Design Thinking and Innovation

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1 NO POVERTY
2 NO HUNGER
3 GOOD HEALTH
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 RENEWABLE ENERGY
8 GOOD JOBS AND ECONOMIC GROWTH
9 INNOVATION AND INFRASTRUCTURE
010 1 011
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE AND JUSTICE
17 PARTNERSHIPS FOR THE GOALS
THE GLOBAL GOALS
For Sustainable Development

Ministry of Human Resource Development
Government of India

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Key Principles of NEP

- **Respect for Diversity & Local Context**
  In all curriculum, pedagogy, and policy.

- **Equity & Inclusion**
  As the cornerstone of all educational decisions.

- **Community Participation**
  Encouragement and facilitation for philanthropic, private and community participation.

- **Use of Technology**
  In teaching and learning, removing language barriers, for Divyang students, and in educational planning and management.

- **Emphasize Conceptual Understanding**
  Rather than rote learning and learning-for-exams

- **Unique Capabilities**
  Recognizing, identifying them in each student.

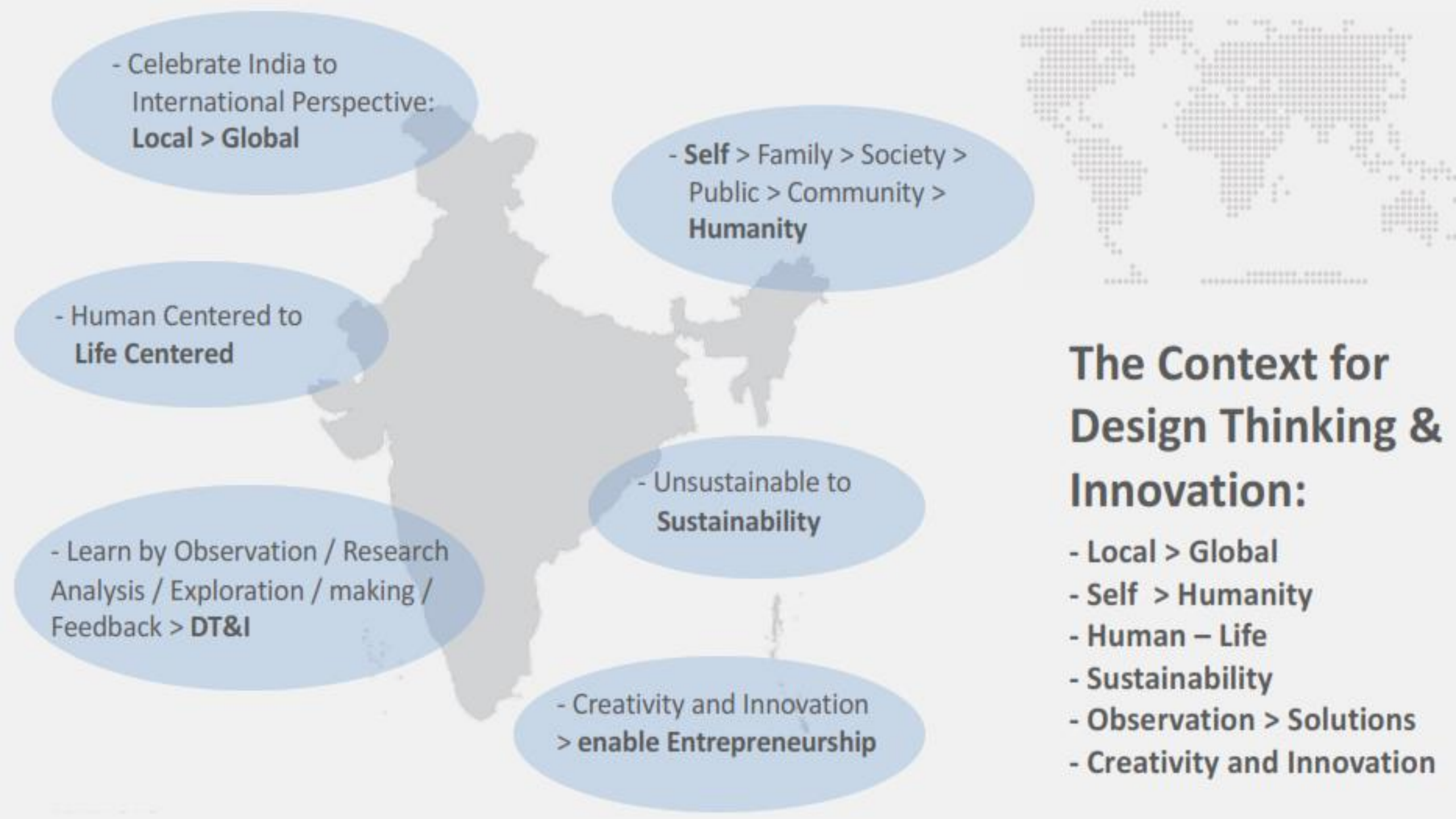
- **Critical thinking and Creativity**
  To encourage logical decision-making and innovation

- **Continuous Review**
  Based on sustained research and regular assessment by educational experts.

NEP2020

Keywords relevant to DT&I:

- Conceptual Understanding
- Critical Thinking
- Creativity
- Innovation
- Equity and Inclusion

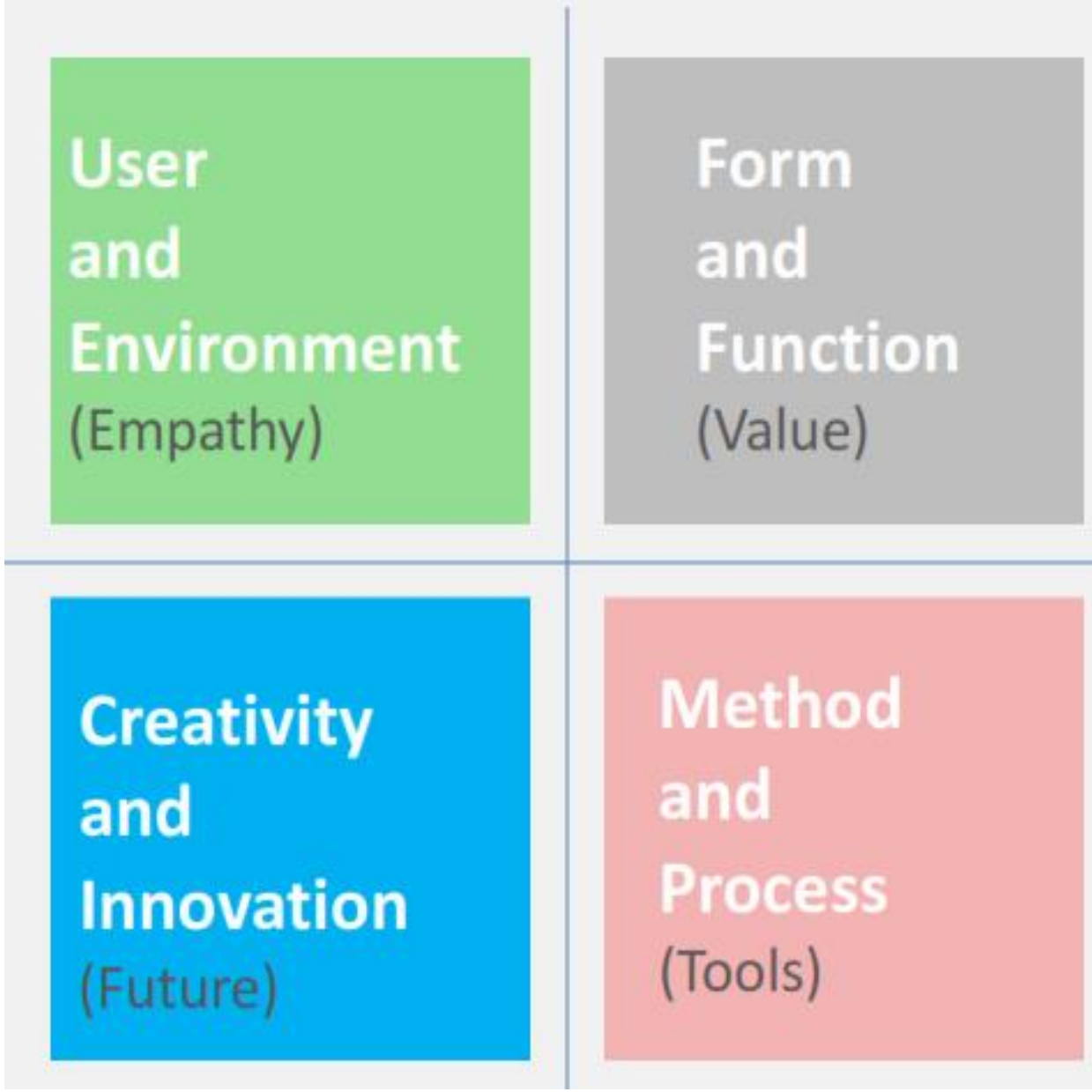


The Context for Design Thinking & Innovation:

- **Local > Global**
- **Self > Humanity**
- **Human – Life**
- **Sustainability**
- **Observation > Solutions**
- **Creativity and Innovation**

What is Design?

In a nutshell, design is about **understanding needs** and being **sensitive to issues**, **identifying problems** that need to be solved, and **creating innovative appropriate solutions** considering aspects of **context, social concerns, sustainability** and **technology** such that it makes a **positive difference to life in our universe.**



What is Design?

User and Environment

. Useful to the User
. Sustainable Solutions

Form and Function

. Good looking Shape/Form
. Works well

Creativity and Innovation

. Something new
. Innovative

Method and Process

. Solve Problems
. Phase by Phase

Who is a Designer?

A designer is a highly **creative person** who **enjoys solving problems**. The reason why they enjoy being creative is that they are **sensitive to the needs of life** and understand the extent of the **issues in society and environment**. This sensitivity allows a designer to be **logical (analytical)** as well as **intuitive (creative)** and to think of **opportunities for creative design solutions** that enhance the **lives of people and other living beings**.

What is Design Thinking?

Design Thinking is a method to solve problems using a process. It is one of the most effective ways to create something new.

A process that helps you understand users, research relevant information, identify and analyse the problem, explore creative ideas or concepts, then prototype, build, test and get feedback - to find an appropriate innovative solution to the problem.

Design Thinking as a process converts a problem into a solution, and an idea into something useful, whether it's a vehicle, a building, a graphic, an equipment, a service or a system.

Who is a Design Thinker?

A Design Thinker is a person who applies the Design Thinking process to solve problems and find creative innovative solutions in any field or domain.

For example, you could apply Design Thinking to **solve problems in several fields**. It could even be applied to solve problems at **home** or in your **neighbourhood** or in your **place of work**.

Whether it is a **simple problem or a complex problem**, a design thinker finds creative ways to tackle them.

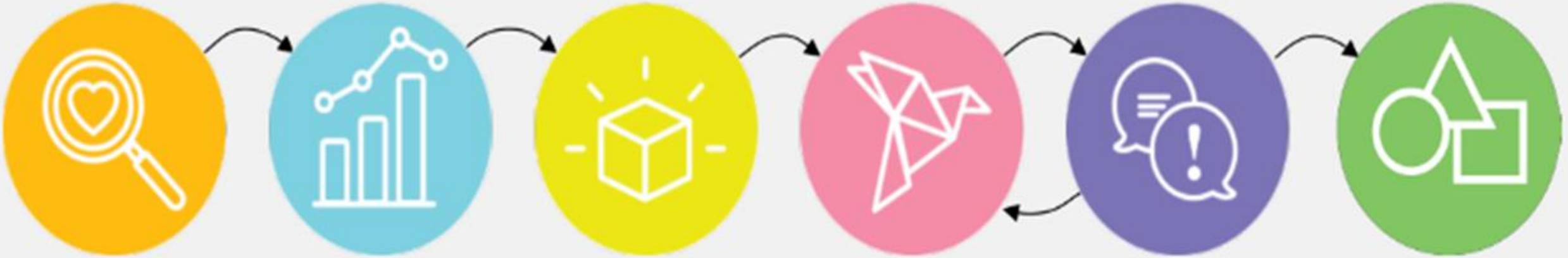
Person behind Design Thinking:

Herbert A. Simon:

Herbert Simon (1916-2001) proposed '**Design as a way of Thinking**' in his book, 'The Sciences of the Artificial' published in 1969.

According to Simon,
"The proper study of mankind is the science of design."
To design is "**to devise courses of action aimed at changing existing situations into preferred ones**".

What is the Design Thinking Process?



Phase 1:

- Research

- helps you to identify needs and locate issues to be solved through observation and research

Phase 2:

- Analyze

- helps you to understand, define and analyse the problem area

Phase 3:

- Ideate

- helps you to come up with several alternate creative innovative solutions to the problem

Phase 4:

- Build

- helps you to build mock-ups, creating scenarios, and then prototyping and detailing

Phase 5:

- Test

- helps you to get feedback through evaluation and testing

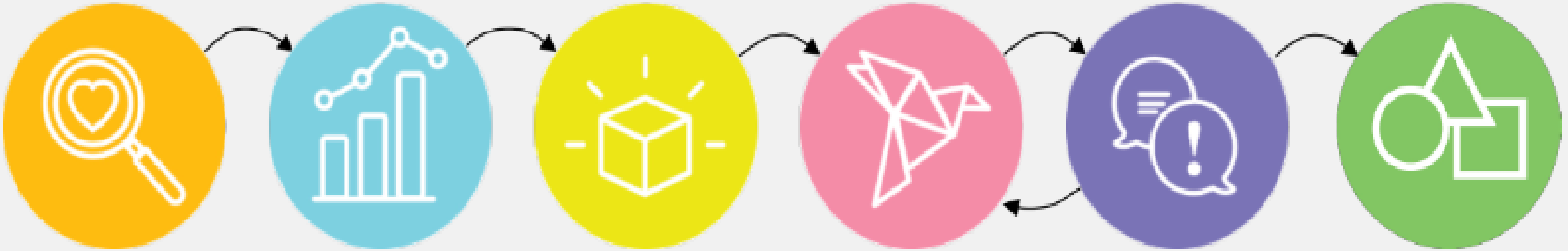
Phase 6:

- Implement

- helps you to actualize and produce the solution so that it reaches and gets used by the users

What is the Design Thinking Process?

It involves the following six phases in the process of solving a problem:



Phase 1:
- **Research**
- Observe
- Empathize
- Study
- Need finding

Phase 2:
- **Analyze**
- Understand
- Synthesize
- Define
- Visualize
- Mappings

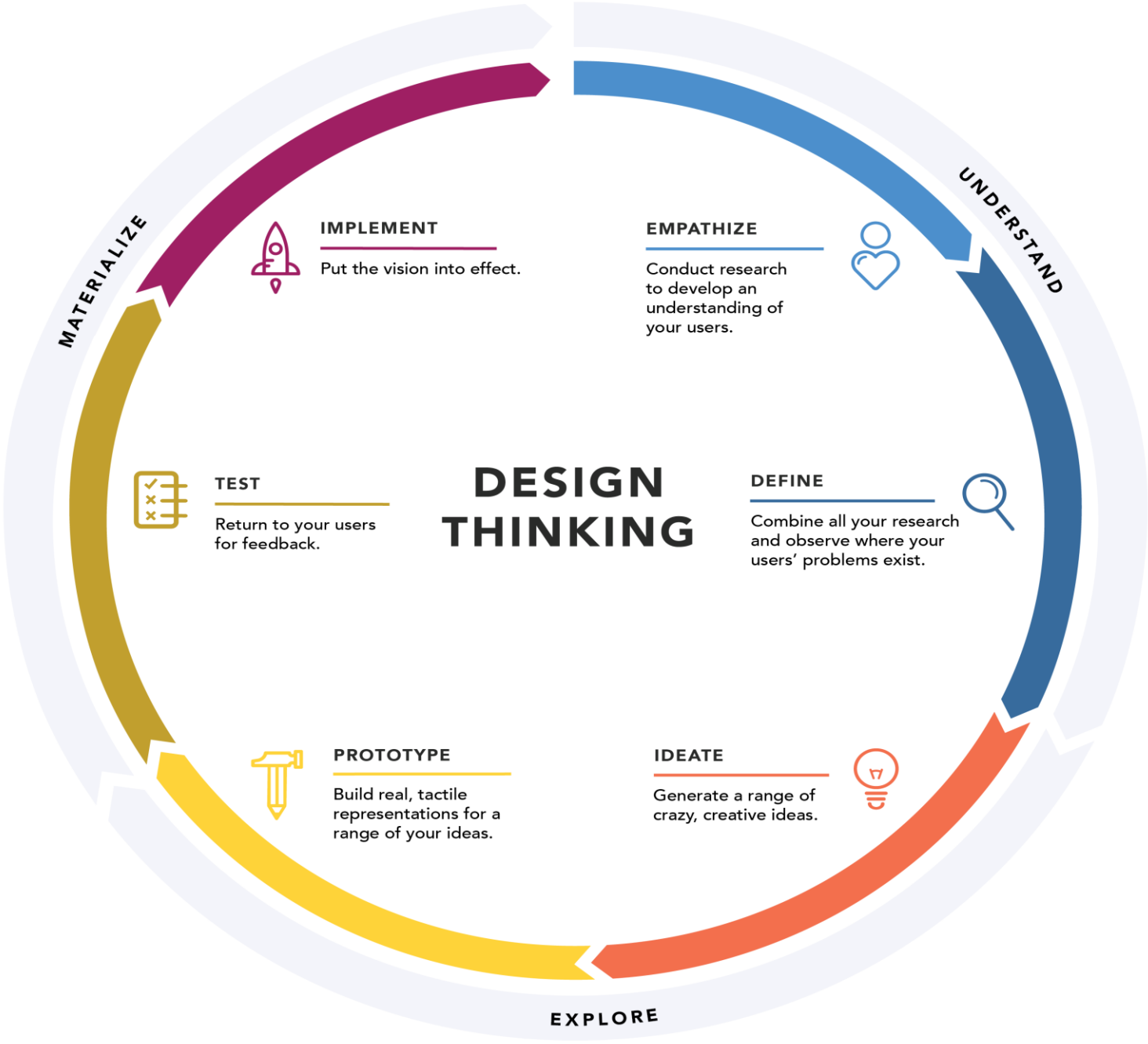
Phase 3:
- **Ideate**
- Create
- Explore
- Experiment
- Concepts
- Innovate

Phase 4:
- **Build**
- Mock-up
- Prototype
- Develop
- Detail

Phase 5:
- **Test**
- Reflect
- Test
- Feedback
- Iterate

Phase 6:
- **Implement**
- Reflect
- Produce
- Industry
- Business
- Enterprise

Example of application of Design thinking process by an organization



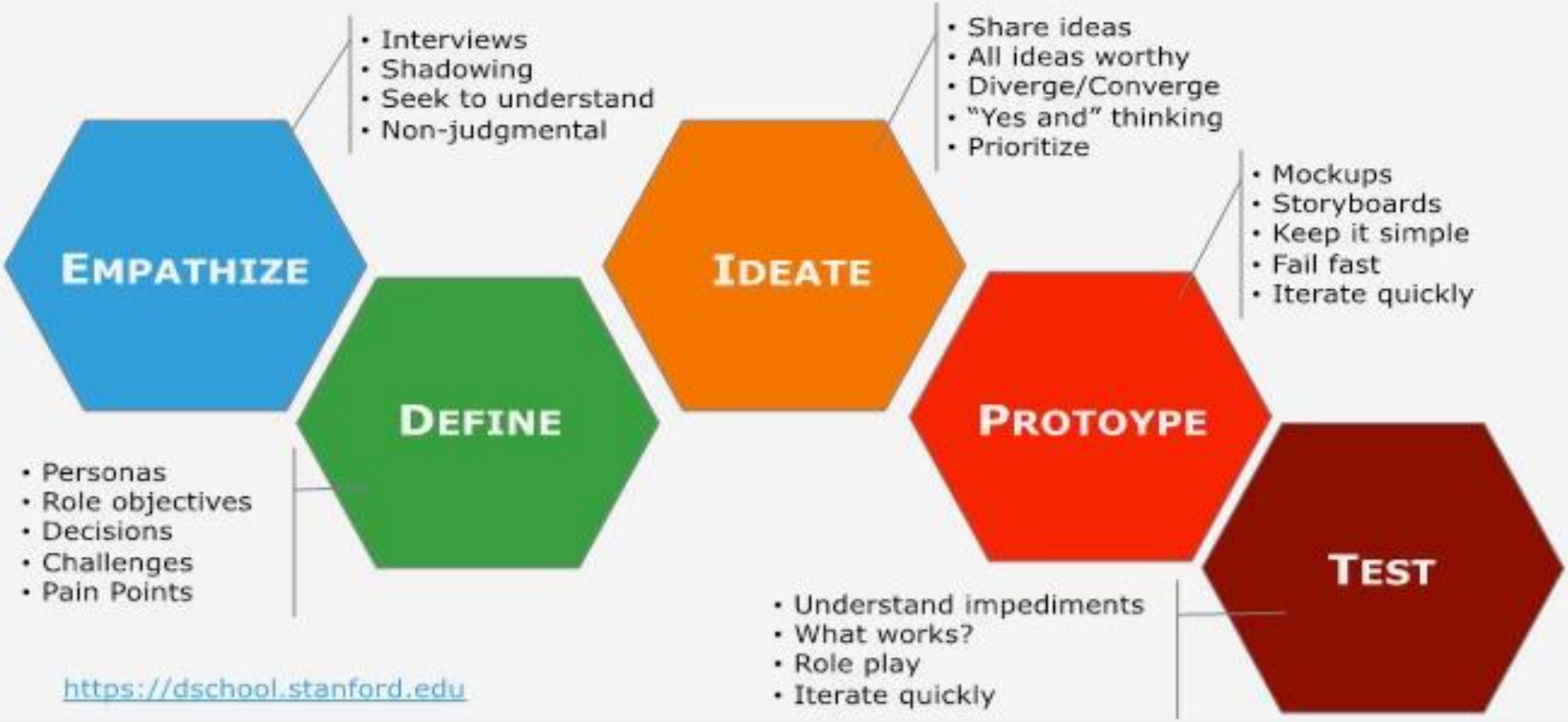
What is Innovation?

Innovation involves the implementation of something new and replacing or reframing the existing mindset.

It is about **translating a concept, idea, thought, or invention into artefacts and services** that **create value in life**. It is the process of transforming ideas into commercial reality. Innovation plays a major role in society.
It helps us cater to the needs of people that arise from constant physical, social and emotional changes.

Design pursues Creativity of Innovation.

Design Process – by d.school at stanford



Design Process – by IDEO

INSPIRATION

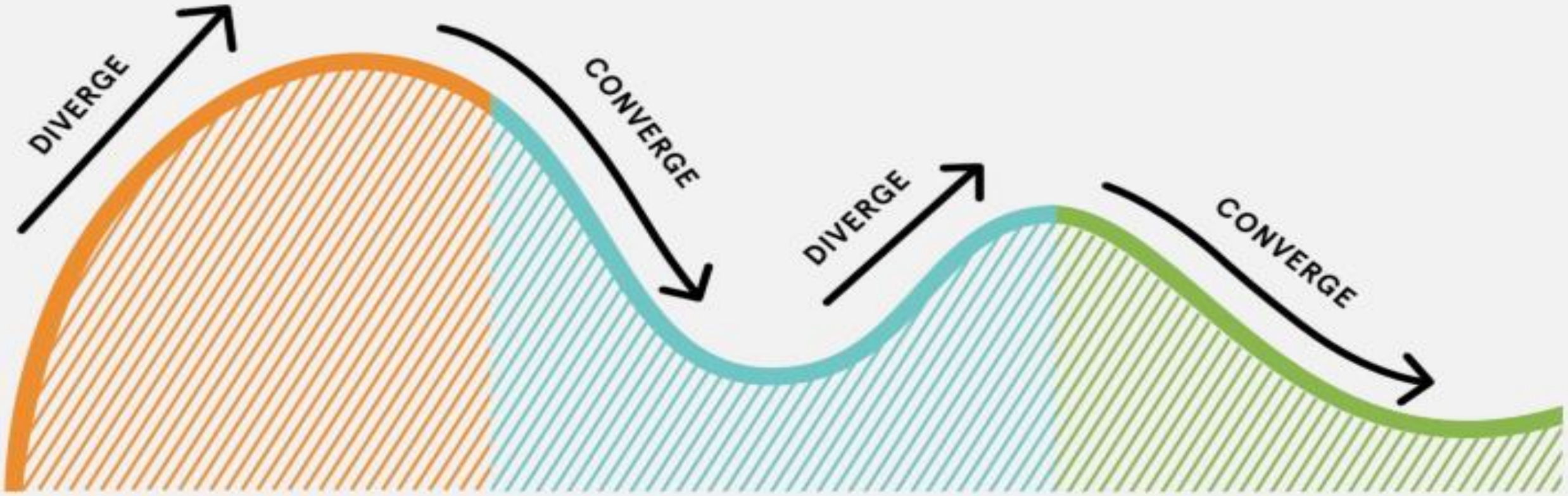
I have a design challenge.
How do I get started?
How do I conduct an interview?
How do I stay human-centered?

IDEATION

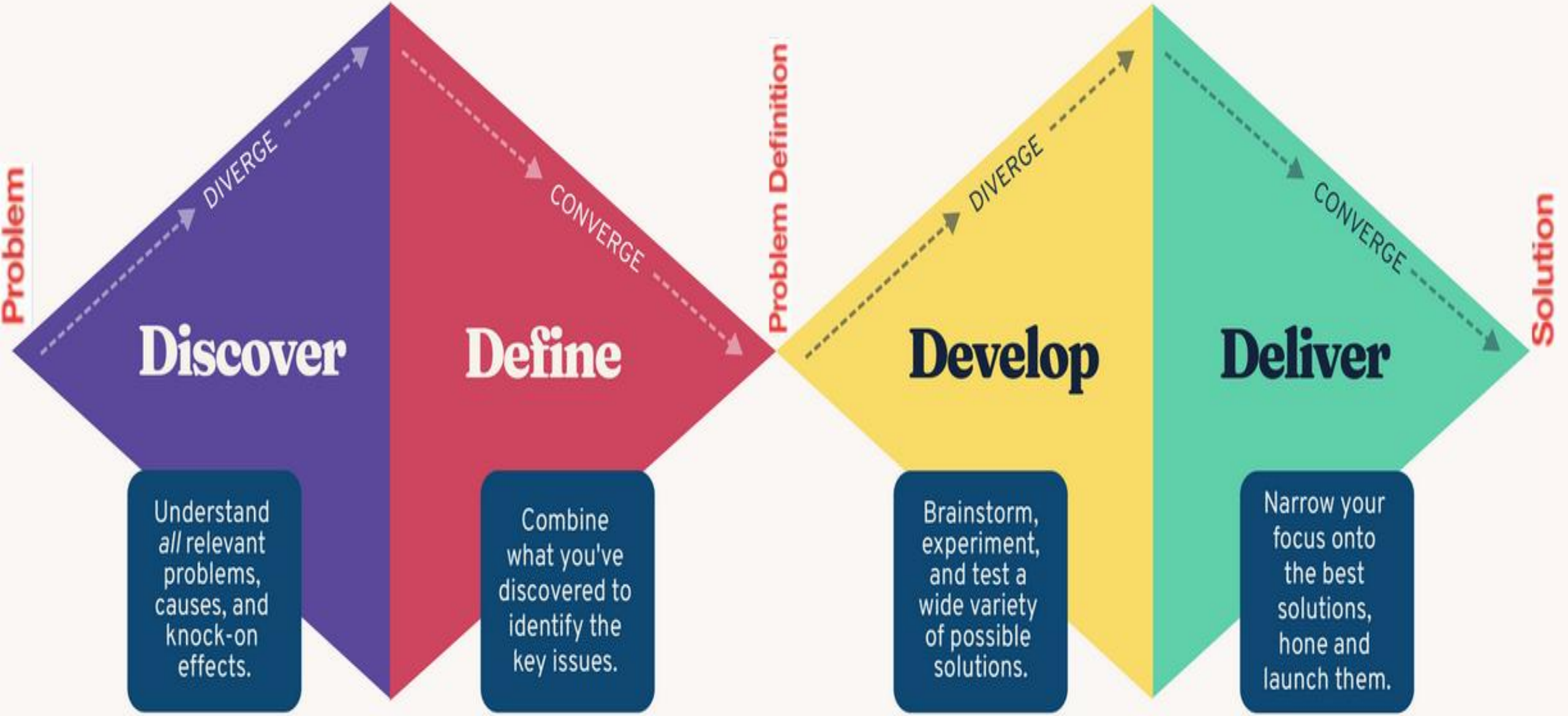
I have an opportunity for design.
How do I interpret what I've learned?
How do I turn my insights into tangible ideas?
How do I make a prototype?

IMPLEMENTATION

I have an innovative solution.
How do I make my concept real?
How do I assess if it's working?
How do I plan for sustainability?

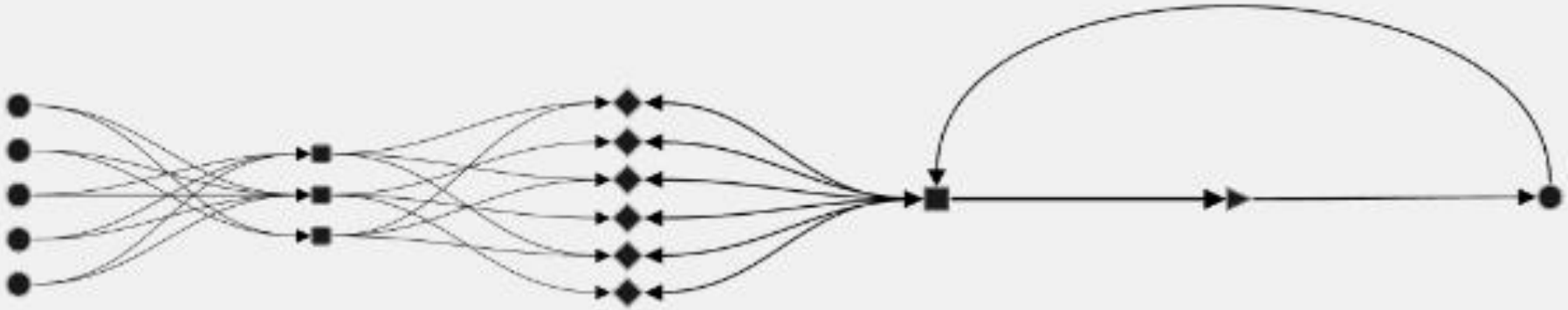


The double diamond design process by Design Council, UK



Design Process – Indian Knowledge System

Design Thinking and Innovation as part of
Indian Knowledge System
> Shilpa Shastra
> Vastu Shastra
> Natya Shastra



Observation

- Nature as Inspiration
- Study of Life

Critical Analysis

Analysis of Life Cycles, Structures, Materials, etc

Creative Variations

- Explorations based on Structure and not Sameness

Learning

- Observe, Explore, and Mastering

Implement

- Perform, Create, Produce

Validation

- Sustained across centuries

The Design Process – Co-operative/Collaborative

Interdisciplinary + Group work

. Research > Brief/Researching the Problem Space
Users, Environment, Artifacts

. Analysis > Understanding the Problem Space
Inferences & Design Opportunities

. Ideate > Explore Alternative Concepts
Creativity and Explorations

. Build > Prototype and Development
Detail and Development

. Test > Test and User Feedback
Iterate and Reflect

. Implement > Produce - Business and Industry

Participative + Iterative

Project Outcomes: could be in any of these fields

A. Product Design
Design of Products/Artifacts/Devices useful for any of the 17 SDGs

B. Environment Design
Design of Home/Office/Public Spaces on issues for any of the 17 SDGs

C. Game/Toy Design
Card/Board Game or a Toy based on addressing issues for any of the 17 SDGs

D. Digital Design
Design of an interactive digital system/device/ software addressing issues for any of the 17 SDGs

E. Service Design
Design of services addressing issues for any of the 17 SDGs

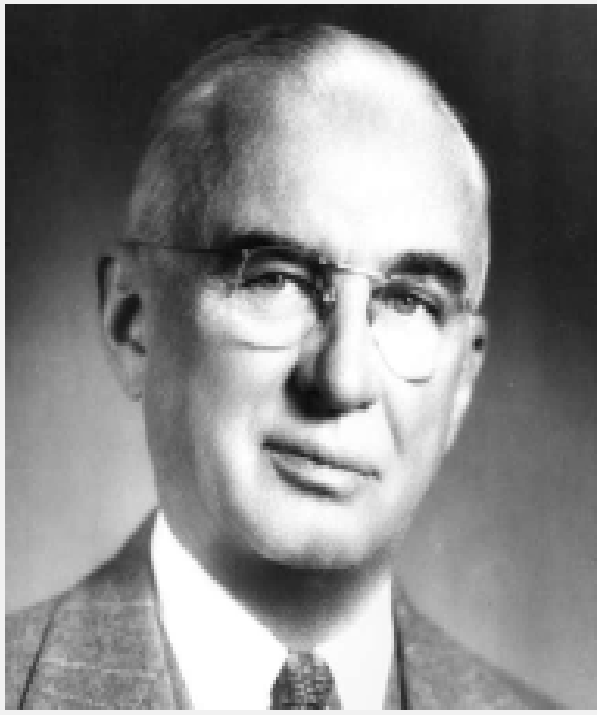
F. Communication Design
Design of Identity/Campaign/Narratives/Video on issues for any of the 17 SDGs

G. Learning Design
Learning content on addressing issues for any of the 17 SDGs

H. Open Design of your choice
Open Design Challenge of your choice addressing issues for any of the 17 SDGs

Brain-Storming:

Alex. F. Osborn:



Alex. F. Osborn (1888-1966) is regarded as as father of brainstorming.

According to Osborn,
"**Brainstorming:** Using the brain to storm a creative problem - and doing so in commando fashion, with each stormer attacking the same objective".

What is Brain-Storming?

Brain-storming is known as the **creative thinking technique** to **generate key-words or ideas** associated with the topic/problem that you are trying to solve.

One **freely storms the mind** to spontaneously generate these **without any criticism.**

Brain-storming could be **used at different phases of the design process**: - to understand the topic, to get a worldview, to generate ideas, and to find alternate solutions.

Steps in Brain-Storming:

1. Note down the topic that you have selected for Brain-Storming
(A clear statement of the topic/problem is recommended)

2. Brain-storm for associated key-words and note these down
(as scribbles, on post-it notes, online on Miro/Figma, etc.)

3. Note down the key-words randomly and not in any particular order
(so that cross-relationships, combinations and improvements could be made)

4. Do not criticize anyone – all keywords or ideas should be welcome
(even unusual ones)

5. Do this until one runs out of new key-words
(greater the number, the more the variety)

Brain-Storming:

Key-words for topic:
World of Children

Example from a brief brain-storming on key-words for 'World of Children'.

Write down **words** that come into your mind when you think of children – one on each note.

You can stick the sticky notes neatly on a surface – which could be a wall, glass surface, white board or on a large sheet of paper.

Brain-Storming:

Sorting them into groups:

Card Sorting:
The key-words are sorted in different categories by association or similarity.
Let the groups form naturally based on their relationships.

(called Open Card Sorting when the category titles emerge out of sorting and categorizing and are not pre-determined)

Brain-Storming:

Title for the groups:

Naming the group:
Find a title for each of the groups.
Give the group a name that captures the meaning of the group.

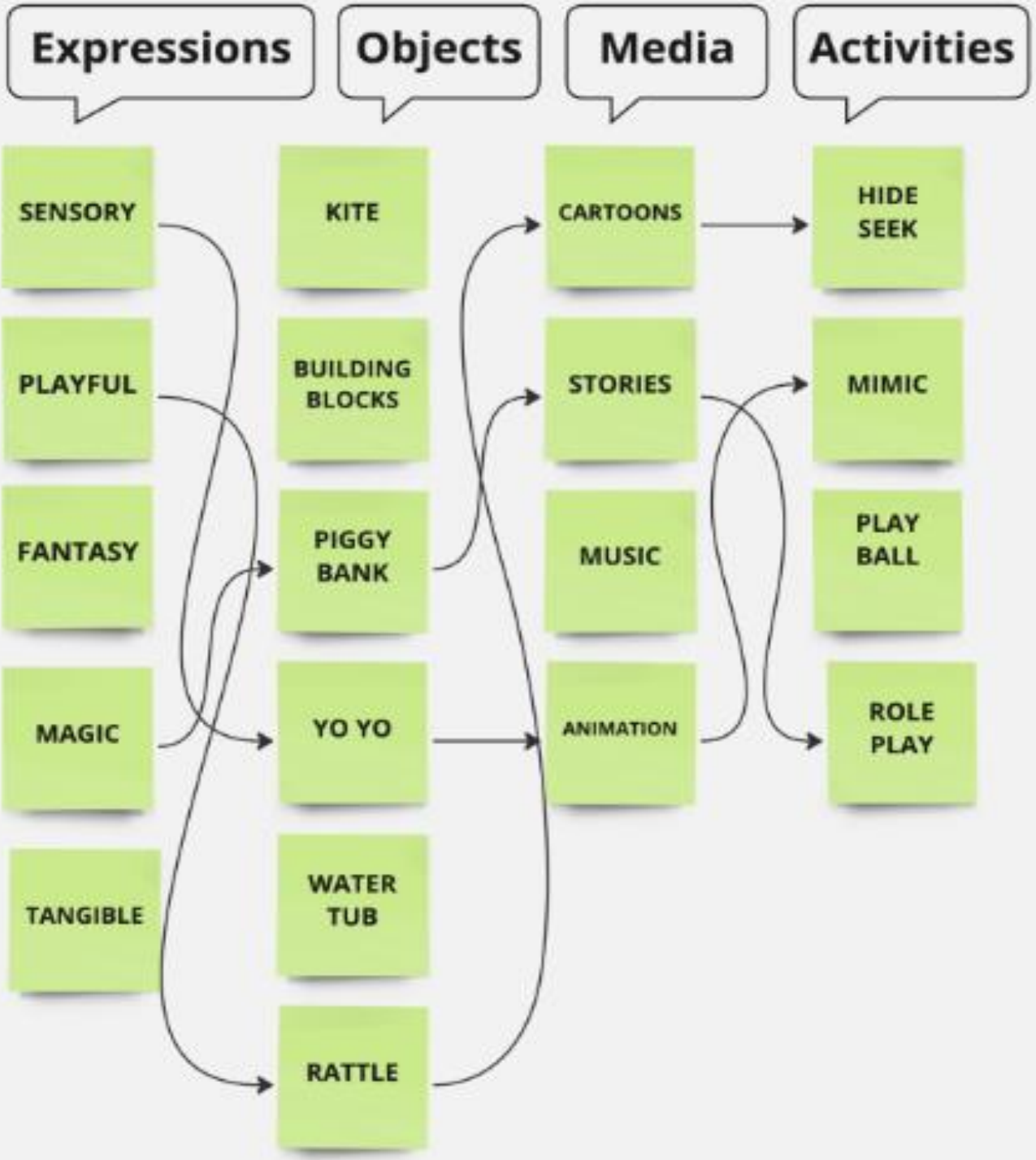
This **Heading** or **Title** for each of the groups will indicate how many major categories are present in the topic of 'The World of Children'.

Brain-Storming:

Affinity Links:

Look for connections:
Look at each of the Key-word from one group and see if there is a connection to another key-word in another group.
If you find connections, draw lines with arrowheads to make this connection.
This connection is known as '**Affinity Links**'

Affinity Links point towards Ideas.
For example, a Playful Rattle can be part of a Cartoon to play the game of Hide and Seek.
Or, Magic makes a Piggy bank tell stories so that they can Role Play the characters.



What is Mindmapping?

Mindmapping is a simple creative thinking technique that helps you **identify and discover the components or ideas associated with the topic/theme topic/problem** that you are trying to solve.
Mindmaps show how the **components are connected/linked to the main topic/theme as categories and sub-categories**.

Mindmaps give a worldview/overview of the problem space.

Mindmapping could be used at different phases of the design process: - **to understand the topic, to get a worldview, to generate ideas, to find alternate solutions, to compare feedback, and to link components of the system**.

Steps in Mindmapping:

1. Draw the main theme in the centre
(recommended as keywords expressing the main topic/problem clearly)

2. Brain-storm for key-words as branches and sub-branches of the theme
(as scribbles, in bubbles, online using Miro/Figma, etc.)

3. Connect the keywords (with lines) as branches of the central theme

4. Use colour code for differentiating categories, thickness or weight for showing hierarchy and arrow-heads to show direction

5. Make use of images/icons to make information visible

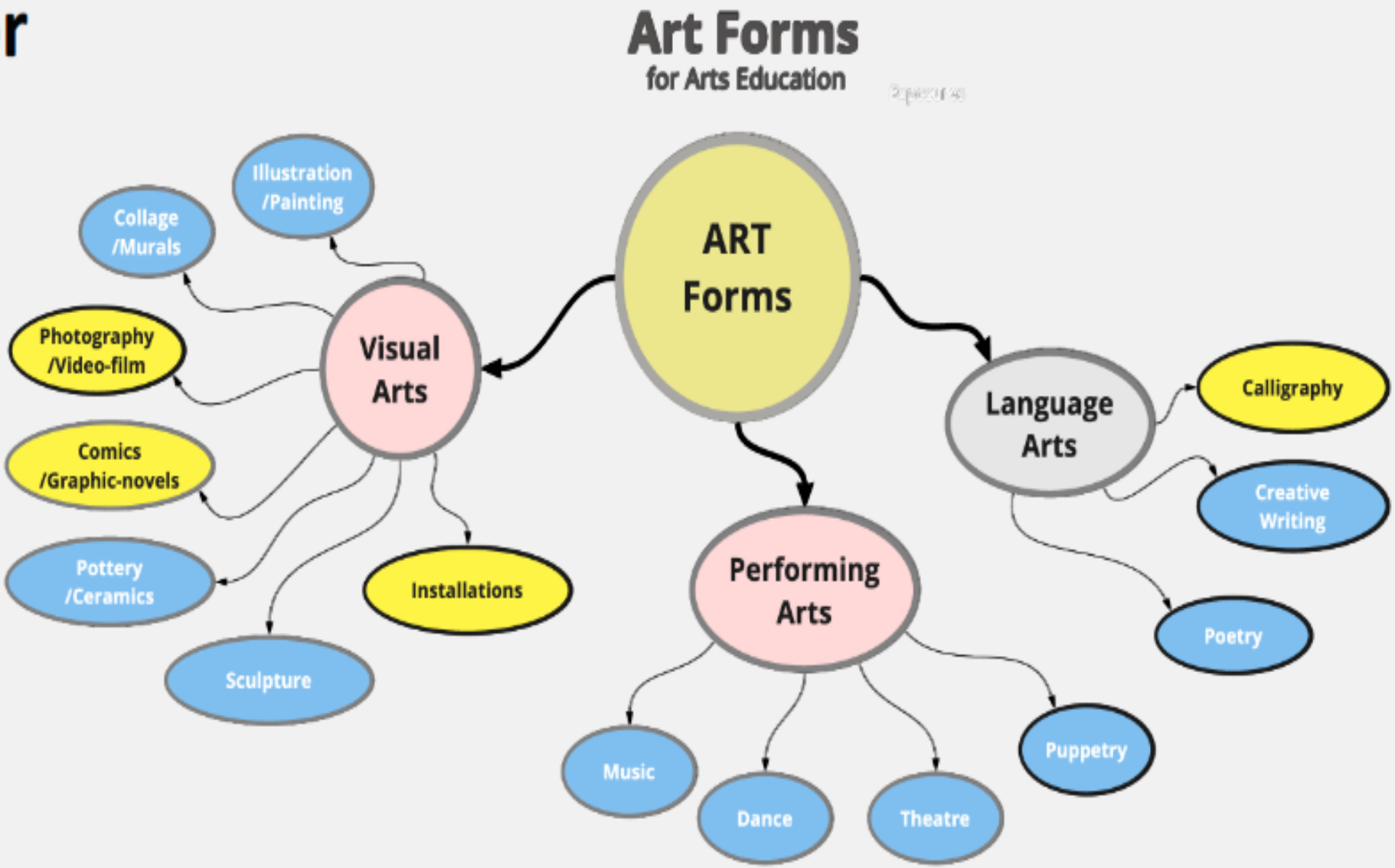
6. At least Three levels of branching is required to show the topic in depth

Mindmapping for topic:

Art Forms

Example from a Mindmapping session for understanding the topic ‘Art Forms’ to be learnt in schools.

Shown are 2 levels of categories and with the use of colours to differentiate categories - the ones in grey colour are not yet to be introduced in schools



Person behind Mind-Mapping:

Tony Buzan:

Tony Buzan (1942-2019) coined the term ‘Mind mapping’.

According to Buzan,
“Mind mapping is a technique based on memory and creativity and comprehension and understanding, so when the student or a child uses the mind map, they are using their brain in the way their brain was designed to be used, and so the mind helps them in all learning and cognitive skills. It simply helps them in what the brain does naturally”.

What is ‘Secondary Research’?

- **Searching through past and existing information or data** (also known as literature search)
- Do note that someone else has taken efforts to collected this information/data. Hence, it needs to be acknowledged.
- Secondary Research is based on Secondhand information/data whereas Primary Research is based on Firsthand information/data
- The information/data could be either qualitative or quantitative in nature

Why do we begin by 'Secondary Research'?

- We start with Secondary Research on order to **find out what information about the topic (problem area) does not exist** so that we can make use of Primary Research to fill-in this information.

- **Secondary Research gives an idea of existing information or knowledge** about the topic that we are trying to solve. Once we know this, and **find gaps in this information** that could be useful to understand the domain of the problem, then Primary Research based on **firsthand information/data becomes useful and necessary.**

- **Secondary Research > Primary Research**

Documenting Secondary Research:

- Information gathered should be **categorized**, **titled** and **organized** - indexed in folders and subfolders

- Information gathered from books and other publications both online and offline should be noted as **keywords**, with **titles** and by writing **summaries** (should be careful not to plagiarize)

- **Keep note of all the references**, even references for images, charts, drawings, any content downloaded from the internet, etc.

What is Plagiarism?

- Plagiarism Definition:
  "the practice of copying another person's ideas, words or work and pretending that they are your own, without consent of the original author"

- All existing information/data is due to the efforts of someone else Hence, this needs to be acknowledged. We do this by giving full references. (more about this in the section on 'how to reference')

- Plagiarism is unethical.

How to do Referencing . . .

- In the Harvard system, references are be cited in the text or below the image within brackets **(e.g. (author, year), (author, year))** or numbered in brackets and listed at the end of the paper/report/presentation in the order in which they appear in the text. i.e., **(Bharucha, R., 2003)**

- References are listed in the following format as shown here:

References: book

Bharucha, R. (2003) Rajasthan an Oral History. Penguin Books, India.

Why is ‘Primary Research’ important?

Primary Research based on first hand information/data becomes useful and necessary **to fill-in the gaps** that secondary research did not reveal. It could be that this information/data has not ben collected before or is not accessible.

As a designer, when you go to the environment where the issues are, **you experience the problem space** and this is an invaluable asset to the understanding of the problem.

Primary Research is about **finding minor details and specific information** that can make a major difference to your understanding of the problem space.

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Primary Research is about **finding minor details and specific information** that can make a major difference to your understanding of the problem space.

The following are useful Primary Research Methods for designers:

1. Observation and Documentation
2. Conversations, Queries and User Narratives
3. Contextual Inquiry
4. Questionnaires and Surveys
5. Talking to Experts
6. Focus Group Discussions

1. Observation and Documentation:

- Observation and Documentation involves **observing the User** at their **natural location** while using the product or the service. These observations are **documented through text, images and video** using a sketchbook/notebook and a mobile camera.

2. Conversations, Queries and User Narratives

- It's best to converse with the User while he/she is doing the activity. This is to get the **user's thoughts, opinion, feedback, challenges** while using the product or service. Requesting them to narrate their experiences could provide useful information.

3. Contextual Inquiry (combination of the above two methods)

Contextual Inquiry is a method to **understand the needs of the user** through **observations and conversations** at the **user's own location or environment** while the **person is doing/performing the activity**.

4. Questionnaires and Surveys

Questionnaires and Surveys involve answering a set of questions by the user. These can be **done either offline or online**. Care should be taken to set the questions properly so that there is no confusion and the **question can be answered clearly**. The questions could be **open-ended or close-ended** with predefined answers / using a rating scale.

5. Talking to Experts

Talking to **experts who have in-depth knowledge** of the topic could be very useful.

6. Focus Group Discussions

Focus group is a **discussion among users** related to the Problem Area or Topic with a **moderator to lead the conversations**. The discussions could **reveal their thoughts and opinions** along with comments and suggestions. These are documented for further analysis.

Documentation could involve any of these methods of capturing information:

- Notes
- Sketches
- Photographs
- Audio recordings
- Video recordings

Documentation could involve capturing information about the following:

- People/Life and Activities
- Place and Environment
- Objects and Artifacts (Arts and Crafts)
- Motifs and Paintings
- Activities and Performances
- Events and Festivals

Documentation could involve gathering information through any of these activities:

- Observations
- Conversations
- Interviews
- Study and Analysis
- Feedback

Seeking Permission:

- Its is very important not to assume that you can go and document something that belongs to someone else.
- **seek permission before you start documenting – its ethical.**

. It could be quite **intrusive to take photographs** of people without their knowledge.
- **seek permission** before you start photographing people, activities or their environments.
- It's **essential to protect the users identity** and **be respectful of their privacy**, more so if it involves children, the elderly or persons with disability.
- be **sensitive to their concerns**, be **respectful of their culture, and traditions**.

- Do **get the clearance for your study** from your institute/organization's **Ethics Committee** - especially if it involves the above mentioned user groups

These are the steps involved in Primary Research:

1. Identify sources of primary research relevant to your topic
2. Note down as points a list of key issues that you intend to discuss
3. You'll need visit the place of your users and observe them in action
4. Converse with them to collect relevant information/data (focus on listening)
5. Document the information/data through images, text, audio and video
6. Use Contextual Inquiry/ Focus Groups/Questionnaire/Survey to get quantitative or qualitative information from a set of users

Sources of Secondary Research:

- Publications: Literature, Books, Journals, Reports, Articles
- Case studies, Projects, White Papers, Newspapers
- Events: Conference Papers, Workshops, Symposiums
- Information gathered from the Internet, Web resources:
- - Websites, Blogs, Web Magazines, Web Journals, etc.
- Data Sets, Survey Results, Census Data, Records and Standards

What are 5Ws and 1H?

Who? What? Why? When? Where? & How?

5Ws and 1H are the six fundamental questions that you ask about issues concerning your chosen topic.

The questions are the following:

1. **Who?**
2. **What?**
3. **Why?**
4. **When?**
5. **Where?**
6. **How?**

Finding answers to these questions will be very useful for understanding of the topic.

WHO?

1. Who does it?
2. Who is doing it?
3. Who should be doing it?
4. Who else can do it?
5. Who else should do it?

WHAT?

1. What to do?
2. What is being done?
3. What should be done?
4. What else can be done?
5. What else should be done?

WHERE?

1. Where to do it?
2. Where is it done?
3. Where should it be done?
4. Where else can it be done?
5. Where else should it be done?

WHEN?

1. When to do it?
2. When is it done?
3. When should it be done?
4. What other time can it be done?
5. What other time should it be done?

WHY?

1. Why does he can do it?
2. Why do it?
3. Why do it there?
4. Why do it then?
5. Why do it that way?

HOW?

1. How to do it?
2. How is it done?
3. How should it be done?
4. Can this method be used to other areas?
5. Is there any other way to do it?

Lets ask 5Ws and 1H questions for the topic '**Designing Toys for Children**':

Who are connected with toys for children? Who is it for?

- siblings, friends, school-mates, parents, grand parents, teachers, salesman, . . .

What are toys for children? What forms, material, texture, softness do toys have? Research?

- Toys can be cognitive, sensory, physical, social, . . .
- Toys can be for play, learn, experience, role-play, share, . . .

Why are toys essential for children? Why do children play with toys?

Children play with toys. Play is how children learn to have fun, to socialize, to think, to solve problems and to work. Play connects children with their imagination, their environment, and the people around them.

Toys help children with patience, skills, imagination, creativity, . . .

When are toys used by children?

Toys are used by children from 4 to 6 months onwards . . . . . .

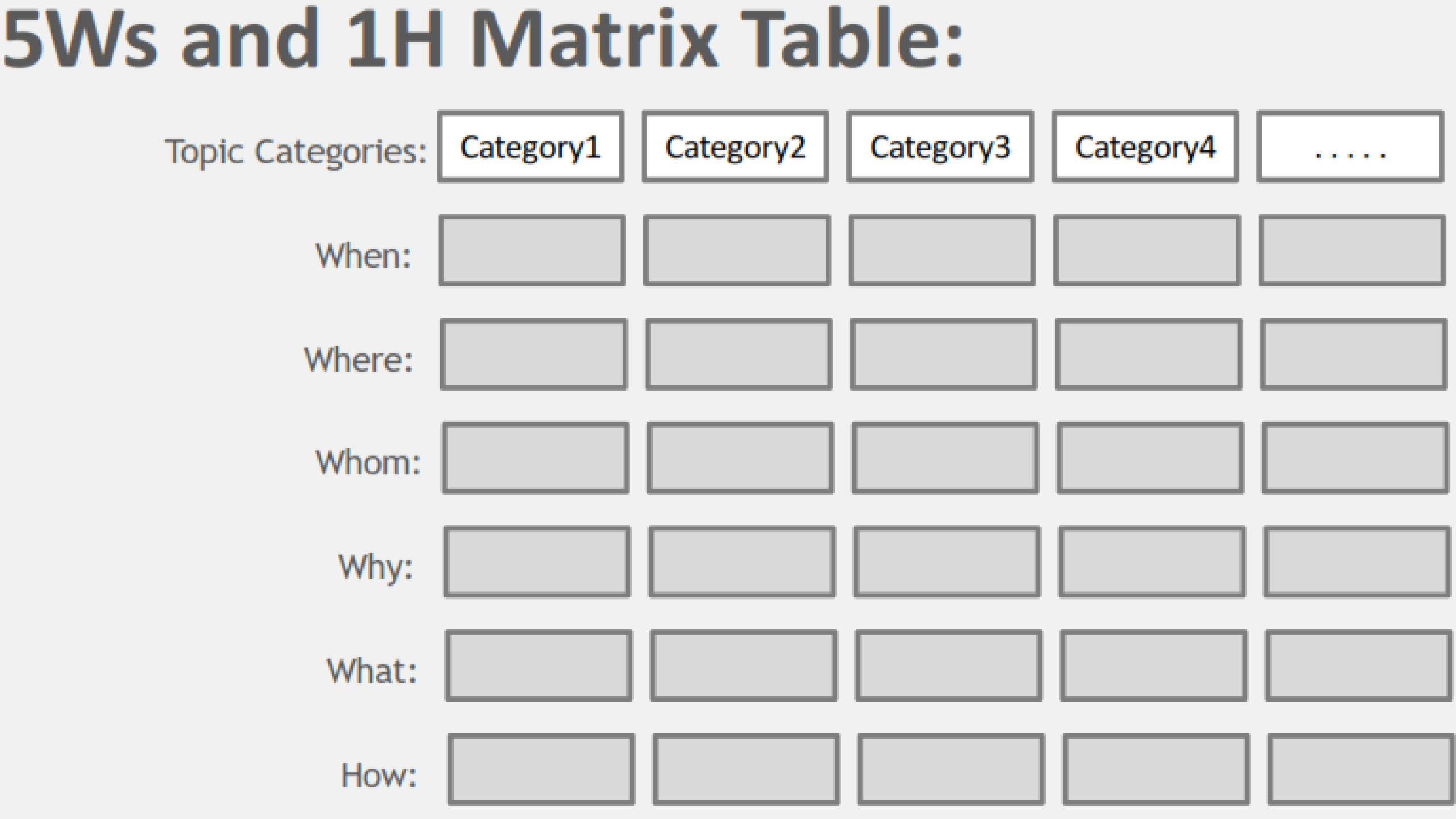
Where are toys available for children?

- Toys are available at home, play-school and schools

How are toys used by children? How do children learn to use toys? How are Toys made?

Children play, role-play, have fun with toys. They use toys for imagination, storytelling, sharing, challenges, socialising, . . .

5Ws and 1H Matrix Table:



5Ws and 1H Matrix Table - example:

	Activities	Environments	Behaviour
When?	Children usually have a daily routine: Getup > breakfast > school > lunch > study > play > homework > tv > dinner > sleep	- at home in the morning, evenings and at night - at school in the daytime - at playground in the evening	Children's behaviour is dependent on their comfort levels, tiredness, rest-times, etc.
Where?	Children's activities happen mainly at Home, School and Playgrounds	Children's environment is made up of Home, School, Playground, Outings, Celebrations, Make-believe world, etc.	Children are comfortable in environments that are familiar to them.
Whom?	Children are social and would like to interact with Parents, Siblings, Grand Parents, Teachers, Friends and neighbors	- at home with parents, Siblings, Grand Parents, Neighbors - at school with teachers, school mates - at playground with friends	Children are usually friendly with those that are familiar.

Person behind 5Ws :

Sakichi Toyoda:

Sakichi Toyoda (1867-1930) conceived of 5Ws and used it at Toyota which he founded.

According to Toyoda,
"There is nothing that can't be done. If you can't make something, it's because you haven't tried hard enough."

What is Contextual Inquiry?

Contextual Inquiry is a primary research method to **understand the** needs of the user through **observations and conversations** at the **user's own location or environment** while the **person is doing/performing the activity**.

Observe the user while he/she is doing the task or activity. The observations are documented. Observing users in action while they are using and interacting with the product/services can lead to interesting inferences.

Converse with the user to seek feedback/opinions about the activity, decisions, challenges, interests, backgrounds, context, etc. You can request them to narrate their experiences.

Contextual Inquiry (CI):

1. Observe and converse at users location while the user is performing the activity

2. These have been documented through **text notes, images and video**

3. Go through this information and **write the summary as key phrases on Sticky Notes/cards**

4. You could **use different colors** to denote Observations, Problems, Suggestions, etc.

5. Sort those with affinities into categories through open card sorting

6. Give a **title** for each of the categories and **mark the ones that are important**

Persons behind Contextual Inquiry:

Karen Holtzblatt and Hugh Beyer:

Karen Holtzblatt and Hugh Beyer conceived of the user centered design process 'Contextual Inquiry' in 1988.

According to Karen Holtzblatt and Hugh Beyer,
"Contextual Design is a user-centered design process that uses in-depth field re-search to drive innovative design"

What are ‘Questionnaires’?

Questionnaires have a set of **specific designed questions** that will help you **gather data/information from users.**

Questionnaires help you **gather data quickly** and can include both **quantitative and qualitative** information.

Questionnaires can have both **open ended** as well as **close ended** questions.

Questionnaires and Surveys:

- Questionnaires refer to a set of questions and Surveys refer to the method of collecting, analyzing data/information from several respondents.

Types of Questions . . .

1. Open-ended / Unstructured Questions:

- Open-ended or unstructured Questions **allow for free expressions or opinions**. These are great for getting **qualitative feedback and responses**.

Example: How do you like this course on DT&I so far?

2. Close-ended / Structured Questions:

- Close-ended or structured Questions have **pre-defined set of answers to a question**

Example: How much did you like the DT&I course? (1) Very much, (2) Somewhat and (3) Not at all

3. Dichotomous Questions:

- Dichotomous Questions have **binary as answers** – usually an 'Yes' and 'No'

Example: Did the DT&I course talk about Tools? Answer: (1) Yes and (2) No

4. Multiple Choice Questions:

Multiple Choice Questions have **multiple choice of possible answers**.

Example: Are these the phases of DT&I process? (1) Research, (2) Analysis, (3) Ideation (4) Marketing, (5) Prototyping

5. Scaling Questions:

a. Lichter Scale Questions use a rating scale for selection.

Eample: The quality of DT& I course was good: (1) Strongly Agree (2) Neutral (3) Strongly Disagree

b. Numerical Scaling Questions use a number rating scale.

Example: Rate the quality of the DT&I course on 1 to 5 scale (1 being very bad and 5 being very good)

c. Sematic Differential Scaling Questions use two opposite adjectives.

Example: Rate the quality of the DT&I course from being (1) Easy - - - - - - - - (5) Difficult

Questionnaires Steps:

1. Identify the data/information that you would like to collect through Questionnaire

2. Identify the users group that you want to administer the questionnaire

3. Write down the Questions in a clear manner

4. Figure out the type of Question and the **related response answers**

5. Administer the Questionnaire and get the responses (online or offline)

6. Analyze the responses and represent the quantifiable ones as **Charts and Diagrams**

7. Make a list of inferences from this study

Talking to Experts:

Why do you need to Talk to Experts:

Subject experts are **knowledgeable and have expertise about the topic** that you are trying to understand. Conversing with them could **provide you with in-depth information** relevant to your topic.

How do you locate Experts:

This depends on the topic that you have chosen.

The expert that you are looking for could be Scientists, Faculty Researchers, Field Officers, Managers, and others.

What are Cue-Cards?

Cue Cards are helpful as reminders on what to ask and when to ask.

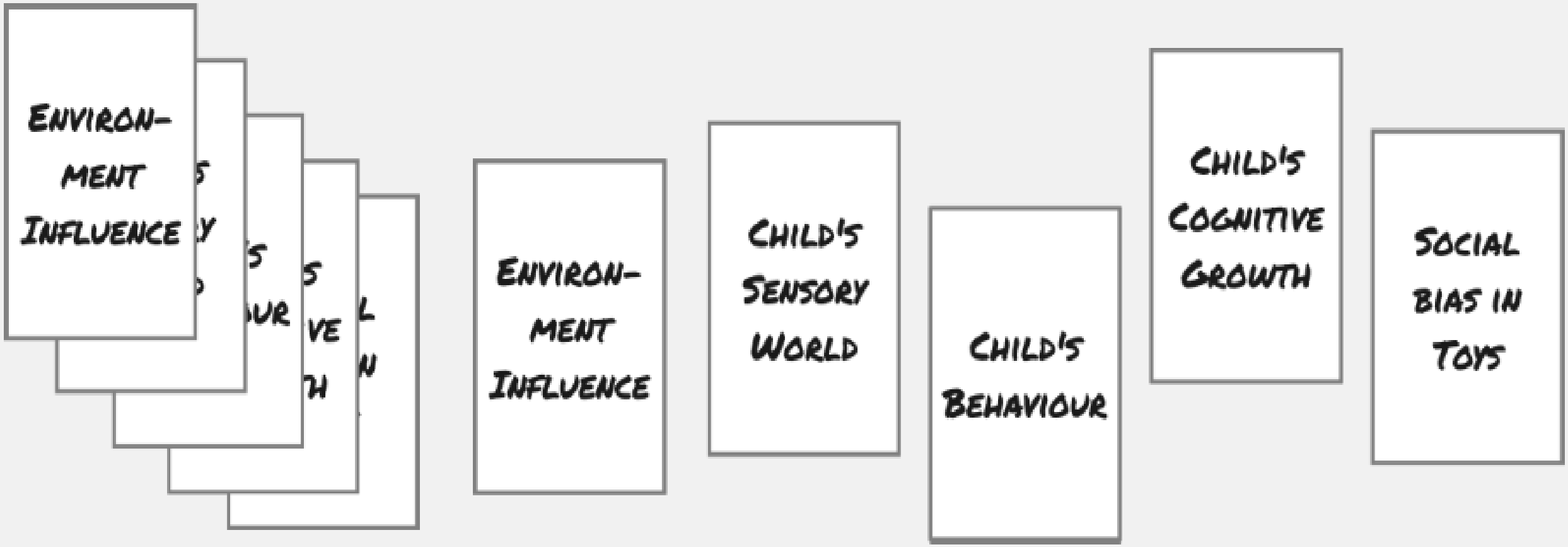
- These are **small pieces of card paper** (A6 size) arranged in the order in which the questions are to be asked or during conversations/discussions.

- After careful study of the topic, the the information that you are seeking from the Expert or User are **written as keywords or in short phrases**.

- Cue Cards can be used during any of these – (a) **Contextual Inquiry**, (b) **Conversations/Interviews with Users**, and (c) **Talking to Experts**

Example of Cue-Cards:

Example of **Cue Cards for understanding Children's choice for Toys** while speaking to a **child specialist:**



What is 'Data/Information Analysis'?

Analysis involves critically examining the data/information that you have collated from Primary and Secondary Research to **make sense** of it and **identifying issues/needs** connected with your chosen **topic.**

Analysis helps convert data/information from **Observations/Studies** to making **Inferences** to finding **Opportunities** which leads to outlining the **Recommendations for Design**.

What does ‘Data/Information Analysis’ Involve?

Analysis involves Selection, Sorting, Cross-relating, Prioritizing, and visualizing the data/information that has been gathered by primary (user study) and secondary research (literature study).

Analysis involves:

1. **Selection:** Select and Choose
2. **Sorting:** Classification, Grouping of similar factors, Chunking, etc.
3. **Cross-relating:** Comparing, Differentiating factors, Inter-connectedness, Affinities, etc.
4. **Prioritizing:** Assigning hierarchy, Ordering factors, Sequencing, etc.
5. **Identifying Uniqueness:** identifying Unique Features, Differentiator, etc.
6. **Visualizing:** Making Diagrams, Charts, Mappings, etc.

Why is 'Analysis' important?

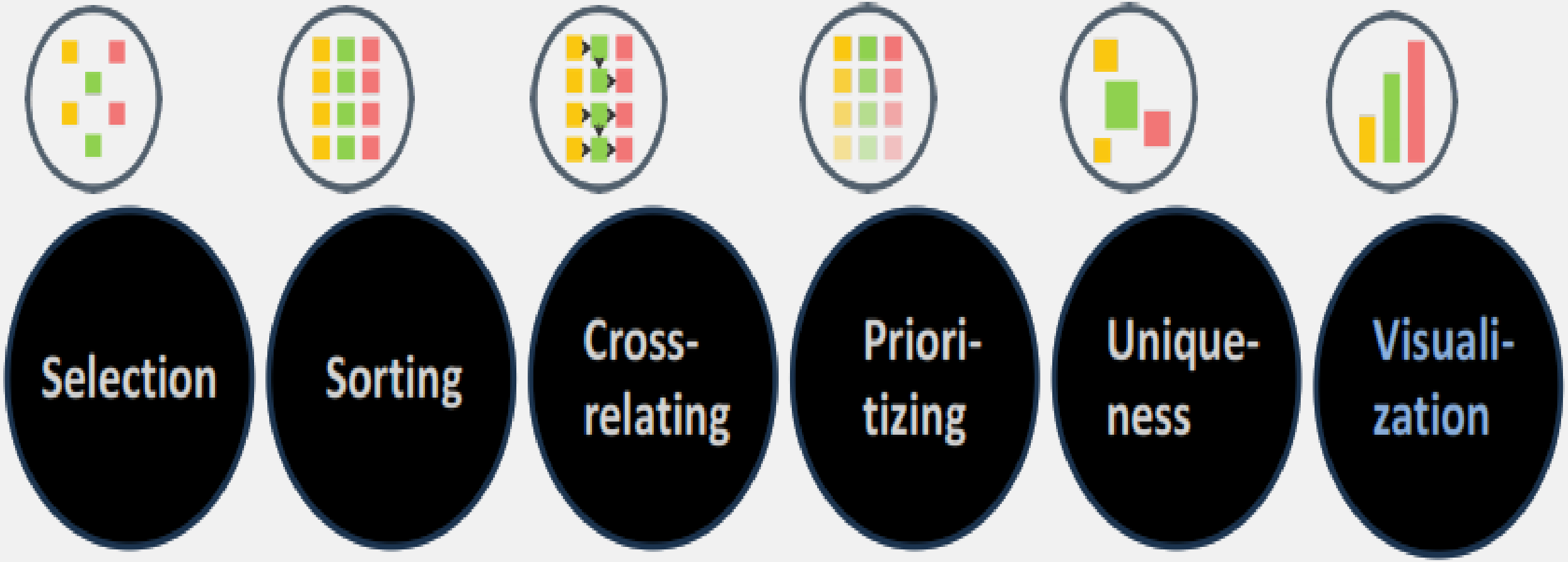
- Analysis **involves critically examining** the gather data/information that has been collated

- Analysis involves **making sense of the data/information in a systematic organized manner** such that it is useful in **identifying the needs** for solving issues connected with your topic.

- the **recommendations** from the analysis will **help in redefining the problem statement.**

Data/Information Analysis . . .

(The first 3 have been used as part of Secondary and Primary Research)



What are Mappings?

Mappings help you to **visualize the information/data for your topic**.

When information/data is made visible through mappings, it makes it **easier to make cross connections** as well as **see the whole picture at one glance**.

Mappings can be done from **different points of view:**

- Artifacts (include Objects, Media, Services, Built environment)
- Spatial, Temporal
- Cognitive, Behavioral, Sensory
- Social, Narrative and Sustainable

Artifact Mappings

Artifact Mapping:

- Artifact in our context refers to any of the following

a. Objects

b. Medias

c. Services

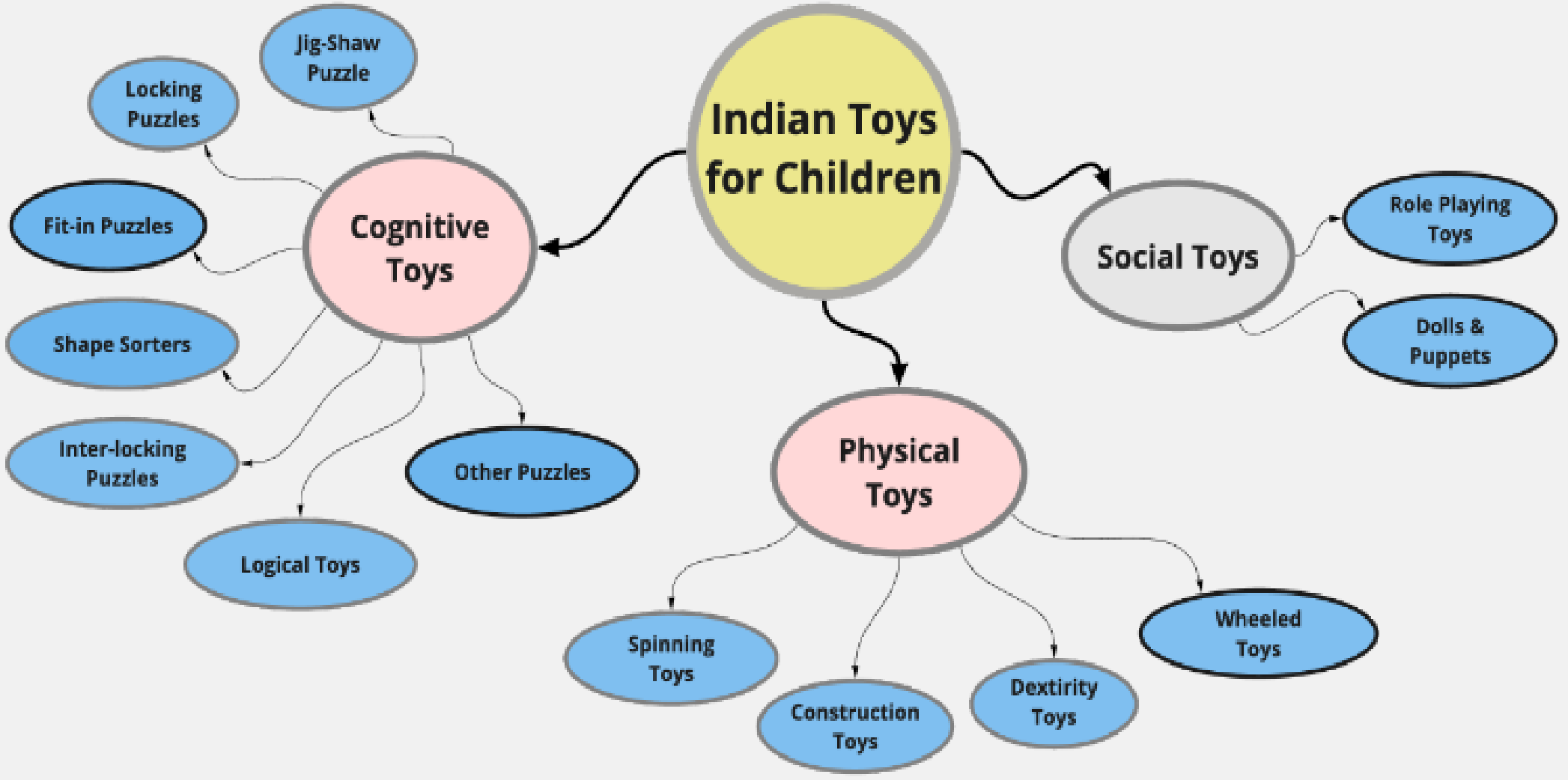
d. Built Environment (Buildings and Structures)

- **Artifact Mapping** refers to showing the **Artifacts connected to your topic in relation to each other**

- The Artifact mapping can be organized according to **other Artifacts, Timeline, Location, Costing, Complexity, Types, Usefulness, etc.**

Artifact Listing through Mind-mapping:

Start with **Mindmapping of Artifacts:**



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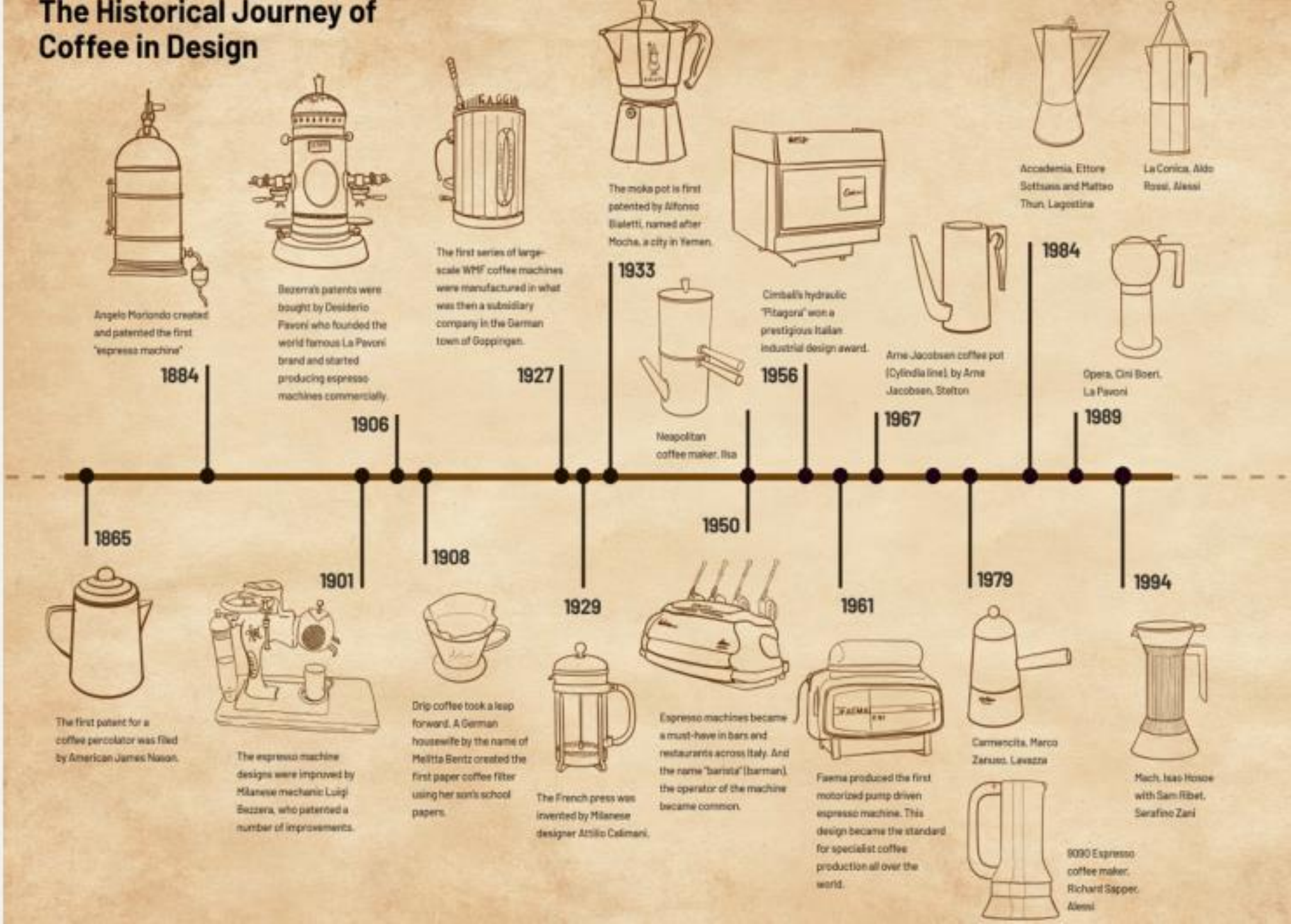
Artifact Temporal Mapping showing **Coffee Makers across Time Example 5:**

The Historical Journey of Coffee in Design



Artifact Mapping Example 1 . . . (Scale)

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Artifact Mapping of Indian Toys for Children in a scale of **Simple to Complex** and **Costly to Affordable**:

Activity Mapping:

- Activity as the name refers to an activity or a process done across a timeline.

The different types of activity mappings include:

a. One day in the life of . .

b. User Journey mapping

c. Life-cycle mapping

d. Causal Mappings/Diagrams

- **Activity Mapping** are also referred to as **Temporal Mappings**

Types of Activity Mappings:

1. One Day in the Life of . . . .

One day in the life of could be of an **User, Product or Service**. It documents the **sequence of events from time A to time B**. The time could be the time required to complete an activity – **few hours, a day, a week or even an year or more.**

2. Journey Mapping

Journey Mapping documents the journey of an user, product or service in relation to many other factors that are related to it. It could be the environment, artifacts, time, feelings, other users, feelings, etc.

3. Life Cycle Mapping

Life Cycle mapping is quite similar to 'One Day in the Life of' except that completes a cycle and comes back to the starting point..

4. Causal Mappings

Causal mappings are interconnecting the variables in an activity. The connections could be uni-directional, bi-directional or looped together.

Activity Mapping Steps:

1. Select an Activity connected with your topic

2. Select a Timeline for the Activity
- a day, a week, a month, a year, lifetime

3. Make a Timeline of the different phases of the Activity and note down the keywords

4. Organise the Activities in a given Space
- Time could be either on X axis or Y axis or circular

5. Make use of **colours to differentiate** and **arrows to show connections**

6. Draw inferences from the mapping

7. Make a list of inferences from this Mapping

Activity Mapping Example: One day in the Life of a Child

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Activity Mapping
- One Day in the life of a Child
Example 1:

Activity Mapping Example: Journey Map of an Autistic Child

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Activity Journey Mapping
- in relation to Environment, Stakeholders, Feelings, and Tools
Example 2:

Activity Mapping Example: Life Cycle Map of a Toy

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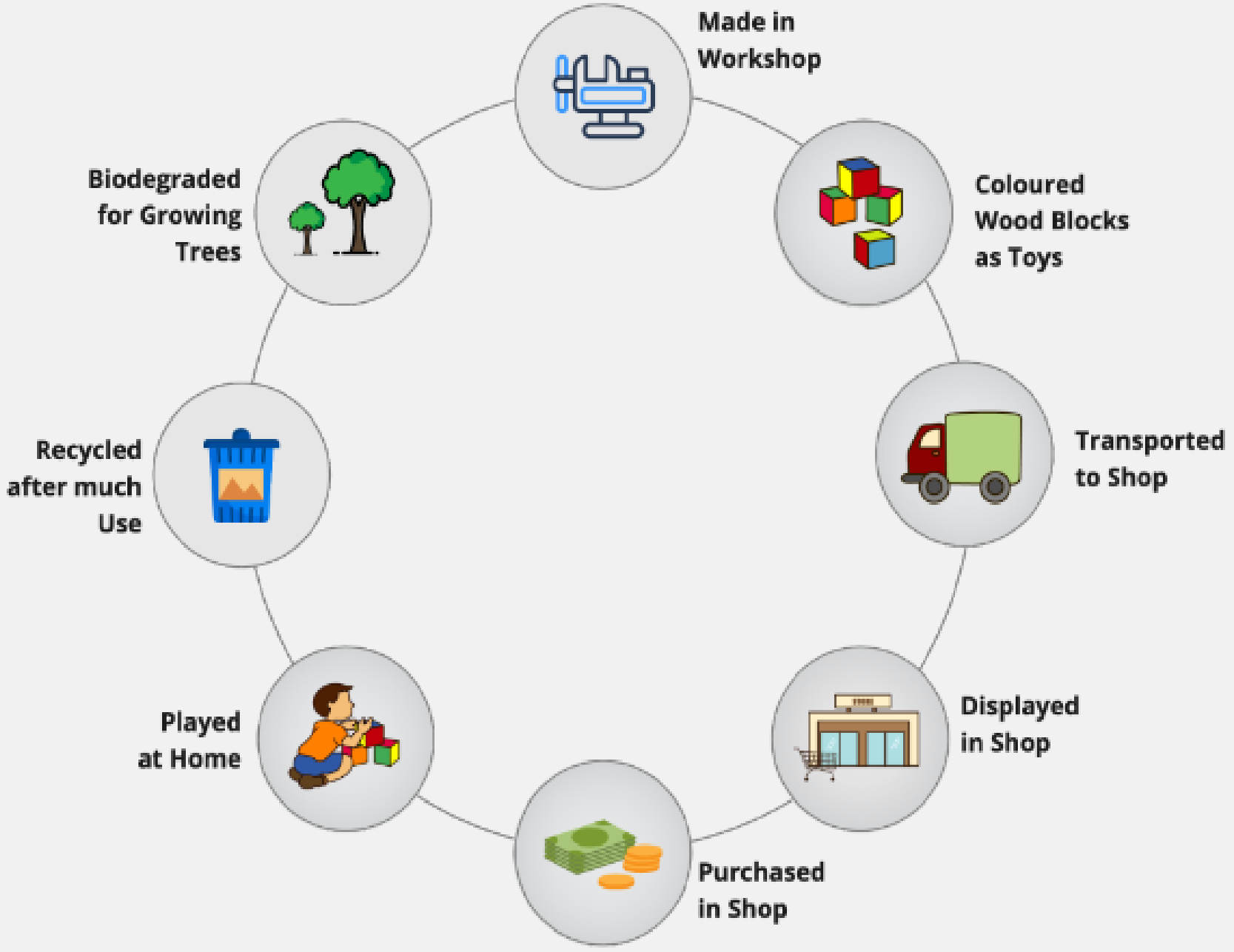
Recycle Toys for Children

Life Cycle Mapping
- showing different stages of the Toy
Example 3:



Activity Mapping Example: Causal mapping of Healthcare

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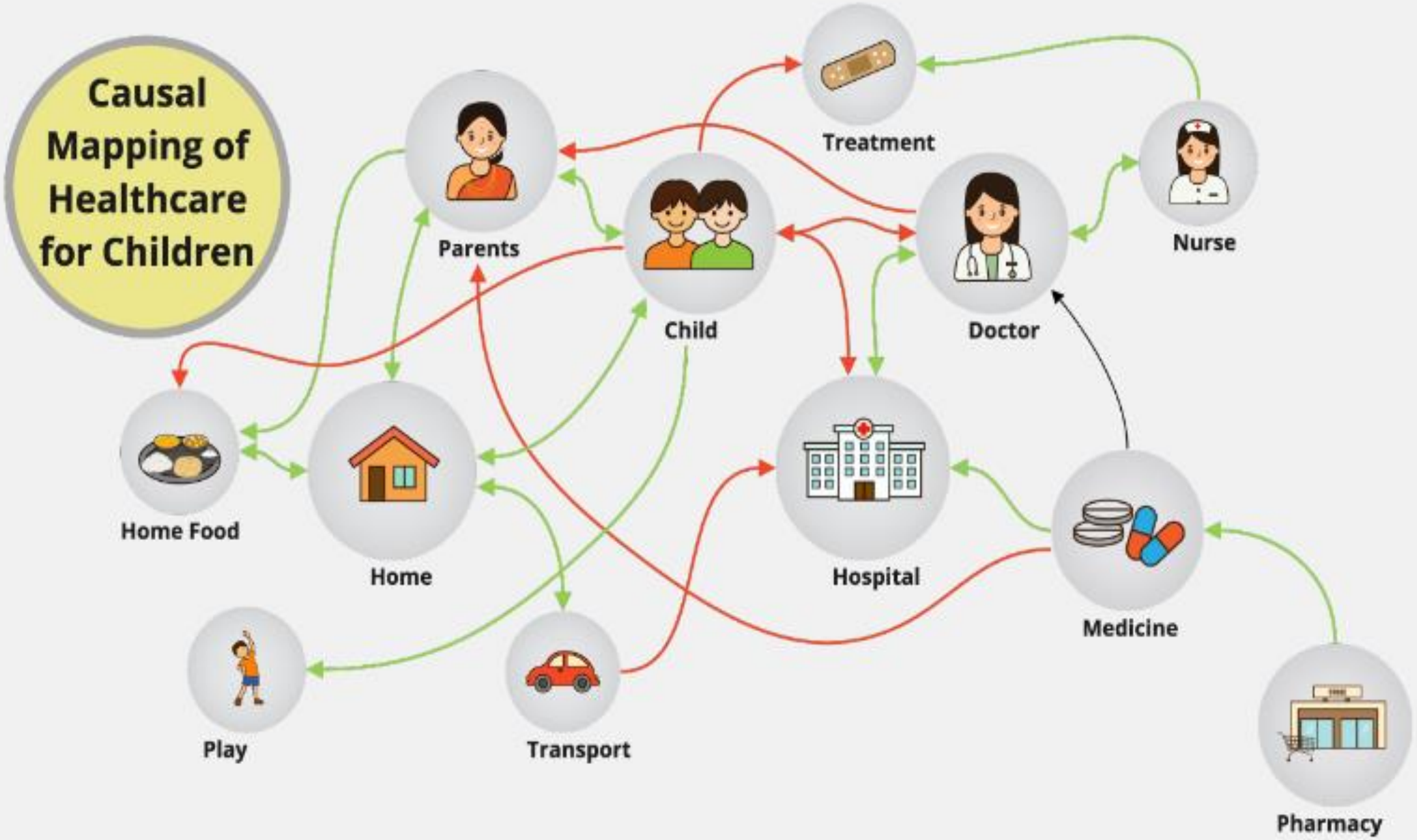
Causal Mapping - showing Healthcare system for Children Example 4:



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Shintoism
temporal map

Activity Temporal Mapping
Documenting the **History of Shintoism**

Pre-4th Century
Prehistoric and Ancient Periods

- Practices centered around nature worship, animism, and ancestor veneration.
- Kami (spirits or gods) were believed to inhabit natural elements like trees, rocks, and mountains.

8th to 12th Centuries
(Nara and Heian Periods)

The establishment of the Nara and Heian capitals saw the formalization and organization of Shinto practices.

The compilation of written records such as the Kojiki and Nihon Shoki, which outlined myths, legends, and rituals, contributed to Shinto's codification.

4th to 7th Centuries:

- Influences from neighboring cultures, notably China and Korea, led to the importation of Buddhism and Confucianism into Japan.
- Shinto practices coexisted with these imported belief systems, adopting some of their rituals and structures.

- The Meiji Restoration of 1868 aimed to modernize Japan and promote nationalism.
- Shinto was redefined and used as a tool for state ideology, leading to the separation of Shinto from Buddhism and the establishment of State Shinto.
- Shrines were rebuilt, and Shinto rituals were integrated into public life.

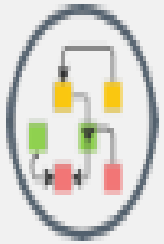
Late 19th to Early 20th Centuries
(Meiji Restoration)

- Shinto continues to be an integral part of Japanese culture and identity.
- Shrines and rituals are still actively maintained and visited by millions of people each year, especially during traditional festivals and ceremonies.
- Shinto's role in modern Japanese society remains diverse, with some adherents emphasizing its spiritual aspects while others engage in cultural practices without necessarily holding strong religious beliefs.

21st Century

- After World War II, State Shinto was abolished by the Occupation forces, and the Japanese government was separated from religious affairs.
- Shinto regained its autonomy and was practiced freely alongside other religions.
- There was a resurgence of interest in Shinto rituals and traditions, although some aspects remained controversial due to their association with Japan's militaristic past.

20th Century Mid to Late



Spatial Mapping:

- Spatial Mappings refers to an mapping artifacts, activities and environments connected with your topic and shown in relation to each other on a spatial dimension.

(a) Physical Spatial Mapping
(b) Spatial Connectivity Mapping

- **Spatial Mapping** are also referred to as **Environment Mappings**

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Spatial Mapping

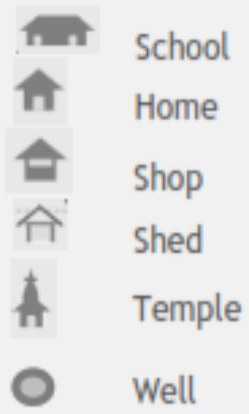
Visualizing the different **facilities in a rural location**

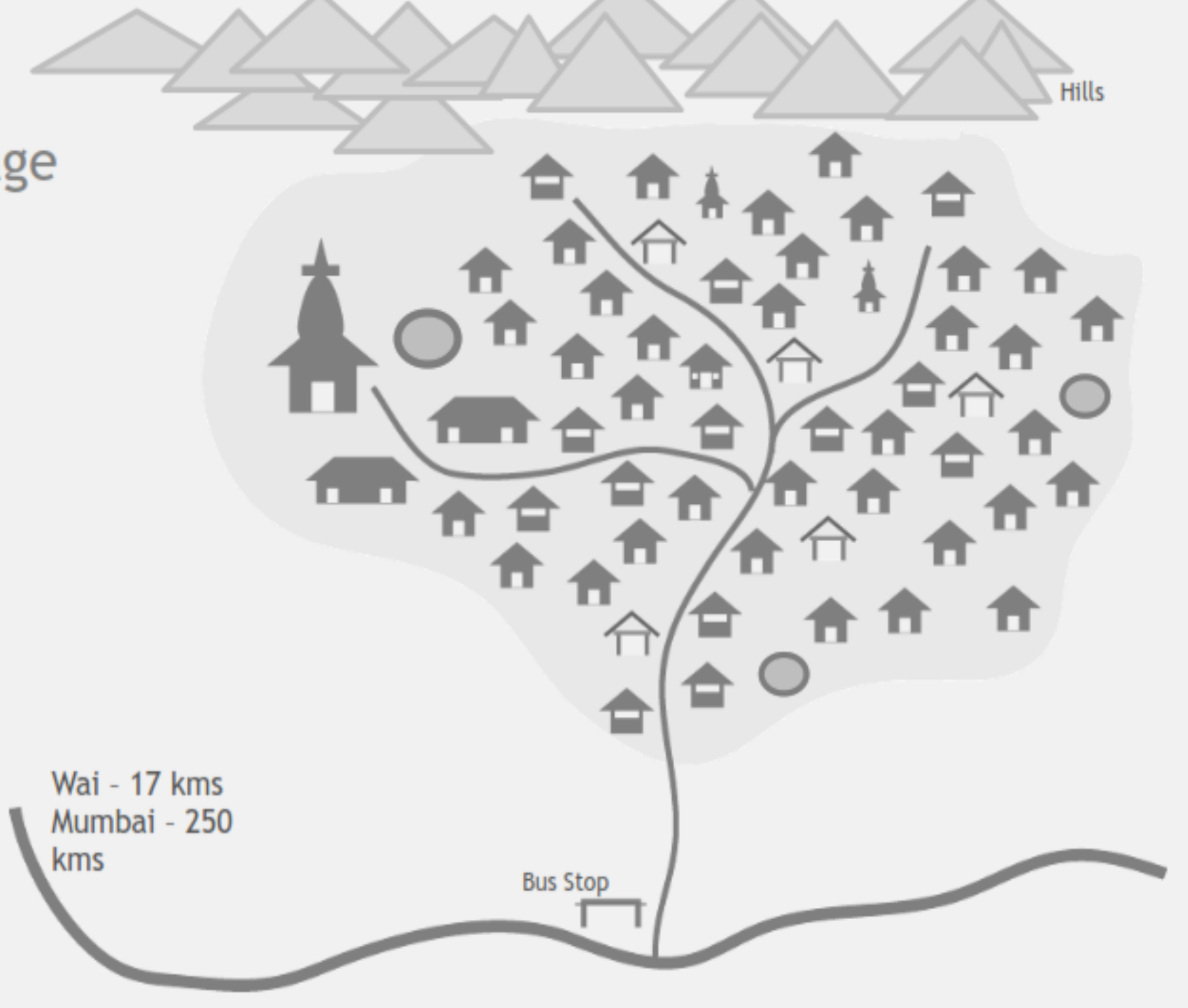
Example 1:

From: dsource.in, IDC, IIT Bombay

Chikhli Village

. 650 households, 4000 people
. Agriculture, Labourers
. Plains
. Have mobiles





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IIT Bombay to Marine drive

Total steps - **7537**
Duration - **1**hr **55** mins

Ambience | Mode of transport | Garbage | Noise | Distance | Greenery

Spatial Mapping
Visualizing **Journey from IITB to Marine Drive**
Example 3:

From: Vaibhav Jangid
dsource.in,
IDC, IIT Bombay

What does 'Data/Information Analysis' Part 2 Involve?

Analysis Part 1 involved:

1. Selection
2. Sorting
3. Cross-relating
4. Prioritizing
5. Identifying Uniqueness
6. Mapping and Visualizing

Analysis Part 2 involves (OIOR):

1. Observation
2. Inference
3. Opportunities for Design
4. Recommendations for Design

+

5. Redefining the Problem Statement

Data/Information Analysis part 2:

(Observation > Inference > Opportunities > Recommendations)

1. Observation:

. refers to the **data/information that you gathered** from Primary and Secondary Research

2. Inference:

. refers to the **conclusions reached (synthesis) through critical analysis of the data/information gathered** with reference to your problem space.

3. Opportunities:

. refers to the **recognition and discovery of factors that are helpful for solving issues** connected to your problem space

4. Recommendations:

. refers to the **listing of actionable factors that show the way forward towards possible design ideas and solutions.**

Redefining the Problem Statement:

- You started this project by picking up a topic and then did **research on finding issues to be solved**.

- Analysis helped you further in **identifying the needs** for solving issues connected with your topic.

- with these new findings, you could now **redefine the problem statement.**

OIOR Table - Example 1: (Design a Toy for Children)

	O 1. Observations:	I 2. Inferences:	O 3. Opportunities:	R 4. Recommendations:
A	Boys and Girls mostly **play separately**	The type of play seems **different for boys and girls**	Explore Play activities that could be of **interest to both boys and girls**	Design a play activity that is **gender neutral**
B	**Storytelling** is part of the **culture and tradition** in India	**Stories** are very **interesting to children**	Explore Play activities **using story / narratives**	Design a play activity that is **based on a story**
C	School teachers would like to **make learning joyful**	**Learning could be fun** through play activities	Explore **Play and Learn** activities	Design a **play activity** that can help **learn a concept**

Redefining the Problem Statement could include:

- what is being designed
- whom is it being designed
- how is it being designed
- where is it being used
- which materials or process does it involve
- etc.

Redefined problem statement:

Design an engaging 'Play and Learn' Constructive Toy for Children in the age group of 3 to 6 with features of Collaboration, Sharing and Storytelling, to be used at home and playschool, using Sustainable Materials.

Example of Problem Statement:

- Initial Topic:

Design an engaging Toy for Children.

- Redefined problem statement:

Design an engaging 'Play and Learn' Constructive Toy for Children in the age group of 3 to 6 with features of Collaboration, Sharing and Storytelling using Sustainable Materials.

OIOR Table - Example 2: (Digital Payment System Design)

	O 1. Observations:	I 2. Inferences:	O 3. Opportunities:	R 4. Recommendations:
A	Some users use the ATM because they are **not able to talk to ladies** in the bank	Some users find it easier to **deal with a machine than a person of opposite sex**	Explore ways to **overcome social barriers**	Design a monetary transaction space where users are **socially comfortable**
B	Parents are **reluctant to give debit cards** to children	Easy access to money can be **tempting to spend**	Explore having a **family account with limits to children**	Design a family payment system with **different limits** for each member
C	User **lost money** through debit card - reluctant to use it	Credit and Debit **Cards** are seen as **insecure**	Explore ways to make digital transactions **be secure and feel secure**	Design a digital transaction system that is **also seen as secure**

Problem Statement - Example 2:

- Initial Topic:

Design an Digital Payment System.

- Redefined problem statement:

Design an easy to use, fully secure 'Digital Payment System' that also feels secure, can be shared between family members with set limits and overcomes social barriers in its use.

What is ‘Ideation’?

Ideation involves finding several alternate ideas to the identified problem statement.

The ideas need to be **new and unique.**

Its also one of the **most exciting phases of the design process** as it involves generating interesting ideas.

Ideation involves making use different **tools like brainstorming, Idea Sketching** and the use of **Creativity Techniques**.

What is ‘Creative Ideation’?

Creative Ideation involves finding several alternate **creative** ideas to the identified problem statement.

Creative Ideation involves Creativity.

Being creative **involves thinking of unique and new ideas**.

Brain-Storming:

According to Osborn,
"Brainstorming is using the brain to storm a creative problem"

Alex. F. Osborn

Osborn suggested these four rules for creative brainstorming:

1. **No criticism of any Idea**
2. **Quantity of Ideas**
3. **Unusual Ideas**
4. **Combine and Improve Ideas**

Divergent Thinking

Divergent thinking is a non-linear mode of creative thinking that helps you to come up with several unique ideas in solving a problem.

Joy Paul Guilford

Divergent Thinking is characterised by **flexibility, originality and fluency.**
(Guilford, 1959)

SCAMPER

SCAMPER is an acronym for seven creativity techniques suggested by Bob Eberle.

Bob Eberle

S = Substitute (with something else)
C = Combine (with another)
A = Adopt (for something else)
M = Modify (change something)
P = Put to another use
E = Eliminate (remove something)
R = Reverse (inverse or change direction)

Lateral Thinking

Edward de Bobo coined the word 'Lateral Thinking' as a way of creative thinking.

Edward de Bono

He believed that Creativity Thinking Skills can be learnt and improved over a period of time.

He popularised creative thinking and has written over 80 books with translations in over 40 languages.

Why is ‘Ideation’ important?

- Ideation plays an important part in the process of finding a solution to a problem **by suggesting many possible ways to solve the problem.**
- once there are several ideas, the **ones that are most appropriate can be taken up for further development**.

Ideation part 1:

(Brain-Storming > Idea Sketching > Creativity Methods > Several Ideas)

How to use Brain-storming for Ideation?

Brain-storming for Ideation is known as the **creative thinking technique** to **generate key-words or ideas** associated with the problem that you are trying to solve.

- **Freely storm the mind** to spontaneously generate ideas **without any criticism.**

- **Generate several ideas** – the more the better

- **Conceive of unusual, unexpected, creative ideas**

- **Combine ideas and improve them**

Reference: Alex. F. Osborn

Brain-Storming:

Steps in Brain-Storming:

1. Note down the Problem that you have selected for Brain-Storming
(A clear statement of the problem is recommended)

2. Brain-storm for associated ideas as key-words or sketches and note these down
(as scribbles or sketches on post-it notes, online on Miro/Figma, etc.)

3. Note down the key-words/sketches randomly and not in any particular order
(so that cross-relationships, combinations and improvements could be made)

4. Do not criticize anyone – all keywords/sketches or ideas should be welcome
(even unusual ones)

5. Do this until one runs out of new key-words/sketches
(greater the number, the more the variety)

Example of Brain-storming for Ideation

Lets say the redefined statement for the problem is:

Design an engaging 'Play and Learn' Constructive Toy for Children in the age group of 3 to 6 with features of Collaboration, Sharing and Storytelling using Sustainable Materials

How to use Idea-Sketching for Ideation?

Idea-Sketching involves visually sketching the ideas created out of brain-storming.

Idea-Sketching is useful to create quick rough sketches of ideas or concepts that you have in your mind. **Sketching makes ideas visible.**

Idea-Sketching is where the initial ideas begin to build, so that you can envision what you are designing.

Sketching is mainly to help explore and explain design ideas.

How to use Idea-Sketching for Ideation?

Idea-Sketching involves visually sketching the ideas created out of brain-storming.

Idea-Sketching is useful to create quick rough sketches of ideas or concepts that you have in your mind. **Sketching makes ideas visible.**

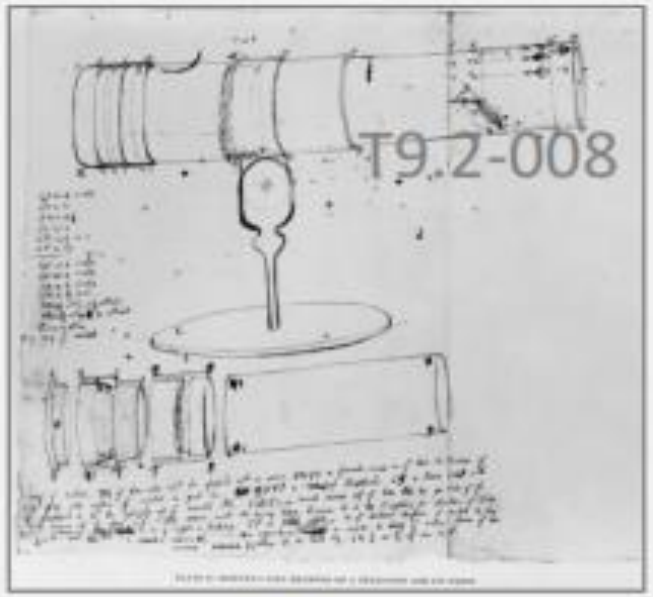
Idea-Sketching is where the initial ideas begin to build, so that you can envision what you are designing.

Sketching is mainly to help explore and explain design ideas.

Idea-Sketching is a rough quick sketch that can be done easily by anyone.

Idea-Sketches can be **easily created** using pen and paper or a whiteboard. The idea is to keep your sketches **fast, rough and dirty**. This helps you worry less on design aesthetics and focus more on rapid formulation of ideas.

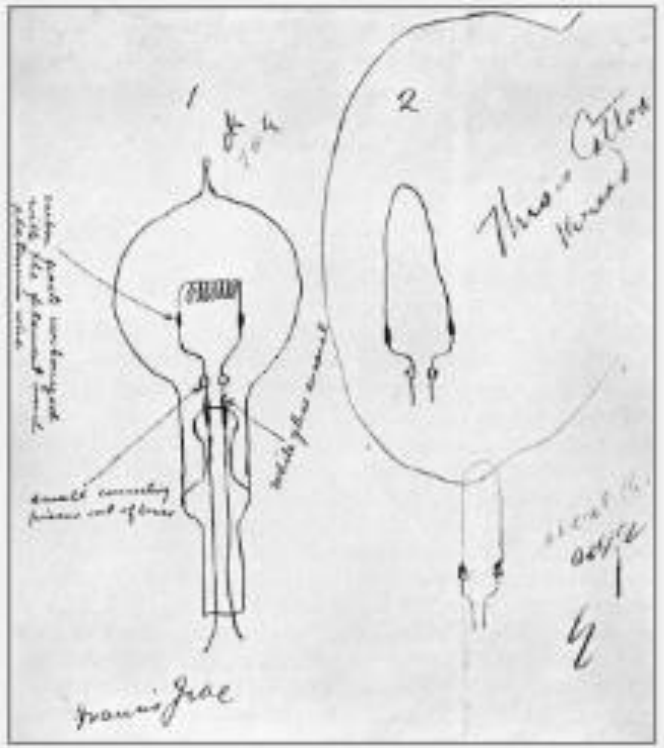
Lets look at some idea-sketches by Scientists:



Idea sketch by **Isaac Newton** showing a reflecting telescope and its components

Actual prototype of the first reflecting telescope

Idea sketches of early lightbulb, with comments by **Thomas Edison**

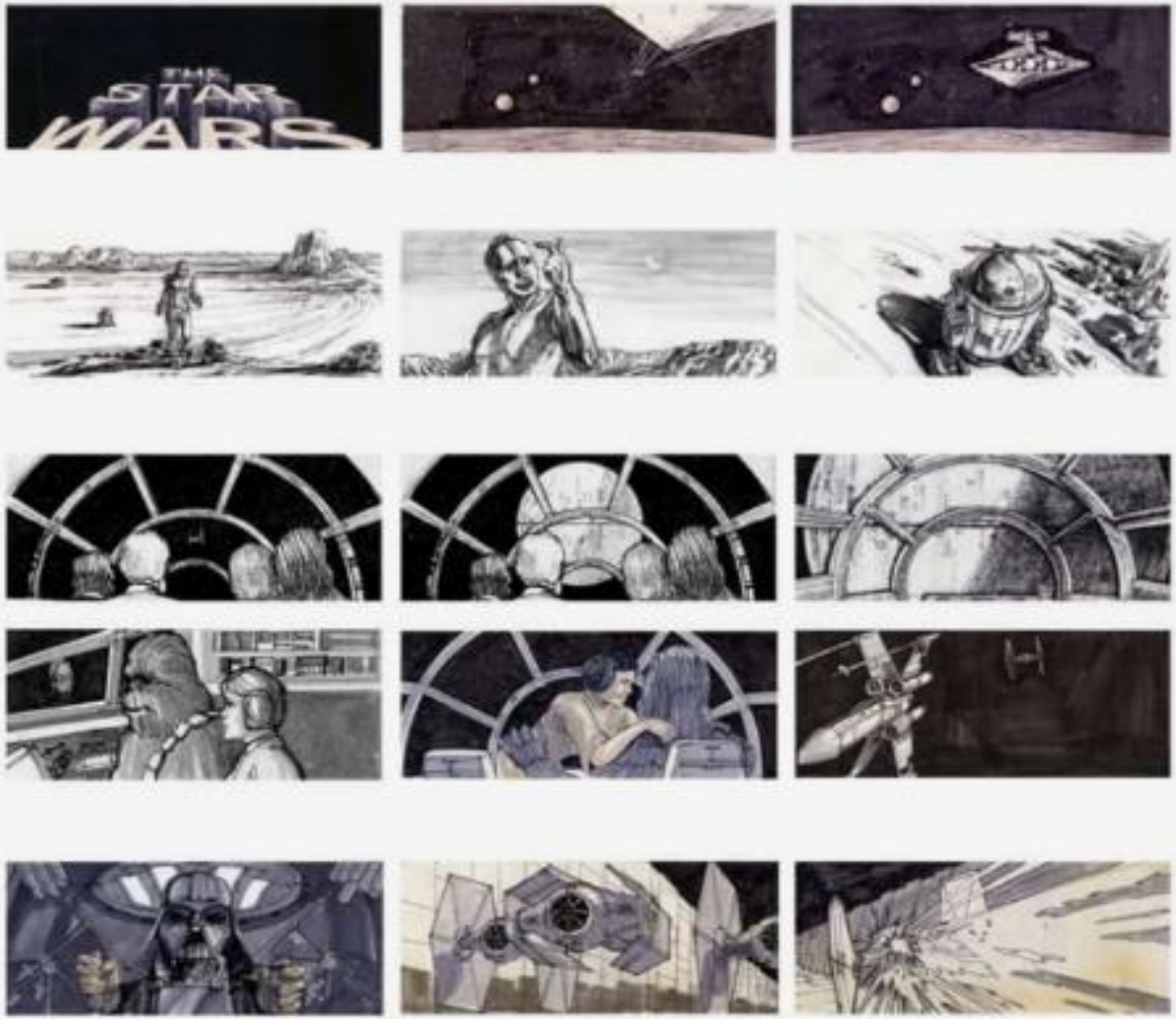


Final prototype of the first bulb

These are rough idea sketches, sufficient for showing the concept

Lets look at some idea-sketches by Film Makers:

Story board Idea sketches for the film Pather Panchali by the film director **Satyajit Ray**



Story board Idea sketches for film Star Wars by the film director **George Lucas**

Lets look at some idea-sketches by Product Designers:

Doodle sketches and final design of Water Bottle by designer **Ross Lovegrove**

Rapid sketches and final design of Chairs by designer **Charles Eames**

Lets look at some idea-sketches by Graphic Designers:

I ♥ NY

Idea Sketches and final design of 'I love New York' by Graphic Designer **Milton Glaser**

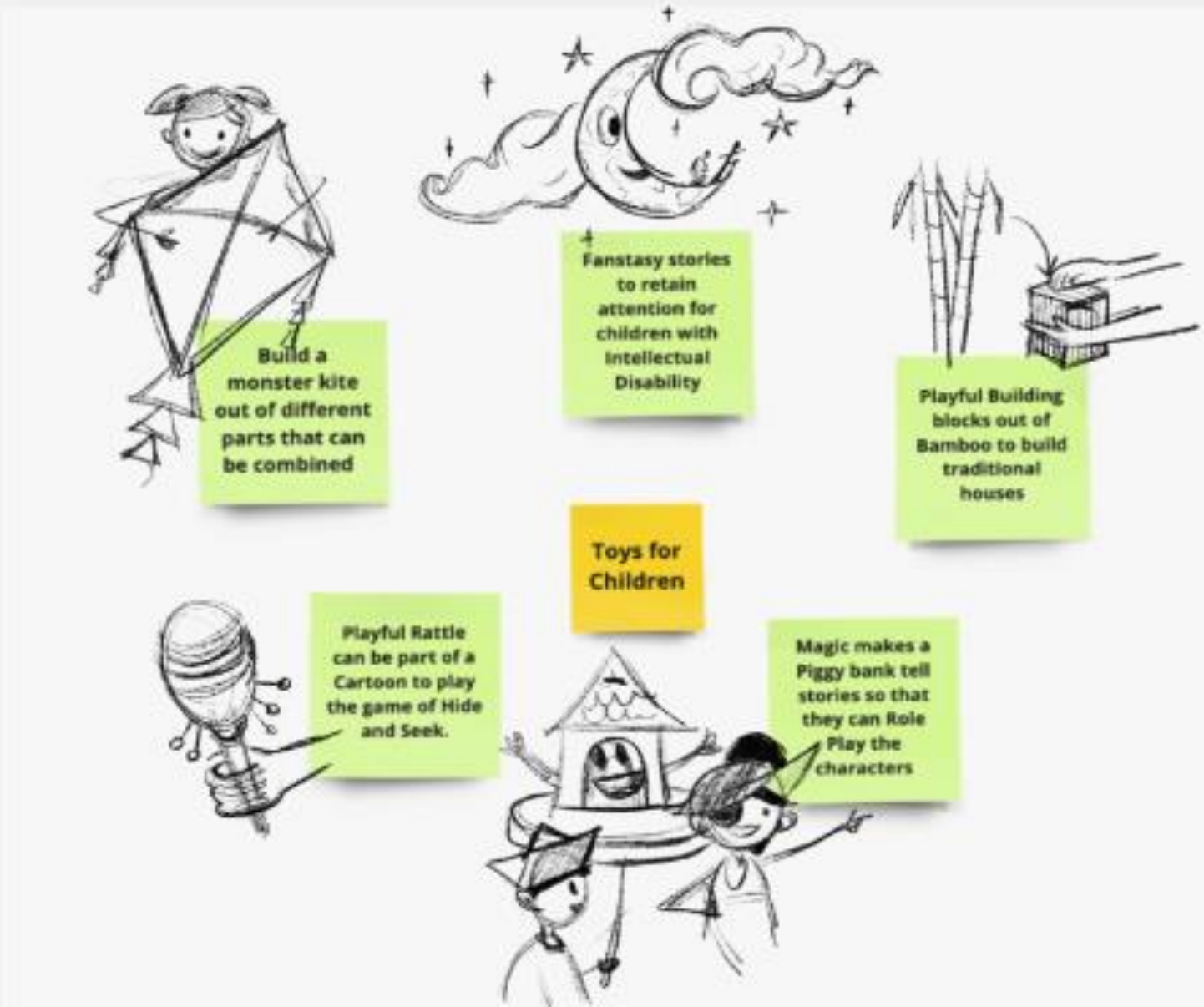
Idea sketches and final design of the logo for NEXT by Graphic Designer **Paul Rand**

Example of Idea-Sketching for Ideation

The redefined statement for the problem is:

Design an engaging 'Play and Learn' Constructive Toy for Children in the age group of 3 to 6 with features of Collaboration, Sharing and Storytelling using Sustainable Materials

Shown here are the different idea-sketches created out of keywords from brain-storming



SCAMPER is an acronym for seven creativity techniques suggested by Bob Eberle:

S = Substitute (with something else)

C = Combine (with another)

A = Adopt (for something else)

M = Modify (change something)

P = Put to another use

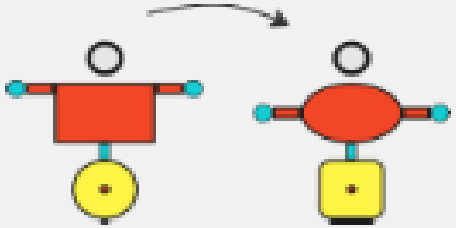
E = Eliminate (remove something)

R = Reverse (inverse or change direction)

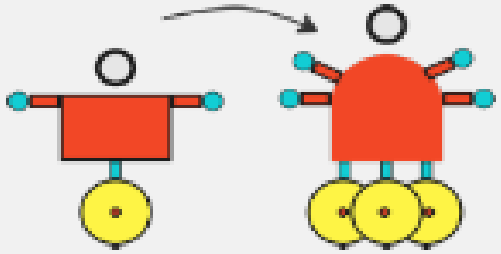
SCAMPER involves making use of these creativity techniques to further improve your idea-sketches

7 SCAMPER techniques:

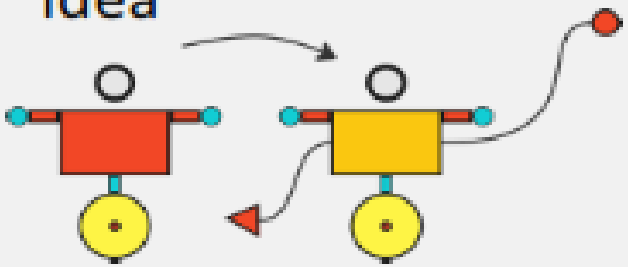
S = Substitute
Substitute the parts of an idea with another idea



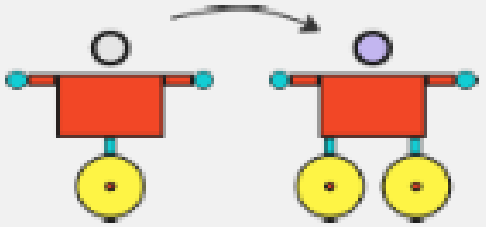
C = Combine
Combine an idea with another idea



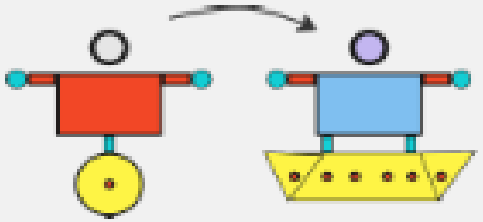
A = Adapt
Adapt feature/s of an idea from another idea



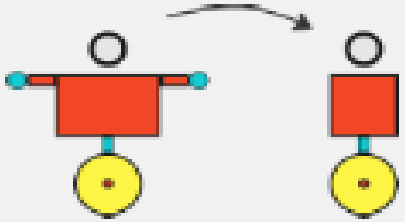
M = Modify
Modify an idea to make it better



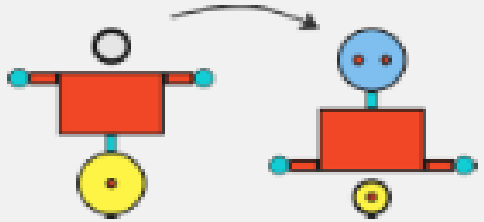
P = Put to another use
find another use or application for the idea



E = Eliminate
Eliminate parts of the idea to make it more efficient



R = Reverse
Reverse or inverse the idea



How to use Lateral Thinking for Ideation?

Edward de Bobo coined the word 'Lateral Thinking' as a way of creative thinking. He believed that Creativity Thinking Skills can be learnt and improved over a period of time.

'The need to be right all the time is the biggest bar to new ideas. It is better to have enough ideas for some of them to be wrong than to be always right by having no ideas at all'.
by Edward de Bobo

'Instead of linear or vertical thinking, which relies solely on logic, Lateral Thinking is a deliberate, systematic process of using your ability to think in a different way'.
by Edward de Bobo

- It essentially means being able to think creatively or "outside the box" thinking, solve a problem.
- Usually, logical thinking is used to solve problems in a direct, straightforward way (also known as vertical thinking). Lateral thinking, however, looks at things from a sideways perspective (also known as horizontal thinking), in order to find answers that aren’t immediately apparent.
- People who engage in lateral thinking can find solutions to problems that aren't obvious to others. As a result, lateral thinking is a useful skill in many industries. It's the essence of creativity that can be beneficial in the workplace, especially in times of change when regular solutions may not be consistent. For example, marketers and advertisers often employ people with this skill so that they can introduce new perspectives to their promotions. This is why many interviewers ask questions that try to test the lateral thinking skills of potential candidates.

How to improve lateral thinking skills: Lateral thinking is innate for some individuals. It's also possible for people to learn and develop this skill so that they can implement it into real-life applications. Since lateral thinking isn't a skill that everyone can comprehend easily, some individuals might not notice their improvements until they can apply this skill to a real problem they encounter.

➢ The concept of lateral thinking centers around these six core principles

- **Focus** encourages a shift in attention to uncover breakthrough ideas and new opportunities.
- **Challenge** questions traditional ways of thinking to dig deeper into alternative solutions.
- **Alternatives** offer a way to explore different approaches and possibilities.
- **Random entry** focuses on introducing unrelated elements to spark creative thinking.
- **Provocation** challenges assumptions to provoke new thoughts and ideas.
- **Harvesting and treatment** focus on generating and identifying valuable ideas without judgment and refining them into practical solutions.

How many Ideas?

How many Ideas:

- The ground rule is at-least 3 different unique ideas

- 12 is a comfortable number of alternatives

- and more than 12 would be great

What is ‘Ideation’ Part 2?

Ideation part 2 is an extension of part 1 in finding further alternatives as ideas or concepts that are unique, new and innovative.

Ideation part 2 makes use of a creative method known as **Synectics**.

In addition to **Synectics**, we’ll look at similar creative methods like **Analogical Thinking, Metaphors** and **Inspiration from Nature**.

What is ‘Synectics’ . . .

Synectics as a creative method was quite useful in ideation by making a **connection between ideas that are out of box and not connected with each other.**

Gordon realized that making use of ‘**Anologies’** lets one think of **new and surprising ideas.**

In addition, Gordon encouraged the use of **'metaphors'** to **“make the familiar strange and the strange familiar"**.

Why is 'Ideation part 2' important?

- Ideation part 2 shows another creative ideation tool 'Synectics' to support creation of unusual and surprising ideas.

- once there are several ideas, the **ones that are most appropriate can be chosen through evaluation and taken up for further development**.

- It makes sense to present the chosen final ideas as Concept Maps as these would visually represent the interconnections between the components of the system.

Ideation part 2:

(Synectics/Analogy/Metaphors/Nature Inspiration > Concept Evaluation > Maps)

What is ‘Analogical Thinking’?

‘Anological Thinking’ makes use of ‘Anology’ to generate fresh new ideas and make surprising connections.

These are some of the different types of Analogies:

1. Personal Analogy – imagine yourself as the idea for the Object and tries to role-play the situation with ones experiences and come out with new ideas.

2. Direct Analogy – make use of similar objects or situations in both the man made and natural world and make new connections

3. Fantasy Analogy – make use of your imagination to make the familiar strange

What is ‘Metaphorical Thinking’?

‘Metphorical Thinking’ makes use of ‘Metphors’ to generate fresh new ideas and make surprising connections.

A metaphor is a figure of speech in which a word or phrase denoting one kind of object or action is used in place of another to suggest a likeness or analogy between them (Merriam-webster Dictionary).

Examples of some Metaphors:

1. **‘Desktop’** as a Metaphor to simulate the working environment on a computer screen
2. My teacher has a **‘Heart of Gold’** as she has always supported me.

What is ‘Inspiration from Nature’?

‘Inspiration from Nature’ makes use of observing how nature solves problems and adopting these to your problem space.

We can make use of inspiration from nature to solve problems in design. Mankind has done this for thousands of years.

Examples of some Inspirations from nature:
1. The shape of the beak of the kingfisher bird as inspiration for the shape of the bullet train.
2. The fractal structure found in nature as inspiration for making structurally strong architectural buildings.

What is ‘Concept Evaluation’?

The seral concept ideas that are generated needs to be evaluated to prioritise the concepts:

The way to do this would be to make matrix of ideas on one axis and the design criteria on the other axis and give weightages to the design criteria based on a scale.

The different design criteria could be based on these:

1. User Experience and Environment (Sustainability)
2. Form (Aesthetics) and Function
3. Creativity and Innovation (Newness)
4. Cost and Maintenance

Example of ‘Concept Evaluation’:

Shown below are 3 final concepts evaluated through Total Scores vs Weighted Average scores (in brackets) in a rated scale of 1 to 5. The weighetd scores are based on how important are the factors relatively.

Factors- 1-5 scale (% weights)	Ease of Use (15%)	Aesthetics (15%)	Sustainability (20%)	Innovation (20%)	Cost and Maintenance (30%)	Total
Final Concept 1	5 (.15)	4 (.15)	3 (.2)	3 (.2)	3 (.3)	18 (3.45)
Final Concept 2	3 (.15)	5 (.15)	5 (.2)	4 (.2)	5 (.3)	22 (4.5)
Final Concept 3	2 (.15)	2 (.15)	4 (.2)	3 (.2)	5 (.3)	16 (3.5)

Final Concept 2 has scored the highest score in both Total Scores (22) and weighted scores (4.5). Final Concept 1 has scored 2nd in Total scores and 3rd in weighted scores and Final Concept 3 has scored 3rd in Total scores and 2nd in weighted scores.

What are ‘Concept Maps’?

Concept Maps visually depict how the idea is interconnected to other components or parts of the problem space that you are trying to find a solution.

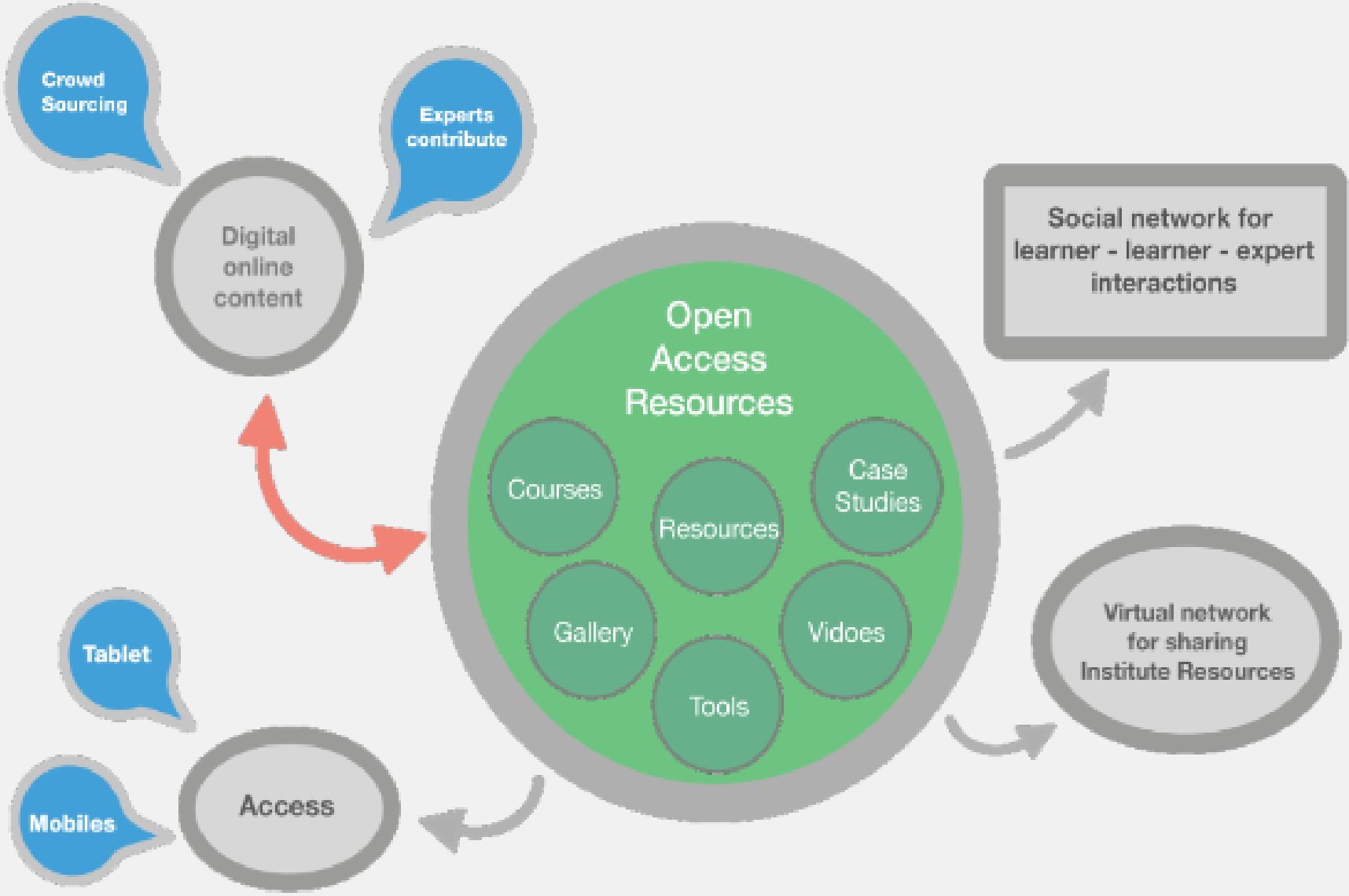
Joseph Novak

Concept Maps are helpful to give an overview of the parts of the solution

Concept mapping for understanding and learning was developed by Joseph D. Novak at Cornell University in the 1970s

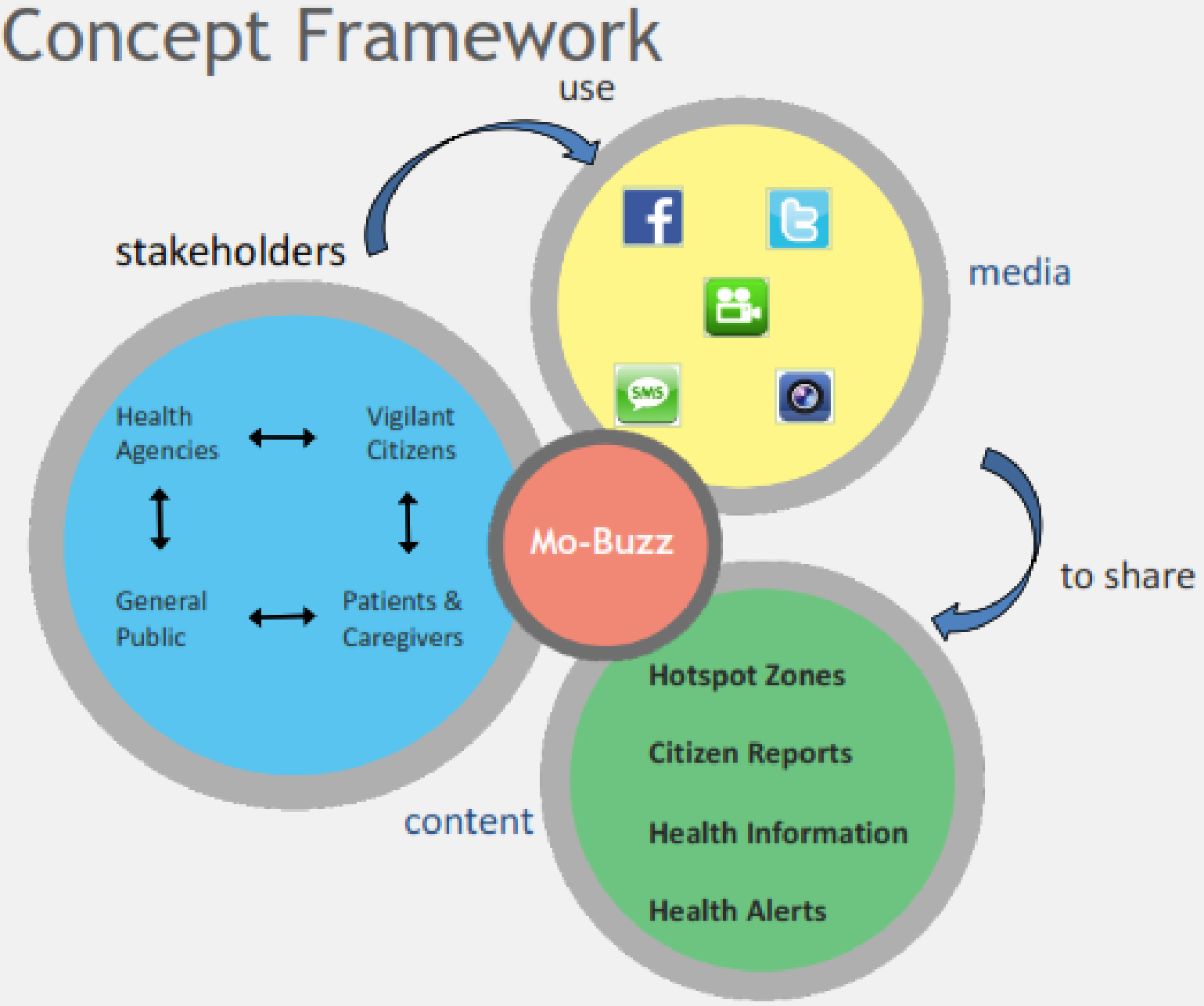
What are ‘Concept Maps’. . .

Here is shown an example of concept map visually representing the different components of the D’source.in learning environment as an idea.



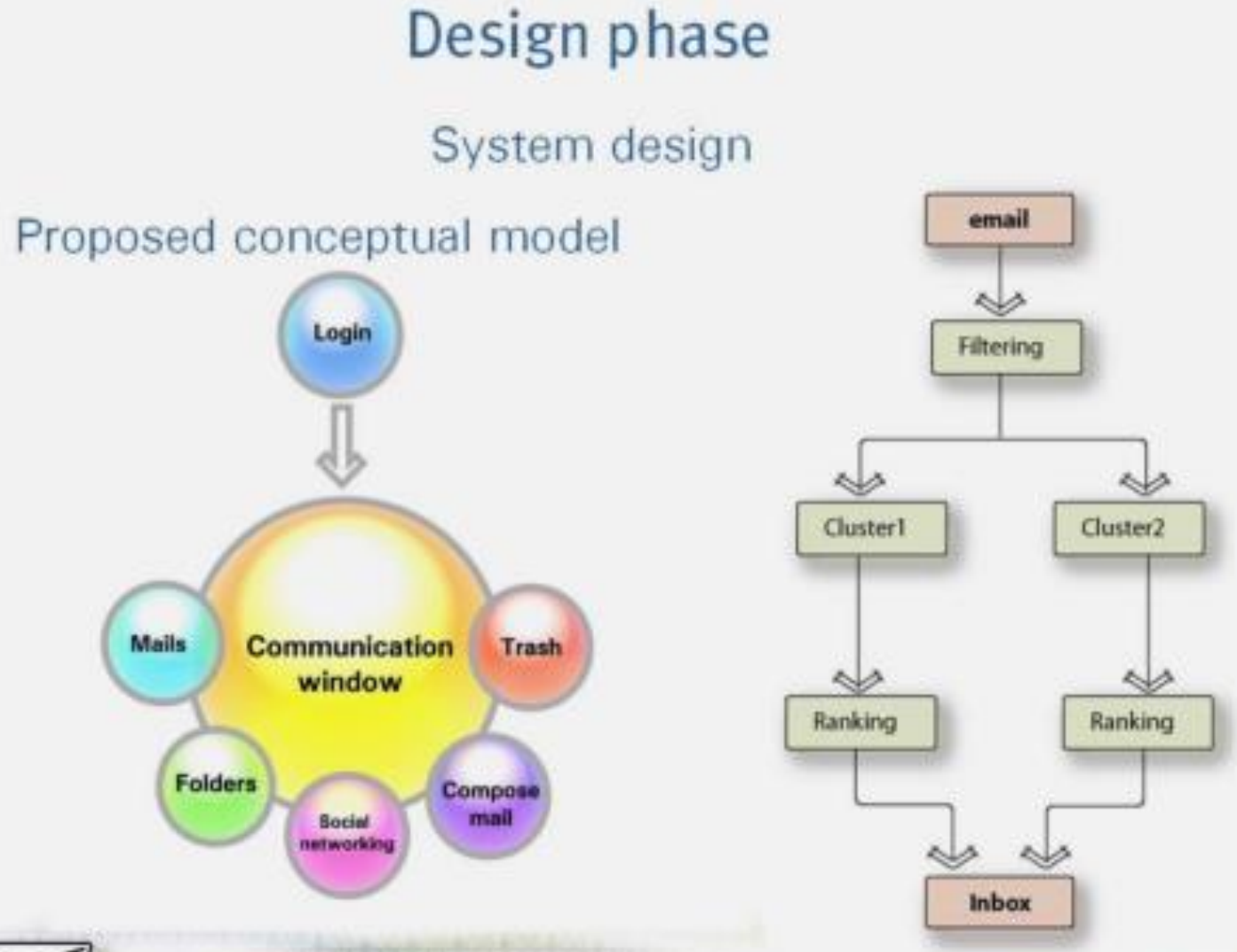
Example of ‘Concept Maps’. . .

Here is shown an example of concept map visually representing the different components of the Mo-Buzz Malaria tracking network.



Example of ‘Concept Maps’. . .

Here is shown an example of concept map visually representing the different components of the a new email application based on ranking and prioritising.



How to use Synectics for Ideation?

Synectics as a creative method coined by George M. Prince and William J.J. Gordon was quite useful in ideation by making a **connection between ideas that are out of box and not connected with each other.**

Synectics also makes use of Brain-storming for Ideation to **generate key-words or ideas** associated with the problem that you are trying to solve to **conceive of unusual, unexpected, surprising ideas**.

Synectics adopted the words **Syn+ectics** from Greek language, which means **"the joining together of different and apparently irrelevant elements"** in new combinations/connections.

Steps in Synectics: as an extension of brainstorming

1. Note down the Problem that you have selected for Brain-Storming
(A clear statement of the problem is recommended)

2. Brain-storm for unusual ideas as key-words or sketches and note these down
(as scribbles or sketches on post-it notes, online on Miro/Figma, etc.)

3. Make use of Analogies, Metaphors or Inspiration from Nature to make connections
(so that cross-relationships, unexpected combinations and surprising ideas could be made)

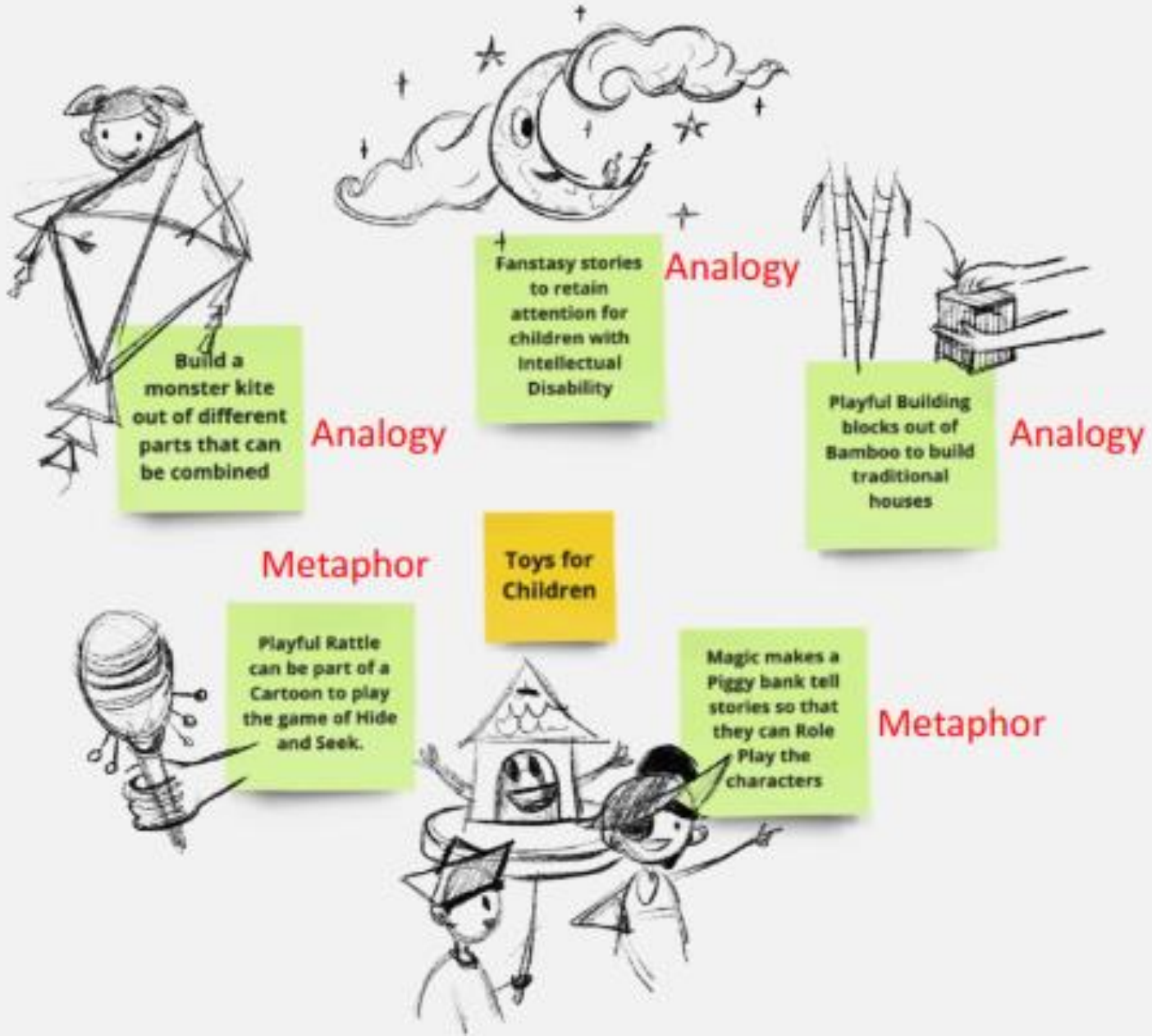
4. Do not criticize anyone – building on each others ideas should be welcome
(mostly unusual ones with new point of views)

5. Do this until one runs out of new out of the box ideas
(greater the number, the more the variety)

Example of using Synectics for Ideation:

Lets say the redefined statement for the problem is:

Design an engaging 'Play and Learn' Constructive Toy for Children in the age group of 3 to 6 with features of Collaboration, Sharing and Storytelling using Sustainable Materials



Personal Analogy:

In using **Personal Analogy for Ideation, imagine yourself as the idea for the Object and try to role-play the situation with ones experiences and come out with new ideas.**

If you are designing a wooden Toy for Children, Imagine yourself as the wooden toy, and imagine what children will do to play with the wooden toy – that means children might sit on you, pull and push you, take you for a ride, share it with their friends, etc.

Or, If you are designing a Chair for the Elderly, Imagine yourself as the Chair, and imagine the needs of the Elderly to rest and relax – that means elderly will sit on you, be relaxed and comfortable, might want to stretch their legs, etc.

Direct Analogy:

In using **Direct Analogy for Ideation, make use of similar objects or situations in both the man made and natural world and make new connections and come out with new ideas.**

If you are designing a wooden Toy for Children, Imagine the wooden toy is like a Train (direct analogy from man made world) with different bogies – so that it can be made modular with different functions that can be attached.

Or, If you are designing a Chair for the Elderly, Imagine the Chair to be like a Pendulum (direct analogy from man made world), and juxtapose the needs of the Elderly to rest, relax and be comfortable.

Fantasy Analogy:

In using **Fantasy Analogy for Ideation, make use of make use of your imagination to make the familiar strange and make new connections and come out with new ideas.**

If you are designing a wooden Toy for Children, Imagine the wooden toy is like a dancing snake with several heads (fantasy analogy from imagination) - so that it can dance or coil and go to sleep.

Or, If you are designing a Chair for the Elderly, Imagine the Chair to be like a shape changing robot (fantasy analogy from imagination) - so that it can predict the need for the Elderly to rest, relax and be comfortable.

Inspiration from Nature for Ideation?

'Inspiration from Nature' makes use of observing how nature solves problems and adopting these to your problem space.

We can make use of inspiration from nature to solve problems in design. Mankind has done this for thousands of years.

Nature Inspired Design is also known by the following names:

1. Biomimicry
2. Bionic
3. Biomimetic

Examples of some Inspirations from Nature:

1. The **shape of the beak of the kingfisher bird** as inspiration for the **shape of the bullet train.**
2. The **fractal structure found in nature** as inspiration for **making structurally strong architectural building layouts.**
3. The **Shark skin inspired swimsuit fabric to be less resistant to water** drag.
4. The **flight and the shape of birds have inspired the shape of aircraft.**

What is ‘Prototyping’ Part 1?

Prototyping Part 1 involves Soft prototyping.

Soft prototypes are rough, sample, draft versions of the ideas or concepts and **helps one to visualize, make it tangible, test, get feedback and change/iterate before the design is finalized.**

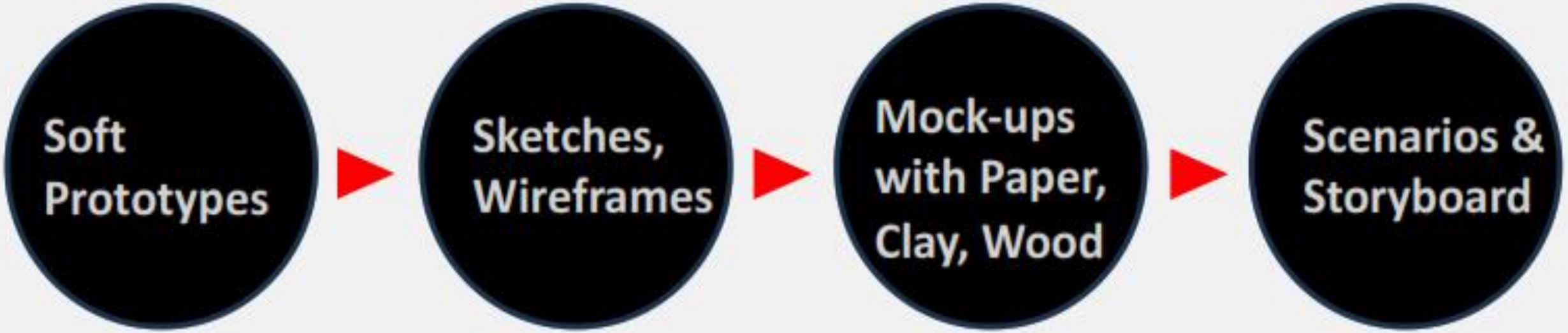
Soft prototyping is fast, saves time, saves cost and **can be a reasonable representation and understanding of what the final design would be like both in terms of its form and function.**

Why is ‘Prototyping part 1’ important?

- Prototyping part 1 shows several ways that one can represent their initial ideas as 2D and 3D mock-up models.
- this is great for getting feedback and iteratively making changes to the design.

Prototype part 1:

(Soft Prototypes > Ketches > Mock-ups > Scenarios and Storyboards)



‘Prototyping’ in Creative Domains:

Architecture:
- Quick Sketches,
- 3D Renderings,
- Scaled Models

Arts:
- Rough Sketches,
- Draft Drawings,
- Scaled Models

Film:
- Rough Script,
- Scenario Sketches,
- Setting,
- Character Sketches

Animation:
- Rough Script,
- Scenario,
- Character Sketches,
- Animatics

Graphic Design:
- Rough Layouts,
- Paper Prototypes

Product Design:
- Rapid Sketches,
- Rough Renderings,
- Paper/ Foam/ Plaster Prototypes

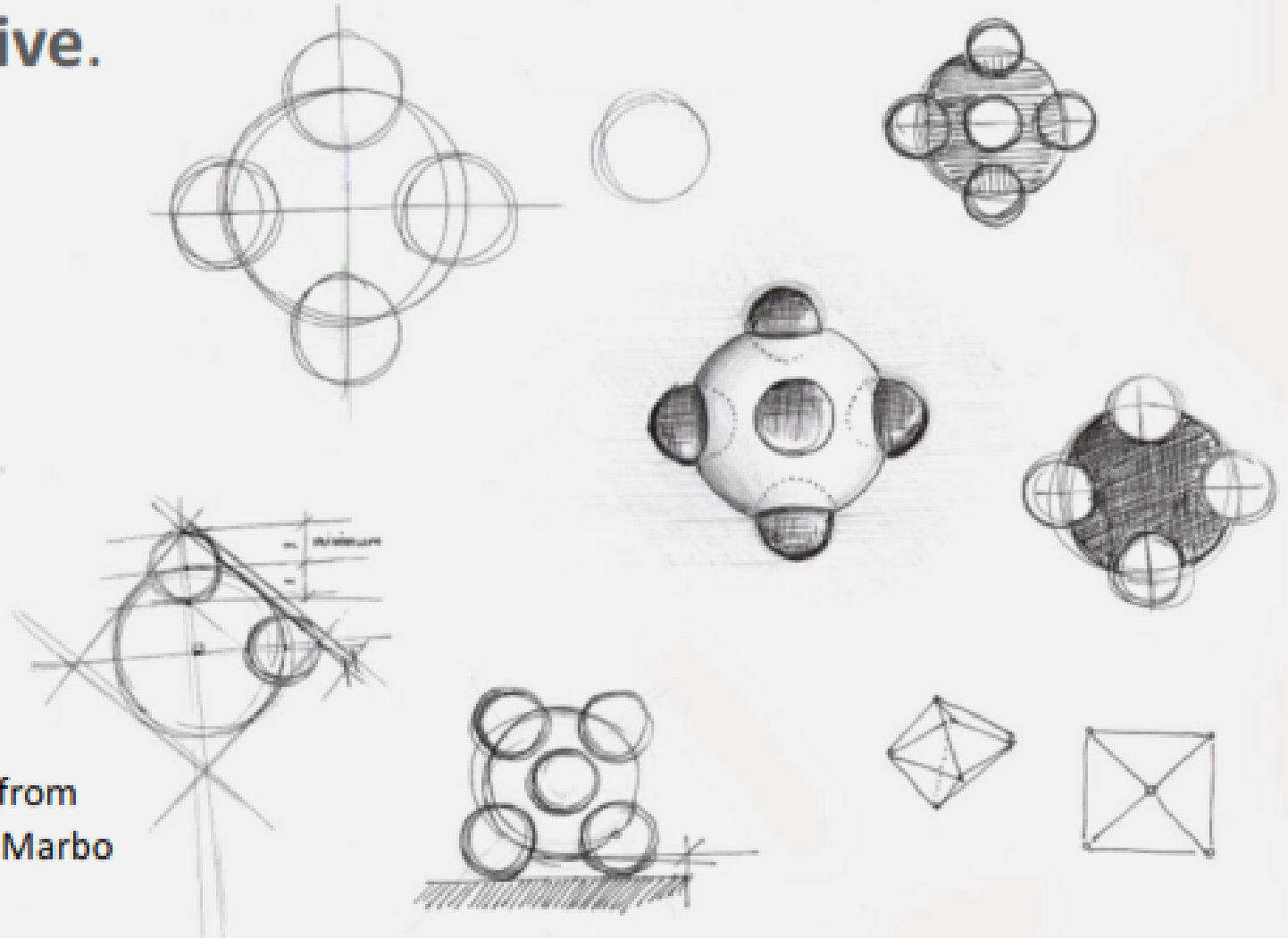
Digital Design:
- Rough Sketches,
- Wireframes
- Architecture
- Low-fidelity Prototypes

Science/Technology:
- Equations/formulas,
- Sketches, Drawings
- Scaled Models
- Experimental set-up
- Pilot Test

What are Rough Sketches?

Rough Sketches as the name suggests are rough, quick and enables being iterative.

Rough Sketches are sample, draft versions of the ideas or concepts and **helps one to quickly visualize, test, get feedback and change/iterate before the design is finalized.**

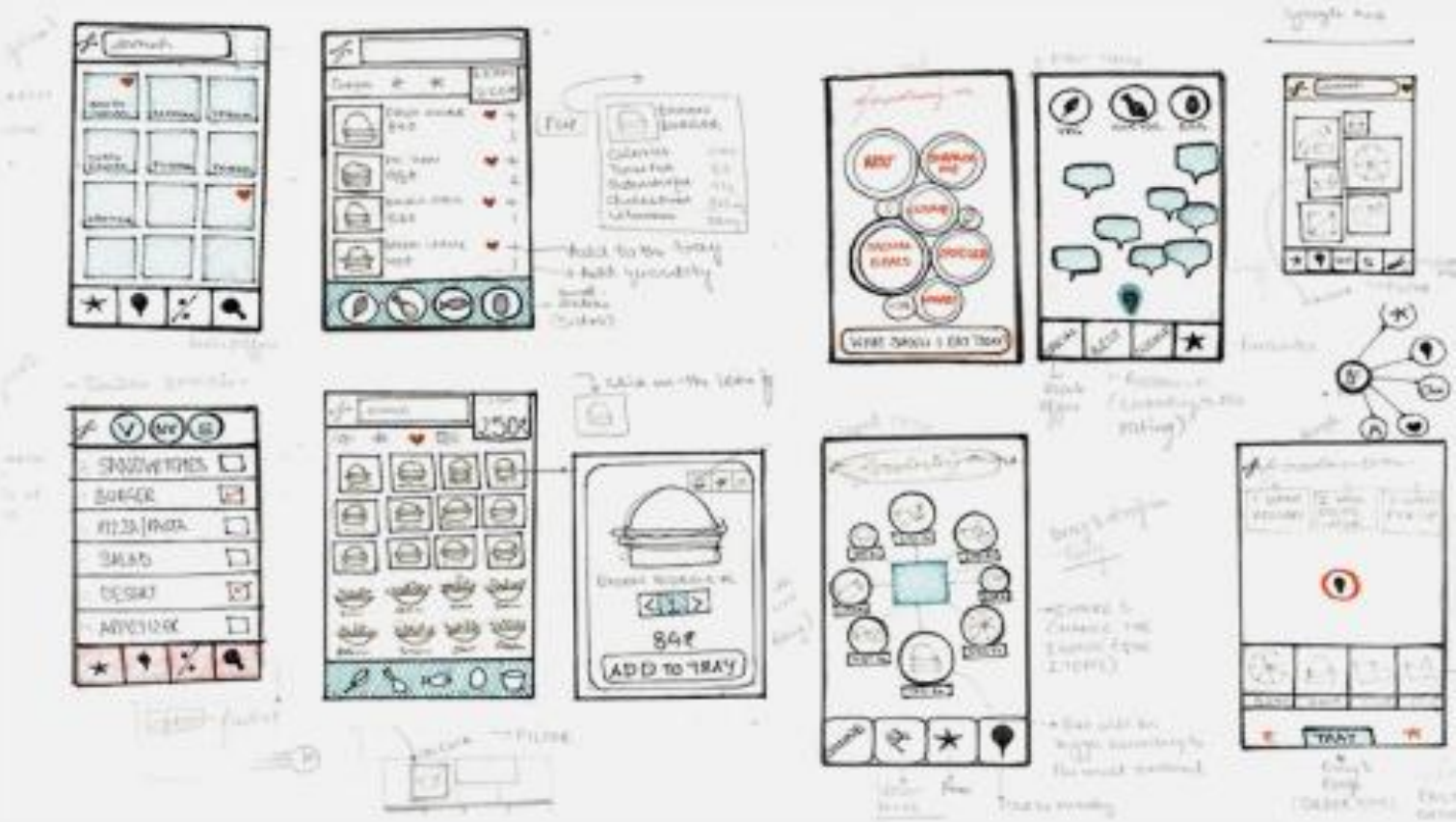


Reference: from dsource.in (Marbo Ideation)

What are Wireframes?

Wireframe Sketches are simple, quickly drawn outlines of the interface elements that are part of the digital environment especially for screen based interfaces.

These wireframes help one to quickly visualize the layout,composition, test, get feedback and change/iterate before the design is finalized.



Reference: from dsource.in (Food menu interface by Astha Kabra)

What are ‘Draft Layouts’?

Draft layouts are rough, quickly drawn outline of the elements of a page showing different elements of the composition like text, images, interface elements, grids, etc.

Layouts ideation are useful for both the digital as well as the physical layouts. - a web page, Mobile interface or that of a poster, magazine or a storybook.

These Draft Layouts help one to quickly visualize the layout, test, get feedback and change/iterate before the design is finalized.

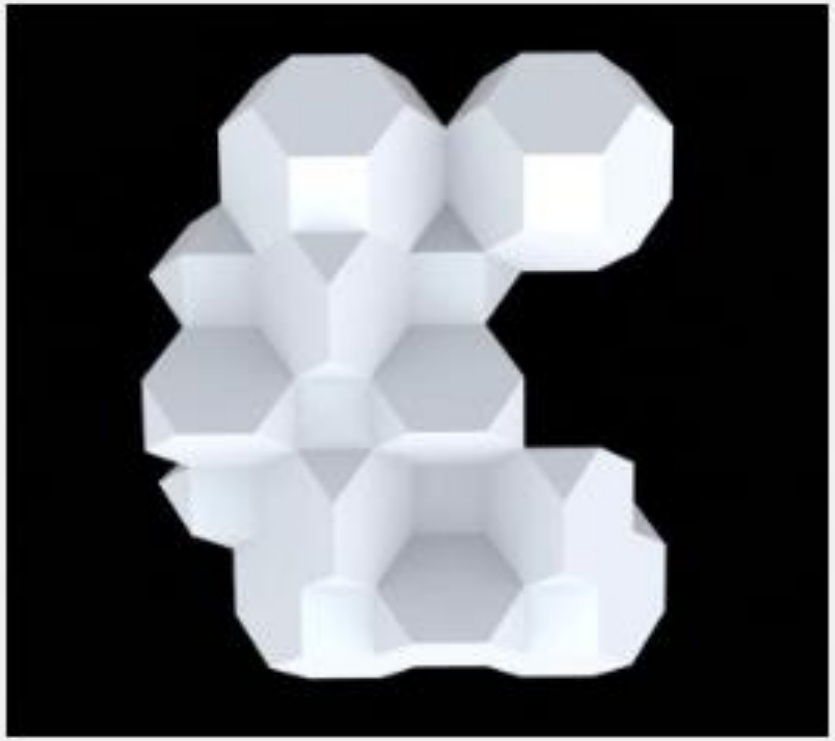
Draft Layouts . . .

Shown here are draft initial ideation layout along with the final version layout for an animation film.

What are Paper Prototypes?

Paper Prototypes are a rough, hand sketched layouts of the ideas suited for Digital interface layouts, Graphic Publications as well as 3D objects done using paper.

Paper Protypes are simple, easy, draft versions of the ideas or concepts and **helps one to quickly visualize, test, get feedback and change/iterate before the design is finalized**.



Reference: from dsource.in (Geometry in Designn by Prof. Ravi Mokashi Punekar and Prof. Avinash Shinde)

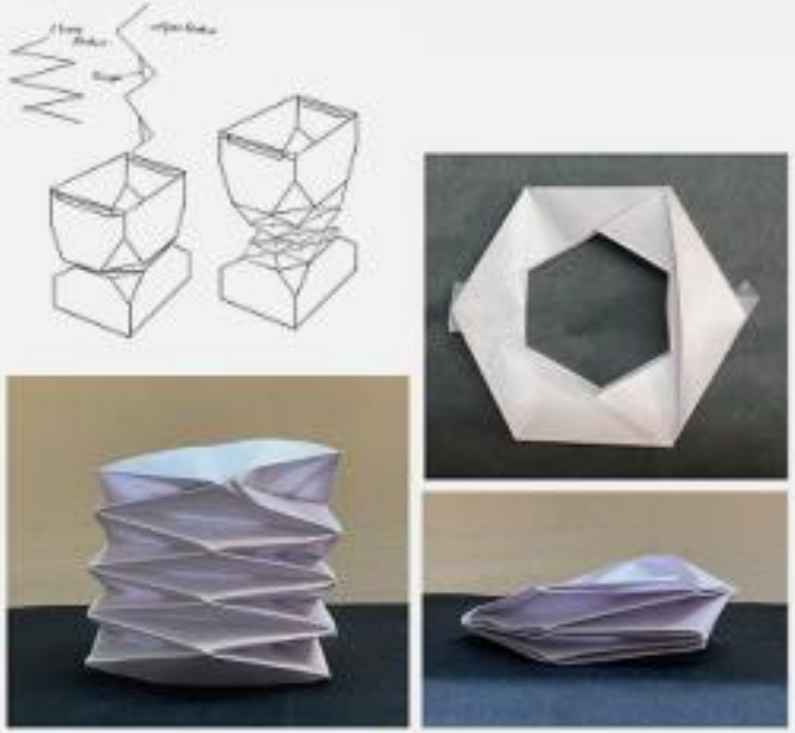
Reference: from dsource.in (Pop Up design by Mugda Kale)

What are Mock-ups with Card-board?

Card board Mockups of the idea can be made quick and iteratively to come out with several versions using a thick paper or cardboard.

Card-Board Mockups are sample, draft versions of the ideas or concepts and **helps one to quickly visualize, test, get feedback and change/iterate before the design is finalized**.

Reference: from dsource.in (Packaging Design Course by Prof Mandar Rane and Purba Joshi)



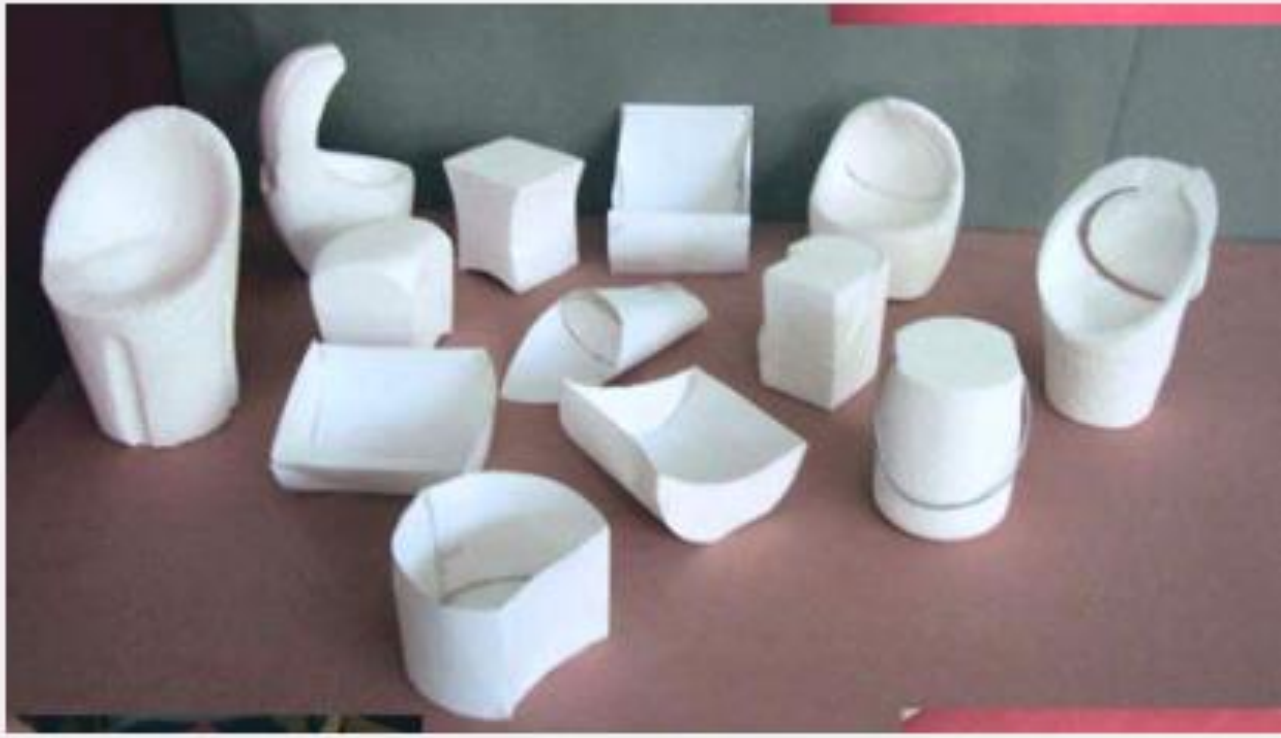
Reference: from dsource.in (Vegetable Storage unit by Arunprakash Ezhilarasan)

What are Mock-ups with Clay?

Clay Mockups of the idea can be made quick and iteratively to come out with several versions. **Clay is also suitable for organics shapes.**

Instead of Clay, Plaster of Paris could also serve to make rapid 3D draft models to try out ideas.

Here are shown plaster and paper prototypes for redesign of a bucket.



Reference: from dsource.in (Product Design Course by Prof Bapat and Purba Joshi)

What are Mock-ups with Wood?

Wood Mockups of the idea can be made and are suitable for making a mock-up of organic shapes and including details.
The wooden mock-ups can be painted.
And soft wood is easier to workwith.

Wooden Mockups are sample, draft versions of the ideas or concepts and **helps one to visualize, test, get feedback and change/iterate before the design is finalized.**

Reference: from dsource.in
(Case Study 'Smaran')

What are ‘Scenarios’ and ‘Story- board’?

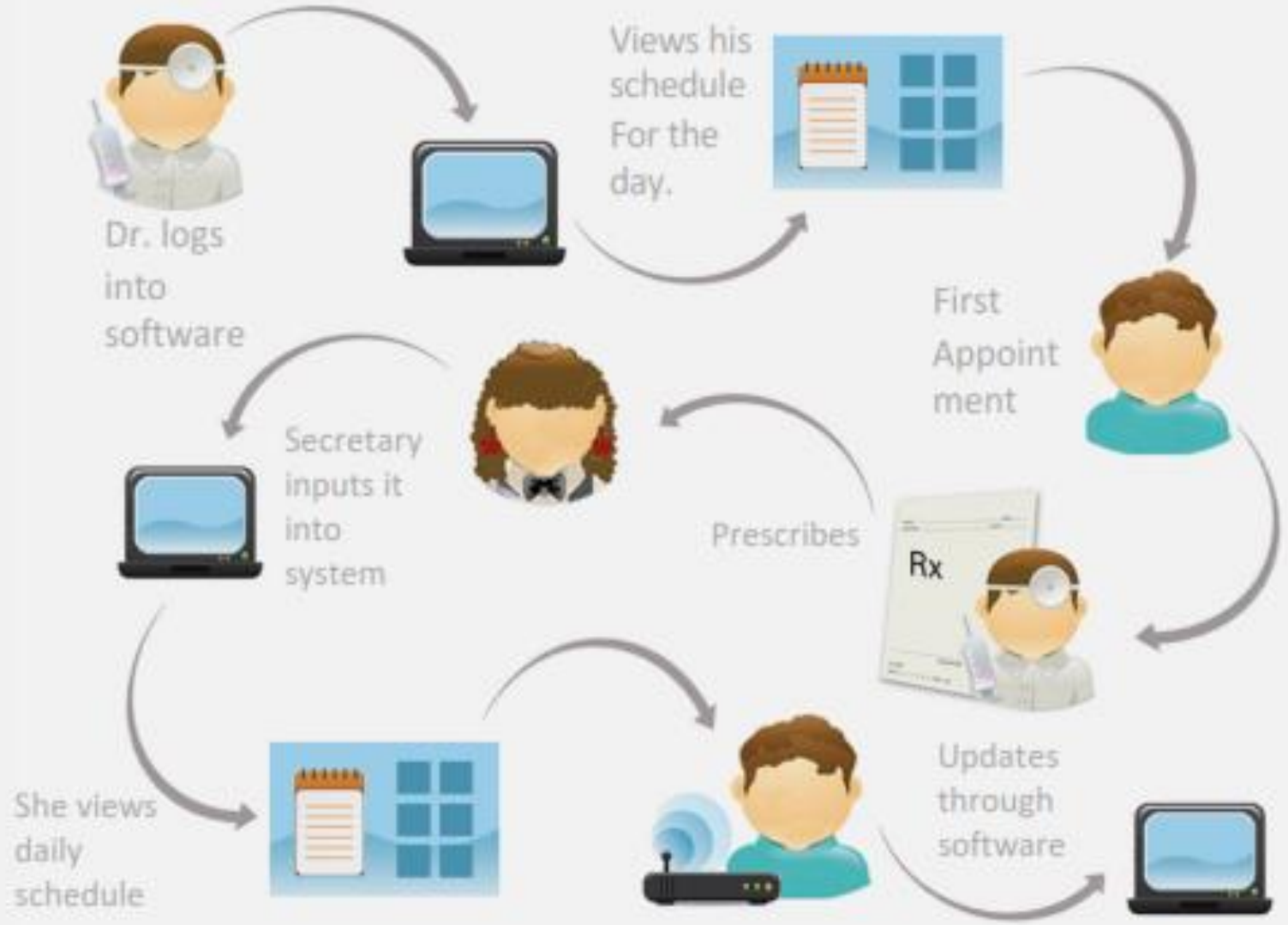
Scenarios are the sequence of events or actions the user takes in interacting with the designed idea. The scenario can be fictional demonstrating the use of the idea/concept. The scenario can make use of personas.

The different ways the scenario or storyboard can be narrated are:

1. Written in text form
2. Illustrated with visuals
3. Storyboard with step by step visuals and text
4. As a video with narration

What are ‘Scenarios’ & ‘Story- board’ . . .

Here is shown an interaction between the patient and the doctor along with the secretary as a scenario.



What is ‘Prototyping’ Part 2?

Prototyping Part 2 involves Medium Prototyping, the next version of **ideas and concepts.** It also involves **trying out - Minimum Viable Product (MVP) or Proof of Concept (PoC)** as well as **understanding how the user would interact and experience the concept** along with **deciding appropriate choices of technology and media.**

Soft > Medium > **Hard**

Prototyping part 2 takes you closer to the final version of the idea or concept. And, helps one to visualize, make it tangible, test, get feedback and change/iterate before the design is finalized.

Why is ‘Prototyping part 2’ important?

Prototyping part 2 takes you further closer to the final version of the idea or concept. And, helps one to visualize, make it tangible, test, get feedback and change/iterate before the design is finalized.

Prototyping Part 2 involves Medium Prototyping, the next version of ideas and concepts. It also involves trying out - Minimum Viable Product (MVP) or Proof of Concept (PoC), Information Architecture (IA) as well as understanding how the user would interact and experience (XD) the concept along with deciding appropriate choices of technology and media.

Soft > **Medium** > **Hard**

Prototype part 2:

(MVP > PoC > IA > XD)

‘Medium Prototyping’ in Creative Domains:

Architecture:
- Form Sketches,
- 3D Renderings,
- Scaled Models

Arts:
- Draft Sketches,
- Draft Drawings,
- Scaled Models

Film:
- Draft Script,
- Scenario Sketches,
- Setting,
- Character Sketches

Animation:
- Draft Script,
- Scenario,
- Character Sketches,
- Animatics

Graphic Design:
- Draft Layouts,
- Paper Prototypes
- Printed Outputs

Product Design:
- Draft Sketches,
- Draft Renderings,
- Proof of Concept

Digital Design:
- Draft Sketches,
- Info Architecture
- Medium-fidelity Prototypes

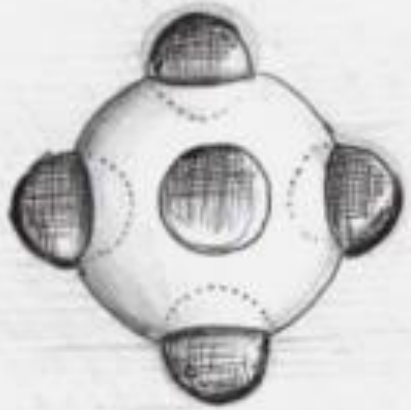
Science/Technology:
- Equations/formulas,
- Drawings, Visualization
- Working Models
- Experimental set-up
- Testing and Validation

What is Minimum Viable Product (MVP)?

Minimum Viable Products as the name suggests have just enough features or functionality in order to get feedback from its users.

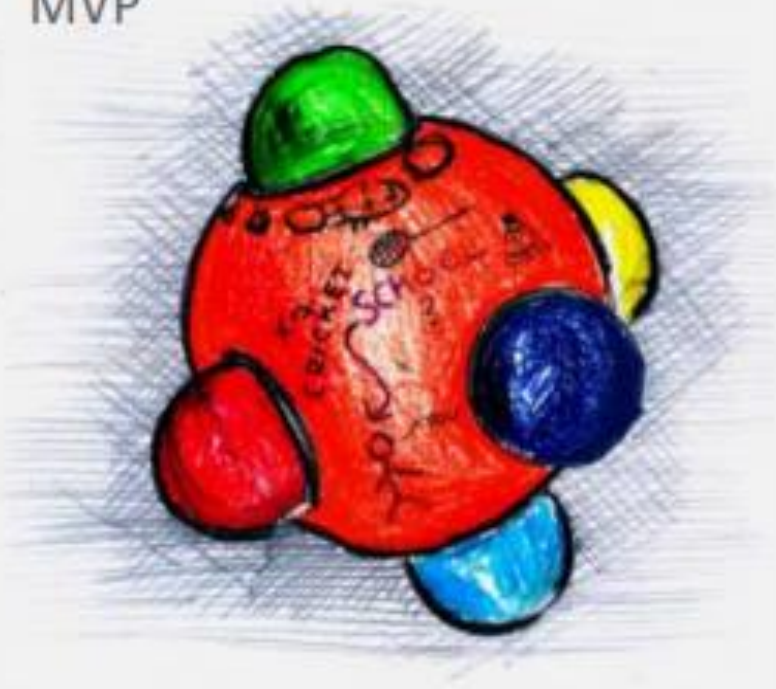
MVP can be seen as part of the lean startup process saving time, efforts and costs.

MVP is a simple version and helps one to quickly visualize, test, get feedback and change/iterate in order to make the next iteration.



Reference: from dsource.in (Marbo Ideation)

Idea Sketches of the sharable Marbo product as reference for making MVP



Steps in MVP: a simple prototyping technique

1. Select the concept/idea that you want to prototype
(Make sure to write down the most important aspects of your concept)

2. Decide a way to prototype this using simple methods and materials
(you could use Foam, Cardboard, Plaster, Soft wood for 3D products.
Cardboard, printouts, cutouts for 2D products.
Wireframes/Low-fidelity prototypes on Paper, Figma for Digital Prototypes and Ardino, sensors for Interactive prototypes)

3. Make the prototype
(such that it has just enough features or functionality)

4. Get Feedback from Users
(Let the users use the MVP and get feedback from them)

MVP – getting feedback from children:

Shown here is an example of MVP made of foam with detachable units
- a tangible simple version to get feedback.

The MVP has just sufficient details to get feedback from children.

Oh we can scribble on it!

I can detach this marble and give it to my friend!!

We want it!!

Can I change the way it looks?

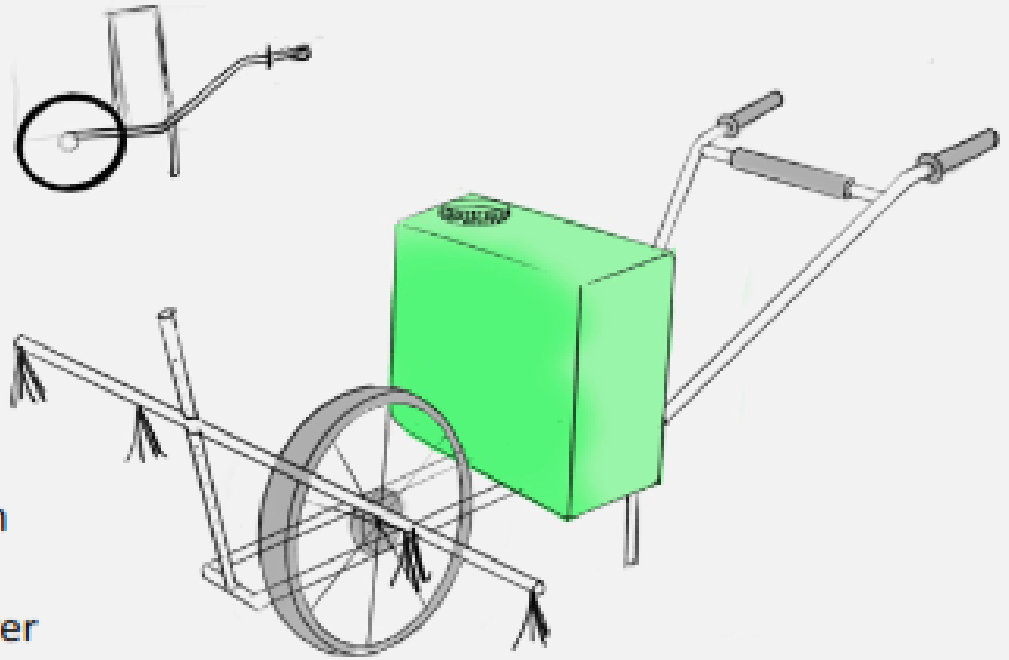
What is Proof of Concept (PoC)?

Proof of Concepts (PoC) is to demonstrate the feasibility of the core concept in order to get feedback from its users.

PoC is great for testing the functional, technical, material aspects of the concept in turn saving time, efforts and costs.

PoC much like MVP helps one to quickly visualize, test, get feedback and change/iterate in order to make the next iteration.

Idea Sketches of the Pesticide Sprayer Concept as reference for making PoC



Reference: from dsource.in (Pesticide Sprayer Ideation)

Steps in PoC: a demonstratable prototyping technique

1. Select the concept/idea that you want to prototype
(Make sure to write down the most unique aspects of your concept - it could be functional, technical or material aspects)

2. Decide a way to prototype this using available methods and materials
(you could use metal, wood for 3D products.
Cardboard, printouts, cutouts for 2D products.
Figma for prototyping Digital interfaces and
Ardino, sensors for Interactive prototypes)

3. Make the prototype
(such that it has just enough features or functionality)

4. Get Feedback from Users
(Let the users use/test the PoC and get feedback from them)

PoC – used for testing the redesign of Pesticide Sprayer:

Shown here is another example of PoC mock-up of one of the concepts - a tangible minimum version to test, get feedback and iterate.

What is Information Architecture

If **Communication of Information is of importance** in your design, then **Information Architecture is very helpful**.

Information Architecture refers to the **organization of information** in a manner that it makes **locating and navigating through information easy and understandable.**

Information **Architecture** is useful in **design of websites/digital environments, control panels, wayfinding systems for public places and roads, layout of a museum and markets, catalogues and directories**.

IA in different domains:

Digital Interfaces:
- Navigation,
- Icons,
- Menu,
- Buttons & Hyperlinks

Control Panels:
- Buttons/Switches,
- Sliders,
- Rotary knobs
- Interface Displays

Wayfinding Roads
- Signages,
- Symbols + Text,
- Arrows,
- Colour

Museum Layouts:
- Layouts,
- Navigation,
- Signage Directory,
- Arrows

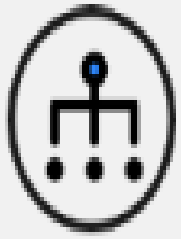
Store Layout:
- Directions,
- Signage
- Sections
- Facilities

Public Places:
- Facility listing,
- Signages,
- Directions
- Navigation

Directories:
- Index,
- Content Listing
- Page Numbers
- Use of Icons

Library Layouts:
- Layouts,
- Index/Catalogue
- Navigation,
- Indexed Shelves,
- Arrows for Direction

Steps in IA: Organization of Information



1. Categorize the information into different groups based on similarity

(You can make use of Card Sorting to give heading to each of the categories)

2. Decide the direction of Information Flow – this will decide the Navigation

(ideate on the most logical way to go from one information to another – this will become the direction or path of the information)

3. For wayfinding, its best to do a walkthrough and decide the decision making points

(The decision making points would be the places where information needs to be displayed)

4. Make a rough Prototype and get feedback

(Let the users use/test the rough prototype and get feedback from them)

Example of Information Architecture:

Shown here is the Facilities Architecture useful for the Design of Wayfinding and Signage System for Mumbai Suburban Railway Stations

Example of Information Architecture:

Shown here is the Information Architecture for the Jellow Interface – a communication device for children who have difficulty with speech

Reference: dsource.in

What is Experience Design?

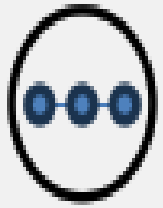
Experience Design is the design of Products (both Physical and Digital), Services or Systems to facilitate easy understanding, satisfying engagement and good/emotional experiences.

Easy Understanding:
> easy to locate, comprehend, navigate and use.

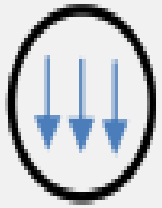
Satisfying Engagement:
> feels good to interact,
> Is functional, works well

Good/Emotional Experiences:
> feels comfortable,
> memorable involvement

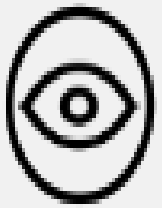
Steps in XD: Experience Design



1. Do a step by step walkthrough of all the sensory interactions with the product/service



2. While doing the step by step walkthrough note down all the decision making points
(The decision making points wood be the places where the interaction needs to be easy and intuitive)



3. Decide how many of the senses will be involved in interacting with the concept
(What sense are the best suited ones for the interaction that is needed)

4. Make a rough Prototype and get feedback
(Let the users use/test the rough prototype and get feedback from them)

Examples of Experience Design

1. **A ceiling fan** that recognizes the presence, sets its speed according to ambient temperature, makes no noise and switches off when the person leaves the room.

2. **A grinder/mixer** that grinds silently, can mix in a range of fine to rough grinding and gives a signal when the grinding is done.

3. **An email application** that can reveal the mood of the message, shows the importance/urgency of the message and can identify if the message is from friends, colleagues and strangers. It would make use of space, size, colour, icons, etc. to visualize and organize the emails appropriately.

What is ‘Final Prototyping’ Part 3?

Prototyping Part 3 involves Hard Prototyping, the final version of **ideas and concepts.** Here the prototype is made to look as much as like it should be – it could be **based on its materials, shape, colour, size and function.**

At this stage it is essential to look at **Human Factors/Ergonomics** to make sure the concept **fits in with human capabilities and limitations.**

Soft > **Medium** > **Hard**

Prototyping part 3 takes you very close to the final version of the idea or concept. And, helps one to visualize, make it tangible, test, get feedback and change/iterate before the design is finalized.

How is ‘Hard Prototyping’ done?

Some of these techniques make sure to represent and visualize the final version of the concept or idea and be able to get feedback from its users.

A. Human Factors/Ergonomics – maps to user capabilities and limitations

B. System Mapping – to give an overview of the solution along with its interconnected elements

C. Hi-Fidelity Prototyping - it looks like what the final producd be like

D. 3D Modelling and Printing – both can produce actual prototypes in 3 dimensions using the actual materials and with functionalities

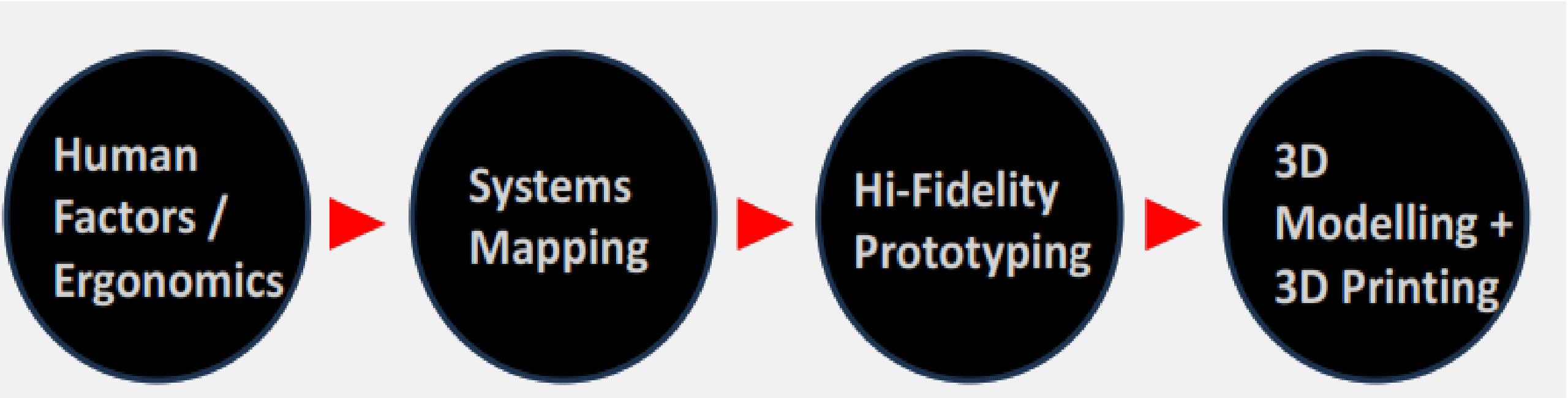
‘Hard Prototyping’:

Human Factors / Ergonomics:
- Matching User Capabilities and Limitations

System Mapping:
- Visualise Core idea with its interconnected elements

Hi-Fidelity Prototyping:
- Hard Prototyping,
- Close to Final Product
- Form and Function details

3D Modelling and Printing:
- 3D prototypes,
- 3D Printed Prototypes
- Material, Size and Function


Human Factors / Ergonomics
Systems Mapping
Hi-Fidelity Prototyping
3D Modelling + 3D Printing

Human Factors and Ergonomics . . .

International Ergonomics Association in 2000 defined
Ergonomics (or human factors) as the scientific discipline concerned with the understanding of the interactions among human and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance.

Ergonomics (or human factors) is a vast field with varied applications and branches. Here in this section, is an introduction to this subject as part of Design Thinking and Innovation course

Learners interested in knowing more about this subject are encouraged to look through the references mentioned in this chapter.

Three broad specializations of Human Factors /Ergonomics) is as follows:

Physical Human Factors / Ergonomics:

- Physical Capabilities and Limitations
- Anthropometrics
- Physical Workload
- Postures
- Ambient Conditions
- Visual Ergonomics

Cognitive Human Factors / Ergonomics:

- Memory, Attention
- Perception
- Emotion
- Motor Response
- Information Processing
- Human Computer Interaction

Organizational Human Factors / Ergonomics:

- Teamwork
- Social Interactions
- Collaborative Workspaces
- Social Systems
- Environments

Application of Human Factors/Ergonomics:

Physical Human Factors / Ergonomics:

Anthropometrics:

Anthropometrics is the measurement of human dimensions.

This is very useful while doing design of workspaces, seating, controls for operator, drivers comfort.

Do note the dimensions are not the same for all users.

Visual Ergonomics:

Visual Ergonomics plays an important role in the design of signage systems, readability of newspapers, control display panel organization and systems where visual decision making is key. One needs to look at light conditions, movement of the eye, the angle of vision, Contrast in foreground background, Visibility at night or in low light conditions, etc.

Cognitive Human Factors / Ergonomics:

Memory, Attention, Perception and Motor Response play a significant role in the ability of Human beings to process Information.

Application of these considerations are in the design of Human Computer Interaction systems or applications.

Organizational Human Factors / Ergonomics:

Teamwork, Social Interactions, collaboration are important factors while designing collaborative workspaces, social public space environments, Social networking systems and design of spaces for social interactions.

Human Factors/Ergonomics specializations:

Think of Human Factors/Ergonomics) while designing any of the following:

Knob of Door:
- for a child, elderly
- person with disability

Toys for Children:
- Softness, edges, colour, material

Cooking Utensils:
- person with low vision,
- elderly

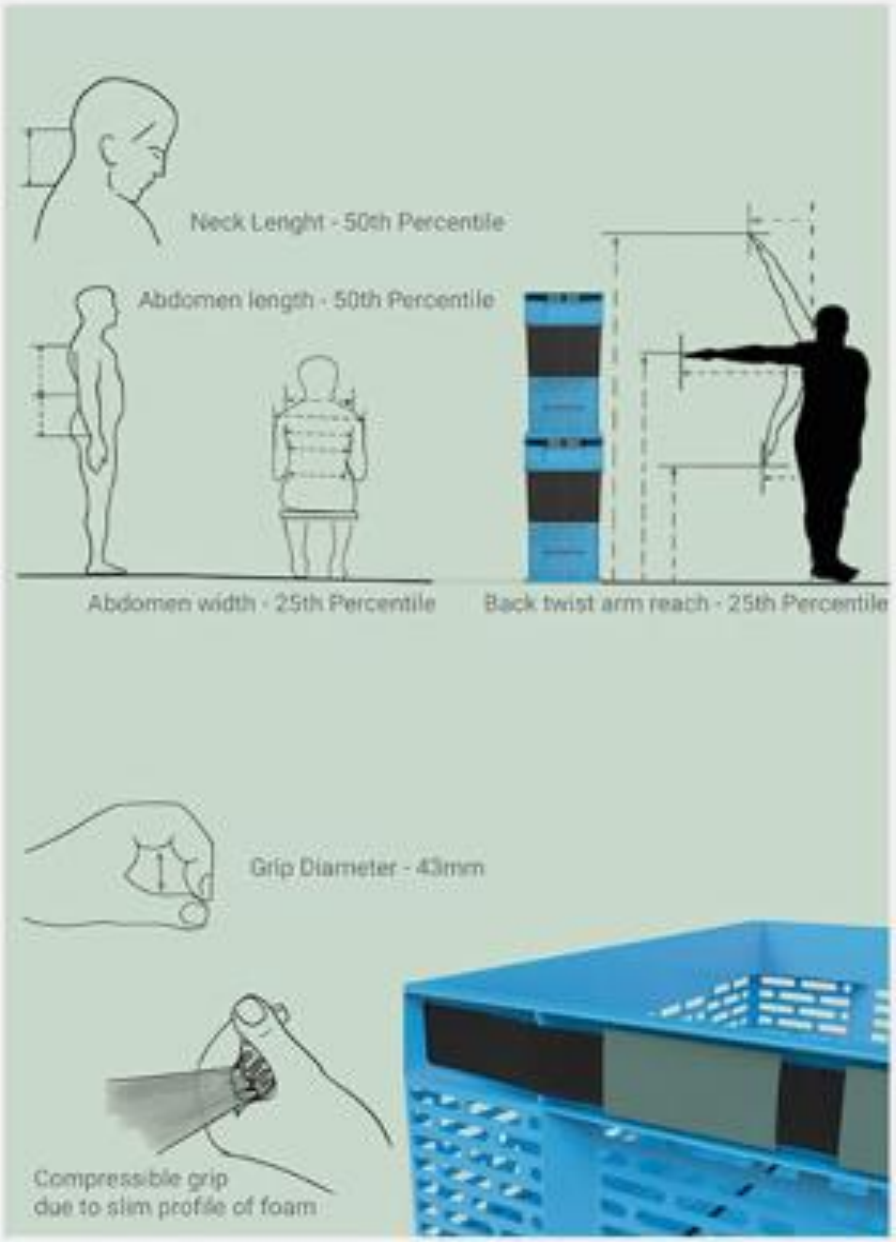
Wayfinding Signage:
- for a child, elderly
- person with low vision
- person with different language

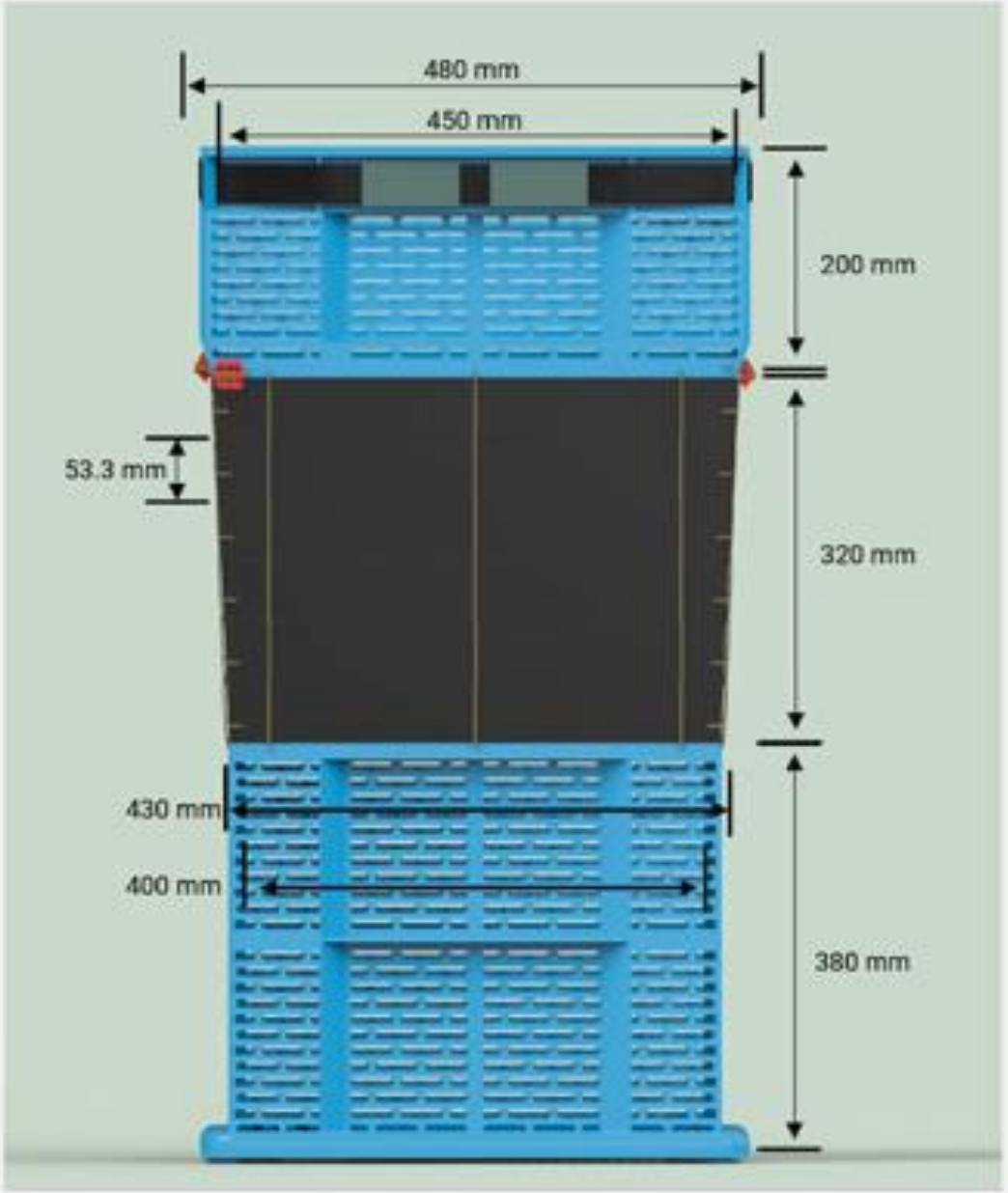
Mobile for Elderly:
- size of touch interface
- size of text

Medicine Instructions:
- for a child, elderly
- person with readability issues

Safety for Women:
- public Lighting
- emergency options
- social safe systems

Anthropometric Factors applied to Storage Design:



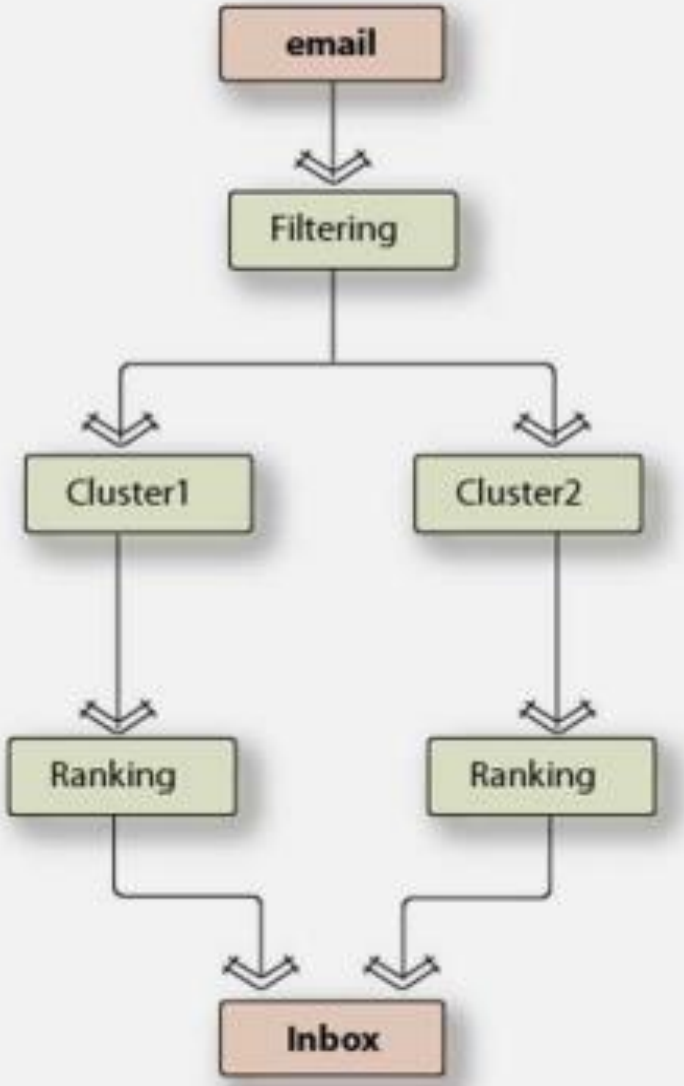


What are System Maps?

System maps are kind of similar to Concept Maps (shown in week 10 Tools) **and depict how the final design solution is interconnected and linked to other components or parts of the solution.**

System Maps are helpful to give an overview broader perspective of the interconnectedness of the solution in one visual representation.

Systems Map for a new email interface:



What is Hi-Fidelity Prototyping?

Hi-fidelity prototype is the prototype version of the concept with almost all the details in terms of shape, colour, texture, resolution and functionality

This is great for getting the feedback from its users as it is almost like the final version.

Digital versions of Hi-fidelity prototypes are easier to make than the 3D prototypes. Hi-fidelity prototypes are great for prototyping Publications, Digital Interfaces, Packaging solutions, Card and Board games.

Examples of Hi-Fidelity prototype:

- A Smart Device for Bedroom

After undergoing numerous revisions and undergoing a thorough examination, the app has evolved into its current state, which is a result of careful refinement and improvement.

What is 3D Modelling and 3D Printing?

3D modelling is used for creating objects in 3 dimensions. The 3D modelling could be created physically, digitally or 3D printed digitally

Physical 3D Modelling:
Various materials can be used for this: Wood, Metal and Plaster

Digital 3D Modelling:
Digital 3D models are done inside a computing environment using many applications
a. solid modelling
b. wireframe modelling
c. surface modelling

3D Digital Printing:
3D digital printing allows for making 3D objects using various materials
- there are many ways/methods of 3D printing.

Gather feedback from real or target users.

Why test?

Testing involves gathering feedback from real or target users to evaluate a design's success and identify where improvements are needed. The Test and Prototype stages usually occur in a cycle, as prototypes are refined (or replaced) in line with user feedback before being re-tested again and again, until the product or service is ready to be launched. The Test stage is essential to:

- identify usability and accessibility issues early, so that the user experience can be optimised prior to implementation, hence saving time and money
- keep the user at the heart of decision-making, by determining whether the design satisfies their needs, rather than being driven by assumptions
- reveal unexpected insights that were not uncovered during the Empathise stage and may invalidate or re-focus the problem or solution.

What is Usability Study . . .

It could be about any of these factors:

- **Efficiency**
- **Human Factors/Ergonomics**
- **Experiences, Interactivity**
- **Ease of Use, Intuitive to use, Affordances**
- **Aesthetics,**
- **Learnability**
- **Sustainability**
- **Comfort levels**

It could be about the design of any of these:

- **Products,**
- **Services,**
- **Digital interfaces,**
- **Communication medias,**
- **Environments**

How to do Usability Studies?

Usability studies can be done in many ways.
Here are a few suggested methods:

- **Observation and Conversations** - before using, while using, after using
- **Think Aloud Protocol** - while using
- **User Testing** - while using

The feedback that one gets can be both qualitative or quantitative:

Qualitative: Comfort, Feelings, Ease of Use, Experiences, Aesthetics

Quantitative: Efficiency, Error/mistake numbers, Time taken, Efforts, Recollection

What are the variables in Usability Studies?

These are the different variables in Usability Studies:

1. Observation **by Designer** and Observation **by the User**
2. **Offline** and **Online**(remote) Observation
3. Observation **in Natural settings** and Observation **in Laboratory/Workshop settings**
4. Observation **In person** and Observation **Unobtrusively**

Why do Usability Studies?

Usability studies helps identify issues or problems with the designed solution (at any stage of the design process).

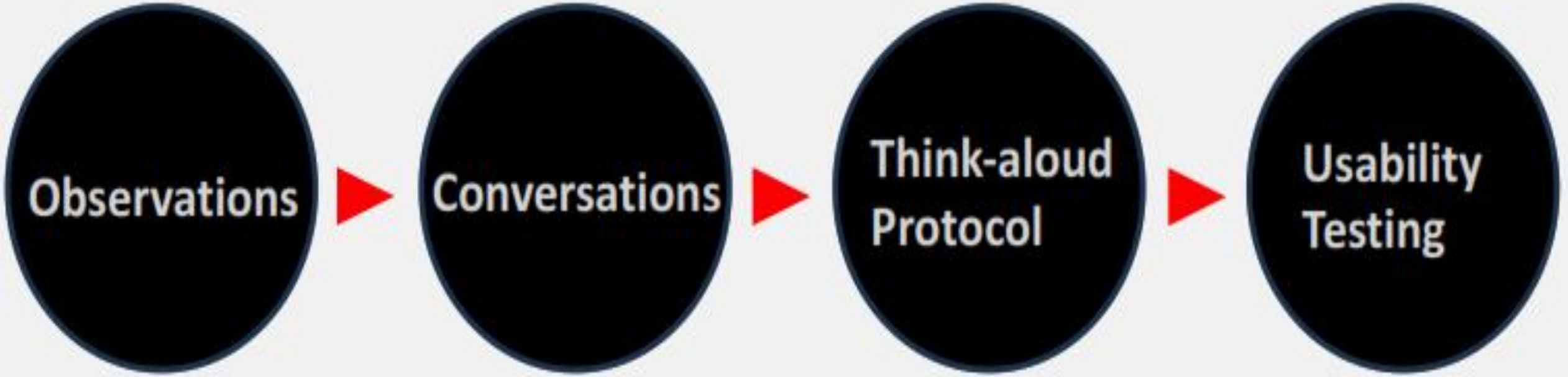
This feedback in turn can be useful in iteratively rectifying the problems and in turn redesigning.

It does **save time and efforts** as one can get feedback early on in the design process.

Usability Studies:

(Observations > Conversations> Talk –aloud Protocol> Usability Testing)

Here are a few suggested methods:

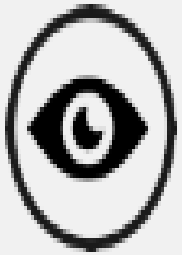


Steps in Usability Studies through Observation:

1. Finalise the prototype of Product/Workspace/Service

2. Give the prototype to the user for observation before using it

Observe the prototype for its physical features



3. Observe the prototype while it is being used

can reveal its usefulness, ease of use, comfort, skills for using, human factor considerations

4. Document the feedback before using and while using the prototype

Document while giving the feedback

What is Conversation?

Conversation is a simple method of collecting data/information about the designed solution by conversing with the user.

Conversation is done by the **Designer** with the **User** discussing various aspects of the design solution.

It is helpful to make a list of issues that the designer would like a response from the user while the user is interacting with the design solution. Cue cards can be helpful in this regard (refer to week 6: T6.2-011).

Conversation and not Interview:

Do note that we use the word Conversation instead of Interview. The main reason for this that the designer needs to get responses that are:

a. Spontaneous

b. Narrative (describing the sequence of interactions)

c. Natural exchange of experiences

What is Conversation . . .

Conversation with the User:
can be done before using the solution, while using the solution and after using the solution.

Conversation before using the design
in progress can identify its characteristics such as aesthetics, affordance, readability, feeling of comfort, its expression, etc.

Conversation while using the designed solution
can reveal its usefulness, ease of use, comfort while using, skills required for using, interactivity, human factor considerations, etc.

Conversation after using the designed solution
can reveal its overall characteristics and an overview of the solution.

Documentation:
Its best for the designer to take notes or video/audio record while conversing with the user.

Examples:
Converse with the user while trying out the newly designed Bamboo Easy Chair/ controls for Solar powered Insecticide Sprayer.

Conversation . . .

Steps in Usability Studies through Conversation:

1. Finalise the prototype of Product/Workspace/Service

2. Give the prototype to the user for conversation before using it

Converse with the users about the prototype and its physical features

3. Converse with the user while the prototype is being used

Can reveal its usefulness, ease of use, comfort, skills for using, human factor considerations

4. Converse with the user after using the prototype

Can reveal its overall characteristics and an overview of the solution

5. Document the Conversations

take notes or video/audio record while conversing with the user

What is Think Aloud Protocol?

Think Aloud Protocol is a method of collecting data/information about the designed solution where the user speaks aloud about the interactions while interacting with the solution.

The Thinking aloud is done by the **User** describing various aspects of the design solution while performing the tasks in using the solution.

Who introduced Think Aloud Protocol:

Think Aloud Protocol was described by Clayton Lewis and this method was based on the work on Protocol Analysis by K. Ericsson and Herbert A. Simon

What is Think Aloud Protocol . . .

Think Aloud Protocol:

The designer needs to request the user to think aloud about the prototype.

This can be done before using the solution, while using the solution and after using the solution.

The user says aloud about the interaction that he has about the solution.

The designer can prompt the user to do certain tasks or actions such that the use of the product is described by the user.

The designer documents the verbiage of what the user says while using the prototype.

Think Aloud Protocol method can reveal its usefulness, ease of use, comfort while using, skills required for using, interactivity, human factor considerations, etc.

Documentation:

Its best for the designer to take notes or video/audio record while the user is thinking aloud.

Examples:

User thinks aloud while trying out the newly designed music system/ controls for a smart bedroom.

What is Usability Testing?

Usability Testing is a method to evaluate and measure the characteristics of the prototype.

It involves requesting the **users to use the product and complete specified tasks, while their reactions are being documented and measured.**

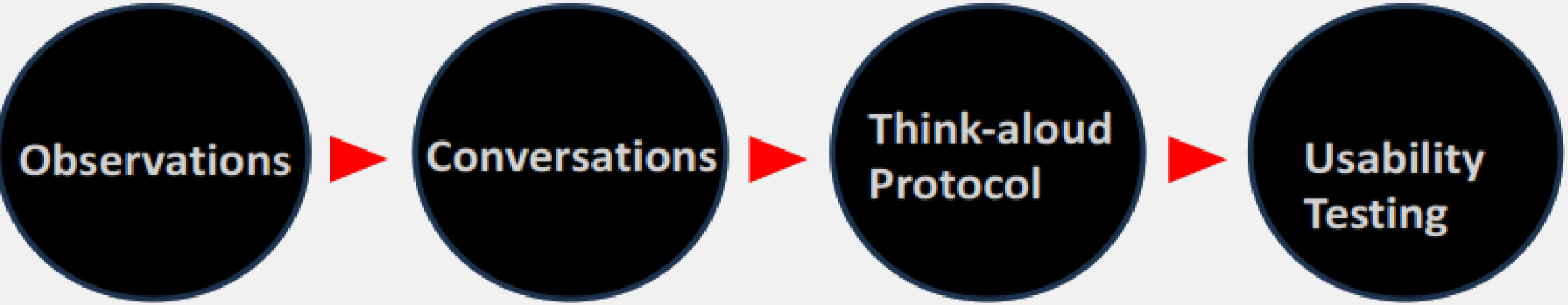
Usability Testing needs careful observation and documentation over a period of time by having different users perform similar tasks. The results can be compared, analysed to identify issues and problems in the present prototype.

This could be in terms of **its Function, Ease of Use, Interactivity, Human Factors, Comfort, Aesthetics, etc.**

Usability Studies:

(Observations > Conversations> Talk –aloud Protocol> Usability Testing)

Here are a few suggested methods:



Implementation

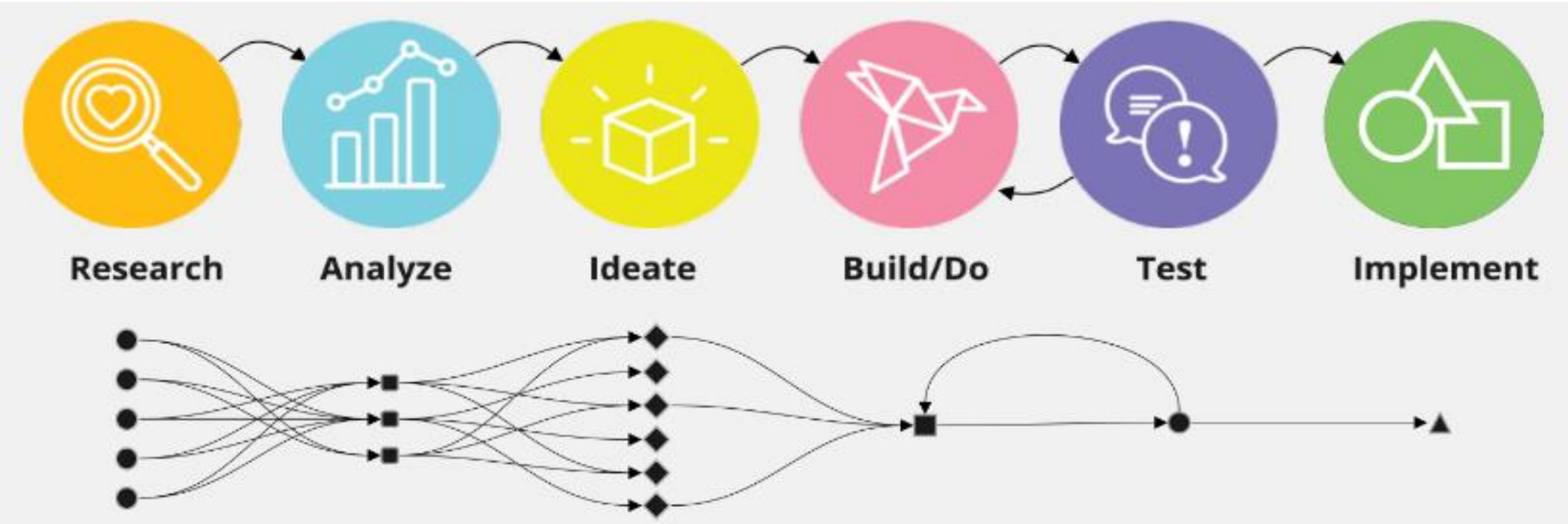
- The implementation phase is the final stage of the design thinking process, where you put your ideas and observations into action to create a solution. It's the culmination of the previous phases, and you can expect to continue making modifications and iterations until you find a successful solution.
- It’s important to note that testing and experimentation don’t abruptly end. You can expect additional iterations and modifications to the solution that entail returning to a previous stage. Continue refining until you find a successful solution and implement it. Once you’ve done that, the design thinking process is complete.

❖*Here are some things to consider during the implementation phase:*

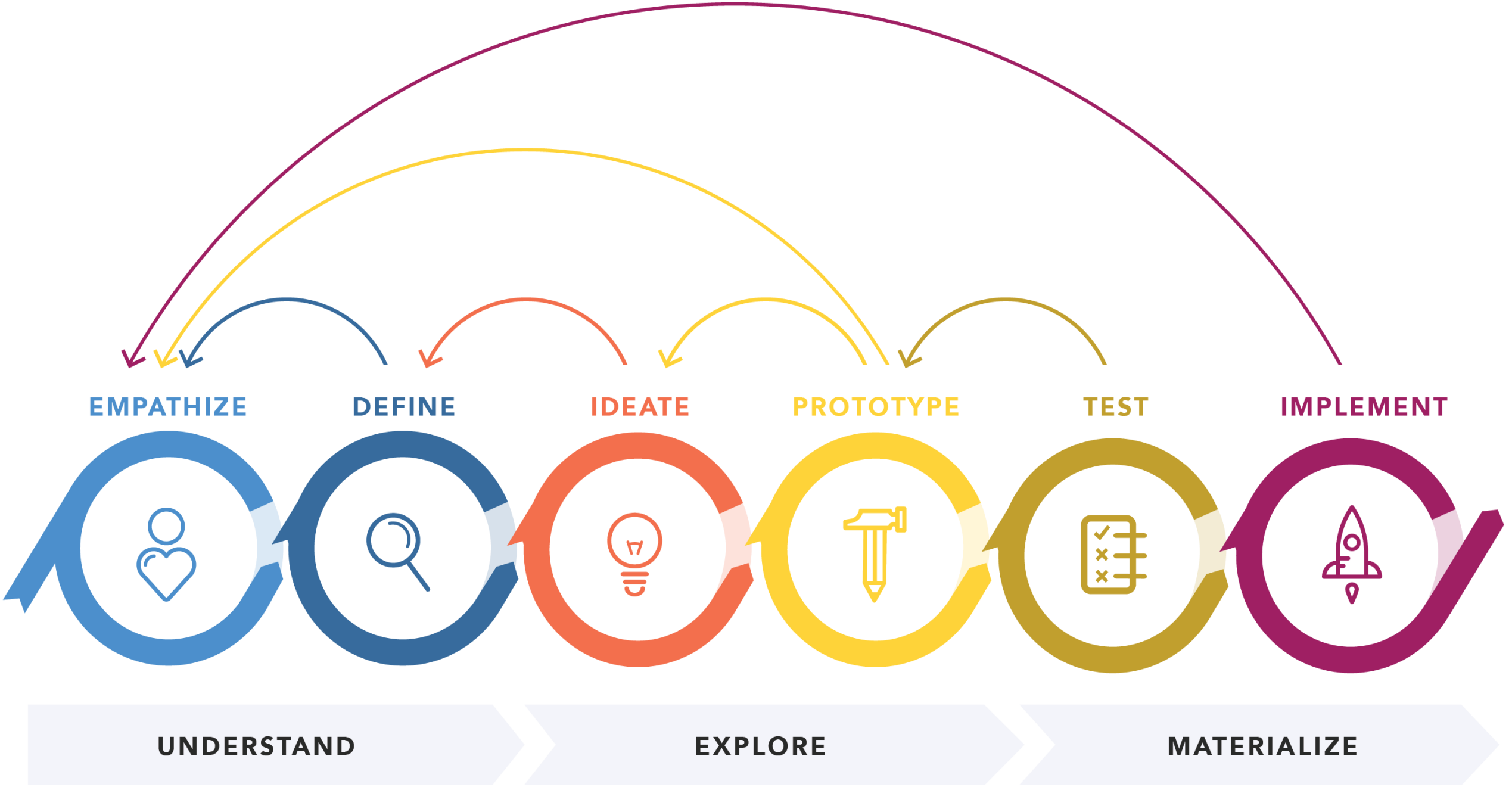
➢**Think about the long term:** Consider a roadmap for your solution, and more complex questions like what growth means.

➢**Keep iterating:** You might need to return to previous stages to make modifications and refinements.

➢**Continue testing:** Testing and experimentation don't end with the implementation phase


Research
Analyze
Ideate
Build/Do
Test
Implement

Example of Design Thinking process flow implemented by an organization



Innovative Business Model

An Innovative Business Model is a high-level strategic plan for creating and sustaining an innovative organisation.

- The Innovative Business Model encompasses **all the significant components of the organization** - from creating products or services to production to marketing and delivery.

- The Business Model is **useful for further development, getting funded and serves as a reference document/presentation** for starting an innovative business entrepreneurship.

Shown here is how to build a Canvas to **look at all the significant components of the organization** - from creating products or services to production to marketing and delivery and to look at **how value is created and sustained** – could be in terms of its social, economic, cultural significance.

Innovative Business Model Canvas

Name
Name of the proposed company

Key Activities
Key activities of the company – Product/Services/Process

Vision and Mission
Vision:what would the company do?
Mission: How will the company do it?

Team Members
Names and their expertise

Mentors/Expert Advisors
Names and their expertise

Key Partners
Describe how key partners will support

Innovative Business Model Canvas . . .

Problem Statement
List top problems are being solved

Opportunities
List key opportunities for the business

Solution
List top features of your solution

Deliverables
List major deliverables to the customer

Differentiators
List Unique features of your solution

Positioning
Describe how the solution is positioned in the market

Innovative Business Model Canvas . . .

Key Resources
Physical
Financial
Property
Intellectual
Human

Revenue Streams
Sales,
Subscription based,
Honorarium,
Consultancy Fees,
Renting,
Licensing, etc.

Cost Structure
Fixed Costs
Variable Costs

IPR
IP, Open Source,
Creative Commons, etc.

Customer Segment
Primary Customers,
Secondary Customers

Channels
List Medias through
which you can reach
your Customers

Future Plans
Development
in terms of
technology,
Materials and media

These considerations are essential for an Innovative Business Model:

1. **Vision and Mission** (What and How)

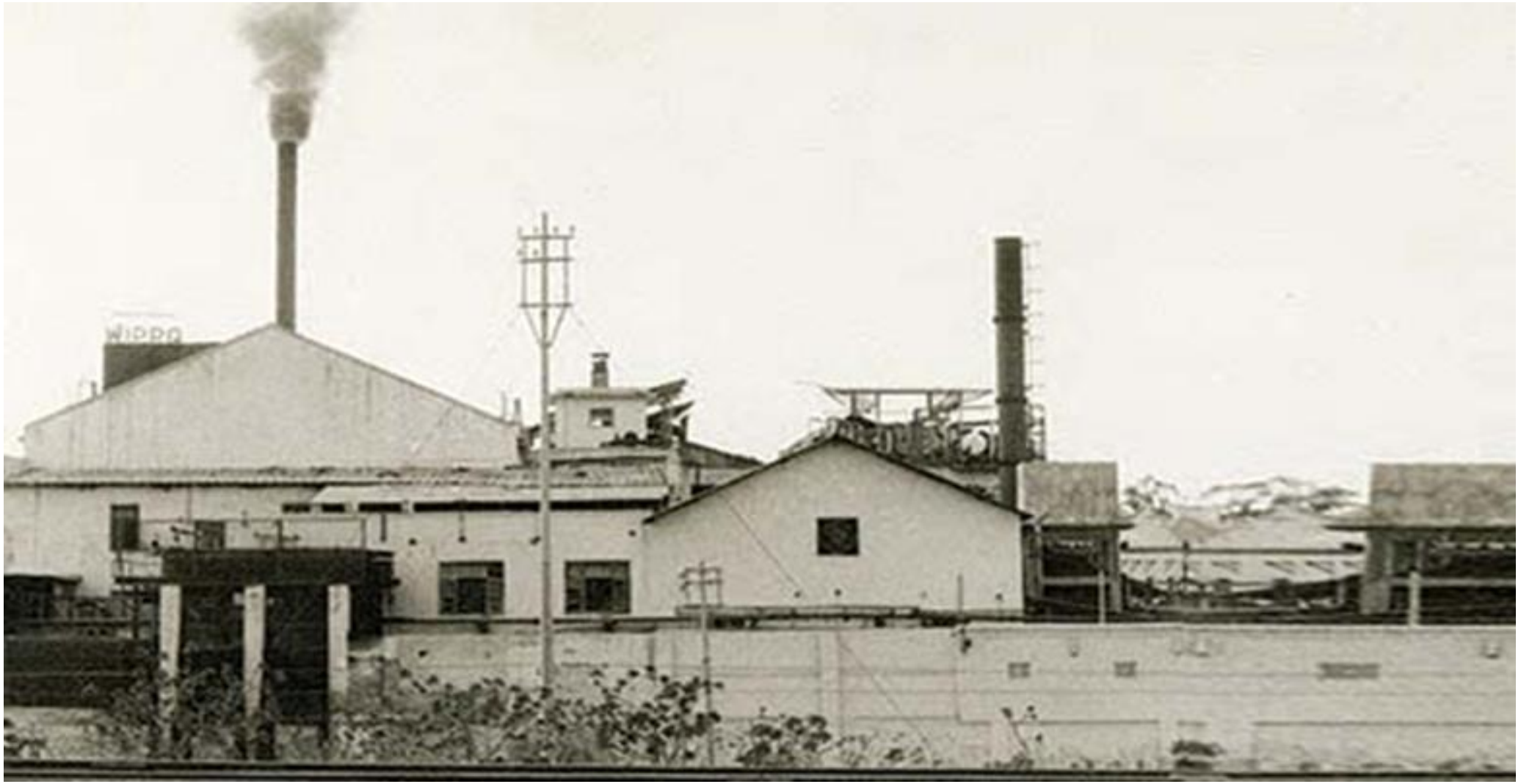
2. **Problem Statement and Opportunities**

3. **Solution and deliverables**

4. **Differentiators and Positioning**

5. **Future Plans**

First Products of some popular companies

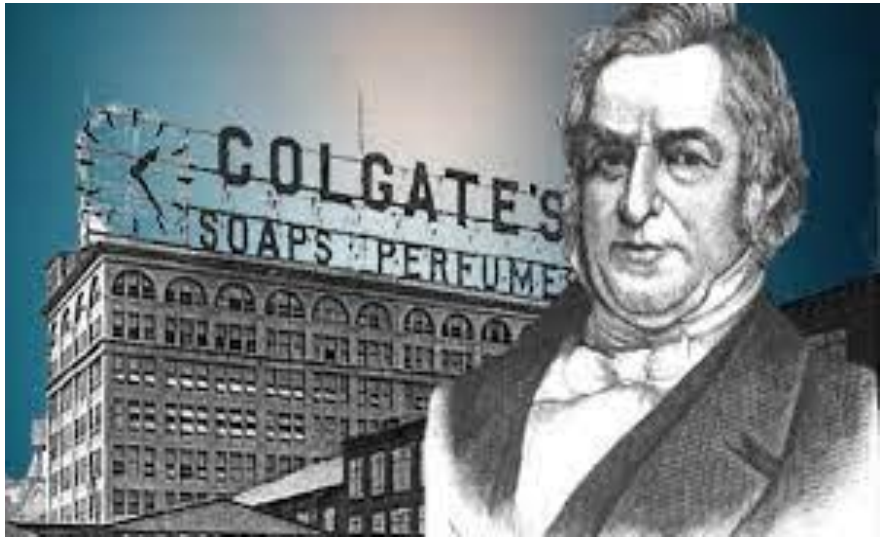


Wipro - Vegetable Oil

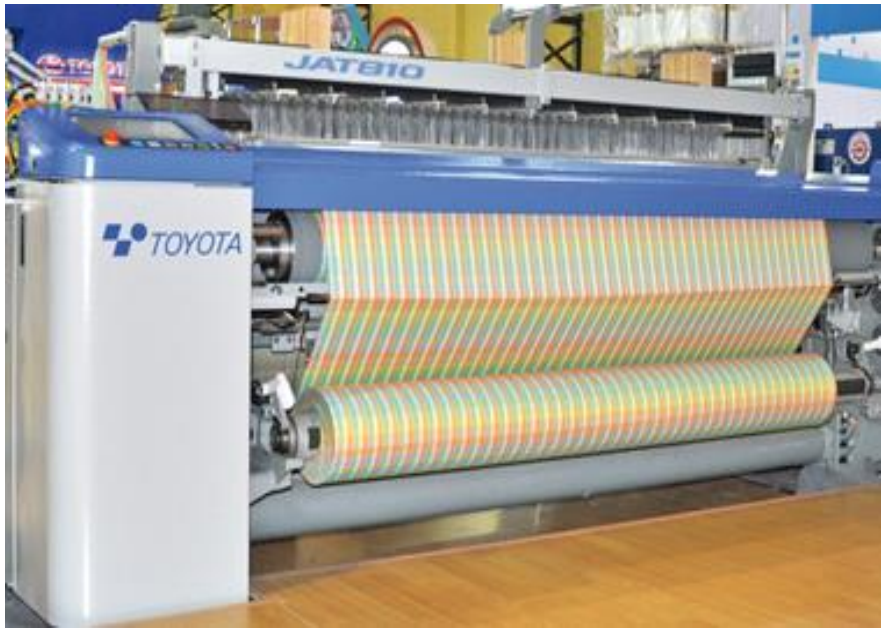
(Western India Palm Refined Oils Limited)

Nokia - Toilet Paper

Sony - Electric Rice Cookers



Colgate – Candles and Soaps



Toyota - Looms

IKEA - Pens & Stationary Delivery

LG - Face Cream

Lamborghini – Tractors

Nike – Importer of shoes from Japan

SWOT Analysis

The SWOT analysis identifies at a strategic level the strengths, weaknesses, opportunities, and threats of a business organisation.

SWOT analysis helps in making decisions and improve performance

Representing in a 2x 2 grid helps in comparison and analysis

Ref:
https://en.wikipedia.org/wiki/SWOT_analysis

SWOT Analysis details

Strengths
- Uniqueness
- Advantages
- What works well

Weakness
- What to improve
- Gaps in skills and expertise
- Limitations

Opportunities
- Market Gaps
- Customer Needs
- Value proposition

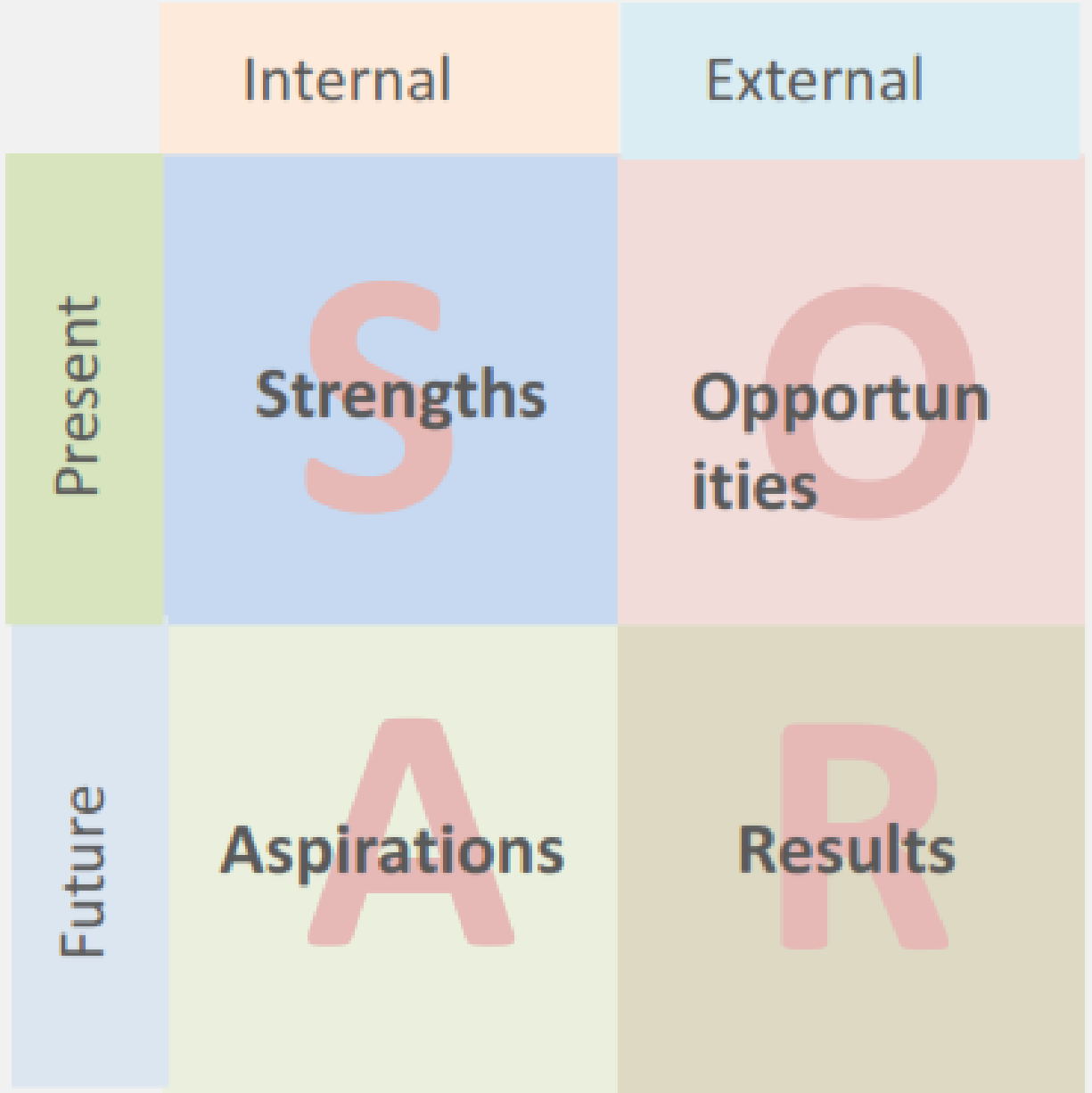
Threats
- Competition
- New materials, technology
- Changing Markets

SOAR Analysis

The SOAR analysis identifies at a strategic level the Strengths, Opportunities, Aspirations, and Results of a business organisation.

SOAR analysis helps in making decisions for the present as well as in the future.

Representing in a 2x 2 grid helps in comparison and analysis



SOAR Analysis details

Strengths
- Uniqueness
- Advantages
- What works well

Opportunities
- Market Gaps
- Customer Needs
- Value proposition

Aspirations
- Future Plans
- Vision and Mission
- Making a difference
- Inspirations

Results
- Achievements
- Setting Goals
- Track Progress
- Improve performance

Pitch Presentation

A high level presentation of your Innovative Business Model is called a Pitch Presentation.

The Innovative Business Model of your proposed Organisation/company is presented in brief so as to get an overall understanding of the outcomes and the value proposition.

A Pitch presentation is such that it takes only a few minutes to convince potential investors, partners, etc.
In these few minutes you describe what the company is, about existing opportunities, what its products/services are and its future plans.

Business Model Steps:

(Innovative Business Model> SWOT Analysis> SOAR Analysis > Pitch Presentation)