



**NEW SPECIFICATION
GCSE Design & Technology:
Resistant Materials Technology**

**Exemplar Project
iPOD Docking Station**

Autumn 2010

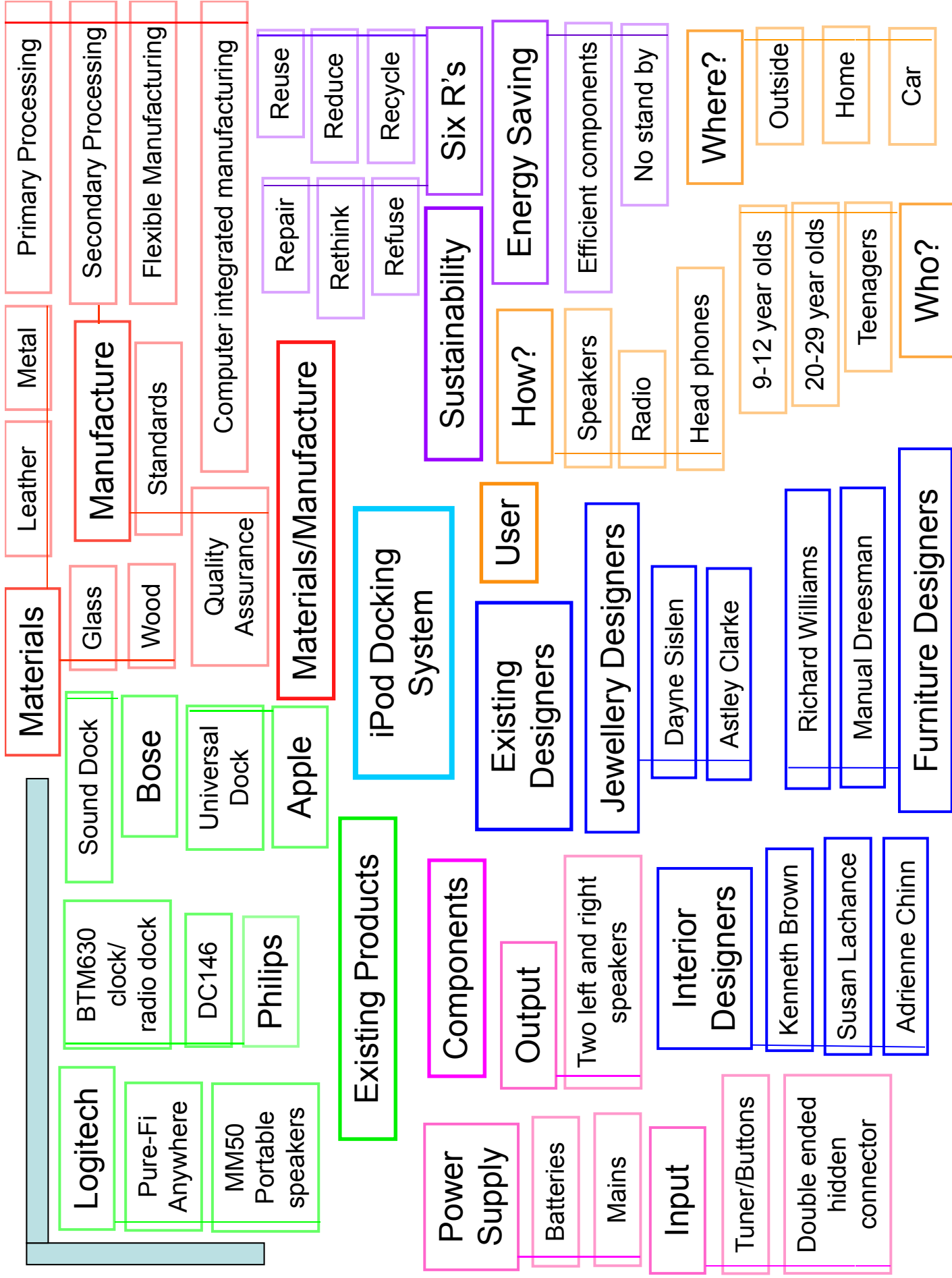


The Problem:

I have been asked to design a iPod docking system to be sold in a museum's shop. The museum is a major design museum, based around modern contemporary artists and designers and their work.

The Brief:

For my research I will look at different areas of contemporary design, including art, architecture, lighting and furniture. This will cover types of designs people like to have in their homes and the most modern types of contemporary design which the museum would want their products to feature in their shop. I will also look at the different designers that the museum would feature; this means that my product will represent what the museum is about and address the interest of it's visitors.



Contemporary Art Research

Furniture:

Furniture design has a mixture of geometric and rounded shapes.



Mood Board decisions

This is a mood board, it shows the shapes that will influence my final ideas and a combination of different contemporary art, shapes and colour schemes.



Shape



Decoration



Colour



Manoeuvrability



Existing Product Analysis

"Zeppelin" by B and W



I like the zeppelin because I think it is an attractive shape which is simple and has no messy buttons or volume control. I like also like the ergonomically designed iPod stand, it allows the used to change the song and adjust the volume easily; it allows the user to clutch the iPod as if it were not in a stand, making it easy and comfortable to control.

It also has a matching designed remote control, it is similar shaped to the zeppelin but made from plastic and designed to feel comfortable in the palm of a user's hand. It has an attractive stainless steel finish and black cloth stretched over the large speakers.

I like the whole design, but feel it could be thinner and more suitable for more homes.

The BOSE Sound Dock takes the traditional look of speakers and makes it new and contemporary. It is a great quality product, both in sound and materials.

Like the zeppelin, the speakers come with a matching, easy-to-use remote; this could be a design feature that I would use as it seems quite popular. It is very suitable for any home; it is modern, not too big, but very powerful and will blend in anywhere. However it is quite expensive and might put people off buying it.

BOSE Sound Dock



Sony SRS T10PC



These speakers are mainly for portable use, which I think would be an interesting feature to include in my product. The speakers are a still good quality product as they are from a well

known make, but they are much smaller, cheaper and have a lower sound quality than the others I have looked at. However, the extra portable feature and lower price makes it much more appealing to a larger market. They have a nice simple design with similar sized speakers to what I am going to use in my product. They are also available in different colours but unlike the others do not come with a remote. I prefer these speakers because they are more practical, cheaper and appeal to my age range better.

Designer Research

My first designer I will research is **Dayne Sislen**, she is an American jewellery designer. She works only with fine materials such as gold, silver, pearls and other gemstones.

Each of her pieces is handmade, through different skilful processes that differ depending on the materials being used. She studied art, sculpture and design at school and now offers people the chance to buy handmade art influenced jewellery. Her pieces are based on flowing shapes especially seen in nature e.g. waves, with sometimes added touches of more geometric shapes.



Top: The Wave
Bottom: Spring Pin

Both are clearly influenced by shapes seen in nature. The Wave even includes a pearl, which also originates from the sea.

Another Contemporary designer is **Richard Williams**. He opened his first workshop on his own in 1990 and now works with a full team of craftsmen. He still designs all the pieces the workshop produces and his designs have earned him awards such as eight Guild Mark's and the Claxton-Stevens Prize. He was also awarded an honorary Master of Arts Degree in University. His design includes furniture such as chests, cabinets, tables and fittings for kitchens and bedrooms.



From looking at his work, there is a certain theme that carries through his pieces. He prefers to work with woods that have patterns and texture. He also seems to like supporting big bulkier shapes on thinner weak-appearing legs.

Sustainability

These are the six R's of sustainability and how I could apply them to my product:

Recycle, Reuse, Reduce, Repair, Rethink and Refuse.

To make my product sustainable I can try and fulfil as many R's as possible. To do this I could:

Recycle: Use recycled and/or recyclable materials/components in my product and its packaging.

Reuse: I will reuse parts from older iPod Docks (e.g. speakers) and make it so that my packaging could be reused in the future by not making it completely specific to my product e.g. not using blister packaging.

Reduce: Use as little packaging as possible.

Repair: Provide a manual/hotline/website so that buyers can know how to fix problems that happen with the product and fix them easily.

Rethink: Remove the stand-by button on my product to avoid electricity loss.

Refuse: Not use certain materials from an un-sustainable sources, e.g. wood.

I could also make my product run using clean, renewable, efficient sources of power e.g. solar. I could also recommend use of or supply rechargeable batteries; stopping batteries and harmful chemicals being put into landfill.

Research Analysis

In my research I have found lots of different examples of modern contemporary design. The most useful of my research has been the shapes provided by looking at architecture.

The buildings I will base design ideas upon have been built from strong, attractive materials such as lots of glass and lots of metal, as well as different parts made from polished wood.

This has been useful to see what materials I can use to recreate this contemporary look. However, I would have to change them slightly to fulfil a sustainable side of my product or to make it easier to manufacture; as lots of wood and metal would be expensive to create a model from and buy as well as manufacture in quantity in the future.

There is a mixture of cube shapes and flowing lines/shapes in my research. There seems to be a wide range of shapes I can use but materials such as wood, leather and metal seem to be repeating themselves.

The best way to make my product sustainable is to make it and its packaging from recycled/recyclable materials. Also to use as little packaging as possible, as it will probably be thrown away after being bought. I will also not be putting a stand-by button on my product, as this wastes electricity when it is kept on.

Specification

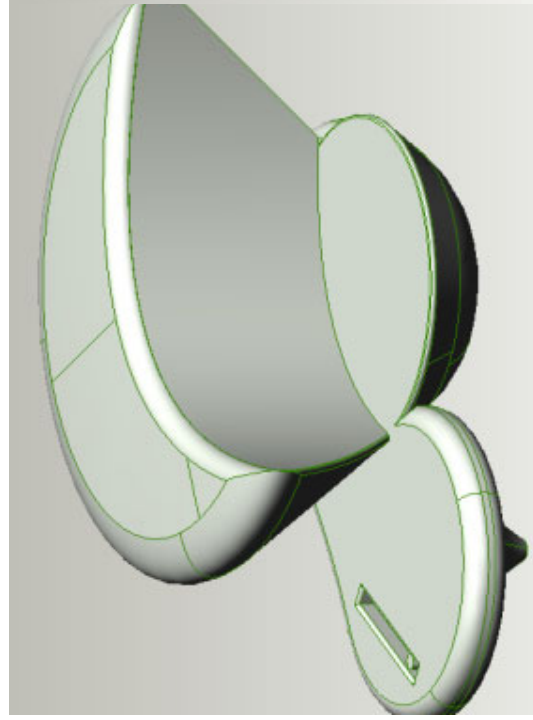
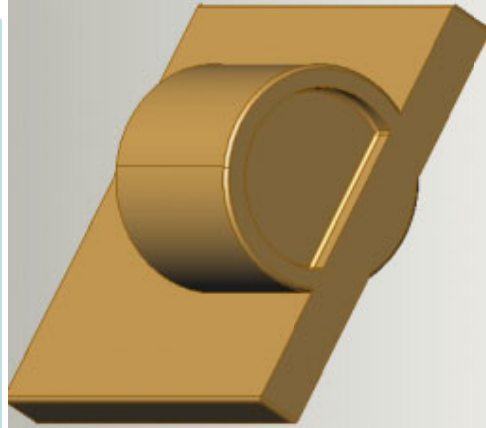
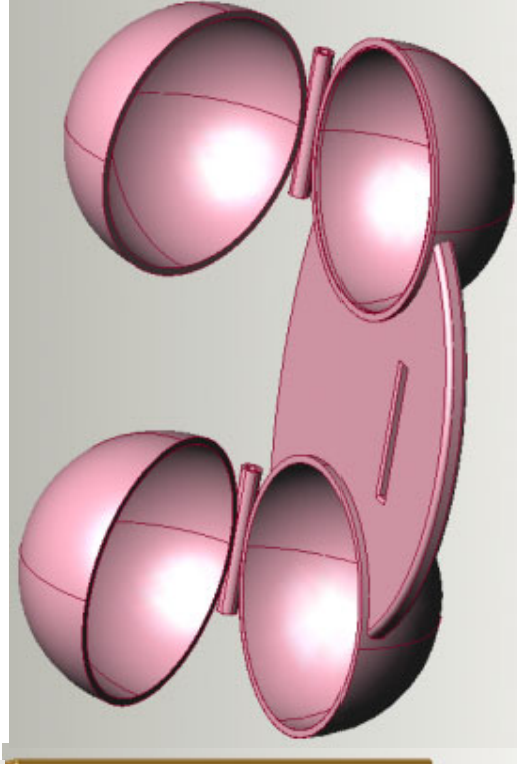
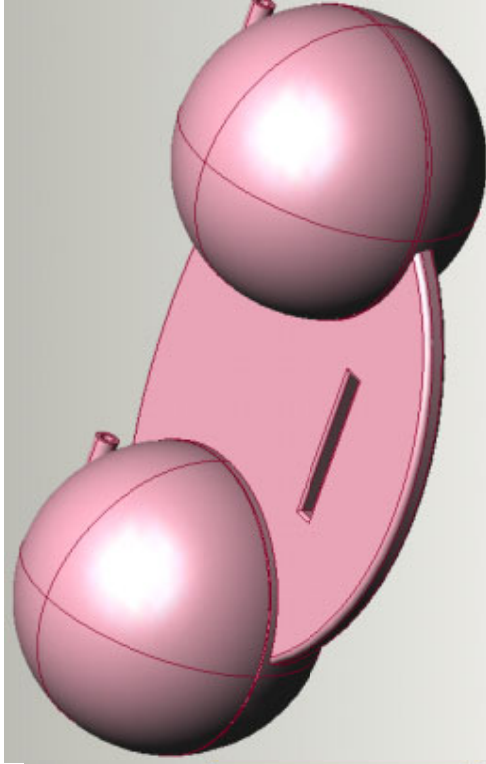
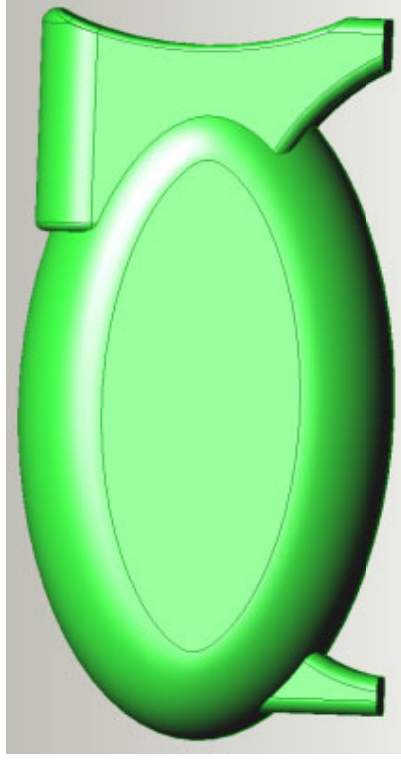
- My product must have two 25 watt speakers that can be open and closed as well as rotate. I think this is a good selling point and the best point of design, making it individual, well designed and appealing to a wide audience.
- My product will be aimed towards the visitors at a modern contemporary art museum but I also think that the product can be sold on a larger scale and could then be aimed towards a young, teenage audience as they are the biggest users of cheaper, affordable speakers as well as very interested in modern art styles.
- I plan to make my product from acrylic and polythene because they are good insulators and heat resistant meaning they won't melt from the heat of the circuit after being turned on for a while. They are also strong and durable, making the product sturdy and have a longer guarantee. Each of the plastics are also available in many different colours, making it easy to select my colours and offer a range or choice of colour themes to consumers. It also means I can match the colours of different plastics perfectly.
- The materials I have selected will make the product have a good durability and because the pieces have been glued together using solvent cement the joins are strong. The product will be powered by a 9 Volt battery which, after a period of time, will need replacing. As well as this, at some point the circuits in my product may need replacing or repairing. This means that my product will need accessibility to its circuits and will therefore have a push fit base that can be pulled out easily.
- I aim for my product to be low in cost to consumers, this is because I think this will make it a better competitor to other products on the market and more appealing. To keep cost of production down I will manufacture my product in quantity, and by the time that continuous production has begun the costs will lower. The materials are also quite cheap compared to other higher quality materials. I will produce my docking station on a large scale because I think that it will be sold not only in museum shops but able to be sold in electronic shops etc.
- The style that will be included in my product will be a modern contemporary art theme, fitting with my research. To do this it will have a mixture of shapes and colours that I have found in my research e.g. curves and straight lines.
- I will use a 9 Volt PP3 battery to power my docking station; this lowers risk of electronic shocks to any user. All laser cut edges will have quality control to make sure they are sanded and shaped so that any user will not be harmed by sharp edges and makes the product more user friendly to a larger age range.
- By making my product battery powered, this means less energy will be wasted from a mains supply and makes the speakers potentially portable. This is all in keeping with environmental issues. To make my product as environmentally friendly as possible I will use flat pack packaging and as little as possible to transport and hold my design. Parts of my product can be recycled after use; a lot of the circuitry (if not broken) can be removed and transferred into different or newer products.

Quality Control

<u>Product Part</u>	<u>Quality Control</u>
Laser Cut Edges	The sharp edges will need to be checked that they are sanded so that they are smooth and not contain any imperfections so that they won't cause harm to a user.
Joins	The joins on the central box and between plastics where they have been solvent cemented will need to be checked for a strong hold. The durability is important so all the joints need to be completely sealed and not able to come away from each other.
Speakers	The speakers would need to be checked that they work and that they are glued firmly in place. As the speakers can not be re-glued as they are completely sealed in their dome, it is important that they have a secure join with the speaker and are working properly before being sold.
Circuits	I would need to check that all my circuits are concealed, working and accessible. There has to be accessibility to my circuits so that if anything broke, it could be easily seen to and fixed. The battery also has to have easy access as it may need to be changed regularly over the life span of the product.
Hinges	Hinges on the speaker spheres will need to be checked to see whether they are working smoothly. This is a crucial part of my design and the speakers need to be able to be opened, left open upright and closed easily.

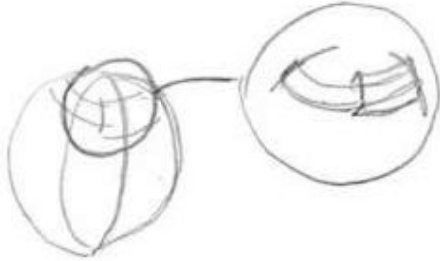
Pro Desktop Design Ideas

This is a collection of images of the designs I have created on ProDesktop. Most of my designs became too complex to manufacture, moving me on to a next design.



Original sketch ideas - hinges

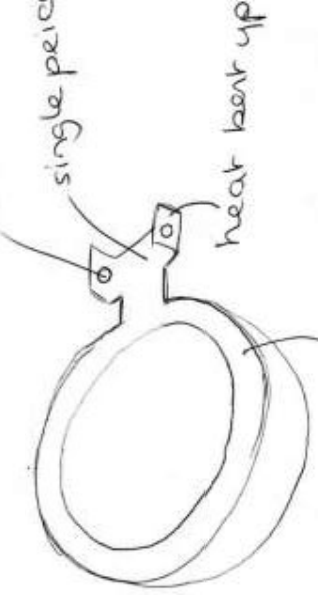
These are a collection of my original ideas



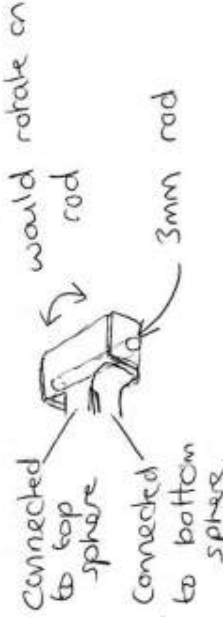
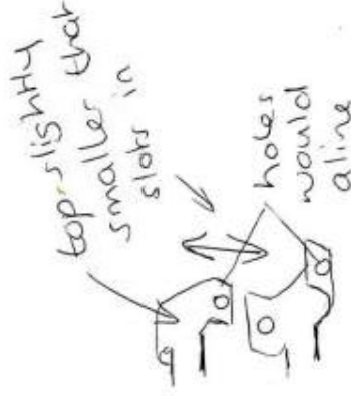
These are some of the original card hinges I used to test measurements.



3mm diameter hole

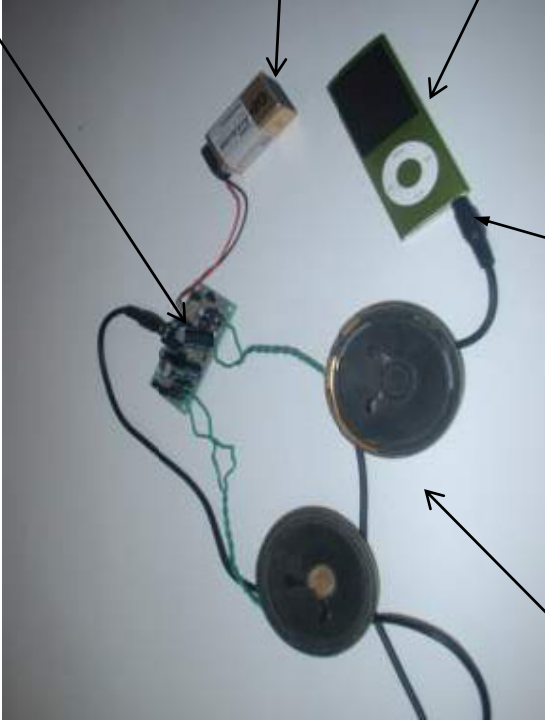


seperate ring attached to sphere



This was my final design for a working hinge

Components



Part:
Circuit board

Where on my design:
Within my central box.

Part:
Battery Cell

Where on my design:
Beneath my central platform

Part:
iPod

Where on my design:
The central platform

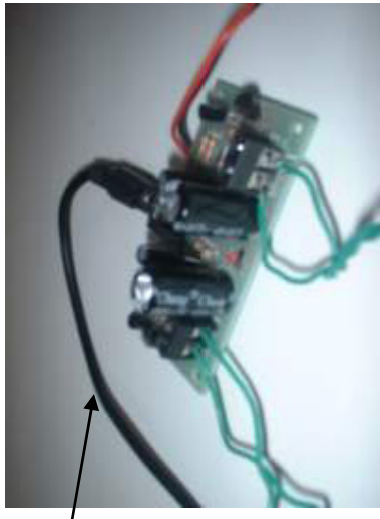
Part:
Speaker sized
50mm
diameter.

Where on my
design:
Within my two
speaker
domes.

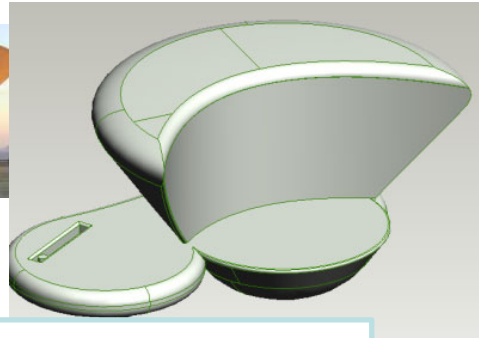
Part:
Digital Audio Jack

Where on my
design:
Beneath where my
iPod will sit, will
connect directly to
iPod when sat on
stand.

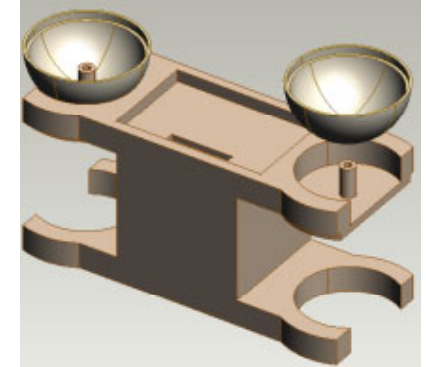
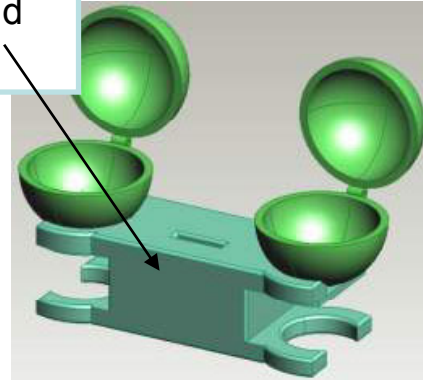
This wire needed shortening as it only needed to be a certain length; to do this I cut the wire, removed the excess wire, stripped the smaller wires inside and soldered them back together again.



Final design development



Central box and spanners

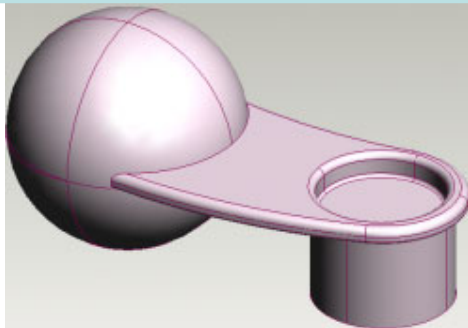


This was my original design based around an architectural design I found in my research. After creating part of my first model, I realised the design was too complex to reproduce in quantity so had to simplify and change my design.

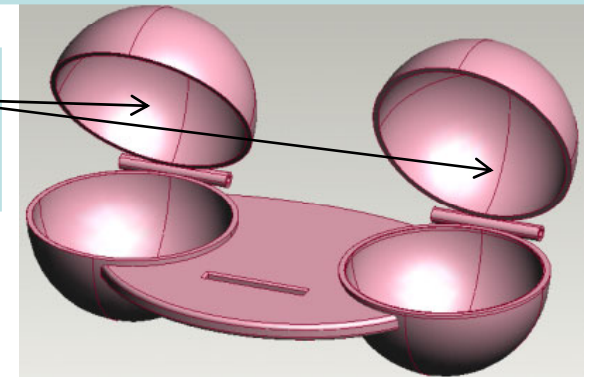
This still needed more work as I now needed somewhere to put the circuitry and somehow hold the speakers in place. I created a central box to house my circuits and a 'spanner' like shape to hold the speakers and act as a base. I also created a hinge on the top 'spanner' which allowed the spheres to rotate smoothly.

This was my next step in designing, I had to simplify my original design as much as possible so on ProDesktop I did this quick sketch but found it still needed some work as I had no where to house my speaker or circuits.

I still liked the idea of a sphere in my design, so I made it more symmetrical and found that I could house the speaker inside the sphere and have the sphere open up.



Speakers will be housed here

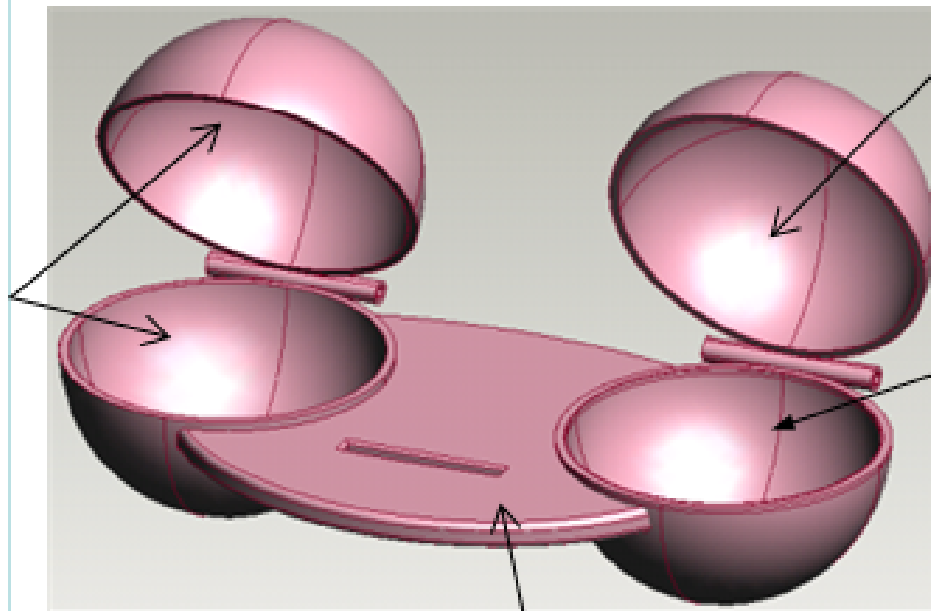


Manufacture Process

<u>Part</u>	<u>Process</u>	<u>Equipment</u>	<u>Possible Problems</u>	<u>Quality Assurance</u>
Spheres for speakers	<ul style="list-style-type: none"> • Vacuum forming two wooden, half spheres with negative gradients. • Drilling holes for tubing 	Vacuum former, drill	Web appearing between domes. Not enough suction on vacuum former.	Perfect half sphere has been formed without imperfections.
Central Box	<ul style="list-style-type: none"> • Laser cutting four correctly measured 3mm pieces of acrylic. 	Laser Cutter, 2D Design	Incorrect laser cutter settings	Correctly measured sides on computer.
'Spanner' shapes that hold speakers	<ul style="list-style-type: none"> • Laser cutting 10mm piece of acrylic. 	Laser Cutter, 2D Design	Incorrect laser cutter settings	Correctly measured sides on computer.
Hinges	<ul style="list-style-type: none"> • Laser cutting 3mm piece of acrylic. • Bending correctly 	Laser Cutter, 2D Design, line bender	Incorrect laser cutter settings Human error	Correctly measured sides on computer.
All	Assembly: <ul style="list-style-type: none"> • Solvent cementing parts together 	Hand done, right angled machine block	Incorrectly glued Not kept in place long enough to dry and set	Kept in place long enough for glue to dry, strong hold
All	<ul style="list-style-type: none"> • Sanding edges 	Wet and dry sanding paper	Scratches	Checked for scratches Sanded with different gradients of sanding paper

Ideas for Manufacture

Blow mould or vacuum form two domes and hinge them together.



The speakers will be mounted in the top half of the sphere

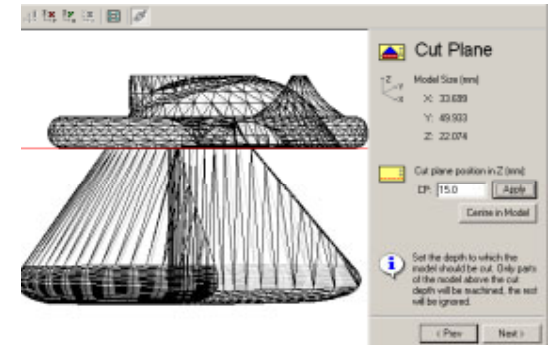
The rest of the components will be housed in the bottom of the sphere

I think I will vacuum form a hollow shape or create two laser cut shapes in order to thread through the wires to connect the iPod.

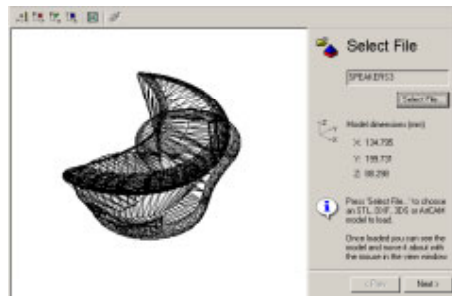
Model Manufacture

To produce my first 3D prototype out of foamalux, I used a programme called Minicam. Using my design from ProDesktop, I began creating my model by making the base.

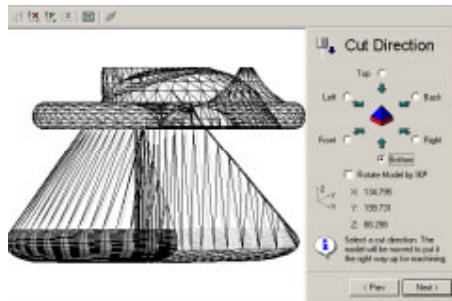
Then, I chose which part of my design I wanted to create and cut off the part I didn't.



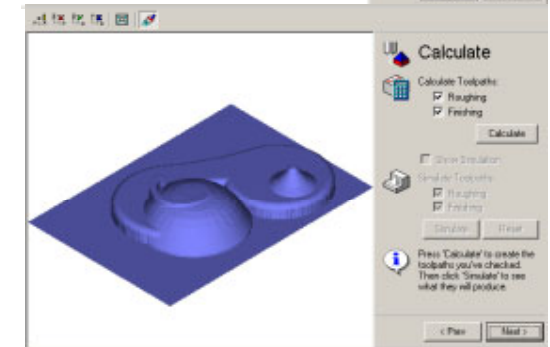
I began by importing my design from ProDesktop after converting it into a CTL file.



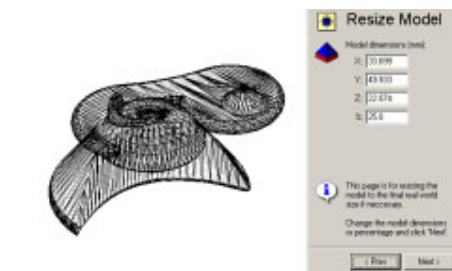
I then chose which direction to cut from and flipped the design so it could cut the base.



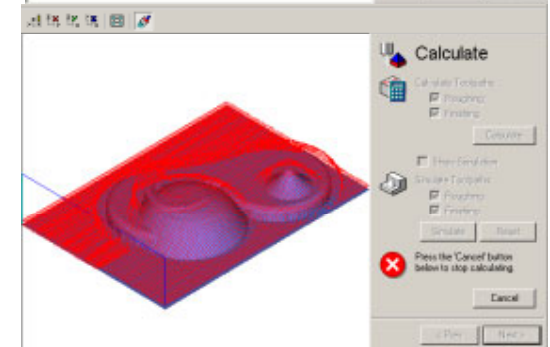
I also needed to choose what roughing and finishing tools I wanted to cut with and also choose the correct amount of step over. The programme then calculated each straight line cut.



Next, I resized my design so that the prototype would be a suitable size. I scaled my original drawing to 25%.

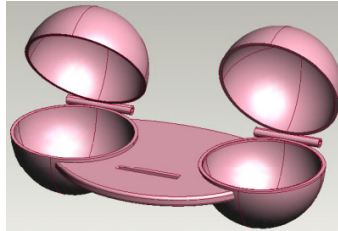


The machine then cut each calculated line into the foamalux.

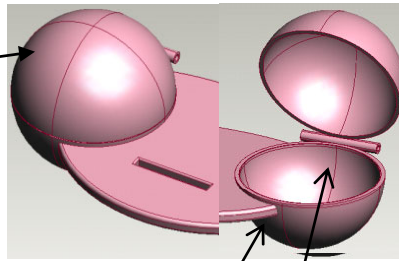


Model Manufacture page 2

After creating part of my model I realised that my product was too complex to create; it was possible to create my model using foamalux but not possible to create a final product. Therefore, I had to use a different design to carry on with.



My new design



To begin my model I got two tennis balls that were perfect size to represent the two spheres on my model.



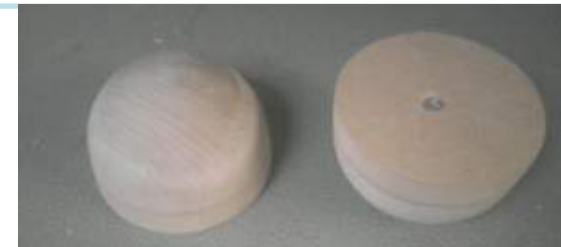
To halve the tennis balls I used a coping saw, however I had to make some initial incisions with a craft knife.



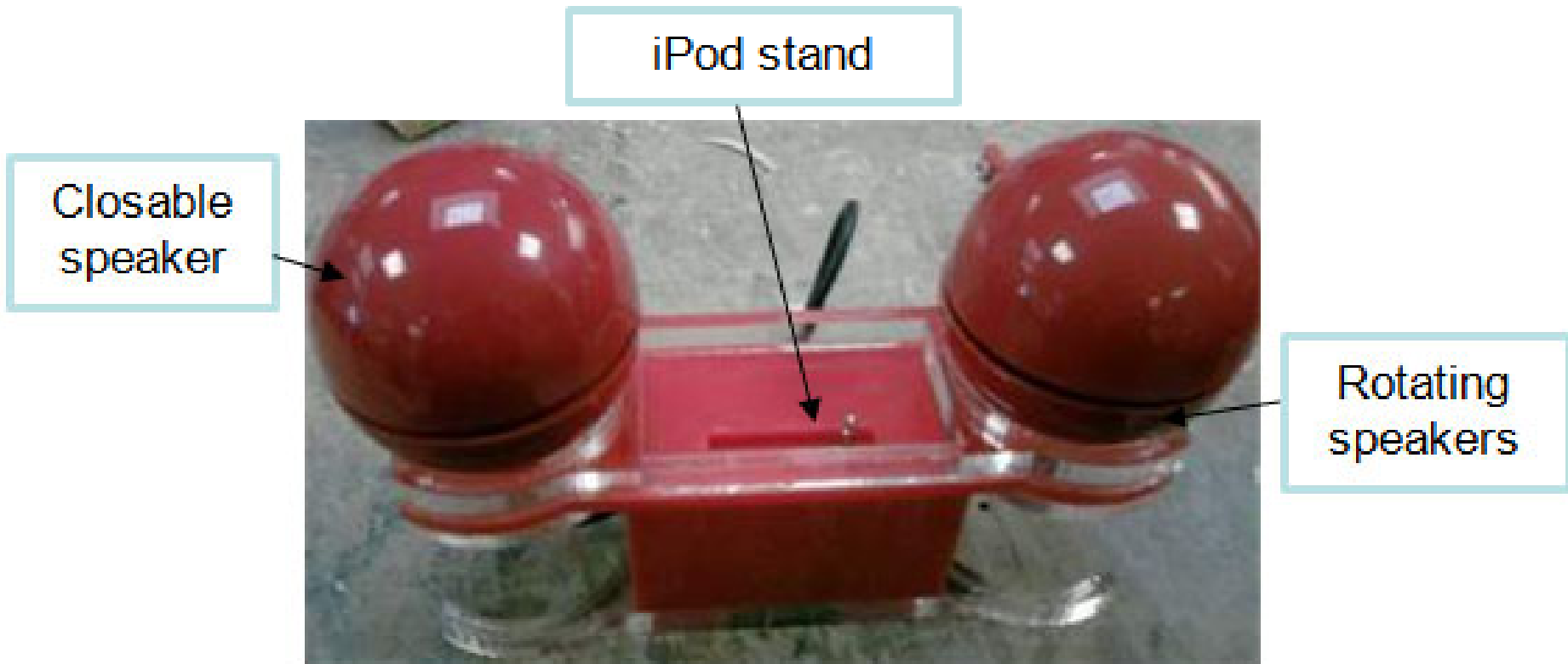
Next I created the stand from foamalux, I used the tennis balls as rough size guidelines to how big my speakers were going to be and sketched out my design on a big enough piece. To do I rough cut I used a band saw and then smooth the edges with sand paper. To create the iPod holding slot I used a chisel.



To remove the last of the glue and yellow coating from the tennis balls I sanded them down. Next I used double sided sticky tape to attach them to the holder and each other, creating a hinge. I then went on to create my first prototype.



To create two vacuum foam half-spheres I had to use some old wooden puppet heads, which were sawn in half and had an extra length of wood added to the bottom. These will be used to vacuum form my final spheres.



This is my finished product with the speakers closed.

Testing and Evaluation

I think the product is very easy to use because there are no buttons, instead it is completely controlled by the iPod and the speakers open and close easily. The design is very sleek and simple. My speakers function as intended because all the circuitry, hinges and movements move smoothly and correctly.

I think my product looks really stylish and in keeping with my contemporary design brief, it includes both rounded and straight shapes and edges and has a very nice overall look, very different to anything else on the market.

I especially like my speakers on my product because they are unique and a good selling point. I dislike my overall choice of colour, which was bright red, but think that the red combined with the clear plastic suits the brief and fits in with the research I did.

Yes because it has good features such as the speakers and would look very good in my age group's home/bedroom, which could have been influenced by the fact that I was designing them and had my own ideas of what I wanted it to look like in the end. I also like the fact that it doesn't look like normal speakers and some people have to look closer before figuring out what they are.

I expect a consumer to pay between £30-£40 for my product because it would be quite cheap to reproduce on a continuous production line and I would aim to keep the price low because I think this is an important selling point.

The advantages compared to other products on the market is that the product is that it is quite cheap and has a new, interesting design. It also has a very simple design and has no fussy buttons or remotes.

The disadvantages are that it is not fully portable (as it is quite chunky) and not made out of high quality materials, also that it only work with one generation of iPod.

Testing and Evaluation continued

During manufacture, my design was modified to accommodate the circuits and make the design transfer from computer design into product. For example, on my ProDesktop design the spheres had nowhere to sit and were not connected to the central piece, therefore I had to redesign in order to make the product work.

Problems I faced in manufacture were difficulties such as a web appearing between my two vacuum formed domes, as well as the vacuum former not having enough suction, this all makes the vacuum form useless. This wastes time and materials and can mean having to go back in steps. Other problems came up, such as slow production on the laser cutter when using 10mm acrylic, this was overcome by doing this out of lesson time, meaning no lesson time wasted waiting for pieces to be cut out.

I controlled quality during making by using computer programmes such as ProDesktop or 2D Design to create my pieces accurately. When using solvent cement to glue my central box pieces together at right angles, I used the correct equipment to make sure the pieces met at ninety degrees. I also made sure that all my pieces were firmly joined together; using the correct amount of adhesive and allowing long enough to set.

The quality could be improved on the finish of my product, for example on the sanding of edges and few scratches. I also feel I could have made a better fit of my hinges inside my spheres, which do not fit perfectly due to human error. Other than that I feel I have created a quality product that is strong and not flimsy with a good finish. If I was to modify anything on my product I would change that it only works with certain iPods and make it more universal, therefore making it more appealing to a wider audience.