IDC School of Design
अभिकल्प विद्यालय
IIT Bombay

Project-II Report (2022-23)

Smart Cradle

"To design a smart cradle for an urban upper-middle-class (nuclear) couple living in space-constrained homes with relevant technologies using turned-wood aesthetics."

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Acknowledgement

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I appreciate the students of the IDC School of Design helpful advice, insightful opinions, and courteous assistance. I am thankful to Mr. Milind Jadhav, who gave vital insights from his experience in baby products. I also want to express my gratitude to everyone who donated their time to help me with my user study. Also, I would like to thank my family and friends for their valuable support.

Table of Contents

Introduction

A cradle is an infant bed that rocks but is non-mobile. It is a device that is used to put babies to sleep. Cradle has a rocking, swinging, or translating motion that eases the baby and put it to sleep. It takes a lot of effort from parents to physically rock the cradle to generate a swinging motion. The reason why cradling is important is that:

- Babies associate the rocking motion of a cradle with the movements they felt while nestled in the safety and security of their mother's womb. Thus, few newborns can resist the gentle rhythms of the cradle.
- It helps in putting the baby to sleep quickly
- Provides warmth similar to that inside the womb
- It is a savior for colic pain as the rocking motion helps to relieve it
- Helps in vestibular system development

For a nuclear family where both parents are working, it becomes important to have technologies for baby monitoring. Cradles available in the market are functional but very less take into account their aesthetics which would be relevant to modern households.

Secondary Research: Online Market

Cradle/ Bouncers/ Basinets	 Star & Daisy	 Star & Daisy	 Prisma Rattan Baby Cradle	 Baybee	 R for Rabbits lullabies	 Cribby by Gor Shahbazyan
Features	• Automatic rocking • dining tray • mosquito net • urine mat • touch panel • bluetooth • music	• Automatic rocking • Adjustable speed	• traditional style • Assam cane • gives an exotic look to your place, • relaxation to your kids mind & body.	• traditional style • Assam cane • gives an exotic look to your place, • relaxation to your kids mind & body.	• Automatic & Manual Swing Mechanism • Smart timer • Soothing Music & Volume Controller	• read babies to sleep • temperature and humidity measurement • room lighting functions • virtual table cum baby scale
USPs	Technologically loaded	Functional and modern	Traditional design	Wifi control & Technology	Basinet + Cradle	Premiumness
Selling Price (MRP)	Rs. 5,887/- (11,199/-)	Rs. 9,999/-	Rs. 6,499/- (9,500/-)	Rs. 15,990/- (19,999/-)	Rs. 8,949/- (10,998/-)	N.A

Fig. 1: Comparison of products selling online

Insights:

- Price range for a cradle is Rs. 8000/- to 15,000.
- Automatic rocking is a must where USP is technology
- Features like a mosquito net, music, and monitoring are provided.
- Traditional cradles or cradles focusing on wooden aesthetics might not be technologically loaded.
- People find it difficult to repair because of poor customer service
- Most of them market the product as relaxing and comfortable.
- User assembling the product is also considered

Literature Study

Throughout the course of my research, I came across numerous research papers and other resources that influenced many of the choices in the design phase. They gave me both fresh ideas and confirmed my original hypothesis. This material is included in the paper's references section, which is located at the end.

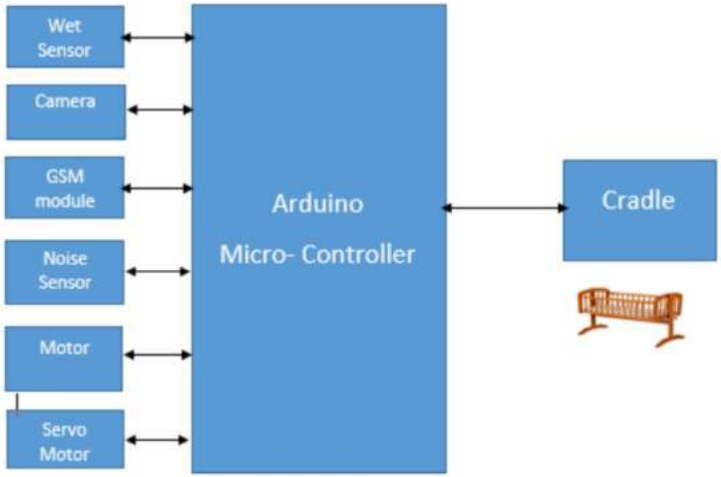

Fig.2: Component diagram (Paper: Smart baby cradle)

Smart Baby Cradle

Unlike adults, infants require a completely different approach to healthcare as they are totally dependent on their parents. Infants cannot give feedback about health conditions as their only way to express discomfort is by crying. Hence a specially designed healthcare system is needed to take care of the infants. It would gradually decrease the burden on parents, especially mothers. In support of the above theory, authors have developed a system that is based on a commercial GSM network. Vital baby parameters such as body temperature using an LM35 sensor, heart rate using an IR transmitter and receiver, and respiratory rate by using a Piezo sensor located on the patient's chest are sensed, filtered, and given to the microcontroller. A wet sensor detects urine condition in the cradle and all other data is given to the microcontroller. The authors also proposed the idea of mounting a camera on the cradle, so the parents can get live images of the infant inside the cradle when they are away. A speaker communication system helps calm the baby by hearing the parent's voice. Also, a mobile toy over the baby's sleeping area to ease the baby. A remote subsystem with a GSM module receives data and sends it to the microcontroller for processing.

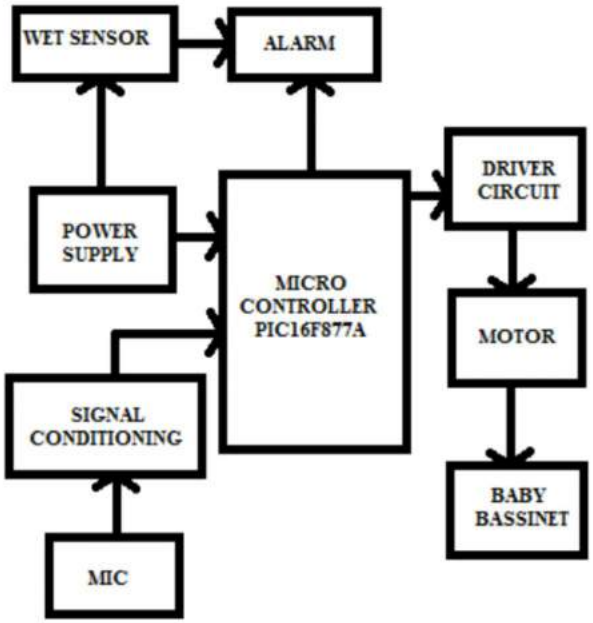

Fig.3: Schematic diagram of various components (Paper: Design of Automatic & Indigenous E-Cradle)

Design of Automatic & Indigenous E-Cradle

In the proposed design, there will be a circuit placed along the cradle which will sense the sound intensity of the cry of the child and takes necessary actions based on the sound intensity of the child's cry. The system is designed to help parents and nurses in infants care. The design aims at the following points: 1. Cradle starts swinging automatically when the baby cries. 2. If the baby stops crying before 2 minutes, then the cradle will stop automatically after 3 minutes of swinging. 3. Sounds an alarm if baby cries for more than a stipulated time of 2 minutes indicating that baby need attention. 4. Sounds an alarm when the mattress gets wet. The components used are a microphone, signal conditioning, microcontroller (PICI6F877A), motor driver circuit (L293D IC), DC motor (60rpm, 12V, 1A), moisture sensor, Alarm, and baby bassinet.

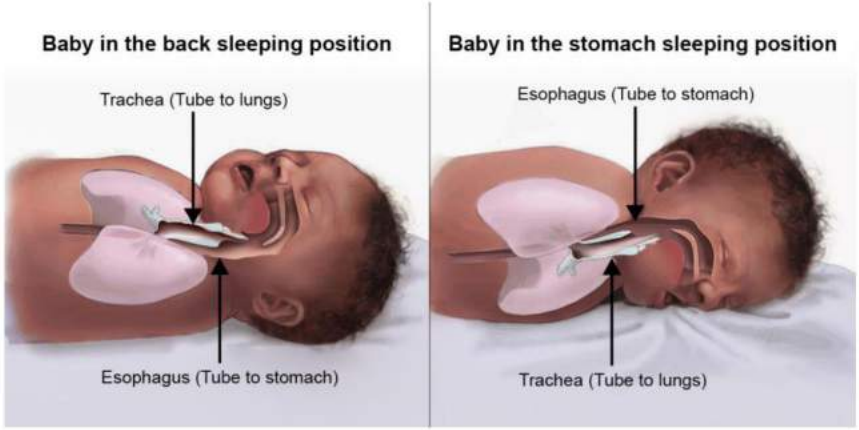

Fig.4: Supine (left) and prone (right) sleeping positions

Supine and Prone Infant Positioning: A Winning Combination

Supine sleeping continues to be recommended as the safest position for the majority of infants and should be continued, unless medically contraindicated, for at least the first 6 months of the infant's life. Many infants will continue to sleep in this position. Along with the supine sleep position, it is essential to provide supervised prone playtime as well as other position changes during the day to avoid gross motor milestone delays, head molding, shoulder retraction, and torticollis. Infants who sleep supine may not initially like prone positioning, but even as much as 15 minutes a day may make a difference in motor milestone acquisition. The risk of choking due is avoided, as the risk of choking when anything is spat up will be pushed down by gravity to the lowest point of the esophagus. Thus the airway (trachea) is protected.

Fig.5: Infant should be placed on the back while sleeping

Infant Sleep Position and SIDS

In 2005, the American Academy of Pediatrics (AAP) Task Force on Infant Sleep Position and Sudden infant death syndrome (SIDS) (hereafter, the AAP Task Force) issued revised recommendations for reducing the risk of SIDS.1 Among them was the recommendation that healthy babies be placed on their backs to sleep as the main way to reduce SIDS risk. many research reports showed that babies placed on their stomachs to sleep were at greater risk of dying from SIDS.

The Back to Sleep campaign sponsors and the U.S. Consumer Product Safety Commission warns against placing any soft, plush, or bulky items (such as pillows, quilts, comforters, pillow-like bumpers, sheepskins, or stuffed toys) in the baby's sleep area. These items could come in contact with the baby's face, which may hinder exposure to oxygen, cause the baby to get overheated, or suffocate the baby—all possible contributors to SIDS.

Insights- Literature Study

First I looked at the basics of smart cradles- the components, functions required, and the anatomy of the structure. While understanding the online market, I found that my target group required technological features. So, I went ahead with finding and deciding the various technologies required.

Automatic rocking, music, and baby monitoring like urine detection, crying alert, motion alert, and video monitoring, are the most common technologies added to smart cradles.

Later I looked at the sleeping position required for infants. It was found that for the first 12 months, the supine (on the back) position is the safest. It helps in maintaining good spinal cord development, and prevents SIDS (Sudden Infant Death Syndrome) and the risk of choking is avoided.

Primary Research: Market Visits

Location1: Mothercare, R City mall, Ghatkopar (W)

Fig.6: 5-in-1 rocker basinet- Masstela

Price: Rs. 9,299/-,
Material: PES fabric, stainless steel, PE
This bassinet has two seating positions, one for laying down & sitting up. There are provisions for attaching toys. A member at the bottom acts as a stopper and can be used to lock the rocking.

Fig.7: Music vibration bouncer- Mastela

Price: 4699
Material: PES fabric, stainless steel, PE
This is a rocker that vibrates and puts the baby to sleep with music. The bed has a basket-like shape that holds the baby in place. The suspension effect of the structural member magnifies the vibrations.

Fig.8: Cot

Price: 14999/-
Material: Pinewood
This is a bed for babies when they are able to crawl out of the cradle. It has storage space and height adjustment as the baby grows. The form is planar and the product is assembled in panels

Location 2 : Me n moms, R City mall, Ghatkopar (W)

Fig.9: wooden cradle - meemee

Price: Rs.9000/-
Material: Pinewood
This cradle doesn't have a regular swinging motion but a transverse motion, due to which a lot of elements are reduced. Non-toxic paint coating is used. It can be easily dismantled and flat-packed.

Fig.10: Steel cradle - meemee

Price: 5000/-
Material: Steel frame, PES
The entire structure is made of coated steel wrapped with PE fabric. The form is rounded and has the semantics of it being made for kids. It also has an additional space for storage.

Fig.11 metal cradle - meemee

Price: 9000/-
Material: Mild Steel.
Very low in height so the user has to bend down a lot to rock or pick up the baby. It has a drawer for storage. It has locking wheels to avoid moving while rocking and otherwise.

Fig.12 Steel cradle - meemee

Price: 4000/-
Material: Mild Steel
The steel frame provides the cradling motion just by rotating the wheels up & the curved profile touches the ground. It has a lower height comparatively thus, it gives discomfort to the parents.

Fig.13 Wooden cot - meemee

Price: 25,000/-
Material: Pinewood
This is a cot for newborns to 4yrs. Easy to assemble, it goes with modern aesthetics also. Babies tend to chew on the wooden frame, so a nontoxic plastic covering is provided on that area.

Fig.14 Basinet cum cradle - meemee

Price: 4000/-
It acts as a bassinet, cradle, and bed. A locking mechanism prevents the cradle from swinging. Ease of assembly is one of the USPs where the user itself can assemble without customer service help.

Fig.15 Salesperson at 'Me n Moms'

Interview
Name: Milind Jadhav
Job: Salesperson at Me n Moms
Experience: more than 2 years

Key Insights:

- Electric cradles are the best sellers. They don't even have a demo piece to show, it sells so fast
- They provide assistance with assembling the cradle
- Different customers have various requirements. The rich class usually prefers wooden cradles/cots, because it is not made in China, and also trust the material. The upper class usually prefers electric cradles.
- Some of the customers use the same cradle for the next baby.
- Cradle works till 6 to 8 months, because some babies try to come out later.

Location 3 : Jelebele, Powai Market

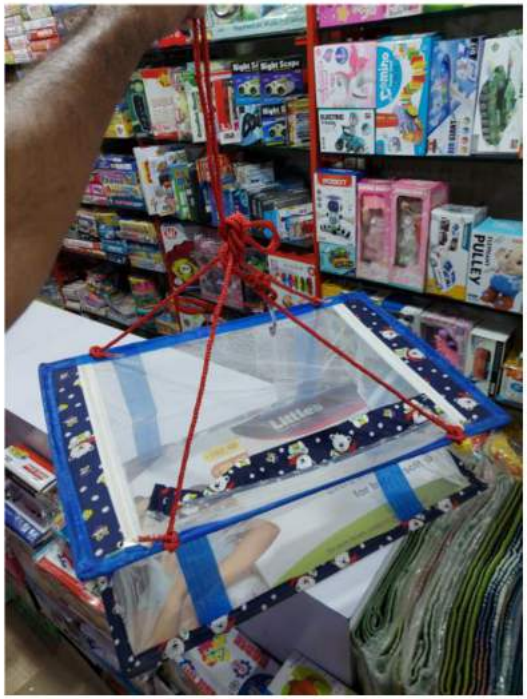

Fig.16: Hanging cradle

Price: Rs. 1200/-
Material: PES, Nylon rope
This cradle is targeted at low-income group consumers. Here people living in very small homes prefer this type of cradle.

Fig.17: Rocker

Price: Rs. 3300/-
Material: Nylon fabric and mesh, Plastic structure.
It is very easy to assemble this rocker. It takes up very less space and the baby is constricted in motion (which is preferred for newborns). It has vibration which helps in putting the baby to sleep.

Fig.18 Rocker

Fig.19 Catalogue of cradles, basinets, etc

Price: Rs. 3300/-
These two products were similar to the product in *Fig. 17.* the differentiator is that these products add to the

This catalog provides a range of products that the shop can provide on demand. The products target lower middle-class to middle-class groups. So, the product is purely functional.

Location 4 : Mothertouch, R City mall, Ghatkopar (W)

Fig.20 Cot and cradle combo (meemee)

Fig.21 Cot and cradle combo

Price: Rs. 19,000/-
Material: Pinewood
This is provided in a cot and cradle combo for parents who don't want to spend time searching for a cot once the baby grows. The cot also performs a rocking motion when the wheels are moved up.

Price: 15,000/-
Material: Mild steel, PES
A cot and cradle combo, with playful graphics, this product have a different way of swinging where four fabric reinforcements facilitate swinging.

Fig.22 Cot and cradle combo (meemee)

Price: Rs. 19,000/-
Material: Pinewood
One of the additional features it includes is that the cot extends to become a bed. There is no cradling/rocking motion. However, it comes as a combo with the cradle.

Fig.23 Cot and cradle combo

Price: 9000/-
Material: Mild Steel.
Very low in height so the user has to bend down a lot to rock or pick up the baby. It has a drawer for storage. It has locking wheels to avoid moving while rocking and otherwise.

Fig.24 Automatic cradle

Price: 13,000/-
Material: Mild steel, PES, PE
The USP of this type of cradle is the technologies in it. Automatic cradling, varied speed, rocking timer, and music. Costumers prefer automatic cradles over others.

Fig.25 Bouncer

Price: 6,500/-
Material: Cotton fabric, PES, PE
Just like the previous bouncers. It has a stand which stops the rocking.

Location 5: Babyhug, Vidyavihar

Fig.26 Extending cot to bed

Fig.27 Cot and cradle combo

Price: Rs. 15,000/-
Material: Pinewood
One of the additional features it includes is that the cot extends to become a bed. There is no cradling/rocking motion.

Price: Rs. 19,000/-
Material: Pinewood
This is provided in a cot and cradle combo for parents who don't want to spend time searching for a cot once the baby grows. The cot also performs a rocking motion when the wheels are moved up.

Insights- Market Visits

Looking at the different products available in the market, it was definite that the consumers demanded automatic cradles. Wood as a material has developed a sense of trust as well as the necessary aesthetics.

Easy assembly with fewer parts was also a necessary feature in it. For wooden materials, the cradle was usually made up of pinewood. And those cradles never had any other functions other than the basic one.

The most common plastic used as a material is polyethylene. The color was usually bright like white. Polyester was used for cradle bed materials and in other arts where the fabric was needed.

The average price range of the product was Rs. 6000/- to 20,000/-. Wooden cots were the costliest while bouncers were the cheapest products

User Study

User 1: Adhiraj Family, Vashi, Navi Mumbai

Fig.28 User 1 home and cradle used

- Baby's name: Adhiraj Shinde (Second child)
- Age: 4 months
- Parent's occupation: Father: Finance consultant,
- Mother: Pharmacist
- Cradle cost: Rs. 2500

Interview insights:

1. It's difficult to constantly attend to the baby while at home doing chores.
2. Grandmother takes care of the child because both parents are working.
3. A suggestion of automatic rocking when the baby cries or wakes up was given by them.
4. After 6 to 8 months, the cradle becomes useless as the baby tries to come out and moves a lot (based on their first child experience)
5. The toys given on the cradle are useless.
6. It's a difficult task to unmount the cradle for stroller use. Stroller use is also less and is used indoors itself.
7. Technology at a good price is favorable.
8. After using the cradle, they will either sell it to somebody or give it to homeless people after use.
9. There is an emotional connection with the cradle as the child grows in it in its nascent stage.

Product Analysis of User 1

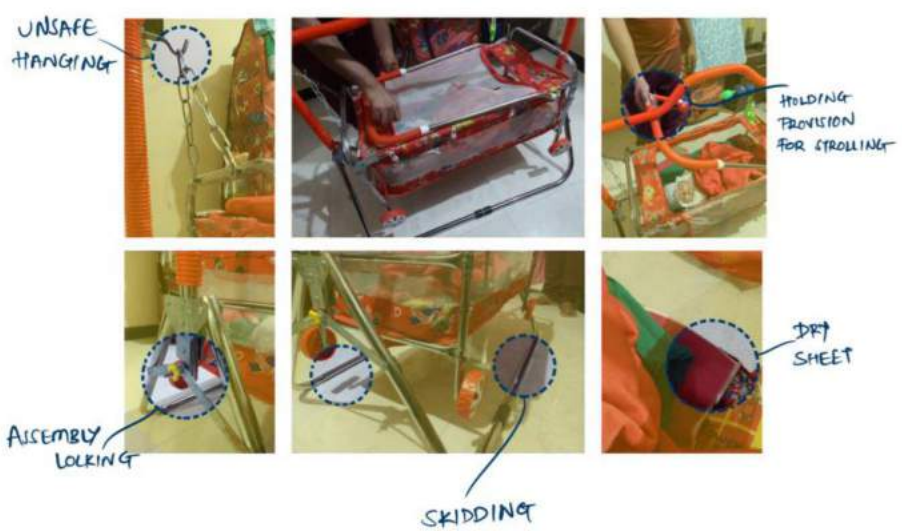

Fig.29 Product analysis part1

The product is easy to assemble with fasteners. However, the sharpness of pipe ends needs to be considered. While swinging due to the metal parts' friction it produces an undesirable sound. The handle provided for stroller use could be unsafe. Bolts sticking out are unsafe and can hurt the surrounding people.

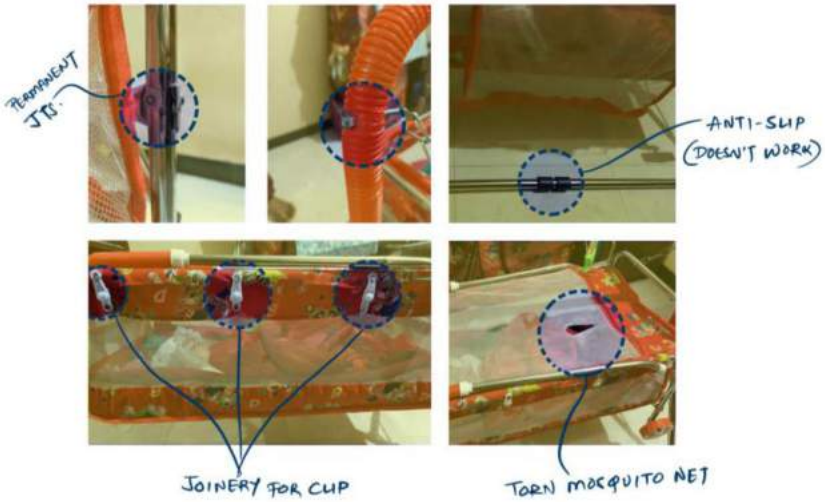

Fig.30 Product analysis part.2

Some connections are permanent which could have been easily made temporary to facilitate assembly. The mosquito net gets torn after some time. The cradle tends to slip while swinging because of insufficient grip. A standard joinery for putting together the cradle bed is used.

User 2: Khamkar family, Bhandup, Mumbai

Fig.31 Khamkar family

Fig.31 Cradle

Fig.31 User 2 product usage (user photos)

- Baby's name: Dhruv Khamkar (first child)
- Age: 6 months
- Parent's occupation: Father: IT professional
- Mother: IT professional
- Cradle cost: N.A

Interview insights:

1. This cradle has been passed down in the father's family for 3 generations. So the age of the cradle is around 80+ years
2. The interesting fact about this is that the family is very emotionally connected to the cradle and treats it as a blessing from ancestors
3. When asked about the difficulties faced, the major issue was the heaviness of the cradle.
4. The triangular form is very outward so it hurts other people.
5. Hired a caretaker and had to change her due to inattentiveness.

Product observations:

1. The structure is very rigid and strong.
2. In Indian ceremonies cradles are decorated, and the structural design facilitates that very well.
3. It also gives the user an experience to customize the cradle themselves due to its anatomy.

User 3: Bomble family, Mumbai (now in Canada)

Fig.33 Bomble family

Fig.34 User 3 product usage (user photos)

- Baby's name: Aarohi Bomble (first child)
- Age: 6 months
- Parent's occupation: Father: Service professional
- Mother: HR
- Cradle cost: N.A

Interview insights:

1. During the initial times there was a lot of anxiety with baby care since they were working.
2. Grandmother was there to take care of since both of them were working parents
3. Living in Mumbai, they faced space issues however now in Canada that is no more an issue
4. While carrying food or anything else over the cradle they were mindful of the baby in the cradle.
5. This cradle was sold on OLX later

User Preferences

Survey

Cradle for your baby

This is a survey for an academic project at IIT Bombay conducted by Prathmesh Pedamkar (M.Des Industrial Design 2021-2023).

Feel free to contact for any queries or feedback.
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The name and photo associated with your Google account will be recorded when you upload files and submit this form. Your email is not part of your response.

* Required

The cradles seen below all have identical technological features, price and building standards. Based on the aesthetics (looks) which cradle would you consider buying? *

A
B
C

Please rate the importance of the following cradle-related features. *
(1 = Low importance 5 = High importance)

	1	2	3	4	5
Automatic Swinging					
Urine Detection					
Music					
Application Control					
Audio Video Monitoring					
Baby Crying Detection					
Night Vision					
Motion Alert					
Health Tracking					
Portability					
Ease of Assembly					
Space Saving					
Flatpacking					

Basic Information

Name *
Your answer

Age *
Your answer

Occupation *
Your answer

Location *
Your answer

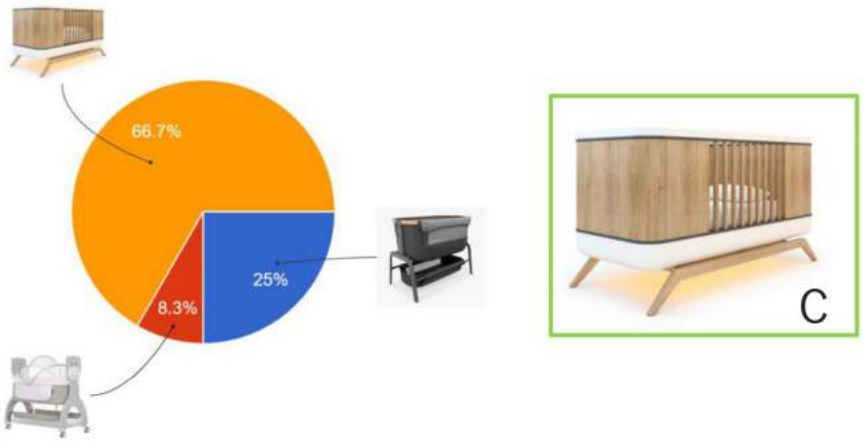
Mobile no.
Your answer

Fig. Survey sheet

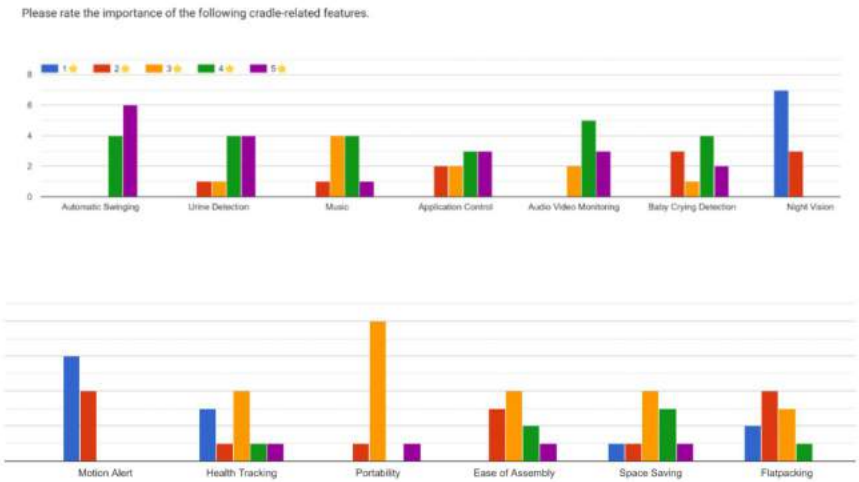
- No. of participants: 13
- Age group: 26 to 41 years

The survey was done to understand the aesthetic preferences of the potential consumer and the technological features they desire. They were asked to choose any of the three cradles in the survey sheet and rate the importance of features they would want.

Survey results



Fig, Pie chart showing aesthetic preference



Fig, Graph showing importance of features for costumers

According to the participants, the following factors were the reason for choosing option “C”

1.It looks like a premium product and not just a cradle
2. Something they would like to show to other people
3. Wood material is associated with ‘trust’
4. It is unique

The highly rated features were Automatic Rocking, Urine Detection, Application Control, Audio Video Monitoring, and Cry Detection. The moderately rated features were Music, Portability, Ease of assembly, Space-saving and Flatpacking

Explorative Research – Sankheda Furniture

Fig.31 Sankheda Cradle

Ghodiyun' (child's cradle) is believed to be one of the first furniture items produced using this form of expression. It is a prized possession in Gujarati families and is passed down through the generations as an heirloom.

Colorful and ornate, yet elegant, Sankheda furniture is made with teak wood and traditionally a luminous lacquer finish is given to the products, giving depth and a natural glow.

While researching Sankheda and going through the processes I found that it is a very manufacturing process but the output product is very novel and crafty.

Sankheda Furniture- Manufacturing Process

1

Turning, sanding, and priming the teak wood on a lathe.

2

Coloring with pre-heated water-soluble colors

3

Harkalai, is used to make patterns while turning.

4

Coloring with Akik (agate) stone is rubbed over the wooden member to enhance the lustre water-soluble colors

5

Clear Lac is applied which gives the member a glowing orange color.

6

Kevda leaf is used for final finish and gloss

7

All the components are assembled together with wood joinery into a single furniture piece.

Fig.32 Sankheda way of making

Insights From Explorative Research

Fig.33 Wood turning operation

Fig.34 Lacquered finish

Fig.35 Batches of parts

Fig.36 Mortise and tenon assembly

Sankheda products are beautiful and aspirational but the ingenuity of the manufacturing process is the aspect that impressed me. The entire product is made of turned wood elements and mortise and tenon joinery with fasteners.

The production process is similar to an industrial layout where parallel processes can happen and assemble at the end, thus reducing idle time and providing.

The lacquered finish makes it royal with beautiful Indian patterns and motifs.

The mortise and tenon joint is one of the strong and is used widely in many other furniture applications.

Design Decisions – Technology

Fig.37 baby monitoring devices

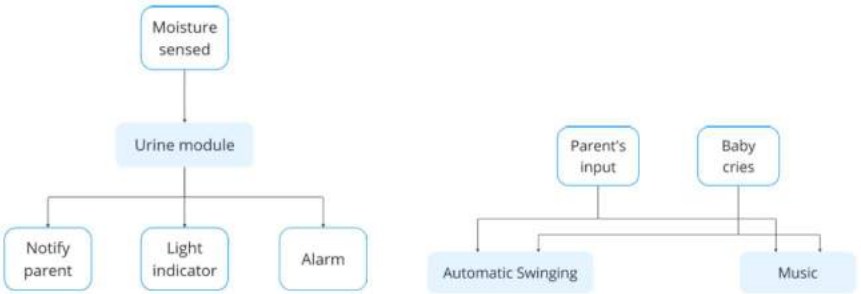


Fig.38 Flowhart –(left) Urine detection (right) Automatic swing and music

During the start of Ideation, I need to finalize the technologies that needed to be incorporated. Based on existing products, user interviews, and literature study, technologies of automatic rocking, music, crying detection and alert, urine detection and alert, motion alert, and audio video monitoring are required.

Incorporating all these technologies in the cradle itself will also cause an issue of maintenance if they happen to fail or malfunction. However, baby monitoring devices are available which provide all the necessary requirements of the user and more.

So, a decision was taken to provide provision to attach these devices on the cradle. rather than incorporating all the technologies, the focus was shifted to working on technologies like automatic rocking/swinging and urine detection and alert.

Components

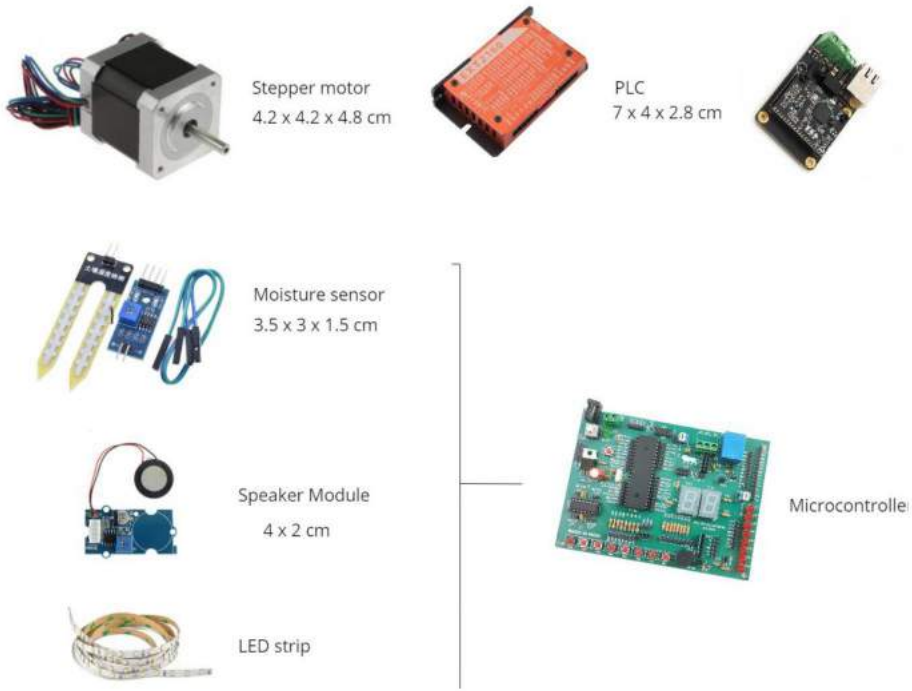


Fig.39 Components used in the cradle

The motor used is a stepper motor since it requires fewer components and no additional mechanism to give a swinging motion. The step angle can be adjusted to 30 degrees and the speed can be varied too. A wet sensor is used to detect the urine and a microcontroller unit sends the signal to the parent. The same MCU is used to turn on the lights and a mild alarm. LED lights are used. The Speaker module is used for the alarm sound. A button is pressed by the caretaker to turn off the lights and alarm sound.

Materials and Manufacturing

Grade A Teakwood is chosen as the material for the turned-wood elements. It has a uniform, golden brown color, close grains, and a glossy surface. It is high in teak natural oils which play a key role in teak's outstanding resistance to outdoor elements by protecting it from unfavorable weather elements and repelling insects. Although the price is high it justifies the application of satisfying mechanical requirements and aesthetic value.

Woodturning is the manufacturing process used for wooden elements. This constraint was chosen because the entire visual sense adds to the uniformity and minimalism which can be seen in contemporary furniture and also the manufacturing becomes simple. Also, there are almost no wooden cradles using wood-turning aesthetics in the market apart from traditional products.

Metal joineries would be made by Aluminum 6063 by the process of casting since it is already being used in various furniture joineries and also provides great casting properties.

Ergonomics

Fig.39 (left) Parents discomfort (right) Supine position for babies

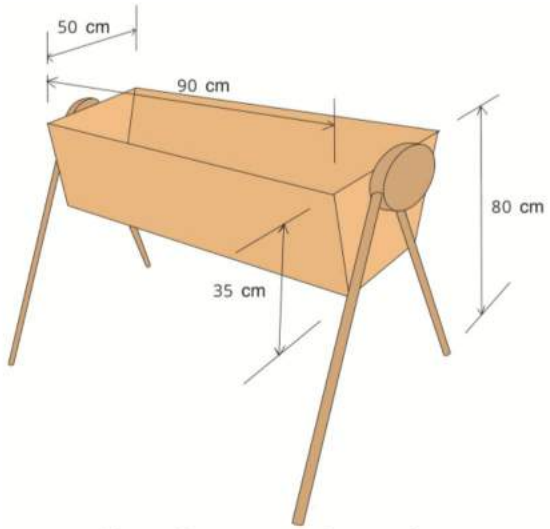


Fig.40 Dimensions for cradle

For Parents

Data shows that 66% of caregiving parents experience musculoskeletal pain during the first 4 years of their children. Lifting the child in and out of the crib was reported to be one of the over-average stress activities

For infants

The supine position as mentioned earlier in the Literature Review is the best sleeping position since it keeps the airways open and providesspine support.

For 1-year-old, 95th percentile baby:

	Global	Indian
Weight	11.8 kg	8.4 kg
Height	80.2 cm	73.9 cm

I looked at the ergonomic considerations, existing products, and research papers to finalize the minimum dimensions required.

Design Brief

User:
An urban upper-middle-class* couple living as a nuclear family in tier 1 cities of India.

Objective:
To design a turned wood baby cradle with relevant technologies for baby monitoring & comfort, while conforming to the aesthetics of a modern household.

Must haves:
- Design for constrained spaces of tier 1 city homes.
- Design for easy assembly by the user.
- Relevant technologies.
- Design for modern home aesthetic.

Throughout the entire ideation phase, simultaneous research also took place and the design brief was revised multiple times depending on the insights.

Understanding User Experience– Role Playing

Activity 1: Picking up and keeping down the baby

Fig.41

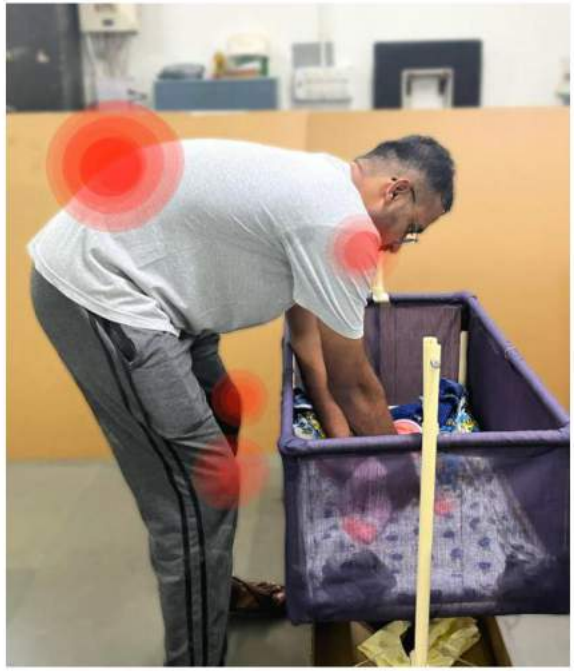


Fig.42

Fig.43

The actor here is 6' (183 cm) and a male. The purpose of roleplay was to understand the various activities happening with the cradle. To get an understanding of ergonomic consideration, spatial understanding, and experience of the user. This will help further in the ideation process.

Fig.41 Complete extension of the arm and cantilever posture gives discomfort.
Fig.42 Uncomfortable back posture. And pain experienced in the shoulders too.
Fig.43 Considerations to be taken for accessibility for this activity. The absence of a cross member at the top of the cradle eliminates obstruction.

Activity 2: Swinging the cradle

Fig.44

Fig.45

Fig.46

Fig.44 Arched back and bent neck give discomfort. The duration of activity can go up from 30 seconds to 90 seconds so fatigue sets in too. There is full involvement in the activity as both the hands and other senses are focused on it.

Fig.45 When the activity is to be performed for a shorter duration this posture is used. It also adds strain on the back but is comparatively lesser than the previous one.

Fig.46 This position is comfortable, but needs a chair or a bed for the parent to sit. There is a disconnection with the process because the parent is on the phone.

Activity 3: Cleaning the mattress

Fig.47

Fig.47 After the baby is kept out of the cradle this activity is performed. Since the weight of the mattress is comparatively lesser than the baby, the discomfort is not felt much because of bending as seen in 'Activity 1'. However, accessibility is to be considered for the arms to function comfortably without any obstruction.

Fig.48

Fig.48 Placing the mattress properly flushed with the inner edges and corners of the cradle. The bending does provide discomfort.

Activity 4: Accessing storage area

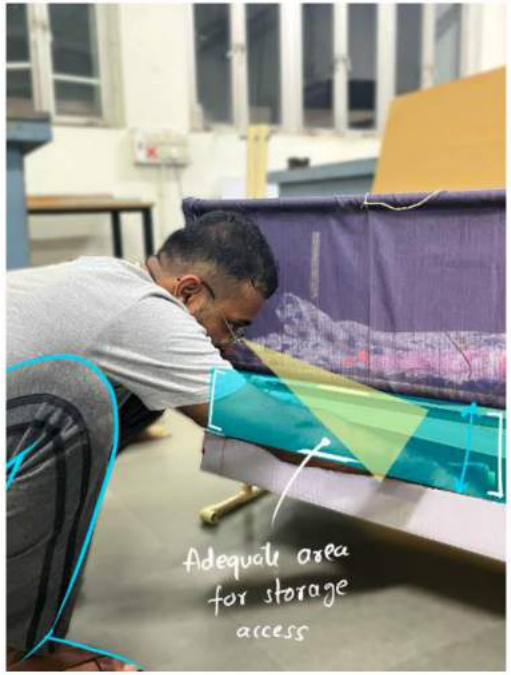


Fig.49

Fig.50

Fig.51

Fig.49 Squatted posture is very uncomfortable if you are not used to it, even though it has been shown to be good for your spine. The distance between the cradle and the storage area must be considered for ease of access and visibility.

Fig.50 In a crossed-legged sitting position the visibility is better and the body is at ease. Usually, here the parent is trying to find something or trying to arrange things.

Fig.51 Based on the activity perform the minimum space required was considered further

Roleplay #2

Fig.52

Fig.53

Fig.54

Fig.55

The actor here is 5'6"(167.6 cm) and a female. The second roleplay was done to get a different perspective.

Fig.52 Pain in the lower back and neck. But since the activity of lifting is short it is manageable.
Fig.53 Slight pressure in the neck. The parent is fully involved in the process.
Fig.54 Comfortable posture. Require a rope and a sitting area like a chair or bed
Fig. 55 Storage access dimensions are almost similar to the previous one, but the effort experienced was reduced

Ideations

The ideation phase evolved during the research that took place simultaneously and is divided into two parts- Phase 1 and Phase 2. The first phase along with meeting the brief then, explored the ideas of various ways of functioning the swing. It mainly focused on adding a unique sense to the user's perception of a normal cradle available in the market and surprise with a sense of newness.

Phase two of ideation began with a concrete design brief and explored the possibilities of meeting the market demands with a unique proposition of making turned wood as the cradle's DNA while achieving the must-haves of the design brief. Design elements from the first phase were also used here. Here, the major focus was on the space constraint and ease of assembly to the user. So, various joineries were also explored during the same

Starting with the relevant mood boards and tinkering with explorations, I went forward with ideations

Mood board 1- Turned wood

Fig.41 Moodboard 1 – turned wood

Looking for visuals conveying modern style, which includes geometric minimal forms as well as smooth and flowing forms

Form exploration from Moodboard 1

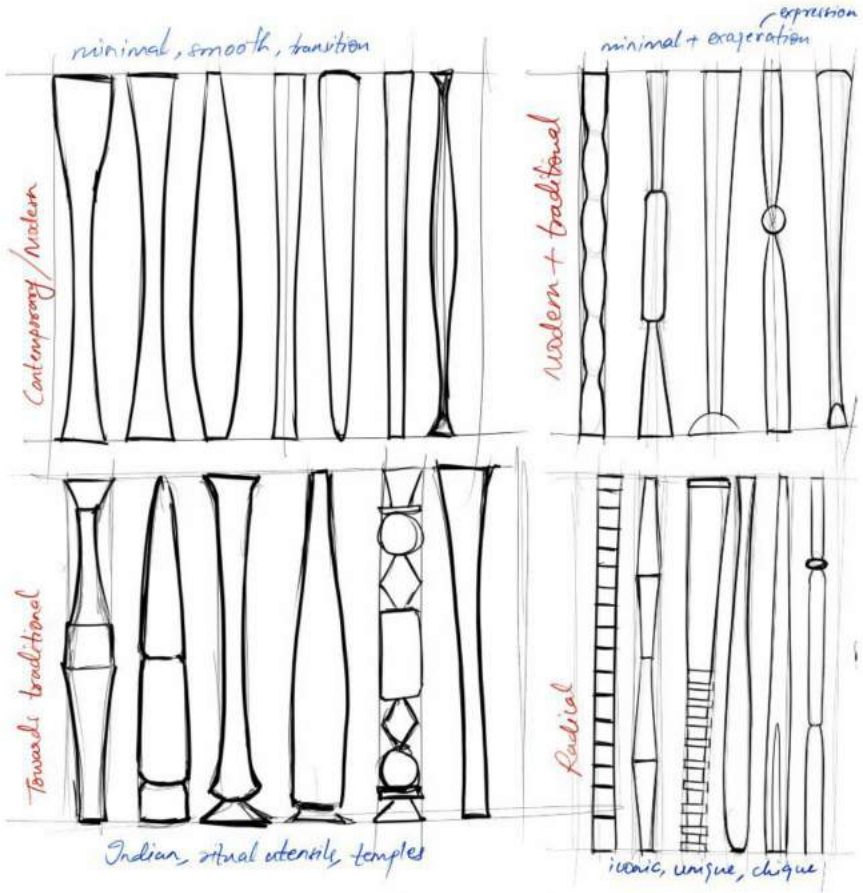


Fig.42 Form exploration from Moodboard 1

Forms were explored with the following parameters:

1. Contemporary and Minimal
2. Traditional and Indian
3. Modern+Traditinal and Minimal+exaggeration
4. Radical and Iconic

Mood board 2- Modern design visual elements

Fig.43 Mood board 2- Modern design visual elements

Attributes of modern design:

- Design is Functional.
- Form Follows Function
- Minimal
- Neutral colors, Monotone colors (beige and white)
- Natural light & Open spaces
- A touch of luxury
- Commercial products like cement boards/metal panels
- Light flooring (wood)
- Hint of textures
- Technologically updated

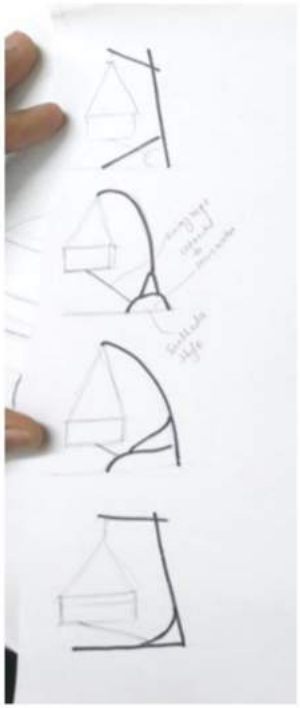
Mood board 3- More than a cradle

Fig.44 Mood board 3- More than a cradle

In this mood board, a deliberate attempt to make the cradle more than a functional product is evident. “Form follows function” as well as “Less is more” principles can be seen. Following the aesthetics of a contemporary product, these visuals helped more in the second phase of ideation where more focus was given on biding by those principles

Ideations Phase 1

Idea 1



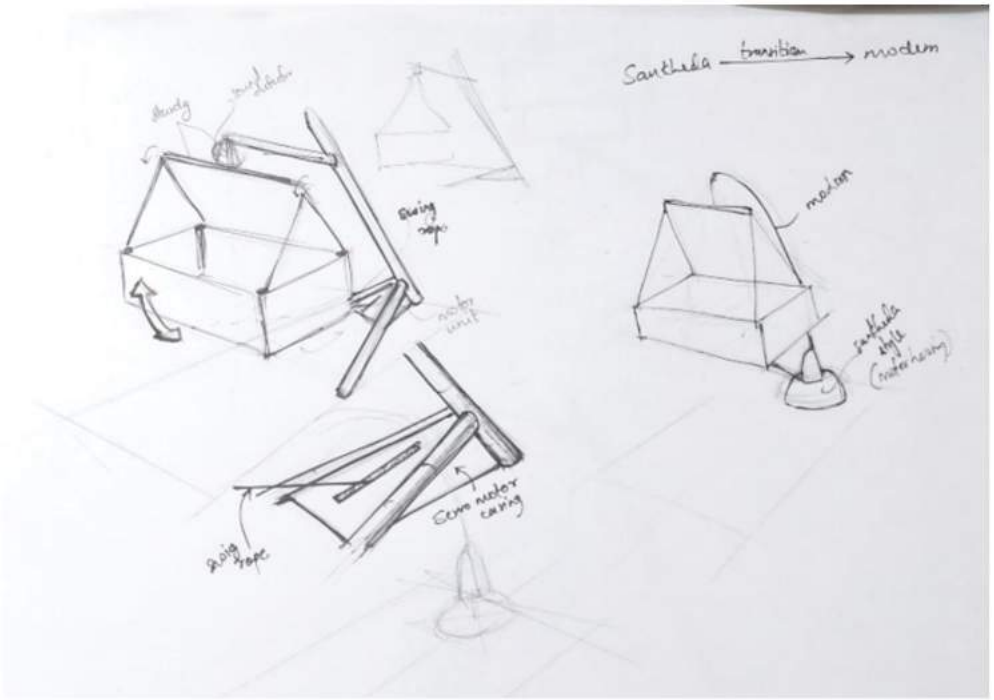


Fig.45 Idea 1

A hanging swing with a rope attached to the motor assembly gives a sense of the traditional Indian practice of swinging the cradle with a rope. The turned wood elements add to the simple assembly and the structure is self-balancing.

Idea 2

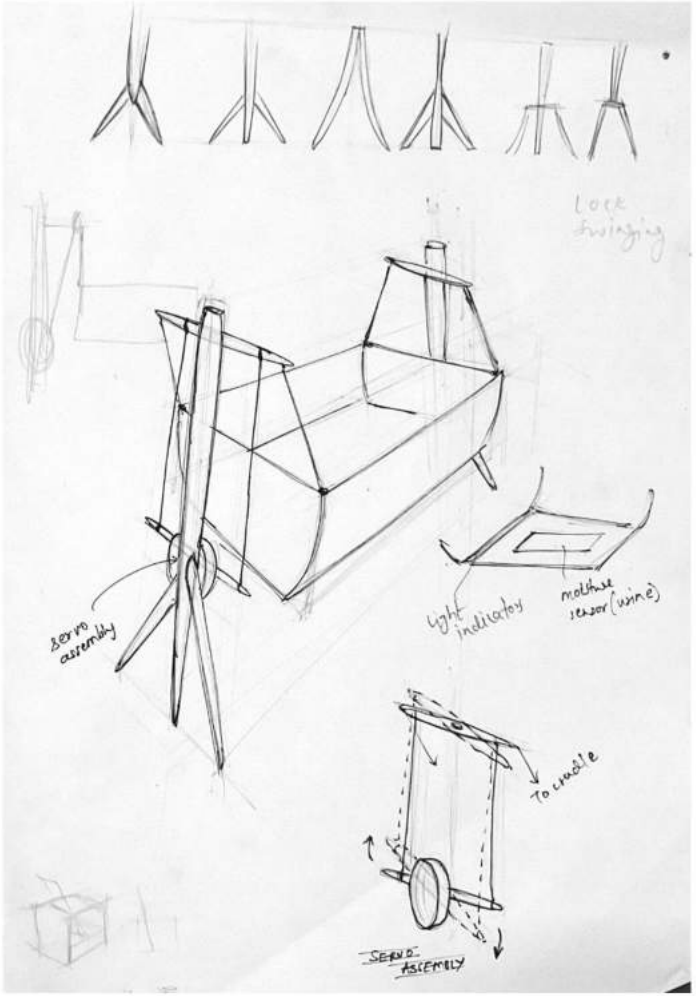


Fig.46 Idea 2

Here the structure adds the traditional effect to the modern household along with the form being modern. Here we celebrate the details of the swinging mechanism.

Idea 3

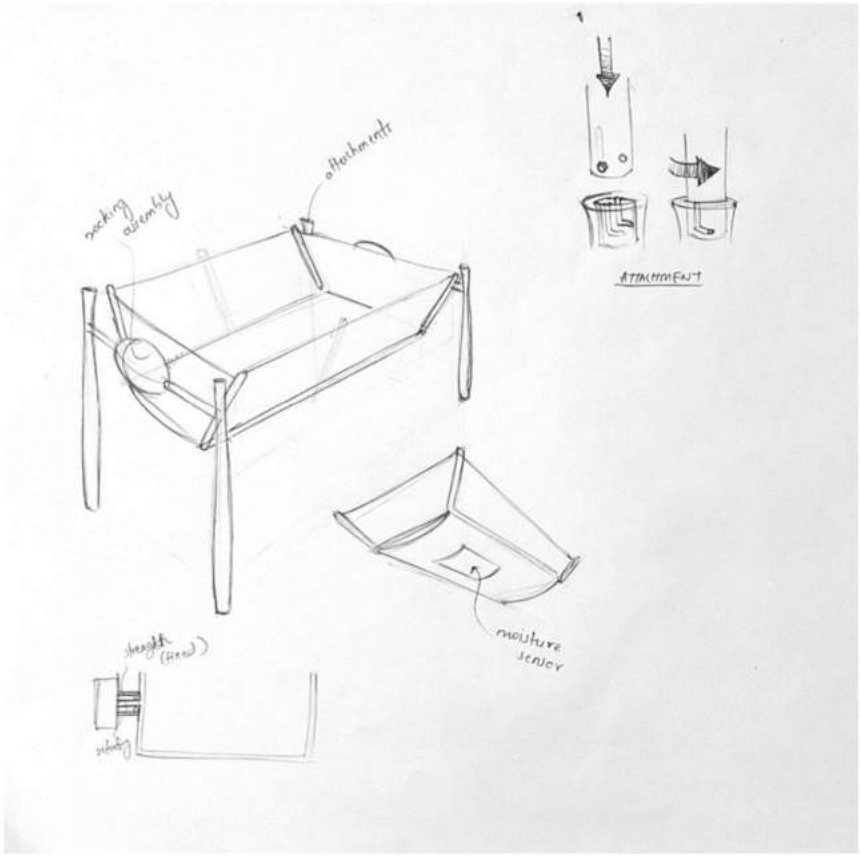


Fig.46 Idea 3

Minimum elements to provide optimal packaging and user assembly. Here the visual appeal would be added through the turned wood elements of the product

Idea 4

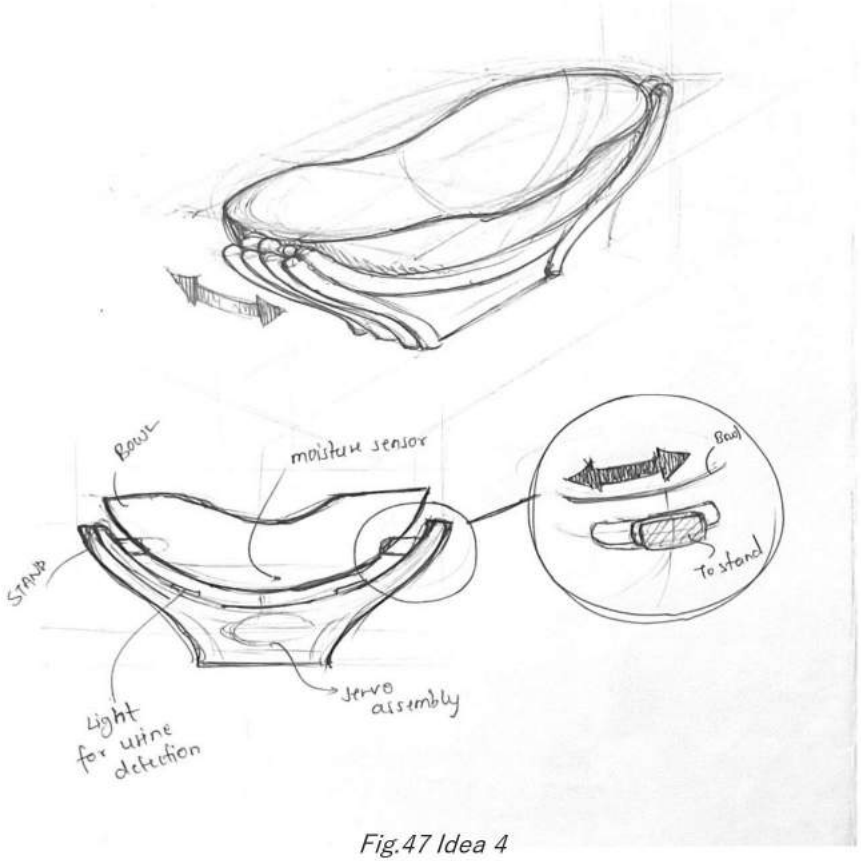


Fig.47 Idea 4

Turned wood bending is the element that adds a sense of security visually, mimicking the palms carrying a child. This design leans towards combining modern aesthetics with a traditional touch.

Ideations Phase 2

Idea 5

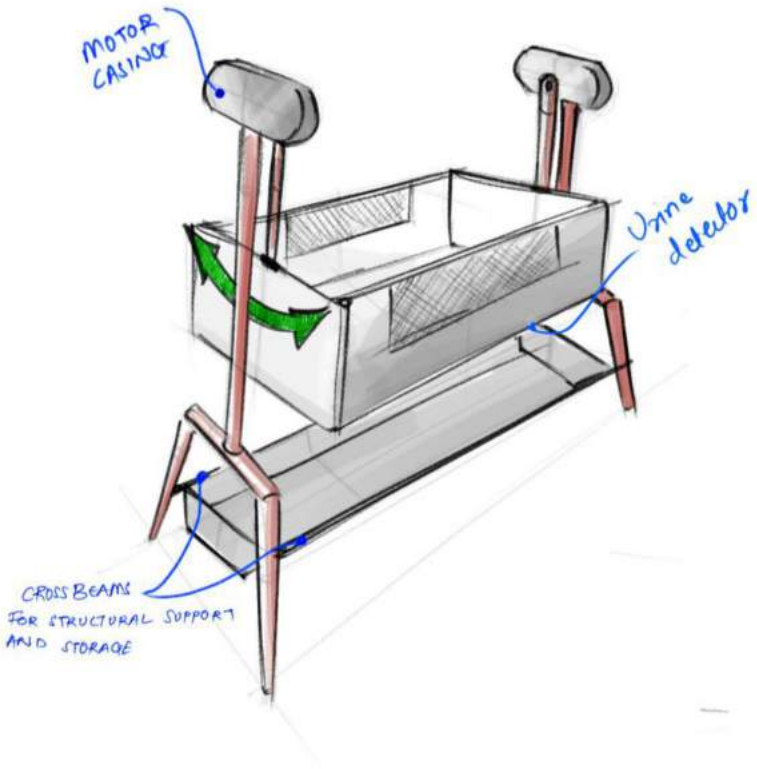


Fig.48 .1 Idea 5

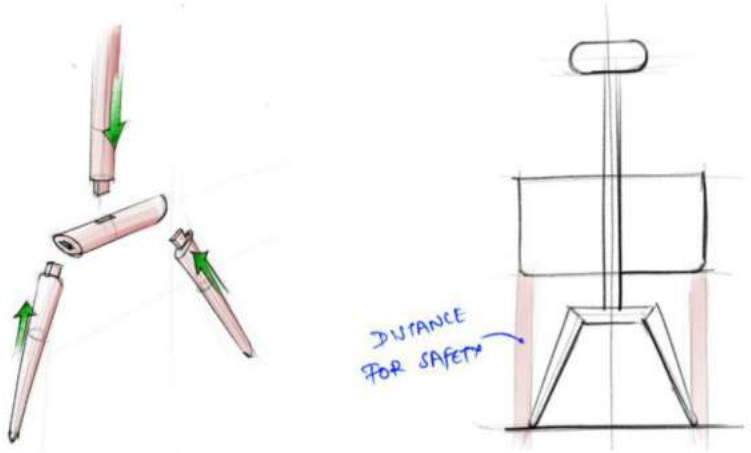


Fig.48 .2 Idea 5

Here fewer elements are used to facilitate ease of assembly and the structural form with voids gives a sense that the product might take less space.

Idea 6

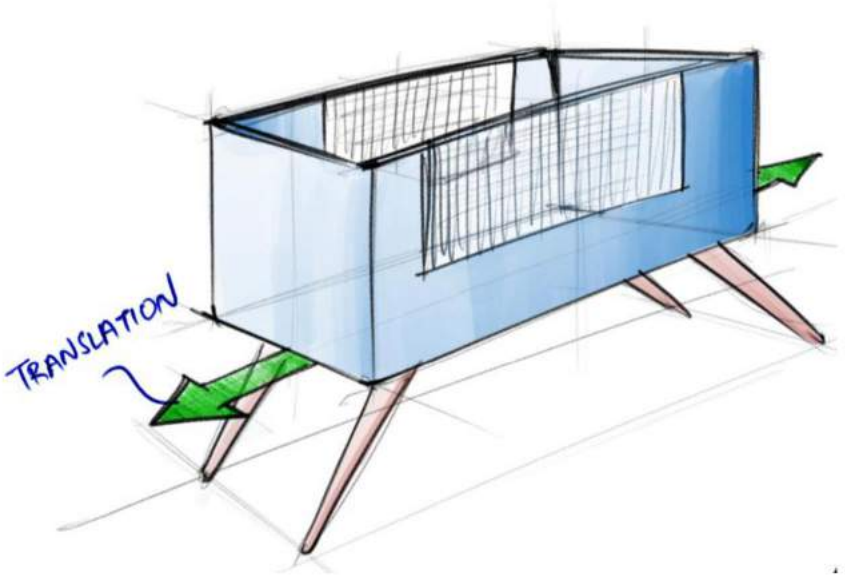


Fig.49 .1 Idea 6

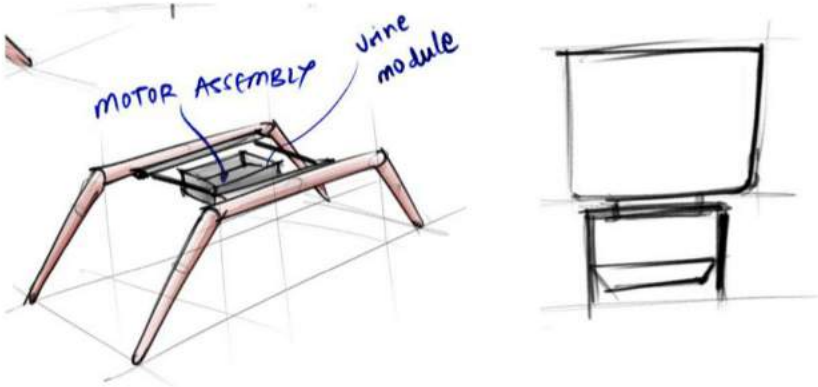


Fig.49 .2 Idea 6

Here the direction of motion is the translation and this ideation has the least area consumption from all others. A slider-crank mechanism is used to facilitate the motion

Idea 7

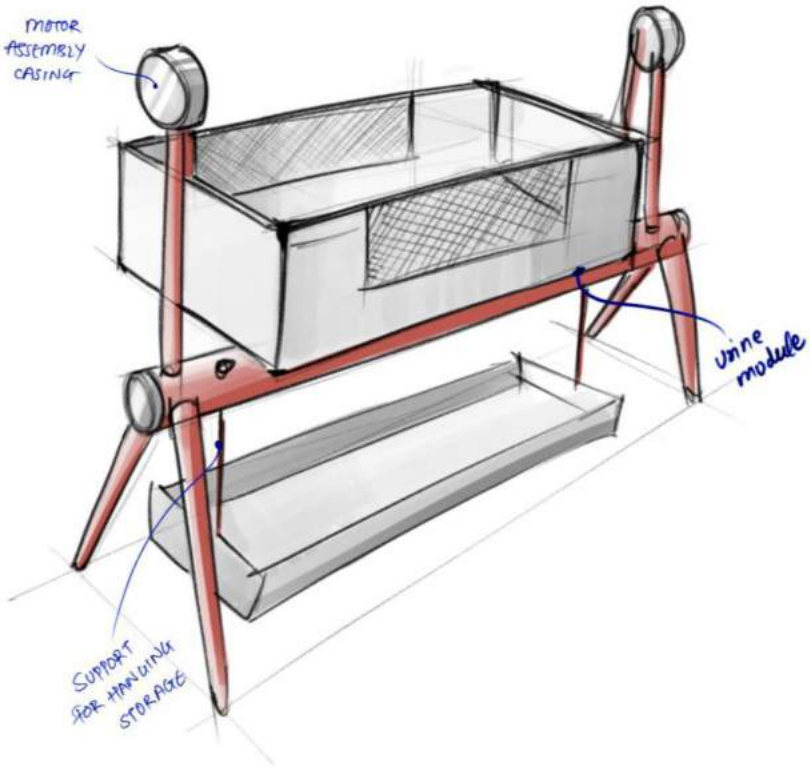


Fig.50 .1 Idea 7

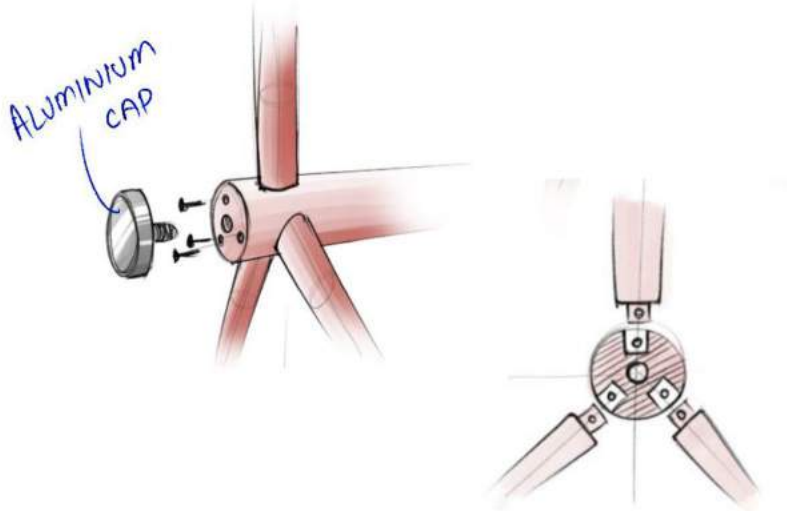


Fig.50 .2 Idea 7

Most of the elements are connected to one single cross-member element to have load stability and also ease of assembly. The type of joinery used is also used in a way that facilitates easy intuitive assembly with a good axial loading system.

Idea 8

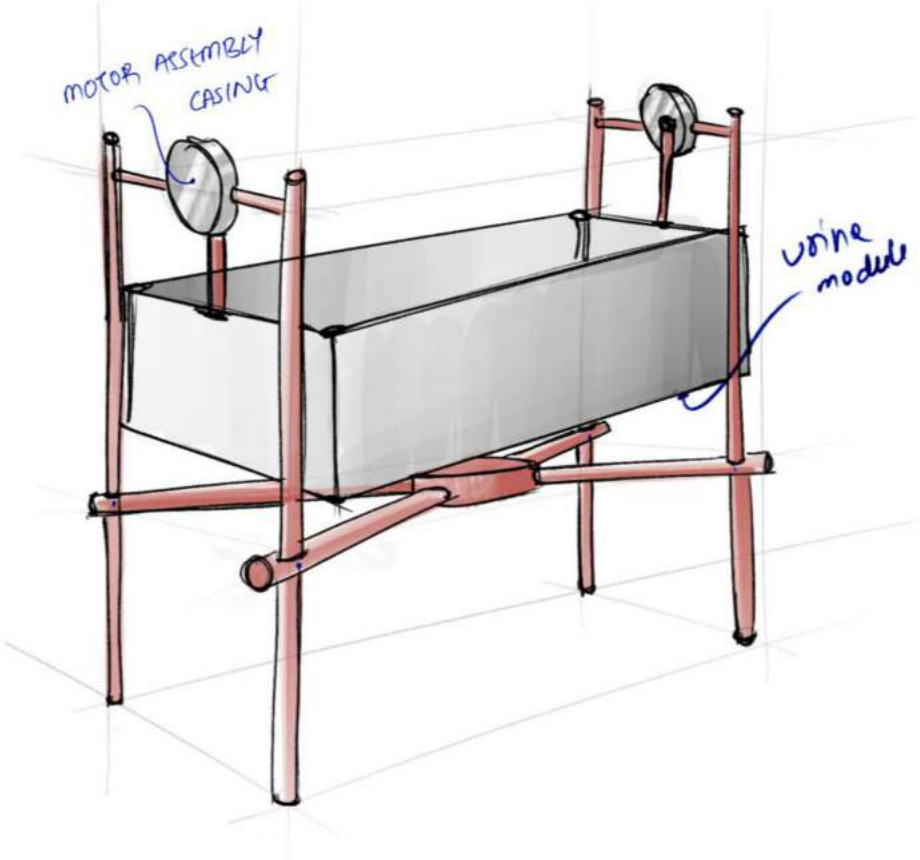


Fig.51.1 Idea 8

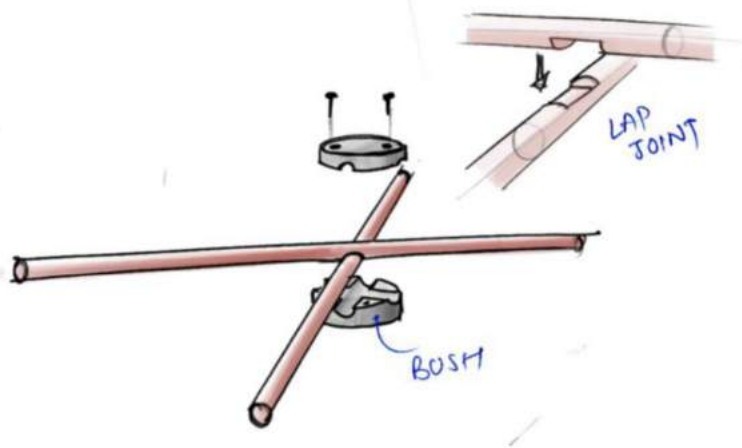


Fig.51.2 Idea 8

Here also the aim was to have easy assembly and take up the minimum space possible. The cross members are assembled first and the rest of the assembly happens later.

Concepts

Concept 1

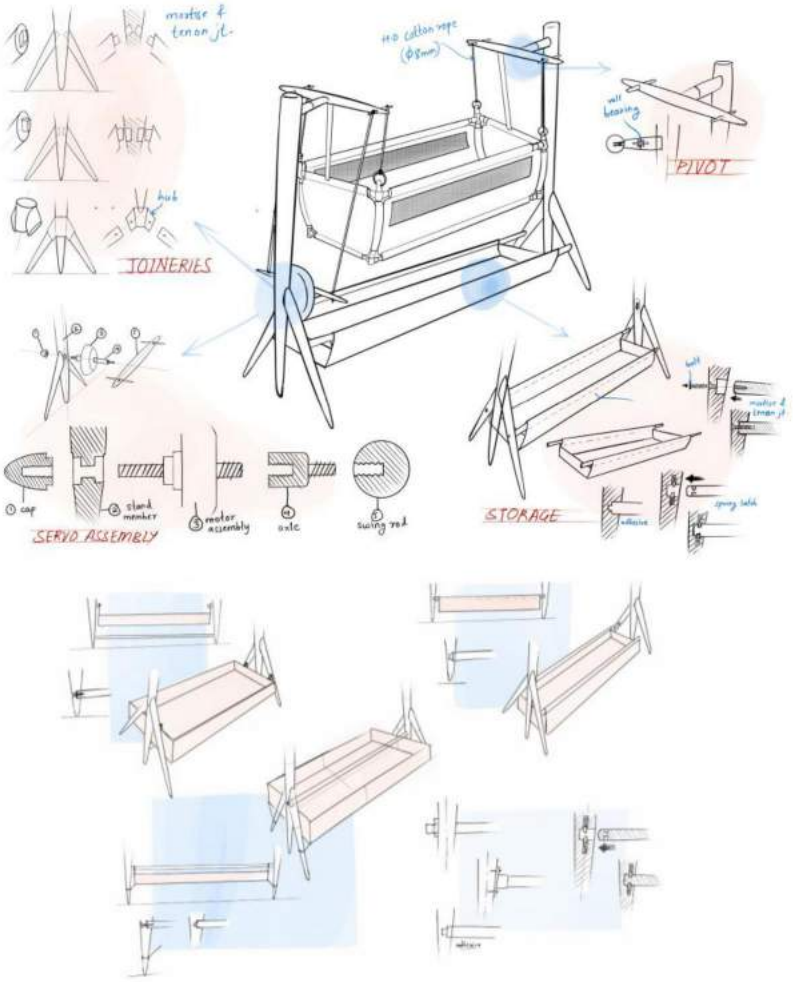


Fig.52.1 Concept 1

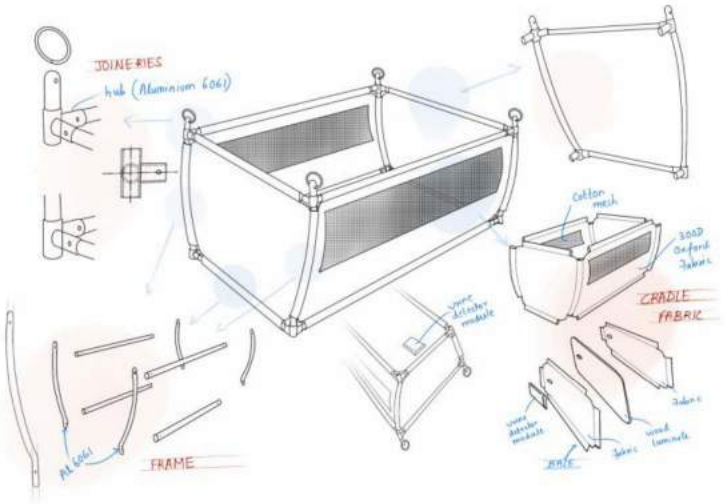


Fig.52.2 Concept 1

Here the details are well addressed for ease of user assembly. The cradle members are made of Aluminum 6063 for the purpose of curved form.

Concept 2

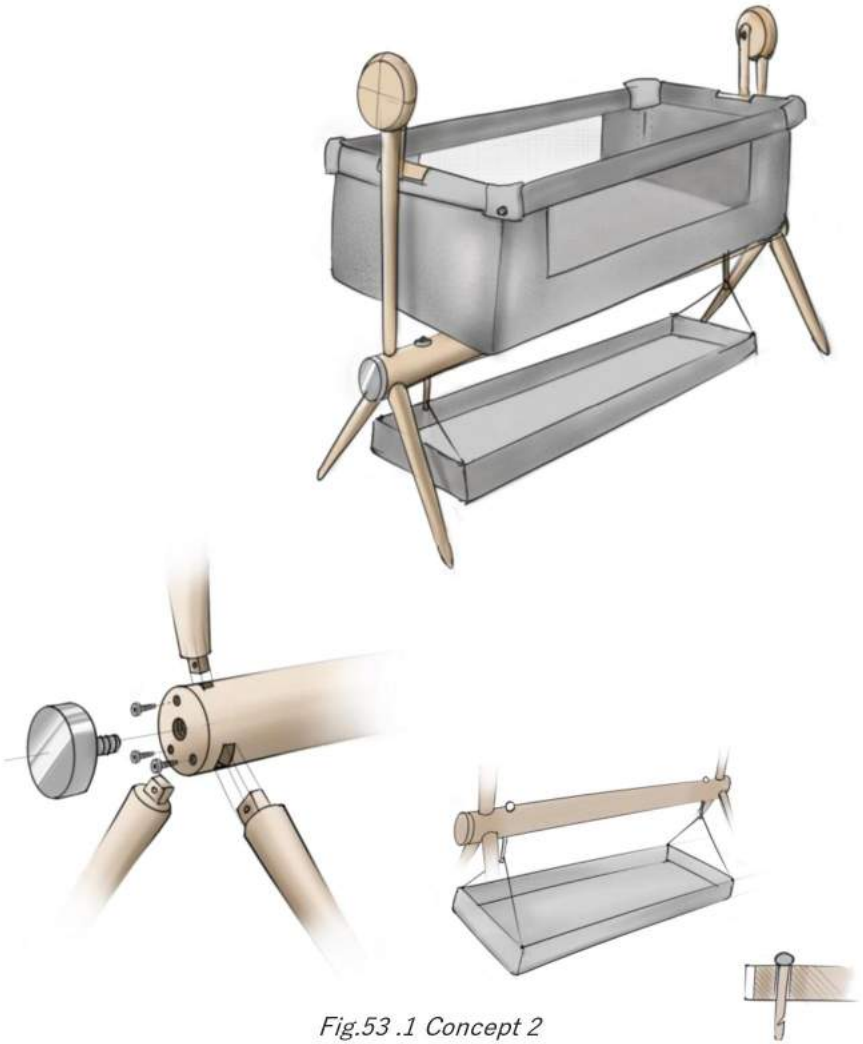


Fig.53 .1 Concept 2

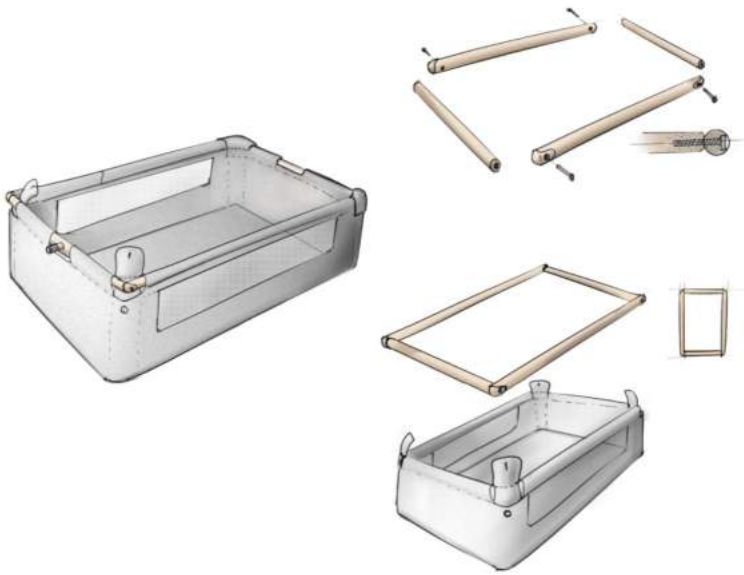


Fig.53 .2 Concept 2

The concept of ease of assembly and special constraints were addressed. The structure also helps in highlighting the turned wood aesthetic of the product.

Concept 3

Fig.54.1 Concept 3

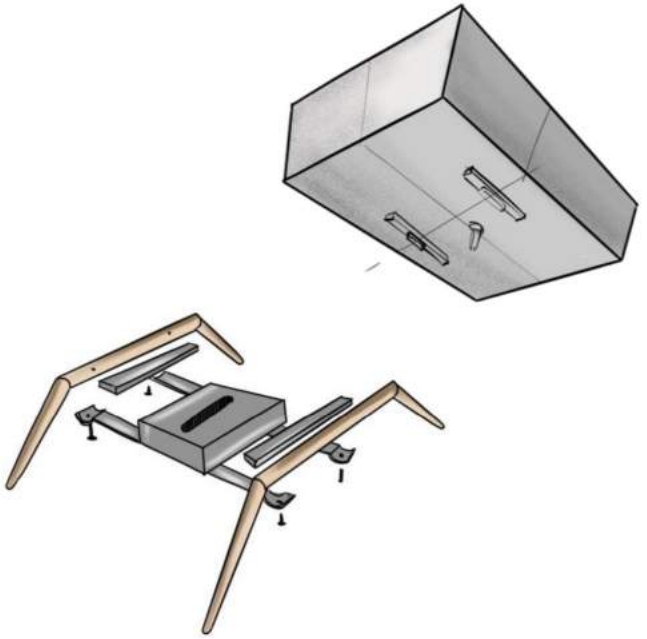


Fig.54.2 Concept 3

The least material used, the least space taken and easy assembly are the major USPs of the product.

Mockups

Mockup 1: Idea 5

Fig.55.1 Mockup 1- idea 5

Fig.55.2 Mockup 1- idea 5

Mockup to test Idea 5. The stability was good,

Mockup 2: Idea 6

Fig.56.1 Mockup 2- idea 6

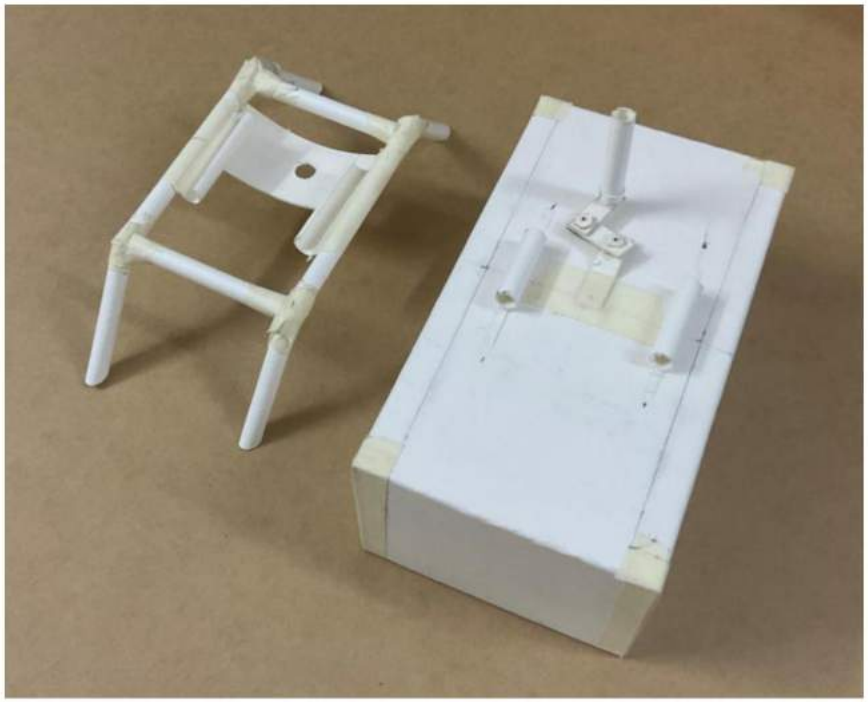


Fig.56.2 Mockup 2- idea 6

Mockup to test idea 6. Here the product looks very modern but to case all the electrical and electronic components would be a task

Mockup 3: Idea 7

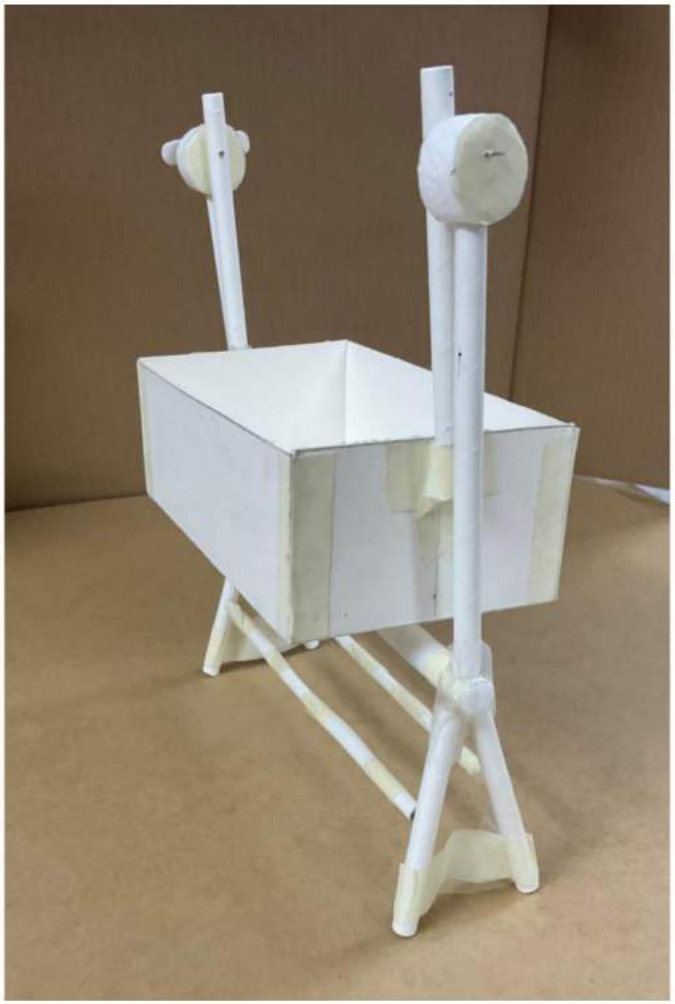


Fig.57.1 Mockup 2- idea 7

Fig.57.2 Mockup 2- idea 7

Mockup to test Idea 7. A bit unstable because of iproper construction. But it achieves the goal

Mockup 4: Joinery 1

Fig.58.1 Mockup 4- joinery 1

Fig.58.2 Mockup 4- joinery 1

Joinery 1 to facilitate the working of Idea 7.

Mockup 5: Joinery 2

Fig.59.1 Mockup 5- joinery 2

Fig.59.2 Mockup 5- joinery 2

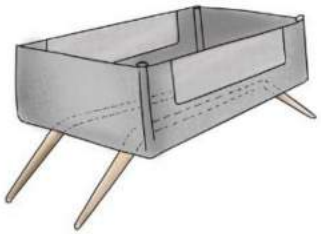
Joinery 2 to facilitate Idea 7

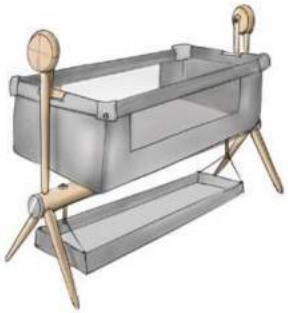
Mockup 6: Joinery 3

Fig.59.2 Mockup 6- joinery 3

Screw joineries when made with a strong material are really effective and facilitate easy assembly.

Concept Evaluation

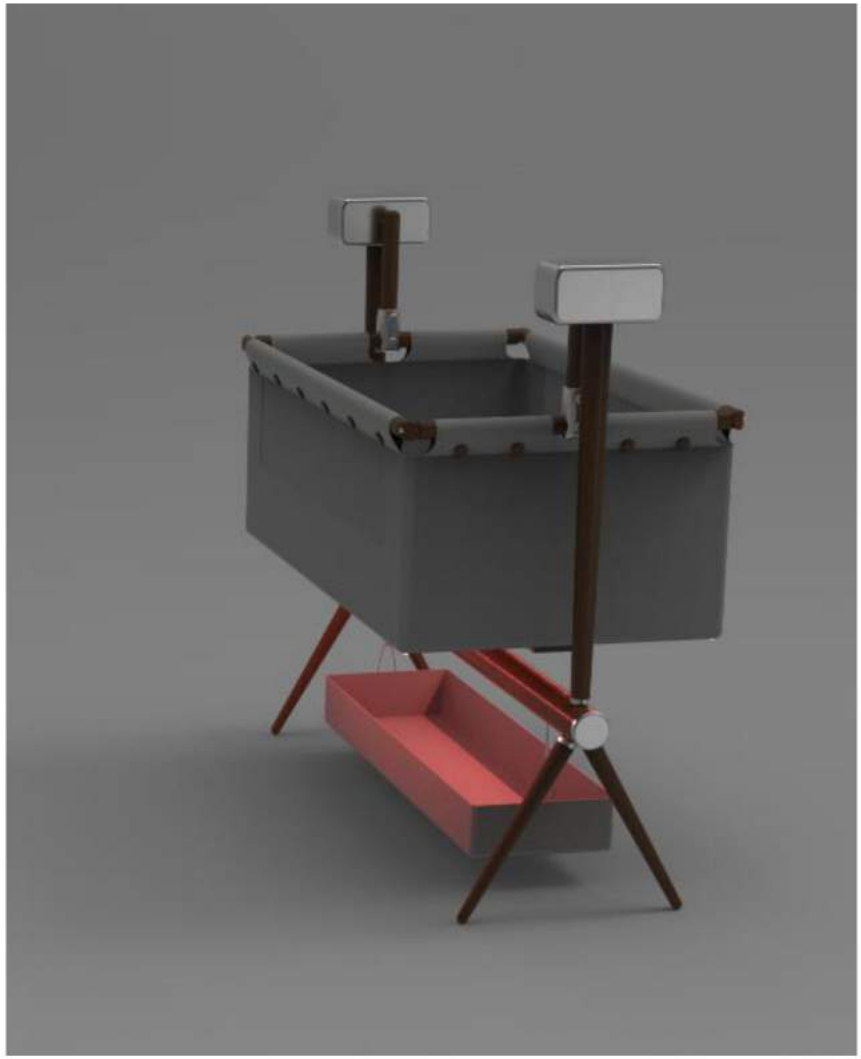




Parameters	Concept 1	Concept 2	Concept 3
Space constrain	-	● ● ●	● ●
Ease of Assembly	-	●	● ●
Modern	●	● ● ●	● ●
Scope for technology inclusion	●	●	● ● ●
New	● ●	● ● ●	● ● ●

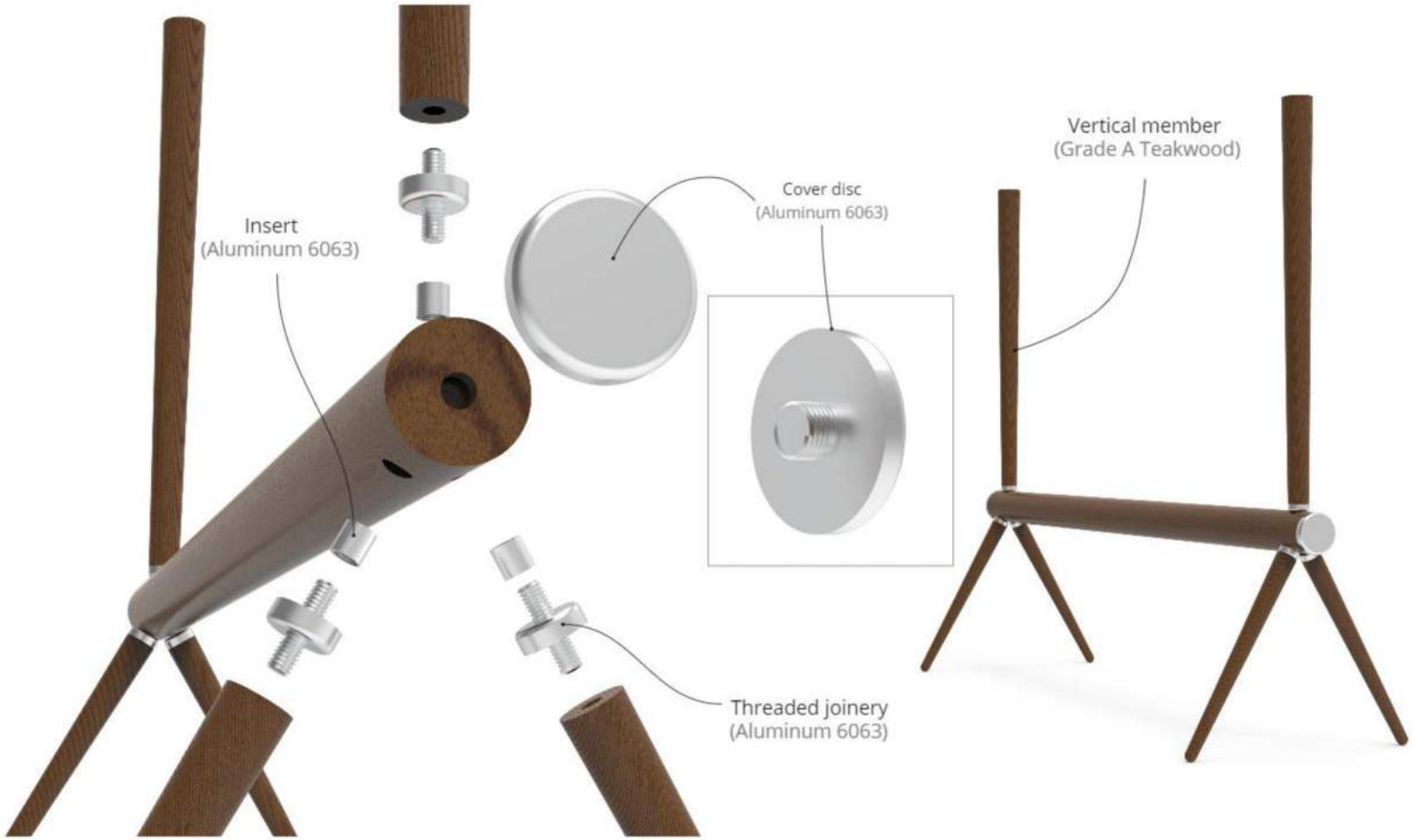
Concept evaluation was done by 5 users in the virtual mode where I explained to them the decision parameters and the designs. A rating out of three was then given by me according to their preferences

Final Concept

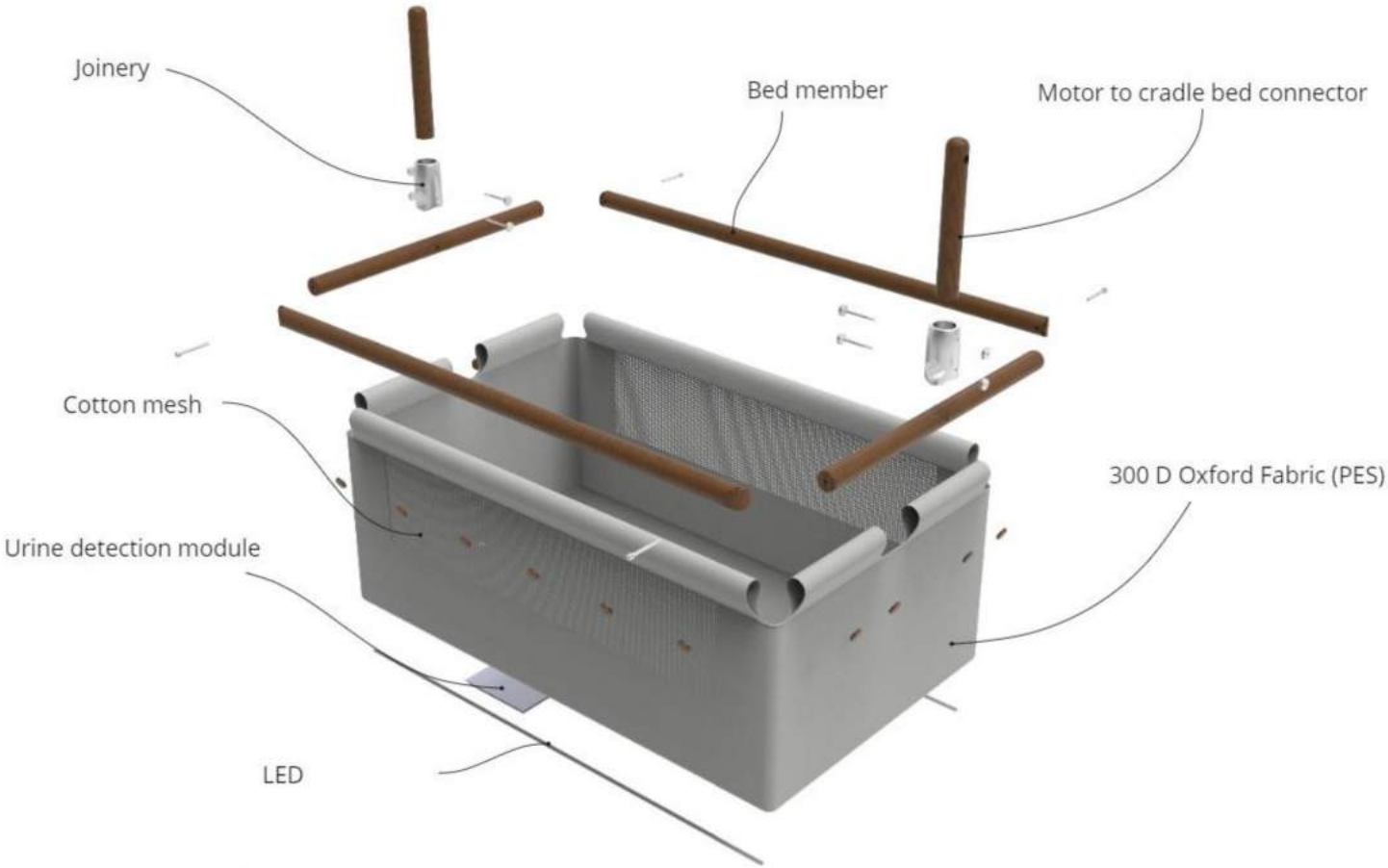


Details

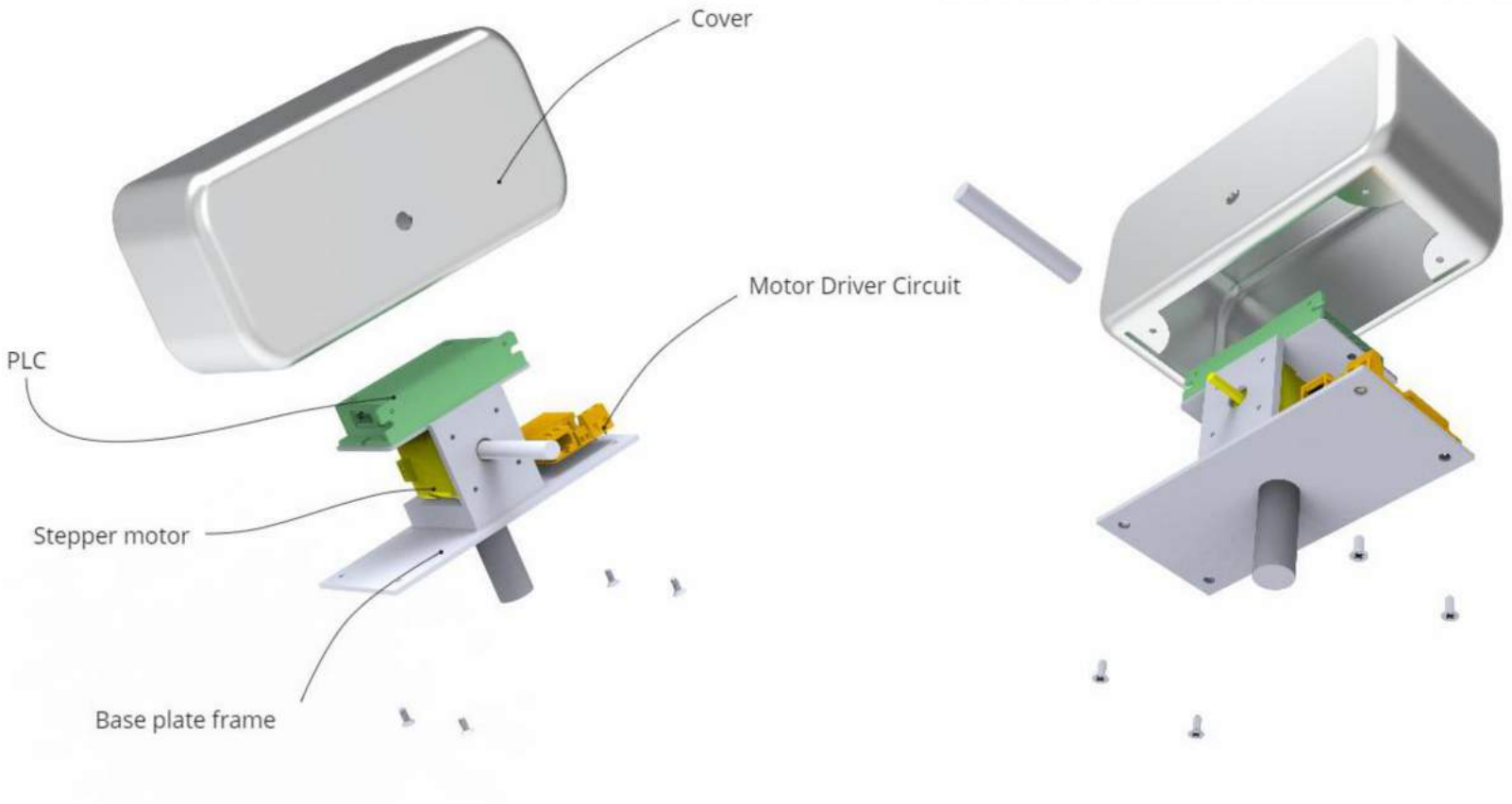
Joineries



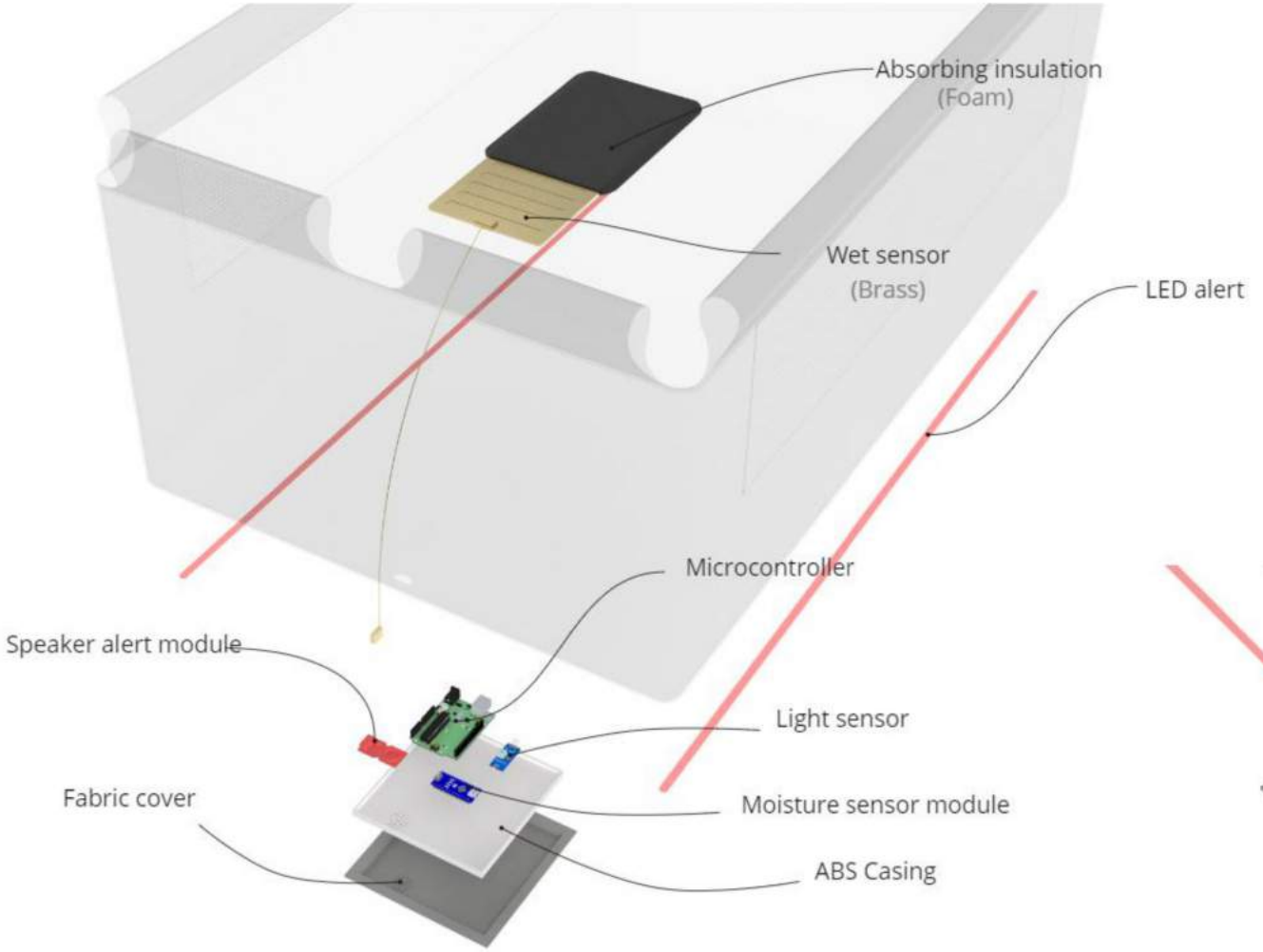
Cradle Bed

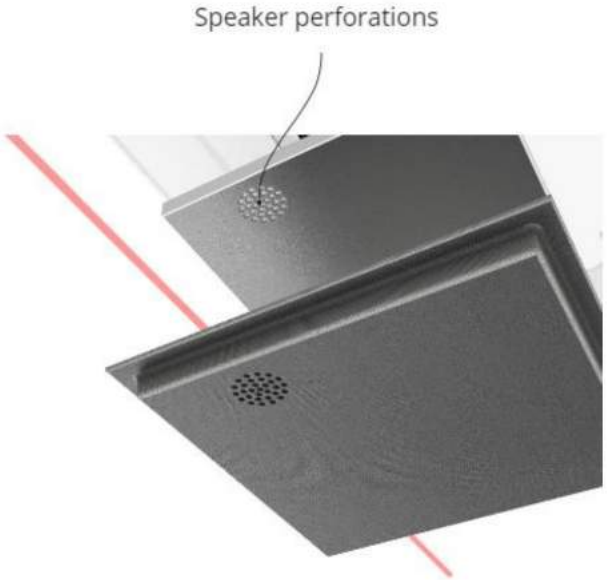

Joinery
Bed member
Motor to cradle bed connector
Cotton mesh
300 D Oxford Fabric (PES)
Urine detection module
LED

Motor Casing

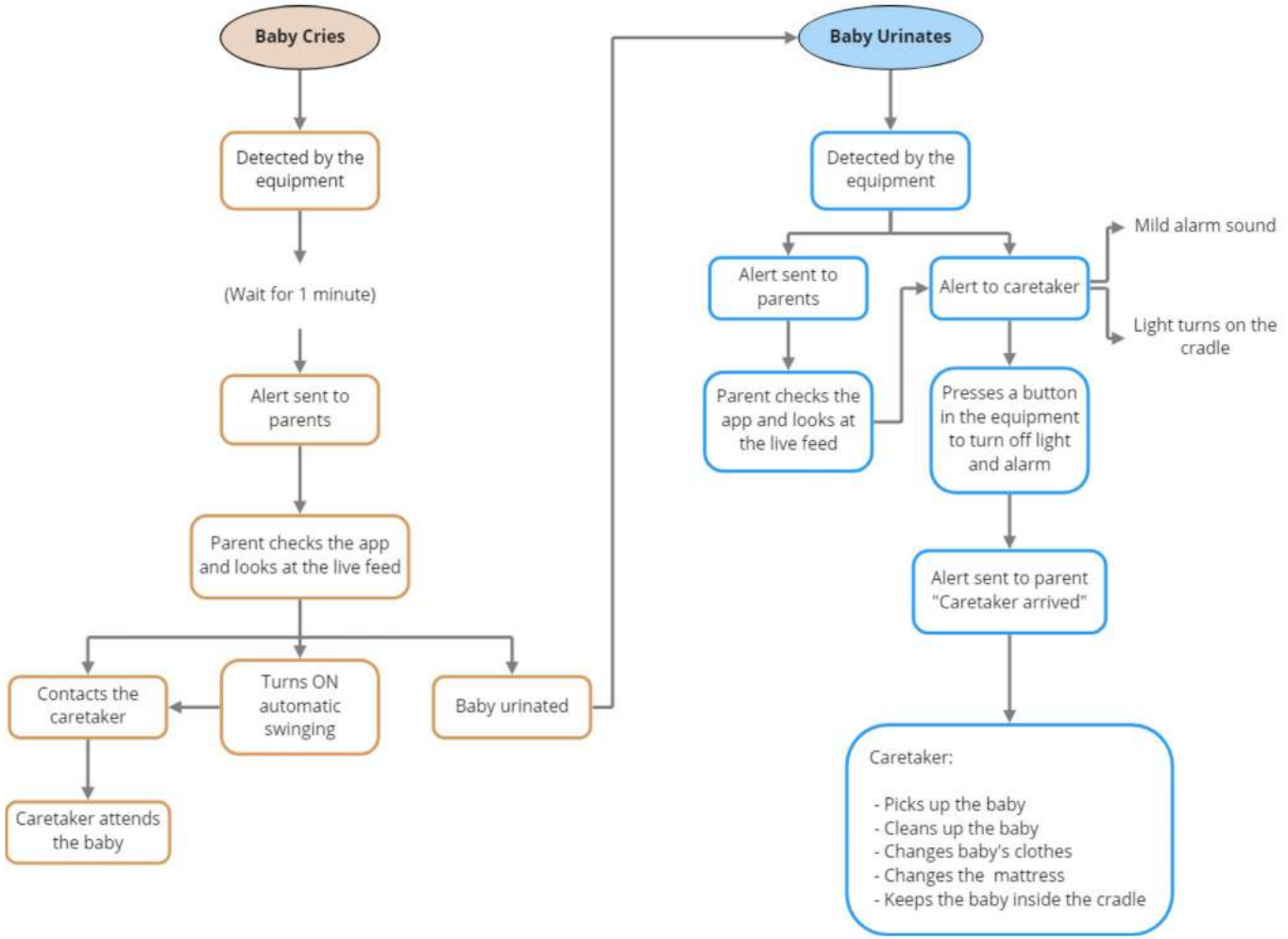


Urine detection





User Scenario – Scenario Chart



Usage Scenarios

Scenario 2: When the baby cries

Scenario 2: When the baby urinates

Scaled Model

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