

# Product Design

# Tech folio

## Contents

Understanding the end-users .....	4
Interview questions .....	4
Interview questions .....	5
Interview questions .....	6
End-users profile .....	7
Design Breif.....	9
Outline of Context .....	9
Specifications .....	9
Constraints & Considerations.....	10
Design Priority & Quality Statement .....	11
Product Design Factors .....	12
Evaluation Criteria .....	14
Research & Visualisations.....	15
Mind Maps:.....	16
Mind-Map: Research .....	16
Mind-Map: Materials .....	17
Mind-Map: Innovative Feature .....	18
Mood Boards:.....	19
Mood-Board: Overall Aesthetic.....	19
Mood-Board: Style Focused Aesthetic .....	20
Mood-Board: Innovative Feature .....	21
Innovation & Design Component.....	22
ResearchH .....	23
Primary Research - Materials .....	23
Primary Research - Materials .....	24
Secondary Research - Materials.....	25
Secondary Research - Materials .....	26
Secondary Research - Materials.....	27
Secondary Research - Materials .....	28
Secondary Research - Materials .....	29
Secondary Research - Fixings .....	30
Secondary Research - Features .....	31
Secondary Research - Features .....	32
Secondary Research - Features .....	33
Secondary Research - Tactile Aesthetics .....	34
Secondary Research - Tactile Aesthetics .....	35
Secondary Research - Visual Aesthetics .....	36
Secondary Research – Environmental effects.....	37
Secondary Research – Innovative Feature parts.....	38
Secondary Research – Innovative Feature parts .....	39
Sketches & Visualisations.....	40
Design Option: 1 .....	60
Evaluation: .....	61
Design Option: 2 .....	63
Evaluation: .....	64
Design Option: 3 .....	66
Evaluation: .....	67
Design Option: 4 .....	69
Evaluation: .....	70
Design Option: 5 .....	72
Evaluation: .....	73

Ranking/ Comparison Table.....	75
Preferd option.....	76
Working drawing.....	Error! Bookmark not defined.

## Table of Contents

SCHEDULE Production Plan .....	83
<b>TimeLine .....</b>	<b>86</b>
Gantt Chart – Overview .....	87
Risk ASSESSMENT.....	90
Quality Measure.....	94
Materials and Processes .....	97
Testing and Trialing.....	103
Tools and EQUIPMENT .....	105
Manufacturing in industry .....	112
PProduction Journal .....	118
Modification table.....	132
Feedback on modifications .....	133
Care Instructions/ Label .....	135
Evaluation report .....	139

# UNDERSTANDING THE END-USERS

## Interview questions

### **1. Can you tell me about yourself?**

The end-users are a family living in Highton, they consist of a two boys one which is 10 who goes to Bellaire primary school and is completing year 5 and the other who is 17, he goes to Geelong college and is finishing his last year, the mother is 44 working a full time at NDIS helping disabled people through hardships and providing support as a project manager while the father is 46 working self-employed and running his own commercial and private cleaning business and a grandfather who is 83 and previously working as a teacher he migrated between Australia and India pre-pandemic with his wife who recently passed. As they are planning to move houses soon because they are getting another one built, they want some sort of centre piece for the living room which will contrast with the rest of the room.

### **2. What are your goals relating with work and lifestyle?**

They are wishing to be able to set up a self-sustaining business which will provide a high enough revenue allowing for an early retirement, this is why they are currently looking into being property developers and owners, currently owning 3-4 properties including empty plots on which they plan to build residential housing. They would like the early retirement so they can spend more time with their family and enjoy life to the fullest without being constrained to a 9-5 job.

### **3. What leisure activities or interests do you enjoy in your free time?**

the family has a variety of hobbies with each member having individual preferences to what they do in their free time, the youngest child loves to play games on his iPad and going out to bounce around on the trampoline, they oldest child loves to play basketball which is a common interest between him and the grandfather, he is usually out until 9pm practicing for basketball season. They all love to watch sports on the tv including Basketball, cricket, footy and wrestling. Similarly, they also enjoy watching movies which is why they have a movie room built in their house, when the family have free time, they occasionally watch movies or shows based on but not limited to the comedy, action, sports, or sci-fi genres.

### **4. Are there specific colours or combination of colours you prefer?**

The family has a keen eye for design and an appreciation for both light and dark colour palettes. They stated that they prefer the soothing and classic tones of light colours such as white and grey and fancy the lighter colours as they are visually expanding and allow for the room to seem bigger than it truly is, similarly to this they find lighter colours versatile especially because they can easily fit into the contemporary, minimalist, and bohemian design they prefer. additionally, the family is drawn to the boldness, contrast and depth that is brought to a room, they say it helps to differentiate the design elements and allow for them items or features to stand out.

### **5. Are there any specific textural qualities you prefer?**

The end-users prefer a smooth finish as it will prevent splintering and the grain of the wood splitting, they have specifically stated that they prefer product which have been properly finished and sanded so they don't cause any injuries, yet they don't like a matt finish and would rather have some shine as it helps products to pop out.

# UNDERSTANDING THE END-USERS

## Interview questions

### **6. Are there any materials you fancy if so, what do you like about them and why are they preferred over other materials?**

The end-user has expressed their admiration for the qualities of timber particularly its durability and ability to withstand the effects of time while still being pliable to handle daily use. They appreciate the natural beauty that timber showcases when oiled or stained and believe it would complement other items and accessories in their living room. Additionally, the family finds the use of timber to provide a warm and inviting atmosphere, contributing to the overall comfort and spaciousness of their living space. The family has also shown an interest in metals, particularly steel or brass, because they have rust-resistant properties and lightweight properties especially because steel has a sleek and modern aesthetic that can bring a unique and sophisticated touch to any living space.

### **7. How do you assess the quality of a product, and how important is it to you?**

The family have stated the quality of any product is highly important to them as it is more satisfying to know what you have is adequately built, they state major aspects of quality for them includes the finishing of a product, how durable it is, and the materials used for construction. They stated that these were the primary factors when determining quality in their terms as these features will be acting in everyday use as they must. They have stated that they would prefer the finishing and materials to be of higher condition as it will last longer meaning there will be less contribute to landfills assisting with sustainability. It was found they look for products which are not too hefty as they are easy to move around and shift.

### **8. What is your budget range for this product or service?**

After consolidation they have decided to have a budget around \$500 as if they went lower to around \$200 it's too cheap that low grade materials will have to be used meaning the final products aren't of adequate quality and are not as durable and strong or aesthetically appealing as if the products bought was bought at a higher price.

### **9. Would you rather purchase 10 items for 10\$ or 1 item for 100\$, does the quality of the product effect your purchasing decisions?**

The family has stated they would much prefer the 1 item for 100\$ as it provides a higher quality and would yield better to the effects of time, similarly they had stated that they would not have to go out again and again replacing the item if it were built correctly and with high grade materials, furthermore the appearance is usually of a better build and is built with enough strength so it can withstand everyday tasks as the more expensive products are usually more durable, they decided that the expensive product would likely be higher value for money as they wouldn't have to go through the hassle of replacement or clean-up when the cheaper product eventually break.

# UNDERSTANDING THE END-USERS

## Interview questions

### **10. How do you feel about sustainability and is it important in your life?**

Sustainability plays a major rule in the family's life as they deeply believe in recycling and reusing, this is why they are constantly donating and recycling items. They actively try to watch their carbon footprint and avoid buying single use items, they have a garden of their own where they grow some foods and plan on installing solar panels.

### **11. What are your favourite products or brands that you use regularly and why?**

The family have searched and found products they like at a variety store including Furniture galore, Focus on, Temple and webster and Adders. They look for quality in the products as well as its aesthetics so they can fit it into the house, as they stated before the construction of the product is extremely important so that it can last and not get damaged.

### **12. Do you have any ideal design style which you find favourable, if so, what aspects are there that make you like the style so much?**

The end-user design preferences are very broad and wide rang as they encompass a vast range of styles, with a special fondness for the minimalist and functional aesthetics of the Scandinavian style. They appreciate its tones and simplistic designs which still look great, they have a special appreciation for the quirky vibe of retro un and the glamour and sophisticated setup of Hollywood glam. Even though they like the minimalistic designs they also love the free-spirited and eclectic nature of bohemian beauty and the charm of modern Hamptons. Some of the family prefer a more traditional design they all seem to be able to agree on a contemporary country vibe.

### **13. Are there any visual item/ aspects or parts in a product which you prefer in products, furniture, or designs?**

The family have a decerning eye for the quality when it comes to products purchase for their house, they place very high value on the comfort and style, often seeking something that will offer a supportive and enjoyable experience when used. Furthermore, they prioritise style making it highly considered when purchasing, as they prefer pieces which will elevate the overall appearance of their living space, additionally the family understand how important durability which is why they go out of their way to look for something which can withstand the test of time. Lastly, they seek a product which is versatile and has several functions.



# UNDERSTANDING THE END-USERS

## End-users profile

The end-users are currently living in a spacious two-story house located within Highton. They are planning on moving to their new house which should be completed by the end of this year. The family consists of a full-time mother who works as project manager at NDIS helping rehabilitate people who have disabilities. She is 44-year-old. The father, Harcharanjit, is 46 years old and manages a successful commercial cleaning company which operates around Geelong, while also engaging in other strategies to increase his income, such as flipping homes. They have two kids one who is a 10-year-old attending year 5 at Bellaire primary school and another who is 17 years old going to The Geelong college, the whole family love sports and both of the kids are playing basketball, the younger one used to do footy and the older child has done swimming, diving, athletics, baseball, soccer, hockey and archery, even making it to the stingrays rep team in 2017. They are also taking care of the grandfather, who is approaching 84 and was once a high school teacher in India. Sadly, his wife passed away last year at the age of 79.



The family expresses a fondness for the impact that bold hues, striking contrast, and rich depth bring to a space. They believe that these elements help to distinguish the various design components and make individual pieces or features more prominent. They love the modernistic style and their preferred design styles are contemporary, minimalist, and bohemian, each offering a unique



aesthetic and vibe. The family prioritise the quality and



costing of a product as very important.

The end-user family are planning to move houses soon as they are getting a new one built, this means they will need to purchase new items and furniture to decorate the interior. They like the natural look of timber contrasted with the modern style of steel. The end-users like the colours silver, grey, blue, and green. But in terms of furniture, they prefer a more modern and simplistic design.





# DESIGN BREIF

## Outline of Context

The end-user, who is soon to move into a newly built house, seeks to elevate their interior decor with a coffee table that seamlessly blends in with the overall aesthetic while simultaneously serving as a captivating centrepiece. They need it to match well with the rest of the aesthetic and environment and act as a centre piece, this means the Coffee table must have something which is different and eye-catching built in. As the table will be used as a regular table when there are people over it must be able to handle everyday wear-and-tear without being damaged, it must be robust and resilient. The end-users have suggested adding a glass top as it will provide visual appeal and also fit into the modern contemporary design the rest of the house possess, additionally the glass top will be extremely helpful in preventing unsightly stains and preserving its pristine appearance. To fully realize their vision, the end-users has set their sights on a unique, modern-shaped coffee table crafted from high-quality timber. They specified they needed it to be functional in all circumstances including parties, small gatherings, or just normal days, they want the table to have ample storage for easy storage of items.

## Specifications

The final creation will be comprised of resilient hard woods, robust metals, and sleek glass. Carefully crafted to be 1300mm in length, 750mm in width, and 500mm in high, ideally striking a perfect balance between aesthetics, portability, durability, and functionality. The top will be made to holster a large segment full of sand which can be moved around by a steel bearing to create artworks and intricate patterns, it will all be encased in a large glass sheet which will act as a shield against contaminations, spillages and the sand falling out. The table is going to consist of a modern aesthetic which will beautifully juxtapose against the surrounding environment and furnishings. The table will have a rectangular shape as it offers optimal coverage and compatibility with the overall design and layout of the house. Additionally, there will be ample storage for stowing away items to add more functionality to the table, and it will be coated in an exquisite finish to enhance the overall beauty and aesthetics of the table. There will be an intricate construction process which will show exceptional attention to detail resulting in a stunning and refined product made to be superior in quality to its retail counterparts.



# DESIGN BRIEF

## Constraints & Considerations

### ***Constraints:***

- Must be sized to fit the designated space.
- Must be made of a durable, easy to clean material.
- Must have a shape that complements the surrounding furniture and décor.
- Must be of an appropriate height.
- Must include an engaging and interactive element.
- Must match the overall style and aesthetics of the room.
- Must be functional for its intended purpose.
- Must be sturdy and well balanced.
- Must be of high quality with minor imperfections.
- Must be environmentally friendly and sustainable in its material and manufacturing.

### ***Considerations:***

- Should incorporate a well-designed handle for opening the shelves/ drawers to allow ease of use.
  - May contain a castor for wheeling around the table and making it easy to move around.
  - The finish could have some level of weather resistant, so it won't get damaged by water or sunlight.
- Should have a base larger than the top to allow it to be sturdier and more capable of handling weight and decreasing the chance of it tipping.
  - Might incorporate layered wood as an aesthetic feature such as a light wood sandwiched between.
- Should incorporate hidden screws and joints to allow for a smoother finish texture and more aesthetic appeal.
  - The final product should be able to look clean everywhere.
  - Should have at most a ±1mm difference in height to ensure a flat tabletop.

# DESIGN BRIEF

## Design Priority & Quality Statement

### ***Design Priority:***

- Must look and complement the other furniture and in the room it is placed alongside.

The primary constraint when designing and constructing the coffee table is based on the aesthetics. The table needs to look more aesthetically pleasing than its predecessor and be able to fit in with the surroundings or work as an act alone centre piece that still compliments the existing space and furniture.

### ***Quality Statement:***

#### **Timber segments:**

As there will be movable and removable parts it may require some loose-fitting parts, such as the drawers, but the other joints will be secure, sturdy, and precise for optimal stability. As the budget allows it, the timber will be chosen and strengthened to reduce or even stop the warping and minimize the number of knots and faults in the timber. The Coffee table will be designed in an ergonomic manner to allow use for extended periods, easy sitting and allowing plenty of space to move around it. All structural joints will be made extremely secure using glue and nails/ screws, all the gaps will be under  $\pm 1\text{mm}$ . The aesthetic external joints will be mostly held with glue to be kept clean and have a maximum gap of  $\pm 1\text{mm}$ . all the parts will be square and level. It will need to have slightly rounded fillet on its corners and edges which will be kept to a constant radius around the whole perimeter of the table. Furthermore, it will be fully sanded to at least 200 grits for a smooth quality finish.

#### **3D printed segments:**

Due to the layered printing style of 3D printing the external shells of the printed parts will need to be thoroughly sanded to a flat surface with minimal extrusions. The parts will have movement as they will form a gantry system so they will need to have tolerances of  $\pm 0.5\text{mm}$ , furthermore it will have a dense infill which will promote strength and allow for the parts to be screwed together while also joining with glue.

#### **Glass segments:**

The glass will be trimmed to fit the precise size with a tolerance of  $\pm 0.5\text{mm}$ , it will have a chamfer on the edges. The glass purchased will have all impurities removed making it fully clear and have no tinting.

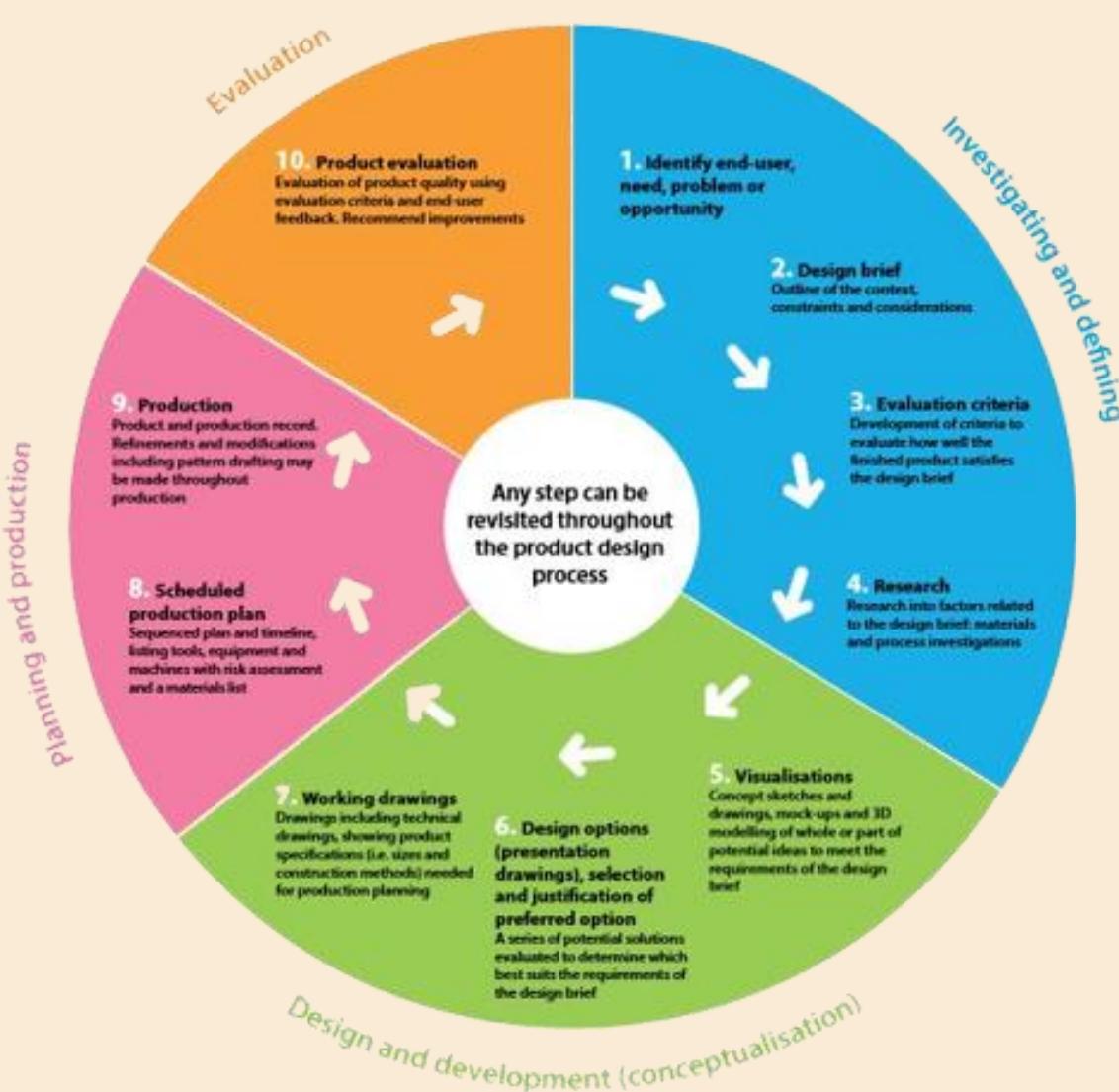


# DESIGN BRIEF

## Product Design Factors

Product design factors	Parameters
Purpose, Function, Context	The end-users require the coffee table because it will provide a flat surface for placing coffee cups or other dishes, newspapers and magazine or any other knick-knacks. In terms of environmental context, it will be placed in the guest living room which is near the entry of the house, meaning it will be one of the first things seen so it will need to be visually appealing. The table will need to be made to the highest quality with minimal imperfections and near perfect joints. As well as looking good it needs to survive an extended period of at least 4 years, hence why durability and longevity is a key point in the construction. Furthermore, as it won't have many moving parts it will be extremely reliable. Any kinetic parts will be further refined and supported to insure endurance. In terms of primary function, the coffee table must be a strong and ridged surface which can be used to place items on. The secondary functions supporting the primary function are legs, which make the table sturdy, raise its height, a set of drawers which can be used to store the knick-knacks and items, a flat and level surface to prevent spillages. As quality has utmost value in the eyes of the end-user, it will massively influence how that table will be constructed and what materials will be used. Other items to be considered include the design, aesthetics, construction methods and finishing.
User-centred design	The table will be designed to account for a wide range of ages from toddlers to elders. In order to prevent injuries, it will incorporate a wide range of features. The table will have some premium additions such as a high-grade finish and high-quality materials including but not limited to wood, glues or joining materials, hinges, and drawer slides. Ergonomics will highly contribute to the design of the product as the anthropometry (body proportions and sizes) of the user will decide on the table height and size
Innovation and Creativity	In terms of innovation & creativity the table will have a glass top and inbuilt lights so the table can stand out. Furthermore, it will be power by a battery instead of a power cable as this will allow for it to be portable and movable as well as light weight.
Visual, Tactile and Aesthetic, (Design principles and elements)	Because the coffee table is required to be visually appealing, it will use a large range of design elements and principles. There will be patterns made using lines created by joints and have a smooth texture. The table will incorporate a variety of design principles this includes proportion, balance, and symmetry. Due to the table needing to be used and seen everyday, it will use a 3:5 ratio in terms of width to length as it is aesthetically pleasing, work well with other furniture and is seen as the golden ratio for design. Furthermore, it will be designed in a symmetrical fashion with an even layout of drawers for storage as well as attractive.
Sustainability	As the Coffee table is intended to be constructed in an environmentally friendly and sustainable manner, the 3 pillars of sustainability: social, environmental, and economical will need to be factored. The construction will account for the safety and health in all those workers involved, sourcing wood from an environmentally friendly certified business as well as reducing wastage from cut offs and ensuring there is positive economic growth and legal sourcing. This will factor in the supply chain making sure its materials are ethically sourced and preferred closed loop
Economics	Economics include budget, materials, labour, and time. The main constricting factor is the budget as that will decide on the quality of the whole product, which will affect the value given to the end user. Furthermore, the budget effects the materials and time. As the coffee table is a school project there is no cost for labour, machinery, or facilities.

Legal Responsibilities	The Table will meet the Australian standards. These include safety, reliability, consistency, and quality, it will also be following the international standards. During construction and use by the end-user the table must be fully safe, meaning the product will comply to the OH&S (Occupational Health & Safety) and WHS (Work Health and Safety) rules to have safe premises, machinery, and materials. As there is going to be electrical aspects, all components will meet regulations and be certified by experts.
Materials	As the product is made to last the materials must be capable of surviving extended periods of time, which will further assist with the sustainable nature of the chosen material. The top structure will be ridged, not bend or warp, be waterproof and will not get scratched by minor inflictions or dented to prolong longevity. Due to a constant temperature, there won't be much need for factoring in expansion and contraction. As the room is light coloured it would be preferred to have some contrast, meaning possibly using a mix of dark and light material. to help with the aesthetics and feel. Furthermore, the materials will be smooth and won't splinter when sealed. They will be more appealing to look at and to resist damage to the wood there will be a high-quality finish.
Technologies	As the table will be constructed in a proper workshop there are a variety of tools which can be used for optimal construction quality, therefore there will be plenty of power tools used to speed up the process of construction and to a higher quality. Similarly, all factors will be considered when picking materials to choose the best form. A range of professionals will convert the raw materials into a usable state, removing moisture, followed by suitable construction methods.

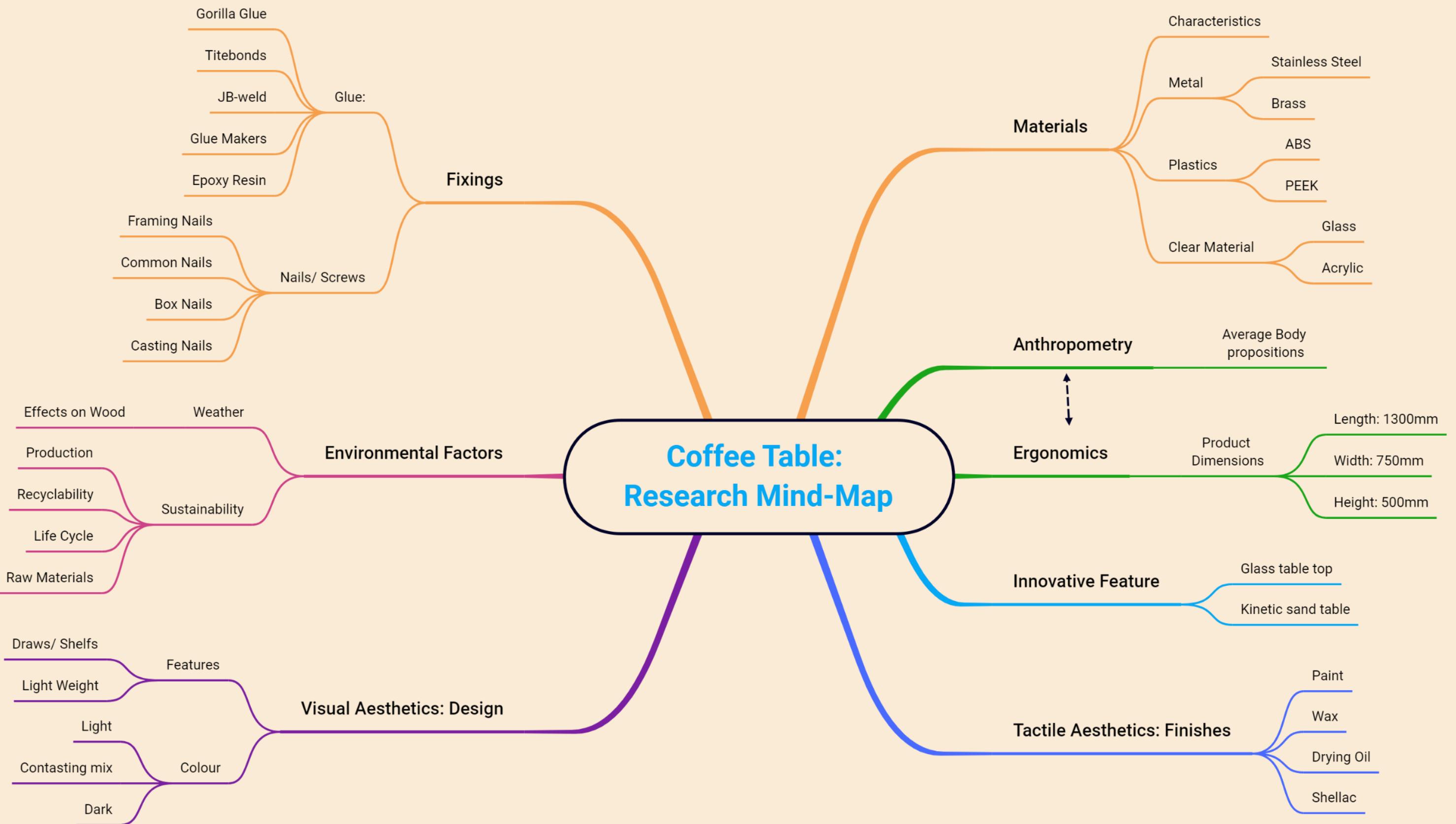


# DESIGN BRIEF

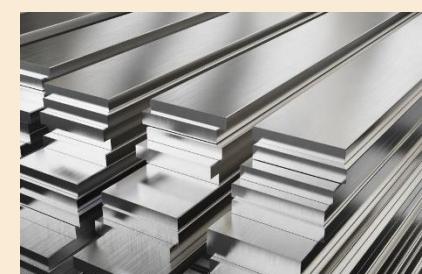
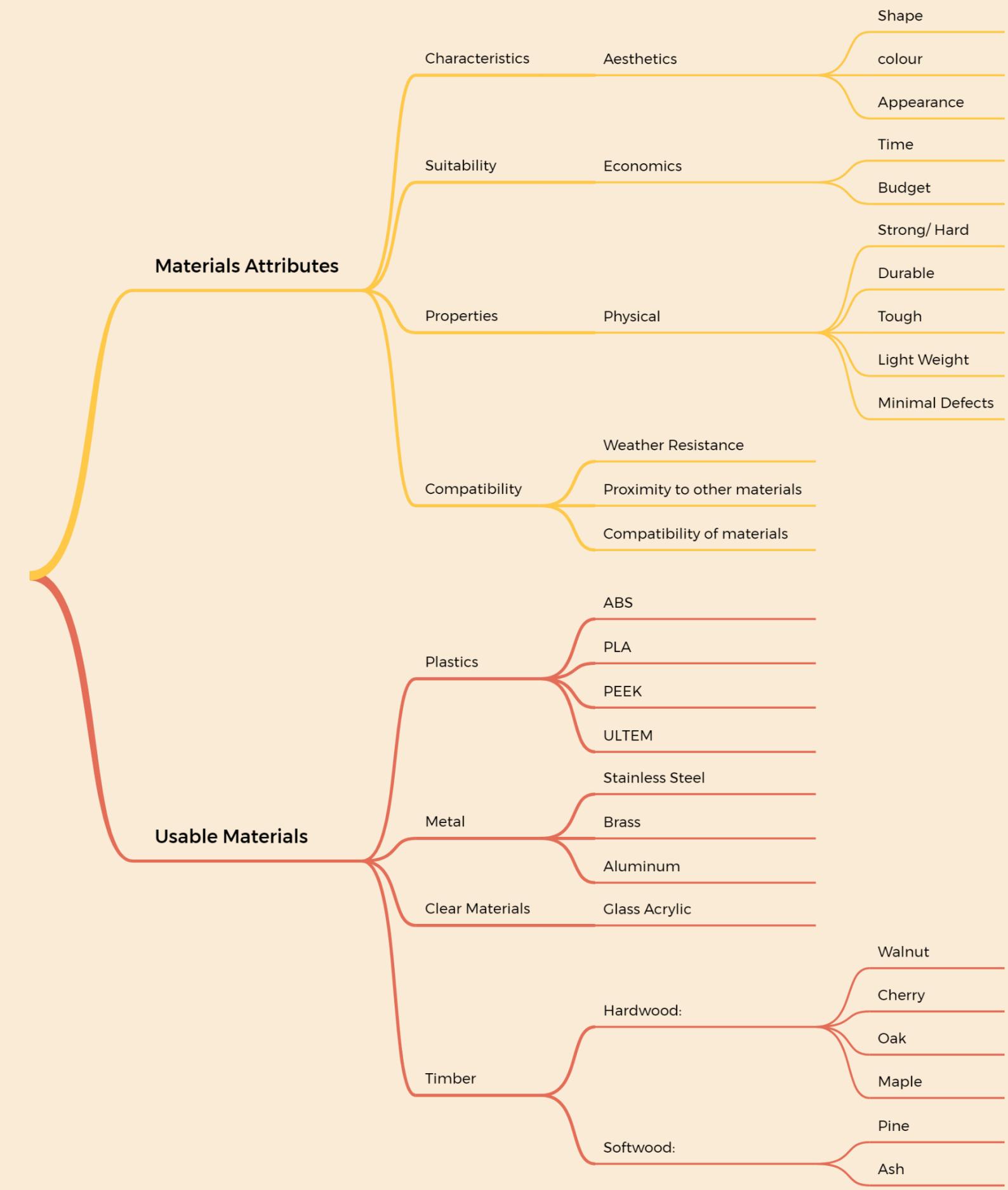
## Evaluation Criteria

No.	Evaluation criteria	Justification/ relevance to the brief	Ways to Achieve this	Checking Method on Finished Product
1	Is the Coffee table appropriately sized to fit the designated space?	There is limited space in the room, If the product is too large it would have to be placed somewhere else meaning it won't be the centrepiece.	I will carefully measure the available space and factor in how much walking space is required. I will research table ideas for small spaces	- Measure it up. - Fit and try. - Try it out and ensure it fits.
2	Is the table be made of a durable, easy to clean material?	The final product must last an extended period to reduce waste and improve quality.	I will test several woods and finishes. I will research what materials are durable and repel moisture	- Spilling stuff onto the table and then removing it - Scrub and ensued no damage. - Run trials on the materials. - Test product under simulated use conditions
3	Does the table have a shape that complements the surrounding furniture and décor?	As the table will be a centrepiece it must contrast to provide a better ambiance and improve general aesthetics	I will explore several designs ideas.	- Have a discussion with the end-user and get feedback. - Show others and gain feedback
4	Is the table of an appropriate height?	To ensure comfortable sitting and ergonomics, if the product is not comfortable to sit around it will lose one of the key purposes.	I will ensure the table factors in ergonomics and body anthropometry	- Have people sit around and use the table. - Run trials in which the end user uses the product then analyse the data
5	How does the table include an engaging and interactive element.	As the table is a centrepiece to the room it must be visually pleasing and appealing to see when coming into the given area.	This will be done by fully understanding what is engaging as satisfying to watch and seeing if I can replicate the feeling.	- Showing others and seeing their response - Showing the client - Seeing if it gets boring after a while
6	Does the product match the overall style and aesthetics of the room?	They want an aesthetically pleasing design, if it doesn't look great the end-user may not be willing to purchase it.	I will create extensive design options for the end-user to choose from This will also include testing the materials in the room.	- Show others and get their recommendations and feedback.
7	Is the table functional for its intended purpose?	If the table does not fit its main purpose, then there isn't much point of keeping it as it would only be there for looks.	I will check the flatness and balance of the top	- ensuring the table is level. - placing items and making sure nothing falls
8	Is the product sturdy and well balanced?	If the table isn't strong and balanced it won't be able to hold items as it might break or make them fall	I will make sure to measure. I will test several timbers for strength	- Testing top level with a flat edge and a level - Pushing it over and seeing if it falls
9	Is the table made to the upmost quality with limited imperfections	As the table is a centrepiece item it must have the best quality and craftsmanship in construction	I will heavily sand the table. I will ensure to accurately measure without parallax	- Inspect joints for quality. - Use a tape measure and square to ensure proper joining.
10	Is the table environmentally friendly and sustainable in terms of material and manufacturing?	There are limited supplies in the world, if the table is not sustainable then eventually all materials will run out	I will carefully research for a sustainable and certified produced to purchase from	- Ensure seller certification. - Confirm the seller is sustainable.

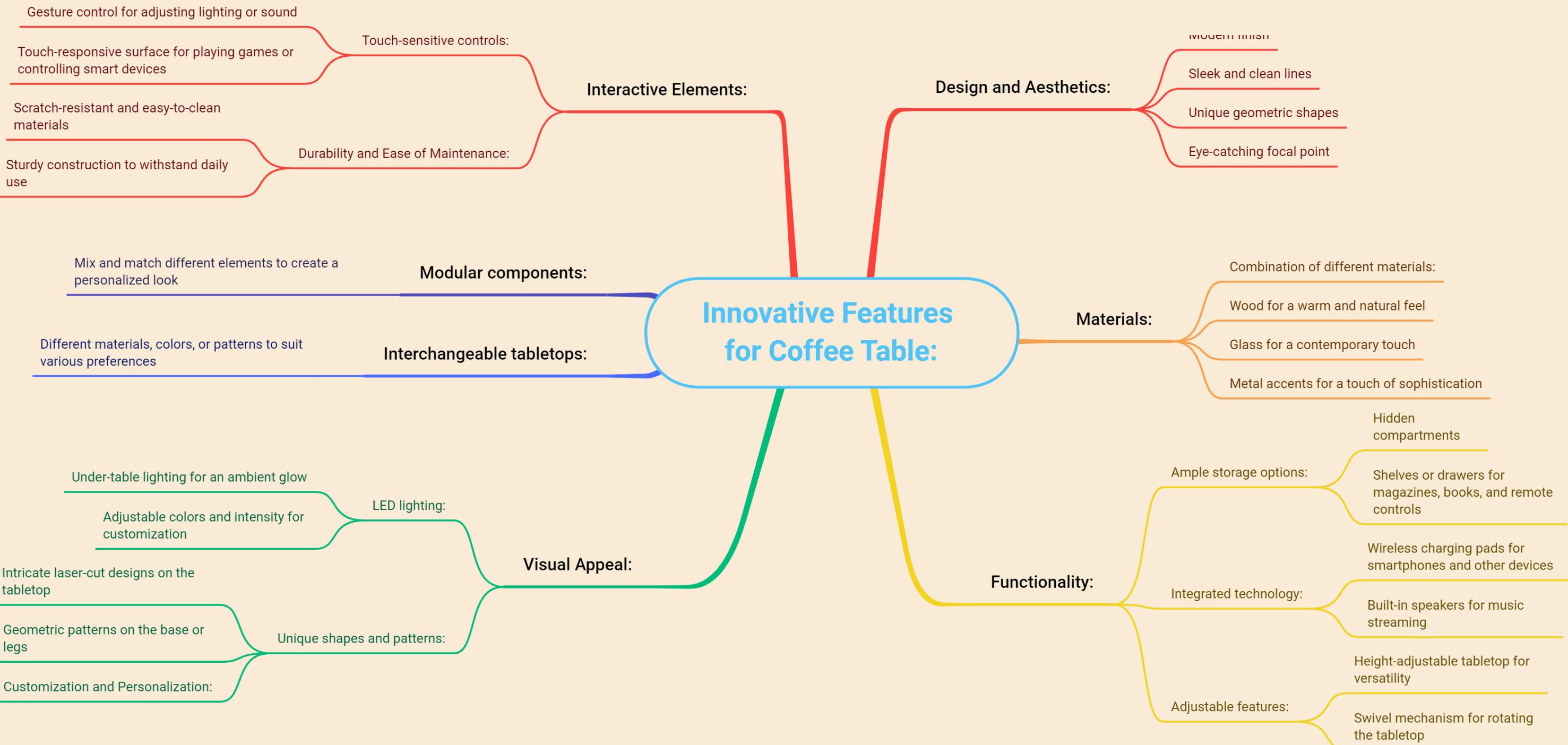
# RESEARCH & VISUALISATIONS

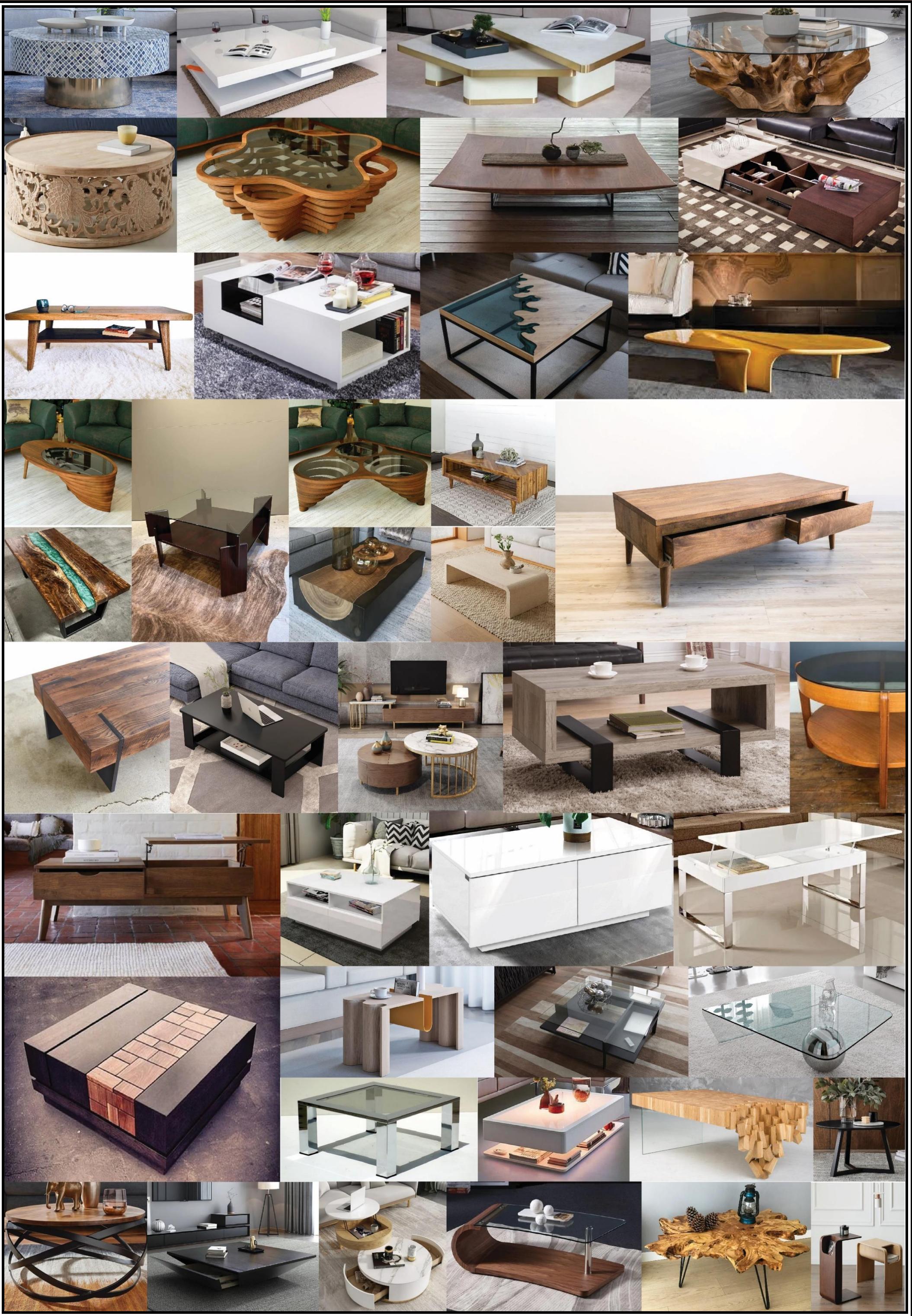


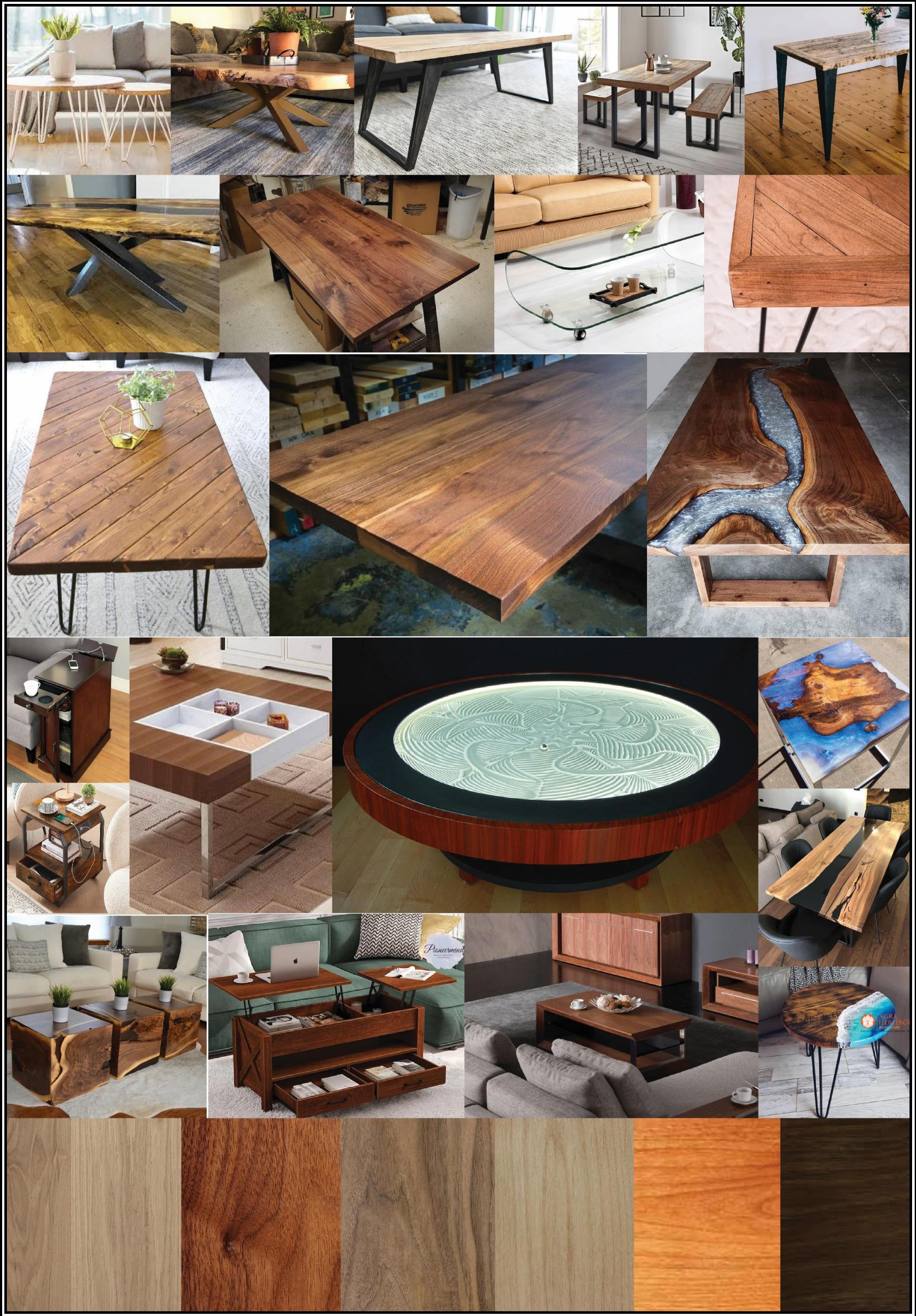
## Coffee Table: Materials Mind-Map

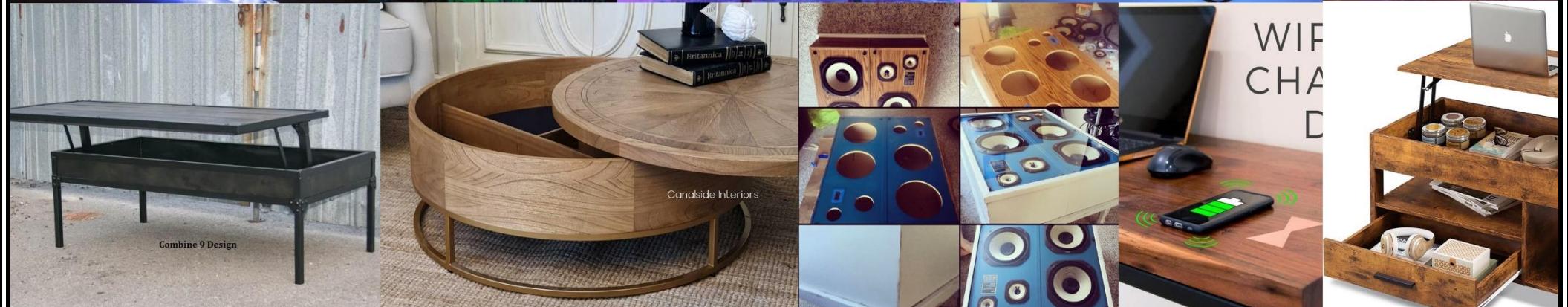
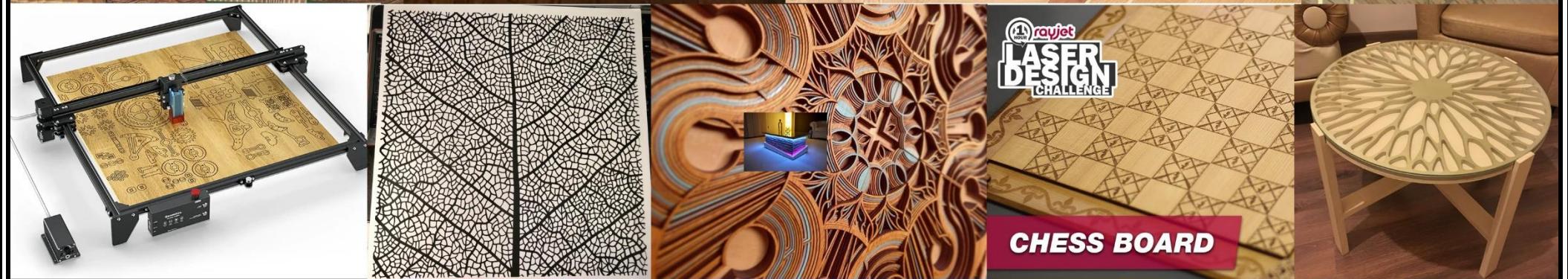


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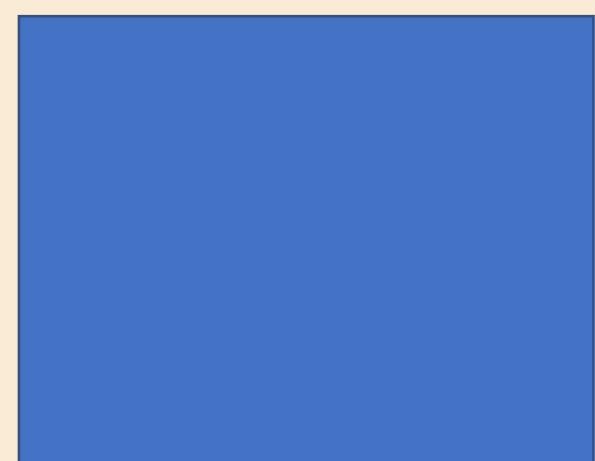
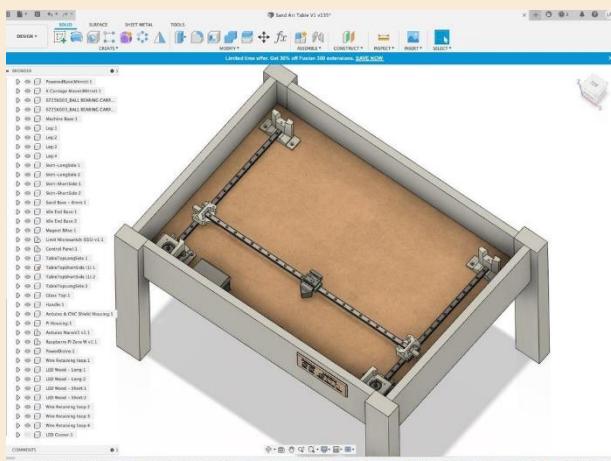
# RESEARCH

## Innovation & Design Component

The innovative design component will be a kinetic sand sculptor. It will consist of a small metal ball which will be pulled around through sand leaving a long continuous trail, this trail will be used to create patterns and art through the sand while being visually pleasing both while running and while turned off. It can be scaled in any direction to fit any table top. The purpose for this specific feature is to provide visual interest by having movement and texture. As the product is being designed for visual interest it will not need to serve any specific purpose other than being visually appealing to see and be able to catch the eye of a viewer.



There wasn't an excessive amount of research in order to develop the idea of kinetic sand sculptor, the end user was offered a variation of choices and they found this would best suit their home. In terms of research for the actual construction process I had to look into elements such as finding a suitable mechanism for moving the gantry, testing the viability and best material choice for the medium the ball would slide through, and some basic prototyping from cardboard. Some refinements made include the material the mounts will be made of, the type of movement setup, and the magnets strength.



It will consist of a mix of technical, software and hardware elements working in conjunction to offer smooth separation and seamless design, in terms of software there will be a mix of Computer Numerical Control (CNC) and position controlling elements to position the ball on the table, when it comes to hardware there will be 3D printed motor houses, button mounts, free wheels, drive belt and many others, these will all need to be tested to ensure everything will work correctly together, the CNC software will control the location of the gantry using motors which will shift the positioning of a belt drive. Through this a magnet will move which will have the metal bearing attached. As it can be scaled to any size it will be quite easy to implement into the table and around any other components.

The main feature/ highlight of the innovative feature is to provide visual contrast with a table, as it provides a modern and more fleshed out look. In addition and increased usability as it can work as a centre piece of a room and a statement article. In terms of added issues it will need to be powered therefore requiring batteries which will last an extended period of time, furthermore it may make it around 5 kg heavier, to solve these issues I can use high capacity batteries and use a light material such as acrylic for the top, but will most likely keep it glass because of the premium finish.

The kinetic sand sculptor would be a great addition to a coffee table for several reasons. Firstly, it adds an innovative and visually dynamic element to the table, which can make it more interesting and engaging to viewers. The movement and texture created by the kinetic sand sculptor can draw the eye and create a unique visual experience that is not found in most traditional coffee tables. Secondly, the kinetic sand sculptor can serve as a statement piece and add a sense of modernity and sophistication to the overall aesthetic of the coffee table. It can create a focal point for the room and elevate the look and feel of the space. Furthermore, the kinetic sand sculptor can also provide a creative outlet for the user to express themselves and create unique patterns and designs through the sand. This can be a fun and interactive way to engage with the coffee table and add a personal touch to the space. Overall, the impact of the innovative feature on the coffee table will depend on the preferences of the end user and their desired aesthetic for the piece. As they are for a unique and visually dynamic piece of furniture, the kinetic sand sculptor feature will be a great addition.

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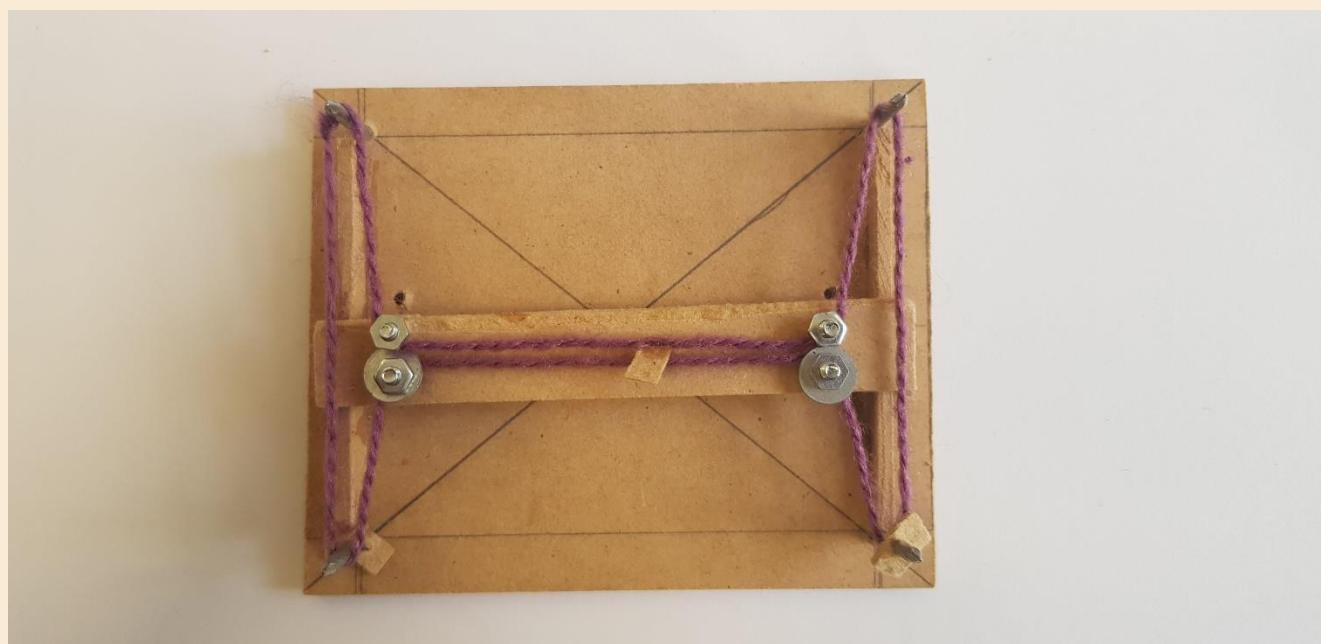
# RESEARCH

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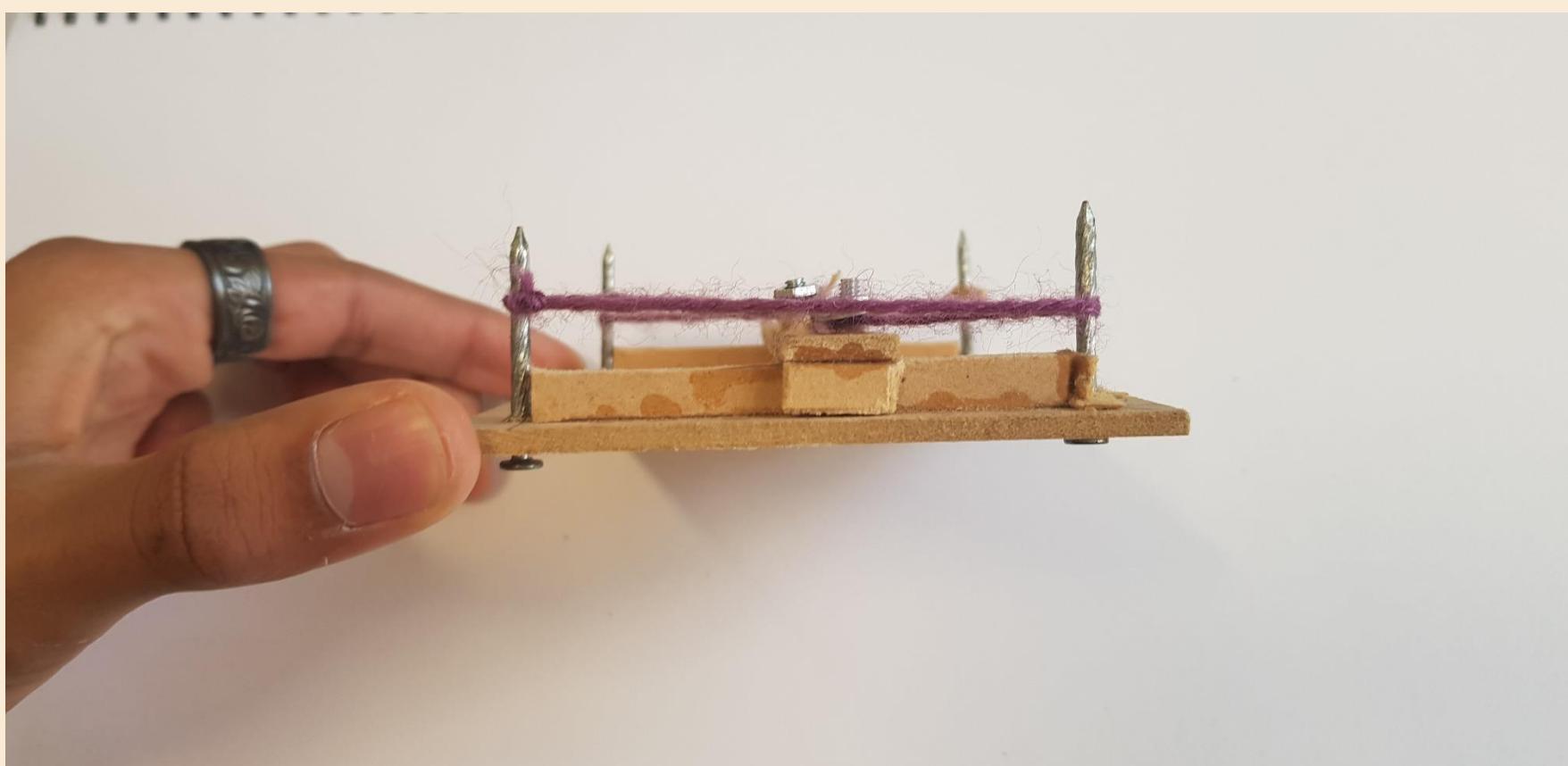
## Primary Research - Materials

# RESEARCH

## Primary Research -gantry

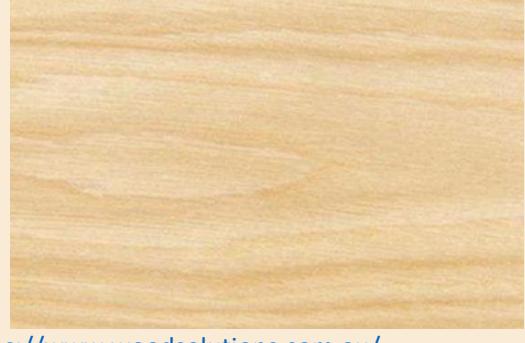


The provided image offers an overview of the operational concept of the gantry setup, highlighting its dual-directional movement utilizing only two models. I have personally developed and prototyped these models, rigorously ensuring their functionality and confirming their viability and suitability for the designated task.



# RESEARCH

## Secondary Research - Materials

Product Name:	Appearance:	Benefits and Disadvantages: Price per (in mm):	Image & Description	Suitability /10
<b>Timbers</b>				
Walnut, American Black	Its heartwood ranges from a golden to rich chocolate brown colour, sometimes with narrow streaks of a darker purplish brown. Sapwood is a distinctive creamy white colour. American black walnut is a fine and generally straight-grained timber, although sometimes it has an attractive wavy or curly grain, giving it a highly decorative figure.	Species Type: Hardwood Commonly known as: Black Walnut Strength group: SD5 (medium strength) Density: 615kg/m <sup>3</sup> Joint strength/ construction: JD3 (Reasonably High) Hardness: 4.5kN /20kN (Medium) Durability above ground: Reasonably high (15-45 years)  Price per: 150x25: \$34.20	 <a href="https://cdn.shopify.com/s/files/1/2793/9882/products/">https://cdn.shopify.com/s/files/1/2793/9882/products/</a> Brown, chocolate, mottled or streaky	American black walnut doesn't fare well outdoors but maintains a beautiful warm appearance indoors therefore making a great option.  9.0/10
Oak, American White	American white oak has light-coloured sapwood and a light to dark brown heartwood. White oak is mostly straight grained with a medium to coarse texture, with longer rays and more figure than American red oak. It has large distinctive growth rings, and some medullary rays may be present.	Species Type: Hardwood Commonly known as: White Oak Strength group: SD6 (Reasonably Low) Density: 750kg/m <sup>3</sup> Joint strength/ construction: J2 (High) Hardness: 6kN/ 20kN (medium) Durability above ground: Medium 15-25 years  Price per: 150x25: \$23.44	 <a href="https://www.woodsolutions.com.au/">https://www.woodsolutions.com.au/</a> White, yellow, pale straw to light brown	White Oak is a durable and strong hardwood that can withstand the wear and tear of daily use, but may need a protective layer.  8.0/10
Pine, Hoop	fairly soft and has a low density, often with very wide annual growth rings. The sapwood is white to pale yellow, but often indistinguishable from the heartwood, which is light brown to yellow.	Species Type: Softwood Commonly known as: Queensland Pine Strength group: SD5 (Medium) Density: 530kg/m <sup>3</sup> Joint strength/ construction: JD4 (Medium) Hardness: 3.4kN/ 20kN (Reasonably Low) Durability above ground: 0-7 years  Price per: 140x90: \$4.85	 <a href="https://www.woodsolutions.com.au/">https://www.woodsolutions.com.au/</a> White, yellow, pale straw to light brown	The pine may be good to build the internal structure but it does not have the desired appearance therefore making it rank quite low.  6.3/10
Maple, American Hard	It produces an attractive timber with creamy-white sapwood, sometimes with a pink tinge, and light to reddish brown heartwood. Higher grades of the timber are selected for the white colour of the sapwood, and this can limit their availability. While generally straight-grained, American hard maple can have a distinctive curly, fiddleback or Birdseye figure. Figured maple is generally only commercially available as veneer.	Species Type: Hardwood Commonly known as: Sugar Maple Strength group: SD5 (Medium) Density: 705kg/m <sup>3</sup> Joint strength/ construction: JD3 (Reasonably High) Hardness: 6.4kN/ 20kN (Medium) Durability above ground: 7-15 years  Price per: 150x25: \$19.90	 <a href="https://www.woodsolutions.com.au/">https://www.woodsolutions.com.au/</a> White, yellow, pale straw to light brown	It is a hard and dense wood that can withstand daily use, spills, and scratches without denting or splintering. It is also relatively easy to work with, which makes it a popular choice for furniture makers.  7.5/10
Chestnut, Wormy	Wormy Chestnut is not a distinct species of Chestnut, but rather refers to American Chestnut ( <i>Castanea dentata</i> ) trees that were killed by the chestnut blight of the early 1900s, which were subsequently damaged by insects, leaving holes and discoloration in the standing trees.	Species Type: Hardwood Commonly known as: Aussie wormy chestnut Strength group: SD5 (Medium) Density: 800kg/m <sup>3</sup> Joint strength/ construction: JD3 (Reasonably High) Hardness: 8kN/ 20kN (Medium) Durability above ground: 7-15 years  Price per: 150x25: \$15.30	 <a href="https://www.wood-database.com/">https://www.wood-database.com/</a> Pink to pink, brown	While wormy chestnut can be a durable and strong wood, it may be necessary to fill in the wormholes and other imperfections. But has a beautiful appearance.  7.5/10

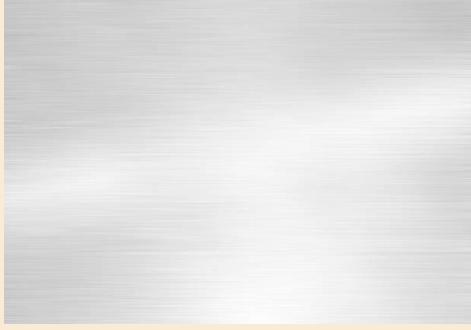
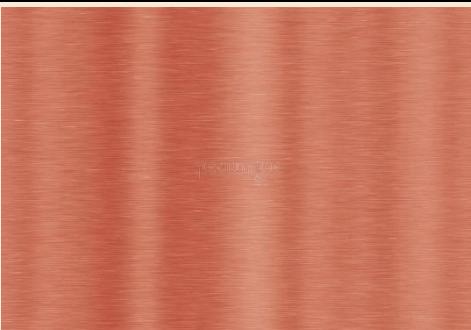
# RESEARCH

## Secondary Research - Materials

Product Name:	Appearance:	Benefits and Disadvantages: Price per (in mm):	Image & Description	Suitability /10
Timbers				
Ash, Victorian	Victorian ash timber usually has a straight grain but may also produce fiddleback markings and have visible gum veins. It has a coarse texture. The heartwood ranges from pale pink to yellowish brown and a walnut colour can be achieved by steaming with ammonia. The heartwood is often indistinguishable in colour from the softwood.	Species Type: Hardwood Commonly known as: Mountain Ash Strength group: S4 (medium high) SD4 (medium strength) Density: 650kg/m3 Joint strength/ construction: JD3 (Reasonably High) Hardness: 5.7kN /20kN (Medium) Durability above ground: 7-15 years  Price per: 150x25:		A relatively light and strong wood, Victorian ash has a slight grain, though not being as appealing and is not overly durable. Also it has a very light colour therefore it would look great. 7.4/10
Australian Blackwood	It is definitely an 'appearance timber', with a heartwood that is a rich golden brown. This is sometimes complimented by reddish streaks or a narrow band of darker colour, indicative of the growth rings. The sapwood is much paler in appearance. Blackwood has a medium and even texture. Its grain can either be straight or have a wavy, fiddleback pattern, which is valued for furniture and veneers.	Species Type: Hardwood Commonly known as: Black Wattle Strength group: S4 (medium high) SD4 (medium strength) Density: 650kg/m3 Joint strength/ construction: JD3 (Reasonably High) Hardness: 7.6kN /20kN (Medium) Durability above ground: 7-15 years  Price per: 150x25:		Australian blackwood has beautiful grain and texture and offers a nice density but still is slightly overly reddish for the final piece. 7.6/10
Spotted Gum	The species referred to as spotted gum vary in appearance but not in durability class or other properties. The heartwood ranges from light brown through to dark red-brown hues. Sapwood is usually white to light brown in colour. The presence of a wavy grain can produce an attractive fiddle-back figure. The wood has a slightly greasy feel.	Species Type: Hardwood Commonly known as: Spotted Iron gum Strength group: S2 (high) SD2 (high strength) Density: 990kg/m3 Joint strength/ construction: JD1 (Very High) Hardness: 11kN /20kN (Medium) Durability above ground: 40+ years		Spotted gum offers a similar appearance to blackwood, the distinct difference is that it has more granular patterns which result in a oversaturated appearance 6.7/10
Sydney Bluegum	Sydney blue gum is a large hardwood species growing to a height of 60 metres or more. It occurs natively in forests along the coast of New South Wales and southern Queensland. Sydney Blue Gum is also extensively grown as a plantation species in South Africa and South America, where rapid growth yields timber of much lower density than Australian material.	Species Type: Hardwood Commonly known as: Blue Gum Strength group: S3 (Reasonably high) SD3 (Reasonably high strength) Density: 840kg/m3 Joint strength/ construction: JD2 (High) Hardness: 11kN /20kN (Medium) Durability above ground: 5-15 years		Bluegum is extremely hard and strong but this also makes it very heavy and the table will be hard to move, it also has an overly orange colour. 6.8/10
Jarrah	Jarrah is a unique Australian hardwood renowned for its versatility. Its durability and strength make it an ideal timber for a range of structural and design applications, with timbers that display colours ranging from deep red to blonde. Jarrah timbers reflect the hues of the Western Australian landscape. The heartwood varies in colour from rich reds to browns, while sapwood ranges from a pale yellow to orange. The texture of the timber is moderately coarse and even-textured grain, although some interlocked, wavy grain may feature, creating interesting fiddle-back figure. This makes it an appealing architectural and design material..	Species Type: Hardwood Commonly known as: Blue Gum Strength group: S4 (Medium high) SD4 (Medium high strength) Density: 820kg/m3 Joint strength/ construction: JD2 (High) Hardness: 11kN /20kN (Medium) Durability above ground: 5-15 years		Jarrah is extremely hard and strong resulting in a very heavy and hard to move table, this will be a hassle to clean around and to move, it also has an overly reddish, orange colour which will surpass the accepted visual contrast. 6.9/10

# RESEARCH

## Secondary Research - Materials

Product Name:	Description and Appearance:	Benefits and Disadvantages:	Image & Description:	Suitability /10
<b>Metals</b>				
SAE 304, Stainless Steel	304 stainless Steel has a shiny and reflective surface that gives it a modern and polished look. Furthermore, the material has a silver-Grey colour that is uniform and consistent throughout its surface.	Machinability: 45% Thermal expansion: $17.2 \times 10^{-6} /K$ Corrosion Resistance: Water, distilled: 1 (excellent) Tensile strength: 515 MPa Versatility: 80/100 Density: 7,930 Kg/m <sup>3</sup> Conductivity: 3.45% Hardness, Rockwell B: 92 HRB Magnetism: non-magnetic  Price 600 x 300 x 0.9mm: \$42.75	 <a href="https://www.clintonaluminum.com/304-stainless-steel">https://www.clintonaluminum.com/304-stainless-steel</a> silver colour, uniform spread	Stainless steel offers a wide range of protection and resistance, while not as machinable it has a extremely high strength and is not magnetic.  7.8/10
Yellow, Brass	Yellow brass is a popular metal alloy made of copper, zinc, and small amounts of other metals like lead, iron, or aluminium. It has a distinctive yellow-gold colour, this can vary in brightness depending on the amount of zinc in the alloy. While some brass objects have a smooth, polished surface, while others may have a brushed or hammered texture that adds visual interest.	Machinability: 80% Thermal expansion: $20 \times 10^{-6} /K$ Corrosion Resistance: Water, distilled: 2 (moderate) Tensile strength: 340-570 MPa Versatility: 85/100 Density: 8,470 Kg/m <sup>3</sup> Conductivity: 28% Hardness, Rockwell B: 75 HRB Magnetism: Non-magnetic  Price	 <a href="https://stock.adobe.com/au">https://stock.adobe.com/au</a> yellow gold colour, brushed finish	Having a beautiful gold appearance for a fraction of the price it is very visually aesthetic, as is also very machinable. But it is very dense and heavy.  7.8/10
Aluminium	Aluminium is a lightweight, durable metal that is widely used in a variety of industries, including aerospace, transportation, construction. It has a silvery-white colour, which can vary depending on the surface finish and texture. Aluminium can be polished to a high shine or left with a matte finish.	Machinability: 50-60% Thermal expansion: $23.1 \times 10^{-6} /K$ Corrosion Resistance: Water, distilled: 1 (excellent) Tensile strength: 40-90 MPa Versatility: 90/100 Density: 2,700 Kg/m <sup>3</sup> Conductivity: 61% Hardness, Rockwell B: 55 HRB Magnetism: Non-magnetic  Price: 0.5 x 300 x 900mm: \$27.48	 <a href="https://www.istockphoto.com/">https://www.istockphoto.com/</a> silver/white colour, high shine	Aluminium is much less dense then other materials but this comes at the cost of a very low tensile strength, appearance wise it will contrast nicely  6.8/10
Copper	Copper is a versatile and widely used metal known for its distinctive reddish-brown colour and its excellent electrical and thermal conductivity. Copper has a reddish-brown colour, which can range from bright and shiny to deep and muted. Copper can also develop a patina or tarnish over time, which can range from green to brown to black if oxidised.	Machinability: 40% Thermal expansion: $16.5 \times 10^{-6} /K$ Corrosion Resistance: Water, distilled: 1 (excellent) Tensile strength: 220-370 MPa Versatility: 90/100 Density: 8,960 Kg/m <sup>3</sup> Conductivity: 100% Hardness, Rockwell B: 65 HRB Magnetism: Non-magnetic  Price	 <a href="https://www.dreamstime.com/photos">https://www.dreamstime.com/photos</a> reddish colour, high sheen	While copper is not magnetic it is extremely reddish in tone therefore taking away the beauty of the table, this makes it difficult to fit into the table without visual conflict  6.2/10
Iron	Iron is a heavy, strong, and durable metal that has been used for thousands of years in a variety of applications, including construction, manufacturing, and art. One of the main appearance factors of iron is its dark grey or black colour, which can vary depending on the level of carbon and other elements in the alloy. Iron can be polished to a high shine.	Machinability: 25% Thermal expansion: $11.8 \times 10^{-6} /K$ Corrosion Resistance: Water, distilled: 3 (inferior) Tensile strength: 600 MPa Versatility: 80/100 Density: 7.870Kg/m <sup>3</sup> Conductivity: 50% Hardness, Rockwell B: 85 HRB Magnetism: Magnetic  Price	 <a href="https://www.pinterest.com.au/">https://www.pinterest.com.au/</a> Dark colours, low sheen, scratched/ wire brushed	While the dark iron will contrast quite well with the rest of the table it is magnetic therefore being a challenge when incorporating the metal ball  6.9/10

Mostly from <https://www.matweb.com/search/DataSheet.aspx?MatGUID=abc4415b0f8b490387e3c922237098da&ckck=1>

# RESEARCH

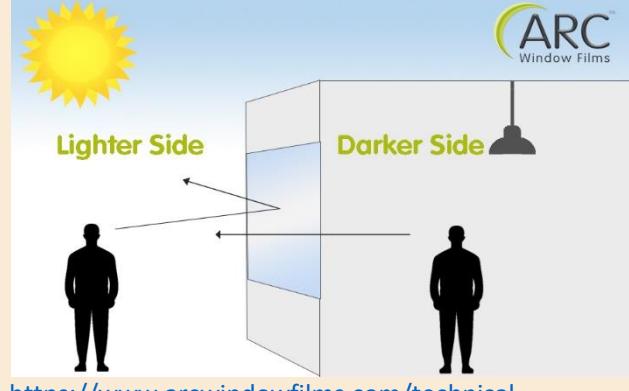
## Secondary Research - Materials

Product Name:	Description and Appearance:	Benefits and Disadvantages:	Image & Description:	Suitability /10
Plastics/ 3D Printing				
ABS	<p>Aesthetically, ABS is available in a range of colours, both solid and translucent, with a smooth and shiny surface finish. ABS has a slightly rough texture that may be visible on the surface of the print and can be minimized through the use of high-quality filament or sanding. Visible layer lines may also appear on larger prints and can be reduced through changes to the nozzle size or layer height. ABS provides a range of aesthetic options for 3D printing, including colour, surface finish, and texture.</p>	<p>Strength: 8 (excellent) Tensile strength: 45 MPa (high) Flexibility: 2/10 (not very flexible) Heat resistance: 80°C (very high) Chemical resistance: 9-10 pH (good) Price per gram in AUD: \$0.10-\$0.20 AUD per gram.</p> <p>Environmental impact: ABS has a high environmental impact due to its non-biodegradable nature and the potential release of harmful fumes during printing. Therefore, it can be rated as 8/10 (very high) in terms of environmental impact.</p>	 <a href="https://google.com/images">https://google.com/images</a>	<p>ABS is very strong compared to other filaments but isn't flexible, therefore making it a good product for designing items which will be used for a long time.</p> <p>7.9/10</p>
PEEK	<p>PEEK is typically available in its natural colour, which is amber. The surface finish of PEEK is smooth and glossy, but it can be further polished to achieve a higher gloss finish. PEEK is not prone to warping, which means that it does not require post-processing steps such as sanding or coating. However, the layer lines may be visible on the surface of the print, especially on larger prints. Overall, the primary aesthetic factors of PEEK are its natural amber colour, smooth surface finish, and visible layer lines.</p>	<p>Strength: 9 (excellent) Tensile strength: 100 MPa (excellent) Flexibility: 3/10 (not very flexible) Heat resistance: 250°C (extremely high) Chemical resistance: 9-10 pH (good) Price per gram in AUD \$1.50-\$2.50 AUD per gram.</p> <p>Environmental impact: PEEK is a high-performance thermoplastic that is recyclable and has a low environmental impact compared to other high-performance plastics. Therefore, it can be rated as 4/10 (moderate) in terms of environmental impact.</p>	 <a href="https://google.com/images">https://google.com/images</a>	<p>PEEK is extremely strong and lightly more flexible than ABS, PEEK is much more expensive per gram due to this added strength and durability. Further more having much more heat resistance to friction.</p> <p>8.4/10</p>
PLA	<p>PLA is available in a wide range of colours, including opaque, translucent, and metallic shades. The surface finish of PLA is smooth and glossy, and it is relatively easy to sand or polish for a higher gloss finish. PLA prints may have visible layer lines, especially on larger prints, but they can be minimized by using a smaller nozzle size or by increasing the layer height. Overall, the primary aesthetic factors of PLA are its wide range of colours, smooth surface finish, and visible layer lines.</p>	<p>Strength: 6 (good) Tensile strength: 60 MPa (good) Flexibility: 8/10 (very flexible) Heat resistance: 60°C (moderate) Chemical resistance: 7-8 pH (moderate) Price per gram in AUD: It varies but is usually around \$0.05-\$0.20 AUD per gram.</p> <p>Environmental impact: PLA is a biodegradable and compostable material made from renewable resources, such as corn-starch or sugarcane, making it a more environmentally friendly option than other plastics. Therefore, it can be rated as 2/10 (low) in terms of environmental impact.</p>	 <a href="https://google.com/images">https://google.com/images</a>	<p>PLA is typically a counterpart to ABS having a reduced strength while being incredibly more flexible and cheaper. Yet it will not be as functional if items being put to constant strain and friction.</p> <p>6.6/10</p>
ULTEM	<p>ULTEM is typically available in its natural amber colour, and it has a smooth and glossy surface finish that can be further polished to achieve a higher gloss finish. ULTEM prints may have visible layer lines, but they can be minimized by using a smaller nozzle size or by increasing the layer height. ULTEM is not prone to warping, which means that it does not require post-processing steps such as sanding or coating. Overall, the primary aesthetic factors of ULTEM are its natural amber colour, smooth surface finish, and visible layer lines.</p>	<p>Strength: 9 (excellent) Tensile strength: 80 MPa (very high) Flexibility: 3/10 (not very flexible) Heat resistance: 180°C (high) Chemical resistance: 9-10 pH (good) Price per gram in AUD: It varies but is usually around \$5-\$10 AUD per gram.</p> <p>Environmental impact: ULTEM is a high-performance thermoplastic that is not biodegradable and requires a significant amount of energy to produce, making it less environmentally friendly than some other materials. Therefore, it can be rated as 7/10 (high) in terms of environmental impact.</p>	 <a href="https://google.com/images">https://google.com/images</a>	<p>ULTEM is one of the strongest filaments but comes at the trade off of not being flexible, this is not to big if a deal as it will be used to create gears and holding brackets, another advantage of ULTEM is the heat resistance of 180°C</p> <p>9.3/10</p>

Mainly from <https://chat.openai.com/> and <https://filapedia.com/filament-database/>

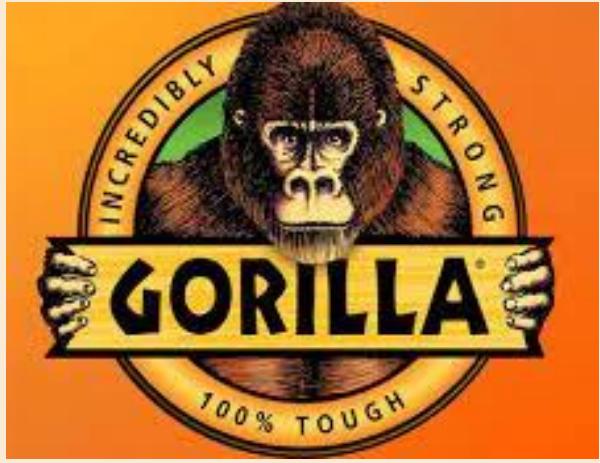
# RESEARCH

## Secondary Research - Materials

Product Name:	Description and Appearance:	Benefits and Disadvantages:	Image & Description:	Suitability /10
<b>Clear Material</b>				
Tempered, Glass	<p>Tempered glass is a type of safety glass that is heat-treated to increase its strength and durability. Tempered glass is available in its natural colour, which is a clear and transparent finish that allows light to pass through. The surface of tempered glass is smooth and glossy, with a slight greenish tint that can be visible when viewed at an angle. Tempered glass can also be customized through the use of tinted or frosted glass, which provides additional aesthetic options for applications that require privacy or a specific visual effect. Overall, the primary aesthetic factors of tempered glass are its clear and glossy finish, transparency, and tinting options.</p>	<p>Strength: 10 (excellent) Tensile strength: 120 MPa (excellent) Flexibility: 1/10 (not flexible) Heat resistance: 200°C (excellent) Chemical resistance: 7-8 pH (good)</p> <p>Environmental impact: Tempered glass has a relatively low environmental impact compared to other materials used in 3D printing, as it is made from natural materials and can be recycled. However, the manufacturing process and transportation of tempered glass can still have some negative impact on the environment. On a scale of 1-10 where 10 is the highest impact, tempered glass would be around a 4/10 (moderate impact).</p> <p>Price:</p>	 <p><a href="https://clearglass.com.au/wp-content/uploads">https://clearglass.com.au/wp-content/uploads</a></p>	<p>Tempered glass offers a beautiful finish and incredible strength with a tensile strength of 120MPa, it offers no flexibility which will work perfectly as a table top. It has a slight blueish tint when viewed from a specific angle and is heavier than other materials.</p> <p>8.2/10</p>
Acrylic	<p>Acrylic is available in a wide range of colours, including opaque, translucent, and transparent finishes. The surface of acrylic is smooth and glossy, with a slightly plastic-like feel. Acrylic is also highly customizable, as it can be polished to achieve a higher gloss finish or sandblasted or etched to create a frosted or matte finish. Acrylic is also available in different textures, such as smooth, textured, or patterned surfaces, providing additional aesthetic options for various applications</p>	<p>Strength: 8/10 (very strong) Tensile strength: 72 MPa (excellent) Flexibility: 4/10 (not very flexible) Heat resistance: 70°C (high) Chemical resistance: 7-8 pH (good)</p> <p>Environmental impact: 6/10 (moderate). Clear Acrylic is a type of plastic, which has a moderate environmental impact due to its production process and disposal. However, it can be recycled and reused.</p> <p>Price:</p>	 <p><a href="https://www.justsignageonline.com.au/product">https://www.justsignageonline.com.au/product</a></p>	<p>Acrylic can be dyed and made opaque which means it has extreme cost. Customizability, it is typically lighter than tempered glass but not as much of a premium and can bend.</p> <p>7.6/10</p>
Acrylic mirror	<p>Acrylic mirrors are available in a range of colours, including clear, silver, gold, and bronze. The surface of acrylic mirrors is smooth and reflective, with a slightly plastic-like feel. Acrylic mirrors can also be customized by etching or sandblasting to create patterns, designs, or a frosted effect. Acrylic mirrors are also lightweight and easy to handle, making them ideal for various applications, such as interior design, art projects, and stage productions.</p>	<p>Strength: 8 (very good) Tensile strength: 75 MPa (high) Flexibility: 3/10 (not very flexible) Heat resistance: 80°C (very high) Chemical resistance: 9-10 pH (good)</p> <p>Environmental impact: 4/10 (moderate) while acrylic is recyclable, the production process can have negative environmental impacts and the material is not biodegradable. Additionally, the manufacturing process for creating the mirror coating on the acrylic can involve toxic chemicals.</p> <p>Price:</p>	 <p><a href="https://www.ebay.com.au/itm/252970436895">https://www.ebay.com.au/itm/252970436895</a></p>	<p>An acrylic mirror can be used where the opacity can be changed through using electrical currents, this will be much more pricy but again be a very premium product, it is quite strong offering decent resistance.</p> <p>6.6/10</p>
One way mirror	<p>One-way mirrors are typically made of glass with a partially reflective coating applied to one side. They have a silvered or tinted surface that appears opaque from one side while allowing visibility from the other side. The surface of one-way mirrors is smooth and reflective, with a slight green or grey tint. One-way mirrors are commonly used in surveillance rooms, optical devices, and theatrical performances, providing a unique and intriguing visual effect.</p>	<p>Strength: 7 (good) Tensile strength: 50 MPa (high) Flexibility: 1/10 (not flexible) Heat resistance: 80°C (very high) Chemical resistance: 9-10 pH (good)</p> <p>Environmental impact: 6/10 (high) - the production process for one-way mirrors made on glass can involve high energy consumption and use of potentially harmful chemicals. The disposal of glass can also have negative environmental impacts.</p> <p>Price:</p>	 <p><a href="https://www.arcwindowfilms.com/technical-information">https://www.arcwindowfilms.com/technical-information</a></p>	<p>A one way mirror can be used like the electronic mirror where light can change which side can see through, this will be difficult to implement but offer an impressive finish.</p> <p>7.2/10</p>

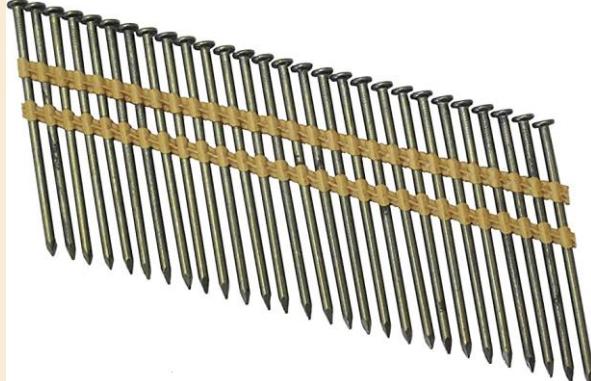
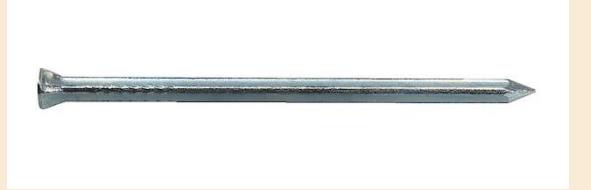
# RESEARCH

## Secondary Research - Fixings

Product Name:	Description and Appearance:	Benefits and Disadvantages:	Image & Description:	Suitability /10
<b>Glue &amp; Epoxy</b>				
Titebonds 3, Glue	When fully cured, it is not possible to determine the exact physical appearance of the glue because it dries to a translucent yellow colour that is difficult to distinguish from the surrounding wood fibres.	Type of glue: Polyurethane-based adhesive Waterproofing: 10/10 Bond strength: 2200 psi (15.2 MPa) Versatility: 14/20 Open time: 8-10 minutes Closed time: 24 hours Clean up: Can be cleaned up with water while wet, requires mechanical removal when dry. Price in AUD: \$20-\$30 per L	 <a href="https://titebond.com.au/products/titebond-iii">https://titebond.com.au/products/titebond-iii</a>	Titebond 3 has excellent curing capability's being able to hold extremely heavy pieces without breaking the bond, it finished in a translucent yellow colour. 9/10
Gorilla Glue, Glue	When fully cured, Gorilla Glue has a characteristic yellowish-brown colour and a hard, rigid texture	Type of glue: Polyurethane adhesive Waterproofing: 10/10 Bond strength: 4,000 psi (27.6 MPa) Versatility: 20/20 Open time: 10-15 minutes Closed time: 1-2 hours Clean up: Use acetone or isopropyl alcohol to remove uncured glue. Once cured, it can only be removed mechanically. Price in AUD: \$70-\$75 per L	 <a href="https://gorillaglue.com.au/">https://gorillaglue.com.au/</a>	Gorilla glue is extremely strong, even stronger than Titebond but comes the caveat of being extremely expensive per L and hard to remove. 7.6/10
JB-Weld, Glue/ Epoxy	Clear Weld cures to a clear, transparent bond when applied to a thickness of less than 15 mm. This means that the bond will turn transparent when it has reached full cure. While Marine Weld cures to a dark grey colour when fully cured	Type of glue: Epoxy Waterproofing: 10/10 Versatility: 20/20 Bond strength: 3960 psi (27.3 MPa) Open time: 20 minutes Closed time: 4-6 hours Clean up: Clean up uncured epoxy with acetone or rubbing alcohol. Cured epoxy must be mechanically removed or sanded. Price in AUD: \$15 per 25mL	 <a href="https://www.jbweld.com/">https://www.jbweld.com/</a>	JB weld is known to use an epoxy mix which will dry and harden into a very ridged finish that can be hard to remove and one of the most expensive options. 4.6/10
Epoxy Resin, Glue/ Epoxy	It generally undergoes a transformation from a liquid state to a solid state through a curing process that involves passing through a gel state. In terms of appearance, epoxy resin can have a clear, glass-like finish when fully cured, making it a popular choice for a variety of applications including coatings, art, and jewellery making. However, the final appearance can also be affected by factors such as the colour of the pigments or dyes added to the resin and the smoothness of the surface.	Type of glue: Epoxy Resin. Waterproofing: 10/10. Versatility: 18/20. Bond strength: 7,000-10,000 psi (48-69 MPa). Open time: 30min – 2hr Closed time: 36hr Clean up: Requires special solvents or alcohol-based cleaners to be cleaned up, as it does not dissolve in water. The surface should be wiped clean before the epoxy sets. Price in AUD: \$100-\$150 per L	 <a href="https://www.theepoxyresinstore.com/">https://www.theepoxyresinstore.com/</a>	Using a pure epoxy can be extremely strong but the curing time takes incredibly long and can stain the wood, but it is also immensely strong holding incredible weight. 5.6/10
Elmer's E7310 Carpenter's, Glue	They're affordable, easy to find, and offer a relatively strong bond. Many PVA glues will dry with a slightly milky white or yellow tint	Type of glue: Carpenter's Wood Glue Waterproofing: 8/ 10 Versatility: 15/ 20 Bond strength: 4,000 psi (27.6 MPa) Open time: 15 min Closed time: 20 min-30 min Clean up: Clean up excess glue with a damp cloth before it dries. Use soap and water to clean up dried glue. Share Prompt Price in AUD: \$150-\$180 per L	 <a href="https://www.elmers.com/hardware">https://www.elmers.com/hardware</a>	Elmer's glue is typically known as a school glue, the carpenter's glue has a decent versatility but comes with an immensely high price tag 4.8/10

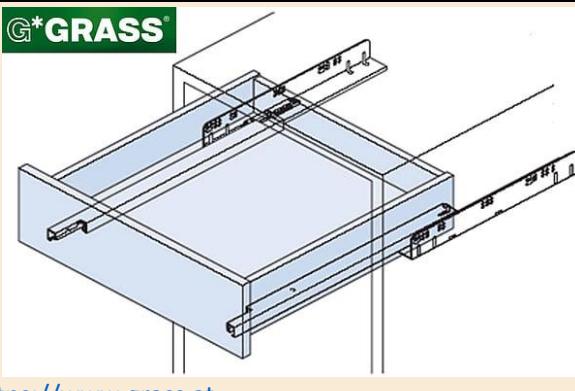
# RESEARCH

## Secondary Research - Features

Product Name:	Description and Appearance:	Benefits and Disadvantages:	Image & Description:	Suitability /10
Screws & Nails				
Framing, Nails	Framing nails are typically used in construction and carpentry for framing and other heavy-duty applications. These nails are usually larger and thicker than standard nails and are designed to provide a strong hold for structural components.	Size: 50mm - 150mm in length, and 2.5mm - 4mm thick. Material: Steel (with some made of stainless steel or galvanized steel) Shank: Ribbed Point: Diamond-shaped with a sharp angle of around 33° to 34° Coating: Zinc or galvanized coating (depending on the nail) Holding strength: 3.5mm thick nail with a length of 90mm able to hold up to 300kg. Tensile Strength: 300MPa-500MPa	 <a href="https://m.media-amazon.com/images">https://m.media-amazon.com/images</a>	Framing nails may be too large and bulky for this project as it is made to have a fine finish.  6.3/10
Common, Nails	Common nails are the most basic type of nail used in woodworking and construction. They are made of steel or iron and are typically uncoated, giving them a plain, metallic appearance. Common nails are used in a wide variety of applications, including framing, trim work, and general carpentry. They are often used for fastening wood to wood, such as in building walls, roofs, and floors.	Size: 13mm-150mm in length, and 1.2mm - 5.6mm thick Material: Steel, Stainless steel Shank: Smooth, Point: sharp but slightly blunted, 20°-25° Coating: zinc or galvanized coating Holding Strength: 3.5mm thick nail with a length of 90mm able to hold up to 250kg. Tensile strength: 500MPa-900 MPa.	 <a href="https://www.concrete-nails.com/img/">https://www.concrete-nails.com/img/</a>	Common nails have the benefit of good strength and being more compact, thus they will be better on this scale of project.  9.2/10
Box, Nails	Box nails are a type of common nail that is smaller in size and has a thinner shank than traditional common nails. They are typically made of steel or iron and are uncoated, giving them a plain, metallic appearance. One of the primary uses of box nails is in the construction of wooden boxes, crates, and other small-scale woodworking projects.	Size: 25mm-100mm in length and 1.6mm-3.8mm in thickness Material: Steel Shank: Smooth can have rib Point: Blunt point, 15°-20° Coating: zinc or galvanized coating Holding Strength: 3.5mm thick nail with a length of 90mm able to hold up to 180kg. Tensile strength: 400MPa-500MPa	 <a href="https://www.google.com">https://www.google.com</a>	Box nails come in very small sizes which means they will work properly for the micro joints and have a clean finish  9.4/10
Casing, Nails	Casing nails are a type of finishing nail that are designed to be used in finish carpentry applications, such as installing trim, moulding, and other decorative elements. They are typically made of steel or stainless steel and may be coated with a layer of galvanized or other corrosion-resistant material.	Size: 32mm-102mm in length and 2.5mm-4mm in thickness Material: Steel Shank: Smooth, can be either tapered or straight Point: sharp diamond point, 30°-34° Coating: such as a zinc or galvanized Holding Strength: A 3.5mm thick casing nail with a length of 90mm can typically hold up to around 260kg Tensile strength: 450MPa-550MPa	 <a href="https://www.reshow.no/debris/">https://www.reshow.no/debris/</a>	Casing nails are offer a more premium application as they typically are very thin leaving a tiny hole and quite a clean finish, But they aren't as strong  7.7/10
screws	Screws are a type of fastener that are commonly used in woodworking and construction projects. They are made of metal, typically steel, and come in a variety of sizes and shapes. Screws are available in a variety of head types, including flat, round, oval, and pan heads. The head type determines the tool required for installation, such as a flat-head screwdriver, Phillips-head screwdriver, or hex driver. Screws are commonly used in a wide variety of applications, including building decks, installing drywall, and assembling furniture. They are also used in cabinetry and woodworking projects.	Size: 10mm-150mm in length and, 2mm-8mm in thickness. Material: steel, stainless steel, brass, etc Shank: Threaded shank that can be fully or partially threaded depending on the type of screw. Point: Sharp, pointed tip that can be flat or cone-shaped, 40°-60° Coating: zinc or galvanized coating Holding Strength: Varies depending on the type of screw, the material it is being screwed into, and its length and thickness. Specific weight capacity cannot be provided without more information about the screw and its application. Tensile Strength: 400MPa-600MPa	 <a href="https://studentlesson.com/common-types-of-screws">https://studentlesson.com/common-types-of-screws</a>	Screws come with a wide range of features and a variety of uses, they offer superior holding strength because to the threads digging into the wood. They can be made to have a flush finish to be more aesthetically pleasing.  9.8/10

# RESEARCH

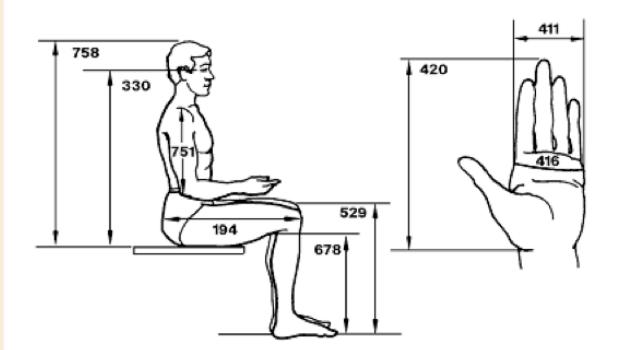
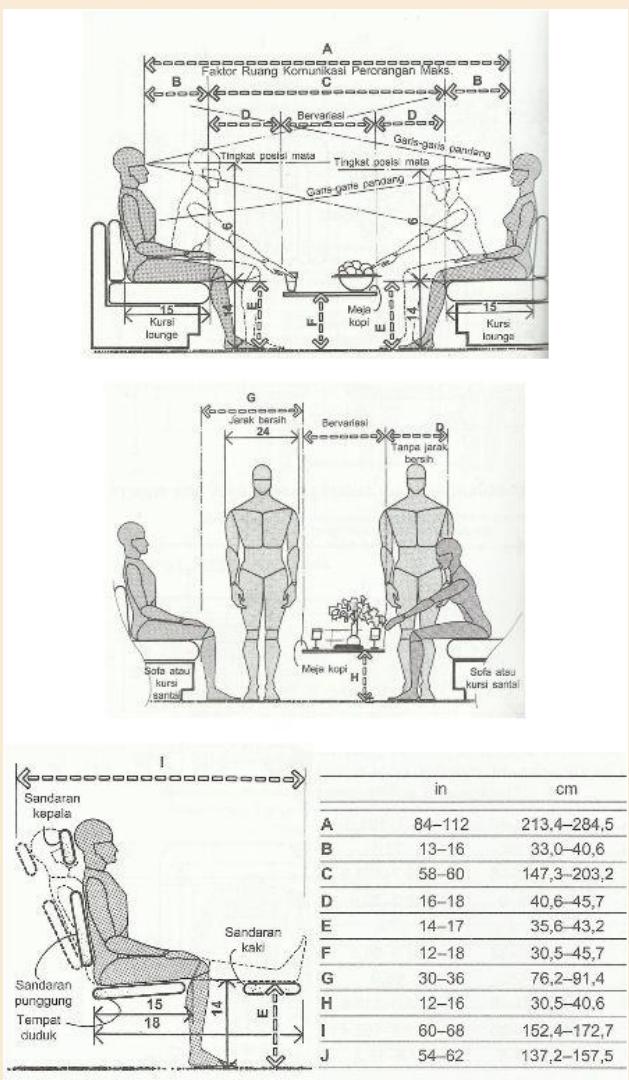
## Secondary Research - Features

Product Name:	Description and Appearance:	Benefits and Disadvantages:	Image & Description:	Suitability /10
Drawers & Shelfs				
Blum, Drawer runners	Blum drawer are both hated and loved by furniture makers as they offer an extremely soft finish being one of the smoothest drawer runners but come with some more fiddly parts to install correctly. But the final quality is fully worth the effort as it adds an extreme level of sophistication without any compromise	Compatibility: 20 (excellent) Ease of installation: Simple and straightforward; attach the runners to the drawer and then secure them to the cabinet sides. Durability: 450N breaking force Smooth operations/satisfying: 9/10 Weight Capacity (kg): Up to 30kg Price: \$60-\$120	 <a href="https://www.blum.com/au/en/">https://www.blum.com/au/en/</a>	Blum Drawer runners are one of the most smooth ones on the market offering the most premium finish but coming in extremely expensive. 9.3/10
Hettich, Drawer runners	These runners are made of high-grade materials for sophisticated use offering an extremely smooth use which is designed to last the test of time and being user over an extended period of time	Compatibility: 19/20 Ease of Installation: Attaches to drawer and cabinet with screws. Durability: 600N breaking force Smooth Operations/Satisfying: 9/10 Weight Capacity: Up to 45kg Price: \$30-\$50	 <b>Hettich</b> Technik für Möbel <a href="https://www.hettich.com/">https://www.hettich.com/</a>	Hettich are much cheaper than the before mentioned Blum runners, they are much stronger in terms of holding capacity but may not have as smooth operations. 8.7/10
Accuride, Drawer runners	These drawer runners are made from high-grade materials, such as cold-rolled steel, which gives them excellent durability and strength. They are also available in a variety of sizes, making them compatible with a wide range of drawer types and sizes.	Compatibility: 19/20 Ease of installation: Quick and easy using screws. Durability: 680N breaking force Smooth operation/satisfaction: 9/10 Weight capacity: Up to 45kg Price: \$20-\$50	 <a href="https://www.accuride.com/en-us">https://www.accuride.com/en-us</a>	Accuride runners offer a large holding capacity coming in many shapes and size, the are much cheaper than the premium models but may not be as smooth. 8.5/10
Grass, Drawer runners	Grass drawer runners are high-quality, durable components that are designed to provide smooth, quiet operation for drawers of various sizes. The runners are made of high-grade materials and are engineered to withstand significant weight and force and made to withstand the constant stress. Grass drawer runners have a sleek and simple appearance, with a silver or grey metallic finish.	Compatibility score: 18/ 20 Ease of installation: Screw runners onto cabinet and drawer sides, mounting bracket included Durability: 500N breaking force Smoothness score: 9/ 10 Weight capacity: Up to 30kg Price: \$50-\$70	 <a href="https://www.grass.at">https://www.grass.at</a>	Grass runners aren't overly strong in terms of holding capacity and are more expensive than the Accuride runners. 6.8/10
Shelves	Shelves are an essential piece of furniture found in almost every household and commercial space. They are designed to provide storage space for various items and come in different sizes, shapes, and materials to suit different needs and preferences.  Appearance wise they can be veneer or use a slab for a more aesthetic appearance.	Drawer storage cabinets are much better at making full use of the available cubic space  using shelves instead of drawers can also be a budget-friendly solution.  Shelves increase the visibility and accessibility of tools and provide a secure location for important records.  Shelves are flexible and can be adapted to fit different storage needs, making them a versatile storage solution.	 <a href="https://google.com">https://google.com</a>	Shelves can be made very easily without the requirement of a complex system of drawer runners, the cast next to nothing and when constructed right can handle extreme stress and weight. 8.7/10

<https://blog.theshelvingstore.com/>, <https://blog.storemorestore.com/>, <https://schoolofdecorating.com/>,

# RESEARCH

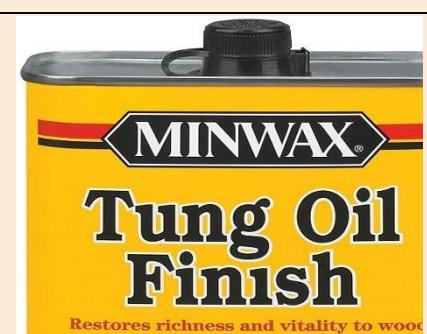
## Secondary Research - Features

Feature name:	Description and Appearance:	Benefits and Disadvantages:	Image & Description:	Suitability /10																																	
Kinetic Sand Sculptor & Glass Tabletop																																					
Kinetic Sand Table	A metal ball rolls silently through sand, forever creating and erasing beautiful patterns. The table will use a Cartesian motion platform to move a magnet underneath a table. On top of the table, a metal sphere attached to the magnet moves through craft sand to draw attractive patterns, by blending movement along two independent axes, it can move a magnet under the sand field very precisely along predetermined paths stored in files within a small computer inside the table.	<ul style="list-style-type: none"> <li>- Aesthetic appearance</li> <li>- Interest to the table</li> <li>- Contrasting element</li> </ul>	 <p><a href="https://www.thisiscolossal.com/2016/09">https://www.thisiscolossal.com/2016/09</a></p>	The top will include a kinetic sand sculptor as it will offer a beautiful finish and a premium feature found in much more expensive tables, it will be the centrepiece of the table catching the eye.																																	
Anthropometry	<p>Anthropometry is the study of the human body's measurements and proportions. Designers of furniture, like other product designers, use anthropometric data to create products that are comfortable and ergonomically designed for their users. It can be used to create a better fitting and suited piece of furniture which will last accordingly and have a more comfortable feel. In addition to improving comfort, furniture that is designed with anthropometry can also improve safety. For example, a desk that is too high or too low can cause discomfort and strain on the neck, shoulders, and back, while a chair that is too low can cause pressure on the knees and strain on the lower back.</p> <p><a href="https://www.hfes.org/">https://www.hfes.org/</a></p> <p><a href="https://www.cdc.gov/niosh/topics/ergonomics/">https://www.cdc.gov/niosh/topics/ergonomics/</a></p>	<p>Improved Comfort: Designing products, including furniture, with anthropometry in mind ensures that they fit the human body properly.</p> <p>Better Accessibility: By taking into account the range of human body sizes and abilities, products can be designed to be more accessible to a wider range of users.</p> <p>Increased Efficiency: Designing products with anthropometry in mind can also increase efficiency.</p>	 <p><a href="https://benjenkins.weebly.com">https://benjenkins.weebly.com</a></p>	Anthropometry is the study of the human body's measurements and proportions. Similar to ergonomics, as this the table will be used often it will need to be comfortable to sit at and increase efficiency of use.																																	
Ergonomics	<p>Ergonomics is a crucial consideration in furniture design because it ensures that furniture is safe, comfortable, and effective for people to use. Ergonomic furniture is designed to reduce strain on the body, improve posture, and reduce the risk of injury. It takes into account how people interact with their surroundings and customizes furniture, lighting, and cabinets to suit individual needs.</p> <p>There are three types of ergonomics: physical, cognitive, and organizational. Physical ergonomics focuses on the body's interaction with the environment and is particularly relevant to furniture design. It aims to reduce discomfort, fatigue, and the risk of injury. Cognitive ergonomics deals with mental processes such as attention, perception, memory, and reasoning. It aims to optimize the design of furniture and other objects for ease of use, minimizing the need for training and reducing the risk of errors. Organizational ergonomics focuses on how work is organized and aims to optimize the design of furniture and other objects to increase productivity and reduce stress.</p> <p><a href="https://planner5d.com/blog/">https://planner5d.com/blog/</a></p> <p><a href="https://sleephall.com/2023/02/14/">https://sleephall.com/2023/02/14/</a></p> <p><a href="https://hatil.com/blog/en/">https://hatil.com/blog/en/</a></p>	<p>(Very similar to anthropometry)</p> <p>Improved Comfort: Ergonomic design aims to reduce discomfort and fatigue by ensuring that products fit the human body properly. For example, a keyboard that is angled to reduce wrist strain can help prevent repetitive strain injuries.</p> <p>Enhanced Safety: Ergonomic design can also make products safer to use. For example, a power tool with an ergonomic grip can reduce the risk of slipping or dropping the tool.</p> <p>Improved Health: Ergonomic design can have long-term health benefits, such as reducing the risk of musculoskeletal disorders or chronic pain caused by poor posture or repetitive strain injuries.</p>	 <table border="1"> <thead> <tr> <th></th> <th>in</th> <th>cm</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>84–112</td> <td>213,4–284,5</td> </tr> <tr> <td>B</td> <td>13–16</td> <td>33,0–40,6</td> </tr> <tr> <td>C</td> <td>58–60</td> <td>147,3–203,2</td> </tr> <tr> <td>D</td> <td>16–18</td> <td>40,6–45,7</td> </tr> <tr> <td>E</td> <td>14–17</td> <td>35,6–43,2</td> </tr> <tr> <td>F</td> <td>12–18</td> <td>30,5–45,7</td> </tr> <tr> <td>G</td> <td>30–36</td> <td>76,2–91,4</td> </tr> <tr> <td>H</td> <td>12–16</td> <td>30,5–40,6</td> </tr> <tr> <td>I</td> <td>60–68</td> <td>152,4–172,7</td> </tr> <tr> <td>J</td> <td>54–62</td> <td>137,2–157,5</td> </tr> </tbody> </table> <p><a href="https://library.binus.ac.id/eColls/eThesisdoc">https://library.binus.ac.id/eColls/eThesisdoc</a></p>		in	cm	A	84–112	213,4–284,5	B	13–16	33,0–40,6	C	58–60	147,3–203,2	D	16–18	40,6–45,7	E	14–17	35,6–43,2	F	12–18	30,5–45,7	G	30–36	76,2–91,4	H	12–16	30,5–40,6	I	60–68	152,4–172,7	J	54–62	137,2–157,5	Ergonomics follows a similar branch to anthropometry, it considers factors to improve comfort, enhance safety, and improve the long term health of the user, this can be done by finding the optimal height for a coffee table which will allow for easy use for most if not all people. It can be used to reduce chances of strains or chronic pains and is a must have in all furniture designs.
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Info from <https://chat.openai.com/>, [https://en.wikipedia.org/wiki/Vitruvian\\_Man](https://en.wikipedia.org/wiki/Vitruvian_Man), <https://humanforartists.com>,

# RESEARCH

## Secondary Research - Tactile Aesthetics

Product Name:	Description and Appearance:	Benefits and Disadvantages:	Image & Description:	Suitability /10
Finishes – Paint & Oil				
Sherwin-Williams, paint	<p>Cashmere® interior acrylic latex paint has a smooth, low-sheen finish</p> <p>SuperPaint® interior acrylic latex paint has a uniform, medium-sheen finish.</p> <p>ProMar® 200 Zero VOC interior latex paint, may have a slightly more textured finish.</p>	<p>Protection: 6/10 (good)</p> <p>UV resistance: Moderate</p> <p>Aesthetics: Highly regarded for aesthetic appeal, wide range of colours and finishes</p> <p>Durability: 8-10 years depending on surface and environmental conditions</p> <p>Ease to clean: Easy</p> <p>Price in AUD: \$35-\$70 per L</p>	 <p><a href="https://www.google.com.au/images">https://www.google.com.au/images</a></p>	<p>Sherwin-Williams paint offers good protection against UV resistance but is usually known for being more aesthetic, it is quite pricey.</p> <p>8.2/10</p>
Dulux, Bunnings, Paint	<p>Wash&amp;Wear® interior paint has a smooth, low-sheen finish,</p> <p>Dulux Weathershield® exterior paint has a more textured finish to help protect against weathering.</p> <p>Other Dulux products, such as their Design Effects Collection or their Suede and Velvet finishes,</p>	<p>Protection: 6/10 (good)</p> <p>UV resistance: moderate</p> <p>Aesthetics: - variety and ranging</p> <p>Durability: 8-10 years depending on the conditions it is exposed to.</p> <p>Ease to clean: Easy</p> <p>Price in AUD: AUD \$55 for 4L can (price may vary by location and colour)</p>	 <p><a href="https://www.bunnings.com.au/">https://www.bunnings.com.au/</a></p>	<p>Dulux is a basic company held in Bunnings, it offers good protection and comes in a variety of aesthetic options.</p> <p>8.9/10</p>
Monarch, paint	<p>Monarch Exterior Gloss enamel paint has a high gloss finish that provides a smooth and shiny texture</p> <p>Monarch Weather guard exterior paint has a more textured finish that helps to protect against weathering and fading.</p>	<p>Protection: 7/10 (good)</p> <p>UV Resistance: Moderate</p> <p>Aesthetics: Great, with a wide range of colour options and a smooth, even finish</p> <p>Durability: 7-9 years depending on the conditions it is exposed to.</p> <p>Ease of Cleaning: Moderate</p> <p>Price in AUD: \$30-\$50 per L</p>	 <p><a href="https://www.ppgpaints.com/products">https://www.ppgpaints.com/products</a></p>	<p>Monarch paint offers good protection against scratches and weather. It has a long life span coming in around 8 years, and is not overly pricy.</p> <p>8.9/10</p>
Cutek, K & M, Wood Oil	<p>Formulated to enhance the natural beauty of the timber, rather than covering it up like paint or other coatings.</p> <p>The final appearance of Cutek K &amp; M will depend on the type and condition of the timber being treated, as well as the number of coats applied.</p>	<p>Protection: 7/10 (good)</p> <p>UV resistance: Moderate (able to handle moderate UV light exposure)</p> <p>Aesthetics: The paint is available in a range of colours and finishes, including gloss and matte.</p> <p>Durability: 8-10 years, depending on the conditions it is exposed to.</p> <p>Ease to clean: Easy</p> <p>Price in AUD: \$50 per L</p>	 <p><a href="https://www.kmpaints.com.au/cutek_info.php">https://www.kmpaints.com.au/cutek_info.php</a></p>	<p>Cutek is a much more expensive paint that offers good protection it is able to handle an extensive amount of UV before peeling.</p> <p>8.6/10</p>
Minwax Tung, Wood Oil	<p>natural, hand-rubbed look to interior wood surfaces such as furniture, cabinets, doors, and trim. Minwax Tung Oil Finish is smooth and satin-like, with a slight sheen, The final appearance of the finish will depend on the type and condition of the wood being treated, as well as the number of coats applied.</p>	<p>Protection: 6/10 (good)</p> <p>UV resistance: Moderate</p> <p>Aesthetics: warm, natural-looking finish that enhances the wood's grain and colour.</p> <p>Durability: 2-3 years, depending on environmental factors.</p> <p>Ease to clean: mediocre</p> <p>Price in AUD: \$15-\$30 per L</p>	 <p><a href="https://www.amazon.com.au/">https://www.amazon.com.au/</a></p>	<p>Minmax oil is used in a wide array of furniture already, it has a relatively low life span before needing to be re applied but it is quite cheap and affordable.</p> <p>7.8/10</p>
Rustins Danish, Wood Oil	<p>Designed to nourish, protect, and enhance the natural beauty of interior and exterior wood surfaces such as furniture, doors, cabinets, and decking.</p> <p>satin-like, with a subtle sheen that enhances the natural grain and colour of the wood.</p>	<p>Protection: 8/10 (Excellent)</p> <p>UV resistance: Moderate -</p> <p>Aesthetics: Enhances the natural beauty of wood with a smooth and natural finish.</p> <p>Durability: up to 5 years</p> <p>Ease of cleaning: Easy</p> <p>Price in AUD: \$20-\$30 per L</p>	 <p><a href="https://www.wood-finishes-direct.com/product/">https://www.wood-finishes-direct.com/product/</a></p>	<p>Danish oil is similar to minmax oil, it has a slight sheen to it that enhances the natural grain pattern.</p> <p>7.7/10</p>

# RESEARCH

## Secondary Research - Tactile Aesthetics

Product Name:	Description and Appearance:	Benefits and Disadvantages:	Image & Description:	Suitability /10
Finishes – Shellac & Wax				
Rubio, Monocoat, Wood Finish/ Sealer	The finish is known for its ability to enhance the natural grain and texture of the wood, rather than hiding it like some other types of finishes. Rubio Monocoat is applied in a single layer, which allows the wood to retain its natural feel and texture, while also providing protection against moisture, stains, and wear. The finish is available in a wide range of colours to complement different types of wood and design preferences.	Protection: 8/10 (excellent) UV resistance: Moderate Aesthetics: Enhances natural beauty of wood, available in various colours. Durability: Average lifespan of 5-7 years Ease to clean: Easy to maintain and clean with a damp cloth Price in AUD: \$75 per L	 <p><a href="https://rubimonocoat.com.au/">https://rubimonocoat.com.au/</a></p>	Rubio Monocoat is a extremely premium finish which costs much more then other finishes, it enhance the colours and grain of the wood making it pop. 9.8/10
Zinsser, Shellac	Zinsser Shellac has a unique texture that is hard to describe. It's like a cross between velvet and glass, with a silky smooth feel that is both glossy and matte at the same time. The finish is incredibly durable and provides a long-lasting protective barrier against moisture, stains, and scratches. The texture is so unique that it has become a signature feature of Zinsser Shellac, setting it apart from other finishes on the market.	Protection: 8/10 (Excellent) UV resistance: Low Aesthetics: High-gloss finish, enhances natural wood grain, smooth and even finish Durability: 6-12 months Ease of cleaning: Easy Price in AUD: \$20-\$30 per L	 <p><a href="https://www.rustoleum.com.au/product-catalog/">https://www.rustoleum.com.au/product-catalog/</a></p>	Shellac has a high gloss finish and offers great protection, but needs to be reapplied quite often as it is wax based. 8.2/10
Minwax Paste Finish Wax	It is designed to be easy to apply with a soft cloth or brush, and it spreads evenly over the surface of the wood, making it appear richer and more vibrant.	Protection: 6/10 UV resistance: moderate Aesthetics: enhances natural beauty of wood, available in different shades, buffable to a high shine Durability: 6-12 months Ease to clean: relatively easy Price in AUD: \$30 per L	 <p><a href="https://sherwinwilliams.widen.net/content/">https://sherwinwilliams.widen.net/content/</a></p>	Finishing wax is like shellac but offers less protection and can even cost more, it is made to enhance the natural beauty of the piece. 7.6/10
Furniture Clinic Beeswax, Wood Wax	It is designed to be easy to apply with a soft cloth or brush, and it is absorbed into the wood to nourish and protect the surface. The end result is a smooth and polished finish that feels natural to the touch.	Protection: 6/10 UV Resistance: Moderate Aesthetics: Gives a traditional, warm and natural finish to wood surfaces, enhancing the natural grain and colour. Durability: 6-12 months Ease to clean: moderate Price in AUD: \$100 per L	 <p><a href="https://www.furnitureclinic.com/beeswax-polish">https://www.furnitureclinic.com/beeswax-polish</a></p>	Beeswax will offer a decent amount of protection and gives a traditional warm finish to the grain, the only issue is the extremely high price per litre coming in at 100\$. 8.8/10
Staples Crystal Clear, Wood Wax	semi-solid wax with a smooth and creamy texture. When applied to a surface, it dries to a clear, glossy finish that enhances the natural texture and appearance of the material. The wax does not typically alter the colour of the surface it is applied to, but it can help to highlight and deepen the colour and grain of the material. Overall, the appearance of Staples Crystal Clear Wax is designed to be transparent and subtle, allowing the beauty of the underlying material to shine through.	Protection: 6/10 (mediocre) UV resistance: Moderate Aesthetics: natural appearance of the surface Durability: Can last for several months before needing to be reapplied, Ease of cleaning: Easy, removed with a wax stripper if necessary Cost: Approximately AUD \$25 per 1 L	 <p><a href="https://www.amazon.com/STAPLES-211-Carnauba-Paste-1-Pound/dp/B001OBTOXM">https://www.amazon.com/STAPLES-211-Carnauba-Paste-1-Pound/dp/B001OBTOXM</a></p>	Another wood wax it stapes clear paste way, it sets clear and lasts several months before needing to be reapplied, it isn't too pricy but doesn't offer great protection. 7.6/10

Info from <https://www.woodsolutions.com.au>, <https://www.bunnings.com.au> and <https://www.woodsolutions.com.au/timber-finishes-interior> and etc..

# RESEARCH

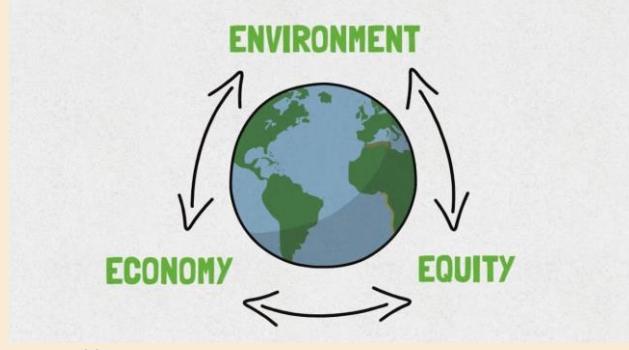
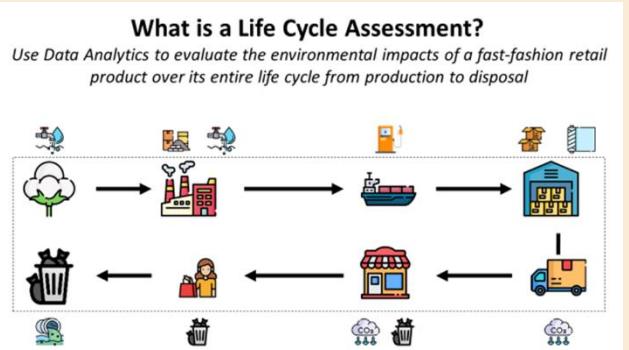
## Secondary Research - Visual Aesthetics

Factor	Properties & effects:	Image:	Suitability /10
Colours & Tone			
Colour	<p>Mood enhancement: Colour can have a significant impact on our emotions and can be used to create different moods in a space.</p> <p>Visual interest: The use of colour in furniture can add visual interest and depth to a room, making it more visually appealing and dynamic.</p> <p>Room Balance: it can be used to balance the</p> <p><a href="https://journals.sagepub.com/doi/full/10.1177/2158244014525423">https://journals.sagepub.com/doi/full/10.1177/2158244014525423</a>  <a href="https://eilpatel.com/blog/choose-best-color-conversion">https://eilpatel.com/blog/choose-best-color-conversion</a>  <a href="https://www.pantone.com/products/lifestyle/color-messages-meanings">https://www.pantone.com/products/lifestyle/color-messages-meanings</a></p>		N/A
Black:	Is associated with power, sophistication, and elegance. Black can give a room a sleek and modern look, but it can also be associated with formality and can feel heavy and oppressive if used excessively.	 <a href="https://b2cfurniture.com.au/">https://b2cfurniture.com.au/</a>	The end user would prefer a lighter shade as they want a more vibrant room but font mind if it is on the darker end.
Brown:	Often associated with warmth, stability, and comfort. It can make the viewer feel grounded, safe, or cosy. Dark brown furniture can give a room a classic and timeless look, but it can also feel heavy and traditional.	 <a href="https://www.tlcinteriors.com.au/">https://www.tlcinteriors.com.au/</a>	Brown offers a traditional look making it quite good for a vintage theme but may not be great for the modern elements of the table.
Grey:	Gray is often associated with sophistication, neutrality, and balance. It can make the viewer feel calm, composed, or practical. Dark grey furniture can give a room a modern and minimalist look, but it can also feel cold and sterile if not balanced with warm colours.	 <a href="https://www.overstock.com/">https://www.overstock.com/</a>	Grey is quite modern and clean; it offers a practical look without overcompensating and being overly eye catching.
Beige:	Beige is often associated with warmth, neutrality, and calmness. It can make the viewer feel comfortable, relaxed, or grounded. Light beige furniture can give a room a cosy and welcoming feel, but it can also feel dull and uninspiring if not balanced with other colours.	 <a href="https://buffetandhutch.com.au/products/">https://buffetandhutch.com.au/products/</a>	Beige works well with whites as the contrast and complement each other but it may take away from the sand sculptor as the two colours will be overly similar.
White:	White is often associated with purity, innocence, and simplicity. It can make the viewer feel peaceful, clean, or spiritual. Light-coloured furniture can give a room a fresh and airy feel, but it can also feel sterile if not balanced with warm colours.	 <a href="https://www.ikea.com/au/en/p">https://www.ikea.com/au/en/p</a>	White will also overcompensate in terms of colour and take away from the sand sculptor, causing the viewer to be confused at what they are looking at initially.

<https://www.woodworkerssource.com/> and <https://www.minwax.com/>

# RESEARCH

## Secondary Research – Environmental effects

Effect:	Description and Appearance:	Benefits and Disadvantages:	Image & Description:	Suitability /10
Sustainability and Weather				
Weather	Weather can have various effects on furniture, particularly wooden furniture. As the temperature and humidity fluctuate, wood furniture can expand and contract slightly, leading to cracks and splits in the wood. However, well-built furniture is designed to consider these effects and won't take damage from such movements.	To prevent damage to wooden furniture, it is recommended to keep the temperature and humidity within the home at around 22-23 degrees Celsius and 40-45 percent, respectively. Additionally, using a coaster for hot drinks and dishes can protect wooden surfaces from heat and moisture, which can cause staining and damage.  the disadvantages of weather on furniture may vary depending on the type of furniture and the weather conditions.	 <a href="https://www.lazysusanfurniture.co.uk">https://www.lazysusanfurniture.co.uk</a>	As the weather usually stays around 20 degrees in Victoria it won't be overly difficult to keep it protected as the table won't have to face external conditions.
Sustainability	Sustainability is a concept that focuses on meeting the needs of the present without compromising the ability of future generations to meet their own needs. It involves the responsible use and management of natural resources to support social, economic, and environmental well-being. Sustainability has three dimensions, namely environmental, economic, and social, and it is commonly described as having the environmental dimension as the most important.	Firstly, sustainability helps meet the needs of the present without compromising the ability of future generations to meet their needs, which is the primary goal of sustainability  Secondly, sustainable businesses tend to attract better quality investments and have a much lower financial, insurance, and liability risk  Thirdly, embracing sustainability practices can improve a company's bottom line by making it more marketable and attracting new customers, who are increasingly conscious of the environment	 <a href="https://www.sustain.ucla.edu">https://www.sustain.ucla.edu</a>	Sustainability has a huge impact on how and what the table will be constructed from, it will use sustainable and licenced wood to ensure as low of a carbon foot print and leaving enough for the next generation.
Life cycle assessment, LCA	Life cycle assessment (LCA) is a methodology used to evaluate the environmental impacts associated with all stages of the life cycle of a product, process, or service, from raw material extraction to disposal or recycling. LCA is also known as life cycle analysis  The assessment considers a wide range of environmental impacts such as energy consumption, greenhouse gas emissions, water usage, and waste generation. LCA is used to identify areas of improvement in the product's life cycle and to guide decision-making towards more sustainable options. It can also be used to compare different products or processes and to inform policy decisions	LCA consists of three main phases. The first phase is the goal and scope definition, where the purpose of the study and the system boundaries are defined. The second phase is the life cycle inventory, which involves collecting and structuring data on the inputs and outputs of the system being studied. The third phase is the life cycle impact assessment, where the significance of the environmental impacts is evaluated based on the life cycle inventory flows.  Environmental impact reduction: LCA can identify environmental hotspots within a product's lifecycle, allowing potential improvements to be identified and implemented. This can lead to a reduction in the product's overall environmental impact.  <a href="https://ugreen.io">https://ugreen.io</a>	 <a href="https://www.valsir.it/">https://www.valsir.it/</a>   <a href="https://towardsdatascience.com/">https://towardsdatascience.com/</a>	The LCA effects everything and everyone, it factors the carbon foot print and what effect the production of a product will have. As there will be many different pieces coming together, it factors in how energy, water and etc are used to create the raw materials for production as well as transportation. Therefore I will have to factor all of these in to ensure the smallest carbon footprint as possible.

# RESEARCH

## Secondary Research – Innovative Feature parts

Product Name:	Description and Appearance:	Benefits and Disadvantages:	Image:
Stepper motors	<p>Stepper motors are a type of electromechanical device used for precise control of rotational motion. They are frequently employed in a variety of settings where precise positioning is necessary, including robots, 3D printing, CNC equipment, and automation systems.</p> <p>A rotor, a stator, and a number of electromagnetic coils make up stepper motors. The motor's revolving component is the rotor, while the stationary component is the stator. To produce a magnetic field that interacts with the rotor, the coils are positioned in pairs around it and energised in a particular order.</p>	<p>Precise Positioning: Stepper motors offer precise control over position and movement without the need for feedback devices like encoders.</p> <p>High Torque at Low Speeds: Stepper motors provide high torque at low speeds, making them suitable for applications requiring holding torque.</p> <p>Cost-Effective: Stepper motors are generally more cost-effective, eliminating the need for additional components.</p> <p>Easy to Control: Stepper motors have a straightforward control interface, making them accessible for beginners and hobbyists.</p>	<p><a href="https://electronics.stackexchange.com/">https://electronics.stackexchange.com/</a>  <a href="https://www.cncsourced.com/">https://www.cncsourced.com/</a></p>
Linear guide rails	<p>Linear guide rails, also known as linear motion guides or linear slide rails, are mechanical components used in various applications to provide smooth and precise linear motion. They are often used in robotics, automation systems, industrial machines, and other areas where precise linear movement is necessary.</p> <p>A rail and a carriage are the components of linear guide rails. The rail acts as a guiding surface and is a long, stiff, and often straight track. In order to offer stability and resistance to wear, it is often built of hardened steel or other robust materials. A set of rolling components or bearings are located inside the carriage, which is attached to the rail and allows for smooth operation</p>	<p>Precise and Smooth Motion: Linear guide rails provide high accuracy and smooth linear motion for the gantry system. They minimize friction and play, ensuring consistent and reliable movement.</p> <p>Noise Reduction: The linear guide rail design minimizes vibration and noise during gantry operation. This is especially important in applications where noise levels need to be kept low, such as in medical or laboratory settings.</p> <p>Reduced Friction and Wear: The design of linear guide rails minimizes friction between the rail and the carriage, resulting in lower wear and tear. This reduces maintenance requirements and extends the lifespan of the gantry system.</p>	<p><a href="https://www.makerstore.com.au/">https://www.makerstore.com.au/</a>  <a href="https://all3dp.com/2">https://all3dp.com/2</a></p>
Aluminium flat bar	<p>Aluminium flat bar refers to a type of aluminium extrusion that has a flat and rectangular cross-section. It is commonly used in various applications where a lightweight, corrosion-resistant, and easy-to-work-with material is required.</p> <p>Aluminium flat bars are typically manufactured through the extrusion process, where a billet of aluminium is heated and forced through a die to obtain the desired shape. The resulting flat bar has straight edges and a smooth surface finish.</p>	<p>Lightweight: Aluminium flat bars are lightweight compared to other materials like steel. This makes them easier to handle and transport, and it reduces the overall weight of the gantry system. The reduced weight can contribute to improved acceleration, lower energy consumption, and decreased wear on other components.</p> <p>Easy Machinability: Aluminium is a highly machinable material, making it easy to fabricate and modify according to specific requirements. It can be easily cut, drilled, or shaped to create custom linear guide rail configurations that suit the gantry system's design.</p>	<p><a href="https://www.bunnings.com.au/">https://www.bunnings.com.au/</a>  <a href="https://www.directaluminium.com.au/2021-catalogue/">https://www.directaluminium.com.au/2021-catalogue/</a></p>
Belt drive	<p>Belt drives are mechanical devices that connect two or more spinning shafts together by transferring motion or power. They are constructed up of a flexible belt that wraps around pulleys or sheaves installed on the shafts and is often composed of rubber or synthetic polymers.</p> <p>Friction between the belt and the pulleys is the basis for how the belt drive works.</p>	<p>Energy Efficiency: Belt drives have excellent energy efficiency due to their low friction operation. The use of materials with high coefficient of friction, such as rubber, in the belt and pulley system ensures efficient power transmission. This can result in energy savings and reduced operating costs over time.</p> <p>Lightweight: Belt drives are lighter in weight compared to other drive systems, such as gear drives or chain drives. This lightweight nature makes them suitable for applications where weight reduction is a priority or where the overall weight of the system needs to be minimized.</p>	<p><a href="https://www.sciencedirect.com/topics/engineering/">https://www.sciencedirect.com/topics/engineering/</a></p>

# RESEARCH

## Secondary Research – Innovative Feature parts

### Estimated Minimum Items Required:

- Stepper motors (appropriate for your gantry system)
- Stepper motor drivers (matched to the motors)
- Microcontroller or PLC (to control the stepper motors)
- Power supply (suitable for your motors and drivers)
- Linear rails (for gantry movement)
- Belt drive system (to transmit motion from the motors to the gantry)
- End stop switches (to establish home positions)
- Wiring and connectors
- Mounting brackets and hardware



### Rough process of setting up the 2-dimensional gantry:

- 1) Design and assemble the gantry frame structure, including the linear rails and belt drive system. Ensure that the gantry is rigid and capable of supporting the load.
- 2) Install the stepper motors onto the gantry frame using appropriate mounting brackets. Make sure they are securely attached.
- 3) Connect the stepper motors to their respective drivers using suitable wiring and connectors. Pay attention to the correct wire connections (usually four or more wires per motor) and ensure proper insulation.
- 4) Connect the stepper motor drivers to the microcontroller or PLC. Refer to the datasheets and instructions for the specific drivers you are using to correctly wire them.
- 5) Connect the microcontroller or PLC to the power supply and ensure the voltage and current ratings are appropriate for your stepper motors and drivers. Take necessary precautions for electrical safety.
- 6) Install end stop switches at the gantry's home position(s) and wire them to the microcontroller or PLC. These switches will help establish reference positions during the homing process.
- 7) Program the microcontroller or PLC to control the stepper motors. You will need to define the desired motion profiles, steps, speeds, and acceleration/deceleration values. Use appropriate libraries or programming languages for stepper motor control.
- 8) Implement the homing process in your software. This typically involves moving the gantry towards the end stop switches until they are triggered, then establishing the corresponding positions as the home position(s).
- 9) Test the gantry's movement and motion control. Check if the motors move smoothly and accurately as per your programmed instructions.
- 10) Fine-tune the stepper motor parameters and control algorithms as necessary to optimize the gantry's performance. This may involve adjusting step timings, acceleration values, or implementing feedback control systems.
- 11) Once everything is working correctly, secure and protect all wiring and connections to ensure long-term reliability and safety.

Product Name:	Description and Appearance:	Benefits and Disadvantages:	Image:
Arduino	<p>The open-source Arduino hardware and software platform offers an adaptable and user-friendly setting for developing interactive electronic devices. The hardware part of it is a board with a programmable microcontroller, and the software part is an integrated development environment (IDE).</p> <p>A microcontroller unit (MCU) and input and output pins, such as digital and analogue pins, are commonly included on an Arduino board, allowing you to connect numerous sensors, actuators, and other electrical components. Either an external power supply or a USB connection can be used to power the board.</p>	<p><b>Easy to Use:</b> Arduino has a user-friendly development environment and a simplified version of C/C++ programming language, making it accessible for beginners and those without extensive programming experience.</p> <p><b>Open-Source:</b> Arduino is an open-source platform, meaning its hardware and software designs are freely available to the public. This openness fosters a collaborative community that shares projects, code, and knowledge, allowing users to learn from others and contribute to the platform.</p> <p><b>Cost-Effective:</b> Arduino boards are relatively inexpensive compared to other microcontroller platforms, making them accessible to a wide range of users. They offer a cost-effective solution for prototyping and DIY projects.</p>	

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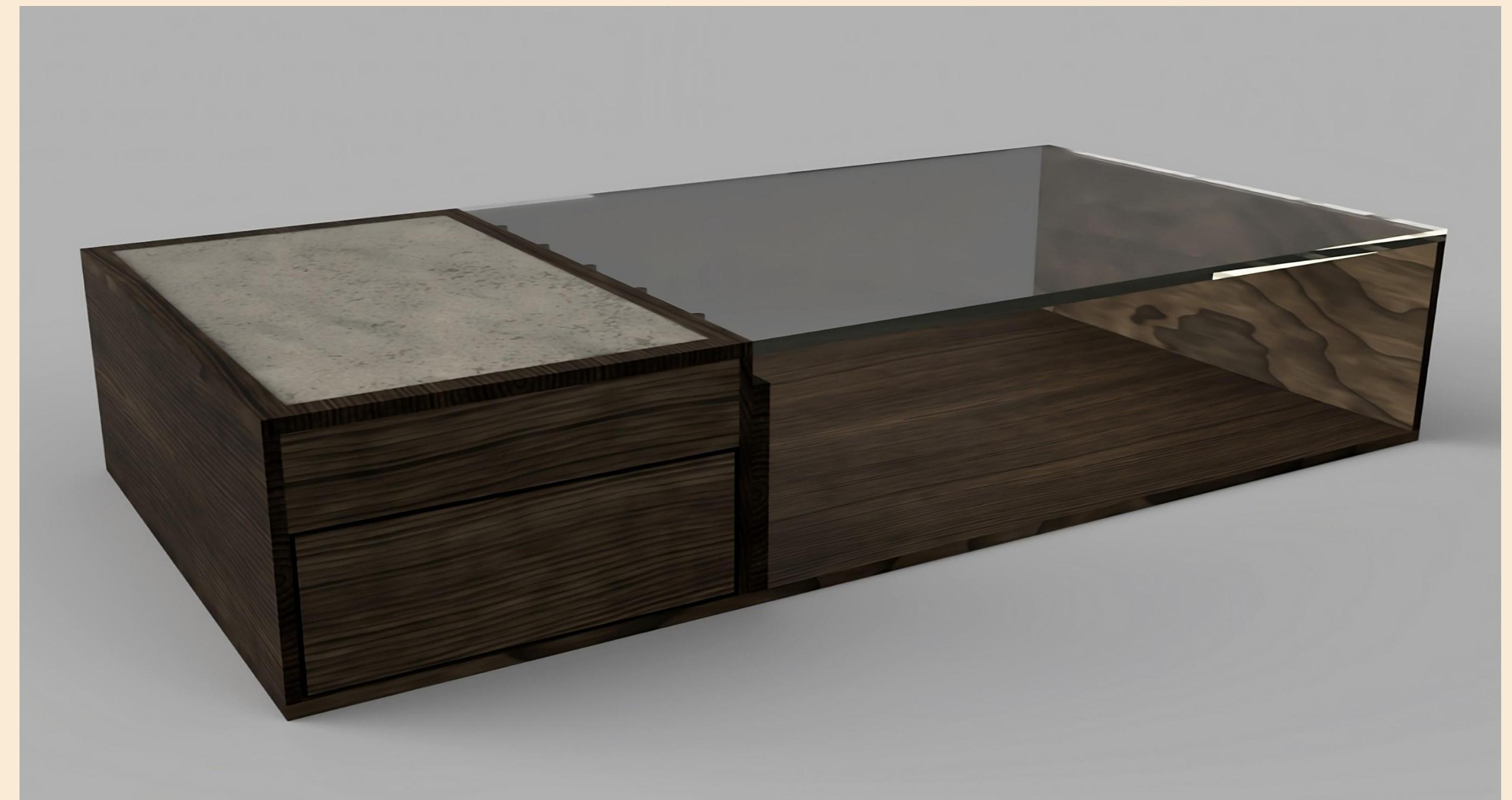
# SKETCHES & VISUALISATIONS

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# DESIGN OPTIONS AND JUSTIFICATION

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## DESIGN OPTION: 1

# DESIGN OPTION: 1

## Evaluation:

No.	Evaluation criteria	Score /10	Explanation on how?
1	Is the Coffee table appropriately sized to fit the designated space?	8/10	The coffee table quite well fits within the restricted area but may be too small as the couches are relatively large.
2	Is the table be made of a durable, easy to clean material?	9/10	The table is constructed of walnut and steel with a high-grade finish, possibly rubio monocot as it is extremely resistant and easy to clean.
3	Does the table have a shape that complements the surrounding furniture and décor?	7/10	It works quite well in terms of visual appeal and filling the void in the room. The main issue is that it's a little small without legs.
4	Is the table of an appropriate height?	7/10	Its quite small without proper legs only being 200mm tall without legs.
5	How does the table include an engaging and interactive element.	7/10	The table incorporated the Kinetic Sand Sculptor, but the issue is that its quite small in comparison to other iterations meaning it doesn't get the full spotlight it deserves.
6	Does the product match the overall style and aesthetics of the room?	9/10	The colouring and style of the product do match the rest of the room well, the main consideration is still sizing vertically as it may look awkward being so much smaller then the couches
7	Is the table functional for its intended purpose?	9/10	It will easily function for holding up items and various oddities, the
8	Is the product sturdy and well balanced?	7/10	The product is extremely well balanced but will have difficulties leveling out on difficult terrain as the whole base must be touching the ground.
9	Is the table made to the upmost quality with limited imperfections?	7/10	The tables quality will be dependent on the final production it will, the main factor to consider is the overall joining which has been measured and checked in Fusion 360.
10	Is the table environmentally friendly and sustainable in terms of material and manufacturing?	8/10	The timber will be received from a sustainable producer, this producer is Mathew's timbers, they are Australian certified and ensure sustainable wood.
Total scoring		78/100	

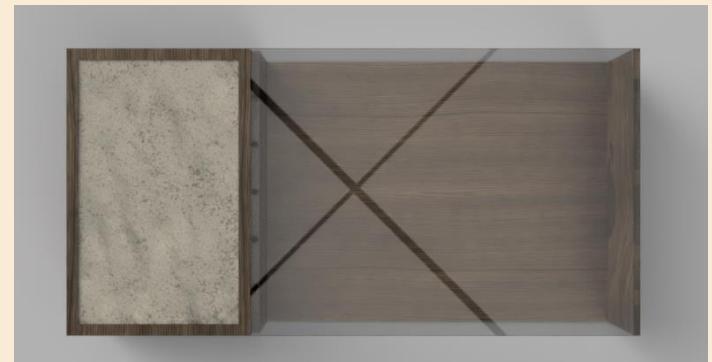
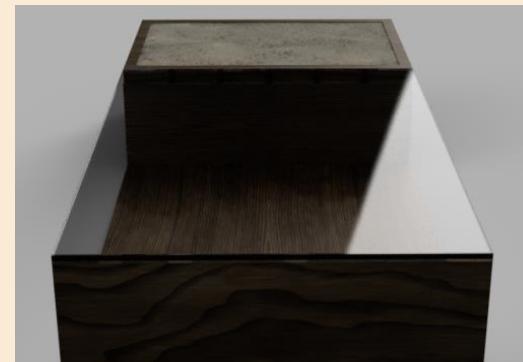
Overall end-user feedback

# DESIGN OPTION: 1



Unfortunately the options has quite a small Kinetic Sand Sculptor meaning it won't attract as much attention, furthermore it isn't supported by any lighting or other features to pull the focus to it.

The Option doesn't have legs and uses a wide flat base, the main issue with this is that it wont be overly easy to level out on uneven terrain or carpet.



Further comments: The overall aesthetics are quite nice but the main issue with the table is that it wont work overly well as an central piece.



## DESIGN OPTION: 2

# DESIGN OPTION: 2

## Evaluation:

No.	Evaluation criteria	Score /10	Explanation on how?
1	Is the Coffee table appropriately sized to fit the designated space?	7/10	The table fits but its slightly oversized and will need reduction, furthermore, is quite an awkward height to comfortably use.
2	Is the table be made of a durable, easy to clean material?	8/10	This table will be made of American white oak consisting of a rubio monocoat finish which offers a nano level finish.
3	Does the table have a shape that complements the surrounding furniture and décor?	7/10	While the overall table design works with the furniture the drawer boxes seem oversized and whole table has an overly light colouring which may make it pop out too much.
4	Is the table of an appropriate height?	6/10	It is slightly oversized which makes it somewhat awkward to grab and place items, it would need a overall size reduction to take up less space
5	How does the table include an engaging and interactive element.	7/10	The top successful encompasses the innovative feature but the main issue is that it takes up a lot more space then expected vertically, meaning the top would be extremely thick.
6	Does the product match the overall style and aesthetics of the room?	6/10	The overall aesthetics for the table work decently with the room as the couches are also a light colour which the back feature wall is black. This would provide nice contrast.
7	Is the table functional for its intended purpose?	8/10	It works perfectly for storing and putting items on top of, there is plenty of storage space for placing almost anything.
8	Is the product sturdy and well balanced?	7/10	The base consists of 4 thick legs which means it wont be going anywhere anytime soon, it can easily hold weight without shifting around.
9	Is the table made to the upmost quality with limited imperfections?	7/10	The tables quality will be dependent on the final production it will, the main factor to consider is the overall joining which has been measured and checked in Fusion 360. But because of a easy design it isn't overly difficult
10	Is the table environmentally friendly and sustainable in terms of material and manufacturing?	8/10	The timber will be received from a sustainable producer, this producer is Mathew's timbers, they are Australian certified and ensure sustainable wood.
Total scoring		71/100	

Overall end-user feedback

## DESIGN OPTION: 2



Further comments:



DESIGN OPTION: 3

# DESIGN OPTION: 3

## Evaluation:

No.	Evaluation criteria	Score /10	Explanation on how?
1	Is the Coffee table appropriately sized to fit the designated space?	10/10	The Design fits nicely withing the designated space ensuring there isn't any overhang or collisions with surrounding items or space. Its slightly the height restriction therefore making it easy to use.
2	Is the table be made of a durable, easy to clean material?	9/10	The table is constructed of walnut and steel with a high-grade finish, possibly rubio monocot as it is extremely resistant and easy to clean.
3	Does the table have a shape that complements the surrounding furniture and décor?	9/10	It works quite well as the surrounding elements have a somewhat similar shaping. The table works well because its using roughly a 3:5 ratio which is considered a golden ratio in table making.
4	Is the table of an appropriate height?	10/10	The table is around 500mm tall which means it works well for the ergonomics and sizing of the surrounding couches, it can easily be used without needing to reach around too much.
5	How does the table include an engaging and interactive element.	10/10	The table incorporates the kinetic sand sculptor which will act as the interest piece of the table. After testing I found that it is engaging to watch and keeps the end-user entertained.
6	Does the product match the overall style and aesthetics of the room?	9/10	The room has a very mixed contrast of light-coloured walls with a dark feature wall, there's light couches and dark furniture, this means the table will suit the environment and aesthetics quite well.
7	Is the table functional for its intended purpose?	10/10	It is fully functional as a table and it completely supports anything put on the top, it is designed to support plenty of weight.
8	Is the product sturdy and well balanced?	10/10	Due to the full body steel base, it can handle immense amounts of weight without any sort of deformation or hindrances to strength.
9	Is the table made to the upmost quality with limited imperfections?	8/10	This will be dependent on production quality, but the table is designed to fit together perfectly.
10	Is the table environmentally friendly and sustainable in terms of material and manufacturing?	7/10	The timber will be received from a sustainable producer, this producer is Mathew's timbers, they are Australian certified and ensure sustainable wood.
Total scoring		92/10	

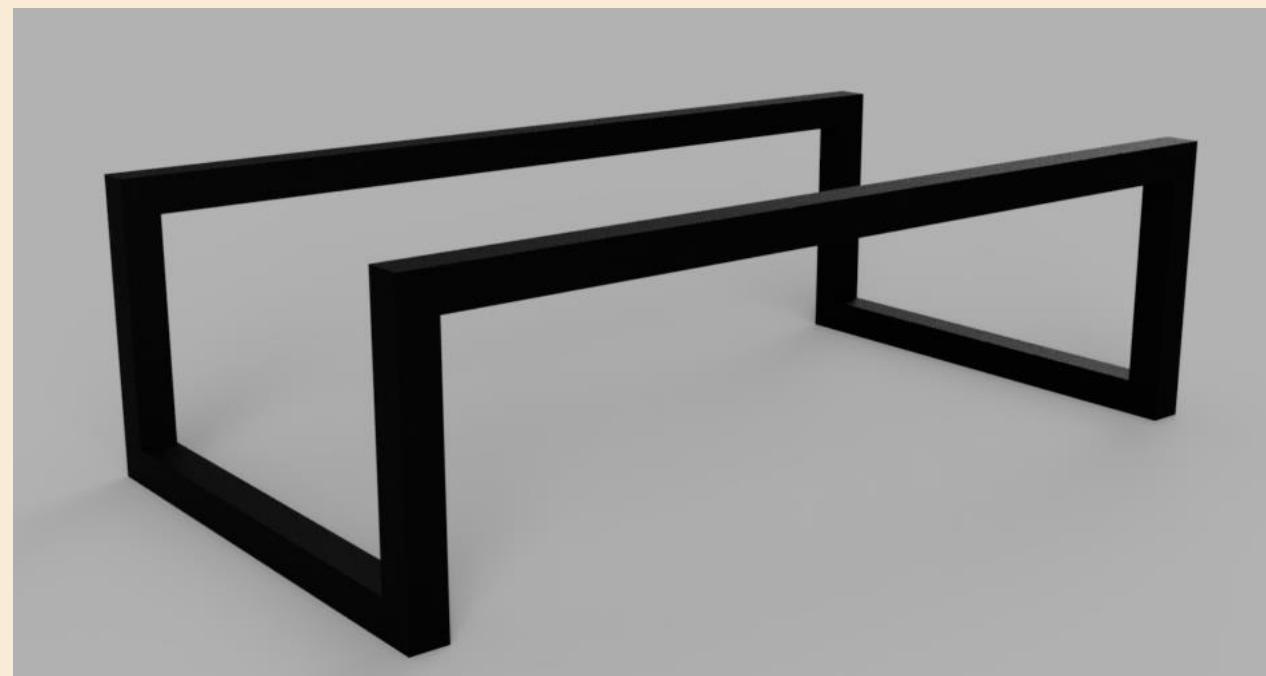
Overall end-user feedback

# DESIGN OPTION: 3



The innovative feature is the centrepiece of the design meaning it gets the most attention, it's got further interest added because of the lighting around the edges

As the legs are made of steel square they won't have any issue on becoming level, furthermore, because they are quite wide they can easily deal with any weight put on the sides without the fear of it toppling over.



Further comments:

The table looks quite nice and offers a good appeal for being the main option the black legs work well with the walnut the overall table will have a nice contrast with the rest of the room.





## DESIGN OPTION: 4

# DESIGN OPTION: 4

## Evaluation:

No.	Evaluation criteria	Score /10	Explanation on how?
1	Is the Coffee table appropriately sized to fit the designated space?	8/10	The Table easily fits within the designated spacing. Furthermore, the rounded corners allow for a softer more elegant walk around experience.
2	Is the table made of a durable, easy to clean material?	9/10	Yes, the table will be made of a beautiful maple wood, when finished with rubio monocoat will allow for super easy cleaning.
3	Does the table have a shape that complements the surrounding furniture and décor?	8/10	The shape works well as a centrepiece but the smooth curves most likely won't work overly well with the interior room.
4	Is the table of an appropriate height?	10/10	It is quite well designed in terms of height and offers adjustable legs to change the height to suit multiple couches.
5	How does the table include an engaging and interactive element.	8/10	The whole table is quite visually engaging and fascinating, this will be further with the addition of the innovative design component. The major factor to consider will be the extra required width of the top.
6	Does the product match the overall style and aesthetics of the room?	7/10	The overall design works decently with the room but as previously stated may not fit in seamlessly and most likely will grab attention straight away.
7	Is the table functional for its intended purpose?	8/10	It works perfectly fine in order to hold items, the only reason it doesn't receive a 10 is because there isn't any secure drawer to hide the clutter.
8	Is the product sturdy and well balanced?	7/10	It works well for balance as there are 4 sturdy legs to hold the weight of anything put on it and the weight of the top, the main issue is that its top heavy.
9	Is the table made to the upmost quality with limited imperfections?	8/10	As everything is finalized and designed most parts can have laser cut stencils and ensure near perfections to 1mm difference.
10	Is the table environmentally friendly and sustainable in terms of material and manufacturing?	8/10	The timber will be received from a sustainable producer, this producer is Mathew's timbers, they are Australian certified and ensure sustainable wood.
Total scoring		81/100	

Overall end-user feedback

# DESIGN OPTION: 4



The primary function of the table is quite well suited and incorporated in the design but the main issue in the table is that it has curved edges which may cause items to fall down.

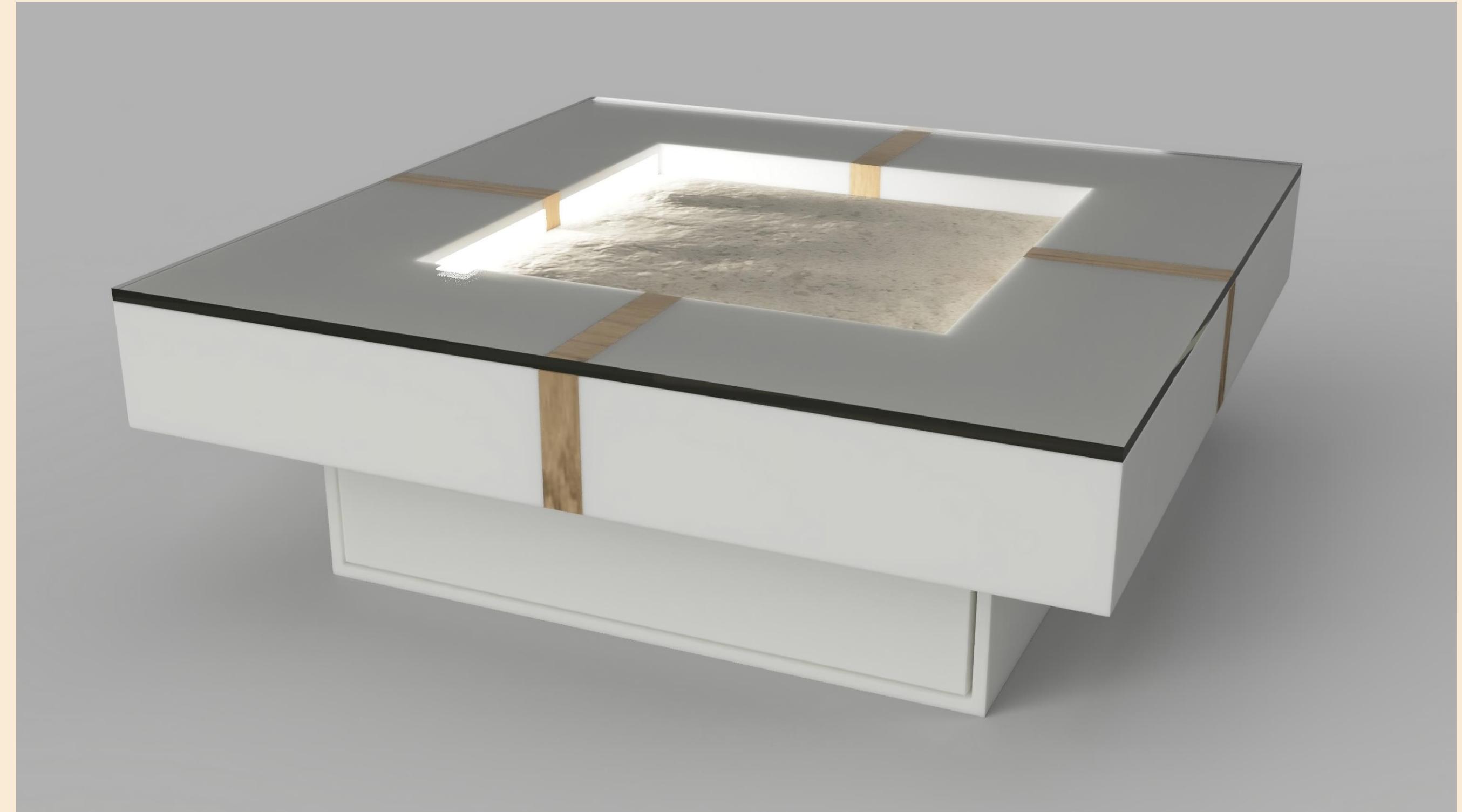
The legs will be solid steel meaning that it won't have issues in the leveling or scaling on carpet as it can push the carpet down, it makes sure that the whole table will be supported well. The curve will be made of multiple trapezoids.



Further comments:

The curved edges look very appealing but they do offer some technical difficulties in production, something to factor in for them would be to cut each one even without deviation, possibly this could be completed by using a router or templates





## DESIGN OPTION: 5

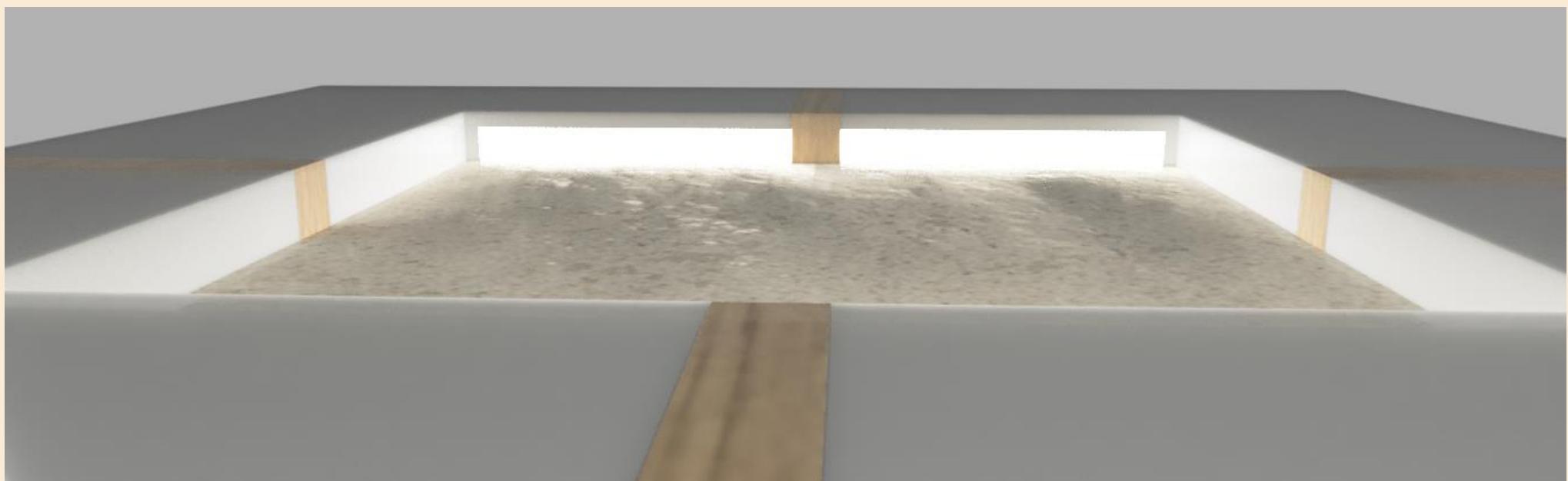
# DESIGN OPTION: 5

## Evaluation:

No.	Evaluation criteria	Score /10	Explanation on how?
1	Is the Coffee table appropriately sized to fit the designated space?	7/10	The table is decently sized but may be an issue in terms of length as there would be a wider gap between couches on side compared to the others.
2	Is the table be made of a durable, easy to clean material?	9/10	The materials would be painted therefore allowing for very easy clean-up of the table, especially the glass.
3	Does the table have a shape that complements the surrounding furniture and décor?	6/10	The shape mostly complements the surrounding, the main difference is that the square shape may not look great in a rectangular space.
4	Is the table of an appropriate height?	9/10	The height works very well compared to the couches, it's easy to grab and place items from. Only issue in grabbing from a distance.
5	How does the table include an engaging and interactive element.	10/10	The table seamlessly incorporates the innovative feature without any hassle of where to place items and controllers. The batteries, rails, controller, MCU and etc can easily fit in the top.
6	Does the product match the overall style and aesthetics of the room?	8/10	The overall colour may pop out too much, but this can be dimmed in terms of paint colour choice, the lighter wood may be better as a dark walnut or spotted gum to contrast the couches and paint.
7	Is the table functional for its intended purpose?	9/10	It easily completes its purpose allowing for plenty of space for storing and holding of items.
8	Is the product sturdy and well balanced?	9/10	It's extremely well balanced but could fall only if there is extreme pressure placed on the very edge, but nothing normal will be this heavy.
9	Is the table made to the upmost quality with limited imperfections?	8/10	The table mainly consists of repeating parts therefore I can use a template and router to get exact pieces every time, furthermore parts may be able to get laser cut according to the Fusion 360 drawings.
10	Is the table environmentally friendly and sustainable in terms of material and manufacturing?	8/10	The timber will be received from a sustainable producer, this producer is Mathew's timbers, they are Australian certified and ensure sustainable wood.
Total scoring		83/100	

Overall end-user feedback

# DESIGN OPTION: 5



The main feature of this option is how the innovative components seamlessly fits into the tables design. Some major features include the extra wide base, and the large drawers on each side which allow for plenty of storage space, the wood strip adds an element of visual interest and appeal to the overall design.



Further comments

# RANKING/ COMPARISON TABLE

		Design option 1	Design option 2	Design option 3	Design option 4	Design option 5
1	Is the Coffee table appropriately sized to fit the designated space?	8/10	7/10	10/10	8/10	7/10
2	Is the table be made of a durable, easy to clean material?	9/10	8/10	9/10	9/10	9/10
3	Does the table have a shape that complements the surrounding furniture and décor?	7/10	7/10	9/10	8/10	6/10
4	Is the table of an appropriate height?	7/10	6/10	10/10	10/10	9/10
5	How does the table include an engaging and interactive element.	7/10	7/10	10/10	8/10	10/10
6	Does the product match the overall style and aesthetics of the room?	9/10	6/10	9/10	7/10	8/10
7	Is the table functional for its intended purpose?	9/10	8/10	10/10	8/10	9/10
8	Is the product sturdy and well balanced?	7/10	7/10	10/10	7/10	9/10
9	Is the table made to the upmost quality with limited imperfections?	7/10	7/10	8/10	8/10	8/10
10	Is the table environmentally friendly and sustainable in terms of material and manufacturing?	8/10	8/10	7/10	8/10	8/10
Total scoring		78/100	71/100	92/10	81/100	83/100

Final decision: the option beginning produced will be option 3 as it has met and exceeded most if not all of the criteria coming in with an overall ranking of 92/10.

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# PREFERRED OPTION

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# SCHEDULE PRODUCTION PLAN

Step	Process and Materials	Tools/Equipment	Risks	Safety Measures	Adjusted Est. Time
1	Initial Checks		Tripping, inadequate lighting	Ensure proper lighting and workspace	10 mins
2	Checking all wood has arrived	Tape measure, square	Injury from tools	Use proper body positioning and hand placement while measuring to avoid accidents. Ensure tools are in good condition.	15 mins
3	Laying everything out, ensuring all pieces fit	Tape measure, square	Injury from tools, material mishandling	Use proper body mechanics when handling materials and tools. Ensure tools are sharp for precise cuts.	20 mins
4	Marking out pieces with chalk	Chalk	Inhalation of chalk dust	Wear a dust mask and use chalk in well-ventilated areas. Avoid blowing away dust with your mouth.	10 mins
5	Ensure safe storage of all timber until needed	Storage area	Material handling injuries	Lift with your legs, not your back. Stack materials safely to prevent tripping hazards.	5 mins
6	Cut out top for referencing all other parts	Circular saw, straight edge	Injury from power tools	Use safety goggles, ear protection, and maintain a firm grip on the saw. Ensure proper material support and secure the workpiece.	25 mins
7	Domino edges	Domino joiner	Injury from power tools	Keep hands clear of the tool's path, use the tool's handle for control, and ensure a stable work surface.	15 mins
8	Glue up of top	Wood glue, clamps	Glue-related injuries	Apply glue evenly, use enough clamps, and wipe off excess glue promptly.	30 mins
9	Sand off any residue and bumps	Orbital sander, sandpaper	Inhalation of dust	Wear a dust mask, eye protection, and hold the sander securely to avoid injury from vibrations.	15 mins
10	Use track saw to cut off edges of piece	Track saw	Injury from power tools	Ensure material is secured and square on the track before cutting.	20 mins
11	Cut out the long parts of drawer holder	Jigsaw	Injury from power tools	Follow safety guidelines for jigsaw use, maintain proper control, and use sharp blades.	25 mins
12	Test fit together to ensure everything is correct size	Tape measure	Accidental injury during fitting	Double-check measurements for accuracy and avoid forcing pieces together.	10 mins
13	Domino all pieces	Domino joiner	Injury from power tools	Keep hands clear of the tool's path, use the tool's handle for control, and ensure a stable work surface.	20 mins
14	Glue and clamp all parts together ensuring proper connection	Wood glue, clamps	Glue-related injuries	Use clamps, apply glue evenly, and wipe off excess glue promptly.	30 mins
15	Sand off residue and any bumps	Orbital sander, sandpaper	Inhalation of dust	Wear a dust mask, eye protection, and hold the sander securely to avoid injury from vibrations.	15 mins
16	Use track saw to cut off edges of piece	Track saw	Injury from power tools	Ensure material is secured and square on the track before cutting.	20 mins
17	Cut out smaller sides of the holder	Jigsaw	Injury from power tools	Follow safety guidelines for jigsaw use, maintain proper control, and use sharp blades.	15 mins

18	Check overall fit with the tops	Tape measure	Accidental injury during fitting	Ensure proper alignment and fit and avoid placing fingers in tight spaces.	10 mins
19	Prepare dominos in the tops and spaces for final assembly	Domino joiner	Injury from power tools	Keep hands clear of the tool's path, use the tool's handle for control, and ensure a stable work surface.	20 mins
20	Inset glue to domino joints and joining faces for a strong bond, then clamp tightly together	Wood glue, clamps	Glue-related injuries	Use clamps, apply glue evenly, and wipe off excess glue promptly.	30 mins
21	Sand all faces and edges to have a smooth finish	Orbital sander, sandpaper	Inhalation of dust	Wear a dust mask, eye protection, and hold the sander securely to avoid injury from vibrations.	20 mins
22	Ensure/check sizing and cut out pieces of drawers	Circular saw	Injury from power tools	Ensure proper measurements, use safety goggles, and maintain a firm grip on the saw.	20 mins
23	Give them a quicksand for a good final finish	Orbital sander, sandpaper	Inhalation of dust	Wear a dust mask, eye protection, and hold the sander securely to avoid injury from vibrations.	10 mins
24	Mark out all locations for dominos on short and long pieces	Tape measure, marking tools	Accidental injury during marking	Double-check measurements for accuracy and avoid excessive pressure when marking.	15 mins
25	Add glue to holes, place in dominos and clamp together	Wood glue, clamps	Glue-related injuries	Use clamps, apply glue evenly, and wipe off excess glue promptly.	30 mins
26	Go in with scraper to remove the bulk of the glue, then follow up with the orbital sander to get the final quality finish	Scraper	Inhalation of dust, injury from tools	Wear a dust mask, eye protection, and use proper technique when scraping and sanding.	20 mins
27	Mark and cut base of drawers	Circular saw	Injury from power tools	Ensure proper measurements, use safety goggles, and maintain a firm grip on the saw.	15 mins
28	Stain to the desired colour	Stain, brushes	Skin irritation, inhalation of fumes	Work in a well-ventilated area, wear gloves, and use proper brush technique.	45 mins
29	Use glue and nails to firmly mount to drawers	Wood glue, nails	Glue-related injuries	Ensure proper alignment and safety, use clamps if necessary.	25 mins
30	Use router to trim off any excess and finish off with light sanding	Router, sandpaper	Injury from power tools	Wear a dust mask, eye protection, and use proper router technique.	30 mins
31	Mark out location of drawer slides on all drawers and internal sides of the drawer holder	Tape measure, marking tools	Accidental injury during marking	Double-check measurements for accuracy and avoid excessive pressure when marking.	15 mins
32	Drill required pilot holes and screw in the drawer slides, ensuring smooth movement	Drill, screwdriver	Injury from tools	Use appropriate safety precautions, such as drilling at a controlled speed.	20 mins
33	Use any scraps of metal to understand and get used to welding and how to maneuver the MIG welder	MIG welder, scraps of metal	Welding-related injuries	Wear welding helmet, gloves, and protective gear. Practice welding in a safe environment.	45 mins
34	Locate pre-cut steel square tube and measure to ensure correct sizes	Tape measure	Material handling injuries	Ensure proper measurements and use proper lifting techniques.	20 mins
35	Mark out any locations where welding will need to be done	Marker	Injury from marker use	Use a firm grip and maintain proper hand placement when marking.	15 mins
36	Sand down with angle grinder until a complete shine is achieved at the marked locations	Angle grinder	Inhalation of dust, injury from tools	Wear protective gear, work in a well-ventilated area, and use proper angle grinder technique.	30 mins
37	Use metal weld magnet to ensure perfect square when welding	Metal weld magnet	Injury from magnet use	Handle the magnet with care, avoid pinching fingers, and ensure proper placement.	10 mins
38	Add small beads to begin with to stabilize the piece then completely secure and fill any gaps	MIG welder	Welding-related injuries	Wear welding helmet, gloves, and protective gear. Use proper welding techniques.	45 mins

39	Sand off excess welds to have flat surface	Angle grinder	Inhalation of dust, injury from tools	Wear welding helmet, gloves, and protective gear. Use proper angle grinder technique.	15 mins
40	Send off to be powder coated by Shacks powder coating		Risk of improper coating, material handling injuries	Ensure proper handling during transport to the coating facility.	? mins
41	Begin construction and layout of motors and tracks on base of Plywood sheet	Plywood sheet, measuring tools	Material handling injuries	Ensure proper measurements, lift with your legs, and use a clear workspace.	30 mins
42	Secure all loose parts (stepper motors and linear rails) at their corresponding mounting locations with screws and glue	Screws, glue	Injury from tools	Use appropriate safety precautions, such as using the right screws and glue.	45 mins
43	Lay out GT2 timing belt over the mounted GT2 idle wheels and pulley and cut to size, then secure using screw-based clamp	Tape measure, clamp	Injury from tools, pinching hazards	Use proper body positioning and hand placement, avoid pinching hazards, and use sharp cutting tools.	20 mins
44	Attach the trolley carriage and magnets to the timing belt on the central track	Screws, screwdriver	Injury from tools	Use appropriate safety precautions, such as using the correct screws and proper screwdriver technique.	20 mins
45	Insert cables to stepper motors and connect to Arduino + CNC shield for initial GRBL test	Cables, Arduino, CNC shield	Electrical shock, incorrect connections	Ensure proper connections, follow wiring diagrams, and check for any exposed wires.	30 mins
46	After success, add the Raspberry Pi as the CPU and external link as well as the Arduino Nano for LED controls	Raspberry Pi, Arduino Nano	Electrical shock, incorrect connections	Follow wiring diagrams, double-check connections, and ensure proper grounding.	45 mins
47	Ensure everything works using wall mount plug, later switch to battery	Power source, battery	Electrical shock, short circuits	Check for proper grounding and wiring and ensure no loose connections or exposed wires.	30 mins
48	On completion, place to a safe location for final assembly	Workspace	Material handling injuries	Ensure materials are stored securely and organized to prevent tripping hazards.	15 mins
49	Re-sand all parts to a 240-grit finish, then apply oil and Rubio Monocoat for the final protective layer, then allow to dry	Sandpaper, finishing materials	Inhalation of finish, skin irritation	Wear dust mask, eye protection, and gloves when handling finish materials.	45 mins
50	Start with adding top onto the frame for easy installation	Screws, screwdriver	Injury from tools	Ensure proper alignment and safety when attaching the top to the frame.	15 mins
51	Next, use some lifting blocks to adjust the height of the drawer holder to the correct location above ground, then mount to the frame	Lifting blocks, screws	Injury from lifting, improper installation	Lift with your legs when using lifting blocks and ensure proper alignment when mounting.	25 mins
52	Using rebate mount in the sand sculptor moving components	Screws, screwdriver	Injury from tools	Use proper attachment techniques and ensure all parts are securely fastened.	20 mins
53	Then use spacers to set the correct distance above the base of the electronics mount to allow for easy and free movement	Spacers, screws	Injury from tools, incorrect spacing	Use proper spacing measurements, avoid over-tightening screws, and ensure safety when handling spacers.	15 mins
54	Place on the next piece of ply on top of these pillars and secure in place with small screws	Plywood sheet, screws	Injury from tools, material mishandling	Ensure proper attachment and safety during the assembly process.	20 mins
55	Scatter sand on top of the table then close it off by placing on top glass element	Sand, glass element	Inhalation of sand, glass breakage	Handle sand with care, wear a dust mask and eye protection, and use caution when placing the glass element.	30 mins
				EST Minimum time	870 min

**Note:** Estimated times given in this schedule are based on the assumption that all operations will continue without unexpected issues or delays. Real-world circumstances such as equipment malfunctions, material shortages, or unexpected complications can affect the actual time for each step. It is advisable to allocate some additional time in the system during an emergency to account for potential interruptions or changes. Safety procedures and best practices must be followed at all times to minimize risks in the workplace.

# TIMELINE

# Gantt Chart

The Gantt chart displays the timeline for various project tasks. The x-axis represents time from May 21 to August 27. The y-axis lists tasks with their corresponding start and end dates.

ID	Title	Start Time	End Time	May			Jun				Jul				Aug			
				21 - 27	28 - 03	04 - 10	11 - 17	18 - 24	25 - 01	02 - 08	09 - 15	16 - 22	23 - 29	30 - 05	06 - 12	13 - 19	20 - 26	27 - 02
66	total project	06/20/2023	08/25/2023															
1	Initial Checks	06/20/2023	06/21/2023															
6	Top	06/21/2023	06/28/2023															
12	Draw Holders	06/28/2023	07/12/2023															
26	Drawers	07/12/2023	07/22/2023															
38	Metal frame	07/24/2023	08/10/2023															
47	Innovative Feature	08/07/2023	08/12/2023															
57	Completion	08/14/2023	08/25/2023															

Gantt Chart – Overview

# Gantt Chart – Overview

6	<input type="checkbox"/> Top	06/21/2023	06/28/2023
7	Top Cutting	06/21/2023	06/22/2023
8	Domino Edges	06/21/2023	06/23/2023
9	Top Glue-Up	06/22/2023	06/24/2023
10	Sanding Residue and Bumps	06/26/2023	06/27/2023
11	Edge Trimming with Track Saw	06/27/2023	06/28/2023

Gantt Chart – Top

# Gantt Chart – Top

The Gantt chart illustrates the sequential tasks for drawer assembly:

- Task 12: Draw Holders (06/28/2023 - 07/12/2023)
- Task 13: Lamination of long sides (06/28/2023 - 07/05/2023)
- Task 14: Long Drawer Parts Cutting (06/28/2023 - 06/29/2023)
- Task 15: Test Fit Assembly (06/28/2023 - 06/29/2023)
- Task 16: Domino Joining (06/28/2023 - 06/30/2023)
- Task 17: Glue and Clamp Assembly (06/29/2023 - 07/01/2023)
- Task 18: Sanding for Finish (07/03/2023 - 07/04/2023)
- Task 19: Edge Trimming with Track Saw (07/04/2023 - 07/05/2023)
- Task 20: Short sides (07/05/2023 - 07/12/2023)
- Task 21: Short Drawer Parts Cutting (07/05/2023 - 07/06/2023)
- Task 22: Fit Check with long sides (07/05/2023 - 07/06/2023)
- Task 23: Prepare Dominos for Assembly (07/06/2023 - 07/07/2023)

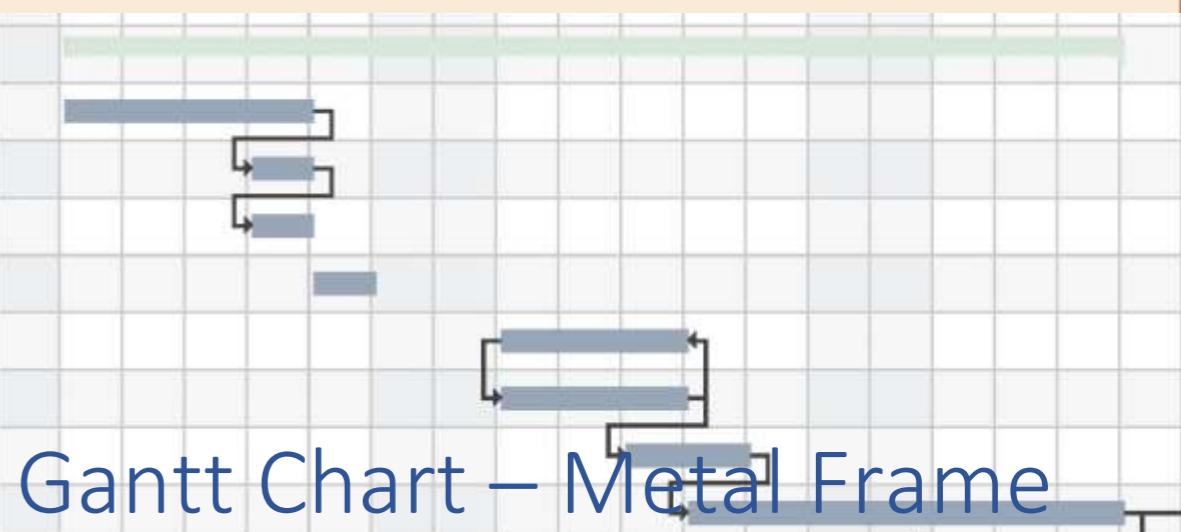
Arrows indicate dependencies between tasks: Task 12 leads to Task 13; Task 13 leads to Task 14; Task 14 leads to Task 15; Task 15 leads to Task 16; Task 16 leads to Task 17; Task 17 leads to Task 18; Task 18 leads to Task 19; Task 19 leads to Task 20; Task 20 leads to Task 21; Task 21 leads to Task 22; Task 22 leads to Task 23.

# Gantt Chart – Drawer Holder

Gantt Chart – Drawer Holder				
26	□ Drawers	07/12/2023	07/22/2023	
27	Sizing and Drawer Cutting	07/12/2023	07/13/2023	
28	Drawer Sanding	07/12/2023	07/13/2023	
29	Mark Dominos Locations	07/13/2023	07/14/2023	
30	Glue and Clamp Drawer Parts	07/14/2023	07/15/2023	

## Gantt Chart – Drawers

38	☐ Metal frame	07/24/2023	08/10/2023
39	Welding Practice	07/24/2023	07/28/2023
40	Measure Steel Tubes	07/27/2023	07/28/2023
41	Mark Welding Locations	07/27/2023	07/28/2023
42	Angle Grinder Sanding	07/28/2023	07/29/2023
43	Magnet Alignment	07/31/2023	08/03/2023
44	Welding	07/31/2023	08/03/2023
45	Excess Weld Removal	08/02/2023	08/04/2023
46	Powder Coating (external)	08/03/2023	08/10/2023



Gantt Chart – Metal Frame

47	□ Innovative Feature	08/07/2023	08/12/2023
48	Base Construction/Layout	08/07/2023	08/08/2023
49	Securing Motors and Rails	08/07/2023	08/09/2023
50	Timing Belt Installation	08/08/2023	08/09/2023
51	Trolley Carriage Attachment	08/08/2023	08/09/2023
52	□ Electrical Connections	08/09/2023	08/11/2023
53	Arduino to Motors	08/09/2023	08/10/2023
54	Raspberry Pi Integration	08/09/2023	08/11/2023
55	Initial Testing with Power	08/11/2023	08/12/2023
56	Safe Storage for Assembly	08/11/2023	08/12/2023

Gantt Chart – Innovative Feature

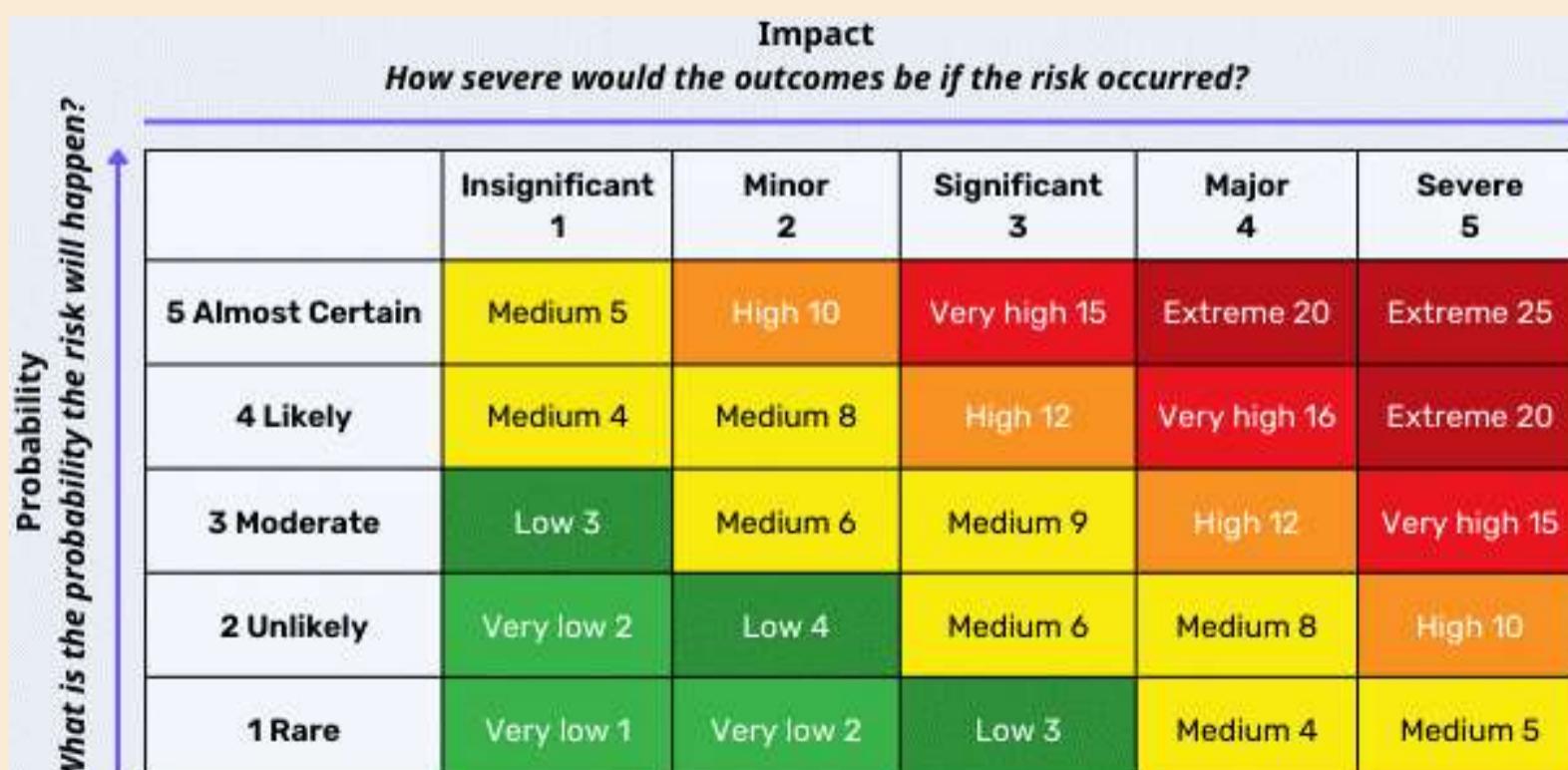
57	□ Completion	08/14/2023	08/25/2023
59	Final Sanding and Finish	08/14/2023	08/18/2023
60	Top Attachment	08/18/2023	08/19/2023
61	Drawer Holder Installation	08/21/2023	08/22/2023
62	Sand Sculptor Components	08/22/2023	08/23/2023
63	Spacer Installation	08/23/2023	08/24/2023
64	Plywood Sheet Attachment	08/23/2023	08/24/2023
65	Sand and Glass Placement	08/23/2023	08/25/2023

Gantt Chart – Completion

# RISK ASSESSMENT

## Hand Tools

Tool	Possible Harm	Likelihood vs. Seriousness	Rating	Risk Controls
Tape Measure	- Minor cuts or scrapes while handling and retracting the tape.	Low/ Low	4	- Always handle the tape measure with care.
	- Tripping hazards due to the tape lying on the floor.			- Keep the tape properly coiled when not in use.
Square	- Cuts or injuries when mishandled or dropped.	Low/ Low	3	- Handle the square safely and store it securely.
	- Potential for inaccurate cuts if not used correctly.			- Train users on proper square usage.
Chalk	- Minor skin irritation or allergic reactions for some individuals.	Low/ Low	2	- Wear gloves when handling chalk.
	- Inhalation of chalk dust may irritate the respiratory system.			- Use in well-ventilated areas.
Straight Edge	- Cuts or injuries when mishandled or dropped.	Medium/ Low	4	- Handle with care and store properly.
	- Potential for inaccurate cuts if not used correctly.			- Ensure proper training for users.
Clamps	- Pinching or crushing injuries if mishandled.	Low/ Low	3	- Keep hands clear when clamping.
	- Risk of objects falling if not secured properly.			- Use appropriate clamping techniques.
Sandpaper	- Abrasions and skin irritation when handled improperly.	Low/ Low	2	- Wear gloves and use proper technique.
	- Inhalation of dust may irritate the respiratory system.			- Use in well-ventilated areas and wear a mask.
Chisels	- Cuts and hand injuries if mishandled.	Medium/ Low	4	- Use proper technique and keep hands clear.
	- Risk of objects falling if not secured properly.			- Secure workpiece properly.
Hand Planes	- Cuts and hand injuries if mishandled.	Medium/ Low	4	- Use proper technique and keep hands clear.
	- Risk of objects falling if not secured properly.			- Secure workpiece properly.



# Power Tools

Tool	Possible Harm	Likelihood vs. Seriousness	Rating	Risk Controls
Circular Saw	- Severe cuts or amputations if not used safely.	High/ High	20	- Always wear appropriate safety gear.
	- Kickback can result in serious injuries.			- Follow manufacturer's safety guidelines.
	- Flying debris can cause eye injuries.			- Use safety glasses and face shields.
	- Risk of electrical shock if not used correctly.			- Inspect cords and plugs regularly.
Angle Grinder	- Severe cuts, burns, and other injuries if mishandled.	High/ High	21	- Always wear appropriate safety gear.
	- Kickback can result in serious injuries.			- Follow manufacturer's safety guidelines.
	- Flying debris can cause eye injuries.			- Use safety glasses and face shields.
	- Risk of electrical shock if not used correctly.			- Inspect cords and plugs regularly.
Metal Welder	- Burns, electrical shocks, and exposure to fumes and gases.	High/ High	22	- Proper training and certification are crucial.
	- Risk of fire if not used correctly.			- Use appropriate personal protective equipment.
	- Exposure to toxic fumes can lead to respiratory issues.			- Use in a well-ventilated area.
	- Risk of UV radiation exposure without proper eye protection.			- Wear welding helmets and safety goggles.
Table Saw	- Severe cuts or amputations if not used safely.	High/ High	20	- Always use safety features and guards.
	- Kickback can result in serious injuries.			- Follow manufacturer's safety guidelines.
	- Flying debris can cause eye injuries.			- Use safety glasses and face shields.
	- Risk of electrical shock if not used correctly.			- Inspect cords and plugs regularly.
Mitre Saw	- Severe cuts or amputations if not used safely.	High/ High	20	- Always use safety features and guards.
	- Kickback can result in serious injuries.			- Follow manufacturer's safety guidelines.
	- Flying debris can cause eye injuries.			- Use safety glasses and face shields.
	- Risk of electrical shock if not used correctly.			- Inspect cords and plugs regularly.
Router	- Severe cuts, burns, and other injuries if not used properly.	Medium/ High	18	- Use safety guards and wear eye protection.
	- Inhalation of dust may irritate the respiratory system.			- Use dust collection systems and wear a mask.
	- Risk of kickback can result in serious injuries.			- Secure workpiece properly.
	- Risk of objects being ejected if not secured correctly.			- Ensure proper router bit installation.

Jointer	<ul style="list-style-type: none"> <li>- Severe cuts or amputations if not used safely.</li> <li>- Risk of kickback if the material isn't properly supported.</li> <li>- Flying wood chips can cause eye injuries.</li> <li>- Risk of electrical shock if not used correctly.</li> </ul>	High/ High	20	<ul style="list-style-type: none"> <li>- Always wear appropriate safety gear.</li> <li>- Use push blocks and maintain control.</li> <li>- Use safety glasses and face shields.</li> <li>- Inspect cords and plugs regularly.</li> </ul>
Power Planer	<ul style="list-style-type: none"> <li>- Severe cuts or amputations if not used safely.</li> <li>- Flying wood chips can cause eye injuries.</li> <li>- Risk of objects being ejected if not secured correctly.</li> </ul>	High/ High	20	<ul style="list-style-type: none"> <li>- Always wear appropriate safety gear.</li> <li>- Use safety glasses and face shields.</li> <li>- Ensure proper blade installation.</li> </ul>
Orbital Sander	<ul style="list-style-type: none"> <li>- Hand-arm vibration syndrome with prolonged use.</li> <li>- Inhalation of dust may cause respiratory issues.</li> <li>- Risk of electrical shock if not used correctly.</li> </ul>	Medium/ High	16	<ul style="list-style-type: none"> <li>- Limit exposure to vibration, take breaks.</li> <li>- Use dust collection systems and wear a mask.</li> <li>- Inspect cords and plugs regularly.</li> </ul>
Delta Sander	<ul style="list-style-type: none"> <li>- Hand-arm vibration syndrome with prolonged use.</li> <li>- Inhalation of dust may cause respiratory issues.</li> <li>- Risk of electrical shock if not used correctly.</li> </ul>	Medium/ High	16	<ul style="list-style-type: none"> <li>- Limit exposure to vibration, take breaks.</li> <li>- Use dust collection systems and wear a mask.</li> <li>- Inspect cords and plugs regularly.</li> </ul>
Drill	<ul style="list-style-type: none"> <li>- Cuts, burns, and hand injuries if not used properly.</li> <li>- Risk of electrical shock if not used correctly.</li> </ul>	Medium/ Medium	10	<ul style="list-style-type: none"> <li>- Use safety guards and wear eye protection.</li> <li>- Inspect cords and plugs regularly.</li> </ul>
Impact Driver	<ul style="list-style-type: none"> <li>- Cuts, burns, and hand injuries if not used properly.</li> <li>- Risk of electrical shock if not used correctly.</li> </ul>	Medium/ Medium	10	<ul style="list-style-type: none"> <li>- Use safety guards and wear eye protection.</li> <li>- Inspect cords and plugs regularly.</li> </ul>
Belt Sander	<ul style="list-style-type: none"> <li>- Hand-arm vibration syndrome with prolonged use.</li> <li>- Inhalation of dust may cause respiratory issues.</li> <li>- Risk of electrical shock if not used correctly.</li> </ul>	Medium/ High	16	<ul style="list-style-type: none"> <li>- Limit exposure to vibration, take breaks.</li> <li>- Use dust collection systems and wear a mask.</li> <li>- Inspect cords and plugs regularly.</li> </ul>
Track Saw	<ul style="list-style-type: none"> <li>- Severe cuts or amputations if not used safely.</li> <li>- Kickback can result in serious injuries.</li> <li>- Risk of objects being ejected if not secured correctly.</li> </ul>	Medium/ High	16	<ul style="list-style-type: none"> <li>- Always wear appropriate safety gear.</li> <li>- Follow manufacturer's safety guidelines.</li> <li>- Ensure proper blade installation.</li> </ul>
Domino Jointer	<ul style="list-style-type: none"> <li>- Risk of cutting or pinching fingers if not used carefully.</li> <li>- Possibility of wood kickback if not secured correctly.</li> </ul>	Medium/ Medium	12	<ul style="list-style-type: none"> <li>- Use safety guards and wear eye protection.</li> <li>- Secure workpiece properly.</li> </ul>

# Risk control at different stages of production

Stage of Production or Use	Areas of Hazard - Examples	Possible Injuries - Examples	Risk Control Measures - Examples
Wood Preparation	1. Use of Circular Saw	1. Cuts and Abrasions	1. Always wear safety goggles and gloves.
	2. Handling Heavy Timber	2. Strains and Sprains	2. Lift with legs, not the back.
	3. Dust from Sanding	3. Inhalation of Dust	3. Wear a dust mask and work in a well-ventilated area.
Joinery and Assembly	1. Use of Domino Joiner	1. Hand Injuries	1. Keep hands clear of tool path, use the tool's handle.
	2. Wood Gluing	2. Glue-related injuries	2. Apply glue evenly, wipe off excess promptly, use clamps.
	3. Operation of Power Tools	3. Various Injuries	3. Follow safety guidelines, wear appropriate protective gear.
Sanding and Finishing	1. Orbital Sander Operation	1. Inhalation of Dust	1. Wear a dust mask and eye protection, hold sander securely.
	2. Use of Angle Grinder	2. Dust Inhalation, Cuts	2. Wear protective gear, work in well-ventilated area.
	3. Application of Stain	3. Skin Irritation, Fumes Inhalation	3. Work in well-ventilated area, wear gloves.
Metalwork/Welding	1. Metal Welding (MIG Welder)	1. Welding-related Injuries	1. Wear welding helmet, gloves, practice in a safe environment.
	2. Use of Angle Grinder	2. Dust Inhalation, Cuts	2. Wear protective gear, work in well-ventilated area.
	3. Handling Metal Materials	3. Cuts, Strains	3. Use proper lifting techniques, wear gloves.
Electrical Installation	1. Wiring and Connections	1. Electrical Shock, Burns	1. Follow wiring diagrams, ensure proper grounding.
	2. Use of Power Tools	2. Various Injuries	2. Use tools with care, check for loose wires and connections.
	3. Battery Installation	3. Short Circuits, Electrical Shock	3. Double-check connections, ensure proper grounding.
Assembly and Final Touches	1. Heavy Lifting	1. Strains, Lifting Injuries	1. Use lifting blocks, proper lifting techniques.
	2. Use of Screws and Fasteners	2. Injuries from Tools	2. Use appropriate screws, secure workpieces.
	3. Glass Element Handling	3. Glass Breakage, Cuts	3. Handle glass with care, wear gloves and eye protection.
Transport	1. Handling Finished Product	1. Back Injuries	1. Use proper lifting techniques, team lifting if needed.
	2. Securing Product for Transport	2. Falls, Accidents	2. Use appropriate straps, secure the load properly.
	3. Loading and Unloading	3. Crush Injuries	3. Clear pathways, use mechanical aids if available.
Product Use	1. Sharp Edges and Corners	1. Cuts, Bruises	1. Ensure edges are rounded and smooth.
	2. Stability of Coffee Table	2. Trips, Falls	2. Ensure the table sits level, use anti-slip pads if necessary.
	3. Glass Element Handling	3. Glass Breakage, Cuts	3. Handle glass with care, keep away from children.
Product Disposal	1. Handling Disassembled Parts	1. Cuts and Abrasions	1. Wear gloves when disassembling.
	2. Waste Material Disposal	2. Trips, Falls	2. Keep the disposal area clear and well-lit.
	3. Recycling Metal Components	3. Cuts, Metal Handling Injuries	3. Use appropriate bins and containers for metal recycling.

# QUALITY MEASURE

Material Inspection
<ul style="list-style-type: none"><li><b>Look for flaws:</b> Inspect the entire surface of the materials for knots, cracks, splits in wood; pits, scratches, corrosion in metal; chips, cracks, defects in glass. Detecting these flaws is crucial for ensuring the coffee table's structural integrity and aesthetics. Wood knots weaken the table, cracks can worsen over time, metal pits affect strength, scratches diminish appearance, and glass defects compromise safety and aesthetics.</li><li><b>Use proper lighting and magnification:</b> Ensuring adequate lighting and using magnification tools help spot even tiny flaws that might be missed by the naked eye.</li><li><b>Assess repairability:</b> If flaws are minor and repairable, addressing them promptly can salvage the material. For major, unrepairable flaws, rejecting the material prevents quality issues.</li><li><b>Document inspection results:</b> Documentation is essential for traceability and quality assurance, facilitating communication with suppliers and team members to meet quality standards.</li></ul>
Design and Engineering Review:
<ul style="list-style-type: none"><li><b>Evaluate material integration:</b> Verify that wood, metal, glass, and electronics components are seamlessly integrated into the design. Ensure that the design allows for secure attachment and proper alignment of all materials.</li><li><b>Inspect electronic integration:</b> If the coffee table includes electronics, confirm that the design accommodates these components safely and effectively. Check for appropriate wiring routes and adequate ventilation to prevent overheating.</li><li><b>Check for safety features:</b> Ensure that the design incorporates safety features, such as rounded edges or protective covers for glass components, to minimize potential hazards for users.</li><li><b>Review for aesthetics:</b> Evaluate the design for aesthetic appeal and coherence. Confirm that it aligns with the intended style and design elements.</li><li><b>Consider ease of assembly:</b> Assess the design for ease of assembly, including clear instructions and minimal complexity to reduce assembly errors.</li><li><b>Validate compliance:</b> Confirm that the design complies with safety and regulatory standards relevant to the materials used, electronics, and overall product safety.</li></ul>
Fabrication and Assembly Quality Checks:
<ul style="list-style-type: none"><li><b>Ensure accurate measurements:</b> During fabrication and assembly, precision is crucial. Confirm that all measurements are accurate to ensure the coffee table components fit together seamlessly and that there are no alignment issues.</li><li><b>Check for precise cuts:</b> Inspect the cuts made in wood, metal, and glass components to ensure they are clean, straight, and without defects. Precise cuts are essential for proper assembly and a polished final product.</li><li><b>Verify proper fit:</b> Assemble the components to check that they fit together correctly. Misaligned or ill-fitting parts can lead to structural weaknesses or aesthetic flaws.</li><li><b>Examine joinery:</b> Pay special attention to joinery techniques, such as welding or fastening methods. Ensure that they are executed correctly and securely to guarantee the coffee table's stability and durability.</li><li><b>Evaluate welding and soldering joints:</b> For metal components, inspect welding and soldering joints for strength and completeness. Weak or incomplete joints can compromise the table's structural integrity.</li><li><b>Inspect finishing quality:</b> Check the quality of finishes applied to wood and metal components. The finishes should be even, free from blemishes, and enhance the overall appearance of the coffee table.</li><li><b>Test electronic components:</b> If electronics are integrated, conduct comprehensive testing to ensure all components are functioning correctly, wiring is secure, and any integrated features are operational.</li><li><b>Perform weight and load tests:</b> Verify the coffee table's weight-bearing capacity by subjecting it to load tests to ensure it meets specified weight limits without structural deformation or instability.</li><li><b>Address defects promptly:</b> If any defects or issues are identified during fabrication or assembly, address them promptly to prevent them from carrying over to the final product.</li><li><b>Document quality checks:</b> Maintain detailed records of all quality checks conducted during fabrication and assembly. This documentation aids in tracking the production process and addressing any recurring issues effectively.</li><li><b>Conduct dry fits:</b> Before final assembly, perform dry fits where components are assembled without permanent attachment. This ensures that all parts align correctly before permanent joining.</li><li><b>Inspect fasteners and connectors:</b> Check the quality and tightness of screws, bolts, nuts, and other fasteners. Loose or improperly fastened components can lead to instability.</li><li><b>Check for sharp edges and corners:</b> Examine the coffee table's edges and corners to ensure they are smooth and safe for users, especially if they come into contact with glass or metal.</li></ul>

- **Evaluate the ease of disassembly:** Assess whether the coffee table can be disassembled easily for transportation or repairs without compromising its integrity.

#### Woodwork Quality Control:

- **Check for wood defects:** Inspect wood components for knots, cracks, or splits that might affect the coffee table's structural integrity and aesthetics. Knots can weaken the table, while cracks and splits can worsen over time, compromising durability and safety.
- **Examine wood finishes:** Inspect applied finishes (stains, varnishes, paints) for even application and absence of blemishes. Properly finished wood enhances the coffee table's appearance and protection against environmental factors.
- **Evaluate joinery:** Examine joinery methods like dovetails, mortise and tenon, or biscuit joints to ensure they are executed accurately and securely. Proper joinery is critical for the table's strength.
- **Check for warping or bowing:** Assess wood components for any warping or bowing, as these issues can lead to an uneven tabletop or unstable legs. Straight and stable components are essential.
- **Assess wood grain direction:** Ensure that the wood grain is oriented appropriately to prevent structural weaknesses. For example, tabletops should have grains running perpendicular to the length for stability.
- **Inspect for splinters or sharp edges:** Examine wood edges and corners for splinters or sharp edges that could pose a safety hazard to users.
- **Check for proper sanding:** Confirm that wood surfaces are sanded appropriately to be smooth to the touch and free from rough spots or imperfections.
- **Use precision machinery:** Utilize CNC machines and other precision equipment to ensure accurate cuts and shaping of materials, guaranteeing consistent sizing across multiple components.
- **Implement jigs and templates:** Design and use jigs and templates to guide the fabrication and assembly processes, aiding in the consistent sizing of parts and maintaining uniformity.
- **Quality control at each production stage:** Conduct quality checks during various production stages to verify that components meet sizing specifications and address issues promptly.
- **Utilize measurement tools:** Use measurement tools such as callipers, rulers, and tape measures to verify dimensions at critical points during production.
- **Establish tolerance levels:** Define acceptable tolerance levels for sizing variations and ensure that components fall within these predetermined limits.
- **Measure Twice, Cut Once:** Measure components and cuts carefully before making any permanent alterations to prevent sizing mistakes.

#### Metal Quality Measures

- **Metal Inspection:** Inspect metal parts for surface defects, such as pits, scratches, or corrosion, which can affect appearance and durability.
- **Welding and Soldering Quality:** Verify the quality of welding and soldering joints for strength and completeness.
- **Surface Finish:** Ensure that metal surfaces are finished properly with even coatings or finishes.
- **Material Thickness:** Confirm that metal components meet the specified thickness requirements.
- **Structural Integrity:** Assess the structural integrity of metal parts, especially load-bearing elements.
- **Rust Prevention:** Implement rust prevention measures if working with ferrous metals to maintain appearance and prevent corrosion.
- **Fastener Tightness:** Inspect and tighten fasteners (screws, bolts, nuts) to prevent loosening during use.
- **Powder Coating/Painting:** If applicable, ensure that powder coating or painting is applied evenly and provides adequate protection.
- **Safety Considerations:** Address any sharp edges or protrusions on metal components to prevent user injuries.

#### Glass Quality Measures

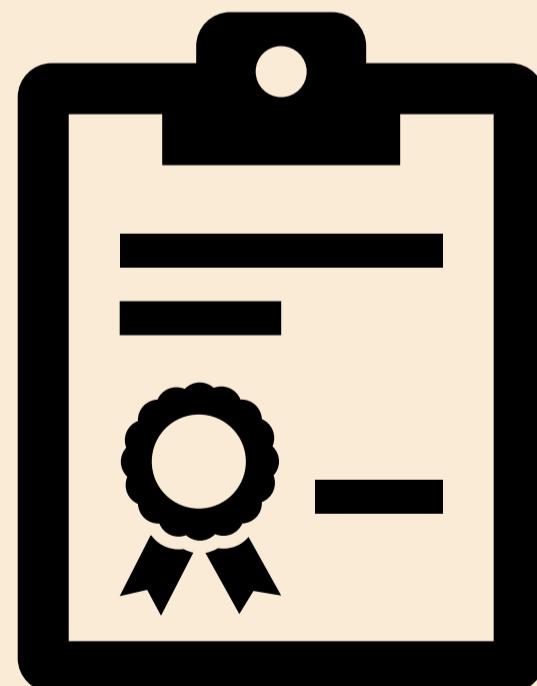
- **Glass Inspection:** Regularly inspect glass components for chips, cracks, or defects that may compromise safety or aesthetics.
- **Edge Polishing:** Ensure that the edges of glass panels are polished and smooth to prevent injury and enhance the table's appearance.
- **Tempering/Laminating:** If applicable, confirm that the glass is properly tempered or laminated to enhance safety.
- **Size Accuracy:** Check glass dimensions to ensure they match design specifications and fit securely within the table structure.
- **Glass Thickness:** Verify that the glass thickness meets safety and design requirements.
- **Secure Mounting:** Confirm that glass components are securely mounted to prevent accidental displacement.

#### Electronics Testing

- **Functionality Testing:** Test all electronic components (e.g., lighting, smart features) to ensure they function correctly and reliably.
- **Wiring Inspection:** Inspect wiring for proper connections, secure attachment, and adequate insulation to prevent electrical hazards.

- <b>Voltage and Current Checks:</b> Verify that voltage levels and current flow are within safe and specified limits, preventing overheating or electrical failures.
- <b>Short Circuit Testing:</b> Conduct short circuit tests to ensure there are no unintended connections that could disrupt electronics' performance or safety.
- <b>Burn-in Testing:</b> Subject electronic components to extended operation at full load to identify potential issues and ensure long-term reliability.
- <b>Smart Features Testing:</b> If the coffee table includes smart features (e.g., IoT connectivity), test connectivity, responsiveness, and compatibility with user interfaces.
- <b>Battery Testing:</b> For battery-powered components, assess battery life, charging performance, and safety features (e.g., overcharge protection).
- <b>User Interface Testing:</b> Evaluate the functionality and user-friendliness of electronic interfaces (e.g., touch controls, remote controls).
- <b>Safety Precautions:</b> When conducting electronic testing, follow safety protocols to prevent electrical accidents or damage to components.
- <b>Integration Testing:</b> Verify that electronic components are integrated seamlessly into the coffee table design, with proper cable management and aesthetics.
<b>Finish and Aesthetics</b>
- <b>Surface Inspection:</b> Examine the overall surface of the coffee table for uniformity, smoothness, and any imperfections.
- <b>Finish Quality:</b> Assess the quality of applied finishes (e.g., staining, varnishing, painting) for evenness and absence of blemishes.
- <b>Colour Consistency:</b> Ensure that the colour and finish of wood, metal, and glass components match and are consistent throughout the table.
- <b>Edge and Corner Detail:</b> Examine edges and corners for smoothness and absence of sharp edges or splinters, ensuring user safety.
- <b>Grain Alignment:</b> If applicable, verify that wood grain alignment is consistent and visually appealing, especially for tabletops.
- <b>Hardware and Fasteners:</b> Confirm that any visible hardware (e.g., screws, bolts) is appropriately concealed or finished to match the aesthetics.
- <b>Glass Clarity:</b> If the table incorporates glass, inspect it for clarity and freedom from distortion, ensuring a clear view of any underlying features.
- <b>Assembly Consistency:</b> Ensure that all components are correctly aligned and assembled to maintain overall symmetry and aesthetics.
- <b>Aesthetic Details:</b> Evaluate any design elements, such as decorative inlays or patterns, for accuracy and visual appeal.

\*Everything should be made to Australian standards\*



# MATERIALS AND PROCESSES

## Timber - Walnut

### 1. American Black Walnut (for drawers and drawer holder):

- **Description:** American Black Walnut is a hardwood known for its rich, dark colour, fine grain, and durability. It has excellent machining properties, making it ideal for furniture components like drawers.
- **Application:** American Black Walnut is well-suited for drawer fronts and drawer boxes due to its strength and aesthetic appeal. It can be finished with various stains or clear coatings to enhance its natural beauty.
- **Processing:** To work with American Black Walnut effectively, ensure precise milling and joinery techniques. Use sharp cutting tools to prevent tear-out or splintering. Pay attention to grain direction when designing and assembling the drawers for optimal stability and aesthetics.

### Quality Standards for American Black Walnut:

- **Dimensional Accuracy:** Ensure that the dimensions of the American Black Walnut components meet the specified design requirements. This includes the thickness, width, and length of the drawer pieces.
- **Surface Finish:** Achieve a smooth and flawless surface finish, free from visible defects, scratches, or dents. Proper sanding and finishing techniques should be applied.
- **Joinery Integrity:** Confirm that the joinery methods, such as dovetail or butt joints, are precise and secure to prevent warping or loosening over time.
- **Stain or Finish Application:** As a stain or finish will be applied, ensure that it is evenly distributed and provides the desired colour and protection while still allowing the natural beauty of the wood to shine through.

### 1. Have you considered the environmental impact and sustainability of using American Black Walnut? Are there any alternative materials that might be more eco-friendly?

Environmental considerations are crucial when selecting materials. American Black Walnut is not considered a sustainable wood source due to overharvesting concerns. To address this:

- Explored alternative materials such as sustainably sourced hardwoods like maple, oak, or bamboo, or consider engineered wood products like MDF (Medium-Density Fibreboard) with a walnut veneer to achieve a similar look with a smaller environmental footprint.
- I'm continuing to use American Black Walnut; therefore, I will consider sourcing it from certified sustainable suppliers who adhere to responsible forestry practices.

### 2. How will you handle any waste material generated during the milling and processing of American Black Walnut, and do you have plans for recycling or reusing any offcuts or byproducts?

Efficient waste management is essential for sustainability:

- Implement a waste reduction strategy by optimizing the cutting plan to minimize offcuts and waste during milling.
- Consider repurposing or recycling any wood offcuts into smaller projects or components to minimize waste.
- Explore options for recycling or reusing any waste materials that cannot be repurposed within my project, such as turning them into wood chips for landscaping or biomass energy.

### **3. What are the cost implications of using American Black Walnut for the drawers and drawer box, and does it align with your budget constraints?**

American Black Walnut is typically more expensive compared to other wood species. To manage costs:

- Explore cost-effective alternatives if budget constraints are a concern.
- Consider sourcing the wood from local suppliers to potentially reduce transportation costs.
- Balance the use of American Black Walnut by combining it with more cost-effective materials for less visible components of the drawers or by using veneers to cover less visible surfaces.

### **4. Are there any unique challenges or risks associated with American Black Walnut that need to be addressed in the manufacturing process, such as wood movement or seasonal changes in humidity?**

American Black Walnut, like many hardwoods, can be sensitive to environmental changes:

- To address wood movement and humidity concerns, ensure proper acclimation of the wood to the manufacturing environment before processing. This can help minimize warping or cracking.
- Implement appropriate joinery techniques that account for potential wood movement, such as allowing for expansion and contraction in the design.
- Consider using finishes that protect the wood from moisture, which can help mitigate some of these challenges. And have a protective layer of rubio monocoat

## **Steel Square Tube**

### **2. Steel Square Tube (for frame of table):**

- **Description:** Steel square tubes are strong, rigid, and suitable for structural applications. They are commonly used for table frames due to their stability and load-bearing capacity.
- **Application:** Steel square tubes are ideal for the frame of my table, providing a sturdy and long-lasting foundation. They can be powder-coated or painted to match my design's aesthetic.
- **Processing:** When working with steel, precision is key. Proper cutting, welding, and grinding techniques should be employed. Ensure that welds are clean and structurally sound. Consider using protective coatings to prevent rust and corrosion.

### **Quality Standards:**

- The square steel tubes should meet industry standards for structural integrity. Ensure that the tubes have the necessary thickness and dimensions to support the weight of the table and any loads it may bear.
- Welding should adhere to recognized welding standards (e.g., AWS D1.1 for structural steel welding). Welds should be inspected for quality, ensuring they are free from defects and meet specified strength requirements.
- Powder coating or painting should be applied following best practices for even coverage, durability, and resistance to wear and corrosion.

### **1. Have you specified the grade and thickness of square steel tube required for the table frame, considering the anticipated load and design requirements?**

- I have chosen 1.6mm thick 50x50 hollow square tube for the table frame. This selection is based on careful consideration of the expected load capacity of the table and the design's aesthetic requirements.
- The 1.6mm thickness provides adequate structural strength for the table, ensuring it can support various loads while maintaining a sleek appearance.
- The 50x50 dimensions offer stability and balance, supporting the table's surface effectively without the need for additional reinforcements.

**2. Do you have qualified welders or welding professionals involved in the project to ensure the integrity of the frame's welds?**

- I will personally handle the welding for this project. While I may not hold formal welding certification, I have invested time in training and practice to develop proficient welding skills.
- I am committed to applying industry-standard welding techniques, including clean and strong weld joints, to ensure the integrity and safety of the frame.
- Rigorous weld inspections will be conducted to verify the quality and strength of each weld, meeting or exceeding industry standards.

**3. What type of protective coating or finish will be applied to the steel frame to enhance its appearance and prevent corrosion?**

- I plan to apply a durable powder coating finish to the steel frame. Powder coating is renowned for its aesthetic appeal and corrosion resistance.
- The chosen powder coating will not only enhance the appearance of the frame but also protect it from environmental factors, including moisture and oxidation.
- This finish choice aligns with the goal of providing long-lasting quality and minimizing maintenance requirements for the end user.

**4. How will you ensure that the steel frame aligns accurately with other components of the table to achieve stability and a level surface?**

- Achieving precise alignment is crucial for both stability and aesthetics. I will employ several strategies to guarantee accuracy:
  - Use custom jigs and fixtures designed specifically for this project to maintain proper angles and dimensions during assembly.
  - Perform meticulous measurements and cross-checks at key points to ensure symmetry and alignment.
  - Conduct a dry fit of components before welding to identify any potential issues and make necessary adjustments.

**5. Are there any specific safety regulations or standards for steel frames in furniture design that need to be followed?**

- I will conduct thorough research to identify any local or regional safety regulations or standards related to steel frames in furniture design.
- These regulations may pertain to factors such as structural integrity, safety during welding, and guidelines for using welding equipment and protective gear.
- Compliance with these standards is paramount to ensure the safety and well-being of the end users of the table.

By addressing these questions with detailed plans and strategies, I am confident that the steel frame for the table will meet high-quality standards while ensuring safety and structural integrity.

# 10mm thick Glass (changed)

### 3. 10mm Glass (for tabletop):

- **Description:** 10mm glass is a thicker variant known for its strength and transparency. It is commonly used for tabletops due to its modern and elegant appearance. Tempered glass is often preferred for safety and durability in such applications.
- **Application:** 10mm glass is an excellent choice for your table's tabletop, providing an elegant and durable surface. It offers transparency that can showcase the table's structure or any decorative elements beneath it.
- **Processing:** When working with glass, precision is crucial. Proper cutting, shaping, and finishing techniques should be employed. To enhance safety, consider using tempered glass, which shatters into small, less dangerous pieces if broken.

#### Quality Standards for 10mm Glass:

- **Safety:** Ensure that the glass used meets safety standards, especially if it's not tempered. Tempered glass is generally preferred for tabletops to reduce the risk of injury if breakage occurs.
- **Finish:** Examine the glass surface for imperfections, such as scratches, chips, or bubbles. The glass should have a flawless, clear appearance.
- **Edge Work:** If the edges of the glass will be exposed, consider edge polishing or bevelling for a smooth and aesthetically pleasing finish.
- **Thickness Uniformity:** Confirm that the glass is consistently 10mm thick across the entire tabletop to ensure structural integrity.

**Have you considered the need for tempered glass for safety purposes, especially if the table will be used in a household with children?**

- Yes, I've considered the need for tempered glass for safety.
- Tempered glass significantly enhances safety by shattering into small, less hazardous pieces upon breakage.
- This choice is especially critical for households with children to minimize the risk of injuries from potential accidents.

**What measures will you take to protect the glass during transportation and installation to prevent chipping or scratching?**

- Protective measures during transportation and installation:
  - Each glass panel will be individually wrapped in foam or bubble wrap to prevent chipping or scratching.
  - Secure packaging to immobilize the glass during transit.
  - Soft, non-abrasive materials like felt or rubber gaskets during installation to prevent scratches.

**Do you plan to have any decorative elements beneath the glass that may affect the appearance or functionality of the tabletop?**

- Consideration of decorative elements:
  - Yes, I plan to incorporate decorative elements beneath the glass.
  - These elements will enhance aesthetics without compromising functionality.
  - The glass will be securely mounted and sealed to showcase these decorative elements effectively.

**Have you assessed the weight of the glass tabletop and its compatibility with the table's frame and design?**

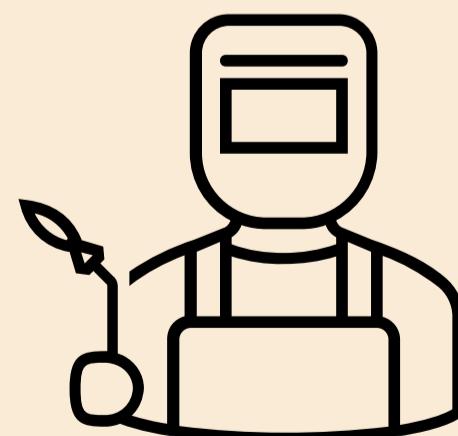
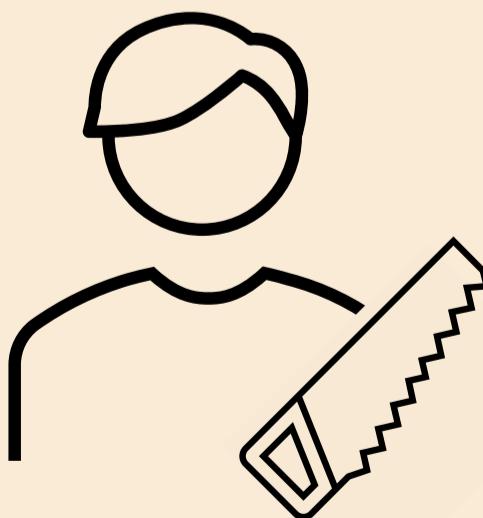
- Weight assessment and compatibility:
  - I've assessed the weight of the 10mm tempered glass and its compatibility.
  - The table's frame is designed to adequately support the glass's weight.
  - Material choices, such as square steel tubes, ensure the frame's load-bearing capabilities and structural strength.

# Processes – woodworking

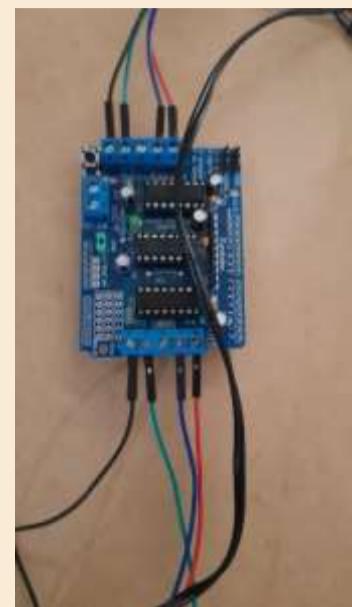
Process	Description	Use	Suitability (Why)	Usability (out of 10)
<b>Woodworking</b>				
Marking Out	Marking out involves measuring and marking wood for cutting or shaping.	Ensures accurate cuts and joints. Essential for precise woodworking projects.	Highly suitable for woodworking as it ensures precise dimensions and alignment.	9
Screwing	Screwing involves using screws to join wood components.	Securely joins wooden parts, providing strong connections.	Very suitable for woodworking as it offers a reliable method for assembly.	8
Scraping	Scraping entails removing small amounts of material from the wood's surface.	Used for smoothing and finishing wood surfaces.	Suitable for achieving a smooth finish and removing imperfections.	7
Ripping	Ripping involves cutting wood parallel to its grain.	Used to create long narrow strips of wood.	Highly suitable for making straight cuts and creating specific dimensions.	9
Planning	Planning is the process of shaping wood by removing thin layers.	Achieves a smooth, flat surface and precise thickness.	Highly suitable for surfacing and dimensioning wood pieces accurately.	9
Sanding	Sanding involves using abrasive materials to smooth wood surfaces.	Provides a fine finish, removes imperfections, and preps for finishing.	Very suitable for refining wood surfaces before applying finishes.	8
Laminating	Laminating combines multiple layers of wood to form thicker panels.	Used for creating stable and thicker wooden surfaces.	Suitable for enhancing wood strength and thickness in various applications.	7
Drilling	Drilling creates holes in wood for various purposes.	Essential for joinery, hardware installation, and creating openings.	Highly suitable for woodworking projects requiring holes or dowel joints.	8
Staining	Staining involves applying a finish to enhance wood's appearance.	Enhances colour, grain, and protection against moisture.	Very suitable for adding colour and protection to wooden surfaces.	8
Routing	Routing is the process of hollowing out an area in wood using a rotating bit.	Used for decorative edges, grooves, and shaping wood.	Suitable for adding intricate designs and details to woodworking projects.	7
Joining/Assembling	Joining wood involves connecting multiple pieces to create a larger structure.	Essential for constructing furniture and other wooden items.	Highly suitable for creating stable and functional wooden assemblies.	9

# Processes – Metalworking

Process	Description	Use	Suitability (Why)	Usability (out of 10)
<b>Metalworking</b>				
Cutting	Cutting metal involves separating metal pieces into desired shapes.	Essential for shaping and sizing metal components.	Highly suitable for metalworking as it's fundamental for shaping and sizing.	9
Drilling	Drilling creates holes in metal for various applications.	Used for hardware installation, assembly, and fabrication.	Very suitable for metalworking projects requiring precise holes.	8
Beating	Beating metal involves shaping it by striking it with hammers or mallets.	Used for forging and forming metal into specific shapes.	Suitable for shaping and manipulating metal without complex machinery.	7
Surface Finishing	Surface finishing includes processes like polishing and grinding to improve metal appearance and texture.	Enhances aesthetics and removes imperfections from metal surfaces.	Very suitable for achieving a desired appearance and texture in metal products.	8
Welding	Welding joins metal pieces together by melting and fusing them.	Provides strong and permanent metal connections.	Highly suitable for metal fabrication, creating structural integrity.	9
Metal Folding	Metal folding involves bending metal sheets or strips to create angles or shapes.	Used for creating bent or folded metal components.	Suitable for shaping metal into specific angles and configurations.	7
Forging	Forging is a metalworking process where metal is heated and shaped by hammering or pressing.	Used for creating strong and durable metal components.	Highly suitable for manufacturing robust and load-bearing metal parts.	6



# TESTING AND TRIALING

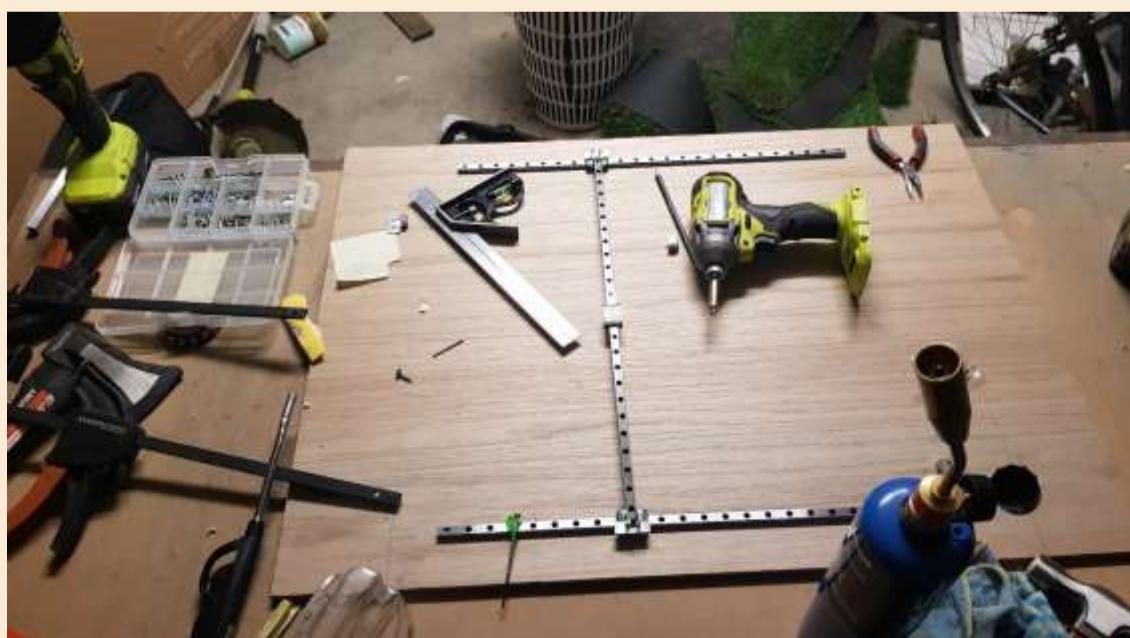


The objective of this procedure is to conduct comprehensive testing to ensure the proper functionality of all motors and electronic components within the CNC machine. This rigorous testing process will validate that the CNC system operates seamlessly, and all motors function as intended, including their precise movement across all axes.



When I first set up the CNC machine, I encountered a problem with too much friction in the aluminium track. This issue caused the machine's parts to move sluggishly, affecting its overall performance. To solve this problem and make the machine work smoothly, I decided to switch to linear rails, which turned out to be a much better choice. The linear rails reduced friction, and the machine operated much more efficiently as a result.

After switching to linear rails, I proceeded to set up the final layout for the linear rail track and carriages. This configuration allowed for smooth and precise movement of the CNC machine components along the rails. With the new linear rail system in place, I conducted thorough testing of the updated electronics setup to ensure that the machine operated flawlessly.





As part of the feasibility study for the CNC machine, I initially considered using wooden components for certain parts. However, upon closer examination, it became apparent that using aluminium would provide greater strength and durability. Consequently, I fabricated aluminium parts for specific components of the machine. An example of such a part is shown below, which features two securely mounted screws in the fabricated holes.

This decision to switch to aluminium for critical components ensured the CNC machine's reliability and longevity, addressing potential issues related to wear and tear that wooden parts might have posed. By carefully assessing the materials used, I aimed to optimize the machine's performance and durability while keeping some wooden parts where they provided secure mounting positions.



I invested a solid three-hour stretch into mastering the fundamentals of welding, with a particular focus on achieving strong, reliable weld beads that don't compromise the workpiece integrity. It was a hands-on session that allowed me to grasp the nuances of controlling heat and ensuring a stable, secure joint.

Process Tested	Testing Results/Information Gained
Dominos	<ul style="list-style-type: none"> <li>- Measured and cut wooden blocks to desired domino dimensions.</li> <li>- Ensured uniformity in size for consistent gameplay.</li> <li>- Checked for any defects or irregularities in the wood.</li> <li>- Prepared the wooden blocks for the gluing process.</li> </ul>
Gluing	<ul style="list-style-type: none"> <li>- Applied adhesive evenly to bond dominos securely.</li> <li>- Tested the strength of the adhesive bond after drying.</li> <li>- Checked for any excess adhesive that needed cleaning.</li> </ul>
Finishing	<ul style="list-style-type: none"> <li>- Applied a protective finish to enhance durability.</li> <li>- Ensured a smooth and polished surface for aesthetic appeal.</li> <li>- Checked for any imperfections in the finish.</li> </ul>
Sanding	<ul style="list-style-type: none"> <li>- Smoothed rough edges and surfaces for safe handling.</li> <li>- Checked the overall feel of dominos for comfort during play.</li> <li>- Inspected for any remaining splinters or rough spots.</li> </ul>

\*Other physical samples available\*

# TOOLS AND EQUIPMENT

## 1. Circular Saw:

- **Setup:**

- Place the saw on a sturdy work surface, ensuring it's not wobbly.
- Adjust the blade depth by:
  - Loosening the depth adjustment lever.
  - Setting the blade depth slightly deeper than the material thickness.
  - Aligning the blade with any guide marks on the base.

- **Part Change:**

- Unplug the saw to ensure it can't accidentally start.
- Retract the blade guard fully for easy access.
- Use the provided wrench to:
  - Loosen the blade nut by turning it counterclockwise.
  - Carefully remove the old blade.
  - Insert a new, compatible blade.
  - Tighten the blade nut by turning it clockwise, ensuring it's snug.

- **Safety Measures:**

- Always wear:
  - Safety glasses or goggles to protect your eyes from debris.
  - Ear protection to reduce noise exposure.
  - A dust mask to minimize dust inhalation.
- Keep your hands away from the blade path.
- Use a rip fence or a straight edge guide for straight cuts.
- Maintain a stable stance with your body to the side of the saw.



<https://cdn.axminstertools.com/media/catalog/product> and <https://www.popularmechanics.com/>

## 2. Power Drill:

- **Setup:**

- Insert the appropriate drill bit or driver into the chuck.
- Adjust the drill's speed and torque settings based on your task.

- **Part Change:**

- Unplug/ remove battery of the drill to prevent accidental activation.
- Open the chuck jaws fully by turning the chuck counterclockwise.
- Insert or remove the bit as needed.
- Securely tighten the chuck by turning it clockwise.

- **Safety Measures:**

- Wear safety goggles to protect your eyes from flying debris.
- Keep your hands away from the rotating drill bit.
- Use clamps or a vice to secure the workpiece.
- Avoid wearing loose clothing or jewellery that could get caught in the drill.



<https://www.finehomebuilding.com/>

## 3. Angle Grinder:

- **Setup:**

- Ensure the correct abrasive wheel is securely attached.
- Adjust the safety guard to the appropriate position, covering the wheel.

- **Part Change:**

- Disconnect the power source to prevent accidental startup.
- Use the provided wrench to:
  - Loosen the wheel nut counterclockwise.
  - Carefully remove the old wheel.
  - Install a new, compatible wheel.
  - Tighten the wheel nut clockwise, ensuring it's snug.



- **Safety Measures:**

- Always wear:
  - Safety glasses or a face shield to protect your face from sparks and debris.
  - Hearing protection due to the high noise level.
  - Gloves to protect your hands.
- Maintain a firm grip on the grinder.
- Be cautious of sparks and debris generated during use.

<https://www.osha.gov/Publications/angle-grinder-safety>

#### 4. Table Saw:

- **Setup:**

- Place the table saw on a level and stable surface.
- Adjust the blade height to slightly exceed the workpiece thickness.
- Align the rip fence parallel to the blade for accurate cuts.

- **Part Change:**

- Disconnect the power source for safety.
- Raise the blade to its highest position.
- Use the Arbor wrench to:
  - Loosen the Arbor nut counterclockwise.
  - Carefully remove the old blade.
  - Install a new, compatible blade.
  - Tighten the Arbor nut clockwise, ensuring it's snug.

- **Safety Measures:**

- Always wear:
  - Safety glasses or goggles to protect your eyes.
  - Ear protection due to the noise level.
- Use a push stick for narrow cuts to keep your hands away from the blade.
- Keep the blade guard in place during operation.
- Stand to the side of the blade's path.



<https://www.popularwoodworking.com/table-saw-safety/>

#### 5. Mitre Saw:

- **Setup:**

- Set the desired angle and bevel for your cut using the saw's controls.
- Secure the workpiece firmly against the fence and the saw's table.

- **Part Change:**

- Unplug the saw to prevent any accidental activation.
- Lower the blade guard to access the blade.
- Use the provided wrench to:
  - Loosen the blade nut counterclockwise.
  - Carefully remove the old blade.
  - Install a new, compatible blade.
  - Tighten the blade nut clockwise, ensuring it's snug.



- **Safety Measures:**

- Keep your hands clear of the blade path during operation.
- Use a stop block or clamp for repetitive cuts to maintain accuracy.
- Wear safety glasses or a face shield to protect against debris.

<https://www.wagnerspraytech.com/>

## 6. Welder (MIG):

- **Setup:**
  - Select the appropriate welding wire and shielding gas based on your material and project.
  - Set the wire feed speed and voltage according to the manufacturer's recommendations.
- **Part Change:**
  - Turn off the welder and disconnect the power source.
  - Release the tension on the wire spool.
  - Remove the old wire spool and load a new one.
  - Reset the tension to ensure smooth wire feeding.
- **Safety Measures:**
  - Wear a welding helmet with the proper shade to protect your eyes from the welding arc.
  - Use heat-resistant welding gloves and flame-resistant clothing.
  - Ensure proper ventilation or use a fume extraction system to minimize exposure to welding fumes.

<https://www.millerwelds.com/>



## 7. Drill Press:

- **Setup:**
  - Secure your workpiece to the drill press table using clamps or a vice.
  - Adjust the drill bit's height and select the appropriate speed for your material.
- **Part Change:**
  - To change drill bits, lower the drill press's quill.
  - Loosen the chuck by turning it counterclockwise.
  - Insert or remove the drill bit as needed.
  - Tighten the chuck clockwise to secure the bit.
- **Safety Measures:**
  - Always wear safety glasses or goggles to protect your eyes from debris.
  - Keep your hands away from the rotating drill bit.
  - Avoid wearing loose clothing or jewellery that could get caught in moving parts.
  - Ensure proper lighting to see your work clearly.

<https://www.hgtv.com/design/remodel>



## 8. Belt Sander:

- **Setup:**

- Attach the desired grit sanding belt, ensuring it's centered on the sander's rollers.
- Adjust the belt tension and tracking to prevent slipping.

- **Part Change:**

- Unplug the sander to prevent accidental activation.
- Release the belt tension by using the tension lever or knob.
- Remove the old sanding belt and install a new one, following the manufacturer's instructions.
- Reapply the tension to the belt.

- **Safety Measures:**

- Operate the sander with both hands for better control.
- Avoid exerting excessive pressure on the workpiece.
- Wear safety glasses to protect your eyes from dust and debris.

<https://www.osha.gov/>



## 9. Chisels:

- **Setup:**

- Ensure the chisel blade is clean and sharp.
- Use a honing guide to maintain the correct bevel angle.
- Secure your workpiece in a vice or clamp it down.

- **Part Change:**

- Sharpen the chisel by using sharpening stones, a honing guide, and honing oil.
- Periodically inspect the blade for any nicks or damage and address them as needed.

- **Safety Measures:**

- Always wear safety glasses or goggles to protect your eyes from wood chips and debris.
- Use a proper grip to maintain control over the chisel.
- Keep your hands behind the cutting edge.



<https://education.qld.gov.au/initiativesstrategies>

## **Hand Plane:**

- **Setup:**

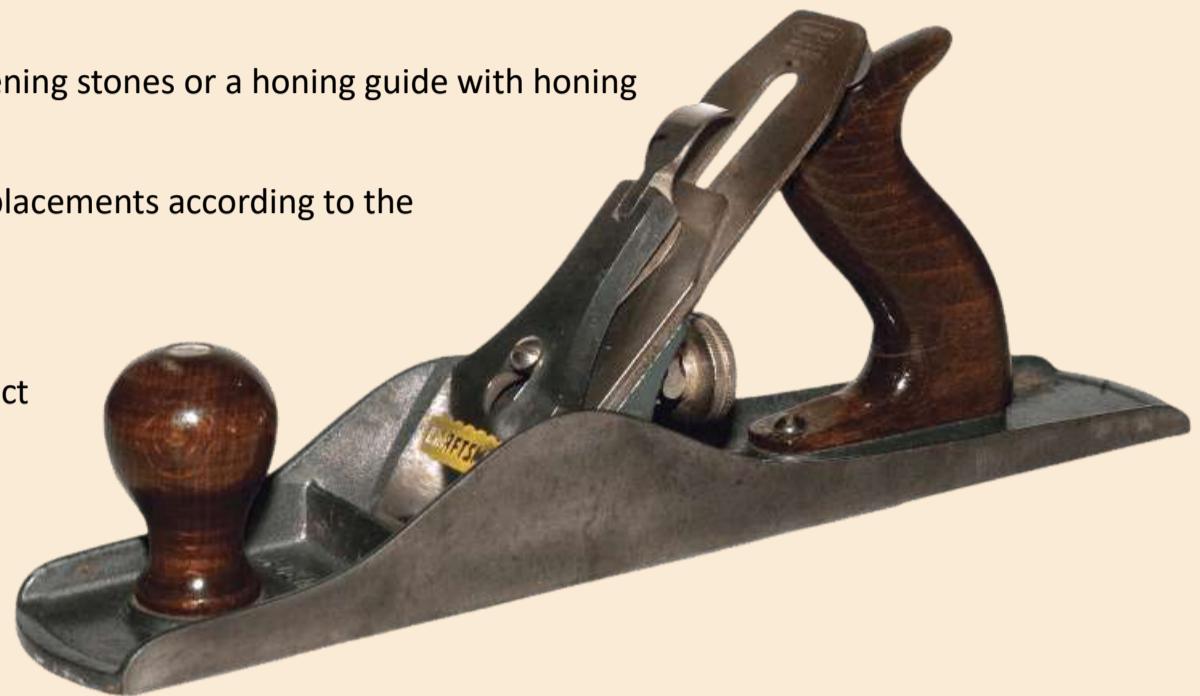
- Check that the plane's blade is clean and sharp.
- Adjust the blade depth and lateral position to control the cutting depth and alignment.
- Secure the workpiece on a flat surface or workbench.

- **Part Change:**

- To sharpen the plane blade, use sharpening stones or a honing guide with honing oil.
- Check for any blade adjustments or replacements according to the manufacturer's instructions.

- **Safety Measures:**

- Wear safety glasses or goggles to protect your eyes from wood shavings.
- Use proper hand placement and body positioning to maintain control.
- Work with the grain to avoid tear-out and maintain a stable stance.



<https://en.wikipedia.org/>

## **Scraper:**

- **Setup:**

- Ensure the scraper blade is clean and properly burnished to create a burr.
- Hold the scraper at an angle and apply downward pressure during use.

- **Part Change:**

- Periodically re-burnish the blade to maintain the burr.
- If the blade becomes dull or damaged, re-sharpen it using a file or honing guide.

- **Safety Measures:**

- Wear safety glasses or goggles to protect your eyes from metal shavings.
- Use a proper grip and be cautious of the sharp edges.
- Work in a controlled manner to avoid accidents.



<https://www.rockler.com/>

## Screwdriver:

- **Setup:**
  - Ensure the screwdriver bit is clean and matches the screw head type and size.
  - Apply even pressure and keep the screwdriver aligned with the screw.
- **Part Change:**
  - If the screwdriver bit becomes damaged or worn, replace it with a compatible one.
- **Safety Measures:**
  - Keep your fingers away from the screwdriver tip to avoid injuries.
  - Use the appropriate size and type of screwdriver to prevent stripping or damaging screws.
  - Work in a well-lit area to clearly see screw heads and avoid slips.

<https://www.oritech.com.au/>



# MANUFACTURING IN INDUSTRY

## how will it be manufacture in industry?

### 1. Material Sourcing:

- Walnut Lumber: Source high-quality American black walnut lumber that meets the desired thickness and quality standards.
- Steel Hollow Square: Procure the required steel tubing in the necessary dimensions.
- Acrylic Sheet: Purchase clear 8mm acrylic sheets in bulk.
- Hardware and Drawer Components: Source drawer slides, handles, and other necessary hardware.

### 2. Cutting and Shaping:

- Walnut Tops: Cut and shape the walnut lumber into the desired tabletop dimensions (1300mm x 700mm). This process may involve saws and planers.
- Steel Base: Cut and shape the steel hollow square sections to create the base structure of the table. This may involve laser cutting, welding, and grinding to achieve the desired shape and finish.
- Acrylic Sheet: Cut the acrylic sheets to the same dimensions as the tabletop and ensure smooth edges.

### 3. Finishing:

- Apply the chosen oil finish to the walnut tops. This can be done using a combination of sanding and finishing equipment, followed by buffing.
- Powder Coat the Steel Base: Apply the satin black powder coating to the steel base components. This process typically involves powder application, curing in an oven, and quality inspection.

### 4. Drawer and Compartment Assembly:

- Assemble the four drawers using the purchased drawer slides and hardware.
- Create the lower compartment and ensure it is properly separated from the top section with a 90mm gap. Attach any necessary supports or brackets.

### 5. Assemble the Table:

- Secure the steel base to the walnut tops using appropriate fasteners.
- Carefully slot the acrylic sheet between the walnut tops, ensuring it fits snugly and securely.

### 6. Quality Control:

- Inspect each component and the assembled table for quality, making sure there are no defects, rough edges, or imperfections.

### 7. Packaging and Shipping:

- Package the finished product securely to prevent damage during transit.
- Ship the coffee tables to distributors or directly to customers.

### 8. Volume of Production:

- The volume of production depends on the demand for the product. In an industrial setting, production can vary from a few tables per day to a larger-scale operation producing dozens or more per day.

### 9. Quality Assurance:

- Implement quality control measures at each stage of production to meet quality standards and customer expectations.

# Industrial Equipment

## Woodworking Equipment:

### 1. Table Saw:

- **Use:** Cutting walnut lumber to size, creating precise cuts for tabletops.

### 2. Planer and Jointer:

- **Use:** Flattening and smoothing walnut tops, ensuring they are level and uniform in thickness.

### 3. Edge Bander:

- **Use:** Applying edge veneer or solid wood edging to the edges of the walnut tops for a finished look.

### 4. CNC Router:

- **Use:** Precision cutting and carving on the walnut tops, allowing for intricate designs or patterns, also used for putting in wire cutouts.

## Metal Fabrication Equipment:

### 5. Laser Cutter or Plasma Cutter:

- **Use:** Accurately cutting steel hollow square sections into desired shapes for the base structure.

### 6. Welding Equipment:

- **Use:** Joining and welding steel components together to create the base.

### 7. Grinders and Sanders:

- **Use:** Finishing and smoothing welded joints and surfaces for a polished look.

### 8. Powder Coating Equipment:

- **Use:** Applying the satin black powder coat finish to the steel base components.

## Acrylic Cutting Equipment:

### 9. CNC Router:

- **Use:** Precise and clean cutting of acrylic sheets to match the tabletop dimensions.

## Finishing Equipment:

### 10. Sanders:

- **Use:** Smoothing and preparing surfaces before applying finishes.

### 11. Buffing and Polishing Machines:

- **Use:** Achieving a smooth and polished finish on wooden surfaces.

### 12. Spray Booth:

- **Use:** Applying the chosen oil finish to the walnut tops evenly and efficiently.

## Assembly Equipment:

### 13. Clamps and Fastening Tools:

- **Use:** Securely assembling various components of the coffee table.

### 14. Drawer Slide Jigs:

- **Use:** Assisting in precisely installing drawer slides.

## Quality Control Equipment:

### 15. Measuring Tools (e.g., Callipers, Rulers):

- **Use:** Ensuring accurate dimensions and quality standards are met.

# Processes and Volume of Production

## 1. Laser/CNC Cutting:

- **Process:** Laser or CNC cutting involves the use of computer-controlled machines to precisely cut materials such as steel hollow square sections for the base or acrylic sheets for the tabletop. These machines use focused laser beams or router bits to make intricate cuts.
- **Impact:** Precision cutting ensures that components fit together seamlessly during assembly, reducing the need for adjustments or rework. This technology enables intricate and complex designs on materials, enhancing the aesthetic appeal of the coffee table. It also minimizes material wastage, contributing to cost-efficiency.

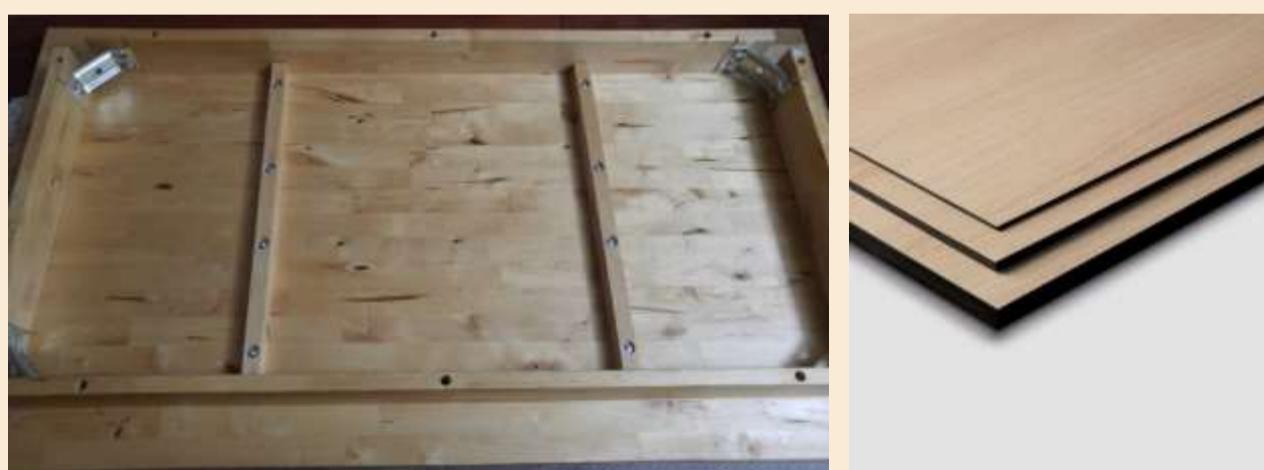


"The laser beam hits the surface of the material and heats it so strongly that it melts or completely vaporizes. Once the laser beam has completely penetrated the material at one point, the actual cutting process begins. The laser system follows the selected geometry and separates the material in the process."

<https://www.troteclaser.com/en-au/learn-support/faqs>

## 2. Using Different Materials (MDF/Ply) in Hidden Parts:

- **Process:** Integrating different materials, such as MDF or plywood, in hidden or non-visible parts of the table involves strategic material selection based on structural requirements and cost considerations. For instance, MDF or plywood may be used for drawer compartments or internal supports where aesthetics is less critical.
- **Impact:** This approach optimizes material costs by utilizing less expensive options where appearance is not a primary concern. It helps maintain the overall structural integrity of the table while managing production expenses.



Manufacturers use MDF and plywood in hidden furniture areas for cost-efficiency without sacrificing strength. These engineered wood materials are cost-effective, ideal for internal components with minor aesthetic importance. By choosing MDF or plywood for parts like drawer interiors or supports, manufacturers cut material costs while maintaining structural reliability. These materials' consistency, customizability, and compatibility with finishes make them essential in balancing cost-effectiveness and durability, offering consumers budget-friendly yet sturdy furniture.

<https://www.homelane.com/blog/mdf-vs-particle-board/>

### 3. Machinery - Giant Thicknessers:

- **Process:** Giant thicknessers are heavy-duty machines used to achieve a consistent thickness in wooden components, such as the tabletop. They feature large planning surfaces and powerful motors to handle sizable workpieces.
- **Impact:** The use of giant thicknessers ensures uniformity and flatness in the tabletop, eliminating variations in thickness. This precision contributes to the table's visual appeal and functionality. It reduces the need for manual sanding or leveling, saving both time and Labor costs.



[https://www.scmgroup.com/en\\_AU/](https://www.scmgroup.com/en_AU/)

### 4. Robotic Welding:

- **Process:** Robotic welding involves the use of automated machines equipped with welding arms to perform precise and consistent welds when assembling the steel base. Programming defines the welding pattern and parameters.
- **Impact:** Robotic welding enhances production efficiency by automating a critical process. It eliminates the variability associated with manual welding, resulting in consistent weld quality. Reduced Labor requirements translate into cost savings and increased productivity.



<https://www.kemppi.com/en-US/support/welding-abc/robotic-welding/>

### 5. Specialized Powder Coating Treatment:

- **Process:** Specialized powder coating involves applying a powdered pigment to the steel base and curing it in an oven to create a durable finish. The choice of satin black powder coating provides a particular aesthetic.
- **Impact:** This treatment offers excellent protection against corrosion and wear while maintaining a sleek and attractive appearance. The satin black finish adds a touch of sophistication to the coffee table, contributing to its market appeal and perceived value.



<https://www.pfonline.com/articles/fundamentals-of-powder-coating>

## 6. Bending Plastics:

- **Process:** Bending plastics is a thermoforming process that uses heat to shape the acrylic sheet to match the table's design requirements.
- **Impact:** Precise plastic bending ensures that the acrylic sheet conforms accurately to the table's dimensions without any distortions or defects. This process guarantees a clear and visually appealing tabletop, allowing the kinetic sand sculpture to be prominently displayed.



<https://uvacrylic.com/plexiglass/clear-acrylic-sheet/>

# Industrial Manufacturing

**Type of Manufacturing:** The type of manufacturing for this coffee table would typically fall into the category of Custom or Batch Production.

1. **Customization:** The coffee table is designed with specific customer preferences in mind, including the choice of materials, dimensions, finishes, and the inclusion of a kinetic sand sculpture. Each table can be customized to meet individual customer requirements, which aligns with custom production methods.
2. **Variability:** Custom or batch production allows for flexibility in responding to varying customer demands and design specifications. This approach accommodates unique features and design changes from one table to another.
3. **Attention to Detail:** The modern style and quality finishes, such as satin black powder coating and oil finishing for the walnut, require meticulous attention to detail, which is often associated with custom production.

**Lean Manufacturing Principles:** Lean manufacturing principles may be applied to optimize efficiency, minimize waste, and improve overall production. For example, lean techniques could involve streamlining workflow, reducing material waste, and minimizing excess inventory.

<https://www.unleashedsoftware.com/blog/manufacturing-processes>

## Number of Tables Produced/ Volume of production:

- The production volume can vary based on market demand and production capacity.
- In custom or batch production, the number of tables made may range from a few units to a few dozen per month.
- Manufacturers may adjust production volumes to meet demand and avoid overproduction or underproduction.

## Expected Cost per Product:

- The expected cost per product is influenced by several factors:
  - **Material Costs:** The cost of materials, including American black walnut lumber, steel, acrylic, and finishing materials.
  - **Labor Costs:** The cost of skilled labor required for woodworking, metal fabrication, assembly, and finishing.
  - **Overhead Costs:** These include rent, utilities, machinery maintenance, and other operational expenses.
  - **Equipment Costs:** Costs associated with equipment maintenance and depreciation.
  - **Quality Control Costs:** Expenses related to ensuring product quality.
- The choice of materials, production efficiency, and economies of scale impact the final cost.

## Estimated Price Depending on materials used in Batch production.

- **Low-End Estimate:** \$1,500 to \$2,000 per table
  - This estimate assumes lower material costs, simplified design, and minimal customization.
- **Mid-Range Estimate:** \$2,000 to \$3,500 per table
  - This estimate accounts for moderate customization, high-quality materials, intricate design, and skilled craftsmanship.
- **High-End Estimate:** \$3,500 to \$5,000+ per table
  - This estimate includes highly customized features, complex design elements, premium finishes, and attention to detail.

<https://chat.openai.com/c/e1f4f9fd-e19c-443e-9d3b-96d0cf2c84ea>

# PRODUCTION JOURNAL

Date	Time Taken (mins)	explanation of step/s completed or outsourced	materials and equipment and safety procedures	quality measures used	Modifications	Next session I need to
Initial checks						
21/06/2023	10	checking wood arrival making sure everything was there	N/A	scanning wood making sure it's all usable and looks aesthetically pleasing and has no defects		
	15	labelling all pieces with chalk	chalk			
	10	storing all pieces to side of workspace	N/A			
	25	begin Marking out the pieces	chalk, ruler, tape measure, square,	ensure proper measurements		continue marking out the proper sizes of wood

Images



22/06/2023	50	Finish marking out wood	chalk, ruler, tape measure, square,	ensure proper measurements		
	10	get Top cut out	Mitre saw, PPE	Cut properly on the lines which are oversized, Utilize measurement tools		Layout and work out final markings of the other pieces of wood

Images



23/06/2023	40	laid out the rest of the pieces and worked out where each piece would go	chalk, ruler, tape measure, square,	ensuring proper measurements (oversized) for piece and laying out by using letters and numbers so they don't get mixed up	realised I could get away with lamination 3 instead of 4 pieces of walnut to cutdown on the price	
	10	get tops cleaned up, planed, and squared	Planer, Table saw, jointer	Measure Twice, Cut Once		
	5	store wood back	N/A	N/A		
	60	Finish remarking pieces after discovering issue with initial setup (managed to save more wood)	chalk, ruler, tape measure, square, paper, pencil, calculator	Measure Twice, Cut Once, proper marking,		after holidays laminate the Top, to create 2 pieces

Images



18/07/2023	50	Working out how I want to lay out the top to be the most aesthetically pleasing	N/A	ensure minimal defects are visible		
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Images



20/07/2023	10	double checking Drawer holder is properly marked out	chalk, ruler, tape measure, square, paper, pencil, calculator	Measure twice, Cut once		
	30	getting these parts cut out (oversized)	chop saw, PPE	Measure twice, cut once, Use precision machinery		layout and work around how the parts will be placed together

Images



21/07/2023	20	lay out the trimmed down timber and work out positioning and location	Chalk	look for visible defects		
	20	work out positions of side spacers	Tape measure, ruler, chalk	ensure visible accuracy, Ensure precise measurements and cuts.		
	20	Domino and glue the long side together to have a strong bond that is aligned	Domino Joiner, Domino's, Glue, Clamps, Pencil, Ruler, PPE	Verify proper fit and joinery.		
	40	Lay out next long side, (made of 4 pieces) mark out domino lines.	, Glue, Clamps, Pencil, Ruler, PPE	Verify proper fit and joinery. Measure twice, Inspect for material flaws		Sand and scrap all the sides to a near perfect finish of both panels

Images



25/07/2023	50	Properly dominoing the long pieces together	Domino Joiner, Domino's, Glue, Clamps, Pencil, Ruler, PPE	Verify proper fit and joinery. Measure twice, Inspect for material flaws		
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Images



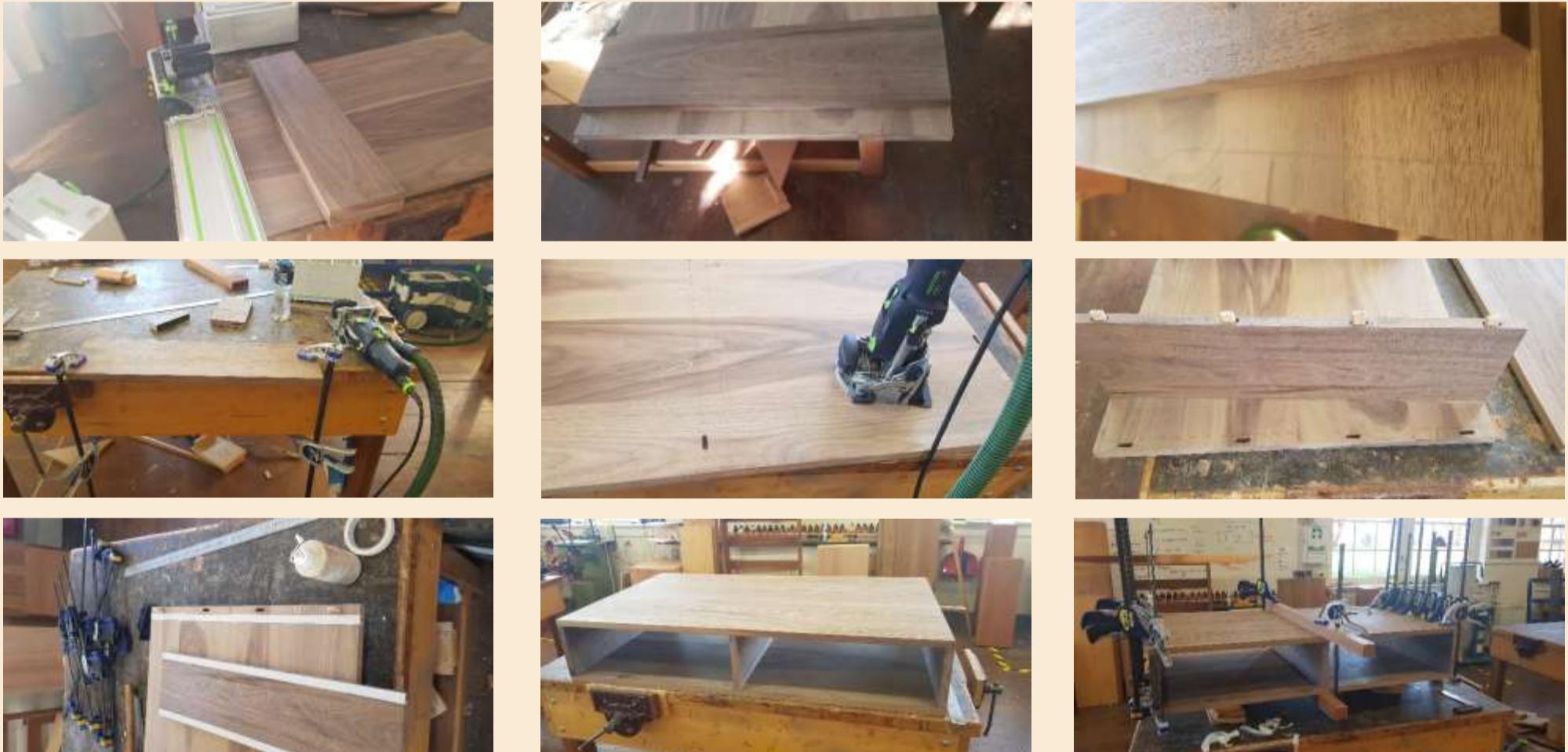
26/07/2023	10	scraping both sides of both tops	scraper	Check for wood defects and finish, Examine joinery, warping, and grain.		
	40	using orbital sander to remove all residue and bumps from the top of the laminated pieces	Orbital sander, Shop vac	Ensure proper sanding and machining.		

Images

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27/07/2023	20	Trim off excesses sides of the long sides	ruler, pencil, Track saw, clamps, track, Shop vac, PPE	Check for precise cuts		
	40	mark out and domino all locations where the short sides will connect, use domino machine in vertical position and put in holes, test fit all dominos to ensure proper fit	Domino machine, ruler, square, clamps, PPE	Ensure accurate measurements, Check for precise holes.		
	40	Put in holes on the short sides using the domino after marking out locations	Domino machine, ruler, square, clamps, PPE	Ensure accurate measurements, Check for precise holes.		
	40	test fit the box to see how everything fits together		Dry fit together, Examine joinery		
	15	apply tape in preparation for glue	Tape			
	15	insert glue and clamp all pieces together	Glue, Clamps	Clean up excess glue		scrape and sand all the glue to have a near completed finish

Images



28/07/23	60	Sanding all edges, faces and sides of the box	Orbital Sander, Shop vac, PPE	Examine wood finishes, confirm that wood surfaces are sanded, Establish tolerance levels		work out how to reduce size of the top two pieces that will be laminated
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Images



31/07/2023	40	working out final dimensions of each part of top before laminating together	chalk, ruler, square, tape measure, calculator	ensure proper measurements		Complete 2 top pieces for final joinery
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Images



1/08/2023	40	measure domino locations then domino top sides	Domino machine, ruler, square, clamps, PPE	Ensure accurate measurements, Check for precise holes.		
	4	test fit	N/A	Dry fit together, examine joinery		

Images



4/08/2023	30	sanding, scraping and cleaning up to final quality	scraper, Orbital Sander, Shop vac, PPE	Examine wood finishes, confirm that wood surfaces are sanded, Establish tolerance levels		
	20	removing access of edges with track saw	ruler, pencil, Track saw, clamps, track, Shop vac, PPE	Check for precise cuts		
	10	test fit of how the steel will go together to create the framing for the table	steel bars	dry fitting, check joinery	getting new steel tubes to cover large hole which would be visible from the sides	while waiting for welder get drawer boxes cut out

Images



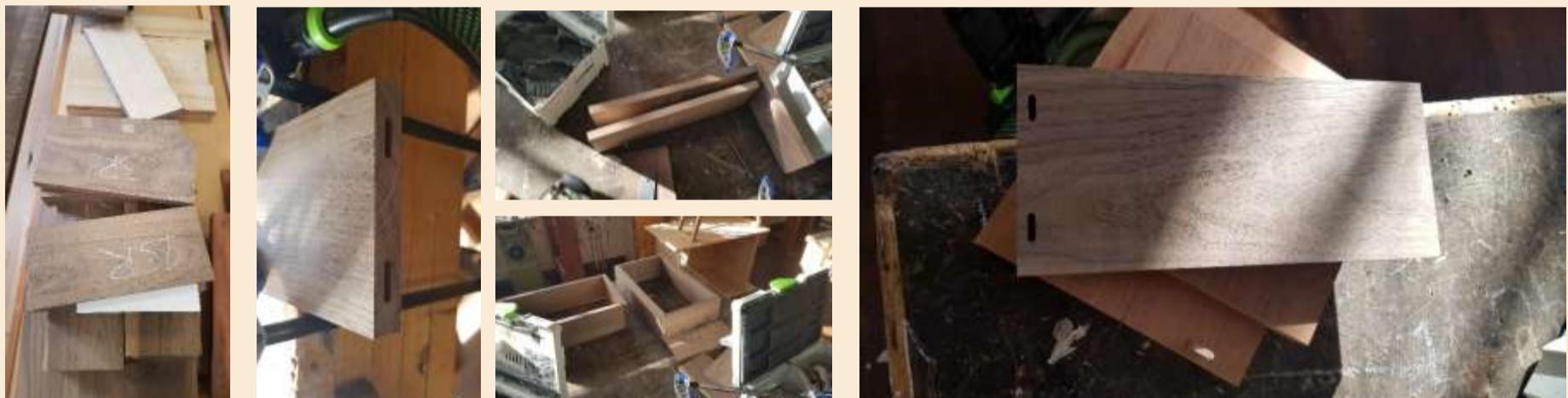
9/08/2023	10	get draw boxes cut out	chop saw, planer, jointer, PPE			
	40	label and organise which piece correlated where	chalk, ruler, tape measure, square,	ensure proper locations, dry fit test		assemble the drawer boxes using dominos

Images



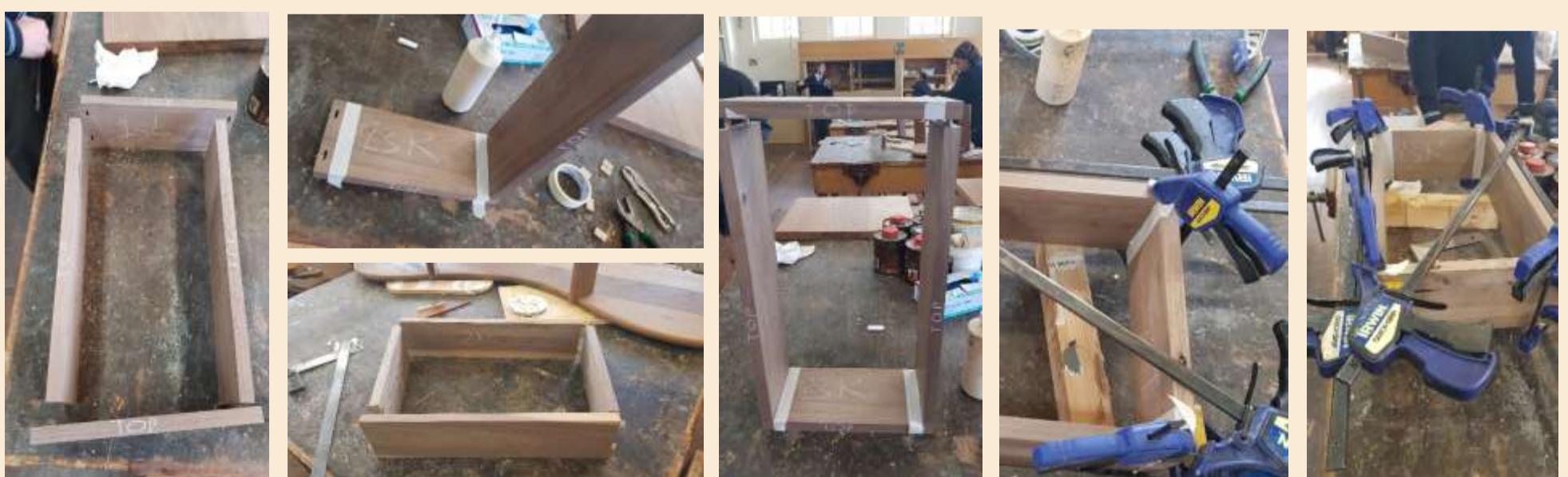
10/08/2023	10	marking out the correct locations for dominos	pencil, ruler			
	5	practice dominos into scrap wood	Domino machine, ruler, square, clamps, PPE	just testing depth stops and ensuring its ready for the real hole		
	30	dominoing into each side of the	Domino machine, ruler, square, clamps, PPE	Ensure accurate measurements, Check for precise holes.		
	5	quick test on the fits	dominos, dominoed wood	dry fittings to see if they are proper		glue up as many boxes as possible

Images



14/08/2023	10	laying out boxes				
	5	applying tape	tape			
	40	gluing up together and holding with clamps	glue, clamps, dominos	dry fittings to see if they are proper		finish gluing boxes and get started on making frame

Images



15/08/2023	30	finishing gluing and clamping final box	glue, clamps, dominos	dry fittings to see if they are proper		
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	20	begin sanding the welding points on the steel square	angle grinder + sanding disk, pencil, PPE	Inspect metal ensuring proper sand	sand faces and complete work on frame
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Images



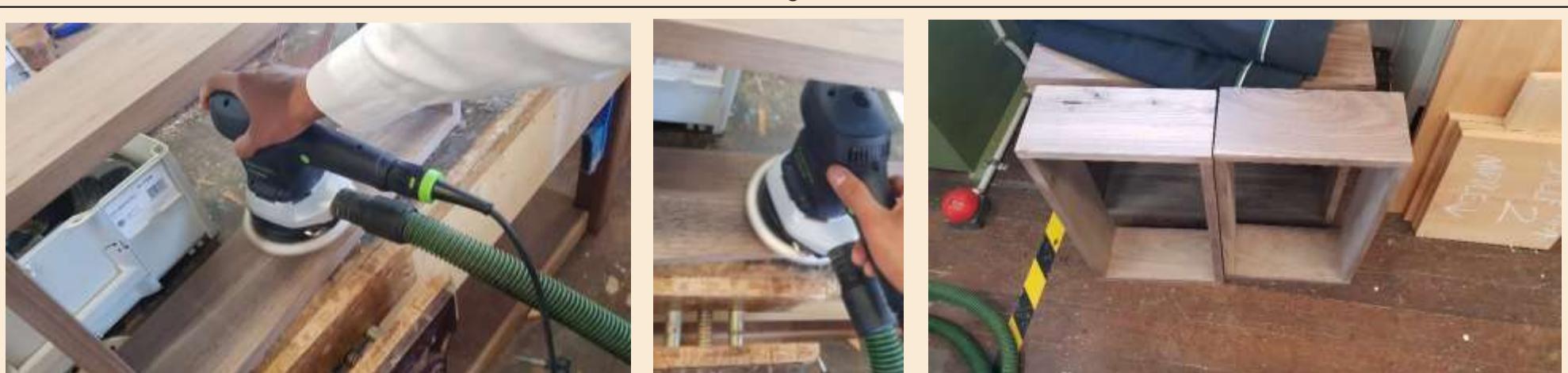
17/08/2023	40	sanding all faces of the completed drawer boxes to a completed standard	Orbital Sander, Shop vac, PPE	Examine wood finishes, confirm that wood surfaces are sanded, Establish tolerance levels		
	10	continue cleaning up the Steel hollow square	angle grinder + sanding disk, pencil, PPE	Inspect metal ensuring proper sand		complete internal sanding (had enough sanding for one day)

Images



18/08/2023	50	continue internal sanding of the faces	Orbital Sander, Shop vac, PPE	Examine wood finishes, confirm that wood surfaces are sanded, Establish tolerance levels		
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Images



22/08/2023	120	Practice and learn how to weld	Mig Welder, safety gear, PPE, welding helmet	Verify welding, thickness, confirm material thickness requirements, Assess structural integrity of component	Begin proper welds and joints
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Images



23/08/2023	10	layout basic setup of frame	Steel Hollow Square			
	10	use magnet to hold parts in place and set up clamp	Magnet, clamps			
	20	weld together starting off with tacs	Mig Welder, safety gear, PPE, welding helmet, Clamp			
	20	grind off excess on the sides	Angle grinder + grinding disk, PPE			
	120	setting up electronic parts at home,	LN293D controller, Arduino uno, NEMA 17 steppers, wires, UCB mini port, computer, Arduino ide	Functionality Testing	having to switch out to a different motor driver and the LN293D is not capable of working with GRBL like the A4988	Stretch out frame

Images



24/08/2023	55	Working on expanding the metal frame using clamps, whilst this worked it did not give the results I wanted.	Clamps, Wooden spacer blocks		mark out where the frame will be cut to re weld the whole structure again
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Images



25/08/2023	50	marking out where I will cut the joints to re-form the base around a template	Chalk, Large square	Measure Twice, Cut Once, establish tolerance levels (for powder coating), Implement jigs and templates	stretching out the length of the frame to be 1305mm instead of 1300mm to leave extra space for the added thickness after powder coating	Rejoin the frame to correct modified dimensions
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Images



26/08/23-04/09/23	520	cutting and rewelding the frame over the template to ensure square and inline, this process went on for over a week as the corners of the weld would cool and contract pulling the whole shape out of square, which was a huge irritancy, even on the large wooden template it caused issues, in the end the frame didn't come out perfect, but it looks quite good.	Mig Welder, safety gear, PPE, welding helmet, Clamp, Ply template	Measure Twice, Cut Once, establish tolerance levels (for powder coating), Implement jigs and templates, verify proper fit, examine joinery, Check for precise cuts, Address defects promptly, Welding and Soldering Quality, Metal Inspection	stretching out the length of the frame to be 1305mm instead of 1300mm to leave extra space for the added thickness after powder coating	mark out locations of draw slides
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Images

5/09/2023	50	marking out the exact location of the drawer slides to ensure perfectly smooth use	Pencil, ruler, square, calculator	Measure Twice, Utilize measurement tools		attach the drawer slides and runners
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Images



6/09/2023	95	properly securing every slide to the drawers ensuring they all line up correctly	impact driver, PPE, Drill	Check for warping or bowing, check for precise cuts, Verify proper fit	attach the drawer runners to interior of Drawer holder
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Images



7/09/2023	100	making sure each one of the drawers smoothly fits into the drawer frame, and preparing for the addition of interior slide mounts	planer, sander, PPE, Ruler, Square	Check for warping or bowing, check for precise cuts, verify proper fit, use precision machinery	attach the drawer runners to interior of Drawer holder
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Images



8/09/2023	120	securely adding the interior drawer slides by using a template	template, impact driver, PPE, Drill	Check for warping or bowing, check for precise cuts, Verify proper fit	begin work on Drawer fronts
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Images



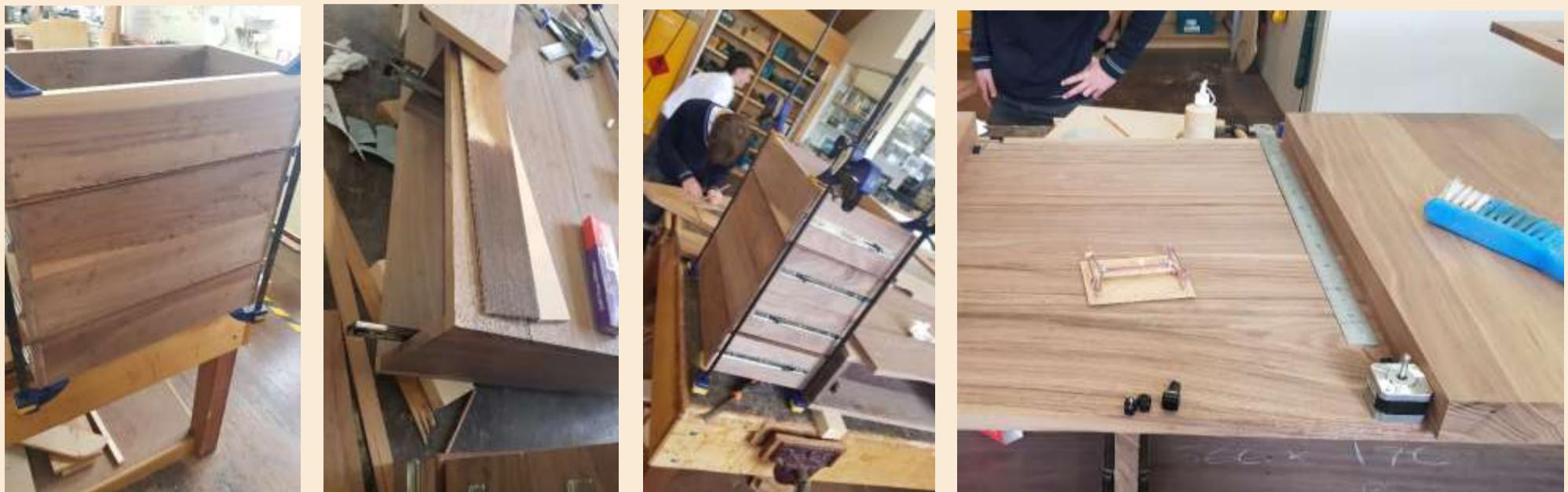
11/09/2023	50	getting drawer fronts cut out and placing them into correct positions in the actual Drawer Holder	Mitre saw, PPE	Check for warping or bowing, check for precise cuts, verify proper fit, use precision machinery	attach bottom of drawers on after applying a stain to the ply
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Images



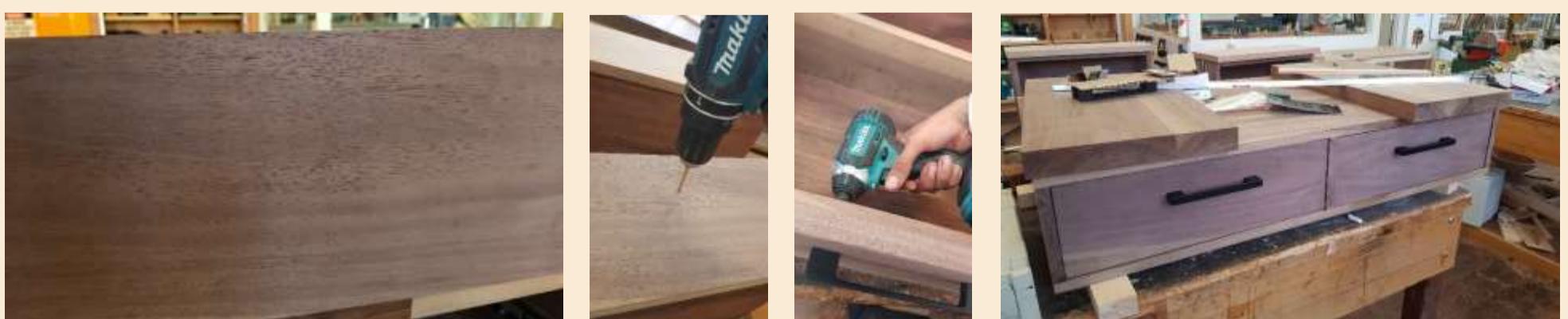
12/09/2023	50	staining PLY for bottom of drawers	Stain, brush, cloth, gloves	even spread and coating, examine wood finishes		
		attaching bottoms using nails, glue and clamps	Glue, Nails, Hammer, Clamps	conducting dry fits, inspect joinery, verify proper fit		
		laying out how everything will be placed on the full table with the tops installed	all parts already assembled	dry fit		try get on drawer fronts and handles

Images



13/09/2023	60	attaching drawer fronts ensuring proper placement	Screws, Impactor, drill, PPE	conducting dry fits, inspect joinery, verify proper fit, ensure correct speeds are used on drill, don't over tighten		
	30	marking out locations for handles	ruler, clamp, Pencil	Measure Twice, utilize measurement tools, ensure do always double check location, Ensure accurate measurements		
	30	drill holes at correct locations for each handle	drill, PPE	Measure Twice, utilize measurement tools, ensure do always double check location		
	20	checking fit of each hole with the handles	Handles	Verify proper fit, Inspect fasteners and connectors		
	50	Adjusting fit the handles to the correct locations on the drawer	impactor, handles, PPE	Inspect finishing quality		
	20	finalizing and securing everything down with bolts	impactor, handles, PPE	Inspect fasteners and connectors		mount frame to Drawer Holder

Images



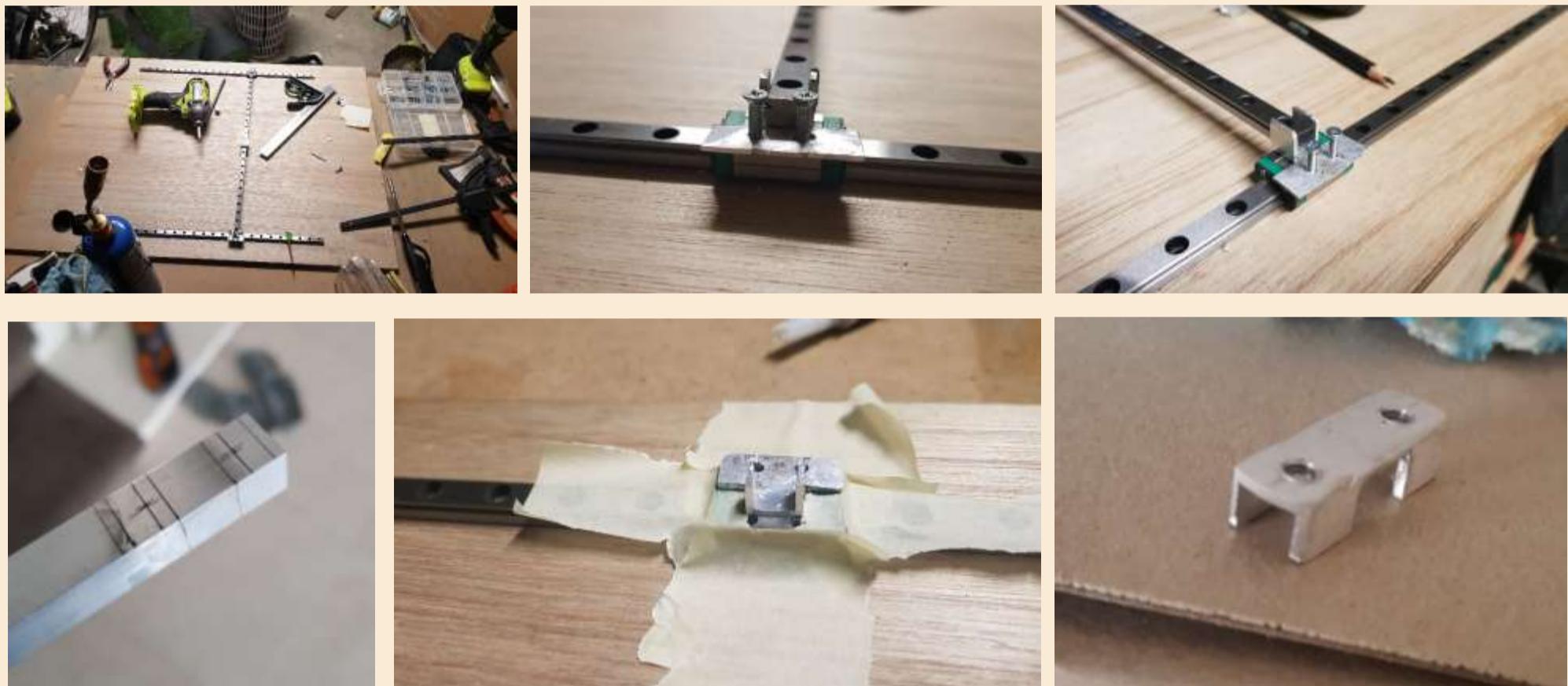
14/09/2023	20	aligning all pieces in the correct locations of the frame	spacer blocks, mallet	Ensure accurate measurements, verify proper fit, Utilize measurement tools		
	20	mount the Drawer holder to the frame by using self-tapping screws	Self-tapping screws, Drill, Impact driver, PPE	Measure Twice, drill Once, Establish tolerance levels		
	10	work out where the electronics will sit	Board with electronics, clamps, holding block	Wiring Inspection, Integration Testing		
	70	drill holes to mount screws for mounting the tops	Drill, PPE	Measure Twice, drill Once, Establish tolerance levels		
	70	use right angle drill to countersink the holes	Right angle drill, counter sink	ensure the drill goes in vertical		
	10	hold down with clamps and screw into place	Clamps, cloth	make sure there are no scratches		
	70	screw the tops in place with the right-angle driver	Right angle drill, 70mm screws	don't over tighten, ensure it goes in straight		
	10	get side mounts for holding the electronics cut out and pressure fit in location	Spare walnut, mitre saw, nails, glue	Ensure accurate measurements, verify proper fit, utilize measurement tools, use precise cutting tools		complete electronics and mount to final product

Images



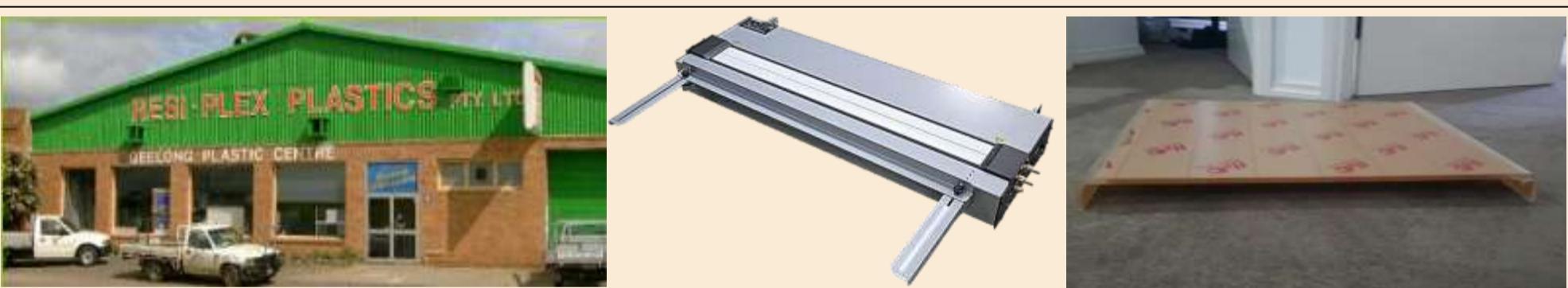
20/09/2023	20	Fixing linear rails onto the base board	Linear rails, drill, impactor, screws	Ensure accurate measurements, verify proper fit, utilize measurement tools, use templates or jigs		
	210	making custom aluminium parts to mount other parts	aluminium C channel, blow torch, hammer, anvil	Metal Inspection, Structural Integrity		
	20	attaching the custom aluminium parts and other parts on top of each other	screws, screwdriver	Fastener Tightness		attach everything together, apply light finish, mount electronics and control panel

Images



28/10/2023	240	Getting the acrylic bent at resin-plex	Acrylic sheet, industrial bender	Surface Inspection, Secure Mounting, Size Accuracy	Using Acrylic instead of glass	
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Images



1/10/2023	TBD	apply finish to the body and tops of the table	oil, cloth, gloves	Surface Inspection, Aesthetic Details, Finish Quality		
	TBD	place in electronics and mount with the sides	all electronic components	Integration Testing, Burn-in Testing, Functionality Testing		
	TBD	Final construction of all parts	all completed parts	Finish Quality, Hardware and Fasteners, Assembly Consistency, Aesthetic Details		Complete for the show

Powder coating						
Date	Time Taken (mins)	explanation of step/s completed or outsourced	materials and equipment and safety procedures	quality measures used	Modifications	Next session I need to
8/09/2023	30	To start off Use methods like sandblasting or chemical pretreatment to have a clean surface to powder coat and remove blue paint.	Sand, sandblaster, PPE	Even removal of paint		
9/09/2023	15	Powder Coating Boot, Use a specialized booth to evenly distribute the powder and prevent excess powder from escaping.	Powder Coating Gun, Powder Coating Booth,	ensure that powder coating or painting is applied evenly and provides adequate protection.		
12/09/2023	45	Heat the coated object to 350°F to 450°F (177°C to 232°C) to melt and fuse the powder, forming a durable finish. Followed by allowing the object to cool, either in the oven or at room temperature.	Oven, cooling room	Let it properly temper		
13/09/2023	20	Examine the coated surface for defects like bubbles or inconsistent coverage.		Surface Inspection, Aesthetic Details		
14/09/2023	30	Completion and installation to the table				Complete rest of table

Images



**Total time:** 3424mins or 57 hours

# MODIFICATION TABLE

Modification	Description	Benefits	Impact on timeline	End-User Sign	Teacher Sign
Added thickness to drawer holders	The modification involved increasing the thickness of the drawer holders, which are components used to support and secure drawers within a piece of furniture	<ul style="list-style-type: none"> <li>- Improved strength and durability of drawers and holders.</li> <li>- Reduced risk of sagging or breakage, enhancing functionality.</li> <li>- Extended lifespan of the furniture piece.</li> </ul>	N/A		
Using 3 plank lamination	realised I could get away with lamination 3 instead of 4 pieces of walnut to cutdown on the price	<ul style="list-style-type: none"> <li>- reduced cost of creating the lamination</li> <li>- wood used in the overall build</li> </ul>	N/A		
Altercation of steel hollow square	getting new steel tubes to cover large hole which would be visible from the sides	<ul style="list-style-type: none"> <li>- The large hollow games/ holes won't be visible</li> <li>- It would have a much more aesthetic appearance</li> </ul>	+4 days		
welding metal frame at school	This modification consisted of welding the metal frame, A structural component of the project, at school which later proved to be regrettable	<ul style="list-style-type: none"> <li>- Valuable hands-on experience in welding.</li> <li>- Potentially improved precision and strength of the metal frame.</li> <li>- Enhanced employability and welding skills.</li> </ul>	+21 days		
powder coating	Powder coating is a finishing process where a dry powder is applied to a surface and then heated to create a durable and attractive finish.	<ul style="list-style-type: none"> <li>- Increased durability, making the project much stronger.</li> <li>- Enhanced aesthetics with a professional appearance.</li> <li>- Improved resistance to scratches, chipping, and corrosion.</li> </ul>	+7 days		
Final frame length being 1305mm	The project's final frame length has been set at 1305mm, which is a crucial dimension that determines the overall size and proportions of the project.	- Ensures there's enough space to place in the drawer frame even after the powder coating has been added on	+1 day		
A4988	having to switch out to a different motor driver and the LN293D is not capable of working with GRBL like the A4988	<ul style="list-style-type: none"> <li>- The original controller doesn't work therefore I had to switch and purchase a new controller</li> <li>- The new controller offers much more versatile control</li> </ul>	+7 days		
Using acrylic instead of glass	This modification involves replacing traditional glass with acrylic for specific components of the project.	<ul style="list-style-type: none"> <li>- Reduced weight, making the project lighter.</li> <li>- Improved safety as acrylic is less likely to shatter.</li> <li>- Maintained clarity for transparent components.</li> </ul>	N/A		
Bending acrylic instead of joining with glue	Instead of joining acrylic components with glue or adhesive, this modification involves bending the acrylic to create curved shapes.	<ul style="list-style-type: none"> <li>- Eliminated visible seams or adhesive, achieving a cleaner appearance.</li> <li>- Enhanced aesthetic quality and cohesion.</li> <li>- Provided a more visually appealing and structurally sound solution</li> </ul>	+2 days		

# FEEDBACK ON MODIFICATIONS

## Creator feedback

### ~ Added thickness to draw holder ~

"I'm absolutely delighted with the decision to increase the thickness of the drawer holders. It was a deliberate choice to enhance the overall strength and durability of my design. Seeing users appreciate the sturdiness and reliability is incredibly gratifying. It's a reminder that even small design changes can make a significant impact."

### ~ welding metal frame at school ~

"Welding the metal frame as part of my learning experience was personally rewarding. It added depth to my project while providing valuable skills. Though learning to weld was a fun experience, it wasted a lot of time, resulting in me rushing at the end. Knowing that my work contributed to someone's education brings a sense of fulfillment."

### ~ powder coating ~

"The decision to use powder coating for the finish was transformative. It not only elevated the aesthetics but also increased the durability of the furniture. Hearing users talk about how it enhances both form and function validate my choice. While some weld locations have defects, the satin black makes them nearly invisible from a distance which helps to resolve self-doubt".

### ~ Final frame length being 1305mm ~

"The 1305mm frame length was a bit unexpected initially. It didn't align with my original plan. However, it turned out to work well, fitting proportionately and contributing positively to the project's success. The minor size difference proved inconsequential in everyday use, reminding me of design's flexibility and pleasant surprises."

### ~ A4988 ~

I switched from the L293D to the A4988 controller for my GRBL system and found it to be a positive change. The A4988's higher micro stepping resolution improved precision, resulting in smoother and more accurate performance. Its lower power consumption and reduced heat generation are advantageous for long-term use. However, proper configuration of voltage and current limits was necessary, and updating documentation was important to inform users of the changes.

Overall, it's been a valuable upgrade for my project.

### ~ Using acrylic instead of glass ~

"Choosing acrylic over glass for this project was a deliberate and thoughtful decision. I believed that it would bring several advantages to the table, and it's truly rewarding to see how users have responded to this choice. Acrylic not only contributes to a lighter overall design but also significantly enhances safety, which was a top priority. Knowing that users appreciate the reduction in weight, the added safety, and the maintained clarity is a testament to the success of this design decision. It reaffirms my belief in making design choices that prioritize both aesthetics and functionality while ensuring user well-being."

### ~ Bending acrylic instead of joining with glue ~

"I aimed for a seamless, clean look, and the decision to bend acrylic instead of using glue was instrumental. Users noticing the minor 6mm radius shows their keen eye for detail. It's valuable feedback that helps me refine my craftsmanship and strive for perfection."

# End-User feedback

## ~ Added thickness to draw holder ~

"The added thickness to the drawer holder has certainly enhanced its appearance. It provides a more substantial and sturdy feel, which is appreciated. However, some users have mentioned that it feels slightly bulky when handling it. Despite this, the overall consensus is that the added thickness is a positive improvement, making the drawer holder more robust and durable."

## ~ welding metal frame at school ~

"The welding work done at school is truly commendable, especially considering it was your first experience with welding. Your precision and attention to detail are evident in the quality of the welds. This achievement speaks volumes about your potential in this field, and it's a great start to your welding journey."

## ~ powder coating ~

"The outcome of the powder coating process has exceeded our expectations. It not only enhances the visual appeal of the project but also gives it a contemporary and sleek appearance. The smooth finish and even coating are a testament to the care and expertise put into this step. We are genuinely thrilled with the results."

## ~ Final frame length being 1305mm ~

"The minor shift in frame length due to the frame extension is hardly noticeable to the naked eye. It's a minute difference from the original size and doesn't affect the overall functionality or aesthetics of the project. This small alteration does not detract from the quality of your work and is well within acceptable tolerances."

## ~ A4988 ~

"While it was unfortunate that the initial A4988 component had some issues, it's reassuring to see that it has been resolved and is now functioning correctly. Your dedication to troubleshooting and resolving the problem demonstrates your commitment to delivering a reliable and efficient product."

## ~ Using acrylic instead of glass ~

"The decision to use acrylic for added protection, particularly for child safety, is a wise choice. Acrylic is known for its durability and transparency, making it an ideal material for this purpose. It provides an added layer of security, giving users peace of mind when using your product."

## ~ Bending acrylic instead of joining with glue ~

"The choice to bend instead of joining may be noticeable to some, but it's not a significant concern. This approach has its advantages, such as increased structural integrity and a seamless appearance. The minor aesthetic difference is a reasonable trade-off for the overall improvement in functionality and durability."

# CARE INSTRUCTIONS/ LABEL

## Instructions for Use

### Assembling Your Coffee Table:

- Assemble the table according to the manufacturer's instructions, ensuring all components are securely fastened.
- Use the provided tools and follow the step-by-step guide to prevent any damage during assembly.
- Seek assistance if needed to avoid excessive strain on yourself or the table.

### Disassembling for Transport:

- When disassembling the coffee table for transportation, carefully follow the reverse of the assembly instructions.
- Keep all components organized and labelled to simplify reassembly.
- Protect delicate surfaces during disassembly by using soft cloths or padding.

### Support and Safety:

#### Proper Support:

- Always support the table evenly and from its base when moving it.
- Avoid dragging or lifting by the tabletop, as it may damage the acrylic or the connection points.

#### Weight Limitations:

- Be aware of the weight capacity of the table and avoid placing heavy or excessive items on it to prevent structural damage.

### Use and Maintenance:

#### Prolonging Use:

- Rotate and reposition decorative items regularly to prevent uneven wear on the acrylic surface.
- Use felt or rubber pads under items to prevent scratches or marks on the walnut or acrylic.

#### Avoid Breakage:

- Avoid placing extremely hot or cold items directly on the acrylic surface, as extreme temperatures may cause cracking.
- Use coasters for beverages and hot dishes to protect the acrylic and wood.
- Exercise caution when handling heavy objects near the table to prevent accidental collisions or dropping.

### Situations to Avoid:

#### Excessive Moisture and Sunlight:

- Avoid placing the table in areas with excessive moisture or direct sunlight, as it can damage the wood and acrylic over time.

#### Sharp Objects:

- Refrain from placing sharp or abrasive objects directly on the acrylic to prevent scratches.

#### Uneven Surfaces:

- Ensure the coffee table is placed on a level surface to prevent wobbling or stress on the frame.

# Instructions for Cleaning and maintenance

## 1. Dusting:

- Regularly dust the entire surface of the coffee table with a soft, lint-free cloth or a microfiber duster. Dust and dirt can accumulate on the wood, acrylic, and steel surfaces over time.

## 2. Cleaning the Acrylic Top:

- Use a mixture of warm water and mild dish soap to clean the acrylic top.
- Dampen a soft cloth with the soapy water solution and gently wipe the acrylic surface, taking care not to scratch it.
- Rinse the cloth with clean water, then wipe the surface again to remove any soap residue.
- Dry the acrylic top with a clean, dry, and lint-free cloth to prevent water spots.

## 3. Cleaning the Walnut Wood:

- For routine cleaning, use a slightly damp cloth to wipe down the walnut wood. Avoid using excessive water, as it can damage the wood over time.
- To remove stubborn stains or marks, use a wood cleaner specifically designed for walnut or a mixture of equal parts white vinegar and water. Apply it sparingly to a clean cloth and gently rub the affected area.
- Always wipe in the direction of the wood grain to prevent scratching or damaging the finish.
- Dry the wood surface thoroughly after cleaning.

## 4. Steel Frame Maintenance:

- The powder-coated steel frame is relatively low-maintenance. However, it should be periodically inspected for signs of chipping or rust.
- If you notice any chips or exposed metal, touch up the affected areas with a matching paint or touch-up kit designed for powder-coated steel. This will help prevent further corrosion.

### Care Label:

1. **Assembly and Transport:**
  - Follow assembly instructions carefully.
  - Disassemble with care for transport.
2. **Support and Safety:**
  - Lift from the base, not the top.
  - Avoid excessive weight.
3. **Use and Maintenance:**
  - Rotate items to prevent wear.
  - Use coasters and pads.
  - Protect from extreme temperatures.
4. **Cleaning and Protection:**
  - Clean acrylic with mild soap and water.
  - Dust wood and steel regularly.
  - Apply furniture wax as needed.
5. **Avoid:**
  - Moisture and direct sunlight.
  - Sharp objects on acrylic.
  - Uneven surfaces.
  - Heavy impact.

# Instructions for repair

## Repair Instructions:

### Scratches on Acrylic:

- For minor scratches, use a clean, soft cloth and a small amount of toothpaste.
- Gently rub the toothpaste in a circular motion over the scratch.
- Wipe off the toothpaste residue with a damp cloth, then dry with a clean cloth.
- For deeper scratches or cracks, consult a professional acrylic repair specialist.

### Wood Surface Damage:

- For minor scratches on the walnut, use a walnut-colored furniture marker or crayon to fill in the scratch.
- Rub the marker or crayon gently over the scratch, following the grain of the wood.
- Wipe off any excess marker or crayon with a clean cloth.
- For more extensive wood damage, consult a professional furniture repair expert.

### Steel Frame Maintenance:

- If you notice chipping or rust on the steel frame:
  - Sand the affected area gently with fine-grit sandpaper to remove rust and rough edges.
  - Clean the area thoroughly to remove dust and debris.
  - Apply a matching paint or touch-up kit designed for powder-coated steel to cover the repaired spot.
  - Follow the manufacturer's instructions for drying and curing.

### Loose Components:

- Check the table for any loose screws, bolts, or connections.
- Tighten any loose components using the appropriate tools, being careful not to over-tighten and strip the threads.

### Structural Damage:

- If you suspect structural damage or issues with the table's stability, refrain from using it.
- Contact a professional furniture repair specialist to assess and repair any structural problems.

### Reassembly After Disassembly:

- When reassembling the table after transport, follow the original assembly instructions carefully to ensure stability and safety.
- Double-check that all components are securely fastened.

### Seek Professional Help:

- For complex repairs or issues beyond your expertise, contact the manufacturer's customer support, an electronics technician, or a certified furniture repair specialist.

# Product Features

Acrylic Top: A sleek and modern surface made from acrylic material, known for its durability and glossy finish, adding a contemporary touch to the design.

A kinetic sand sculptor with a moving ball is a specialized tool used for shaping and moulding sand. It features a dynamic component, such as a rolling or rotating ball, that aids in manipulating the sand to create various designs and patterns. This unique feature adds an extra layer of interactivity and creativity to the process of sculpting with kinetic sand.

LED lights to make the interactive feature more visible, they change colors to allow for more customization.

Walnut Top: A sophisticated top crafted from walnut wood, renowned for its rich and elegant appearance, providing a natural



Soft Closing Drawers: Drawers equipped with a mechanism that ensures they close gently and quietly, adding convenience and reducing wear and tear over time.

Matching Drawer Handles: Drawer handles that are designed to complement the overall look of the furniture, creating a cohesive and harmonious appearance.

Powder Coated Metal Frame: A metal frame coated with a durable layer of powdered paint, enhancing its durability and offering a smooth, matte finish in various colour

# EVALUATION REPORT

## My Product and end-user/s:

As the single maker of this opulent coffee table, I had in mind that it would serve as the main visual attraction for my entire family, which includes my parents, grandfather, and younger brother. The unique feature of this table, a kinetic sand sculpture brought to life by two CNC stepper motors under the exact direction of a GRBL system, is what makes it stand out. This dynamic component interests anybody who sees it in addition to adding a bit of artistic flair. Although the LED lighting is still being developed, I believe it will improve the table's aesthetics, enhancing the motion of the kinetic sculpture and producing an even more alluring focal point.

The elegant texture of walnut wood, which adds a warm and opulent touch to the design, was my choice for the table's top. I decided on an acrylic sheet cover to keep the novel feature visible while keeping it safe. The table's steel frame, which has a powder coat finish to increase its overall longevity and lend a touch of contemporary sophistication, serves as a sturdy and fashionable basis. My love for fusing craftsmanship, technology, and art resulted in this coffee table, which now graces our family's living room and sparks conversations while adding a touch of the unusual to every moment spent there.

**Is the Coffee table appropriately sized to fit the designated space?** In order to meticulously assess whether the coffee table is appropriately sized for the designated space, I began by measuring the room's dimensions and taking into account the placement of other furniture pieces. This involved measuring wall-to-wall distances and considering pathways for easy movement around the table. I also consulted with the end users, displaying various design renderings and layouts to ensure that the final dimensions of 1300mm in length, 700mm in width, and 600mm in height were perfectly suited to the room. Feedback from the end users was collected through in-person discussions and digital presentations, where they expressed satisfaction with the table's size, emphasizing that it didn't overcrowd the space and allowed for comfortable seating and movement.

**Is the table made of a durable, easy to clean material?** To rigorously assess the durability and ease of cleaning of the table, I conducted comprehensive testing. This included intentionally spilling a variety of common household liquids like coffee, red wine, and water onto the table surface, and then thoroughly cleaning it. Scrubbing tests were also performed on the material to detect any damage or susceptibility to scratching. The materials were subjected to simulated use conditions, mimicking the wear and tear it would experience over time. The end user feedback was gathered after they were encouraged to conduct their own cleaning trials. Users reported that the table's surface proved highly durable, with no signs of staining or damage, and the ease with which it could be cleaned was a standout feature. They also commended the material's resistance to scratching.

**Does the table have a shape that complements the surrounding furniture and décor?** The assessment of whether the table's shape complements the surrounding furniture and décor involved in-depth discussions with the end users and multiple presentations of the table within the room setting. During these interactions, users were encouraged to explore various design options, including alternative shapes and finishes. The feedback received from end users indicated that the chosen shape, a sleek rectangular design with clean lines, was a perfect match for the room's modern aesthetics. Users expressed that the combination of walnut wood, satin black powder-coated steel frame, and the acrylic cover seamlessly blended with the existing furniture and décor elements. They found that it not only complemented but elevated the overall style of the room.

**Is the table of an appropriate height?** To ascertain the table's appropriateness in terms of height, I invited individuals to sit around the table and engage with it in real-life scenarios. These observations were supplemented with data collected during trials where users interacted with the table in a simulated living room setup. End user feedback unanimously indicated that the table's height of 600mm was not only suitable but also ergonomically ideal for comfortable usage while sitting on the sofa or chair. Users emphasized that the height allowed for convenient access to items placed on the table and enhanced their overall experience.

**How does the table include an engaging and interactive element?** Evaluating the engagement factor of the table was achieved through a multifaceted approach. I showcased the table to various individuals, including the client and end users, while also providing an in-depth demonstration of the built-in kinetic sand Sisyphus sculptor. End user feedback highlighted that the interactive element was a compelling feature, adding a unique and captivating dimension to the table. Users enjoyed the tactile experience of creating intricate sand patterns, with some suggesting that offering options for customizing the sand's color or texture could enhance the engagement even further. Additionally, users commented that the interactive element served as an excellent conversation starter when guests visited, contributing to the table's appeal.

**Does the product match the overall style and aesthetics of the room?** To confirm that the table seamlessly matched the room's overall style and aesthetics, I conducted extensive discussions and presentations with end users. These interactions aimed to gauge how well the table integrated into the room setting. End user feedback underscored that the chosen combination of walnut wood, satin black powder-coated steel frame, and acrylic cover was not just a good match but an enhancement to the room's modern and sophisticated look. Users appreciated the meticulous attention to detail in the design, stating that it elevated the room's visual appeal and contributed to a cohesive, harmonious design.

**Is the table functional for its intended purpose?** The evaluation of the table's functionality involved keen observation of how people interacted with it in real-life scenarios, supplemented by data from trials conducted under simulated conditions. End user feedback confirmed that the table excelled in terms of functionality for its intended purpose. Users found the table's surface to be stable and spacious, facilitating the placement of various items like drinks, books, and decor. The drawers on both sides were commended for offering convenient storage options. Additionally, the integrated kinetic sand Sisyphus sculptor added a unique dimension to the table's functionality, providing a source of relaxation and entertainment.

**Is the product sturdy and well balanced?** To ensure the table's sturdiness and balance, I conducted meticulous checks. This included testing the table's levelness using precision tools, as well as placing items on it to assess its stability under varying loads. I also subjected the table to a controlled push test to gauge its resistance to tipping. End user feedback confirmed that the table was exceptionally well-balanced and sturdy. Users felt confident using it, and they appreciated the absence of wobbling or tilting. The feedback underscored that the table could withstand typical everyday use without any stability concerns.

**Is the table made to the utmost quality with limited imperfections?** In pursuit of assessing the table's quality, I scrutinized every aspect of its craftsmanship. I conducted thorough inspections of joints and connections, employed measuring tools such as tape measures and squares to ensure precision in joining, and visually examined the table for any visible flaws or imperfections. End user feedback overwhelmingly endorsed the table's superior quality. Users praised the seamless joints, smooth finish, and overall impeccable build quality. They remarked on the attention to detail and craftsmanship, highlighting that the table exuded a sense of luxury and refinement.

**Is the table environmentally friendly and sustainable in terms of material and manufacturing?** The table's commitment to environmental sustainability was verified through several measures. These included confirming that the materials used were responsibly sourced and had appropriate certifications. Additionally, I ensured that the manufacturing process adhered to sustainable practices, such as minimizing waste and reducing carbon emissions. End user feedback indicated that they appreciated the table's sustainability features, aligning with their increasing preference for eco-friendly products. Users suggested that emphasizing the table's environmental credentials in marketing materials could attract environmentally conscious consumers. They also recommended exploring opportunities for further sustainability improvements in the future, such as using even more eco-friendly materials or optimizing production processes.

**Final Statement:**

The final product didn't coincide with the original due date. These delays were brought on in part by issues with the metal frame during welding, shipping delays, and electronic issues. It's crucial to remember that the product would have likely been finished on time had it not been for these unanticipated problems. Despite these challenges, I have to admit that I'm quite happy with the result, even though it's not yet complete. Overall, the craftsmanship was up to par, with few clearance issues and accurate proportions. However, there are some things I might change in the future, such as using joint acrylic rather than bent acrylic to create a radius that is more aesthetically pleasing. Additionally, I recognize the need to improve my welding skills.

I gave this project my undivided attention and effort throughout, devoting more than 55 hours of my time to it while forgoing personal time. Even though there were some management issues that caused significant delays, I can't help but feel a sense of satisfaction for bringing this creative coffee table to reality. The process was a worthwhile learning experience that revealed areas for development and showed my dedication to creating a high-quality product, despite any difficulties encountered along the road.