

YEAR 13

PRODUCT DESIGN

ADAM

KEEN

PORTFOLIO

BRIEF & SPECIFICATIONS

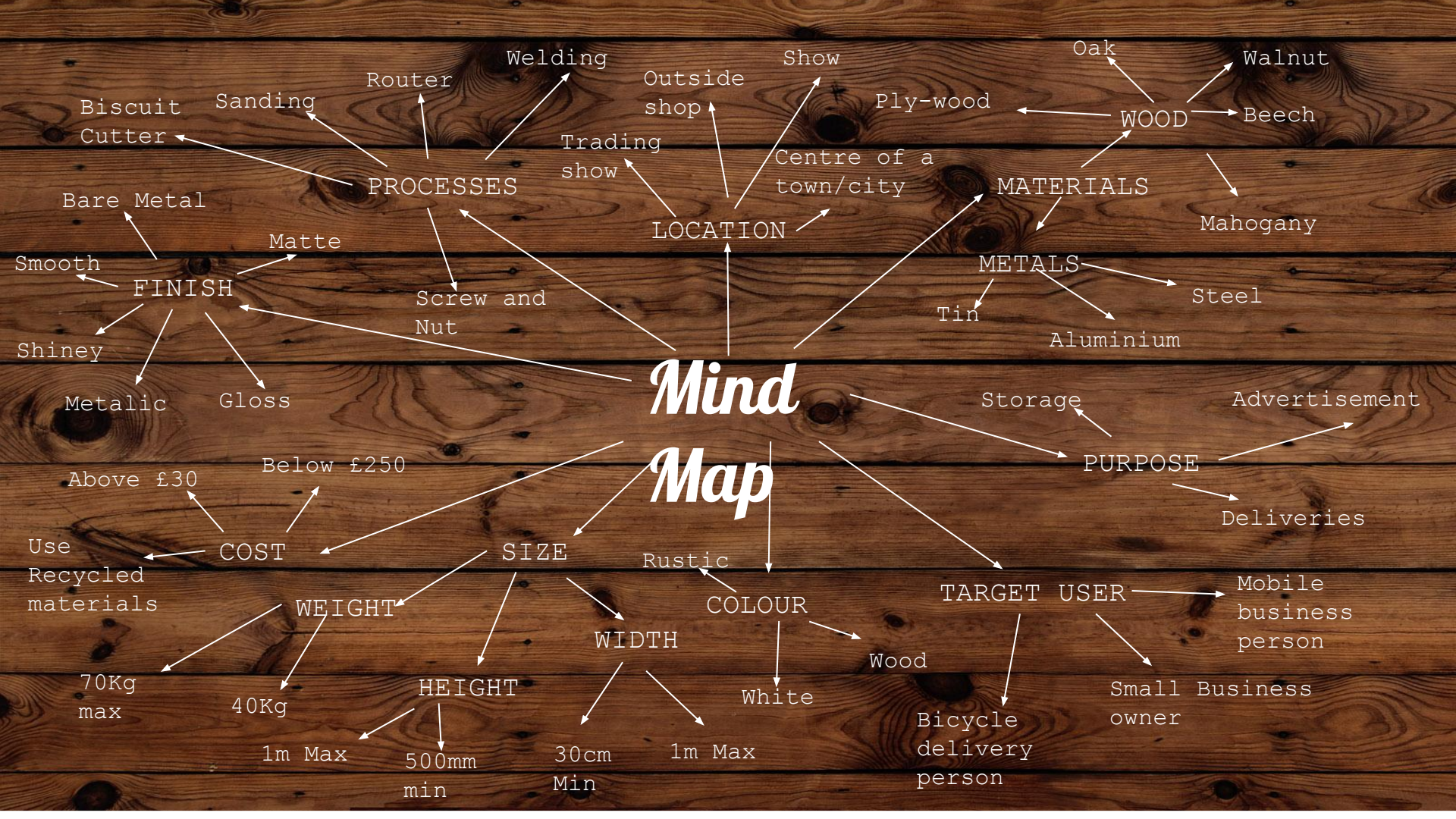
The ability to perform a number of functions can sometimes form a unique selling point for a product. Design and make a product or system with a specific range of functions which has this feature as its main selling point.

DEVELOPED BRIEF

The ability to perform a number of functions can sometimes form a unique selling point for a product. Design and make a bike trailer that can be used as advertisement for a local bike shop called, , that can also be used as storage and can pop out into a display stand. The product must also be able to be transported easily as it will also be used for deliveries.

Specifications

1. My design will be able to carry out its basic functions easily and efficiently.
2. My design will be lightweight however not so light that it is easily knocked over. I will try and make my product greater than 30Kg however below 70Kg.
3. My design will advertise the businesses at hand by using graphic design softwares and branding using adobe illustrator and photoshop.
4. The shapes and colours will be aesthetically pleasing to match the branding of the business.
5. My trailer will be able to serve multiple purposes. It could be used as advertisement, a display stand, a storage facility and also used for deliveries.
6. The product must be made using a variety of processes. To ensure I do this I will try to give my materials different effects and piece it together in a variety of ways.
7. My product will be made from a variety of materials. This will keep my product interesting and will also help me to use a number of processes. To ensure I do this I will judge each of my designs on how I have incorporated a range of materials. If there is a design where I have not done this, I will make it a development to add in more materials.



Mind Map

PROCESSES

LOCATION

MATERIALS

METALS

FINISH

COST

SIZE

WEIGHT

HEIGHT

WIDTH

COLOUR

TARGET USER

PURPOSE

Biscuit Cutter

Sanding

Router

Welding

Outside shop

Show

Trading show

Screw and Nut

Matte

Bare Metal

Smooth

Shiny

Metallic

Gloss

Above £30

Below £250

Use Recycled materials

Rustic

White

Wood

Bicycle delivery person

Small Business owner

Mobile business person

Storage

Advertisement

Deliveries

Oak

Walnut

Beech

Mahogany

Steel

Aluminium

Tin

Ply-wood

Centre of a town/city

WOOD

METALS

Mood Board



Example of the advertisement element



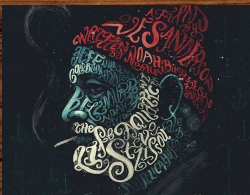
I could use graphic and logo design like this in my work



I like the rustic branding



The idea that the shop could sell from the trailer could be something that I think about while designing



The idea of the trailer dragging behind allows heavier loads to be carried



Research

Burley Flatbed trailer

A flatbed trailer is extremely simplistic in design and build however is made to a remarkable quality and is incredibly robust. The trailer offers a very ergonomic design that ensures that the user can use the product easily and effectively. The trailer is made of materials such as plastic that are easily formed and can withstand different types of weather. However a downside to the product is that the contents of the Trailer are not protected from the weather or surrounding conditions. Also, the trailer doesn't have much Space for advertisement so it would Have to be very cleverly designed to Have this feature or I would have to use a different style of trailer.



Carry freedom

Carry freedom are a company based in Germany and make different styles and types of bike trailers to fit the need of a range of different cyclists. The designs are well thought out and ecological. The frames are made from aluminium so are lightweight and easy to maneuver. Their, multiple designs enable a commuter etc to pick the correct style of trailer for them. The designs are easy to use and simple. They also sell accessories to go on the trailer such as mudguards, handles and hitches.



Butchers bikes

Butcher's bikes have caught my eye and given me inspiration for this project due to the old style frames and the graphic logos and typography on the sign in the frame. This could also be used as a form of advertisement for the company using the trailer. Butchers bikes would have been used for deliveries before 1950 to local shops and businesses as many couldn't afford and didn't need a car. Prior to big supermarkets, there would be many small shops such as bakeries and butchers that would all trade locally. However because of the opening of the bigger supermarkets many of these businesses have closed down and many people wanted to start to drive cars for deliveries so reduced the desire for delivery bikes.



Adglow

Established in 1957, Adglow is a family run business and is the UK's number 1 supplier of point of sale and point of purchase design, manufacturing and installation solutions. I would use Adglow as inspiration for the point of sale aspect of my design. I will take note of the way they apply the shapes and designs of their point of sales to the company being advertised. Also the quality of their point of sales that are made and how I can replicate this in my work.

Target user questions

To make the most suitable product for my target user I have made a series of questions to help me grasp the main qualities needed in my product to make it successful and suit my target user perfectly. I asked 20 people who related to my target user these questions and the results are displayed in the bottom right

1. How much would you be willing to spend on a trailer that can convert to a point of sale display stand?

- a) Below £149 b) £150-£199 c) £200-£249 d) £250-£299
e) £300+

2. What materials would you like the trailer to be made from



Acrylic



Wood



Metal

3. Would you have a use for a delivery bike/trailer that could also be used for promotion?

Yes

No

4. Which style of trailer/do you find most appealing?



A, Sidecar



B, Flatbed



C, Basket



D, Front bed



E, Front basket

5. What would be your main purpose for the trailer?



Deliveries



Storage



Mobile selling



Advertisement

Results

Q1. A=3 people B=2 people C=6 people D=4 People E=5 People

Q2 Acrylic = 3 Wood = 11 Metal = 6

Q3 Yes = 18 No = 2

Q4 A = 3 people B = 8 People C = 3 people D = 2 People E = 4 People

Q5 A = 4 People B = 3 People C = 8 People D = 5 People

Location

The trailer could be taken to a race weekend in order to sell products and advertise the company branded on it or even the trailer itself. The race weekend is relevant due to the fact that the trailer is being towed by a bike and would produce a lot of interest and attention at an event such as this.

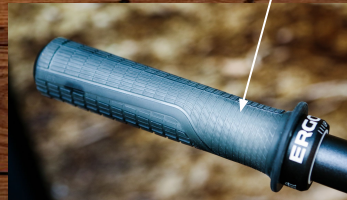


There would be a lot of passing trade in the paddock between races and people looking to spend money on new parts etc that could be sold out of the trailer



Due to the fact that the trailer would be reasonably small and that very few people go to a race weekend with the intention of buying a full bike, the trailer would probably sell a lot more small products such as grips, handlebar tape, washers, headsets, pedals etc that many cyclists will pick up as they go rather than plan to buy them from a certain place

This is a perfect example of the type of selling and advertisement can be used. The quirky shape, aesthetics and products will catch the attention of many cycling fans.



The trailer could be used as advertisement for new products, existing products, upcoming events or even a shop itself. It could be left outside a shop to attract customers and give the shop a higher level of attention. Having my display stand here would reduce the need for a more average shop sign that isn't likely to attract as much attention.



Even if left outside not popped up, here it would still allow light into the shop but also show the branding and details of the shop



The trailer would fit into a busy street scene such as this well and wouldn't look out of place



If it were to be located outside the shop it could be located directly in front in spaces such as these



The branding on the display stand could match the branding of the shop so it fits in with the colour scheme and looks right outside the shop



The trailer is very diverse in location and also in use. It can be used to take to cycling shows/events related to cycling however it can also be used to promote brand nothing to do with cycling. Brand such as Auto Finesse which are related with cars. Another example of this would be a coffee shop despite it's popularity among cyclists. This shows that the design element of the trailer will allow it to be used for a very diverse range of companies. Also, that the branding of the trailer can affect it's use.



Brand such as 'Auto Finesse' (above) would fit the style of trailer perfectly. They sell small car care products that would fit into the trailer easily. Also I would have to pay close attention to their existing branding and make the branding on the trailer match.



My trailer could be located around the edges of the show with other trading stands



The trailer would stand out at an event such as this because many other trading stands will be designed like a tent and will be very bland.

The trailer could be taken out into the street and sell products to get the brand name and logo out there and given more coverage from the general public. Companies that could use this would be smaller companies such as coffee houses. It would be best used on a busy street in a city such as Cardiff, London, New York etc.



For the trailer to be used for this kind of use in locations such as these, I could gain inspiration from existing pop up stalls etc and also hot dog/pretzel stands on the streets of New York that sell to hundreds of people per day



Trailers such as these are highly successful in the streets of new york due to many busy people, eating on the move. The stand is above head height and colourful so people are able to see it easily from a distance



A location such as this would be heavily affected by the weather and would only really get a lot of trade in the days with better weather.

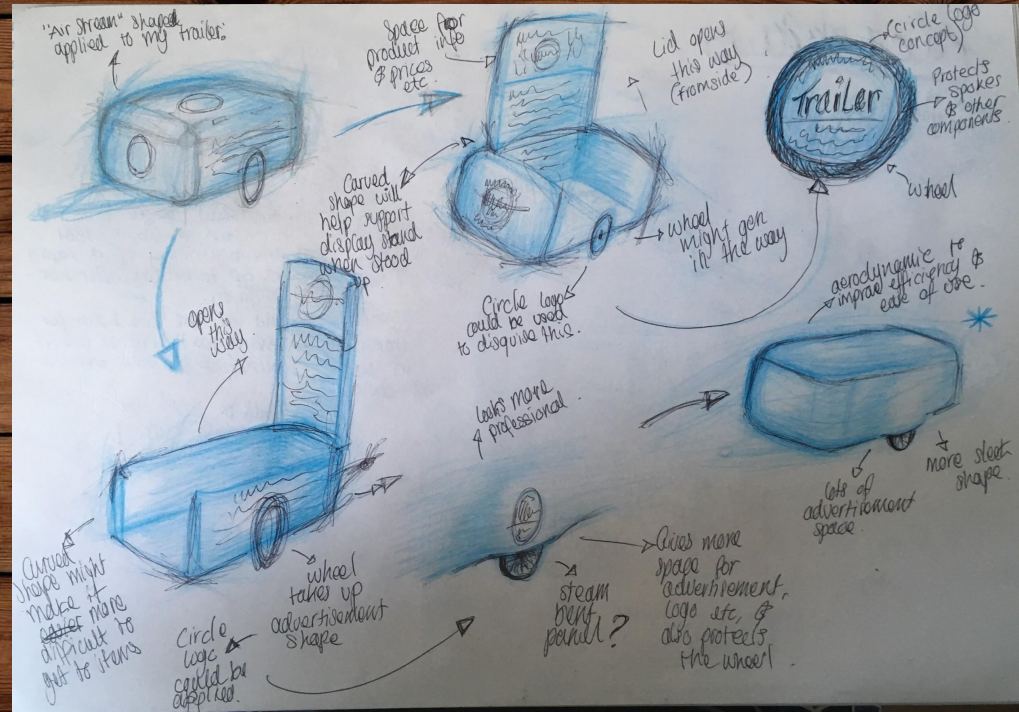
Initial Specifications (In order of importance)	Developed specs	Tests during design	Tests during manufacture	Tests after construction
Function: My design will be able to carry out its basic functions easily and efficiently.	My design will be able to carry the cargo of a small business, be maneuverable, and be able to sell the cargo with ease.	I will make sure of this during the design process by reminding myself of what the different functions of my project are and design elements that affect this directly.	I will test how much weight the frame and welds can take by applying weight on it after each section has been welded together.	I will test this after construction by applying the products a business would sell to it to see how it performs.
Weight : My design will be lightweight however not so light that it is easily knocked over.	My design will be lightweight however not so light that it is easily knocked over.I will try and make my product greater than 30 Kg however below 70Kg.	I will design it to have a minimalist frame and choose lighter yet still robust and sturdy wood		I will test this by using the mode of transport (in this case a bicycle) to attempt to pull it. And to test how it performs.
Secondary Function : My design will be able to move whilst being towed by a bicycle.	The user of the trailer will be able to maneuver the trailer between events and jobs. It will roll easily and will be able to be towed by only a bicycle.	I will design the axle with inspiration from existing and working products with a similar function.	I will make sure that the wheels still spin and work effectively before welding the axle to the frame.	I will wheel and get other people to wheel my product around and ask them to rate the ease of use out of 10.
Tertiary function : My design will advertise the businesses at hand by using graphic design softwares and branding using adobe illustrator and photoshop.	My design will have designated sections that will be used to advertise the businesses and products that they are selling. I will create and develop this by using graphic design softwares such as adobe illustrator and photoshop. This will help it to have a professional finish.	I will design the trailer so it has specific spots for products and companies to be advertised. I will also design a logo, slogan, and advertising board for a business that could use the trailer.		I will make sure all advertisements can be seen clearly and read easily, and gives all information necessary
Aesthetics : The shapes and colours will be aesthetically pleasing to match the branding of the business.	The shapes and colours of the trailer will flow and will be aesthetically pleasing. It will have a rustic look by using reclaimed wood to make it match the branding of the business.	I will take inspiration from nostalgic designs from the past that I feel could influence the shape and form of the trailer and make it stand out.		

Initial specifications	Developed specifications	Testing during design	Testing during manufacture	Testing after construction
<p>Cost : Made using low cost materials.</p>	<p>The trailer will be made from as many upcycled materials and parts as possible.</p>	<p>I will design my product with specific low cost materials in mind.</p>	<p>I will make sure that I use low cost or even upcycled materials such as pallet wood that I will retrieve myself.</p>	
<p>Location : My trailer will be able to be used in a range of locations.</p>	<p>Due to the fact that is maneuverable and serves multiple functions, the trailer will be able to be used and carry out a specific function in a number of different locations such as events, on a street or around town.</p>	<p>I will design the trailer so that it has all the basic requirements needed to carry out all of its basic functions. This will allow the trailer to be used in the multiple functions.</p>		<p>I will test this after construction by using mock up scenarios to see how well the trailer performs in a real and working environment.</p>
<p>Quality : The product must be finished to a high standard. It must be durable and strong.</p>	<p>I will finish the product to a high standard by meticulously measuring, developing and carrying out the development process carefully and precisely</p>		<p>I will test this during manufacture by quality checking after each stage and process during making. I will also check everything on the product works as it has been designed</p>	
<p>Manufacture : The trailer must be formed by using a range of processes.</p>	<p>The product must be made using a variety of processes. To ensure I do this I will try to give my materials different effects and piece it together in a variety of ways.</p>	<p>I will plan and already have a general idea of the processes I can use on design ideas before I develop the idea and plan out fully.</p>	<p>I will test a few different methods of manufacture to ensure that I receive the highest quality result from the selected material.</p>	<p>I will analyse the finished product and the processes that I have used in order to reach the outcome.</p>

Initial Ideas - Airstream Caravans

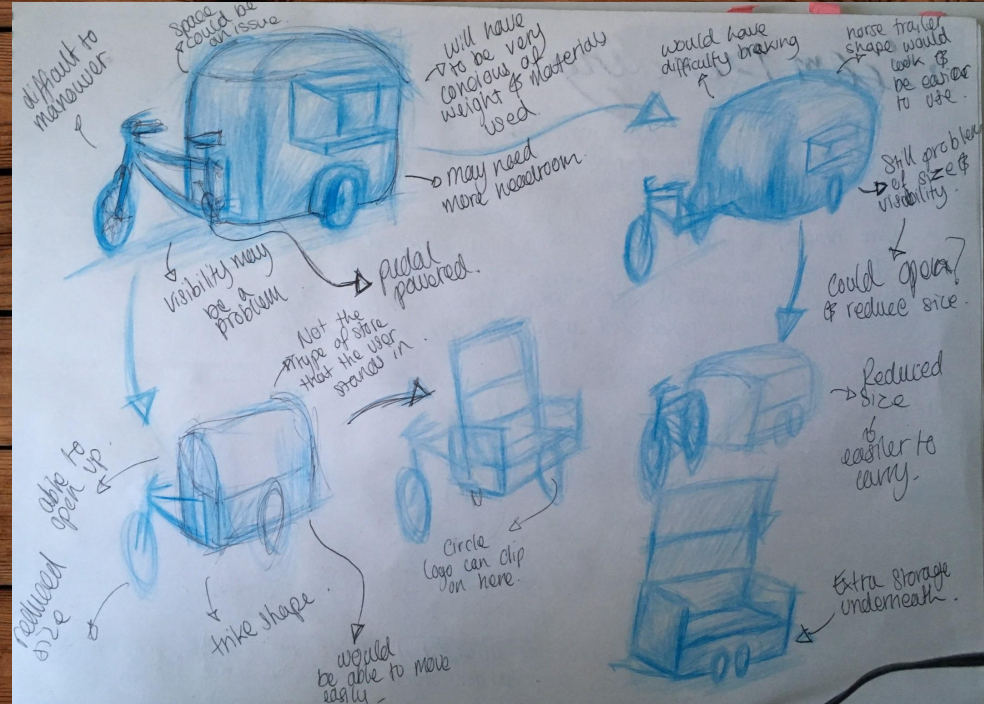
Airstream caravans were created by Wally Byam who launched the company, Airstream, in 1930's. The reason I am looking more into Airstream caravans is due to it's more aerodynamic shape. This means that the person towing will expend less energy as the air resistance would be lower. Alongside this, I love the shape of these caravans anyway. The rustic and extremely distinctive and rustic shape makes them incredibly aesthetically pleasing. Due to this, I thought it would be a good idea to take inspiration from the Airstream caravan and it's shape.

Below is a photo showing an initial ideas page and development using inspiration from Airstream caravans. I then did a final Airstream design which I developed further again which you will see throughout the project.

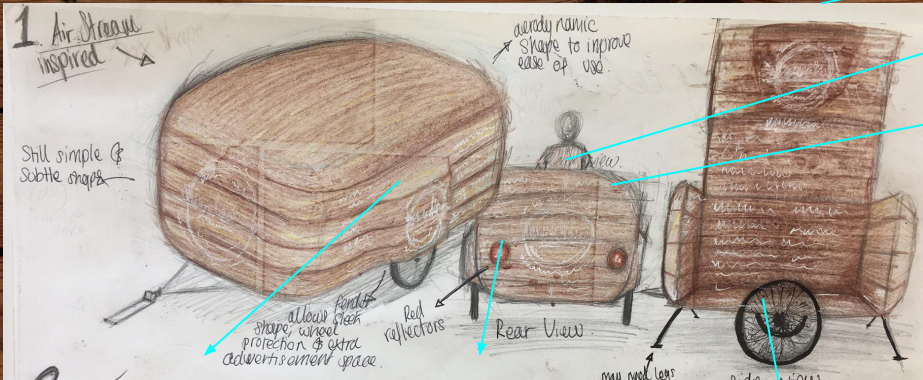


Initial ideas - Rickshaws

Despite being invented in Japan in around 1869, Rickshaws became increasingly popular in countries such as India due to their incredibly functional design and their ease of use and ease to repair. They are mainly used for transport as it is used more and more by taxi drivers. I chose Rickshaws as another iconic design to take inspiration from due to the functionality of the design and also the amount of possibilities that come with it's design. I could also use and take inspiration from horse trailers for the rear due to the fact that they are both extremely similar. To the right is some of my initial ideas and developments using Rickshaws as inspiration.



Design Ideas



Fender to protect wheel as well as make up for lost advertising space on the trailer

Simpler shape would make it easier for the target user when loading it with products etc

Steam bent

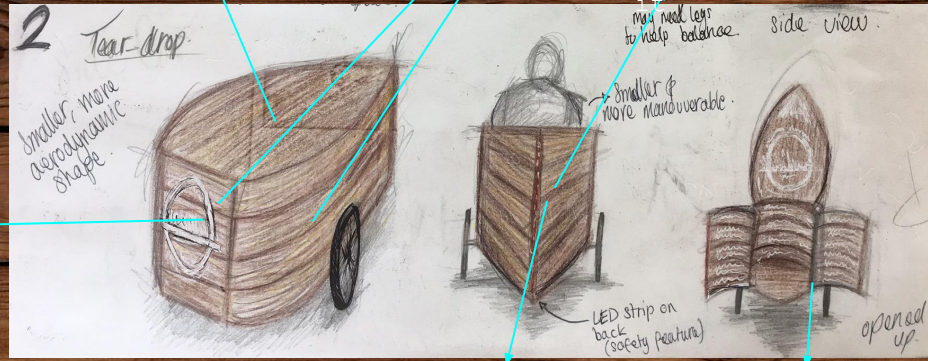
Space for advertisement and product information

Safety feature, red reflectors for when the trailer is being transported

Smaller more confined shape can improve the ease of use however may compromise how many products can fit in

Tear drop shape for more aerodynamics and ease of use

Space for advertisement, logo etc



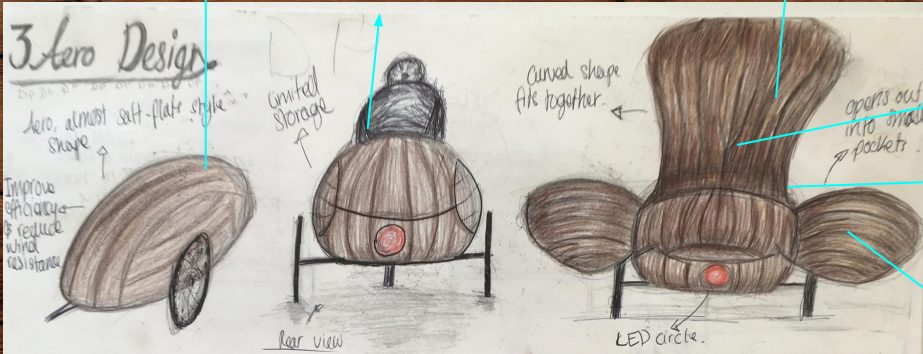
Top opens up and sides open outwards

LED strip on back

Opens up from the narrower section at the back to make use of the wider end to hold larger amounts of products etc

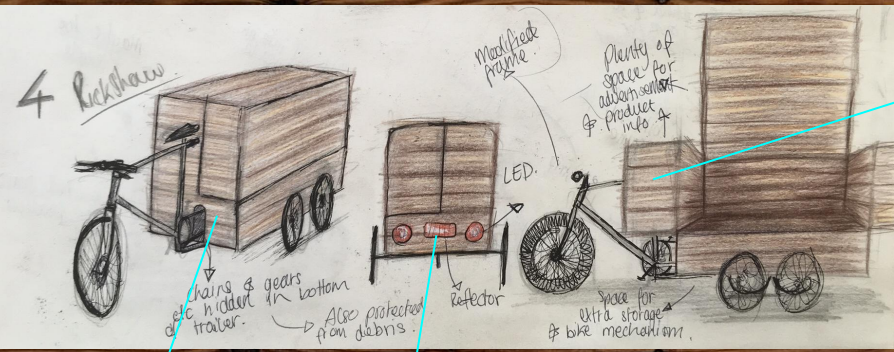
Opens into a pocket that could be used for product info, advertisement etc

Moves away from more rustic and simple shapes in the first two designs



Almost salt-flats style shape

LED lights as a safety feature



Sides fold out to add extra space for promotion and advertisement for products

Fenders fold out to make space for more products to be stored and put on sale as shape may make it difficult to reach all of the products inside

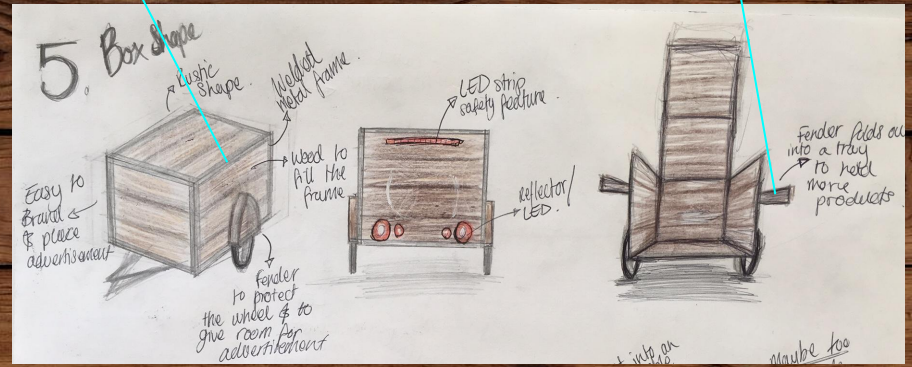
Would be the easiest to make due to simple shape

Bike Mechanism hidden in bottom compartment of container

LED's on back so that it isn't limited to use on daylight hours

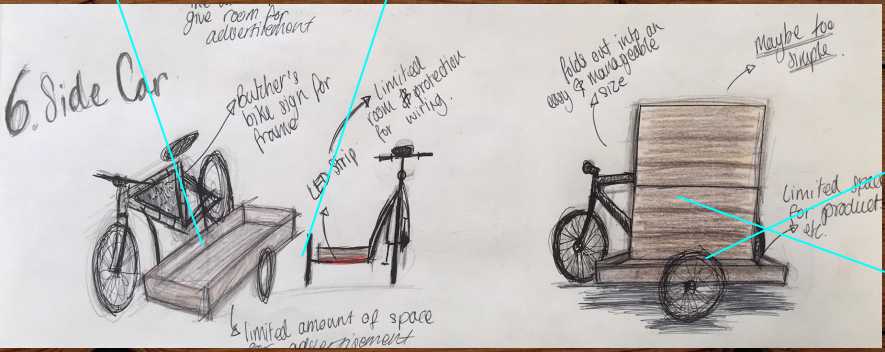
Little space for advertisement when packed away

Limited room in the trailer to carry products and also limited to the type of products that can be carried



Hard to organise products and are likely to fall out when transporting

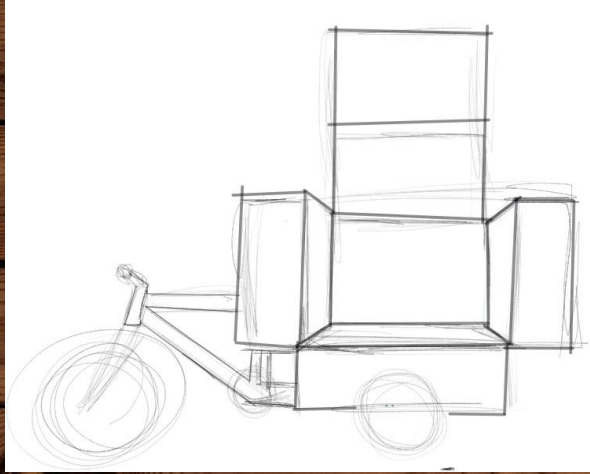
Would have the most space for advertisement but the least space for products



6. Side Car

limited amount of space for advertisement

CAD drawings



After laying out my 6 best ideas in a more detailed representation. I decided to go with the tuc-tuc inspired trailer. I began using the app 'Concepts', partnered with the "Adonit jot pen", in order to gain more detailed and visual presentation drawings. It was extremely useful as it allowed me to use layers and break designs down to the bare sketches which would help with frame design, as well as show what it would look like fully built.

Below is the completed drawing. I used the marker pen tool as well as the pen tool in order to get the blends and shades of colours for both the wood and the bike from itself.



I will develop this idea further by looking into different ways that the cargo holder can open and close. Alongside this, I will look into different ways and places on the trike that it can be held. I will also look more into how I will get the drivetrain to operate efficiently and without any difficulties. I will research more into drive systems already created to try and gain a better understanding of the system and how I will still be able to get the rear wheel to freewheel also.



Developments

I have chosen to take forward the idea inspired by the rickshaw. I thought this would be the best idea to take forward due to it's functionality. This would mean that it is easier for the target user to use and also looks a lot cleaner with the unit moving and functioning as one. I made this decision whilst comparing the designs back to my specifications. This meant that I picked the design which was most functional, and aesthetically pleasing. This development sheet was created using concepts and the Adonit Jot pen. To gain the roughness or the page I used the pencil tool.

Looks very clumsy and awkward

Panel on the front opens rather than panels on the side

May be difficult to evenly distribute weight

Would have to be extremely strong welds due to weight and pressure on the welds

Looking into swapping the cargo holder to the front of the trike, however, handling may be compromised and may also be difficult to engineer

Incorporate Butcher's bikes to advertise the business, this refers back to my specifications

Wheel trim with logo on to maximise advertising space

Could potentially take inspiration from Airstream design and curve the edges

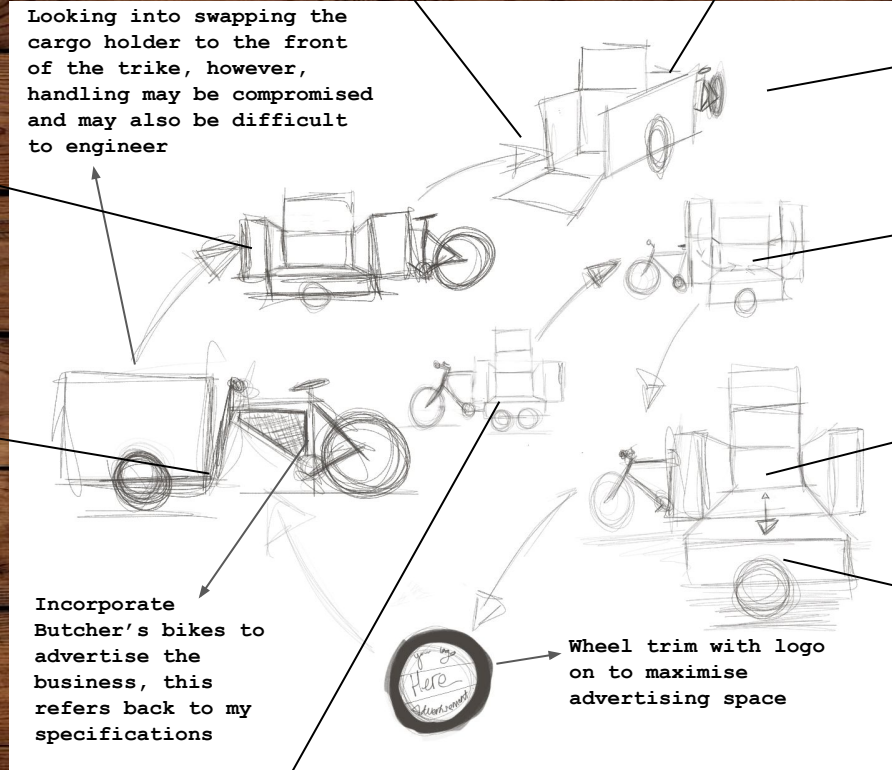
Extra advertising space for business, could show price lists etc

Extra storage for the user's cargo with slide out section.

May be difficult to move slider in and out due to the direction of the wheel

Original idea

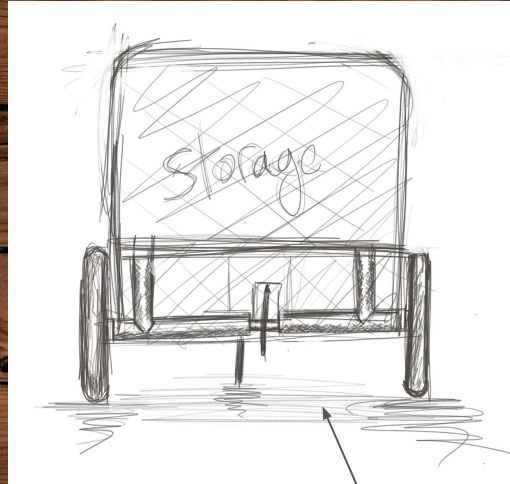
May look better with a single wheel rather than two



Developments

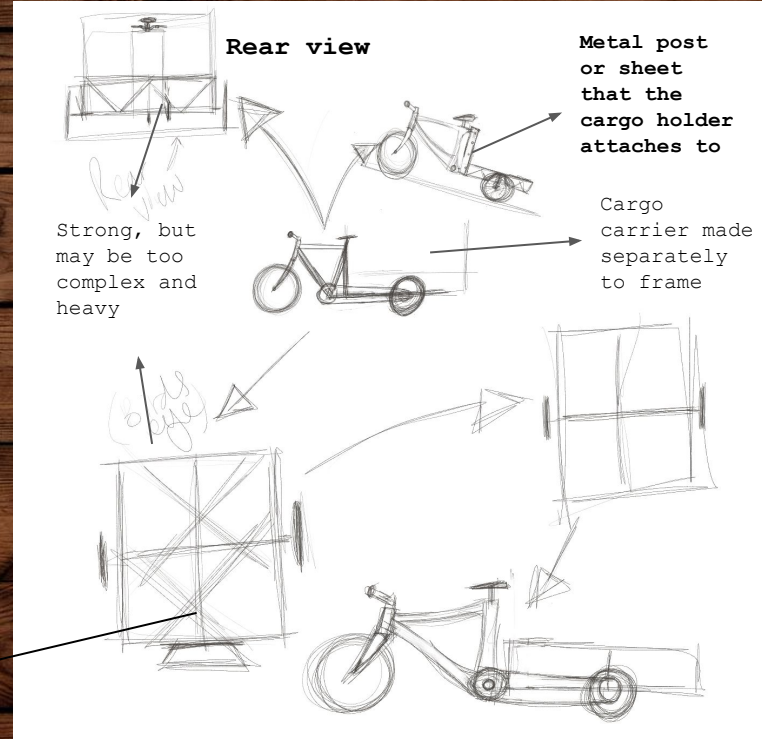
On this page are my development sketches for the frame and more intricate side of the bike and trailer. Such as how the chain will attach to the axle and also an exploded view of the axle itself. However it was after looking more into the design and developing each section that I realised the huge task that I had taken on. This is when I concluded that I wouldn't have enough time to carry out the design so I picked a more simple design to carry out. However, given a longer time period, this would have been my design of choice.

On this design, the top section will be used to hold the cargo, however the bottom would contain the components and drivetrain to make the trike actually move



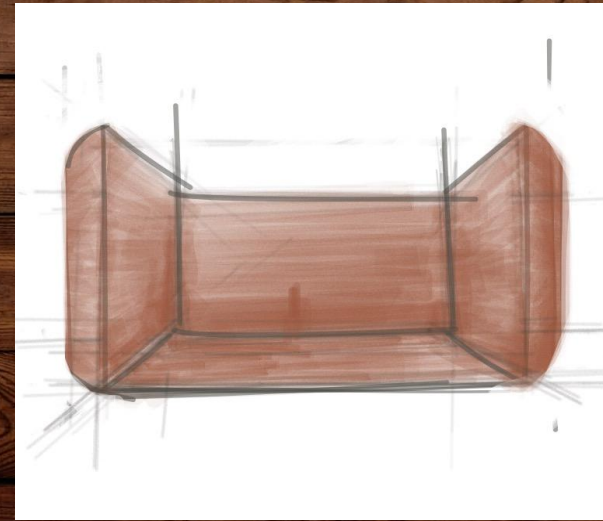
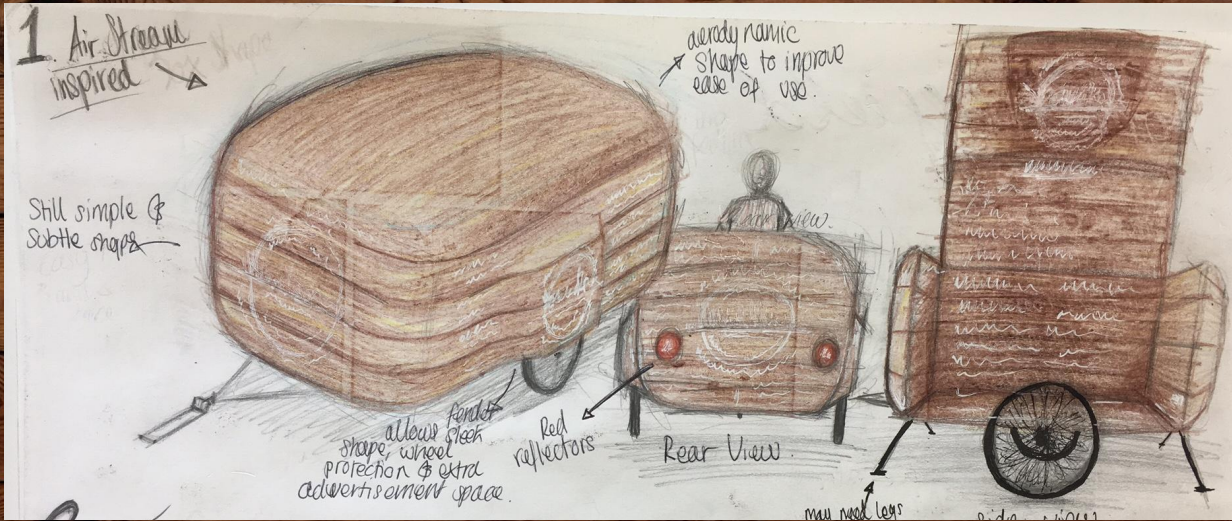
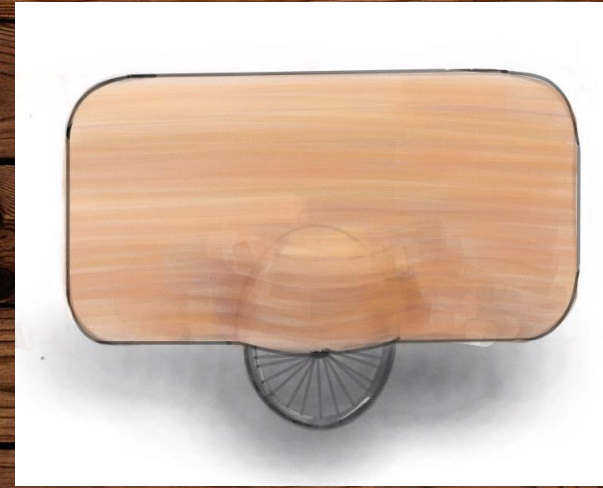
Would be very complex to build

Use of many triangles for strength



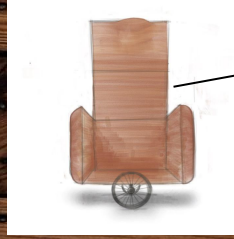
Airstream inspired design

I have reverted back to this design due to the huge task that I would have to take on to complete the Rickshaw design within the time frame given. A more simple trailer system would be more realistic to complete within the time frame. Despite this being my second choice, I feel that the aesthetics of this design are generally better than the first due to the curves of the trailer. However, I can already see many sections that I will need to develop such as the doors, and wheels, possibly even the curves of the design also.



Developments - Take 2

In my second attempt at my developments, I decided to take forward the Airstream inspired idea. Above was my original idea, however I thought the way that it would be used and the way the doors opened and closed was boring and not entirely effective and easy for the user to use. This is why this was one of the main things that I decided to develop as I was already happy with the general ideas for the aesthetics of the product.



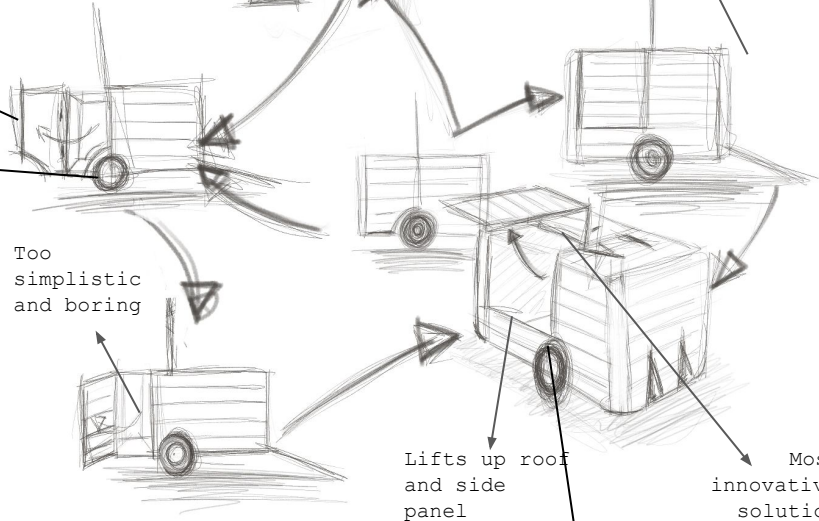
Limited accessibility for user due to roof

False back behind the wheel will allow for a bigger door and opening

In original design, the whole side panel opened up, however I got rid of this as it wasn't an effective use of space

Opening top and front panel as this is where the user will mainly sell from

Trip hazard



Too simplistic and boring

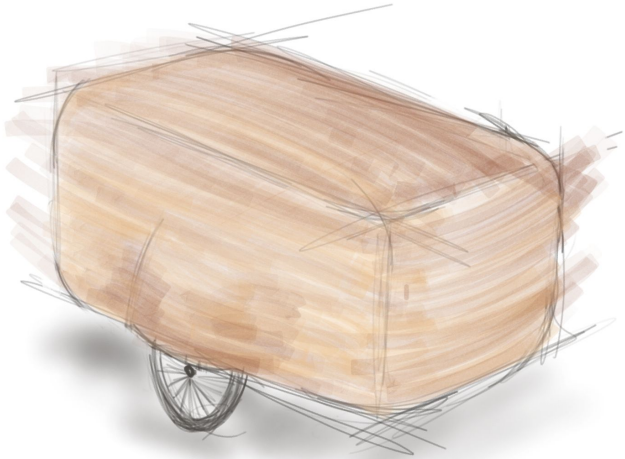
Lifts up roof and side panel

Most innovative solution

Easier for the user to access internal sections to get out stock etc

Will look cleaner without a false back as all lines in the wood will be parallel

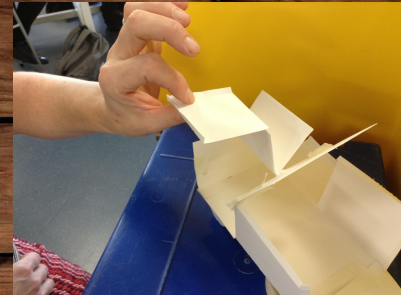
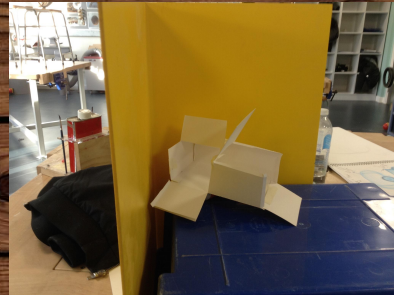
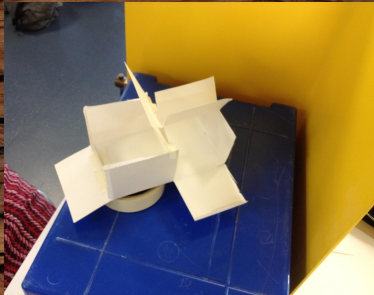
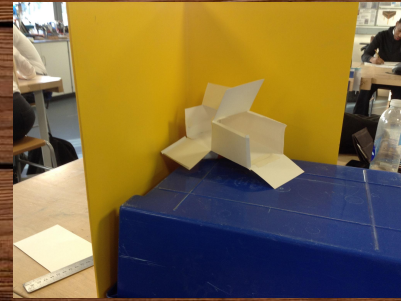
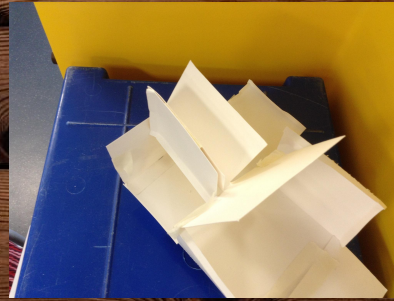
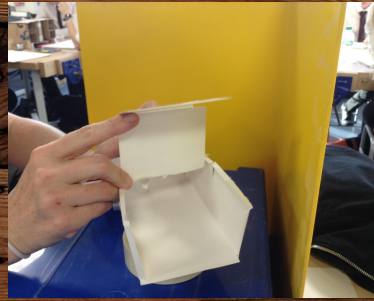
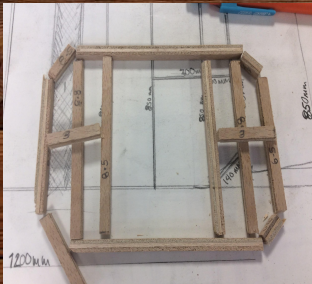
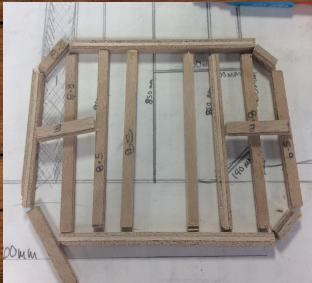
My original idea was to steam bend the wood around the frame to give the rounded look from my original design (left). However This had to be changed from the outset due to how difficult it would be in order to gain accurate bends. So the product I developed from this was using planks of wood, however using rounded corners that will be planed down to gain the desired curve.



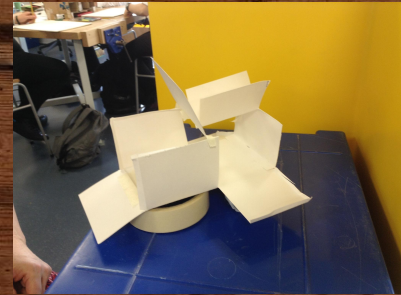
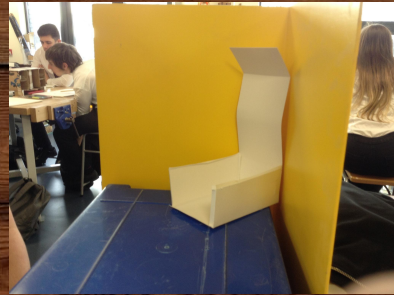
Model Making

Rather than making a model of a finished product, I used my model making stage to help me generate ideas and also gain a better visual understanding of my project. I used the model making stage for both the aesthetics and also for my frame by using small pieces of wood to lay out how I would weld it. This then helped me draw and get an idea of geometries and proportions.

These are examples of initial ideas for my frame that I made using small offcuts of wood. From this I gained a good foundation of ideas which I later developed off



(Above, Right) Photos displaying my generation of ideas for more innovative ways of the trailer opening and closing before beginning sketching

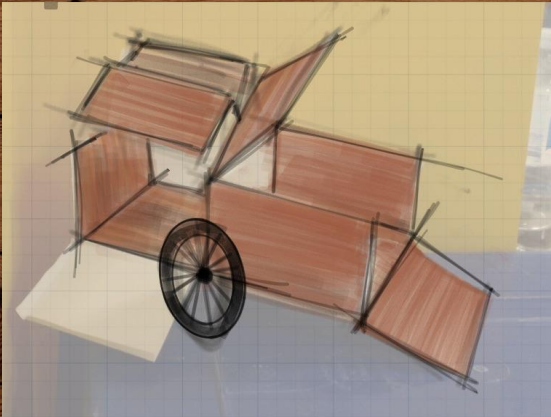


Developments

I generated more some of the ideas for the previous page by making a card model. I did this by cutting and folding the model to quickly gain and visualise ideas. Once I found an idea which I was completely happy with, I decided to take a photo, insert it into "concepts" and trace over the top. This gave me an even better idea of what it would look like on my product and also how well it would work. As you can see in the image below, there is a card model with my product traced over the top.



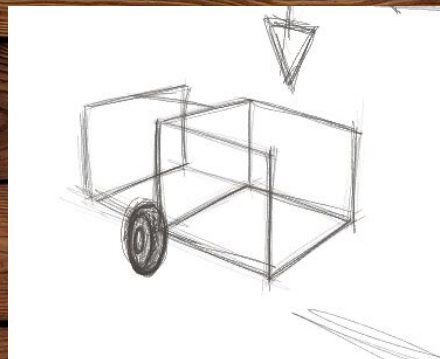
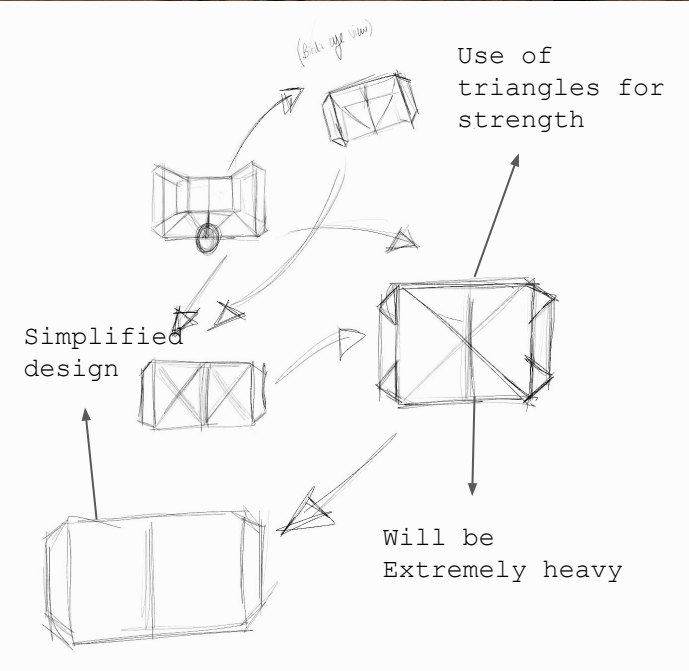
Following on from my model making, I took the sketch and put it into a scenario. This is what helped me decide on the idea of the "gull wings" to take forward as a solution for the doors. I felt that putting it in a scenario helped me visualize the finished product in use. Although it is not a completely accurate drawing, I feel that it will represent the finished product relatively closely in it's environment.



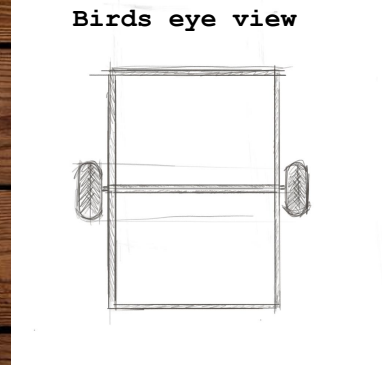
Frame Design

These frame designs were created using "concepts"

Below are some of my initial designs when designing my frame. After this, I decided that they were all far too complicated and developed them further into the frame on the right, which is much simpler, lighter and still strong enough to hold my project together.

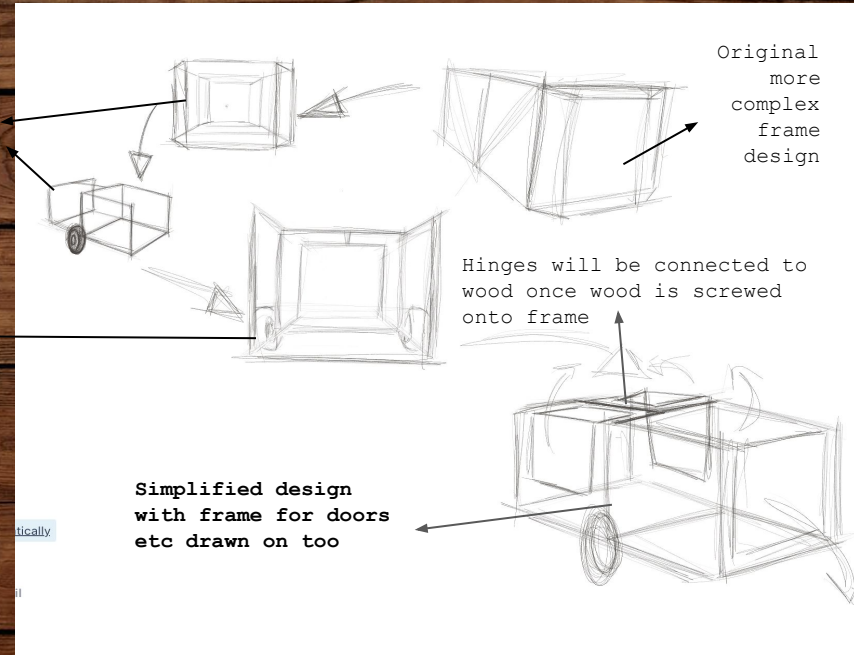


Both right and left show examples of the simplified design. I started with an over complicated design but as I developed it further I got rid of many unnecessary features. This helped me save weight and the cost of materials also.



Removed corner sections which I was originally going to bend the wood around as in my initial ideas this didn't have to open

Front view of simplified design



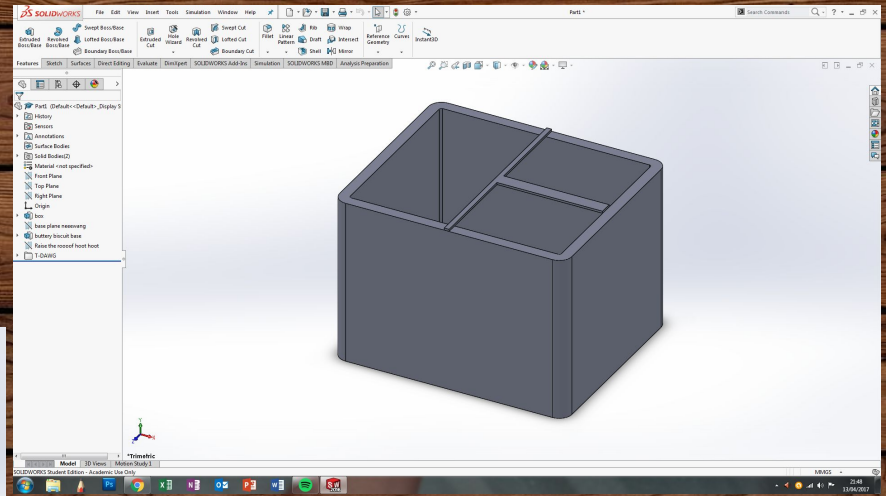
Material Selection

Component	Material	Cost	Suitable for Purpose?	Chosen Material
Body Panels	Oak	High	Oak is a very hard and durable wood which would mean that it would be long lasting. It is also very aesthetically pleasing when finished. However because of this, it may become incredibly precious and the trailer wouldn't be used to it's full potential.	My chosen material is Pallet wood. This is due to the fact that it is lightweight, reasonably durable and gives a rustic finish which I feel would fit the trailer well.
	MDF	Medium	Not aesthetically pleasing, reasonably hard, quite heavy and weight will add up as I use more on my design, resulting in it being difficult to use for the target user.	
	Pallet Wood	Low/Zero	Lightweight, very low cost if any at all, has a very rustic, worn and battered finish from it being in use and I feel that this would have a very interesting look on my design. Also, it is extremely available and I wouldn't struggle to find it.	
Frame	Titanium	High	Titanium has a combination of high strength, stiffness, toughness, low density, and good corrosion resistance. So would be perfect for a frame for my project, however, due to it's use in aerospace and the fact that it possesses so many useful properties, it is an incredibly expensive material.	My chosen material is angle-iron. This is mainly due to its cost and incredible availability. Also, the fact that it is incredibly durable and strong enough to withstand the trailer being functional
	Aluminium	Medium	low density and therefore low weight, high strength, superior malleability, easy machining, excellent corrosion resistance. However, Aluminium would be difficult to weld together to construct the frame with resources available to me.	
	Angle Iron	Low	Slightly heavier than other materials mentioned. However, still very strong, easy to weld, also, the right angle bend in the iron will make my corners on the frame much stronger. It is also cheap, sp with little experience with welding, it would be an ideal material to learn with.	
Axle	Aluminum	High	low density and therefore low weight, high strength, superior malleability, easy machining, excellent corrosion resistance. However, Aluminium would be difficult to weld together to construct the frame with resources available to me.	I will select steel for this component due to the incredible qualities it possesses for the lower price and it is also easier for me to weld with the resources available to me
	Steel	Medium	Steel possesses properties such as high Strength :Toughness :Ductility ; Weldability; and Durability.	

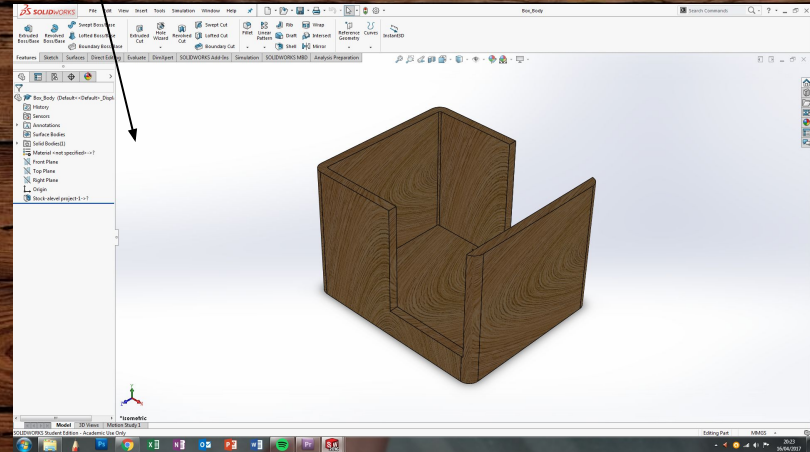
CAD - Solid Works

Cargo Holder - Body

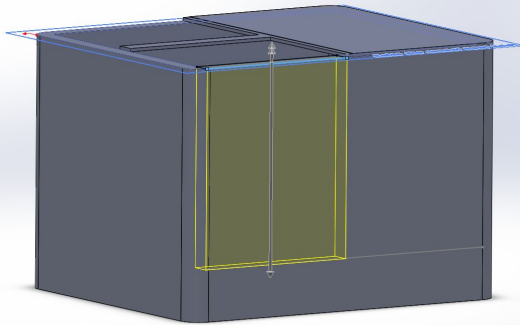
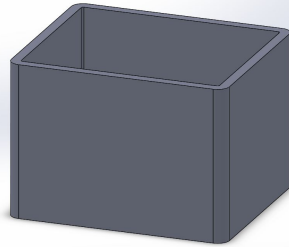
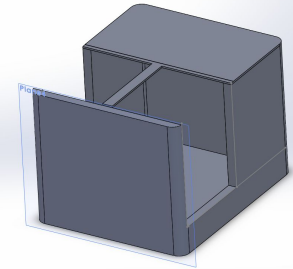
I created this using solid works. As it was one of my first times using the software and still relatively new to it I couldn't make it entirely accurate and struggled to make the wheels and axle components. However I hope to learn more about this software and use it more in my work going forward. To start, I created different planes and used the sketch tool in order to create different shapes.



Adding Materials

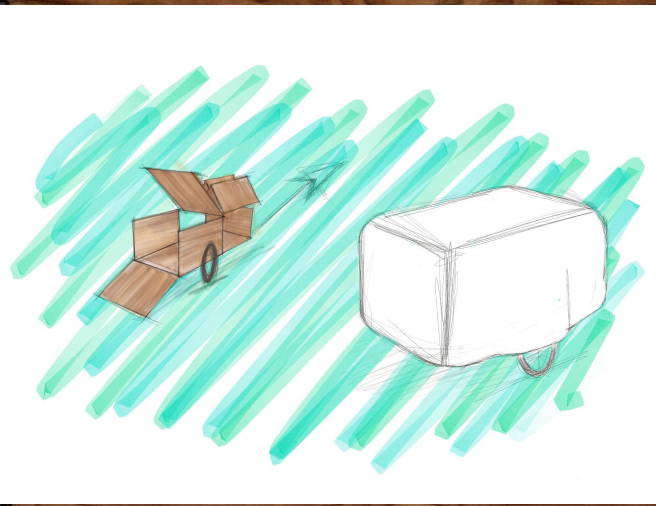


I decided to add a material to the drawing to give a more realistic look to it. However, as it is one of my first times using the software, I wasn't able to make separate planks of wood to give the extra detail needed.



Final Design

On this page is a collection of drawings of my final design. For my final design I decided to use upcycled pallet wood to give a rustic look, which is shown in my sketches using Concepts. I have also decided to use angle Iron for the frame due to the fact that it is cheap but still strong and sturdy which makes it fit for purpose. Below is my final render created on Solid works to show the shape and form of the cargo carrier.



Above is a representation of my original idea in the white, compared to a sketch of my final design. I placed them both next to each other to show the difference my developments made.

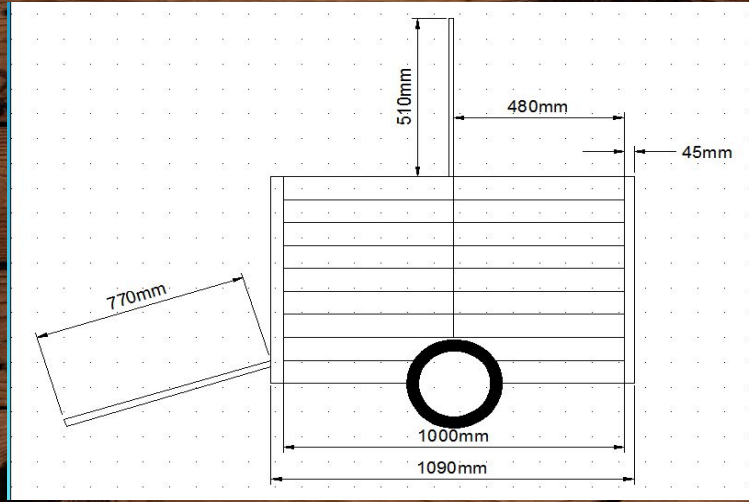
Also, how at a glance it looks like almost a completely different product. However when looking more closely you can still spot similarities.

Below is a final drawing showing how I envision the finished product looking. As you can see, I have shown how the doors will open. Also, I have shown the frame on the inside, although I hope to possibly cover as much of this as I can to give the product a cleaner look. The pallet wood used on the sides will be drilled and screwed into the metal frame. Also, the curved corner sections will be screwed from the inside in order to hide the screws.

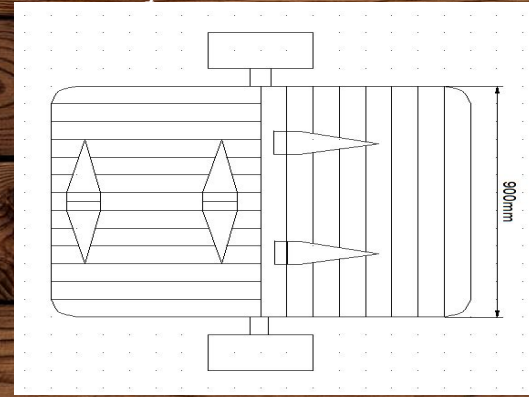


CAD - Working Drawing

Side view

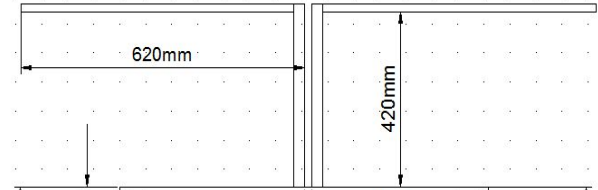


Birds eye view

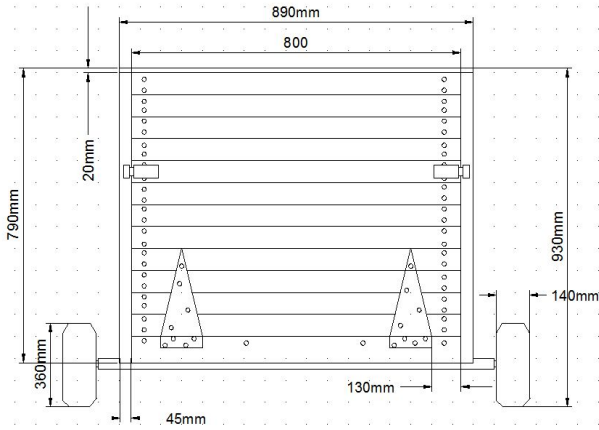


920mm

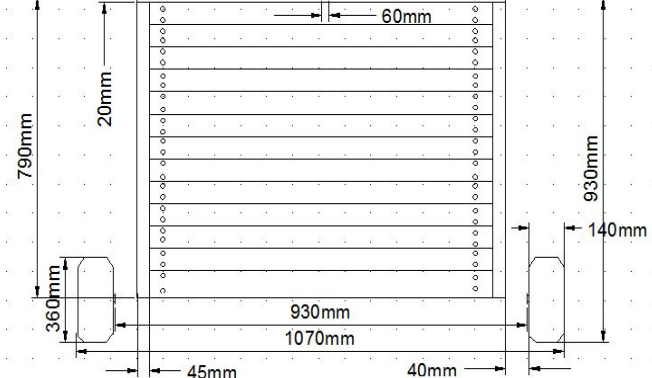
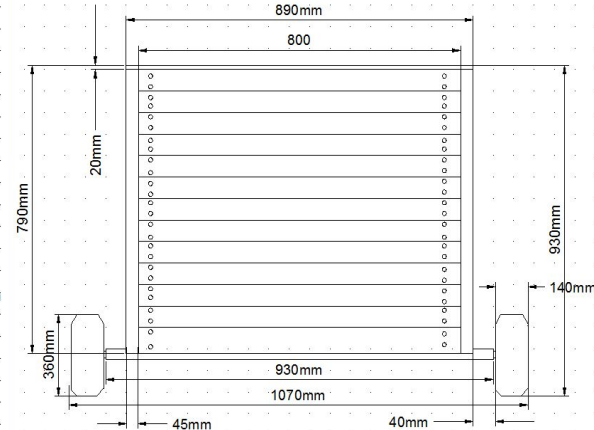
Rear view with gull wings erected



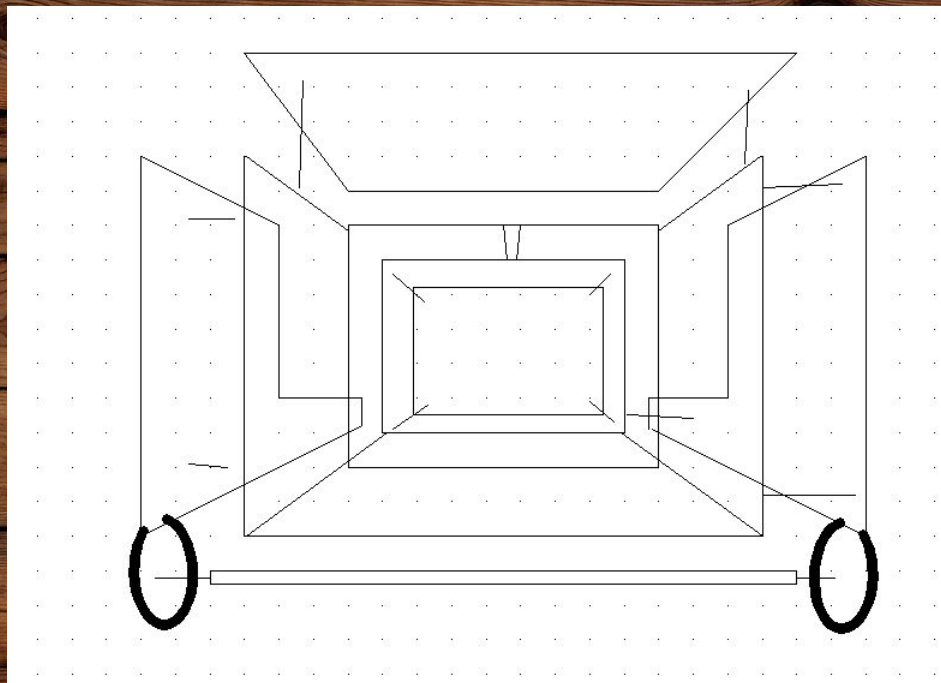
Front view



Rear view



CAD - Exploded view



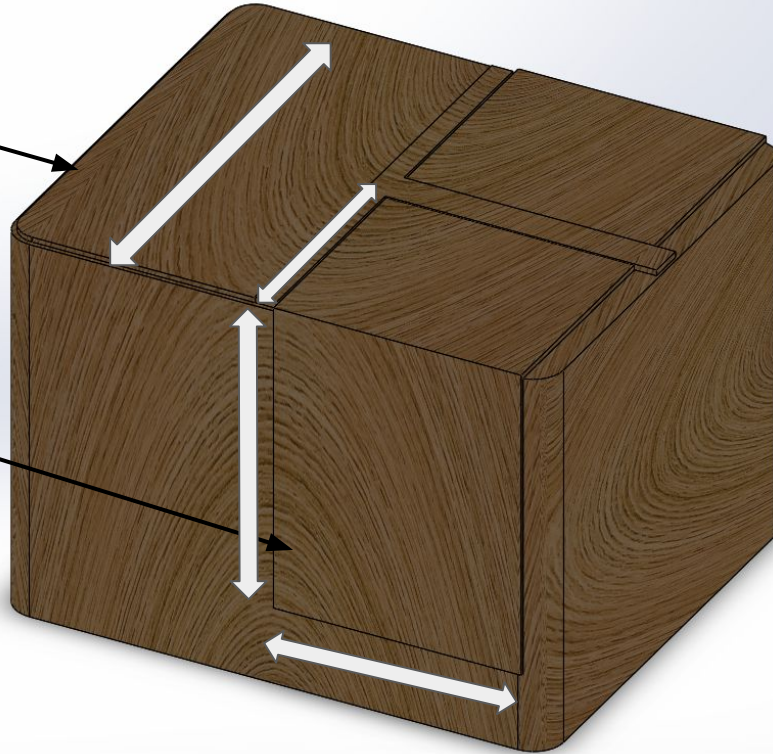
680mm

CAD - Engineering Drawing

Full Assembly

Front Panel Door
Width = 600mm
Height = 860mm

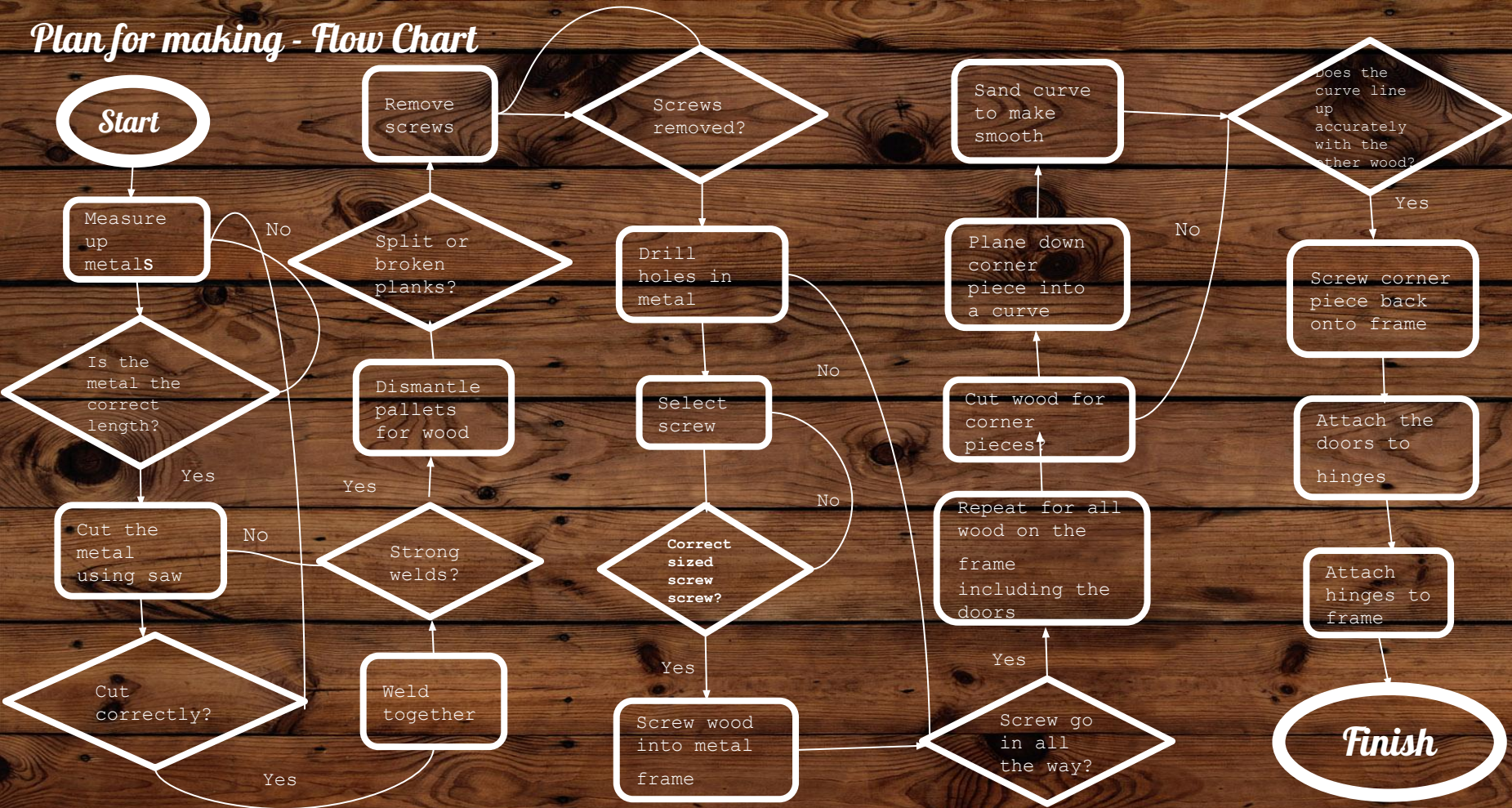
Gull Door
Width = 500mm
Height =
610mm/420mm



Plan for making - Gantt Chart

Task	Estimated vs Actual Time	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Comments
Size up and cut metal for frame	EST	█								1. This took longer than expected as I didn't realise, despite the simplified design, I still needed a lot of metal that had to be measured and cut accurately.
	ACT	█	█							
Weld frame together	EST		█	█						2. This took around the expected time, and the process became faster and easier as time went on as I could practise it more. I am glad to have learnt how to welding as this is a crucial skill that I hope to carry into the future.
	ACT			█	█					
Attach wheels to Axle and weld to frame	EST				█					
	ACT					█				
Dismantle pallets and remove old screws	EST			█	█		█			4. I thought this would take a lot longer due to the magnitude of upcycled pallets I had to use, however once I developed an effective process they came apart relatively easily.
	ACT			█			█			
Drill Holes in frame and screw wood to it	EST				█	█				5. Although this seems like a very simple task, the sheer amount of wood that needed to be drilled and screwed into the frame made this task last longer than expected. When the drilling was completed there was a few hundred holes and screws in the wood and frame that all had to be drilled individually.
	ACT				█	█	█			
Attach Hinges to doors	EST					█				I only really encountered problems with the wood on the door fitting into the gap left flush, however this was easy to fix on the belt sander
	ACT					█				

Plan for making - Flow Chart



Construction Process

Welding

After cutting my angle iron to the correct lengths, I then carried out the lengthy task of welding the material together.



As I had previously had very little experience of welding, this process was a learning curve. However, I completed this task well despite it taking slightly longer than expected, but the welds in the frame hold together well.

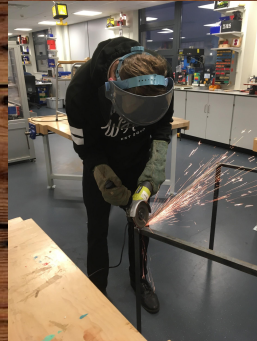


Grinding

Despite getting much better at welding as I practised more, in the beginning I needed to clean up many of my welds as they turned out as and were "slugs". I also used the grinder in order



to cut pieces of metal. For example, I miss calculated the length of the gull wing door and had to cut a section out and re weld, otherwise it would knock on the wheel and wouldn't be functional.



Disassembly of Pallets

Once the frame had been welded and grinded, I was ready to start putting wood on to it. However first I had to retrieve and disassemble it from upcycled pallets. At first, I found it incredibly difficult to disassemble them and tried multiple methods to try this as many pieces split. However, I developed an effective method using a crowbar and a hammer. Once I disassembled the pallets I had the job of removing the screws remaining in them.



Assembly of Side Panels

Once I had completed the tasks mentioned above, I then had to drill through the metal and the wood also. After this, I would have to select the correct sized screw and drill it through both the metal and the wood. This wasn't a difficult task however due to the amount of wood I needed to drill individually, it took a while to complete

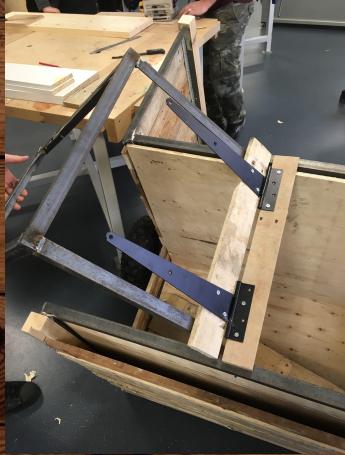


Construction Process

Assembly of Doors

Due to it being a moving part, this was a relatively complex section of my build. I encountered some clearance issues such as the frame for the gull wings being too long. This required me to cut out a section of the metal and re-weld it together. This made the door more functional.

Alongside this, some of the wood obstructed the door from closing properly however I got around this by sanding and filing the wood so it was more straight. After this, I attached the wood and door to the hinges that I had purchased. I had also managed to figure out a way to make the doors stop flush on the frame. This was by making the wood become drilled slightly off center so it would hit the metal and sit on top of the metal like a stopper.



Modifications

Despite being happy with the finished product, looking back there is certain things about the product that I would change. I feel that although the current frame is effective, I think that it would be even better if the frame was lighter again, making it easier for the user to move and maneuver. Alongside this, I think that by using lighter materials would also help this.

Also, despite the rustic look my product has from the wood that I used. It was hard to use and was inaccurate due to it's nature. To get around this I would use more available wood such as oak and burn it to still give rustic look. However not as worn as the wood that I have already used. The worn wood that I am currently using could be seen as a health and safety hazard due to the fact that you can get splinters from it as well as the fact that it is also quite dirty to give the rustic finish.

To help maneuverability, I would reduce rolling resistance with the road by using slimmer and less bulky tyres. Possibly something more like a bicycle wheel.

My original idea was to have it to be pulled by a bicycle, however as it is quite large this may be quite difficult, so if I were to redesign I would make it a smaller design in general or possibly try and use the Rickshaw inspired design.



Evaluation

My opinion

My brief that I designed my product from was; "The ability to perform a number of functions can sometimes form a unique selling point for a product. Design and make a bike trailer that can be used as advertisement for a local bike shop called, , that can also be used as storage and can pop out into a display stand. The product must also be able to be transported easily as it will also be used for deliveries." The problem I was trying to solve was that some small businesses have trouble pushing their brand to new audiences and customers, this is why I decided to make the bike trailer as it can advertise and is portable as well as be used for other functions that can help with the running of the business.

Specifications

My first specification was to do with it's immediate function which was that my design will be able to carry the cargo of a small business, be maneuverable, and be able to sell the cargo with ease. When the manufacturing process was complete I tested this by applying the products a business would sell to it to see how it performs. Once I did this the trailer was very functional and could hold all products that I put inside it with ease. Also, with use of opening and closing doors, products were easy to get to and show. The separate compartments in the trailer also helped a lot with this. My second specification was to do with the weight and I stated that my design will be lightweight however not so light that it is easily knocked over. I will try and make my product greater than 30 Kg however below 70Kg. However, due to the lack of resources I wasn't able to weight the trailer to get an accurate figure. However, I said that I will test this by using the mode of transport (in this case a bicycle) to attempt to pull it. And to test how it performs. I did this and the trailer itself wasn't too heavy to pull at all. Once the trailer started to move it gained a good amount of momentum in order to continue rolling.

My third specification was also my secondary function which said that the user of the trailer will be able to maneuver the trailer between events and jobs. It will roll easily and will be able to be towed by only a bicycle. I tested this by wheeling my project and getting other people to wheel my product around and ask them to rate the ease of use out of 10. However, due to the fact that it is a prototype, and the first full scale trailer I had made, it seemed to have speed wobbles and was very difficult to control at low speed when attached to the bike. So although the weight wasn't too much and it rolled well, when riding the bicycle it was very difficult to control and wouldn't be able to be ridden for a long distance.

My fourth specification was also my tertiary function which stated that my design will have designated sections that will be used to advertise the businesses and products that they are selling. I will create and develop this by using graphic design softwares such as adobe illustrator and photoshop. This will help it to have a professional finish. I tested this by I will make sure all advertisements can be seen clearly and read easily, and gives all information necessary. However, I did not complete this specification in it's entirety. This is because I didn't actually put graphics and advertisement on the trailer as it could be used for many different businesses. However there was designated areas inside the doors which boards could be screwed into as well as panels on the outside which would be easily visible to customers to the business. Another specification that applied to the aesthetics of the trailer stated that the shapes and colours of the trailer will flow and will be aesthetically pleasing. It will have a rustic look by using reclaimed wood to make it match the branding of the style of the business that would own one. I tested this during design by I will take inspiration from nostalgic designs from the past that I feel could influence the shape and form of the trailer and make it stand out. I feel that I completed this specification due to the fact that the only materials that I bought was metal for the frame and hinges for the doors. I also incorporated inspiration from designs such as the air stream design with curved corners on the trailer. I liked the rustic aesthetic of the wood which I decided to leave rather than burning and sanding the wood. A similar specification to this was that the trailer will be made from as many upcycled materials and parts as possible which was mainly to do with the cost. The fact that the majority of the materials were upcycled allowed me to keep the cost of the build incredibly low.

Evaluation

My quality specification stated that I will finish the product to a high standard by meticulously measuring, developing and carrying out the development process carefully and precisely. However despite many attempts to do this, I struggled to keep the trailer entirely accurate. Many of the problems started as early as the frame as some sections weren't straight and the rest of the project suffered as a result.

Also, due to the nature of the wood, it was difficult to keep it all the same size and thickness etc, however none of the pieces were the same which although makes it rough and rustic looking, takes away from the quality of the product.

My manufacturing specification stated that the product must be made using a variety of processes. To ensure I do this I will try to give my materials different effects and piece it together in a variety of ways. I tested this by testing a few different methods of manufacture to ensure that I received the highest quality result from the selected material. I did this with processes such as welding and grinding to test the ease of use with the material.

Opinions of others

In order to gain a better understanding about how useful and successful my product would be, I decided to ask target users if they could view my work and give any constructive criticisms about the product in order to make it better. The majority of the target users gave comments and good feedback about the product. This was the most important part of the evaluation of my product as I could see what the opinions of the users were which was the most useful for me. After this stage I then went back and created modifications page which shows things that I would change about the product personally with some points from the target user. Many of the users said that it is a good, functional product that would be of use to their business overall. I received many positive comments and many people liked the way doors opened and closed and many said that the overall aesthetics were good. Many comments were also mentioned about the good amount of space to show multiple price and products lists, as well as space on the outside to show logos and slogans etc. However the constructive criticisms I received were entirely fair and I thought much

the same about my build. Many people said that it was slightly too big to be pulled by a bicycle as it was difficult to judge the width as it is trailing behind and there would be high risk of a crash. Another popular criticism was that it should have skinnier tyres to reduce rolling resistance and make it easier to move over all. I also received comments saying that it should have suspension which would make the ride a lot nicer. However a unanimous comment that was made was about the speed wobbles that I have previously mentioned.

Manufacture

Due to the scale of the product and the amount of work I had to do I did struggle with the manufacturing stage. This meant that I wasn't the most organised when working however there was a reasonable amount of organisation. This included simple things such as measuring all metal for frame and wood to go on top of this. However due to the sheer amount of materials such as the wood and metal I had to measure and cut there was bound to be mistakes made along the line. Sometimes wood wasn't all same size, had to use file or sander, however some inaccuracies I wasn't able to sort out 100%.

The metal frame for both gull wing doors on the back was originally too long due to a mistake which was that I didn't realise that the length of it would mean that the door wouldn't be able to open due to it hitting on the wheel. To resolve this issue I measure how much I would need to take out of the frame in order for the door to clear the wheel. After this I used the cutting blade on the grinder in order to remove the section quickly and cleanly and then re welded the metal to allow it to move easily past the wheel.

There is some major differences between my product and one that I could buy from a professional company. Some of the differences include the materials used. Many other products would use a plastic for the side panels rather than wood. This is because it is lighter, more professional in aesthetic, and many different prints would be able to be put onto the plastic. Alongside this, products produced by professional companies would be much smaller, lighter would possibly

Evaluation

have purpose built bike permanently attached to it. However the downside to this would be that the shop bought product would be much more expensive in comparison to my product. This is because the majority of my project is built using upcycled materials. This is because I only paid for metal and hinges to use on the doors and frame. All wood and other parts such as the wheels and the axle were upcycled. If my product was to be produced using batch production there would have to be major changes to my design. I would have to completely re-think and change the materials used for the side panels and use a much more available wood that has been burnt and sanded or use a similar plastic that many other manufacturers that produce a similar product. I would also have to manufacture my own axles which would have to use a purpose built wheel in order to keep them all consistent and keep all products working the same.

The use of templates and jigs would speed up the frame production and sizing of materials rather than individually measuring each section. This would massively improve accuracy and consistency also, making sure that all trailers made in the batch would be as similar as possible.

Other factors

A major problem for small businesses is that advertisement on a larger scale is incredibly expensive. My trailer would reduce cost of advertising for small business and push the brand or business out into the public eye in order to help the business grow. It is also a functional and useful asset to have and could also help with the running of the business.

However due to its sheer size in its current design, it could be a nuisance to store away due to the fact that it is rather large if the business doesn't have the space to store it.

If the product was developed and put into batch production in a design studio with a workshop designing specifically for different companies and clients, it would create a low level of employment.

There would be a few specialists within the studio and workshop to ensure a high quality product could be made within a reasonable amount of time. Within the studio and workshop there would be 1 or two product/industrial designers, 2 welders and metalworkers, 3 woodworkers, 2 graphic designers. So it would be a relatively small workshop and production team however there would be enough people to ensure that the studio and workshop run smoothly. The smaller size would allow close work with company to make sure it is the ideal product and perfect fit for their business.

Conclusion

Overall I am pleased with my work, when I bare in mind the new skills acquired from building it as well as gaining more confidence in the workshop. However, problem after problem and was a major learning experience with the difficulties due to moving parts and doors as well as inaccuracies with frame and wood which I have already outlined throughout the evaluation.

That once one inaccuracy occurs, domino effect and the rest of the project suffers as a result, and I would try to be more accurate if I had to do it again.