

# EDEXCEL

## GCE Design and Technology: Product Design (A2) (Graphics Products)

### EXEMPLAR MATERIAL 3

**Title:** Promotional pack for veterinary group.

**UNIT:** 6GR04



My clients.



Pages from the presentation used by my clients in the 'Puppy Party' information sessions. The topics included are:

- Vaccination
- Parasites and worming
- Flea treatment
- Insurance
- Dental hygiene
- Pet Passports

Puppy owners could do with leaflets of each of these topics to help them understand and remember the information given.



There is no charge to attend to 'Puppy Parties' so my clients only have a limited budget to work with. They receive some free products and promotional material from the veterinary pharmaceutical company Intervet.



There is a possibility that Intervet would sponsor the production of the 'Puppy Packs' in return for advertising in them, instead of providing the free products.



The only way of letting people know about the 'Puppy Party' information sessions at the moment is 2 A4 posters given to the practice by Intervet. Fewer people than expected have attended the sessions so far so my clients need a better advertising method.



### Project Introduction

My client for this project will be Powderham Veterinary Group. I will be working with two of the veterinary nurses they run for people with new puppies. These are called 'Puppy Parties' and are important to my client as they help to promote the practice and bring new clients in. Also, they are a good way of getting important information on pet care across to owners, reducing the number of problems seen by vets (e.g. Dogs not being vaccinated or poor dental health)

A product I could design is an information pack to accompany the 'Puppy Parties'. On this page I have collected relevant information and images to give me a clearer idea of the project and a feel for the different aspects / themes involved.



At each 'Puppy Party', the puppy owners are given a selection of leaflets about pet insurance. This is because my clients are not allowed to promote one particular product but must provide information so that people can decide for themselves. They also receive a free sample of Royal Canin dog food and a sachet of pet toothpaste. These are the products that a 'Puppy Pack' would need to be designed to contain.



The 'Puppy Packs' could also contain a product which would be useful in caring for a puppy. For example a flea comb or dog toothbrush.





**CLIENT PROFILE** I will be designing a Veterinary product for Powderham Veterinary with the aim of helping them to attract more clients. The development of this design is being undertaken by Elaine Noble (above) and Vicky Emmott (below). These individuals have

responsibility for the organisation of the 'Puppy Parties' and running sessions. It is regarding information to make decisions / products / working them into a budget allocated by the practice. PINDERHAM VETERINARY GROUP IS A BUSINESS BASED IN OTHER AREAS. MY TWO PRACTICES COVER THE SAME AREA TO FIND WAYS OF IMPROVING THEIR SERVICES TO COMPETE WITH OTHER PRACTICES. THEY WOULD NEED THEM APART FROM IMPROVING THEM AND SET THEM APART FROM THEIR COMPETITORS.

I interviewed my clients to find out more about the 'Puppy Parties', their aim and purpose and to generate ideas for products which would be of benefit to them in running the information sessions.

The purpose of the 'Puppy Parties' is predominantly to inform owners about caring for their dog, with a view to preventing / reducing the amount of problems seen by vets caused by inexperienced owners. (These include animals not being vaccinated or being fed the wrong diet). My client also describes the 'Puppy Parties' as being run to 'give clients something back'. This is why there is no cost to attend them. Finally, these sessions are also intended to raise the profile of the practice, helping to attract new clients ahead of competing practices. This means that any product / design should feature the logo of Powderham Veterinary Group to link the two in people's minds.

The fact that running these sessions does not generate any profit raises issues with funding for the project. Powderham Vets is only able to provide 'limited funding' and would need it to cost as little as possible. This would be a major constraint with regards to making a product to be distributed at the 'Puppy Parties' but my clients suggested that this could be overcome by asking for sponsorship from relevant companies. At the moment, they receive free samples of products from Royal Canin (food), and Virbac and Ceva (pet toothpaste) and suggest that funding could be sought from companies (eg. Menal animal health and Bayer). These companies cannot provide samples as their products must be prescribed by a vet. The product designed for such companies in return for sponsorship and / or product information for such companies would also include advertising the insurance policies available. It is important that owners know about all of the alternatives so they can make an informed decision. This means that some way of keeping these up together would be helpful (ie. a folder for each person).



**SP** Shering-Plough Animal Health

Occasionally, companies donate other products to be distributed at the 'Puppy Parties' (such as toys for the puppies). However, the number of items provided is never sufficient to enable each attendee to receive one each. My client feels that giving a free gift like this helps to enhance the appeal of the information sessions and promote their message. Therefore, they would like a product that is exclusive to the practice and they would want to ensure that sufficient supplies would be available to meet demand. The exclusivity would allow this product to be used to promote the practice, for example by including its logo in the design. As the main aim of the 'Puppy Parties' is to promote a high standard of pet care, my client feels that any product distributed should be of practical relevance to the topics discussed. This should be something which would assist in pet-care tasks and examples given by my clients include; A flea comb, a tick removal tool, a toothbrush / fingerbrush, a clicker for training.

My clients believe that several of the health problems most commonly seen by vets (eg. dogs not being vaccinated, obesity / poor diet, poor dental health in dogs) could be prevented by making owners more aware of the issues and how to stop them occurring. The information will be given as a talk with notes displayed on a flipchart. My clients are concerned that people will not be able to retain everything that is said and they may not be able to make notes as they will have their puppy with them. To solve this problem, my client would like a set of leaflets / information sheets to distribute to owners for future reference. These should be visually appealing to encourage people to refer to them and my clients have suggested that it would be a good idea to include images / diagrams to explain points.

One problem my clients have found with organising the 'Puppy Parties' is publicising them. They currently have two A4 posters up in the practice but are concerned that people will not notice these.



My client is planning to run 'Puppy Parties' and these will be called 'Puppy Parties' and will be displayed on a flipchart during the talk but this relies on people being able to take notes. My client has stressed how important it is that people take this information on board or remember that it would be of benefit to them. My client has also suggested that they should have a product to hand out to owners for future reference. My client has also suggested that they should have a product to hand out to owners for future reference. My client has also suggested that they should have a product to hand out to owners for future reference.

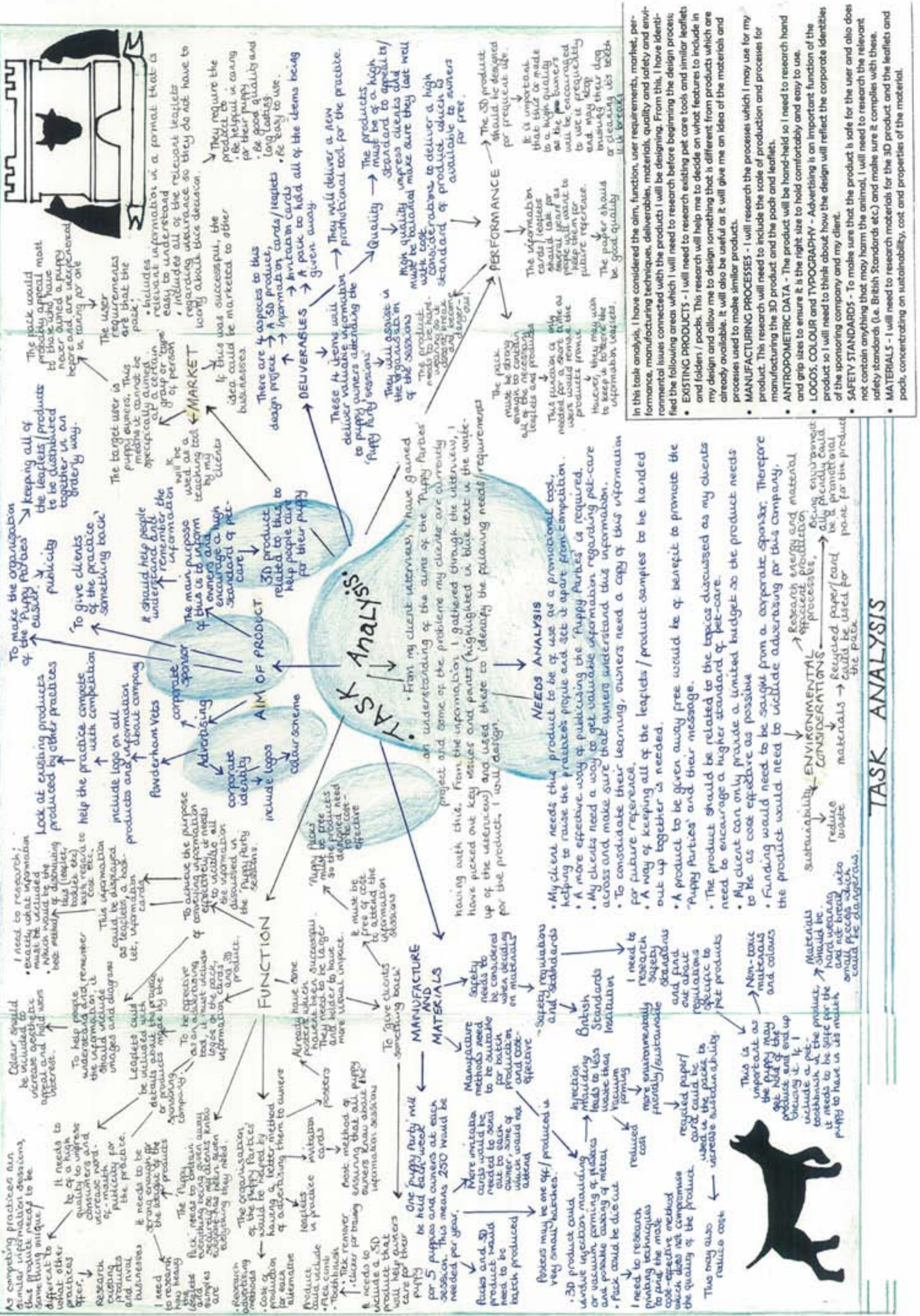


**traccer Petplan**

**Pinnacle Pet Healthcare**

DESIGN BRIEF & CLIENT INTERVIEW

13-09-09



In this task analysis, I have considered the aim, function, user requirements, market, performance, manufacturing techniques, deliverables, materials, quality and safety and environmental issues connected with the products I will be designing. From this, I have identified the following areas which I will need to research before beginning the design process:

- EXISTING PRODUCTS** - I will need to research existing pet care tools and similar leaflets and folders / packs. This research will help me to decide on what features to include in my design and allow me to design something that is different from products which are already available. It will also be useful as it will give me an idea of the materials and processes used to make similar products.
- MANUFACTURING PROCESSES** - I will research the processes which I may use for my product. This research will need to include the scale of production and processes for manufacturing the 3D product and the packs and leaflets.
- ANTHROPOMETRIC DATA** - The product will be hand-held so I need to research hand and grip sizes to ensure it is the right size to hold comfortably and easy to use.
- LOGOS, COLOUR and TYPOGRAPHY** - Advertising is an important function of the product so I will need to think about how the design will reflect the corporate identities of the sponsoring company and my client.
- SAFETY STANDARDS** - To make sure that the product is safe for the user and also does not contain anything that may harm the animal, I will need to research the relevant safety standards (i.e. British Standards etc.) and make sure it complies with these.
- MATERIALS** - I will need to research materials for the 3D product and the leaflets and packs, concentrating on sustainability, cost and properties of the material.

## TASK ANALYSIS

# Existing Product Research

Tick Removal Tools

One of the features recommended by my clients to include in my design for a 3D product was a tick removal tool. This would be useful to owners as it relates to the advice given in the Puppy Party information sessions and my clients feel that it would encourage people to take this advice. If their dog was bitten by a tick, the owner would need to remove it as quickly as possible as it may be carrying pathogens such as Lyme disease which are a threat to humans as well as animals. A tool such as those shown on this page is necessary to avoid getting tick saliva or blood on your hands. The tool must be easy to use to remove the tick without damaging it - removing it wrongly can lead to the head/mouth parts of the tick being left behind in the skin, causing infection. Also, applying pressure to the body of the tick will cause it to regurgitate the contents of its stomach. Tick bite the host, potentially spreading disease. Providing owners with a suitable tool will allow them to remove any ticks quickly and safely, reducing the risk of related problems seen by my clients.

There are several tick-removal tools available and I have researched these, concentrating on ease and safety of use, materials and production and cost.

## TICK KEY



← Made from aluminium  
 This product is likely to be used to remove ticks from the dog's body.  
 Cheap to produce  
 Tick key over the tick and slide it to the correct point on the opening. Tick key will hold the tick and lift the tick equally. The slot side to hold the tick and lift the tick equally. Tick key will hold the tick and lift the tick equally. The slot side to hold the tick and lift the tick equally.

## TICK PINCHER



← This product is made from stainless steel with a rubber grip which is easy to use and safe as it does not damage the tick. The aluminium used in this product is also attached to a spring to prevent corrosion when it is used. It also attaches to a spring to prevent corrosion when it is used.

## OTOM



← This product is made from stainless steel with a rubber grip which is easy to use and safe as it does not damage the tick. The aluminium used in this product is also attached to a spring to prevent corrosion when it is used.

## QUICKER Tick nipper



← This product is made from stainless steel with a rubber grip which is easy to use and safe as it does not damage the tick. The aluminium used in this product is also attached to a spring to prevent corrosion when it is used.

## TICK REMOVER



← This product is made from stainless steel with a rubber grip which is easy to use and safe as it does not damage the tick. The aluminium used in this product is also attached to a spring to prevent corrosion when it is used.

## ABS



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## OTOM Tick remover



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## High-Impact Polyethylene



← This product is made from stainless steel with a rubber grip which is easy to use and safe as it does not damage the tick. The aluminium used in this product is also attached to a spring to prevent corrosion when it is used.

## TICK NIPPER



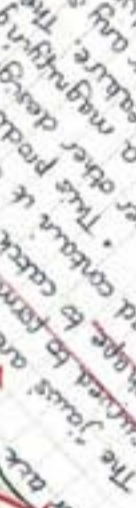
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**TIX TICK REMOVER**

This product is made from ABS and its separate components would probably be made using injection moulding. Advantages of this design are that it is easy and safe to use without damaging the tick. It would also be light weight to carry around.

The product consists of a wire noose which retracts into the plastic casing. This protects it from damage and means the size of the noose is easily alterable. However, it would be more difficult to clean if there was any blood on it as it would get inside the casing.

The adjustable noose grasps the tick securely from all sides which is an advantage over the pronged tools, making it easier to use than these other products.



Pressing the button on top of the tool extends noose.



You place the noose around the tick and release the button to tighten it where it attaches to the skin.



Twisting the tick causes it to let go of the skin and it can be removed.

Over-tightening of the wire loop may be a problem with this so it would need to be made in such a way that the noose did not retract fully into the casing, damaging the tick. This is one of the few products which feature a brand name/logo on the actual item, not just the packaging. This is something I will need to include in my design to make sure the product is useful as an alternative tool.



**Existing Product Research**  
Tick Removal Tools



**TICK-NER**

This is the most expensive product on the market of tick removal as it uses cryotherapy to freeze the tick. It is one of the best methods may be carrying at the same time. However, there may still be a problem with it the tick being left behind.

Although this is an effective tool, the high production costs need to be factored in. It would mean that it would not be practical as a free product for the puppy. Also, the section is adjusted so small insects would be difficult to remove. Lifting it straight up as shown in the diagram may also lead to the tick coming away in the skin.

Another possible problem with this product is that it would be much heavier than other tools. This would be an issue when it came to making the tick string enough to hold the tool with them (eg. on dog walks).



Tool is placed over tick

Tick is sprayed with hydrogen peroxide



Match in end of curved section fits around tick. Twisting the tool removes the tick. This design is well suited to its purpose as it does not damage the tick. This would make it expensive to manufacture as this design is based on a pair of tweezers which are difficult to use without squashing the tick, thus causing

This product is shaped like a spoon. When the head, preventing it being dropped and getting lost or coming into contact with hands.



Slide tick to secure tip around tick

Curved prongs avoid putting pressure on the tick's body

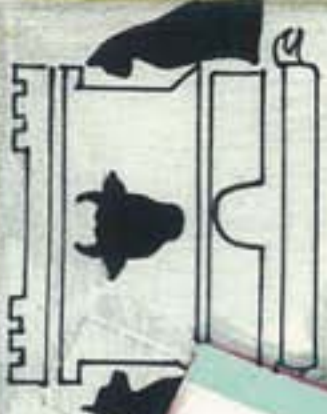
Matchstick has the tick, thus causing

I have looked at 8 different tick removal tools. There were several features which many products had in common; for example, several included prongs which fitted around the tick. Many also relied on a twisting motion to remove the tick. Discussing these features with my clients, I found that, in their opinion, this is the safest and most effective method of tick removal. The products my clients felt would be most useful were the tick-key and the tick remover. As some people have problems using other tools (for example the O-TM tick remover) as the tick slips off the tool when it is twisted.

Many of the products were made using injection moulding, from thermoplastics such as ABS and polystyrene. It is important to choose a material which is durable and can be cleaned easily. Being light weight is also an advantage as people may want to carry the tool with them (eg. on dog walks). I will need to research these materials and manufacturing processes in greater detail in order to select the most suitable combination for my design.

Many of these products consist of several components but there are a few which are made in one piece. This may be a useful feature to include in my design as products made in one piece from one material will tend to be cheaper to produce and I will be working to a limited budget.

Some of the products feature the brand name/logo of the manufacturer while others only display this on the packaging. I will need to think about this in my design; as the product will not have packaging (other than the 'Puppy Pack'), it should feature the practice logo. Methods of achieving this seen here are punching images/text into aluminium, printing onto plastic and engraving/raised detail on plastic.





There are several products available each designed slightly differently. Although they differ in appearance, all clickers make the same sound and work in the same way. All products consist of a plastic case with a thin piece of metal inside which is pressed down to create the sound. The two products above have been designed with aesthetics in mind, featuring buttons to press, patterning with colour and shape taken into consideration. Being rounded with smooth edges would make these products more comfortable to hold and including a thumb makes it immediately obvious which part of the metal you need to press down, even without looking at the clicker. This is a useful feature which gives the products above an advantage over the basic version shown on the left - this does not have anything to indicate where to press so you may end up pressing the wrong end of the metal, meaning that the sound would not be produced quickly enough or dogs may keying or dig at it reducing the risk.



Another product recommended by my clients is a 'puppy pack' which is a clicker that can be used in the puppy pack as the puppy can be trained to associate the click sound with a positive action. The clicker must be simple to operate and must produce a clear sharp sound which does not vary. This sound is pressed immediately when the exact moment the owner can pinpoint the dog to understand the behaviour occurs, helping the clickers work commands. On this page I have researched how clickers work (including the materials and manufacturing methods) and the mechanism by which the sound is produced and some existing products.

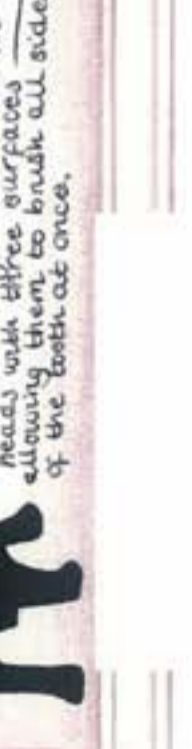
Top section of clicker is made from injection or compression moulded thermoplastic. It includes a post which fits through the metal components to attach the components to each other, without the need for glue/screws or further processing.



Sheet of metal approx. 1mm thick. Plastic casing made from thermoplastic (such as ABS), probably injection moulded. When pressure is applied to this end of the piece of metal, the vibration flattens out, on releasing the pressure, it springs back into place, making the clicking sound.

A common feature of all products seems to be a ring to allow it to be attached to a keyring or dogs lead. This is useful as it reduces the risk of losing the product.

Another difference between clickers designed for dogs and those for humans is the angle of the brush-head in relation to the handle. In human brushes the bristles are angled back towards the handle whereas in dog brushes the bristles are angled away. This is to compensate for the different angle at which the brush is held. Several dog brushes include brush-heads with three surfaces allowing them to brush all sides of the tooth at once.



From my research into existing toothbrush products for pets I noticed that there are several simulators being designed for human use and those for dogs. For example, many products consist of a brush head and base and those for dogs have a variety of products available for dogs (ie finger brushes, chewable brushes, etc). This difference in materials is something I may be asked to think about when designing my 3D product.

Human toothbrushes often include a soft, elastomeric material on handle to improve gripping characteristics. Dog toothbrushes often have rubber bristles instead of polymer fibres. These may have longer than traditional bristles which become damaged and splay out easily, especially if the dog was to bite them. Tend to be made from one material only with no difference to improve grip.

I looked at the patents for a new toothbrush made by Colgate - Palmolive. This is something I will think about in my design as most existing pet toothbrushes do not seem to have been designed with ergonomics/comfort in mind and giving consideration of dual materials also encourages people to use the product with the use of different colours, patterns or textures.

COLGATE - PALMOLIVE BRUSH. COMMERCIAL and INDUSTRIAL PRACTICES. The plastic used for the arm should have a shore hardness of 95 to 100. Typical materials used for this are nylon, polyethylene, PETE, acrylic and (most commonly) styrene/acrylonitrile (SAN). Choice of material is important as it needs to be non-toxic and hard-wearing and have the correct ductility. However, copolymers making them suitable for my product.

SHORE HARDNESS - A method of measuring a material's resistance to permanent indentation. The scale was invented by Durometer. The hardness value is determined by the indenter of the Durometer sample.

Pressure pad that conforms to more pressure, making the handle more comfortable to hold. This also improves grip and control. This also makes it difficult to reach all the teeth, especially as it can be not keep all during brushing. Most commonly used for this are rubber and polypropylene (a polypropylene rubber), although this may also be expensive to source.



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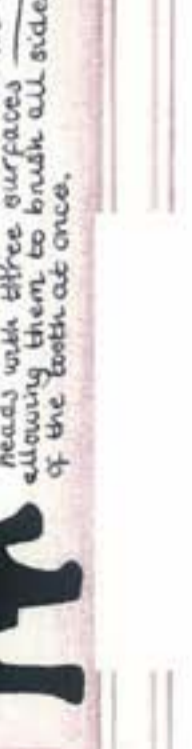
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Steel comb teeth, plastic handle (ABS). This comb is longer than most combs; the teeth are 40mm in length which may be useful for dogs with thicker fur. The handle is 50mm long.

Teeth are stainless steel and handle is Polypropylene with a logo printed on for professional use. Teeth are 20mm in length and handle is 50mm long and 50mm wide.



Teeth are made from stainless steel, they are 40mm in length. The handle is 40mm in length, 58mm wide and 5mm thick.

Handle made of ABS with rubber on the handle for a better grip / more comfortable hold. The teeth are 15mm long.

Teeth are stainless steel (11mm in length) and the handle is ABS (180mm long). The way that the handle extends away from the teeth and its curved shape may make it fit into a hand more easily.



Product	Handle length	Handle width	Length of teeth
1	30mm	50mm	40mm
2	89mm	27mm	10mm
3	40mm	58mm	40mm
4	200mm	40mm	15mm
5	50mm	50mm	20mm
6	180mm	30mm	11mm
7	200mm	40mm	13mm
8	180mm	30mm	10mm
Average	121 mm	41 mm	20 mm

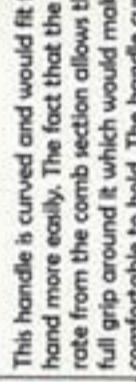
Table listing the dimensions of the flea combs on this page.

This comb also has a handle which extends away from the comb section. The handle is made from PP and polyurethane (the red section) which is a soft polymer for grip. The handle is shaped slightly to fit into a hand which would make it more comfortable to use. The whole product is 200mm long and the teeth are 15mm long.



This handle is not shaped to fit into a hand - it is very long so it may stick into the palm of the hand and the plastic is very thin which would make it more difficult to grip.

This handle is curved and would fit the shape of a hand more easily. The fact that the handle is separate from the comb section allows the user to get a full grip around it which would make it more comfortable to hold. The handle curves above the teeth of the comb so it may be more difficult to control as you would be applying pressure downwards at an angle.



This handle shape looks as if it would be easiest and most comfortable to hold. It is more rounded whereas the others are quite thin. This shape is easier to grip and the handle is shaped slightly to fit the shape of a hand. The section of soft polymer would give better grip than the other handles which are just smooth plastic.



**Product 1:** ABS and stainless steel. The handle would have been made by injection moulding and the teeth by casting.  
**Product 2:** This product would be manufactured in one piece but injection moulding. The material is not specified but it is likely to be a thermoplastic such as PP or ABS.  
**Product 3:** see product 1  
**Product 4:** ABS and rubber handle. The handle would be made in two sections with the two different polymers injection moulded to the correct shape separately. The metal head would be made by casting and the three sections attached together.

**Product 5:** The handle of the brush is made from PP. This would probably have been injection moulded.  
**Product 6:** ABS and stainless steel (see product 1)  
**Product 7:** PP and polyurethane handle. Polyurethane is added to make the handle easier to grip.  
**Product 8:** ABS and rubber for grip. This research shows that the most common materials for flea combs are ABS and Polypropylene for the handle and either these polymers or stainless steel for the teeth. A few of the products I looked at included soft polymers such as rubber in the handle so I will also need to research these to decide whether this is something I should include in my design. Most of these combs will have been made by injection moulding so it might be helpful to research this process when thinking about manufacturing methods.

### EXISTING PRODUCTS RESEARCH - FLEA COMBS and TOOTHBRUSHES

On this page, I have collected images of existing flea combs and dog toothbrushes. As there is a lot of variation in the size of flea comb handles and the length of comb-teeth between products, I have researched the dimensions of several existing products and found an average size for each component. I have also looked at several shapes of comb handle to decide which would be easiest and most comfortable to use. Finally, I have listed the materials used in each product and the manufacturing processes which have probably been used. I can use this information when I research materials and processes for my product as they are likely to be similar. Looking at pet toothbrushes, I found that there are two types of product available: some brushes resemble human toothbrushes with a separate handle and brush head made from different materials and others are made to fit onto a finger. These 'finger-brushes' make it easier to reach all of the teeth. I have researched both types of brush including materials, manufacturing processes and average dimensions of each product type.

**Products 1,2,3:** All three brushes would be made by injection moulding. 2 and 3 are made from one material only (PVC) whereas product 1 would require the PVC bristles and HIPS handle to be made separately, increasing production time and cost for this product. Flexible PVC is used which would allow it to stretch slightly, giving a tighter fit on the user's finger and allowing the bristles to bend against the teeth.  
**Products 4, 5, 6:** These brushes all have a plastic handle with bristles made from a different material. The handles are all Polypropylene and the bristles are made from nylon. The handles are likely to have been injection or compression moulded. A soft-polymer could be added for grip.



Table listing the dimensions of the finger-brushes on this page.

Product	Length	Diameter
1	50mm	28mm
2	42mm	22mm
3	54mm	25mm
Average	49 mm	25 mm

Finger brushes made from High Impact Polystyrene with PVC bristles. They are 50x30mm.

Table listing the dimensions of the handles of the toothbrushes. From this, the average length of brush is 172mm. The brush-head on each brush is around 20mm and the bristles are 10-15mm long.

Product	Length of brush	Width of handle	Thickness of handle
4	140mm	11mm	6mm
5	150mm	15mm	11mm
6	225mm	8mm	5mm
Average	172 mm	11 mm	7 mm

These brushes are made from PP with nylon bristles. They have three heads angled in different directions to reach all sides of the teeth.



These brushes also have plastic caps to cover the bristles and keep them clean.



PVC finger brush, 42x22mm. Different lengths of bristles on either side, to suit different sizes of teeth and the smaller bristles can be used to brush the gums.



Brushes made from flexible PVC. They are 54mmx25mm and fit over a finger. This makes it easier to control the brush and reach all sides of the teeth.



PP toothbrush with nylon bristles. 2 heads of different sizes for different areas of the mouth. Curved shape is different from human toothbrushes and makes it easier to reach all sides of the teeth. This brush is 225mm in length.

The handle is made of Polypropylene and the bristles are nylon. The length of the product is 140mm.



Table listing the dimensions of the toothbrushes on this page.

**SCALE OF PRODUCTION**

The current plan for the 'puppy parties' is to hold one each week with 5 owners attending each session. This would mean that my clients would require only 250 packs per year. However, as many as 2000 puppies may be registered with the practice in one year. This means that my clients may be able to extend the 'puppy parties' scheme in the future and so may require more packs at a later date. Also, the company sponsoring the production of the 'puppy packs' may wish to produce more, either to give away themselves or to supply to other practices. These would need to be slightly different to the product I am designing in order to suit the other practices/companies, something which would be most easily achieved if the packs were being batch produced. Small changes could be made to the design and a batch produced, then the changes reversed and a batch of the original product made. The quantity of products needed also tends to vary with batch production. Scale of production is something I will need to think about in my design. The product must be able to be made using automated processes suited to batch production.

**Injection moulding**

Injection moulding is most commonly used with thermoplastics and can produce complex shapes. Several of the products I looked at in my research were made using injection moulding. The process involves a rotating screw in a hopper containing a softened polymer is pushed along a barrel containing a rotating screw. The screw is rotated by a motor and the granulated polymer is pushed along a hopper into a steel barrel and softened by a jacket of heaters around the barrel where it is heated and softened. The softened polymer is then pushed into the mould cavity. The hydraulic ram forces the mould cavity is filled. The pressure is left to cool for a few seconds and the plastic removed. The polymer is removed and any excess plastic removed. The product is removed and any excess plastic removed.

Being able to combine two materials is an important advantage as it may be useful in the product (for example combining metal teeth with a plastic handle or the fibrous comb may make the product more hard-wearing than one made entirely from plastic).

**3D Product**

Possible materials for the 3D product are thermoplastics/elastomers. Plastics (thermoplastics/elastomers) thermosetting polymers/elastomers soft polymers. Metal (eg. Aluminium). On this page, I have researched production processes suited to working with these materials in batch production.



Injection Moulding  
Hopper  
Heaters  
Rotating screw  
Mould  
Hydraulic ram

**Disadvantages**

- Initial set-up costs are high (process more suited to producing higher volumes of products)
- Moulds are expensive
- Thermosetting plastics cannot be recycled
- The moulds need to be simple so complex 3D shapes are difficult to create
- Quality is not consistent for high volumes
- More suited to larger components

This is a problem as the product needs to be relatively small to fit in light packs and be light and convenient to carry and use. It is also likely to be made in several small components.

**Compression moulding**



Heat at mould  
Insulating plate  
The polymer sets hard in the mould then the mould is opened and the product removed using ejector pins.

**Sheet metal forming**

This involves applying mechanical force at room temperature to a sheet of metal. The material which is punched out is called a blank. This is the method which will have been used to make the 'Tick key' product. In this process, a hole is punched into a sheet of metal. The material which is punched out is called a blank. This is the method which will have been used to make the 'Tick key' product.

**Advantages**

- Fully automated process
- Very complex 3D shapes can be produced (both small batches and high quality)
- Suited to batch production with consistent quality
- Minimal finishing is required
- Close tolerances on small, intricate items can be achieved
- Little waste is produced
- Little moulds are cheaper to make than those for injection moulding
- Can be used for plastics and elastomers
- Lower pressures are required in the mould so this process takes less energy than other moulding processes
- Short cycle time

Lower energy consumption may mean that compression moulding would be a more sustainable method of manufacture. However, the fact that it is most suited to thermosetting plastic cannot be overlooked.

**Compression moulding**

This process is mainly used to permanently shape polymers such as urea formaldehyde. A prepared block of powdered plastic is placed between the two halves of the mould are heated to soften the plastic. The two halves of the mould are forced down into the softened plastic and the top section is opened and the half by a hydraulic press. This forces the polymer to flow out into the mould cavity. The polymer sets hard in the mould then the mould is opened and the product removed using ejector pins.



The text on the metal could have been stamped onto the surface before punching and other methods of cutting and engraving text include laser cutting, although the machinery required is expensive. The text on the metal could have been stamped onto the surface before punching and other methods of cutting and engraving text include laser cutting, although the machinery required is expensive.

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Lower energy consumption may mean that compression moulding would be a more sustainable method of manufacture. However, the fact that it is most suited to thermosetting plastic cannot be overlooked.



This method generates a lot of waste material but this can be melted down and re-used. This method is often automated and so would be suitable for batch production. Holes punched here before shape is punched.

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- Very complex 3D shapes can be produced (both small batches and high quality)
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# CE

## SAFETY STANDARDS

Safety is an important factor to consider in the design and manufacture of any product and I will need to think about the safety of my product both to the user and the dog. There are no regulating bodies or specific safety guidelines for the pet product industry and the safety standards a few manufacturers of these products have researched a few manufacturers of these products which they implement independently.

- Several companies (Kong co., PetSmart, Fido) follow regulations created for children's toys. The most commonly used standard is EN-71 which relates to
- Mechanical and physical properties
- Flammability
- Specificiation for migration of certain elements
- Organic chemical compounds

Following these regulations means that the product will not contain any toxic materials (this is important in pet products as the animal may chew the product and especially important for my product as it will include a toothbrush). It also prevents the product from having sharp edges or parts which could cause entrapment, features which improve safety for the user.

Some manufacturers hire an independent company (such as the Bureau Veritas Supply Chain Management) which tests the product for a selection of toxic or harmful substances. This allows the manufacturers to claim 'certified not-toxic' on their product packaging. The substances which must not be present are:

- Arsenic
- Barium
- Cadmium
- Chromium
- Lead
- Mercury
- Selenium

Controlling hazardous substances in pet products has become more of an issue in recent years as there have been concerns over phthalates in rubber toys and lead in paint.

Another standard often followed by pet product manufacturers is the European Community Directive 88/378. This is also a standard related to toy safety and ensures that the product has no parts which can stab, trap or choke and does not release harmful substances if chewed or swallowed.

Other safety considerations will be ensuring that the product is safe to hold and use (eg. no sharp edges and no components which are likely to break off, creating a sharp edge) and making sure it is easy to clean for hygiene reasons (eg. if it was to get blood on it the removal of a tick which could potentially spread pathogens).



This data shows that the best/most precise grip can be achieved with a cylinder of 10mm diameter. This is an average for the whole population so this figure will vary between men and women.

## ANTHROPOMETRIC DATA AND SAFETY STANDARDS

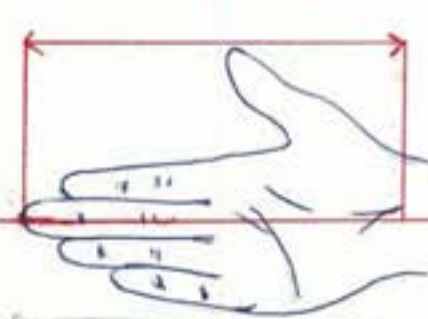


DATA FOR HAND BREADTH (mm)

Percentile	1st	5th	50th	95th	99th
Men	81	84	90	98	100
Women	71	73	79	86	89

DATA FOR LENGTH (mm)

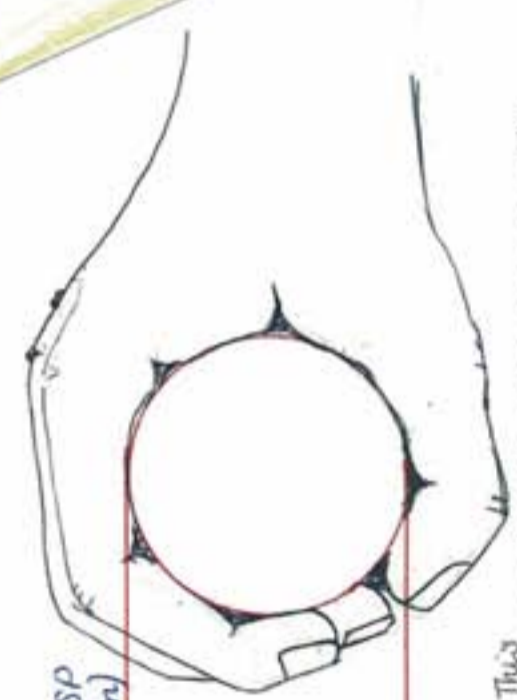
Percentile	1st	5th	50th	95th	99th
Men	173	179	193	211	219
Women	159	165	180	197	205



HAND GRASP (mm)

The product I will be designing will be hand-held so I will need to make sure it is not too wide or narrow to be held securely. The maximum hand grasp size (ie size of cylinder that can be held with the third finger and thumb touching) is:

- 5th percentile 45mm across
- 50th percentile 50mm across
- 95th percentile 55mm across



This data is taken as an average from the whole population so these figures will be different for men and women. As a result, it may be better to make the product smaller to cater for smaller hand sizes as it could still be held securely with fingers overlapping if larger hand sizes.

In my design, I will need to take into account human physical dimensions to ensure that the product is comfortable to use. I have researched dimensions relating to hand size and grip. This page, I have data relating to anthropometric and grip.

## RESEARCH



Thermoplastics	Advantages	Disadvantages
High Density Polyethylene (HDPE)	Has a high softening point and can be sterilised, something which would be useful in this product. Comes in a wide range of colour and is suitable for injection moulding. Low cost in comparison with many other thermoplastics.	HDPE is susceptible to stress cracking and has lower stiffness compared to some other thermoplastics (e.g. Polypropylene).
Polypropylene (PP)	PP is lightweight which is an advantage as the lighter the product, the less strong the packs with need to be, reducing manufacture costs. It can be sterilised and has good impact and chemical resistance and will bend without breaking or weakening.	Chemical resistance makes this material difficult to decorate with paint, labels or ink. This may be a problem for adding the practice logo to the product, it can crack easily in areas with small radii.
High Impact Polystyrene (HIPS)	Has high impact resistance and strength. Comes in a range of colour. Suitable for injection moulding.	There is some concern about the trace presence of chemicals used in the production of polystyrene in the final plastic product. This would be a problem for the tooth brush section of the product as it may be chewed by the dog, potentially releasing these chemicals.
Polyvinyl Chloride / Polychloroethenediyd (PVC)	Has high chemical resistance. Can be made flexible by the addition of plasticiser meaning it could be used to make the toothbrush bristles. It is very durable as it is resistant to chemical and oxidative reactions. It is a thermoplastic and is suitable for injection moulding. Can be recycled and the properties are not altered/reduced with recycling.	Some plasticiser used can cause the plastic to leach dangerous chemicals. This problem can be avoided by making sure the plasticiser does not include phthalates.
Acrylonitrile Butadienestyrene (ABS)	Higher impact strength, toughness and scratch resistance than Polyethylene and Polyethylene. Light and durable. Good chemical resistance. Good appearance and high surface finish, reducing amount of finishing / processing needed during manufacture. No chemicals are used in the production of ABS.	Slightly more expensive than HDPE and HIPS.



## Sustainability

**Bioplastics** (or organic plastics) are made from renewable biomass sources. These include vegetable oil, corn starch, pea starch and algae. Instead of the petroleum products used to manufacture conventional plastics, these are made from renewable biomass sources. These include vegetable oil, corn starch, pea starch and algae. Using Biomass to produce bioplastics has advantages in lessening the environmental impact of the product and reducing the amount of waste sent to landfill. Using Biomass to produce bioplastics has advantages in lessening the environmental impact of the product and reducing the amount of waste sent to landfill. Using Biomass to produce bioplastics has advantages in lessening the environmental impact of the product and reducing the amount of waste sent to landfill.

## Aluminium

Most of the Tick Removal tools I looked at in my existing products research were made from plastic, although a few were made from metal / included metal components. The metals used were either Aluminium (i.e. The Tick Key which my clients feel is the best product currently available) or Stainless Steel. I have decided only to research Aluminium as the high cost of Stainless Steel means I could not include it in my design.

Advantages of Aluminium	Disadvantages of Aluminium
<ul style="list-style-type: none"> <li>• 100% recyclable</li> <li>• Very light material</li> <li>• Highly corrosion resistant so it can be washed without rusting</li> <li>• Ductile (can be easily machined and formed at room temperature so energy costs of production are reduced)</li> <li>• Different surface treatments can be used to improve appearance (e.g. Paint or lacquer)</li> <li>• Non-toxic</li> </ul>	<ul style="list-style-type: none"> <li>• More expensive than plastic</li> <li>• Scratches easily</li> <li>• Difficult to join</li> <li>• A large amount of energy is needed to extract the metal from it's ore, reducing the sustainability of the final product</li> </ul>



All of the flea combs that I looked at in my existing products research had teeth made of steel / stainless steel or plastic. Stainless steel is steel alloyed with chromium. It would be useful in this product as it is corrosion resistant and will not rust. This is important as the flea-comb needs to be able to be washed. It is a sustainable material as it is 100% recyclable and stainless steel products are typically 60% recycled metal. Using recycled material requires a lot less energy than extracting and processing the metal so this would also reduce production costs. The disadvantage of this material is that it is much more expensive than most other metals.

**Materials for the leaflets and invitation cards**  
 Paper is categorised with regard to weight. The highest quality leaflets tend to be made from 150-300gsm paper (usually white bond paper or silk or glass art paper). Lower cost leaflets tend to be around 100gsm and the cheapest flyers are 80gsm. To research printing prices, I requested a sample pack from printing company, Face Media Group. Keeping the cost of this product as low as possible is important as my clients only have a small budget so I focused mainly on the cheaper products available. The cheapest leaflets produced by Face Media Group are made from white bond paper (this can be recycled or new) and are 100gsm in weight.

The thicker leaflets (300gsm) are similar in weight to post-cards so these would be useful for the invitation cards.  
 Leaflets/cards can be coated (a thin layer of clay added to give a smooth finish), uncoated or laminated. Coatings and lamination protect the paper so this would help the leaflets to last longer (this is important as people may want to keep them to refer to). It is not so important that the invitation cards are durable so these could be uncoated to reduce cost. My clients need to be able to write addresses on the cards so I tested the laminated and uncoated versions to see which was easier to write on. This showed that biro ink does not work well on a laminated surface.



## Materials for the folder / pack

When researching existing packs and folders similar to the one I will be designing, I found that they tend to be made from cardboard (around 300-400gsm board), polypropylene or polycarbonate. Polycarbonate is a thermoplastic polymer. It comes in sheet form which could be cut using a laser cutter to produce a net for a box/folder. The advantages of using polycarbonate is that it is extremely strong and lightweight. This means that the folder can be made as light as possible but will be strong enough to hold all of the leaflets and products required. It comes in different colours which is an advantage as the pack must be aesthetically appealing and making it colourful would help it fulfil this specification point. It can be recycled and recycled material incorporated in the product. A possible disadvantage is that it is slightly more expensive than other materials which could be used (i.e. Cardboard, polypropylene) but the cost may be reduced by using recycled material.



## Modelling Materials

**Polymorph** (Polycaprolactone) is a biodegradable thermoplastic material with a low melting point (around 65 degrees centigrade). It can be repeatedly shaped and reshaped. Common uses of Polymorph include:

- Vacuum forming moulds
- Joining components together
- Moulding of handles or specialised components
- Modelling / Prototyping

It is also used in the manufacture of some other polymer...



It is especially useful as a modelling material as it becomes soft enough to mould by hand with relatively little heating. This is usually done by placing polymorph granules in hot water. When they reach 62 degrees centigrade, the granules form a mass of clear material similar to nylon. This can then be shaped by hand or pressed into a mould.

On this page, I have looked at existing leaflets and folders similar to those required by my clients for the 'puppy packs'. I have looked at the costs of printing leaflets in different sizes and colour combinations. I have also considered the advantages and disadvantages of materials used to make the folders shown on this page and the methods of manufacturing these.

This product would be manufactured as a net and can be easily assembled to form a box. It has tabs which hold the bar together when fitted into slots on the opposite surface. This allows the folder to be assembled without the need for gluing or further processing, reducing production costs/manufacture time.

This leaflet is part of a booklet of 6 A5 page leaflets made by Bayer Animal Health about parasites. This product has a similar purpose and audience to the leaflets I will be designing so it is useful to look at the contents and design features of the booklet.

**Continuity/consistency:**  
 → All pages in the booklet follow a similar layout with a clear title and the circle-motif repeated throughout.  
 → The same colours (green and blue) are used on each page, as well as the same font/typography.

**Images**  
 → There are images on every page to break up the text and make the pages more engaging/interesting and keep reader's attention.

Images and diagrams are also useful for illustrating/explaining points. This is important for the 'puppy packs' as they need to help owners understand and remember information. **Some information is displayed as tables or charts.** These are useful for getting information across instantly and are often easier to read and take in than blocks of text.

Printing Costs for Leaflets

Leaflet type and quantity	Full colour	Full colour on 1 side, black and white on the other	Limited to 2 colours (and white) on both sides
A5 Booklet, stapled, 6 pages x 50	£593.77	£404.20	£300.40
A4 page, tri-folded x 150	£193.77	£128.00	£102.69
A4 page, folded into A5 booklet x 150	£193.77	£128.00	£102.69
A5 single sheet, unfolded x 300	£172.33	£117.00	£77.37

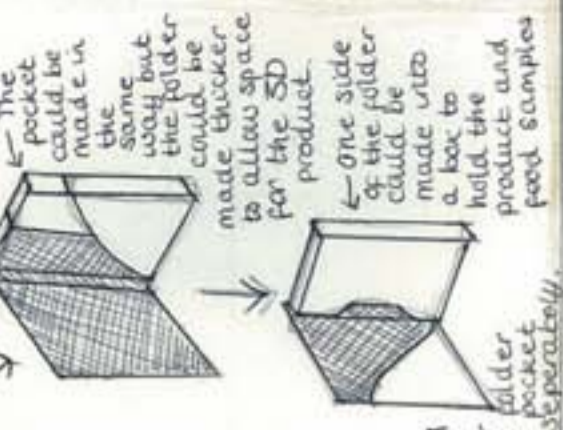
This is an example of a product similar to the pack I will be designing. It is produced by pet food company Iams to contain leaflets about the company and product samples, which is similar to the items my clients need the pack to hold. It is made from polypropylene which is suited to this product as it has a high strength to weight ratio so only a small amount of plastic is needed to make a strong container. However, polypropylene is difficult to print on so the design is limited to the company logo on a sticker in the corner. My clients feel that the 'Puppy Pack' folder should be more appealing visually with more colour and images.

**Manufacture Methods**  
 Folders are normally made as flat nets using die-cutting. This process uses specially shaped blades, bent into the desired shape and pressed into the material. With thinner materials such as cardboard, many sheets can be cut at once. Fold-lines can also be engraved/stored. Another possible manufacture method is laser cutting which uses a laser controlled by a CNC programme. It is a very precise method but is very expensive.

As this product is only intended to hold paper, it would need to be adapted to hold 3D products.



The pocket to hold the sheets of paper fits together without gluing. This reduces the amount of processing needed to manufacture this product but there may be a risk it would come apart if the contents of the folder was too heavy.



**Advantages**

- Light weight
- Stronger than cardboard
- Waterproof to protect leaflets and products inside
- More rigid than cardboard to protect items being carried/bent.
- Strong (as folder can hold over 400g weight)
- High quality printing surface
- Can be recycled
- Can be laminated/coated
- Most environmentally friendly material which may be seen as a 'selling point' for the product
- The cheapest board available at this thickness.

**Materials**

- Polypropylene
- 350gsm
- Silk board
- 350gsm
- Recycled board

**Disadvantages**

- Less environmentally friendly as it is made from oil.
- High chemical resistance of polypropylene makes it difficult to decorate with ink, paint or labels.
- Coatings/lamination necessary to protect the board and increase its rigidity raise production costs.
- Poor quality printing surface means it is difficult to decorate.
- More permeable to water and may become damaged by humidity in the over time.



To improve the visual appearance of the pack, it could be made from clear plastic, allowing the leaflets (which will be more colourful/greater visual impact) to be seen through it.

A tab on the top of the folder fits into this slot to hold the box closed and keep the contents contained.

The cheapest option would be to print leaflets in black and white. However, as the product needs to be visually appealing and engaging enough to encourage people to read and refer back to it, my clients feel it would be much more successful if it was colourful, despite the extra cost. The second cheapest option would be to limit the colour scheme to two colours only. This is roughly half the cost of full colour printing and means that the leaflet can still be colourful and have greater visual impact. This is an example of a leaflet printed using only light and dark blue. Using very different colours for the titles and main text makes them stand out and break up the text well. **sure we will always be in recent years fewer**

**How can antibiotic resistance be less?**  
 By using antibiotics less resistance. It's not possible to stop resistance spreading at all.

RESEARCH

16-11-09

Product	Most useful feature	Disadvantages
OTOM	<ul style="list-style-type: none"> <li>This product uses the least plastic and is made from one material only making it cheaper and more environmentally friendly than the other products.</li> </ul>	<ul style="list-style-type: none"> <li>My clients have found that this product can be difficult to use as it does not grip the tick securely and it can slip out from between the prongs when the tool is twisted.</li> </ul>
Tick Nipper	<ul style="list-style-type: none"> <li>This product includes a magnifying glass which my clients feel would be a useful feature as it would help people to see if they have removed all of the insect.</li> </ul>	<ul style="list-style-type: none"> <li>This product may be expensive to produce as it uses more material than some of the other products available (e.g. the OTOM tick remover) and has several components which would need to be made separately.</li> </ul>
Tick Key	<ul style="list-style-type: none"> <li>Shape is easy to use as it contains the tick and does not damage it when it is being removed.</li> <li>Very lightweight and fits on a key ring so it is easy to carry with you.</li> </ul>	<ul style="list-style-type: none"> <li>Aluminium is more expensive than some alternative materials (e.g. ABS, HIPS)</li> </ul>
Tick Out	<ul style="list-style-type: none"> <li>Colourful and larger than the other products so there would be room to print a logo.</li> </ul>	<ul style="list-style-type: none"> <li>Less practical as it is an outward shape to carry around. My clients feel it would be difficult to use without damaging the tick.</li> </ul>
Trix	<ul style="list-style-type: none"> <li>Very easy to use without damaging the ticks.</li> </ul>	<ul style="list-style-type: none"> <li>The wire loop is quite thin and may snap easily. The way that the loop retracts back into the casing may make it difficult to clean.</li> </ul>
Tickner	<ul style="list-style-type: none"> <li>Kills the tick while removing it so there is no chance it will bite the user once removed from the dog.</li> </ul>	<ul style="list-style-type: none"> <li>My clients feel that this product is unnecessarily 'high-tech'. It is bulky and heavy and would be very expensive to produce.</li> </ul>
Tick Pincher	<ul style="list-style-type: none"> <li>The fact that this product is made from metal rather than plastic may mean it is more durable.</li> </ul>	<ul style="list-style-type: none"> <li>Expensive to produce and the metal may corrode over time, especially if the product was washed.</li> </ul>
Tick Scoop	<ul style="list-style-type: none"> <li>Made in one piece, using only a small amount of material.</li> </ul>	<ul style="list-style-type: none"> <li>The prongs which go either side of the tick to remove it are very small so it would be difficult to keep the tick in the tool when twisting it.</li> </ul>

My research into colour schemes, logos and typography showed that in order to reflect the veterinary / medical theme, the product should be modern / contemporary in style. The colour scheme should include blue, green, silver/grey and possibly yellow as this colour is flea-



Disadvantages

Product	Most useful feature	Disadvantages
Combo-Brush	<ul style="list-style-type: none"> <li>The soft-grip polymer handle makes it more comfortable to hold and easier to use as it fits the shape of a hand.</li> </ul>	<ul style="list-style-type: none"> <li>As only a flea-comb is required in this pack, the design including several different brushes and combs is overly complicated and would be too expensive to produce.</li> <li>This product is designed more for general brushing, rather than as a flea comb so my product will need to have more finely spaced teeth.</li> </ul>
Kong Zoom-Croom	<ul style="list-style-type: none"> <li>This product is the most aesthetically appealing as it is brightly coloured and resembles a cartoon dog. My clients feel that this style of product would be well suited to the 'Puppy Pack'.</li> </ul>	<ul style="list-style-type: none"> <li>The larger teeth extend lower than the flea-comb teeth and may stop the smaller teeth from reaching the under layer of the coat.</li> <li>This comb does not have a separate handle so it may be more difficult to grip.</li> </ul>
Multi-tooth comb	<ul style="list-style-type: none"> <li>The ergonomic design the handle is shaped to fit a hand, making it easier and more comfortable to hold.</li> </ul>	<ul style="list-style-type: none"> <li>This comb does not have a separate handle so it may be more difficult to grip.</li> </ul>
Safari Comb	<ul style="list-style-type: none"> <li>This product would be the most cost effective and easy to manufacture as it is smaller than the other products and is made in one piece from one material.</li> </ul>	<ul style="list-style-type: none"> <li>This comb does not have a separate handle so it may be more difficult to grip.</li> </ul>



Product	Most useful feature	Disadvantages
Tooth Hugger	<ul style="list-style-type: none"> <li>My clients think that the feature of putting the toothpaste inside the brush head so that it is released slowly during brushing is a good idea.</li> <li>It can be difficult to get dogs to cooperate with having their teeth brushed so the fact that the dog will chew on these brushes by choice is useful.</li> </ul>	<ul style="list-style-type: none"> <li>The rounded shape of the brush head and lack of bristles would make it difficult to reach all areas of the teeth.</li> <li>These products rely on the dog chewing them off their teeth. It is very unlikely that all bristles on the brush and not all sides of the teeth will be reached.</li> <li>The bristles on this brush are quite short.</li> </ul>
Easy-Brush and Edible Brushes	<ul style="list-style-type: none"> <li>In my client's experience, this type of brush is the easiest and most effective for reaching all of the teeth. It requires the least material of all the products I have looked at making it the cheapest and most sustainable.</li> </ul>	<ul style="list-style-type: none"> <li>The Nylon bristles in this product would not last as long as those with rubber/plastic bristles and they tend to break and splay outward.</li> </ul>
Finger Brush	<ul style="list-style-type: none"> <li>The feature of having three brush heads angled in different directions can be brushed at once, making brushing easier and less time consuming.</li> </ul>	
Tri-Headed Brush		



The product will need to comply with EN-71 and European Community Directive 88/378

The quantity of packs required means it would be batch produced. Most of the 3D product will be made from plastic which will be

RESEARCH EVALUATION  
On this page, I have reviewed my research and made decisions about the materials and colours I will use in my designs and the processes which would be used to make them. I discussed each product I looked at in my existing products research with my clients and asked them to identify the best features of each one and the disadvantages of each. I will refer to these comments when designing my 3D product and aim to include the features which made the existing products successful and avoid those which were identified as disadvantageous.

Material for 3D product	Decision	Reason
	<ul style="list-style-type: none"> <li>Polypropylene for any sections of the product which need to be cleaned (comb, tick remover)</li> <li>PVC (for the toothbrush)</li> <li>Poly(lactic Acid Bioplastic (for sections of the product which do not need to come into contact with water)</li> <li>Stainless steel (for the comb-teeth)</li> <li>Aluminium (for the clicker)</li> </ul>	<ul style="list-style-type: none"> <li>PP is a thermoplastic which can be recycled (the material used could also contain recycled PP). It is lightweight and has good chemical resistance and will bend without breaking or weakening so it can be formed into different shapes easily.</li> <li>PVC can be made flexible by adding plasticisers. This will be useful for the toothbrush as the bristles need to be able to bend and the material can stretch to fit on a finger securely. It can be injection moulded.</li> <li>Including bioplastic will make the product more sustainable / environmentally friendly. Bioplastics can be slightly permeable to water which would mean they could be damaged by washing. Therefore I would only use this material for components which will not need cleaning regularly. Poly(lactic Acid polymers have properties similar to PP and are the most durable of the bioplastics.</li> <li>The comb teeth must be very thin and finely spaced. If they were made from plastic, they would be likely to snap but metal is more durable. The comb will need to be cleaned so stainless steel is required to prevent corrosion.</li> </ul>
Materials for pack/folder	<ul style="list-style-type: none"> <li>Polycarbonate</li> </ul>	<ul style="list-style-type: none"> <li>This material is much stronger and more durable than the alternatives (cardboard). To make a pack of the same strength, a much greater weight of cardboard would be needed which would make the product less environmentally friendly. Polycarbonate can be recycled and recycled material could be used.</li> </ul>
Leaflets	<ul style="list-style-type: none"> <li>Coated 100gsm white bond paper (made from recycled fibre)</li> <li>Full colour printing on the first page, but where leaflets extend to 2 pages, the second should be two colours only.</li> </ul>	<ul style="list-style-type: none"> <li>This is a medium weight of paper so this is a compromise between the highest quality and keeping the production costs down. Thicker paper would also make the pack heavier which would be a disadvantage. Recycled paper is the same price as 'new' paper so it makes sense to use 100% recycled paper as this increases the sustainability of the product. The paper should be coated to enhance the appearance of the leaflets and to protect them, making them last longer for people to keep and refer to in the future. They must have visual impact and be aesthetically appealing to encourage people to read them so my clients feel that they need to be in full colour. It would reduce costs if double-sided leaflets were printed with only two colours on the back.</li> </ul>
Invitation cards	<ul style="list-style-type: none"> <li>300gsm uncoated white bond paper (recycled)</li> <li>Full colour print on the front and black and white only on the back.</li> </ul>	<ul style="list-style-type: none"> <li>This weight of paper is suitable for the invitation cards as it is normally used for postcards and so is rigid enough not to be damaged in the post. They can be uncoated to reduce costs and as they do not need to be durable. Coatings also make them more difficult to write on. 100% recycled paper can be used to reduce their environmental impact. They must be brightly coloured to attract attention and encourage people to look at them so full colour printing is necessary for the front of the cards. To reduce costs, the back should be black and white only.</li> </ul>

### 3D Product

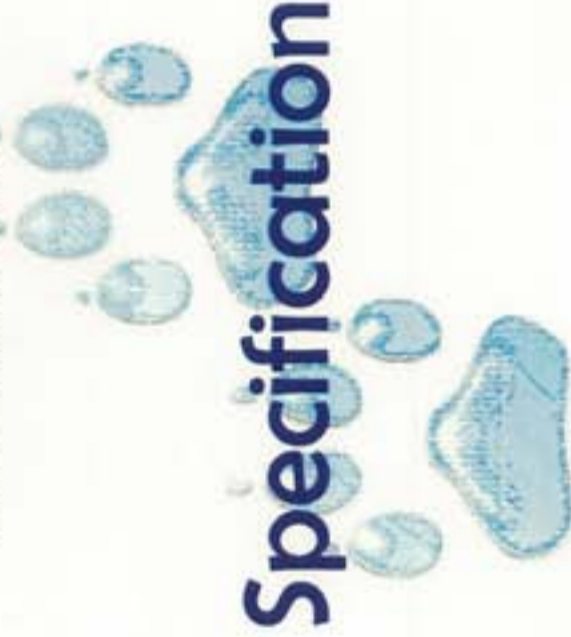
- It must include:
  - A flea comb
  - A dog toothbrush (this must be a finger-brush and the bristles must be made from the same material as the body of the brush)
  - A tick removal tool
  - A training clicker
- For ease of storage, the above elements must be combined to make one object or have the ability to fit together as one piece
- The materials used must be non-toxic. In accordance with EN-71 safety standards, the materials used must be free from arsenic, barium, cadmium, chromium, lead, mercury and selenium
- It must be durable and suitable for regular use
- It must be designed using anthropometric data on hand and grip sizes to ensure it is comfortable and easy to use
- It must have no sharp components or parts which are liable to snap, leaving sharp edges
- The materials and processes involved must be as environmentally friendly as possible
- It must be suitable for batch production
- It must be as cost effective to produce as possible, working to a budget of £500 for the first batch of products
- It must be as light as possible so that the pack/folder is not damaged by the weight of the contents
- The height and width of the product must not be greater than those of an A5 leaflet (as this is the size the pack/folder will be) i.e. Not greater than 210 mm x 148 mm
- It must feature the logo of Powderham Veterinary group and the sponsoring company, Intervet
- It must be aesthetically appealing (e.g. Colourful and an unusual / interesting shape)
- The colours used must be those used in the logos (green, blue and silver) to continue the theme of corporate identity
- To reduce the environmental impact of the product, as much of it as possible must be made from Bioplastic (Polylactic acid polymers);
- The toothbrush must be made from PVC
- The teeth of the comb must be made from stainless steel
- The tick remover must be made from Polypropylene as this section will need to be cleaned regularly and Bioplastics can be damaged by exposure to water
- The teeth of the comb must be between 15 and 20 mm in length



Invitation Cards

The 'Puppy Pack' as a whole must meet the needs identified in the needs analysis by:

- Including a 3D product which is relevant to the pet care topics discussed in the information sessions
- Containing leaflets with all the necessary information clearly and simply with images and diagrams to help explain points
- Promoting Powderham Veterinary Group
- Being useful to the practice clients so that they will have a good opinion of it and create a good reputation by word-of-mouth
- Publicising the 'Puppy Party' information sessions
- Keeping all of the pet insurance leaflets and free product samples given away at the 'Puppy Parties' up together in a pack / folder



## Specification

- They must be visually appealing and have sufficient visual impact to make people notice them and want to look at / read them
- The fact that they come from Powderham Vets must be instantly recognisable so they are not mistaken for junk mail (e.g. The logo must feature prominently)
- They must be made from 300gsm white bond paper which is made from recycled fibres, increasing the product's sustainability
- The paper must be uncoated to allow the addresses to be written in the back easily
- They must be postcard / A6 size (153x109 mm)
- They must feature the logo of Powderham vets and Intervet, information about the practice (contact details) and information about the time and location of the 'Puppy Parties'
- They must be printed in full colour on the front but in black and white only on the back to reduce printing costs

### Leaflets

- There must be one leaflet for each topic discussed in the 'Puppy Party' information sessions (Parasites, Worms, Neutering, Microchipping, Dental hygiene, Pet passports, Insurance and Vaccination)
- They must be made from 100gsm white bond paper made from recycled fibres
- They must be aesthetically appealing and engaging to look at (i.e. Colourful with images etc.)
- They must include images, diagrams, text and tables / charts to fully illustrate and explain the information
- Each leaflet must be A5 size (210x148mm)
- The leaflets must contain all of the information from the 'Puppy Parties' flipchart presentation and any other details which my clients feel are necessary
- Each leaflet must feature the logo of Powderham Veterinary group and the sponsoring company, Intervet
- The colour scheme used must be consistent with that used in the logos, pack, invitation cards and 3D product (green and yellow / blue and silver)
- The pages must be double sided with the information about one topic on one side and another on the other side. Some subjects require more information than others so both sides of the leaflet may be used for these.
- Where a leaflet extends to two pages on one subject, the front should be printed in full colour and the reverse side in two colours (not including black) only to reduce printing costs
- The leaflets must be finished with a clay coating to protect and add strength to the paper, making them more durable and enhancing their appearance
- The inks used must be non-toxic and water based to allow the paper to be recycled more easily when the pack is not needed anymore
  - The typography used must be modern / contemporary, similar to those used in similar product and the logotypes of the pharmaceutical companies I researched. It must also be simple and clear to read
  - The font size must not be smaller than 9pt
  - There must not be too much text on one page and the text must be broken up with headings, images etc.
  - The quality of printing must be high to ensure that the text is printed clearly and the ink does not bleed, making it difficult to read. The quality must be monitored during production

- The pack must be made from polycarbonate (if possible, a percentage of this material must be recycled)
- It must be strong enough to hold all of the leaflets
- needed, the 3D product and the free product samples given away at the 'Puppy Parties' (a 40g pack of puppy food and an 8g sachet of toothpaste)
- It must be able to be batch produced
- It must be produced as a net which can be assembled without the need for gluing or further finishing to reduce production time and cost
- It must be able to be closed securely and resealed after opening so that the contents will not fall out
- It must use the minimum amount of material to reduce costs and be as environmentally friendly as possible. This means it should not be larger than the maximum height and width of the largest leaflets (with a few millimetres of extra space), i.e. Height must be between 212 and 217 mm and width must be between 150 and 155 mm.

Pack / Folder





# LEAFLET DESIGNS

Specification points for leaflets;

- The leaflets must be A5 size
- They must be aesthetically appealing and engaging to look at (eg. colourful and including images to break up the text)
- Each leaflet must feature the logo of the veterinary practice and the sponsoring company
- To reduce printing costs, the colour scheme must be limited to two colours only (as well as black and white)
- To generate ideas for lay plans for the leaflets I have designed one of the leaflets (on vaccination) and will then use the basic layout of my final design for the rest of the leaflets. Features this leaflet must include;

- Information about each vaccine
- Images
- Title and logos

The text needed includes an introduction paragraph and a paragraph about each vaccine available



My clients prefer these two fonts as they are the least formal.

• Anad R rounded MT Bold

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initial ideas for lay plans

## Vaccination

- Distemper
- Hepatitis
- Parvovirus
- Parainfluenza
- Leptospirosis



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# MODELLING

Let impact a writing background

idea 1: This design continues the idea of having a pawprint pattern behind the text as my clients liked this as a motif behind the table on each page. This pattern is colourful, giving the leaflet a greater visual appeal.

idea 2: This design is a mix of the two ideas above.

Puppies can be vaccinated from 8 weeks. The diseases we protect against are parvovirus, distemper, hepatitis, and leptospirosis. Once the initial course is given, a yearly booster injection is required.

Distemper is a viral disease spread by urine, saliva and faeces. It is now rare in the UK due to vaccination but causes painful inflammation of the liver which can result in permanent damage and often death.

Hepatitis is a viral disease spread by urine, saliva and faeces. It is now rare in the UK due to vaccination but causes painful inflammation of the liver which can result in permanent damage and often death.

Parvovirus is a viral disease causing vomiting and diarrhoea and affecting mainly young unvaccinated dogs. SER (serum electrolyte renal) is a common cause of death in some areas of the UK, it is a remnant of the virus which affects the gut for life even if dogs recover.

Leptospirosis is a bacterial disease which can be contracted from the urine of rats or other dogs and contaminated water. It causes vomiting, abdominal pain and internal bleeding and can also pass to humans.

Distemper is a fatal viral disease. Symptoms include eye and nasal discharge, coughing, vomiting, diarrhoea, paralysis and painful shaking of the body.

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Final

This is the final layout and colour scheme for the leaflet on vaccination. The other leaflets will follow this layout, although some require less text and may only cover the first page, in the other leaflets, the space for the vaccination schedule on the second page will be taken up by space for more notes or other images/diagrams. My clients have chosen this colour scheme as it is the boldest with the text and image standing out against the white background. However, they have suggested that the other leaflets have a very pale background colour so that people can differentiate between the topics.

To make the headings even more distinctive/separate from the main body of text, an image could be added as a backdrop. This could be repeated on every leaflet, creating a consistent motif throughout the pack. The image or the text would have to be much lighter/a different colour so it can be seen.

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# Invitation Card DESIGNS

FRONT



Puppy Party Invitation

## IDEA 1

This idea fulfills the specification in that it features the necessary logos and addresses the puppy parties. The central image attracts the eye and the background could be coloured to increase its visual impact. However, the practice logo is very small in this design and is not immediately noticeable. As one of the specification points is that the cards must be instantly recognisable as coming from the practice so they are not dismissed as junk mail, I have developed this idea to make the logo the most prominent feature.

This idea is clearly linked to Powderham Vets. My clients do not like this idea as they feel that the logo and colours are too formal and are not appealing to more 'fun' and appealing style.



Puppy Party Invitation

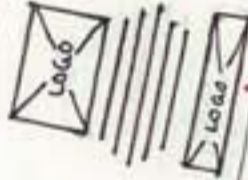
that the cards should have a more 'fun' and appealing style.

To make the card less formal while still including the logo, I have redesigned the logo in a cartoon style. My clients prefer this idea as they feel that this style of image is more appealing and more likely to encourage people to look at the card. The bright colours are reminiscent of a party invitation and drawing the castle as a bouncy-castle links to the name of the information session (Puppy Parties).



the name of the information session (Puppy Parties)

TEXT



## Information about the practice

This design includes all the relevant information and the logos. However, the basic layout and lack of images makes it boring to look at.

Information about the time and location of the puppy parties

## Specification for Invitation Cards

Each card must be A6 (postcard) size: 155x105mm.

- The cards must be visually appealing and have sufficient visual impact that people will notice and read them.
- The fact that they come from the practice must be instantly recognisable (i.e. the logo must be featured prominently so that they are not discarded as 'junk mail').
- They must feature details of the time and location of the 'Puppy Parties', information about the practice and the logo of the sponsoring company.



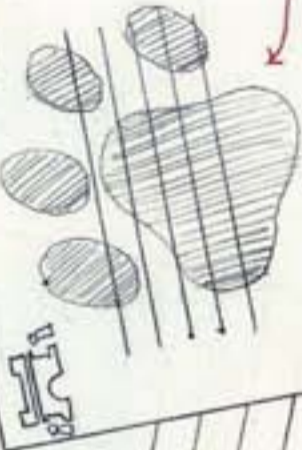
Powderham Veterinary Group  
7 Powderham Road  
Newton Abbot  
01626 363079

104 Newtown Road  
Torquay  
01803 63700



You are invited to a 'Puppy Party' at our Newton Abbot practice. This is an information session about caring for your new puppy and related issues such as pet insurance. It's also a great opportunity for your dog and to socialise with other dog owners. We hope to see you there! 363079

## BACK DESIGN



My clients prefer this idea, it is similar to the first design but includes an image behind the text making it more interesting to look at.

The image behind the text dominates this motif from the leaflets in the 'Puppy Packs'. It also adds the informal feel of the front of the cards more than the other design.

I created this design by scanning in my drawing of the new logo idea and editing it in Photoshop to add the text. However, I do not like this design as the pencil drawing looks unfinished/unprofessional as the rest of the card has been created digitally. To make the style of the image more in keeping with the rest of the card and leaflets, I created the logo again using cartoon images of a bouncy-castle from the original logo and editing the colour in Photoshop. The resulting design is more modern and consistent with the rest of the pack in style.



Puppy Party Invitation

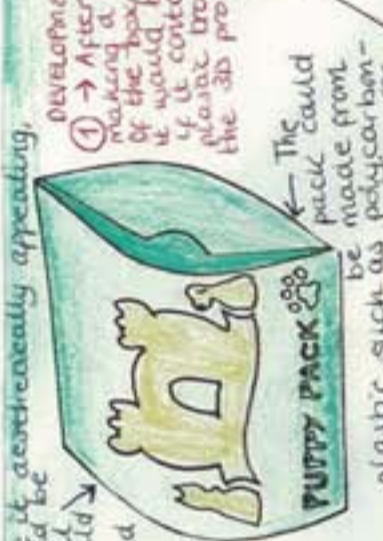
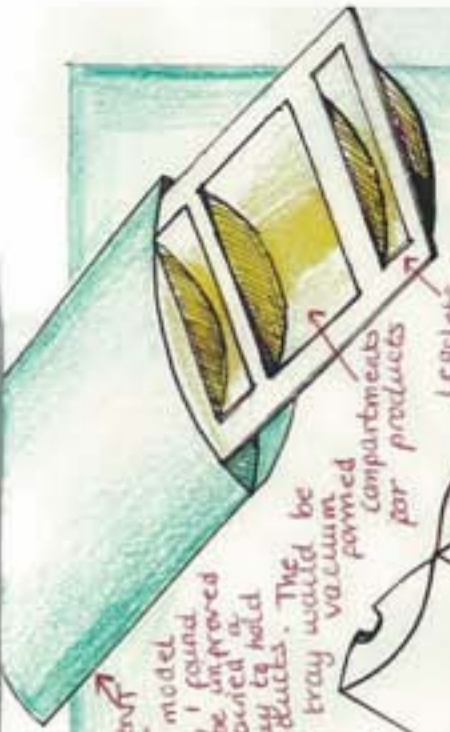
... editing the colour in Photoshop. The resulting design is more modern and consistent with the rest of the pack in style.



Powderham Veterinary Group

INVITATION CARD DESIGNS

FEB 11TH 2010



# Modelling and Development

**Development**  
 1. After making a model of the box, I found it would be improved if it contained a plastic tray to hold the 3D products. The tray would be vacuum formed for products.

To make it aesthetically appealing, it should be colourful and could be decorated with the practice logo.  
 This idea is based on boxes used for jewellery as these are strong and can be opened and resealed. They can be made from a simple net which does not include too much material.

To reduce the production costs and environmental impact of the product, I have tried to keep the leaplet pockets as small as possible. This means the minimum material and gluing is required. However, when I modelled this idea, I found that the pouches may need to be larger to cope with the weight of the leaplets.

This idea is based on a simple folder with pockets on each side to hold papers. To adapt it to hold 3D products as well, there would be a blister pack on the back.

**Specifications for Pack/Folder**  
 - The pack must be strong enough to hold all of the leaplets and free products included in the 'puppy faces' faces.  
 - It must not use excess material which is not necessary as this will reduce production costs.  
 - To reduce production costs further, the pack should be able to be batch produced in a net and assembled with minimum finishing/gluing needed.  
 - It must be aesthetically appealing and the design must relate to its purpose.

**Selection of Materials**  
 - One of the best features of this design is that it fits together without glue, which reduces production time and cost, and environmental impact and allows it to be transported and stored as a flat net, taking up less space. As a result, I have developed this design to incorporate tabs which fit together instead of the glue tabs in the original design.  
 - Net for final design, including the tabs to hold it together.

**Modelling**  
 To test how successful this idea would be and to find a way of attaching the folder to the blister pack, I made a cardboard model of this design. Attaching the blister pack to the folder is difficult as the leaplets and products need to be able to be taken out and put back in easily.  
 - I found that if the folder was tilted, the leaplets would fall out.  
 - Pockets which extend the full length of the folder would be more successful.

This would need to be made using a rolled vacuum forming, so that the plastic comes out in a neat, ready for the folder to slot into.  
 - Leaplets are less likely to fall out of this version of the larger pockets.  
 - Box (A5 size) made from plastic such as polycarbonate (could also be made from biopolymers/recycled plastic to reduce its environmental impact) and decorated with vinyl text/logo. The box can be opened and revealed securely so the contents will not fall out.

The simple box shape allows it to be transported and stored as a flat net, taking up less space. As a result, I have developed this design to incorporate tabs which fit together instead of the glue tabs in the original design.

The pack fits together using tabs which clip into slots on the opposite side of the net. This is an advantage as the boxes do not require gluing so processing and production time are reduced. Also, the packs can be stored and transported flat and assembled after distribution, reducing storage and transport space needed.

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# idea 1

Plastic case which is hollow to contain the four products (flea comb, toothbrush, tick remover and clicker). The ends must be able to be removed and replaced securely to reseal the tube.

There would be a ridge on the tube which the projections on the other section would fit under when twisted.

This idea is similar to the way a light bulb fits into a socket.

The top could be made slightly smaller than the tube so that it fits exactly. This is the simplest design but would need to be made to a very small tolerance it would otherwise it would not close properly or would come open again.



# Flea comb

To make the comb easier to use, it could be adapted from the original design to include a handle. This would be shaped to fit a hand and could also be made from a soft polymer for better grip.

Standard shape could be altered to make it more interesting. A rounded shape would be more comfortable to hold.

The top would need to be shaped to fit exactly into the tube. This could be injection moulded in plastic. Alternatively, a soft polymer could be used which would allow slightly in shape when pressed (like a cork in a bottle).



As most of the tools are smaller than the comb, it would make more sense to have a separate compartment for the comb and a smaller section for the other items.

These could be vacuum formed from plastic (this may need to be a polymer like polypropylene as some bio-places are not suitable for vacuum forming).



In my existing products research, I found that the toothbrush should have a rubber head instead of longer, as this will last longer.

The rounded shape of the handle is necessary for the product to resemble a paw print but may make them difficult to hold and use.

This would be made easier if they were made from a soft polymer (elastomer) so that they would mould slightly to the user's hand shape.



The casing would be injection moulded from coloured bioplastic (poly-lactide) as it would be most durable and work well with injection moulding.



# IDEAS FOR 3D PRODUCT

This idea was generated through peer-design. It fulfils the specification as all of the tools fit together in one piece and its shape relates to the puppy theme. This also makes it interesting to look at / aesthetically appealing.

The main section could be decorated with the practice logo as the product must help to promote them.



The rounded shape of the handle of the tools is necessary for the product to resemble a paw print but may make them difficult to hold and use.

This would be made easier if they were made from a soft polymer (elastomer) so that they would mould slightly to the user's hand shape.



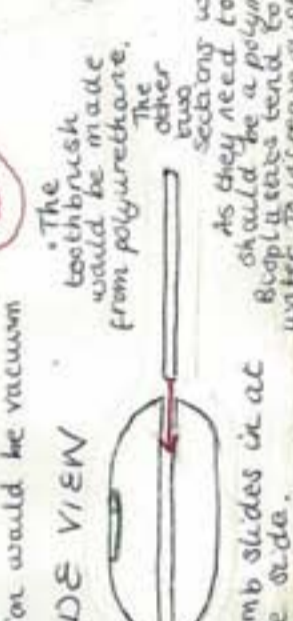
Like idea 2, all of the tools fit together to make one object. This idea is better than idea 1 as it uses less material, making it cheaper and more sustainable to make. The shape is less appealing/relevant to the purpose of the product but making each component from coloured plastic makes it more aesthetically pleasing. The necessary logos could be added on the underside of the central section.



The four removable sections could be made in a way similar to clips on nappies. They would click into grooves in the main section and come out again when pressure was applied to the ends forcing them inward and making it thinner.



It would be difficult to make the clips for each product fit into exactly the right size and shape for it to clip in.



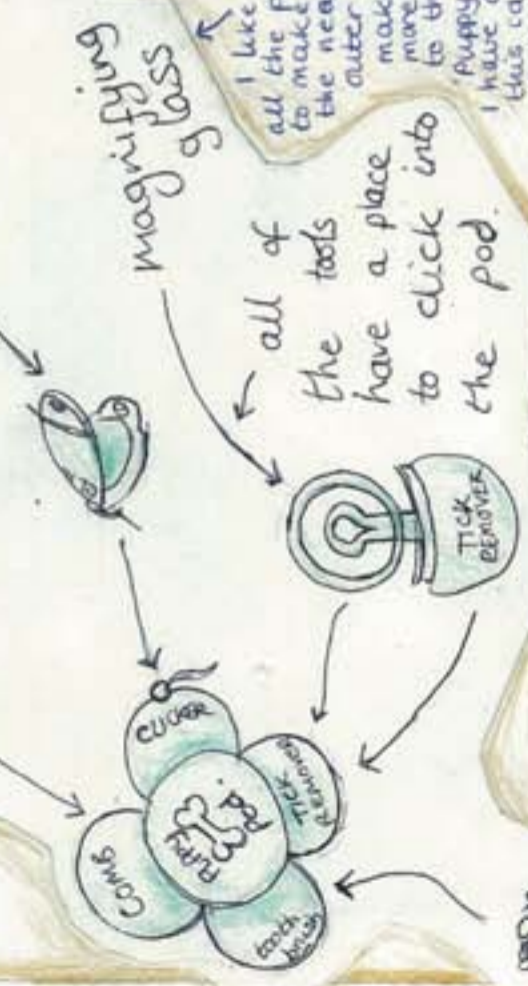
The toothbrush would be made from polyurethane. The two sections would be made from plastic. As they need to be a polymer like polypropylene as bioplastics tend to be slightly permeable to water, to increase sustainability, this could include recycled plastic.



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have simple design and works



The products slip into slots in the main section.

Plastic shape products together decorated with vinyl logos.

I like this design as all the products clip together to make a single object without the need for a container/outer packaging. To make it more relevant to the puppy theme, I have developed this idea to a paw-print shape.

I would need to think about how to make the components clip together securely.

Concentrating only on aesthetically pleasing shapes of the products means that ergonomic considerations are disregarded - I may need to alter the shapes of the tool handles to make them easier/more comfortable to use.



Tray formed for tools to fit in.

raised base handle

finger grooves on handle side



Tray fits into box.

vinyl shapes

leaflets - tray for products

plastic box

This design is very simple and would be quick and easy to make by vacuum forming plastic. It fulfills the specification in parts in terms of what it needs to include but may not be sustainable/environmentally friendly enough as it uses a large amount of plastic (ie. making a separate box, and tray as well as the products themselves). This impact would be reduced by using biopolymers.

This shape is quite basic and could be made more interesting. However, the simple box shape would be easy to make which may make this idea more cost-effective.

The box could be decorated with an image or the practice logo to make it more aesthetically appealing and to fulfil the specification in part of advertising the practice.

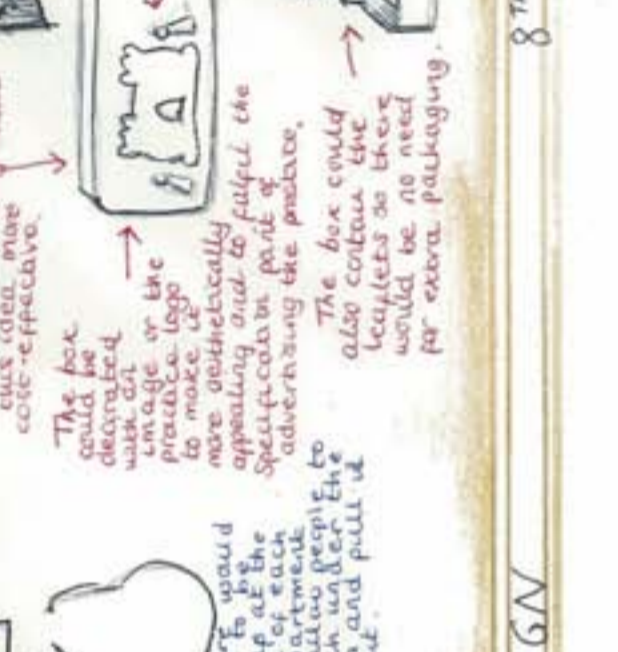
The box could also contain the leaflets so there would be no need for extra packaging.



Tools fit into hollow section. This would only work if they were all long and thin in shape which is practical for the toothbrush, tick remover, clicker etc.

Hollow plastic case

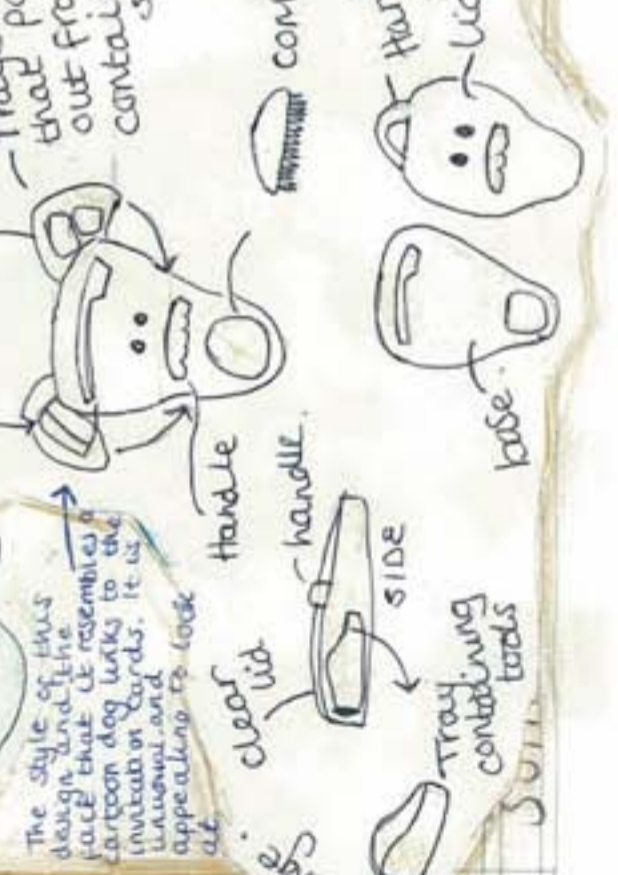
Top screw into hollow section



Instead, both ends could come off and there could be two hollow sections (at each end), one extending 3/4 of the way through the tube to hold the longer tools and one extending 1/4 of the length of the tube for the rest.

The edges of each compartment would need to extend slightly so that the product would clip in under the overhanging plastic.

There would need to be a gap at the edge of each compartment to allow people to reach under the item and pull it out.



The style of this design and the face that it resembles a cartoon dog lucky to the invitation cards, it is unusual and appealing to look at.

clear lid

handle

handle

side

Tray containing tools

base

**idea (4)**

Shape and style based on the Swiss Army knife with the red and white colour scheme adapted to reflect those in the logos.

This design works well for the flat tools (comb, tick remover and magnifying glass) but there is no where for the clicker and toothbrush. One way to include these would be if the two plastic sections were made thicker.

The top half would be the metal ticker with the hole drilled in the base for the toothbrush. Alternatively, could be vacuum formed around the toothbrush shape so this would clip in.

The rounded shape would be difficult to hold, the plastic casing would need to be thinner to fit into a hand easily.

Thinner shape (my research very anthropometric) shows that it should be 50mm wide and 80mm tall (maximum) to fit the average hand.

Flat tools fit in between the two layers of plastic.

Clicker  
Toothbrush clips underneath

As inspiration for my design, I looked at other multi-tool products. This design is based on a Swiss Army knife as both products must incorporate several tools as one object.

The product would be made from two pieces of plastic (could be bi-plastic) joined by two plastic/metal posts (one at back end).

Each tool would need to have a groove cut into the side which sticks out from the plastic case so that the user could easily pull it out.

Each tool would have a hole drilled at one end to fit over the post allowing it to rotate so it could be pulled in to use and kept hidden in between the layers of plastic for storage.

The tick remover and magnifying glass

The tick remover and flea comb could be made from metal as this would be more durable than plastic. (eg. Aluminium) This could be lacquered to prevent corrosion and a coloured dye added to make the product more aesthetically appealing. The two plastic sections need to be hollow/shaped to fit the toothbrush so these could be vacuum formed.

Top decorated with vinyl shapes (logos)

Swiss Army knife logo replaced by practice logo on one side and the internet logo on the other.

**idea (5)**

All of the products are attached to a keyring loop. Each one would be made with a ring attached and could be used on the main ring or taken off to use separately. However, it would take quite a long time to take each item off the main ring and as they are only made of plastic, the rings may snap if repeatedly removed and put back on the ring.

A clip like this could be used to attach the tools to the ring, making them quick and easy to take on and off.

All of the tools combined into one piece. This could be made by injection moulding all in one piece or as separate components and attached together. Being unable to take the tools apart may make them difficult to use and clean and the shape may be too bulky to hold properly, especially with the tick remover and magnifying glass.

Each tool would have a hole drilled in the top and be attached to the plastic/metal clips by a plastic/metal ring.

Instead of being a separate component, the tick remover could be incorporated into the comb handle.

The original idea developed to have a shaped handle which would fit into a hand more comfortably. This could be made from a soft polymer for better grip. The tick remover and magnifying glass would fold away so they would not stick out into the users hand.

Like the Swiss Army knife idea, the tick remover and magnifying glass could be fitted into a slot in the handle and pulled out when needed so that they did not get in the way when using the other tools.

As the product must also advertise the practice and the sponsoring company, this idea could include a keyring featuring their logos.

It would be better if the tools could be removed at the keyring more easily as people will need to take them off to clean them and they would be difficult to use when attached to the others.

Tools would be injection moulded from plastic (PP for the comb and tick remover as these need to be washed which could damage bi-plastics and bi-plastic for the clicker and keyring). The tick remover could also be made from aluminium.

Keyring made from plastic with vinyl shapes and lettering

Plastic clips

Each tool would have a hole drilled in the top and be attached to the plastic/metal clips by a plastic/metal ring.

Instead of being a separate component, the tick remover could be incorporated into the comb handle.

This design is simple and could easily be made by injection moulding. Being able to make it all as one piece would reduce production and processing costs.

**DESIGN IDEAS**

**idea (6)**

Like the Swiss Army knife idea, the tick remover and magnifying glass could be fitted into a slot in the handle and pulled out when needed so that they did not get in the way when using the other tools.

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### Idea 3

My clients like this design as all of the items fit together without the need for extra packaging. It is more compact than some of the other designs which my clients feel would make people more likely to keep and use it. The rounded shape of the clicker makes it easy and comfortable to hold but the comb does not have a separate handle which may make it more difficult to use. There is less space for the necessary logos so these would need to be featured on the bottom of the product where they may not be seen as easily.

This idea is colourful which makes it visually appealing. The colour reflects those in the two logos featured which helps it to serve the purpose of advertising these companies.

All three sections may need to be washed so bioplastic could not be used as these can be damaged by water. This design could be developed so that the tick-remover was removable from the middle section. This could mean that the clicker could be made from bioplastic. As it is, the toothbrush would be PVC and the rest would be Polypropylene (with aluminium for the clicker).

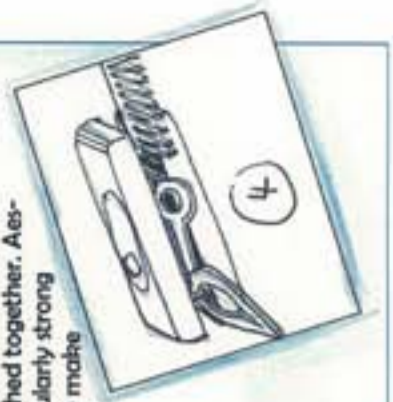
All of the components could easily be made by injection moulding. It is suitable for the scale of production required as it could easily be batch produced.

As it is, all of the product must be made from conventional plastic (PP) but it could be developed so that the largest section (the clicker) could be made from bioplastic. This would reduce its environmental impact. Also, recycled Polypropylene, aluminium and PVC could be included in the other components. As this design does not include a separate case, less material is needed, reducing waste when it is disposed of.

This product uses the minimum amount of material it includes only components which are essential to the function of the product. This lack of excess plastic means material costs will be low. The comb is made of plastic in this design which is much cheaper than stainless steel.



Of the 4 designs I have analysed here, my clients feel that the best two are ideas 1 and 4. They feel that the shape of 1 (which resembles a bone) would appeal to the owners attending the 'Puppy Parties' as it relates to the puppy theme and the cartoon-style is informal and goes well with the style of the invitation cards. The problem with this design was the large quantity of material required to make the separate case and tool. Idea 4 fulfils the specification well in that it is very compact and all of the tools fit together as one object without the need for extra packaging. My clients feel that this design was particularly successful as each tool can be used separately without the others getting in the way, even though they are all attached together. Aesthetically, this design was not particularly strong and the shape could be adapted to make it easier / more comfortable to hold.



### Idea 1

This idea consists of the four tools required and a plastic case to store them in. My clients are happy with the design of the individual components as the comb handle and clicker are shaped to fit easily / comfortably into a hand (rounded with grooves for better grip) and the toothbrush is a fingerbrush as requested. It serves the purpose of advertising the practice and the sponsoring company well as there is a lot of space for the logos to be featured prominently on either side of the casing.

My clients feel that this design is the strongest aesthetically. They like the way that the shape relates to the theme of puppies and think that this would appeal to their clients.

As the outer casing and clicker do not need to come into contact with water, they can both be made from Bioplastic. As all the tools would be made separately, they can all be made from different materials and the one which is most suited to that purpose selected without having to consider the other components. The toothbrush would be made from PVC, the tick remover from PP and the comb from PP and/or stainless steel and polyurethane.

This design could easily be batch produced. All of the components could be made by injection moulding although further processing would be needed to fit the comb teeth and the metal into the clicker. I may encounter some difficulties in making a prototype model of this design: in this case, the outer casing could be made by vacuum forming in two sections and the tick remover could be made using a laser cutter to cut out the shape from a PP sheet.

A large proportion of this product can be made from bioplastic which reduces its environmental impact greatly. There would also be an opportunity to use recycled thermoplastics for the other components. However, a large amount of material is used in the casing which is separate from the tools and serves no other purpose than to keep them up together. This could be seen as a waste of material, reducing sustainability.

The shape of the casing is quite complicated with the two compartments inside so this may be more costly to produce. Also, the fact that all of the components and the case are separate means that production and assembly of the product would take longer and a relatively large amount of plastic is needed to make them all, increasing cost.

## Analysis of Design Ideas



### Idea 5

This design is very simple and my clients feel it would be easy to use. They like the way that all of the tools are attached to a key ring as this means people could easily carry the tool with them or attach them to a dog lead. The key ring with the logo on helps to advertise my client and the sponsoring company. A possible problem with this design is that the tools must be made quite small to fit onto a normal sized key ring and be compact enough to carry around. This means there is not much opportunity for ergonomic design, such as the inclusion of a handle on the comb. It should include a magnifying glass as well.

This product is relatively aesthetically appealing as it is colourful and incorporates the colour from the two logos. The black clips look slightly untidy / out of place with the rest of the product but these could be made different colour to make them stand out less.

The central ring could be made from metal or plastic. Metal would be more expensive but this would probably be a better choice as it is stronger and the combined weight of all of the tools and the key ring may damage a less durable material. The clicker and the clips attaching the tools to the ring could be made from bioplastic and the comb and tick remover from PP.

Manufacturing this product would take more time than some of the other designs as there are more components to make (each of the tool, the ring, the key ring and the clip) separately. They could each be made by injection moulding and it is suitable for batch production.

The use of bioplastic makes this product more sustainable. Any metal and petro-plastic used could include recycled material as this will reduce cost and be more environmentally friendly.

There may be increased production costs with this product due to the multitude of separate components which would need to be manufactured individually and then assembled. Also, metal is the most expensive material included in my design so the metal ring and chain attaching the key ring would increase the material costs.

After discussing my designs with my clients, I am discarding ideas 2 and 6 as they do not fulfil the specification adequately.

Idea 2 has positive aspects; the shape is unusual and quirky/appealing to look at and relates well to the puppy theme. However, in order to create the desired shape, the handles of the tools would have to be shaped in a way that would make them less practical as they would be difficult / uncomfortable to hold. Also, a large amount of plastic would be used for the middle section which the tools clip into. This serves no purpose other than to hold the tools together so this is a waste of material.

Idea 6 would be too difficult to use as the way that all of the tools fit together as one piece means that the other parts of the tool would get in the way and make it difficult to hold. As it would all be made from one material and the components cannot be removed, all of it would need to be suitable for cleaning. This means that bioplastic could not be used for any of the product as this could be damaged by exposure to water. This goes against the specification as it reduces the sustainability of the product.



### Idea 4

My clients like this design as it is very compact and all the tools fit together in one piece. The way that the comb and tick remover are stored in between the two layers of plastic will protect these more fragile components which may be liable to snap (for example if it were dropped). It fulfils the function of advertising the practice as there is space for the logos on the top of the handle. My clients feel that the shape of the handle may be difficult to hold and could be improved.

The aesthetics of this design are not as strong as some of the others as the shape is not unusual or eye-catching and does not relate to the purpose of the tool as my first design does. However, it is important that functionality is not compromised for aesthetics. The colour scheme along with the minimalist shape with the curved edges makes it look contemporary and gives it the look of a medical device.

The plastic casing would be made from bioplastic (Poly(lactic acid polymer) and the toothbrush from flexible PVC. The clicker is made from a small sheet of aluminium set into the top section. The comb would be made from stainless steel and the tick remover from Polypropylene. The two logos would be made from vinyl.

The two halves of the product would be made separately, this could be by injection moulding. Alternatively, these could be vacuum formed and a hole drilled for the clicker in the top half although this would require more processing. The toothbrush would be injection moulded and the metal comb would be made by casting. The tick remover and magnifying glass could be made by cutting the shapes out of a PP sheet on a laser cutter.

A large proportion of this product could be made from Bioplastic which are environmentally friendly as they will biodegrade. As this design is very compact, the minimum amount of material is used, further reducing the environmental impact. Being able to make most of the product by injection moulding is also an advantage as exactly the right amount of plastic can be injected into the mould, generating little waste.

The compactness of this design means it uses comparatively little material, reducing initial costs. Production costs may be slightly higher than in some of the other designs as each component must be made separately and further processing is needed to assemble the product. However, my clients feel that this extra cost is worth it as this product is much more practical than the designs which can be made in one piece as each tool needs to be able to be used separately, without the other components getting in the way / making it more difficult to hold.

**Idea (4)**

The two designs my clients identified as the best were 1 and 4. Idea 4 fulfills the specification well as all of the tools are combined into one object which is very compact and easy to use.



**Idea 1**  
The shape of idea 1 makes it more appealing/interesting to look at than the other designs and relates well to the purpose. The main problem with this idea was that the tools do not join to each other but are stored inside a plastic case which means using a large amount of extra material.

This design combines features of the two designs which came out as most successful in my design analysis. It has the shape of idea 1 and the tick remover and magnifying glass fit into the end and rotate outward like the tools in a Swiss army knife.



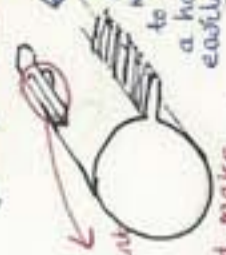
All of the tools are incorporated into one object, apart from the toothbrush which must be removed for use.

Finger brush clips into compartment on the top of the handle. This would be made by vacuum forming.

Like in idea 4, these two tools fit between the two layers of plastic and can be pulled out to the side when needed.



Comb teeth can be much smaller so this idea uses less metal, reducing production costs.



The compartment for the toothbrush in the comb handle would make it more uncomfortable to hold. Being at the outside, the brush could fall out when the comb was used...

The three sections come apart so that the clicker, comb and tick remover can be used separately, making them easier to hold and use without the other sections getting in the way.



The middle segment should be made round to fit into a hand more easily.



Instead of the External Compartment for the toothbrush, the comb handle could be hollow and the brush stored inside. This would keep the brush cleaner, too which is also an advantage.

**DEVELOPMENT**

This design fulfills the specification in that it incorporates all of the items into one object. However, it would be more practical if the individual tools could be removed and used separately. The rounded ends make it quite bulky and it would be difficult to hold. To extend past the ends, the comb teeth are much longer than is necessary so it could also be made more compact, and use less material.

**Design**



Clicker

The comb handle could be made from/coated with a soft polymer such as polyurethane for better grip and to make it more comfortable to hold. The shape could also be adapted so it would fit the shape of a hand more easily.

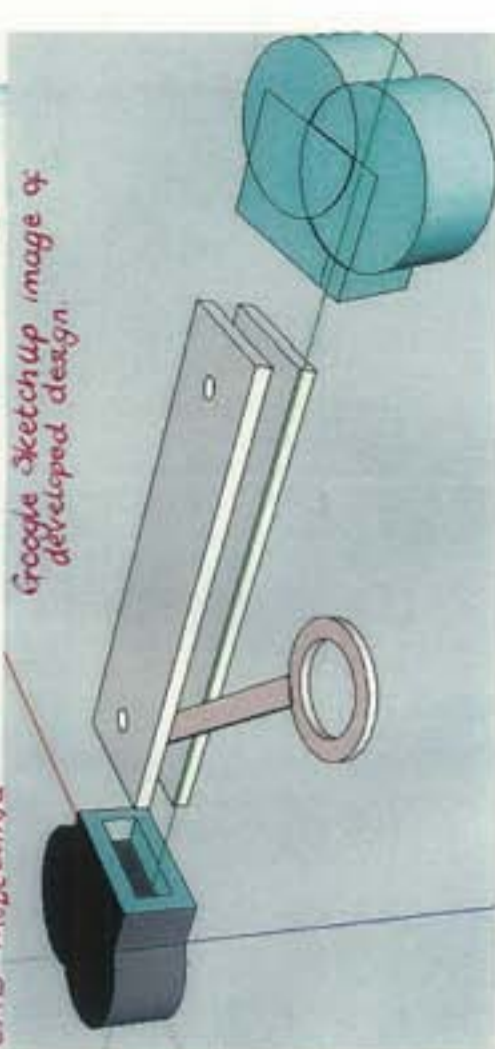


Tube containing toothbrush



Tick remover and magnifying glass

**CAD MODELLING**



Google Sketchup image of developed design

**Ways of attaching the 3 components together,**

The ends could screw into the mid section. This would mean that they would attach securely but would make the product more difficult to make as the screw thread would have to be added. Also, the ends could not be removed quickly as they would need to be unscrewed.



There could be a band of rubber/ an elastomer to stretch over the middle section and create a tight seal so the ends would not fall off.



Alternatively, the middle section could be made hollow with the ends fitting into it, like a cork in a bottle. The part of the end sections which fits inside the middle piece could be made from a soft polymer.

A problem with this design is that the toothbrush would need to be removed from the tube before the comb was used or it would fall out. This may lead to it getting lost and it may fall on the floor and get dirty.

One way of solving this problem would be to move the toothbrush to one of the ends where it could be stored in a vacuum-formed compartment, like in the original design.

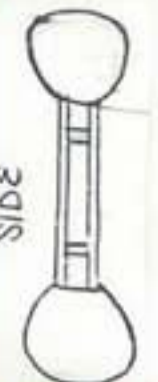


There would not be enough space for two tools to be in one end piece so the tick remover and magnifying glass could be moved into the middle section with the comb.



To make it more compact, the comb, tick remover etc. could fold away (like the Swiss army knife idea).

SIDE



21<sup>ST</sup> FEB 20

**DEVELOPMENT**



→ Discussing this design with my clients, they are happy with the way it can be split into three sections and each tool used individually. However, the flat shape of the middle section (which forms the handle of the comb) does not fit the shape of a hand easily.



→ To avoid the edges of the two layers of plastic sticking into the users hand and making the product uncomfortable to hold, the edges could be curved/rounded.

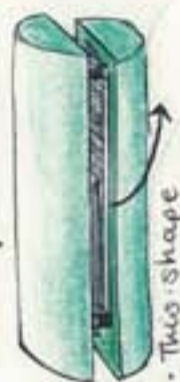


→ This is a rough model of the comb (made from cardboard with a plastic comb) which I made to look at the way that the product would be held and the general hand position used. I asked several people to hold this model in the way that they would if they were combing a dog. This photograph shows the hand position used.



← This design is the result of my first development page, containing features of my best original designs.

→ To fit more comfortably into a hand, the handle could be made round as this is the shape the hand makes when gripping something.

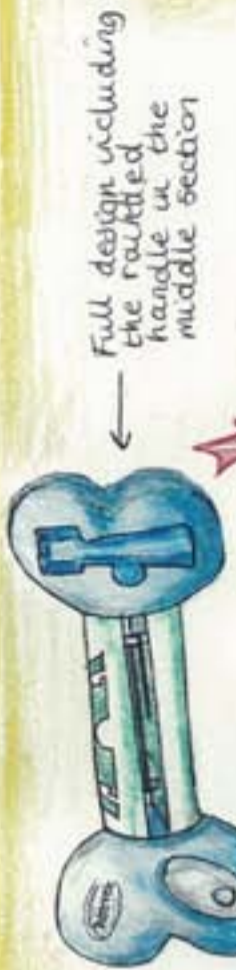


→ This shape also means there are no sharp edges or edges sticking out into the hand.



→ This shape of handle could fit into the ends in a similar way as in my original idea.

# DEVELOPMENT and MODELLING



← Full design including the rounded handle in the middle section

→ Several of the existing products I looked at had rubber added to the handle to provide a better grip. My clients felt that this was a useful feature and it would make this product easier to hold as it would be made from smooth plastic.



→ Pads made from a soft polymer (eg. rubber or polyurethane) Here, I have placed the grip-pads on the sides which would mean the logo would not be covered by them (on the top), I would see exactly how it would be held before deciding where these pads should go.



→ Design for the shape of the handle combining the features of the clay models caused by the impressions made by different people holding them in the way they would hold a comb handle. It would need to be shaped in the same way on both sides so that it could be used by both right- and left handed people.



← grooves for finger grip.

→ I modelled this handle shape in clay to see if it would be comfortable to hold.

→ I then asked my clients to hold this prototype handle and give their opinions on how easy it would be to use.

→ These photographs show that this shape of handle can be used with either your right or left hand. (client comments on next page)

→ The model was curved downwards by the position of the hand.

→ The ridge along the side caused by the pressure of the thumb or left hand.

→ Ridges created by fingers.



TOP



→ The model was curved downwards by the position of the hand.



→ Thinking about adapting the handle shape to fit into a hand more easily, I asked some people to hold a piece of clay of roughly the same size as the comb handle would be (a cylinder of diameter 40mm and 120mm in length). These photographs show the shapes produced by this.

→ Pressing the clay in the way that a comb handle would be held caused it to bend to the side. This curve cannot be included in the final shape as it curved a different way depending on whether you were right handed or left handed so each side would be unsuitable for some users.



→ The hand position at the comb handle shows that the soft-polymer sections should be on the underside of the handle near the comb teeth where the thumb sits and on the top nearer the other end where it is gripped by the fingers.



→ To work out exactly where I would need to look at anthropometric data on hand sizes and take measurements from more people holding this model.

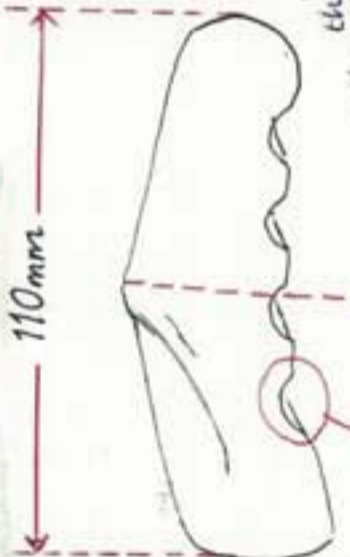
→ To make the handle more comfortable to hold as well as imprinting grip, it could be shaped to fit into a hand more exactly. (eg. ridges/depressions where the fingers would sit)



# DEVELOPMENT COMB HANDLE

## Anthropometric

data on hand sizes shows that average hand breadth is 90mm for men and 79mm for women. For the product to be suitable for most of the population, I will take the 99th percentile of this data (100mm) as the minimum length for the handle. In my existing products research, I found that comb and brush handles tend to be larger than the average hand size so I have made my design 110mm in length.



55mm diameter at widest point



The hand-impressions I took to find a suitable shape for the handle all included grooves for the fingers. These were the same depth and distance apart in all of the models (approximately 7mm deep and 20mm from the middle of one impression to the middle of the next). This seems to suit most hand sizes so I will use these dimensions in my product.

Average hand grasp size is a circle of diameter 50mm. This is measured with the hand held so that the middle finger just meets the thumb.



However, improved grip and better control will be achieved if the handle is held with the fingers and thumb overlapping, so I will make the diameter of the handle 35mm at its widest point. This is the size used for the clay models and my clients and others I asked to test them found this size to be comfortable and easy to use.

The hand-impressions that I took to develop the shape for the handle indicate that the ridge for the thumb needs to be around 17-25mm. I will make the ridges 20mm across as this will suit most thumb sizes.

## MODEL OF FINAL DESIGN FOR COMB HANDLE



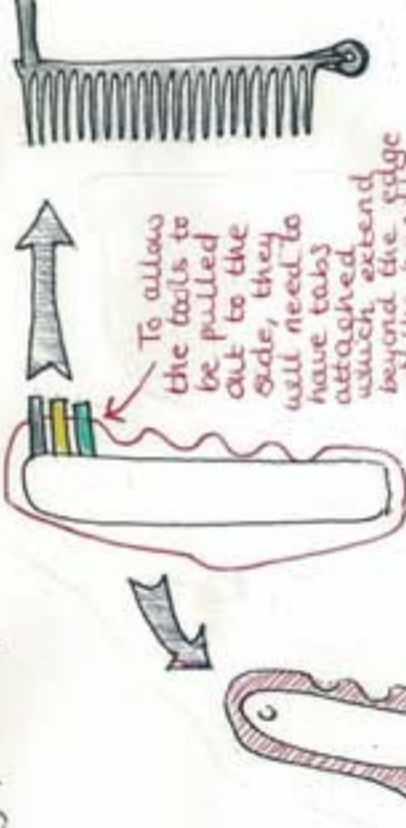
These edges should be rounded so that they are not sharp/uncomfortable to hold.



The handle could be made from an inner section (made from plastic) with the shaped exterior made from soft polymer and attached over the top. In my prototype model, I could make this section from polymorph.



Central section which holds the comb, tick remover and magnifying glass on a post at one end. This will be made from two layers of bi-plastic, attached with a cylindrical piece of metal at each end. (Riveting) The rivets will be placed through holes drilled in both pieces of plastic and the ends deformed by hammering so that they expand to more than the diameter of the holes, holding them in place.



Given that the shape of the handle curves downward slightly, the inner plastic section should also be shaped in this way. This will make it easier to create the shape with the polymorph when applying it on top of this section.



So that they do not stick out into the user's hand, the tabs must all protrude from the base of the handle, away from the finger-grip section. This means that the shorter tools (the tick remover and magnifying glass) will have to be extended to the full length of the handle.

Making the tabs for each tool different colors will allow people to identify them easily and select the right one.

It is important that the comb stays in place when it has been pulled to the extended position for use. To make sure it does this, a 'locking mechanism' may be needed. For example, a hook extending from one piece of plastic to the other underneath the comb could stop it from rotating back under the handle. However, this would have to be very small and would be fiddly to put across, especially as the soft-polymer coating would extend past the end of the inner section.

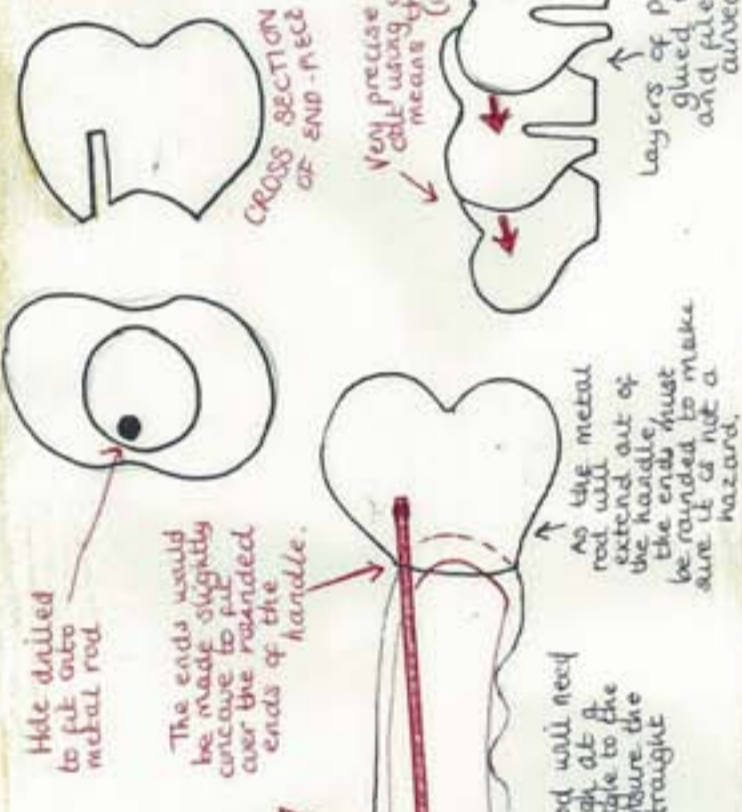
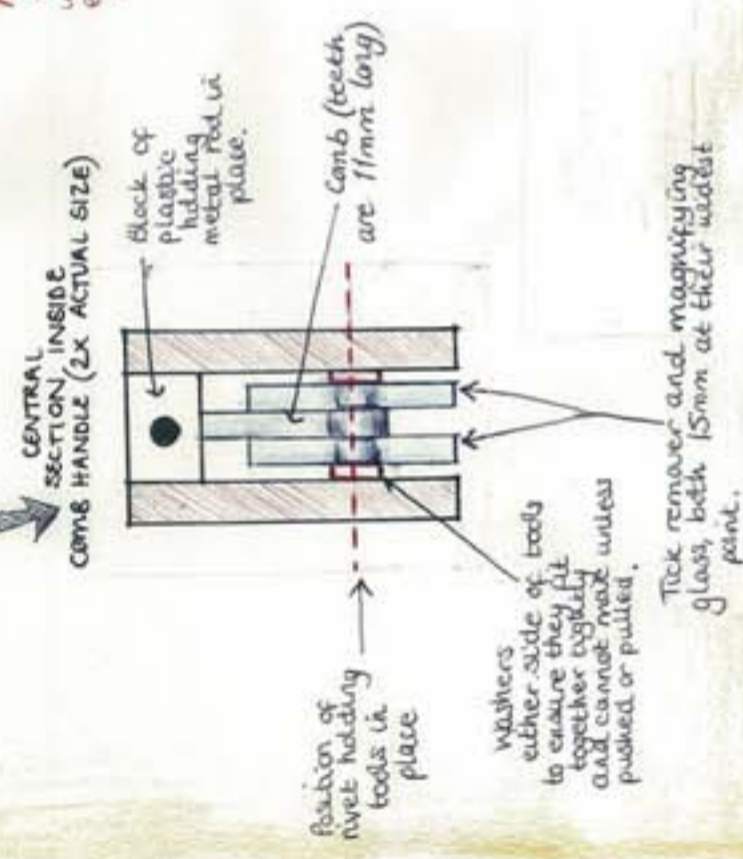
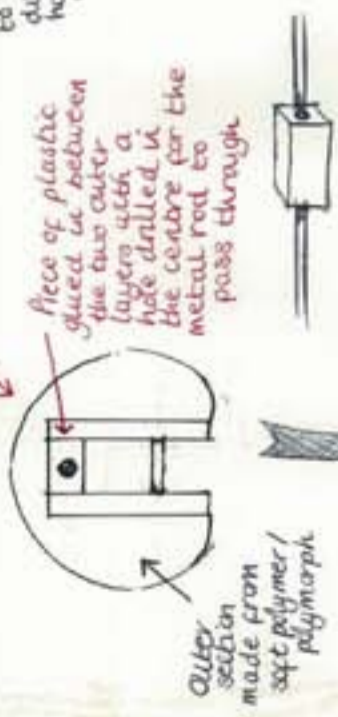


The tools in a Swiss-army knife remain in the desired position as they fit together very tightly and so need to be pushed or pulled to move them. I could make my product in this way by making sure the two pieces of plastic were exactly the right distance apart to hold the tools together tightly. To avoid damage to the tools, washers could be added between them.



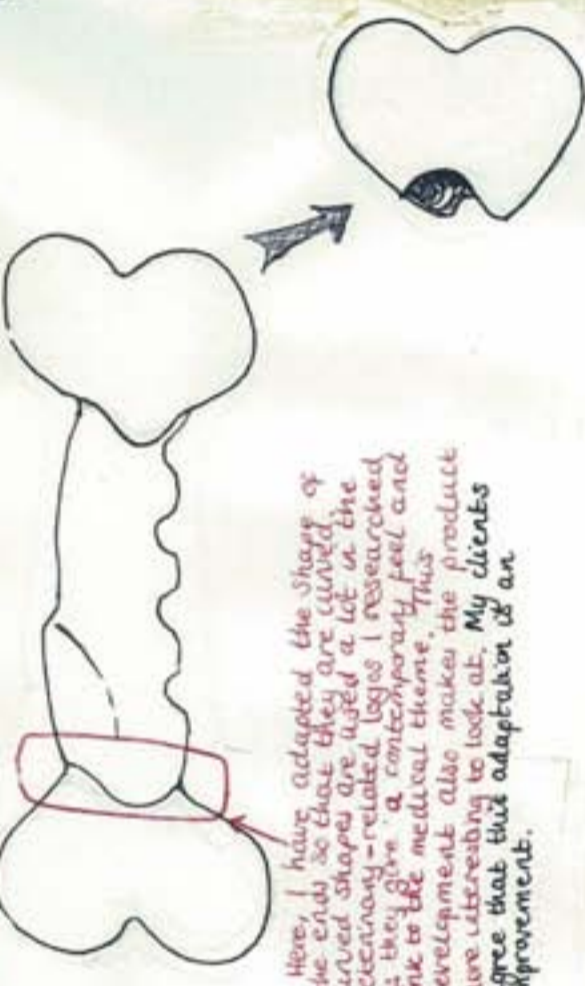
**Design including comb handle**  
 The new shape of the middle section means that the end will no longer be able to fit on in the same way as in my original design. Instead, there could be a metal rod running through the comb handle and the ends could have holes drilled in them to fit onto this.

This metal rod would need to be attached to the plastic section in the middle of the comb handle.

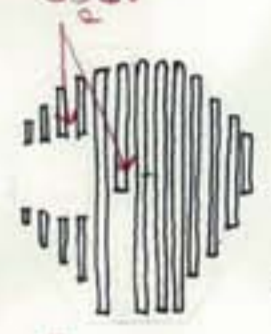


# DEVELOPMENT

**AESTHETICS**  
 Looking at the design above, most of the shape in the product are curves which makes the straight edge of the join between the ends and mid section look slightly out of place.



In my original design, the ends would have been made by vacuum forming. In this design, the shape was made more complicated so making them using this process would be difficult. They could be made by injection moulding as this can make more complex shapes. Another method is cutting precisely shaped layers of plastic and gluing them together to build up the 3D shape.



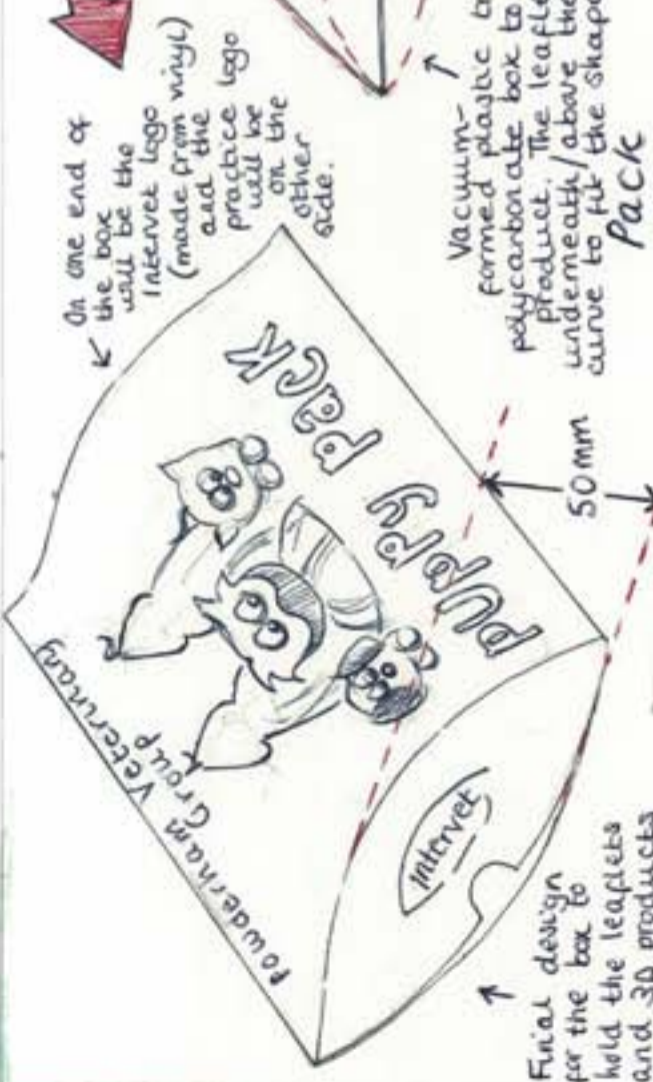
The colour scheme is important as it must reflect the colours in the two logos featured, helping to promote my client and the sponsoring company. To make the product more colourful and more aesthetically appealing, the layers of plastic in the end sections could be different colours.

Trials for colour combinations →



**CLIENT FEEDBACK**  
 My clients are happy with this design. They feel that it would be greatly improved by the developments to the comb as much more comfortable to hold than the original, unshaped one. They also like the change to the products appearance, especially the multi-colored end sections. Of the colour combinations on the right, they like 2 and 3 as these reflect the logo colours. They think that pastel colours go best together and that 1 and 4 are too dark/bright.

# FINAL DESIGNS



Final design for the box to hold the leaflets and 3D products. It will be made from polycarbonate with the decoration (logos, text etc.) made from vinyl. In keeping with the colour scheme of the leaflets and product, the polycarbonate will be white with green/blue vinyl. To reduce production costs, I have used only one colour of vinyl. Keeping to only two colours also makes the images/text appear bolder as the contrasting colours give them more visual impact.

## Vaccination

**Parvovirus** is a viral disease which can be transmitted from the mother to her puppies. It is one of the most common causes of death in puppies under the age of 12 weeks. It is highly contagious and can be spread by direct contact with infected puppies, or by contact with their faeces, urine, vomit, or milk. It is also spread by contact with contaminated surfaces and people. Symptoms include diarrhoea, vomiting, and depression. Death usually occurs within 7-14 days of the onset of symptoms.

**Distemper** is a viral disease which can be transmitted from the mother to her puppies. It is one of the most common causes of death in puppies under the age of 12 weeks. It is highly contagious and can be spread by direct contact with infected puppies, or by contact with their faeces, urine, vomit, or milk. It is also spread by contact with contaminated surfaces and people. Symptoms include coughing, sneezing, and discharge from the eyes and nose. Death usually occurs within 1-2 weeks of the onset of symptoms.

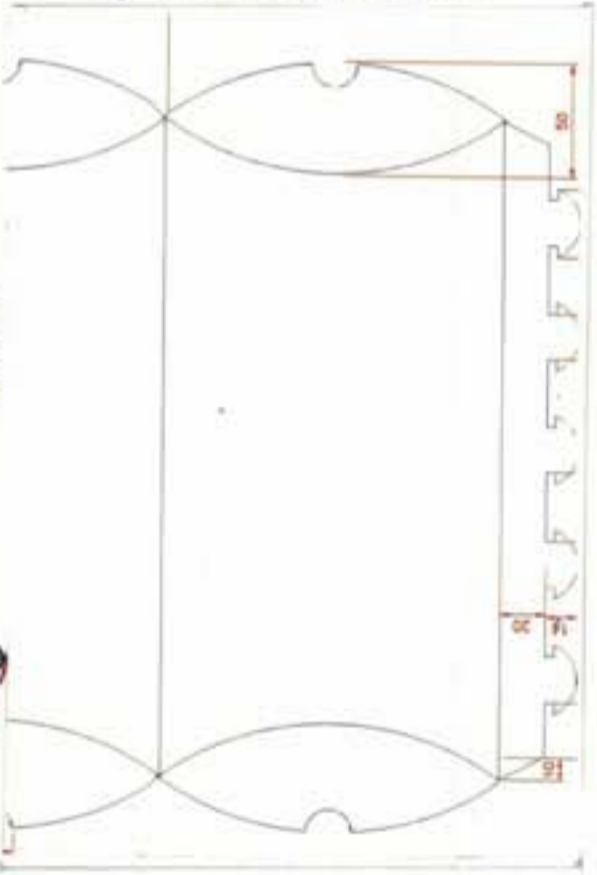
**Leishmaniasis** is a parasitic disease which can be transmitted from the mother to her puppies. It is one of the most common causes of death in puppies under the age of 12 weeks. It is highly contagious and can be spread by direct contact with infected puppies, or by contact with their faeces, urine, vomit, or milk. It is also spread by contact with contaminated surfaces and people. Symptoms include skin lesions, weight loss, and depression. Death usually occurs within 1-2 months of the onset of symptoms.

## Leaflets

Parvovirus is the viral cause of intestinal disease in dogs. It is highly contagious and can be spread by direct contact with infected puppies, or by contact with their faeces, urine, vomit, or milk. It is also spread by contact with contaminated surfaces and people. Symptoms include diarrhoea, vomiting, and depression. Death usually occurs within 7-14 days of the onset of symptoms.

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This is the net for the 'Puppy Pack' box, incorporating the tab system for holding it together which I found was the best way to secure it closed without gluing.

Final design for the invitation cards, including the new design of the practice logo. The colour scheme is in keeping with the leaflets and the rest of the 'Puppy Pack'. The cards will be made from 300gsm uncoated white bond paper (recycled) and the contact details of the practice will be printed in black and white only to reduce printing costs.

Logos on both sides of the card to help promote Intervet and Powderham vets.

Recycling symbol to encourage people to recycle the card, increasing the sustainability of the product.



Images of balloons and the bouncy castle at the logo link to the 'Puppy Parties' theme.



Recycling symbol to encourage people to recycle the card, increasing the sustainability of the product.

You are invited to a 'Puppy Party' at our practice. This is an information session about caring for your new puppy and related issues such as pet insurance. It's also a great opportunity for your puppy to socialise with other dogs and people. Please reply on 01283 563378. We hope to see you there!

Powderham Veterinary Group  
1 Powderham Road  
Devon EX16 1BQ

# Final Design

## 3D Product

To add more advertising for the practice and sponsoring company, both end sections will display logos. These will be made from grey vinyl.



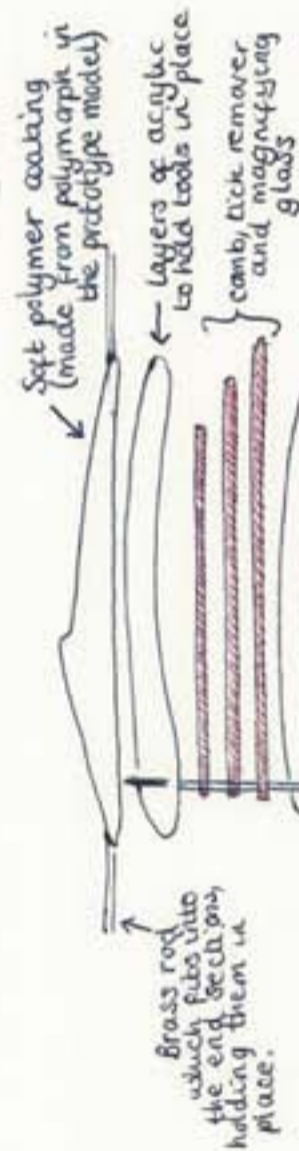
RIGHT



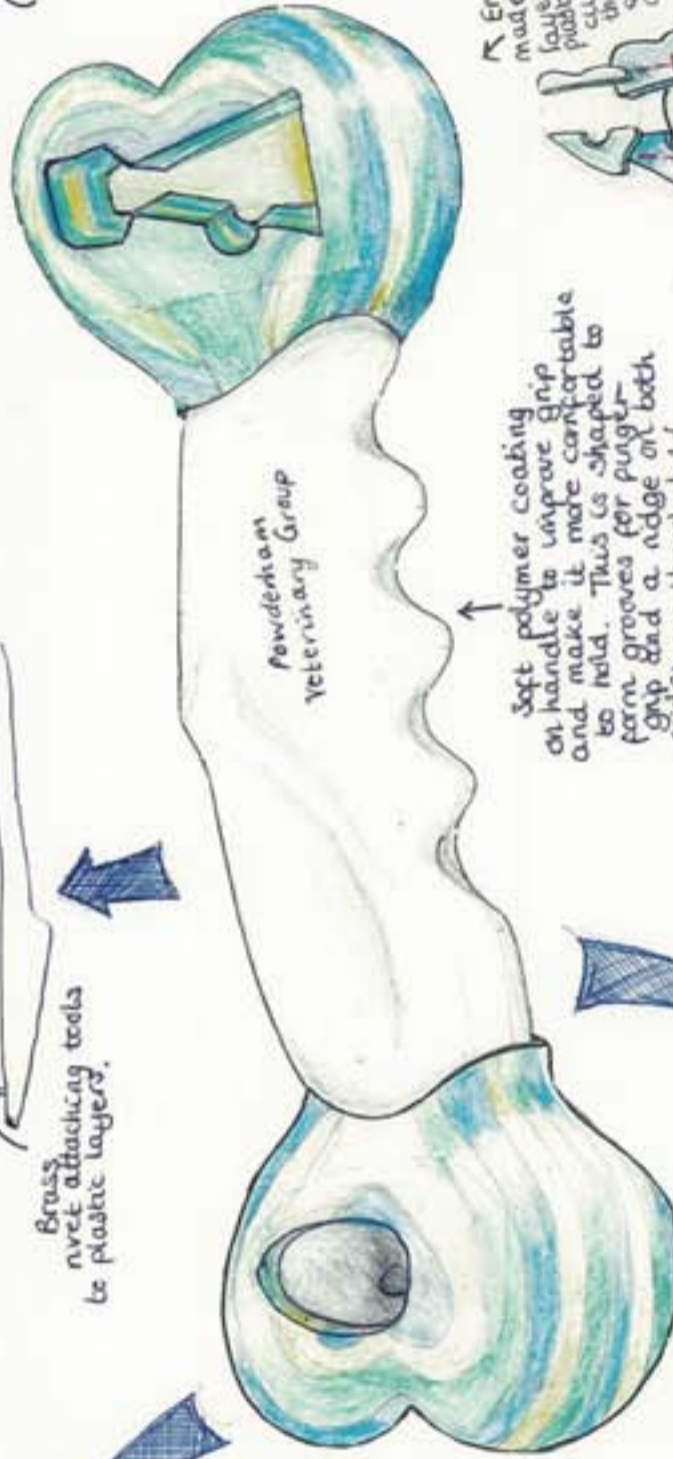
LEFT



2D design files for the 3 tools and the inner section of the handle, showing the position of the tools within the handle when not in use.

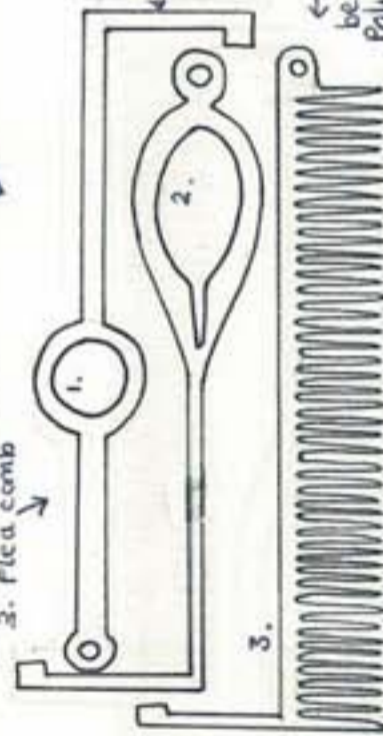


Brass rivet attaching tools to plastic layers.



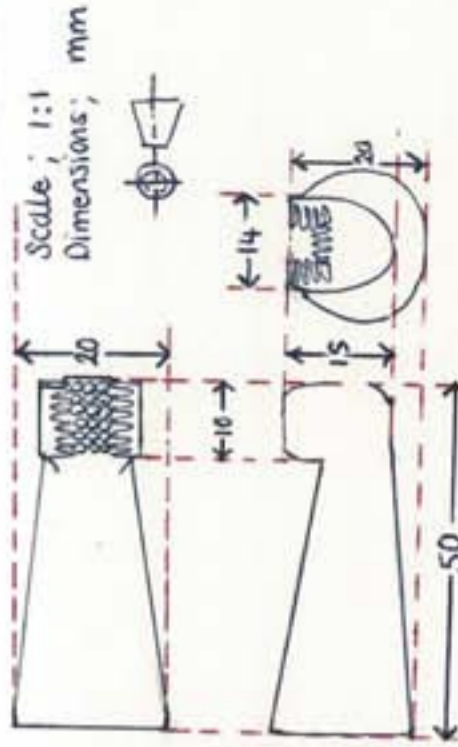
Soft polymer coating on handle to improve grip and make it more comfortable to hold. This is shaped to form grooves for finger-grip and a ridge on both sides for thumb-hold. Text on the side made from vinyl.

1. Magnifying glass
2. Tick removal tool
3. Flea comb



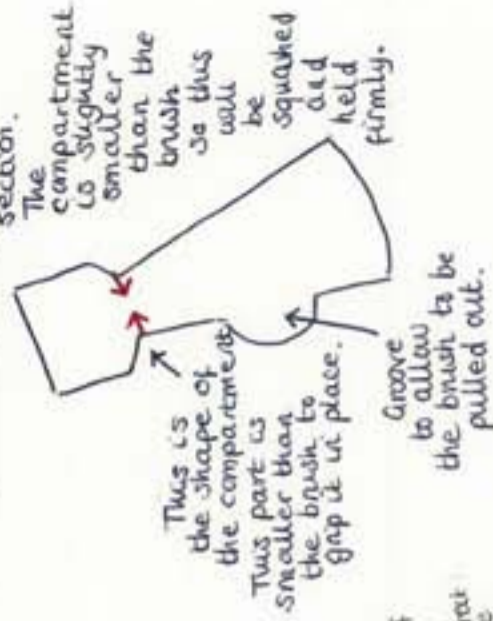
Tabs which will extend out of the handle allowing the tools to be pulled out.

All three tools will be made from 2mm thick Polypropylene



Scale: 1:1  
Dimensions: mm

Finger brush would be made by injection moulding flexible PVC (in my prototype model, this component will be made from MDF and rubber) As it is flexible, it will press into the compartment in the end section.



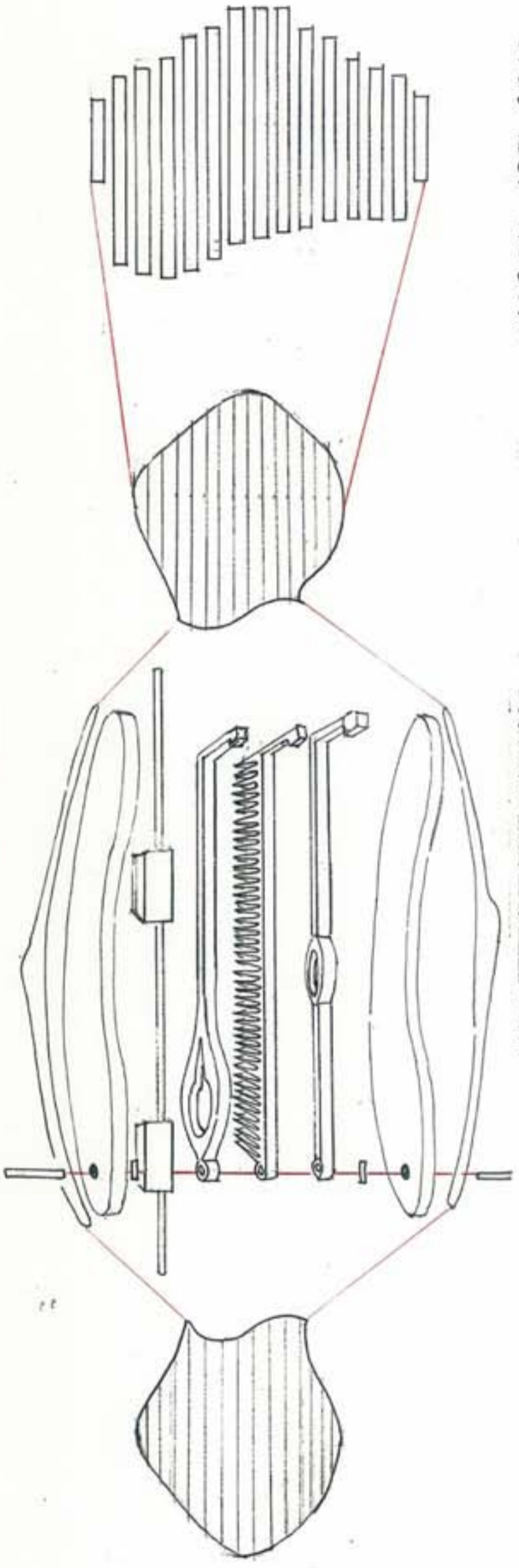
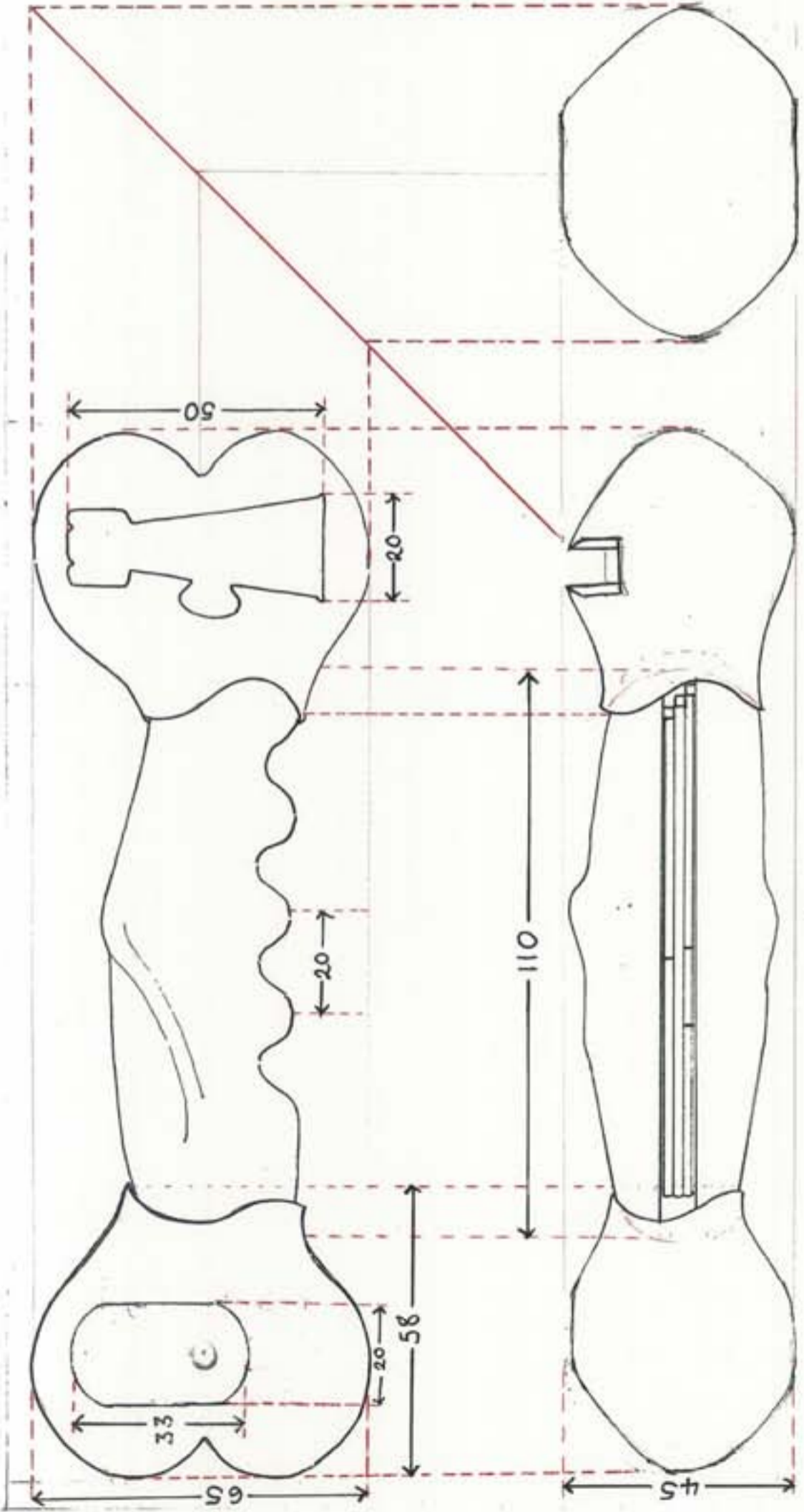
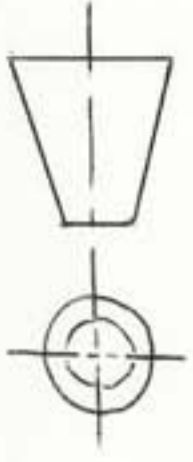
CLICKER



Ends made in layers of plastic cut to the correct shape on the laser cutter (eg)

The shape of the end section containing the clicker (cross-section) The metal section will be screwed into the plastic over a ca deep enough that it can be pressed down to create the sound.

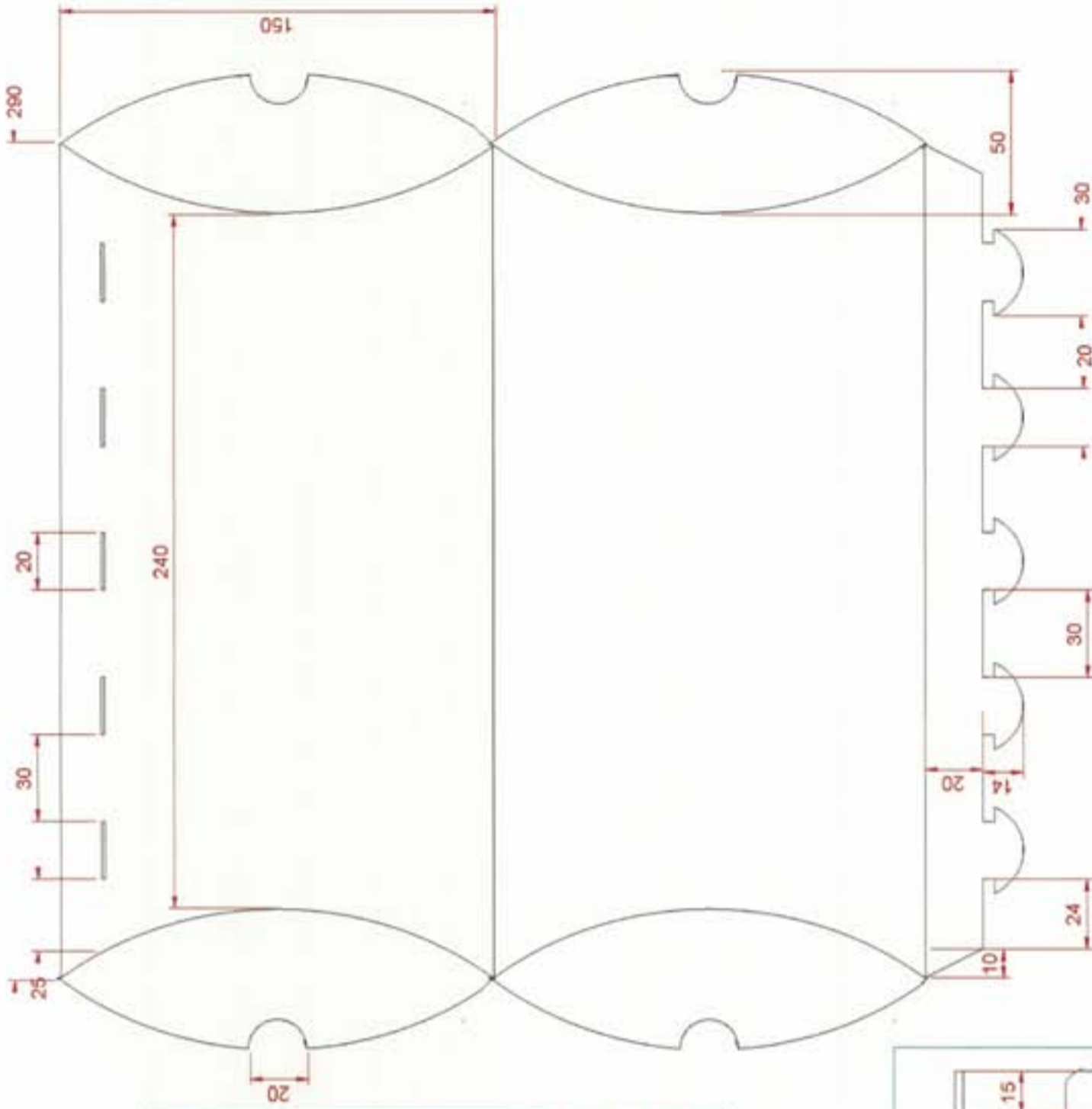
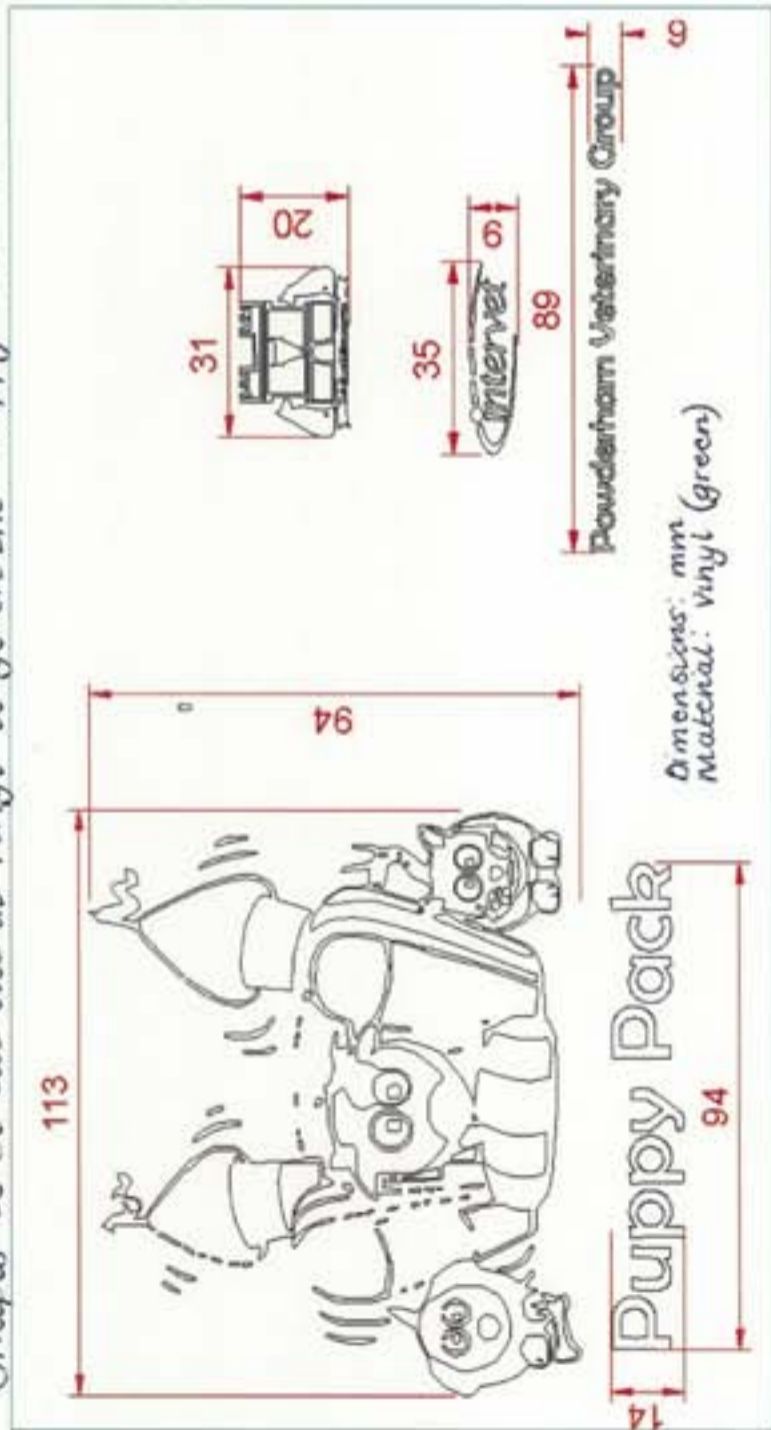
3D Product	
Scale	1:1
Dimensions	mm
Orthographic	Third Angle



WORKING DRAWINGS

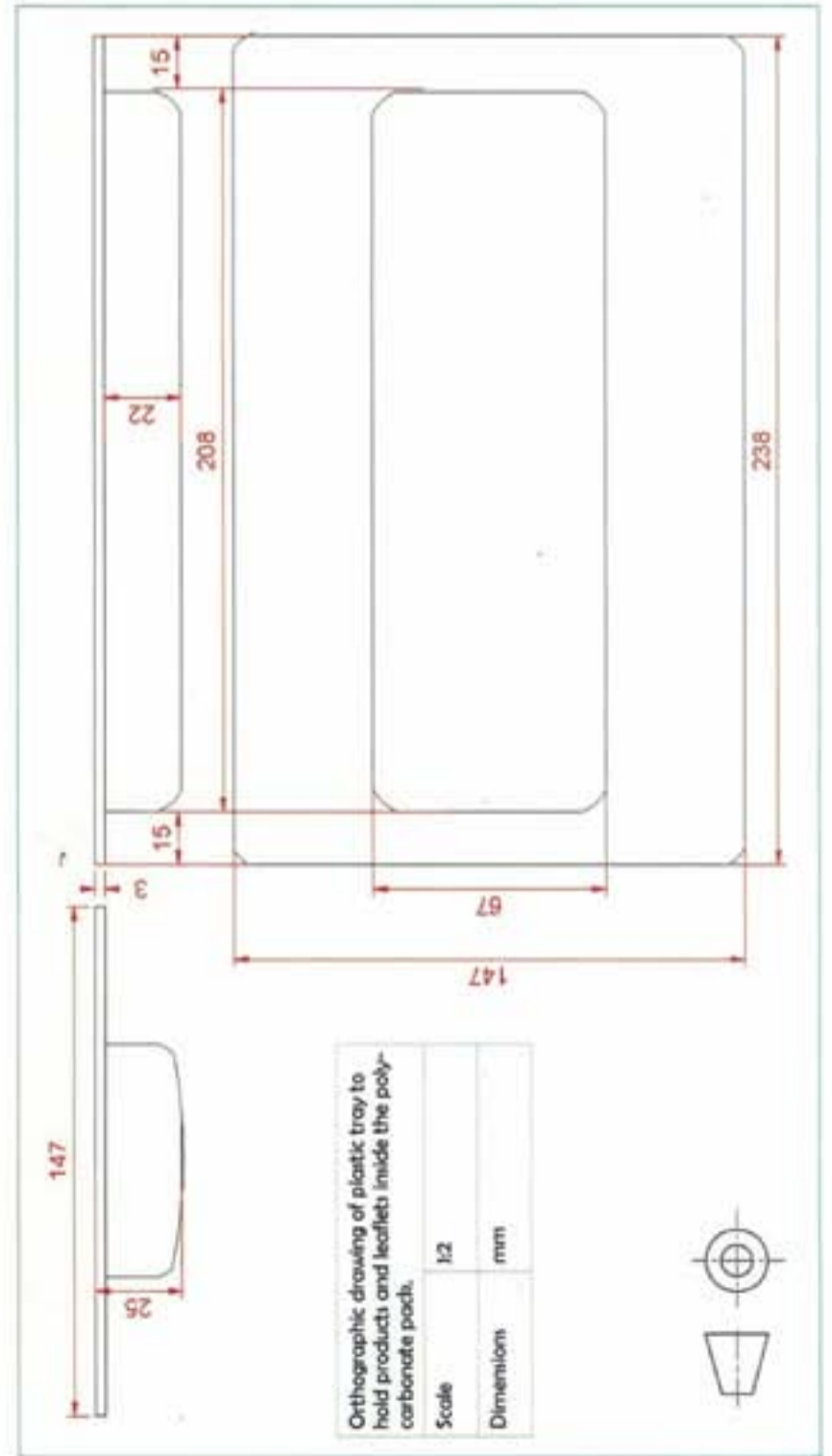
MARCH 18<sup>TH</sup> 2010

Shapes to be cut out in vinyl to go on the 'Puppy Pack' Box.

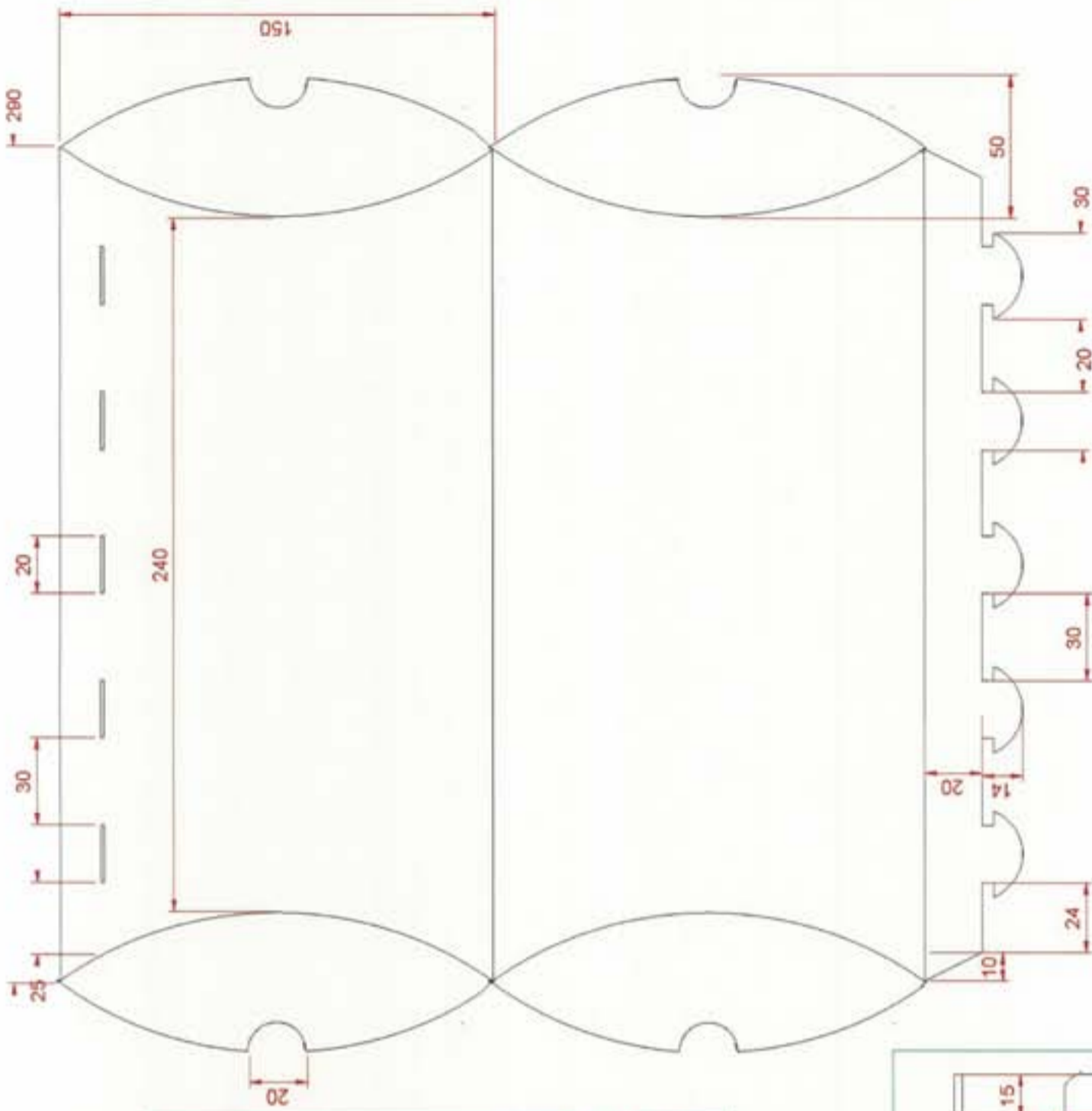
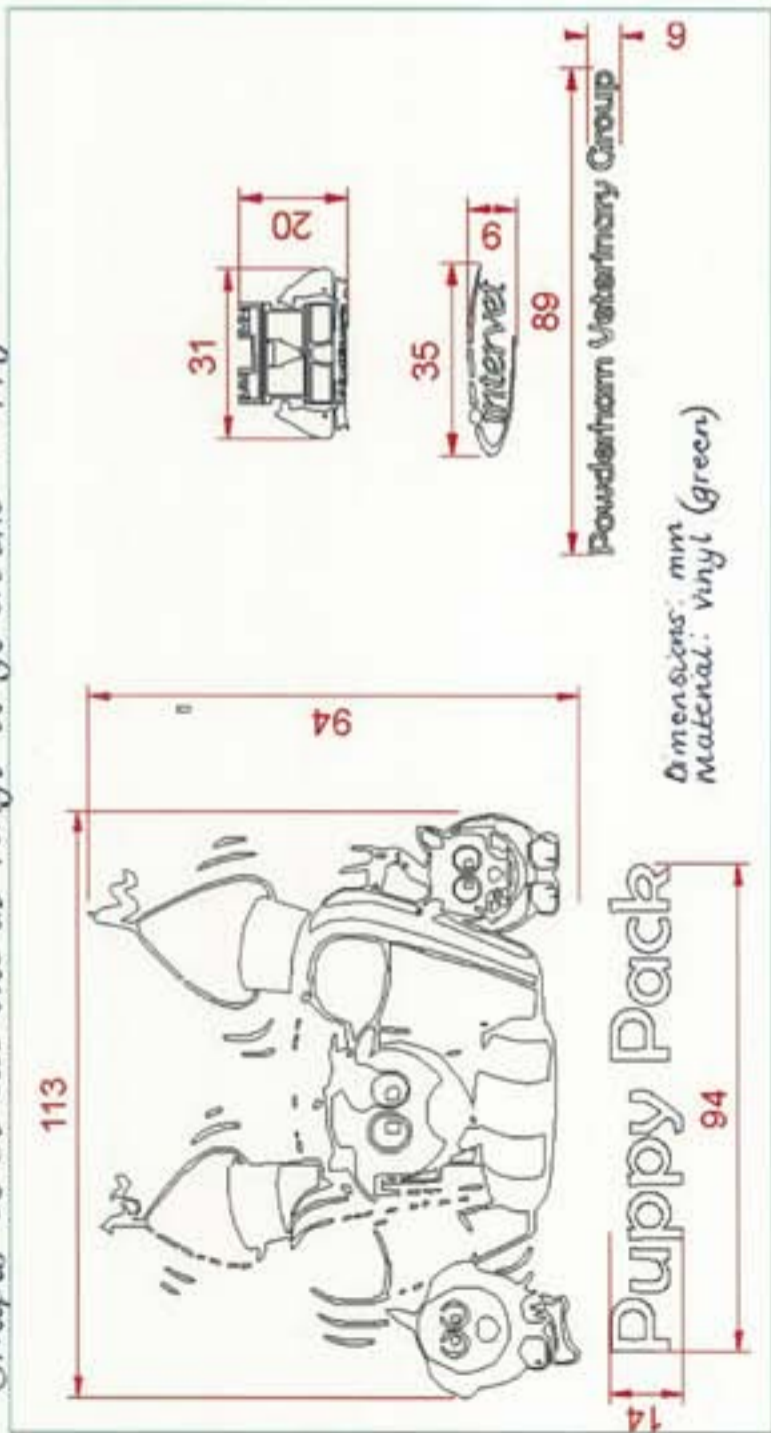


Net for 'Puppy Pack' Box

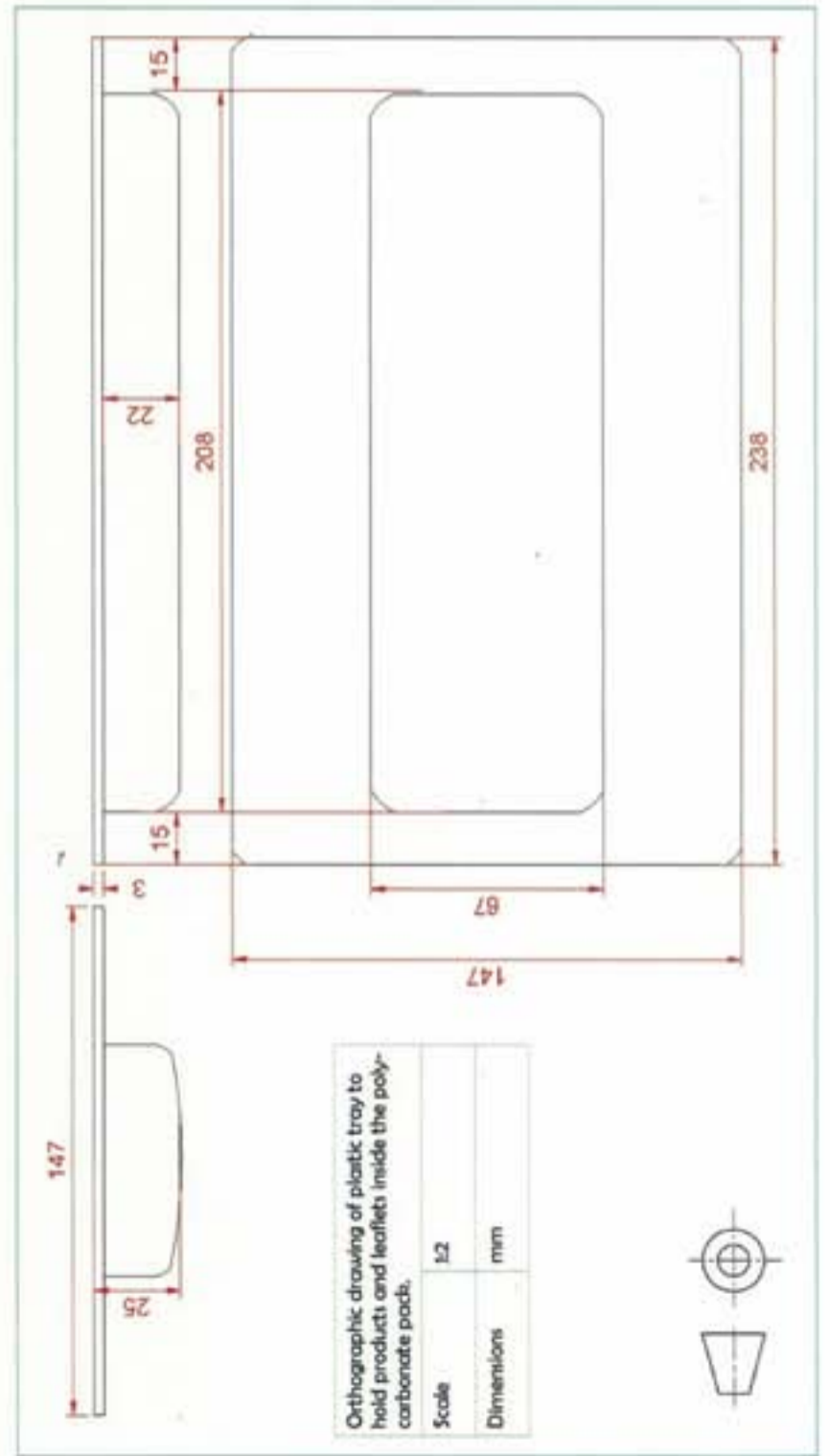
Dimensions: mm  
Material: polycarbonate (white)  
Scale: 1:2



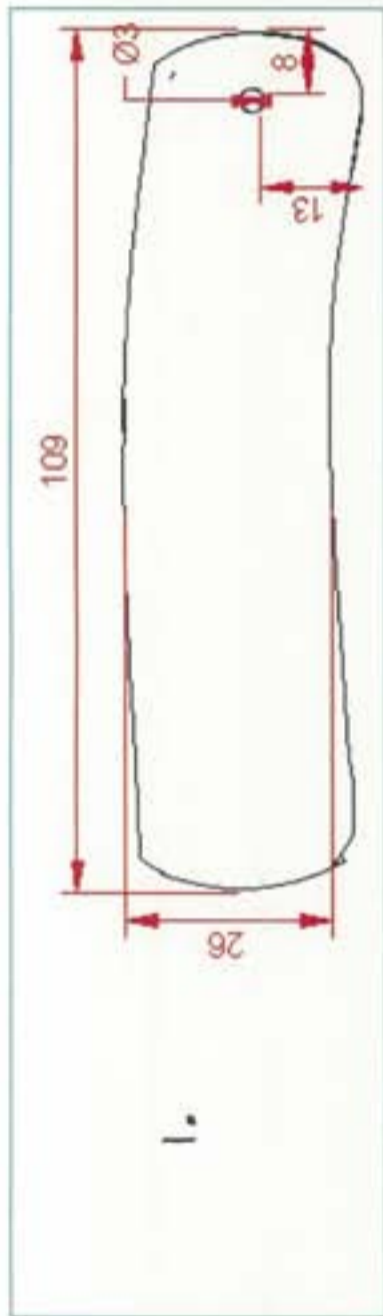
Shapes to be cut out in vinyl to go on the 'Puppy Pack' Box.



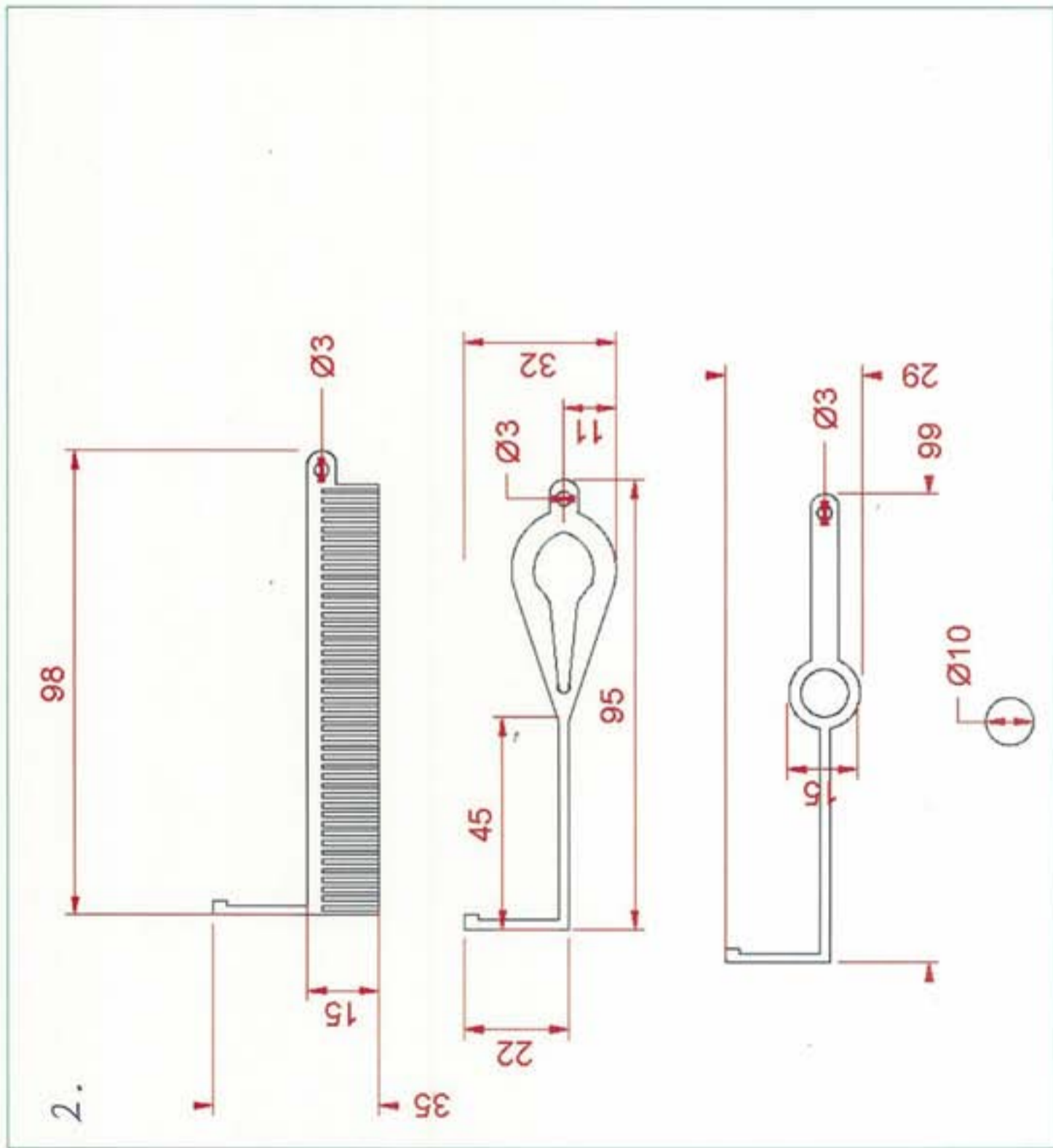
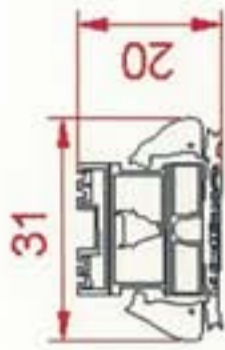
Net for 'Puppy Pack' Box  
Dimensions: mm  
Material: polycarbonate (white)  
Scale: 1:2







3.



2.

WORKING DRAWINGS

1. Plastic layers to hold tools in place inside handle X 2  
 Dimensions: mm  
 Material: 3mm Acrylic (cut on laser cutter)  
 Scale: 1:1
2. Tools which will fit inside handle (comb, tick remover, magnifying glass)  
 Dimensions: mm  
 Material: 2mm Acrylic → \*DESIGN MODIFIED TO INCLUDE THESE TOOLS MADE FROM ALUMINIUM INSTEAD OF PLASTIC  
 Scale: 1:1
3. Vinyl decoration for 3D product X 2  
 Dimensions: mm  
 Materials: Vinyl (blue)  
 Scale: 1:1

**Step 1**  
 Create 2D design files for all components to be cut out on the laser cutter. These include:  
 • The 15 layers which make up each end-section (these must be shaped to form the cavities needed to store the toothbrush and clicker)  
 • The comb  
 • The tick-removal tool  
 • The magnifying-glass (separate files for the handle/frame and the lens)  
 • The two layers which will form the inner section of the handle and hold the tool in place  
 All lines to be cut must be drawn in red. To ensure that I have drawn the shapes correctly, I could model the components by laser-cutting the files in cardboard.

- Tools / equipment needed:**
- CAD programme (2D design)
  - Laser cutter
  - Plastic/metal file, glass paper, metal pot-hushe (solvent cement), metal pillar drill, hammer
  - File, glass paper, pillar drill, hammer
  - Tenon Saw, metal file
  - Screws, screwdriver
  - Tenon saw, glass paper, adhesive (PVA glue and all purpose adhesive)
  - CAD programme (2D design)
  - CNC vinyl cutter and application tape

**Step 2**  
 Cut out shapes drawn in 2D design on the laser cutter in 3mm acrylic making sure that the layers for the end-sections are cut out of the correct colour to build up the three colour pattern when glued together.



### Production Plan for 'Puppy Pack'

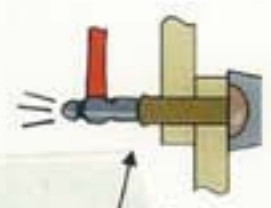
- Step 1**  
 Draw out the net for the box in 2D design making sure that lines to be cut are drawn in red and the fold lines are drawn in black so that these will be scored into the plastic.
- Step 2**  
 Cut the net out of a polycarbonate sheet using the laser cutter.
- Step 3**  
 File any sharp edges of the plastic which may cause injury. Folding along the scored lines, assemble the pack, pushing the plastic tabs into the slots securely to keep the 3D shape.
- Step 4**  
 Draw the design for the decoration of the pack (i.e. The image from the 'Puppy Party' invitations and necessary logos and text) in 2D design.
- Step 5**  
 Cut these out from vinyl sheets using the vinyl cutter and apply to the box using application tape.
- Step 6**  
 Make a mould for the plastic tray to hold the 3D products from MDF (tools needed for this will include a tenon saw / hand saw, belt sander and glass paper). Vacuum form this mould in HIPS. Cut out tray and file edges to ensure they are not sharp.
- Step 7**  
 Print 2D items (leaflets and invitation cards) and assemble pack by placing these along with the 3D products into the correct compartments on the tray and into the box.

**Step 3**  
 Before assembling the end-sections, use a file and glass paper to sand the edges of the sections which will form the cavities for the toothbrush and clicker. This is important to ensure that there are no sharp edges on the cavities which users may hurt themselves on and to make sure the layers will fit together exactly. Assemble the two end-sections, being careful to line the layers up exactly so that the shapes for the cavities fit together evenly. Screw the metal component of the clicker into the correct position. Attach the layers together using solvent cement. Use a file and glass paper to round/smooth off the edges of the shape to make the outer edges curved. When the correct shape is achieved, go over the edges with wet and dry paper to ensure they are completely smooth. Polish using metal polish to give it a shiny / glossy appearance, enhancing the product's aesthetic appeal.

**Step 5**  
 Cut the brass rod to the correct length (140 mm) and file the ends using a metal file to make sure they are not sharp and will fit tightly into the holes in each end section. Fit the metal rod into place, where it will be secured by the polymorph's outer layer.



**Step 4**  
 File edges of plastic tools to ensure there are no sharp surfaces, especially on the tabs used to pull the tools out from the handle.  
 Drill holes in plastic layers for the inner section of the handle, comb, tick remover and magnifying glass for the metal rivet to pass through.  
 Assemble the inner section by slotting the outer layers and tools onto the metal rivet with washers either side of the tools to ensure a tight fit.  
 Use a hammer to flatten the ends of the rivet against the plastic, deforming it so that it cannot fit back through the holes.



**Step 6**  
 Construct a clay mould for the soft-polymer section of the handle (i.e. With grooves the correct size and spacing for the grip so that the polymorph can be pressed into this, forming the correct shape). Prepare the polymorph for moulding by placing the amount needed in water heated to between 60 and 65°C. (It must not be heated above this temperature or it will become too liquid to be moulded).  
 Once it is soft enough to be moulded, remove the polymorph from the water and form a cylinder around the plastic centre of the handle section. Mould the polymorph into the correct shape (including the grooves for finger grip and thumb ridge) by hand using the clay mould to ensure it is the correct dimensions and shape. Wear gloves to protect hands from the heat.  
 Secure the polymorph outer section to the inner plastic section with screws.

**Step 7**  
 To make a model of the fin-gerbrush, make the brush head from three blocks of MDF. Glue rubber over the top (using a sheet of rubber with indentations to form the bristles and smooth material for the rest of the brush).

**Step 8**  
 In 2D design, draw out the two logos needed (for Intervet and Powderham Vets) and the text ('Powderham Veterinary Group') to be cut out on the vinyl cutter.

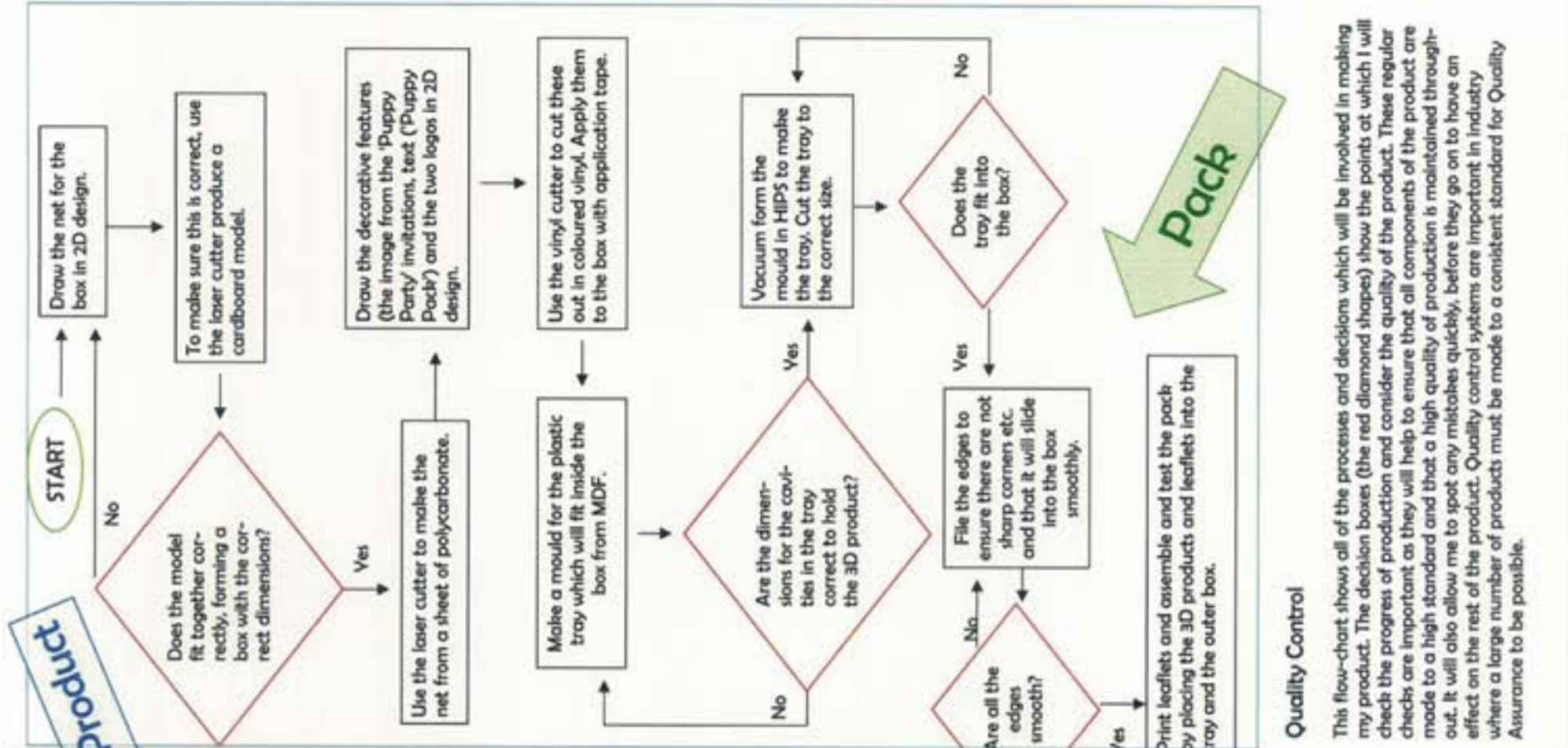
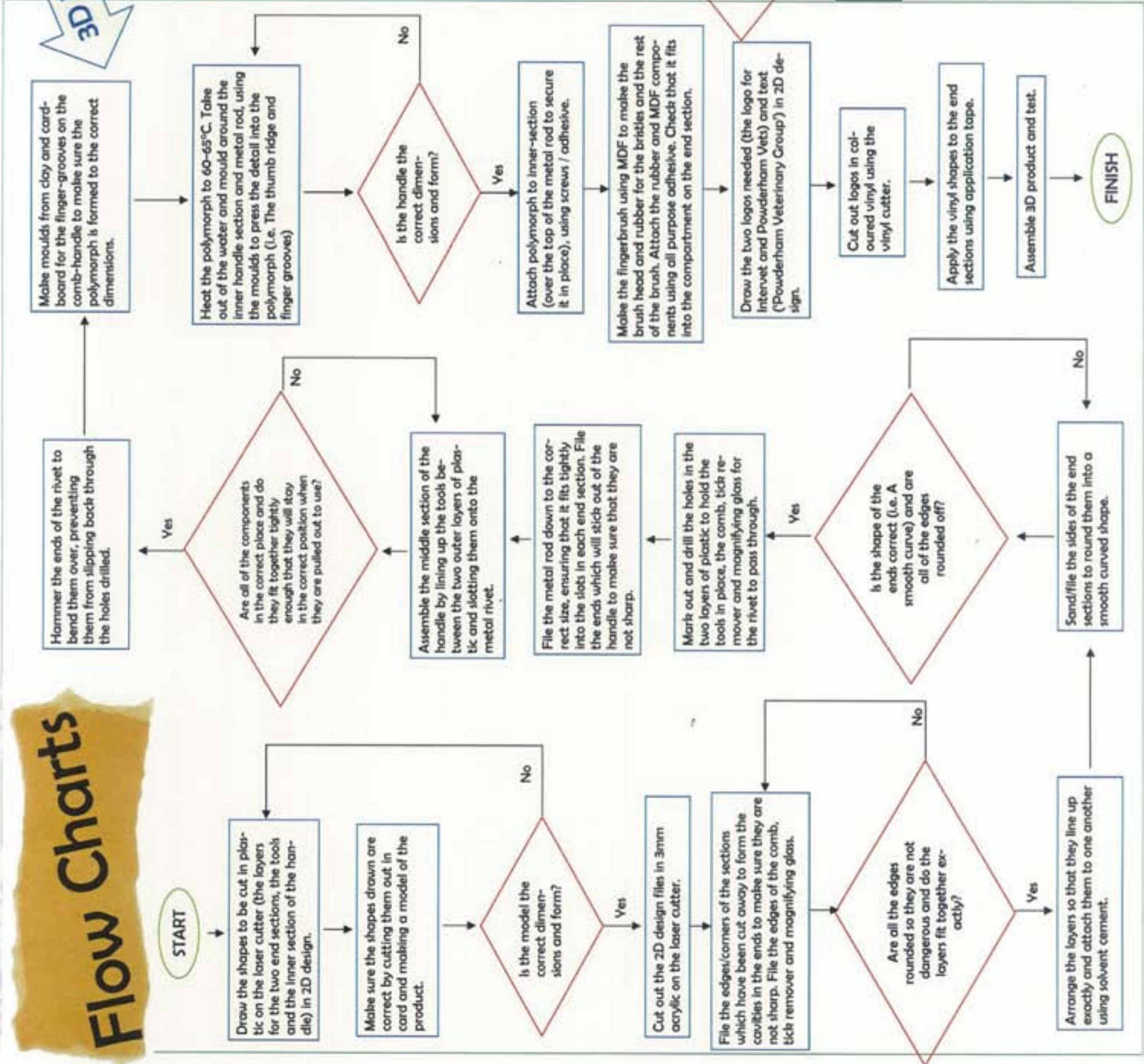


**Step 9**  
 Cut out the logos and text in vinyl using the vinyl cutter.  
 Apply the logos to the end-sections and the text to the handle using application tape.  
 Assemble the whole product then test and evaluate it, gaining client and user feedback.



# Production Plan

# Flow Charts



## Quality Control

This flow-chart shows all of the processes and decisions which will be involved in making my product. The decision boxes (the red diamond shapes) show the points at which I will check the progress of production and consider the quality of the product. These regular checks are important as they will help to ensure that all components of the product are made to a high standard and that a high quality of production is maintained throughout. It will also allow me to spot any mistakes quickly, before they go on to have an effect on the rest of the product. Quality control systems are important in industry where a large number of products must be made to a consistent standard for Quality Assurance to be possible.

## COSHH

COSHH (Control of Substances Hazardous to Health) regulations are a set of requirements placed on employers to protect employees and other persons from exposure to dangerous substances.

The requirements include a system of risk assessment and measures to reduce / prevent exposure to hazardous chemicals. It also involves health surveillance and training of employees to ensure any hazardous substances are dealt with correctly.

During this project, the only potentially hazardous substances I may come into contact with are fumes from laser-cutting plastic, dust from wood/MDF and metal and solvent adhesives. These would be dangerous if inhaled frequently and could potentially cause lung damage and have a carcinogenic effect on repeated exposure. I will not be in contact with these substances for long periods of time so this risk is low although I should still take measures to reduce my exposure to these. They may also be harmful to the eyes so I should wear goggles when working with these substances.



### Gloves

Gloves should be worn when handling objects which are hot or using machines which heat materials up (e.g. Vacuum former). They may also be needed when using sharp implements / machinery with sharp blades or where there is a risk of objects flying off.



### Goggles

Goggles must be worn when using machinery and tools which produce dust or fumes (including the laser cutter, saws, band-facer etc.) or where there is a risk of objects flying off which could damage the eyes.



### Apron

An apron should be worn to protect clothing and prevent clothing from catching in machinery which would be dangerous.



### Shoes

Always wear closed-toe shoes so that if you drop something (e.g. A sharp tool), you are less likely to damage your feet. Shoes should always be done up securely and high-heeled shoes should never be worn in the workshop as these may cause you to trip and injure yourself.



### Hair and Jewellery

Long hair must be tied back when using machinery as it could become caught and cause severe injury. Jewellery should also not be worn when using machines as this presents the same risk of getting caught.

## Basic Safety Measures

- Never use machinery without permission / supervision from a teacher
- Always make sure you are confident of how to use the tools / machinery required correctly before you begin
- Always concentrate fully when using machinery and do not let anyone distract you
- Always make sure that there is a teacher around before using machinery or tools which may be dangerous if used incorrectly
- Wear appropriate clothing and footwear and any protective clothing needed (e.g. Goggles) when using machinery
- Make sure you are aware of where the emergency stop button on the machine you are using is
- Never listen to music while using tools or machinery as it may distract you, leading to injury

On this page, I have considered the potential hazards I will face when making my product and thought about measures I can take to minimise any risks encountered. These are listed in the table below. I have also researched relevant regulations (Control of Substances Hazardous to Health) which would be an important consideration were this product to be manufactured industrially / in the real world.

# Health & Safety

## Process

Laser cutting (used to cut acrylic tools and polycarbonate folder net)



Moulding outer section of comb handle in Polymorph



Solvent Adhesives (solvent cement used to attach acrylic components together)



Drilling, filing sharp edges, sawing wood for vacuum forming moulds.



Making MDF mould for vacuum-formed tray.



Vacuum forming plastic for tray.



## Control Measures

Before beginning laser cutting, ensure that the fume extraction system is switched on. If fumes can still be smelled, a mask should be worn. Make sure that the settings on the laser cutter are correct so that it does not burn the plastic as this would create hazardous smoke.



Use a thermometer to make sure the water being used to heat the polymorph does not go above the necessary temperature. Wear gloves when moulding the polymorph by hand.

Be careful not to inhale fumes from solvents (a mask could be worn if there is a high risk of this). Gloves could be worn to prevent contact with skin.

Be careful when handling sharp implements and using machines such as the band-saw not to touch the blade/sharp edges. Wear gloves if necessary.

Wear a mask to prevent inhalation of dust and goggles to protect the eyes.

Wear gloves when handling the hot plastic. Be careful not to leave the plastic under the heater for too long (check it regularly to make sure it is not becoming too hot)





14th - 16th April 2010

- Using the design for the layout of the leaflets I created in Publisher, I added relevant text and images to create the leaflets for each topic, discussed in the Puppy Parties.
- To make the invitation cards, I scanned in an image I had drawn to replace the existing practice logo. I edited it using Photoshop to add text but was not happy with this design. I then developed two original designs using new images which I edited using Photoshop.

5th May 2010

- I glued the layers cut out on the laser cutter together to build up the two end sections using solvent cement.



6th - 10th May 2010

- Using a file and glass-paper, I filed the edges of the end-sections down to round off the corners of the layers and create a curved shape. Once the corners had been rounded off fully, I went over this with wet and-dry paper to create a completely smooth finish.
- I used a screw to secure the metal into the clicker and solvent cement to secure the final layers of plastic to the top of the clicker.



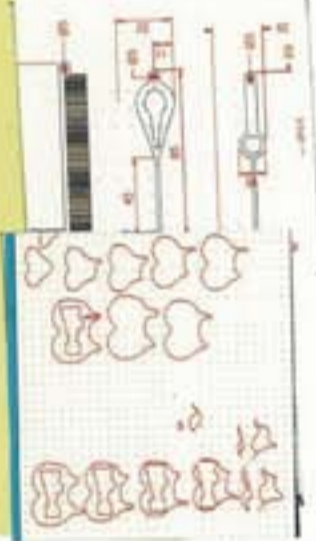
### DEVELOPMENT

- When I assembled the product, I found that one metal rod would not be enough to hold the whole thing together and support the end sections. The ends would rotate too much and not be held securely. Therefore I decided to modify my design to include three rods passing through the polymorph layer (one above the plastic inner section and one either side).



19th - 23rd April 2010

- In 2D design, I drew out the shapes of plastic to be cut out using the laser cutter (the 15 pieces needed for each end section, the 3 tools and the two layers of plastic which make up the handle).



27th April 2010

- To check that I had created the 2D design files correctly, I cut out a trial version of one of the end sections using scrap plastic. The components fitted together correctly but, looking at it, I thought that there would be too much of a difference in size between each layer to allow it to be filed down to give a rounded shape. I made the 2D design files to make each layer more similar in size.

28th April 2010

- I cut out the layers for both end sections and filed the inside edges (ie around the compartment for the toothbrush).
- I then used the laser cutter to cut out the comb. However, there was a problem with this as the fine spacing of the comb teeth meant that they were very fragile. I showed this to my clients who agreed that this was not practical and felt that the plastic was also to thick for a comb.



### 3D Product PRODUCTION LOG

11th May 2010

- Using metal polish, I polished the plastic end-sections to give them a shiny/glossy finish and make them more aesthetically appealing.
- I marked out the designs for the tick remover, comb and magnifying glass on aluminium (1mm thick) and cut these out using a piercing saw. I then filed the edges with a metal file and glass paper.



12th May 2010

- Using a pillar drill, I drilled the holes needed for the two plastic tools and the aluminium rod to length using a hacksaw and assembled the middle layer. I used the handle, to flatten and assemble the rivet against section of the layers so that I used of the rivet so that the ends of the layers back the plastic plus holes. I would not hole through the tabs on the tool I painted colours so that they differ in identity which one they need easily.



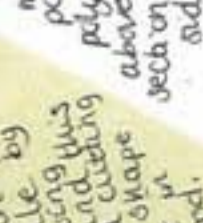
14th May 2010

- Using the laser cutter and vinyl cutter, I cut out the net for the pack and the vinyl graphics to go on this. I peeled off the section of the image I did not want and used application tape to transfer the rest of it to the box.
- I made a mould from MDF for the plastic inside the box and vacuum-formed this in HIPS.



15th May 2010

- I made a polymorph to form in the same shape as the shape of the plastic of the handle by drawing this around cutting and cutting out in wood.



- I cut out three lengths of aluminium rod and drilled two extra holes in each end section for these to slot into. I assemble the product with the wooden mould in place of the handle, ready to form the polymorph around.



- I heated up the polymorph in hot water and moulded it around the wooden mould, pressing it to fill the cavities in each end section and to fit the shape of a hand. When this had cooled, I removed the wooden mould and fitted the plastic inner. In 2D design, I drew the logos and text needed and cut these out in blue vinyl on the laser cutter. I applied these to the product using application tape.



15th May 2010

### DEVELOPMENT

- When I made the flea-comb from Acrylic (2mm thickness), I found that this was not a suitable material for this purpose as the teeth were too fragile and snapped off easily. A thinner material would also be preferable as the smaller the comb teeth, the more easily they will pass through the coat. I therefore decided to adapt my design to make the 3 tools (comb, magnifying glass and tick remover) from Aluminium. This is well suited to this purpose as it is extremely strong even when in thin sheets.

- I made the top/bottom from rubber with raised 'pimples' to form the bristles, attached to plastic rod for the handle.
- I printed the leaflets and invitation cards and assembled the pack.



## FUNCTION

To assess how well the product meets the needs of the user as well as my clients I asked a dog owner to test the product. She tested each component and was able to use all of the tools easily and replace them after use which shows that the product functions in the way intended. I asked her to compare each component tool to existing products to assess whether they were as good as / better than those already on the market. She found that the clicker worked as well as a shop-bought product (the clicking noise was as loud as the shop bought version and her dog responded to the sound well.)



Testing the comb. This shows that the tools rotate out from the handle successfully and the rivet holds them in place tightly so they do not move/ rotate back when in use. It shows that the handle is the right size and shape to hold easily in the correct position. The comb is strong enough to be used without breaking which shows that it was the right decision to modify the design to include metal tools instead of plastic ones which were not durable.

User testing the clicker. This demonstrated that this tool functions well and is the correct size to be held comfortably. From this photo you can see that the hole in the top is the correct size and shape to press the metal down with your thumb.



To test the success of the new logo design, I showed it to my clients and to a client of the veterinary practice. Both thought that the new design was much more appealing than the existing version. They like the way that the design includes the same features (the castle and the same three animals) as this sticks to the identity of the practice which has already been developed. My clients said that they would like to use my logo design in place of their current logo as it is much more modern and they think that the quirky / cartoon style is more attractive and would be more likely to promote the practice / make it appeal to new clients. My test user felt that using this new logo design on the invitation cards was a good idea and that they would be likely to find the cards appealing and be encouraged to find out more about what was being offered as a result.

## Testing

### AESTHETICS

My clients are happy with the way the product looks and my test user also said that the shape is appealing and goes well with the 'Puppy Party' theme. They think that it is finished to a high standard and particularly like the pattern of 3 colours and the polished finish of the end sections.



### USER COMMENTS

The tool has immediate appeal and is in line with the fun image of the pack as a whole. It reflects the colour scheme + has a relevant 'doggy theme' to the design. It is practical in that it is easy to use + also keeps essential equipment together.

### MEETING SPECIFICATION POINTS

To test how well this product meets the specification, I asked my clients and test user to look at it and decide how well it meets each point. My clients feel that it meets all of their needs and the testing shows that it functions correctly. Another purpose of this product was to advertise the veterinary practice which my clients feel that it does well. My test user also said that they would be more likely to recommend the practice to others as a result of the 'Puppy Party' scheme and products. It also needs to advertise the sponsoring company, Intervet. I asked my test user how well it achieved this and they said that the product made the company name memorable and that they would probably be more likely to buy products produced by this company (such as flea treatment). This is important as it is successful in promoting the company it would be more likely that the company would continue to fund the scheme for further batches of the product. As I used different materials and processes to make my prototype model, it is difficult to tell how much each product would cost. In my specification I planned to keep the costs as low as possible to make the maximum number of products per £500 batch. However, some of the modifications I made will increase the cost (i.e. Making the tools from aluminium as this is more expensive than plastic).

My test user could not test the tick remover as her dog did not have a tick. She agreed with my clients comments that the shape of the tool would be easier to use than the product she owns already as it keeps the tick contained and cannot slip off it. The toothbrush could not be tested on the dog as my prototype model was not made from the necessary materials and may not be safe for the dog. However, my test user tested it to make sure it fits over a finger securely which it did. She feels that it would work well agrees with my clients' comments that finger-brushes would be easier to use than conventional toothbrushes as it is easier to reach all surfaces of the dogs teeth.



## ANTHROPOMETRICS

I designed the handle of the tool using anthropometric data and took impressions of hands in order to create the most comfortable shape to hold. In my prototype model, this was made from a hard material (polymorph). I asked my test user to evaluate how comfortable and easy to use the product is with regard to the shape of the handle although this is not a full representation of the actual product as this would be made from soft polymer.



Here, the test user is holding the handle ready to use the tool. This shows that it is the correct size and shape to fit into a hand comfortably. The thumb is sitting on the ridge formed along the side and the fingers sit in the grooves along the bottom of the handle as intended.



# Evaluation

## LEAFLETS:

### Client Comments:

'The leaflets meet all the needs that we specified as they include all of the information we gave about the different subjects discussed in our 'Puppy Parties'. This information is clear and well set out and we like the use of images as these explain the text and make the leaflets interesting to look at. We think these leaflets would be really useful to our clients and help them to understand the information we give them in the 'Puppy Parties'. They would be useful to us as a veterinary practice as they help to promote better care of animals and promote the practice well as our logo is on every page.'

### User Comments

These leaflets are really good, comprehensive guide to puppy care. The layout is clear + the text conveys the relevant information in clearly defined sections. This makes following the essential points more easily. The leaflets look very attractive and there is a good combination of instructive + appealing images.

## INVITATION CARDS

### Client Comments

'We are really pleased with the design for invitation cards because we don't have a good system for promoting the 'Puppy Parties' so having cards to send out would improve the attendance of the sessions. We think that the new logo is much better than the one we have at the moment and we think it would appeal to our clients a lot more because it is so much less formal than ours. The cartoon pictures make it more interesting and eye-catching so people would take time to read the cards. It is also good that they are colourful to attract attention. They include everything we asked for to be on there (the information about the 'Puppy Parties' and the contact details and the logo of Powderham vets).'

### User Comments

The invitation cards are immediately appealing + will help to attract puppy owners to find out more about what is being offered. The invitation has a really fun image developing the practice logo + so will help to reinforce the specific vet practice.



## PUPPY PACK

As a whole the pack meets our needs really well. The box fits in with the rest of the pack and we like the design on the top as it is a clever change to our logo, making it look more modern and more appealing. The box is really practical and there is space to fit all the leaflets we have to give away and any other small products we might have to give away. It can be resealed easily so these can all be kept securely inside. This is good as we want our clients to keep these packs so they can refer to the information later on and use the tools regularly to take care of their puppy. It advertises the practice well as all of the parts of the pack have our name or our logo on. We think this would be a very successful part of the 'Puppy Parties' scheme and would help people look after their pet and to attract new clients to Powderham.'

## 3D PRODUCT

### Client Comments:

## FUNCTION:

'The product includes all of the functions that we suggested would be useful for a puppy owner. This would be a really useful tool to give away at the 'Puppy Parties' because it links to the topics we talk about such as teaching people how to check for fleas and ticks. We like the way that all of the tools fit together as one item but come apart to be used separately. It comes apart into the separate tools and goes back together easily so it is easy to use. We think the design of the tick remover is particularly successful as it is very simple and the shape means that the tick cannot slip out of it which is a problem people have with other types of tick remover. You have listened to our comments about the best types of dog toothbrush as we find that people find fingerbrushes easier to use than other styles of brush. The shape of the handle makes it really easy to hold and it would be comfortable to use.'

## DESIGN

'The product is attractive to look at, we like the three-colour pattern and the bone shape is a good idea because it goes well with the 'Puppy Parties'. We think owners will like this design and it is also practical to use. We also asked for the product to help to advertise the practice which this design does well because our logo is on both sides.'

## QUALITY

'The product is made to a high quality. It works well and is attractive to look at. The materials are a good quality too, we think this product is better than the original version where the tools were made of plastic. These were too flimsy and would have broken too easily. We want people to be able to keep the 'Puppy Packs' and carry on using them for as long as possible so using stronger / better quality materials like the metal for the comb is better.'

## SAFETY

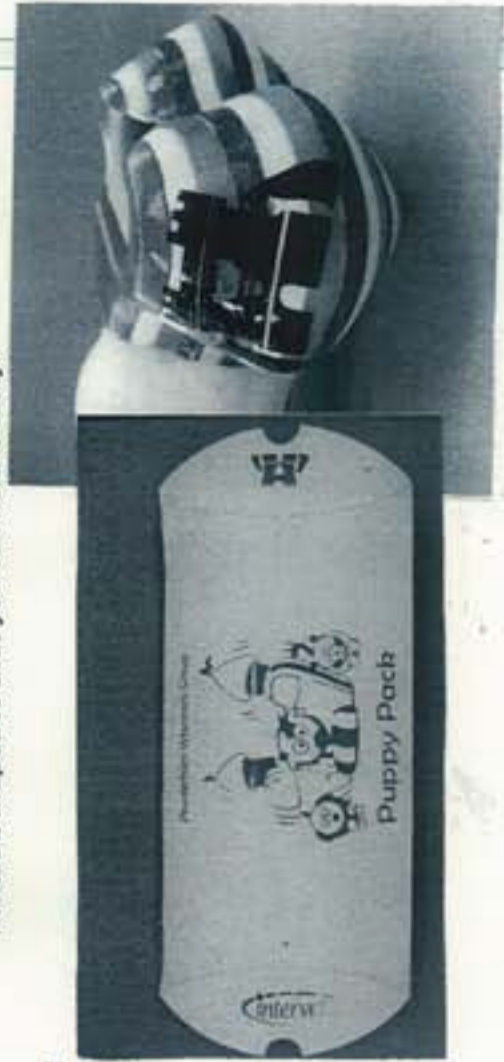
'The product seems safe to use. There is nothing on it which would harm the puppy at all and no small pieces which could come off which the puppy could chew or swallow. We tested it and did not see any problems with it, there are no sharp edges and nothing which could be dangerous for someone using the tools.'

## SUGGESTIONS

'The only thing which might be a problem with this product is that people might want to carry the tools with them on a dog walk (especially the tick remover or clicker) which they couldn't do because this product is too big. If you were looking for other things which could be added in, you could include other products like dog-whistle, but this isn't necessary.'

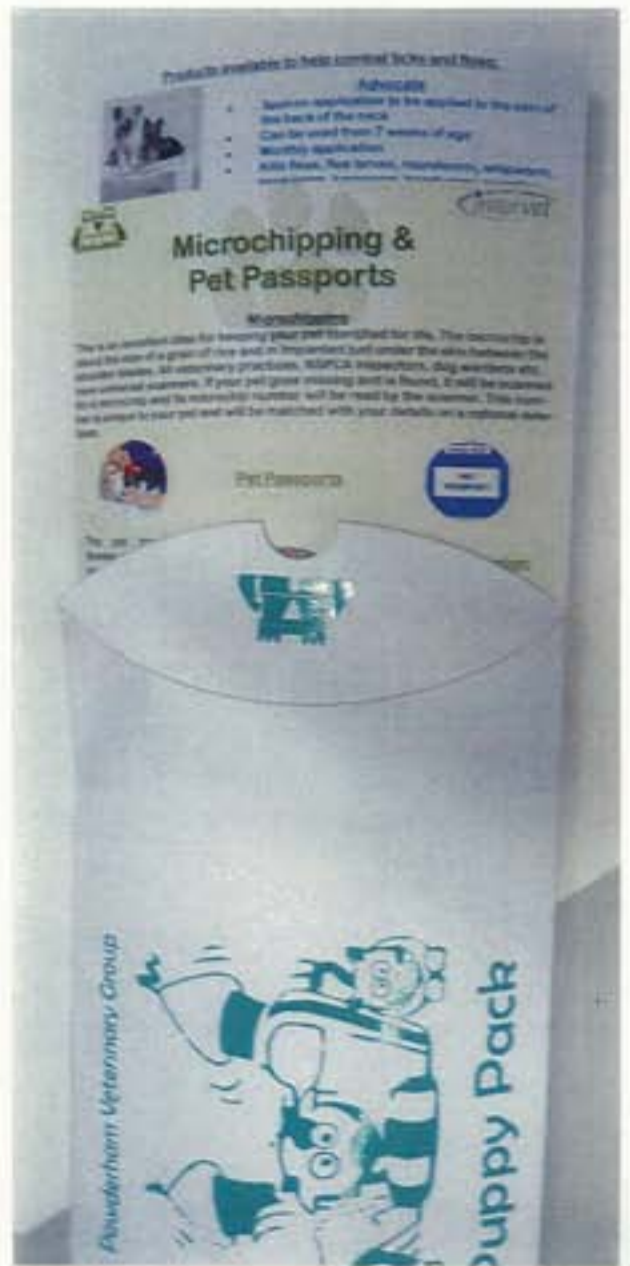
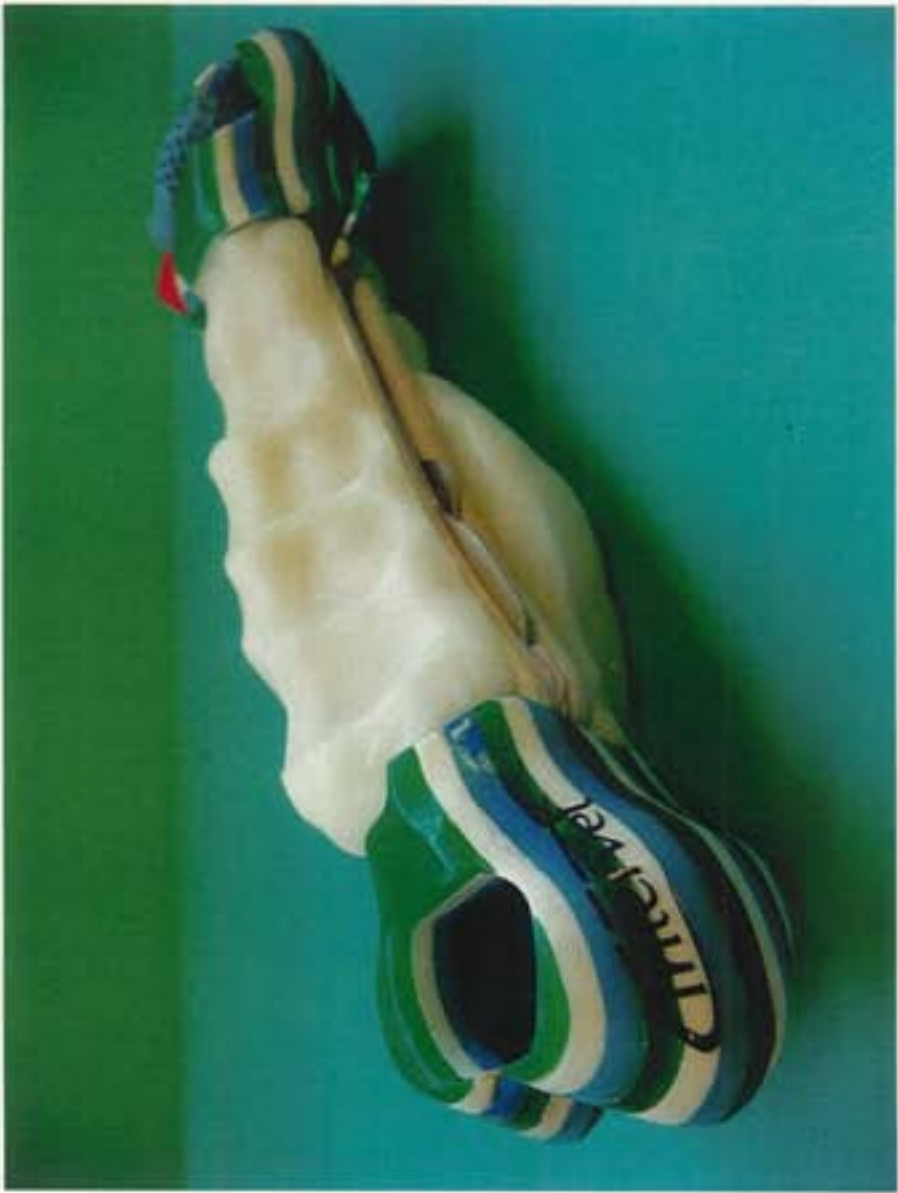
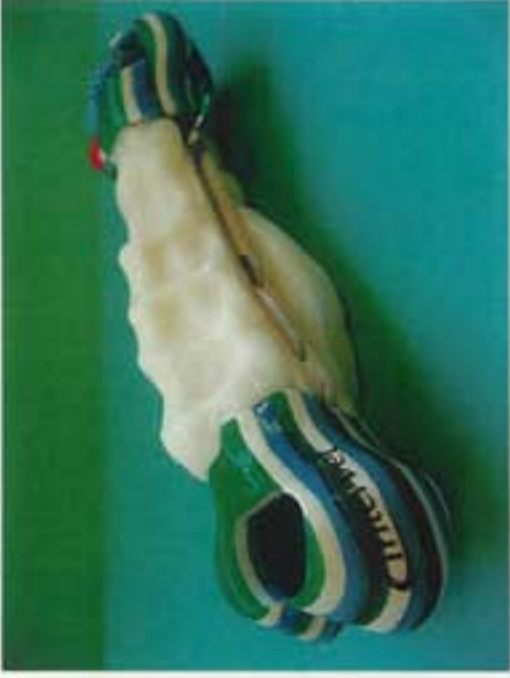
## SATISFACTION WITH DESIGN

'This design meets all of the points we asked for and we really like the way it looks, especially the shape as this is unusual and links to the puppy theme really well. We like the way that all of the tools are combined and fit together to make it more compact and it works well to advertise Powderham Vets because it has the logo and our name printed on it. It is really easy to use and the tools come apart and fit back together easily. We like the way the handle is shaped so that you can hold it easily.'











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photo



Please complete the following:

Design brief:	Promotional pack for puppy owners to be given away by Powderham Veterinary Group.
Client/user group:	Powderham Veterinary group.

Please refer to the instructions on page 2