

# **baby carrier**

Combining the needs of carrying and keeping a baby

**Product design**

**Project II**

Guide  
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**I would like to thank** my project guide, **Prof. Ravi Hazra** for his guidance and support throughout the project. His able guidance gave me an intense insight into this field and helped me probe into the right direction for the project. I would also like to thank all my friends and especially the faculty at the Industrial Design Center. Finally I would like to thank the staff in the IDC workshops for their help during the project.

## **Approval**

The project entitled ' baby carrier ' by Prashant Vetskar is approved for the partial fulfillment of the requirement for the degree of 'Master of Design' in Industrial Design

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Guide

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Chairperson

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Internal Examiner

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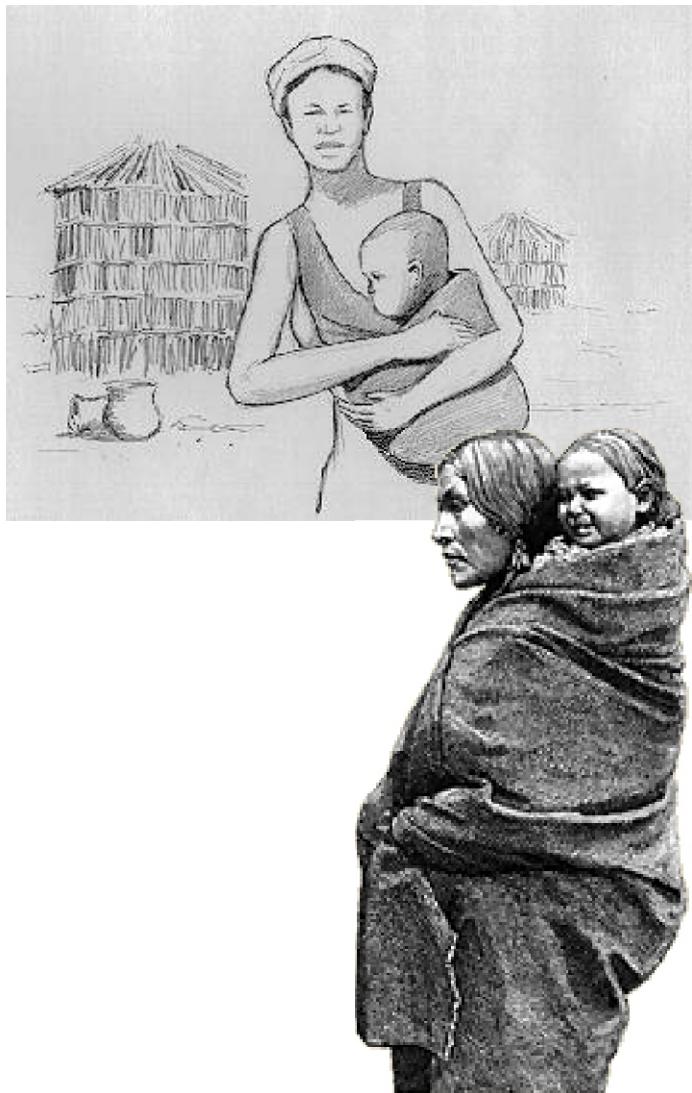
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## introduction



## Introduction

There is nothing in the world that is more dear to parents than their baby. Every moment of this period is special for both the baby and the parents. The baby begins to experience the world outside the mothers womb, the place where all its needs were taken care of. The parents learn to respond to their babies needs. Everything is a new experience.

One such experience is of **taking the baby outside**, away from home. In fact every time the baby is taken out is a real special occasion as there are a number of things that must be considered before venturing from home. Parents have to think of the place to be visited, the duration of outing, the accompanying people, the mode of transport, the weather besides the elaborate preparation regarding the things that need to be carried for the baby. Looking after a baby is a full time occupation.

One of the activities in this experience is of **carrying** the baby itself. All cultures throughout human history found ways of carrying babies throughout day to day life. Parents in India, mostly carry their infants in their arms or on the hip. Babies are swung around to the nursing position when it is time to feed. In north east India the practice of tying the baby to the back is a commonly seen. Babies enjoy their warmth and security of being close to another person, and observe the environment...making sense of it and gradually adding to their experience. There is also a segment of people in India who use baby carriers that enable them to have both their hands free but at the same time maintain proximity to their loved one. This group of people also own other kind of equipment that will tend to other special types of outings where the baby cannot be carried all the time but needs to be kept in a cradle.



1 Traditional baby sling from north east india



Traditional methods of carrying the baby have their own advantage over the modern day baby carriers. Our industrialized world is rapidly getting away from our human carrying tradition. Separating work from family life and the home, segregating our young from parents all day, and isolating ourselves from helping community has led us to separating ourselves from our babies. Just look at our generation. We have plastic infant seats that go into the car, lock on top of strollers, and fit inside shopping carts. Parents can take their baby on a shopping trip and move the baby in the seat from place to place, and never have to even touch the baby! Baby doesn't have interaction with her environment or any people, as she stares up at the ceiling the whole time, or the sky. mothers are seen sometimes struggling with lugging their 15-pound babies in a heavy infant seat...needing both hands to carry it, and leaning way back to maintain balance. They would be much better off just holding their babies in their arms!

Another important activity of taking the baby out is of **keeping** the baby safely when it is not being carried around. This is a activity that is rarely considered while leaving the house for an outing but realized only when a situation arises where one cannot continuously carry the baby. There could be various reasons for it like the amount of time that a baby is to be carried, the nature of work that a parent is indulging in and the location or the situation where the parent is with the baby. That's where the need for keeping the baby arises. for keeping the baby there are various kinds of cradles and cribs available, which somehow are always considered to be an extra burden to be carried as separate items while embarking on a trip out. Due to this reason very often taking the baby out means leaving behind this "keeping" aspect aside and making do with whichever place that seems like an option to place the infant.



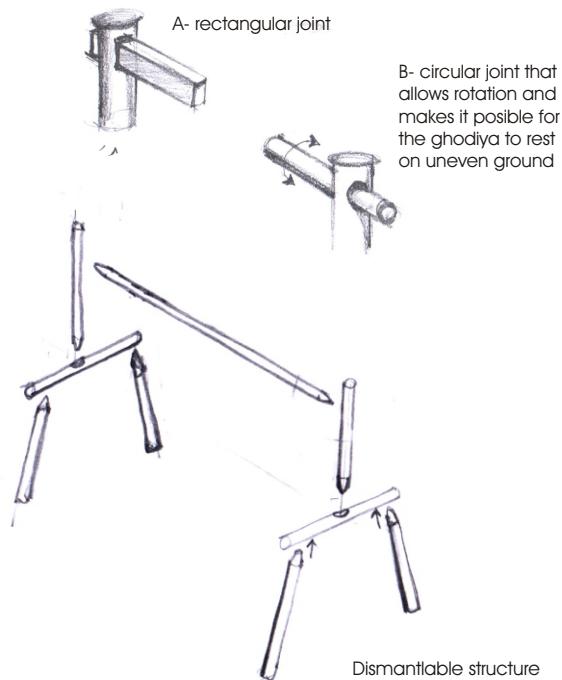
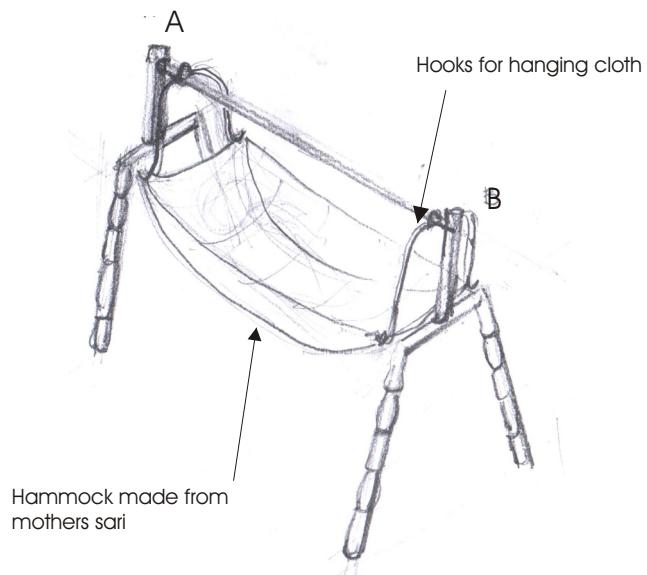
1. Mother using a string to rock the baby

### The Ghodiya

The idea of combining functions (carrying and keeping) has been existing for hundreds of years in a product that has its roots in Gujarat. This traditional product is a common feature in villages and also seen in some Gujarati households in urban situations. It originated from the nomadic tribes who went from place to place carrying their babies along with them. It is also seen holding the babies of construction workers who go about their chores leaving the baby securely inside. It is perfectly suited to the nature of life that these workers have. They are always on the move and the nature of their work demands that the baby be kept and not carried. so the solution comes in the form of a pair of simple wooden frames with a hammock that cozily holds the baby.

Initially it was thought that the concept of carrying on the body and keeping was a new one as none of the products available in the market exhibit such a combination.

The advantage of this product is evident. It gives true mobility to the mother. (mobility does not mean carrying the baby from one place to the other but also means being able to do all the activities that occur on the journey, without which the journey would not be possible.) The wooden frames are braced by a wooden member which allows relative rotational movement between the frame, because of which it can be kept on an uneven ground. The hammock is made of a piece of saree, which allows for a swinging motion that comforts the baby. The hammock itself is used to wrap the baby to the mother when detached from the frame. the frame is dismantled by removing the central bracing piece and the structure collapses to a two dimensional piece that can be carried along since it is light weight.



### Advantages

1. it provides true mobility to parents
2. it is light weight
3. its detailing allows it to be used on uneven surface
4. the hammock allows for swinging movement
5. the hammock supports the babys body
6. it addresses lifestyle of the user
7. it is easy to assemble/disseminate
8. the bracing piece acts like a tent structure to protect baby from heat and insects
9. the bracing piece is also used to hang toys.
10. Ther is no fear of the baby falling out.
11. it is passed down from one infant in the family to the other and is considered to be auspicious. it means that the materials and structure is durable

Even with all these advantages one cannot imagine using this portable cradle in tokays context simply because its form and materials don't match with our lifestyle. However the underlying principle of carrying and keeping the baby is still a important need.

## intent

There are a number of occasions when the baby is taken, that parents cannot continue to carry the baby on the body.

The project is aimed at creating a niche product that will address the need of carrying as well as keeping the baby, which would provide the baby with a secure, hygienic and familiar environment at any time. It also addresses to the convenience of the parents who would be able to engage in activities which they may find difficult to do while holding the baby.

This gear tries to avoid a compromising situation by identifying the kind of situations where such a combination of the two functions was required. Not surprisingly a lot of frequently encountered situations require this combination.

The entire design process was underlain by the most important factor while considering designing baby products, which is safety. No baby product can serve any function that is incorporated unless it addresses all the safety issues.

This product does not try to provide an alternative to the existing product but rather caters to a specific need which is outings that require to carry as well as keep the baby.

## 1.1 market survey

Today there is a vast range of carriers that are available for specific purposes and for specific ages. Since childhood comes only once parents don't mind spending that extra bit to add to the convenience of the baby and the parent. The following show the types of baby products that are available in the Indian market and abroad.

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#### **baby sling**

age	1 month to 1 year (12kgs)
use	carry baby by wrapping in a rectangular cloth
advantage	proximity to the person carrying
Cost	
materials	cotton, 2 metal rings or tied without using rings
manufacturers	homemade, commonly seen in



#### **front/back carriers**

age	1 month to 1 year (10kgs)
use	carry baby by placing inside carrier
advantage	proximity to the person carrying, allows back and front carrying
cost	Rs. 300/- for chinese brands
materials	cotton,
manufacturers	baby bjorn, snugli, chinese brands, evenflo,



#### **frame carriers/ trekkers**

age	6 months to 2 year
use	ideal for carrying baby on treks,
advantage	weight distributed evenly for long distance carrying
cost	Rs4500
materials	aluminum frame, cotton interior lining with waterproof fabric outside
manufacturers	trail blazer, snugli cross country, evenflo,

### carry cot



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age	1 month to 6 months
use	carry and keep baby
advantage	secure environment for baby at any time
cost	Rs. 900
materials	polypropylene injection moulded body, cotton bedding

### bouncy bed

age	1 month to 10m (10kgs)
use	keep baby
advantage	foldable, uses baby weight to rock
cost	Rs. 450/- to 600/-
materials	mild steel powder coated frame, cotton cloth as bedding
manufacturers	wills lifestyle, baby care



### prams

age	3 months to ½ to 2 yrs m (10kgs)
use	take baby on walks
advantage	good for grandparents who find it difficult to carry baby
cost	Rs. 3000 to 17,000/-
materials	aluminium frame, moulded plastic parts waterproof hood,cotton interior



### folding cribs

age	1 months to 2 year
use	keeping the baby
advantage	foldable, lightweight, good to take on travel
cost	na
materials	plastic rod frame with fabric



The entry of these products comes because of the changing lifestyles. these product are all designed in the west except the baby sling which takes inspiration from traditional carrying methods followed all over the world. It does say to an extent that since these product are so acceptable they might be conforming largely to our lifestyles too. Our parents did not use any of the products shown here for us, primarily because they found that the old ways were good enough and secondly because the inflow of these products into the country was negligible.

Lifestyles have changed. parents do not might spending a little more for that extra added convenience that might make the experience of taking the baby out more comfortable for both the parents and the baby.

The concept of carrying and keeping which is seen in only one of the shown product (the carry cot) needs to be taken further.

We will now look at some of these product in detail.

three products were chosen for the analysis.

1. front back carrier- for only **carrying** the baby
2. carry cot for **keeping and carrying**
3. a bouncy bed used purely for **keeping** the baby



### **the carry cot**

This is the only product in the market that addresses the need for both carrying and keeping a baby. it is a very popular product which means that it serves a very necessary purpose. it has the following features.

1. allows for carrying the baby as well as conveniently keeping it as and when required.
2. its molded plastic structure give a feeling of safety and strength.
3. it has a cozy appearance unlike some other product that have an exposed metal frame structure.
4. it has a curved bottom that allows it to be rocked.

it has a broad plastic handle that doubles up as a frame for hooking the hood that prevents light from hitting the baby's eyes.

the cloth that forms the bedding is made from cotton. hence it is skin friendly as well as washable.

however it has the following drawbacks.

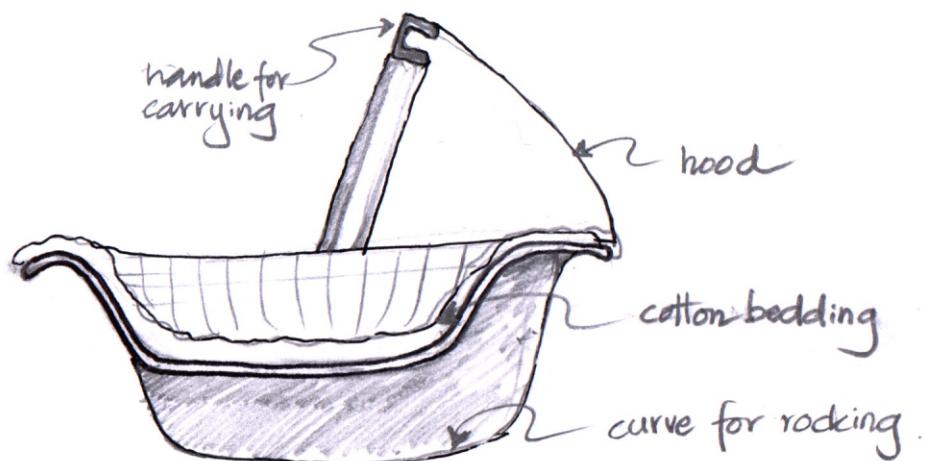
1. one cannot carry it for a long period of time because it causes a strain on the backbone as it has to be held on one side.  
hence it is used for transporting the baby where the distance is short and keeping is the main object of the product.
2. the feeling that one gets is like that of carrying your baby like another piece of luggage. there is nothing personal or motherly about the way of carrying



3. it is cumbersome to carry in a crowded place as the people walking past by tend to bang against the carrier.
4. it always keeps one hand occupied
5. with the baby moving inside it is sometimes difficult to balance the cot with one hand.
6. it cannot be stored as it is a rigid structure and occupies a large volume.

It can be used up to 2 to 3 months

the survey conducted found that it was used occasions like going to friends place, shopping, restaurants, and entertainment malls.





### the front / back carrier

**users:** **baby**, mothers and fathers, grandparents usually prefer prams on long walks

**environments of use-** morning/ evening walks

shopping

going to friends and relatives places

at home while doing work

**product functions-** carry the baby either in front or back (usually front position preferred by most parents interviewed as parent have direct eye contact with baby.)

**user functions-** strap the carrier to the body

lift the baby from under the shoulders

put the babys legs through the leg holes.

place inside carrier.

(some product by snugli and baby bjorn require more elaborate wearing procedure but they are not commonly seen in india)

**materials-** fully cotton and washable, soft stiffer pad around neck for support, padded leg holes

the users of this product were completely satisfied with it as the baby could be carried in it comfortably for upto three hours. fathers especially could carry the baby for long periods of time.

#### advantages

1. carry for long distance
2. weight of baby is distributed over both the shoulders
3. ergonomically correct for the baby, proper support to the hip and neck
4. cotton material washable and skin friendly
5. the baby is held close to the breast of the mother that increases the parent child bonding. there is always a visual contact with the baby while carrying in the front.
6. allows for both the hands to be free
7. adds to the mental stimulation of the baby as it is aware of the things in its environment



## bouncy bed

users involved: baby, parent, grandparents

environments of use- home

sometimes taken on a long distance train journey

product functions- keep the baby when it wants to sit or sleep

user functions- put the baby in the bed,  
adjust the angle to suit sleeping or sitting position

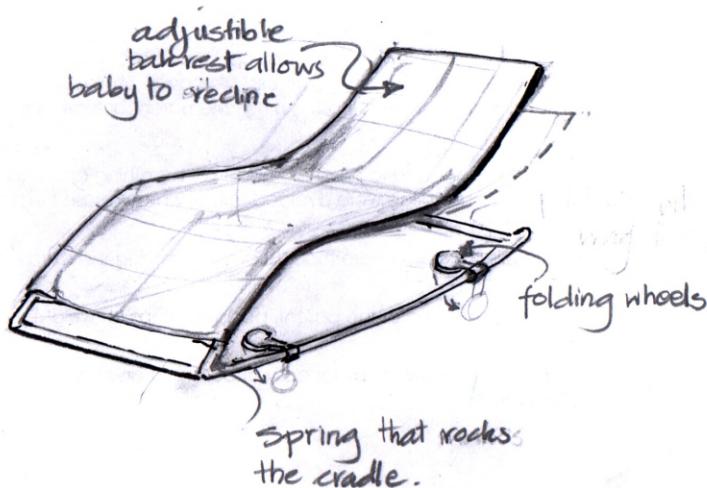
materials- cotton bedding stretched between aluminum or M.S pipe frame

advantages-

1. it can fold up to form a two dimensional frame
2. it uses the babys body movement to rock using a steel spring
3. the cloth bedding is cotton and can be washed
4. the back is adjustable so that the baby can sit and look at the things around than just staring up at the ceiling

disadvantages

1. the frame has to be carried seperately when going on a travel. it adds to the number of things that the parents have to carry.
2. it cannot be carried at all when the baby is in it. hence the wheels at the bottom are used to move it from one room to another



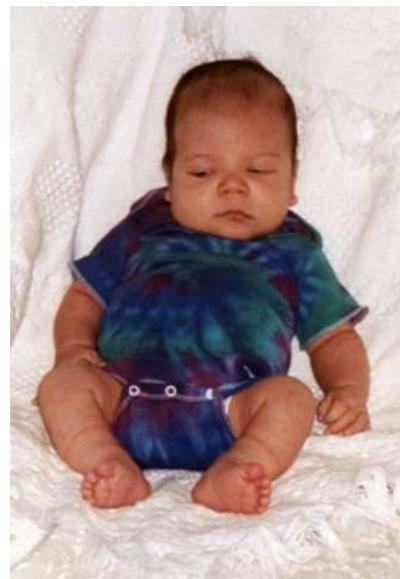


Age(m)	Weight	Height
0	2.89	48.9
1	4.40	52.1
2	4.83	56.0
3	5.57	59.0
4	6.18	61.4
5	6.69	63.5
6	7.10	65.2
7	7.45	66.7
8	7.74	67.9
9	8.0	69.2
10	8.23	70.3
11	8.47	71.5
12	8.72	72.8

Age(m)	Weight	Height
0	2.82	46.3
1	3.72	52.1
2	4.51	56.0
3	5.20	58.0
4	5.80	61.0
5	6.31	62.3
6	6.72	64.0
7	7.14	66.7
8	7.47	66.8
9	7.79	67.9
10	8.00	69.3
11	8.24	70.26
12	8.44	72.0

From the Department of Pediatrics, S.C.B. Medical College Hospital, Cuttack, Orissa, India.

## 2.1 anthropometric data



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## 2.2 Sleeping and carrying postures

### **carrying**

- Considering a baby and some luggage
- Should reduce fatigue while carrying
- Carrying considering different kind of travel

### **safety**

- The movable part should lock firmly
- It should look secure

### **trendy**

- Should look elegant while carrying

## **parents**

### **durability**

- How the product willwear
- Reusable by another child
- The life span of the product

### **ergonomics**

- What is the weight of the product
- The way it is carried, posture

### **pricing**

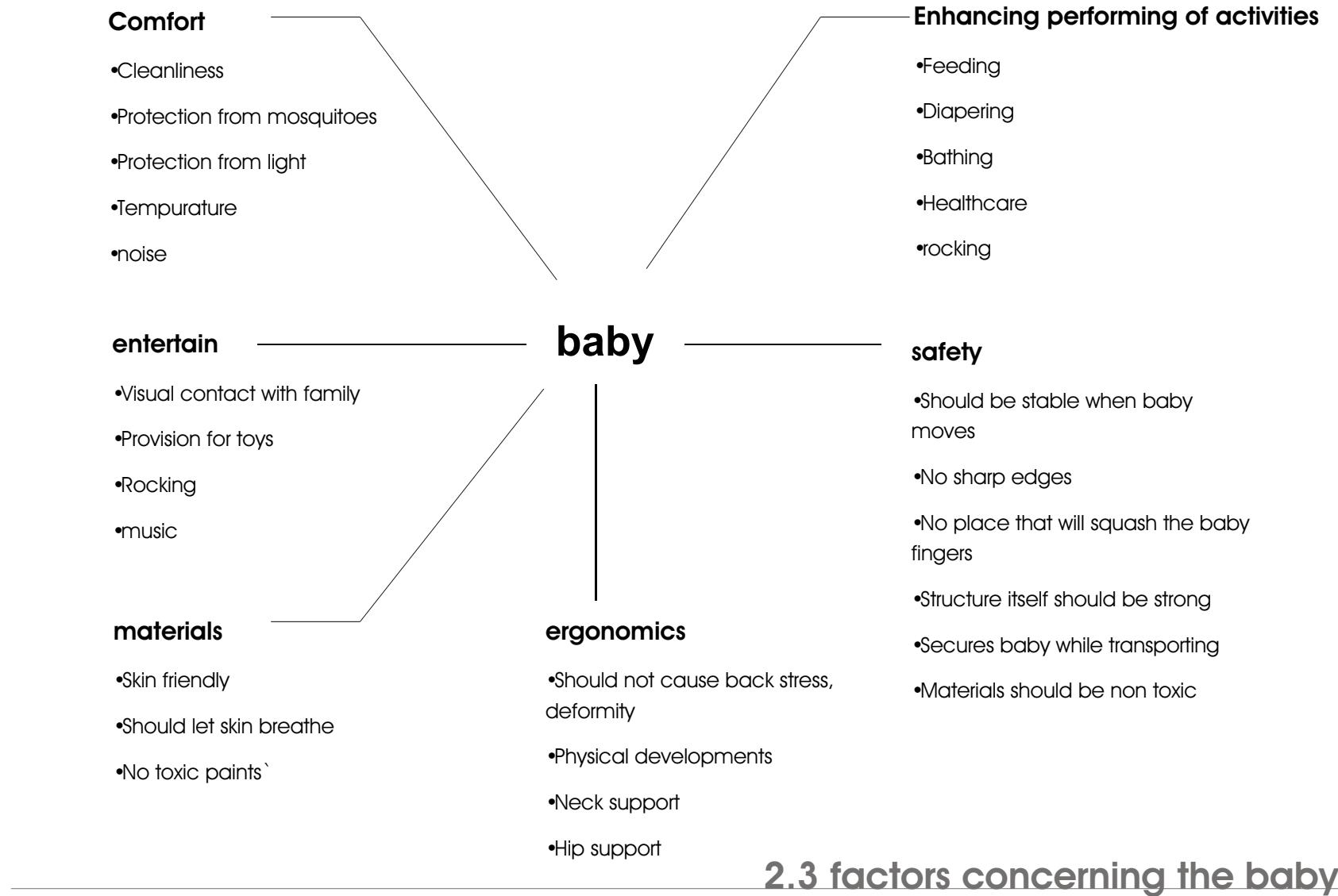
- Compare benefits with respect to cost, also other products pricing, affordability

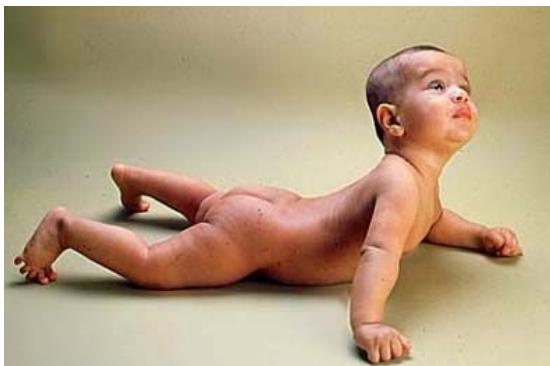
### **Ease of operation**

- How easily it unfolds
- How easily it packs up
- How it is carried
- Where it is stored

## **2.3 factors concerning the parent**

The following charts were made to mark down important points concerning the baby , the parent . The concepts evolved takes different routes depending on the emphasis laid on these factors





### If the baby is a newborn (0 - 3 months)

#### Characteristics & Needs

Physical and emotional presence of a parent or other caregiver is a primary need

Parents should touch and talk to baby as much as possible

Baby will use facial expressions to engage mother's attention

Babies will have uncontrolled reflexes such as jerking, grasping, and sucking

Kicking and waving arms

Baby begins smiling and interacting with parents

Ability to lift head begins at about 4 weeks, but baby's head must be supported at all times

Baby needs to be held and reassured that mother is close by and will respond when needed

#### What To Look For In A Carrier

Secure support that extends from above baby's head down the baby's back

Leg holes that can adjust small enough for a newborn and lock into safe, fixed positions

Padded seat and padded leg hole openings

Easy to get baby in and out with special features like side-entry access

Look for a carrier that is comfortable for both you and baby

#### Recommended Position For Newborns

Cradle position

Facing-in toward parent



### If the baby is 4 - 5 months

#### Characteristics & Needs

Lifts and holds head up unassisted

Vision dramatically improves

Begins reaching for objects

Babbling begins

Baby seeks interaction and outside stimulation:

Parents need to walk with her and introduce her to the surrounding world

Baby will open up to new experiences when faced out in a carrier

#### What To Look For In A Carrier

Adjustable for rapidly growing baby

Features such as flip or fold-style seat so parents can easily change positions

Comfort features for parents such as support panels and padded waist and shoulder belts, since baby is getting heavier

#### Recommended Position For Baby

Facing-out at parent's chest (only when able to hold head up unassisted)

When sleeping, facing-in toward parent

## If the baby is 6 - 12 months

### Characteristics & Needs

Able to sit up alone at about 6 - 7 months

May be able to stand up with support at about 7 months

Knows his or her name and beginning to understand other individual words

Baby still needs his parents' continued support and reassurance

Baby is becoming more independent, should be able to crawl and is beginning to hold parent's hands to walk

Ability to crawl and cruise means that baby proofing is very important

Parent's close proximity, interaction and voice are still important for optimal development

### What To Look For In A Carrier

Multiple carrying positions, such as facing-out and backpack

The backpack position is ideal for:

Holding baby high, at adult level so he may interact with his surroundings

Provide parents with comfortable, hands-free control over their active baby

Comfort features for parents such as parent support panels and padded waist and shoulder belts

For backpack, look for features such as load distributing straps and sternum straps for good stability. The features keep baby close to parent's back so weight is distributed vertically instead back and away from parent.

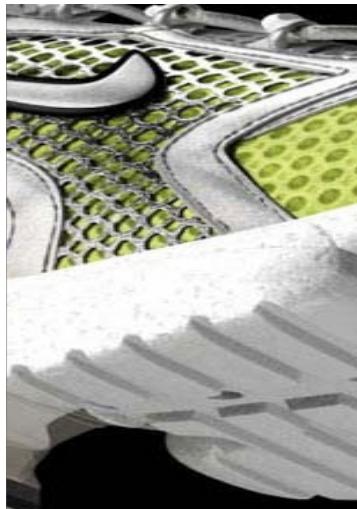
### Recommended Position For Baby

Facing-in toward a parent is best for sleeping

Facing-out is acceptable, but baby must be able to hold head up unassisted

Backpack position is acceptable, but baby must have complete head and neck control (usually at 6 months)





## **potential materials**

The product that was in mind was something that was going to be in close contact with the body while carrying the baby and also convert itself into a place where the baby could be kept. Thus there was the requirement for a combination of softness with rigidity. Moreover, while carrying, the rigid parts were to act as a support but not hurt the parent or the baby.

The materials were to have the quality of breathing and had to be skin friendly. Artificial materials were avoided as they may cause heating of the body. The cloth part had to be easily washable.

Materials like velcro were thought of for gathering the extra fabric and easy attachment.

As for the comfort of the parent, padded straps for weight distribution are required.

Plastic heavy duty snaps for easy attachment and securing the baby to the body.

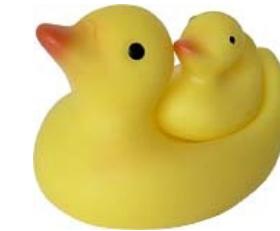
Fluid cushioning technology could be used as it would help in taking jerks as well as balancing temperature variations.

Thin sections of spring steel could be considered for the light flexible framework. .

## Aesthetics

Primarily the aesthetics should keep in mind the visual comfort of the baby. Very bright and happy colors might actually be very disturbing to the baby, and at the same time might not look elegant on the person wearing the product. The aesthetics should be neutral i.e., Not feminine nor masculine as it would be worn by both parents.

The aesthetic has to appeal to the potential buyer. it has to elegantly represent the underlying factors of design. it should impart a feeling of coziness, security, strength. the user of the product is the baby as well as the parent carrying the baby. it has to also look elegant on the person carrying it. A study of the baby products available in the market and also baby products seen in books and magazines was done in order to understand forms and color and the feeling they impart to the user.



Soft forms



## 2.6 aesthetics

1. Listing the occasions when the baby is taken out
2. Identifying the occasions where carrying and keeping are both necessary

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## 2.7 activity analysis



The occasions when the baby is carried out of the house can be classified broadly into two groups i.e.. daily routine outings and special occasions. depending on the nature of outing the gear taken along changes.

## **1. daily routine outings**

### **morning and evening walks**

ways of carrying- front/back carriers or prams (mainly when grandparents are carrying)

amount of time carried for- 1 to 2 hrs

mode of transport- mainly by foot, sometimes by scooter or car to the park

### **going to the creche/ office creche**

ways of carrying- front/ back carriers (for two wheelers), carry cot, car seat (for cars)

amount of time carried for- ½ hour to 1 hour max.

mode of transport- car, two wheelers

## **2. special occasions**

### **shopping**

### **going to friends/ relatives**

### **going to friends/ relatives**

### **going to restaurant**

### **Traveling on a long distance journey**

## Case study 1

**Activity- going out to marine drive with baby**

USERS- PARENT and BABY

SUB-ACTIVITIES

Packing baby's bag  
Getting the baby ready  
From home to car  
From car to Marine drive  
Walking on Marine drive  
Sitting by the sea.

### **Packing the baby's bag & getting the baby ready:**

Considering the nature of the trip (2hour trip, evening time, seaside) The mother packs in the packs of diapers, a milk bottle, a napkin, a box of baby wipes, talk powder. She also decides to use the front carrier for this kind of trip. When this is done she dresses up the baby. She usually uses diapers when on such short trips but for longer journeys the baby prefers to be in nappies. After this the mother wears the carrier, lifts up the baby and places her inside it.

### **From home to the car:**

The family leaves their apartment and chooses to take the lift to the ground floor as it is difficult & dangerous to climb down steps with the baby in the form as one cannot see the steps. The lift takes them to the ground floor and the head for the car. Since the mother is carrying the child the father can easily open the car & get into it opening the rear door to access the baby car seat. The mother takes the baby out of the carrier and places her in the car seat. She then gets in and fastens the car seat belts. She gets out & then gets into the front seat beside her husband.

### **From car to Marine drive:**

The drive takes about twenty minutes. The father makes sure to avoid bumps and tries to drive at a constant speed to avoid jerks. The mother constantly turns back to see if the baby is ok and she even put her hand between the two front seats to touch and comfort the baby.



**Walking on Marine drive:**

The baby is taken out and worn by the father. There is a sea breeze that blowing and the parents wish that they had dressed the baby in something warmer. So father takes the baby out and holds it in his lap while the mother puts on the extra T-shirt and a warm cap on the baby's head. They then walk along the sea regularly encountered by vendors selling peanuts, tea etc. The father also has to watch for the uneven surfaces to avoid jerks to the baby. The baby has a view looking on either side of the carrier but cannot see in the direction where the parent is looking. So every time the parent wants to show the baby something they have to turn at an angle from where the baby can see what they are showing.

They finally give in to the vendors and decide to sip on a cup of tea enjoying the sunset. So they plant themselves on a seat.

**Sitting by the sea:**

The hot tea is brought and the husband gropes for the money while sitting from his back pocket while still holding the baby. He then realizes that since the baby is facing toward him, her legs are not comfortably placed while he is sitting. So he removes the baby from the carrier and places her on his lap, facing away from his body. Back to the tea, he ensures that his neck is craned out to one side away from the body while sipping the tea. In the meantime the baby decides to wet the diapers and starts crying. So the mom spreads the cloth on the seat and puts the baby on it to change the diapers. The seat is used by one and all and no one knows how unhygienic it might be. Also the baby can now roll over so the mother has to be extra careful while changing the diapers. The father now picks up the baby while the mother disposes the diapers & washes her hands. The baby is now happy and is fed from the milk bottle and falls asleep. The family decides to go back after a little walk by the sea.

**Observations:**

The time spent carrying the baby was 25 minutes while about 45 to 50 minutes were spent in stationery activities like sitting, playing with the baby, having tea, changing diapers etc.

Users came up with unique problems only once they reached their destination eg the sea breeze which they wouldn't have imagined at home.

Parents have to make do with compromising situations like placing the baby on the seat to change diapers. Hygiene & comfort is disregarded. Carrying the baby in front has its own advantages & disadvantages. Here the parents had trouble climbing down stairs and also had to pay attention to road condition while walking. Also the parent and the baby are looking at different things so interaction with the surroundings difficult.

When the baby is held facing outwards it looks very disturbing to see a baby dangling in front especially pot bellied individuals where these carriers don't function as desired. Also interaction with surroundings is restricted to 2 sides.

The baby is removed from and put into the carrier several times on such a trip.

Both mother and father take turns to carry the baby but the pattern of who carries when is almost decided.

Legs of the baby have to spread more in the front carrier while the parent is sitting (while standing the legs dangle down)

**Interfaces:**

Both carrying and sleeping are important.

Baby's can roll over on hard surface but not on a hammock shaped surface. Side carrying could be an option which might be useful while climbing up & downstairs.

Some weight would come on one shoulder there could be a possibility to shift the weight to the other shoulder.

Interaction can improve if the baby gets a better field of view.

Carrying on side looks more natural considering the type of carrying everywhere in India.

Back carrying option could also be tried out since it would mean the baby has a full view of thing in the front.

The product should be unisex. Since both the parents use it.

Ingress & outgress has to be a simple process.

While sleeping the baby it should allow a view around & not only the sky. The baby should see the sea.

## Case study 2

### Activity - going to an open air restaurant (pune)

Users father : computer engineer at tata infosys

Mother : teacher at primary school

Baby : 4 months old

Sub activity packing baby bag

From home to scooter

On scooter to restaurant

In the restaurant

The packing of bags is much like the one in the earlier case study as the duration of the outing is almost the same. Additional things taken along include the baby's sleeping bag that will be used once in the restaurant.

The mother wraps the baby in a thin cloth and carries the baby in the front. She carefully climbs down the stairs. On reaching the scooter the mother who is wearing a sari leaves one hand off the baby and takes support of her husband and hops on to the scooter sitting with both legs on one side. The husband drives at a steady pace and the mother is holding on the baby with one hand and to her husband with the other. The turns need to be negotiated with more care and slow speeds.

At the restaurant:

The mother gets off from the seat and the family enters the restaurant. It is late in the evening, tending to get a little cold especially after a short spell of rain. There are mosquitoes around.

The waiter is asked to bring two extra chairs preferably with armrests and to be placed facing each other. They put the baby in the sleeping bag and place it in the cradle formed by the two chairs. Now they get down to ordering food. The baby is looking up at the sky with the parents playing with it once in a while.



Observations:

The activity of carrying the baby took about 35% of the time while the rest was required to keep the baby comfortably.

The mother cannot hold on to any thing while negotiating steps as both her hands are holding the baby. So she has to be very careful.

Climbing on to the scooter with the baby could be dangerous as the mother could slip or lose her balance, especially if the baby moves.

Negotiating turns is dangerous, unnoticed speed breakers too could be unsafe as the mother has to hold on to the baby and balance her self on the bike.

At the restaurant the baby is placed looking up at the sky, thus reducing the possibilities of interaction with the surroundings.

An open-air restaurant means exposing the baby to the sun, wind, dust, insects etc.

Since the baby is placed between 2 chairs the surface touching its back is uneven. The sleeping bag tends to compensate the unevenness.

Inferences:

Climbing steps is easier when one hand can run along the railing for support. Some kind of carrier is needed to hold the baby in a more secured manner than simply holding it with hands. This need is sensed especially while traveling on a two-wheeler.

The carrier should be comfortable while in the sitting position on a scooter. At the restaurant a flat even surface is necessary if the baby is to be placed. The surface also must be clean.

A product needs to be developed where the baby's body is away from the surface of the chair but supported by the frame.

-Provision for protection against heat, cold, dust and insects should be incorporated.

## Case study 3

Activity : going for a picnic.

Sub activity : packing the baby's bag  
Two hour drive  
At the picnic

Packing the baby's bag:

For a day long trip the packing for the baby needs to be more elaborate. The baby's accessories that need to be taken along include clothes, diaper, disposable bibs, baby powder, soap, milk powder, baby wipes, glass, bowl, spoon, thermos, mineral water etc. The parents take their car seat so as to keep the baby safe and comfortable. They also decide to take along a front carrier that could be used to carry the baby around conveniently.

A thought is given to the folding bed that could be used while the baby is sleeping. However the same was overruled considering the several other accessories that need to be carried along side.

Around 7.30am the sumo arrives filled with friends and the mother carries the baby in the front carrier while the father gets the car seat and the other luggage.

It was decided that the car seat would be attached to the rear seat. However a person was already occupying the rear seat. So after trying in vain to adjust the car seat meant for the baby the idea was completely dropped. The mother was now to carry the baby throughout the drive.

The ritual of changing the baby diapers called for another halt before reaching the destination.

The car has stopped and the occupants are out for a stroll while the baby gets his diaper changed. The car seats were covered with rubber mats so as to prevent the soiling of the seats.



The destination was reached after traveling for almost 1½ hours.

Sub activities:

- Walking
- Sitting and talking
- Reading a book
- Eating
- Exploring
- Sleeping

Around 6 hours were spent at the picnic spot. The location was a green spot near Lonavala.

A farmhouse belonging to a friend was used to rest through the afternoon.

The group gets off from the vehicle. The father helps put the foodstuff into the house while the mother wears the baby carrier and secures the baby in it. The group relaxes in the house for a while before venturing out.

The weather is in fact quite cool and humid and the baby has to be covered well. The ground too is very uneven and has a steep slope, making it a little difficult for the mother to move around along with the baby. The front carrier helps to certain extent as it balances and distributes the baby's weight.

The group explores the place for about 20 minutes before they decide to settle down to have food. The mother puts the baby on a piece of cloth on the ground while she prepares the food for the baby. The baby tends to roll over and crawl around, so it needs constant attention. The baby falls asleep after eating.

### **Observations**

Both the carrying and the keeping occupied considerable amounts of time. The front carrier served the function well but was a little problematic while climbing on uneven surfaces. One prefers to see what on is stepping on which becomes difficult while front carrying.

When the baby is kept one has to be sure that the surface where it is kept is even. Parents are also concerned of insects crawling on to the baby. At the farmhouse the beds and sofas were not regularly dusted. One would think twice before putting the baby on it.

### **Inferences**

Carrying the baby on the body is the best way in such conditions  
The carrier should be designed to increase the interaction with the surroundings.

The baby should have its own keeping equipment carried along because one cannot predict conditions of keeping in an unfamiliar place  
The back or a side carrier is a good option for such a trip as it allows full view of things around.

the product should promote intimacy between the parent and child.

the feel and appearance needs to be parently.

the targeted age group is babies upto 9 months

**comfort**- it should be soft and adjust to the baby's body.

**safety**- should be stable when the baby moves

no sharp and hard edges

no place that will squash the babys fingers

should secure the baby while transporting

materials should be skin friendly and non toxic

the mechanism should promote safe ingress and  
outgress from the carrier

the forces acting on the carrier during different uses should be  
studied to impart strength.

its aesthetics should speak of its safety

**ergonomics**- should not cause back stress to either baby or the parent

it should consider the physical growth of baby upto 9 months

it should provide neck s and hip support

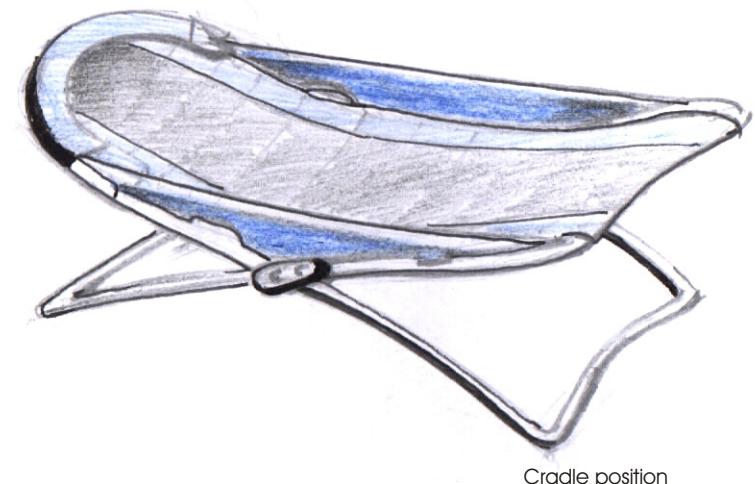
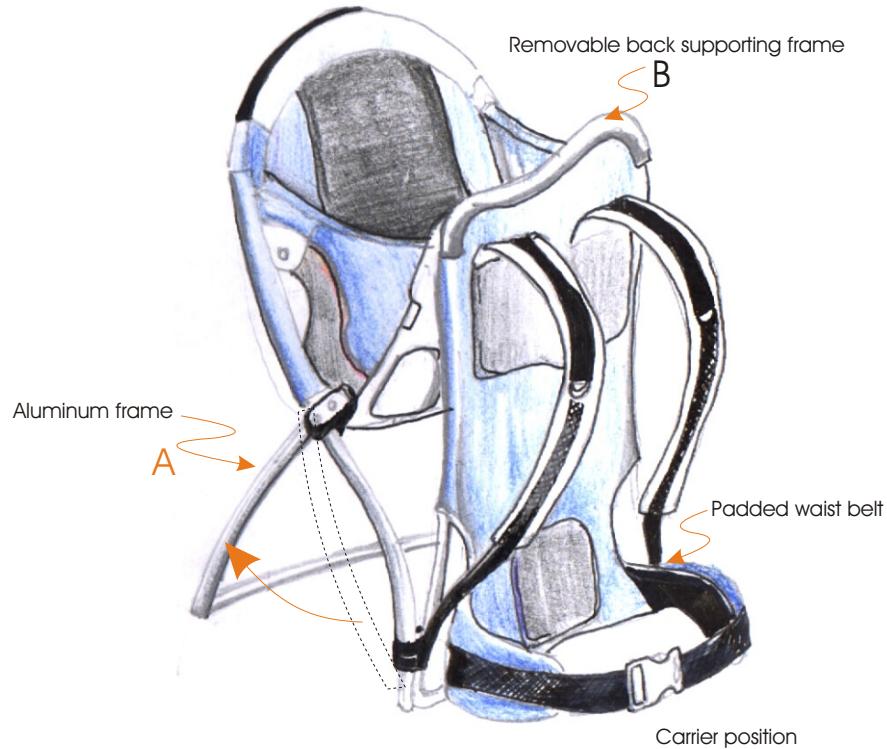
the product weight should be minimized to facilitate the carrying

**ease of operation**- the operating mechanism should involve the minimum  
number of steps

**facilitate activities**- sitting, diapering, feeding

**Interaction**- it should promote interaction of the baby with the environment

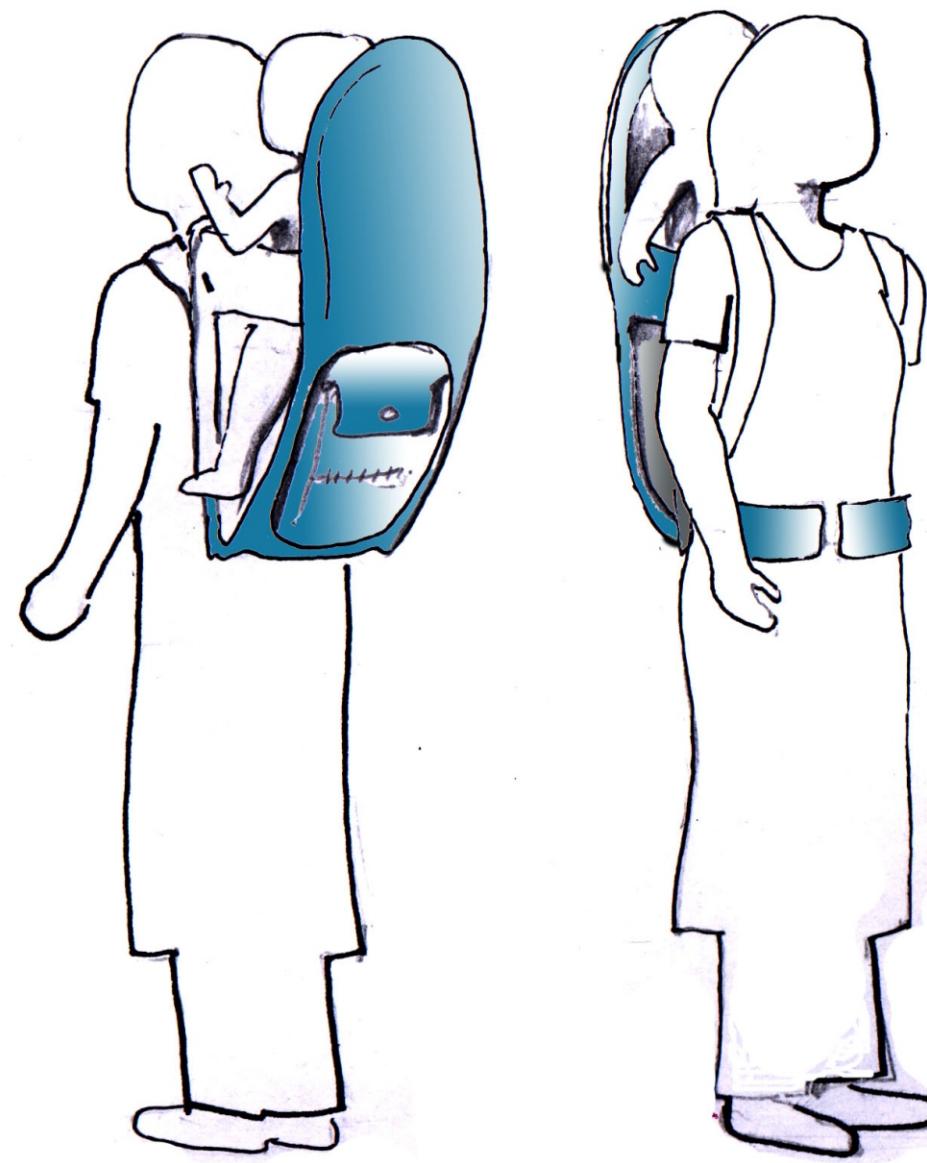




### The back frame carrier

In this concept the baby is carried on the back. In this concept, the combining of the carrying and keeping aspects of the product was worked around a frame that would convert itself into a cradle when placed on the ground.

The product is like a backpack, and places the baby's head above the shoulder. When the backpack need to be removed, the parent has to flip out the stand (A) for support. The carrier is then rested on a flat surface and can be removed. To convert to the cradle position the baby is removed from the carrier and the back supporting frame (B) is detached from the main frame allowing the main frame to fold to the cradle position.



Concept 1

## Evaluation of concept

**Comfort**- the back carrier is comfortable for a baby of age above six months as this is when it can hold its neck well.

**Safety**- the baby is held securely between the two frames and its legs pass through the leg holes ensuring that the baby does not fall out.

**Ergonomics**- parents can carry the baby for long distances as the weight is evenly distributed over the back. The parent has to bend forward slightly to balance the weight.

**Ease of operation**- basically there are three steps. 1)Flipping out the stand and putting down the frame and removing the baby, and 2)detaching the back frame. 3)Opening the frame to cradle position.

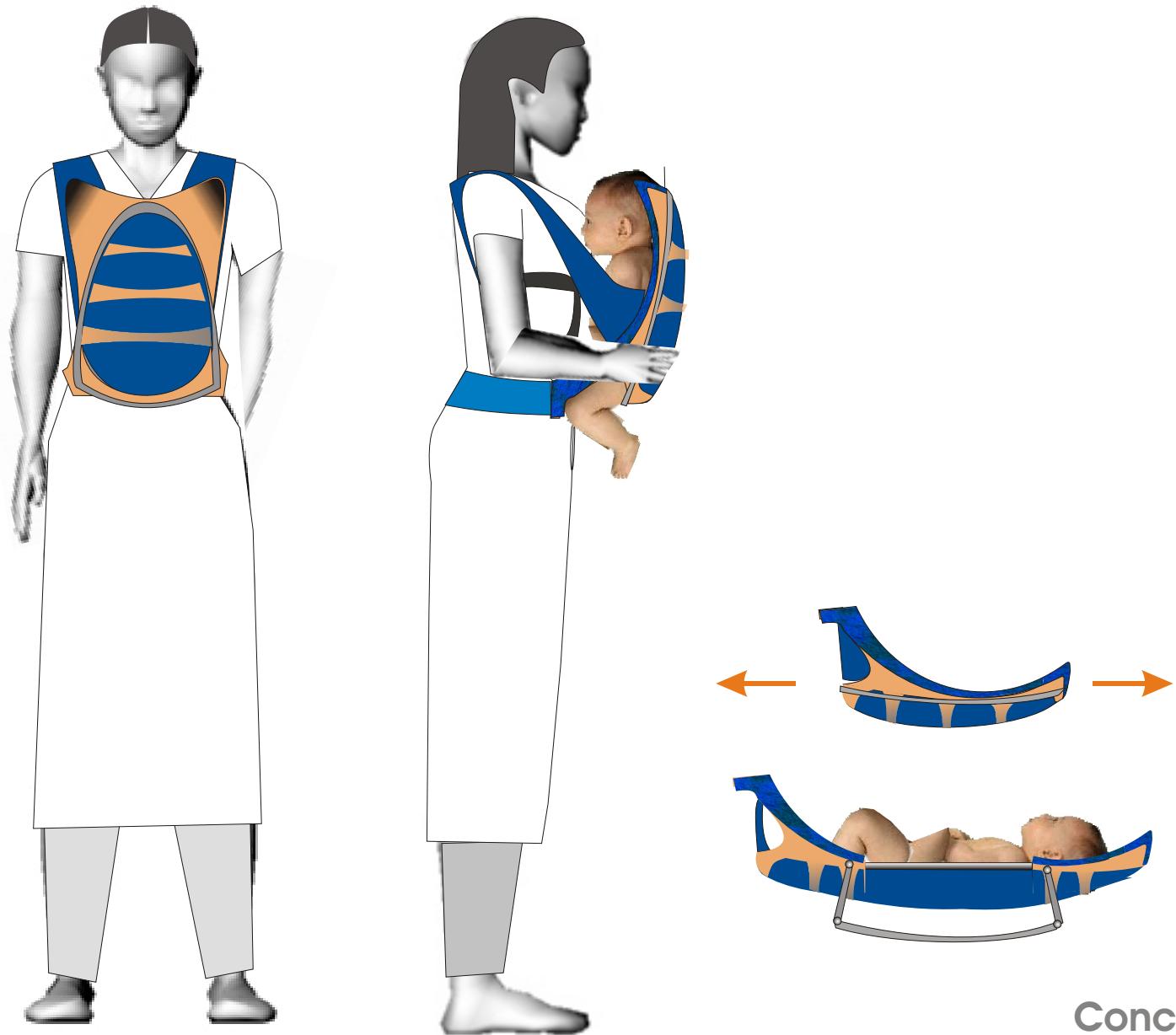
**Product weight**- aluminum frame reduces weight and would weigh slightly more than a haversack with a frame.

**Interaction**- it would lead to better interaction of the baby with the environment as it can see in the direction of the parent by peering over the parents shoulders.

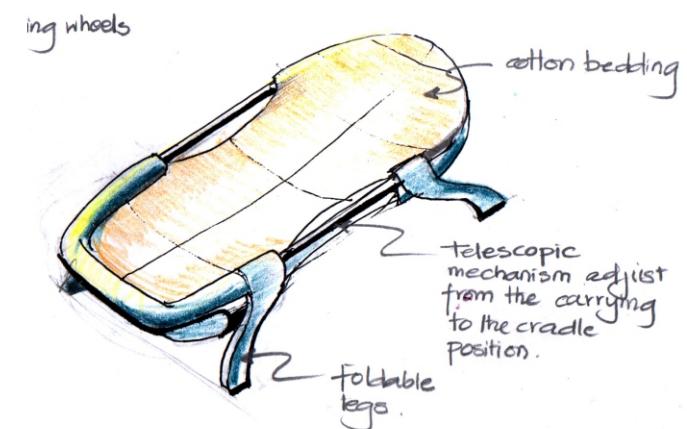
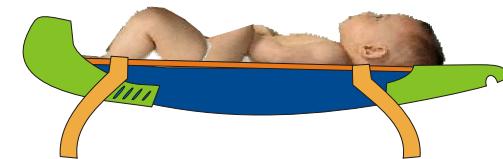
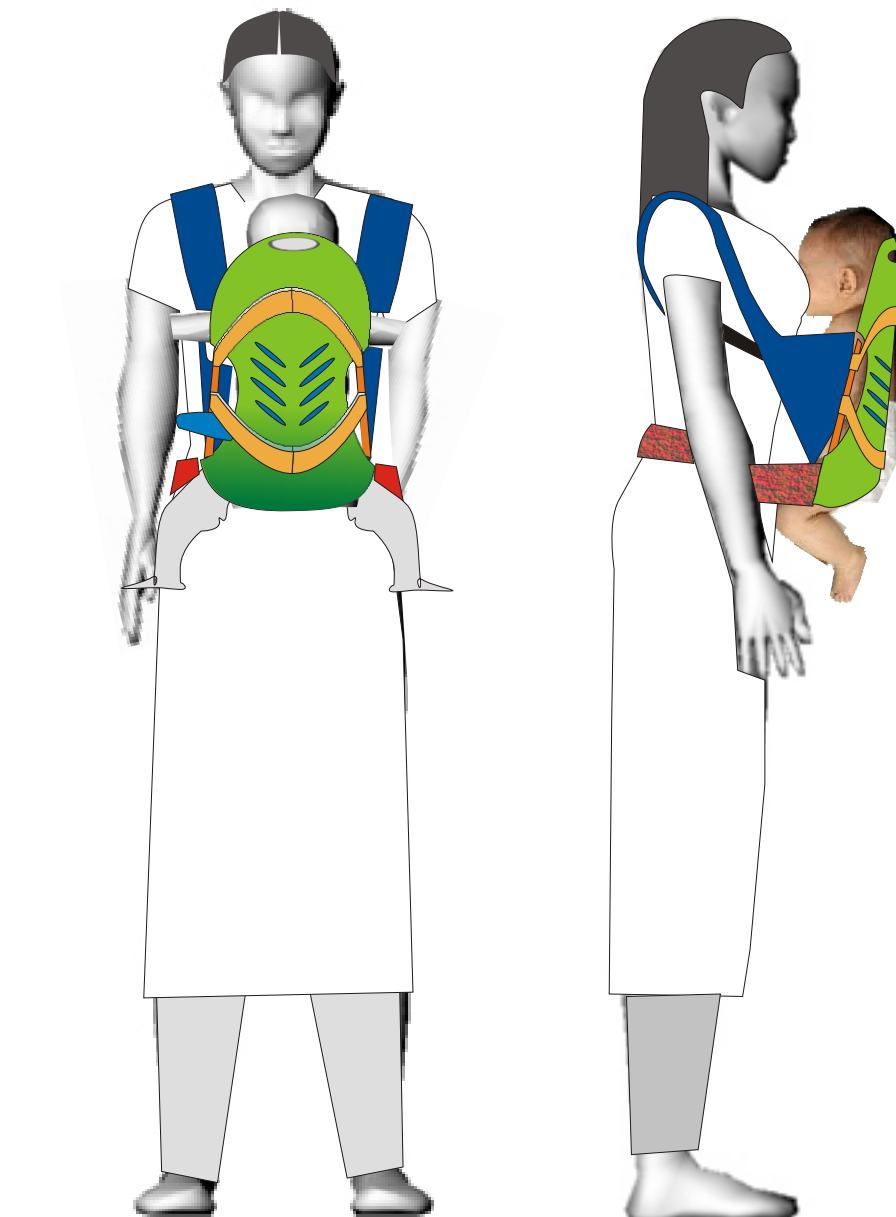
**Aesthetics**- it has the feel of a trekking gear and would look absurd in an urban situation and with Indian clothing thus reducing the range of users tremendously.

**materials**- a aluminum pipe frame structure with nylon cloth used in bags. The interior is cotton padding.

**Miscellaneous**- It cuts off direct eye contact with the baby and a lot of parents were not comfortable with this.



Concept 2  
option1 42



Concept 2  
option 2 43

## Evaluation of concept

**Comfort**- the plastic back frame cannot modify from the cradle posture to the carrying posture. The telescopic mechanism makes the frame rigid and so heavy padding is required where the frame touches the body.

**Safety**- the baby is secure in front of the mother and can be held by the mother.

**Ergonomics**- the cradle position width is larger than the carrying width but the telescopic mechanism allows for growth only longitudinally and not width wise.

**Ease of operation**- basically there are three steps. 1) removing the baby from the carrier, and detaching the plastic frame from the body straps 2) pulling the two parts using the telescopic mechanism 3) placing the baby in it.

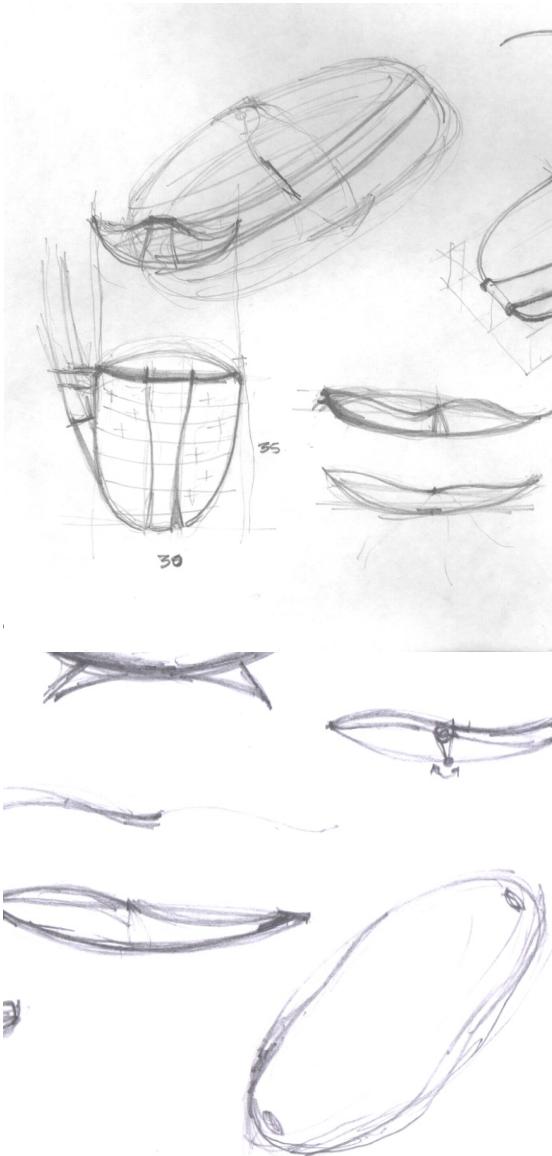
**Product weight**- plastic back and the telescopic mechanism would add to the weight.

**Interaction**- there is better interaction with the environment but lesser with the surroundings

**Aesthetics**- its combination of soft translucent plastic straps that hold the fabric would make it look quite trendy.

**materials**- in first option the frame is polypropylene with a breathing fabric at in between held by soft translucent plastic straps. The second option the entire structure is made in pp. Plastic telescopic sections are used for the telescopic mechanism

**Miscellaneous**- It enhances proximity between parent and baby.

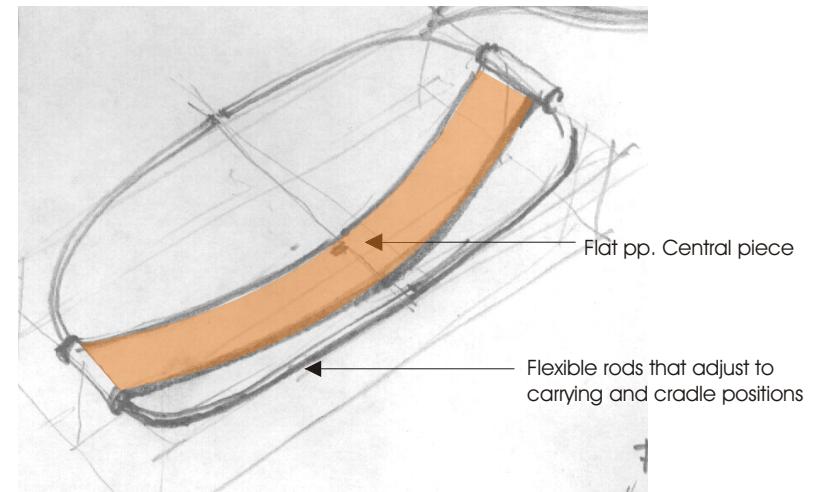


### The folding front carrier

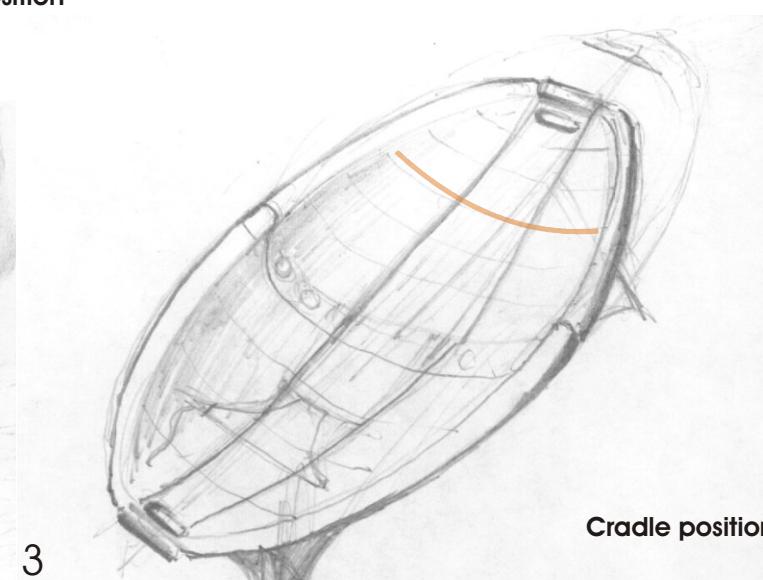
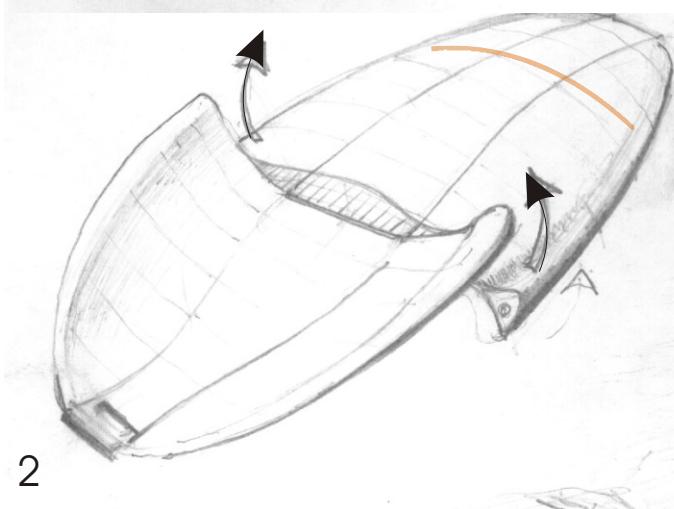
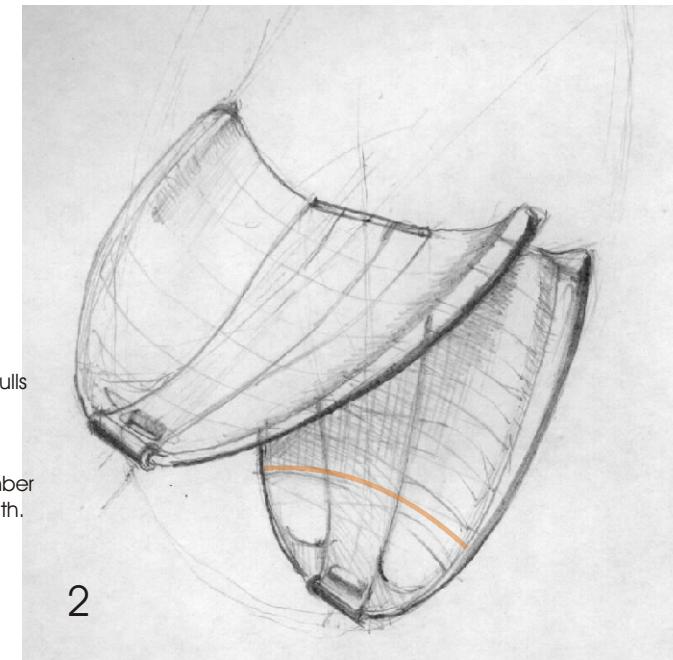
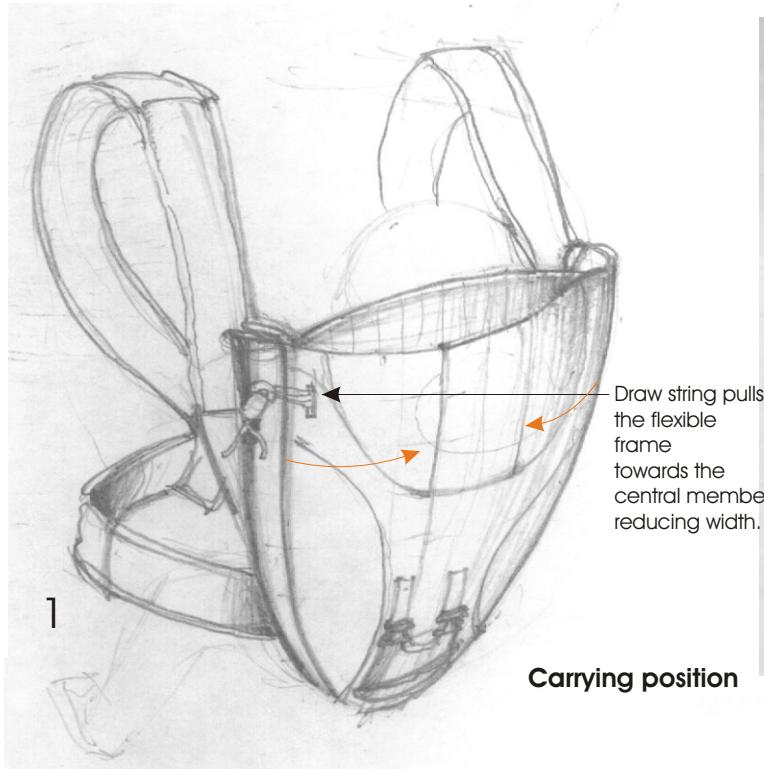
This was a front carrier in which instead of using a telescopic mechanism the folding frame was used. An attempt was made to make the carrier grow length wise as well as along the width by using flexible materials.

The structure consisted of a flat polypropylene piece at the centre that allows it to bend as shown in the sketches. At the ends is a flexible plastic rod that tends flex out when in the cradle position but can be pulled towards the central pp. structure when one wants to carry it on the body. The idea is to adjust the frame to the different purposes.

Another advantage is that it would be much lighter than using the telescopic mechanism.



**Concept 3**

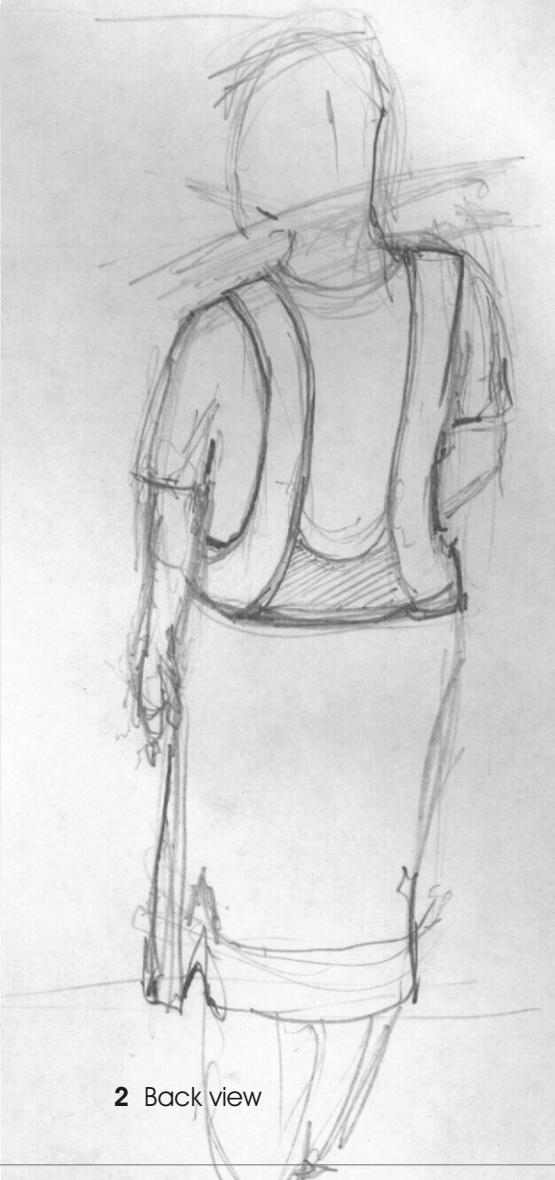


Converting from the carrier to the cradle

**Concept 3**



1 Strap to worn on the body before attaching the carrier to the body.



2 Back view



3 Carrying the baby

**Concept 3**



Carrying position



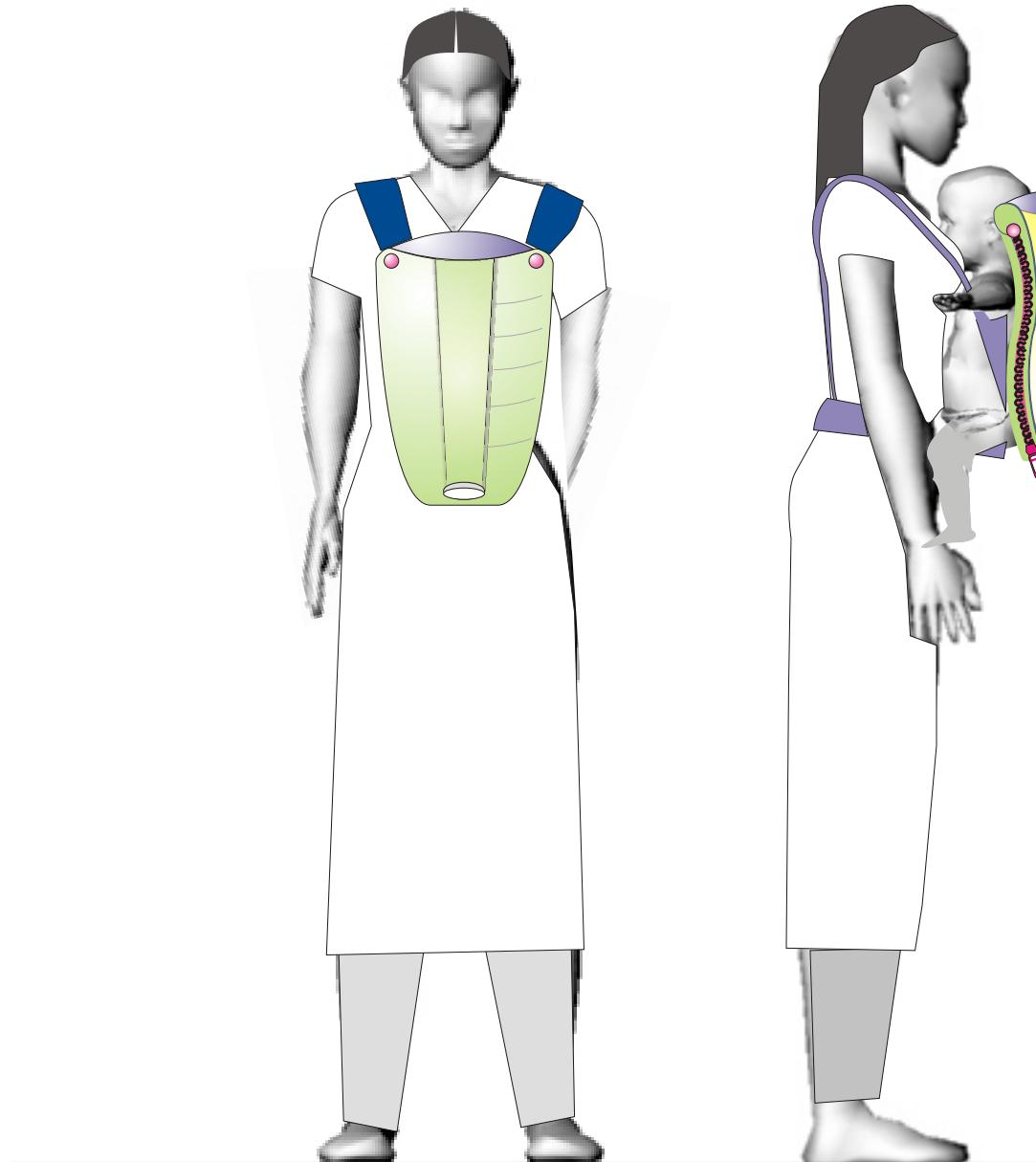
Opening the frame

### The conceptual frame

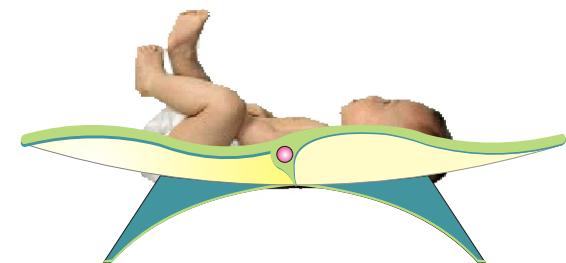


Cradle position

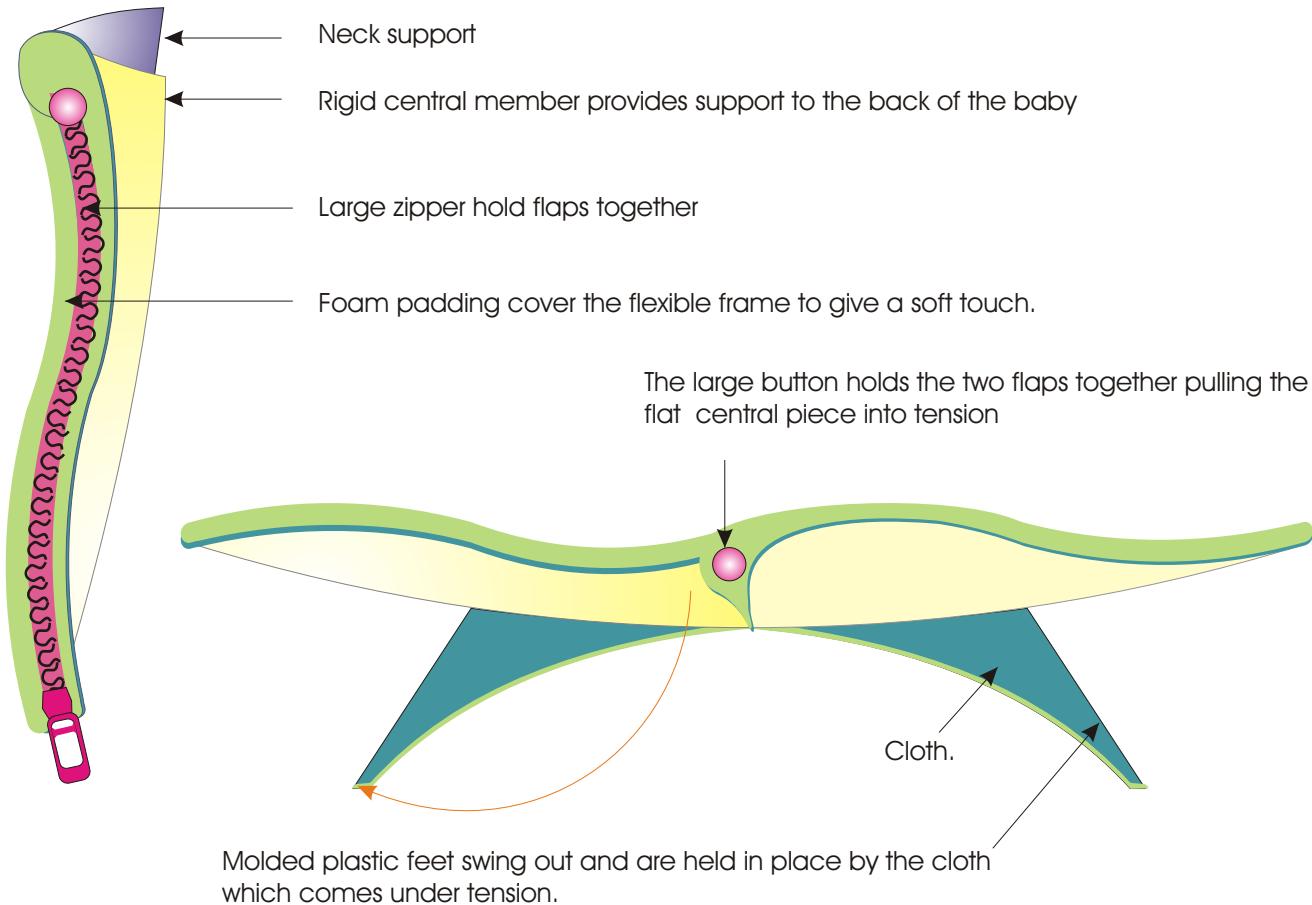
**Concept 3**

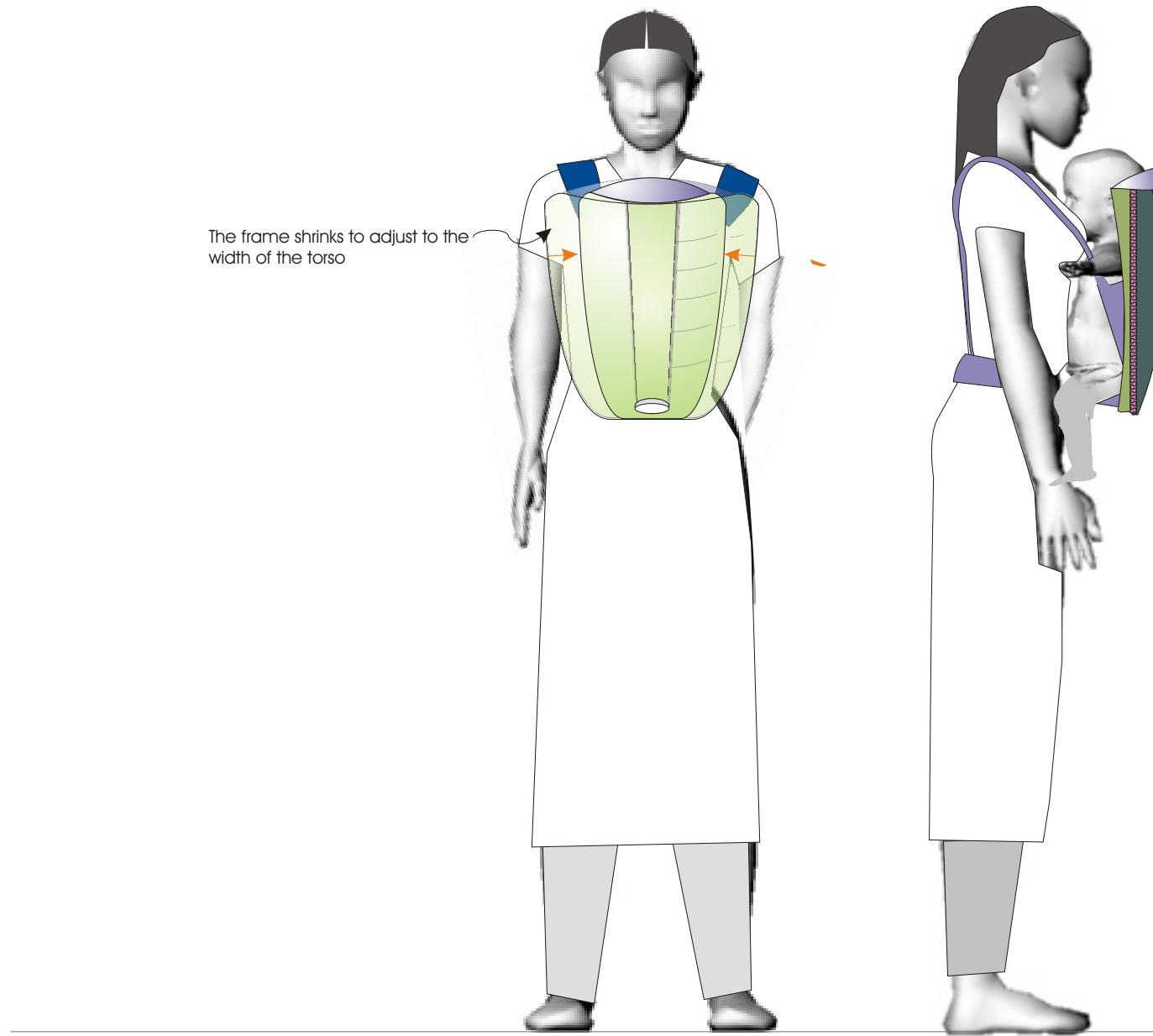


The inspiration for this form was a leaf. The properties of a leaf such as its flexibility, and the smoothness of its curves has been used in the design.

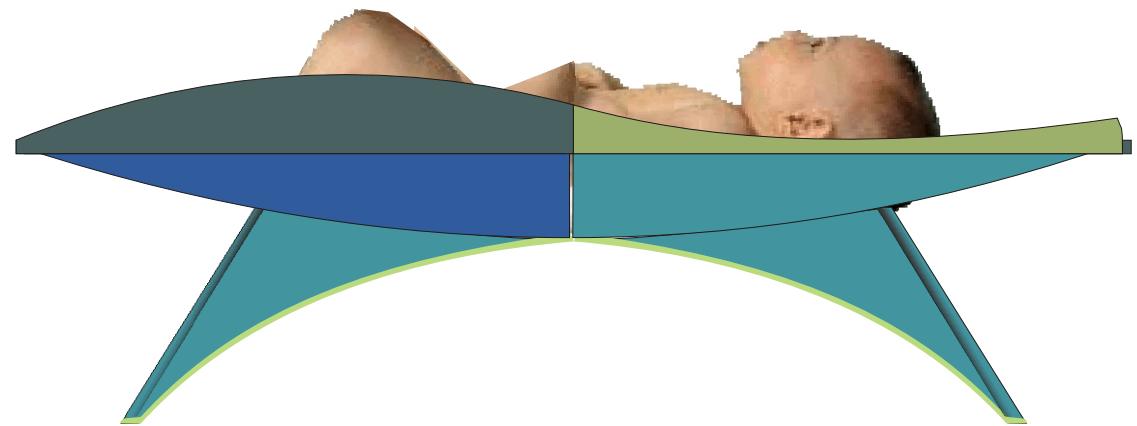
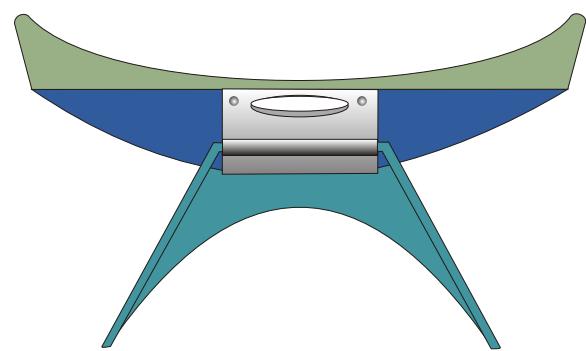
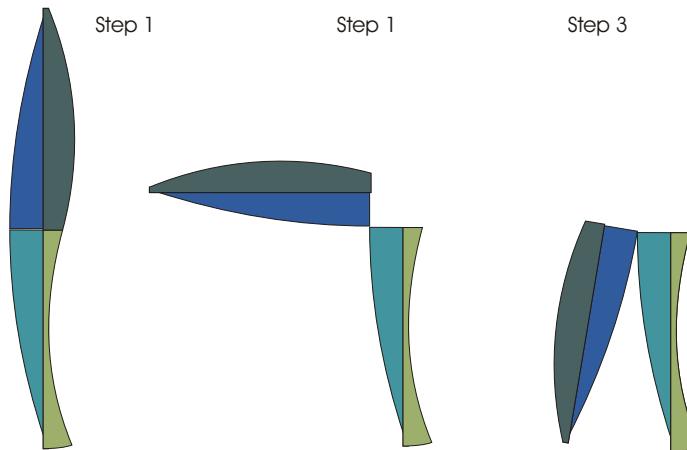


**Concept 3**  
option 1 49





Concept 3  
option 2 51



Side elevations

Step 4

**Concept 3**  
option 2      52

## evaluation of concept

**Comfort**- since the frame has a central pp piece with a cloth web it might hurt the baby. However the advantage to the parents is that the flexible frame is soft to the body while carrying.

**Safety**- the advantage while carrying the baby is that it snugly fit the baby and secures it to the parents body.

**Ergonomics**- the central piece is intended to support the back bone while carrying but uncomfortable while in the cradle position.

**Ease of operation**- basically there are three steps. 1) removing the baby from the carrier, and detaching the frame from the body straps 2) opening the two flaps (flexing the frame to the cradle position happens due to the spring action of frame, the legs flip open automatically because of their own weight) 3) placing the baby in it.

**Product weight**- weight is reduced further from the earlier concept because there is only a hinge compared to the telescopic mechanism.

**Interaction**- there is better interaction with the environment but lesser with the surroundings

**Aesthetics**- soft forms and curves, more definitive form

**materials**- central pp frame, cotton bedding. Spring steel rods for flexibility required from carrying to cradle position.

**Miscellaneous**- baby is close to the chest and can feel the heartbeat of the parent.

## Cocoon

The cocoon is a space which **protects, secures, comforts and shelters** while inside it is a life that is **growing and changing**.

The concept of the baby carrier derives a parallel with this cocoon as the nature of purpose served is so similar. The baby carrier is designed to hold the baby comfortably and protect it till the baby outgrows its use.

To take this idea further it was felt that the carrier itself was to have a life of its own and grow. This was seen when the carrier **metamorphosed** from the carrying position to the cradle position. The nature of the frame and the exploiting of material properties actually responded to this idea of growth.



The clip flips changing its curvature



A combination of these clips open up a world of possibilities



The concept was triggered off by  
**the tic-tac hair clip**

**final concept**

**Concept model** the structure flips to form the opposite curve because of the tic tac mechanism commonly found in hair clips



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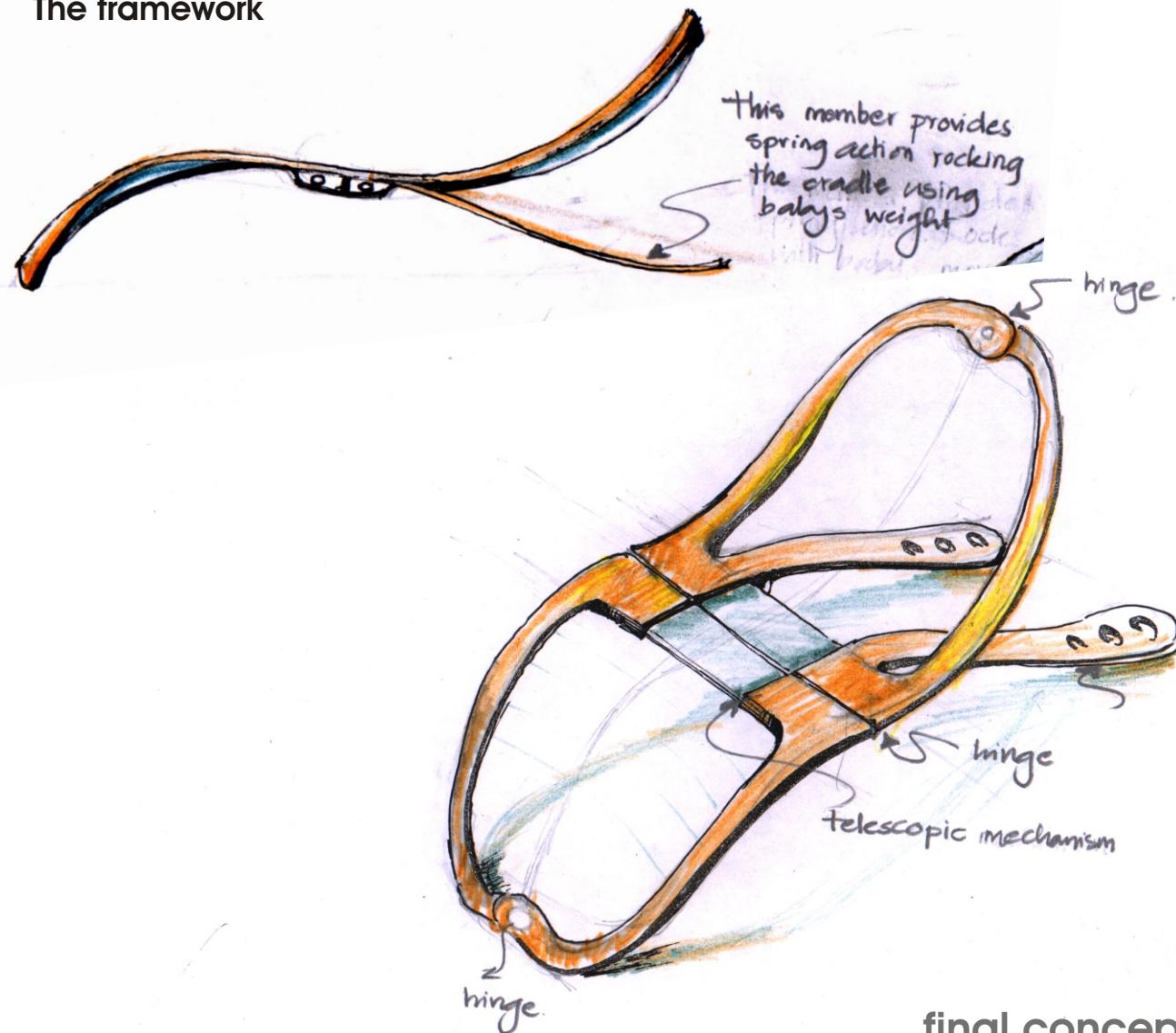
**final concept**



The conceptual frame

final concept

## The framework



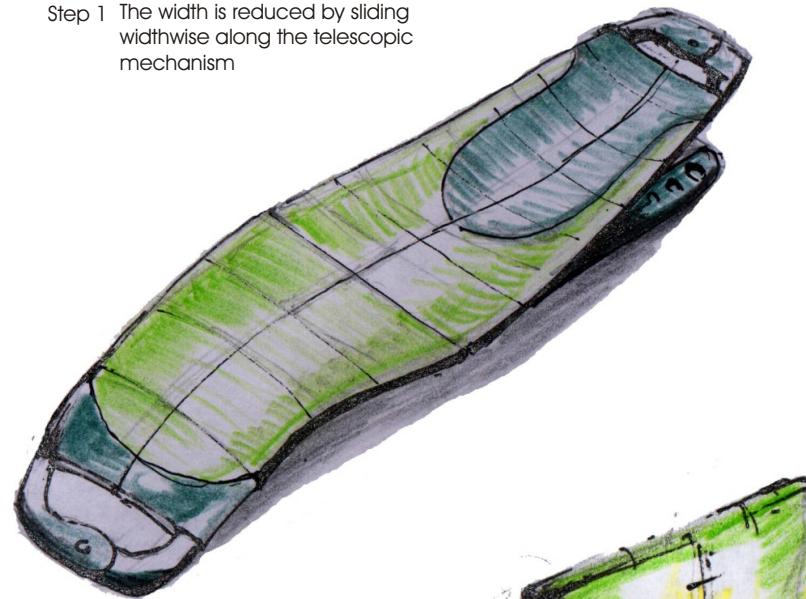
final concept

The cradle position

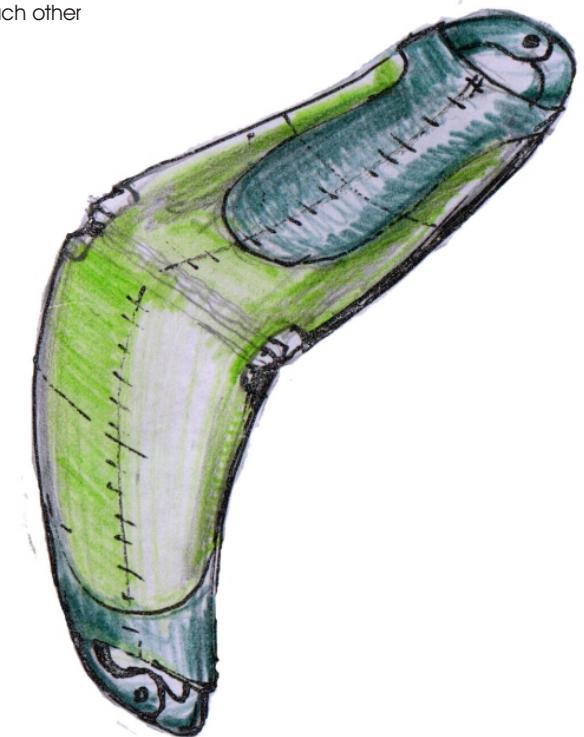


final concept

Step 1 The width is reduced by sliding widthwise along the telescopic mechanism



Step 2 The hinge folds the two flaps on top of each other



Step 3 The large zip holds the two flaps together while in carrying position



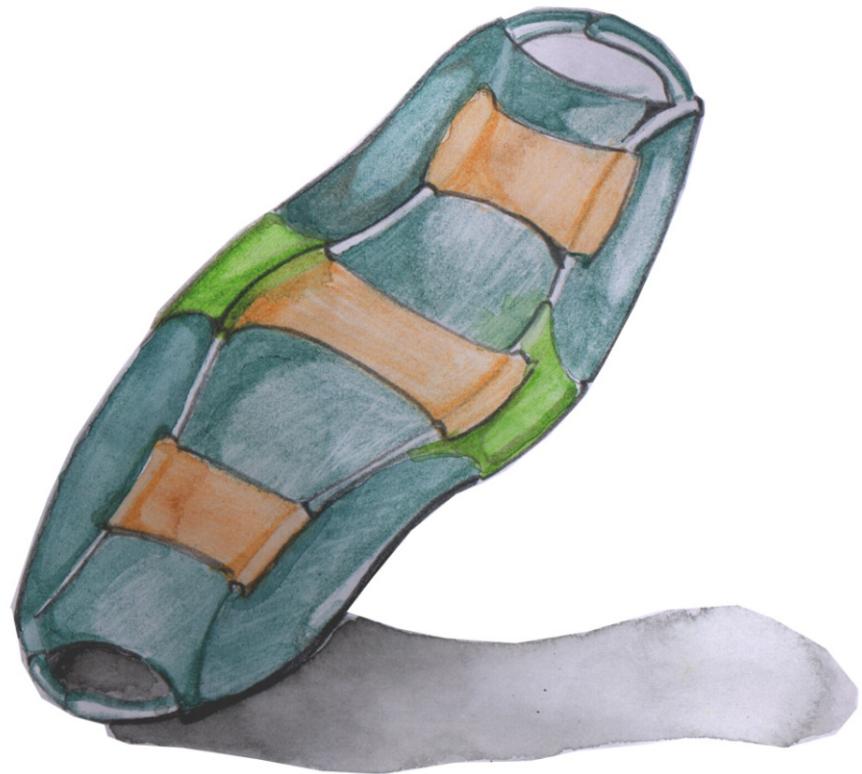
**Steps from cradle to carrying positon**

**final concept**



The string helps the cloth to adjust to the varying width required for converting from cradle position to carrying position

**Underside view**



The adjustment of the cloth width happens using broad velcro straps



**final concept**

The carrying position



---

final concept

## Evaluation of concept

**Comfort**- the product works well in the carrying as well as the cradle position. While carrying the central cloth adjusts to the back of the baby. While keeping the cloth provides a soft padding between the frame and the baby's body.

**Safety**- the product is useful while carrying especially while climbing when one needs to see where one needs to watch the step. While keeping the belts prevent the baby from rolling over.

**Ergonomics**- it is a side carrier so it has uneven weight distribution over the parent's body.

**Ease of operation**- basically there are three steps. 1) removing the baby from the carrier, and detaching the frame from the body straps  
2) flipping open the two parts 3) stretching along width to give required angle and width of seat. Placing baby in the carrier

**Product weight**- thin spring steel section combined with cotton bedding have negligible weight.

**Interaction**- there is better interaction with the environment and with the surrounding because of the side carrying position.

**Aesthetics**- it looks elegant while carrying as well as when in the cradle position.

**Materials**- a flat spring steel sheet cut to form the basic frame, cotton padded cloth that is stretched between the frame.

**Miscellaneous**- It enhances proximity between parent and baby. It uses the baby's weight and movement to rock the baby.  
Considering the carrying methods commonly seen in India and the dressing style of women a side carrier was preferred.

## **Selection of the concept**

After trying out various methods to combine the needs of carrying and keeping the baby the final concept functioned well at various levels of the product. The comparative analysis of the different concepts showed why the final concept was chosen.

### **1. Safety**

In the carrying position the baby is in front of the parent and all its actions and needs can be immediately tended to by the parent. The parent can even hold the carrier with one hand.

### **2. Ergonomics**

Although the weight comes to one side of the body it replicates a more natural and traditional way of carrying that is seen all around us especially here in India. A method can be evolved of using a side carrier in which it is easy to shuffle the baby to the other shoulder.  
In the cradle position the width as well as the height increases unlike the other concepts giving a more comfortable area for the baby.

### **3. Interaction**

Another advantage of carrying on the side is that it improves **interaction** with the surrounding than looking into or looking away from the parent continuously. It results in interaction between the parent and the baby and also interaction with the surroundings.

#### **4. Operational sequence**

Converting from the carrying to the cradle position is easier as compared to the folding and the telescopic mechanism.

#### **5. Product weight**

The product dead weight is less as amount of solid materials like steel or plastic are less and major part is cloth.

#### **6. Form**

The product form is far superior to the other concepts. The softness of the baby is reflected in the curves of the frame. The side carrying position itself is an aesthetic statement where one means to show your most loved one to the world.

#### **7. Special features**

The spring action of legs uses baby's movement to rock the baby. The sun shade is a light tensile structure that completely folds into the carrier.

The back angle is adjustable giving the baby interaction with its surroundings when awake and a flatter angle when asleep.

**The magic of M.C.Escher** by M.C.Escher

**Origami paper folding for fun** by Eric Kenneway

**The human dimension -swedish industrial design-** Edizioni Bolis

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