Geometrical shape recognition toy

Project Activity

Phase 1: Complete the phase one of the design process for the selected need statement

Geometric Shape Recognition Toy:

(Toycathon 2021) TYCH12: Creative toys wishes to develop a toy for the development of the creativity of children. They imagine a toy where a child would combine various fundamental shapes like sphere, cone, cylinder and cuboid to build new figurines or blocks. Develop a game which uses geometrical shapes (especially 3D shapes like sphere, cone, cylinder, cuboid, etc.) and figures to improve a child's creativity.

Step 2.1: Interact with users / clients by asking questions which helps designers to arrive at objectives, constraints, and function.

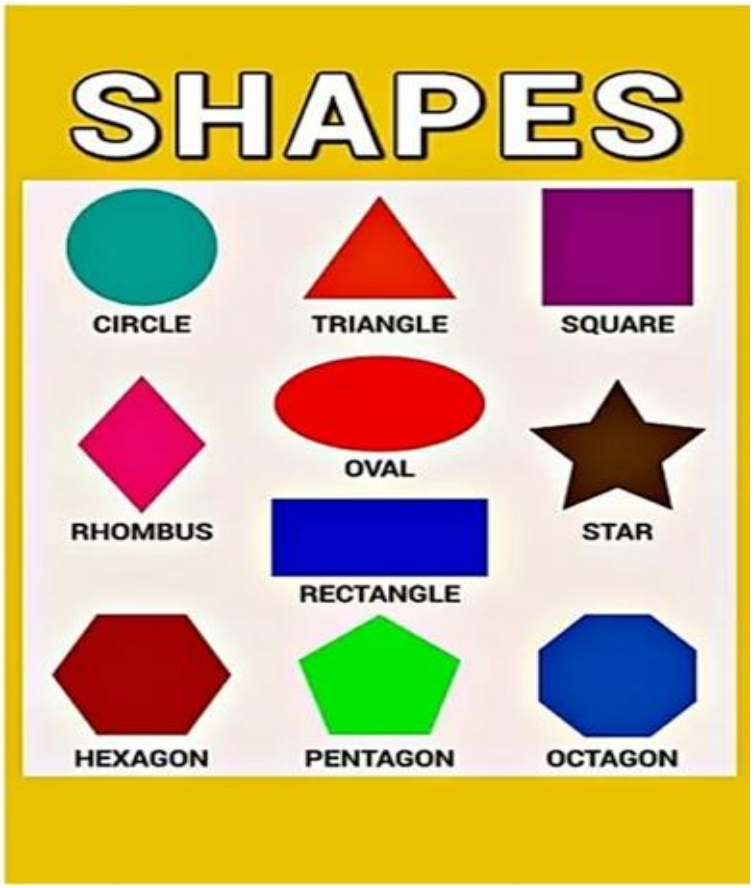
Questions such as	This question helps to designers to
1. What should be the dimensions and the color of the board?	Established clients objective
2. What is your targeted customer base (Age group)?	
3. What are the extra features of this toy?	
4. What color you want for your element pieces?	
5. What if player matches wrong object with given shape?	
1. What will be your approximate budget?	Identify the constraints
2. What is size of this toy?	
3. What is the price of toy?	
4. What are the materials do you want to use to make this toy?	
5. What are the digital gadgets you used in this toy?	
6. How many shapes you are including in this toy?	
7. How much time the LED's , buzzer and display will be on?	
	Establish functions
1. How can u start the game?	
2. How do player know that they won the game?	
3. How the game will recognize that the shape inserted is right?	
4. What function is been used to excite interest in user?	

Step 2.2: Categorize the response into objectives, constraints, and functions.

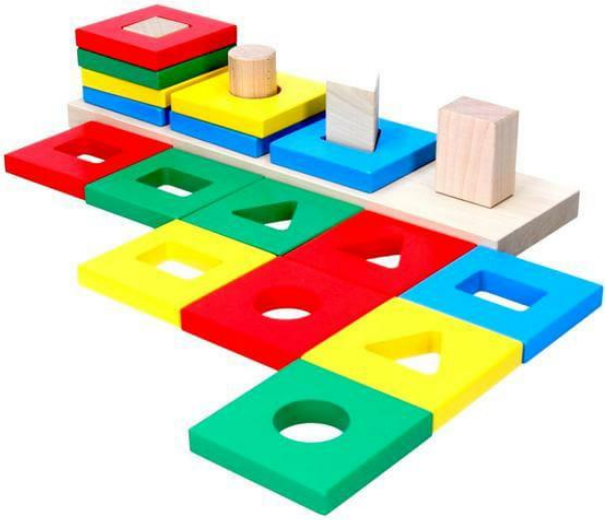
Responses from clients and Users	Objective	Constraint	Function
1. It have a circular board with approximate radius of 15 to 20 cm	YES	YES	
2. Age group 3 to 10 is suitable	YES		
3. This toy is a digital toy with LED's, buzzers and display screen. Also this toy is energy efficient, shockproof and not having sharp edges. This toy maintain accuracy and efficiency. This toy is made up of unhazardous materials and materials which are not chewable. This toy is easily portable. At low cost this toy is giving many facilities.	YES		
4. toy should have fluorescent rainbow colors.	YES		
5. if player match different shaped object then buzzer will sound	YES		
1. Rs1000-1200		YES	
2. It is a circular toy with radius 15 to 20 cm and height is 5 to 7 cm		YES	
3. Rs 1400 to 1600		YES	
4. I want this toy made up of eco-friendly and unhazardous products which are not chewable		YES	
5. In this toy there is display screen, buzzer and LED's		YES	
6. (5-6) shapes , It will vary depend on shape of game.		YES	
1. It can be start by trigger or by button.			YES
2.If player won the game then it will display "Done" with some cartoons			YES
3.With the help of sensor and button(motion detection)			YES
4. LED's get on and some sound will play from the buzzer			YES

Step 2.3: Obtain information through comparative benchmarking to arrive a design

Step 2.3.1: List evolution and breakthrough in technology those are associated with the project?



What are the existing solutions to the problem? (Search using Internet, Journals, Patents, Books, Local shops, and online shopping sites etc. (Collect information about 4 existingproducts)



What are the average costs of existing products in the market?

Rs 749/-
Rs 900/-
Rs 699/-

What are the associated specifications of existing products?

1. **Easy to carry**
2. **Attractive in looks**

Step 2.4: combine the literature survey details and arrive at the design requirements.

Observation and from Literature survey	**Requirement**
Easy to handle	Less size
Attractive	Materials used should not be harmful
Best design	It should increase excitement
High price	Price should be affordable
Have sharp edges	Toy should not have sharp edges
Not a digital toy	Digital toy

Step 3: Find client's objectives

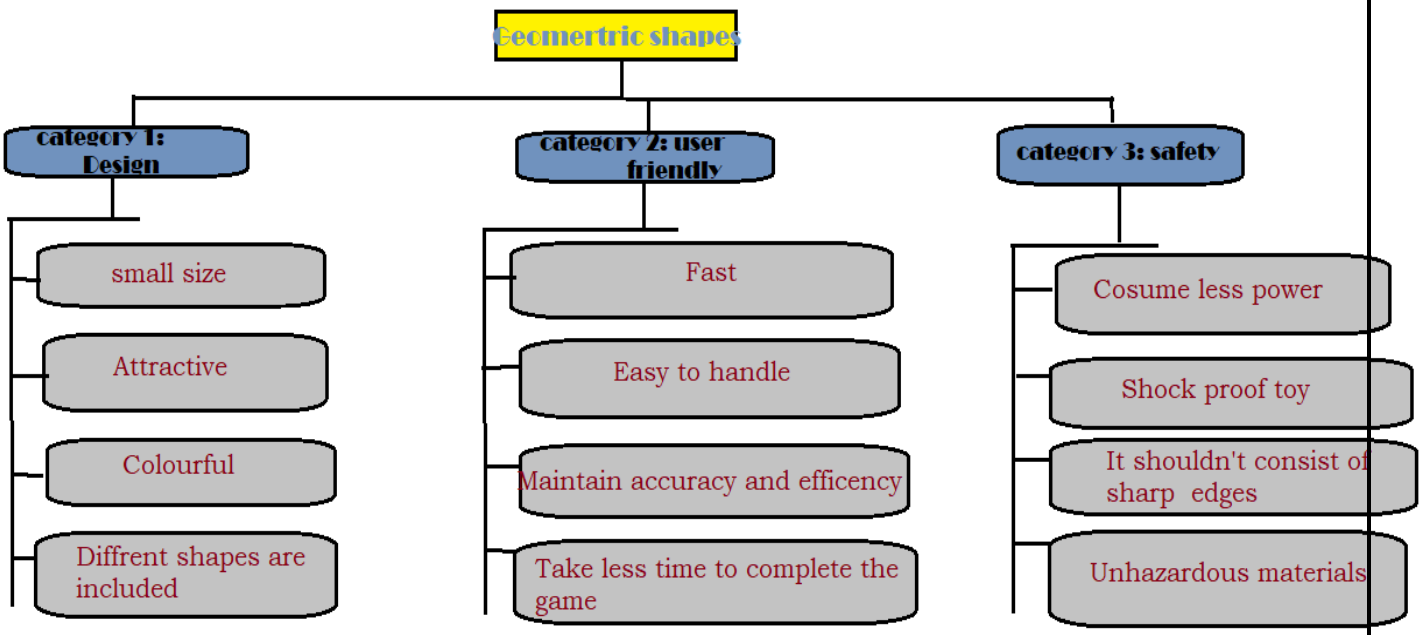
Step 3.1: Prepare a list of design objectives

Sr. no.	Objectives
1	**Energy efficient and safe**
2	**This toy is easily portable**
3	**Shock proof toy**
4	**Small size, light weight.**
5	**Made up with unhazardous materials and materials which are not be chewable.**
6	**Toy shouldn't consist of sharp edges.**
7	**Toy should be affordable.**
8	**Attractive.**

Step 3.2: Order the list in toy sets.

Title: Geometric Shape Toy		
Category 1:Design	**Category 2: User friendly**	**Category 3: Safty**
Small size,	Fast	Consume less power
Different shapes are included	Easy to handle	Shock proof toy
Attractive	Maintain accuracy and efficiency	It shouldn't consist sharp edges.
Colorful	Take less time to complete	Unhazardous materials

Step 3.3: Draw an objective tree



Step 3.4: Priorities among various aims is using a technique called Pair-wise Comparison Chart (PCC)

Objectives	Energy efficient and safe	Portable	Shock proof	Small size, light weight	Made up with unhazardous materials and materials which are not chewable	shouldn't consist sharp edges	Affordable	Attractive	Score
Energy efficient and safe	*	1	0	1	0	0	1	1	4
Portable	0	*	0	1	0	0	0	0	1
Shock proof	1	1	*	1	1	0	1	1	6
Small size, light weight	0	0	0	*	0	0	0	1	1
Made up with unhazardous materials and materials which are not chewable	1	1	0	1	*	0	1	1	4
shouldn't consist sharp edges.	1	1	1	1	1	*	1	1	7

Affordable	0	1	0	1	0	0	*	1	3
Attractive	0	1	0	0	0	0	0	*	1

Rank the objectives in order of decreasing value of importance and the listis:

1. Toy shouldn't consist of sharp edges
2. Shock proof toy
3. Made up of unhazardous materials and materials which are not chewable
4. Energy efficient and safe
5. Portable
6. Attractive
7. Small size

Based on the information gathered through interaction with client first survey and completing phase 3.4, the problem statement 1.1 is formulated as follows:

:

Design a Shock proof toy that shouldn't consist of sharp edges and made up of unhazardous materials & materials which are not chewable Toy should be energy efficient, safe and easily portable. Size of toy should be small and toy should be attractive in look.

Step 3.5: Find constraints

1. Cost around 1400 to 1600
2. Budget is 1000 to 1200
3. 5-8 different geometric shapes
4. Fluorescent rainbow colors are used
5. Made up of nonhazardous materials

Based on the information gathered through interaction with client first survey and completing phase 3.5, the problem statement is

Design a Shock proof toy that shouldn't consist of sharp edges and made up of unhazardous materials & materials which are not chewable Toy should be energy efficient, safe and easily portable. Size of toy should be small and toy should be attractive in look.

It should cost between Rs.1400 to 1600. It should consist of 5-8 different geometrical shapes. Fluorescent rainbow colors are used to make it more attractive.
Toy should made up of nonhazardous materials

Step 3.6: Set up functions

1. Start the game with the button or trigger.
2. When the shape is inserted, the sensor will sense or the button inside the mould will get pressed.
3. It will display "Done" on display screen.
4. It will play sound and LED's glow.

Based on the information gathered through interaction with client first survey and completing phase 3.6, the problem statement is formulated as follows:

Template for Conceptual Design

Design a Shock proof toy that shouldn't consist of sharp edges and made up of unhazardous materials & materials which are not chewable Toy should be energy efficient, safe and easily portable. Size of toy should be small and toy should be attractive in look.

It should cost between Rs.1400 to 1600. It should consist of 5-8 different geometrical shapes. Fluorescent rainbow colors are used to make it more attractive. Toy should made up of nonhazardous materials.

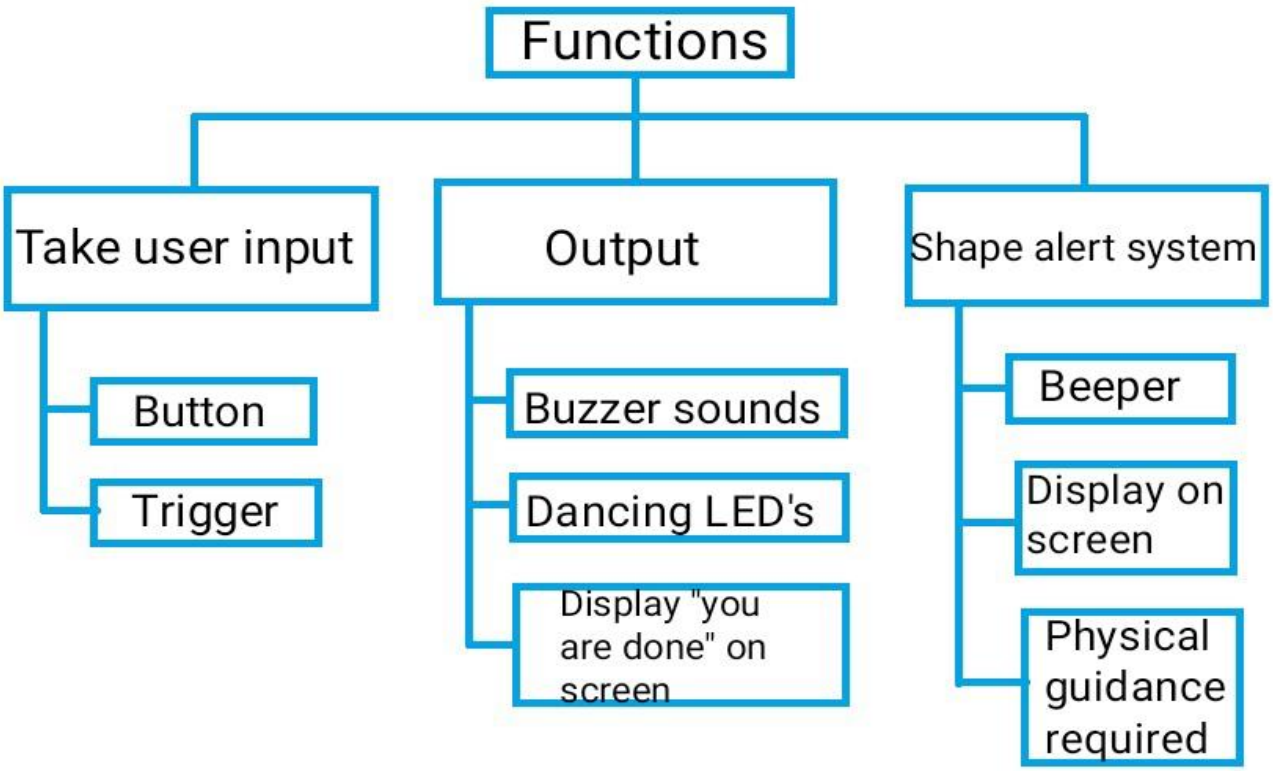
The user should be able to switch on and off the battery power supply also toy should be operated by display screen, there should be a LED light on board to make game more interesting and creative.

Phase 2: Conceptual Design:

This phase of Engineering Design has the revised problem statement has input, and arrives at the requirements of a chosen design as output.

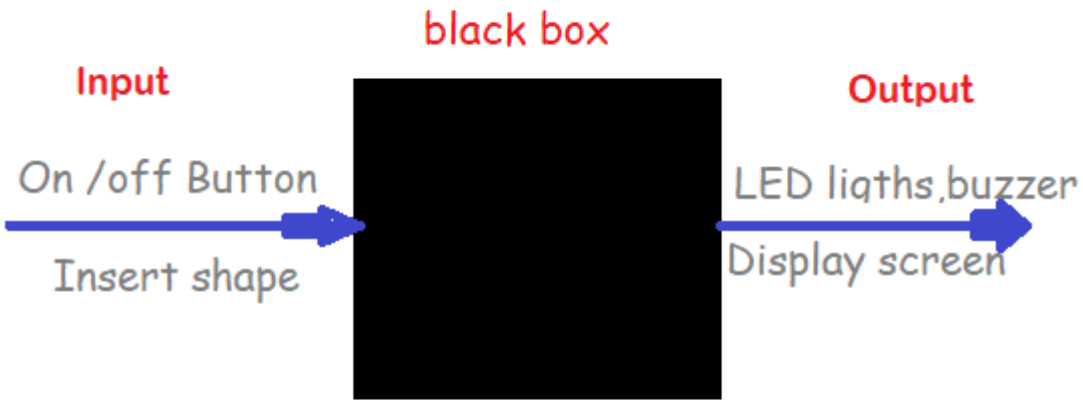
Input	Tasks	Output
1. Revised problem statement 2. Objectives 3. Constraints 4. Principal functions	1. Establish functional specifications 2. Write limits or boundaries 3. Generate design alternatives 4. Develop metrics for alternatives 5. Apply metrics to design alternatives 6. Choose a design concept	1. Requirements of a chosen design

function tree

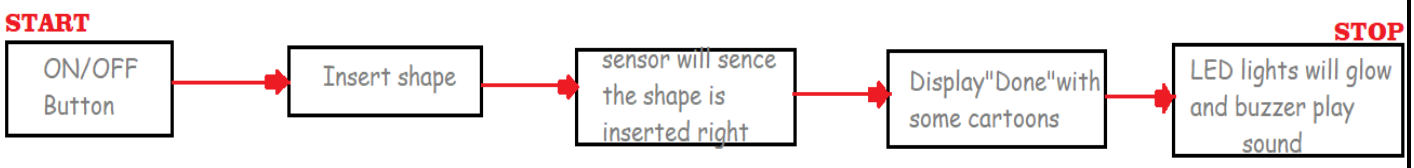


Draw black box and glass box models:

Black box:

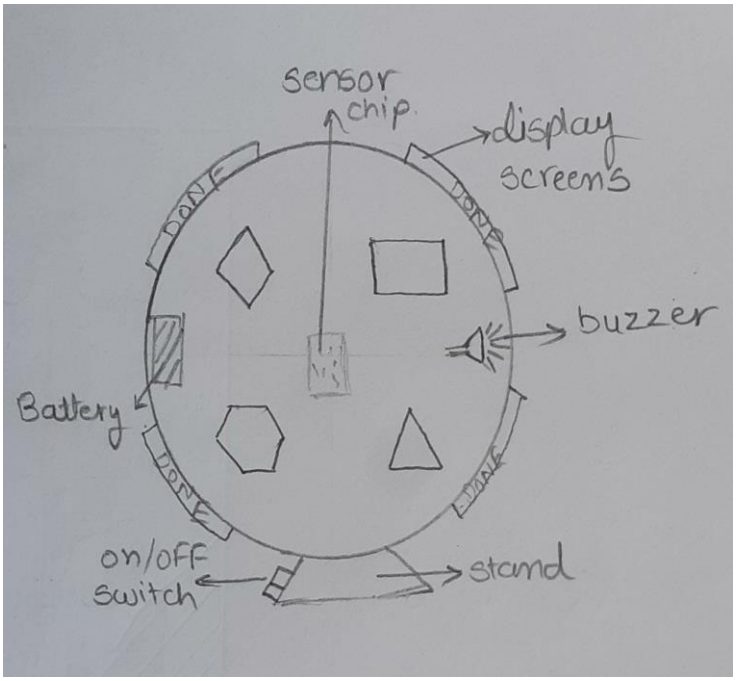


Glass box:

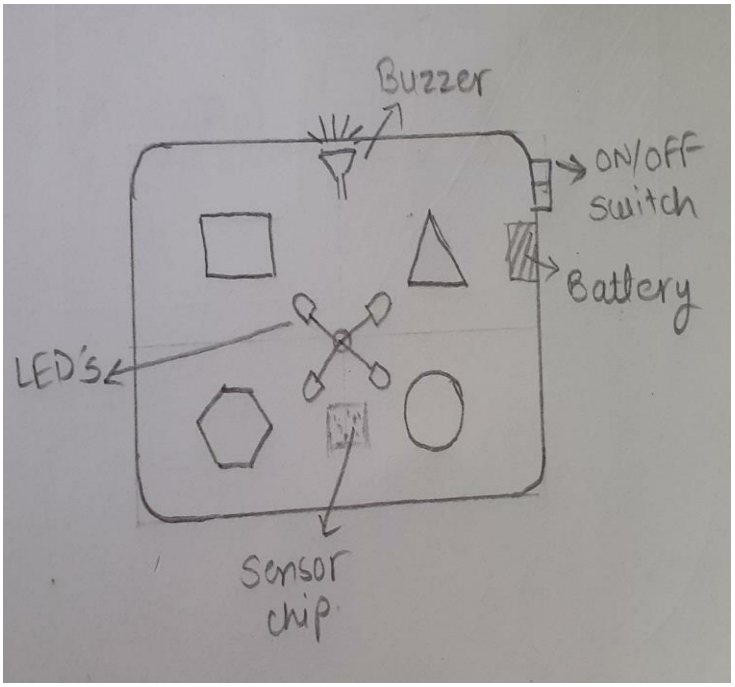


Draw the conceptual models.

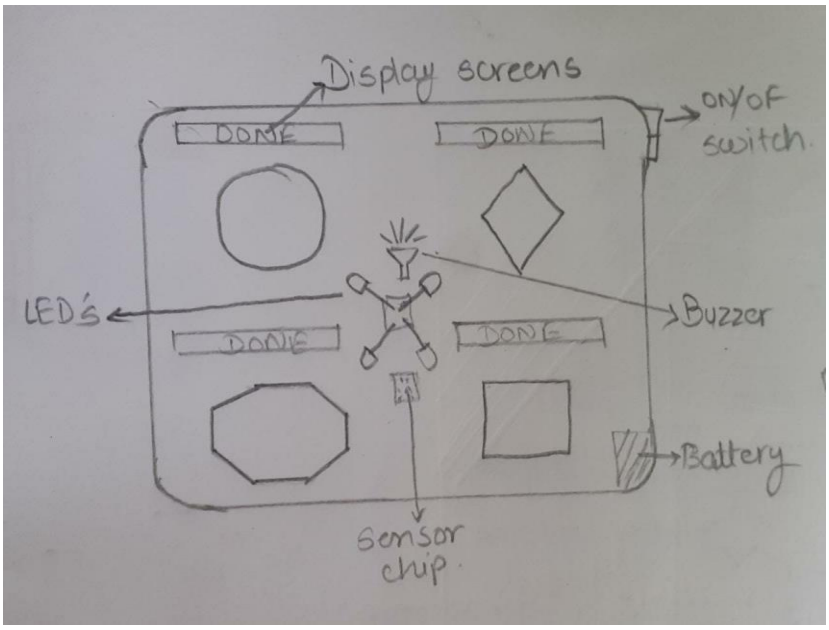
Concept 1:



Concept 2:



Concept 3:



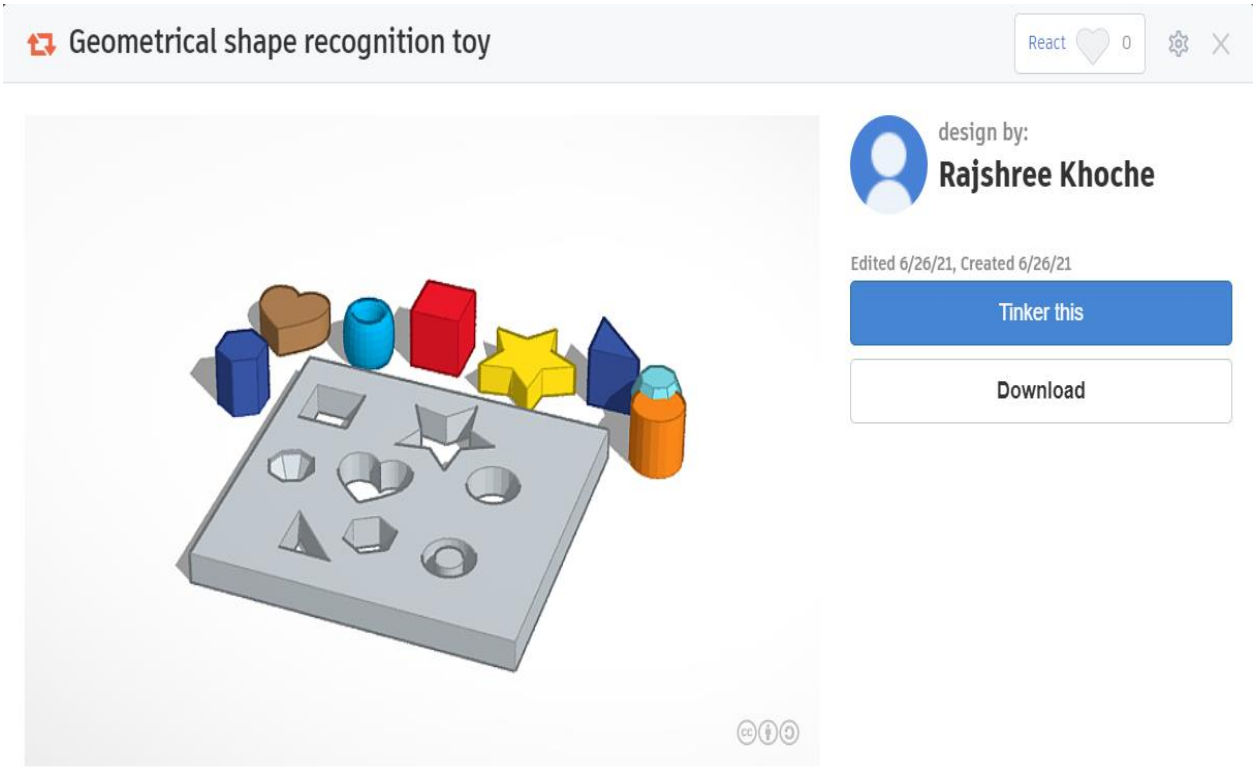
Develop the Pugh Chart to select the best concept

Design Objective	Weight	Concept 1 Vertical	Concept 2	Concept 3
Easy to operate	10	datum	++	+
design	8	datum	+	-
Light weight	9	datum	++	+
Display screen for each shape	7	datum	-	+
Accur acy	8	datum	+	-
		Total +	54	26
		Total -	7	16
		Overall score	47	10

List the requirements to realize the selected concept:

1. One Display screen
2. 5 to 8 Led's
3. sensor
4. buzzer
5. 5 to 8 push buttons
6. quality Materials

3D Design on tinkercad



Circuit Simulation video is also attached,

Thank you,
Rajshree Anil khoche