**COGNI CRIB**

**PURPOSE**

* This project is focused on the idea of designing a Smart Cradle System using IoT named as **Cogni Crib**, which will help parents monitor their child.
* It is a smart, innovative, and protective Cradle System designed to nurture infants in an efficient way.
* The number of working mothers has greatly increased. Consequently, baby care has become a daily challenge for many families. As a result, most parents send their children to their grandparents' houses or to baby care centers. However, parents cannot continuously monitor their babies' conditions in unavoidable situations, and they also need to take care of their mental and physical health.
* Therefore, an Internet of Things-based Baby Monitoring System is proposed as an efficient and low-cost IoT-based system for real-time monitoring.
* The proposed system aims to monitor the baby's vital parameters, such as **urine detection, live actions, crying and sleep**. The system architecture consists of a baby cradle that will **automatically swing** using a motor when the baby cries. Parents can also monitor their baby's condition through an **external app camera**. Moreover, parents can **play music** from the app to entertain the baby.
* The proposed system will be effective in terms of cost and simplicity, ensuring safe operation to enable baby monitoring from a **specific distance and at any time** through the network.
* This system considers all the minute details required for the care and protection of the baby in the cradle through an app.

**END USERS**

1. **Parents:** They will use the Cogni Crib to monitor their babies in real-time, ensuring their safety and well-being while being able to manage their own tasks efficiently.
2. **Care Takers:** If there are other care takers apart from the parents, such as grandparents or nannies, they can also benefit from using the system to monitor and take care of the baby effectively.
3. **Childcare facilities:** Baby care centers or nurseries might use this system to enhance their baby monitoring capabilities and provide better care for the children under their supervision.

**PRIMARY RESEARCH**

**QUESTIONS ASKED:**

1. How often do you face challenges with putting your baby to sleep, and what are the main issues you encounter?
2. What safety concerns do you have when leaving your baby in a traditional cradle or crib?
3. How much does portability matter to you? Do you find it challenging to move the cradle from one room to another or when traveling?
4. Are you interested in features that can soothe or entertain the baby while in the cradle? If so, what types of features do you think would be beneficial?
5. How important is the ease of cleaning and maintaining the cradle to you?
6. How much sleep do you typically get each night when taking care of your baby? Are you satisfied with the quality of your sleep?
7. Have you ever experienced challenges with understanding your baby's sleep patterns and how to improve them?
8. How do you handle situations when your baby is fussy or restless while in the cradle?
9. What technological devices or gadgets do you currently use to aid in your baby's care and sleep routines, if any?
10. How important is the safety of the smart cradle to you, and what features would you expect to ensure maximum safety for your baby?
11. Would you prefer a smart cradle that requires a one-time setup or one that adapts and learns from your baby's sleep patterns over time?
12. What is your approximate budget range for a high-quality smart cradle that meets your needs and expectations?
13. Are you open to investing in a premium smart cradle if it offers significant benefits for your baby's sleep and your convenience?
14. Do you have any concerns about using a smart cradle system, and if so, what are they?
15. Do you prefer traditional cradles or smart cradles?

**CONVERSATION DETAILS**

**CLIENT - 1: (Called By: Ragadharshini )**

**Name: Vadivoo**

**Ph Number:**

**Answers:**

1. To make her baby sleep, she had to learn singing. She practiced staying calm to soothe her baby and kept swinging the traditional cradle all the time. She didn't know when the baby would sleep, so she kept swinging the cradle for a long time. Despite having many other tasks to do, she somehow managed to balance her responsibilities.
2. In the traditional cradle, she believed that using cotton cloth would provide comfort and convenience for the baby. The baby would feel that the mother or father is always closer to them. The cradle swings gently, shaping the baby's body and preventing any discomfort. Since cotton cloth easily gets wet, it makes changing the cloth easy.
3. It had a hanger to hold the cloth cradle, making it easy for them to remove the cloth cradle from the hanger and move it to different places. It was portable.
4. Yes, coloured cradles can be attractive to the baby, and keeping toys in the cradle is fine if the toys are safe and won't hurt the baby. Each baby has different preferences for songs, so we should play their desired songs accordingly.
5. It depends on the cradle's material. If it's a wooden cradle, it is easy to wash and dry it under the sun for a few minutes or hours, and then we can take it back inside. If it's made of cotton cloth, we can put it in the washing machine.
6. Her sleep time was not sufficient for her, and she could not take care of her health. She only had time to sleep when her baby was sleeping. She had to wake up whenever her baby woke up. She also did other works and tried to complete her tasks when her baby was sleeping.
7. She eventually practiced helping her baby follow a sleep pattern. She also learned about her baby's sleep patterns in a few weeks and acted accordingly. To improve the baby's sleep pattern, the baby must eat easily digested food to avoid constipation or indigestion. Additionally, the baby needs to intake sufficient water according to her body weight to maintain a good sleep pattern.
8. Whenever her baby felt restless, she sang the baby's favourite song, swung the cradle, and even after doing everything, if her baby didn't sleep, she would pat the baby back to sleep.
9. At that time, she didn't use technological devices except for putting on the radio or playing songs on the TV. She also believed that babies always prefer the presence of their parents over technologies.
10. Safety of a smart cradle is very important. To ensure maximum safety for the baby, the cradle should be insect-free and equipped to monitor the baby's temperature, breathing, and alert when the baby cries.
11. She prefers a cradle that adapts and learns from her baby's sleep patterns over time because the sleeping pattern of a baby changes as the baby grows.
12. Her approximate budget range for a high-quality smart cradle that meets her needs and expectations is around 10k.
13. No, she won't be investing in a premium smart cradle. She would buy a regular smart cradle, and she also mentioned that it's a one-time purchase product.
14. No concerns, she would use the smart cradle.
15. It depends on the situation. If she does not have sufficient time or has unavoidable tasks, she would prefer the smart cradle. Otherwise, during other times, the traditional cradle would be fine.

**CLIENT - 2: (Called By: Raswanth)**

**Name: Areesh**

**Ph Number:**

**Answers:**

1. Cradle size too small. It should be interesting, rhymes and lullaby, automatic lullaby when the baby wakes up.
2. Jumping. Height cradle and safety measures.
3. Moving the cradle is hard. Wheels and folding.
4. Floating toys. No noise music for good sleep.
5. Hard.
6. 4 hrs per night.
7. It would be better if the sleeping pattern is known.
8. Entertain the baby. Carry the baby and go for a walk and by giving soft toys.
9. Playing videos using mobile
10. No belts. Baby should have a free spacious place and safety nets in the cradle.
11. Adapts and learns from his baby.
12. 5k in general. He would pay 12k if it’s good. Cost would depend on the quality of the product.
13. Yes.
14. Nil.
15. Smart cradle.

**CLIENT - 3: (Called By: Raswanth )**

**Name: Anitha**

**Ph Number:**

**Answers:**

1. Comfortable position for the baby.
2. Jumping. Height cradle and safety measures.
3. Yes. It should be easy to shift between rooms.
4. Voice over. Someone should talk to the baby.
5. Cleaning is important but no one cleans the cradle.
6. She sleeps for 4-5 hrs.
7. She gradually learnt.
8. Thaalaatu or toys.
9. Nil.
10. No belts. Baby should have a free spacious place and safety nets in the cradle.
11. Adapts and learns from her baby.
12. 12k.
13. No.
14. Baby shouldn't fall out.
15. Cradle that’s just big.

**CLIENT - 4: (Called By: Mrinalini )**

**Name: Divya**

**Ph Number:**

**Answers:**

1) Whenever they are putting the baby to sleep like 6-7 times a day. One of the main issues is that the baby wakes up within 10-15 min if they are not comfortable.

2) One of the main concerns is what if the baby wakes up and cries but they are in another room and they could not hear it.

3) It matters a lot that it should be easily moveable.

4)Yes, there should be features like music, toys, and swing with adjustable speed in the cradle.

5)Very important, it should be very hygienic.

6)She needs to wake up about 3-4 times a night and she is not satisfied with the sleep quality.

7)Yes.

8)Play some light music or give them some toys.

9)Phone to play music.

10)Very important as safety is one of the first criteria to look at. The baby should not fall, and it should give indication whenever the baby wakes up or cries.

11)The one that adapts and learns from the baby’s sleep pattern over time.

12)5-10k.

13)Yes, if the cradle is good.

14)Yes, its moveability, and sensors should be battery operated and also indicate if the battery is getting over.

15)She prefers a smart cradle over the traditional one.

**CLIENT - 5: (Called By: Ragadharshini )**

**Name: Priya Dhileeban**

**Ph Number:**

**Answers:**

1. Almost every single time, she couldn't control her baby as her baby would feel very cranky.
2. When putting her baby to sleep in the traditional cradle, she would fear that the baby might fall. As a safety measure, she always kept pillows under the cradle.
3. Portability matters a lot to her, as she felt her baby is most comfortable sleeping peacefully in the cradle. However, while traveling, this became a huge problem as she wasn't able to take her cradle with her. Because of this, she also avoided traveling altogether.
4. She plays music on her mobile.
5. Very important, she would regularly change the baby's cradle bed every day.
6. Not satisfied, hardly 5-6 hours of sleep every day.
7. During the early stages, she had trouble understanding her baby's sleeping pattern, but she planned a consistent sleeping time or schedule. This made it much easier for her now.
8. During fussy situations, she would carry her baby and go for a walk in the fresh air.
9. Her baby won't sleep soon, but she feels music helps in making her baby sleep. She also felt that her baby wouldn't feel lonely whenever the baby wakes up because of the ongoing song.
10. In her opinion, it is essential to ensure that electrical equipment used around babies is properly designed and meets safety standards to avoid negative effects on the baby's health.
11. She prefers Adapts and learns from her baby’s sleep patterns over time.
12. 5-7k.
13. If needed, She would.
14. Because of a few electrical components, she fears it might be harmful or lead to bad health problems.
15. Traditional cradle only because it is 100% harmless.

**CLIENT - 6: (Called By: Ragadharshini )**

**Name: Kannan**

**Ph Number:**

**Answers:**

1. Almost every time, the environment of the cradle should be noiseless, with normal lighting—not too bright or too dark and air circulation is very important.
2. They are using a cotton cloth cradle, and they also feel that there won't be any breathing issues, and the babies won't fall.
3. No difficulty, cloth traditional cradles are easy to carry everywhere.
4. Attractive designs and colours.
5. Easy to wash or clean their cloth cradle.
6. Not sufficient, 6-7 hours everyday
7. Sleeping patterns differ as they grow older, and he also mentioned that parents need to standardize their baby's sleeping pattern based on their feeding schedule.
8. His babies won't sleep properly or feel restless whenever they are sick. To make them comfortable, he would try to create an environment in which babies would like to stay. He would also give them hot water massages to help calm them down.
9. He plays YouTube songs or rhymes. He also gives toys and while feeding or playing with the babies. During sleeping time, he tells stories or plays songs.
10. We need to ensure that the frequencies of these sensors do not affect the baby's health or produce any side effects. The design of these smart cradles should keep the wires properly secured and out of the baby's reach. Complete safety is important, as we don't know what babies will do at any time.
11. Adapts and learns.
12. 8k.
13. Based on its features, if required, he would buy it.
14. Smart cradle’s usage is less, so it's essential to design the cradle in a way that keeps the babies comfortably inside and prevents them from coming out.
15. Traditional cloth cradle because he felt that smart cradles would be difficult to clean, and they might produce excess heat that could be uncomfortable for the baby's body.

**CLIENT - 7: (Called By: Mrinalini )**

**Name: Niranjana**

**Ph Number:**

**Answers:**

1. Every time the baby is put to sleep. There should be no noise and the comfort of the cradle.
2. The baby might fall.
3. A lot as it should be easy to carry. Yes, we find it hard as it is not easy to carry a crib while traveling.
4. Yes, mild music, swinging cradle, colourful toys, bed with comfortable and soft material
5. Should be easily cleanable.
6. Around 5 hrs and are not satisfied as they must wake up multiple times and cannot get continuous sleep.
7. Yes, as it will be easier to take care of the baby if we understand its sleep pattern.
8. Give baby toys, talk to the baby, sing or play music for the baby.
9. Sometimes she uses my phone to play music.
10. Very important the design of the cradle should be good; the wiring should be out of the reach of kids and the cradle should be made up of good quality materials.
11. The one that adapts to the sleep patterns of the baby.
12. 7-10k
13. Yes, if it is efficient
14. Yes, the cleanliness of the smart cradle.
15. A smart cradle.

**CLIENT - 8: (Called By: Sampretha P)**

**Name: Sundhari**

**Ph Number:**

**Answers:**

1. Baby’s sleep schedule is irregular, and it sleeps mostly during the day so it's hard to make them go to sleep.
2. Health issues and might fall.
3. Traditional cradles are too heavy to carry.
4. Rhymes, toys, lullaby.
5. It's hard to clean a traditional cradle.
6. 2-4 hrs because the baby randomly wakes up in the middle of its sleep.
7. Baby’s sleep schedule is irregular, and it sleeps mostly during the day so it's hard to make them go to sleep.
8. Swing the cradle and sing lullaby.
9. Use a normal cradle.
10. Height of the cradle should be more, and the material should be good.
11. Whatever cradle that gives less radiation.
12. 10k.
13. No.
14. Radiation.
15. Smart one.

**CLIENT - 9: (Called By: Sampretha P)**

**Name: Nandhini**

**Ph Number:**

**Answers:**

1. The baby wakes up if it is hungry or if it is in discomfort. Once awake, it's hard to put it back to sleep.
2. The baby might fall out of the cradle easily if the cradle is short and weak.
3. It Would be easy to switch between rooms if the cradle has wheels.
4. Toys and laughing and talking to the baby.
5. Hygiene is important so it is necessary to clean it with ease.
6. 3-4hrs.
7. Yes, it is hard to know the baby's sleep pattern.
8. Playing with toys and carrying the baby on the shoulder.
9. As of now we don't use any gadgets.
10. The cradle should be trustworthy to put a baby in. It should make sure the baby doesn't fall out.
11. One that adapts and learns the baby pattern.
12. 6k.
13. No.
14. The sensors shouldn't short circuit or the baby shouldn't get any shock.
15. Smart cradle.

**CLIENT - 10: (Called By: Mrinalini)**

**Name: Sumathi**

**Ph Number:**

**Answers:**

1. Putting her baby to sleep is challenging every time due to irregular sleep patterns and night wakings of her baby.
2. Suffocation and falls.
3. They need wheels, folding of the cradle to move the cradle from one place to another.
4. Yes, features like soft gentle lullabies, colourful soft toys, gentle swing.
5. It should be easy to clean as cleaning is very necessary for the baby’s hygiene and to create a comfortable environment.
6. Not satisfied, 5hrs sleep
7. Yes, Gradually Understood her baby’s sleep pattern.
8. Check for discomfort like baby’s diaper is wet or not and carry the baby and go for a walk.
9. Play YouTube rhymes.
10. Safety is important. Features like height from the ground should be less, spacious cradle.
11. Adapts and learns from baby.
12. 8k.
13. Yes.
14. Battery life, malfunctioning of sensors.
15. Smart Cradle.

**SUMMARY OF THE PROJECT**

The project aims to create a Smart Cradle System using an Arduino UNO board and various sensors and modules to enhance baby care and monitoring. This system also helps in analysing baby’s sleep through app. The system is designed to assist parents in monitoring their infants more efficiently, especially when they are away or need to attend to other tasks.

**TECHNICAL DETAILS**

1. **Arduino UNO Board**: The Arduino UNO board serves as the central control unit for the entire system. It will process data from various sensors and trigger appropriate actions accordingly.

1. **LM393 Sensor with Built-in Mic**: This sensor is utilized for sound detection, specifically to sense when the baby is crying. When crying is detected, the system will activate the necessary responses.

1. **Servo Motor**: The servo motor is responsible for the cradle's shaking motion. When the LM393 sensor detects crying, the cradle will automatically start shaking, providing a soothing motion to comfort the baby. Manual control is also available, allowing parents to manually operate the cradle as needed.

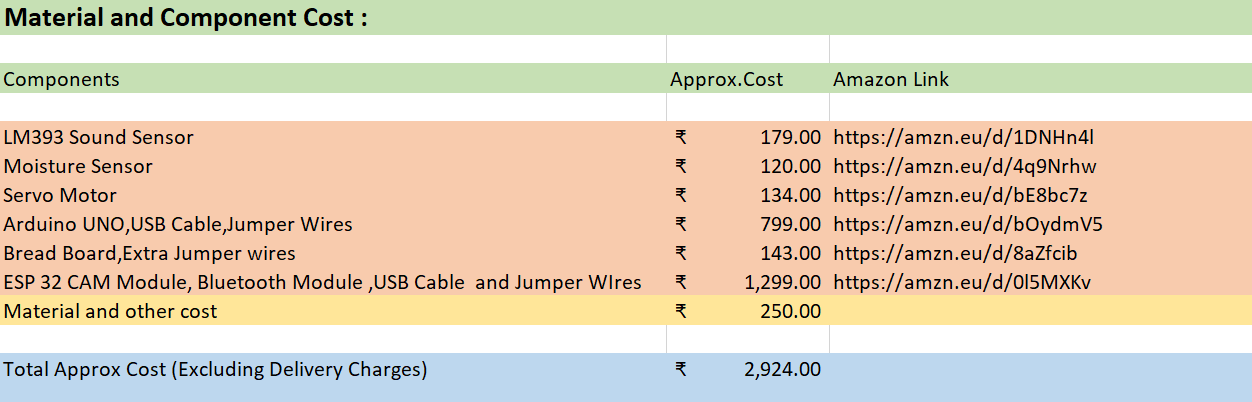
1. **ESP32 CAM and Bluetooth Module**: These modules enable live monitoring of the baby's actions. The ESP32 CAM provides a video feed of the baby's activities, allowing parents to keep a watchful eye remotely through the app.

1. **Wetness Sensor/Moisture Sensor**: This sensor is used to detect the baby's urine or wetness, providing timely alerts to the parents, ensuring the baby's comfort and hygiene.

1. **App Integration**: The system is integrated with an app - the Blynk App or the MIT App Inventor. This app provides a user-friendly interface for controlling the cradle's motion, monitoring live video feed, and receiving alerts from the wetness sensor. It also analysis **baby’s duration of sleep**. Additionally, the app offers an on/off option for playing music, and the lullaby feature activates automatically when the cradle is in motion.

With this Smart Cradle System, parents can monitor their baby's actions and respond promptly to their needs from a particular distance. It also makes us understand about baby’s sleep duration. The automation of the cradle motion and lullaby feature helps soothe the baby, providing a more comfortable and peaceful environment. The integration of IoT technologies, along with the user-friendly apps, makes this system a convenient and efficient solution for modern baby care.

**COST - PROTOTYPE WORKING MODEL**



**WORKING FLOWCHART**

