4.4.4.4 Section D: Developing design ideas (20 marks)

Students will develop and refine design ideas. This may include, formal and informal 2D/3D drawing including CAD, systems and schematic diagrams, models and schedules. Students will develop at least one model, however marks will be awarded for the suitability of the model(s) and not the quantity produced.

Students will also select suitable materials and components communicating their decisions throughout the development process. Students are encouraged to reflect on their developed ideas by looking at their requirements; including how their designs meet the design specification. Part of this work will then feed into the development of a manufacturing specification providing sufficient accurate information for third party manufacture, using a range of appropriate methods, such as measured drawings, control programs, circuit diagrams, patterns, cutting or parts lists.

Mark band	Description
16–20	Very detailed development work is evident, using a wide range of 2D/3D techniques (including CAD where appropriate) in order to develop a prototype.
	Excellent modelling, using a wide variety of methods to test their design ideas, fully meeting all requirements.
	Fully appropriate materials/components selected with extensive research into their working properties and availability.
	Fully detailed manufacturing specification is produced with comprehensive justification to inform manufacture.

Student guide - Sketch Development

Introduction- Have you:

- Fully explained and justified what you have done so far and why we are completing sketch development at this stage of the project.

Sketch development – Have you:

- Sketched your design at its current stage of development (either a full sketch or sketching over photos of your most developed model).
- Drawn additional sketches which further develop your design or show additional details you haven't been able to capture.
- Added annotation to explain your design and the developments made in this task (use ACCESSFMM to guide your notes). You should use specific and technical language. Annotations should be concise but written a way that a third party could understand your design decisions.
- Gained third party or client feedback on your developed design and used this to guide your development.
- Completed relevant research into suitable materials, processes and components that could be used in the manufacture of your final prototype.

Model Development cont. – Have you:

- Evaluated your model against your specification and the needs/wants of your client.

Possible extra ideas for inclusion:

- Use SCAMPER to force sketch developments – **S**ubstitute, **C**ombine, **A**dapt, **M**aximise / **M**inimise, **P**ut to another use, **E**liminate, **R**epeat / **R**otate
- Manufacture an additional model(s) to test or illustrate your design (or part of it).
- Use Google Sketchup (free online) software to draw out your developed design concept.

Summary - Have you:

- Explained what you like and dislike about your modelled ideas and how you intend to move forward e.g. changes to be made, testing or materials and processes, increasing dimensions.

Key vocabulary:

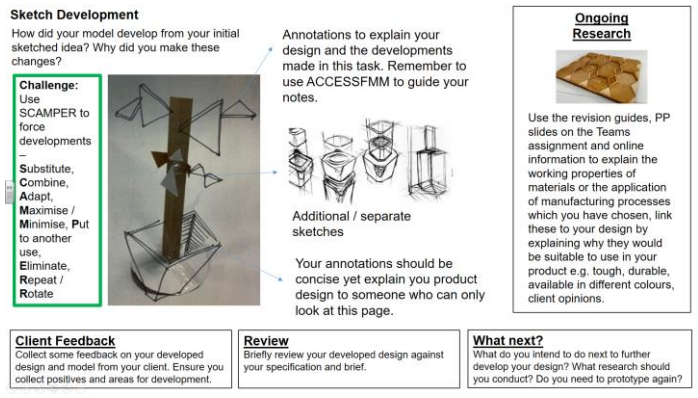
- **Design development –** Developing a design to ensure it fully meets the specification through a range of strategies including research into existing products, sustainability, ergonomics or anthropometrics (*could any successful examples of these areas of research be merged with your design*) or testing the function through 2D/3D modelling e.g. mechanisms (ways of opening or moving).

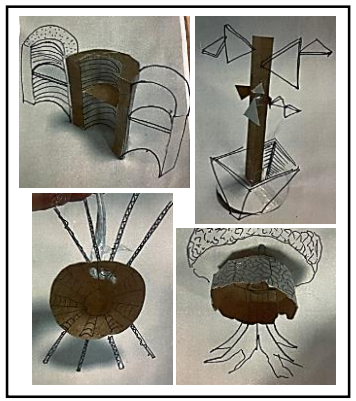
Parent guide – Sketch Development

Introduction to this page

This page is an opportunity for students to further develop their design to ensure it fully meets the need and wants of the client, the design brief and specification.

This is an important part of the design process as for a designer to be successful in industry they would have to meet the needs and wants of any client they are designing for. It is also an opportunity for students to refine their designs across all of ACCESSFMM and possibly to consider aspects they haven't yet been able to explore e.g. how their design could be more sustainable.





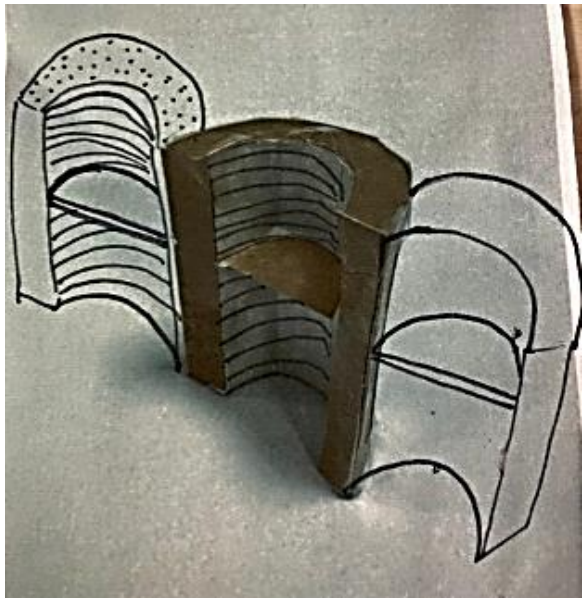
How can you support your child at home?

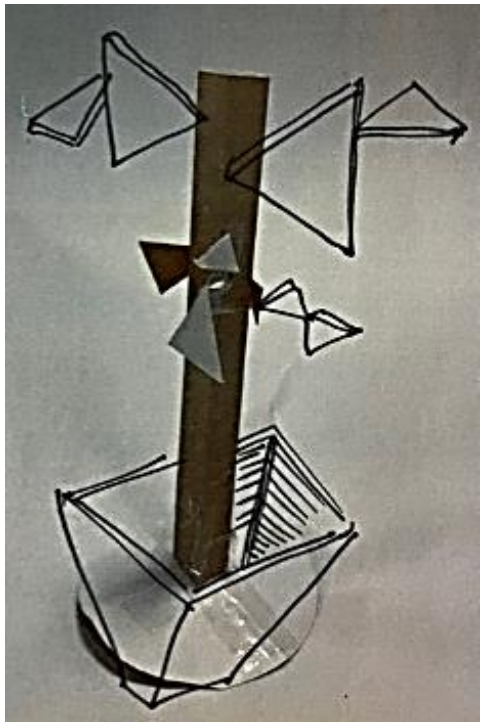
Look over your child's page:

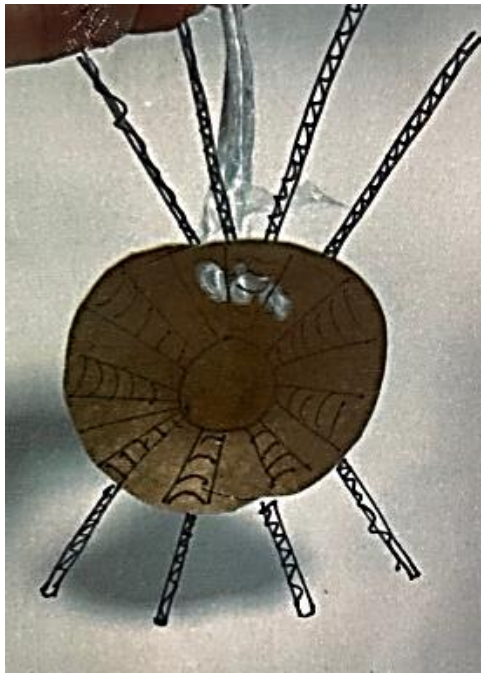
- Is the product that your child has designed appealing? Would it be something you think people would want to buy? Can you suggest any potential improvements?
- Has the design changed and developed from the initial drawing of it on the 'initial ideas' page?
- Do you fully understand the design decisions without extra explanation needed? If not could you suggest the extra annotation they need to add?
- Have they recorded 3rd party or client feedback and explained what they could/will change as a result?
- Do their design developments meet their client's needs and wants, the design brief and specification?
- Could you discuss different materials and manufacturing processes your child could consider when manufacturing their product (*please see the final pages of this document for information on different processes they can use, including links to videos*)?

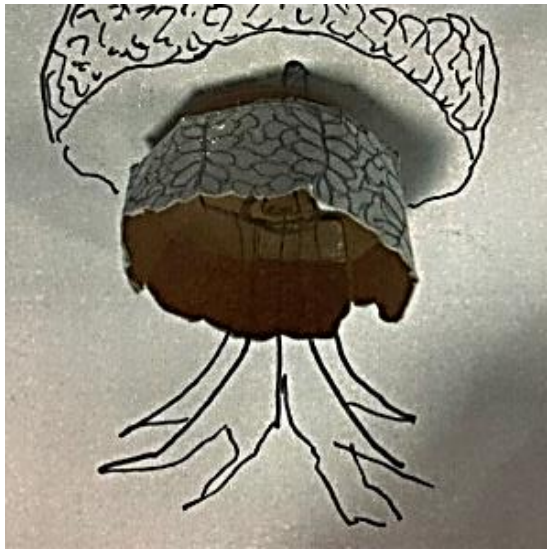
Could you encourage them to add in the extra ideas for inclusion (in green) to help them gain more marks.

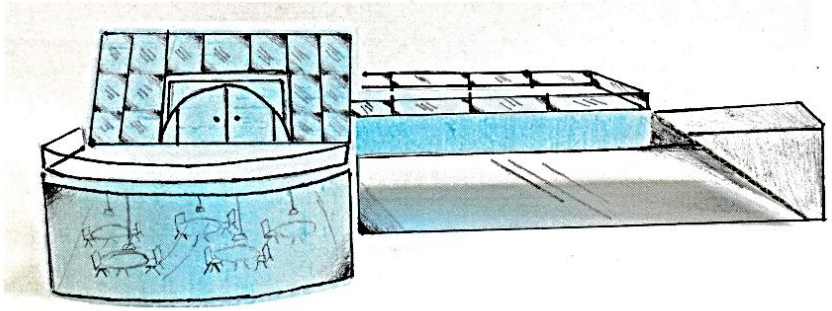
Sketch Development – How to show development

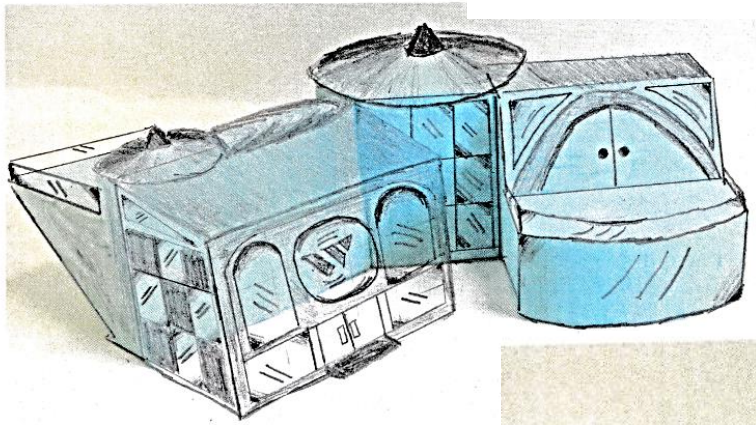


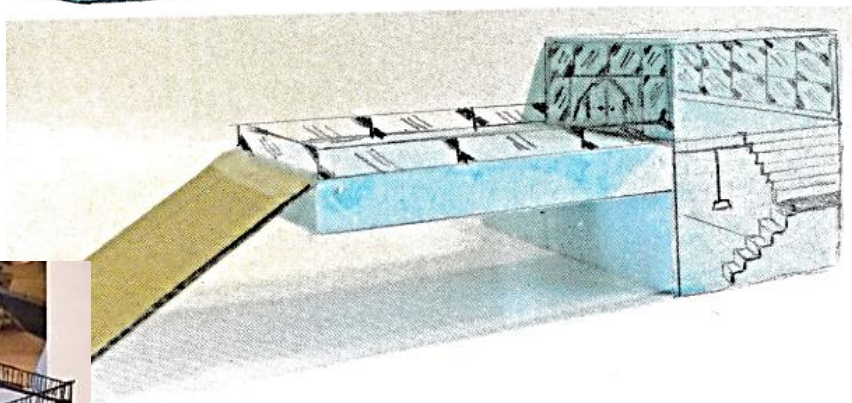


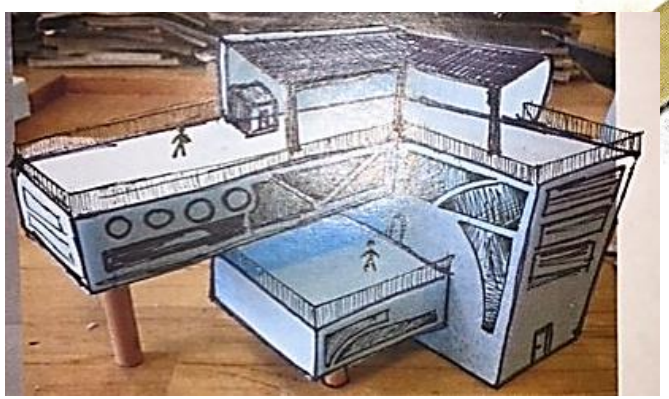












Sketch development – Additional research
Possible manufacturing techniques

https://www.youtube.com/watch?v=uGduSO7wDZE

https://www.youtube.com/watch?v=Q8xaVlG0_Qg

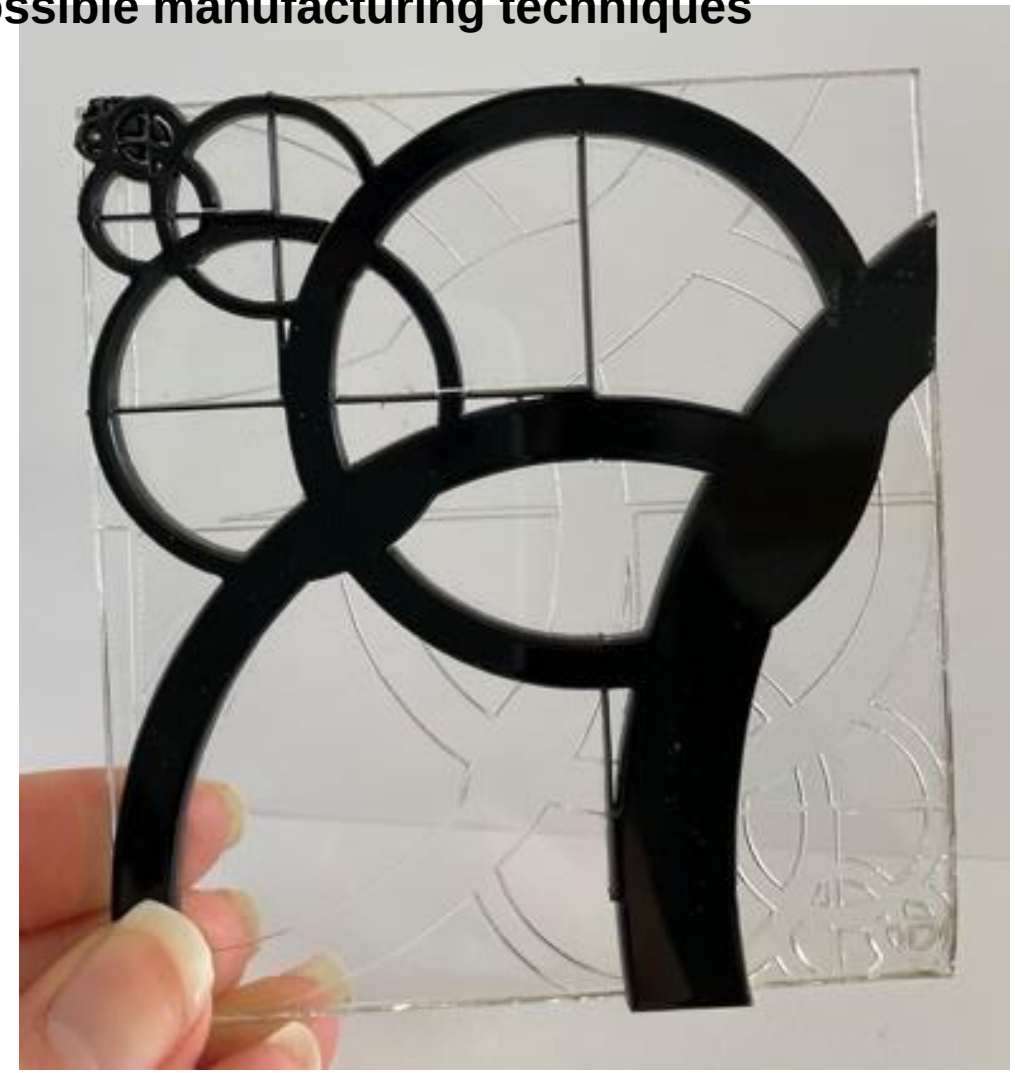
Technique:
Laser engraving

Materials:
Laser ply, MDF, pine, acrylic, fabrics, mylar, polypropylene, paper, card, cardboard

Information:
- Can engrave to differing depths
- Engrave in areas
- Engrave in lines
- Different settings required for different materials
- Can draw own designs
- Can vectorise images from internet
- Very small details possible e.g. 0.5mm

How could you use this technique in a product in your restaurant? **Name a specific product, material and how the technique would benefit the product.**

Sketch development – Additional research
Possible manufacturing techniques



https://www.youtube.com/watch?v=HcKmpIj6n1s

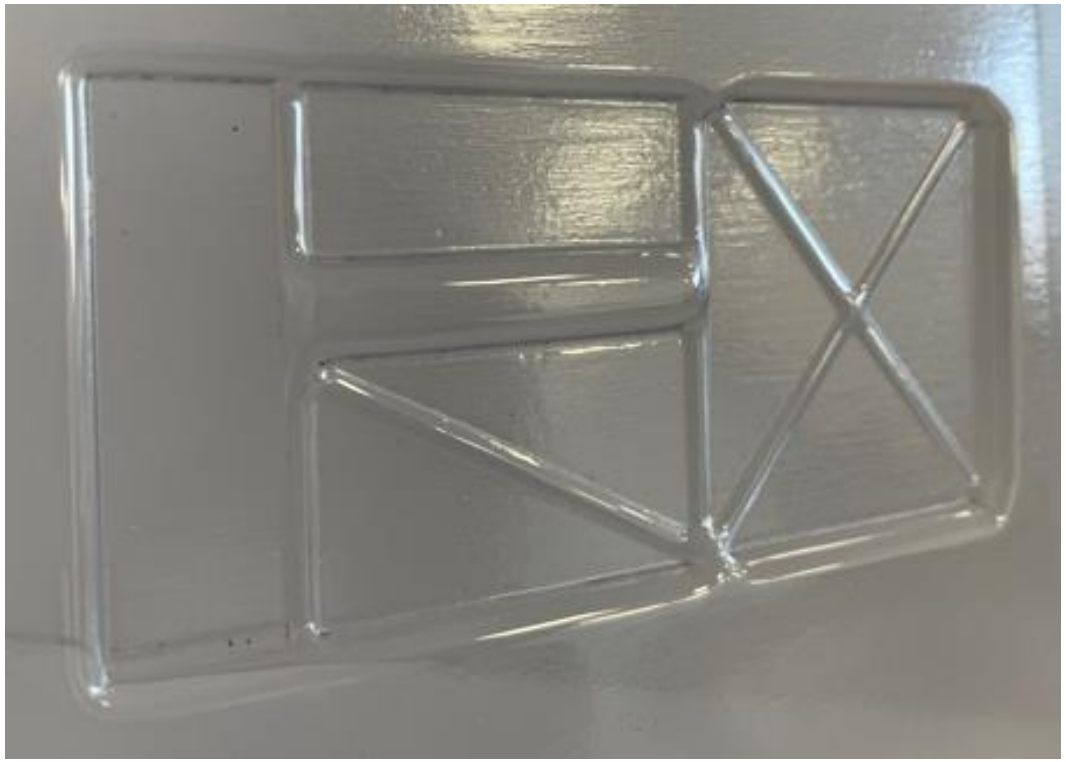
Technique:
Laser cutting

Materials:
Laser ply, MDF, pine, acrylic, fabrics, mylar, polypropylene, paper, card, cardboard

Information:
- Multiple layers of material can be added together
- Can create mechanisms and joints
- Different settings required for different materials
- Can draw own designs
- Can vectorise images from internet
- Very small details possible e.g. 0.5mm

How could you use this technique in a product in your restaurant? **Name a specific product, material and how the technique would benefit the product.**

Sketch development – Additional research
Possible manufacturing techniques



https://www.youtube.com/watch?v=CQcX7_ED868

https://www.youtube.com/watch?v=VFkVxurKeAs

Technique:
Vacuum forming

Materials:
Mylar, HIPS (papier mache, styrofoam, MDF, HDPE formers)

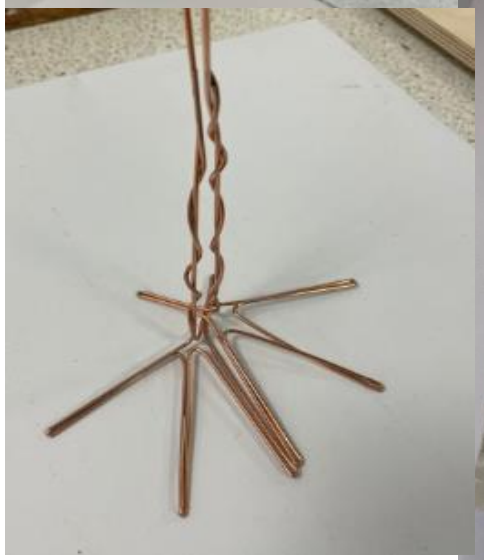
Information:

- Former required to allow plastic to mould around, can be existing product
- Mylar is flexible, HIPS is ridged
- Can form smooth shapes and pick up on textures
- Formed hollow products
- Mylar can be laser engraved with design first

How could you use this technique in a product in your restaurant? **Name a specific product, material and how the technique would benefit the product.**

Sketch development – Additional research
Possible manufacturing techniques

From 2min 40 https://www.youtube.com/watch?v=8Zs5_pxdUF4



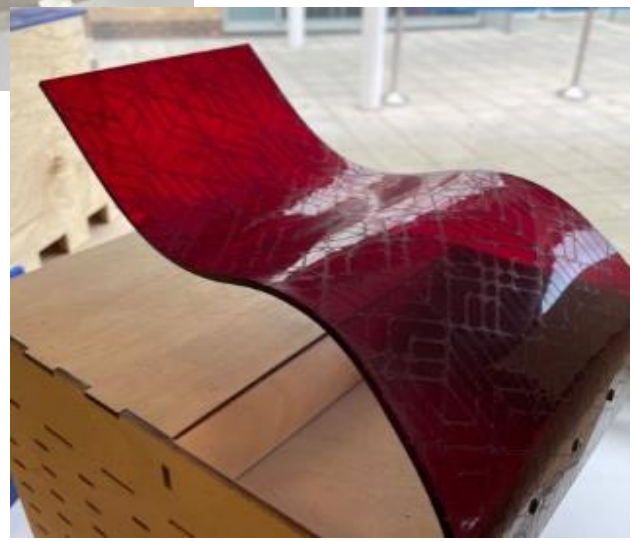
Technique:
Metal forming and beating

Materials:
Sheets aluminium, copper & brass
Rod aluminium & copper

Information:
- Variety of tools used to make different marks e.g. nails, chisels, tin snips, pins, screws
- Variety of tools used to form metals e.g. tin snips, long nosed plyers, metalwork vice
- Wire can be twisted and used to create structure
- Sheets and wire can be layered / attached

How could you use this technique in a product in your restaurant? **Name a specific product, material and how the technique would benefit the product.**

Sketch development – Additional research
Possible manufacturing techniques



https://www.youtube.com/watch?v=zjHAl6vg3FU

Technique:
Polymer forming - Convection oven

Materials:
Acrylic

Information:

- Acrylic can be engraved and laser cut before forming
- Acrylic can be curved and twisted
- Can be freehand formed or former used
- Acrylic needs to be heated until very flexible
- Heatproof gloves / gauntlets required
- If incorrect it can be reheated - thermoplastic

How could you use this technique in a product in your restaurant? **Name a specific product, material and how the technique would benefit the product.**

Sketch development – Additional research
Possible manufacturing techniques

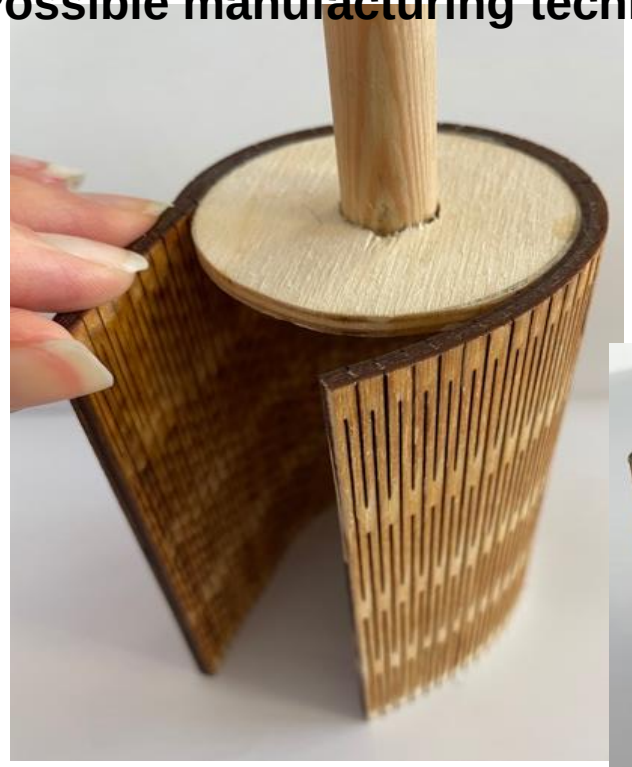
Technique:
Pillar drilling

Materials:
Acrylic, plywood, MDF, pine

Information:
- Variety of depths and drill hole sizes
- Can drill through or engrave
- Acrylic - allows texture on one side and smooth on other
- Great for lighting

How could you use this technique in a product in your restaurant? **Name a specific product, material and how the technique would benefit the product.**

Sketch development – Additional research
Possible manufacturing techniques



https://www.youtube.com/watch?v=QbwD_NvvCwY

https://www.youtube.com/watch?v=s3BrBtG0FHM

https://www.youtube.com/watch?v=tS97x6hECQQ

Technique:
Living hinge (laser cutting)

Materials:
Acrylic, plywood, MDF

Information:
- Variety of hinge designs available
- Remains flexible until fixed, can be used as hinge / door etc.
- Gives aesthetic as well as function

How could you use this technique in a product in your restaurant? **Name a specific product, material and how the technique would benefit the product.**

Sketch development – Additional research
Possible manufacturing techniques

https://www.youtube.com/watch?v=6n3u5i8Lf8g

Technique:
Foam forming

Materials:
Styrofoam & expanded HDPE

Information:

- Used to form huge variety of forms
- Easy to adjust and test ergonomics
- Lightweight
- Can use variety of tools to shape e.g. craft knives, files, rasps, sand paper, hot wire cutter
- Can be finished using Polyfiller or PVA for smooth paintable surface.

How could you use this technique in a product in your restaurant? **Name a specific product, material and how the technique would benefit the product.**

Sketch development – Additional research
Possible manufacturing techniques

https://www.youtube.com/watch?v=-s1d4xy6uiw

https://www.youtube.com/watch?v=d0C5WJ7MldI

Technique:
Polymer forming – line bending

Materials:
Acrylic

Information:

- Acrylic can be engraved and laser cut before forming
- Can only heat one line rather than whole piece of plastic
- Acrylic can be angled and twisted
- Can be freehand formed or former used
- Acrylic needs to be heated until very flexible
- Heatproof gloves / gauntlets required
- If incorrect it can be reheated – thermoplastic

How could you use this technique in a product in your restaurant? **Name a specific product, material and how the technique would benefit the product.**