Case studies from classes led by Dr. Ron Fulbright, University of South Carolina Upstate.

INNOVATIVE ANALYSIS

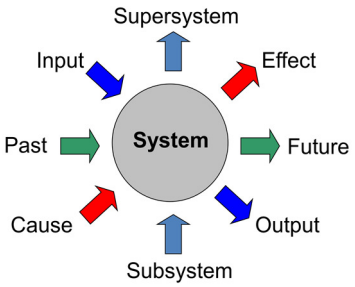
BETTER CRIBS

1. BRIEF DESCRIPTION OF THE SITUATION

Thousands of infants and toddlers are injured every year, and hundreds have died in recent years, as a result of becoming entangled or entrapped by the crib or its attachments/bedding materials. The USA recently outlawed drop-side cribs for this reason. As you can see below, cribs currently on the market have fixed sides. However, this makes it difficult for shorter people and those with back trouble to bend over to lay a baby down in the crib or to pick up a baby from a crib. This becomes more of a problem as the baby ages and gets heavier. Current cribs still have places which can entrap arms, legs, fingers, etc. The introduction of mattress and crib pads mitigate the danger somewhat but cause other problems in that body parts and objects can become lodged between the pad and the bars. Another source of injury is from toddlers falling out of a crib. The height of the bar allows kids to stand in the crib but also makes it very easy for larger, more mobile, children to climb out and sometimes fall.

http://www.youtube.com/watch?v=9oNNKZggUCU
http://www.youtube.com/watch?v=CLJCTpY82B4

2. DETAILED DESCRIPTION OF THE SITUATION



2.1 SUPERSYTEM/SUBSYSTEM ANALYSIS

1. A bed with high sides for a young child or baby.
    1.1 Crib Rods
    1.2 Rod Angles
    1.3 Foot Release Bars
    1.4 Enclosed by sides to prevent the baby from falling
2. Foot Release Bars
3. Gate Shoes Hand Releases
4. Mattress Spring Frames
    4.1 Hooks for Mattress Spring Frames
5. Compression and Bumper Springs
6. A basket.

2.2 INPUT/OUTPUT ANALYSIS

- Need an adult to put baby in crib
- Need an adult to take baby out of crib
- Weight distribution of the baby and the objects inside
- Crib walls keep toddlers from falling and hurting themselves
- Crib walls allow air flow

- Low laying mattress so baby can't get out

2.3 CAUSE/EFFECT ANALYSIS

The crib is used to hold babies or young children in while they are sleeping or playing by themselves. Without the proper height and size of a crib, the child or young children can jump or crawl out of the crib and can hurt themselves.

If the child is overweight and over the size requirement, the crib can turn over and flip and hurt the child.

Some cribs have wheels so that the parent can roll the crib into the room they are at. This can be harmful for the child if the parent is not watching them. The children can make the crib roll and they can roll out the room and down some stairs.

Each crib has a monitor attached with the crib. If there is not a monitor attached to the crib, the parent cannot hear the child if they scream or cry out.

Each crib should have a monitor where they can monitor the breathing of the child.

2.4 PAST/FUTURE ANALYSIS

An infant bed commonly referred to as a crib in English or a far less commonly as a cradle or stock in American English. It is a small bed specifically for infants and very young children, generally up to 3 years old. Infant beds are most common in North America, Europe, and Australia, employed by the majority of parents as an alternative to bed-sharing. Infant beds have a history dating back several hundred years. The earliest and most common type of bed was more like a cradle. Basically, a hollowed-out half log to provide a secure resting place for baby. Many cradles were made on a frame so they could rock gently. Once the baby outgrew the cradle it graduated to a trundle bed considered a toddler bed. The trundle bed was made to fit easily under the parent's bed to conserve space. During the 19th century, the infant bed came into existence as homes became larger. Infant beds were usually homemade and passed on from child to child and passed on through generations since they were constructed of solid wood. During this time there were many children in a family and each one would use the infant bed for the first year or until the next child came along. The nursery started as a small nook located

adjacent to the parent's bedroom. Eventually the idea of the child having his or her own room came to be the standard. Wealthy families who could afford a nanny were able to have a separate room for the child. Homes were built with more bedrooms so they could accommodate more children.

1900

1920

1950

Infant bed design through the years has shown a steady improvement of features yet the same basic shape and form have remained the same. Today infant beds are under continually updated safety rules to ensure that children are safe in their cribs.

3. RESOURCES, CONSTRAINTS, AND LIMITATIONS

3.1 AVAILABLE RESOURCES

Sheets	screws	Bumper (provide protection)
Metal bars	slats/spindles	Gravity
Plastic bars	pad mattress	weight distribution looking device
Mattress	pillow	

3.2 ALLOWABLE CHANGES TO THE SYSTEM

The shape, materials, the weight, flexibility, height, size, portable, texture, and adjustability of the bars are all components in the make and model of the cribs.

3.3 CONSTRAINTS AND LIMITATION.

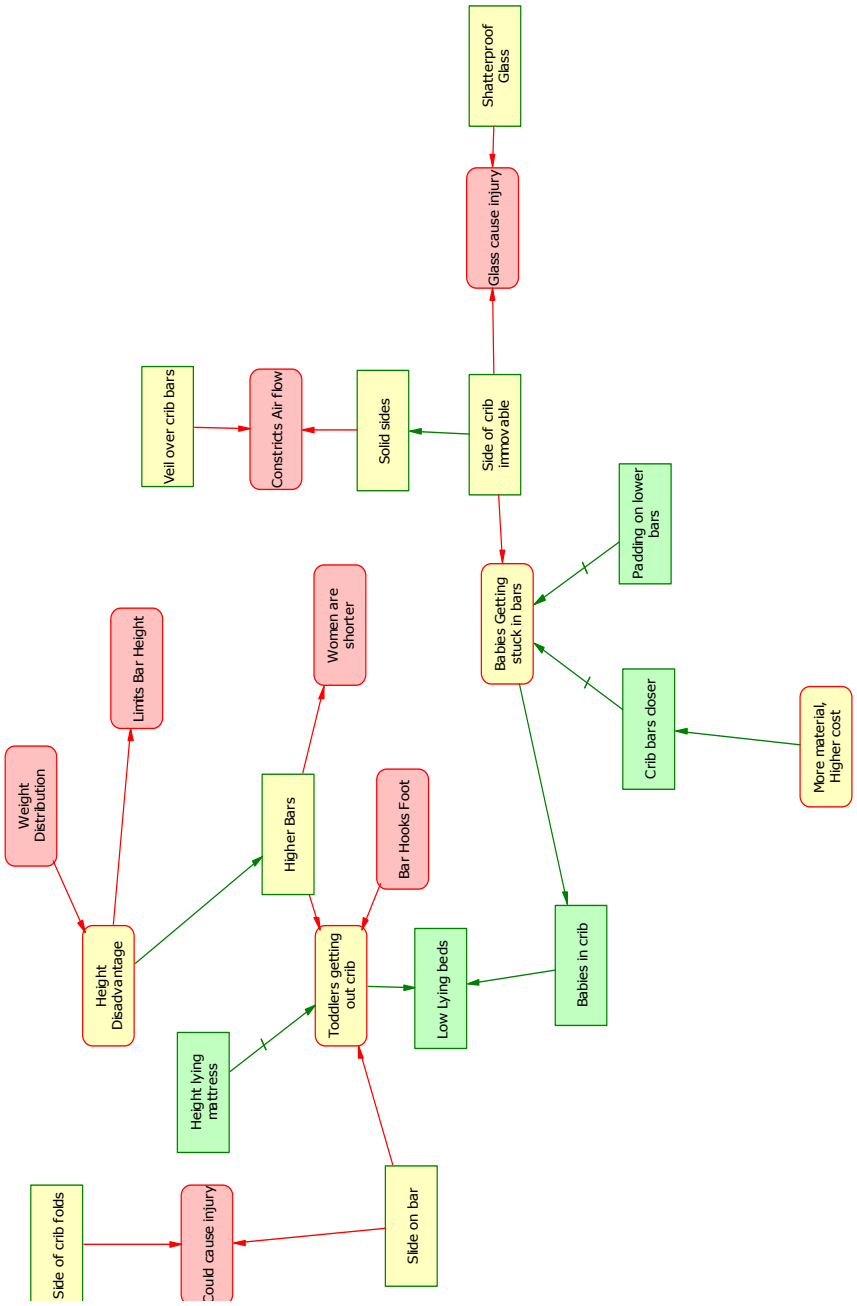
Cribs design will have to be user friendly, so every child can use them. The crib has to be clearly understandable and use according to the child needs. The cribs cannot be harmful to the child, it should protect the child leaving them to getting them their proper sleep and parent no sleepless nights.

The crib will still need to have easy access to the child getting in and out of the cribs.

The cribs still need to be able to have the right space and room for the child to move and breathe.

Do not consider adding glass to the crib. However, it may cause harm to the child and limitation the space and room to breathe.

4. PROBLEM FORMULATION



5. IDEAS

Replace this text with a list of your innovative ideas and the I-TRIZ operators that triggered those ideas. You must have at least 20 ideas.

25. Find a way to eliminate, reduce, or prevent *Constricts Air Flow* under the conditions of *Veil over crib bars.*

1. Digital Cribs- A crib that can monitor the baby's breathing and also move up and down in order for the adult to get the baby out the crib

31. Find an alternative way to obtain *Shatterproof Glass* that does not cause *Glass cause injury.*

2. Glass Cribs- shatterproof glass cribs so that the baby can't get stuck in the bars

15. Resolve the contradiction:*Height Disadvantage* *should exist* to provide *Higher Bars* and *Height lying mattress*.

3. Mattress Blow Up- the mattress can blow up so shorter people can put the baby in the crib and go back down once the baby is in the crib

5. Find an alternative way to obtain *Height lying mattress* that offers the following: eliminates, reduces, or prevents *Toddlers getting out crib* does not require *Height Disadvantage*.

4. Built in step latter- Latter built in to the crib so that shorter people can put the baby in the crib

12. Find an alternative way to obtain *Higher Bars* that offers the following: does not cause *Toddlers getting out crib* does not require *Height Disadvantage* and *Women are shorter*.

5. Gate on front of crib- So you can place the baby in and out of the crib easily

15. Resolve the contradiction:*Height Disadvantage* *should exist* to provide *Higher Bars* and *Height lying mattress*.

6. Put one bar higher than the other- So on one side of the crib you put the baby and the other side is higher so the baby can't come out that way

24. Find an alternative way to obtain *Solid sides* that offers the following: provides or enhances *Side of crib immovable* does not require *Constricts Air Flow*.

7. Screen in crib- Put a screen on the crib so that the baby can't get stuck on the bars

22. Find an alternative way to obtain *Padding on lower bars* that eliminates, reduces, or prevents *Babies Getting stuck bars*.

8. Veil over railings to protect the child from coming out- Veil on lower half of the bars so that baby can't get stuck

17. Find a way to eliminate, reduce, or prevent *Women are shorter*.

9. The side of crib folds down- So that short people can put the baby in the crib

25. Find a way to eliminate, reduce, or prevent *Constricts Air Flow* under the conditions of *Veil over crib bars.*

10. Install a monitor to tell if the baby still breathing

19. Find a way to eliminate, reduce, or prevent *Babies Getting stuck bars*.

11. Make the bar closer- Make the crib bars closer to minimize the baby getting stuck

17. Find a way to eliminate, reduce, or prevent *Women are shorter*.

12. Make the crib adjustable for height- The crib can lift up or come down

16. Find a way to eliminate, reduce, or prevent *Bar Hooks foot* in order to avoid *Toddlers getting out crib*.

13. Make a slider so if the child tries to climb out- So if the baby tries to climb out, their foot will slide back down into the crib

16. Find a way to eliminate, reduce, or prevent *Bar Hooks foot* in order to avoid *Toddlers getting out crib*.

14. Make a plastic bar to shift to side to side

12. Find an alternative way to obtain *Higher Bars* that offers the following: does not cause *Toddlers getting out crib* does not require *Height Disadvantage* and *Women are shorter*.

15. A foot pumps to lift up the mattress- A foot petal to lift the crib mattress up and down

12. Find an alternative way to obtain *Higher Bars* that offers the following: does not cause *Toddlers getting out crib* does not require *Height Disadvantage* and *Women are shorter*.

16. Crib riser- Crib riser that can come up and down and needed

24. Find an alternative way to obtain *Solid sides* that offers the following: provides or enhances *Side of crib immovable* does not require *Constricts Air Flow*.

17. Solid wood with holes- Solid Wood sides so you don't have to worry about baby getting stuck in bars and holes for proper air flow

31. Find an alternative way to obtain *Shatterproof Glass* that does not cause *Glass cause injury*.

18. plastic cribs- So you don't have to worry about Glass shattering and holes in the crib for proper air flow