WALL MOUNTED SPEAKER UNIT

DAN BAINES

CANDIDATE NUMBER: 3010

CENTRE NUMBER: 62451

F523

DESIGN BRIEF

CONTEXT

Problem 1: Home music studios often have small rooms and little floor space for equipment. If the unit allows the speakers and amplifier to be held off the floor it would mean the user could use this space for more equipment.

Problem 2: When using passive speakers an amplifier is needed. This means that wires must traverse between the speakers and the amplifier. Loose wires make studios look messy and are hard to organise. A way of hiding the wires is needed to make the product more useful and look neater.

Problem 3: The computer or device being using to play the music may not be in cable range of the speakers. The shelving must provide extra room to allow for accessories such as wireless transmitters/receivers, Bluetooth receivers and phone docking stations.

The Brief

I will design a wall mounted speaker unit to hold two speakers and an amplifier along with extra accessories. The speakers must be held a suitable distance away from the amplifier and the wires traversing between the three sections must be hidden or organised neatly.

The Client

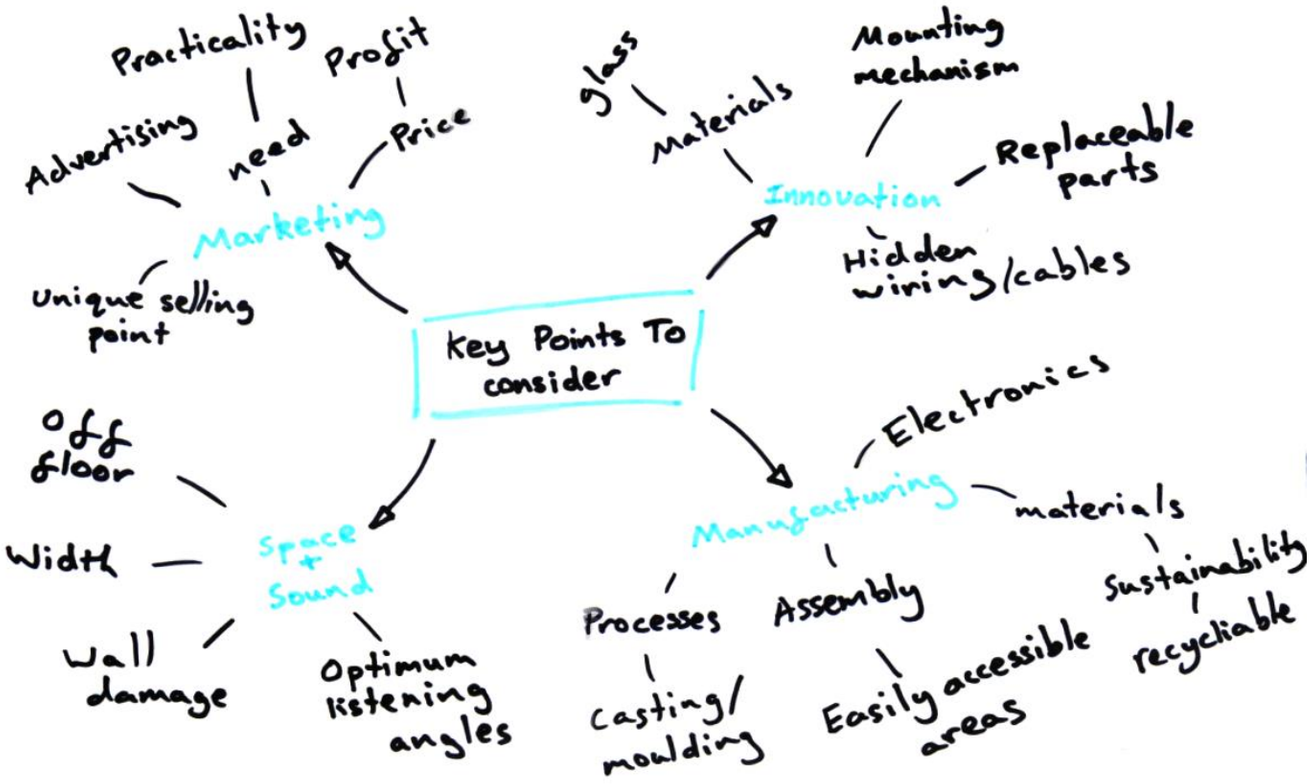
My proposed client would be a home music studio owner. The room they use will most likely be small so space is an issue. This means that cables and wires should be hidden or tucked away neatly. The client would use the speakers for monitoring. The wall mounting system must be very strong as they do not want their expensive speakers to fall and break. The client may also frequently change the speakers they use as technology advances. The speaker shelves must allow for all average size bookshelf type speakers to fit. The user may also want to use there speakers for more casual use so some accessories such as a phone dock and Bluetooth connection may be a good idea to add.

Marketing

In order for my product to sell it needs to be marketable. This means that it needs to be able to attract consumers with it's design but in this case, needs to be largely based on practicality and quality. I also need to think about how it could be manufactured to allow it to be sold easily on the market. It must have a unique selling point that sets it apart from other products in it's field. In this case there are not many wall mounted speaker solutions that hide the wiring, so I can use this point to market my product.

The Real Client

Chris is the owner of a home music studio and has a lot of knowledge of different types of musical equipment. I will be getting useful feedback from him throughout the design process.



DESIGN INSPIRATION

TRANSPARENT SPEAKER:

- Wiring not hidden but shown smartly inside makes it stand out to the consumer.
- Built in amplifier decreases quality and doesn't allow for user choice.
- Doesn't allow for user to use there own speakers/no choice of speakers.
- Wiring not hidden but presented well instead.

IMAGES FROM INTERNET

IPOD SPEAKER SHELF:

- Internal wiring is hidden to make it look simple and modern.
- When not in use for music, can be used as a basic shelf – multi-functional.
- Small speakers with no cabinets – low quality/no choice.
- Easy plug and play design from phone/ipod.

I VISITED THE NEW DESIGNERS EXHIBITION IN LONDON + TOOK PHOTOS OF DESIGNS I SAW

JBL MODULAR SPEAKER

- Multiple units can be linked to fit in/around any corner.
- Low quality Bluetooth speaker – no good for monitoring.
- Invisible mounting makes it look neat on the wall.
- Angled speakers send sound into the whole room.
- Can only be positioned in corners.

CERAMIC SHELVES – NEW DESIGNERS EXHIBITION

- Casted low poly shape is innovative and would fit well in a contemporary home.
- Innovation – nature used with techy style design to create interest.
- Invisible mounting makes it look like floating islands.

SEEN IN LOCAL FORNITURE SHOP

ME LOOKING AT RELEVANT PRODUCTS IN IKEA

INVISIBLE BOOK SHELVES:

- Shelf hidden by back cover of book with small hooks to hold it up.
- Specific to books. Could be more multifunctional.
- Small, light design. Won't pull on wall.
- Screws into wall for sturdy hold.

VALJE FLOATIN SHELVES - IKEA

- Difference sizes and combinations can be added together to fit best to what's on/in them.
- Allows objects to be placed on top and inside.
- Wires would have to come out in front of the shelves looking very messy.

CONCLUSIONS:

- Wall mounted shelves must be able to be placed anywhere on the walls to allow the user to customize there listening environment. Being confined to one place such as corners makes it hard for consumers to get the set-up they want.
- Technical accessories such as USB ports help the shelves to have a more contemporary modern look and feel.
- Wires must either be hidden or presented in an interesting way. Untidy wires makes the product look unfinished and of low quality. Using the wires as part of the product could be a good idea to make it look more innovative.
- Interactive parts of the shelving such as storage or plants will mean the user is more likely to use it regularly. This will mean they are more likely to buy the product again.

DESIGN INSPIRATION

INVISIBLE WALL MOUNTING:

- Strong metal structure holds shelves firmly.
- Requires metal work such as welding – increased manufacture times.
- Support hidden inside shelves – tidy and smart.
- Requires solid shelves – no space inside for wires.

USED A SIMILAR SYSTEM TO MOUNT SHELVES IN MY HOUSE - QUITE HARD WORK BUT LOOKS VERY NEAT

IVISIBLE WALL MOUNTING:

- Hollow spaces inside shelves to hide wires.
- As it can only be screwed in along one line it may droop downwards with time.
- Easy and quick installation – only two parts.

WALL CABLE TUBING:

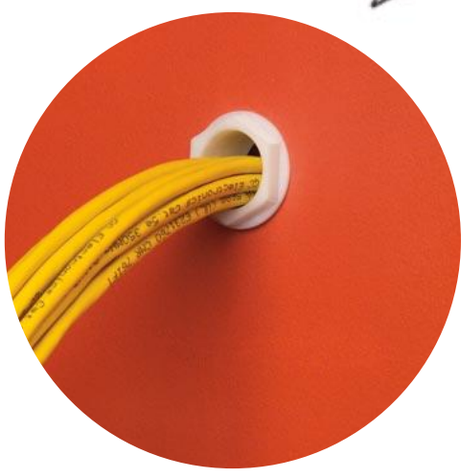
- Keeps wires neat – could be shaped/bent to make interesting designs.
- PVC could look tacky on walls – other materials may look more modern.
- Easy to remove if wires need moving.

HANGING SHELVES:

- Interesting way of creating invisible style shelves.
- Support bar could be very strong as it does not come out too far – no worry of drooping.

CHASING OUT CABLES IS A LOT OF EFFORT TO MAKE TO USE ONE PRODUCT

ANOTHER IDEA FROM MY TRIP TO LONDON



WALL CABLE HOLES:

- Wires completely hidden within wall – very neat and tidy.
- Requires a lot of work and some may not want to put holes in their walls.
- Walls need repairing if cables are removed/no longer needed.

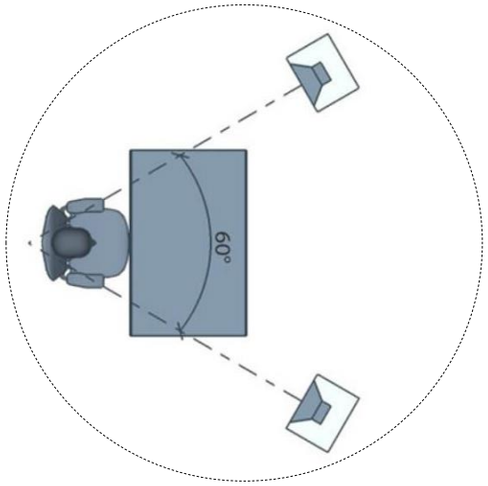
HANGING SHELVES – NEW DESIGNERS EXHIBITION

- Too much weight could be an issue – strong cables between shelves would be needed.
- Would make it hard to hide speaker wires between shelves.
- Hanging shelves would move and swing – not suitable for speakers/amplifiers.

CONCLUSIONS:

- Chasing out wires into the walls is very time consuming. If the user had to do this to use the product it may put them off buying it.
- Some invisible wall mounting methods are much stronger than others. As very precious items are to be stored on the speaker shelves they must be able to carry a lot of weight.
- Some wall mounting methods only provide support in certain places which can lead to the shelves drooping. A solid wall mounting mechanism is needed to make the product feel like it's made to a high standard.
- An easy and quick installation is vital for customer satisfaction. A limited number of steps will allow them to use their shelving right away.

DESIGN INFORMATION



LISTENING POSITION:

To create the best listening environment the user must be directly in between the speakers with a 60 degree angle between them. In order for the design to work in any room it must allow for rotation of the speakers to create a better sound.

BLUETOOTH SYSTEM:

Bluetooth receivers can be used to send music from any Bluetooth capable devices to an amplifier. This means the client can place their shelves across the room and still play music through the speakers. The quality is a little lower sometimes than wires but for most people this is unnoticeable.

EITHER SHELVES COULD SWIVEL OR SPEAKERS MOVE ON TOP OF SHELVES

ALSO NEED TO THINK ABOUT TRADE COMPANIES SUCH AS RICHER SOUNDS - WHAT MAKES THEM WANT IT- USP's

MOST ALSO BE ABLE TO CARRY HEAVY WEIGHT (10KG) FOR PRECIOUS, HEAVIER SPEAKERS

CONCLUSIONS:

- The product needs to be large enough to fit a range of speakers sizes and weights. If any expensive items drop off of the shelves the consumers will not review the product highly.
- Wireless systems that allow users to operate there speakers would be a good accessory to include. It will give them an up to date feel and make them work in more home situations. The more places they can be used the more products that will sell.
- The speakers must be able to move around slightly on top of the shelves to allow the user to position them towards wherever they are situated. This will give the best sound quality and increase the versatility of the product.

B&O
BANG & OLUFSEN

THE DESIGN COMPANY:

Band and Olufsen manufactures a highly distinctive and exclusive range of music products. If I were designing for them my product would need to be of the highest quality possible. Their products are very expensive however the look and sound quality makes them worth the price for the right client.

AVERAGE SPEAKER SIZES:

The speaker shelves must have a top surface of at minimum 250mm x 200mm to fit average size small bookshelf speakers.

The amplifier shelf must have a top surface of at minimum 250mm x 210mm to fit an average size small speaker amplifier.

DESIGN SPECIFICATION

Function:
- The shelves need to be suitable for average size bookshelf speakers and amplifiers allowing it to work for any customers existing products.
- The shelves must have space to store/place accessories such as Bluetooth receivers.
- The shelves must attach to a wall in a way that allows them to be placed anywhere for customer customization and optimum placement.
- Any accessories added to the shelves must be easy to access and take up little space on the shelves that could be used for speakers.

Materials:
- With materials I need to think about the principles of Bang and Olufsen – these are heavily focused on high quality.
- The surface on which the speakers sit must be feel solid and robust so that customers do not worry about their speakers falling i.e. hard woods such as oak.
- The main shelf material must be lightweight so that it is easy to attach to the wall and will not fall with a heavy speaker weight.

Manufacturing:
- Many companies who may sell the product care about product sustainability and environmental impact. Using sustainable materials (recyclable) and production methods that create less waste (moulds/formers) will help to give the product a good environmental name.
- To decrease costs I should use some pre-made parts that can be bought in (i.e power supplies for accessories). This will not decrease quality but will decrease time and cost.

Assembly:
- The shelves must come pre assembled. They will not be too large and this gives them a high quality feel as they have arrived fully ready to use.
- The wall mounting method must be easy for any customer to position them in the perfect place. It must be quick and simple to do so that the customer can start to use their speakers straight away.

Ergonomics:
- It must be possible to position the speakers in an optimum place for hearing – both if a customer is sitting or standing.
- The product should come with information informing the customer on best shelf placement to improve their listening experience. Bang and Olufsen care a lot about sound quality so the shelf information must reflect this.

Aesthetics:
- Speaker wires must be hidden or disguised so that the shelves are not ruined by untidy wires.
- The shelves need to fit well into any modern room. The finish must be smooth and smart. Colours not too bold as the shelves should stand out for their design and not their colour.

Cost:
- My product should cost between £50-£60 to manufacture.
- My product should cost between £150-£200 to purchase.

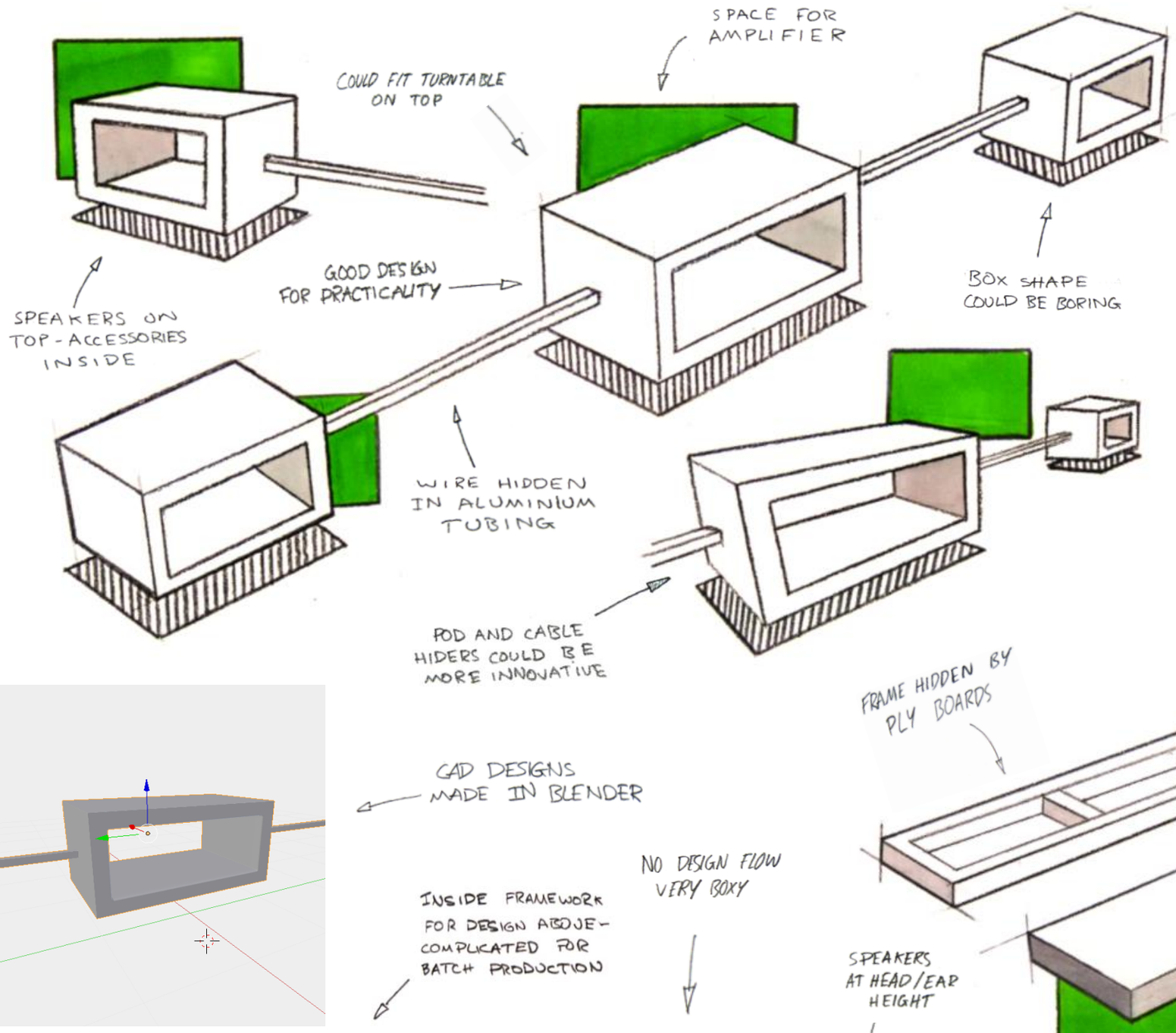
Safety:
- The shelves must attach to the wall very firmly. They cannot drop onto anyone or allow speakers to fall off. Customers will not buy again if this happens.

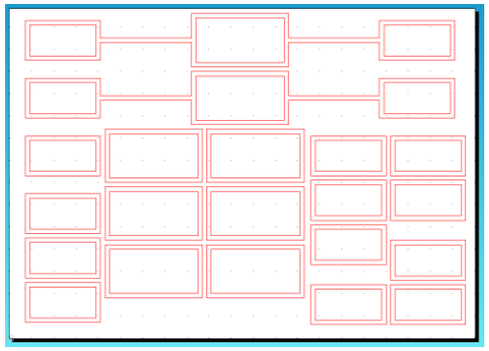
Technical Specification:

- The speaker shelves must have a top surface of at minimum 250mm x 200mm to fit average size small bookshelf speakers.
- The amplifier shelf must have a top surface of at minimum 250mm x 210mm to fit an average size small speaker amplifier.
- The shelves must not stick out more than 400mm from the wall to cause little obstruction in the room.
- Positioning of the shelves must be fully customizable. No set dimensions.

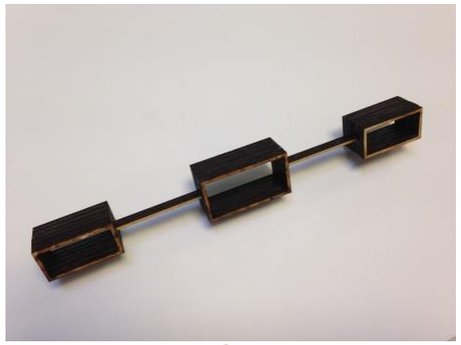
Main Specification Points:

- The shelves must attach to a wall in a way that allows them to be placed anywhere for customer customization and optimum placement.
- The shelves must be made out of materials and be manufactured in a way that makes them environmentally sustainable.
- Speaker wires must be hidden or disguised so that the shelves are not ruined by untidy wires.
- The shelves must have space to store/place accessories such as Bluetooth receivers.
- The shelves must attach to the wall very firmly. They cannot drop onto anyone or allow speakers to fall off.
- The shelves need to be suitable for average size bookshelf speakers and amplifiers allowing it to work for any customers existing products.
- My product should cost between £50-£60 to manufacture.





LAYERS CUT OUT USING 2D DESIGN



LAYERS GLUED TOGETHER TO ASSEMBLE MODEL

Comments from feedback:

Original idea.

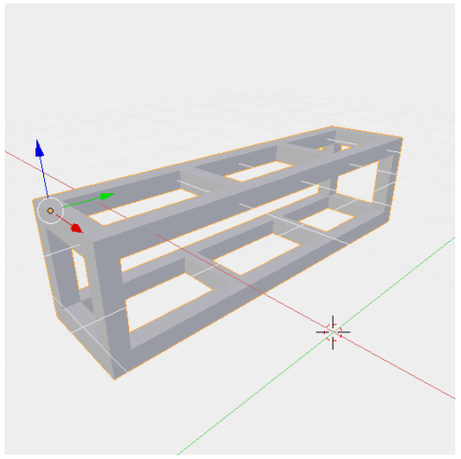
Functionally great.

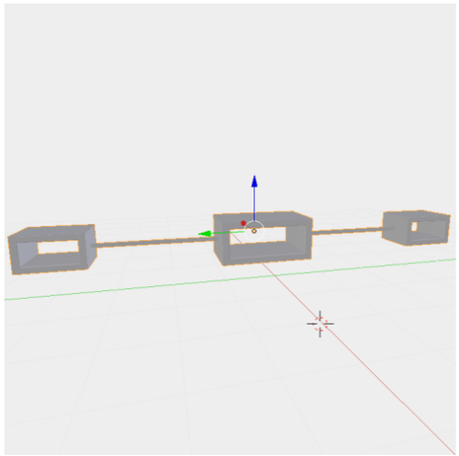
Needs a more contemporary design.

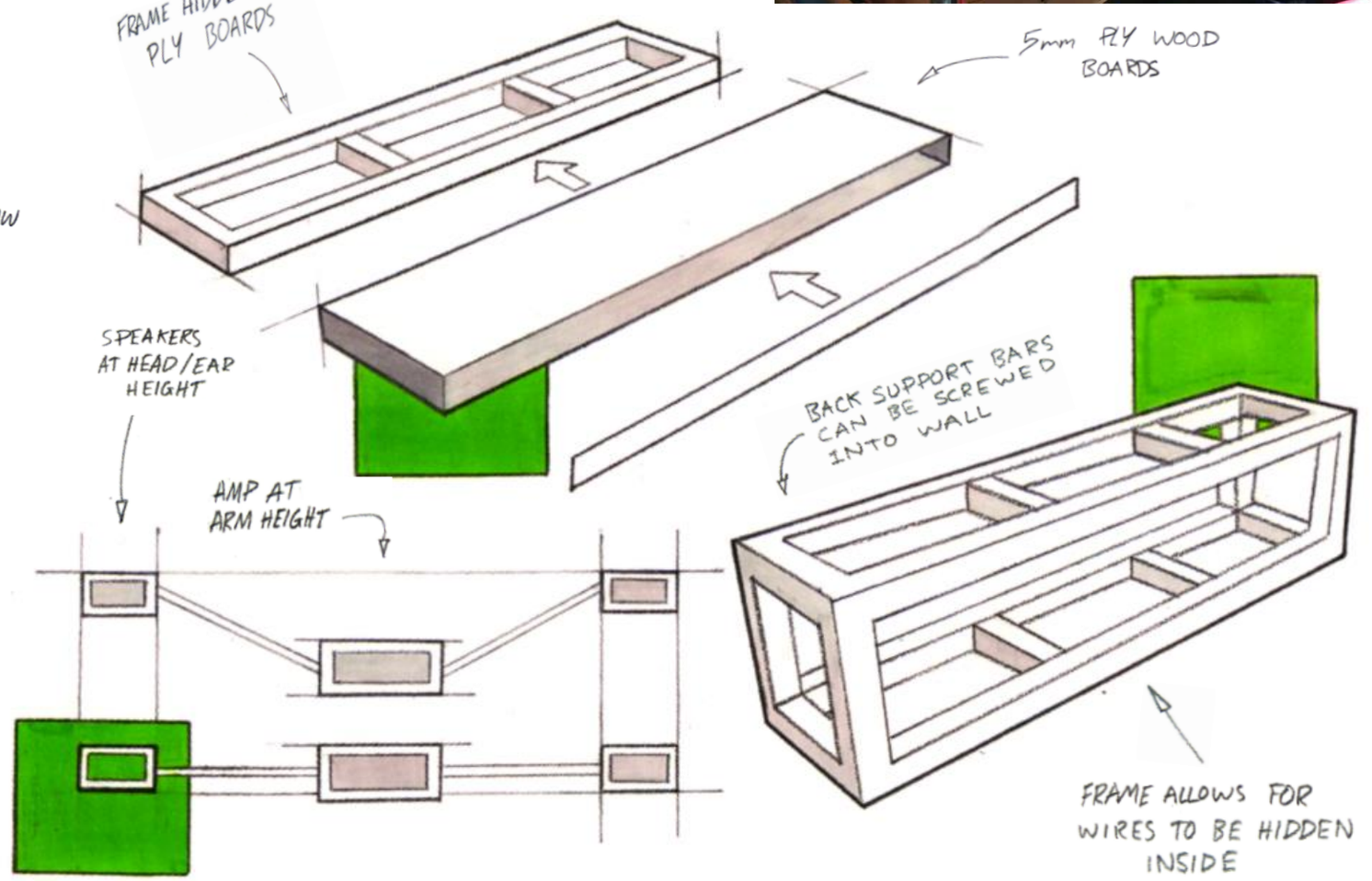
GAD DESIGNS MADE IN BLENDER

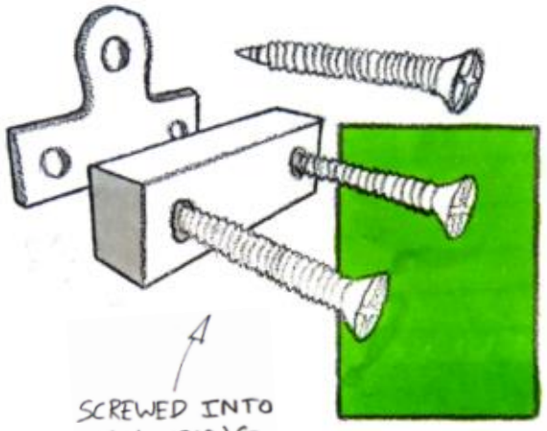
NO DESIGN FLOW VERY BOXY

INSIDE FRAMEWORK FOR DESIGN ABOVE - COMPLICATED FOR BATCH PRODUCTION









SCREWED INTO WALL USING BRACKET

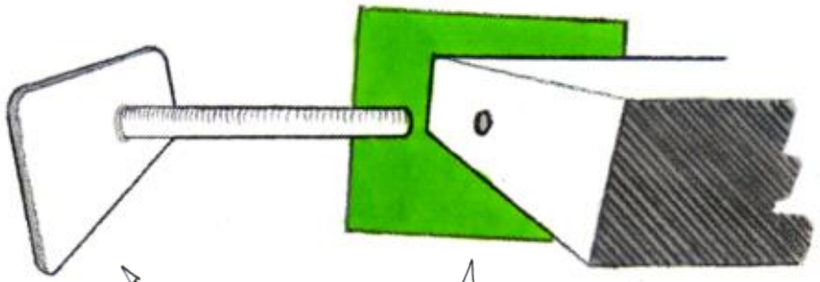
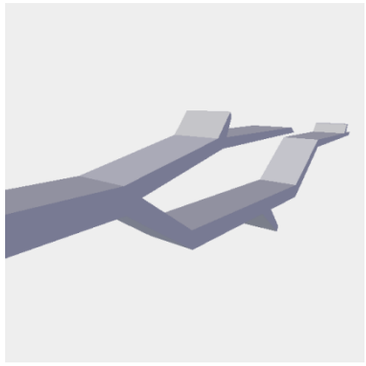


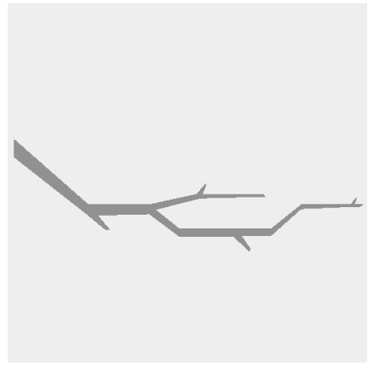
PLATE HIDDEN BEHIND SHELVES

RIGID POLE GIVES STRONG HOLD

MAY DROOP OVER TIME (IKEA SHELVES)



MADE IN BLENDER - EASY TO MANIPULATE AND CHANGE QUICKLY



2D RENDER FROM 3D MODEL USED TO CREATE LASER CUTTER TEMPLATE

EDGES COVERED IN CARD - FLAT PLATFORM

IF MANUFACTURED USE FLEXIPLY IN PLACE OF CARD-SUPPORTED BY BEAMS (ASH)

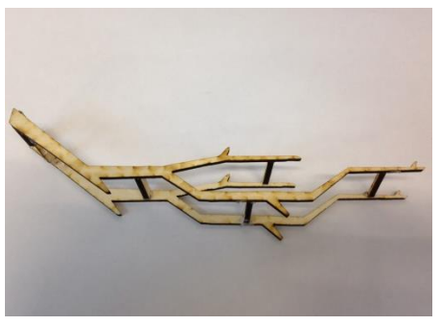
Comments from feedback:

More innovative + good speaker positioning.

Would be difficult to set up and feed wires through design – make assembly/setup easier.

COULD BE USED TO MAKE TEMPLATE FOR MANUFACTURE

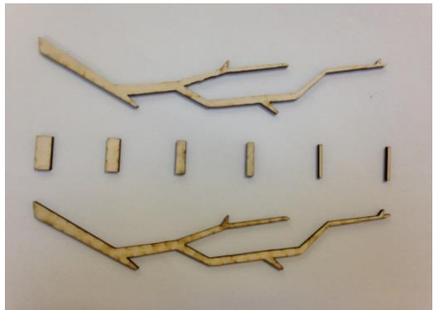
HELPED TO FIGURE OUT SCALING AND MAKE MODEL



SIDES HELD APART BY SUPPORT BARS

COULD BE MANUFACTURED LIKE THIS FULL SCALE

COULD LEAVE FRAME BENEATH EXPOSED



TWO SIDES + CONNECTING BARS CUT OUT ON LASER CUTTER

DESIGN INSPIRED BY NATURE

DIFFERENT HEIGHT LEVELS FOR AMP + SPEAKERS

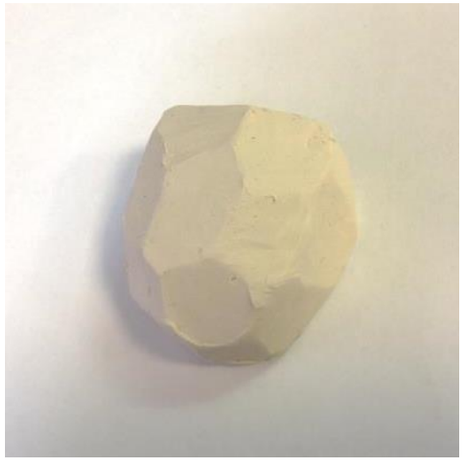
COULD ADD STEPS ON ANGLE FOR STORAGE

FUNCTIONAL YET INTERESTING

WOODEN SUPPORTS IN BETWEEN COVERED IN 5mm PLY SHEETS

NO SPECIFIC SPACE FOR ACCESSORIES

TWO SIDES OF HARD WOOD (OAK)



PLASTICINE MODELLING ALLOWS FOR QUICK CHANGES AND COMPARISON

CHANGE - THINNER, BETTER SHAPE + USES LESS MATERIAL

CHEAPER MANUFACTURE

Comments from feedback:

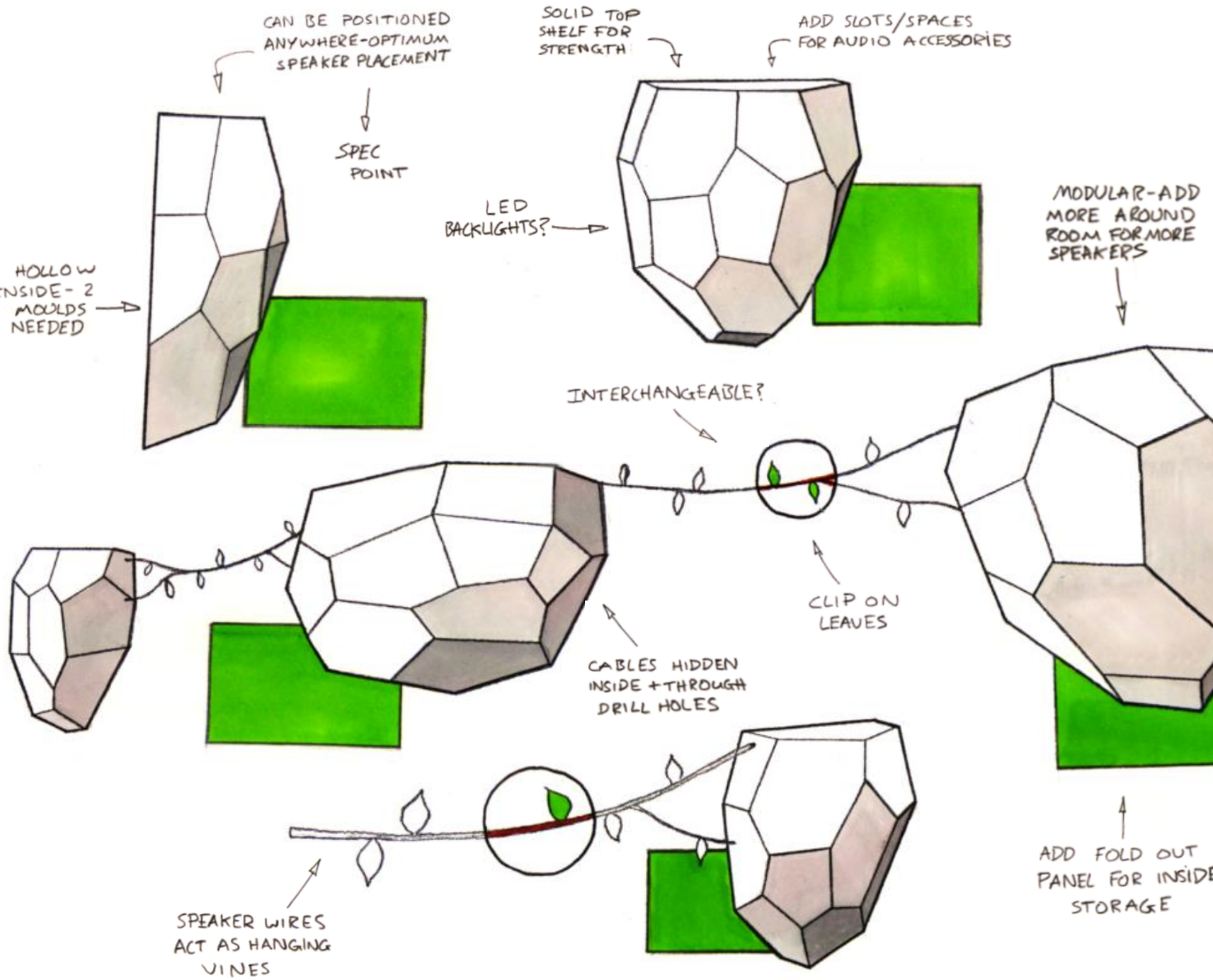
Ingenious disguising wires as part of shelving with clip on leaves.

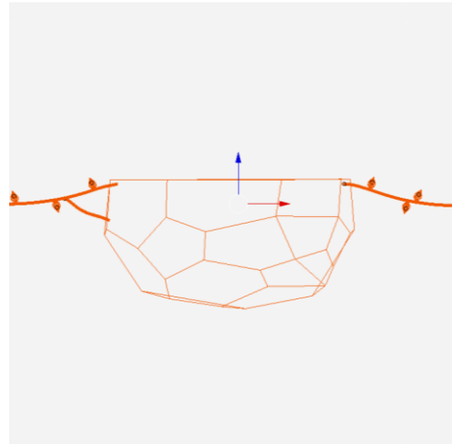
Units take up a lot of space on the wall – would be good if they had another function e.g. storage.

My response to last feedback:

A lot easier to set up as wires don't travel through the inside of the whole design.

Some setup still needed – would be easier to fit wires if units were hollow and accessible from the inside.



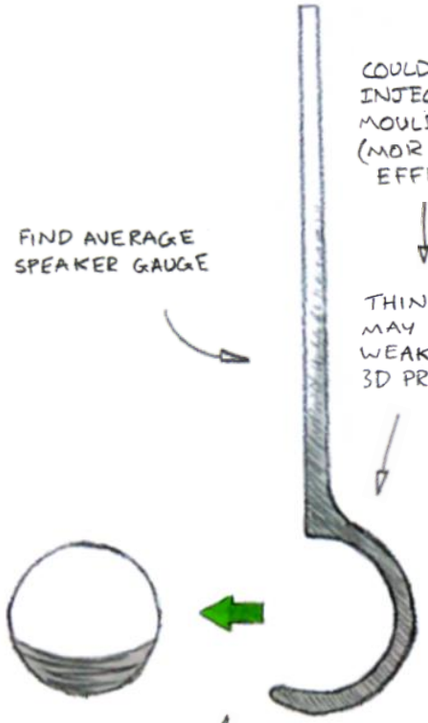


MODELS USED ON 3D ROUTER TO PRODUCE PRODUCT

PRODUCT WOULD BE FAR TOO HEAVY - DEVELOP THIS

USE EARLIER MEASUREMENTS TO ADAPT 3D MODEL

NEED TO WORK OUT SCALING - MUST FIT AVERAGE BOOKSHELF SPEAKERS + AMPLIFIER

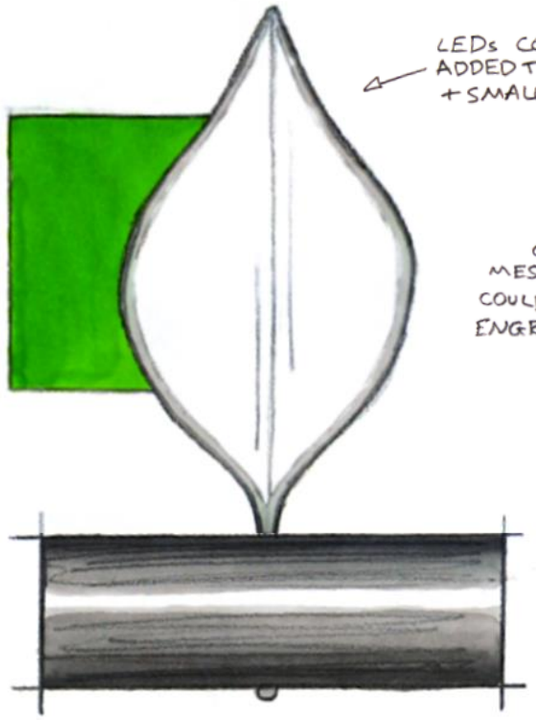


FIND AVERAGE SPEAKER GAUGE

COULD USE INJECTION MOULDING (MORE EFFICIENT)

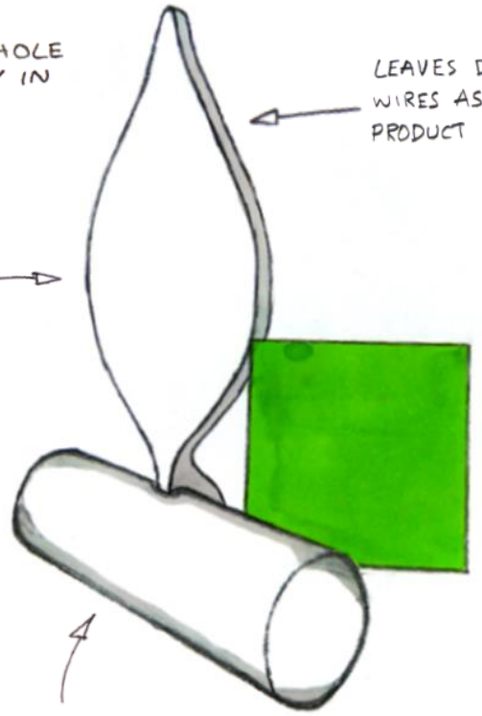
THIN CLIP MAY BE TOO WEAK FOR 3D PRINTING

MAY NOT FIT ALL SPEAKER WIRE GAUGES



LEDs COULD BE ADDED THROUGH HOLE + SMALL BATTERY IN BACK

CHEAP + EASY TO MANUFACTURE

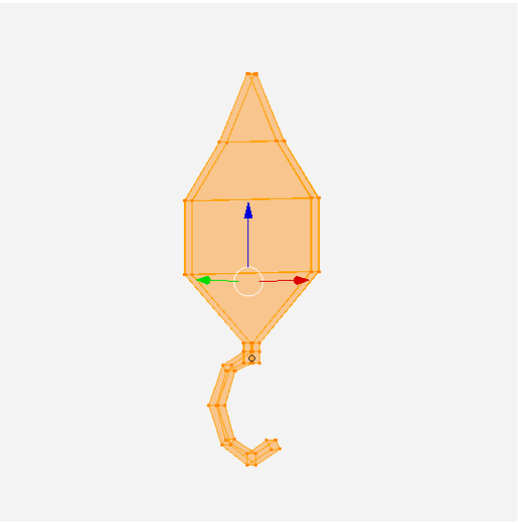


LEAVES DISGUISE WIRES AS PART OF PRODUCT

CUSTOM MESSAGES COULD BE ENGRAVED

3D PRINT WITH THERMOPLASTIC (ABS)

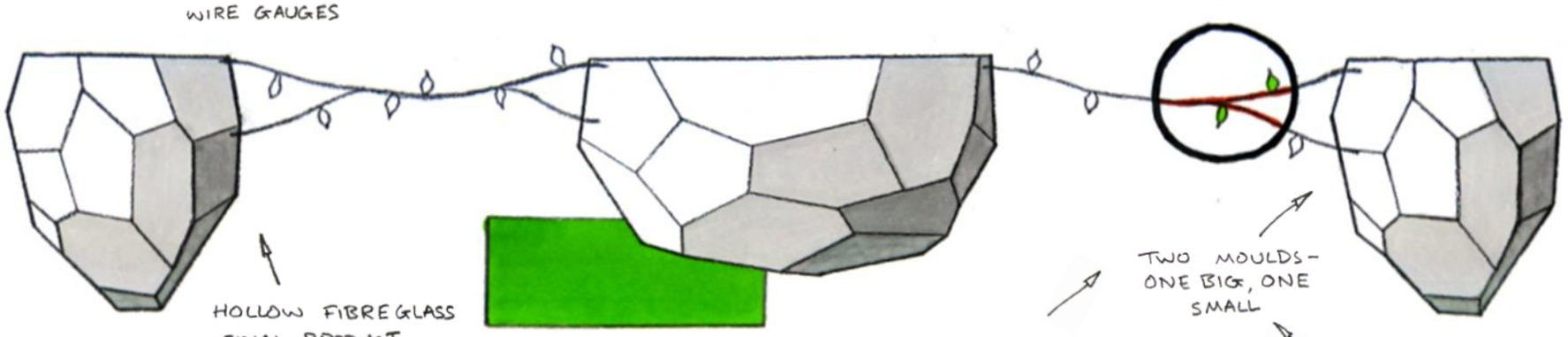
COST OF ABS VS ACRYLIC



COULD LASER CUT IN ACRYLIC AND BEND/TWIST WITH HEAT

WOULD REQUIRE MODEL BEING SPLIT INTO SECTIONS

MODEL USED ON 3D PRINTER



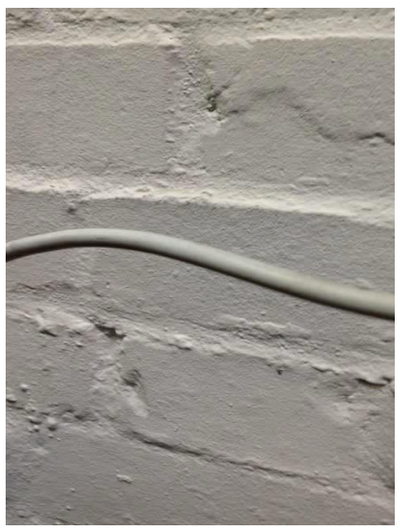
HOLLOW FIBREGLASS FINAL PRODUCT

EFFICIENT, STANDERDISED MANUFACTURE

TWO MOULDS - ONE BIG, ONE SMALL

MANY PRODUCTS FROM ONE MOULD

USE LASER CUTTER TO ETCH VEIN PATTERN



CLIPS FIRMLY ONTO SPEAKER WIRE

MEASURE + USE AVERAGE SPEAKER WIRE GUAGE

MADE IN 3 PARTS ON THE LASER CUTTER

Comments from feedback:

Leaves are a clever solution to the cable problem.

Response:

Make sure that they are cheap to manufacture to not raise overall product price.

Marketing

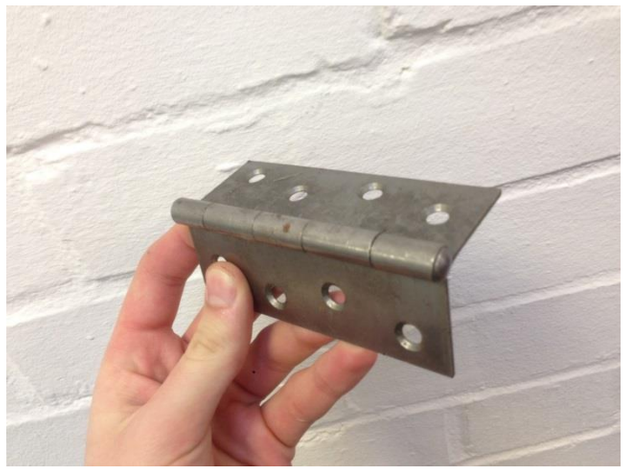
Material expense:
If the units are hollow it is much more cost effective. Instead of buying large blocks of material I would only need sheets. These can be bought in bulk for cheaper pricing.

Methods of manufacture:
The hollow units also allow me to use manufacturing methods such as vacuum forming to create the main shell. This gives a very professional looking finish that will look good in any promotional material and help the product to sell.

Assembly:
This mounting method does require the consumer to screw in a lot of parts to the wall. The consumer may be put of this when the product is being marketed with it's instructions so making this simpler would help the product sell more.

Marketability:
The unique selling point should help the design to sell. There are not many wall mounted speaker shelves that hide the wires and have such a contemporary design.
Instead of just hiding the wires I have made them part of the product. Consumers will be attracted to this as they will like the idea of being able to tidy up their already owned wires.

Advertisement:
This product would be advertised independently to high end music product retailers. A logo and branding would need to be created along with a catchy name. The nature inspired design will help designers to come up with professional looking promotional material.



Comments from feedback:

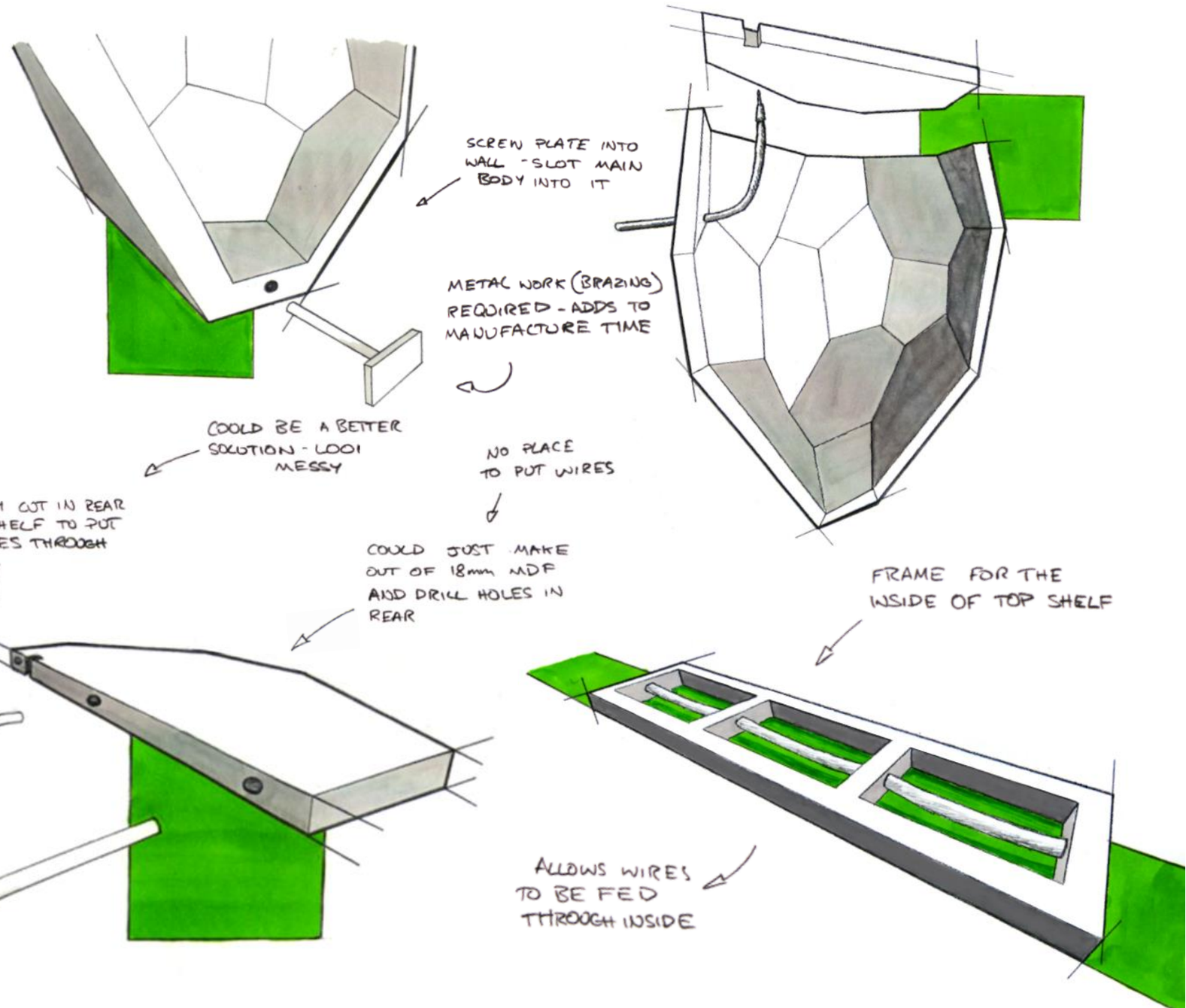
Method of fixing is too complicated for user to complete.

A simpler solution would be better.

Response to last feedback:

Have made the design hollow to allow the user to store items inside.

Need to sort out a solution for how the user will access this area.



Comments from feedback:

Wall fixing method is much simpler and easier to complete.

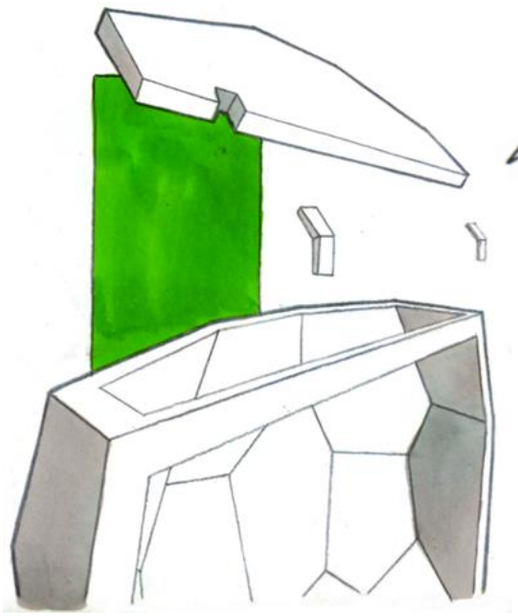
Hinged tops are great to allow user to store accessories.

Response to last feedback:

Added a hinge top to allow the user to access the store space inside.

Development and research into hinge types is needed.

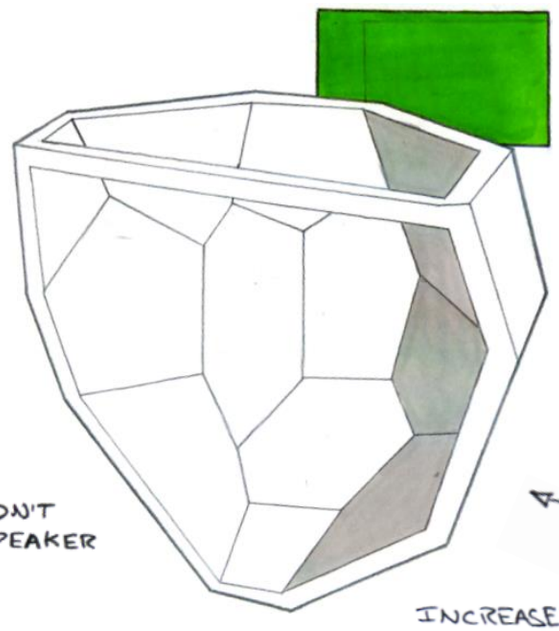
SIMPLER METHOD OF WALL FIXING - CHANGED FROM FEEDBACK



WOULDN'T LIE FLUSH AGAINST WALL

HINGE BARREL WOULD STICK OUT

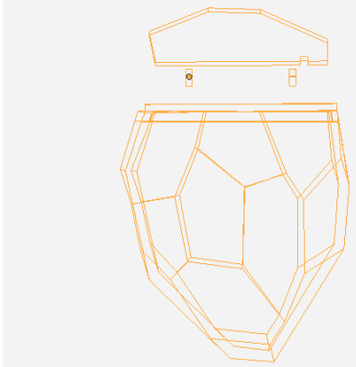
SURFACE WOULDN'T BE FLAT FOR SPEAKER PLACEMENT

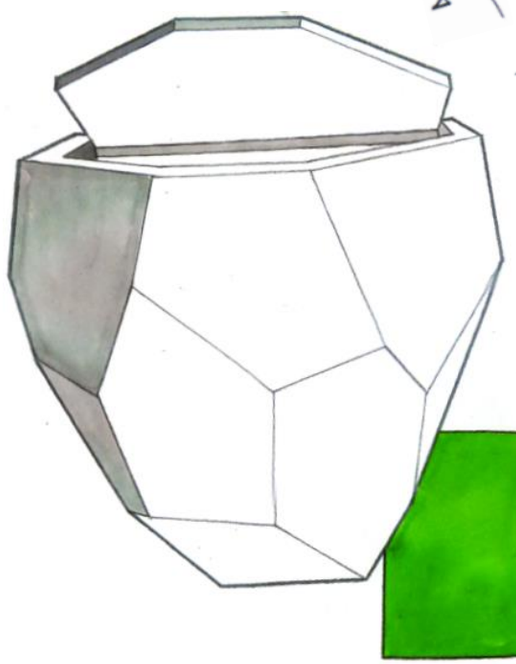


INCREASE HEIGHT OF BACK BAR TO REPOSITION HINGES

CHEAPER + EASIER TO MANUFACTURE AND FOR CONSUMER TO SET UP

MODEL MAY HAVE TO BE ADAPTED TO BETTER FIT SPEAKERS - TOO WIDE

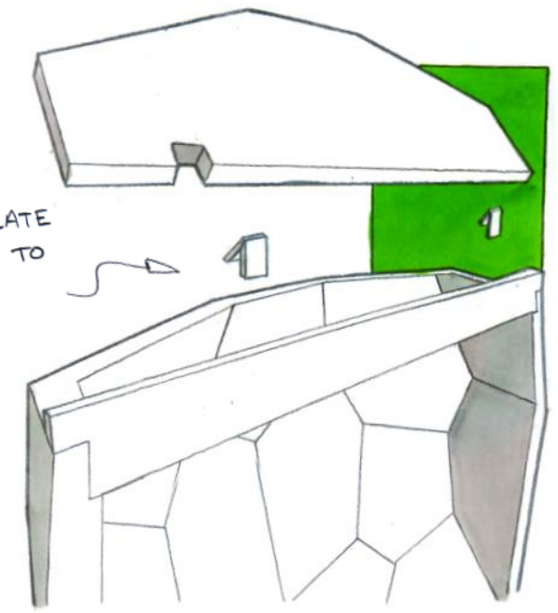




TOP SURFACE FLUSH WITH TOP EDGES

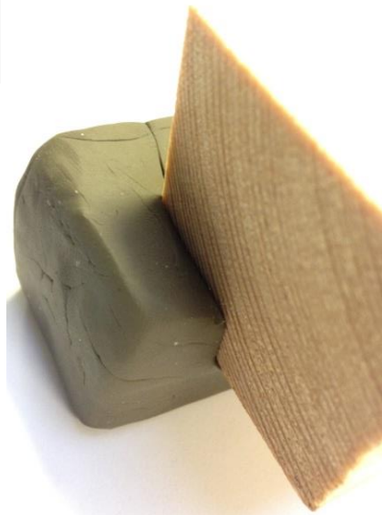
HARD TO ACHIEVE HIGH QUALITY IN MANUFACTURE

ADDED BACK PLATE ALLOWS HINGES TO BE HIDDEN



ALLOWED ME TO ROTATE LID AND MOVE PARTS AROUND TO FIND COLLISIONS

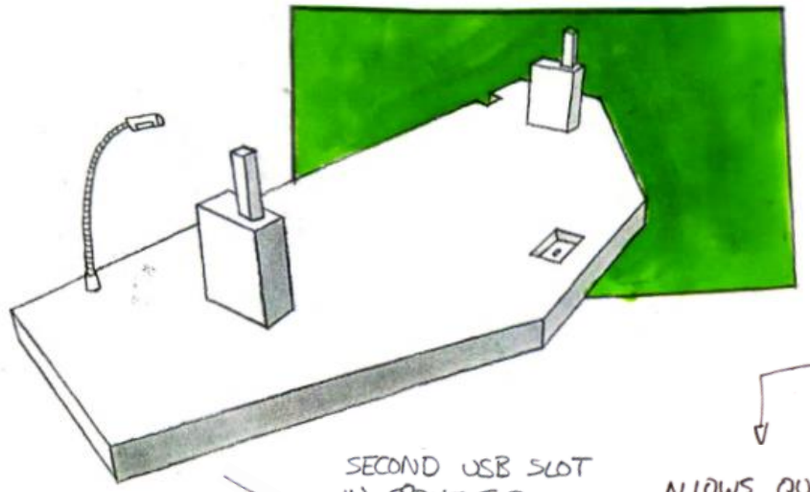
BACK SUPPORT BAR FITS INTO MAIN BODY IN SLOTS - WASTE OF TIME + MATERIALS



DEVELOPMENT OF ACCESSORIES FOR TOP SHELF

JANSJÖ
LED USB lamp, black
£2 A++

INCLUDE USB SLOT IN TOP TO PLUG IN TO

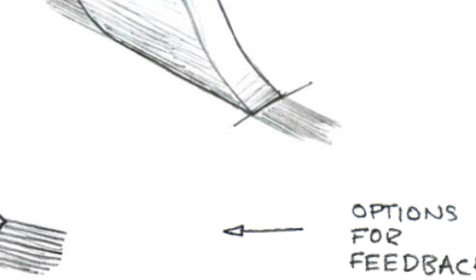


ADDED RUBBER ANTENNA WHILST MODELLING

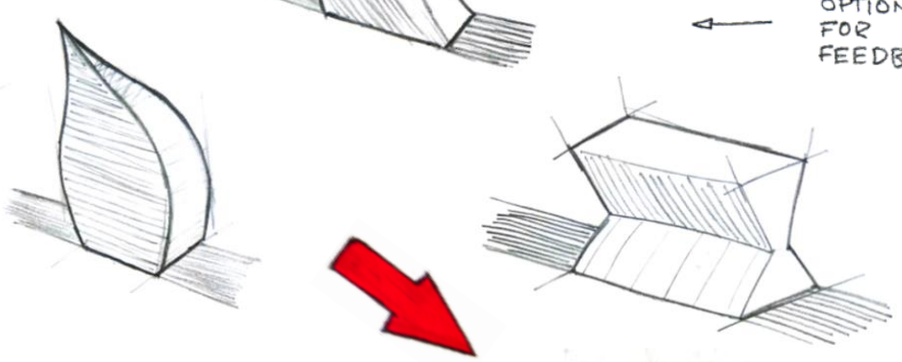
CHEAPER TO BUY IN EXISTING PARTS

DESIGN LESS INTERESTING

CURVY LAMP EXISTS-CHEAPER TO BUY



OPTIONS FOR FEEDBACK

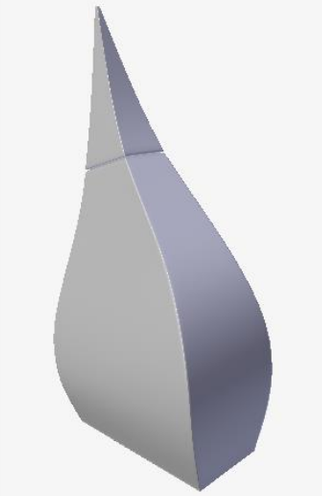


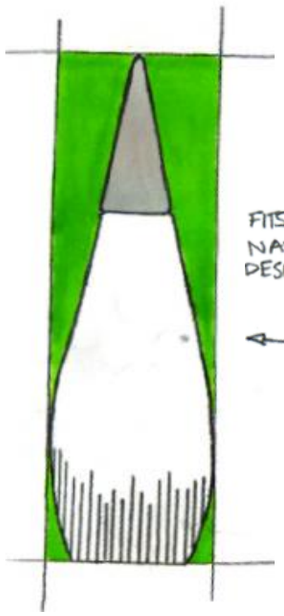
Response to feedback:

Wireless control is perfect for use around a large home studio.

The client has picked their favourite design from the ones suggested. This is the one I then decided to develop through CAD and hand modelling.

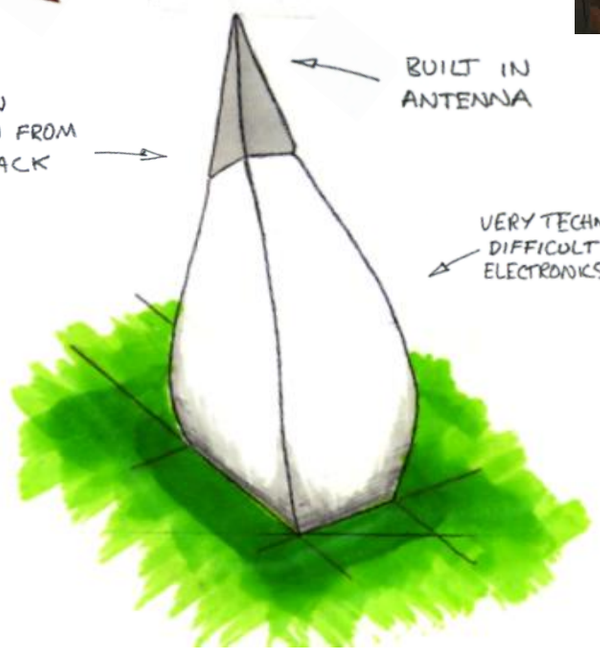
USB MALE TO USB FEMALE





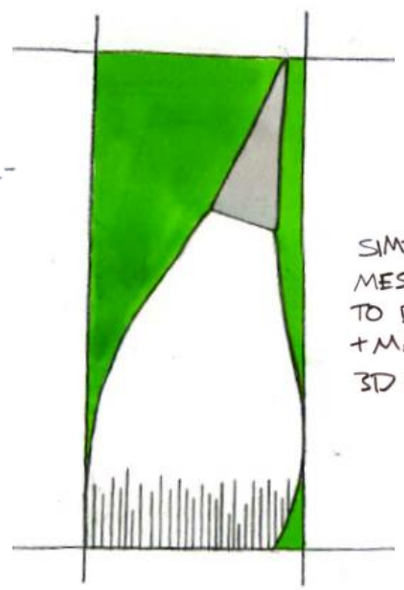
DESIGN CHOSEN FROM FEEDBACK

BUILT IN ANTENNA

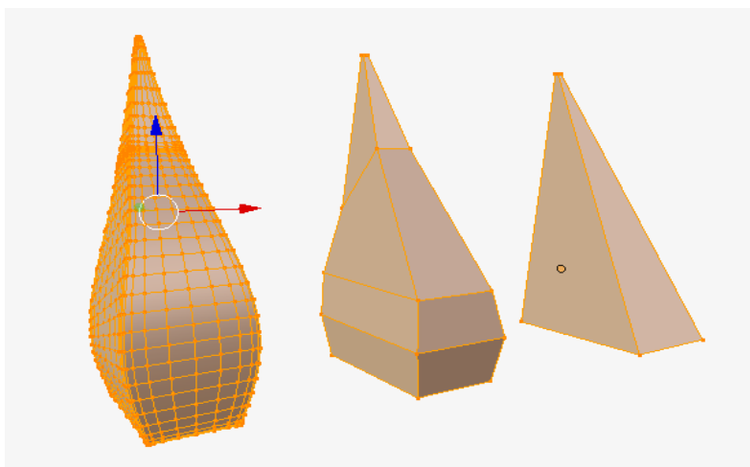


FITS IN WITH NATURE DESIGN-FLOW

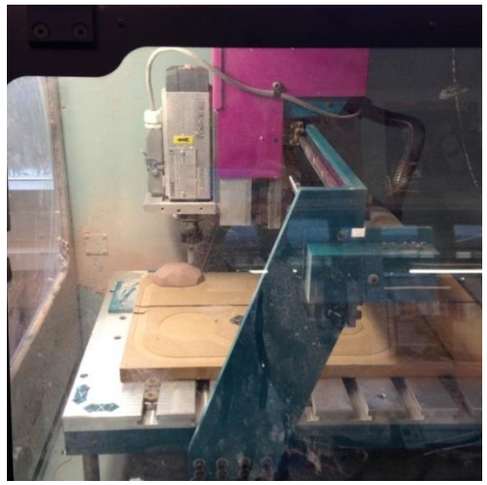
VERY TECHNICAL- DIFFICULT ELECTRONICS



SIMPLE BASE MESH USED TO DEVELOP + MAKE FINAL 3D CAD MODEL



VIDEO RENDERED IN BLENDER- COULD BE USED IN PROMO MATERIAL/ ADVERTISING TO SHOW PRODUCT MOTION



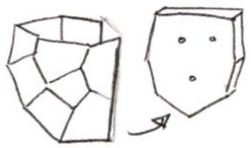
SMALL SCALE MOULDS CUT OUT ON 3D ROUTER FROM .STL FILES

MODELS NEEDED LITTLE CLEAN UP DUE TO HIGH QUALITY CNC SETTINGS

MULTIPLE FORMS CAN BE MADE FROM ONE MOULD

GAVE ME FEEDBACK ON MOUNTING METHOD

UNIVERSITY LECTURER IN FURNITURE DESIGN FROM RYCOTE WOOD



TOLD ME TO USE A WALL MOUNTED BACK PLATE TO SCREW THE SHELL AROUND

FINAL VAC FORMS PAINTED FOR SMOOTH CONTEPORARY FINISH

STRING AND PAPER LEAVES USED TO REPRESENT WIRES

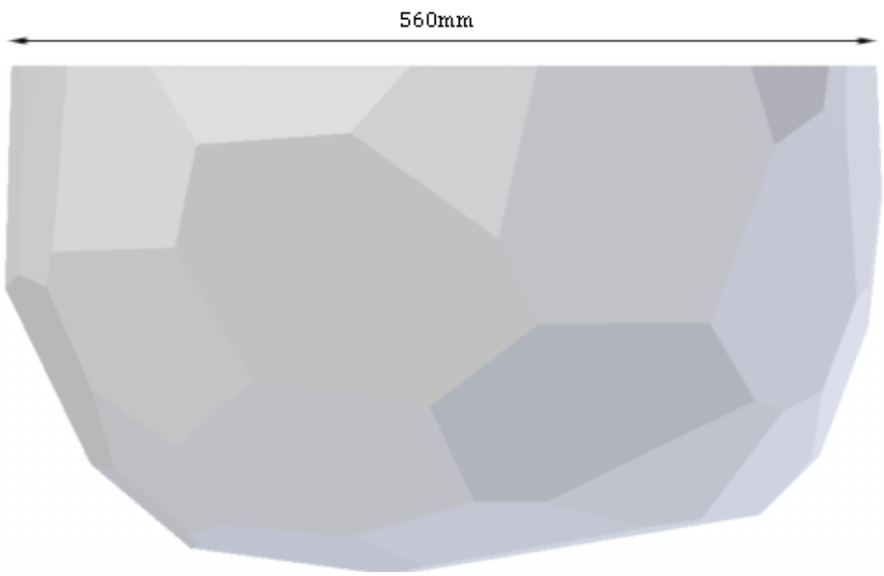
LASER PLY LIDS CUT ON LASER CUTTER AND ATTACHED WITH FABRIC HINGES

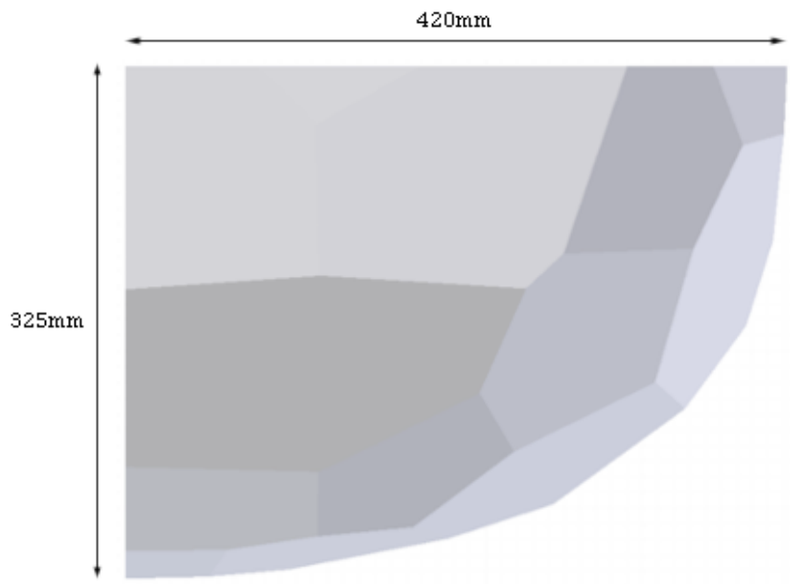
VIDEO SHOWS HEATED HIPS THERMOPLASTIC BEING SUCKED DOWN OVER MOULD TO CREATE DETAILED VAC FORME SHELLS

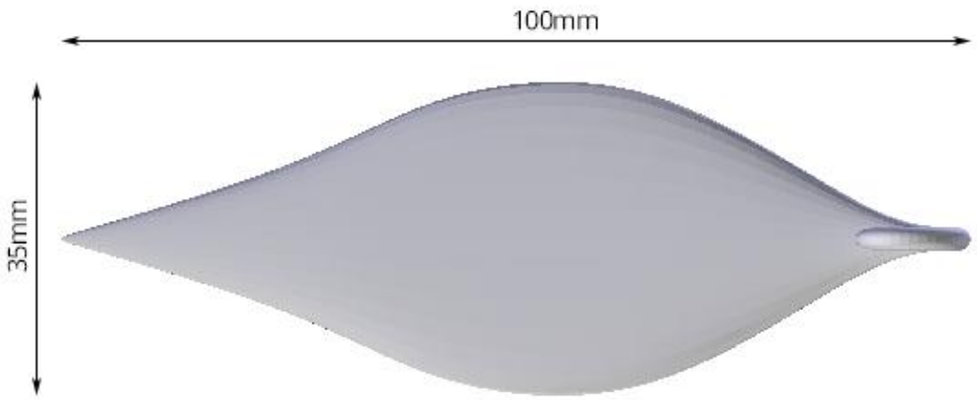
VAC FORMS COME OUT WITH A LOT OF EXCESS MATERIAL - NEEDED REMOVING WITH CRAFT KNIFE

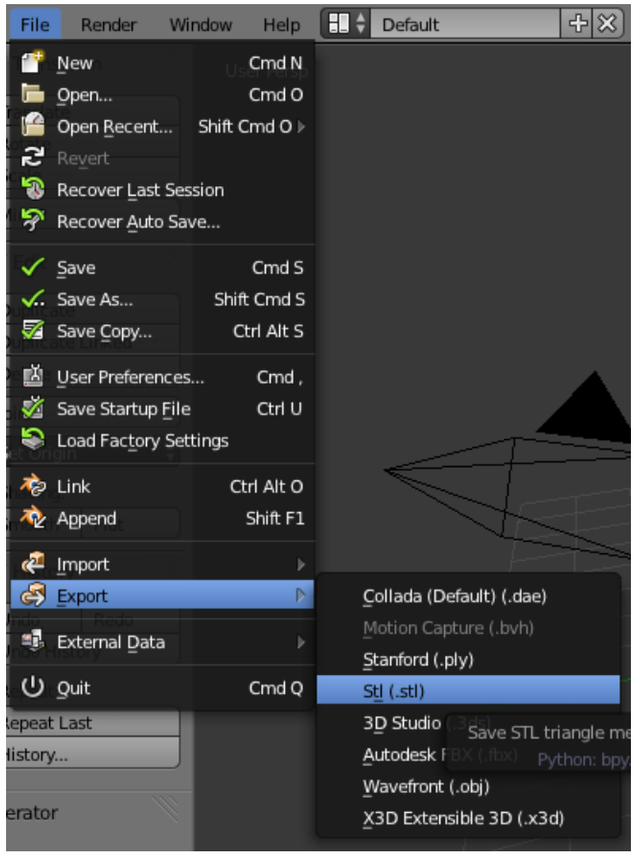
WORKING DRAWINGS

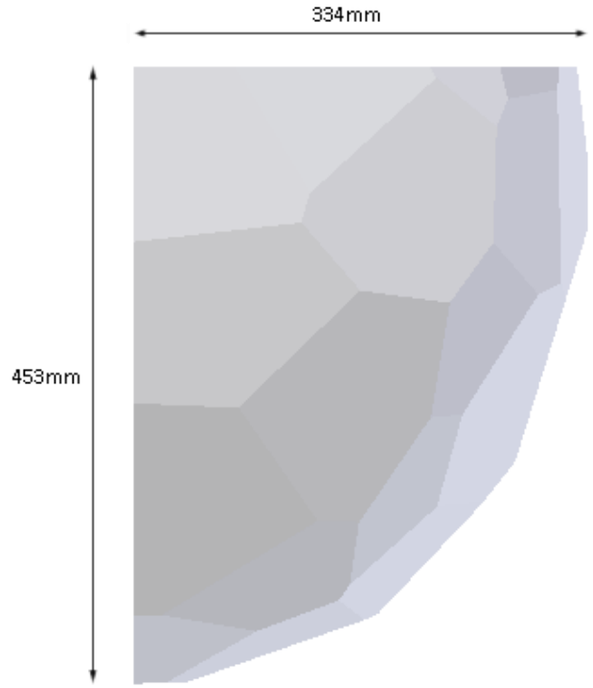
.STL files will be given to manufacturers and loaded into CNC and 3D printer machines. Top and bottom models are for the mould used to make the shells. Centre model is to be 3D printed to make the clip on leaves.











PLAN OF MAKING

WEEK ONE:

MAKING THE MOULD

STAGE 1: Make the 3D models for the moulds in Blender. Files should be converted to .stl to allow them to be used on the 3D router. Split them into 18mm slices to allow them to be cut by the machine.

STAGE 2: Create a cutting list for the MDF and cut out the correct sizes for each layer.

STAGE 3: Mount the 18mm MDF plates into the 3D router. Load up each file and cut it out individually. Use PVA to glue each layer together and filler/sanding to give the mould a perfectly smooth finish.

WEEK TWO:

MAKING THE VAC FORMED SHELLS

STAGE 4: Use a vacuum forming machine to form the ABS thermoplastic over the mould. Repeat 3 times to get 3 shells.

STAGE 5: Clean up and trim the edges of each mould with the band saw and sanding. Quality control check each mould to make sure the back edge lies straight against the wall all around.

STAGE 6: Pre-drill holes in back edges of shells. Quality control check later to make sure they line up with back plate holes.

WEEK THREE:

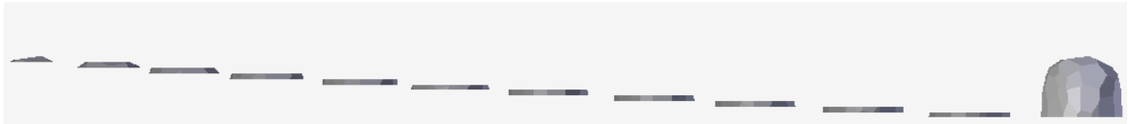
ASSEMBLING AND FINISHING THE PRODUCT

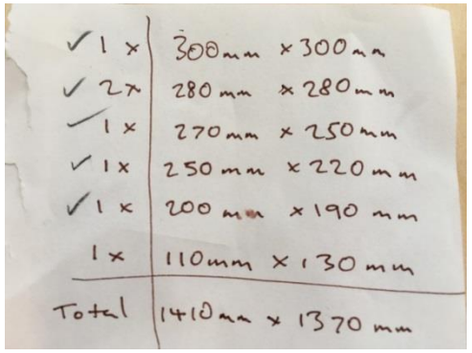
STAGE 7: Cut out back plate on band saw and top shelf on laser cutter. Install hinges to both using drilled holes. Pre-drill holes in front and sides of back plate to make it easier for user assembly.

STAGE 8: Make 3D models for leaves and send to 3D Creation Labs for 3D printing. Do this at start of week as the process takes 4 days till they arrive.

STAGE 9: Install USB in the top of the shelf using laser cut hole. Assemble product using pre-drilled holes to attach the back plate to the wall and shell to the back plate.

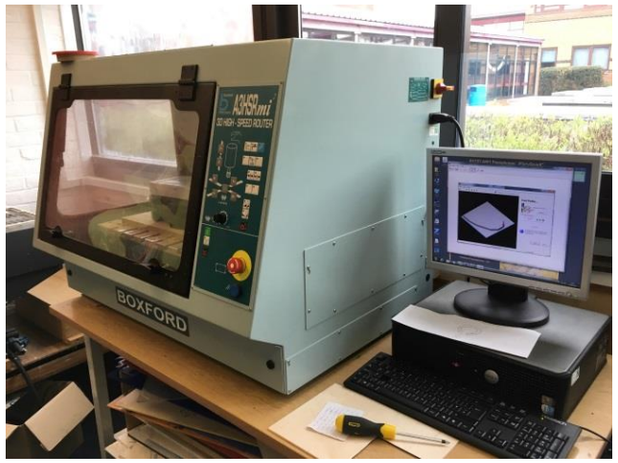
MAKING THE MOULD/ TOOL





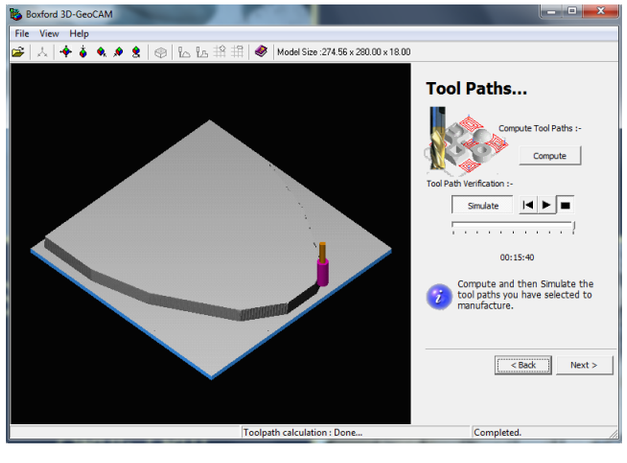
The 3D router we have in our department only has a tool that can cut to a certain height (30mm). In Blender I split up my 3D model into 18mm high slices to be used with 18mm MDF. I converted these to .stl files which work with our machine. I then made a cutting list of rough sizes to be used in the 3D router.

Each layer took just under 30 minutes to cut out plus changeover time. If a few moulds were needed I would use a CNC machine with multiple axis controls so that I could cut the mould out of one piece of material. This would be much more time effective.



MDF sheets cut to size on band saw and ready to be used in CNC machine. Due to the time and material it took to make the mould I could only make one shape. However if I were to do this on a proper production scale I would have made 2 moulds to be used for vacuum forming with the different shapes shown in my design work.

Once the layers were all cut out I glued them together with PVA glue. I then had to fill and sand the mould as the router cut some sides quite roughly. The mould needed to have as little imperfections as possible as vacuum forming would pick all of these up.



The CNC machine software was used to simulate a path for the tool to take when cutting out each layer.

To mount into the vacuum machine the mould needed a plate to sit on. The hole in the middle was for the main vacuum to suck the air through. The mould (tool) was mounted on washers to allow air to flow and pull from beneath it.

VACUUM FORMING THE SHELL

Whilst making the mould I got in contact with a vacuum forming company called Balform. The CEO, Brian Lovelock, was kind enough to give me some advice on how the mould should be to best work on their machines (i.e. needing draft angles) and also to allow me to use one of there machines to vacuum form the shells of my product.

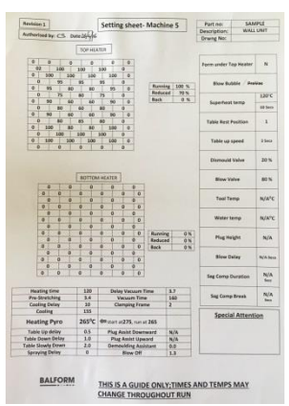
Ones the thermoplastic has been stretched over the mould (otherwise known as the tool) we needed it to be able to separate once the ABS had cooled and hardened. Putting wax on the tool allowed it to separate more easily.

The ABS thermoplastic we used needed to be heated in large ovens over night. This type of plastic absorbs water. When it is heated in a vacuum forming machine this reaches boiling point and so air bubbles appear in the final vacuum form. The overnight heating takes the water out of the plastic meaning the end finish to the product is smooth and without imperfections.

The vacuum forming machines had to be adjusted to fit my tool and it's base. The side clamps needed to fit snuggly so that the vacuum pressure would be high. As my tool was quite tall it meant that we could only use the top heater.

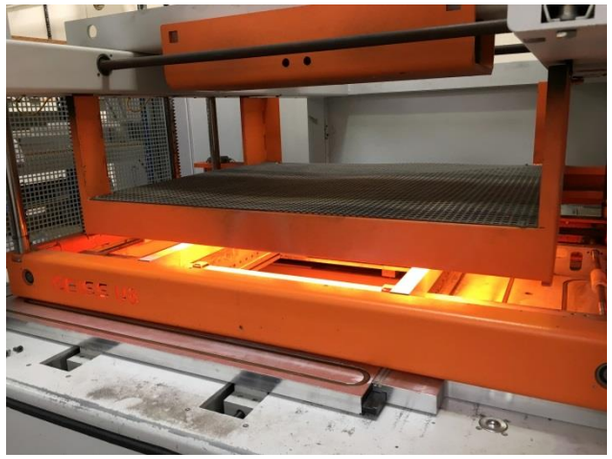
When I arrived I was given two vacuum forming experts to work with. They had a look at my mould and decided how to mount it into the machine. We then had to build the base to allow it to be mounted in the machine seen on the previous page to allow the vacuum to work around the mould.

We then had to set up the machine controls for the vacuum form. This included temperature, heating times, bubble blow times, vacuum times etc. we set up a heat map which would work best for my tool and then set it going. All the settings can be seen on this sheet.


Setting sheet- Machine 5

THIS IS A GUIDE ONLY;TIMES AND TEMPS MAY CHANGE THROUGHOUT RUN

VACUUM FORMING THE SHELL



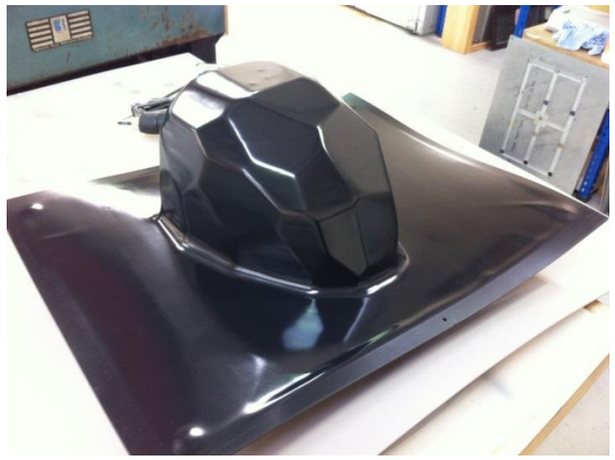
The ABS thermoplastic was sheet was mounted into the machine and heated to 265º for 120 seconds.

The vacuum pressure needed to be kept as high as possible to achieve an accurate form. Ours was a little low so the bottom edges were slightly too rounded. However this can be fixed in the post-vacuum forming work by trimming the form higher up.

VIDEO:

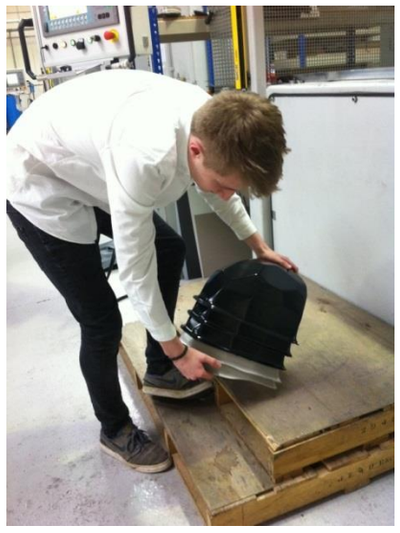
The vacuum is the used to blow a bubble in the plastic. The tool is then moved upwards as the plastic is sucked back down and around it. This means that the plastic is evenly spaced around the tool with no stretching it too much.

The forms came out of the tool very easily showing that the advice from CEO Brian had worked well. The finish on them was smooth and without imperfections so no post work needed to be done on this

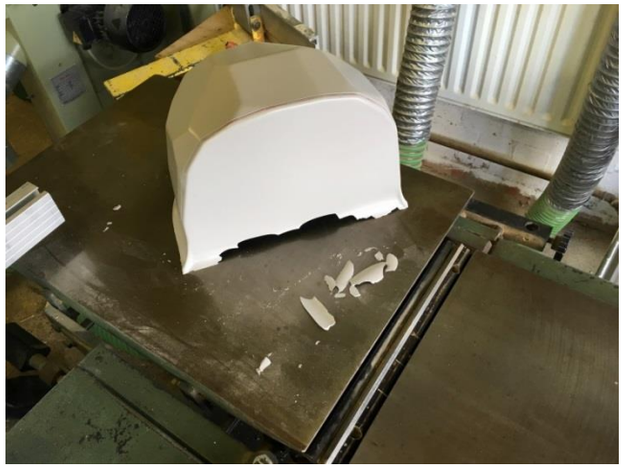


On the first try some of the setting weren't quite right for the material we were using. The plastic was not hot enough and so it split as it was brought down over the mould. We increased the heat and changed some of the timings and it worked perfectly after this.

They then roughly cut around the vac forms on a band saw so that I could eaily take them back to the workshop. Here I would do more detailed trimming and finishing shown on the next pages.

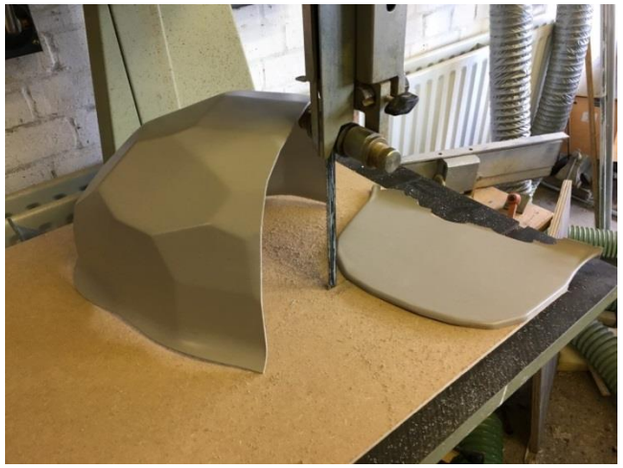


POST VAC FORM ASSEMBLY/ MAKING WORK



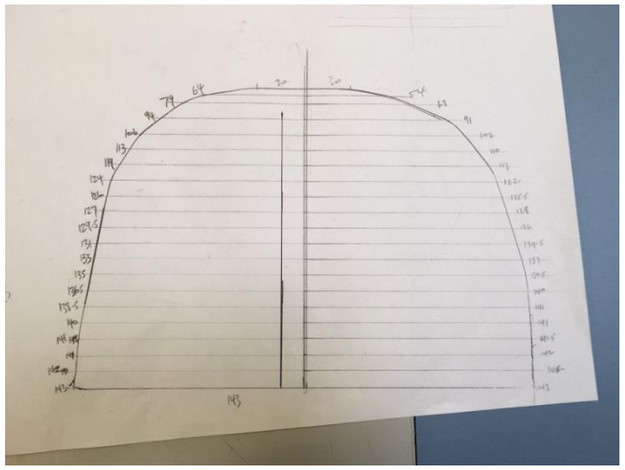
With one of my test forms I tried to trim the bottom on the surface of the planer thicknesser. However as ABS is quite brittle it started to crack and shatter.

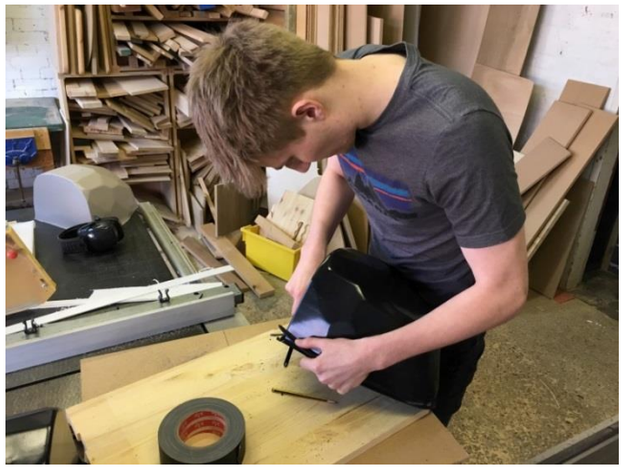
We then used the band saw to cut off the top of the vacuum forms. They fit under the band saw much more easily and so a straight cut could be achieved without much need for clean up work afterwards.



Instead we used the band saw at multiple angles. This meant that the final cut wasn't quite as straight. However this was easy to sort out with file work afterwards.

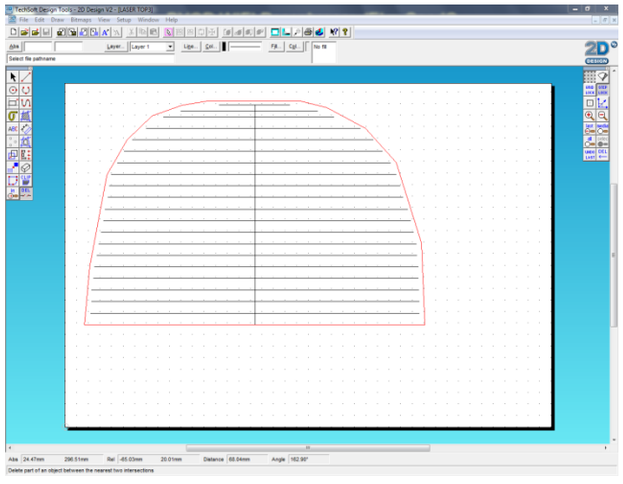
I first tried making the top shelves out of laser cut 3mm acrylic as it would be quick to do. To do this I drew around the top of the vac forms. I then made a centre line and measured the distance out to the edge every centimeter.





After using the band saw the edges needed to be cleaned up slightly. Doing this by hand with the blade of a hacksaw and files/glass paper worked well.

This drawing gave me points to plot into 2D Design V2 software. I then traced around this in red to cut out the shape with a slight lip around the edge.



POST VAC FORM ASSEMBLY/ MAKING WORK

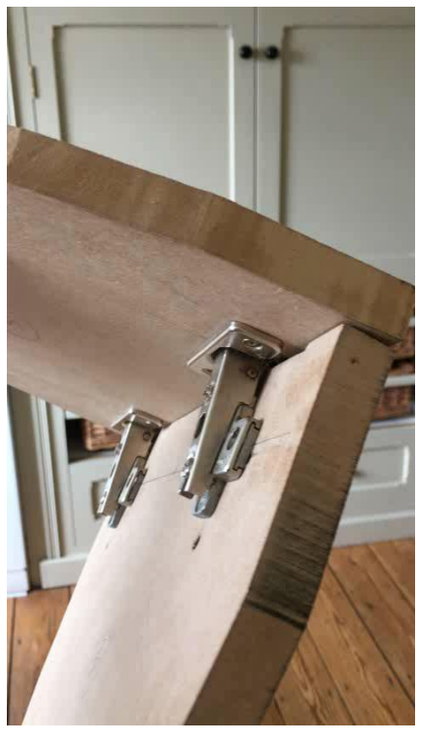
The tops came out of the laser cutter well with a good, smooth finish around the edges. However, after some preliminary testing they weren't looking quite right on the vac forms. I decided to remake the lids out of thicker MDF and have them fit more closely to the top of the shell. This would look much more like my original design work. The feedback on this design work showed that this was a better solution.

I fitted a blank sheet of MDF cut roughly to the right size onto the back plate using hinges. I then put the vacuum formed shells in place and traced around them. This gave me an accurate shape to cut around on the band saw.

Once these were cut they fit very well and could already support a lot of weight with just the back plate and hinges holding them up. Using a flat surface and a sanding block I sanded them by hand at a perfect 90º angle for a smooth finish. These fit much better on top of the vacuum formed shells.

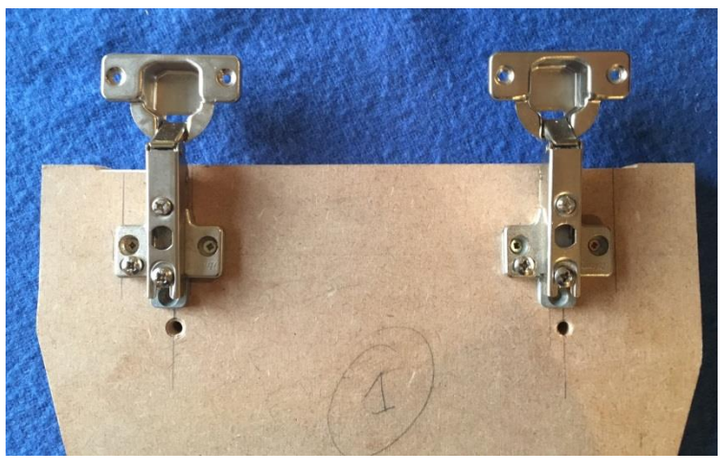
My original design work showed the top plate flush with the top of the back plate. However this would have led to the knuckle of the hinges sticking out the stop – leaving less room on the shelf. While manufacturing I discovered these cupboard hinges. They allow the top plate to hinge upwards without it colliding with the wall it is mounted to. This means I have more room on the top of the shelves and the motion of the top shelf is not obstructed.

VIDEO:



POST VAC FORM ASSEMBLY/ MAKING WORK

A holesaw drill bit was needed along with smaller drill holes to attach the cupboard hinges to the underside of the top shelf. This gives them a very strong hold on the shelf and allows it to sit flat on top of the back plate.



The hinges are then screwed into the back plate.

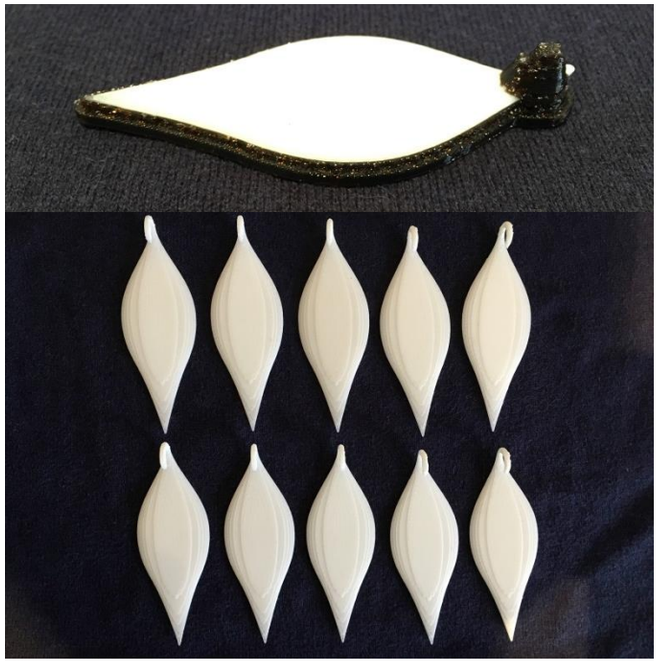
To create the USB slot I used a male to female USB cable. Using drill holes and a file I made a rough shape that allowed the female end to slot in. Once this was in I used filler to tidy up the edges and cover up some of the edging on the cable. I think this worked really well to create a professional looking power input.

A portable phone charger can be plugged into the male end of the cable and placed inside the product to provide power.

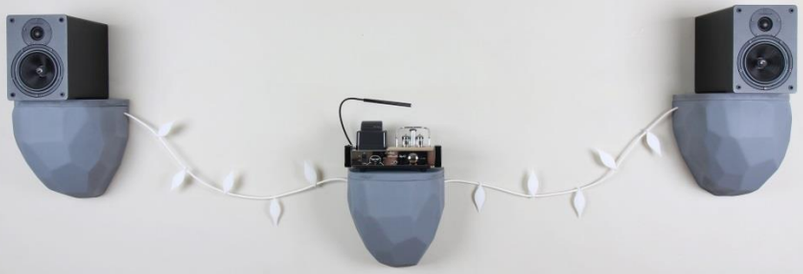
The back plate was then screwed into the wall using pre-drilled holes. The cupboard hinges held the weight of the top shelf and more without the shells being put on so this proves the strength of the top shelf.

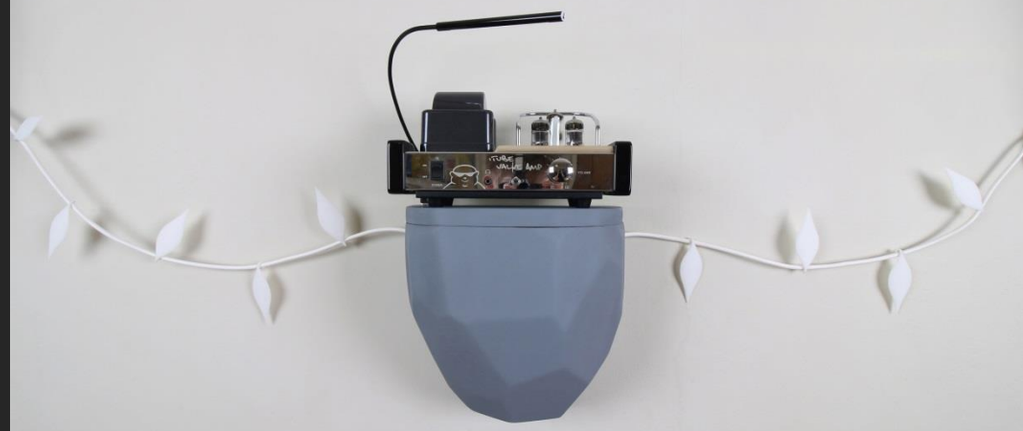
USB cable can be coiled and hidden inside the product.

I send my 3D leaf models from the working drawings into 3D Creation Labs. The top picture shows how each leaf was 3D printed with black support material to support the elevated sections whilst they solidified fully. This support material is removed after printing to create the finished product. This was a quick and easy way to get the leaves made but a cheaper solution would be required if they were made on a larger scale production.



The product was then assembled by the client by screwing the shell around the back sides using the pre-drilled holes.





TESTING

SPEC POINT – MEETS SPEC POINT – DOESN'T MEET SPEC POINT

The shelves need to be suitable for average size bookshelf speakers and amplifiers:

The top shelves do fit small size speakers and amplifiers. The prototype is also slightly smaller than then size of a final manufactured product as I was limited by the tools I had available. However this is something to improve as customers with bigger speakers will be left out. Perhaps a second larger version could be produced.

The shelves must have space to store/place accessories such as Bluetooth receivers:

The hinged top lids allow the user to get inside each unit to store accessories such as Bluetooth receivers. The cupboard hinges prevent the lids from colliding with the back wall. It may have been better to allow access to the interior without having to clear the top shelf first.

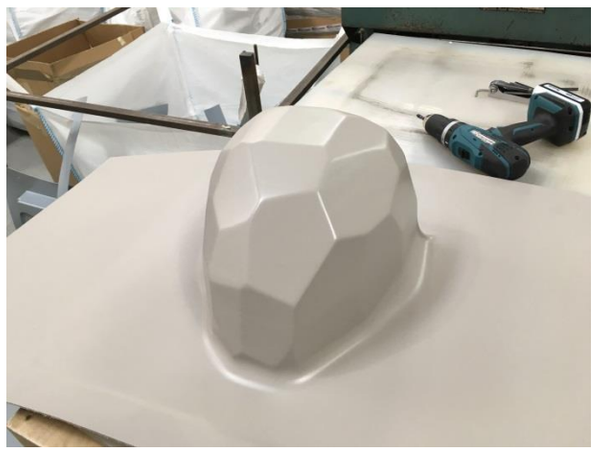
Speaker wires must be hidden or disguised so that the shelves are not ruined by untidy wires:

The clip on 3D printed leaves disguise the speaker wires as part of the product – making them fit in with the nature feel.

The shelves must attach to a wall in a way that allows them to be placed anywhere:

The back plate can be attached to the wall using the pre drilled holes. This means that the consumer can easily attach it anywhere in their home with screws and a few drilled holes.

The shelves must be made out of materials and be manufactured in a way that makes them environmentally sustainable:



The main shell is made from ABS. This can easily be recycled by shredding it and mixing it with virgin material. MDF used for the lids and back plate is made up of many wood waste fibers. This is good as it uses up waste wood that can't be made into planks or other types of timber. The use of moulds also reduces waste as only a small number are needed to make many products.

TESTING

SPEC POINT – MEETS SPEC POINT – DOESN'T MEET SPEC POINT

The shelves must come pre assembled to give them a high quality feel:

The majority of my shelves do come pre-assembled. Everything is pre-drilled ready to be screwed in. However in order to attach them to the wall, the consumer must screw the back plate into the wall. This would be very hard to do if the main shell was already attached so it makes it easier for the consumer to install the units if they come as two separate parts. The shells can easily be attached to the back plate afterwards using the pre-drilled holes.

The shelves must attach to the wall very firmly. They cannot drop onto anyone or allow speakers to fall off:

The units screw into the wall firmly using wall plugs. This may make it hard to move the shelves around a room however it is necessary as expensive equipment may be placed on top of them.

My product should cost between £50-£60 to manufacture:

Wallingford School

St George's Road, Wallingford, Oxfordshire, OX10 8HH
Telephone: 01491 837 115 Fax: 01491 825 278
Email: office.4140@wallingfordschool.com
Web: www.wallingfordschool.com

Headteacher: NJ Willis
Email: head.4140@wallingfordschool.com

25th April 2016

Product Design Practical Project Costs
Student – Dan Baines

Material	Cost per Metre/Sheet	Total
1 sheet 18mm MDF	£21	£21.00
Laser/Model Making Materials		£5.50
Sundries		£5.00
Grand Total to pay		**£31.50**

Payment should be made by either cash or cheque. Cheques should be made payable to Wallingford Schools Academy. If you wish to pay using Parent Pay then please let us know and we will arrange for the amount to be set up for you.

Thank you.

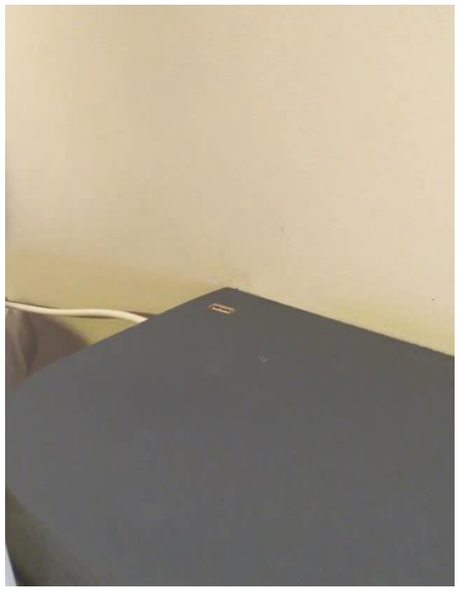
Mr Holden
Team Leader – Design & Technology

This is the pricing list for materials that were used to make my mould. One mould can be used to make a large number of products and I would only need two types of moulds. The MDF used for the top and back plates are also included in the pricing above. The ABS plastic and vacuum forming was free to make my prototype. However this would be the main cost of the product and would definitely be between £50-£60 for all 3 units if not under this.

Any accessories added to the shelves must be easy to access and take up little space on the shelves that could be used for speakers:

The USB slot allows many different accessories that require USB power to be used such as the USB light. It can also be used to charge the consumers phone. The slot can run off of a battery powered phone charger that can be hidden within the product so no extra cables have to run down the wall. The Bluetooth device shown can be used to play music from across the room through the amplifier. This can sit on top of the amplifier so takes up no extra space.

VIDEOS:



Videos showing function of USB slot (accessory spec point) and the opening lids (storage spec point)

TESTING AND INDEPENDENT EVALUATION: STRENGTHS AND WEAKNESSES

STRENGTHS

The wall mounting method allows the product to be placed anywhere using drilled holes. This allows the user to get a good speaker positioning in any room.	The wires between the speakers are disguised in a fun and interactive way allowing the consumer to customize their product.	The product doesn't come fully pre-assembled. Instead it comes in two parts which need to be mounted to each other – extra effort.	To open the product it is necessary to remove the items on top. If you could access the inside without having to do this it would be better.
Vacuum forming the product allows it to be easily made in any colour just by changing the colour of the thermoplastic used. The consumer can pick their custom colour.	The lightweight material and pre-drilled holes allows the product to be easily installed in just 2 steps.	The product doesn't fit larger size speakers or amplifiers. 2 different types of product could be made to fit different sized hardware.	Leaves only fit onto a specific speaker wire gauge. A better clip on mechanism might work with more sizes.

WEAKNESSES

The hinges are hidden within to allow the top shelf to flip upwards without touching the wall it is mounted on. This also gives it a clean appearance.	The vacuum forming gives them a smooth, clean finish right away with out any need for additional painting or finishing.	Screw heads are visible around the back edge of the shell. They aren't too easy to see but they are necessary for it to mount to the wall.	The wire going to the amplifier is not hidden or disguised as the speaker wires are. This would need to be chased out within the wall which is more difficult to achieve.
Each unit contains a generous, easy to access amount of storage for wires and other accessories.	The product frees up floor space for other room accessories and leaves the room tidy by keeping the wires off the floor.	Hinges snap shut and are slightly too hard to lift. Could replace these with soft close hinges which are much smoother.	If a room needs to be re-arranged then it is hard to easily move the product from wall to wall.

TESTING AND INDEPENDENT EVALUATION:

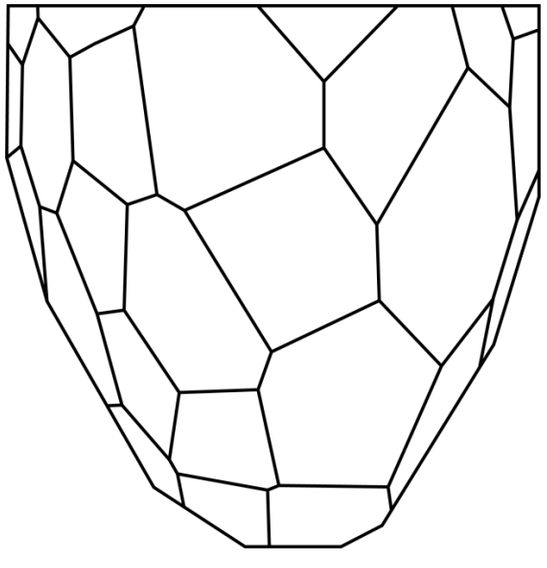
INDEPENDENT EVALUATION

QUESTION	CONSUMER RESPONSE	MY RESPONSE TO CONSUMER COMMENTS
“How did you find the assembly?”	“Really straight forward – two simple steps and the product was on the wall”	Although my spec points specified that the product should come pre-assembled I think that my assembly method works much better having not been. It would have been far too hard to reach inside the product to drill the correct holes or wall mounting accessories like brackets would have had to have been visible on the outside.
“What’s your favourite thing about the product?”	“The contemporary design of the shells”	The use of 3D design and sketching helped me to create an interesting nature influenced shape for the shells. However without CAM machines this would have been very hard to make. The use of 3D router and vacuum forming machines gave the design it’s unique look.
“What developments would you like to be seen made?”	“The lids tend to snap shut slightly – soft close hinges would be better”	If I were to take these into production I would replace the hinges with soft close hinges. This wouldn’t add much cost as they are a similar price to normal cupboard hinges but would give the product a higher quality feel.
“What’s the wall mounting method like to set up?”	“Really sturdy – I was completely confident putting my amplifier and speakers on the units”	Although some wall mounting methods such as small brackets may be more cost effective and require less manufacture. I believe that screwing the custom fit back plate into the wall gives a very strong hold and also makes the product look better – all one solid piece.
“Is the size of each unit good for you?”	“Fit these speakers perfectly. For my larger monitors I would need a larger version”	This prototype had to be made slightly small due to the size of machinery available. However if I were to take the product into production I would make it bigger. I would also have a second version for those who have small speakers and want to take up less room in their home.
“Is there plenty of storage in each unit?”	“There is ample storage inside – my speaker wires were too long but I just coiled them up and put them inside”	The use of vacuum forming meant it was easy to make the shells hollow. This allows the user to open the lid and store items inside. However there are no flat surfaces inside so this may be something to add in future developments.
“What do you think about the finish of the product?”	“I was pleased to be able to choose this colour from the range of finished that were available”	ABS plastic used in the vacuum forming can be ordered in a variety of colours. This makes it very easy to change the colour of the product just by changing the thermoplastic sheet it is made from. Giving the consumer choice makes their individual product feel special.
“What do you think about the way in which the wires have been disquised?”	“I wasn’t too sure about the leaves during the design process but now I think they look really great”	The leaves allow the wires to be easily hung without having to be hidden within walls or put through PVC tunnels. This means that the assembly of the product is much quicker and easier for the user.

MARKETING AND PRESENTATION

Logo/Brand Identity:

The logo has a very simple design which reflects the shape of the product meaning that it is very easy to remember and recognize. The logo text is simple to recreate using a font called “Big Noodle Titling”. This can be easily downloaded and used by designers so that the brand can be represented in the exact same way every time. Wherever the product is advertised or sold, the logo should be visible as it will get stuck in the mind of the consumer. The logo is also greyscale – this is a good idea as if promotional material has to be printed in black and white it will still look the same.



PEBBLE

Unique Selling Proposition:

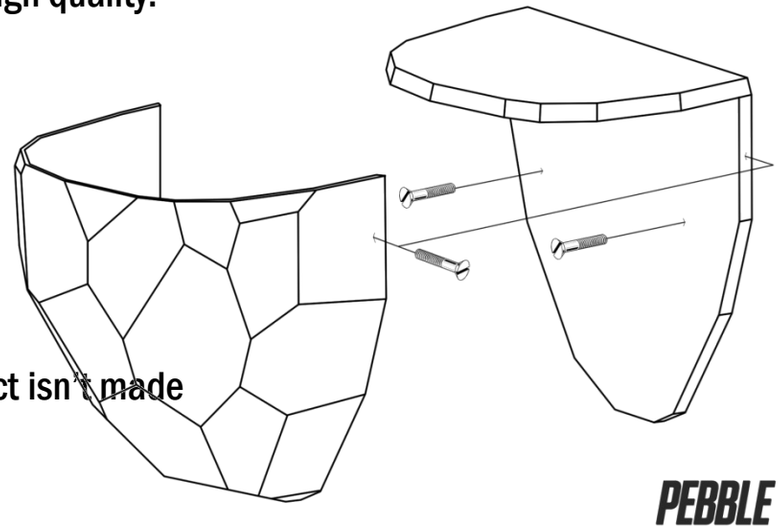
Other wall mounted speaker shelves do exist. However they all have the problem of untidy hanging wires which can only be solved by chasing out wires into a wall. The “Pebble” speaker shelves disguise these wires as part of the product. This is one of the main selling points of the product and needs to come across in any promotional material. All other wall mounted speaker systems are very functional but don’t look very good in a modern home. However “Pebble” has a very high end design and can be made in any colour to suit any home.

Packaging:

The product is quite large and each of the three units comes in 2 parts. There are also smaller parts of the product such as the leaves which are quite delicate. The product should come in one large box so that it is easy to transport. However there may be a need for smaller boxes inside to keep smaller parts safe. Also a lot of protective material will be needed to stop the unit from damaging eachother.

All packaging should come with “Pebble” branding on it so that the brand name and logo get embedded in the consumers heads. This also helps the product to look more professional and high quality.

The product should also arrive with a set of assembly instructions similar to these. The instructions need to be very simple so that anyone can put the shelves together and so that the product comes across with a high quality feel. Too much complicated assembly could lead to the costumer feeling the product isn’t made to a high standard.



Marketing and Presentation

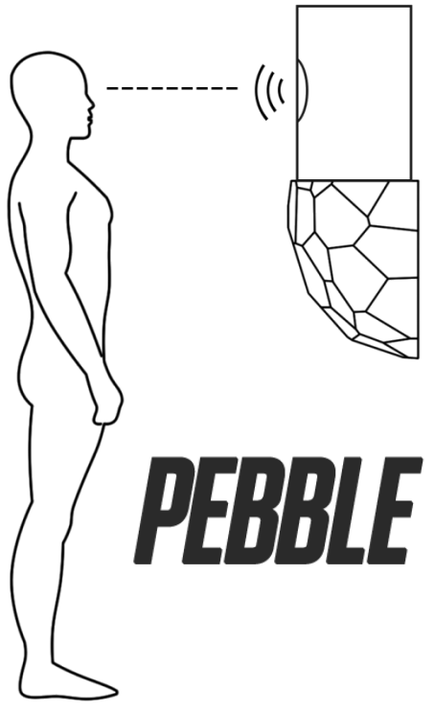
Product, Price, Place and Promotion

Product: The main selling point is the product itself and the features it has that meet the needs of the customer. The “Pebble” shelving unit holds speakers and amplifiers for playing music. However it is different to other speaker holders as it is wall mounted. Most consumers place their speakers on stands. However this takes up unneeded floor space. Therefore this product has a big advantage over the competition.

Price: As there are very few similar products on the market there is little competition in terms of price therefore the product has a high value to the buyer. Also keeping the price just below a major interval (e.g. £149.99) has a psychological effect on the buyer making them think they are getting a cheaper deal. Discount prices should be offered to trade customers so that they can make a good profit from the sales and will want to buy more.

Place: This product would be sold through high end music retailers that value good quality design and have customers who are willing to pay for this. A lot of sales will be done through the internet as the brand starts to grow and create it’s own name. Music product trade fairs such as NAMM are a good place to start growing this name as consumers go to them to check out the latest designs.

Promotion: The product promotion should be targeted at specifically music based media. This is so only the right consumers are targeted and no money is wasted on unneeded advertising. It can also be promoted all year around as it is not a seasonal product.



3D rendered animations can be used to show off how the product works in short promotional videos. This is an example of an animation that shows the products motion. Promotional material on the left showing that users should place the product at optimum listening levels.

This is a small part of a presentation I did to the class and teachers. This helped me to think about how to describe my product in a short and simple way to best allow people to remember it. I explained some of the marketing strategies I would use to present the product such as instructions and packaging info which helped me to better understand why they are useful in terms of sales. A pitch similar to this would be needed when trying to sell the product to trade companies to get them to buy and sell the units. The next page of this presentation shows the slide I used to present my product to the class.

THE PEBBLE

AUDITORY INTELLIGENCE
ELEVATED IMAGINAGTION

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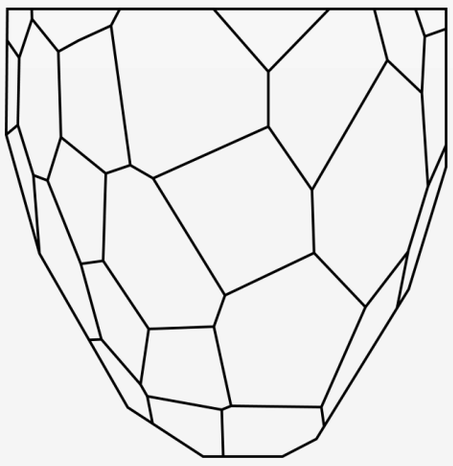
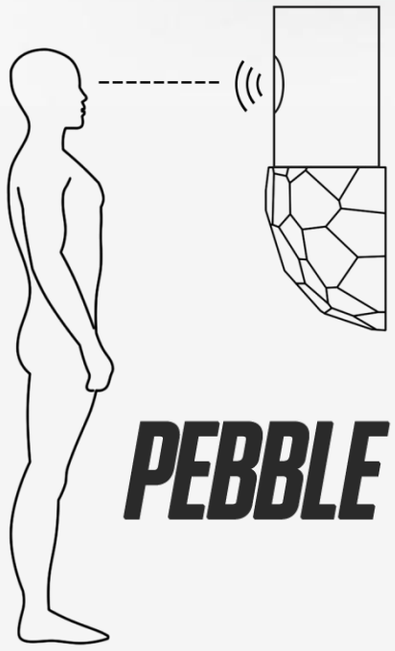
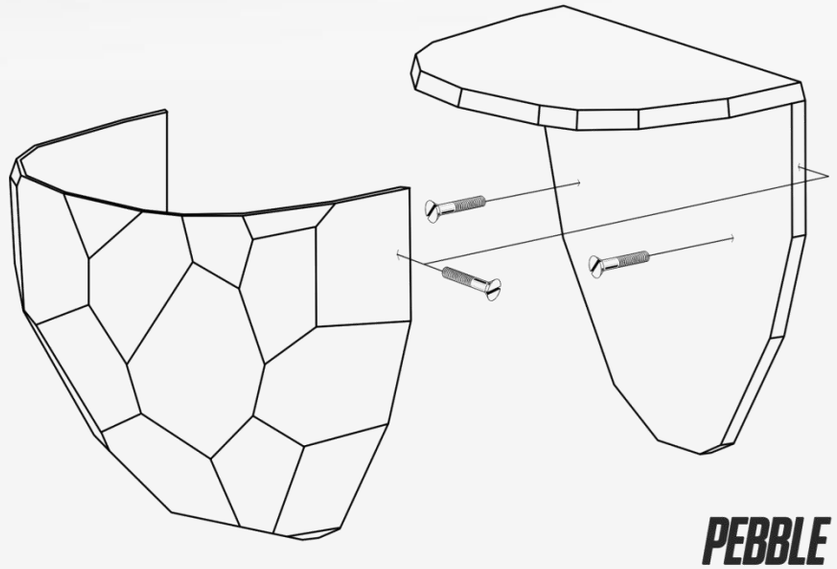


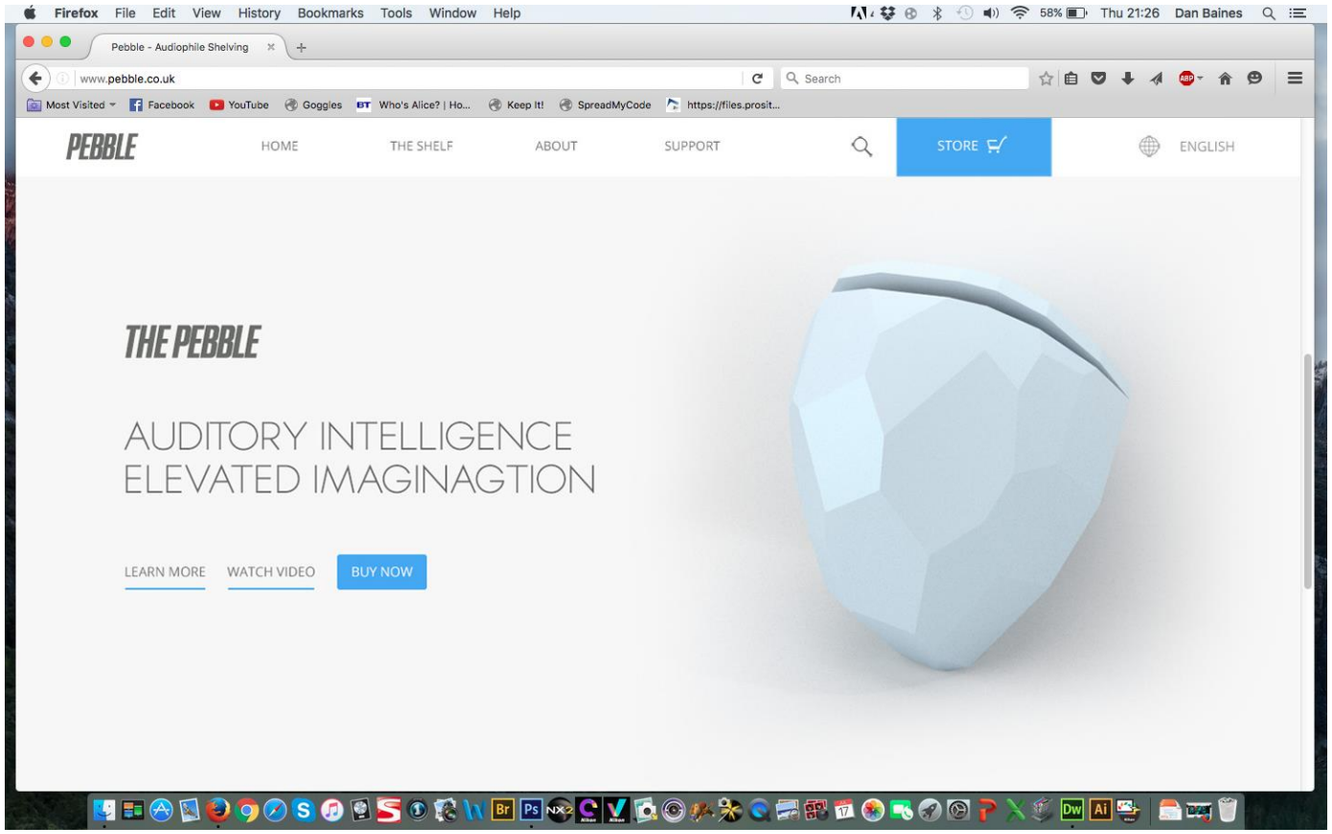




Marketing- Promotional Material

All parts of website and magazine made by me:

Images used on magazine cover and website were rendered in Blender using the 3D models I made when designing. Realistic lighting and camera set-ups were needed to create a photo-realistic look.



Magazine:

MusicTech is a popular magazine for all kinds audio enthusiasts. Consumers look in this magazine for tips on music but also for product reviews and new design releases. Getting an article or even putting an advert in this magazine would target the perfect audience for the speaker based shelving. They also visit a music expo every year called NAMM. To promote the product a stall could be set up at NAMM. Consumers would come to the stall to find out more and ask questions. The adverts and info would lead to an increase in product sales. Magazine advertising costs for MusicTech:

→ ADVERTISING PRINT RATES

SPECIAL POSITIONS	3 series	6	12
Outside back cover	£810	£765	£720
DISPLAY	**3 series**	**6**	**12**
Double page spread	£1185	£1125	£1060
Single page	£615	£585	£550
Half page	£355	£335	£315

Website:

A good way to advertise a new product/brand is by making a website. This can easily be shared online with a link and gives consumers more info about the product.

About pages can be used to tell consumers more about the company behind the product. Helping them realize the quality of the products it makes.

Websites can also be used to sell the product with the use of an online store. This makes it very easy for consumers to purchase the product without having to visit a shop. This can be one of the most frequent ways in which a product is bought as it is so simple for the consumer to complete.

REVIEW AND REFLECTION

LIFE CYCLE ANALYSIS

Acquisition of raw materials: ABS (Acrylonitrile-Butadiene-Styrene) is a thermoplastic made from the monomers Acrylonitrile, Butadiene and Styrene. These are man made materials made using oil. Oil is not a sustainable material and has to be extracted using oil refineries. Building of these and spillages can lead to destruction of natural habitats.

Transporting raw materials: Oil is often extracted from foreign countries such as Saudi Arabia and Iran. This means that if you want to produce ABS in the UK you must transport it here first. This can cost a lot of money using oil tankers to move the oil across the ocean and also isn't very good for the environment due to fuel consumption and pollutants.

Processing raw materials: ABS would be made in factories using expensive equipment. However large quantities of it can be made rapidly as it is a man made material.

Product manufacture: The product could be manufactured in the UK at factories such as Balform. The use of moulds to produce the main shell decreases material waste. Vacuum forming is quick and doesn't harm the environment – only electricity and air is required.

Transportation from factory to shop: If the product were to be manufactured in the UK then the transportation to the shops would be relatively environmentally friendly. However if the product were to be sold worldwide then air transport would create a lot of carbon emissions that harm the environment.

Use of the product: The only thing the product requires is power for the USB connection. Electricity can be generated sustainably so this is not a problem.

Disposal: ABS plastic can easily be recycled to and mixed with virgin material to produce new products. This is sustainable and makes up for the fact that the raw materials are so hard/harmful to acquire.

IMPLICATION OF THE PRODUCT

Moral and Ethical Issues:

The main vacuum forms would be made in English factories such as Balform. The workers here are paid well and have good working conditions. However it may be cheaper to buy the ABS plastic that is manufactured in less developed countries. In countries like this working conditions are a lot more harsh and pay is very low. It may be worth spending a little more money on the ABS plastic so that the people who produce it get to work in better conditions. This also gives the company a better name and will make consumers feel better about buying the product.

Sustainability Issues:

As seen in the life cycle analysis, most of the sustainability issues with the product are in the extraction and transport of the materials. Oil is needed in order to make the raw materials that make up ABS. This can only be extracted in certain places around the world for a good price and this means that it will need to be transported long distances before it can be used to produce the plastic. The extraction of oil can also cause many problem with the environment. Oil refineries take up a lot of space and spillages can cause habitat destruction.

Economic Issues:

A company must save costs where they can to increase their profits. However if this effects the workers in a bad way it may not be a good idea. For this product it may be worth using English factories and good quality materials. This means that the workers get paid well and the product can be sold for a higher price as it is of higher quality. Money can be saved in certain places by buying in some parts such as hinges.

Manufacturing Issues:

There are little manufacturing issues with the product. The shells are made using moulds which saves material and times. This leads to less waste and a more sustainable product. Some processes such as 3D printing (for the leaves) can be very expensive. It may be better to look at other cheaper solutions such as injection moulding. This would also save time and money and many products can be made from one mould.

REVIEW AND REFLECTION

Value of the client:
The feedback from my client throughout the design process was invaluable. Some features were added to the product such as the hinged lids and storage compartments because of his feedback alone. I really enjoyed designing a product that was targeted at a specific person/group and it helped to be able to treat him like a client when making design decisions such as colour and size. His technical knowledge was also very helpful when finding out more about speaker wires and Bluetooth accessories.

Setbacks:
The 3D router in our department only cut on one axis and about 3cm deep. This meant that I couldn't make my mould in one go. However to get around this I split my model up into layers to cut out and glue together. This worked very well and provided a sturdy mould to use in a vacuum forming machine.
My prototype also had to be made slightly small due to the machine restrictions. However in larger scale production I would use a larger 3D router to create a bigger mould.

The importance of various stages of designing and making:
The initial ideas stage really helped to find out what aspects needed to be included in the model. My initial design were very functional but not very innovative. Feedback helped me to realise this and create more unique looking products.
The use of 3D design really helped to create the final product. Without it it would have not been possible to make such a detailed mould by hand. CAM was also invaluable. Without a vacuum former I may have had to use techniques such a fibre glassing. This can take up a lot of time and is much harder to get a good final finish.

Quality control checks during making:
During the making process I made quality control and testing checks to make sure the product would function properly and look good when finished. For example, when I finished the acrylic lids I tested them on top of the shells. These didn't look quite right so I re-made them in MDF to increase the quality. I also tested the hinges once they were stuck to the rough cut wood. This allowed me to make any adjustments before I cut the would so they would fit perfectly once cut.

INDUSTRIAL AND COMMERCIAL PRODUCT DEVELOPMENT

- 3D printing the leaves was very expensive and took a lot of time as each one had to be printed individually. If I were to produce them on a larger scale I would use injection moulding. This would mean that one mould could be used to make many products. This is both quicker and more cost effective and similar materials such as ABS or acrylic can be used. Many leaves could be made in one go and different colours could be selected just as easily.

- For the prototype I only had the resources to make one mould. For commercial production I would make a few copies of each of the two moulds. This would allow me to vacuum form over multiple moulds at the same time - increasing the amount of products made per day. This is a much more cost effective way of producing the product.

- I would also make use of a larger 3D router with a multiple axis cutter so make bigger versions of my mould. Consumers would be able to choose between big and small versions of the product depending on which would best fit their speakers.

FUTURE DESIGN AND QUALITY DEVELOPMENT

- Inside the storage compartment of the product there are no flat surfaces. The user may need these to be able to store more valuable items. One design development could be to add a flat surface half way down the inside of the shell. This would decrease space available but keep the items stores safer.

- To give the product a higher quality feel I would hide the USB cable within the back plate of MDF or custom fit a female end. This would mean the storage of the product would be completely empty when it first arrived giving the consumer a feeling of brand new quality.

- The hinges used on my top shelf mean that they snap shut. These are bought in parts used to decrease costs so it would be easy to change them for soft close hinges. This would give the product a higher quality feel.