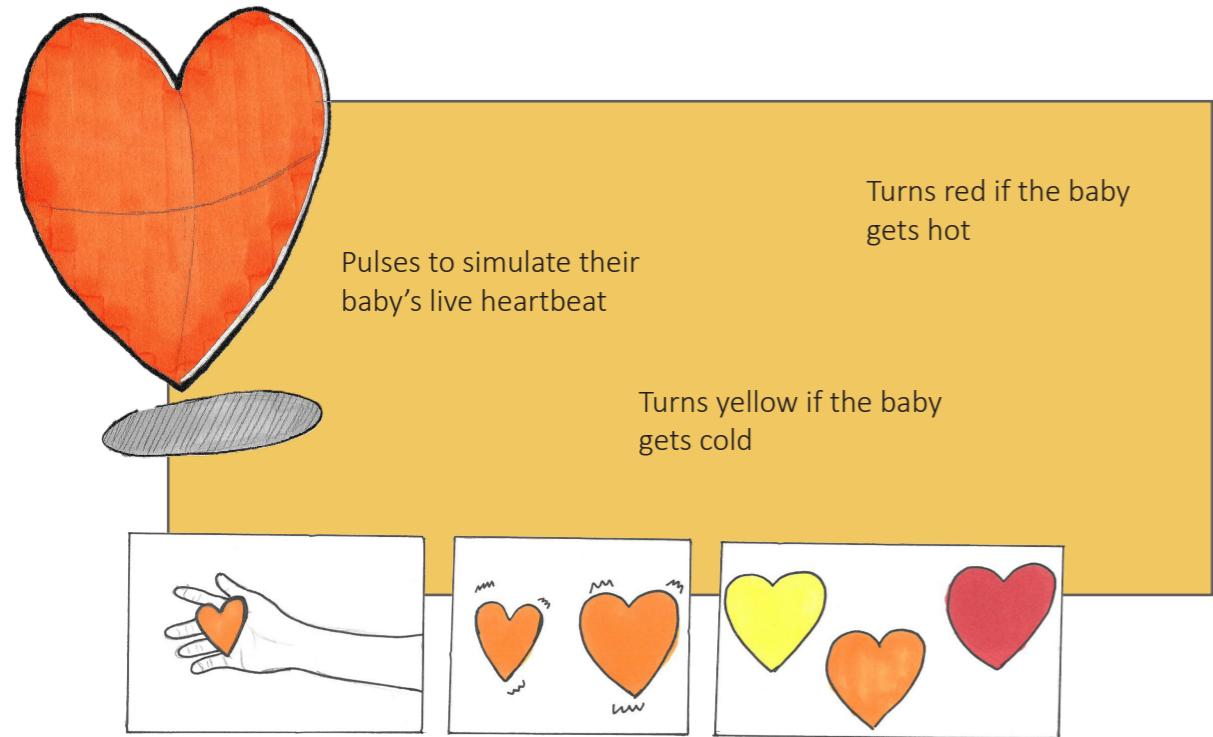
Final Evaluation

Weighted Rating Matrix

The developed ideas were finally put into a weighting matrix against the URS to see how well it meets it, by giving them each a weight- ing the designs that cover the more important points will emerge at the top of the list, this gave an in depth analysis on how well it does the things it has to do. 1 more ideas were then removed at this stage leaving the final 3 designs.

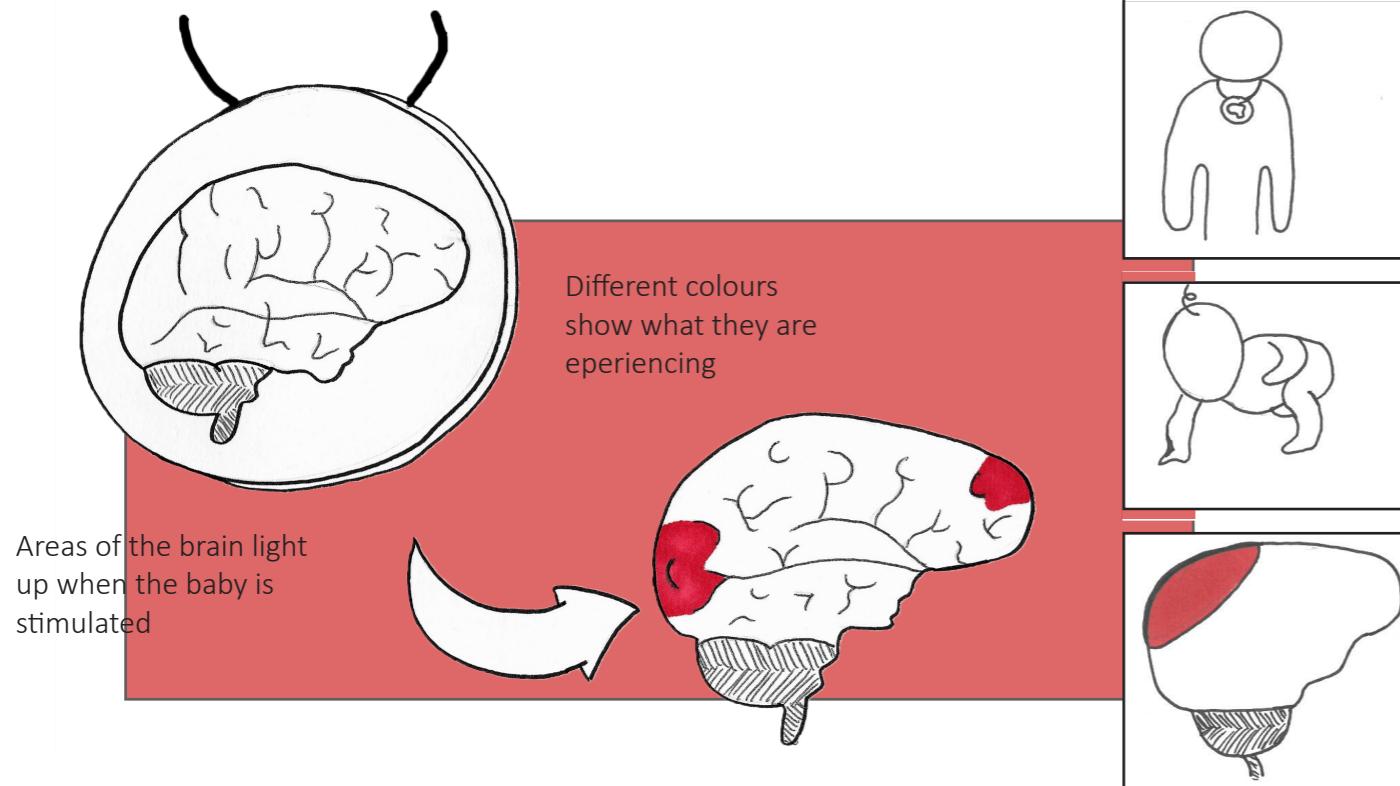
Close Hearts

This is a hand sized heart that a parent can carry at all times, it is linked to their babies vitals and beats like a real heart when the babies heart beats, it also changes colour to show if the baby is too hot or too cold. This helps put the parents mind at ease throughout the day as they can always feel connected to their baby.



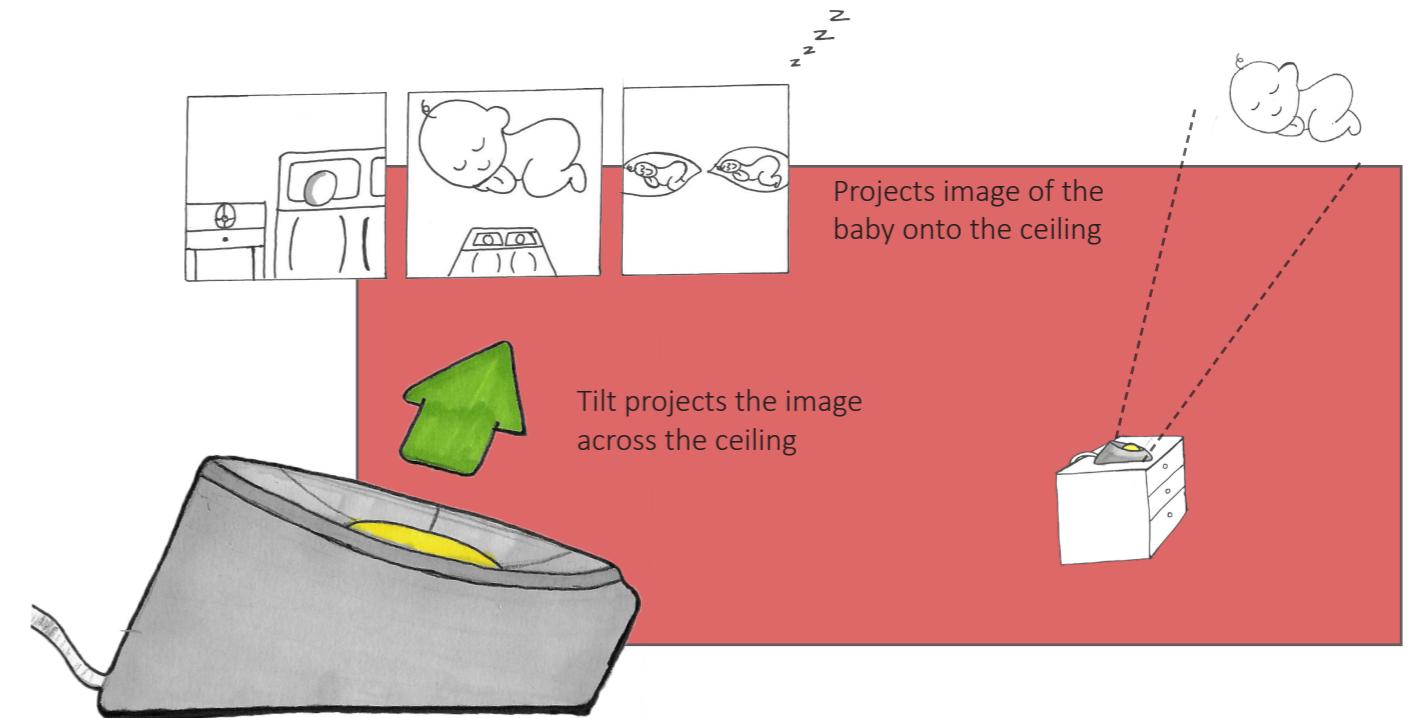
Neuron Necklace

The brain on the necklace represents the baby's brain and as the child experiences things their brain will light up showing how they are feeling, the parent could read this information to get a more detailed insight into their child's brain.



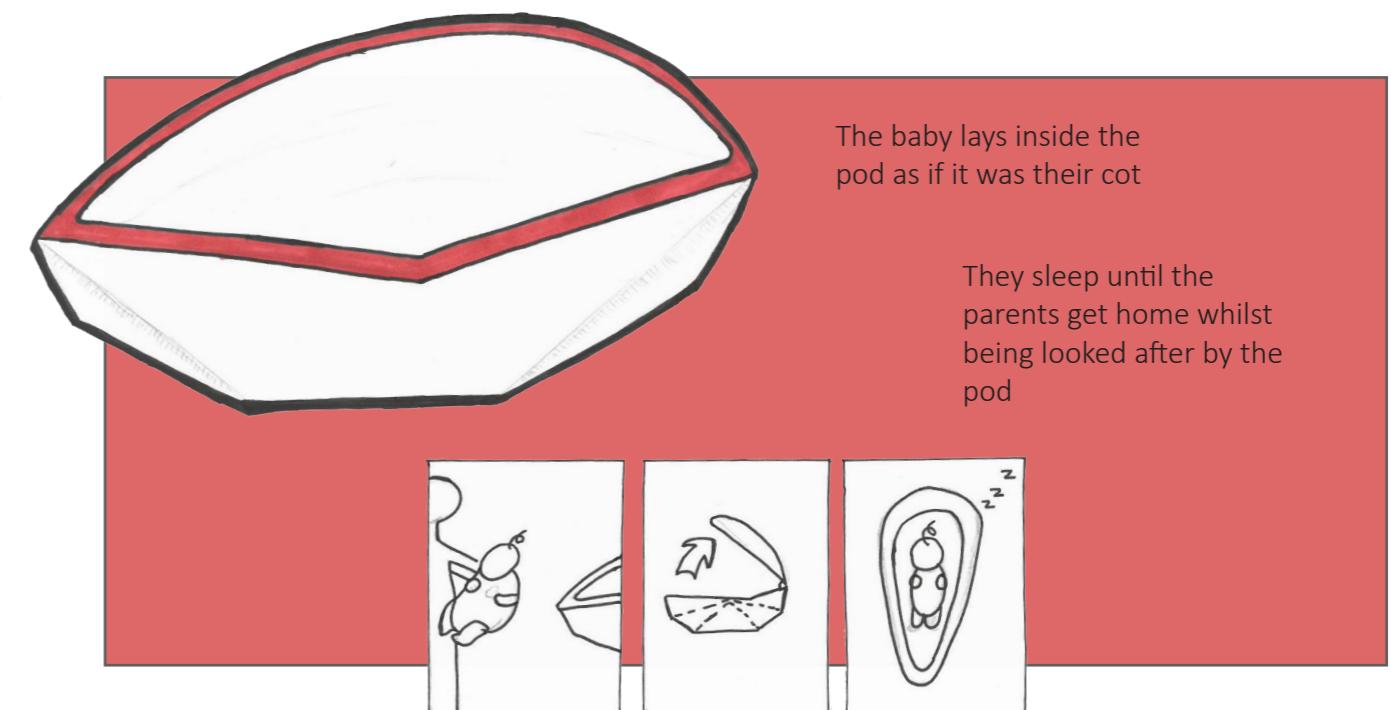
The Sleep Tight

This device goes on a bed side table next to a parent, when the parents are going to sleep they can turn this on and a live video of their baby will be projected onto the ceiling, this makes it seem like the baby is in the room with the parents and if they want to check on their child all they have to do is open their eyes, thus leading to a better, more restful night of sleep.



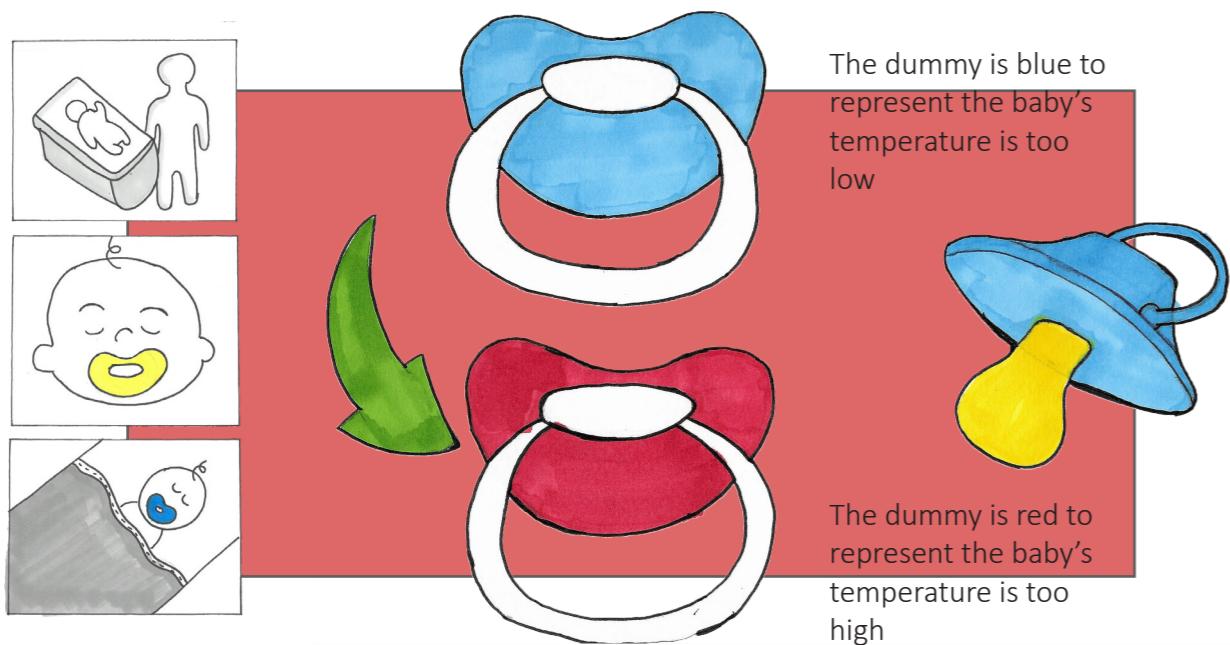
Baby Pod

The parents spend all day worrying their baby won't be looked after properly, this pod looks after the child and caters to their every need until the parent comes home and wants to take over.



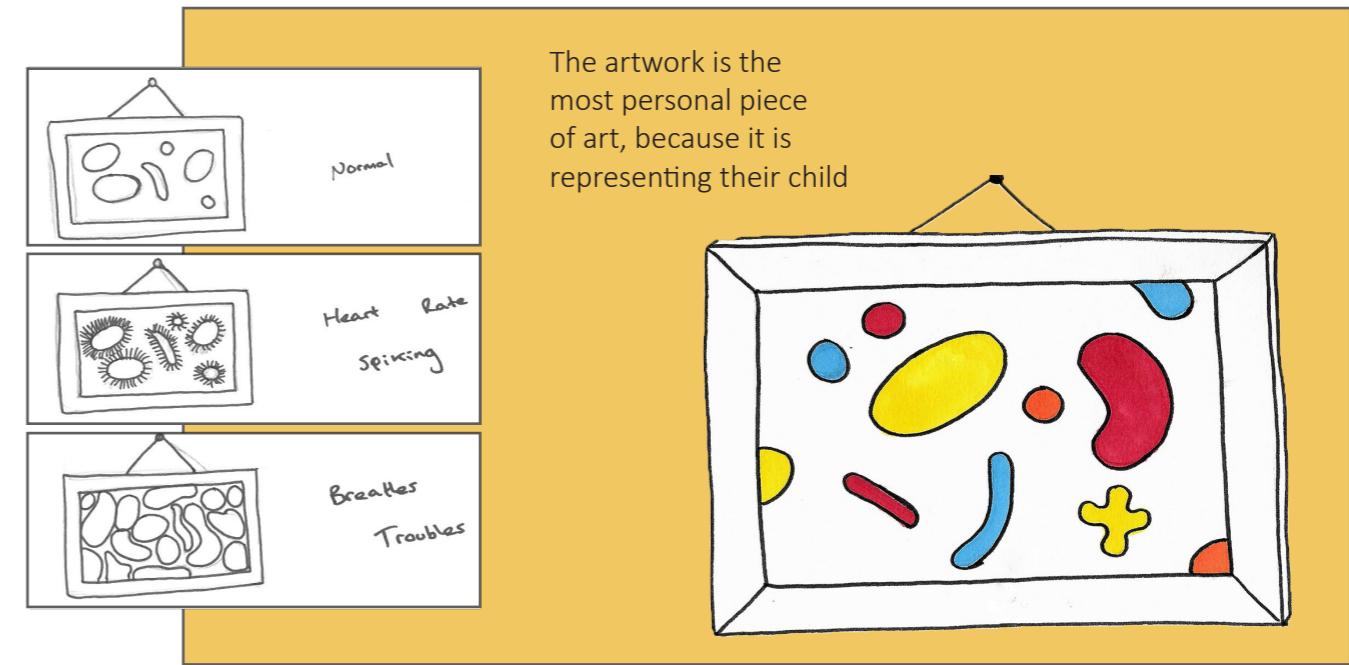
Hot 'n Cold

This dummy acts as a thermometer for the baby, while they are sucking on the dummy the dummy will change colour to show the babies temperature, if they are too cold it will turn blue and if they are too warm it will slowly turn redder, this is a subtle way to make sure the baby is in the correct environment.



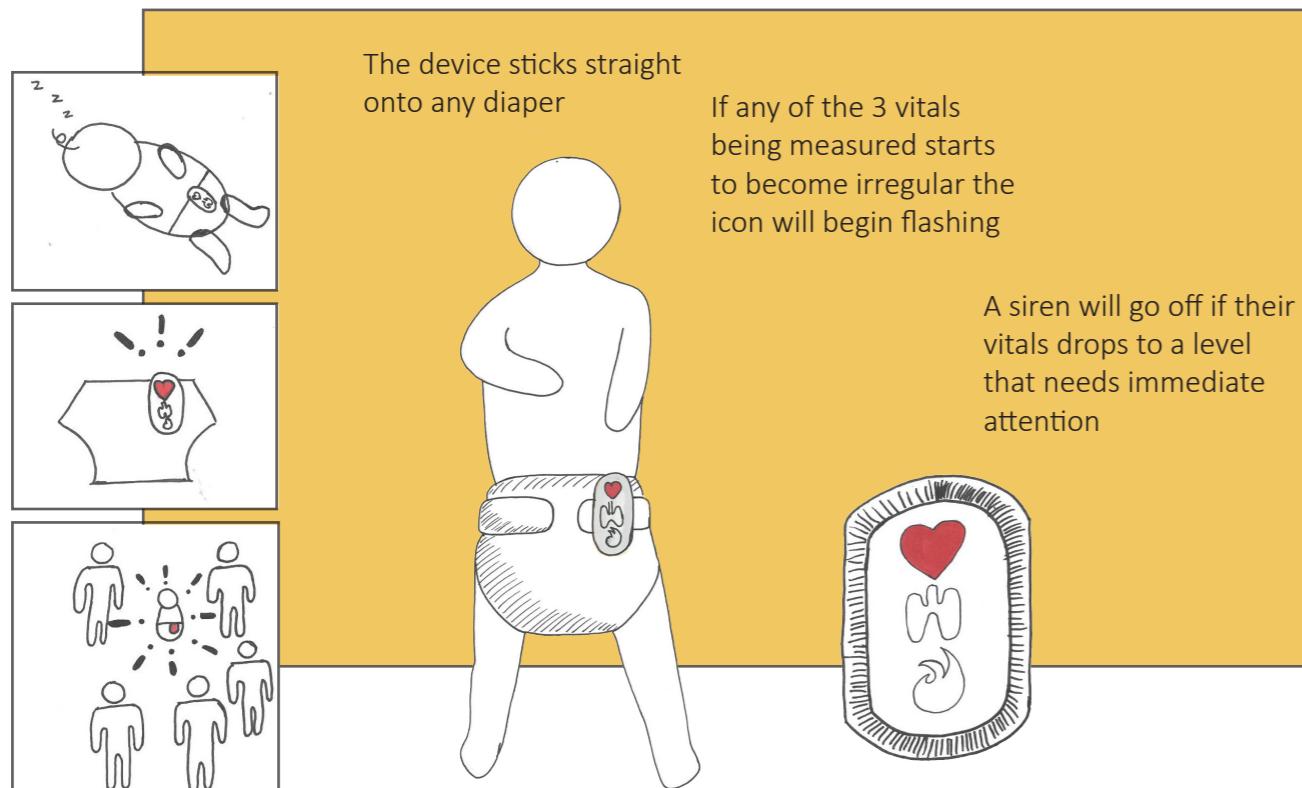
Reactive Painting

This painting is an interactive art work, the painting reacts to the child's vitals, when their heart rate rises the shapes become more rigid and spiky to show that there is a problem. The shapes will scroll along the page endlessly but similarly to how the painting reacts to heart rate it will adapt to the babies breathing, there will be more shape arrangement will be more congested to show the baby is breathing more than normal.



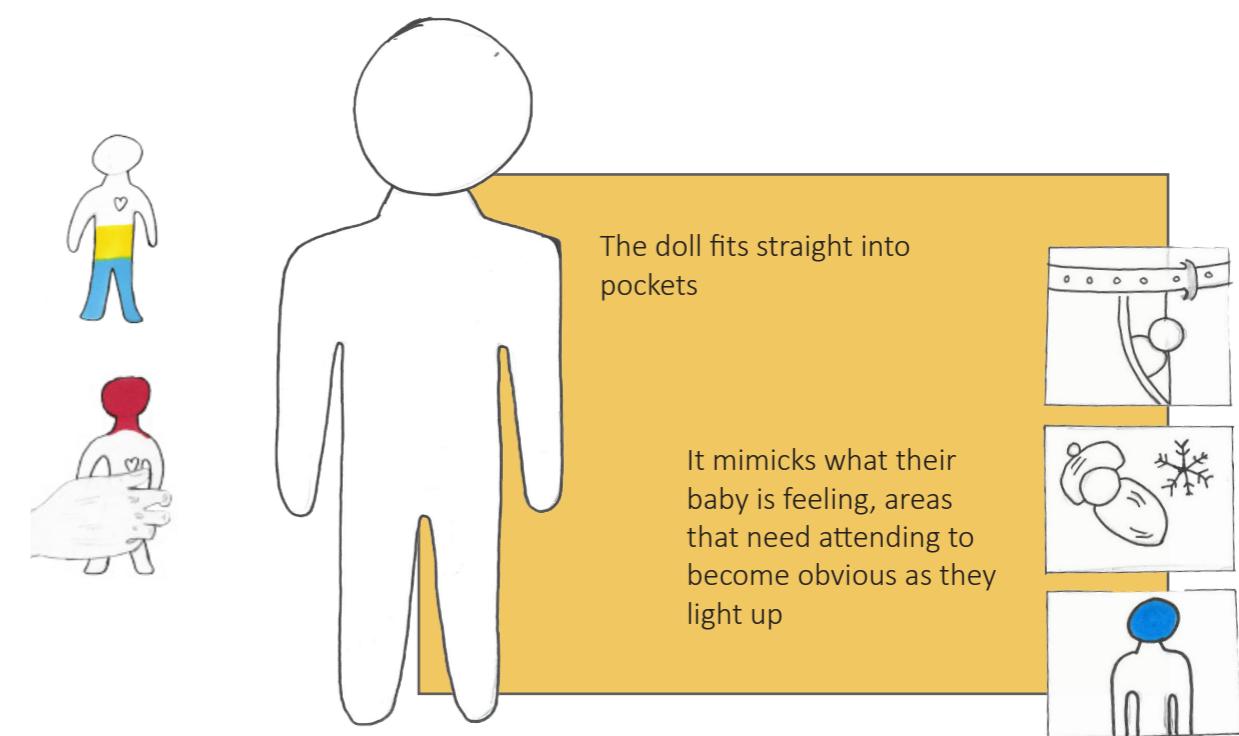
Active Angel

This device sticks onto the baby's nappy and measures their vitals, it stays on them at all times and monitors them throughout the night and day, if there is a problem the symbol on the monitor will start to flash and in case of emergency will sound a siren alerting the people around so the baby will get help from someone nearby or if the parent can't see the flashing indicator.



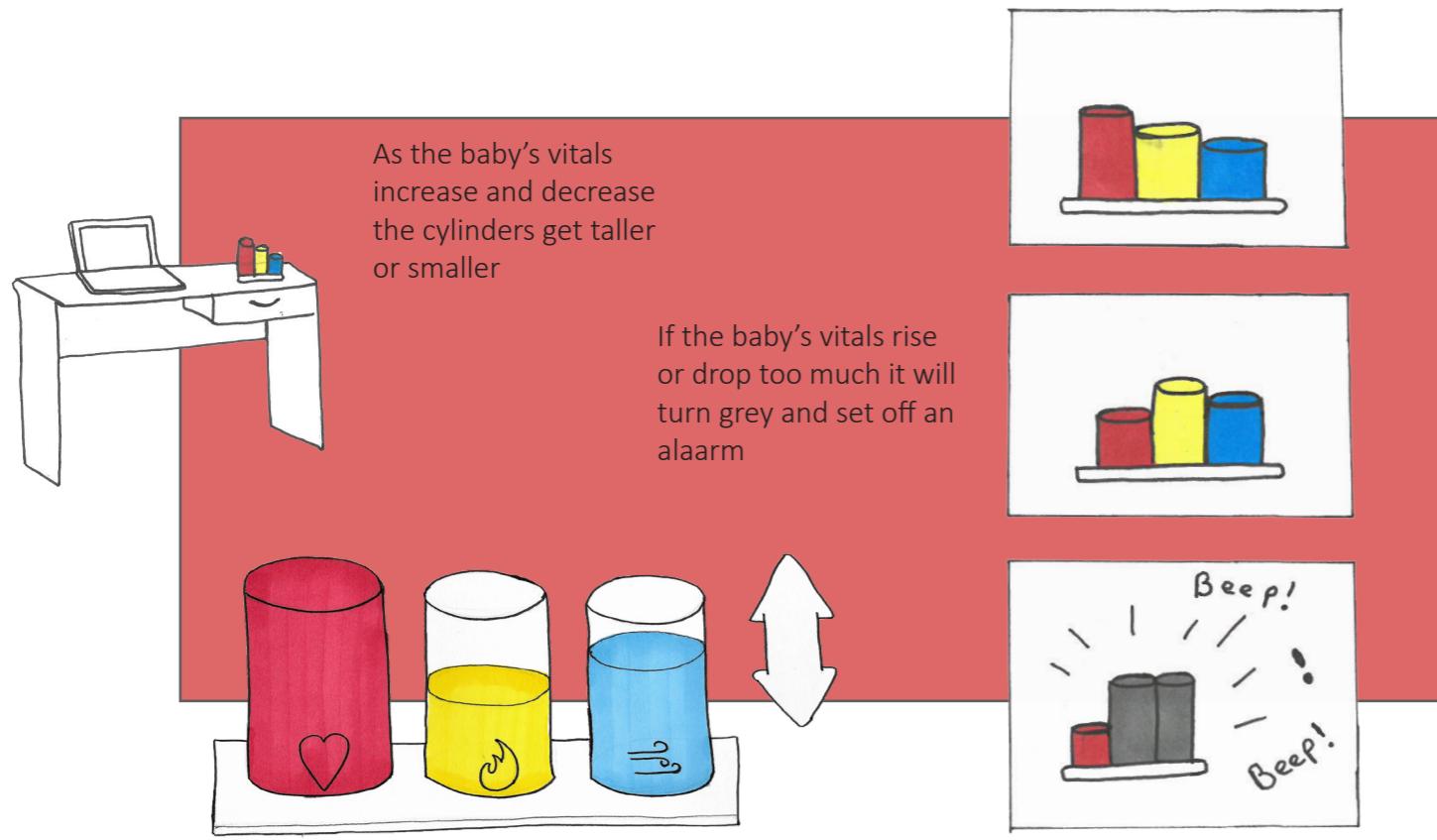
Baby Voodoo

This is a doll that is linked to the user's baby, it changes colour of specific body parts/ areas to show which areas of the baby are too hot or too cold, this gives the parents better knowledge of how they can help cool/ warm up their baby.



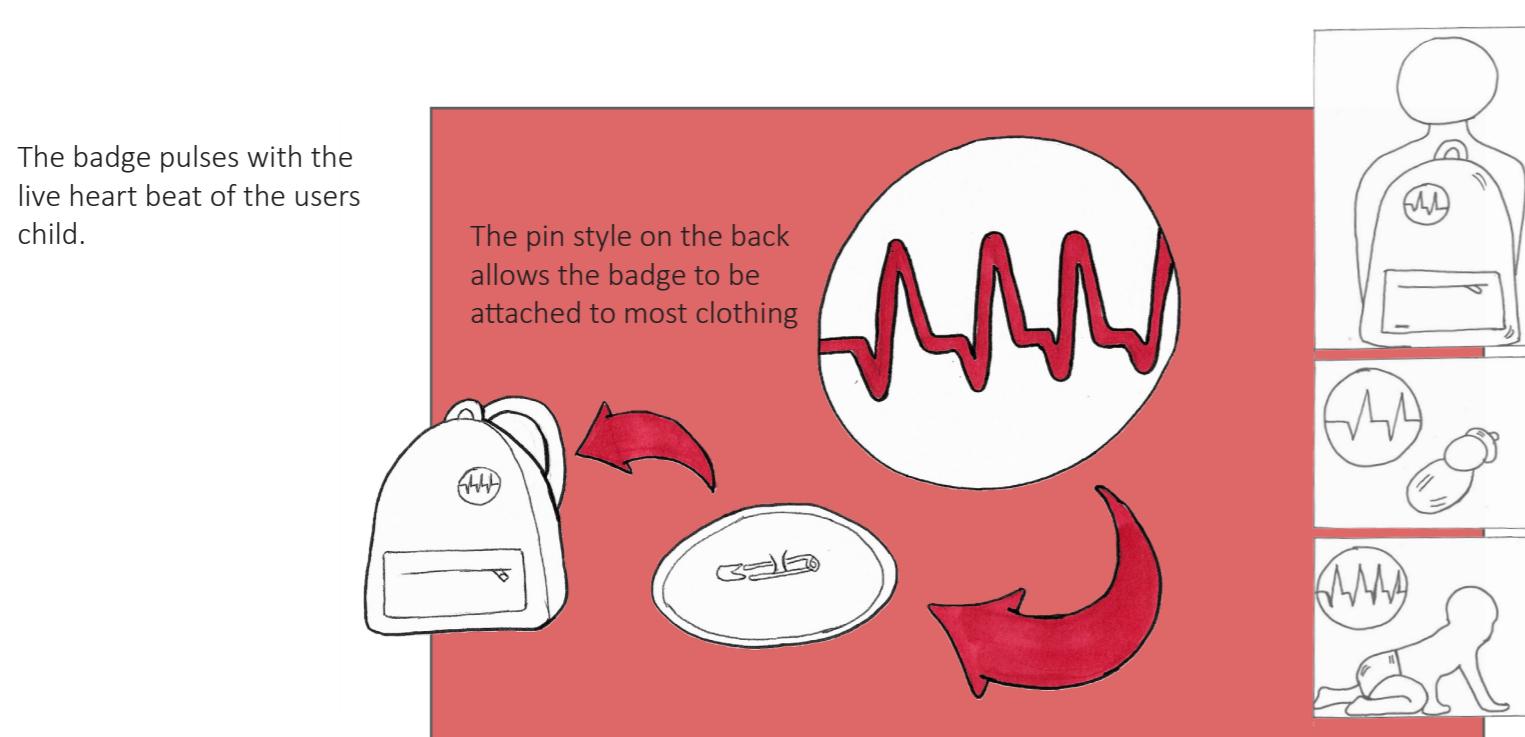
Desk Diligence

This device would sit on the parents table at work, the physical cylinders would move up and down to represent their baby's vital information, this gives the parent a better instant understanding of how their baby is doing and the moving parts give assurance that the baby is unharmed allowing them to get on with their work more effectively.



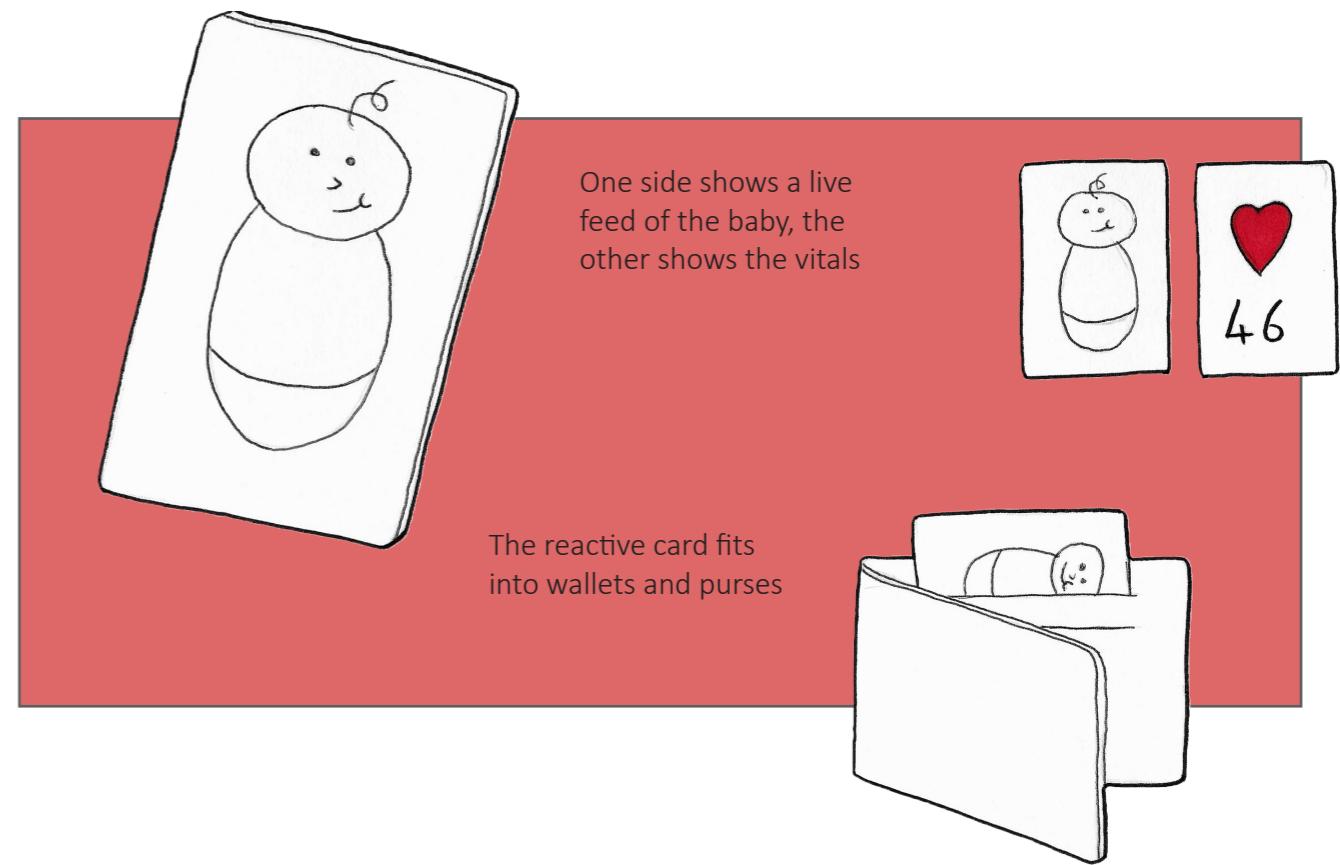
Heartbeat Badge

This badge has a pin on the back and can be attached to various items of clothing and bags that people carry around throughout the day, the badge will show the child's live heartbeat and it has the benefit of being stylish.



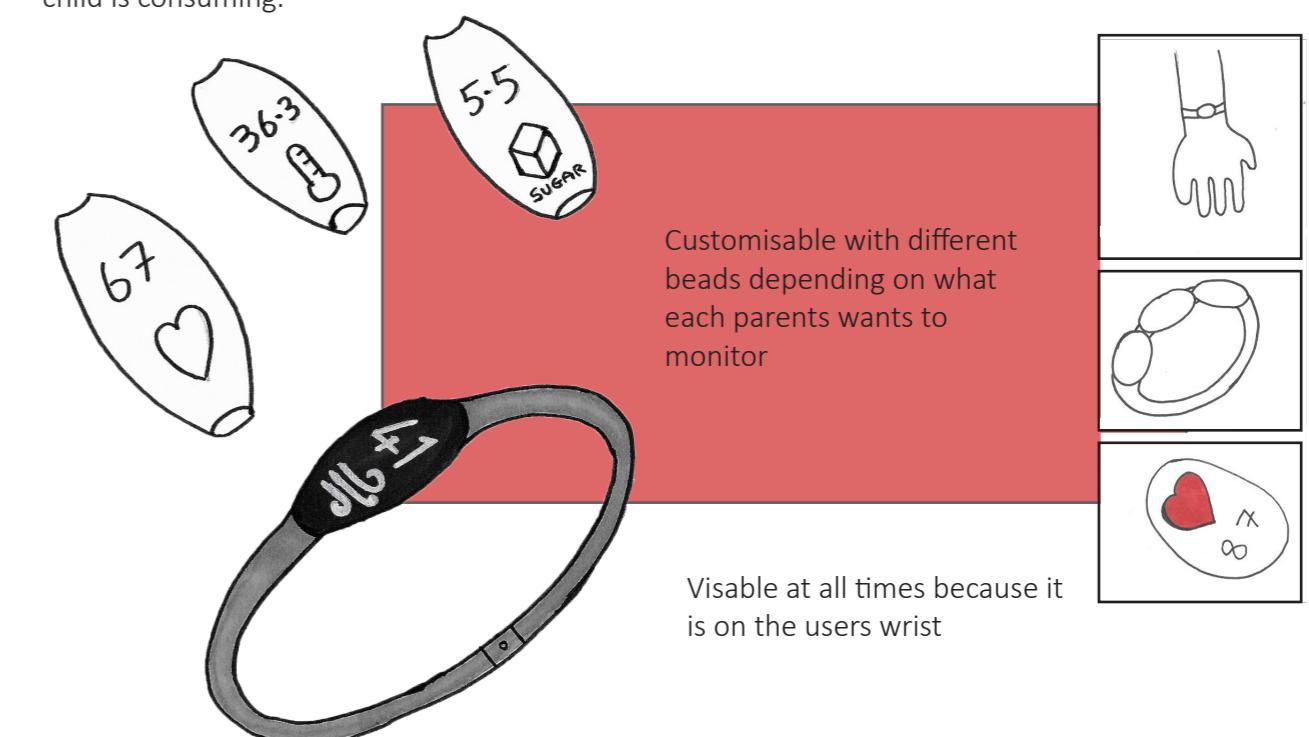
Magic Moving Card

This card fits perfectly into a wallet or purse and its small enough that they could carry it on them at all times, on one side of the card is a live feed of their baby and the other side is the numerical statistics showing the babies vital information.



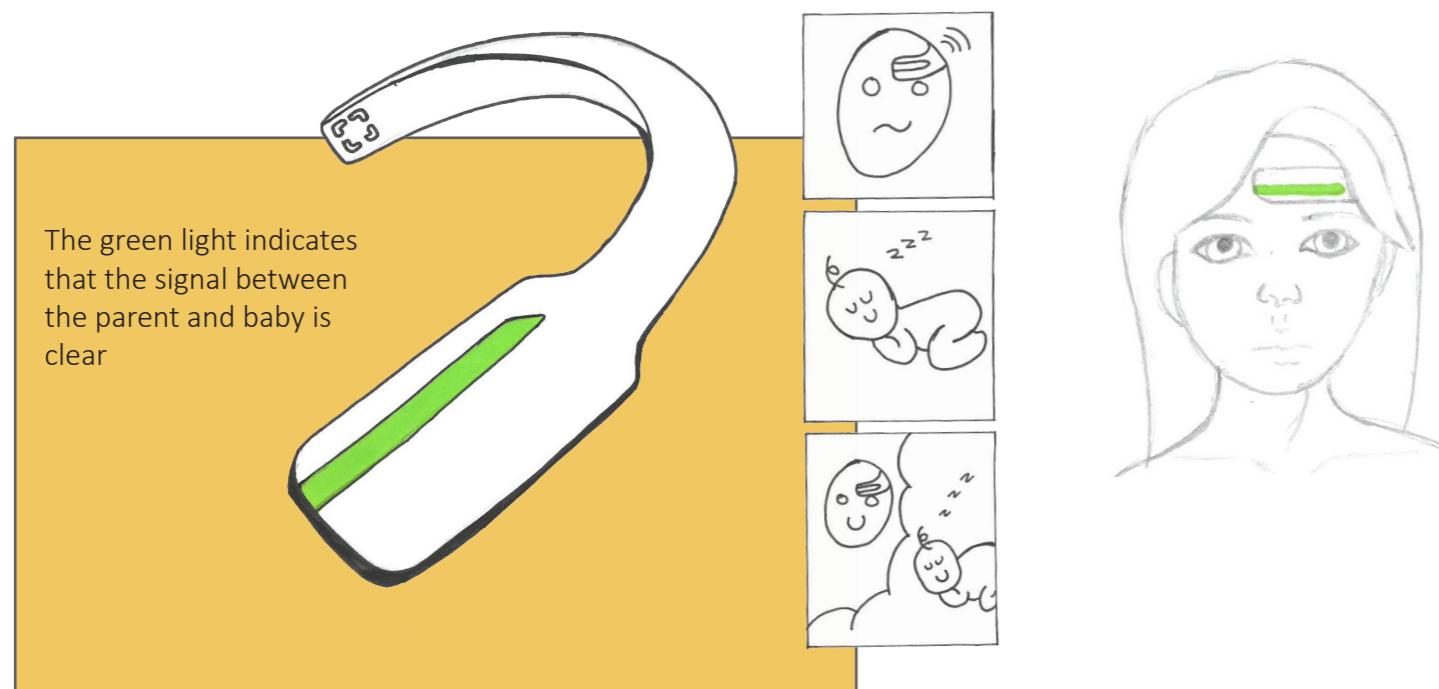
Beat Bracelet

This bracelet is for those parents that want more options of observing their baby, some children have more needs than others and the parent might want to measure more of their baby's vitals, for example; the child could have diabetes and they would have to be more aware of the sugar their child is consuming.



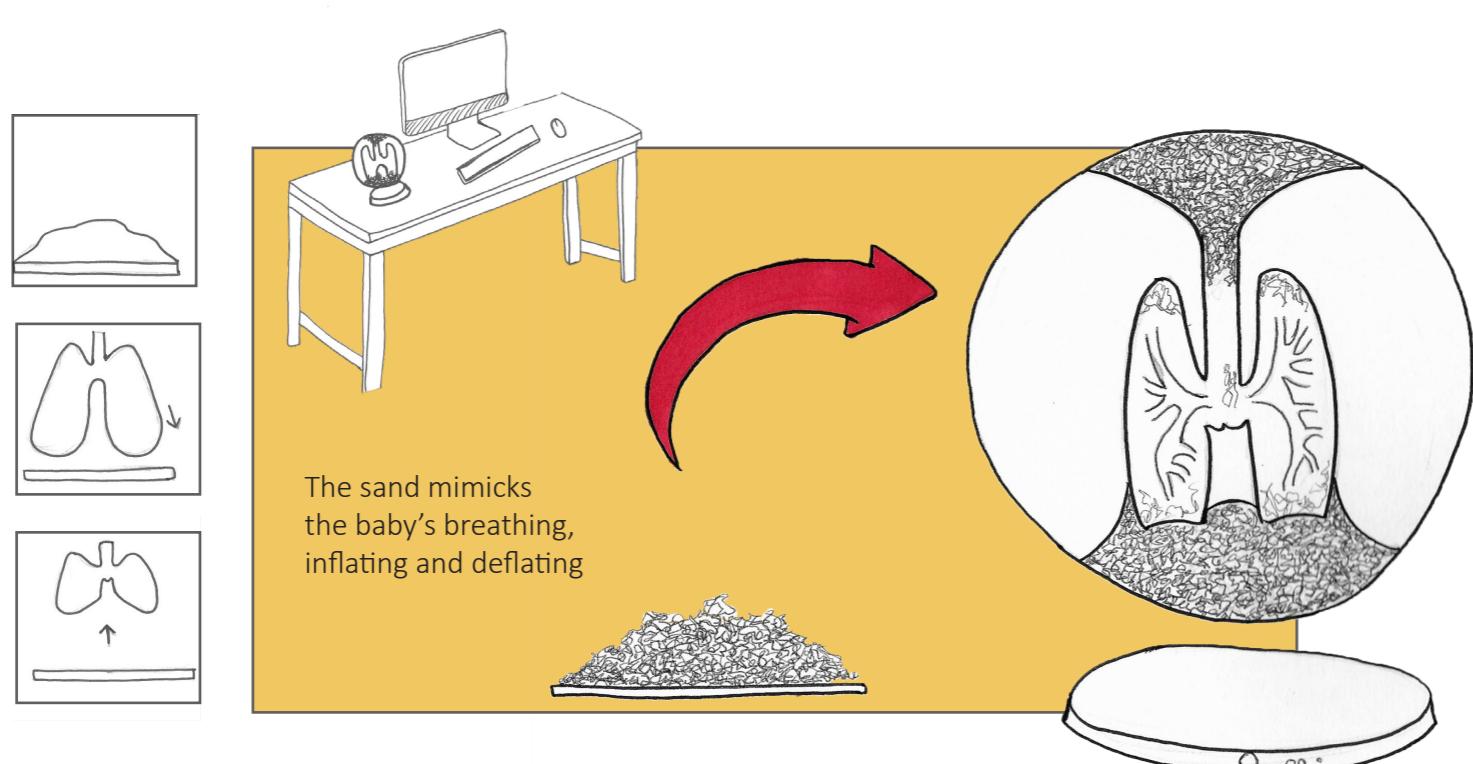
Brain Wave

The head piece links the parent's brain with their baby's brain, the parent will feel how what the baby is feeling, allowing them to know any subtleties with their child such as; tummy aches or if the child is putting something in their mouth they shouldn't be, and other things that parent might not normally see.



Metallic Memories

This device uses metallic sand and magnets to create sculptures of the parent's baby as they move around, while at work they will be able to see their child and what they are doing allowing them to focus more on their work and not miss a thing the baby gets up to when they are gone.



Evaluation

This idea didn't help the parents deal with their stress very much, similar to the baby monitor it wouldn't actually show if the baby was alright in their cot, and it wouldn't alert the parent if anything happens to the baby throughout the night.

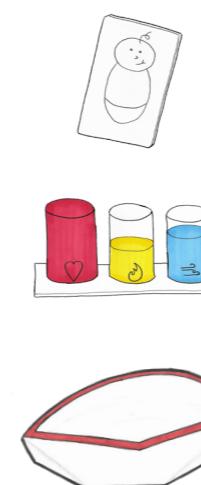


The dummy was too basic, and there isn't much room for the idea to develop.

The badge wouldn't actually help very much, it only shows the babies heartrate which doesn't say anything about if the baby is healthy or not, and most of the time it would be out of view and they could miss important moments.

The main feature of this design was the segmented areas that could be customised, the bracelet isn't an interesting idea but the customisable nature of it could be considered for the ideas being taken forward.

Although it would show off a lot of in depth information about the baby, the idea is too complex, the average person would not be able to tell what each section of the brain lighting up means and by making it easier for them to understand it would take away the depth this idea was offering.



The biggest issue with this idea is that it would be out of site almost of the time, the parent could open their wallet to have a look but most of the time that isn't an option.

The design is very disconnected, 3 cylinders moving up and down is dull and doesn't show very much about the baby at all, and the lack of figures and scale mean it isn't easy to understand.

The pod would do exactly the opposite of what it is designed to do, by keeping the child safe the parents won't have to worry however putting a baby inside a pod would probably scare the parent and they would be too afraid to leave the baby alone in the pod, there are so many ethical issues with this design.

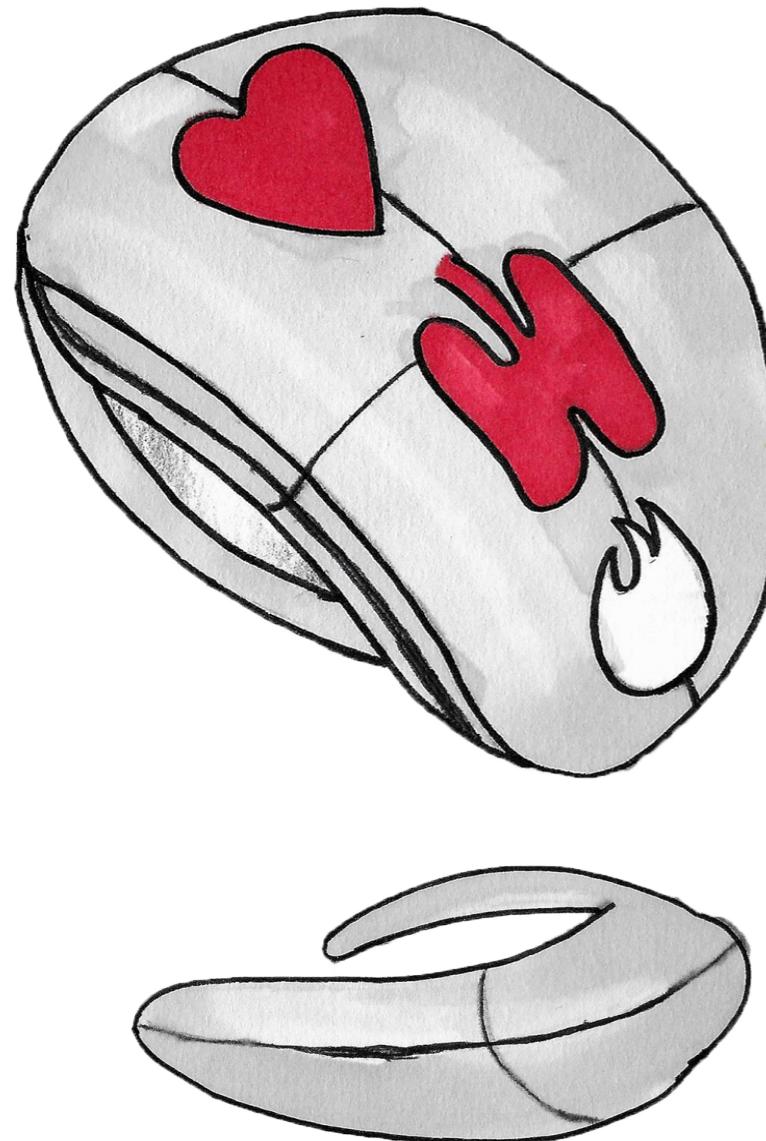
The ideas being taken forward due to their potential are;
 Close Hearts
 Active Angel
 Baby Voodoo
 Reactive Painting
 Metallic Memories
 Brain Wave

Active Angel Developed

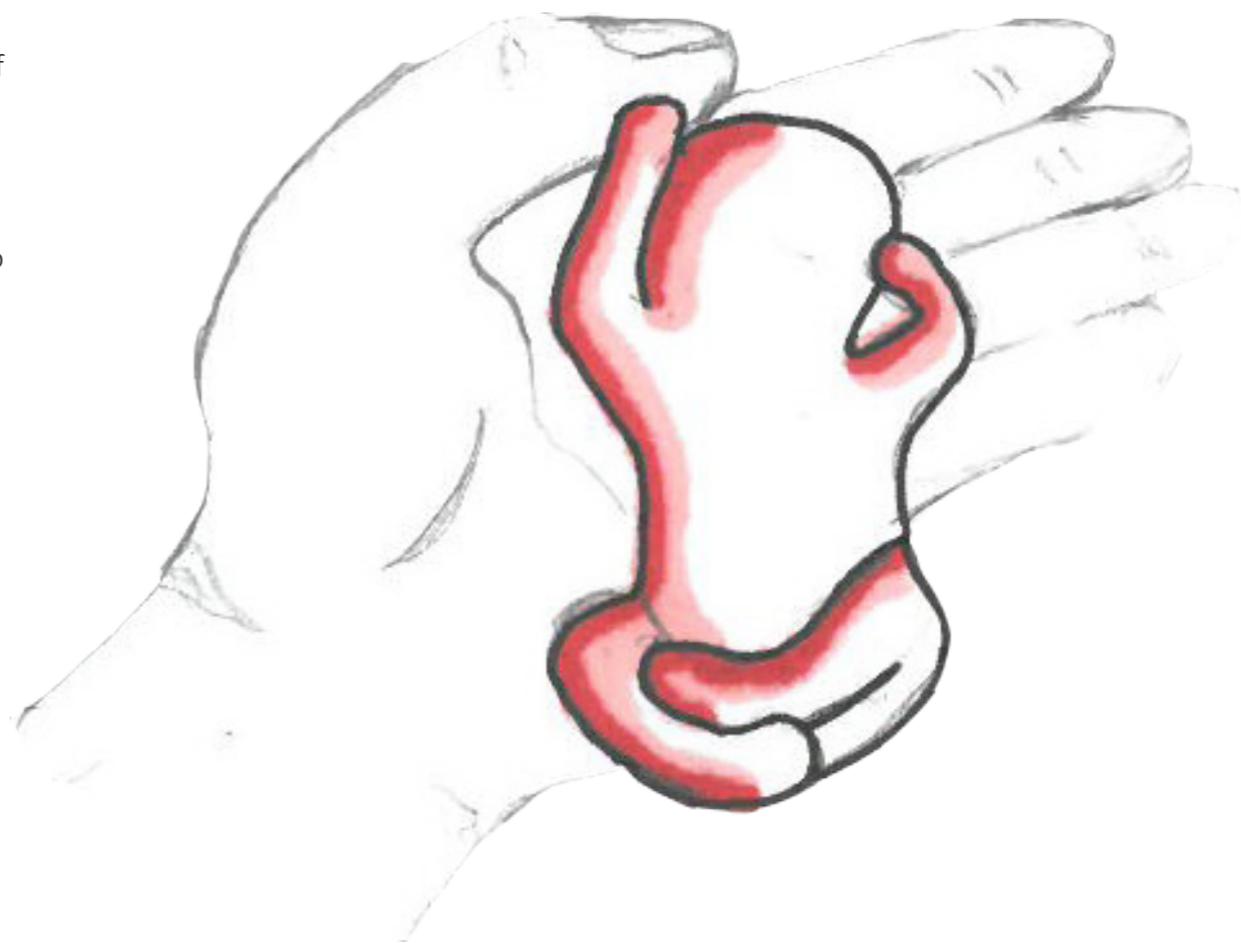
The main concern about this product was that if the product relied on a sticky material on the underside, that it would constantly come off and the baby would be unmonitored rendering the product useless, the other concern about the sticky material was that if it got onto the baby's skin somehow it could irritate them and when it has to be peeled off it could hurt the child. In order to combat this there is now a clip-on system that allows it to easily slip on and off of any nappy, this should prevent the issue of it falling off and the problem of it irritating the babies skin, the baby shouldn't even feel that it's there.

The clip makes it much easier for the parent to move across nappies however it still doesn't completely prevent the fact that it could come off and the parent would know. There would now be a failsafe system built into every product, if the product doesn't detect the babies vitals within a certain time frame an alarm will go off notifying the parents that the baby isn't currently being monitored.

The form was also developed to allow space for the systems inside whilst also keeping the baby's comfort in mind



Close Hearts Developed



Certain aspects of this design have been combined with the baby voodoo concept. Now not only does this doll show what part of the baby are in discomfort but it also now resembles the users baby more clearly, the doll can be customised to look more like each individual child, giving a more personal touch.

In order to make the user feel even closer to their child the doll will emit warmth and it will have a beating heart, all linked to the users baby, so if they start to miss their child they can go into their pocket and just feel this doll and they will know that their baby is waiting for them at home, it gives that instant relief similar to making a call and asking if the baby is alright.

The size needed changing as it was too large before, if it is too large it becomes a hinderance to carry around, by making it smaller it should fit comfortably in pockets and not being too bulky.

Reactive Ring (Developed from Reactive Painting)

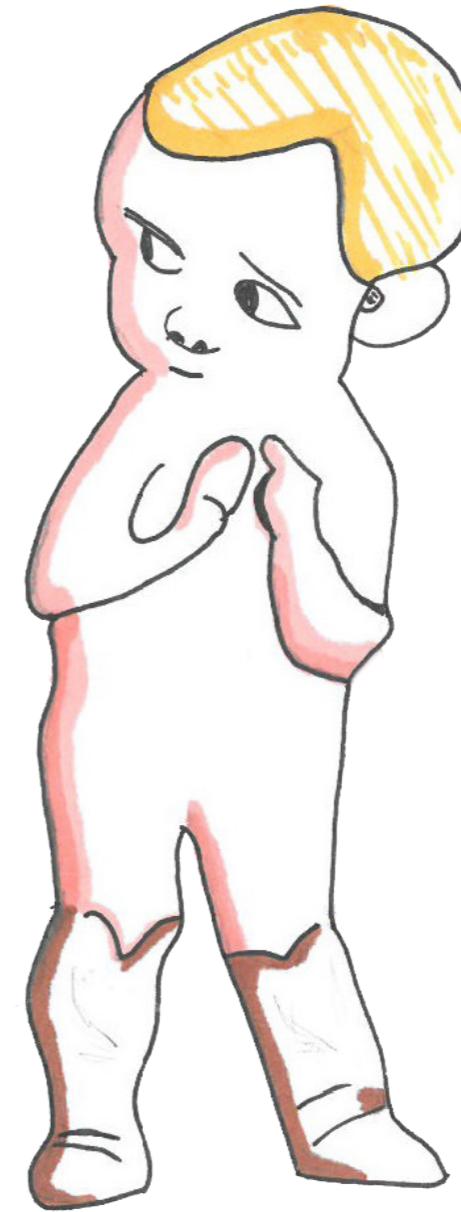
The main problem with the live painting is that it is static on a wall, the idea was unique and interesting but having it be a picture was a waste as they wouldn't be able to see if the baby was alright the majority of the time, so the design was changed into a ring.

The new concept is that; the ring will physically change and evolve based on how the baby is feeling, similar to before, the way the form changes shape will show the user what is happening to the baby (for example, increased heart rate), as the issue gets worse the ring will become more rigid alerting the parent of the problem and how serious it is.

The benefits of the product now being a ring allow the user to have it on them all time, and because it is on a finger it is visible at all times of the day, this allows the parent to keep an eye on the baby throughout their day.



Baby voodoo Developed



The doll still shows specific areas of the baby that are in discomfort however now the idea has been completely rethought. The doll now looks a lot more animated because now it will act things out as well, when the doll isn't in the users pocket the doll will physically move and perform actions that show how the baby is feeling, so for example: if the baby is sleepy, the doll will rub its eyes and begin to yawn. If the baby is too cold the doll will begin to shiver. If the baby hurts their leg the doll will grab their leg and look hurt. There are so many options for this doll and it could bring a lot of life to process of being away from their baby, and it gives a lot more detailed information than the previous iteration of the design.

Not to mention this should improve the user's mental health at work because they will have a constant moving reminder that their baby is doing well, and small details like; when their baby is happy and playful the doll might begin doing a dance, not only showing the baby is feeling happy but the dance should make the user happy as well.

Brain Wave Developed



The device will talk to the user, feeling how the baby feels was quite vague so now it would also monitor the baby's actions and will notify the parent if something has happened or is happening that could require their attention. It could project a live feed of what their baby is doing straight into their minds when something needs their attention, they can then watch the situation and see if it is something normal or a potential issue.

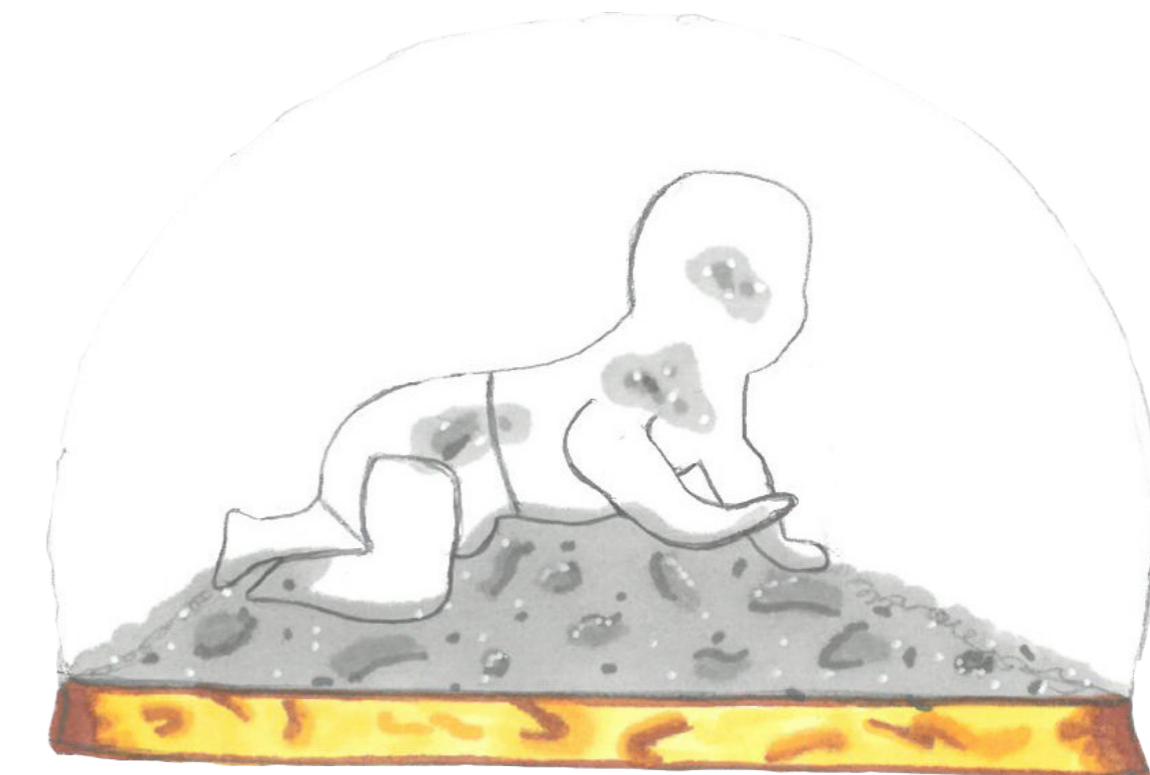
An example of this could be; the baby's heart rate might go up and the parent can watch to see if they need to panic or if the baby is doing something normal and not dangerous. On the other hand, it could show the baby putting things into their mouth and because the user has been notified they can see if it is food for the baby or a potential choking hazard, the projections helps the users anxiety by being able to see what is happening and could save the child's life.

The form was also worked on because in the previous version it seemed too large and noticeable, there was no reason for it to stand out as much as it did, so now the design is much smaller and more streamlined, instead of wrapping around the front and back of the head it now uses the user's ear for support to hold it up.

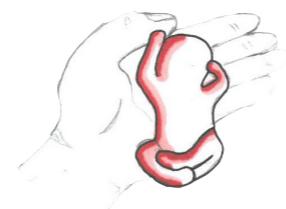
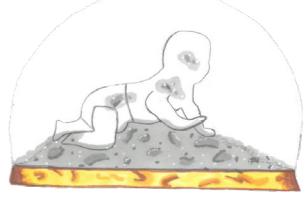
Metallic Memories Developed

The biggest issue with the previous iteration of this design was that it wasn't personable and didn't show the user very much apart from the baby's lungs breathing, it was also a concern that not many people would want to see a pulsating pair of lungs. In order to make the product more about each individual parent and child the parent will be able to see more things made from the sand. Some people might want to see what their baby is doing, and there would be an option to see the baby and what actions they are doing, it allows the parent to connect with the child even though they are apart.

The parent will also still be able to view the baby's lungs as they breathe if they want, or the baby's heart, the choice is theirs.



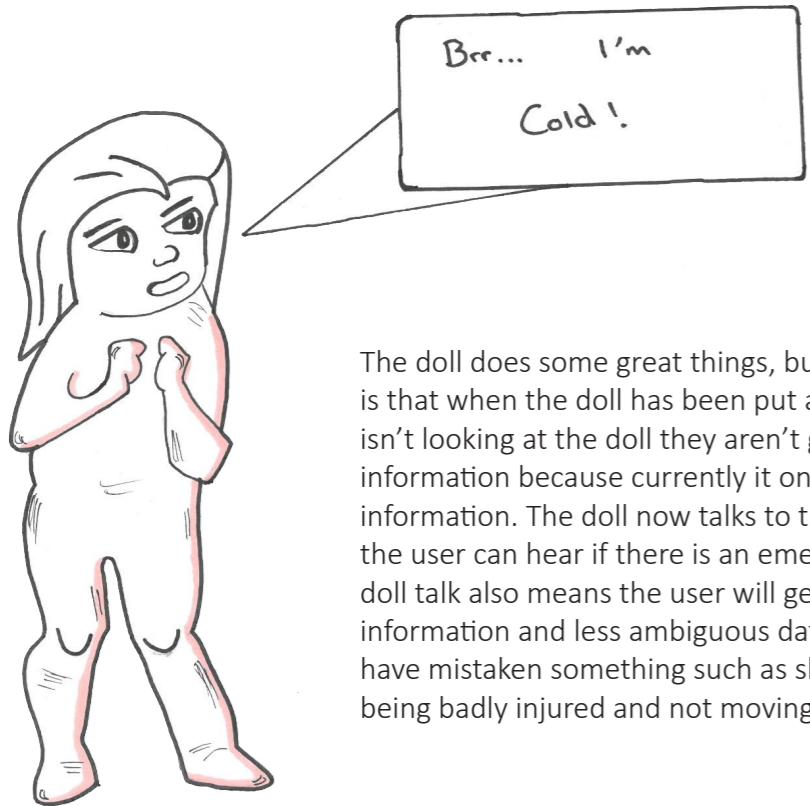
Pugh Matrix

Datum						
Selection Criteria						
Relieve psychological distress	+	+	+	+	+	+
Remotely check vitals	S	+	+	+	+	+
Alert from a distance	S	+	+	+	+	+
Alert in case of emergency	+	S	+	+	+	+
Live and accurate data	S	S	S	S	S	S
Must alert properly	+	-	+	+	-	+
No restrictions on the baby	+	+	+	+	+	+
No down time	S	S	S	S	S	S
Customisable	S	S	S	S	-	S
Total	4	3	6	6	3	6

The datum was a mediocre design that half met all of the requirements, this was done to allow for a range of results to see if each idea was better in each aspect than a mediocre concept.

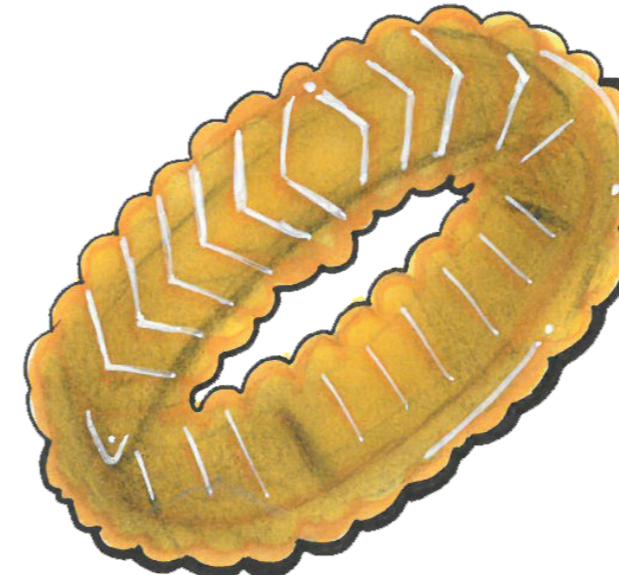
Using the results from this table Close Hearts and Brain Wave scored the lowest and therefore were the weakest of the idea, they have now been removed leaving only 4 ideas left.

Close Hearts Second Development



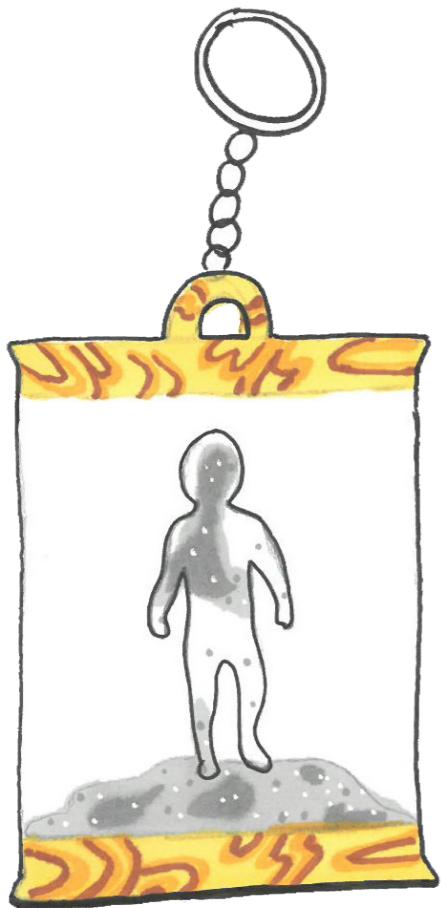
The doll does some great things, but the main problem is that when the doll has been put away if the user isn't looking at the doll they aren't getting any of the information because currently it only gives visual information. The doll now talks to the user and ensures the user can hear if there is an emergency. Having the doll talk also means the user will get more accurate information and less ambiguous data, the user could have mistaken something such as sleeping for the baby being badly injured and not moving.

Reactive Ring Second Development



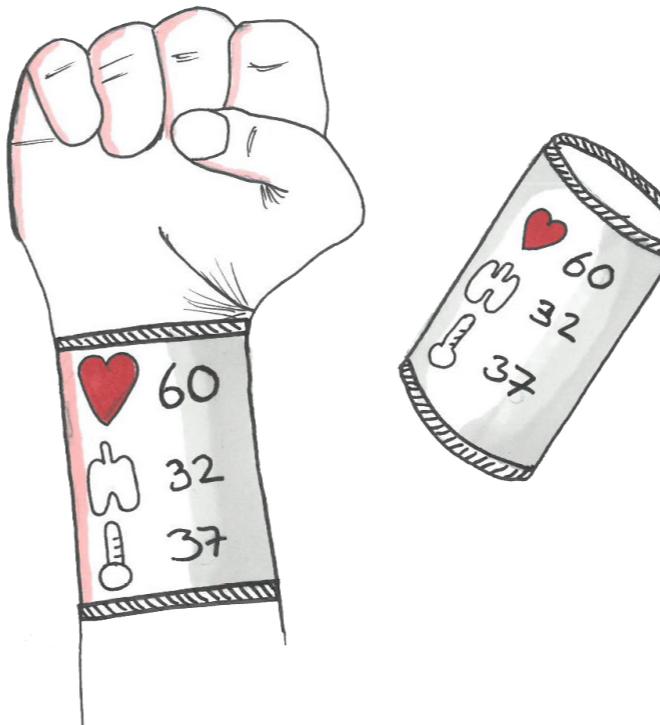
The ring will now change colour as well as form based off the user's baby, there was a lot of things the different shapes meant, and it could have confused the user however at least one of those elements can now be related to the colour changing feature, making it clearer to the user what is causing the ring to change.

Metallic Memories Second Development



The metallic sand was meant to be used on an office desk or table of some sort, the design has been made significantly smaller but that is to allow it to be more portable, in order to make it even more versatile there is a gap for a key ring to fit, so it can even be an attachment they can hang on their keys or they can take it off and put it on a desk when they are working.

Active Angel Second Development



The design scored lower on the Pugh matrix than it should have because it didn't relay much information back to the parents and they had to be with their baby to check the lights weren't flashing, so a transparent forearm sleeve was designed. The sleeve fits over the user's forearm and links to the device monitoring the baby, the more detailed version of the baby's vital statistics are displayed on the transparent material projecting the data onto the users arm for them to look at, and if they want it to not be noticeable the screen will turn off and should be barely visible to other people.

Weighted Rating Matrix

	Weighting								
Selection Criteria									
Relieve psychological distress	10	6	60	9	90	8	80	8	80
Remotely check vitals	8	6	48	7	56	8	64	5	40
Alert from a distance	7	9	63	9	63	8	56	8	56
Alert in case of emergency	7	9	63	9	63	9	63	8	56
Live and accurate data	6	-	-	-	-	-	-	-	-
Must alert properly	7	7	49	9	63	10	70	8	56
No restrictions on the baby	3	-	-	-	-	-	-	-	-
No down time	4	9	36	10	40	8	32	8	32
Customisable	5	3	15	3	15	9	45	9	45
Total		334	390	410			365		

The idea with the lowest score after the weighting matrix was 'Active Angel', therefore it has been removed and the final 3 ideas are: 'Voodoo Baby', 'Reactive Ring' and 'Metallic Memories'.



