ES 115
Design, Innovation and prototyping

4 Project brief + Intro to manufacturing

Design and Innovation Centre
IIT Gandhinagar

Manasi Kanetkar
September 2024

PART 1: Project Brief

Making a questionnaire

Cover the following

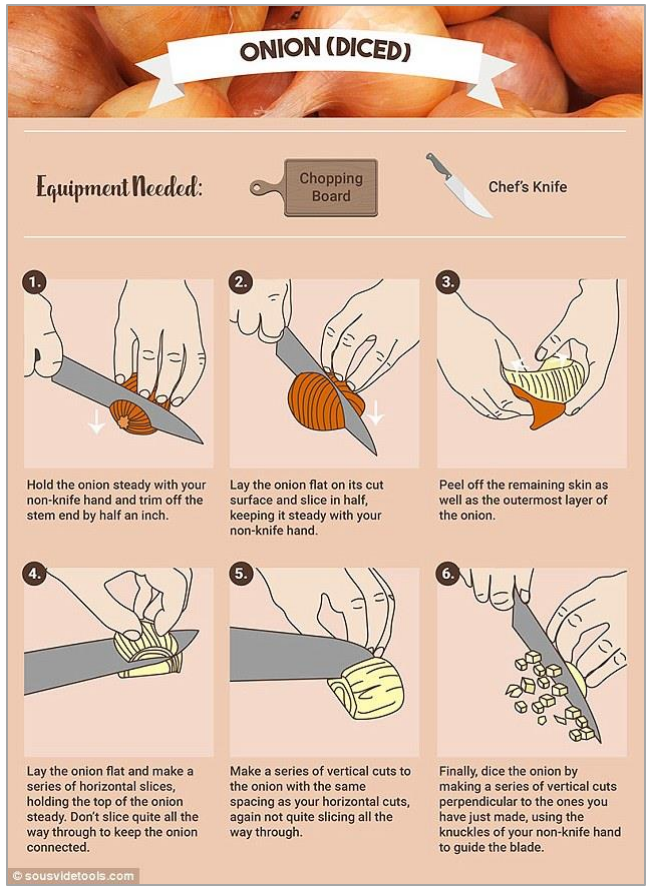
- **User details** (name, age, gender, education as applicable)
- Questions about **frequency** of task, **time taken**
- Level of human **skill** and engagement
- **Products and tools** used in current scenario

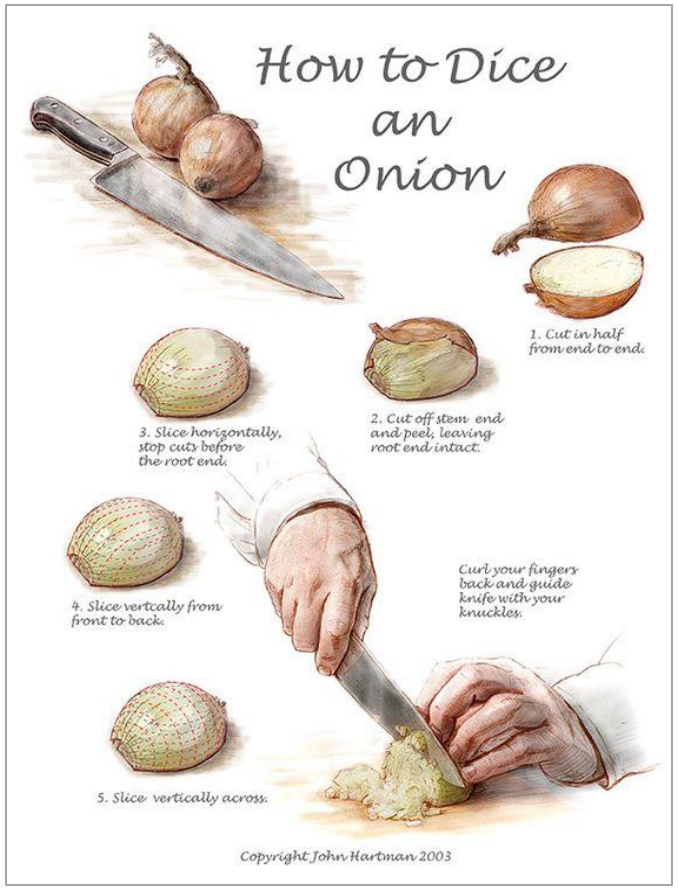
Note: Think of a way to get and record relevant information

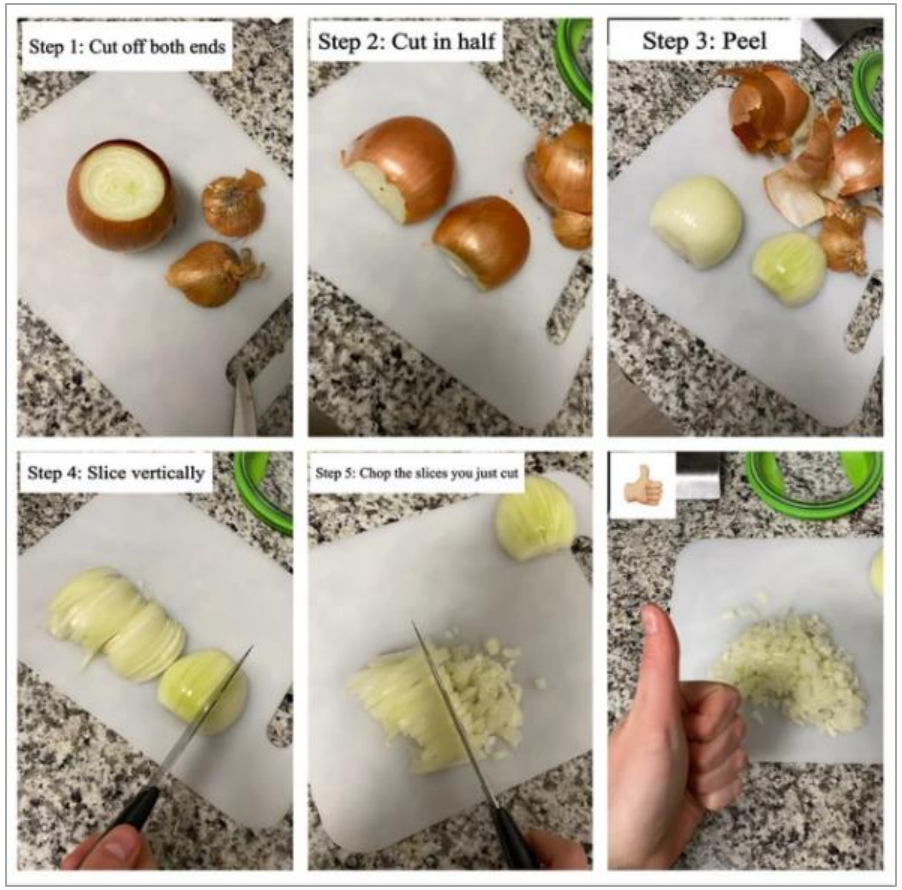
Pointers: Task Analysis

- Breakdown of **task into important stages** (remember paper clip?)
- Note specifics of **environment** (where, when is the device needed)
- **Specific habits** / techniques used by skilled users
- Document the task (how to keep a record)

Examples: Task of dicing onions







Chose the stages (subtasks) and observe issues for each stage

Pointers: Desk research + Expert advice

- **Existing products** in the market for the task
- Product reviews ?
- **Articles / research** on the subject
- Any other content that supports the argument

Template for project statement

“To design tool/ device to _____ (task/ action) for _____(users)”

*Add the context, use appropriate adjectives, adverbs as required

Examples of project statement

1. To design a **portable** tool or device to **keep and carry medicines** for **medical staff** in **remote areas**

2. To design a tool or device that can **carry specs and be compact when they are not used**; **for travelers**.

3. To design a tool or a device to **keep bees in apiculture** for **farmers.**

*The students started brainstorming with the task of 'moving/ carrying'

Examples of project statement

4. To design a tool or a device for **the postman** which will **contain parcels of different sizes and shapes.**

5. To design a tool or a device to **carry hot mess food** to the **hostel room** for **hostel students**.

*The students started brainstorming with the task of ‘moving/ carrying’

Start investigating >> Defining

1. **Purpose (Why)**
2. **Target user group (Who)**
3. **Context (When and Where)**
4. **Project brief as the conclusion of above**

Example 1

Project Brief

Need Statement:

To design a tool/device to **carry basketballs** to and fro the basketball court and hostel area **for players**. (~distance: 500m)

Design Opportunities:

1. The device should easily carry 25-30 balls, without any falling off.
2. It should be lightweight yet sturdy.
3. It should have wheels with good shock absorption qualities.
4. The device should be easy to turn.
5. It should be able to catalog various sizes of balls for ease of players.

Submitted by: Group 4, Needles and Threads

*Note: The physical aspects are still not resolved, we want it that way!

Supporting Data (in gist)

Target Group:

Students and PE facilitators at IITGN

Sizes of Balls (circumference)**:**

Basketball Size 7	29.5 inches
Football Size 5	27-28 inches.

Volleyballs	22.6 - 26.5 inches
Medicine balls	27 inches.

Other Uses:

Organizing and Cataloging balls from multiple sports

Compartments and their Positions:

1. Multiple compartments for balls of various sizes for organization; ease of unloading
2. The compartments should be vertically oriented

PROJECT BRIEF
TRANSPORT

To design a device to transport basketballs to and fro the hostel area & basketball court for players.
(Walking distance : 500m)

TARGET USERS

Students / PE facilitators who play basketball at IITGN.

SIZES

- Basketball size 7 of circumference 29.5 inches.
- Football size 5 of circumference 27-28 inches.
- Volleyballs of size 25.9 to 26.34 inches.
- Medicine balls of circumference 27 inches.

PROJECT STATEMENT

- The device should be able to easily carry 25-30 balls, without any risk of them falling off.
- Since the device has to be pushed by a person, it should be lightweight, yet sturdy.
- The wheels of the device should have good shock absorption capacity.
- The device should be easy to turn.
- One should be able to catalogue the different sizes of footballs and basketballs using the device.

IT SHOULD CATER TO THE USER'S EASE OF:

1. Effort of transporting the balls.
2. Carrying Multiple balls of various sizes.
3. Loading
4. Unloading

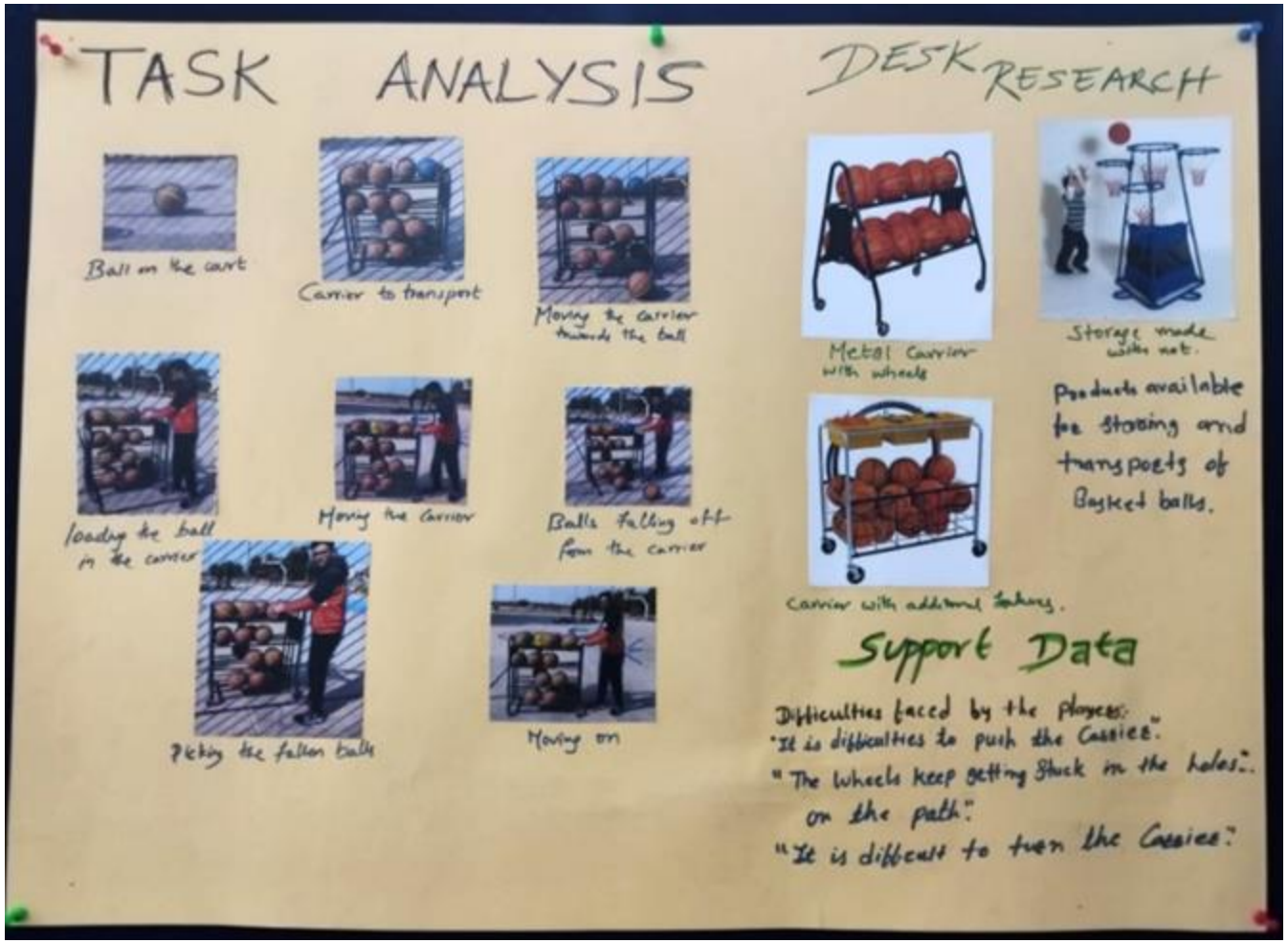
COMPARTMENTS AND THEIR POSITIONS:

1. Should have multiple compartments for balls of various sizes for better organisation and ease of loading.
2. Position should be vertically oriented.

OTHER USES:

Organising & Cataloguing Basketballs, Footballs and Volleyballs of different sizes.

Page 1 / 3



*Note: Students quantified the distances and sizes of balls. They also made a video demonstrating all the problems faced while carrying the existing trolley

Example 2

*The following slides are presented as they were submitted

ES201: Introduction to Design and Innovation
Fall 2022

Project Brief

Team “Design Redesigned”

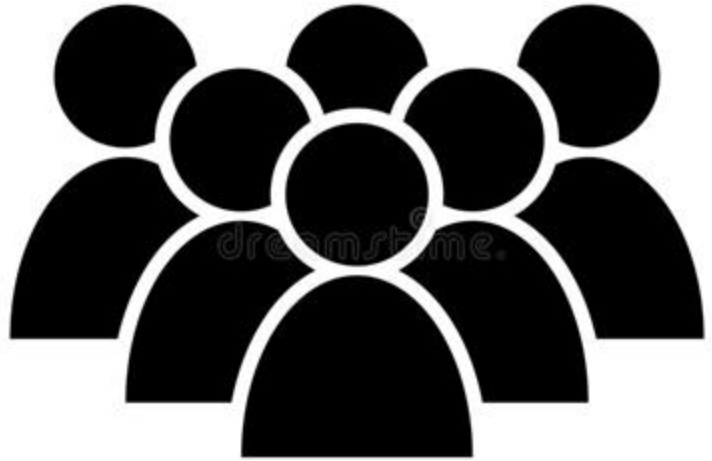
Note: Student names have been removed

Need Statement

To design a compact device to carry specs to make it convenient for users.

User Group

- Students
- Employees
- Elderly people
- Reading-specs users
- Farmers



- All spectacle users with a specific need such as travelling
- Or a specific age group e.g. children under 10 / the elderly

Environment

- Travelling
- Rainy-weather
- Sports
- Crowd (marke
- While sleeping

- Choose 1
- Or combine those which make sense together e.g. travelling + market places

Design Opportunities

- Make cases with better grip.
- We can hang the case (say, on pants/ bags).
- Easy to open; can be opened using only one hand.
- Space for specs cleaning liquid.
- Case is foldable when empty.

- Prioritize
- Keep it crisp
- Use good vocabulary

Major Takeaway (from data collection and analysis)

- Difficulties with the current model of specs case:
  - No provision to carry lens cleaner.
  - Insufficient space to keep the cleaning cloth.
  - Not compact enough .
- Coveted Features:
  - Adjustable Size.
  - Provision to accommodate cleaning cloth and lens cleaner.
- Comfort and Aesthetics:
  - Fit to pockets.
  - Aesthetically appealing.

Repetition

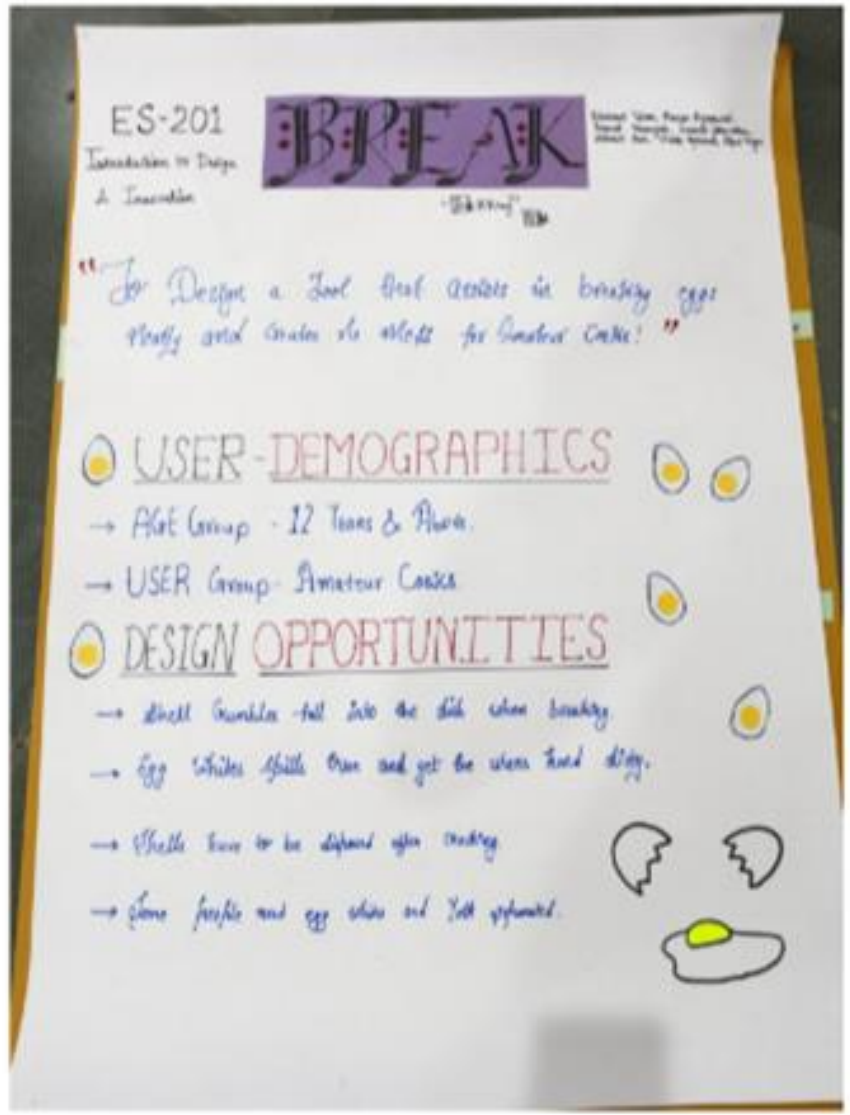
Why combine?

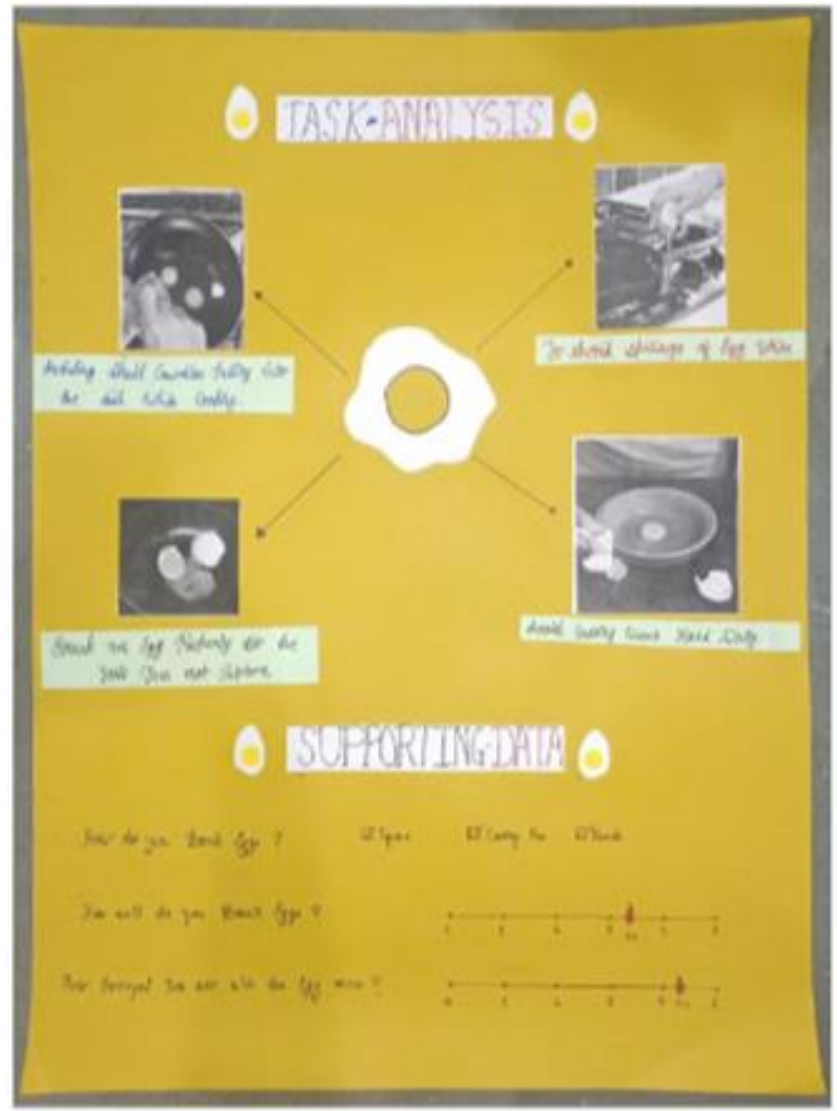
Prioritize

Keep it clear

Use good vocabulary

Example 3


ES-201
Introduction to Design & Innovation
BREAK
"To Design a Tool that assists in breaking eggs Neatly and Cracks to shells for Amateur Cooks!"
USER-DEMOGRAPHICS
→ Age Group - 12 Years & Above.
→ USER Group - Amateur Cooks
DESIGN OPPORTUNITIES
→ Direct Crackle fall into the dish when breaking
→ Egg whites Shells Does not get the where hand dirty.
→ Shells have to be disposed after cracking
→ Shows people and egg whites and Yolk separated.


TASK-ANALYSIS
SUPPORTING DATA

User demographics:
Age Group: 12 & above
User Group: Amateur Cooks

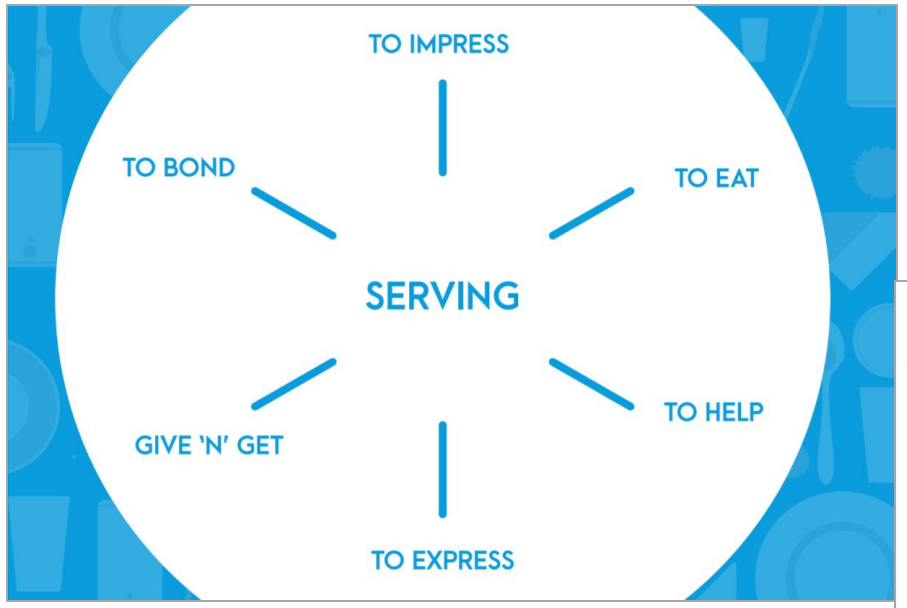
Design Opportunities

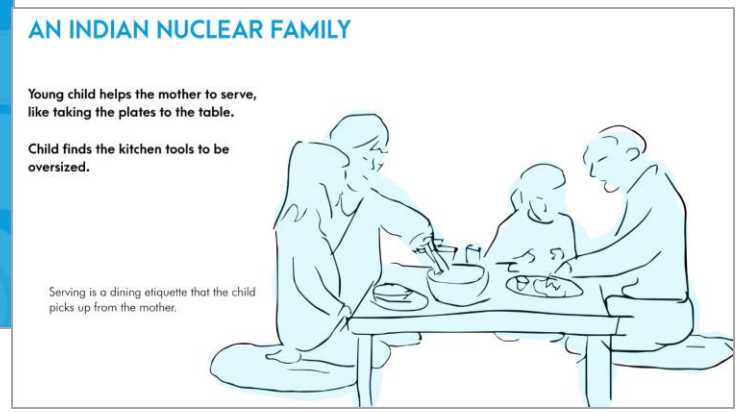
- When cracking the egg, shell pieces might fall into the dish.
- Egg white spills over and gets the user's hand dirty.
- Shells have to be disposed of after cracking.
- Break an egg properly so the yolk does not rupture.
- Some people need egg whites and yolk separated.

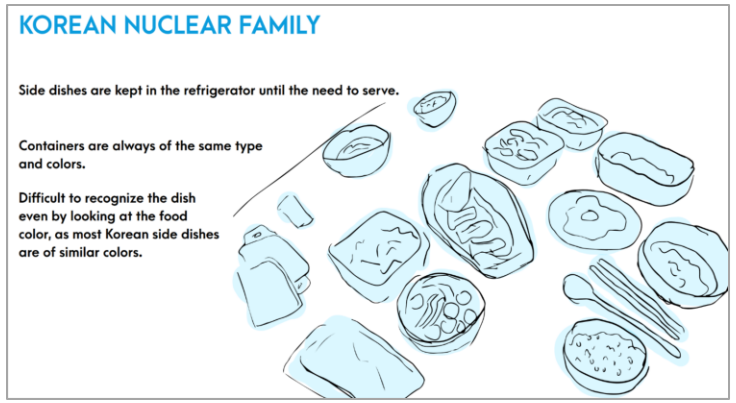
"To design a tool that assists amateur cooks in breaking eggs,
having a neat crack and without creating a mess"

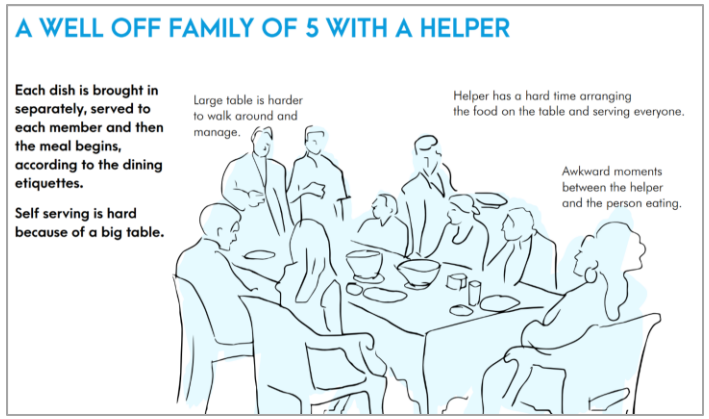
Original statement : To design a tool that assists in breaking eggs neatly and creates no mess for amateur cooks

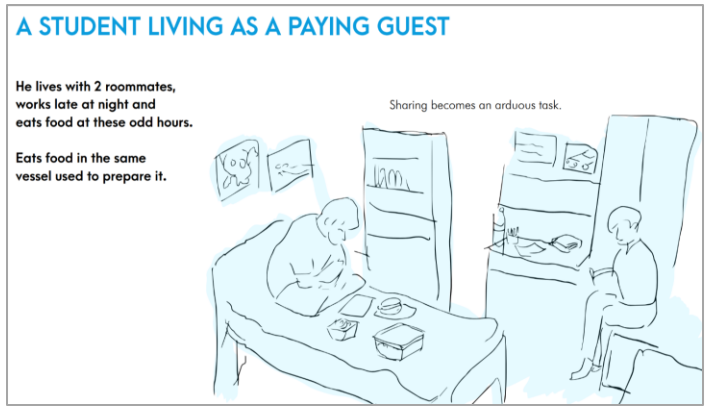
Example 4 : USER STUDY





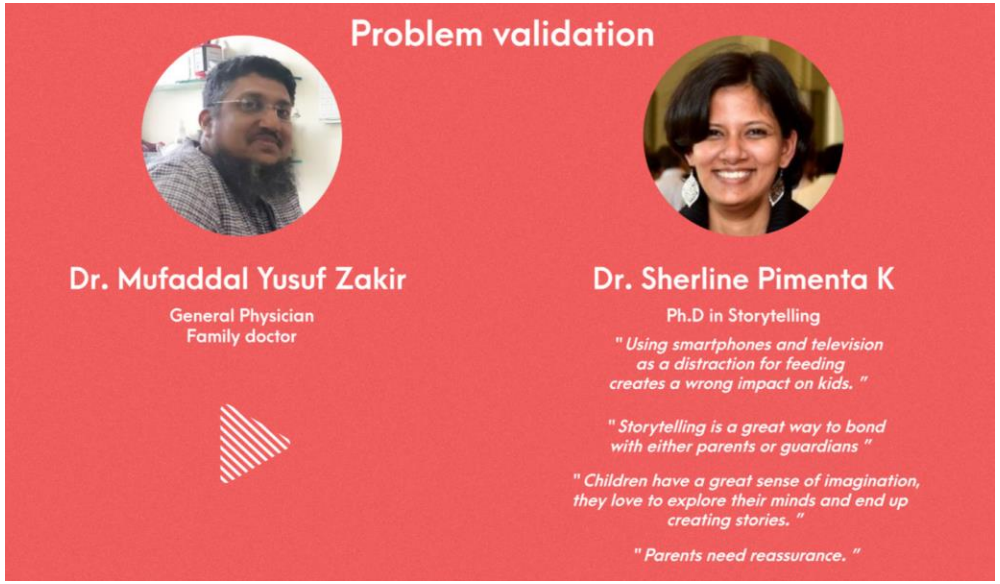






Theme : Serving (food)

To create a product/range of products
that enhances the experience in the process of serving.



Expert advice

Theme : Serving (food)

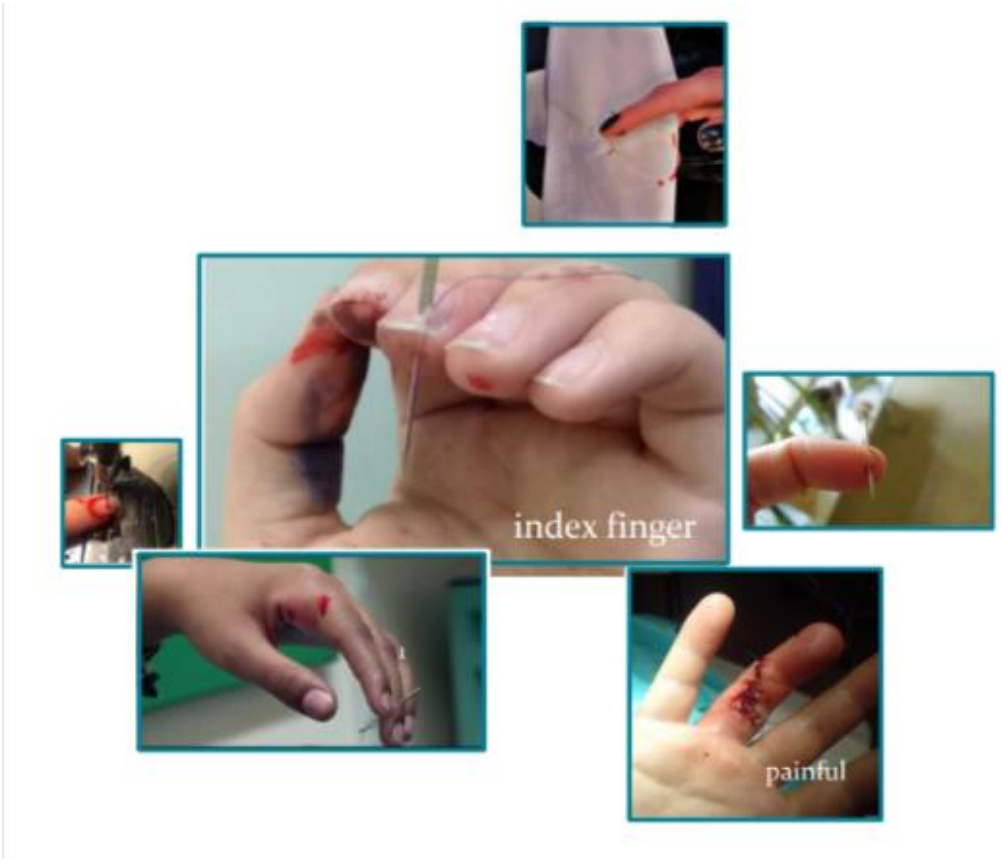
Project statement :

To design a device to serve food to toddlers

Design opportunities

- Interaction between the toddlers and their caregivers
- Avoid dependency on the mobile phones
- Integrate storytelling/ play

Example 4 : Defining brief



'Protecting' finger while using the sewing machine

Finger guard

This guard is design by juki company.Its a kind of wire not exactly the product. its placed over the presser foot hold by the presser foot holder.

Protective ring

Its work as extra layer on the finger.Made up of steel and we have to wear it in our finger.

Eye guard

This devise is mainly protect the eye if needle breaks. It placed above part of needle.

finger guard

- vision problem
- Issue in putting threads
- Not much effective

protective ring

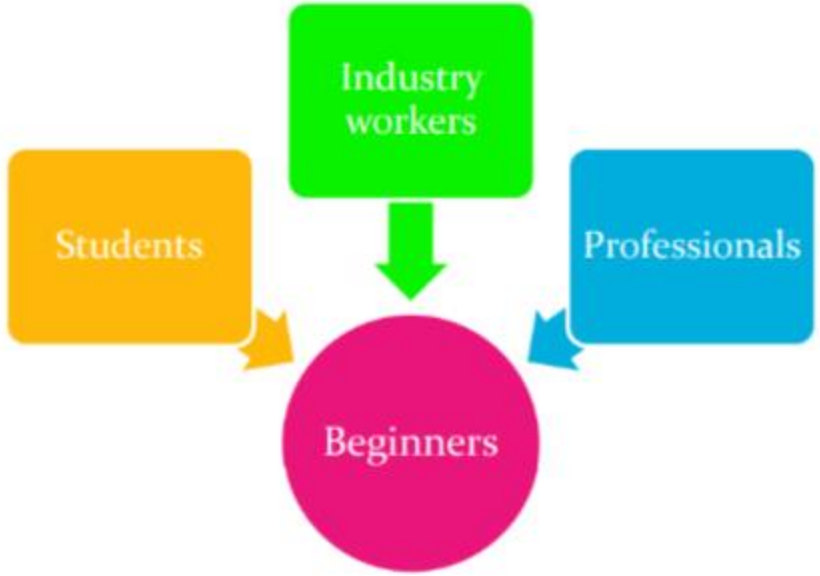
- un comfortable
- handling issue

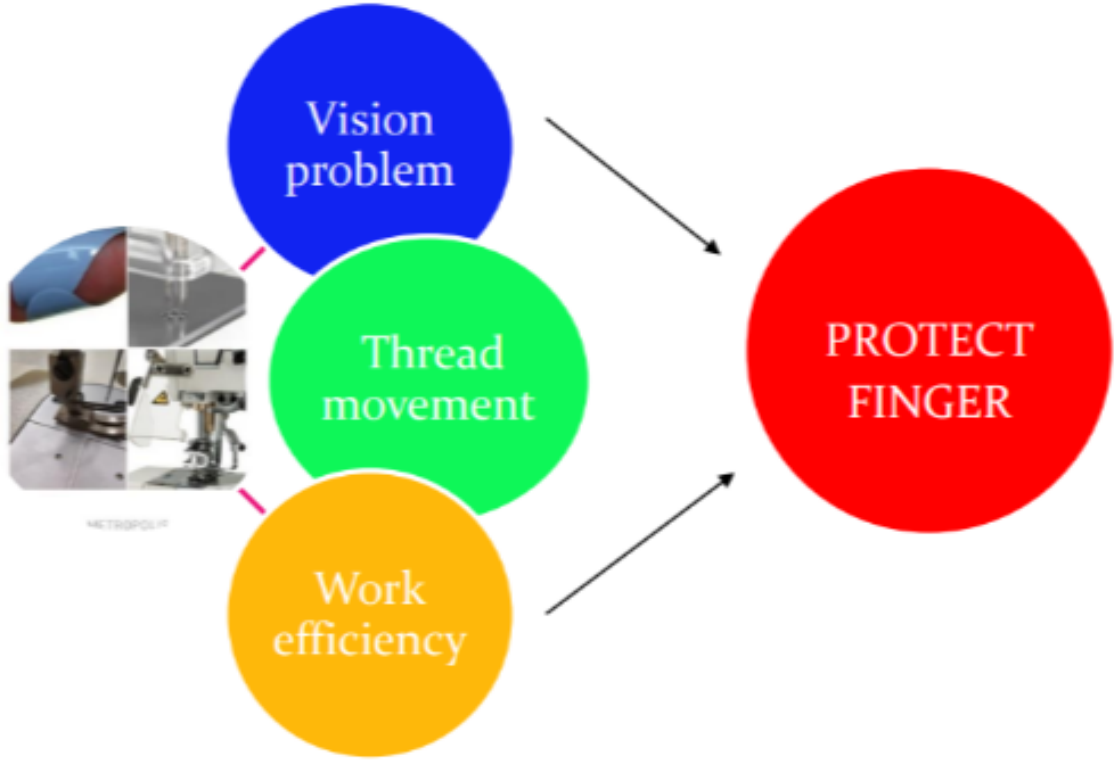
eye guard

- reduce work efficiency
- very much un convenient

ANALYSIS USERS:

All user have one common issue/problem which they faced at the beginning stage of stitching





'Protecting' finger while using the sewing machine

Submission : Project brief / value proposition

1. **Project statement**
2. **Details about the following**

- Profile of the target user (age/ gender /skill level etc.)
- Environment/ context in which the proposed product is to be used
- Design opportunities

3. **Major understanding from data collection and task analysis** (as a supporting document)

*__No solutions to be proposed__ (only opportunities of improvement)

Breather...

Important announcements

- Next class 18th September (Wednesday): Human Factors

- Project brief / value proposition
- Techno-aesthetic detailing

22nd September

Plan the activities well, last minute job will not work for both.
Complete the data collection for project brief by 16th.
Feedback on statements will be provided ASAP.

PART 2: Introduction to manufacturing

Processing as value addition

Processing as value addition

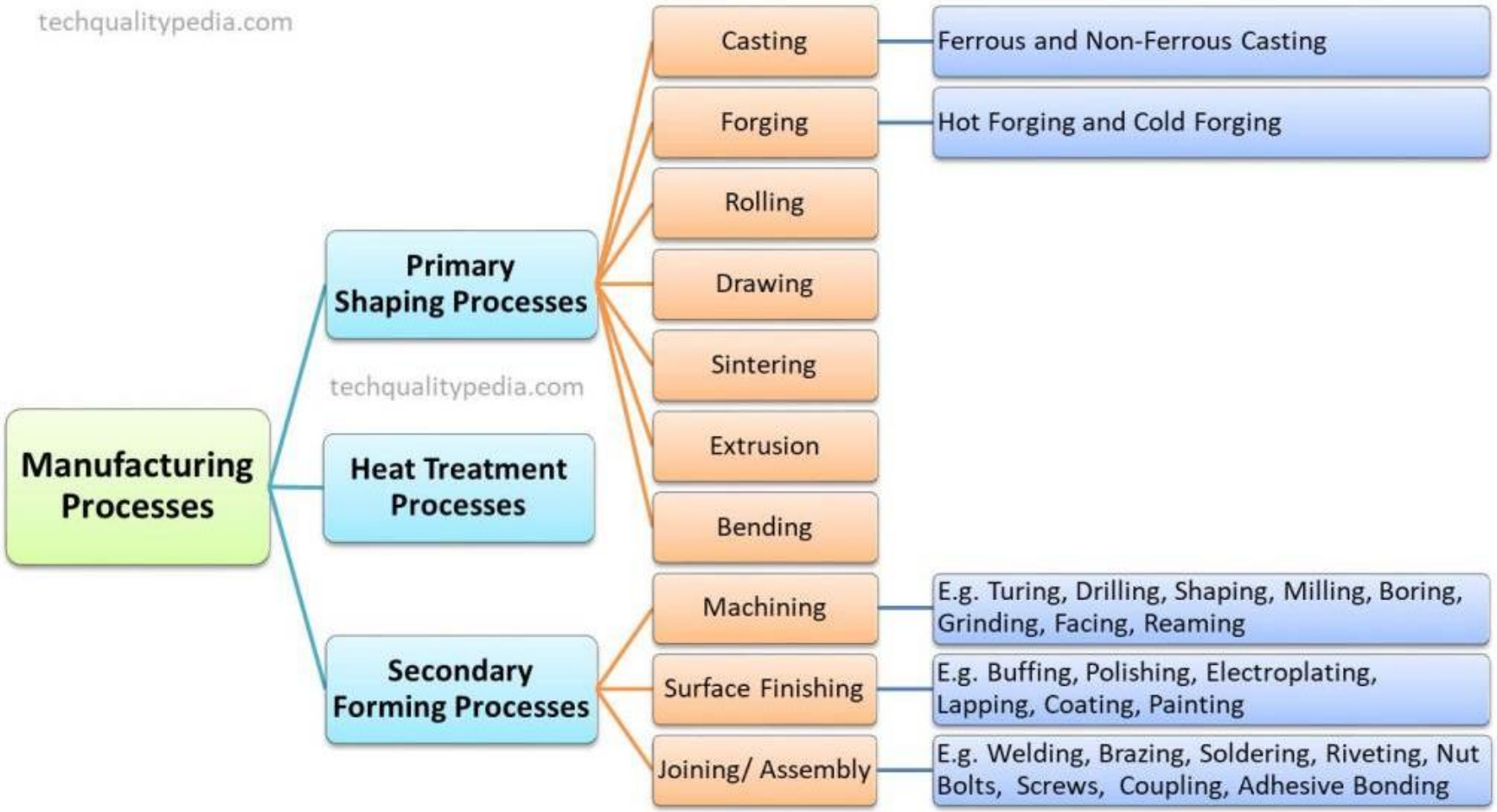
Value
Addition

Processes

Stages of manufacturing

Raw materials › Pre-processing › Processing › Post processing

Classification of manufacturing processes



https://techqualitypedia.com/manufacturing-processes-types/#google_vignette

Boring?

Let us make it very simple

Rocket science/ household kitchen??

Still from a Hindi motion picture Mission Mangal (2019)

Stages of manufacturing

Raw materials

Pre-process

Storage

Tools / machinery

Process

Post- process

Aspects of manufacturing

Common manufacturing processes

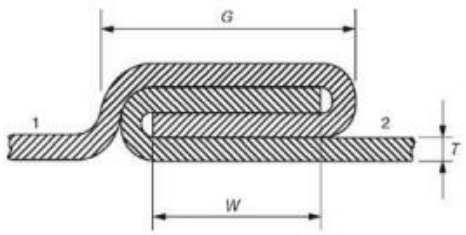
- Fabrication (bending /punching) : Sheet metal / pipes
- Heat treatments : Metals, glass
- Molding / Casting : Plastics, metals, ceramics
- Forming (extrusion, drawing) : metals, few plastics
- Joinery – fasteners, welding, fusing, adhesives, stitching

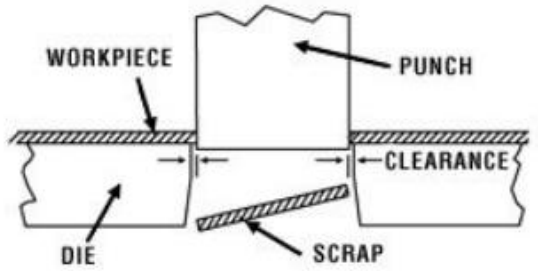
Many other natural materials and specially designed materials will require specialized manufacturing processes

Important resource: https://www.manufacturingguide.com/en/search/process

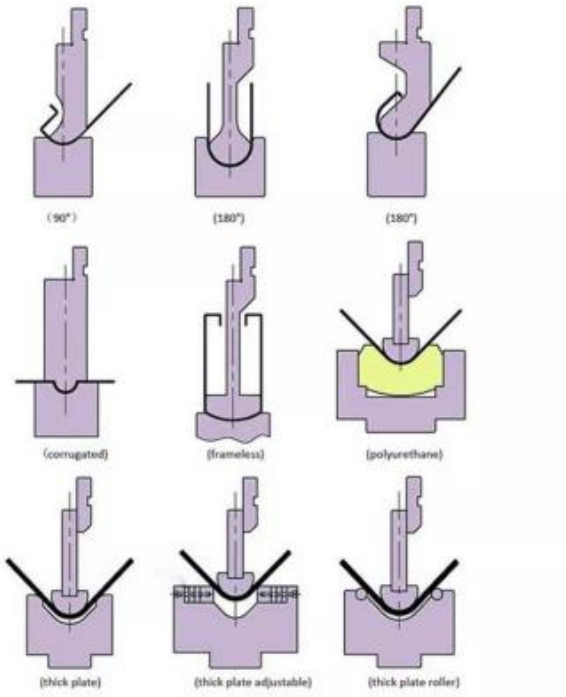
Fabrication

Fabrication





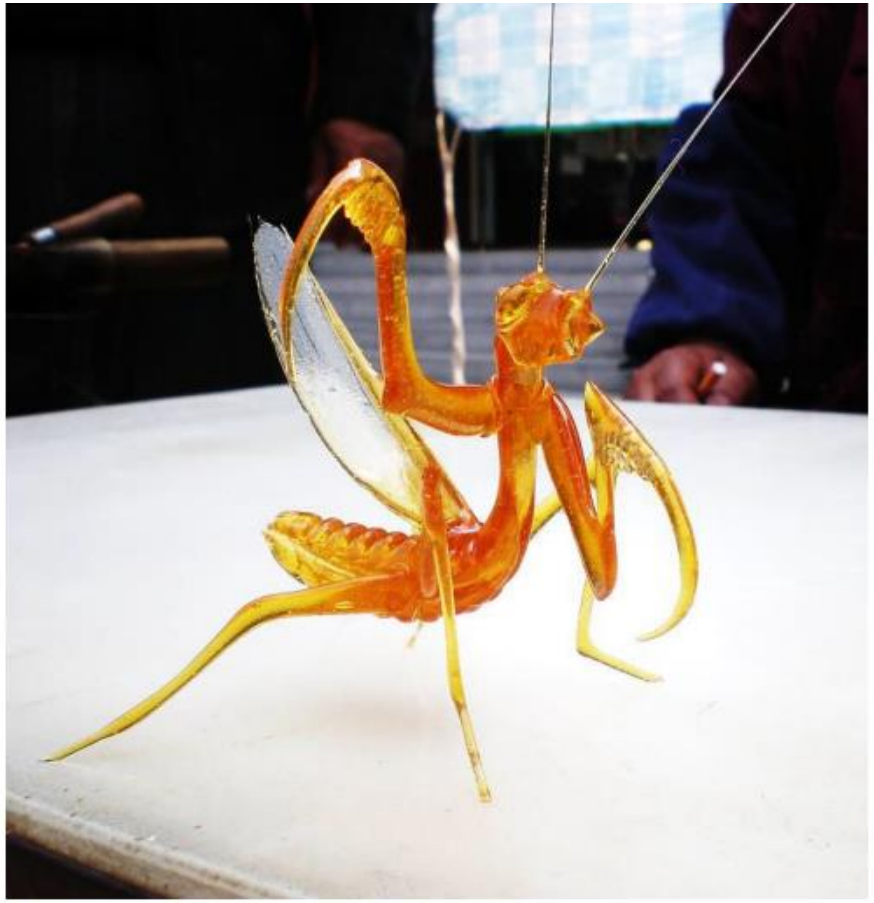
PUNCHING PROCESS



Heat treatment : Rapid cooling

Heat treatment: Tampering

Heat treatment: Glass transition



Sugar

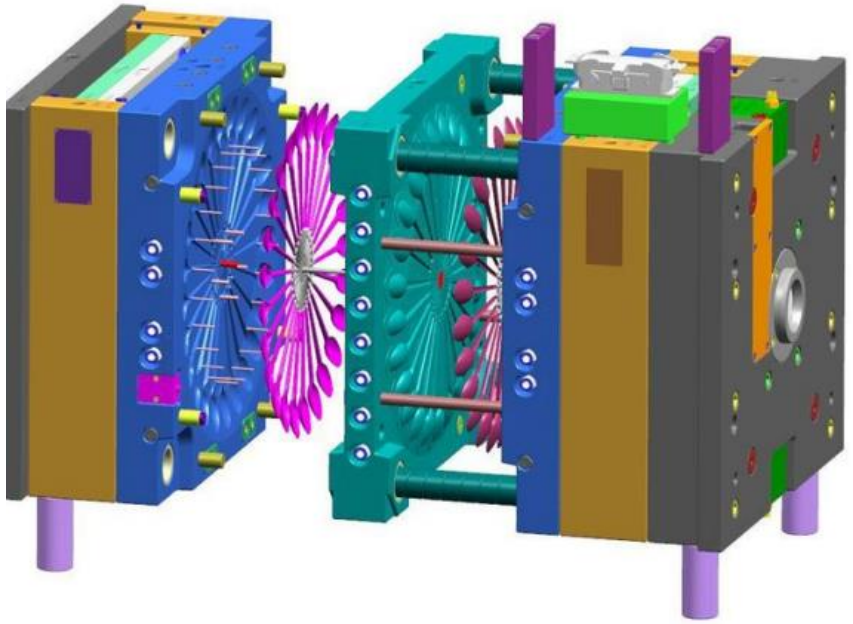
Silica glass

Extrusion

Extrusion

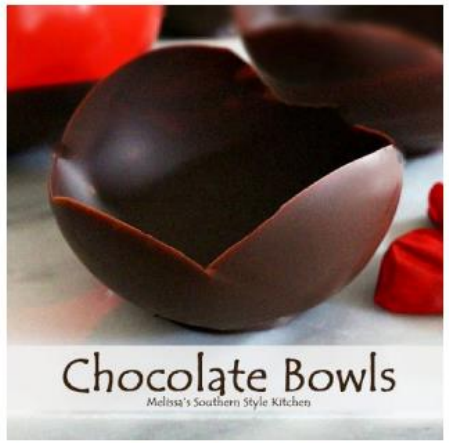
Die casting / moulding

Die casting / moulding



Important resource: https://www.bpf.co.uk/plastipedia/processes/Default.aspx

Rotational moulding (roto-molding)



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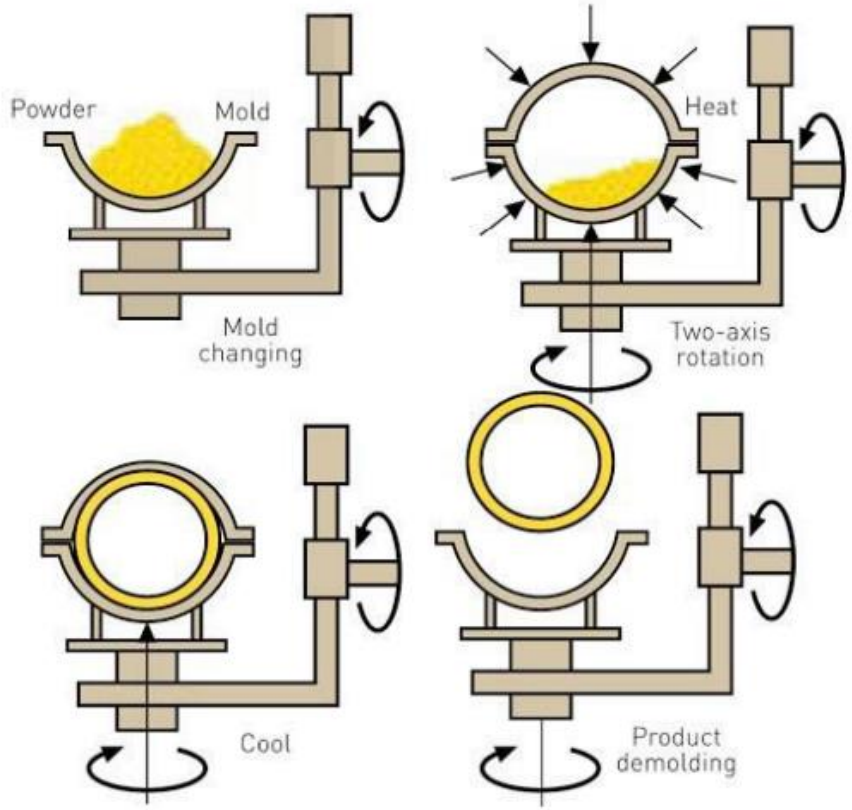

Glazing

Finishing treatments

Dip technique

Hydrographics

To summarize: manufacturing means

PLAN
PROCURE

PRPARE the raw materials, set the machines
SHAPE the parts
FINISH

ASSEMBLE
STORE

ES 115
Design, Innovation and prototyping

4 Project brief

Next class … ‘Human factors’ (18th September)