A Level NEA Coursework



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Candidate number: **3095**

Centre number: **62451**

Coursework Key

Shapes

Click ***HERE*** To Play Me

Highlights Video Clips

EL
Page No.

Page number + Initials

Next Step:

Next Steps

Annotations

Borders

*Client/End User **OWN** Comments*

Primary Research

Response to feedback

Videos

General Comments and Information

Important/Key Comments

Text

Black text = General comments and titles

Blue Text = Subtitles and important/key information within paragraphs

Red text = Negatives

Amber text = Neither positive or negative

Green text = Positives

NEA Evidence

A LEVEL
DESIGN AND TECHNOLOGY

OCR
Oxford Cambridge and RSA

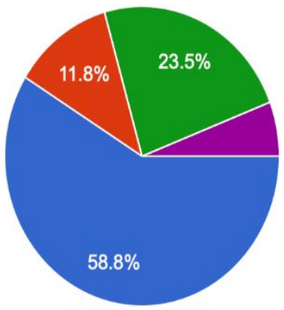
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Introduction of the Context

Context

When sourcing innovative furniture the **options** consumers are faced with are very **limited**. Furniture from large outlets almost always lacks a creative flair, is made from poor quality materials (hidden by veneers/finishes) and at an expensive prices. Currently if a consumer wants to own original pieces their only option is to get bespoke pieces commissioned which further inflates costs due to labour. My aim is to capitalize on the gap in the market for **innovative furniture** that is not only creative but also manufactured and sold at a **reasonable price**.

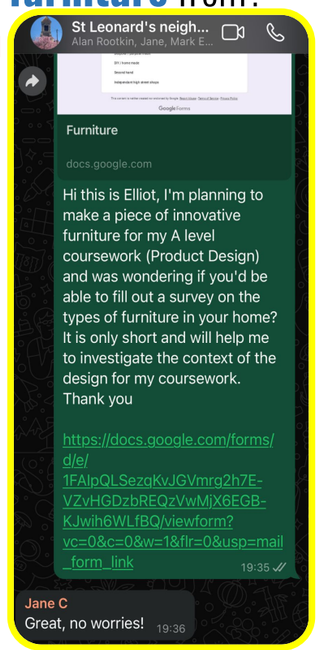
Local Survey - Where do you source your **household furniture** from?



For Example:
- Ikea
- John Lewis
- Oak furniture land
- DFS
- House & Garden
- Furniture Village

Here I asked my neighbourhood group chat the question **'Where do you source your household furniture from?'** This gave me a further insight beyond my own opinion on modern furniture. From my survey (of **15 different households** that responded). I discovered that the majority (58.8%) of people were buying their furniture from **large retailers**. This aligned with what I first believed and is further evidence that an innovative unique product is feasible and has the opportunity to thrive in a market consumed by bland unoriginal furniture.

The survey also drew my attention to the second hand furniture market. Inferring people choose to shop second hand due to **lower costs**. This further reinforces the importance of an affordable design to increase the feasibility of the product.



Examples of Furniture in Peoples Homes


leather is not as popular
prioritising comfort

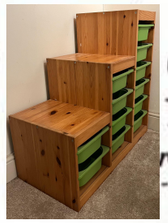

lack inority other than Circular shape
Environment impact of farming cattle


intresting low over lapping Coffee tables
modern look
Circular steel base to match top
Flimsy - only suitable for papers


steel is flimsy
Storage Combined with side table


Curves make for more interesting designs to look at

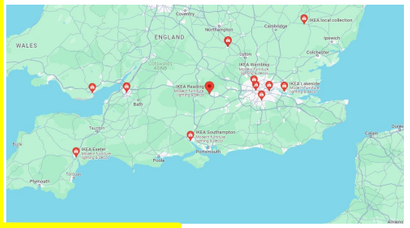
Simple design whilst also being innovative + intresting


Simple design
Cheap + easy to manufact -ure

EL
Page No. 1

Examples of Furniture on the Market from My Visits

Ikea Distribution





The distribution of ikeas in the south of england is concentrated meaning most people live within 2 hours of a store making furniture shopping at ikea very feasible for many people. Here are some examples of products and prices on offer:

on average = a whole week of work in the UK



expen -sive for what it is

Cheap MDF



Bland design

£499 for a dining table

£199 for a TV Stand

£229



Bedside / sofaside table

Bespoke Furniture Distribution



Bespoke/handmade furniture is also widely available however the number of products that are able to produce are often low and more expensive than other retailers.

almost £6,000 for a coffee table



THE VIRGINIA ENGLISH BEAM SQUARE COFFEE TABLE
£3,895.00

Bespoke size + design



modern bench with large high quality oak

interesting innovative curvy handmade chair

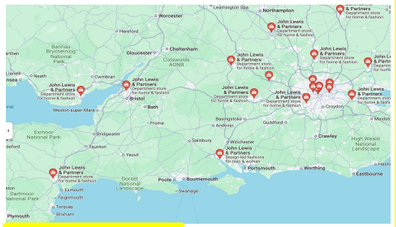
handmade furniture is far more expensive with bespoke work ever higher priced

Priced at over £1000



made from high quality timber

John Lewis Distribution





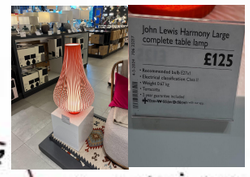
John Lewis is another large retailer for Furniture offering a high level of quality. Similar to ikea it is largely accessible to residents in the south of england thanks to its number stores.



Very expens -ive at £429 for the set

Space Saving simple design

paper lamp for £125



Still expensive at £399 for the set



innovative design but at a very high price

Similar set of tables but more innovative shape + design

My (mainly primary) research so far has shown there is a **large need** for **innovative furniture** that is available at a **reasonable price** that large stores don't supply. As a result giving me a lot of options/avenues of innovative furniture to explore.

Next Step: Exploring a range of challenging market opportunities

Range of Challenging Market Opportunities

Opportunities for Further Consideration



Furniture Types to Consider Ranging From Suitable - Unsuitable

Tables/Desks

- Tables / Desks are Larger Items of furniture that can **showcase upcycled metal pieces**
- Lots of room for innovation

Bar stools/Benches

- Allow for a possibility to be **more rustic/industrial than comfy lounge furniture**
- **Maximum Comfor**t is **less of a requirement** lending these types of furniture to metal work

Sideboards

- Large heavy furniture that **lends itself to metal work**
- **Space to Incorporate upcycled scrap metal** to create an innovative unique design

Lamps

- Possibility to **incorporate lighting into parts of scrap metal** in order to upcycle
- Possibility of **interesting shadows** from scrap metal

Bed Frames

- Little room to showcase upcycled metal work due to mattress covering frame
- Bed Frames are often made out of **"warmer" materials e.g timber**

Sofas/ Armchairs

- **Made from upholstery** with padding, springs, webbing, and fabric or leather covers therefore **not lending itself to upcycled metal parts**

Next Step: Investigating a concept in relation to challenging market opportunities

Unsuccessful Concept In Relation to Challenging Opportunities





























Reasons for Concept being Unsuccessful

I made this in my own time to test the feasability of using pallet wood

However it did not end up being feasable for the reasons stated

Similar ideas have been done before I am aiming to construct something more innovative

Some people may argue that only using pallet wood does not look good

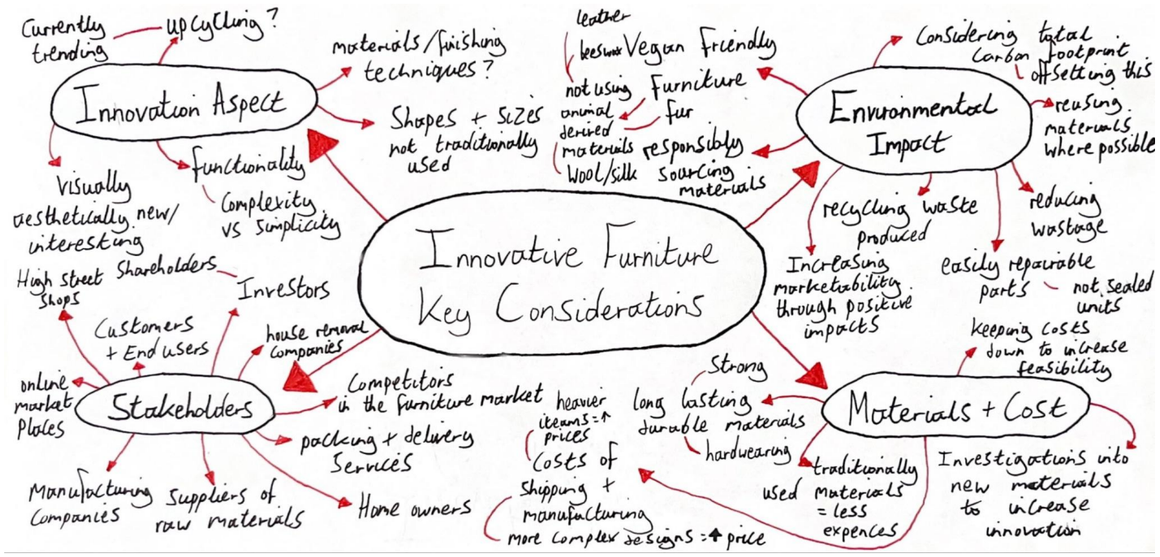
Due to the intensive make labour costs would be high decreasing profit

This idea works well for one person to make however it would be challenging to make in different industry due to every pallet being ^

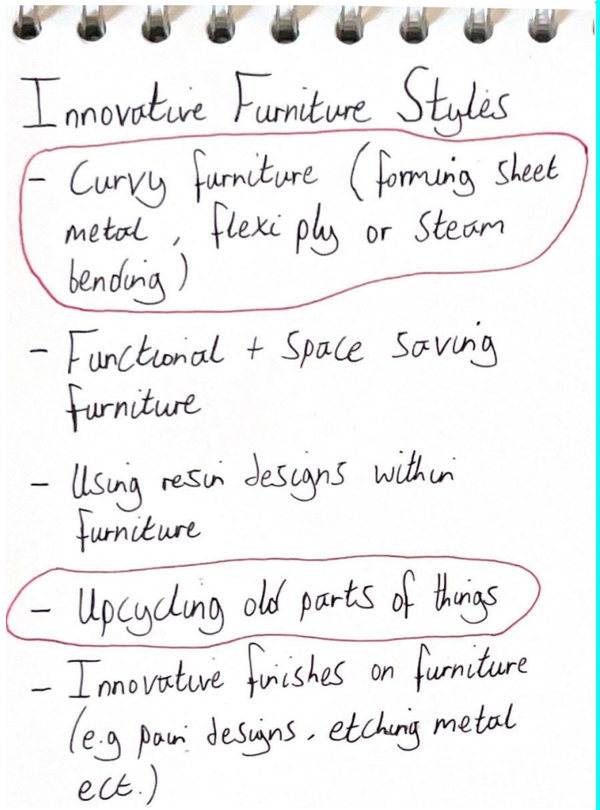
Next Step: Investigating the context further (opportunities for new + challenging furniture styles)

Investigation of the Context

Innovative Furniture Key Considerations



Opportunities for Innovation in Furniture Designs



Innovative Furniture Styles

- Curvy furniture (forming sheet metal, flexi ply or steam bending)
- Functional + Space saving furniture
- Using resin designs within furniture
- Upcycling old parts of things
- Innovative finishes on furniture (e.g paint designs, etching metal ect.)

Feedback on short listed furniture **design styles:**

'Curvy Furniture' – "I have not seen much curvy furniture. It does look interesting and unique but i'm not sure where it would fit in my house.

'Upcycling of old parts' – "I really like the idea of upcycling old parts as it is good for the environment and there will be more character and interest in the furniture as a result of the parts included within the designs"



This is a photo of me talking to a potential stakeholder on the shortlisted furniture designs

SWOT Analysis to determine feasibility of Shortlisted Innovative Furniture Styles

1.) 'Curvy Furniture'

Strengths	- Can be designed to suit natural shape of human body - Very unique + can be built with high standards (steam bending?)
Weaknesses	- No way to flat pack finished furniture - No environmental benefit which is important + 'on trend' now
Opportunities	- Unsaturated market - adds character to any home or space
Theats	- difficulty in shipping + transport due to unique shape ↳ Reduces profit margins

2.) 'Upcycling of old parts'

Strengths	- History of parts can be included to add character - old parts have potential to add structure to design - Environmentally friendly = Saves scrap from landfill
Weaknesses	- Consistantly sourcing parts might be challenging in industry - Sort after parts come with higher price tags e.g (set parts)
Opportunities	- Gap in the market - Potential to source parts that are interesting for cheap prices
Theats	- Shipping costs are greater due to weight of parts - every part to upcycle is slightly different → Challenge when manufacturing

Conclusion (Chosen Design Context)

After conversations with my peers and potential end users as well as research/analysis into solutions to the context, we decided that the **upcycling things** would be the most **suitable and marketable** style to pursue. I believe the idea has many strengths that can be capitalized on to create a marketable and feasible product. For example the **benefit to the environment** by giving existing products a new lease of life as well as the **on trend** aspect of high quality upcycled products that fit a large number of homes by adding character to the areas they are placed. On my next sections I will look into upcycling In more depth.

Next Step: Investigating the chosen context further (opportunities for sourcing upcycled elements)

Further Investigation of the Context

Types of parts to upcycle

In order to create innovative upcycled furniture I need to be decide on a **category** of upcycled material to use. Having researched available options by visiting Oakley Wood Recycling Centre I have created a list of options to discuss with my potential end users as well as photos of my visit to the recycling centre below:

- Metals:
Metal components can be upcycled to create furniture e.g scrap machinery

-Timber:
Timber can be taken from existing products to create new products e.g used Pallets

-Plastics:
Thermoplastics can be remoulded into new products e.g plastic bottles

-Fabrics:
Fabric can be reused to create new products e.g upcycling jeans



Me at Oakley Wood Recycling Centre

Conclusion (Chosen parts to upcycle)

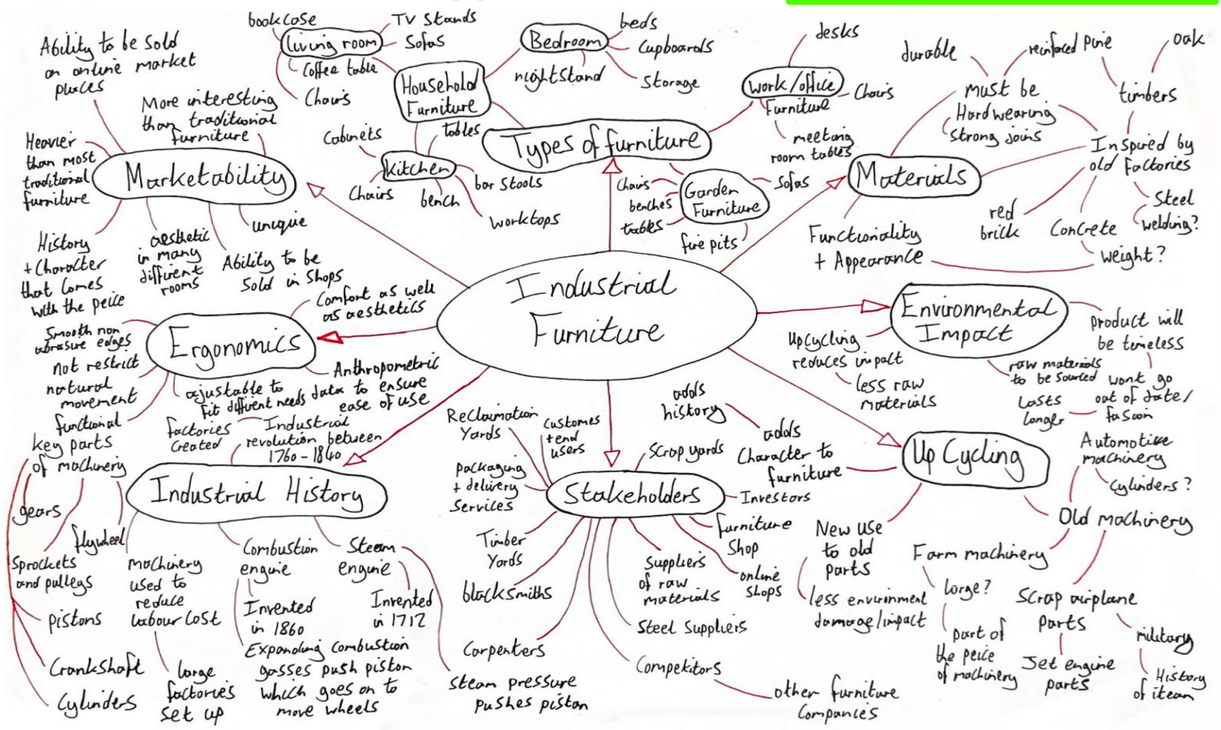


Me talking to a potential end user about parts to upcycle

Arthur mentioned that recycled metals would have more of a "***modern industrial look***" than the other options

Having discussed with potential end users as well as my peers I have decided to pursue the design of innovative furniture using **metals** as the **primary material.** This will create a more **industrial** type of furniture that I have explored below

Possible Challenging Opportunities

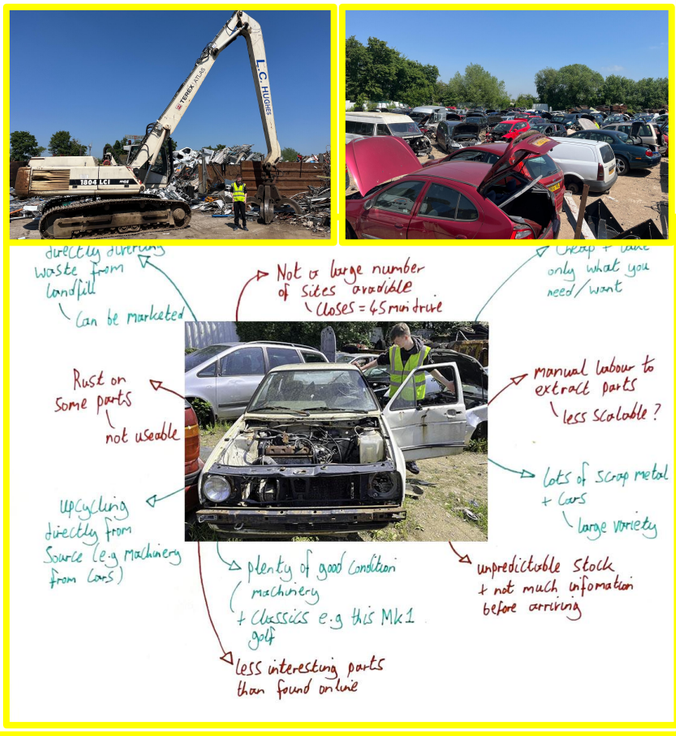


Sourcing Industrial Machinery to Upcycle-(positives + negatives and feasibility)

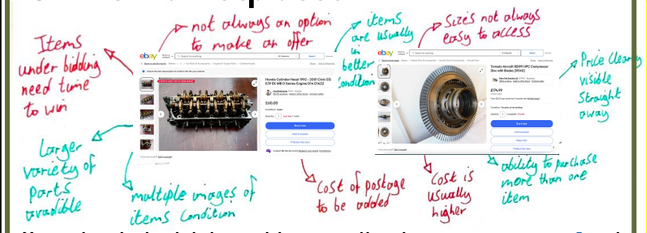
Reclamation/scrap yards



In order to fully understand the benefits and possibilities of using a **scrap yard** to **source machinery** for industrial furniture I Visited and spoke to the manager of a reclamation yard (a potential stakeholder of my product) who informed me that breaking down parts of engines for the bits you desire is **very feasible** as well as reinforcing the **'Much cheaper'** cost of using a reclamation yard over going **online** where 'in demand' parts have already been broken down for the **sole purpose of a profit**. The owner also claimed that in the last 10 years he had seen an increase of people shopping at the yard for with the intent to up cycle the parts brought further adding to the feasibility of the context.

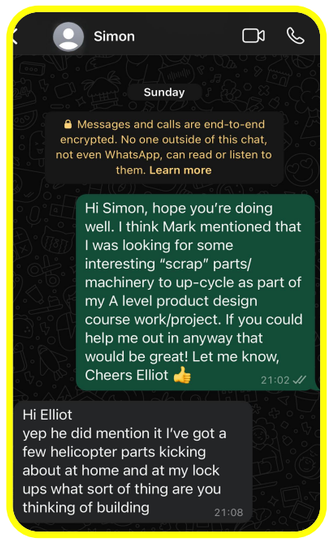


Online Marketplaces



Sourcing Industrial machinery online has **proven easier** in some respects as I have been able to quickly **refine the search** for pricing, size and item type making the process of finding scrap machinery faster. However items online come at a **higher cost** and postage and packaging also needs to be accounted for decreasing profit margins of the final product. Online market places also offer scope to order in more **exciting scrap machinery** such as jet engine turbines that may be more marketable and sell for higher Prices when incorporating into furniture Overall it may be more feasible due to the **wider range of parts** that can be found online instead of at reclamation yards

Local Contacts



In the prototyping stage of design I have potential to **experiment creatively** with scrap metal (often machinery parts) sourced from **local contacts**. This has the potential to benefit me as parts can be sourced quickly and for a **reduced cost**.

Next Step: Introducing the stakeholders, end users and creating a detailed design brief

Introduction of Stakeholder and End User + Design Brief

Design Brief

I will be designing, modelling and making an innovative piece of furniture by **upcycling scrap material** from my conclusion on ***page 4***. Alternative to traditional furniture, it will have a **modern industrial look**, incorporating a piece of **upcycled material** to add to the items innovative personality and challenge of the brief.

Main Stakeholder - Grant Copper



General Information

Name: Grant Cooper

Age: 50

Interests: Mountain biking, Skiing & Design

Occupation: Metal Fabrication (design led projects).

Location: Warborough

Background

Grant Began work as a **Quantity Surveyor** before moved into process analysis and improvement in the **DNA testing** industry. There he took products through FDA approval for sale in the US & designed and managed the **production** of a novel **blood testing** kit for use by vets. **Grant now** mixes this **experience** with the **practical skills** learnt in **construction**. Working with designers and clients to **fabricate** bespoke **metal** work for installation in the Uk and abroad.

Why Grant is a Good Stakeholder to Work With:

Grant is an **ideal stakeholder** to work with throughout the design process as he has an **abundance** of **knowledge** and contacts **within** the **metal work industry**. Grant will be able to give **excellent advice** on **feasibilities** of designs in industry as well as **advice** on **techniques**/**finishes** for my **final prototype**

Main End User - Arthur Lawrence



General Information

Name: Arthur Lawrence

Age: 20

Interests: Sport/fitness, History

Occupation: 3rd year university student

Location: Leeds, West Yorkshire

Background



Having completed both GCSEs and A levels at Wallingford School Arthur is now studying history at the University of Leeds. Having moved into his own house in 2023 and having to furnish his room he has a good understanding of prices of furniture as well as sizing and aesthetically pleasing pieces.

Why Arthur is a Good End User:

Arthur is a great end user as he has an **eye for unique styled furniture** and **on trend aesthetics** making his feedback invaluable to help me craft my designs.

"When shopping to furnished my university house I have found myself wanting more than ikea flatpack furniture. However when looking further afield interesting furniture is expensive and lacks unique selling points" - Arthur

Additional End User - Abi



General Information

Name: Abi

Age: 56

Interests: Football, Reading

Occupation: Teacher

Location: Wallingford

Background

Abi has dedicated her life to **teaching**, working in **various schools**, including a decade in Portugal. She now **resides** in **Wallingford** with her husband and three children, teaching at a local primary school. In her **free time**, she enjoys watching **football** and **reading**. Abi also has a **passion** for **discovering unique furniture**, often purchasing **interesting pieces** that **add character** to **her home**.

Why Abi is a Good End User to Work With:

Abi is an **ideal end user** for **evaluating** the **final product** because she **regularly purchases furniture** and has a **wealth** of **experience** in assessing pricing, quality, and sizing. Her familiarity with different styles, materials, and dimensions that work well in various spaces allows her to provide **valuable insights**. Additionally, her **firsthand knowledge** makes her **feedback** particularly **useful** in **refining** and **optimising** the final **product**.

I will involve my **stakeholder and end user** by asking for **feedback** on the majority of my pages and all aspects of my product. For example, suggesting the materials they'd like included within designs and what they like about their **current furniture** but also how they would **improve** it.

Next Step: Primary and secondary research into a wider variety of additional stakeholders

Extensive Research into Wider Stakeholders

Manufacturing Related Stakeholders

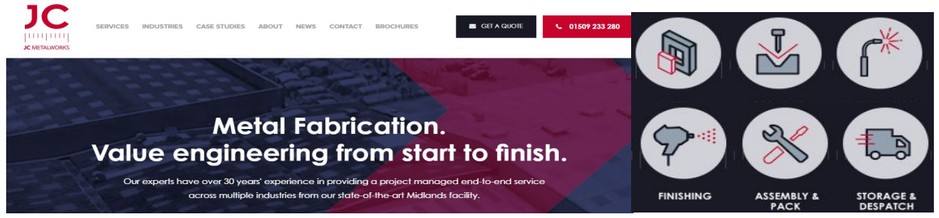




Early Stages of Manufacture

Having visited the Sylva Wood Centre I am also aware of smaller establishments that offer **short term rented workshops** after being shown around their "business hub". The website www.sylva.org.uk advertises these 10x10 metre space for "small businesses and craftspeople who design, innovate or make in wood". In the **early stages of manufacture** it would be important to further consider places/organisations similar to Sylva in order produce furniture on a smaller scale with **less financial risk** due to there month by month billing system.

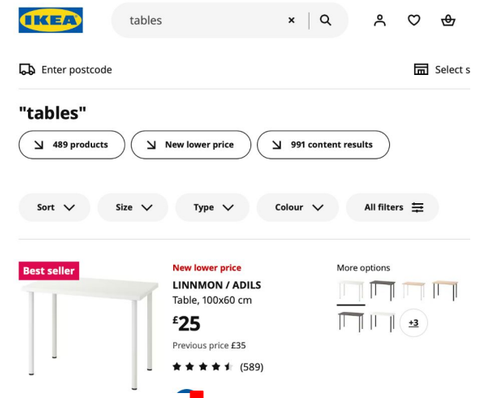
Late Stages of Manufacture



In the UK and abroad, there are a wide range of **steel manufacturers** that I could choose to manufacture **parts of my end product** before it could be **assembled separately** to incorporate an upcycled piece of machinery. By manufacturing the majority of the design it will ensure costs are kept low which can be represented to consumers with the final price. Some potential manufacturing stakeholders I have researched include **JC Metal Works** as well as **HTA Group**.

Market Related Stakeholders

The most **popular furniture** stores in the UK include **ikea**, **furniture village**, **habitat** and **DFS**. Many furniture shops sell a large range of **household furniture** including shelving seating and tables however the don't tend to cater for customers seeking innovative furniture with a sense of personality as these items tend to be **more expensive** to produce and be harder to store/deliver (due to the difficulty of flat packing). As a chain store the complications of real innovative furniture comparatively to their other (much cheaper to produce) products that people still buy means for them it isn't seen as a **worthy investment**.



The range of tables lacks any innovative products

INNOVATION LIVING™


Grids Table Ø35 Black Oak Veneer

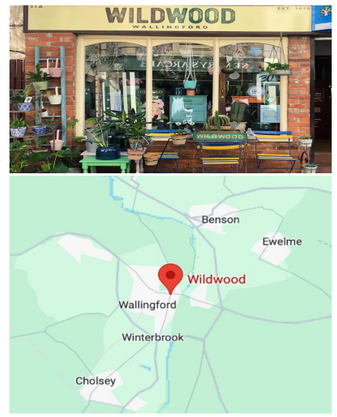

Grids Table Ø35 Oak Veneer

Those who want innovative furniture are forced to look further afield for innovative furniture online at shops such as **'innovation living'** or **'bonaldo'** whilst these companies don't currently sell my innovative furniture design idea they would potential be places I could sell my product .

Other shops who sell more **innovative furniture** online include:

- Poliform
- Visionair
- Funky Chunky Furniture

All of which are places I could potentially **sell my product** if it was decided to be more beneficial than selling directly to consumers. Making these companies stakeholders I should consider



Local Stores

There are a number of places that would be sensible to place my product while I am starting up as in the early stages in manufacture I will have **limited stock**. For example the independent homeware store **'wildwood'** would be an ideal place to trial my product due to their small selection of innovative and interesting furniture pieces.



I often prefer to purchase furniture on-line because of the practicality but, is time allows, it can be fun to visit local stores to get a feel of the furniture - Arthur

Delivery Related Stakeholders

Delivery/transport options

Most of the **manufacturing companies** have the **option for delivery.** This will be largely important as the furniture is likely to be assembled at a different location to some of its manufactured parts.

To deliver **assembled furniture** to households within and outside of the UK, delivery companies such as **DHL** and **Royal Mail** can be used. Other options for delivery include **company vans** due to heavy furniture being challenging to move. However this is **unlikely to be feasible** in the early stages of production.

DHL

Size	Price	Dimension
Large Up to 20kg	From only £4.90	**Maximum dimensions (cm):** 60 (l) x 60 (w) x 60 (h)
Extra Large Up to 30kg	From only £8.80	**Maximum dimensions (cm):** 120 (l) x 70 (w) x 70 (h)

DHL offers delivery on Extra Large packages on **up to 30kg** which is likely to be an option for smaller items of furniture. However if my product does exceed the DHL requirement there are other shipping companies that will handle parcels **40 kg+** such as **DX Freight and Tuffnells**

End User Comments on Delivery

I would want my furniture to be delivered on time and at a reasonable price to ensure my satisfaction with the company - Arthur

Next Step: Creating a list of end user and stakeholder needs and wants from in person meetings

End User + Stakeholder Needs and Wants

PUN
(Primary User Needs)

From my end user + stakeholder needs and wants research i have created 6 key PUN points that I will refer to with the correct numbered circle in my design ideas.

1 PUN The product must have a suitable modern appearance **enhanced** by the upcycled machinery

2 PUN The furniture design must include an item of upcycled machinery and be made of **recyclable materials**

3 PUN The furniture must meet its **intended use** while being user friendly and **ergonomical** as a result

4 PUN The furniture must be **safe to use for all end users**

5 PUN The furniture should be able to be **manufactured cost effectively** to keep the product priced competitively.

6 PUN The furniture must be able to **fit between standard uk door frames** so that it can be easily installed/transported 2000 x 765 x 35mm

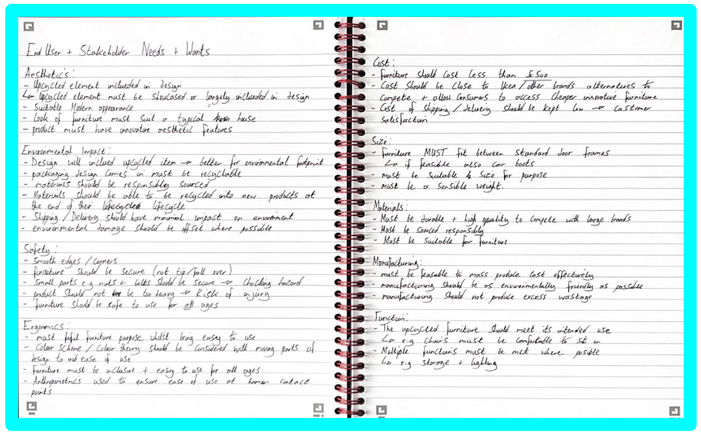
Points to Consider from My Personal Meetings with My End Users and Stakeholder





Me talking to my end user and stakeholder about their needs and wants

My notes from the meeting with end user and stakeholder



Having sat down with both Grant (my stakeholder) and Arthur (my end user) I **took notes** listening to their **thoughts on requirements** my upcycled industrial furniture must meet. From my notes I derived a refined list of essential features and characteristics my product will meet by the end of the design process. By **amalgamating** both **end user** feedback and **stakeholder** feedback I can be confident that my prototype will meet the needs of the target audience as well as those involved.

Aesthetics
- The furniture must have a suitable modern aesthetic
- The furniture should be enhanced by the upcycled element of the design
- The furniture should suit a typical houses decor
- The furniture must look interesting and innovative
- The upcycled element must be showcased or largely included within the design

Ergonomics
- The furniture must fulfill its intended purpose well e.g a chair must be comfortable to sit on
- Colour schemes / colour theory should be utilized in designs when dealing with intractable parts
- Furniture should be inclusive and easy to use for all ages + abilities
- Anthropometric data should be used to ensure harmony between the furniture and end users

Materials
- Materials should have suitable tensile strength and durability as well being easily cleanable once finished
- Materials weight should be considered through the design process
- The materials used for the upcycled furniture should be responsibly sourced
- The materials must be suitable for the intended purpose of the furniture

Environmental Impact
- The furniture must include an upcycled element to reduce its impact on the environment
- The upcycled element must no longer work in its original intended use
- Packaging included with delivery of the furniture must be recyclable
- shipping / delivery must have minimal impact on the environment

Cost
- Furniture should cost less than £500
- The cost of the upcycled furniture should be as close to ikea/large brands equivalent pieces of furniture to stay competitive
- Cost of delivery should be kept low to insure customer satisfaction
- The cost of upcycled furniture should be affordable

Manufacturing
- The final prototype of the upcycled furniture must be able to be adapted to meet mass manufacturing
- Manufacturing should be kept as environmentally friendly as possible
- The manufacturing process should not produce excess wastage of materials

Safety
- Smooth edges and corners must be featured within the design
- Furniture should be secure (not tilt, tip or fall)
- Small parts e.g nuts and bolts should be tight to prevent choking hazards for children less than 3
- The weight of the furniture should be considered (not to cause unnecessary injury)
- Furniture should be safe to use for all ages

Size
- Upcycled furniture must fit between standard uk door frames as well as car boots where possible 2000 x 765 x 35mm
- The size of the upcycled furniture should be suitable for its intended purpose
- The upcycled furnitures size should be considered as it will also have a direct impact on the weight of the piece of furniture

Function
- The upcycled furniture must meet its intended function
- Multiple functions should be considered where possible in the design process for example incorporating lighting with storage

Next Step: Investigating a wide range of materials available to me in school

Broad Investigation of Available Materials

Mild Steel

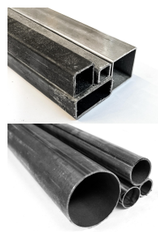
Manufacturing + sustainability

- Mild Steel is manufactured by melting iron ore and coal together Subsequent to extraction in a blast furnace. The mixture is then moved to another furnace to burn off impurities. This process is highly energy taxing as well as the environmental damage from extraction impacts how sustainable the ~~sustainability~~ process is

Physical and working properties



Sections and sizes available



- Mild steel is available in a number of different sections and sizes for example circular, rectangular and square cross sections.

Products/uses



Acrylic

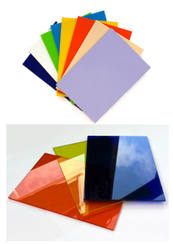
Manufacturing + sustainability

Acrylic is a thermoplastic meaning it can be heated and cooled while maintaining it original properties. However like most plastics it is unable to biodegrade. Therefore the sustainability largely depends on how acrylic is recycled.

Physical and working properties



Sections and sizes available



- Acrylic comes in a range of sheet sizes that can be laser cut to size.

Products/uses

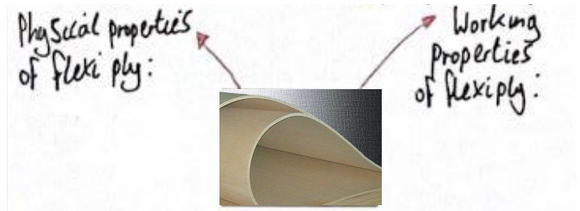


Flexi ply

Manufacturing + sustainability

- Flexi-ply is made from layers that are glued and pressed in the same direction to give it its flexible characteristics. Similar to plywood. The Sustainability of flexiply largely relies on where the wood is sourced and what glue is used

Physical and working properties



Sections and sizes available



- Flexi-ply comes in a range of sizes with slight alterations in thickness. If longer sizes are needed flexi ply can be over lapped to create longer lengths

Products/uses



Laser Ply

Manufacturing + sustainability

- Laser ply is manufactured from thin veneers that are glued together to form sheets. Sustainability of laser plus ply largely relies on the glue that is used and where the wood is sourced from.

Physical and working properties



Sections and sizes available



- laser ply is available in a large range of sizes and thicknesses much like normal laser ply

Products/uses



All of the materials above are **available** in **school** from which I could make my prototype from. Having **investigated each material** I have a **wider understanding** of how I can **utilise** the **properties** of individual **materials** to **create** my final **prototype**. At this stage it is **impossible** to **rule out materials** however from the 4 listed above it is likely that I will use mild **steel** as its **aesthetics** match those of **industrial styled products**.

I like the asthetic of mild steel it fits the decour of most rooms in my house and also complements my other furniture - Arthur

I agree with **Arthurs** comments on **mild steel** and will look to **incorporate** it in some of my **design idea** pages to get a **feel for** its **aesthetic**.

Next Step: Further investigation of materials available to me in school

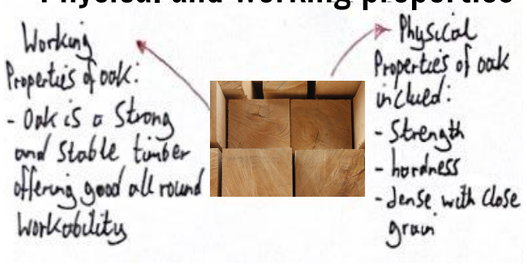
Broad Investigation of Available Materials

Oak

Manufacturing + sustainability

- Oak trees are cut down before being cut to length length on site. Oak is processed where bark is removed. The more sustainable oak comes from responsibly sourced. Oak is a natural material and does not require large amounts of processing reducing its impact on the environment

Physical and working properties



Sections and sizes available



- Oak is available in a large number of sections and sizes. When size becomes an issue sections can be glued together to provide larger sizes.

Products/uses

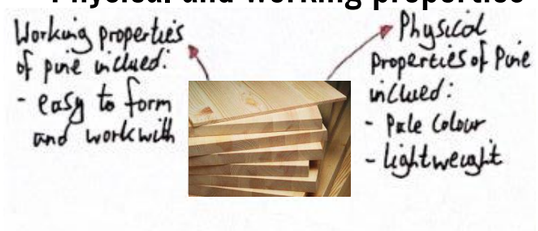


Pine

Manufacturing + sustainability

- Pine wood is considered highly sustainable this is due to its fast growing nature as well as its ability to store carbon. Pine like other timbers has a relatively small amount of processing required adding to its sustainability.

Physical and working properties

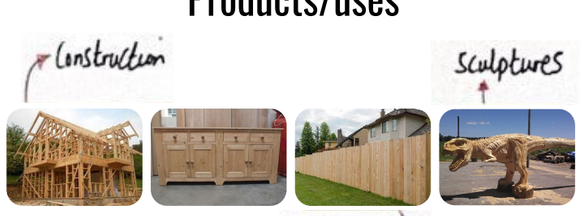


Sections and sizes available



- Pine is available in a large number of sections and sizes and can be cut to required lengths on site.

Products/uses

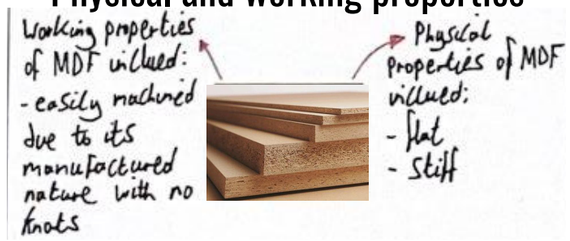


MDF

Manufacturing + sustainability

- MDF is considered to be sustainable and environmentaly friendly. This is due to MDF being mainly constructed from wood fibres which have been reused. Therefore reducing waste as well as resulting in a higher percentage of trees we harvest becoming valuable products reducing strain on forests.

Physical and working properties



Sections and sizes available



- MDF is available in larger sheet sizes than regular timber as it can be manufactured to meet customers need and requirements.

Products/uses

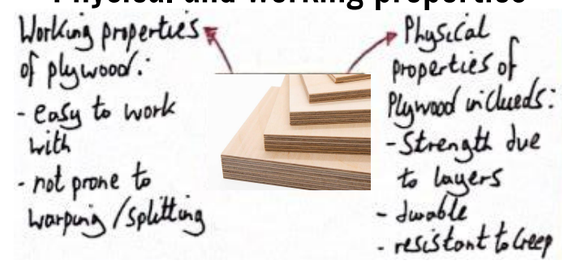


Plywood

Manufacturing + sustainability

- The sustainability of plywood depends on factors including how the wood is sourced and what glue is used to connect layers. For example synthetic glue can make plywood harder to recycle. However there are companies that create more sustainable plywood.

Physical and working properties

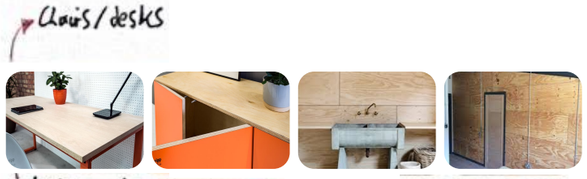


Sections and sizes available



- Similar to MDF, plywood is a manufactured board and therefore can come in in large sizes to meet customers demands.

Products/uses



Similarly to the previous page **all** of the **materials** above are **available** in **school** from which I could **make** my **prototype** from. At this stage as mentioned it is **challenging** to **decide** on **materials**. However when I begin to **generate design ideas** there will be **more scope** for **further research** and **testing** of materials to ensure they **meet** the **intended use**. As well as investigations of suitable **joining methods** and **finishing techniques** for **chosen materials**.

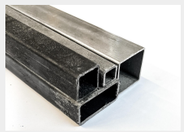
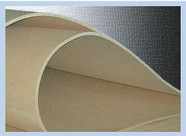
Having used Ashwells Timber Recycling for a project at RHS Wisley, Elliot & I discussed visiting Oxford Wood Recycling to source potentially interesting timber for his project.

Grants comment on **timber** have been really insightful. I will take his advice and visit **Oxford Wood Recycling** to help me **choose timber**.

Next Step: Ranking the suitability of materials for making models and the final prototype

Suitability of Available Materials

Suitability of Available Materials Ranging From Suitable - Unsuitable

Material	Image	Key Aspects	Overall suitability	Purpose for Prototype
Mild Steel		- Mild steel is used in manufacturing and construction due to its **high impact strength**, and its **workability**, allowing easy cutting, welding, and shaping.	- Extremely suitable for an **industrial furniture aesthetic**	- **Framework**, **structural elements** of the design
Oak		- Oak is known for its **strength**, **durability**, and heavy **weight**, making it a good choice for furniture. Its **dense grain** provides excellent **resistance** to **wear** and **impact**.	- Extremely suitable for **high end furniture**	- **Framework**, **structure** or **table tops**
Pine		- Pine is **strong**, **durable**, and **lightweight**, making it a versatile choice for furniture. Its lower density allows for easier machining, while still providing good structural integrity.	- **Moderately** suitable for **furniture**	- **Framework**, **structure** or **table tops**
Plywood		- Plywood is **strong**, **lightweight**, and **cheap**, making it a versatile material for furniture. Its layered structure enhances durability while keeping it easy to work with.	- Suitable for **cheap furniture**	- **Unseen elements** of furniture designs with an extremely low price point
Laser Ply		- Laser plywood is **lightweight**, **thin**, and specifically designed for laser cutting, making it ideal for **intricate designs**, model-making, and detailed engraving.	- Largely suitable for **modelling** however **not suitable** for **construction** of the **final design**	- **Modelling** Designs
Flexi ply		- Flexi plywood is **flexible** and **durable**, making it ideal for creating curved furniture structures.	- Suitable for **innovatively shaped furniture**	- **Framework** and **innovative shapes**/bends in **designs**
MDF		- MDF is **dense**, **cheap**, and **strong**, making it a popular choice for furniture. Its smooth surface is ideal for **painting** and **veneers**.	- Suitable for **cheap furniture**	- Frameworks when a **veneer** is included
Acrylic		- Acrylic is available in **transparent** or **opaque** options, is **malleable** when heated and is **lightweight**. This makes it ideal for signage and displays.	- **Not Suitable** for **most** types of **furniture**	- **Modelling** designs, **alternative** to **glass** for transparent elements

Next Step: Secondary investigation of existing products to identify successes and failures of products

Investigation of Existing Products (Secondary)

Lovely match of wood colour to metal
Bolt heads are not aligned.
Simple, elegant design

Premium finishes + materials

Wide feet / Base

aesthetically quite 'messy'

Looks a little "Display Case"
Base is heavy in comparison to top
Lights a nice addition

The Stool looks small and uncomfortable which means I could be unlikely to

only for sitting on for short periods?

Stool looks uncomfortable

may be a safety hazard

looks unstable

heavy looking design

Cost = higher

Complicated to manufacture
Scalable?

Brass bolts add to industrial aesthetic

premium industrial feet

Shipping = costly

pipes used as table legs

Cost of over £4000

not affordable

Design could look cleaner / less cluttered with mild steel supports



Rustic wood + steel compliment eachother

metal made to look like old parts at the centre

lacks any extra functions

Fabricated metal

compliments industrial look

No upcycling

not as marketable

Visable welds = adds to industrial aesthetic

lack of interest + meaning

+ adds to variety of joins

Clear glass top

easily scratched?

showcases upcycled engine

lighting encorporated into cylind heads of the engine

Wooden base

adds support

bulbs used meet industrial aesthetic

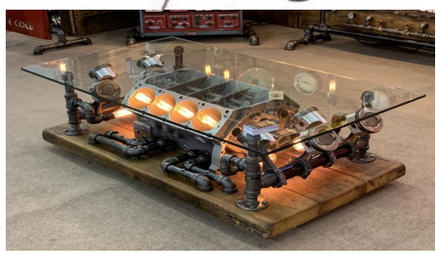
multifunctional appeal

Heavy + bulky

inkeeping with rustic/industrial aesthetic

difficult to transport + expensive

more marketable





materials don't look like great quality

upcycled cog plays large part in design + structure

Chain is not even around cog

not aesthetically pleasing

Shipping costs? + delivery

more expensive for buyers

Improves aesthetic

laser cut metal trim bolted to frame

adds texture

intricate innovative design

likely to sell



locks upcycling

No welding

possible to be dismantled

lack of industrial feel?

height adjusting is slow (manual)

Desk is height adjustable via industrial looking wheels

more ergonomically friendly

pivitable lampshade

adds to function

Older filament light bulb used

adds to industrial aesthetic



increased marketability

provides an extra function

large stable base

adds to industrial feel

aesthetically industrial but out dated

might not fit in newer homes

reduced market

Sharp edges on metal + table top edges

Safety hazard for end users / customers

Upcycled parts

positive impact on the environment

more marketable



large lamp won't fit in smaller spaces

Large bases at bottom of legs

Upcycled old bike seat adds to character + history

Brass lampshade compliments warm glow of light

adds to industrial feel

Wood + Steel compliment eachother aesthetically

hard to transport

Desk is large + bulky

high delivery cost

Desk has a bold aesthetic which might not suit the majority of people

Could impact sales

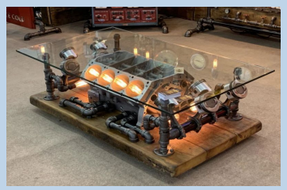
Looks "Heavy" in a good way.
Brass is very individual note with plaques
Has balance

The design looks old which would not be something I could intergrate into my house

The table is complicated as a centre piece to my kitchen

Next Step: Evaluating the existing products from secondary sources to highlight key aspects of designs

Summary Existing Products (Secondary)

Design	Summary of End User comments	Individual Points to Takeaway
	• Wood + metal match nicely • Bolts don't align when tightened • Design is appealing due to its simplicity	★ Simplicity is key ★ Wood and metal match nicely together ★ Small details such as bolt alignment is important
	• Display case looking, upcycled element could be included more • disproportionate large + heavy base • Lights are nice addition	★ Multifunctions e.g lighting is a nice way to improve a product ★ Aim to lean away from a 'display case' and make something that incorporates upcycled element
	• Complicated table • Would work as a centre piece to a room e.g kit	★ Complication can be kept to a minimum whilst still creating an interesting design
	• Looks heavy in a good way • Plaques help add balance and look good	★ Plaques would be a great way to add personality to design thus making my product more market
	• Dated design = not something people would be interested in in modern homes	★ Aim to lean away from dated brass as the main materia
	• Stool looks uncomfortable + small • Unlikely to purchase	★ Ensure product is functional as well as including an upcycled element and being aesthetically pleasing

Arthur & Grant Sharing Their Opinions on Existing Products





Response to feedback

Arthur & Grant highlighted the importance of a **well-rounded design** that is both **aesthetically pleasing** & **functional**. I agree with Arthur on the aesthetics of the two bottom right products and his comments on the stool's functionality in the top right. Similarly, I **agree** with **Grant's comments** on the **importance** of **small details** e.g bolt alignment.

Evaluation of Existing Products (Secondary)

My **secondary research** has **successfully highlighted** various **aesthetics** in **industrial upcycled furniture**, emphasizing the need for a balanced design that is neither **too cluttered nor overly simplistic**. My goal is to achieve a design that is **innovative and engaging** without being overly complicated or overly simplistic.

Next Step: Primary investigation of existing products to identify successes and failures of products

Investigation of Existing Products (Primary)

Visit to “Pat Mead Designs” Workshop

I visited Pat Mead’s design workshop to view his **upcycled furniture work.** Although some of the pieces were unfinished, the visit provided valuable insights into the processes of producing and marketing such products. Below, I have attached my photos, along with images of the completed designs. I have analyzed these products for both their **positive and negative aspects.** This analysis, combined with feedback from end users on the selection of existing products will go towards **improving my initial ideas.**

The 997 Chair

Image from my visit to the workshop



Photo shows upcycled / repurposed porsche 997 car seats

likely no longer safe to use

Seats add to Character of the Chair

more meaning + Character

Could be finished differently

Frame of the Chair doesn't match seat aesthetic

Hard to transport + Ship due to Shape + Size



simple

easy to manufacture

marketable at a higher price tag

electricity Cable means seat is still reclinable

adds to functionality

Seat is not only functional but the Character of the design comes from it



upcycled Chair is part of the design / shown off

Trendy

armrest shape matches the bodywork shape of the porsche 997

The fact the arm rest resemble the roof of the car brings a hidden unique element which makes the more

The Piano Plate Coffee Table

heavy piano plate adds to quality feel



Image from my visit to the workshop

glass top showcases piano plate well

Frame is simple and looks innovation

doesn't stand out as much

expensive delivery

Missed opportunity to use the piano plate as part of the structure



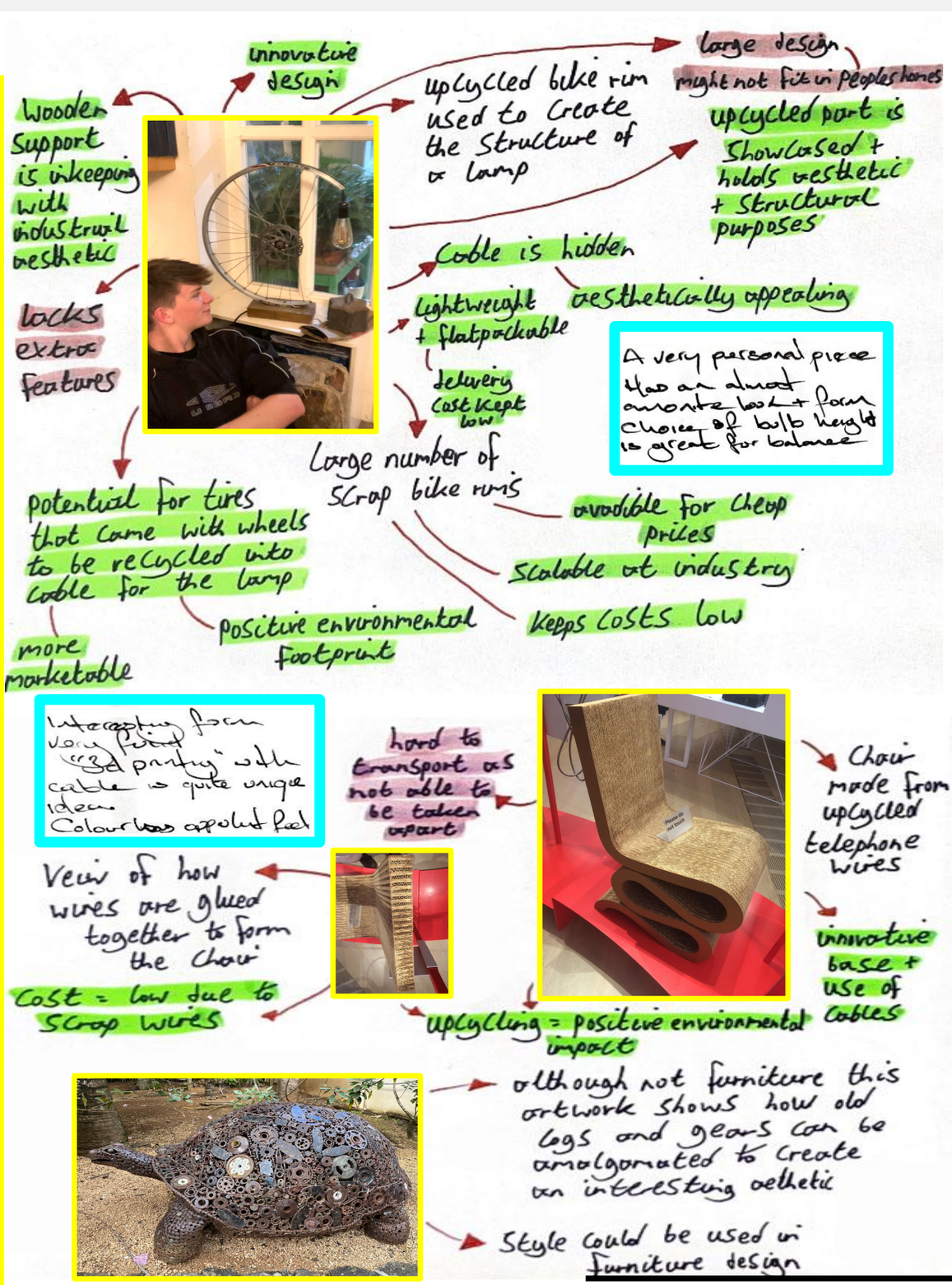
Weight + Size + Shape make product hard to transport

hard to move upstairs

Plate only serves aesthetical purposes

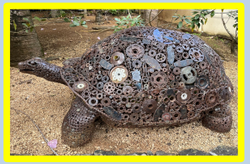
Upcycled piano plat is easy to source as lots of people throw away pianos

The piano plate lacks meaning and is Slightly random element to add into the coffee table



Next Step: Evaluating the existing products from primary sources to highlight key aspects of designs

Summary Existing Products (Primary) + Final Brief

Design					
Summary of End User comments	• The curve of the arm closely resembles the roofline of the Porsche 997, this gives the design an added layer of meaning	• Well balanced design that has a good aesthetic appeal • Design holds personality due to upcycling	• Color is a bit strange • Unique idea • interesting form of then chair	• Piano plate looks out of place • Display cass rather than incorporated in design	• Cogs could be used elsewhere in designs • Could be extremely heavy to pick up if whole design is made of cogs.
Individual Points to Takeaway	★ Incorporating the origin of the upcycled element elsewhere in the design creates a large appeal	★ Aesthetic appeal and balance within in design is important	★ Innovative shapes are important in appeals of design ★ Colour and aesthetics of design are essential for an overall appeal	★ Display cases need to be avoided. Instead I will attempt to Incorporating the origin of the upcycled element elsewhere in the design	★ Cogs are cheap and could be the centre of one of my designs ★ Could significantly increase weight

Arthur & Grant Sharing Their Opinions on Existing Products





Response to feedback

I largely agree with the comments from Arthur and Grant. The more the furniture **effectively showcases and includes** the upcycled element of their design the more **interesting and exciting** the design becomes. This is a crucial factor in my design project. Grants comments on balance in design also jumped out as largely important to please end users.

Evaluation of Existing Products (Secondary)

My primary research has **highlighted a gap in the market for upcycled furniture** (As I have struggled to find relevant furniture to analyse) specifically that which aligns with the core points of my design brief. This gap presents an opportunity that I intend to capitalize on.

Final Brief and Key Points Before Moving onto Generating Initial Ideas

After thoroughly investigating various opportunities, existing products, and materials, as well as consulting a diverse range of stakeholders, I am now better equipped to make an informed decision on the direction of my initial designs. Based on these findings, I have chosen to refine my brief, allowing me to focus my ideas on what I have determined to be commercially viable.

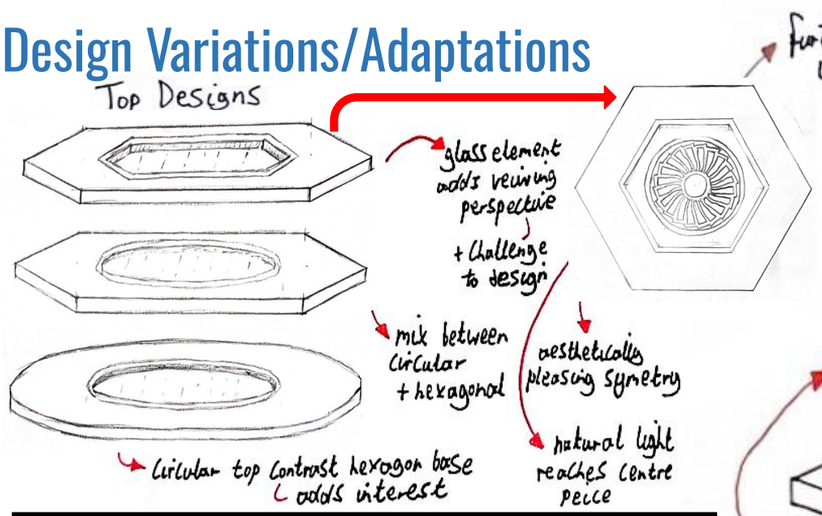
Refined Design Brief

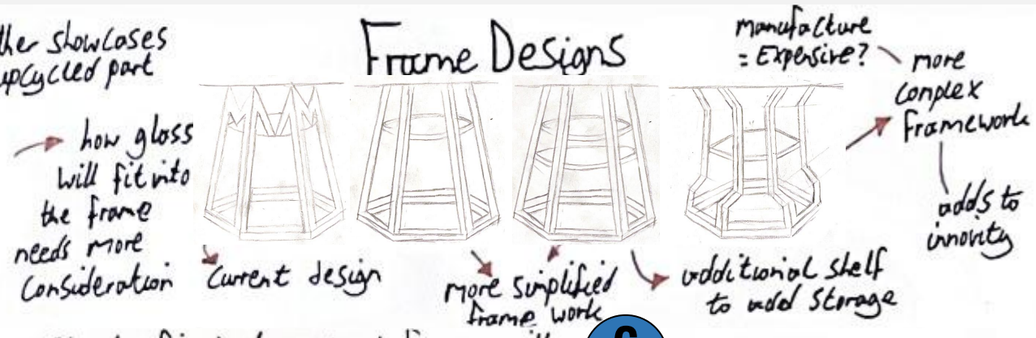
I will be designing, modelling and making an innovative piece of furniture by **upcycling scrap machinery**. Alternative to traditional furniture, it will have a **modern industrial look**, incorporating a piece of **upcycled machinery** to add to the items innovative personality and challenge of the brief.

Next Step: Generating my first initial idea incorporating the research I have collated so far

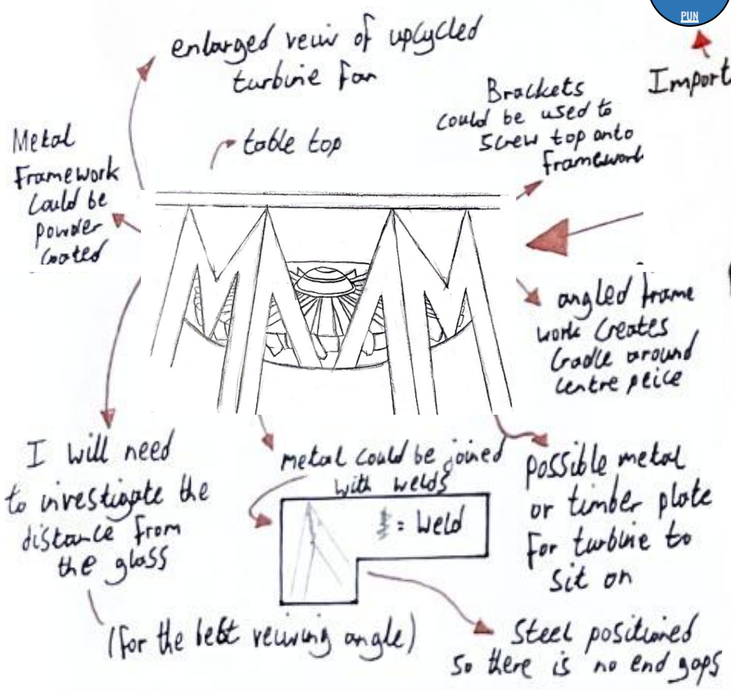
Generation of Initial Ideas - The 'Turbine Table'

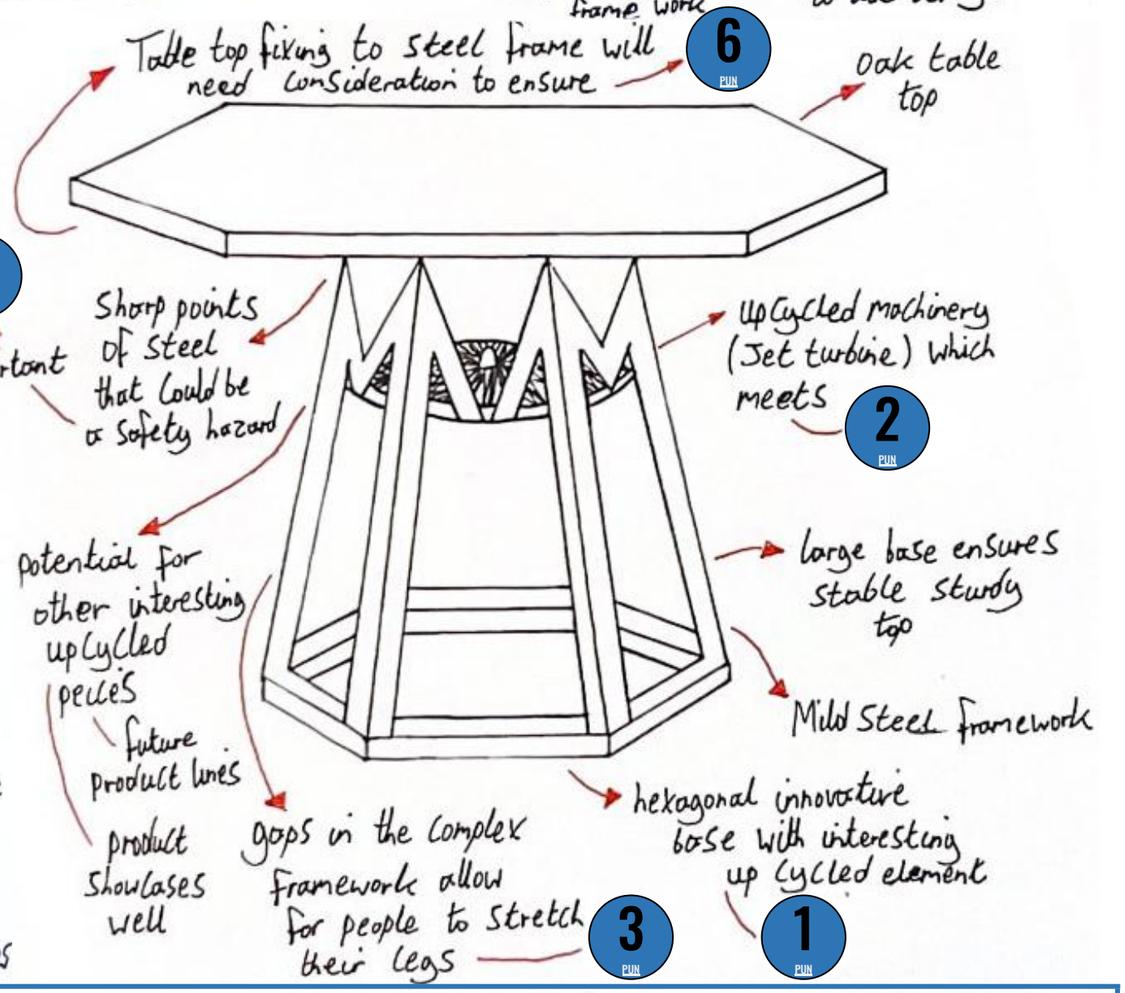
Design Variations/Adaptations

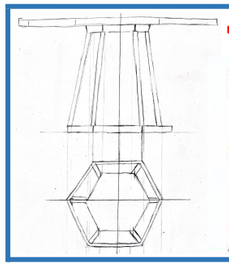




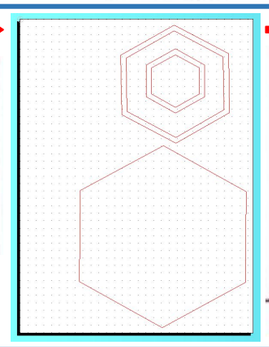
Framework Details



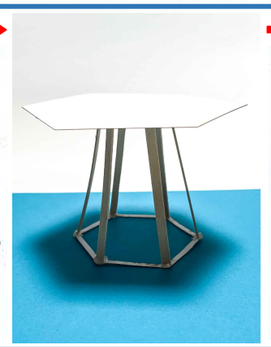




Initial working drawing to base hard work off

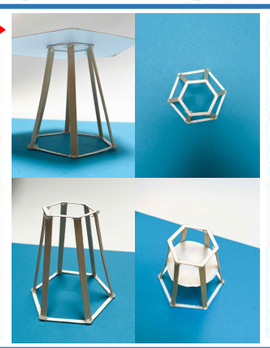


CAD work done on 2D design before being sent to laser cutter. The slanted supports add to aesthetics



Simplified design helps to get a perception of size + proportions

Shows just the frame



The large base adds to stability

I used lollypop sticks between the laser cut card

Shows plate for turbine fan

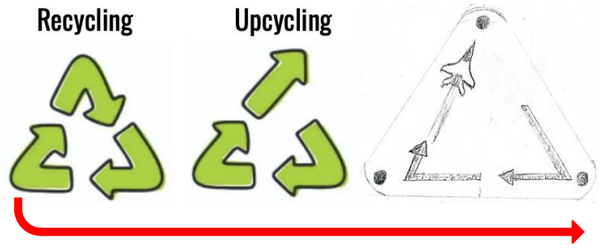
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Page No. 16

Information on Upcycling





Upcycled part is relatively expensive when sourced on ebay but holds significance both in the design and in itself.



Play on upcycling logo to add an element of history and **authenticity** to the design. This graphic could potentially be etched onto steel or welded on as a badge/crest. This will increase the **marketability** and **show off the innovativity** of the design

End User + Stakeholder Feedback



I really like the variation of the upcycling logo. I don't like the main frame design of the copper table. I prefere the one second to the left. - Arthur



Table top shape will be crucial to final design. Options of folded steel for the base should be considered. Height of fan needs to be considered so it isn't lost.

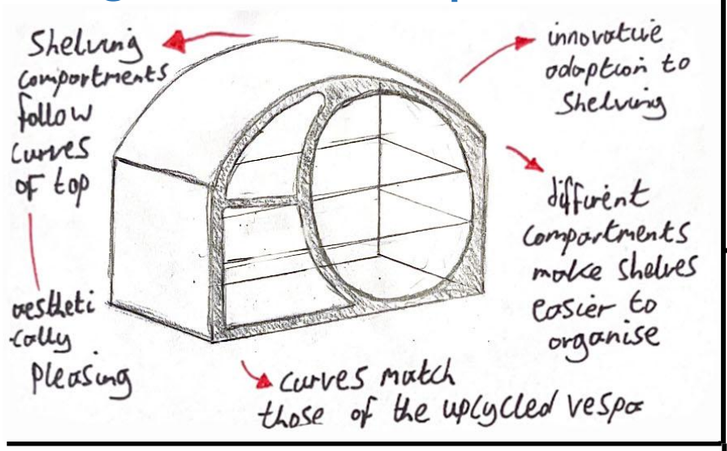
Response to feedback

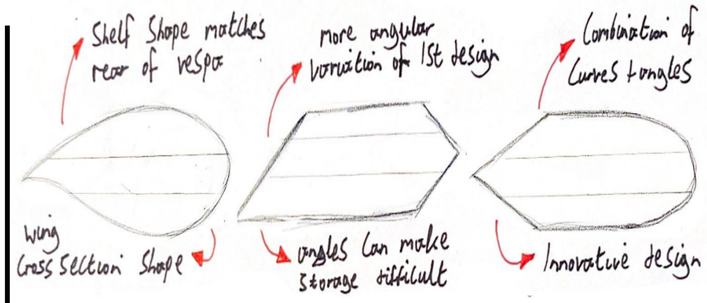
I largely agree with Arthurs and Grants feedback. I will attempt to incorporate the **upcycled logo** in my developments. If i develop this design I will investigate the **table top height**.

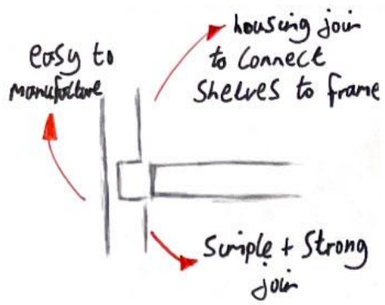
Next Step: Generating another design that takes a different approach to this initial idea

Generation of Initial Ideas - The 'Vespa Bookshelf'

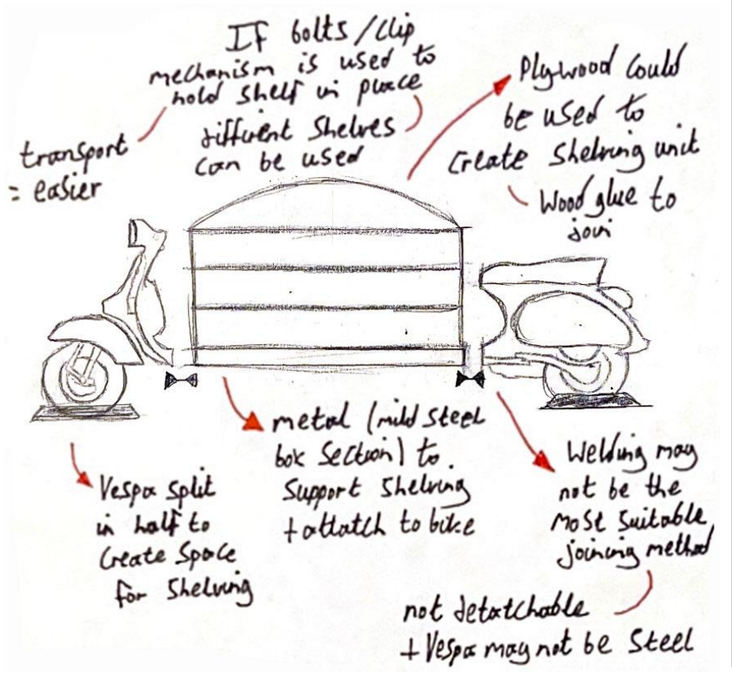
Design Variations/Adaptations

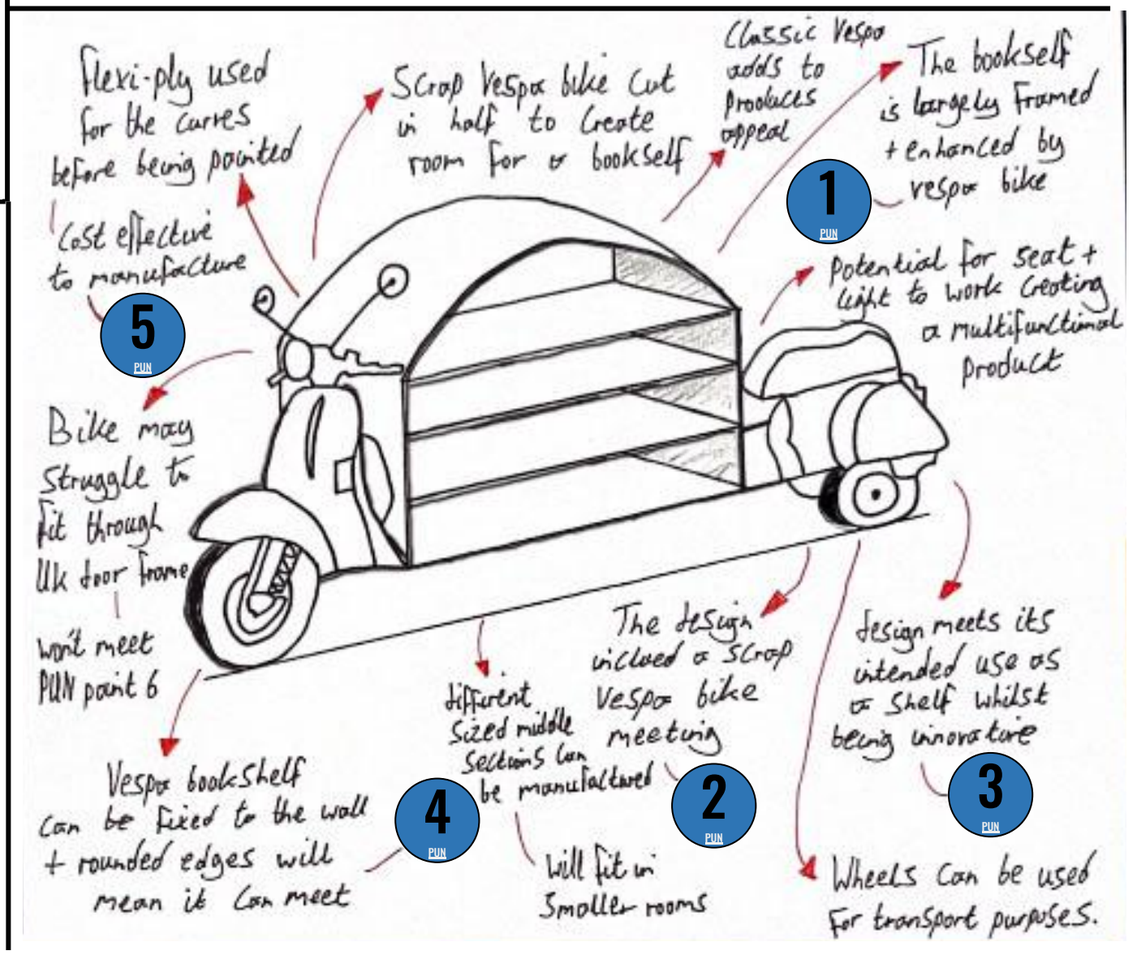






Framework Details

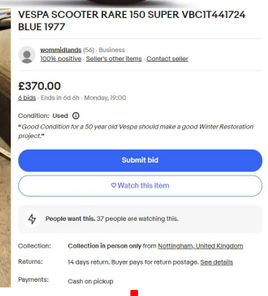




Information on Upcycling







VESPA SCOOTER RARE 150 SUPER VBC1T441724 BLUE 1977

wommidlands (56) · Business
100% positive · Seller's other items · Contact seller

£370.00
4 bids · Ends in 6d 6h · Monday, 19:00

Condition: Used
"Good Condition for a 50 year old Vespa should make a good Winter Restoration project."

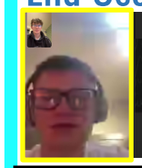
Submit bid
Watch this item

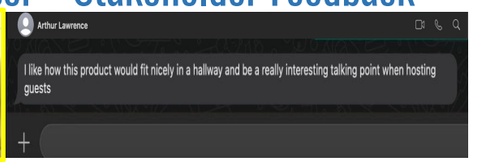
People want this. 37 people are watching this.

Collection: Collection in person only from Nottingham, United Kingdom
Returns: 14 days return. Buyer pays for return postage. See details
Payments: Cash on pickup

The upcycled element of this ensign is a whole **scrap vespa bike**. Not only is this bike **iconic in its design** but it can also be picked up for a **reasonable price** when **broken/not working**. Often disused vespas have large **dent and scrapes** as can be seen from the image above but in my opinion this only **adds to** the **character** of the piece.

End User + Stakeholder Feedback





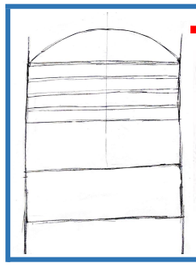


Saving 2 Materials may be problematic to create strength. Balance of shelves per 2 sheets leads to be one board. Uplifting the design to create space in creating interesting idea. Classic design & already sits.

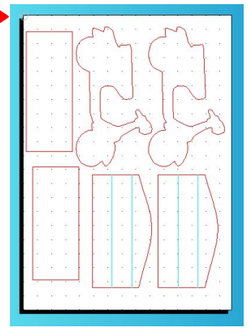
Response to feedback

Grants feedback has been useful, highlighting potential issues of **joining two different metals** that i could encounter in other designs. Arthur has also highlighted a **talking point** within a design is **valuable**.

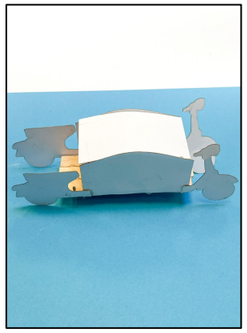
Next Step: Exploring an idea including upcycled elements in the design, rather than as its structure



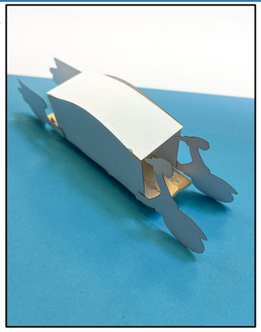
Sketch used to base KAD page off



A5 KAD model to send to laser cutter
parts to be joined with hot glue
Bike drawn in KAD to aid visuals of the model + give real sence



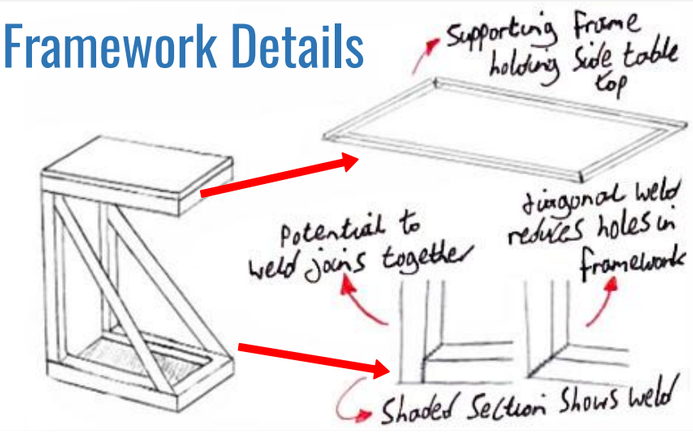
model composed of 2 front and back section's
Width of model should be narrower to be more realistic



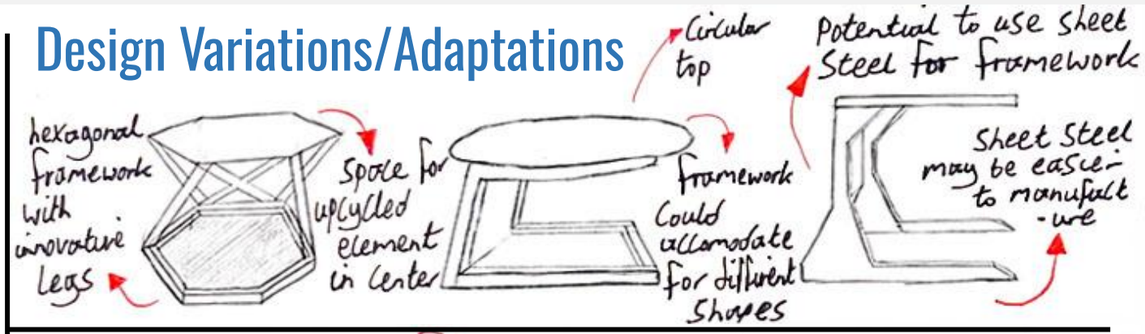
front view shows how model will showcase vespa bike
Supporting central section to hold up + attach shelves can be seen

Generation of Initial Ideas - The 'Versatile Chopper Side Table'

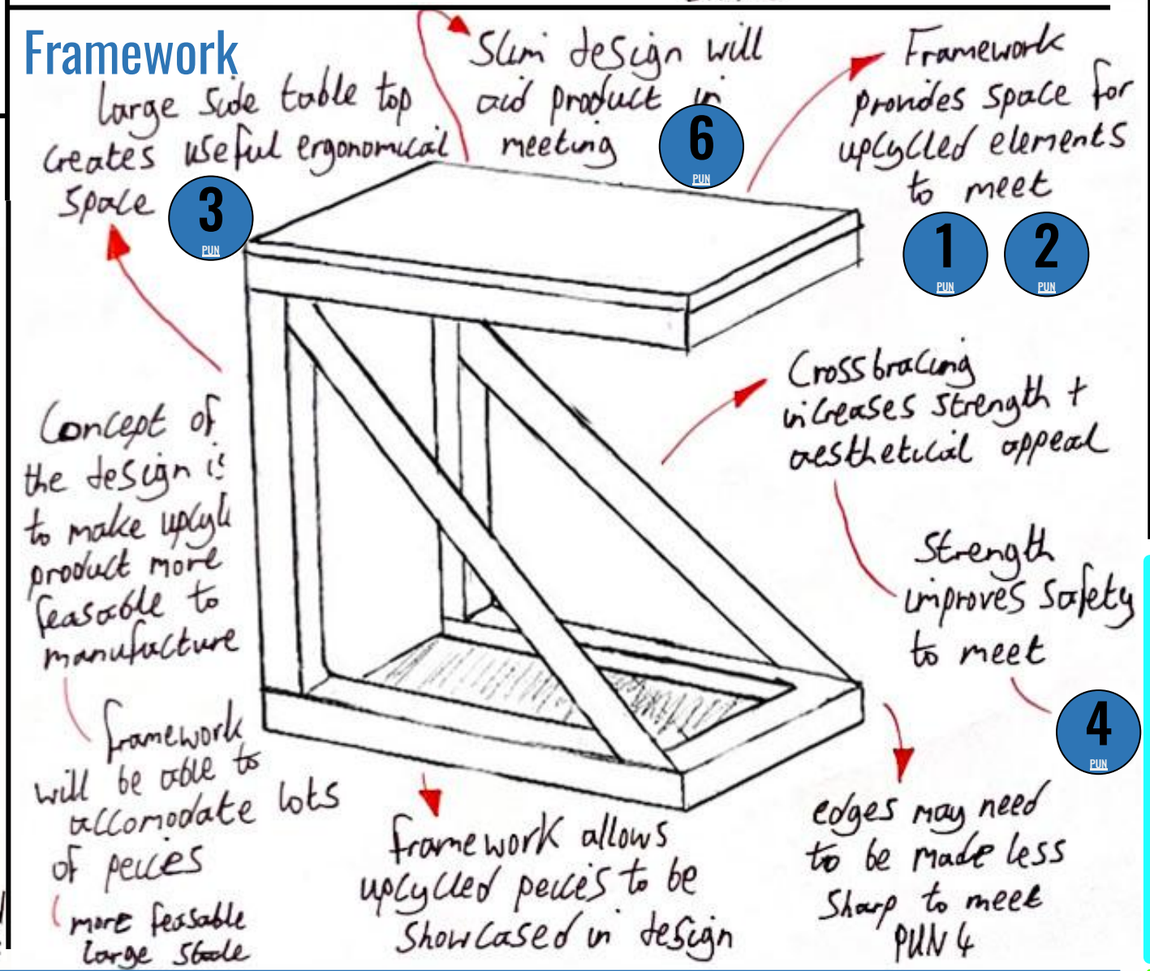
Framework Details



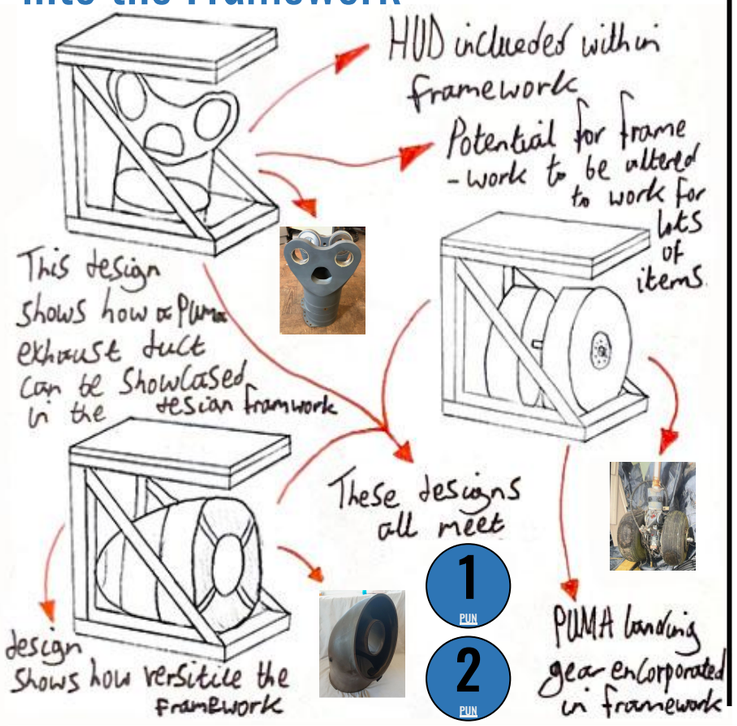
Design Variations/Adaptations



Framework

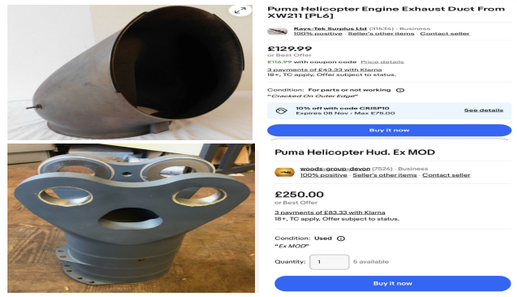


Incorporating Upcycled Elements into the Framework



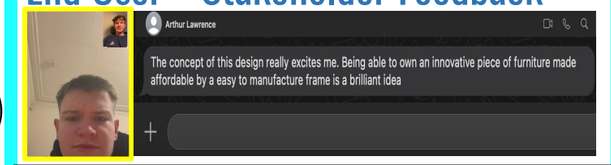
Information on Upcycling

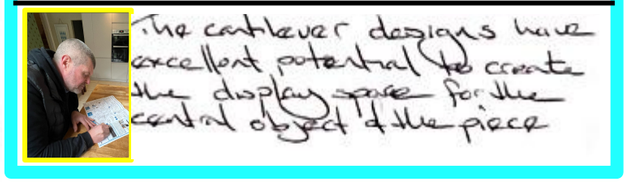




This design is highly **adaptable**, allowing for it to include a variety of scrap parts. In this design idea I have chosen to upcycle components from **Puma helicopters**. Sourcing these upcycled parts is possible from a number of places as shown above. The benefit of such a flexible design is that can **accommodate any upcycled parts** I can source when producing my product **in industry.**

End User + Stakeholder Feedback

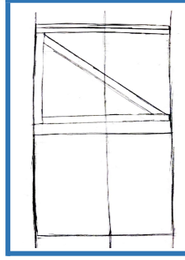




Response to feedback

Both Arthur and Grant have commented on the **potential** this framework holds. Moving forward I believe this design and future designs could have more **innovative shapes** included within them.

Next Step: Developing a design that is extremely innovative, not focussing on a table or shelf framework



Sketch I used to guide the model making process

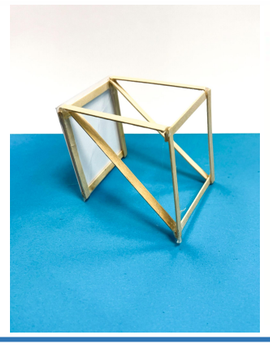


Model created using lolipop sticks and card. All connected using hot glue



This model helped me to envision the product

At this point the product is quite Simple

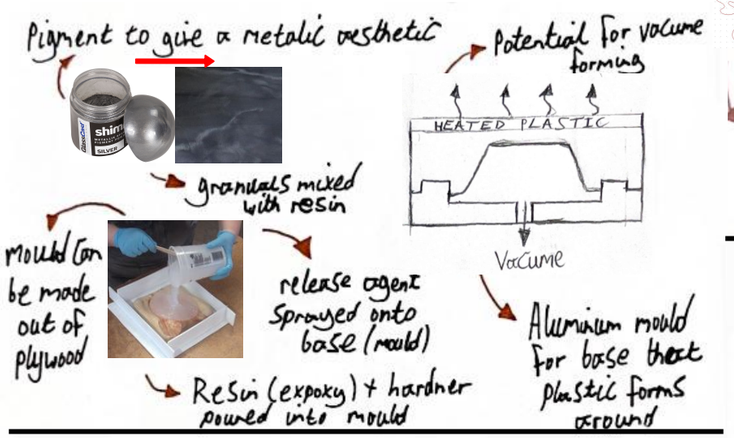


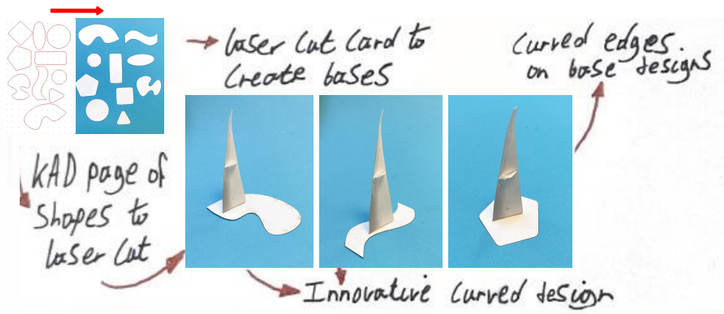
This photo clearly shows the framework of the design

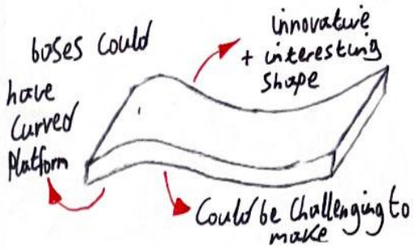
Framework is Strong but not innovative enough

Generation of Initial Ideas - The 'AeroForge Lamp'

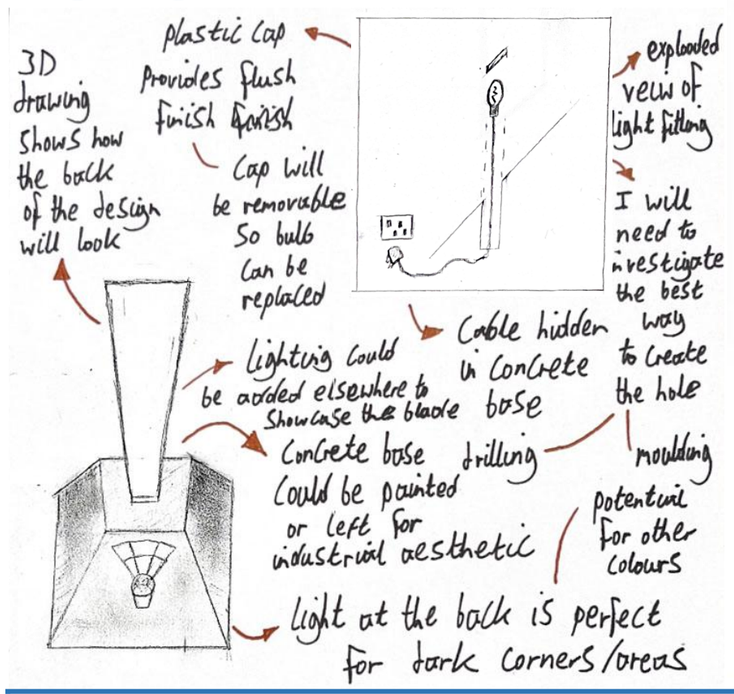
Design Variations/Adaptations

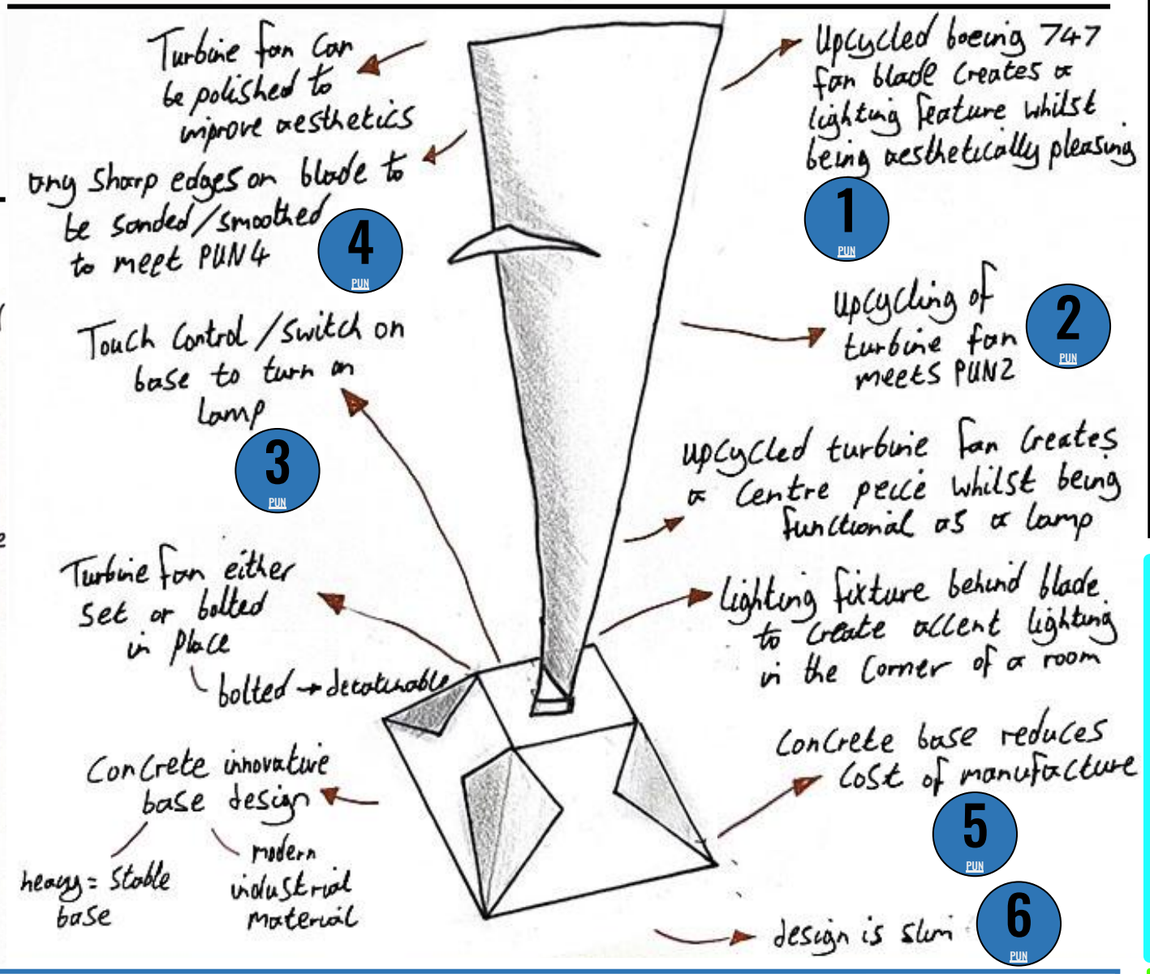


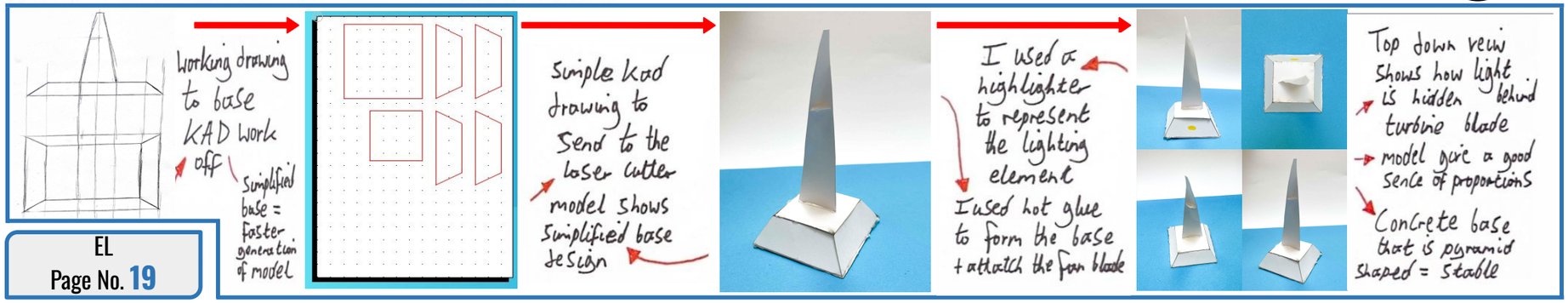




Lighting Fixture Details







Information on Upcycling



CF6 Boeing 747Jet Engine Titanium Fan Blade.

JetStreamAeroParts (13342) · Private
99.4% positive · Seller's other items · Contact seller

US $224.99
Approximately £172.33
or Best Offer

Condition: Used

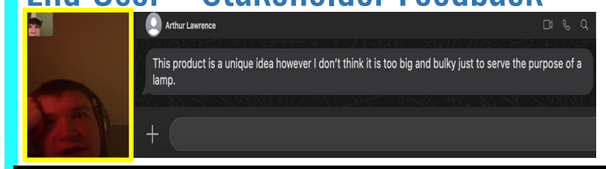
Quantity: 1 More than 10 available · 91 sold

Buy it now
Add to basket
Make offer
♡ Watch this item



The upcycled element included in this design is the fan blade of a **boeing 747**. This upcycled part is a good choice due to its **iconic history**, **increasing availability** and its **aesthetic appeal**. For instance with the 747 being slowly phased out of use these parts will become not only cheaper but also making it **more feasible** at the manufacturing stage due to the quantity of parts parts avadible.

End User + Stakeholder Feedback





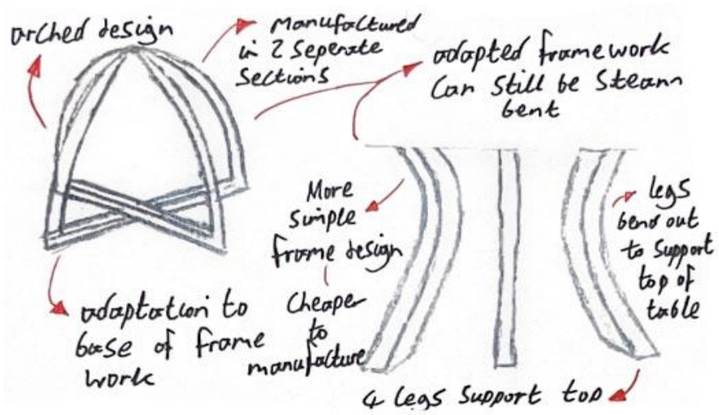
Response to feedback

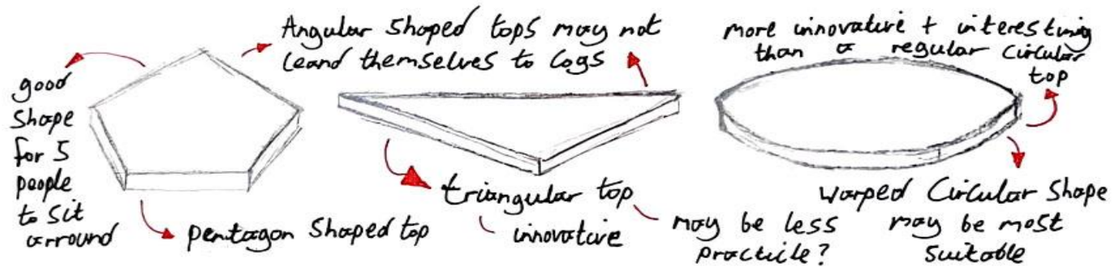
Arthur suggested that the design may be **too bulky** and heavy for its purpose which I take onboard. Grants feedback mentions an **aesthetic element** I had not considered, something I will now **give more thought**.

Next Step: Designing a new idea that incorporates other materials highlighted in my initial research

Generation of Initial Ideas - The 'Gearworks Sidebench'

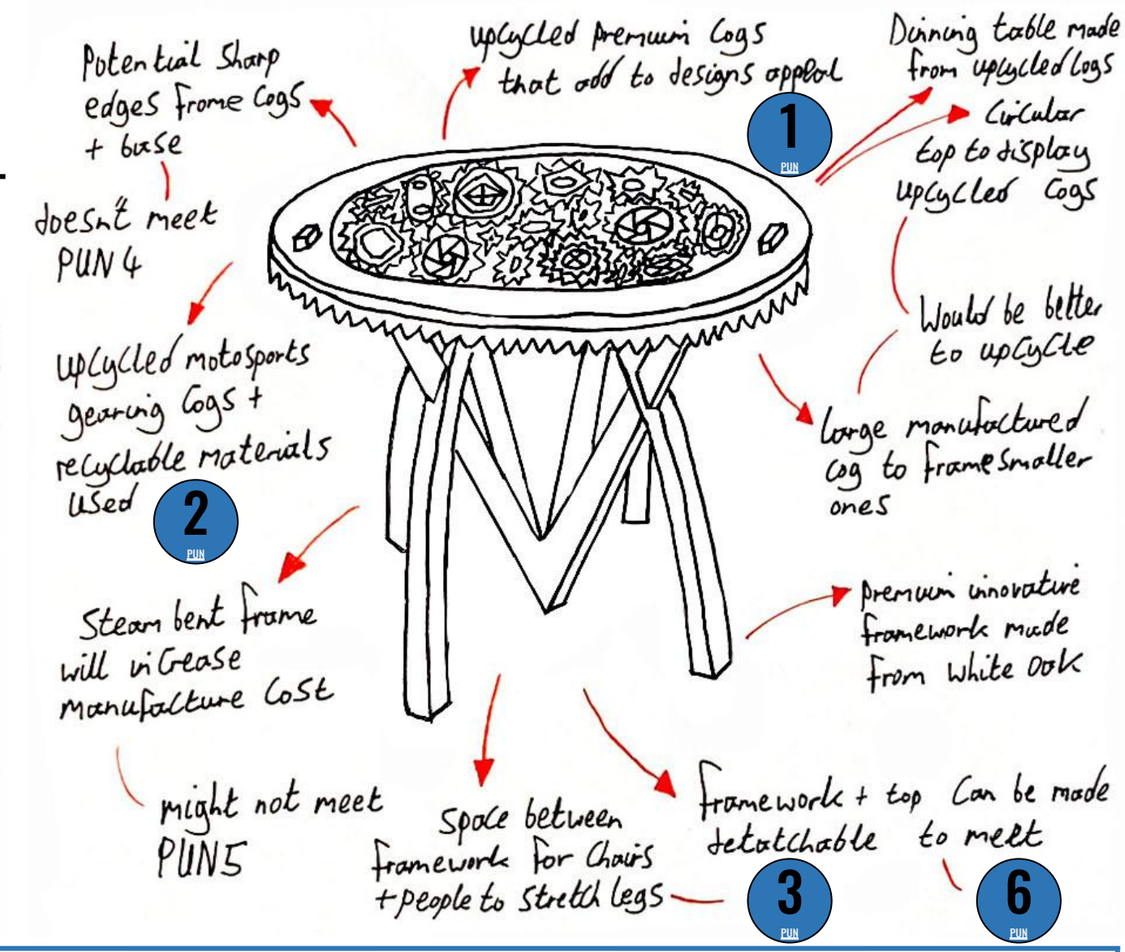
Design Variations/Adaptations

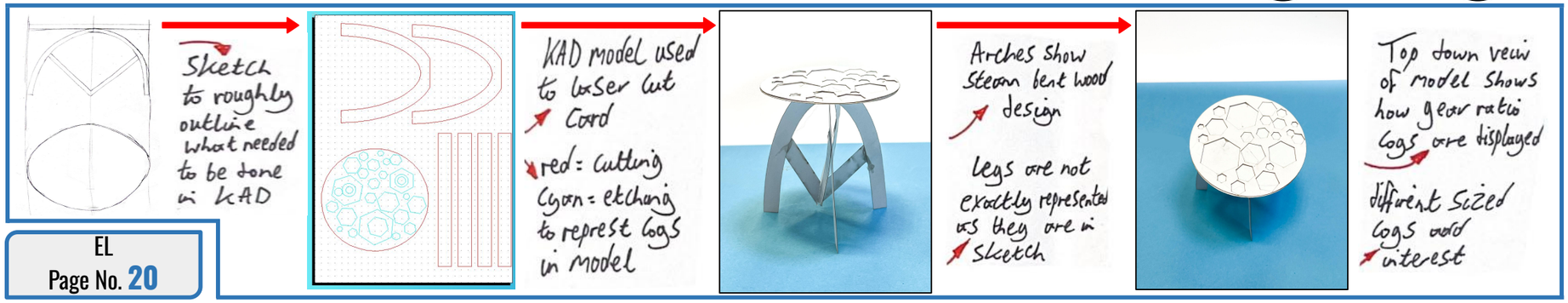




Framework Details

Steam Bending





Information on Upcycling





REDUCED..£40.00 BARGAIN HEWLAND MK5 GEAR RATIOS GEARBOX VARIOUS SIZES FREE P&P

cristalk8 (2785) · Private
99.6% positive · Seller's other items · Contact seller

£40.00

Condition: Used

Quantity: 1 More than 10 available · 7 sold

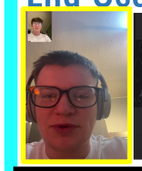
Buy it now

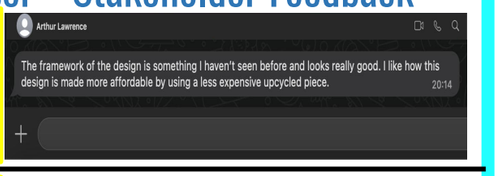
Add to basket

♡ Watch this item

This design uses precisely engineered **gear ratio cogs** manufactured for motosports by **Hewland**. The slightly understated aspects of these cogs means **second hand value** is extremely **less expensive** than other items I have used to design furniture out of. This will give more scope for a **larger profit margin** and a cheaper post prototype product in the market.

End User + Stakeholder Feedback







Elegant design for frame, steam bending is a very interesting method of shaping wood contrasting materials. Gear cogs are a timeless design - clockwork to precision engineering.

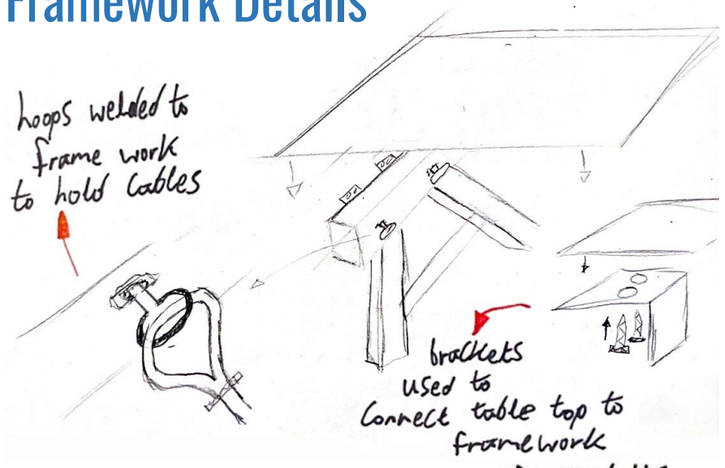
Response to feedback

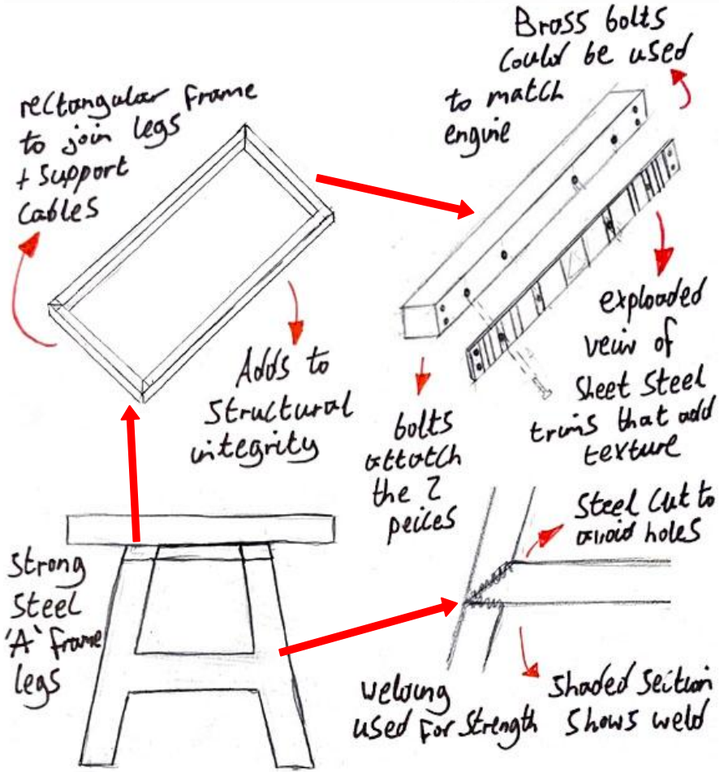
Affordability is something I will continue to strive towards as mentioned by Arthur. The **contrast of materials** mentioned by Grant is something I will consider in future designs to **improve aesthetics**.

Next Step: Generating a design that has a core industrial feel with unlike that of previous designs

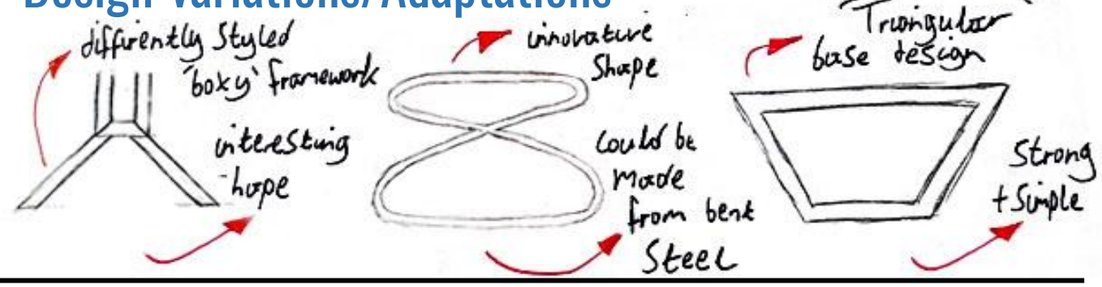
Generation of Initial Ideas - The '997 Suspended Table'

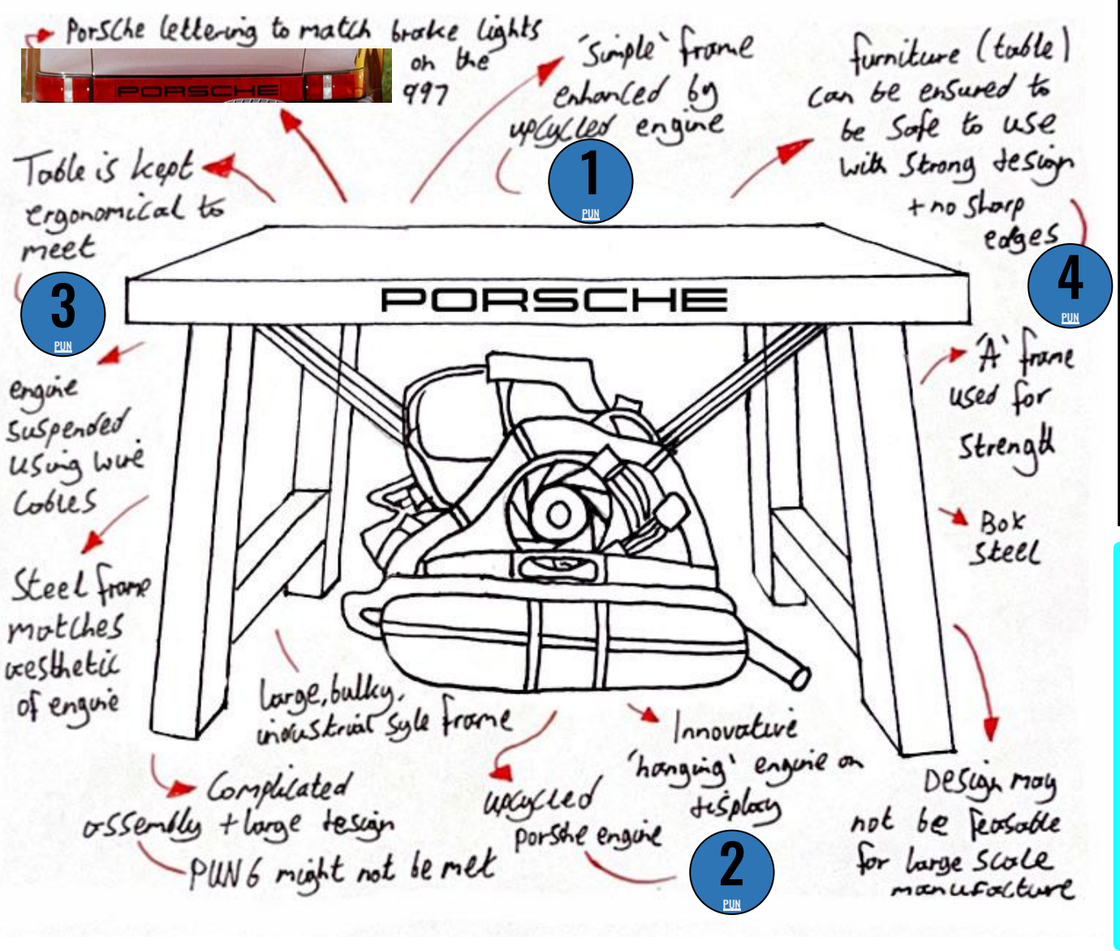
Framework Details





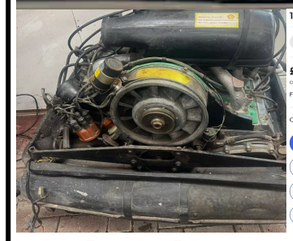
Design Variations/Adaptations





Information on Upcycling

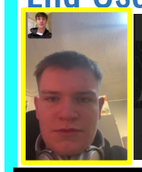


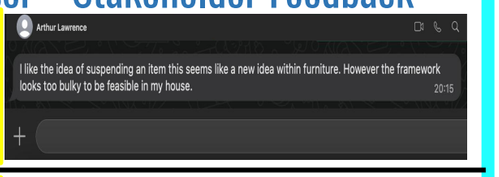




This design of this table includes the **engine** of a **classic porsche 911**. For this to be a feasible design the engine would have to be **beyond repair** to **reduce** the **cost** thereby making the design **feasible**. As shown in the image on the left the engine can be polished to create a **great centerpiece** to add to a room.

End User + Stakeholder Feedback



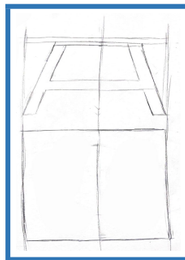




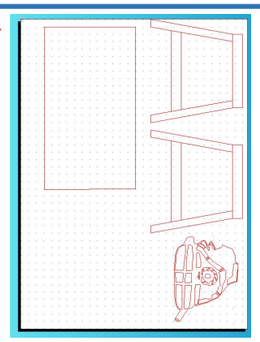
Good contrast between bulky frame & wires suspending engine. Lettering gives context to the engine has a "display case" feel to design. Balance of the engine may pose problematic.

Response to feedback

Arthur's comment on the **size of** the **framework** is definitely an important point to consider even in other designs. I agree that **complexity of** the **balance** may increase manufacture costs and **reduce feasibility**.



This is the rough sketch I used to base my KAD drawing off

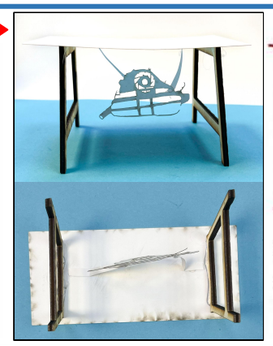


This is the KAD drawing I used to laser Cut the peices to construct my model



The model gives a good idea of what the product would look like

Perhaps a clear glass top would be better



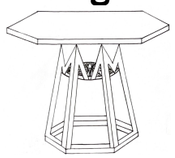
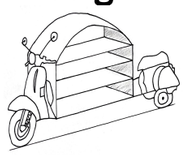
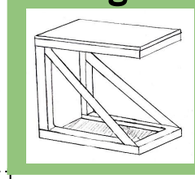
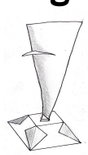
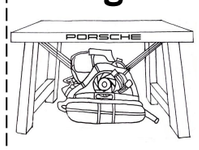
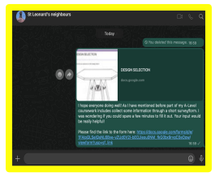
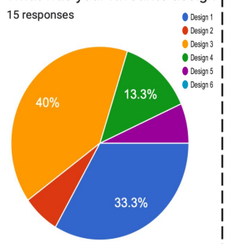
I used paper to represent metal wire to Suspend the engine

From my model I realised extra Support would be needed

Next Step: Selecting a design out of the six innovative ideas I have explored to develop into a feasible product

Design Selection

Conclusive Opinions on Designs:

Name of Stakeholder	Occupation	Design 1	Design 2	Design 3	Design 4	Design 5	Design 6	Chosen Design + reasoning
								
Grant Cooper 	Metal Fabrication	quite Angular nice balanced symmetry	Very interesting idea. Jonging with strength a concern & balance	Compact yet nice open design for displaying. Optimistic with design as well	Sculptural design looks great. Difficult to source timber	Interesting use of stem/bridge Cogs may get lost in overall design & mark.	The Porsche engine looks fantastic Cladding below may be problem	3 - Design was with helicopter pics - Can use more repurposed steel in bridge & use more technique in manufacture.
Arthur Lawrence 	Student at Leeds University	I like the design of the table top	It is interesting using a bike as a stool	It is a bit simplistic	Using a turbine as a lamp is very cool	I like the clear glass with cogs in	The porsche engine brings a different element to a dining table	Overall I think design 2 is the most interesting but it may be impractical
Edward East 	Student at Wallingford	-I like the angles of the framework - it's too plain - I like the use of the turbine	-looks very funky -I like the use of the whole bike	-I like the incorporation of the wheel -I like the simplistic design	-It looks very abstract - the base isn't very appealing	- It's boring - I like the ridged edges - I like the incorporation of the scraps in the middle	-The design is creative and a really good use of the scrap - It's too bulky	Design 3 as it's realistic and a really clean idea
Amelie Brett 	Student at Wallingford	-good complementary shapes - may be difficult to see the turbine	- I like the vintage vibe - very original	- seems less advanced in comparison to the others • Like the use of triangles	- I like the shape - very different	- The underneath v adds good dimension - I like the wheel in the middle	- clever design - I like the use of the engine	Design 5 because I like the shapes and the use of bolts, wheels + scraps
Neighbourhood 	Various	- Classy nicely shaped design - Interesting upcycled element displayed excellently	- Very large therefore might not fit in houses - New, innovative idea	- Very innovative, not something seen for sale - Interest piece of furniture without being 'overpowering' in a room	- Design is interesting for a light - the height of the turbine blade might make it hard to fit in the corner of a room	- Similar to the first design but less attractive - Framework looks innovative compared to many tables	- very bulky and not something that easily blend into a room	
Class Focus Group 	Students at Wallingford	-I like the unique shape of the table - difficult to see turbine	- good use of the vespa - Very large for what the shape is.	-I like the style and framework of the table - plain, not as unique as others	- really nice use of the turbine - may not be stable - may not be effective and light	-I like the use of the cogs with glass over it - might be heavy difficult to move	- really nice use of the engine - will be extremely heavy impossible to move.	Design 1 is my favourite but I like features from 3 and 5

Conclusion

1	2	3	4	5	6
I	I	III		I	

Design number **3** received the **most votes**, so this will be the design I **develop into the final prototype.**

Reflection on Initial Designs and Next Steps

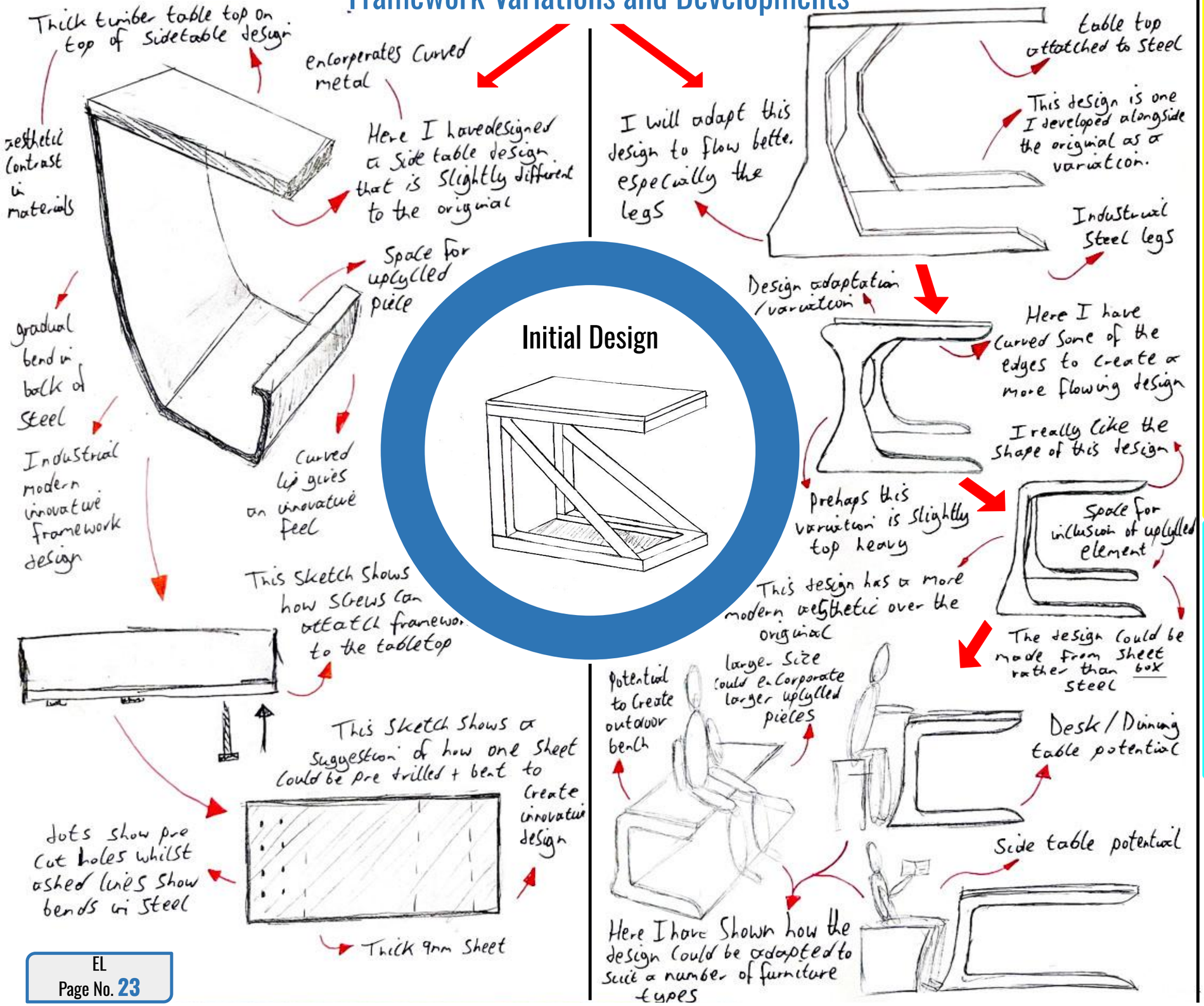
During the **initial phase** of my design process, I focused on creating **innovative**, **distinct**, and **unique designs** to fully **showcase** the **complexity** of the **challenging brief** I am working with. **At the same time**, I **worked** to **develop** technical **models**, **provide detailed insights** into the design, and **explore variations** where appropriate. However, **perhaps** most **importantly**, I have **continuously incorporated stakeholder feedback** to ensure I remain on the **right track**. As a result, I am **pleased** with the **six pages** I have **created** to **document** this **process**.

Moving forward, I am **eager** to further develop **Design Three**, (as selected by a range of stakeholders on the left of the page) I believe it holds great **potential** for **refinement**, not only in terms of **ergonomics** but also **aesthetics**. I am excited to **explore** its **possibilities** and see how it **evolves** as I progress through the **next stages** of the **design process** in the next pages.

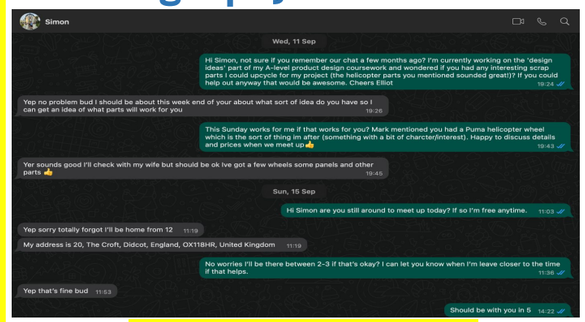
Next Step: Developing the concept of design number 3 (that has been selected as shown on this page)

Initial Design Development

Framework Variations and Developments



Sourcing Upcycled Element

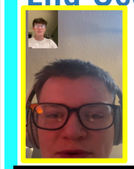


This is me organising my visit to simons yard to view his helicopter parts, in particular the ex **RAF Puma helicopter wheel**.



After visiting Simon's yard, I was lucky to be gifted an ex-RAF Puma helicopter wheel for my product design coursework. He mentioned similar parts sell for £300-£500 on eBay, which will help me estimate costs and feasibility.

End User + Stakeholder Feedback



I think that the design on the right resembles more of the original design I like. I think it would be great to see this design with an upcycled piece included in the design👍



I think the design on the left would have great market potential thanks to its simplicity (one sheet!) and it still has a great innovative look. However I think the design on the right will have the best chance at fully meeting the brief we spoke about at the start.

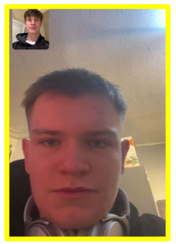
Response to feedback

I completely agree with Grant that the left design, using a single uncut metal sheet, is great for mass production. However, both he and Arthur are right that the **right design** will **better meet** the **challenging brief**.

Next Step: Incorporating the upcycled element I have sourced in further design development of the product

Design Development - Using Upcycled Part

End User + Stakeholder Feedback



I think the wheel would look better facing a different direction. I also think the legs could do with some more texture.



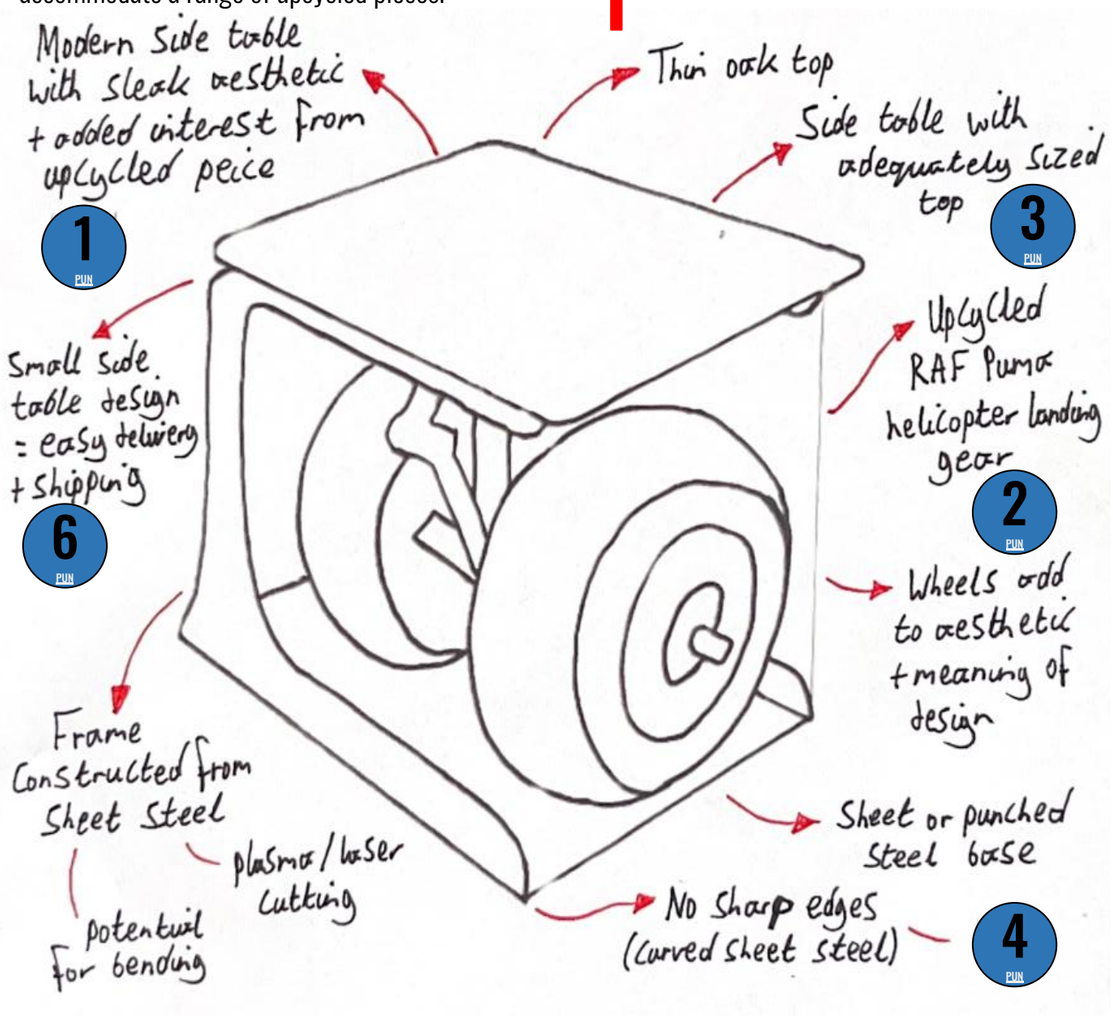
The large wheels look great in the space. Rotor design on top will add element + light would tie thing in theme. Consider cutouts that match woodgrain or alloy. Ensure rigidity across all faces - may need bracing bars at back for

Response to feedback

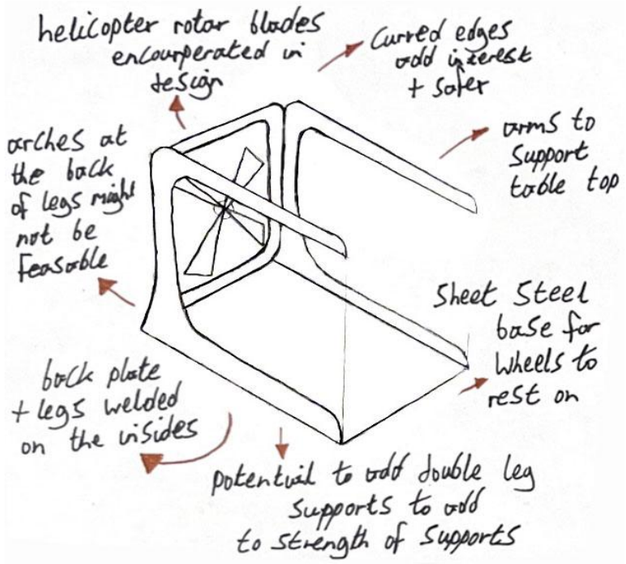
I will incorporate Grant's feedback by **moving** the helicopter blade **cutout to the top** of the side table, making the feature more **cohesive** within the design. His suggestion regarding **cutouts in** the **legs** is another idea I plan to explore further to **enhance** the framework's **aesthetic**. Additionally, Arthur made a valuable point about the **orientation** of the **wheels** within the framework. I intend to experiment with different placements in future design iterations to ensure the **wheel** is **displayed** as **effectively** as **possible**. This consideration will also apply to other elements that may be included within the framework of **future variations** of the product.

Adaptability of Framework

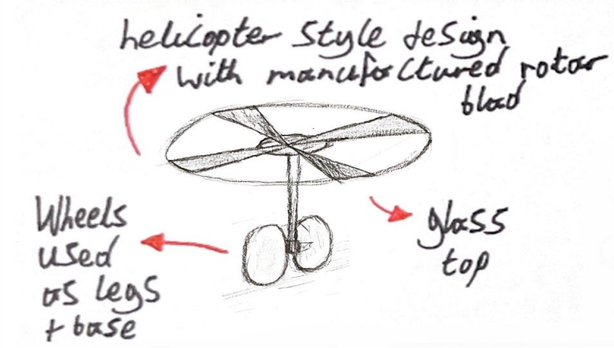
Even though I have sourced a helicopter part to upcycle it is still important that the framework can accommodate a range of upcycled pieces.

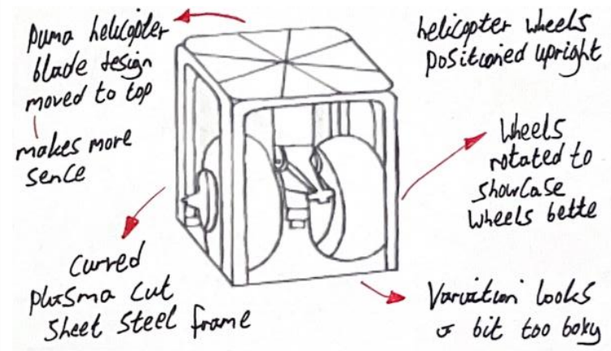


Framework Details

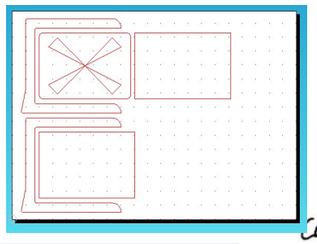


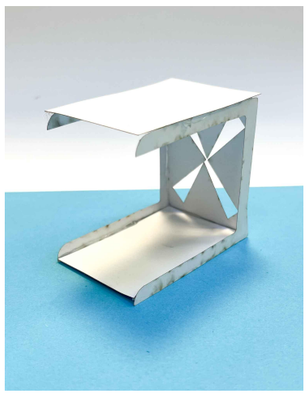
Further Framework Variation

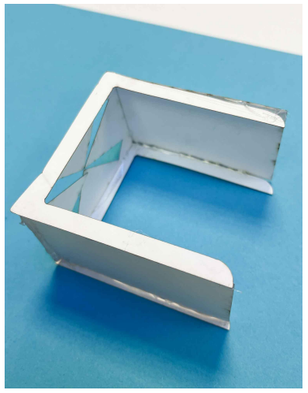




Modelling







KAD model I used to laser cut the card needed to construct my model

cut outs positioned to save as much paper as possible

Helicopter propeller design featured on back of framework

Innovative + interesting feature

Sheet Steel frame -work modeled

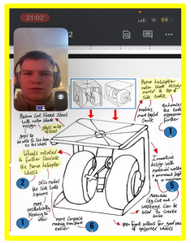
Side view of the model shows how much thicker sheet steel would be (in width)

possibly more aesthetically pleasing

Next Step: Exploring wheel position and developments of the initial framework shown so far

Further Design Development

End User + Stakeholder Feedback



I really like the helicopter rota design on the top! I also think my personal favourite punched steel shape are the circles.



Cutouts & sandwiched pieces could look like moulding & tie in design.
- Raw steel may be standout
consider details/colours.
Weight may be a concern.
Acrylic vs glass top. & is it sat on top or framed.

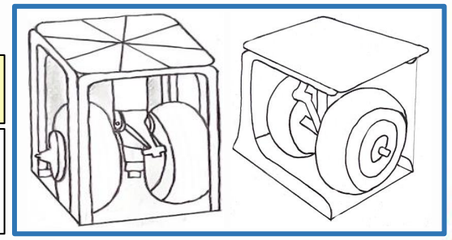
Response to feedback

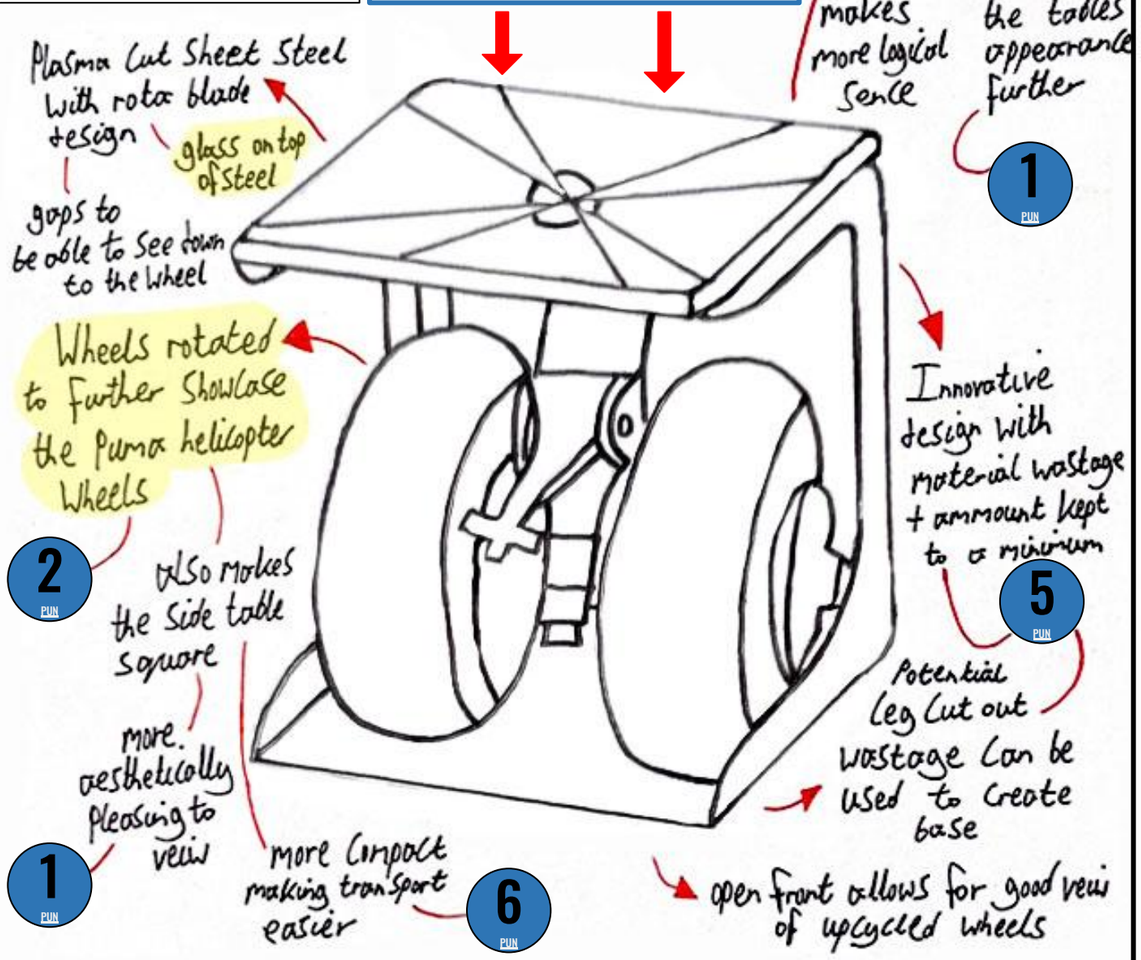
Grant raises important considerations that I have yet to address, particularly regarding the **weight** of the design. To **mitigate** this, I will ensure that the **upcycled component** can be **easily removed** from the framework. Additionally, I appreciate Arthur's positive feedback on **incorporating** the **helicopter design** into the **tabletop**, while also agreeing with Grant that **positioning** the **glass** or acrylic within the framework may help prevent **unnecessary scratches** or damage. I will explore both of these aspects further in the design development process, while also taking into account Arthur's suggestion of using **circular perforated steel**.

Annotations KEY

RESPONSE to Initial Feedback

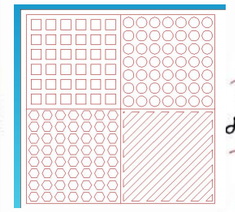
PUN How developments meet PUN points



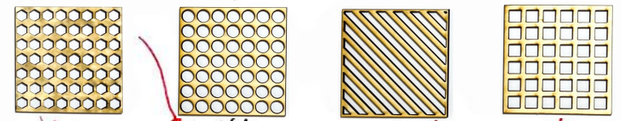


Potential Variations

Perforated Steel Variations

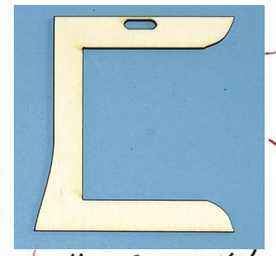


KAD model to laser cut variations
My favourite is the diagonal drain pattern
Adds texture to base of side table
Circular perforated steel



Hexagonal perforated steel
could be positioned better
Grate / drain pattern
Square perforated steel

Variations to Steel Legs

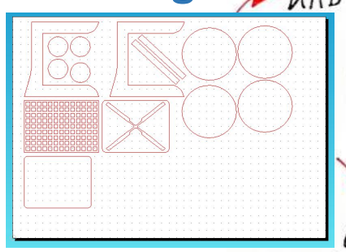


handle at the top of each leg for carrying purposes
This is my favourite as it makes the design
Variations on handle shape
More ergonomical
Different sizes + shapes of plastic



I will need to look into the size of handles
Anthropometric data + tests
I will need to line the handles to make them safe
Aesthetically pleasing
4 PUN
For the actual product I would need to make the cut outs smaller
upcycled element can be seen from sides
added strength
better showcasing
Cut outs = weight saving

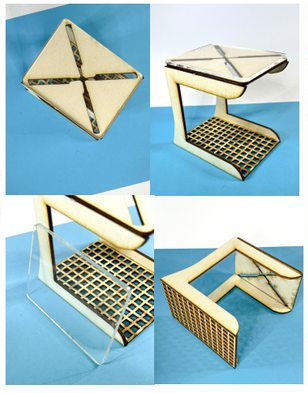
Modelling



KAD Drawing used to laser cut parts of model
1:6 scale based of rough side table measurements
Majority of peices cut from laser ply with one peice cut from acrylic



Silhouette of PUMA helicopter rotor blades
Miniature models show how side table might be used
In future models I will 3D print wheels to create a realistic look
Image shows clear acrylic top represents glass



Clear glass top placed ontop of sheet steel silhouette
allows people to view upcycled wheels from the top of the model
Perforated steel base to add to texture, interest + strength of design

Next Step: Developing the design concept beyond helicopter parts to highlight the framework versatility

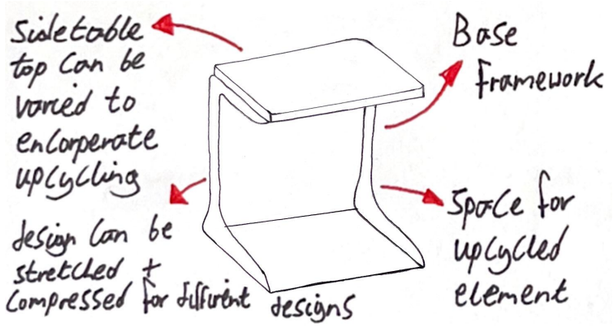
Design Development of the Design Concept

Development of Design Concept

Explanation of Design Concept

My design is **largely bespoke**. However the concept is **easily tweekable** to create **innovative furniture** out of almost **any upcycled element** that is available! Whilst my prototype will have a puma landing gear in it, the **framework** and **concept** can be **applied elsewhere**. I have shown a range of ways this framework and design concept can be **slightly adapted** to create furniture on this page.

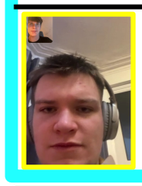
Current Design Concept and Framework

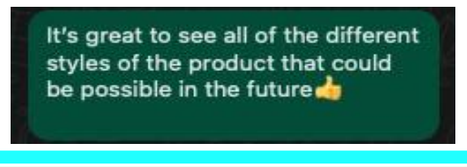


End User + Stakeholder Feedback



Continuous idea created space to incorporate various possible objects. Also allows shape to be explored with Grant & Callum. Various material options possible - Hair to fix display item needs to be thought through.





Response to feedback

I appreciate that both Grant and Arthur are **enthusiastic** about **incorporating variations** within the framework. I value their confidence in how this could **enhance** the product's **marketability**.

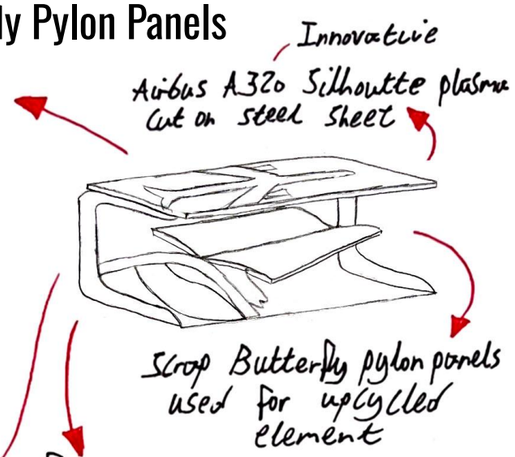
Versatility of Designed Framework

Butterfly Pylon Panels

Upcycled Element



This framework includes the butterfly pylon panels from an **Airbus A320.**

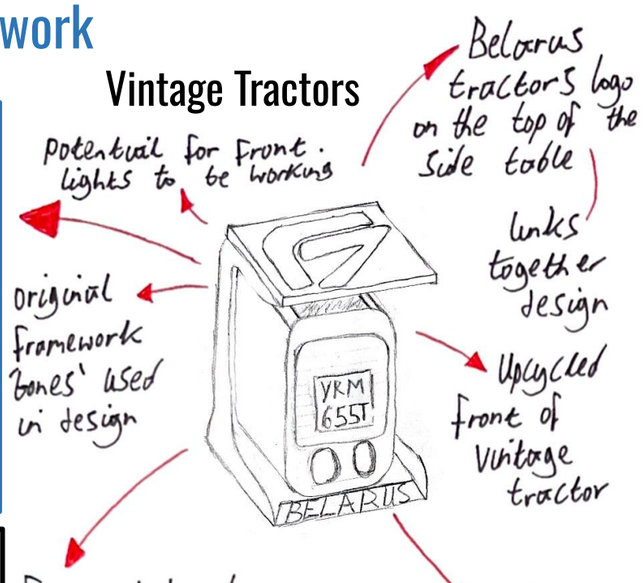


Vintage Tractors

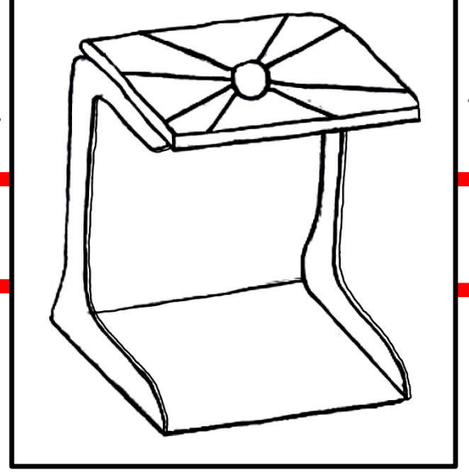
Upcycled Element



This framework features the **front** of a **classic tractor.**



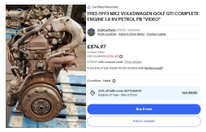
Current Prototype



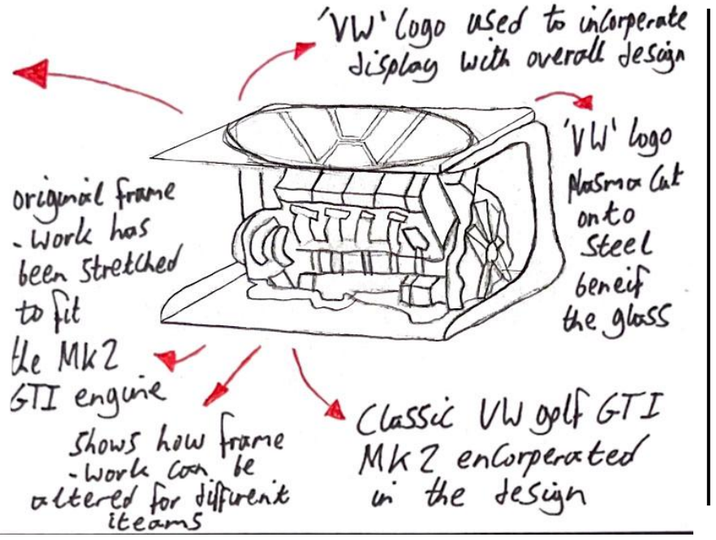
VW MK2 GTI Engine

Upcycled Element



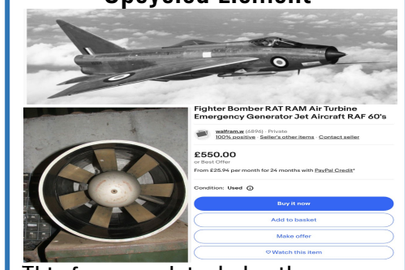


This framework features the **engine** of a **classic MK2 Golf GTI.**

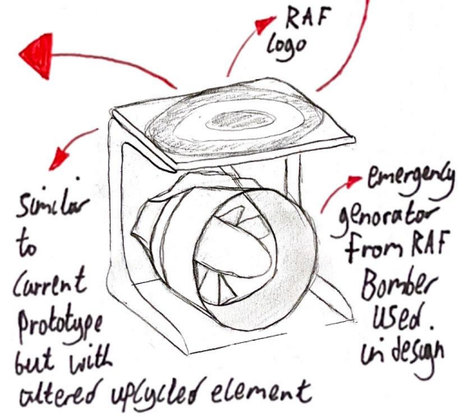


Emergency Generator

Upcycled Element



This framework includes the emergency generator from an **RAF 1960s bomber.**



Next Step: Meeting my stakeholder to advance the aesthetics and ergonomics of the current design

Design Development - in Person Stakeholder Meeting

Possibility to use Grants workshop



Image of Grants Work Shop

More realistic to how my product would be made in industry

For the construction of my final prototype Grant has let me use the facilities at his shop



Image to show the Plasma Cutter

Potential finishes for the steel

Grant and I talked about a variety of finishes including:
- Powder Coating
- galvanising
- Sanding
- Clear Coats

Double 'sandwiched' legs



Potential way to join metal with welds

Innovative idea we discussed = 2 Sheet Steel legs Sandwiched together



Outside legs will have holes whilst inside will be solid



Counter Sunk bolts to connect both sheets of metal

Using offcuts from grants workshop?

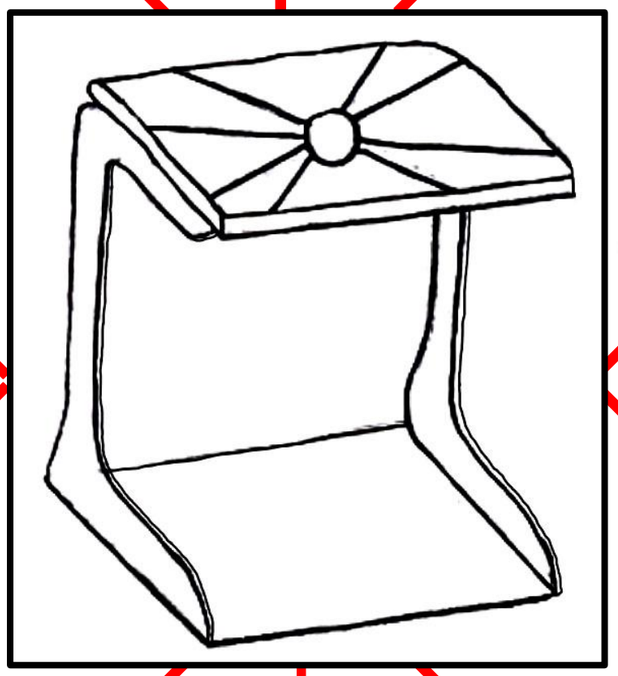
Me and grant discussed using off cuts



once I have sorted up my prototype I will check if off cuts are big enough

Inkeeping with the upcycle theme

Image to show the offcuts at the workshop

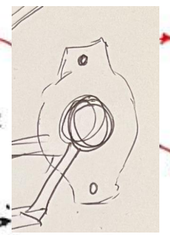


Position of glass

to prevent the glass top getting damaged grant suggested it would be better for the glass to be between the 2 legs rather than on top

Method to connect wheels to frame

This is a quick sketch we drew to visualise the conversation



Me and Grant talked about how to connect the wheels to the frame

This plate would be mounted under the table top

Stem of wheels fits into hole

'Spider Web' Base



Innovative base that Grant suggested

Wheels are able to rest on steel

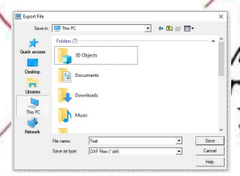
Potential for PUMA Written in Stamped Letters

Me and grant discussed the possibility to Stamp/Cut letters into the steel

This would make the product more innovative + Unique

DXF File Format

I have tested that 2D design can be exported as a DXF



This format will allow me to send my drawings to the laser cutter

Image to show DXF file

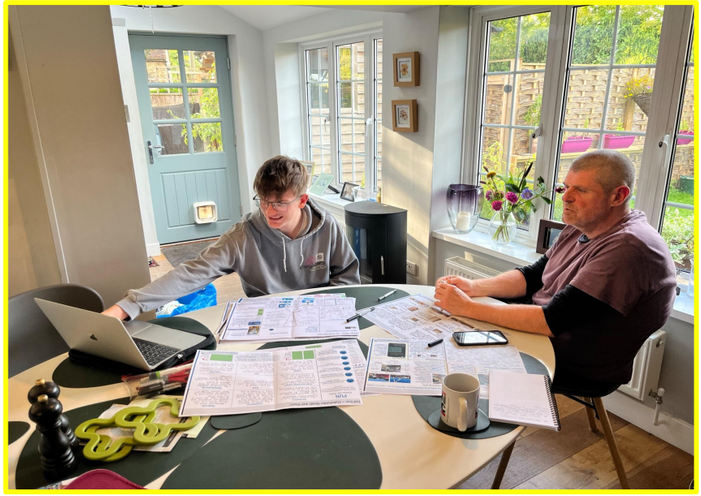
Potential for Added Colour

Colours from the wheels can be used in the design/frame



We talked about making the design less greyscale

Potential Colours to be used



During my **design development meeting** with my stakeholder, I gained valuable insights that have **inspired me** to make changes to **enhance** both the **aesthetics** and **ergonomics** of my design. These improvements will not only improve its overall appearance but also contribute to making it more **innovative and functional**.

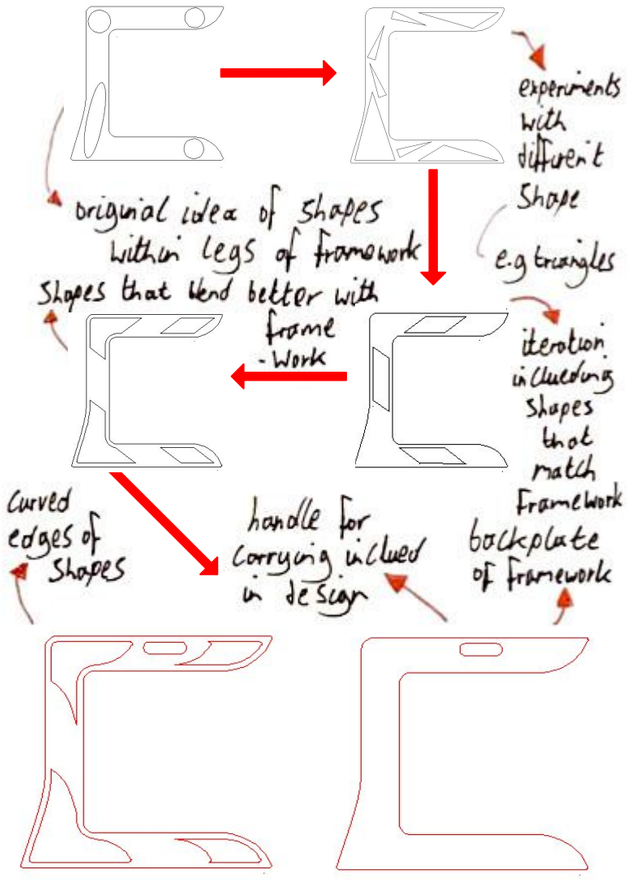
In particular, my conversation with Grant has drew my focus to working with **sheet steel**.His knowledge of the material and equipment available for me to use in his workshop has allowed me to **explore new ideas** I had not previously considered. This has encouraged me to **push** the **boundaries** of my design, making it more **visually appealing** while ensuring it remains **practical** for its intended use.

To capture the **key points** from our discussion, I have created a **detailed mind map** to the **left**. This **outlines** the **important ideas**, **suggestions**, and **techniques** we explored, serving as a useful reference as I continue refining my design.

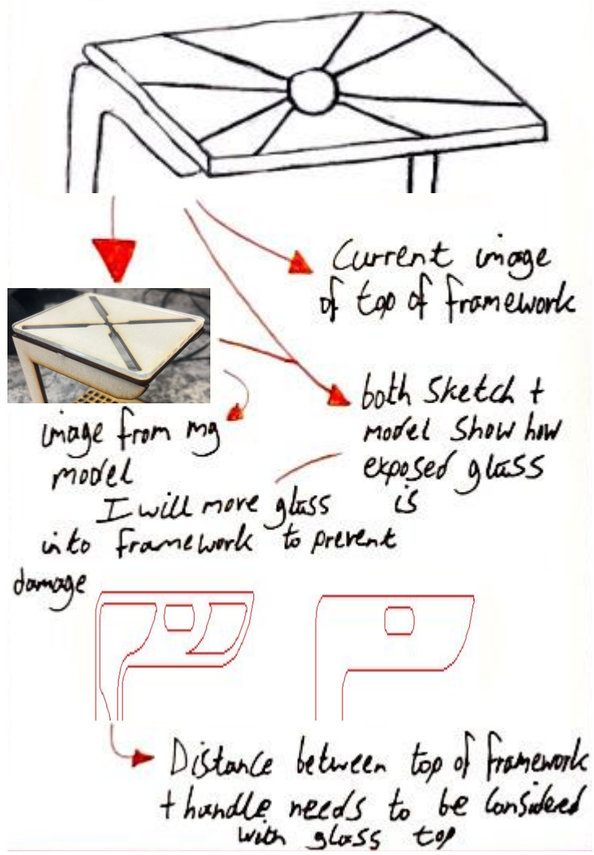
Next Step: Developing the framework by collating the thoughts discussed in this in person meeting

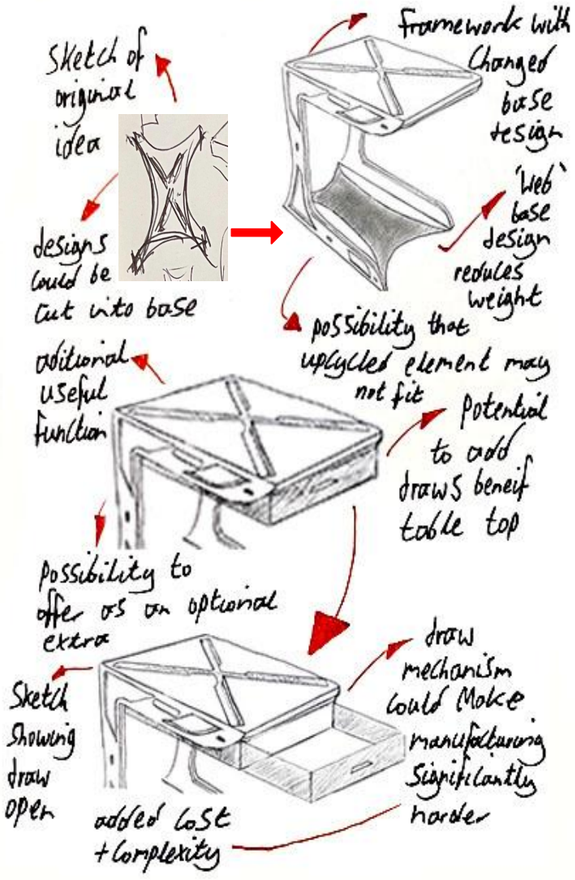
Design Development of Framework

Profile View of Framework

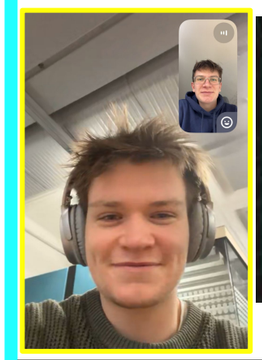


Plan View of Framework

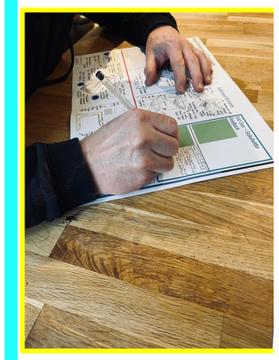




End User + Stakeholder Feedback



You have really acted on my feedback to add more texture to the leg design and I really like it!! My only concern is will this impact the cost of the side table?

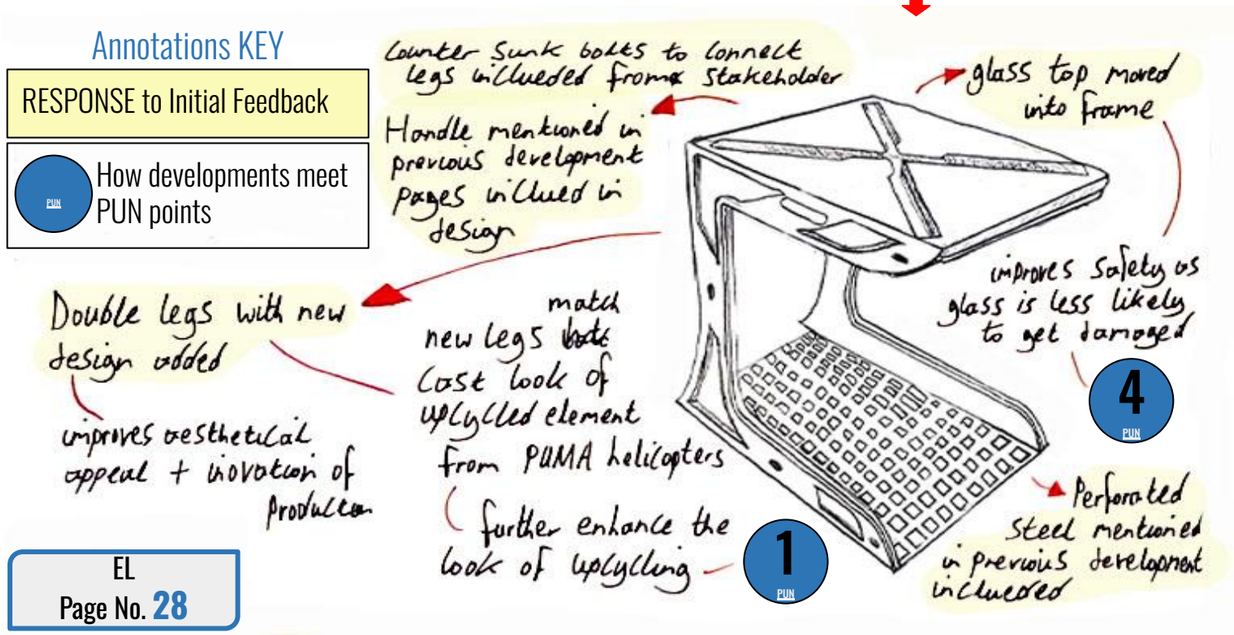


Time to get the "right" cutout shape will pay dividends & make the final piece work best.
Inlaying the glass top should reduce the risk of chipping an edge.
A well functioning drawer would add a practical element to the table But it should avoid changing the aesthetic & feel open space for display.

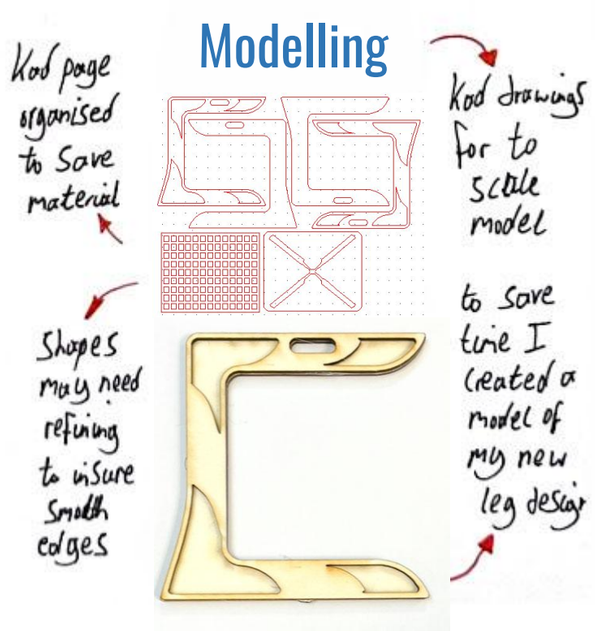
Annotations KEY

RESPONSE to Initial Feedback

PUN How developments meet PUN points



Modelling



Response to feedback

After **incorporating** Grant's **previous feedback** to add **shapes** to the **legs**, it's great to see that he appreciates the design I've developed. I'm also pleased that he likes the **inlaid glass top**. Grant also mentioned the **complexity** of the drawer, and I agree that it may be **too ambitious** for the **initial prototype**. Arthur commented on the **innovative aesthetic** of the leg design and his **hope** it will **not increase production costs**. This should be **achievable** thanks to my access to **CAM technology**, which will allow for quick and precise cutting of the design.

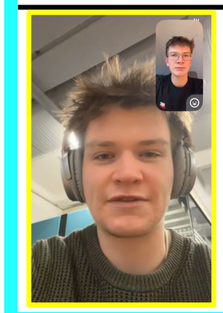
Next Step: Investigating the most suitable materials and stock forms for the current design

Design Development - Materials Research, Testing and Manufacturing Techniques

End User + Stakeholder Feedback



Using Plasma CNC cut sheet steel means any shape that can be created on CAD can be created; Having more design options. Box section would lend itself well to angular or curved shape designs. Finishes are possible - Varnish from raw to polished or powder coated / painted on both



My only comment on this development would be my preference for the table top would be glass as it creates nice reflections and is easy to clean.

Response to feedback

Grant highlighted the wide range of **industrial finishes** available for **steel**, as well as the **unlimited possibilities** when **cutting** sheet **steel** with a **plasma cutter**. This has led me to move forward with a **sheet steel framework**, using machinery like the plasma cutter to achieve the final design. Arthur's comments on the **reflections** of a glass tabletop, along with its **ease** of **cleaning** are what have influenced my decision to **use glass** to best **showcase** the **wheel** within the design. However, this does **not rule out** the possibility of using **other materials**, such as timber, for **future variations**.

Box Steel → Manufacturing

Sizes and Costs

Box Section Steel is available in a range of sizes

Description	Weight	Price (Ex VAT)	Price (Inc VAT)	Quantity
50mm x 50mm x 5mm Mild Steel Box - 1.5 metre length	11.19 kg	£30.00	£36.00	
100mm x 100mm x 5mm Mild Steel Box - 1.5 metre length	22.96 kg	£63.75	£76.50	
50mm x 50mm x 5mm Mild Steel Box - 3 metre length	22.37 kg	£60.00	£72.00	
100mm x 100mm x 5mm Mild Steel Box - 3 metre length	45.92 kg	£127.50	£153.00	
50mm x 50mm x 5mm Mild Steel Box - 4.5 metre length	33.56 kg	£90.00	£108.00	
50mm x 50mm x 5mm Mild Steel Box - 6 metre length	44.75 kg	£120.00	£144.00	

To Create a Similar product from box section steel I would need roughly 6 meters making the cost roughly £144

Welding Equipment



used to join steel

finished join will be a strong as original metal

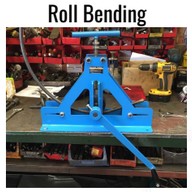
Circular Saw



Circular Saws can be used to cut box section metal

potential for CNC in large scale manufacture

Roll Bending



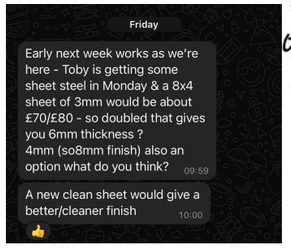
Can be used to bend box section steel

Sheet Steel → Manufacturing

Sizes and Costs

as I need two sheets of 3mm steel the cost is about £160

one sheet of 8x4 3mm steel costs about £80



The cost of both types of steel are similar but sheet steel → CNC

Plasma Cutter



efficient quick way of cutting metal

Plasma cutter can be used to cut sheet steel

Welding Equipment



Can be used to join two pieces of metal

finished join is just as strong as original metal

Press Brake



Used to bend sheet steel

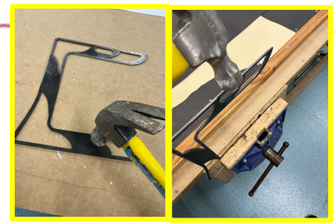
Advances possibilities for manufacturing

Countersunk Bolts



Bolts can join sheets

Material Testing



I tested the impact resistance of sheet steel using a hammer

testing impact strength from above

the steel is more than strong enough to handle daily knocks from things such as hoovers



to test abrasion resistance I used a medium grit

This image shows the scratches left on the metal

for usual wear the steel should be fine

Finishes



Mill Scale left on with Sanding (using an orbital Sander)



Mill Scale removed with no extra finishing processes



Raw Sheet Steel as it comes out of the plasma cutter



Mill Scale taken off and sanded using an orbital Sander

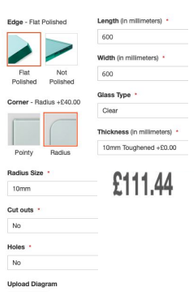
Next Step: Investigating sizes to ensure the design is as ergonomically friendly as possible

Glass vs Wood Table Research

GLASS MIRROR HOUSE

MADE TO MEASURE GLASS

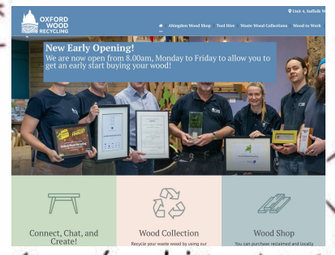
Companies I have researched to provide glass table tops examples of options



prices are between 70 - 150 pounds for a section of glass roughly the right size

available in many shapes and sizes

local which reduces transport costs



one place I would be able to source wood from

recycled wood which aligns with the nature of my product

Positives vs Negatives

Glass	Wood
+ high end finish	+ better Contrast in materials
+ Vision down to upcycled element	+ Often Cheaper
+ Allows for interesting design benefit	+ more available
- expensive	- less vision to upcycled element
	- No interesting design

Design Development - Sizing + Anthropometric Data

Anthropometric and Existing Data

Overall Design Sizing Investigation

45cm is the size of this table top



60x40x25

Existing Sizes



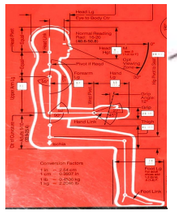
Similar Style Framework to my design

41cm height



might be too small for my design

Proposed Sizes



For my side table the sizes must allow for upcycled peices. to fit therefore My proposed sizes are 60 x 60 x 60 cm

Testing Proposed Sizes



Here is an image of me testing existing sizes of furniture to confirm the sizes I have Suggested

Existing Sizes

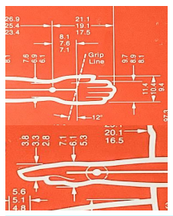
The range of hand grips is from 7-15 cm in length by 3x5 cm in height for the products I have researched



This whole is 12cm x 3cm

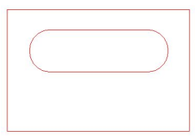
fits the hand nicely + fits big/small hand sizes

Proposed Sizes

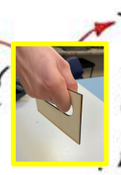


- The handle of the side table must be comfortable to use
- My proposed size is 15cm for the handle

Testing Proposed Sizes



To test my proposed hand size I laser cut a 1x1 model



This picture shows how I tested a large range of hand sizes in person

Delivery Considerations



Size	Price	Dimension
Large Up to 20kg	From only £4.90	**Maximum dimensions (cm):** 60 (l) x 60 (w) x 60 (h)
Extra Large Up to 30kg	From only £8.80	**Maximum dimensions (cm):** 120 (l) x 70 (w) x 70 (h)

My proposed sizes of 62 x 62 x 62 cm will fit in the extra large package

However the weight of 30kg may be not enough



For a batch of 100 units the total delivery cost would be between £11.04 and £15 when including packaging e.g bubble wrap.

Total Delivery Costs

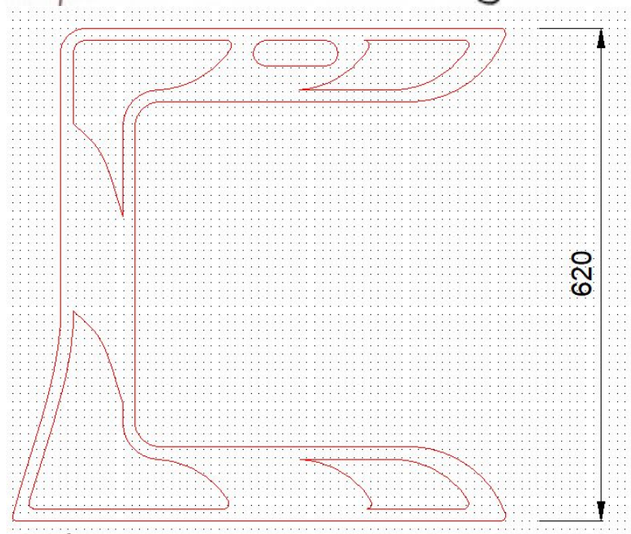
5 lots of 70 x 70 x 70 boxes come in each unit

each box costs £2.24

100 units costs £1.118

Proposed Size of Prototype

The size I proposed for the table is 620mm x 620mm square to create an appealing aesthetical size and functional overall design



I will use these sizes to create a 1:8 scale model of the side table

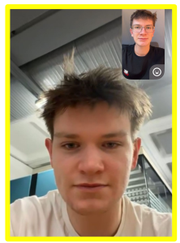
This 2D design shows the sizes of one of the legs in the side table

This height should allow for comfortable usage of the product when it is positioned next to a sofa

End User + Stakeholder Feedback



The dimensions of the wheel assembly will dictate overall dimensions - however its good to see that considerations have been made regards proportionality and practical functionality.



I am very pleased to see you have considered different hand sizes because there is nothing worse than the intended use not working!!

Response to feedback

Grant raises a valid point about the **sizing** of **future variations** of the design, as **different upcycled elements** will inevitably affect the **proposed dimensions**. However, I also agree that exploring various sizing possibilities is certainly **worthwhile**. Arthur is impressed that **hand sizes** are tested to ensure the feature **accommodates** as **many users** as **possible** something I am pleased I worked on.

Next Step: Using my research from throughout the iterative process to create final design developments

Final Design Developments

End User + Stakeholder Feedback



The model is a fantastic proof of concept. The sandwiching of the steel adds a 3D element I like & the propellor cutout ties the whole piece together. It has a precise & engineered look which matches the helicopter theme.



The final design looks great! Now you just need to make sure it is constructed well to ensure the end product looks as good as this 👍

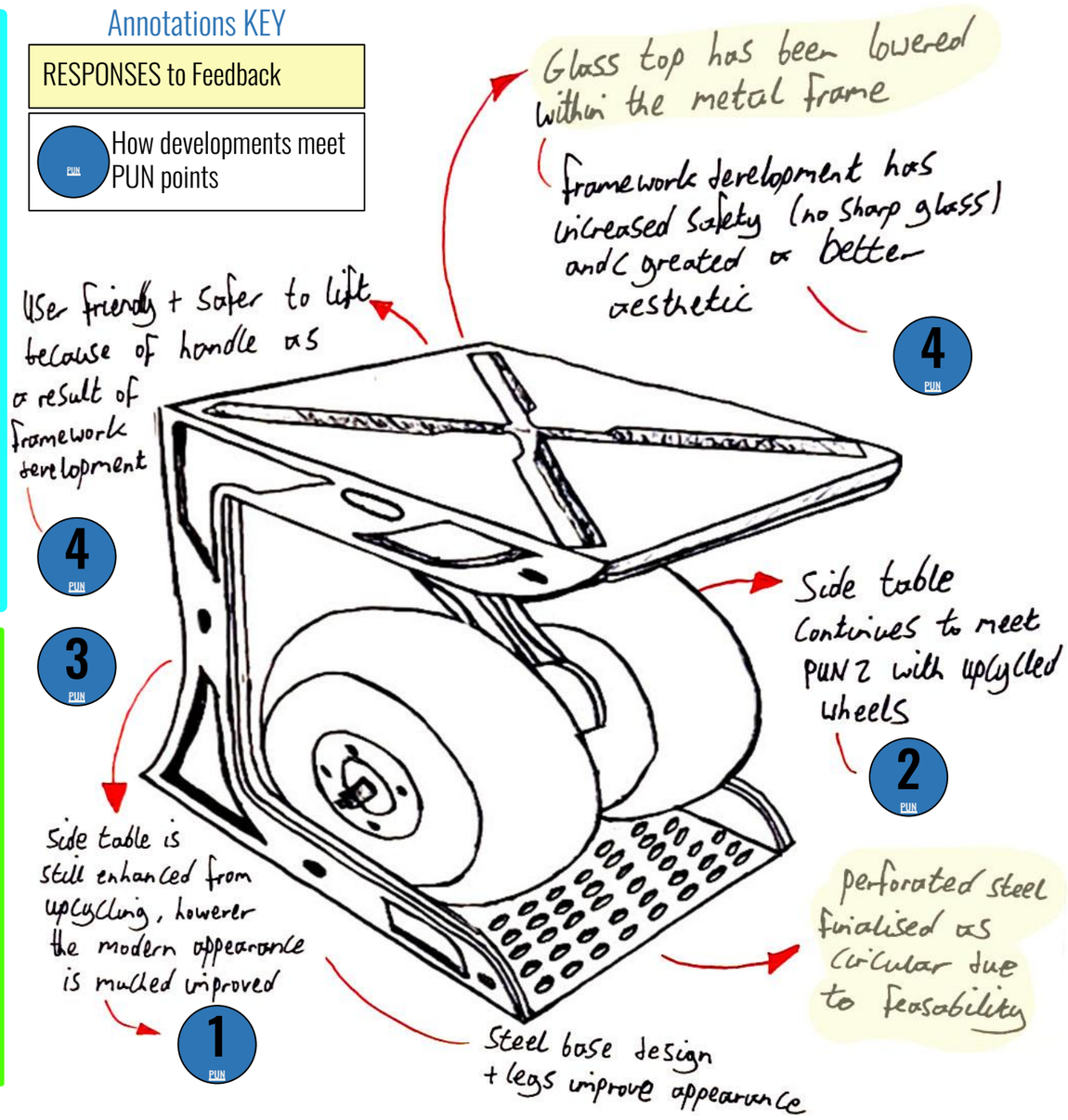
Response to feedback

I am pleased that **viewing** the **model** has reassured both Grant and Arthur about the **direction** and **proposal** of the **final design**. I agree that the **design features enhance** its **precision-engineered aesthetic** as mentioned by Grant. This contributing to the **uniqueness** of this side table. Arthur also raises a valid point about the importance of ensuring the **prototype's quality** is as good as possible. This will not only **satisfy end users** but also **enhance** the design's **marketability**. Overall, I'm **happy** with the final design and **excited** to bring it to **life** and see it in person!

Annotations KEY

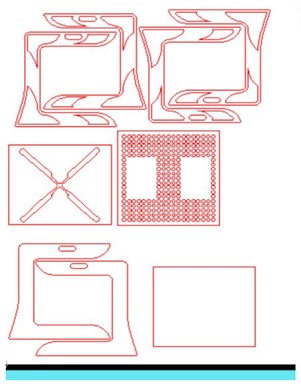
RESPONSES to Feedback

PUN — How developments meet PUN points



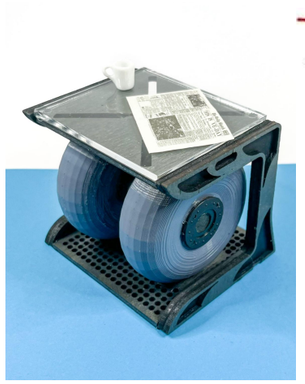
Modelling

CAD file used to laser cut pieces out of laser ply, card and acrylic



these drawings will be used for plasma cutting files

the legs interlock to save on materials



This model shows what the final prototype will look like



The side table top has space for newspapers or other items

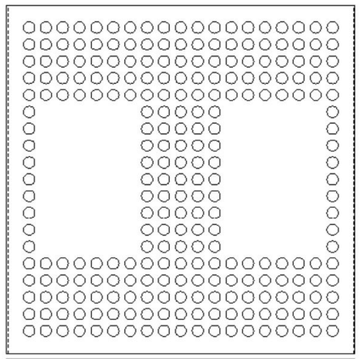
the model shows how the glass will sit flush

Final Additions

Perforated Steel Base

Tracks have been added so the wheels sit on a solid surface

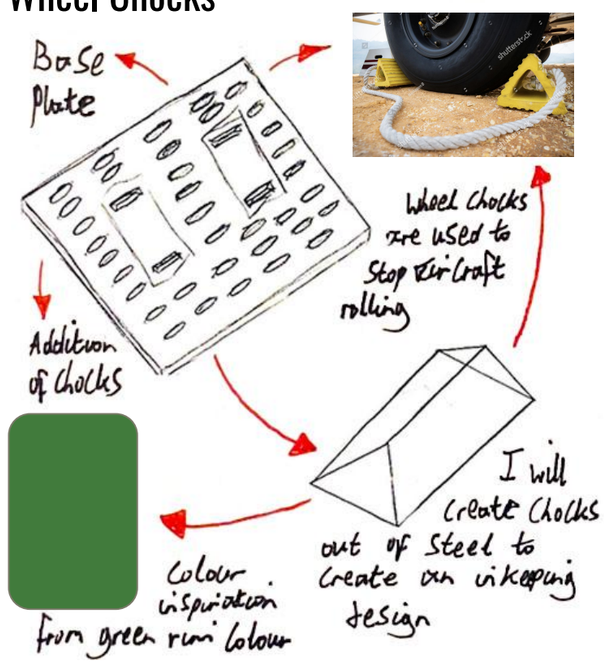
incorporating the upcycled part further



therefore circular cut outs from a drill are the way to create the look

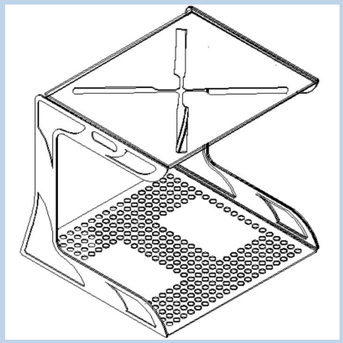
To achive the aesthetic of a perforated base the metal can not be plasma cut due to the risk of bends under heat

Wheel Chocks

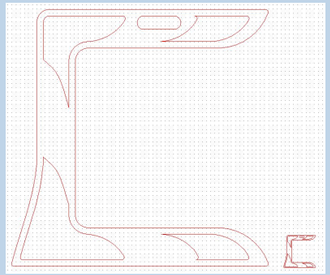


Next Step: Showing how I used a range of equipment and techniques to create my final model

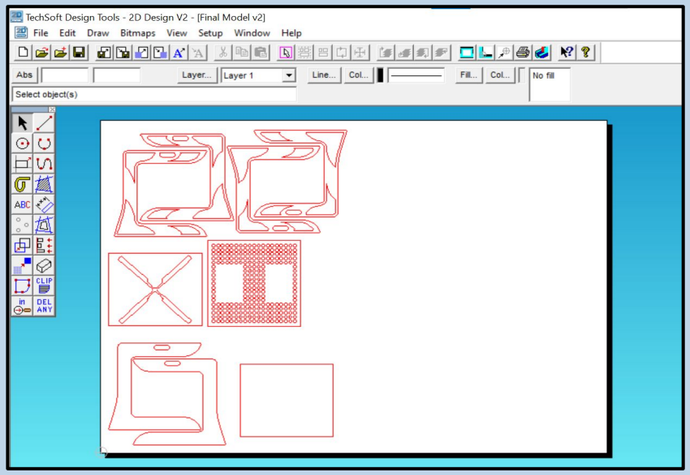
Final Design Development - Modelling my Final Prototype



Creating a 1 to 8 scale cad drawing



-To create a 1:8 scale I divided the measurements of the final product by 8



Using the Laser Cutter to Cut Out Pieces Needed for the Model

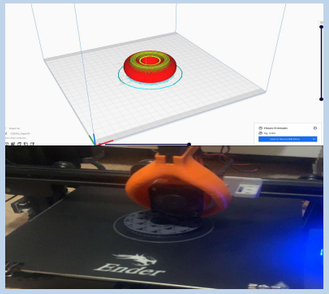


-I used my CAD drawing to laser cut the parts of the scale model.
-I used the laser to cut plywood, acrylic + cord

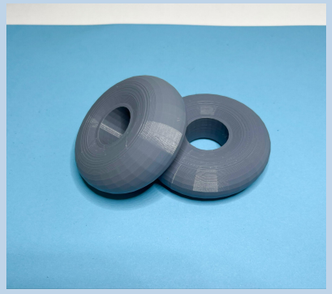


-This image shows all of the laser cut plywood peices before they were spray painted

Using 3D CAD Software to Print 3D Wheel Model



-I used 3D software and a 3D printer to create the 'upcycled' wheels



-This image shows the wheels before they were joined together

Spray painting the Model Pieces



-This image shows me spray painting the plywood grey to match the steel colour.

Assembling the Final Model



-To assemble the model I used PVA glue to join the legs together as it provided a clean, solid join between the plywood peices.



Next I glued the structural peices with a hot glue gun as it sets faster than PVA. Once I had glued it together the model was complete

Images of the final Model (1:8 Scale)



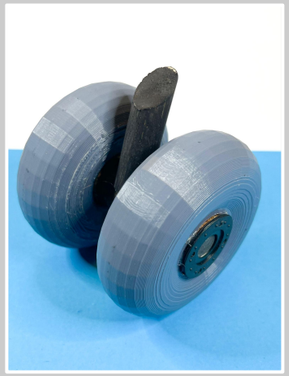
Next Step: Displaying images of my final model

Product Showcase

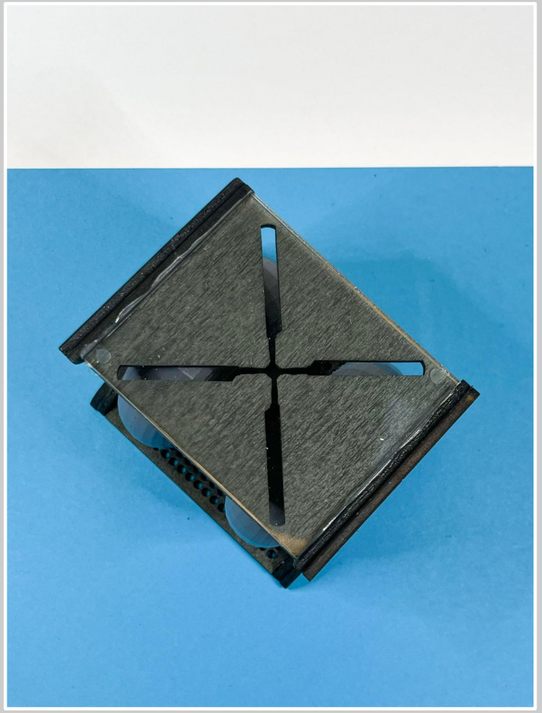












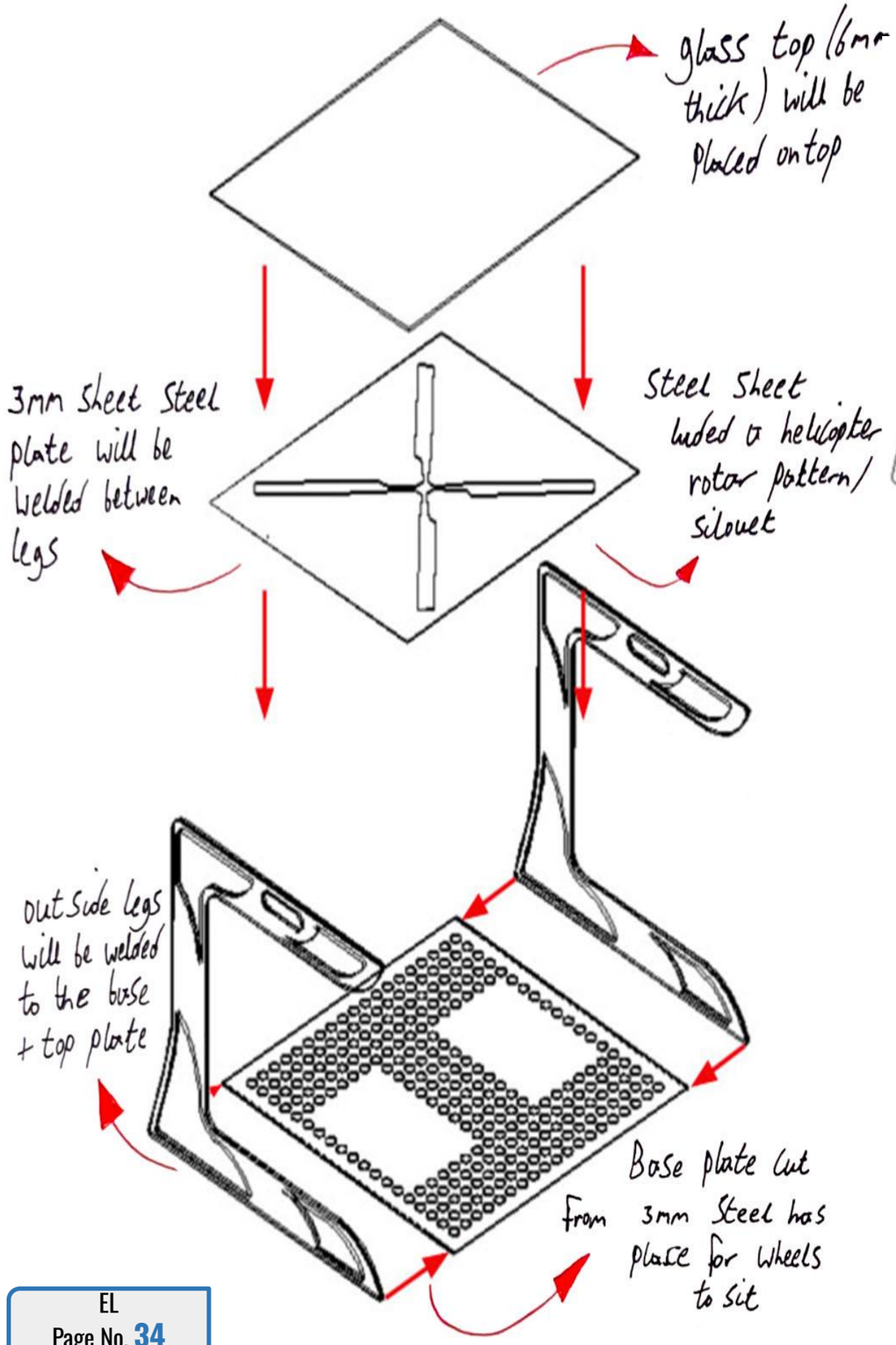




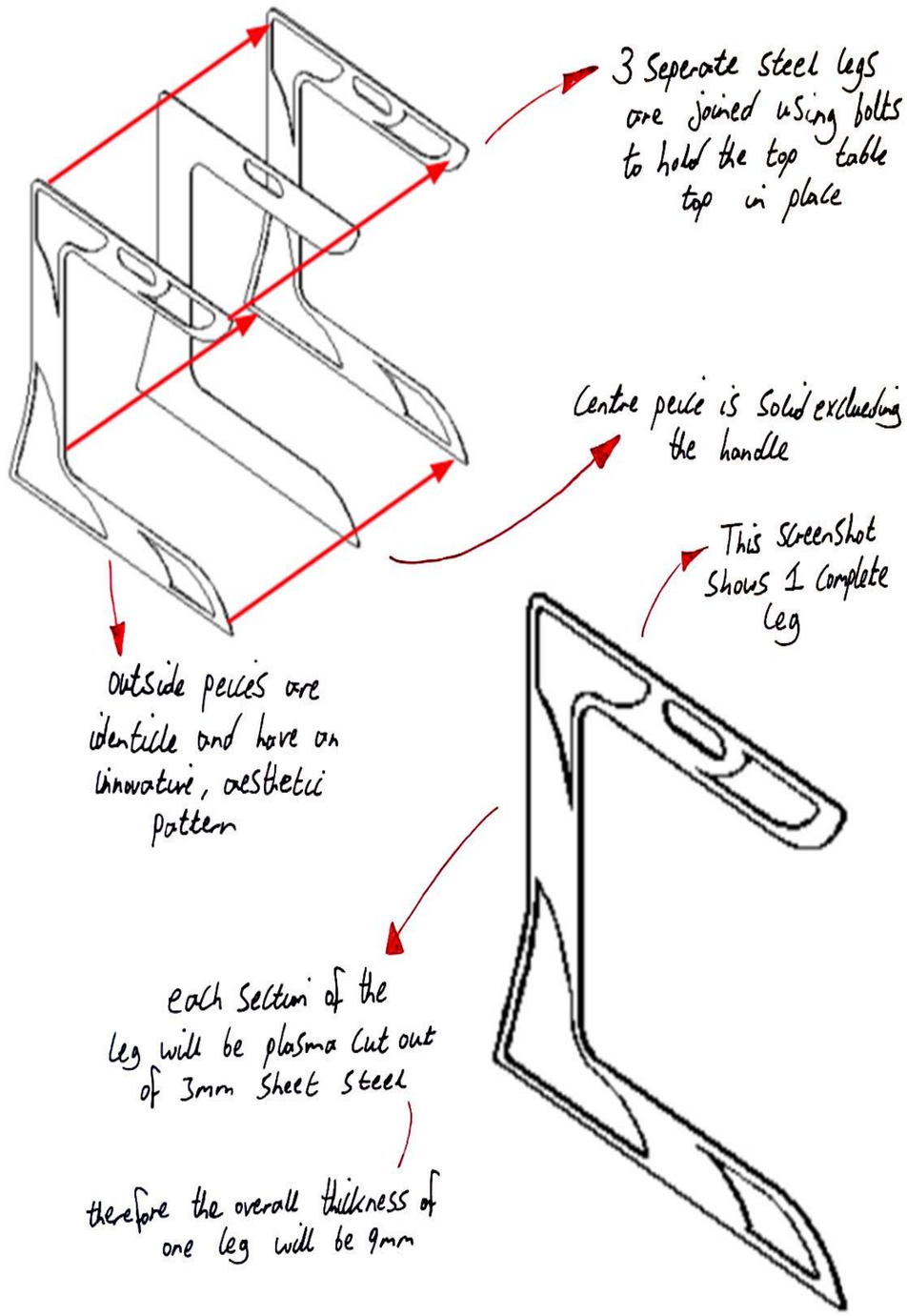
Next Step: Showing exploded views of design that can be used to communicate the design for manufacture

Exploded View

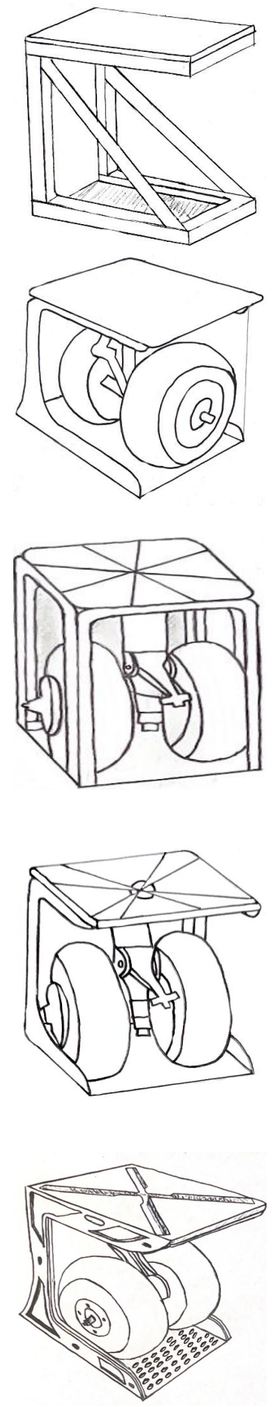
Exploded View of Framework



Exploded View of Leg Design

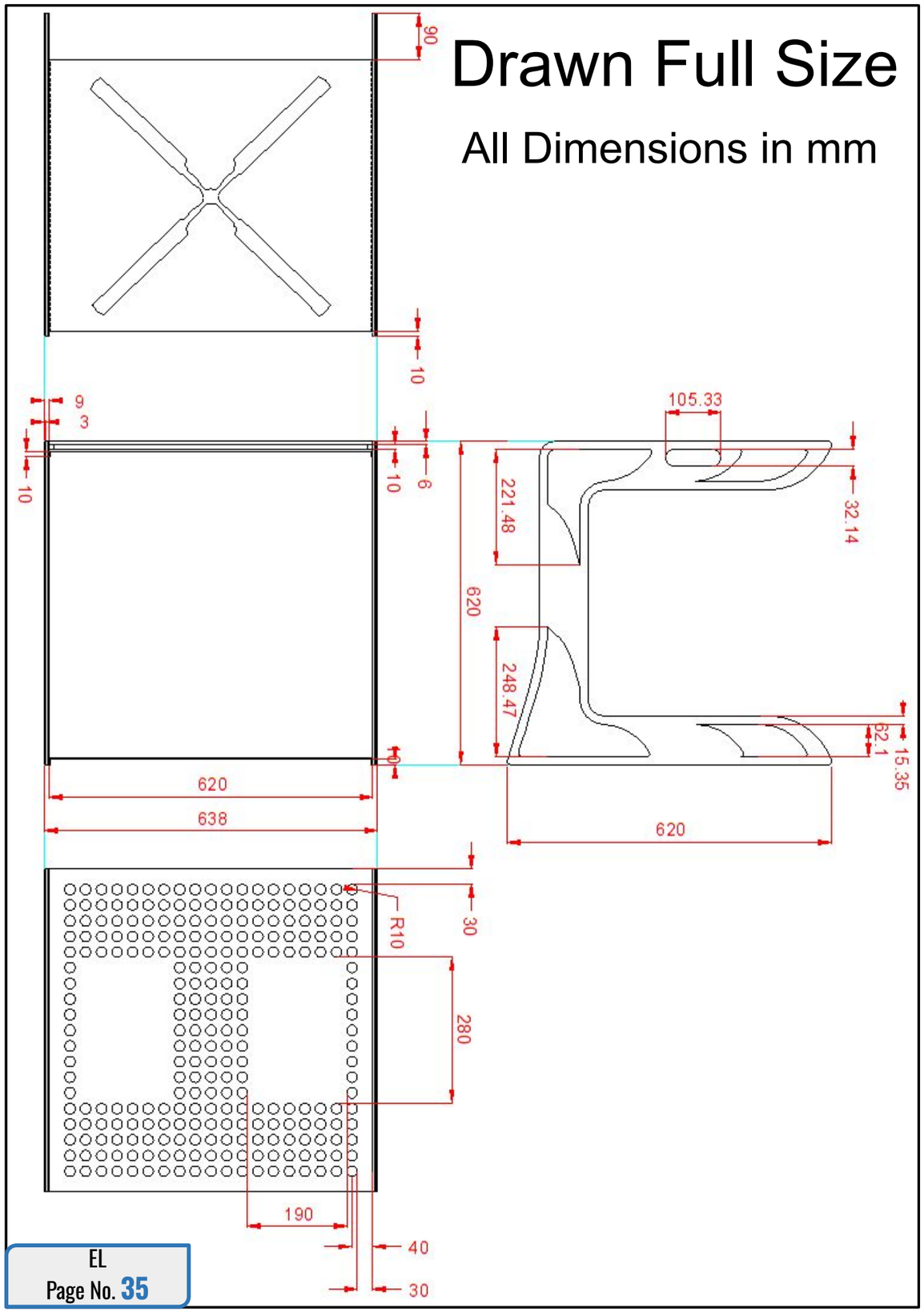


Design Progression

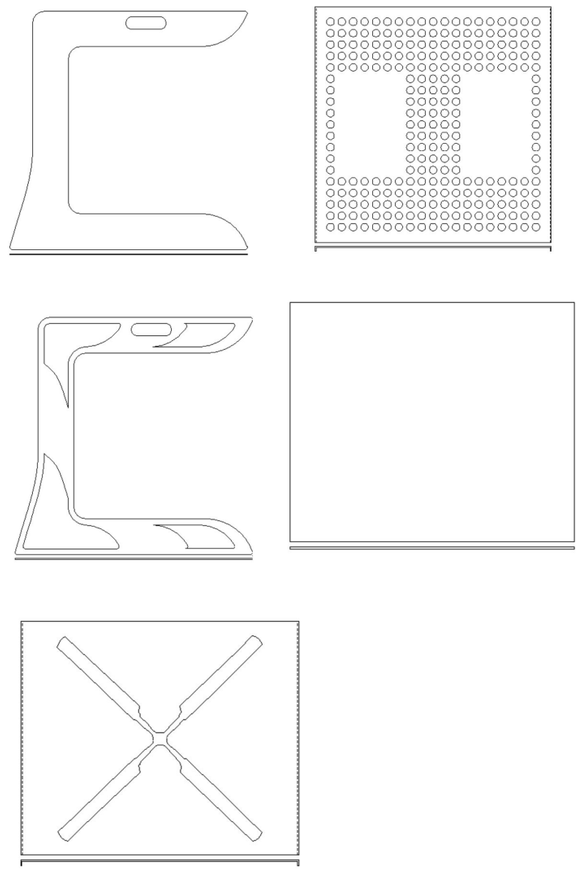


Next Step: Showcasing my technical specification to be used to assist manufacture of the final product

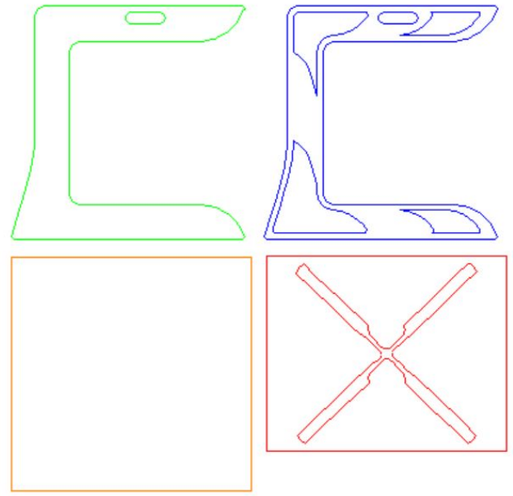
Technical Specification, Parts and Plasma Cutting Files



Individual Parts and Thicknesses

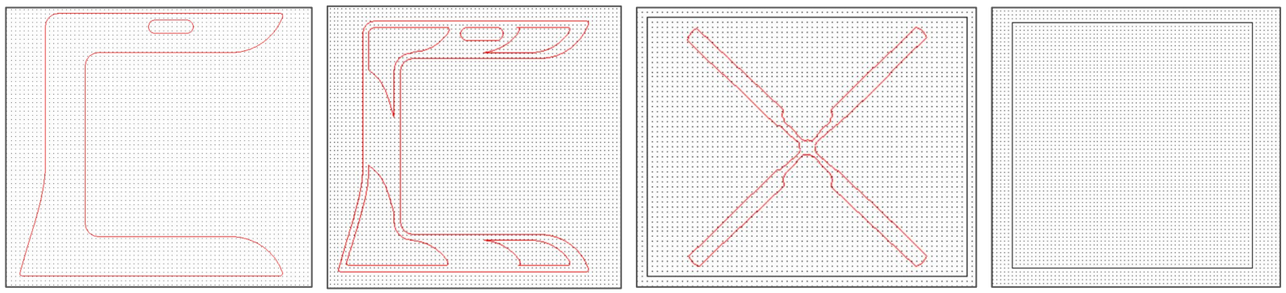


Cutting List



- 2X Middle Leg Plate 620X620
- 1X Glass Top 520X620
- 1x Top Plate 520X640
- 4X Outer Leg Plate 620X620

DXF Files



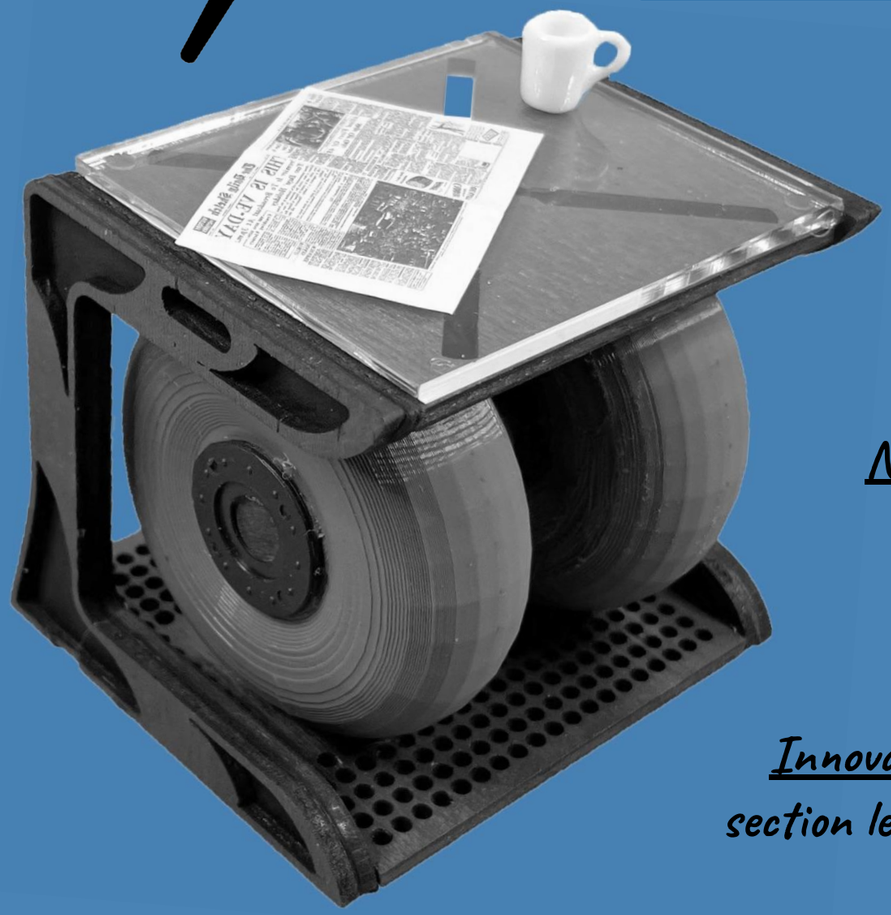
Base Plate 620X640	26/11/2024 19:07	DXF File
Inner Leg Pannel 620X620	26/11/2024 19:06	DXF File
Outter Leg Pannel 620X620	26/11/2024 19:07	DXF File
Top Plate 520X640	26/11/2024 19:06	DXF File

Next Step: Creating a final design presentation to show stakeholders and manufacturers the end product

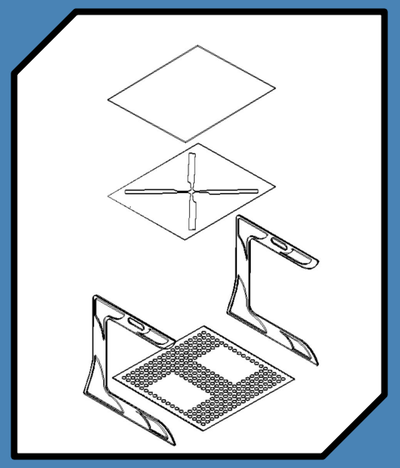
Final Design Solution

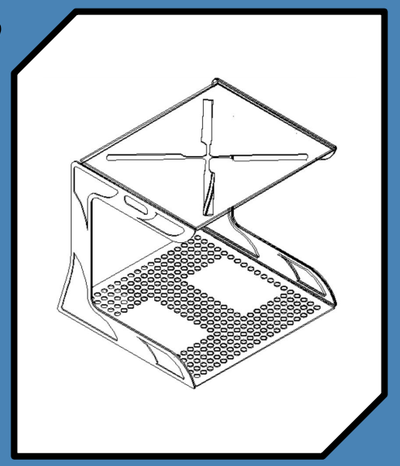
THE HELI SIDE TABLE

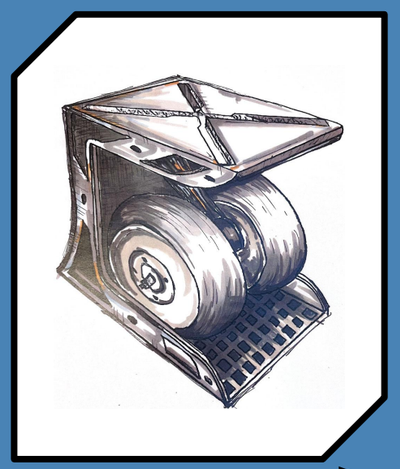
The Heli Side Table is a new style of side table incorporating an upcycled helicopter part within the framework of the table













NEW style of side table.

Unique table top design related to *upcycled* piece.

Innovative 3 section leg design.

Perforated steel base.

The framework is designed to be *easily adaptable* to suit other upcycled pieces.

Next Step: Creating a detailed plan of making to ensure success when creating the final product

Plan of Making

Task	Equipment/Materials	Quality Control	Health and Safety Specific to Task
• Upload DXF files to plasma cutting software and store them	• Computer with 2D design software	• Ensure file accuracy and correct lead in on plasma cutter software	• Minimal risk
• Cut sheet steel out using the plasma cutter and uploaded DXF files	• Plasma cutter, sheet steel (2500 × 1250 x 3 mm)	• Visually check material for imperfections, check cutting speed, power and start position	• Correct PPE (gloves, goggles) and follow plasma cutting safety procedures
• Tack weld leg components together before adding countersunk bolts to secure legs	• Welder, sheet steel leg cut outs, G clamps, pillar drill, correct drill bits	• Verify legs are aligned correctly, ensure countersunk holes are correct depth	• Use correct welding PPE (gloves apron, goggles) ensure grounding and be aware of hot material
• Punch holes in sheet steel base to reduce weight and add to aesthetic appearance	• Mag drill, G clamps, sheet steel base peice	• Use G clamps and magnet to prevent movement and ensure holes are drawn out correctly before cutting	• Use correct PPE (ear defenders, safety goggles)
• Machine top and base to add bends for structure and aesthetical appearance	• Press break, sheet steel top with helicopter cut out.	• Check angle and alignment before commencing	• Keep hands far from moving parts
• Finish steel components to give a better aesthetic appeal to the sheet steel	• Orbital sander, sanding pads, all steel components	• Visual checks for clean smooth surfaces with enhanced aesthetic appeal	• Correct PPE (mask and goggles to protect against potential dust and debris)
• Weld entire framework together	• Welder, G clamps, sash clamps, welding blocks	• Continuously check lamps and welding squares to prevent warping	• Use correct welding PPE (gloves apron, goggles) ensure grounding and be aware of hot material
• Create wheel support out of circular steel tubing	• Tube steel, threaded drill bit and bolt, welder	• Ensure correct sized tubing and that no clashes occur between bolt and wheel stem	• General and welding PPE
• Attach glass top to finish	• 3mm glass top, sticky pads	• Ensure pads are evenly spaced and glass sits flat and secure	• Handle glass with care and enure no sharp objects around when installing glass

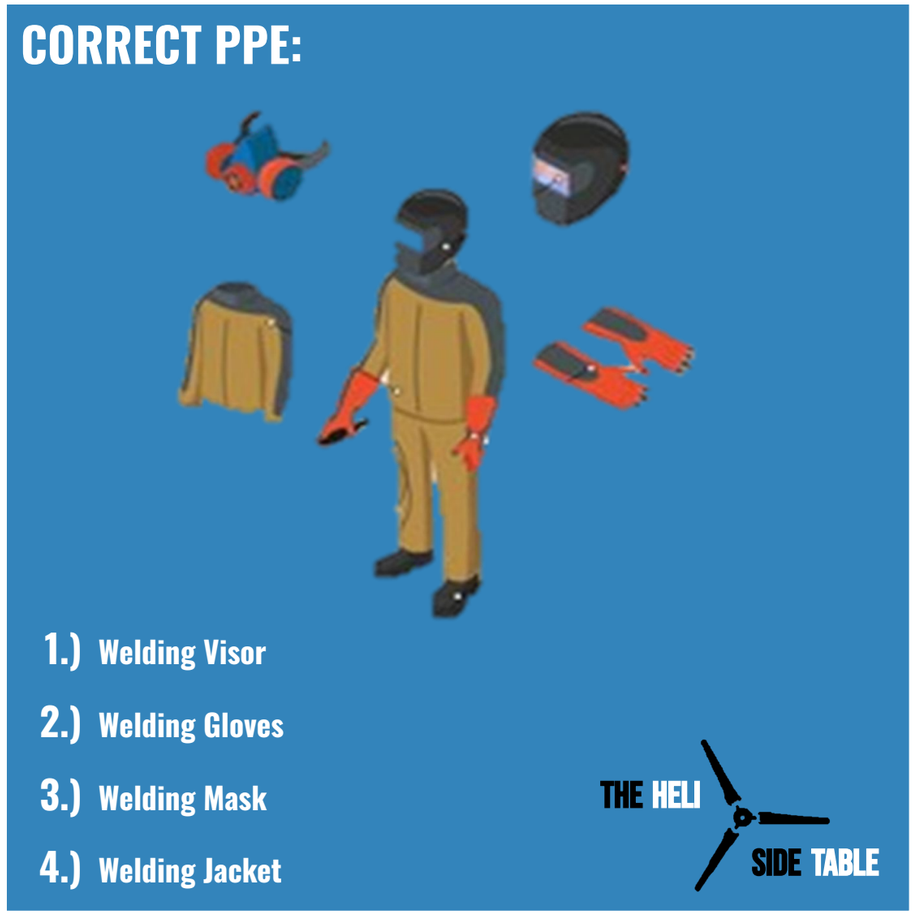
Next Step: Outlining risks and mitigation strategies that could be encountered in manufacture

Risk Assessment - During Making Process

	Slightly Harmful	Harmful	Extremely Harmful
Unlikely	Minor cuts and abrasions	Crowded workspace	Hot Surfaces
Likely	noise exposure	Fire/explosion	Eye damage
Highly Likely	Lifting heavy metal sheets	Trips/falls	Inhalation of toxic gases

Risk	Harm	Mitigation
Inhalation of toxic gases	Inhaling toxic gasses can lead to respiratory health issues e.g lung cancer	Wearing correct PPE e.g respiratory mask
Trips/falls	Broken bones/head injuries from solid equipment	Removing obstructions in immediate workspace
Eye damage	Mild harm includes feeling of sand in eyes with severe harm including blindness	Wearing correct PPE e.g welding mask
Hot Surfaces	3rd degree burns = permanent skin damage from heat of plasma and welding equipment	Making others aware of hot surfaces and allowing metal to cool before moving with heat proof gloves
Fire/explosion	Burns can cause permanent skin damage and smoke inhalation can lead to respiratory issues	Keeping
Lifting heavy metal sheets	Injury to muscles such as strains which can be painful and cause mobility issues	Using correct machinery to move heavy metal such as trolleys and forklifts
Noise exposure	Temporary feeling of discomfort from ringing in ears which an cause concentration issues	Wearing correct PPE e.g ear muffs
Crowded workspace	May not pose direct harm but will Increased risk of other events occurring	Limiting the number of people allowed in the workshop at a given time
Minor cuts and abrasion	Generally heal fast although can cause discomfort and lead to infection	Clean workspace, guards of machinery and correct PPE when handling metal e.g cut resistant gloves

PPE Infographic

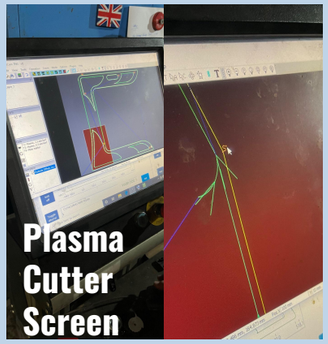


Next Step: Showcasing the what actually occurred when manufacturing the final product

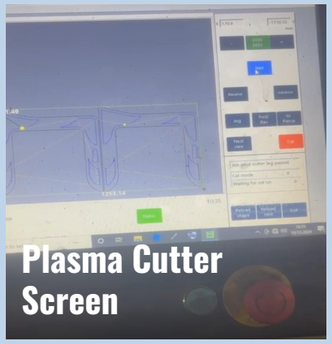
Record of Making

START

Loading CAD Drawings into the Plasma Cutter



- Ensuring lead in cuts from outside the shape



- Positioning legs to minimise wasted steel

Cutting ALL of the steel out



- Plasma cutter cutting steel out of 3mm sheet steel



- This photo shows the minimal wastage of the sheet steel

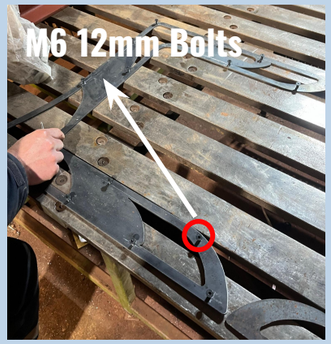


- Image to show all of the steel cut out

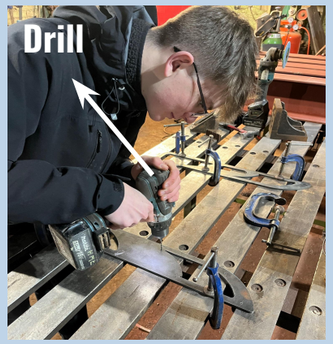


- Removing rough edge of steel left by the plasma cutter

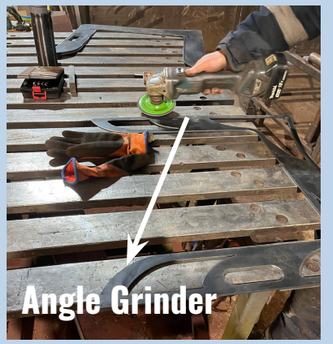
Assembling Legs



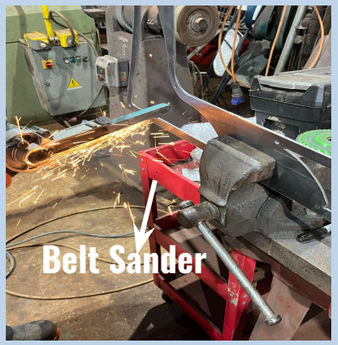
- Lining up and marking where screws will go with chalk



- Drilling holes to mark where to drill the countersunk hole



- Angle grinding / sanding edges lightly for a good fit between legs



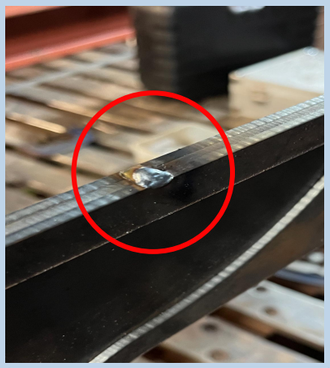
- Here I am using a belt sander to finish the inside of the leg before it is joined



- Using weighted square blocks to line up steel before clamping to bench



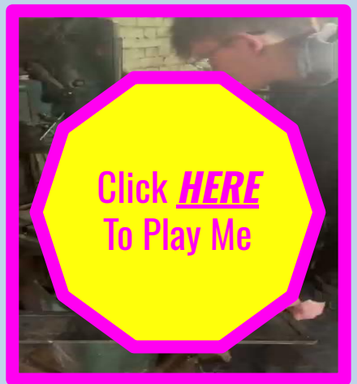
- tacking steel legs together so they can be bolted



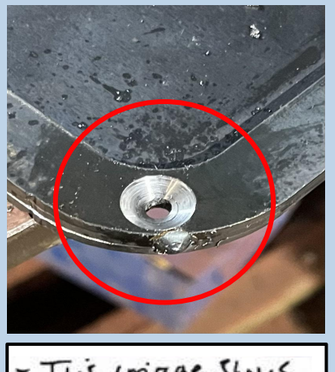
- red circle highlights one of the tacks joining all 3 sheets



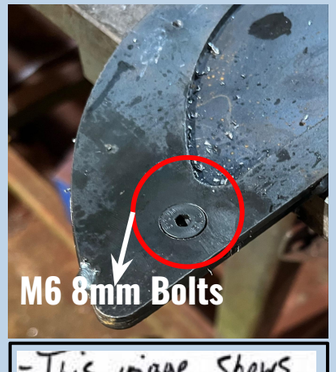
- In order to make the countersunk holes 3 drill bits are needed. Pilot bit, Countersunk bit, threaded



- This video shows me using a pillar drill to create countersunk holes



- This image shows what the hole looks like before the bolt is screwed in



- This image shows how the counter-sunk bolts look on the surface

Next Step: Continuing to outline steps taken to create the final product

Record of Making



-This image shows the bevelling tool I used to get a smooth feel on edges



-This image shows the 2 legs once assembled

Creating Punch Steel Aesthetic



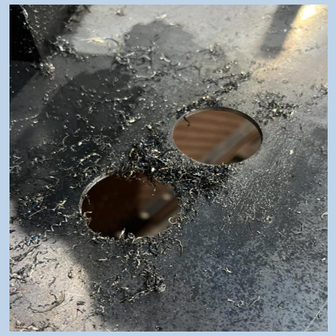
-This image shows the punch, Square, tape measure and Compass used to mark holes



-This image shows how I marked the holes on to the base



-In the video I am using a Mag Drill to drill the holes



-This image shows what the holes look like once drilled

Bending Top and Base Pieces



-To bend the top and base plates I used a press break



-This image shows the bend in the steel on the edge

Finishing the Legs, Top and Base



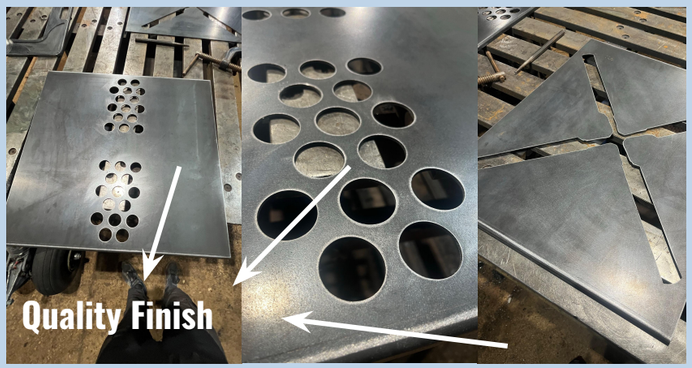
-This photo shows the orbital sander I used to finish framework



-This image shows the medium grit pad on the sander



-This is a video of me sanding the legs of the framework



-The 3 images above show how the sheet metal looks after I had finished it

Assembling the Framework



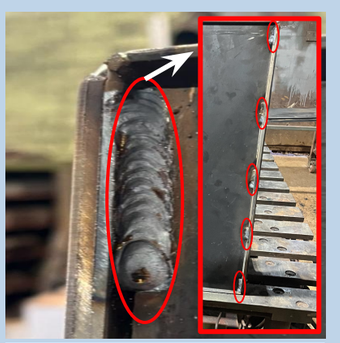
-Using clamps + square right angle blocks to allign base and leg



-Once alligned I welded the front and back in place



Next I rotated the framework to continue joining the base + leg



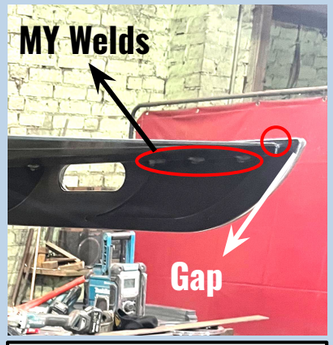
-This image shows where and how the base and leg are welded

Next Step: Outlining the final steps taken to create the final product

Record of Making



- Once I had attatched both legs to the base I flipped the frame
- Work to weld the top on



- This image shows the welds as well as the gap left for the glass top



- This image shows the completed frame - work with the wheels resting on the base

Creating the Support for the Wheel



- Here I used a bevel protractor to measure the angle



- Next the wheel was shortened on the mark I drew on



- This image shows the angle once the landing gear was cut



- Next I marked the angle onto a piece of steel tube



- This video shows the horizontal band - saw cutting the tube



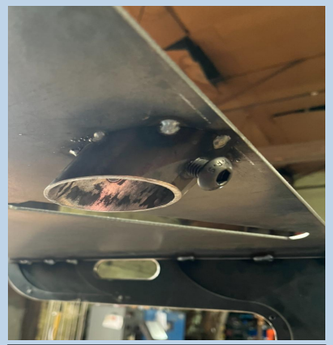
- This image shows the support ring before it was threaded to fit a bolt



- This image shows the position marked on the top plate

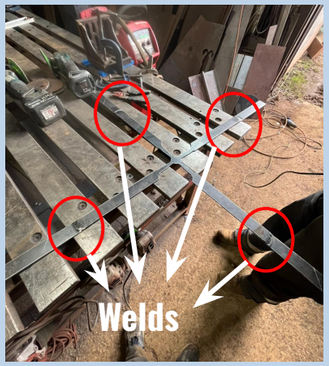


- This video shows me welding the support to the frame

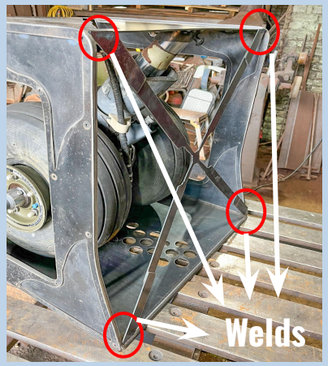


- The image shows the support attatched to the framework

Creating Horizontal Back Support



- This image shows the cut out of the top with extra length added to it



- This image shows how the cross bracing is attatched to the back

Adding Tempered Glass top



- This image shows the addition of the tempered glass top

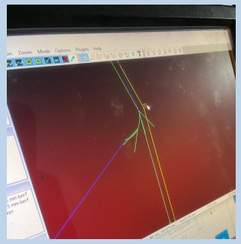
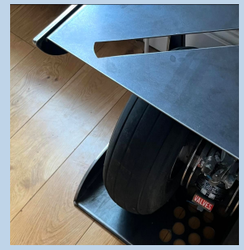
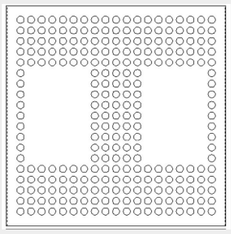
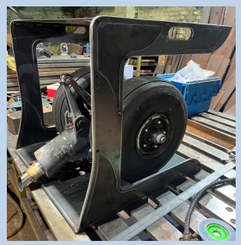
Final Product Image



Finish

Next Step: Reflecting on how problems in manufacture were overcome

Problems Overcome During Manufacture

Issues		Solution	Outcomes	
Lead In on Plasma Cutter - When loading my DXF files on the plasma cutter not all of the lines were complete leading to the software not recognising shapes that needed to be cut		**Tweaking My CAD Work** - I went back to my 2d design files and zoomed into to each line ensuring that there were no breaks in the line and they all joined up smoothly	**Clean Cuts** - The outcome was positive will all cuts being clean and correct due to the action I took to correct the drawings	
Punch Steel Base - The plasma cutter couldn't be used for holes due to potential deformation, and the planned number of holes would likely weaken the base.		**Use MAG Drill + Reduce Holes** - To ensure the steel was not deformed I used a MAG drill and to make sure strength was maintained I significantly reduced the number of holes as well as alternating the pattern design	**New Base Design** - The outcome of this problem was positive and in my opinion the altered design looks better than the proposed idea as it flows better within the design.	
Horizontal Strength - After assembling the framework, I noticed that the top of the side table would flex away from the bottom when pushed.		**Cross Bracing** - To overcome this issue I utilised the cut out from the helicopter design in the top of the table. Using this piece in extended the ends before welding each of the four points onto the framework	**Change to Rear of the Design** - Whilst this solution definitely improved the horizontal strength it was a bit of an afterthought and doesn't perfectly align at the back, something I would change in the future.	
Surface Rust - Due to some moisture settling on the metal during manufacture some surface rust had appeared on the metal creating an issue in the finish of the product		**Different Finishing Technique** - To get around this issue I first sanded the surface rust off leaving shiny spots on the surface of the metal. Next I used a chemical to return the highlighted spots back to their original black colour.	**Hides Speckled Finish** - This solution worked okay to cover up the problem caused by the surface rust.	
Sharp Edges - The edges of the metal had sharp edges that would not be safe in use		**Bevel Tool** - To overcome this I used a bevel tool as well as an angle grinder to smooth any sharp points on the framework	**Change to Edges** - This solution worked well to allow for a safer overall design and consistent edge finish	

Next Step: Unforeseen changes to plan of making

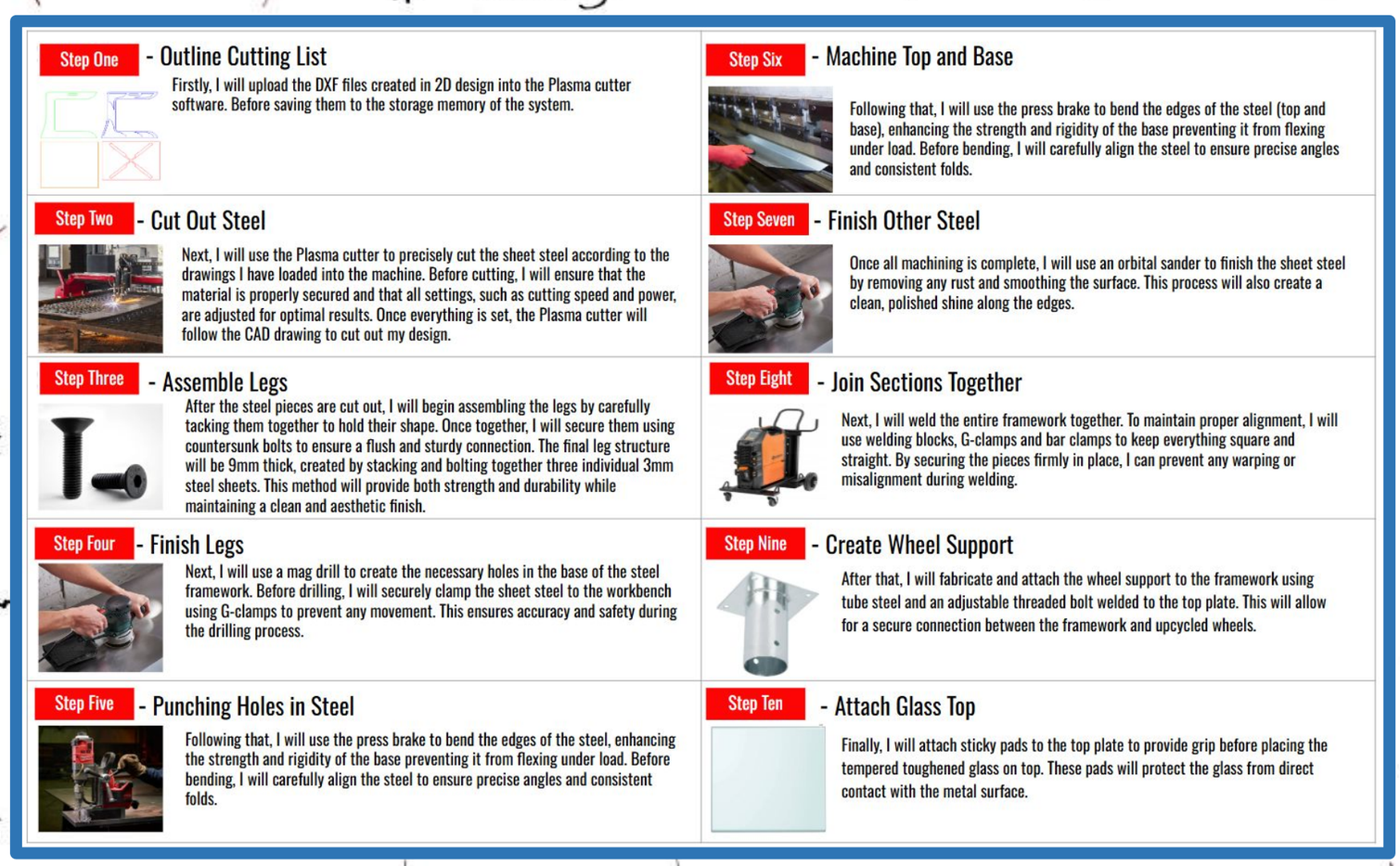
Unforeseen Changes to Plan of Making

In step one I had issues with gaps in the lines of my drawing

once the gaps were filled the step ran as planned

between steps 2 and 3 I added a step (finishing the inside leg) which is a change to the original plan of making

once the legs were assembled I expected to immediately finish them, however it was easier to wait for the top + base to be machined



overall there has been a number of changes when comparing the plan of making to the actual process

In Step two the steel had to be cut out in 2 stages rather than all at once

This was due to an issue with the steel order

This slowed the process down a bit

When assembling the legs I needed to order different sized Countersunk bolts

This was unforseen in comparison to the plan of making

Whilst waiting for the bolts to arrive I finished the edges of the steel with an angle grinder

This added a substantial additional step compared to the plan of making

After assembling the framework I relised it would need horizontal support

Reflection on Initial Designs and Next Steps



During the **process** of **making** the **side table**, I encountered **several challenges** that I had to overcome to **ensure** the **success** of the **final prototype**. These obstacles **pushed me** to **think critically**, **enhancing** my **understanding** of both **materials** and **construction techniques**.

Throughout this journey, I have **thoroughly enjoyed honing** my **skills** and **working** with a **wide range** of **tools** and **techniques**. Seeing my **initial concept evolve** into a **physical product** has been incredibly **rewarding**. In my opinion, the **final outcome** is a **high-quality piece** that **reflects** the **effort** and **attention** to **detail** I put into **each stage** of the **process**. The **record of making** on the previous pages **highlights** the **progression** of the construction.

As I **move forward** to the **next stage** of the design process, I am **eager** to **receive feedback** from others. Their **insights** will be **invaluable** as I **explore potential refinements**, not only to **improve** the table's **ergonomics** and **functionality** but also to consider how it could be **efficiently batch-produced**.

Next Step: Showcasing my final prototype

Product Showcase







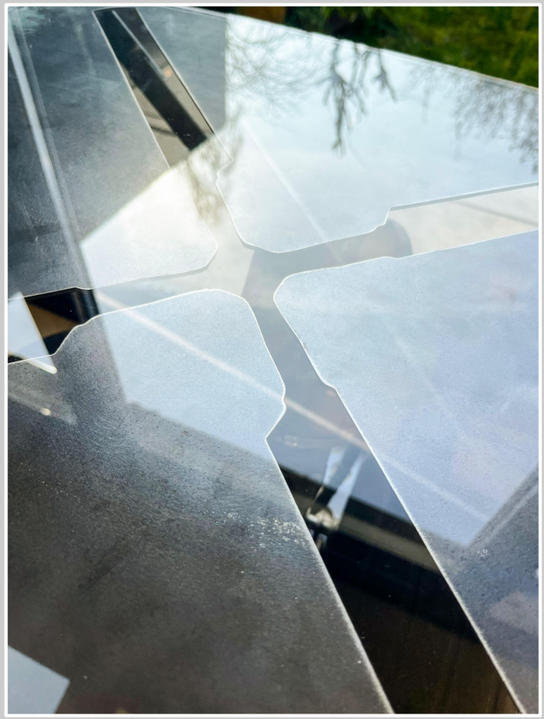




Next Step: Showcasing finer details of my final product

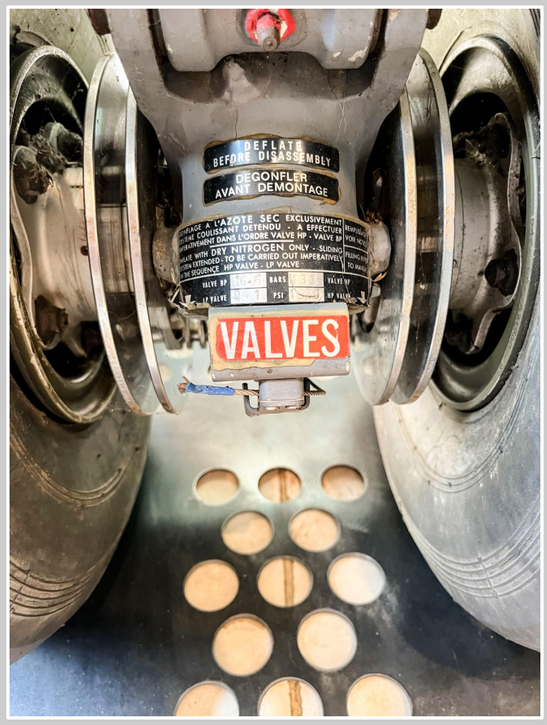
Product Showcase - Details















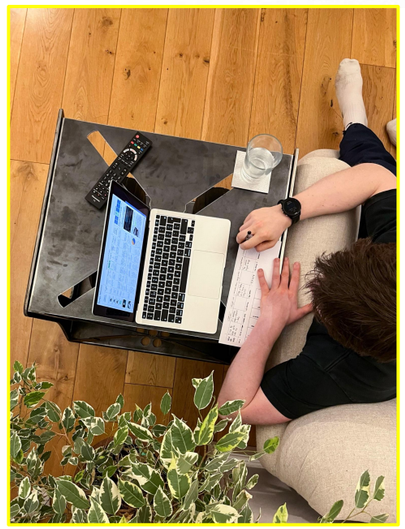


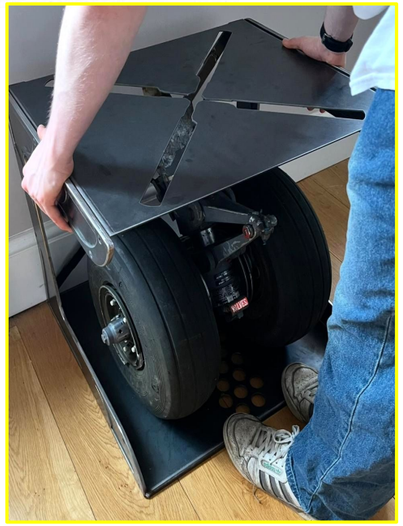
Next Step: Beginning to evaluate the final product with end user and personal testing

End User and Personal Testing

End User - Arthur

- the metal can be a little cool to the touch

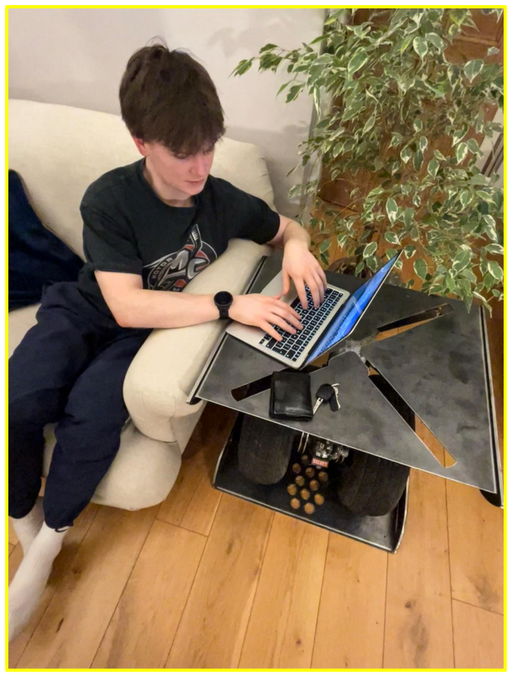






- I have lots of space to sit diffirent glasses. laptops and paper

- the material is a bit heavy so can be diffigicult to move



its innovative, exciting and diffrent design brings a new element to my living room

- the industrial asthetic provide a new element to my living room

Response to feedback

- Arthurs testing and Coments have been really insightful. I am happy he likes the innovation in the design in comparison to a regular side table!
- I also agree with his negative comments in regards to the tempreture of the metal and the weight of the side table!

My Transport Testing

Will easily fit in larger cars / vans

These images show the fit of the side table in a small hatchback

delivery may be expensive due to weight and size





The side table is very heavy especially when landing gear is not removed

The side tables weight prevents it from falling over

This photo shows that seats needed to be folded down for the side table to fit

makes it challenging to lift into the boot of a car

users should also take care when closing boot

due to the weight of the side table it is advisable to take care when driving with it in the boot

My Testing of the Side Table

I believe the leg shape and overall concept of the design is very innovative



This image shows me testing the Heli Side table

this is a strong strength about the design

The side table is very solid and functional as is clear in this image

one of the best parts of the side table in my opinion is the industrial aesthetic

Whilst using the side table I noticed lighting would be useful in lighting up the wheel under the table top



Next Step: Continuing to test my final product with a range of other stakeholders and end users

Stakeholder Testing





I think the final piece is excellent. Visually it really works to have the wheels and looks "whole".

Elliot has been able to do every part of the make himself & I feel that has enhanced his decision making as it has progressed.

Perhaps more time (if available) was spent on different finishes could have been useful, but the final decision has proven to be the correct one aesthetically.



Response to feedback

I am **very pleased** that **Grant appreciates** the final **outcome**, as he has played a **crucial role** in shaping the design through his **valuable feedback** and **insights**. Throughout the design process, his observations have **guided my decisions**, ensuring that the **final product meets** both **aesthetic** and **functional expectations**. On the **following pages**, Grant has provided responses to more **specific** and **directed questions**, offering **further insights** that I will continue to **evaluate**.

I like the fact that people come to my kitchen and comment on my unusual and unique piece of furniture

It's not a block of furniture and looks different from different angles, I like that as it makes looking at it interesting

It's a good size for a coffee table.



I like the use of propellers on the top and also at the back showing where the wheel has come from.



I particularly like the see through nature of the table that there is something to look at under the glass top.

I like the materials used.

I love telling people about where the wheel has come from.

One thing I find difficult is moving it as it is heavy so you need two people to move it.

Response to feedback

Sitting down with **Abi** and having her provide **feedback** on the side table has been really **valuable**. She has **mentioned** a number of **points** that will be **hugely important** in the **evaluation** of the overall **design**.

all the edges have the same finish making it look professional

smooth surface makes it easier to work on

Innotive





cross-bracing at the back makes it look nicer

the circles at the bottom draw your eyes to the writing on the wheel

glass top highlights the helicopter rotor cut out

all put together + well thought through

stable + secure

holds lots of things on the glass top

they slope into the floor

perfect size

shape to the legs

Response to feedback

Amelie's positive feedback on the design is great to hear after going through the entire design process to reach this stage. I really **appreciate** her **comment** about the **perforated** steel **base**, which **draws attention** to the intricate **details** of the **wheel**, an element that **adds** to the design's **aesthetic** appeal.

Next Step: Refined stakeholder and end user comments on key aspects of the design

Stakeholder Feedback

Name: Arthur Rogers - Lawrence

Describe and explain any **strengths** you think the prototype has:
its innovative, exciting and different design brings a new element to my living room

Describe and explain any **weaknesses** you think the prototype
it is heavy so can be challenging to move

What is your overall **opinion** of the product? Would you use it?
Yes, because I think it is interesting

How much would you be willing to **spend** on the product?
£350

What would you change to **improve** the product?
maybe a different material which reduces the weight of the side table

Name: GRANT COOPER.

Describe and explain any **strengths** you think the prototype has: It has a great balance between the hard materials and flowing shapes of the design. It could be the cute wheels are stopped in

Describe and explain any **weaknesses** you think the prototype has: It is heavy.

What is your overall **opinion** of the product? Would you use it? I would - It is unique and practicle

How much would you be willing to **spend** on the product?
£500 - £700

What would you change to **improve** the product? Castors to assist moving. Possibly some lighting to highlight the cut outs.

Stakeholder Feedback

Name: Abi

Describe and explain any **strengths** you think the prototype has:
It's so different I've never seen anything else like it people comment on it all the time!

Describe and explain any **weaknesses** you think the prototype has:
It's heavy and difficult to move on your own.

What is your overall **opinion** of the product? Would you use it?
I really like it because it's so unusual and great sized table to have in my kitchen

How much would you be willing to **spend** on the product?
£500.

What would you change to **improve** the product?
I'd make the wheel metal really shiney and the wheel rims clean.

Name: Amelie Brett

Describe and explain any **strengths** you think the prototype has:
- The shapes on the outside legs
- The back bracing adding strength and also being the helicopter rotor

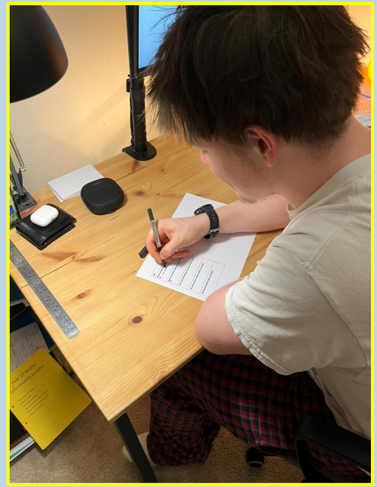
Describe and explain any **weaknesses** you think the prototype has:
- The glass top ends short of the end of the leg
- The wheel has damage to it although it adds character

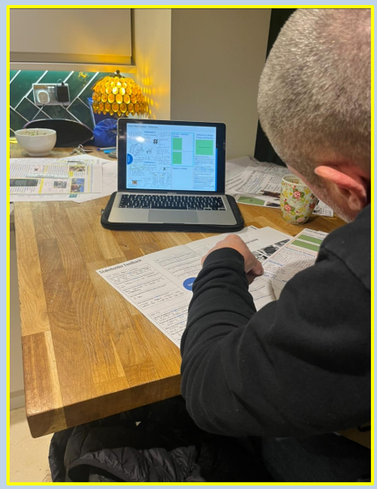
What is your overall **opinion** of the product? Would you use it?
- Really unique and cool
- I would use it

How much would you be willing to **spend** on the product?
- £250 - £500

What would you change to **improve** the product?
- lighting
- powder coat the legs

Photos of Me Collecting Stakeholder Feedback





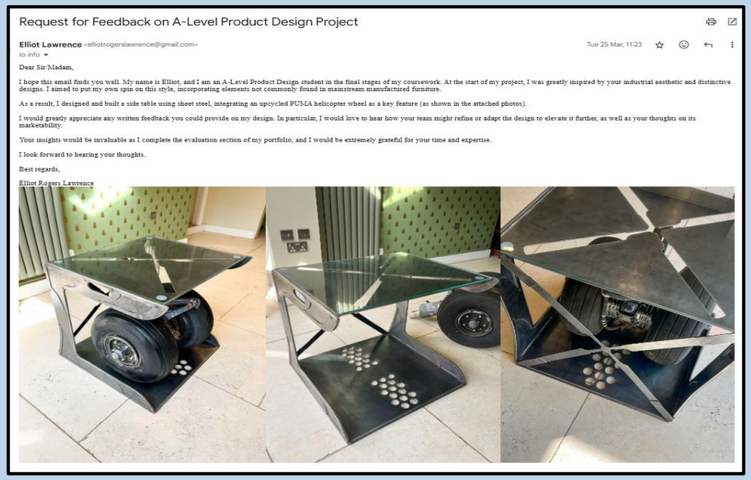

Response to feedback

I have now **gathered feedback** and **testing insights** from **four users**, each with **different backgrounds**, **perspectives**, and **experiences**. Additionally, I've had the **opportunity** to **hear** the **opinions** of many **others**, whether through casual conversations, sharing photos, or in person discussions. All of this **valuable input** has given me the **confidence** to **thoroughly evaluate** the **product** in the following pages!

Next Step: Gaining industry feedback on the final product

Industry Feedback and Price Point Evaluation

Industry Feedback



Request for Feedback on A-Level Product Design Project

Elliot Lawrence <elliotrogerslawrence@gmail.com> Tue 25 Mar, 11:23

to info

Dear Sir/Madam,

I hope this email finds you well. My name is Elliot, and I am an A-Level Product Design student in the final stages of my coursework. At the start of my project, I was greatly inspired by your industrial aesthetic and distinctive designs. I aimed to put my own spin on this style, incorporating elements not commonly found in mainstream manufactured furniture.

As a result, I designed and built a side table using sheet steel, integrating an upcycled PUMA helicopter wheel as a key feature (as shown in the attached photos).

I would greatly appreciate any written feedback you could provide on my design. In particular, I would love to hear how your team might refine or adapt the design to elevate it further, as well as your thoughts on its marketability.

Your insights would be invaluable as I complete the evaluation section of my portfolio, and I would be extremely grateful for your time and expertise.

I look forward to hearing your thoughts.

Best regards,

Elliot Rogers Lawrence

This screenshot shows the email I sent to a range of industry professionals, including brands, designers, and retail shops. The purpose of the email was to gain valuable insights from a commercial perspective regarding the potential of my product. Specifically, I was seeking an suggestions on how to refine or adapt the design to elevate it further, as well as thoughts on its marketability. Although not all of the people I contacted responded, I was fortunate to receive thoughtful and constructive feedback from several people within the furniture industry. Their responses provided me with useful perspectives on the final design, expanding on views already expressed by end users. I have included screenshots of their replies below as well as my personal reflections on the feedback I received and how it has influenced my thinking moving forward.

Request for Feedback on A-Level Product Design Project Inbox ×

Jonathan Ball <sales@steelvintage.com>

to me

Hi Elliot,

This looks really cool, nice job. The steel work looks neat and well put together. I like the use of the helicopter wheel too, definitely gives it a more of a statement peice feel.

Only thing is, it might be tricky to scale up manufacture of these if you're relying on getting hold of real wheels. Maybe casting a copy could be a way to keep the look and make it easier to produce more?

Could work well as a limited edition kind of thing, especially if you gave each one a little info about the parts used and a unique number.

All the best,

John

STEEL VINTAGE

Response to feedback

John's feedback has been **genuinely insightful** and **encouraging**! His comments not only **reinforced** my **confidence** in the **design** of the product, but also suggested a **new perspective** on how to **develop** the **concept**. By suggesting the idea of **casting** a **replica** of the **upcycled wheel**, he's highlighted a **practical alternative** to sourcing **upcycled elements** whilst still maintaining the **unique**, **reclaimed aesthetic**. In addition the cast metal will make the product far more **scalable** and **mass producible**. It has given me a clearer direction for how the piece could **transition** from a one-off **bespoke piece** to a limited edition or even **mass producible** side table.

Request for Feedback on A-Level Product Design Project Inbox ×

Richard Evans <studio@richcraftfurniture.co.uk>

to me

This is a very impressive build. You should be pleased.

From a construction point of view, it looks pretty strong and heavy so this is always a consideration if your customer needs to move the item

My one thought would be that it looks like it's made from mild steel so have you protected the material? It will eventually rust with time.

Good luck

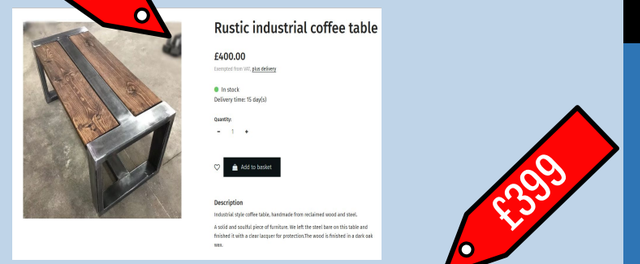
RICHCRAFTFURNITURE

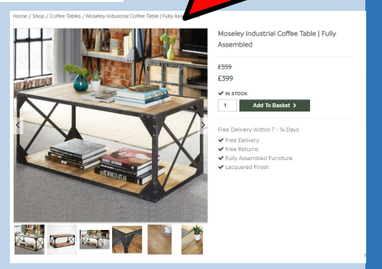
Response to feedback

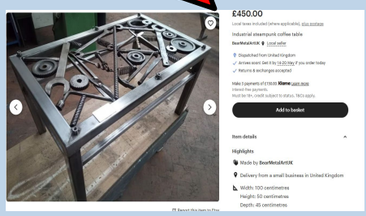
I appreciate Richard taking the time to **provide feedback** on my **final prototype**. He has highlighted a **common concern** in the **weight** of the product, something I will consider for further **modifications** and **improvement** of the product. He has also brought up a concern of **rust** in the **long term finish** of the design, something I have **not yet mitigated**. However this can be solved easily by **adding** a **wax finish** to the design to **prevent rust** in the future. His comment on rust has also lead me to **consider** other **alternate finishes** such as **powder coating** or even **metal plating** for a more **polished aesthetic** in the **future**.

Potential Price Point









Evaluation of price points

Based on my research above and user feedback, I now have a clearer understanding of potential price points for my product. Given the unique historical value incorporated within the design, I believe it can reach and potentially exceed the figures of the products listed above. This is especially possible when marketed to the correct audience.

Next Step: Evaluating the final product against my original specification points

Evaluation Against Specification

PUN (Primary User Needs)		Evaluation of Final Product Against PUN Points			PUN Point Met (Score 1-10)
		My Comments	End User Comments		
			Arthur's OWN Comments	**Grant's OWN Comments**	
1 PUN	The product must have a suitable modern appearance **enhanced** by the upcycled machinery	- I believe the side table has a very modern industrial aesthetic with its sleek metal framework. The upcycled helicopter wheel enhances this feel as well as bringing character and history to the side table	- It does meet the criteria because the shape of the legs are motive and new. Furthermore, the table has incorporated a helicopter wheel.	The Material choices are very modernist. They frame the upcycled wheel assembly ~~that~~ in a way that has the appearance ~~to~~ of crating for shipment of parts for repair or assembly.	8
2 PUN	The furniture design must include an item of upcycled machinery and be made of **recyclable materials**	- An upcycled helicopter wheel in included in the design. In addition the side table is constructed of steel that, if disposed of correctly, can be recycled.	- As a consumer, the material used are able to be recycled at the end of life which is great as someone who is climate conscious	The steel used is fully recyclable & all offcuts will make their way back into the steel manufacturing process. By not coating with any finish this recycling process is simpler.	10
3 PUN	The furniture must meet its **intended use** while being user friendly and **ergonomical** as a result	- The side table could perhaps be slightly smaller in height. However it does meet its intended use very well	- The product can be difficult to interact/use with due to its weight. Furthermore, it is a little bit tall compared to my sofa	The tables proportions work well for its use. It is quite heavy to move, but by making the wheels removable this can be easily overcome.	9
4 PUN	The furniture must be **safe to use** (e.g no sharp edges)	- The side table has rounded edges to improve its safety however the weight and stiffness of steel can still present hazards to users	- It could give me a nasty stubbed toe! But the lack of sharp edges does give merit to its safety	All edges are nicely shaped & rounded & it sits solidly with no chance of collapse.	7
5 PUN	The furniture should be able to be **manufactured cost effectively** to keep the product priced competitively.	- Manufacturing the side table at a large scale would be challenging without tweaking the design	- Because of its uniqueness and material used I have been informed that purchase will be expensive	Using CNC cut steel makes the process less intensive labor wise. It could also be reproducable if mass production were required.	4
6 PUN	The furniture must be able to **fit between standard uk door frames** so that it can be easily installed/transported	- The side table can easily fit between standard uk door frames	- I have been able to fit the side table through doors without issue	The table will fit through any UK doorframe.	10

Next Step: Outlining strengths weaknesses and improvements of the product

Strengths, Weaknesses and Improvements

Strengths

★ Industrial Aesthetic
- The combination of metal and aircraft wheels gives the side a table a bold mechanical look that stands out as a statement piece of furniture



★ Durability
- Made from solid sheet metal the table is built to last a generation



★ Innovative design
- The whole design rethinks what a side table can look like with unique layered legs that nicely show off the upcycling



★ Stability
- The wide base combined with the weight of the table means it is extremely stable when placed on flat horizontal ground



★ Functional
- The glass top means the design is easily used as a side table to place mugs,TV controllers, newspapers ect on



★ Easy to clean
- The glass and metal are materials that are easy to wipe clean



★ Upcycling
- The side table's upcycled helicopter wheel enhances its environmental appeal while adding character and history.



Weaknesses

● Practicality
- Heavy weight makes the side table very difficult to move especially individually



● Lack of storage
- The side table does not have any stored except that of the table top



● Possible oil/grease residue
- There is a chance that some residue, which is unreachable when upcycled element is washed, may leak out over time, potentially staining floors.



● Bulky appearance
- Whilst the bulky appearance may appeal to a large number of people some may dislike this especially if living in a small apartment



● Temperature variation
- The steel framework may become uncomfortably cold/hot to touch depending on the season of the year



● Lack of visual warmth
- The steel and rubber in the design could make the side table uninviting to look at



● Limited market appeal
- The niche aesthetic, size and weight may mean the market for the product may be affected negatively



Improvements

➔ Modular design
- The current design is welded together, but for the side table to be viable for mass production, it would need to be flat-packed and easily dismantled.

➔ LED lighting
- Lighting benefit the side table top could add an interesting function to the design whilst showing off the upcycled element further

➔ Customisable finishes
- If publically available, the framework could have the option to be finished in various ways. For instance, powder coated, galvanised or a brushed steel finish could be applied

➔ Customisable tops
- If publically available, the framework could have the option for different table tops. For instance an oak table top may be more desirable for some consumers.

➔ Integrated storage
- The side table design could be altered to accommodate a draw below the table top for extra storage

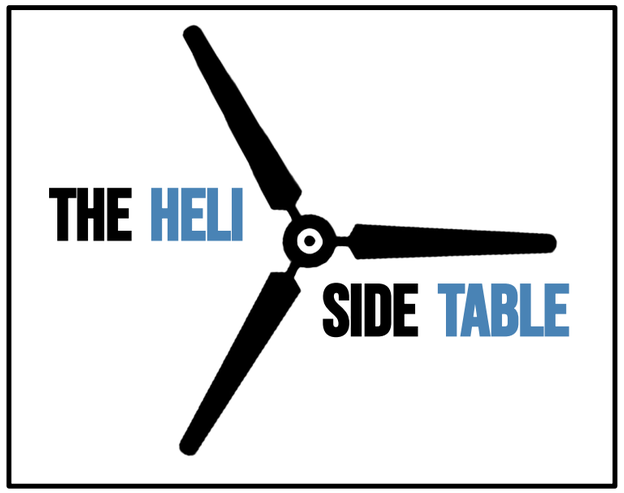
➔ Wheels
- Wheels could be added to the base of the framework to allow the product to be easier to transport

➔ Lighter weight material
- Materials such as aluminium could be considered for a lighter weight product

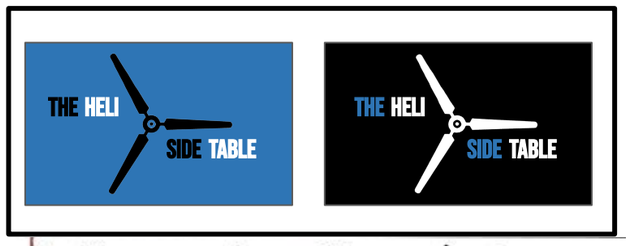
Next Step: Exploring possibilities of marketing the final product

Marketing Potential - Digital Branding

Logo



Main logo encorperating of helicopter rota and my key colours to add to the brand identity. + minimal words = easy to recognise



Alternate colour schemes for logos

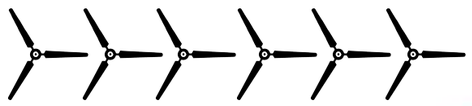
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#FFFFFF

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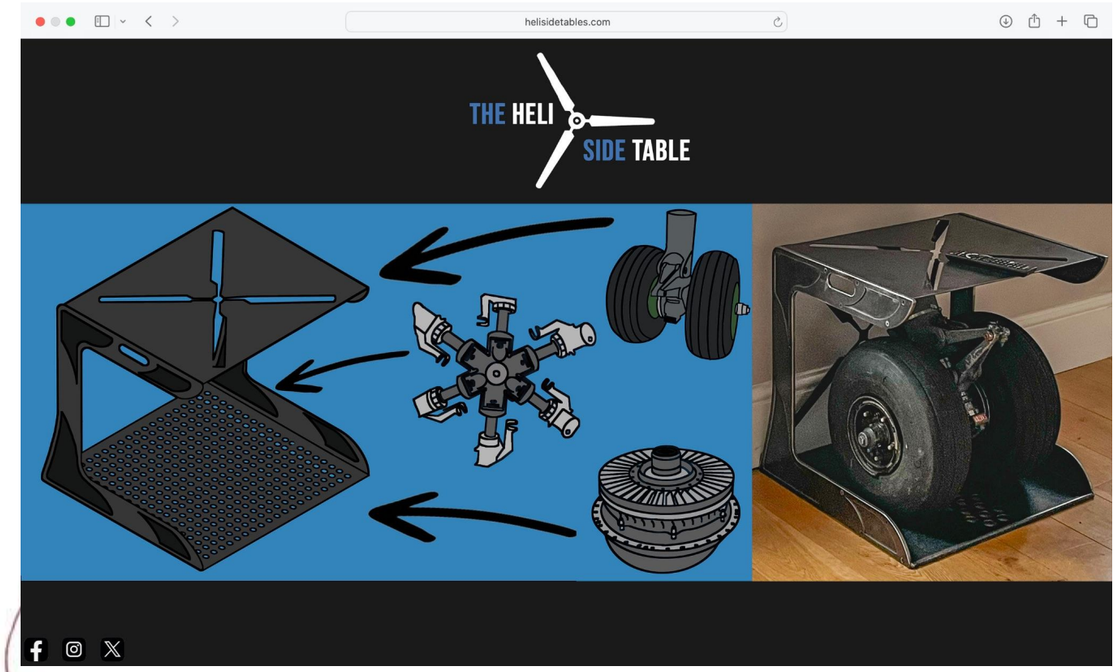
This box outlines the colours I have used along with their unique code

Potential border pattern in keeping with logo



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Website



Website mock up to show how potential customers may browse products and purchase through a website. Website contains consistant colour + brand identity.

Key Marketing Considerations

USP

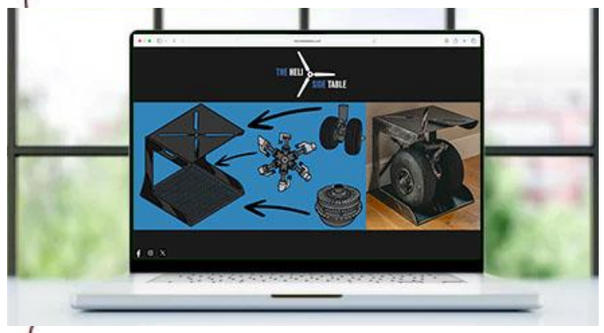
- Unique Selling point is highlighted through marketing process in being upcycled helicopter parts within furniture

Price Point

- Price point is kept as low as possible to keep more buyers interested in the product
- to profit approximately 20% per product I would need to charge £500 - £1000

Render

This image shows how the website may look on a computer

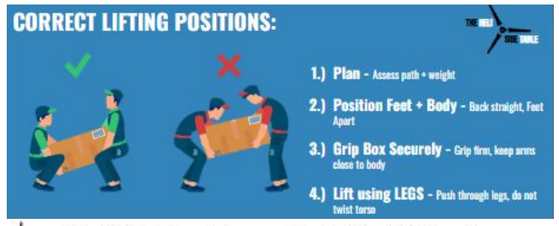


Mock up shows aesthetic site consistant with the quality of the finial prototype

Packaging



Logo can be printed on the side of cardboard boxes to add to brand identity and user packaging experience for customers.



leaflet to show correct lifting position to deliver box distributed to Van / delivery drivers



leaflet outlining user risks could be included as part of packaging experience

Next Step: Investigating feasibility of the product and ways to optimise the design regarding manufacture

Marketing Potential - Feasibility Study

Bespoke Production Costs

Item Description	Quantity	Unit Cost	Total Cost
- Upcycled Wheel	1	£125	**£125**
- 3mm Sheet Steel	(1250 x 2500 x 3)mm	£120	**£120**
- Glass	(520 x 620 x 0.4)mm	£65	**£65**
- Labour	1 x 15 hours	£ 15/hr	**£225**
- Transportation	1	£20	**£20**
- Miscellaneous	5	£50	**£50**
Total Cost			**£605**

As shown in the table I created, the **current** production **cost** of the side table is **too high** to generate a **viable profit** in a competitive market. For this reason, I have conducted **additional research** below into **cost-saving strategies** for batch production to make the design **more financially feasible**.

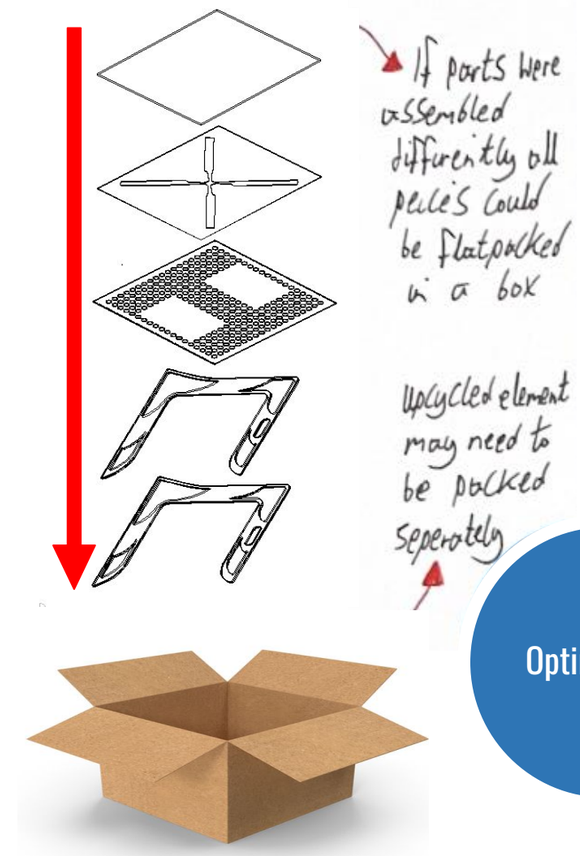
Batch Production Cost-Saving Strategies

Strategy	How Cost is Saved
Bulk Purchasing	Buying materials in larger quantities often leads to discounts from suppliers.
Use of Jigs	Custom jigs improve repeatability and reduce labor time for assembly and machining.
Automation & CNC Machining	Automated cutting and drilling can lower labor costs and increase precision.
Simplify Components	Reducing the number of parts and simplifying designs makes production easier and cheaper.
Efficient Packaging	Using flat pack packaging saves on materials and shipping.

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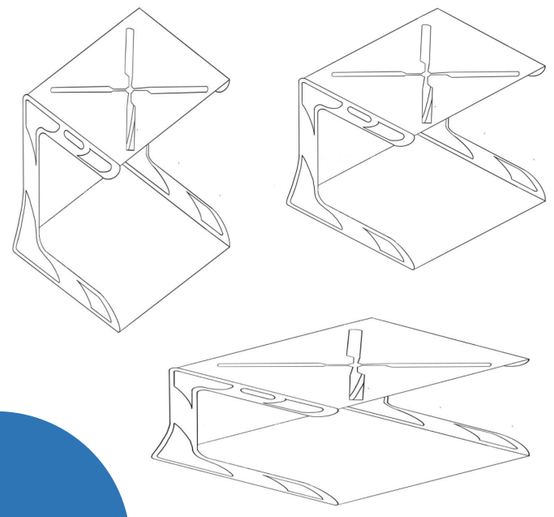
Design Optimisation

Rethink Design to allow for flat packing

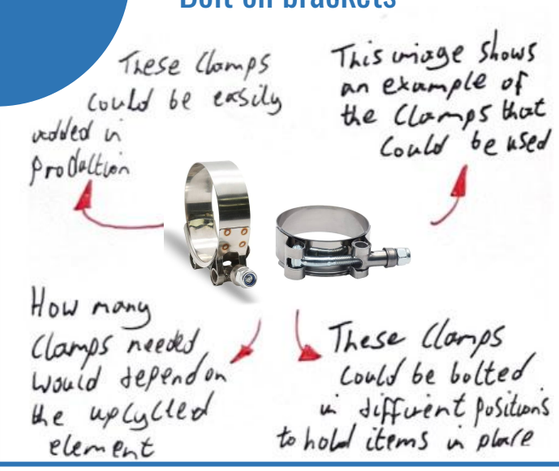


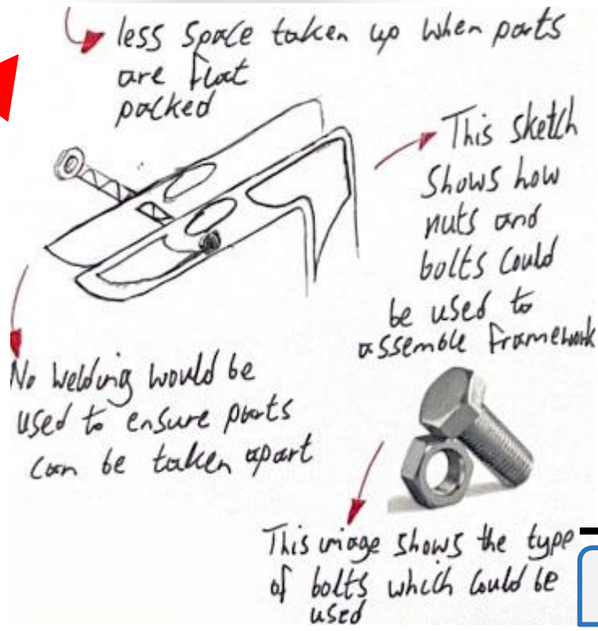
How Other Items can be Included in Framework

Three sizes: tall, horizontal, and regular



Bolt on brackets





I have clearly demonstrated how I would **optimize** the design for **batch production** of **50 units**. By using **different framework sizes** and **adjustable** bolt-on **brackets**, I can **seamlessly integrate** various **upcycled parts** into the **framework**.

Next Step: Evaluating potential wider issues that might arise when the product is sold

Evaluation of Wider Issues

6 R's of Sustainability → KEY - Successes Improvements

Re-Think

Materials

- Metal is a durable and also able to be recycled making it a suitable material for the side table whilst also being sustainable

Design Process

- Rethink how the side table design could be changed to make recycling and repairing easier to do making the the product more sustainable

Refuse

Low-Quality Standard components

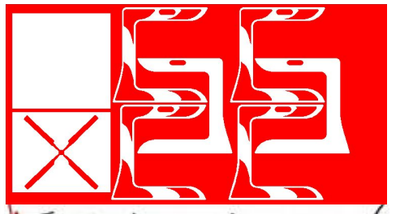
- I have used high quality components such as counter sunk bolts to ensure durability

Excess Packaging

- In the future I would consider packaging options to ensure wastage is low as well as packaging is recycleable to ensure sustainability of the product

Reduce

Current Wastage



The design has been arranged on the sheet of metal to best reduce the amount of waste / off cuts

Future Reduction of Waste

In the future I would take wastage of material into account more during the design process to be sustainable

Repair

Providing services and instructions to:

- Re-finish metal if it gets worn over time
- Repair welds if they get worn over time
- offering upgrades to the design if trends change
- offer reinforcement if the table shows signs of weakness

Reuse

Saving old helicopter parts from landfill

Design encorporates an upcycled helicopter part



Image to show the helicopter wheel that is used in the finial prototype of the design

Recycle

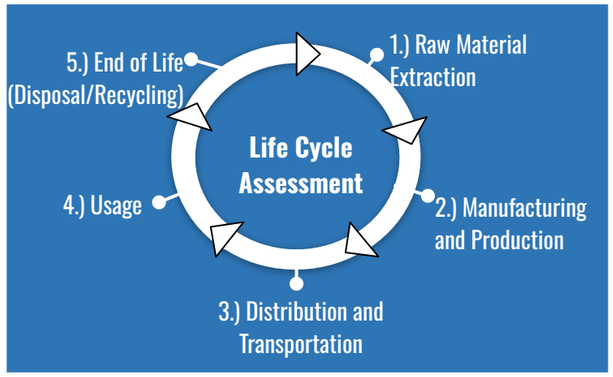
Wastage Disposal

This image shows the skip of scrap metal at the workshop



Metal is taken to be recycled and scrap is paid for accordingly increasing the sustainability of the product

Life Cycle Assessment



1.)
- Sheet steel is energy intensive to produce requiring iron ore mining, refining and smelting at high temperatures
- Sheet steel also requires rolling processes which consume additional energy
- Landing gear is recycled

2.)
- Plasma cutting, welding, Bending all require moderate energy in the manufacture and production of the side table

3.)
- The weight of the metal and landing gear significantly increase emissions to transport the product. The side table is currently not able to be flat packed therefore increasing transportation costs

4.)
- The usage of the side table has minimal impact on the environment as the aesthetic longevity of industrial furniture reduces the need for frequent replacement and materials used are very durable.

5.)
- The side table can be resold or repurposed improving its lifecycle. In addition if correctly recycled the product has minimal impact on the environment when melted down and reused.

Moral Economic and Sustainability Issues

Moral	Economic	Sustainability
- Child Labour, exploitation of workers and low wages when extracting raw materials	- High cost of raw materials - Potentially niche market	- Use of finite materials - Carbon emissions as a result of intensive use of energy in manufacturing

Next Step: Evaluating elements that might pose a risk to users and mitigating these issues

Risk Assessment - Customers + Stakeholders

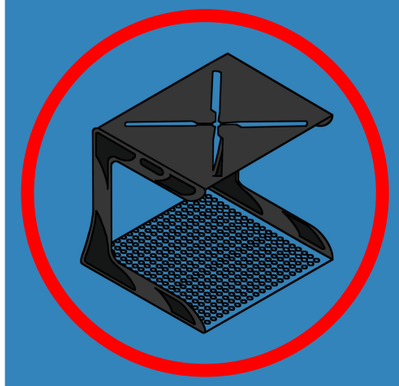
Customers

	Slightly Harmful	Harmful
Unlikely	Sharp Edges	Transporting Table
Likely	Heat Retention	Stability

Risk	Harm	Mitigation
Stability	Injuries such as bruising and crushing if placed on uneven floor	Instructions on where to place side table
Transporting Table	Injuries such as strains and in extreme cases fractures	Instructions on how to maneuver safely
Heat Retention	Mild harm including 1st degree burns	Placing table away from any heat sources
Sharp Edges	Minor cuts and abrasions	Mitigated in Design and manufacturing process where edges are rounded

USER RISKS:

THE HELI SIDE TABLE





1.) **Place on flat ground**

2.) **Transport Correctly**

3.) **Place away from heat sources**

4.) **Be aware of sharp edges**

Stakeholders - Delivery Drivers

	Slightly Harmful	Harmful
Unlikely	Weather conditions	Boxes falling in delivery vans
Likely	Repeated Motion	Lifting Boxes incorrectly

Risk	Harm	Mitigation
Lifting Boxes incorrectly	Back injuries, joint injuries	Training and correct instruction manuals to come with the product
Boxes falling in delivery vans	Potential head injuries, fractures and lacerations when opening doors	Correctly securing boxes with ratchet straps
Repeated Motion	Mild harm including strains in certain areas of the body e.g back	Training on lifting techniques, regular breaks and task rotations
Weather conditions	Frozen paths - fractures and bruises, Extreme heat = heat exhaustion	Monitoring weather conditions and using appropriate gear e.g gloves + footwear

CORRECT LIFTING POSITIONS:

THE HELI SIDE TABLE



1.) **Plan** - Assess path + weight

2.) **Position Feet + Body** - Back straight, Feet Apart

3.) **Grip Box Securely** - Grip firm, keep arms close to body

4.) **Lift using LEGS** - Push through legs, do not twist torso

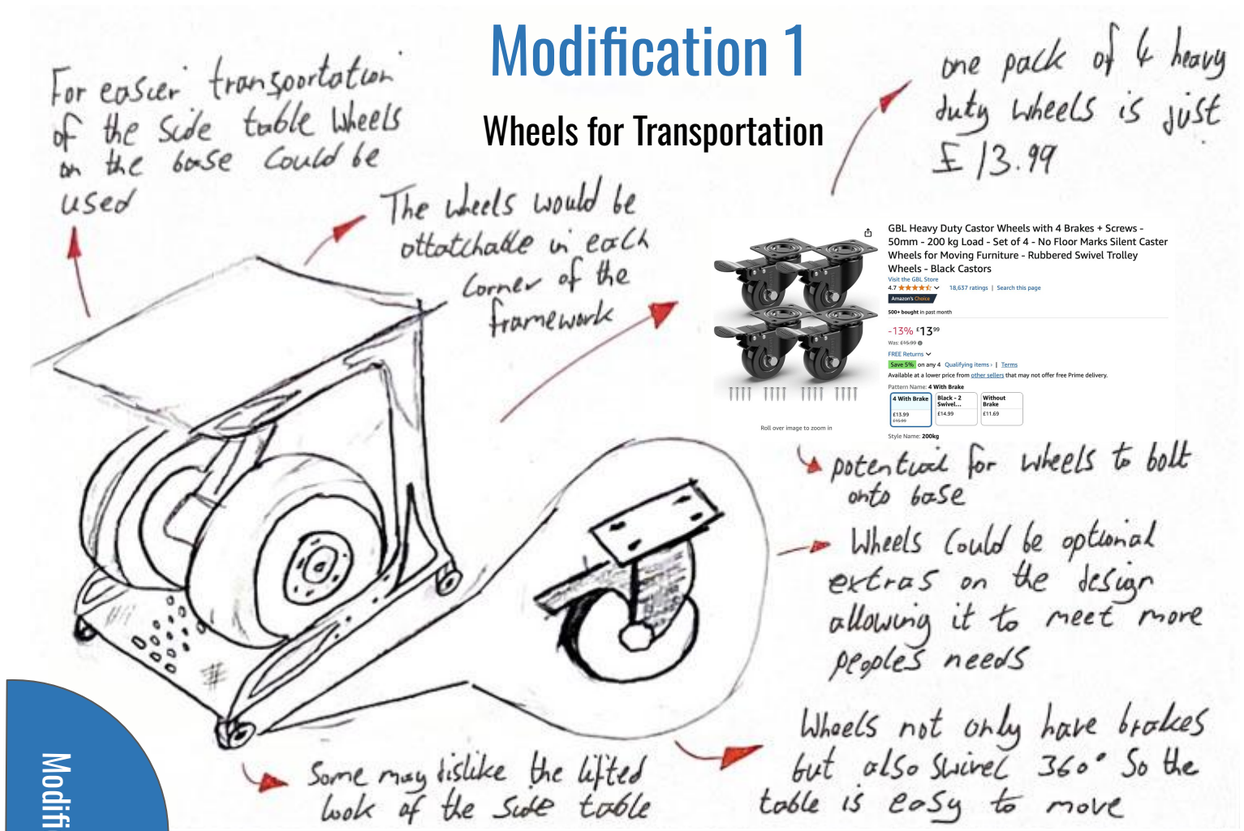
Next Step: Future potential modifications and reflection on the overall design process

Future Modifications + Reflection

Modifications

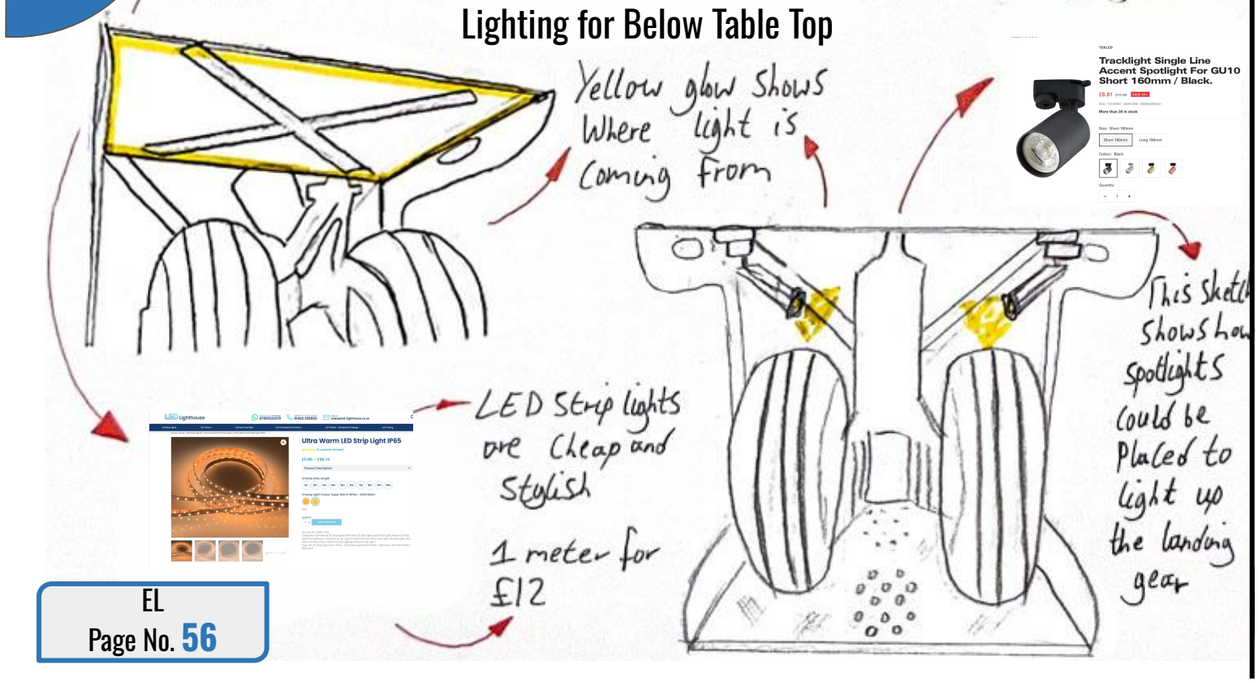
Modification 1

Wheels for Transportation

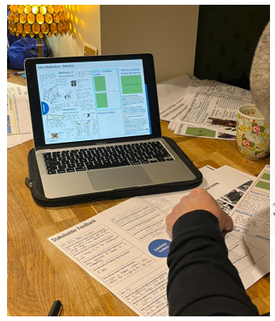


Modification 2

Lighting for Below Table Top



End User + Stakeholder Feedback



Lighting would be an excellent addition. A lot of the design is quite subtle in low lighting it would be great for these elements to pop with subtle lighting

Coasters would work, but does the table need a wax or a place & bolt the extra might be detrimental.



I really like the modification regarding the lights. I would suggest that the lights should have a changeable colour temperature for different times of day.

Response to feedback

I completely agree with Grant's feedback on **both modifications**! I believe that **lighting** plays a **crucial role** in **elevating** the **prototype**, taking it a step further to **enhance** the **overall user experience** and ensure **end-user satisfaction**. Additionally, I think the inclusion of **coasters** would be a **great** feature for **some users** and could potentially be offered as an **optional add-on** in the **future**. Arthur also raises an excellent point about the importance of **adjustable color temperature** for the incorporated lighting. Having the ability to change the lighting to **suit different** environments and **moods** would add another layer of versatility to the design, making it more adaptable to various settings.

Reflection on Design Process and Outcome



Designing and Making Process

Throughout the design process I have learnt to be **flexible** in order to accommodate changes that might not have been previously included in the final design. Overall I **learnt a lot** from the making at **grants workshop** and am **very happy** with how the **final product** turned out!

Likelihood of Success in the Market

I believe with **modifications** making the product **lighter**, able to be **flat packed** and **transportable** the product has a **great chance** of being **successful** in a market where many products are not innovative.

What I have Learned Throughout the Process

During this process I have gained a greater ability to be **adaptable** when designing a prototype that contains an upcycled element. I had to not only keep my **options open** but also ensure the design was **innovative and aesthetically pleasing** throughout the design process. Overall I am really **happy** with how the coursework and the final product turned out!

Next Step: Revise theory!