



NIGHT Pro

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"Innovation distinguishes between a leader and a follower." - Steve Jobs

"Design is not just what it looks like and feels like. Design is how it works." - Steve Jobs

Preface:

It was in the late 2018 that I initially started on the coursework component of the IGCSE Design & Technology course. Since then, I have had immense improvement from the time that I had started this course to the time that I ended the IGSCE Design & Technology course. I was able to improve skills in planning, modeling using computer programs, thinking outside the box & of course building. I have also become a better reflector which would improve my life immensely. It would be an honor to share this project with you & hope that you will find this journey through research, design, manufacturing & evaluation as inspiring as I have.

"Projects we have completed demonstrate what we know – future projects decide what we will learn." – Dr. Mohsin Tiwana



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Health & Safety

Health & Safety

It is the regulations & procedures needed to be followed to prevent accidents or injuries in workplaces or public environments.

The biggest danger in the D&T room is YOU!

You are at risk when you don't understand the hazards or you are careless, or both. The person most likely to suffer from your mistakes is YOU!

1. Only enter a D&T room when told to do so by a teacher.
2. Never rush about or throw things in a D&T room.
3. Keep your work area & floor area clear, with bags & coats well out of the way.
4. Follow instructions precisely; only touch or use tools, equipment, machines & materials when told to do so by a teacher.
5. Never remove anything from any D&T room without permission.
6. Wear eye protection when told to do so & keep it on until you have finished the work that needs the eye protection.
7. When using naked flames (e.g. gas torches in workshops, gas cookers in food rooms), make sure that ties, hair, baggy clothing, etc. are tied back or tucked away.
8. Always stand up when doing practical work in workshops so you can quickly move out of the way if you need to.
9. Always wash your hands carefully before starting work in the workshop & after the end of lessons in all areas.
10. If you are scalded, burnt or a chemical splashes on your skin, wash the affected part at once with lots of water. Tell your teacher. Also report any cuts or abrasions.
11. Report all spillage of any substance or anything that breaks to your teacher.



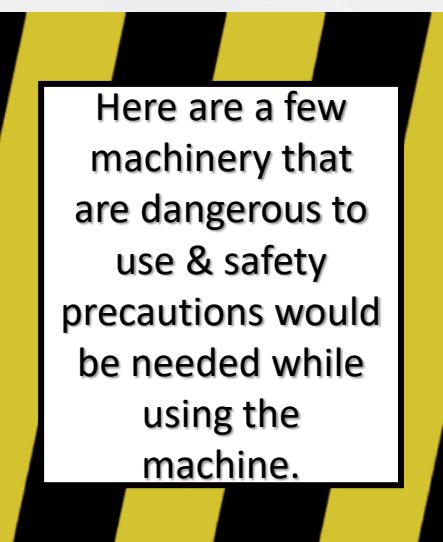
Toxic



Flammable



Explosive



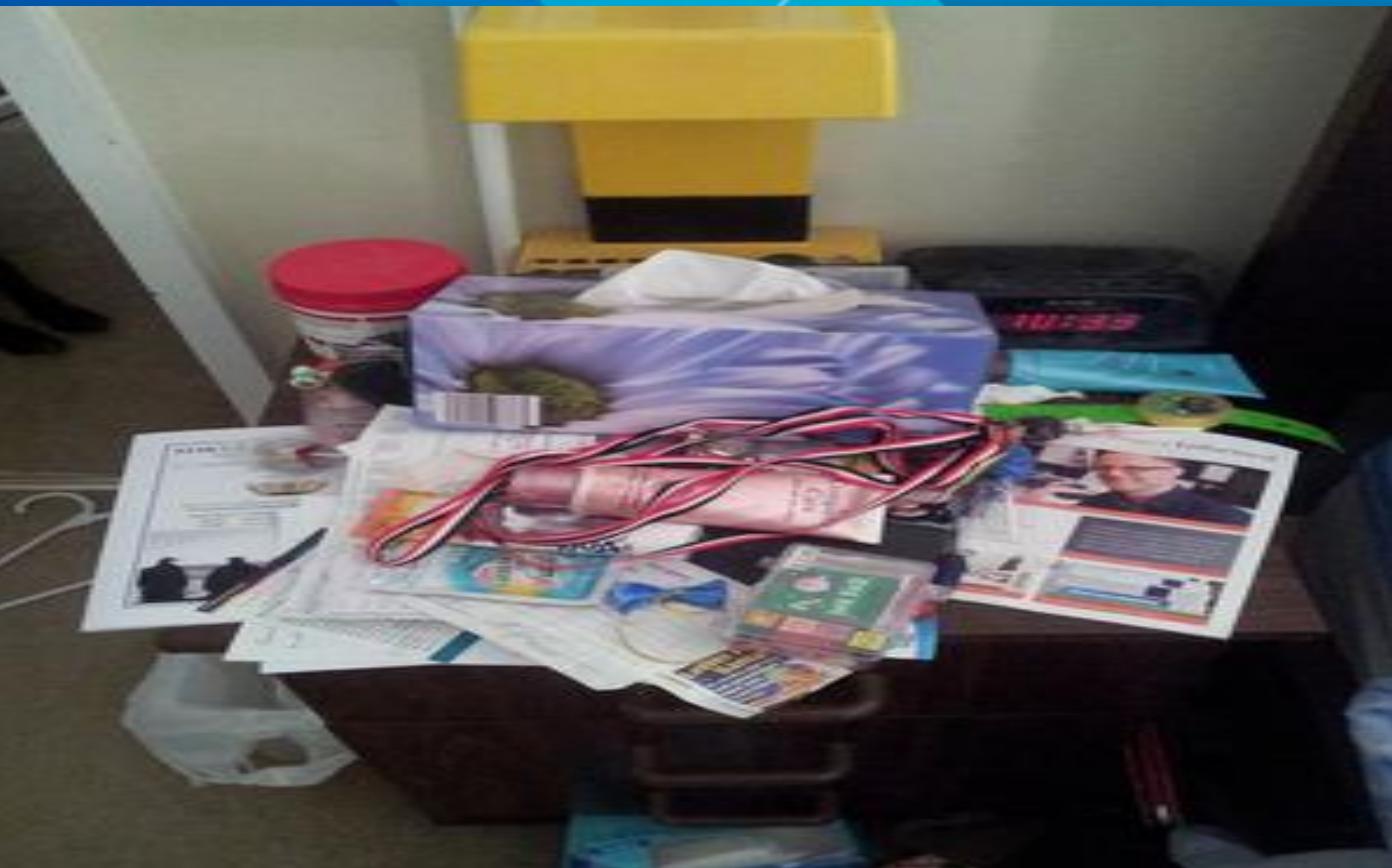
Introduction – Situation & Design Brief

SITUATION

Making everything compact is not new idea in the market. It has been there for many years. A lot of people's bedside tables are full of things. This leaves little or no space to keep new things on their bedside tables. Many of them would think of investing into bigger tables but, it wouldn't be practical. A lot of people in the world also have problems with organizing their belongings, especially at night when they are tired & would like to sleep. The picture on the right shows a messy table.

Many people are looking for ways of organizing basic things kept on the bedside table. They are also looking for multiple features & something compact that would help them organize their bedside tables. They also want something that is aesthetically pleasing & is possibly easy to use.

There is certainly gap in the market for a product that is compact and has features such as spectacle holder, lamp, mobile holder, a book holder with some extra features to be kept on the bedside table.



DESIGN BRIEF

As a designer and innovator, I have taken the situation into deep consideration, I have decided to develop and produce a multi - purpose unit that can be used as a spectacle holder, lamp, mobile holder, a place to keep books along with some extra features. This unit shall help to keep the bedside table clean & organized. The project should be at the same time aesthetically pleasing to the user.



The unit should incorporate all the functions listed in the situation and should meet the requirements outlined in a unique way & should be something practical.

Task Analysis

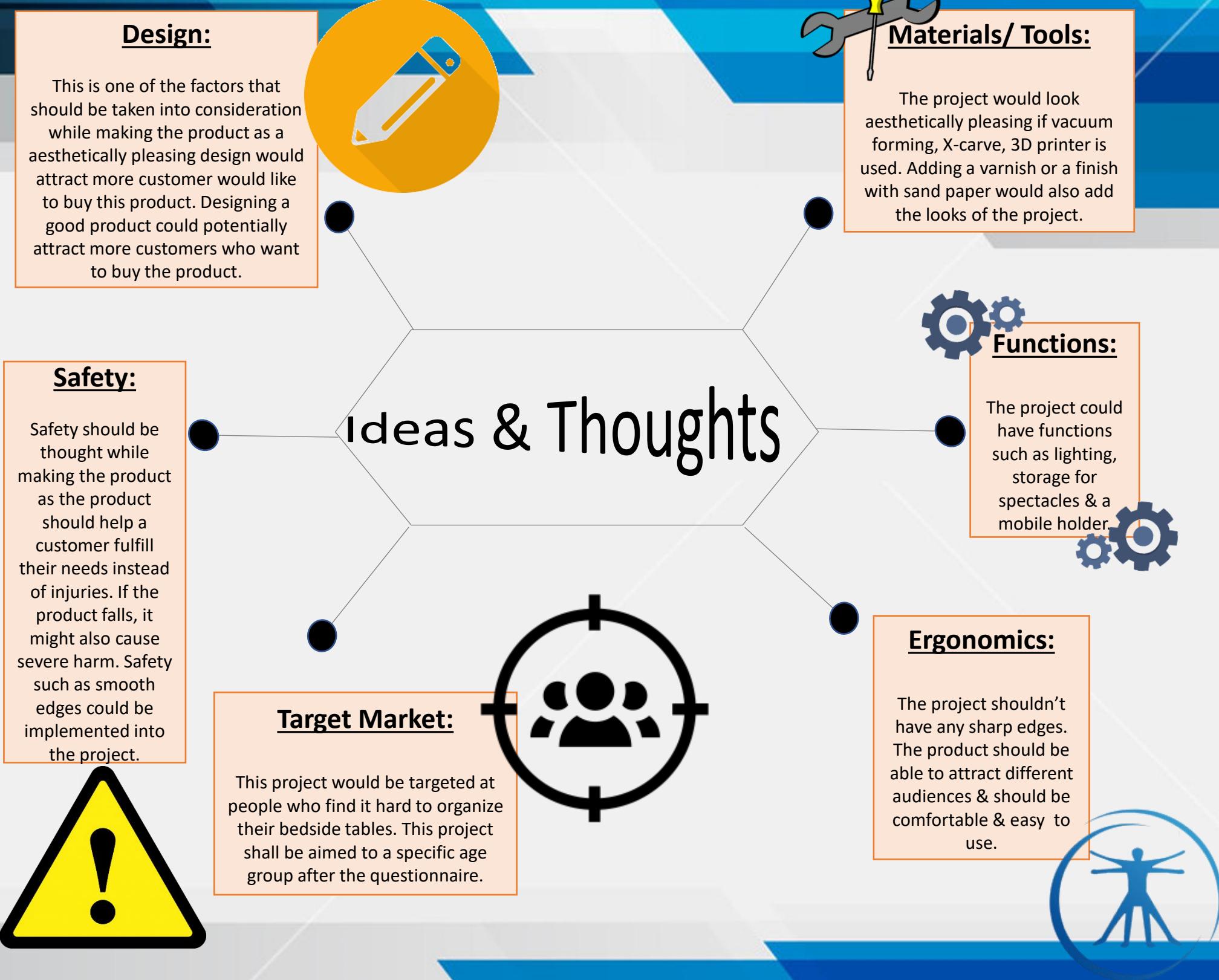
**Target Market:****Shape:****Functions:****Measurements:**

Image Board

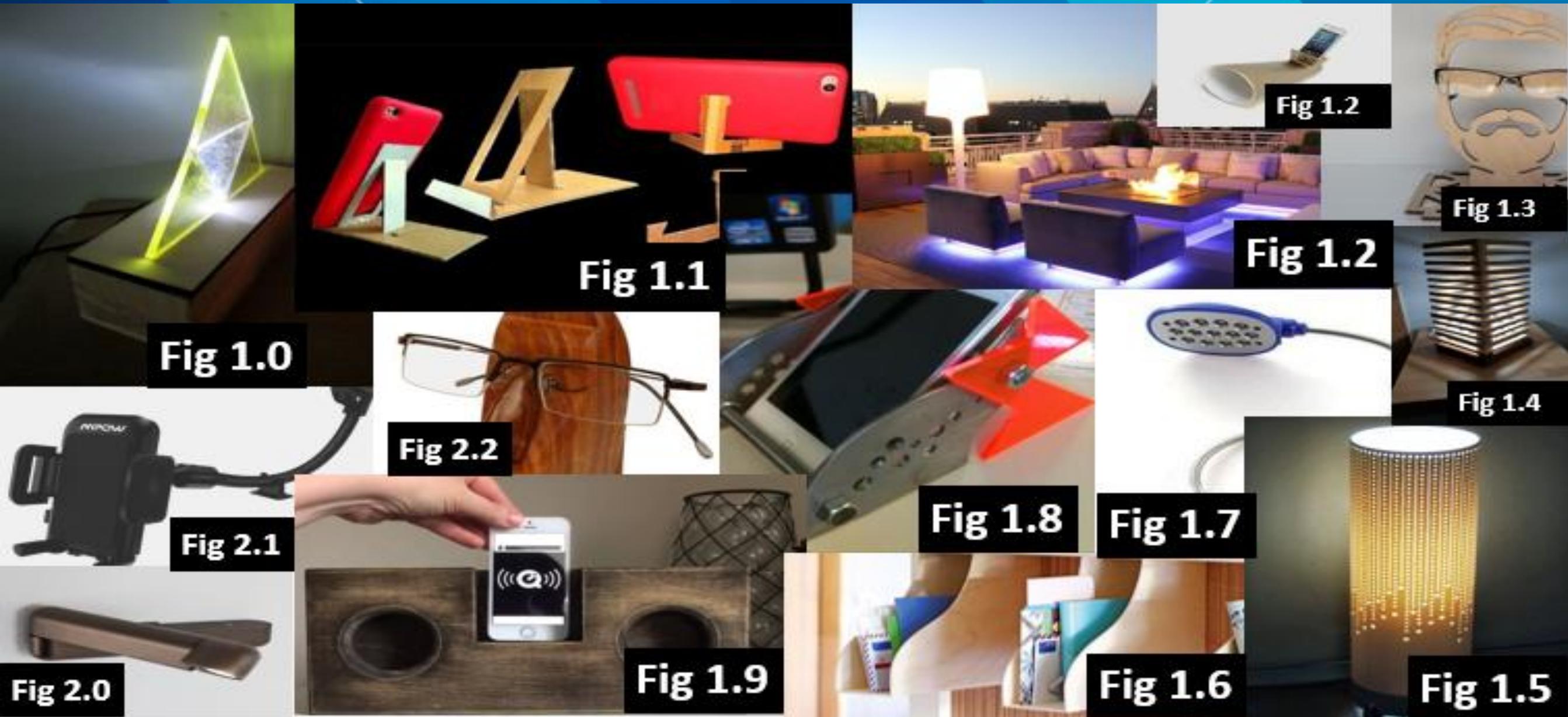


Fig 1.0, Fig 1.2, Fig 1.4, Fig 1.5, Fig 1.7 & Fig 2.0 show different examples of light/lamps. In the product, light shall be a vital part due to it being an night organizer.

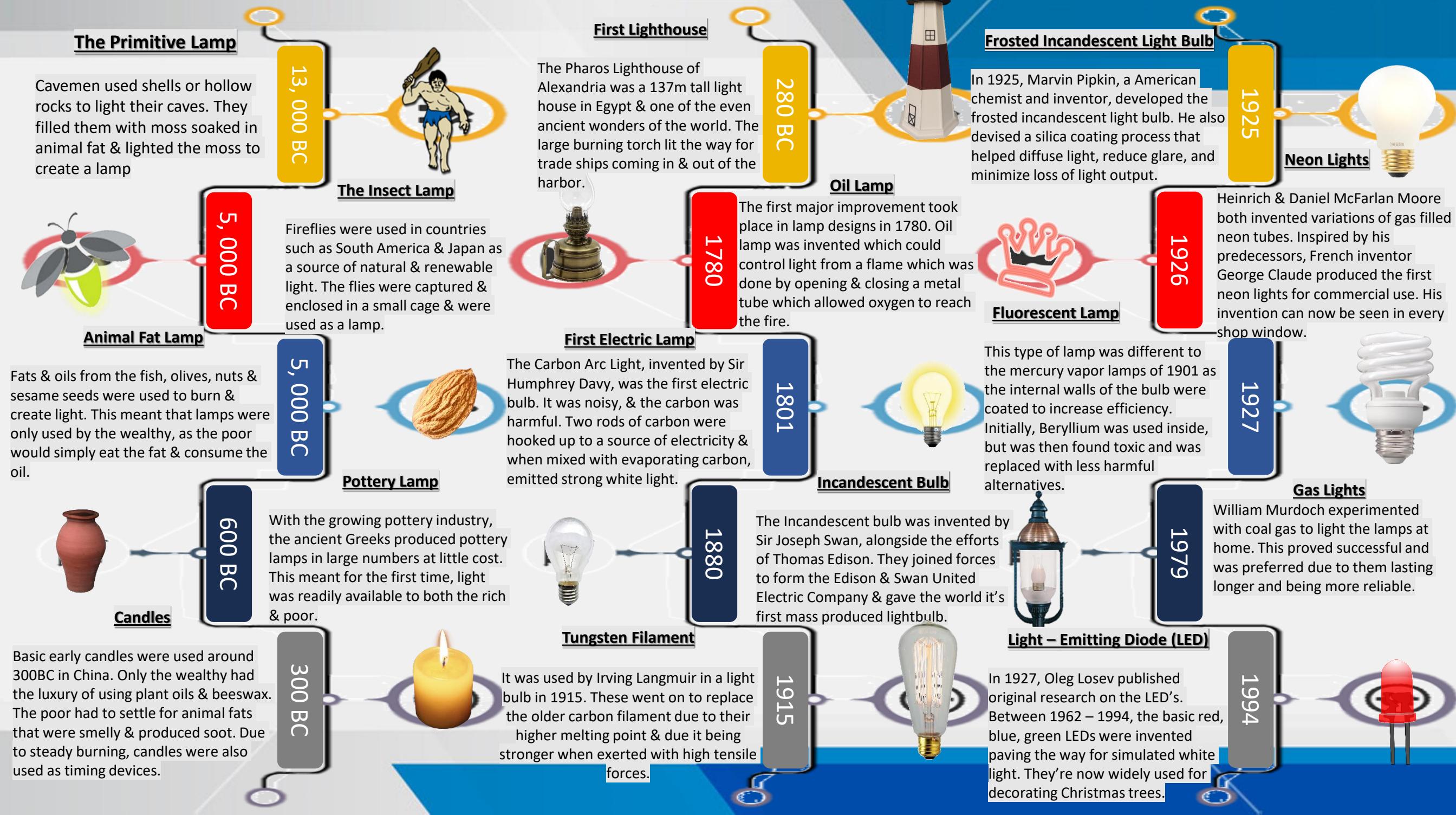
Fig 1.1, Fig 1.2, Fig 1.8, Fig 1.9 & Fig 2.1 show different ways of mobile stands along with some amplifier examples. In the product, a mobile stand would be a vital part as it can be used as a music system & a alarm clock.

Fig 1.3 & Fig 2.2 show the different ways a spectacle could be held. As a lot of people, in today's world wear glasses, this is something which shall be implemented in the project to increase the target market.

Fig 1.6 shows how books could be sorted. As a lot of people read books before they go to bed, this is something that is easy to make & can be implemented in the project to increase the target market.

Product History - Light

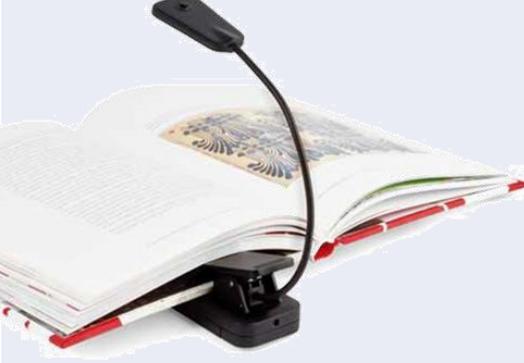
From the strike of a match to the flick of a switch, how we light our lives has drastically changed over the past few millennia. New innovations are happening everyday & light is playing a larger part in our everyday lives.



Product Analysis 1

<u>Product</u>	<u>Features</u>	<u>Advantages</u>	<u>Disadvantages</u>	<u>Rating</u>
	- This is a desk lamp organizer. There are a lot of components situated at the base of the lamp. This allows the user to store scissors, pencils, pens & a mobile phone.	- The color black is a neutral color that could go with any desk. - The component at the bottom allow the product to be used at its maximum & reduces space wasted by large bases of conventional lamps. - The material is plastic which is a good thing as it is easy to clean.	- The metal rod is fixed which means that the light cannot be directed to the wanted place. - Some people might not like the color black - Some people might not find the design aesthetically pleasing.	
	- This is an Apple organizer which allows the user to organize an Apple mobile phone, an Apple smartwatch. It also allows the user to keep things such as pens.	- The product is varnished which would increase the product's lifetime. - It has a natural look. - It is easy to use. - Simple but pleasing design. - There is a place for the charging wire to charge the phone.	- It might be difficult to access items kept at the back rows - Some people wouldn't like the natural wood design. - The user can only keep up to three pens. - Some people wouldn't find any use for buying this product.	
	- This is a simple organizer which allows the user to organize a watch, sunglasses & mobile phone. It also gives space to hang & keep other items.	- Allows the user to keep whatever they want. - Simple & nice design.	- The natural wood used is too dull; isn't aesthetically pleasing. - No soft padding to keep sunglasses. - No area for charging wire.	

Product Analysis 2

<u>Product</u>	<u>Features</u>	<u>Advantages</u>	<u>Disadvantages</u>	<u>Rating</u>
	- It is an ancient looking desk organizer which allows the user to store devices, book & paper. This is made out of hardwoods & shall appeal to people who like to keep ancient items.	- It's antique looks would appeal to some people. - Simple storage for devices, books & paper. - The use of the pipe design to hold the bulb adds to its antique look. - Simple & compact.	- Uses Incandescent bulb which isn't bright as LED bulbs & uses a lot of power. - Some people might not like the antique look. - Small items stored in the product might not be easily found.	
	- This is an multi – usage product that can be used to read at night with the use of the LED light & could also be used as a bookmarker.	- Uses the color black which is a neutral color. - Uses LED lights which are powerful & energy efficient. - Has a clip at its base to hold on to books. - Bendable wire to allow light to be pointed where the user wishes. - Comfortable to use as it is runs on battery.	- Useful for books only or for things that could be held on to. - Some people might not like the color black. - Item usage limited to battery quality & life. - Some people wouldn't find any use for buying this product.	
	- This is a desk lamp organizer. There are a lot of components situated at the base of the lamp. This allows the user to store scissors, pencils & pens.	- Uses the color black which is a neutral color. - Uses LED light which is both powerful & energy efficient. - The component at the bottom allow the product to be used at its maximum & reduces space wasted by large bases of conventional lamps. - The material is plastic which is a good thing as it is easy to clean.	- Some people might not like the color black. - Can store only tall items such as pencils & no short items such as rubbers. - The light is fixed which means that the light cannot be directed to the wanted place.	

Product Analysis 3 - Deeper

Introduction:

- It is an ancient looking desk organizer which allows the user to store devices, book & paper. This is made out of hardwoods & shall appeal to people who like to keep ancient items.

Aesthetics:

- The aesthetics of this product is a combination of the ancient & minimalist themes. The use of hickory wood which has a dark color adds to the ancient looks of the product & can easily match with a lot of interior designs as the color is quite neutral. The pipe design is made from steel which some people might not find aesthetically pleasing if it becomes tarnished or rusted.

Cost:

- This product is about \$100 which is quite expensive to a few customers but the making of the product would have cost them quite a lot in order for the product to look ancient

Target Market:

- This product is targeted towards users who usually are organized but sometimes aren't due to busy schedules. This product would help them to organize their basic utilities such as mobile phones, books, etc.

Size:

- This is a medium – sized product which is 1000mm by 450mm.

Safety:

- This product is not quite safe. Due to it being very heavy, if the product falls, it could be quite dangerous. It also has sharp edges which would add to the danger.

Function:

- The product is aimed at the nightly routine of the user. The product has a bulb along with a place to store books, paper & mobile phone for the user to read, make lists or use their phone before they go to bed.

Incandescent Bulb



Manufacture:

- This product uses hickory wood as the main body of the product. To add to its theme, the product uses a steel pipe & an incandescent bulb.

Ergonomics:

- There weren't any ergonomic considerations made in the designing of the product as there is minimal contact of the user with the product. However, there weren't even any considerations taken for the objects that were kept in the product though they had full contact with the product.

Environment:

- The product is made for everyday use especially at night when the user would like to read a book or make a list for the next day. It is made for internal use meaning that it could be used anywhere inside the house.

Product Analysis 5 - Deeper

Manufacture:

- This product uses birch wood as the whole body of the product.

Ergonomics:

- There weren't any ergonomic considerations made in the designing of the product as there is minimal contact of the user with the product. However, there were some considerations taken to secure the Apple items in the stand; such as holes for the stylus, etc. The edges were also rounded to reduce the risk of cutting the user.

Environment:

- The product is made for everyday use especially at night when they would like to keep their Apple products organized for the next day. It is made for internal use meaning that it could be used anywhere inside the house.

Watch Stand



Introduction:

- This is an Apple organizer which is made of softwood & allows the user to organize an Apple mobile phone, an Apple smartwatch. It also allows the user to keep things such as stylus.

Aesthetics:

- The aesthetics of this product is a combination of the simple & minimalist themes. The use of birch wood which has a light color adds to the good looks of the product & can easily match with a lot of interior designs as the color is quite neutral.

Cost:

- This product is about \$25 which is quite cheap to a few customers but the making of the product would have cost them quite a lot of time to be made perfect.

Target Market:

- This product is targeted towards users who utilize Apple products. This product would help them to organize their basic Apple items such as watches, stylus & mobile phones.

Size:

- This is a small – sized product which is 500 mm by 100 mm.

Safety:

- This product is quite safe as it is very light & easy to carry around. Also, the rounded edges help reduce other dangers.

Function:

- The product is aimed to help Apple user organize their products such as mobile phones, watches, etc.

Product Analysis 4 -

Deconstruction

Lo: To analyze similar products: features, advantages & disadvantages to reduce any flaws in the project.

The two detailed analysis were seen and the product that was more similar to the design brief was deconstructed in order to understand what the current market has done in order to improve the product.

Incandescent Bulb

3 Compartments

Book Storage

Paper Storage

Steel Pipe

Hickory wood

Finger Joint

Mobile Stand

Screw Joint

Materials:

Three types of materials have been used in this product during manufacture. These three materials are:

- Hickory Wood
- Steel Rod
- Incandescent Bulb



Steel and Bulb:

Steel was used in their daily lives everyday due to its rust resistance and strength. Incandescent bulbs were also being used.

This product uses a steel pipe & an incandescent bulb as they were the materials used during that period.

3 Compartments

Book Storage

Paper Storage

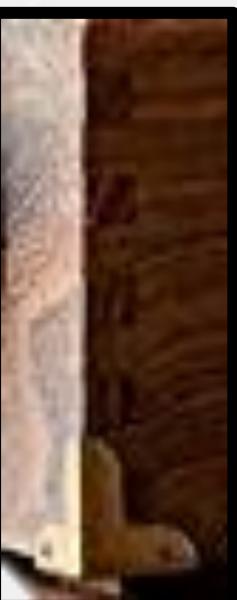
Finger Joint

It is an ancient looking desk organizer which allows the user to store devices, book & paper. This is made out of hardwoods & shall appeal to people who like to keep ancient items.

Compartments:

Compartments have been used for many years. They have been used for separating items, especially for organizing them.

There are three compartments that have been made in this project as the three compartments allows the user to store items in three different categories, such as book, paper and mobile.



Introduction:

Joints:

Two types of joints have been used in this product. These two joints are:

- Finger Joint
- Screw Joint

Finger Joint:

This joint is very commonly used in projects due to it's capability to have a higher glue area. This joint always has a odd number of fingers.

This joint has been used in this project as the large glue area allows the glue bonds to be stronger. This joint also gives this project an esthetically pleasing and eye-catching look.

Hickory Wood:

Hickory wood has quite a strong color contrast, going from a gorgeously deep brown heartwood to a creamy white sapwood. It is also very durable.

This product uses hickory wood as the main body of the product as it has an ancient theme. Its durability allows it to be preferred by customers.



Screw Joint:

This joint is very commonly used in projects due to it's capability to strengthen the joints. This joint is quite easy to use and put together.

This joint has been used in this project as the joint strengthens the joint to the hickory wood. This joint also gives this project an esthetically pleasing and eye-catching look.



Target Market Profile



For my target market user, Kyle Baptista was chosen because he was looking for a bedside organizer in the market that would help organize his things.

Job: Student in High School

Age: 16

Role: School Friend

Home: Apartment

Question	Response
What type of furniture interior design do you like best in your home?	I like designs which are minimalist and, at the same time, natural.
When do you use a light and organiser the most?	At night, as a bedside light to read or keep my things organized, for the next day, before sleeping.
Are there any particular colors, shapes or styles that appeal to you in a home?	I like simple and minimalist things that look natural. They should be attractive.
What would be the maximum price you would spend on a light and organizer?	I would spend up to AED 500 but I would have to like it a lot and it would have to organize all, or at least most of my things.
Is there any type of lamp and organizer you like the most?	I would like to have an organizer that would be able to store my glasses, watch, mobile phone & other small stuff. The light color and intensity should be available for me to control.
Which room in the house do you think needs a light the most?	I think that the bedroom needs the most lighted as I like to read before going to sleep.
Are there any materials you like in a lamp and organizer?	I would like the materials to be biodegradable, meaning that no plastics should be used.
What do you look for when buying a lamp and organizer?	I look for something that can organize all my things



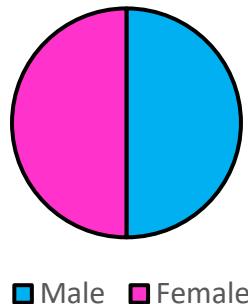
A target market is a group of people that the product or service gets directed towards.

The images shown above are some of the organizers that took care of most of his needs but not all of them. These designs have a minimalistic design and are mainly made from wood.

By doing this target market profile, the wants of the real market can be understood and could be used to refer to throughout the project.

Questionnaire 1

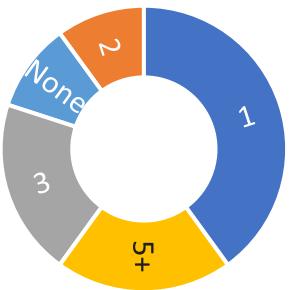
Gender



1) What is your gender?
Male(5) Female(5)

This question's purpose is to make sure both genders are taken into consideration during the project.

Organizational Products



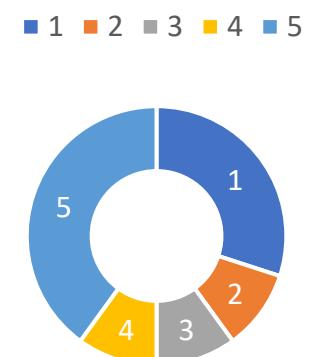
Most people claim to have 1 organizational products and with organization being the current issue, the potential demand of the product would be quite high as it serves a purpose that will be of use.

4) Do you own any products that keep you organized? If yes, how many?

1(4) 2(1) 3(2) 4(0) 5(0)
5+(2) None(1)

This question's purpose is to understand their current needs in order for them to stay organized.

Clutter

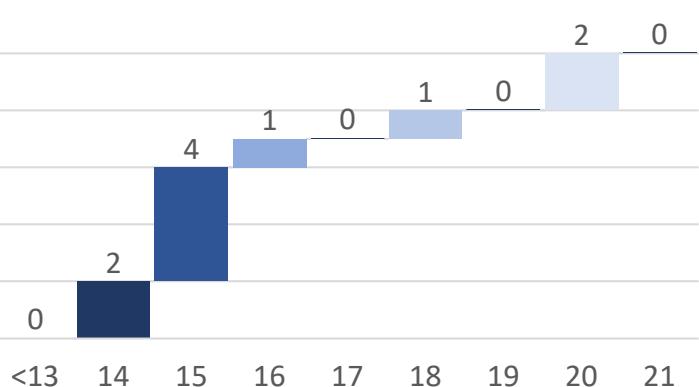


6) On a scale of 1 to 5, how much clutter is there on your bedside table?

1(3) 2(1) 3(1) 4(1)
5(4)

This question's purpose it is understand the extent at which the users face the problem in order for the project to solve the problem.

Age



2) What is your age?

< 13(0) 14(2) 15(4) 16(1) 17(0) 18(1) 19(0)
20(1) 21+(1)

This question's purpose it is understand the age group in order to predict different designs and functions.

Findings show that the product would mainly be targeted at ages 13+. This includes many people who are teenagers or are young adults and so the product must be made suitable for their lifestyles and satisfy their needs.

Accumulation of Clutter



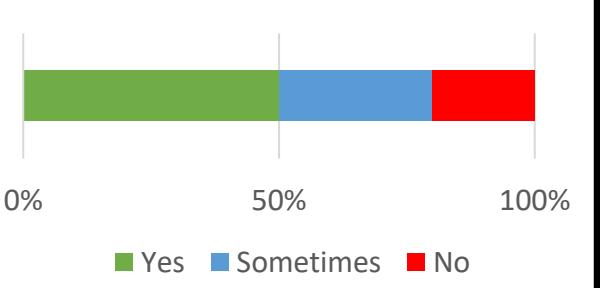
5) Have you ever noticed the accumulation of clutter on your bedside table?

Yes(6) No(4)

This question's purpose it to make sure that the product is being designed to solve a problem and that the design brief is being met.

Responses indicate that there is a good demand for a product which addresses the issue of bedside table clutter and so the product must address this. If it doesn't, then it would only add to the clutter.

Struggle



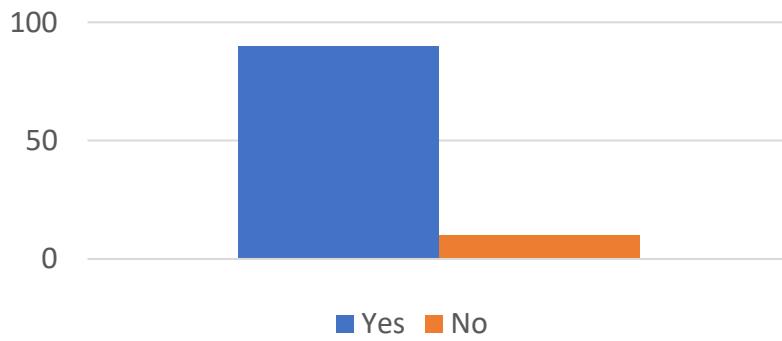
3) Do you struggle with organization?
Yes(5) No(2) Sometimes(3)

This question's purpose is to understand if this project is going to be useful to be launched in the market.

The majority of the 10 people questioned, have some difficulty in keeping their workspace and home organized. Designing a product that would organize would be very beneficial as it would attract a lot of customers.

Questionnaire 2

Lamp & Storage



7) Would you use a multipurpose product which includes a lamp and a multifunctional storage unit?

Yes(9) No(1)

This question's purpose is to understand and confirm if a storage unit and a lamp could be a suitable solution to the problem.

The results of this question confirms that there is a strong demand for this type of product. As the numbers of those whom chose 'yes' was higher, there is evidently shows the high necessity for the product to have a multipurpose lighting and storage product. This further confirms that the concept of the product is a suitable solution to the design brief.

Functional vs Aesthetics

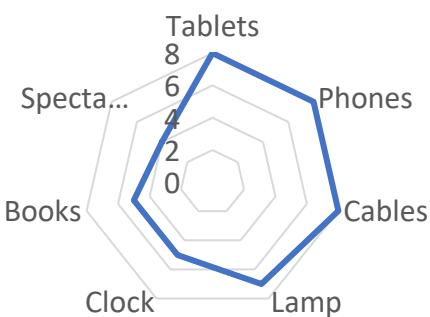


9) What size should the product be?
Small(2) Medium(6) Large(2)

This question's purpose it to understand the wants of the user in order for them to buy the product.

The most common size is medium sized. Several people informed that their bedside tables were good enough for medium sized products. Though quite a few people still asked for a smaller or larger size due to the size of their bedside table.

What do you store?

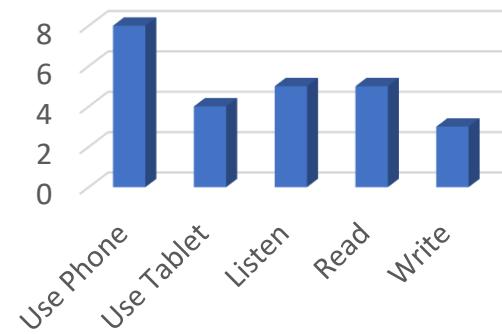


10) Which of the following items do you store or place on your bedside table?

**Tablets(8) Phones(8) Lamp(7)
Clock(5) Books(5) Cables(8)
Spectacles(4)**

This question's purpose it is understand the features wanted by the user in the product.

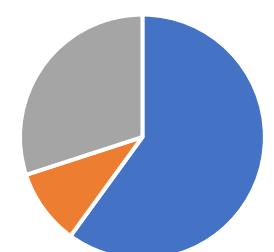
Activities



11) Which of the following activities do you do most often immediately before sleeping and immediately after getting up?

**Use phone(8) Use tablet(4)
Listen to music(5) Read(5)
Write on paper(3)**

Interest



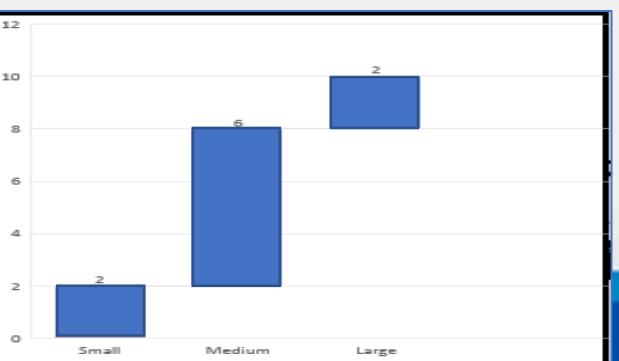
■ Yes ■ No ■ Not sure

12) Would a product such as a bedside organizer interest you?

Yes(6) No(1) Not sure(3)

This question's purpose is to understand the interest of the user in the product.

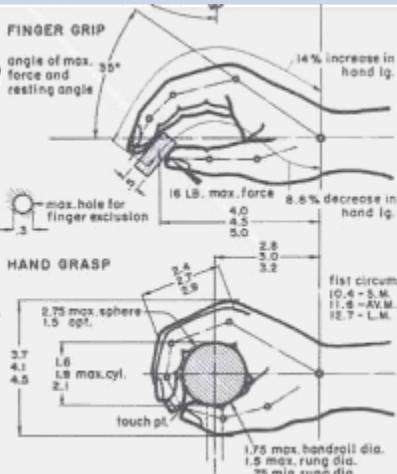
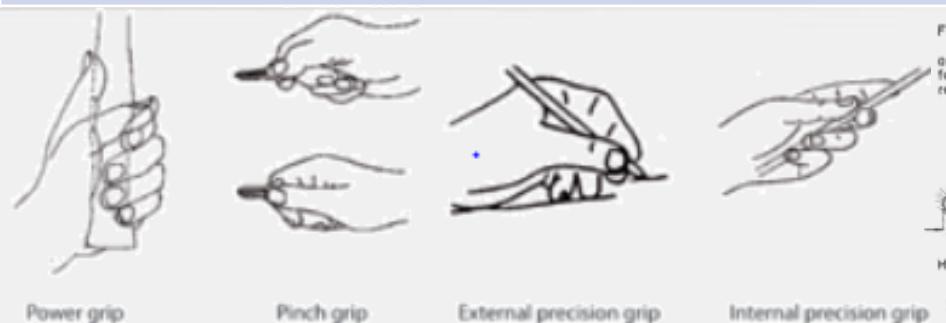
This question shows that people are being interested in the idea.



Ergonomics & Anthropometrics

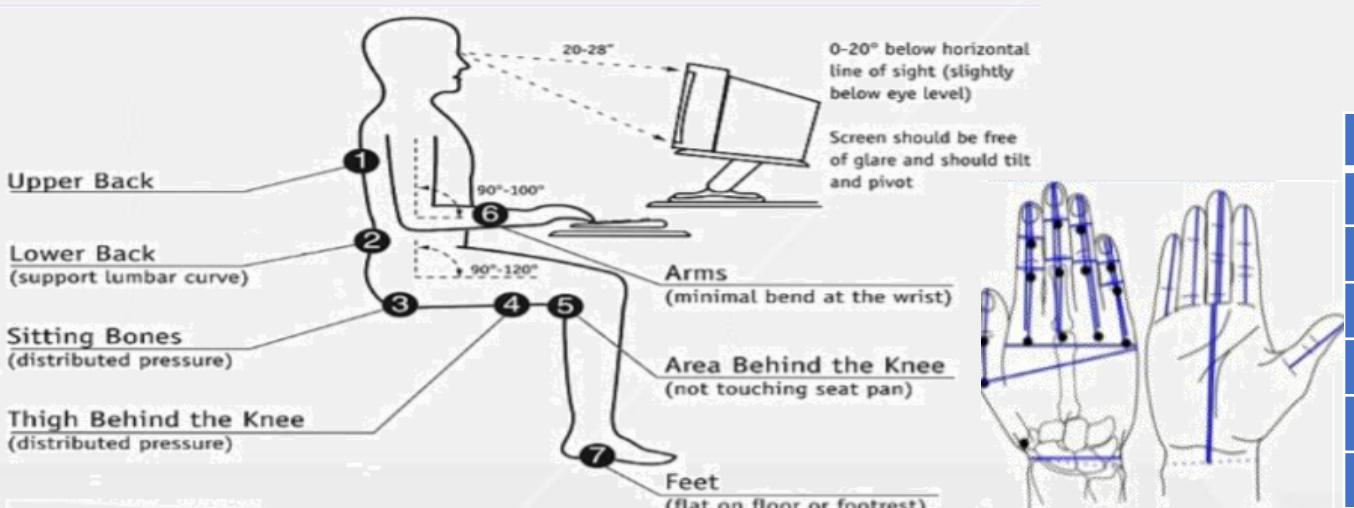
Ergonomics

The study of the interaction between the human body, products and the surrounding environment.



When anthropometric data is applied to a product specifically when designing the shape, texture and feel of for example a door handle, this development is called ergonomics.

Ergonomics will be used to improve the comfort factor of the product.



The bedside organizer would need to be smooth and have a nice feel. Some anthropometrics needed would be the length of their arms, force that the user would exert onto the organizer.

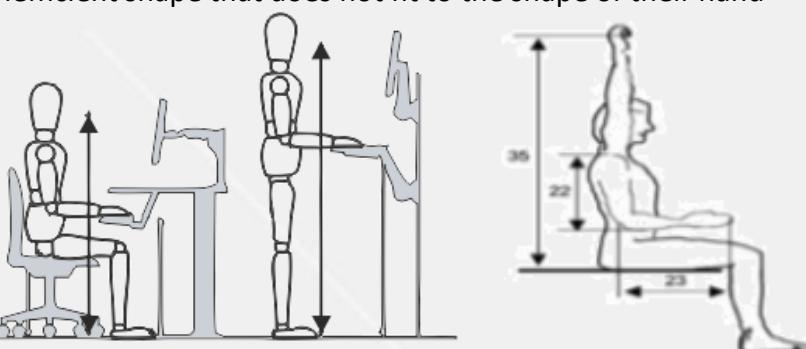
Anthropometrics

The use of body measurements to determine the optimum size for products for comfortable and efficient use.

Examples of anthropometric data include:

- How far people can reach
- How much space people need
- How much force they can exert
- Height of a person
- Length of arms/legs

If the products were to not use anthropometric data, it is likely that customers would not purchase as it is an awkward and inefficient shape that does not fit to the shape of their hand



The anthropometric data displayed, will be used to determine the dimensions of the product and will be taken into consideration when developing suitable ideas.

Age	Height		Hand Length	
	Girls	Boys	Girls	Boys
11	1440	1430	155	155
12	1500	1490	165	165
13	1550	1550	175	190
14	1590	1630	175	190
15	1610	1690	180	195
16	1620	1730	180	195
17	1620	1750	180	200
18	1620	1760	180	200

Woods

Introduction:

Wood is also known as timber. It comes from trees. The trees must grow to full maturity of 25 to 100 years before they can be chopped and used. The two types of timber are softwoods and hardwoods. Planks that are cut from the same tree could have a different grain structure, depending on how they are cut. The closer the wood grains are to each other, the stronger and denser the plank will be.

Plain Sawn:

Wood that is cut parallel to the growth rings, so the growth rings are cut from 0° to 45° to the wide face of the board (a tangential cut) is called plainsawn in hardwoods, and flatsawn in softwoods. Plain sawn flooring is more dimensionally stable and less stable in width (tangentially).

Quarter Sawn:

Wood that is cut perpendicular to the growth rings so that the growth rings are cut from 45° to 90° to the wide face of the board (a radial cut) is called quarter sawn in hardwoods, and vertical-grain in softwoods. Quarter sawn lumber is more dimensionally stable in width (radially) and less stable in thickness (tangentially).

Rift Sawn:

Wood that is cut neither parallel nor perpendicular to the growth rings so that the growth rings makes angles of 30° to 60° to the face of the board known as riftsawn in hardwoods, and bastard-sawn in softwoods.

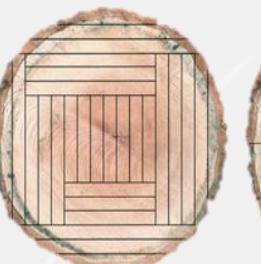
Live Sawn

Wood that is cut from the outside diameter through the heartwood incorporating the full range of the above characteristics on the face of the board is known As live-sawn material. This cut of wood is typically wider and incorporates all at the above dimensional stability and aesthetic characteristics,

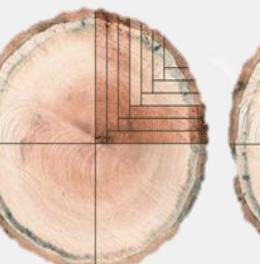


Sawing Patterns of Wood

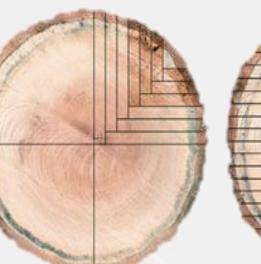
Plain Sawn



Quarter Sawn



Rift Sawn



Live Sawn



Wood was first used to make tools. Tools did contain other natural materials such bones, antlers and stones.



The discovery of bronze and copper allowed man to make the metal saw. This made manipulation of wood easier, allowing for advancements with wood.



Steel was discovered which improved many of the tools. A crane, made from timber, was introduced which allowed men to lift heavier weights at higher heights.



Carpenters were high in demand as buildings were made from wood.

They were considered among the most skilled craftsmen.



Wood is been used for a range of items, including decorations, buildings, etc. It is used for log cabin construction and other items due to it being renewable and sustainable.

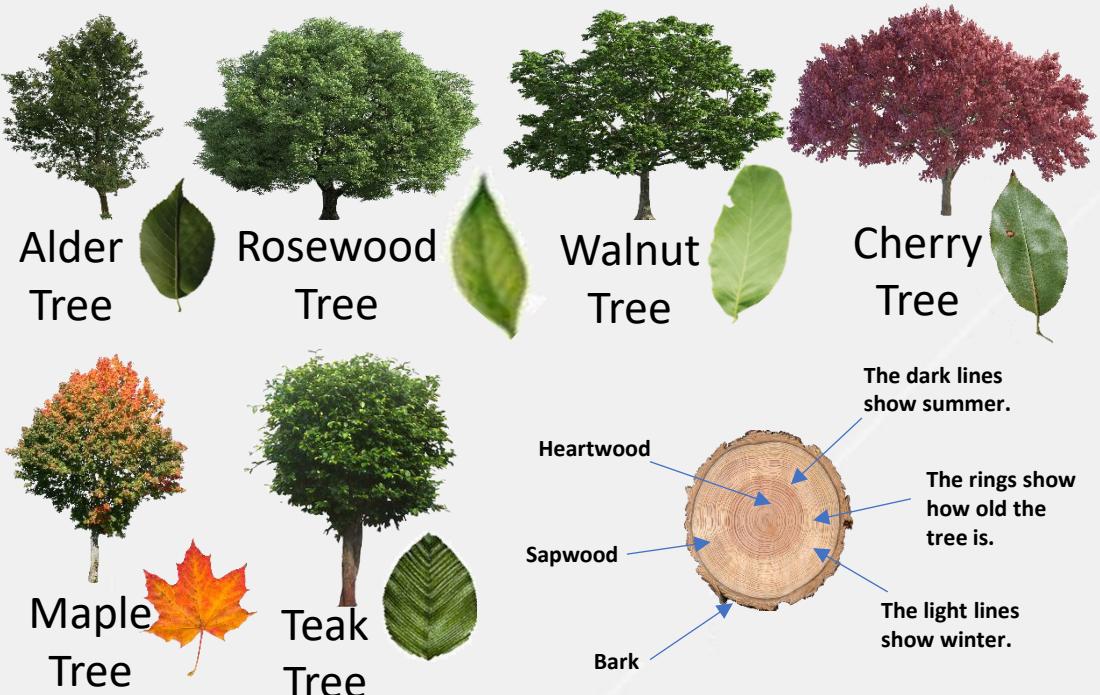


Woods 1: Hardwoods

Introduction:

Deciduous trees are also known as hardwood trees. This is because they produce hardwood timber. They have broad leaves which fall in autumn. Seeds are borne in form of nuts or berries. The trunk divides to develop larger branches.

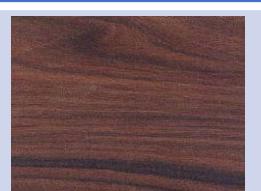
These branches are very irregular. The trees are very slow growing which means that the wood is dense & the fibers in the wood give it strength. Hard timber is more valuable as it is harder & more durable. It is an organic, often visually attractive material.



Alder Tree (One of the Softest Hardwood)

Properties:	Uses:	Product Images:
<ul style="list-style-type: none"> - Light - Soft - Not durable 	<ul style="list-style-type: none"> - Furniture - Picture frames - Musical instruments 	

Rosewood Tree

Properties:	Uses:	Product Images:
<ul style="list-style-type: none"> - Very hard - Fragrant - Closed grain 	<ul style="list-style-type: none"> - Musical instruments - Tool handles - Furniture 	

Walnut Tree

Properties:	Uses:	Product Images:
<ul style="list-style-type: none"> - Strong - Hard - Durable 	<ul style="list-style-type: none"> - Cabinet work - Guitars - Flutes 	

Cherry Tree

Properties:	Uses:	Product Images:
<ul style="list-style-type: none"> - Strong - Hard - Resists warping 	<ul style="list-style-type: none"> - Doors/ stairs - Musical instruments - Interior furnishing 	

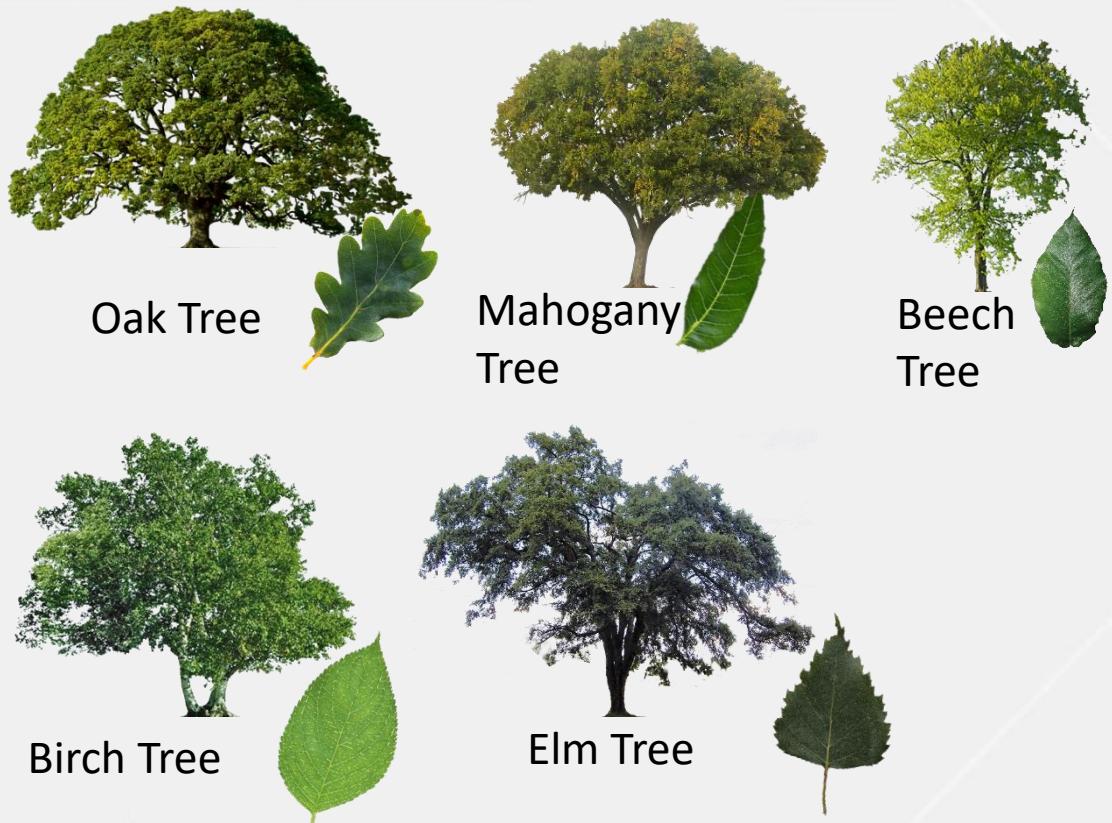
Maple Tree

Properties:	Uses:	Product Images:
<ul style="list-style-type: none"> - Hard - Fine texture - Curly grain 	<ul style="list-style-type: none"> - Bowling alley floors - Violin backs - Furniture 	

Teak Tree

Properties:	Uses:	Product Images:
<ul style="list-style-type: none"> - Strong - Heavy - Durable 	<ul style="list-style-type: none"> - Furniture - Veneers - Indoor flooring 	

Woods 2: Hardwoods



If all these woods are available in the workshop, Walnut wood would most likely be used because of the strength & hardness that it would provide the design idea with. Also, its durability would avoid any damages from occurring to maintain a longer life span.

I would like to use hardwoods, such as walnut, due to their high durability and strength that it would provide my project with.

Oak Tree			
Properties:	Uses:		Product Images:
<ul style="list-style-type: none"> - Strong - Hard - Tough - Corrodes with steel. - Distinctive looks 	<ul style="list-style-type: none"> - Good Quality Furniture - Interior woodwork - Flooring Boards 		

Mahogany Tree			
Properties:	Uses:		Product Images:
<ul style="list-style-type: none"> - Fairly Strong - Durable - Improves sound - Stable Hardwood - Absorbs sunlight 	<ul style="list-style-type: none"> - Good Quality Furniture - Interior woodwork - Flooring Boards 		

Beech Tree			
Properties:	Uses:		Product Images:
<ul style="list-style-type: none"> - Hard - Tough - Strong - Warps easily 	<ul style="list-style-type: none"> - Furniture - Toys - Flooring 		

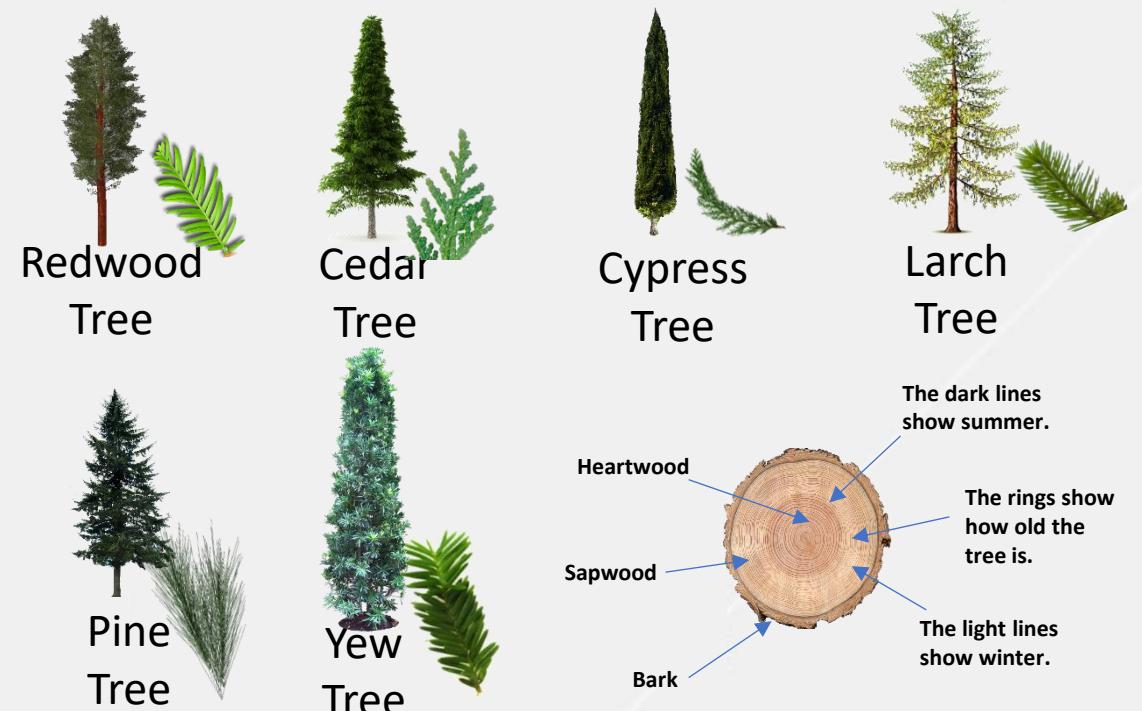
Birch Tree			
Properties:	Uses:		Product Images:
<ul style="list-style-type: none"> - Fine – grained - Attractive sheen - Durable - Oil resistant 	<ul style="list-style-type: none"> - Furniture - Kitchenware - Boxes - Crates 		

Elm Tree (Soft Hardwood)			
Properties:	Uses:		Product Images:
<ul style="list-style-type: none"> - Interlocking grain - Tough - Durable - Resists splitting 	<ul style="list-style-type: none"> - Indoor furniture - Outdoor furniture 		

Woods 3: Softwoods

Introduction:

Coniferous trees or evergreen trees are also known as softwood trees. This is because they produce softwood timber. They have needle-like leaves & are symmetrical in shape (They have a cone shape). The trunk is straight. The trees are very fast growing which means that the wood is less dense with little fibers in the wood. Soft timber is less valuable as it is softer & less durable. They have fewer branches.



Redwood Tree

Properties:	Uses:	Product Images:
<ul style="list-style-type: none"> - Resistant to sunlight, moisture & insects 	<ul style="list-style-type: none"> - Outdoor furniture - Carvings - Musical Instruments 	 

Cedar Tree

Properties:	Uses:	Product Images:
<ul style="list-style-type: none"> - Has a lot of knots - Aromatic - Light 	<ul style="list-style-type: none"> - Drawers - Chest - Boxes 	 

Cypress Tree

Properties:	Uses:	Product Images:
<ul style="list-style-type: none"> - Durable - Resistant to decay - Good finish 	<ul style="list-style-type: none"> - Docks - Exterior Construction - Veneer 	 

Larch Tree

Properties:	Uses:	Product Images:
<ul style="list-style-type: none"> - Resistant to decay - Straight or spiral grain - Small knots present 	<ul style="list-style-type: none"> - Fence posts - Flooring - Boatbuilding 	 

Pine Tree

Properties:	Uses:	Product Images:
<ul style="list-style-type: none"> - Soft - Light in weight - Resists shrinking 	<ul style="list-style-type: none"> - Furniture - Window frames - Floor boards 	 

Yew Tree (Hard Softwood)

Properties:	Uses:	Product Images:
<ul style="list-style-type: none"> - Extremely flexible - Strong - Easy to work with 	<ul style="list-style-type: none"> - Archery bows - Furniture - Carvings 	 

Woods 4: Softwoods



If all these woods are available in the workshop, Juniper wood would most likely be used because of the aromatic smell & interesting grain patterns that it would provide the design idea with. Also, its rot resistance & insect resistance would avoid any damages from occurring to maintain a longer life span.

I would like to use softwoods, such as juniper, due to their high growth rates, meaning lower costs, and good looks that it would provide my project with.

Hemlock Tree

<u>Properties:</u>	<u>Uses:</u>	<u>Product Images:</u>
<ul style="list-style-type: none"> - Light in weight - low resistance to decay - Coarse & uneven texture - Interesting grain 	<ul style="list-style-type: none"> - Good Quality Furniture - Interior woodwork - Flooring Boards - Boxes - Crates - Framing 	

Fir Tree

<u>Properties:</u>	<u>Uses:</u>	<u>Product Images:</u>
<ul style="list-style-type: none"> - Easy to work with - Finishes well - Uniform in texture - Low resistance to decay 	<ul style="list-style-type: none"> - Furniture - Doors - Frames - Windows - Veneer 	

Spruce Tree

<u>Properties:</u>	<u>Uses:</u>	<u>Product Images:</u>
<ul style="list-style-type: none"> - Strong - Hard - Finishes well - Light 	<ul style="list-style-type: none"> - Crates - Boxes - Ladders - Aircraft 	

Juniper Tree

<u>Properties:</u>	<u>Uses:</u>	<u>Product Images:</u>
<ul style="list-style-type: none"> - Aromatic - Rot Resistant - Insect Resistant - Interesting grain patterns 	<ul style="list-style-type: none"> - Pencils - Furniture - Firewood - Paneling - Boat-building 	

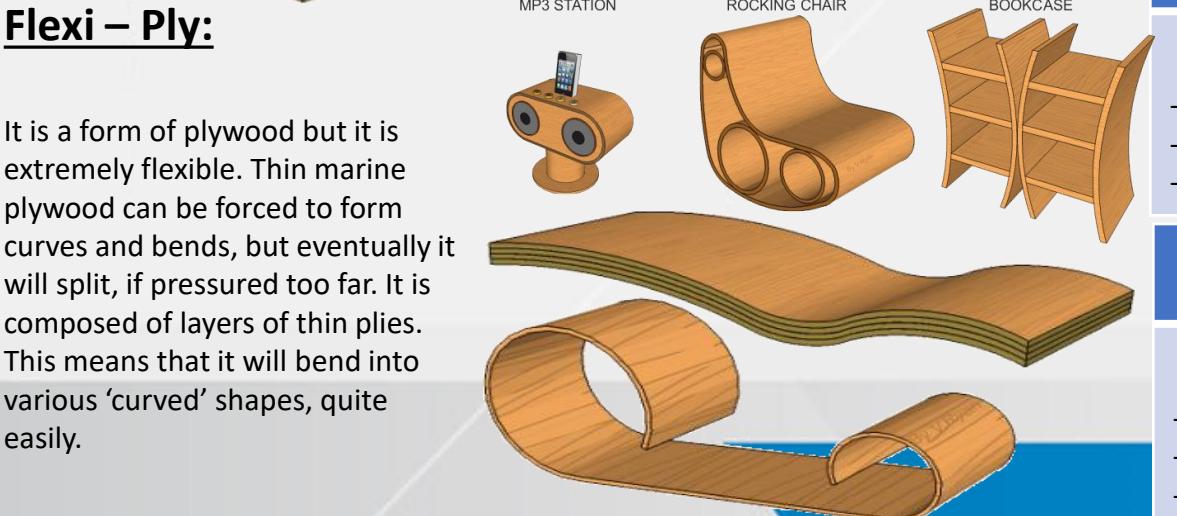
Balsa Tree (Softest Softwood)

<u>Properties:</u>	<u>Uses:</u>	<u>Product Images:</u>
<ul style="list-style-type: none"> - Softest - Lightest - Easy to work with 	<ul style="list-style-type: none"> - Insulation - Surf boards - Model airplanes 	

Woods 5: Manufactured Boards

Introduction:

Manufactured boards are made from the waste sections of felled softwood & hardwood trees. The waste is reduced to pulp, particles or thin strips which are bonded together using special adhesives or resins. Manufactured boards come in sheet form which are available in different thicknesses. They are very stable with uniform thickness. They are less expensive & are covered with a veneer to look like natural wood.



Flexi – Ply:

It is a form of plywood but it is extremely flexible. Thin marine plywood can be forced to form curves and bends, but eventually it will split, if pressured too far. It is composed of layers of thin plies. This means that it will bend into various 'curved' shapes, quite easily.

MDF (Medium Density Fiberboard)

<u>Properties:</u>	<u>Uses:</u>	<u>Product Images:</u>
<ul style="list-style-type: none"> - Smooth - Strong - Resistant to warping 	<ul style="list-style-type: none"> - Shelves - Cupboard - Storage units - Wall panels 	 

Plywood

<u>Properties:</u>	<u>Uses:</u>	<u>Product Images:</u>
<ul style="list-style-type: none"> - Strong - Smooth finish - Doesn't warp 	<ul style="list-style-type: none"> - Airplane wings - Boat building - Roofs 	 

Chipboard

<u>Properties:</u>	<u>Uses:</u>	<u>Product Images:</u>
<ul style="list-style-type: none"> - Cheap - Decorative - Hardwearing finish 	<ul style="list-style-type: none"> - Kitchen worktops - Cupboard shells - Base of drawers 	 

Hardboard (Particle Board)

<u>Properties:</u>	<u>Uses:</u>	<u>Product Images:</u>
<ul style="list-style-type: none"> - Cheap - Light - No moisture resistant 	<ul style="list-style-type: none"> - Cupboard - Furniture - Flooring 	 

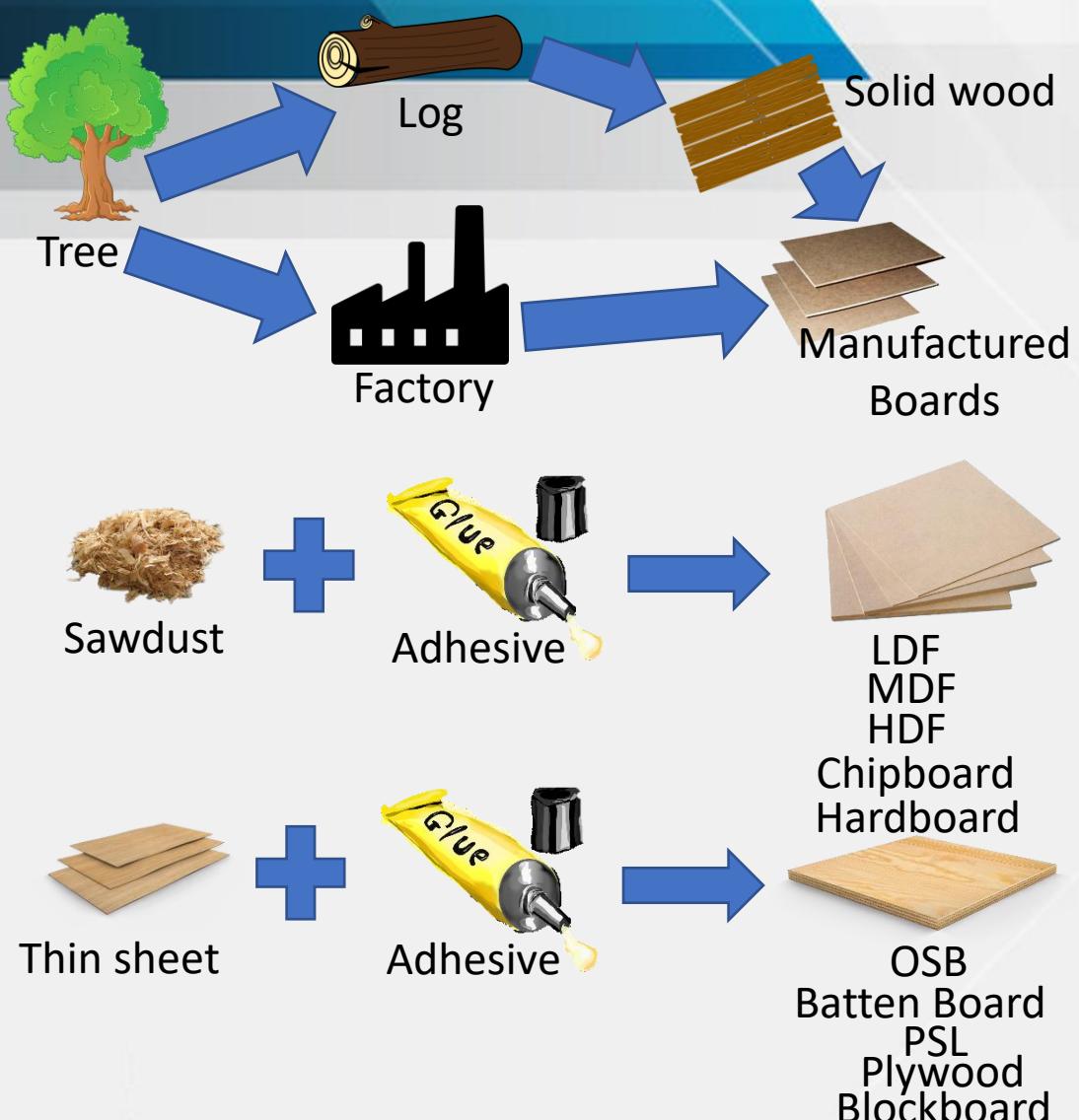
Blockboard

<u>Properties:</u>	<u>Uses:</u>	<u>Product Images:</u>
<ul style="list-style-type: none"> - Strong - Water resistant - Heat resistant 	<ul style="list-style-type: none"> - Shelves - Doors - Tables 	 

Pine board/ Lamwood

<u>Properties:</u>	<u>Uses:</u>	<u>Product Images:</u>
<ul style="list-style-type: none"> - Dense - Strong - Light 	<ul style="list-style-type: none"> - Furniture - Window Frames - Roofing 	 

Woods 6: Manufactured Boards



If all these woods are available in the workshop, Block board would most likely be used because of the strength that it would provide the design idea with. Also, its water resistance & heat resistance would avoid any damages from occurring to maintain a longer life span.

I would like to use manufactured boards, such as blockboard, due to the strength that it would provide my project with. It is also found in many different dimensions, making it easier to find sizes that I would like to use.

OSB (Oriented Strand Board)

Properties:

- Cheap
- Uniform Thickness
- Swells when in contact with water & moisture.
- Takes longer to dry

Uses:

- Flooring
- Walls
- Roof Sheathing
- Furniture
- Ceiling
- Insulated Panels



Product Images:



Batten Board

Properties:

- Cheap
- Not aesthetically pleasing
- Easy to assemble

Uses:

- Roofs
- Tiles
- Doors
- Sailing



Product Images:



LDF (Low Density Fiberboard)

Properties:

- Light
- Weak
- Light
- No moisture resistant

Uses:

- Furniture
- Ceiling
- Molding
- Store Fixtures
- Cupboard



Product Images:



HDF (High Density Fiberboard)

Properties:

- Moisture resistant
- Durable
- Expensive
- Stabilizing material
- Strong

Uses:

- Furniture
- Tools
- Flooring



Product Images:



PSL (Parallel Strand Lumber)

Properties:

- Less prone to shrinking, warping, cupping, bowing or splitting

Uses:

- Post
- Beams
- Header
- Column



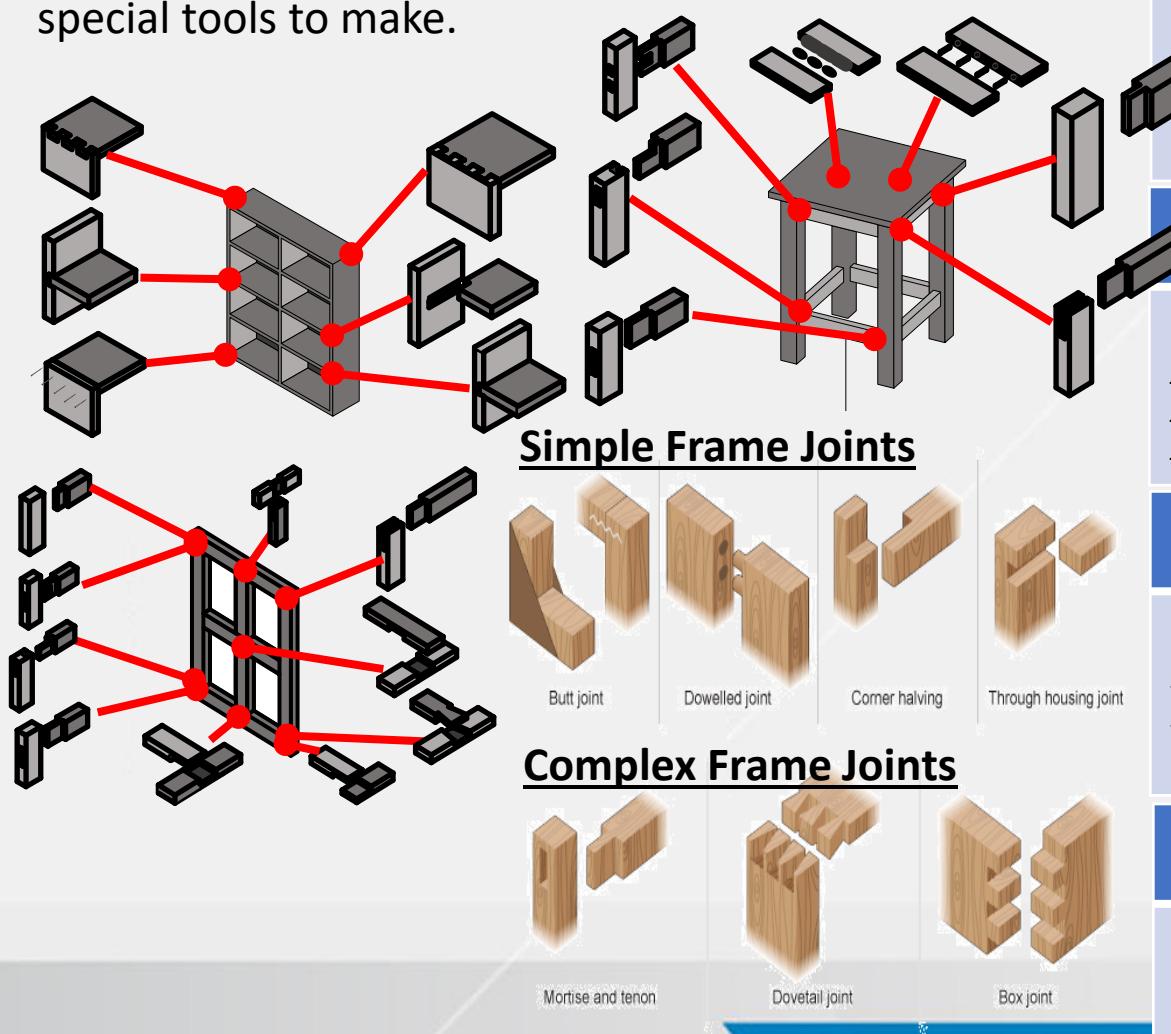
Product Images:



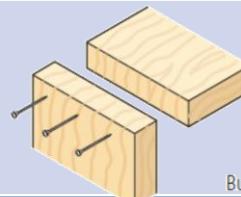
Woods 7: Wood Joints

Introduction:

Wood joints are made up of two pieces of wood joined together. A well-made wood joint wouldn't need glue to hold them into place. Wood joints give strength, stability & durability while allowing the product to be decorative & resist force. However they would be time consuming & would require skill & special tools to make.



Butt Joint

Properties:	Uses:	Product Images:
<ul style="list-style-type: none"> - Simple - Need screws - Greater glue area 	<ul style="list-style-type: none"> - Chairs - Cabinet - Panels 	 Butt Joint

Edge Joint

Properties:	Uses:	Product Images:
<ul style="list-style-type: none"> - Simple - Join narrow boards together. 	<ul style="list-style-type: none"> - Frames - Tables - Crates 	 Edge Joint

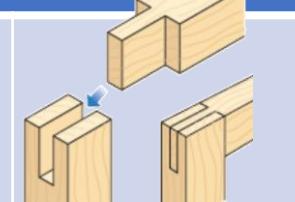
Halving Joint

Properties:	Uses:	Product Images:
The two halves of the joint make up the full thickness	<ul style="list-style-type: none"> - Frames - Rails - Furniture 	 Halving Joint

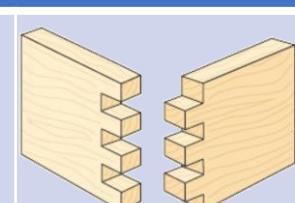
Housing/ Dado Joint

Properties:	Uses:	Product Images:
<ul style="list-style-type: none"> - Quality appearance - Tight fit - Simple 	<ul style="list-style-type: none"> - Shelved units - Dividers for boxes - Book-cases 	 Housing/ Dado Joint

Bridle Joint

Properties:	Uses:	Product Images:
<ul style="list-style-type: none"> - Strong - Not aesthetically pleasing 	<ul style="list-style-type: none"> - Frames - Doors - Tables 	 Bridle Joint

Finger Joint

Properties:	Uses:	Product Images:
<ul style="list-style-type: none"> - Large glue area - Common joint - Odd no. of fingers. 	<ul style="list-style-type: none"> - Cabinet construction - Joining corners of frames & boxes. 	 Finger Joint

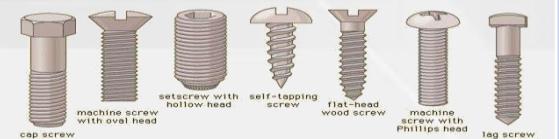
Woods 8: Wood Joints

Screws

Wood screws



Machine screws



Sheet metal screws



Socket screws



Nails

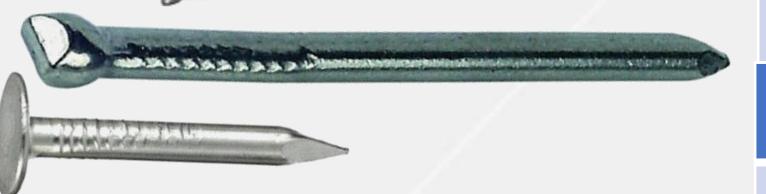
Round head



Brad head



Oval head



Flat head



If all these joints are made in the workshop, Dowel joint would most likely be used because of the strength that it would provide the design idea with. Also, its large glue area would avoid any damages from occurring to maintain strength & look aesthetically pleasing.

I would like to use joints, such as dowel joints, due to their high surface area for gluing that it would provide my project with.

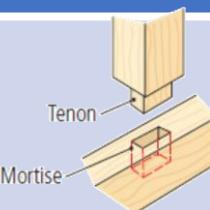
Mortise & Tenon Joint

Properties:

- Widely used
- Large glue area
- Strong

Uses:

- Frames
- Doors
- Tables & Chairs



Product Images:



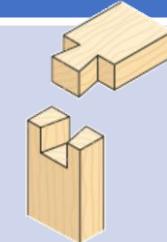
Dovetail Joint

Properties:

- Strong joint
- Attractive
- Tightens when pulled

Uses:

- Drawers
- Boxes



Product Images:



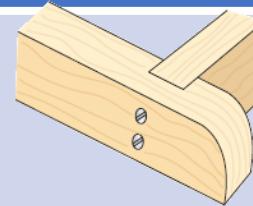
Screw Joint

Properties:

- Strengthen the joint
- Easy to put

Uses:

- Additional strength to all joints.



Product Images:



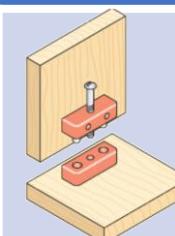
Knock-down Joint

Properties:

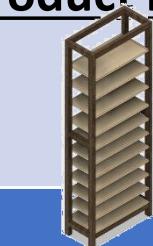
- Allow pieces to be taken apart
- Not strong/attractive

Uses:

- User assembled products
- Cabinets
- Furniture



Product Images:



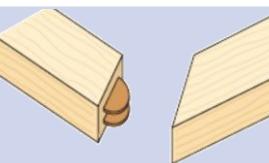
Mitre Joint

Properties:

- Simple joint
- Can be strengthened

Uses:

- Picture frames
- Doors
- Windows



Product Images:



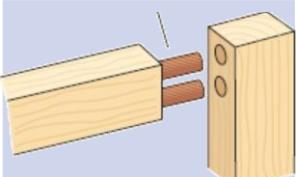
Dowel Joint

Properties:

- Used instead of mortise & tenon
- Doweling jig used

Uses:

- Frames
- Doors
- Table & Chairs



Product Images:



Plastics

Introduction:

Plastic are polymers of different monomers. Polymers are just a chains of monomers. As a polymer grows, the melting point increases, making it more rigid. Plastics are made either by natural or synthetic means. Natural plastics are used since 2000 BC and is obtained from natural sources. Synthetic plastics are produced from fossil fuels and are chemically manufactured.



Plastics against Wood:



- Raw materials of plastics are usually cheaper than the wood.
- Plastics require less energy to produce products.
- Plastics can be mass produced.
- Transporting plastics are cheaper.



Chemicals are usually added during manufacture to change some of their properties:

- **Plasticizers** make the plastics more bendy.
- **Pigments** give the plastics color.
- **Antistatic** reduces the static charge of the plastic.
- **Antioxidants** reduces the oxidation of plastics.
- **Flame retardants** reduce the burning of plastics.



Plastics 1: Research

Natural Plastics:

Animals:



- Horns (Glue)
- Milk (Glue)

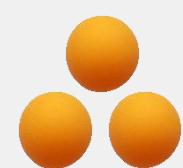


Insects:

- Shellac (Polishing)



Plants:



- Cellulose – found in cell wall (Table-Tennis Balls)
- Bitumen (Roads)
- Cellophane (Wrapping)



Trees:



- Latex (Rubber)
- Amber



Advantages:

- Biodegradable
- Made from renewable resources



Disadvantages:

- Expensive
- Don't last very long

Synthetic Plastics:

Fossil Fuel:

- Crude Oil
- Coal
- Natural Gas



Advantages:

- Are long-lasting
- Mass produced cheaply
- Light
- Flexible

Disadvantages:

- Non-biodegradable
- Made from oil – finite resource, fossil fuel
- Toxic fumes when burned

If all types of thermoplastic &

thermosetting plastics was available in the workshop, Acrylic would be chosen as it is light & strong. It is, at the same time, malleable & aesthetically pleasing.

Properties:

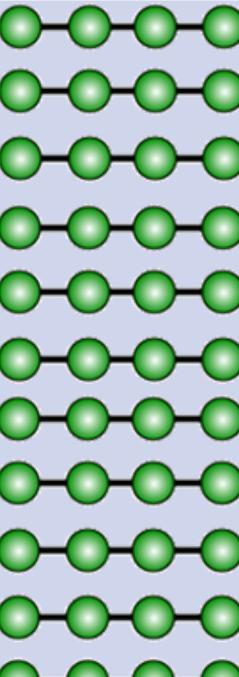
- Expensive
- Strong
- Moldable
- Recyclable
- Light weight
- Thermal insulator
- Electrical insulator
- Shrink resistant
- Chemical resistant
- Easy bendability
- Can melt
- Degrade to direct sunlight or ultraviolet light levels for the extended times

Uses:

- Pipes
- Bottles
- Plastic containers
- Car bodies
- Garden furniture
- Plastic bags

Examples:

- Polyethylene
- Polypropylene
- Polyvinyl chloride
- Polystyrene
- Polybenzimidazole
- Acrylic
- Nylon
- Teflon



Product Images:



Thermosetting Plastic

Polymers which become irreversibly hard on heating or by addition of special chemicals. This hardening involves a chemical change (curing process). The curing process involves a chemical reaction which connects the linear molecules to form a single macromolecule through crosslinks.

Properties:

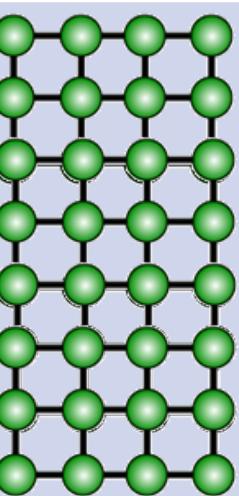
- Chemical resistant
- Heat resistant
- Electrical resistant
- Resistant to high temperatures
- Aesthetically pleasing
- Hard
- Can't be recycled
- Difficult to finish
- Can't be remolded

Uses:

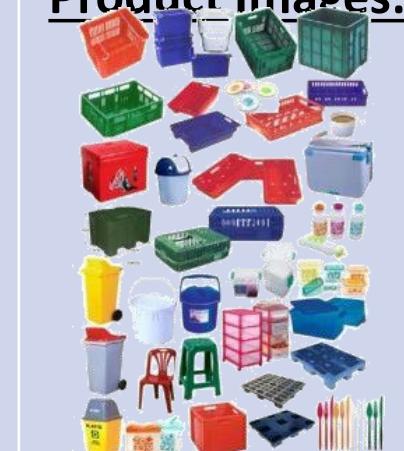
- Electronics
- Signs
- Toys
- Packaging
- Bearing
- Hinges

Examples:

- Epoxy resin
- Melamine formaldehyde
- Polyester resin
- Urea formaldehyde

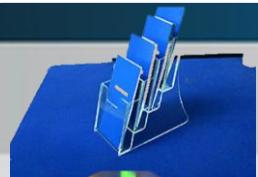


Product Images:



Plastics 2: Research

Thermoplastic



Acrylic - hard, clear, good optical properties, easily machined, polishes well.



High Impact Polystyrene (HIPS) - Light, hard, stiff, water resistant, can be transparent or colored.



High Density Polythene (HDPE) - stiff, strong plastic, can be easily colored & is often used for toys.



Low Density Polythene (LDPE) - Tough, flexible & shatterproof, chemical resistant, easily colored, lightweight, easily moldable (injection molding)



Polyvinyl chloride (PVC) – Rigid PVC: Stiff hard & tough. Flexible has plasticizer to make it soft & rubbery. Both are chemical resistant. Electrical insulating properties. Variety of colors.



Acrylonitrile butadiene styrene (ABS) - high impact strength, tough, scratch & chemical resistant.



Thermosetting Plastic



Urea formaldehyde – hard, stiff & brittle. Good electrical & heat resistant properties



Polyester resin – Hard, strong & brittle. Good electrical & heat insulating properties.

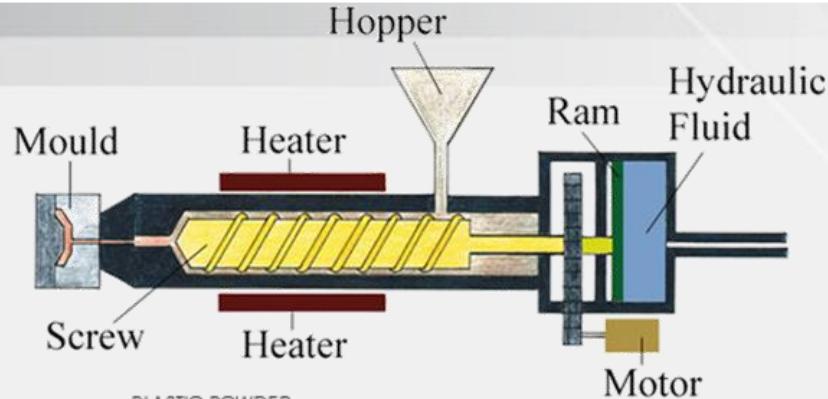


Polyethylene Terephthalate	High – Density Polyethylene	Polyvinyl Chloride	Low – Density Polyethylene	Polypropylene	Polystyrene
- Bottles	- Jugs	- Jugs	- Paper towels	- Yogurt tubs	- Hot cups
- Cups	- Detergent	- Pool liners	- Tissue	- Cups	- CD cases
- Jars	- Shampoo	- Twine	- Squeeze bottles	- Juice bottles	- Razors
- Trays	bottles	Sheeting	- Trash bags	- Straws	Cartons
	Flower pots	Bottles		Hangers	Trays
	Grocery bags				

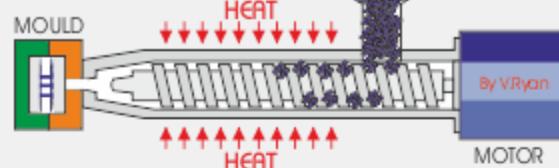
Plastics 3: Molding/ Processes

Process 1 - Injection Molding

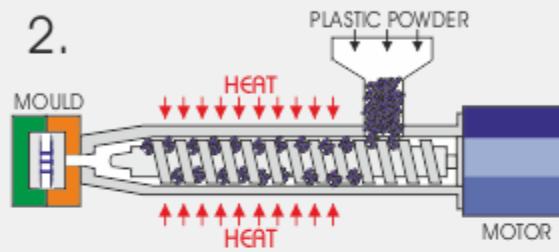
The shaping of plastic articles by injecting heated material into a mold.



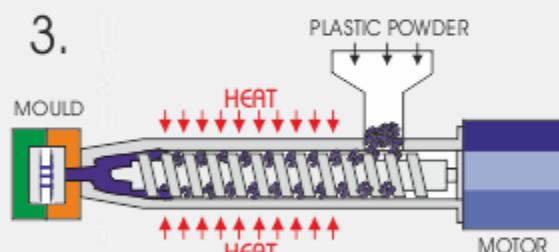
1.



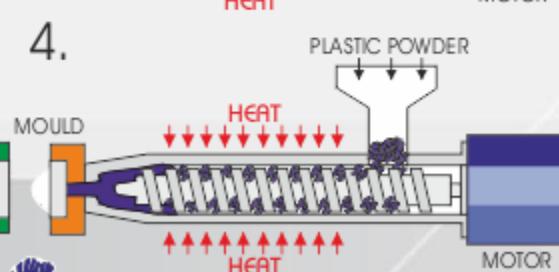
2.



3.

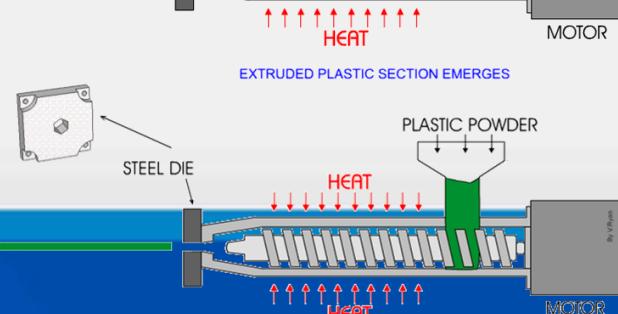
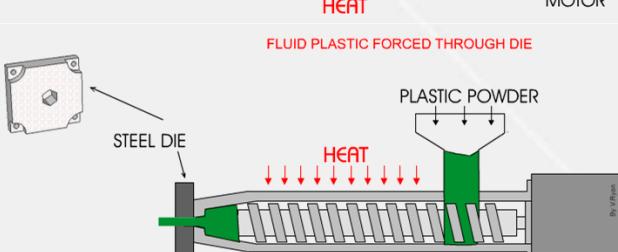
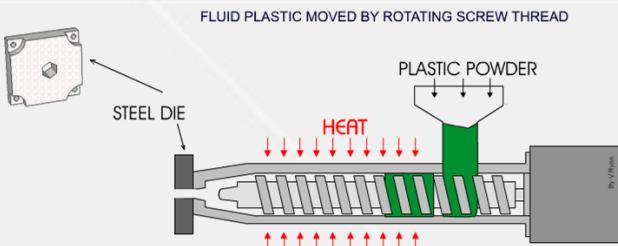
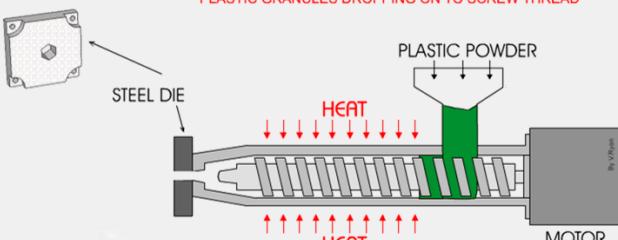
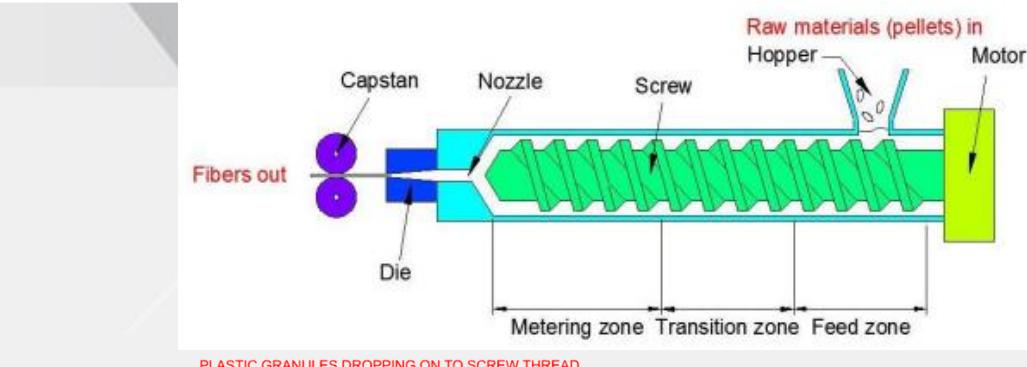


4.



Process 2 - Extrusion

The shaping of plastic articles by injecting heated material through a die.



1) Powdered thermoplastic plastic is dropped in the hopper onto the screw thread.

2) The plastic melts due to the heat & the motor moves the fluid plastic by rotating the screw thread.

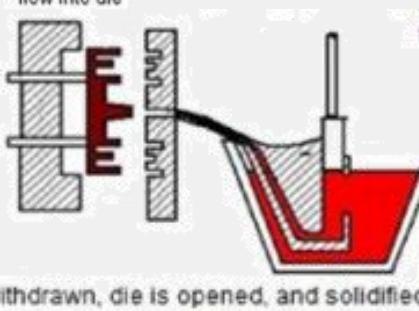
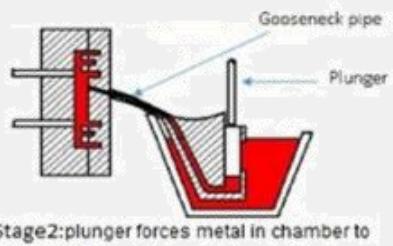
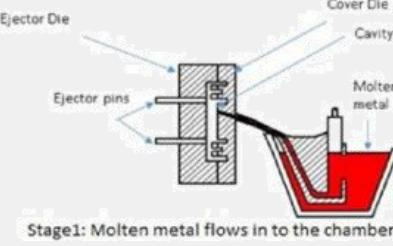
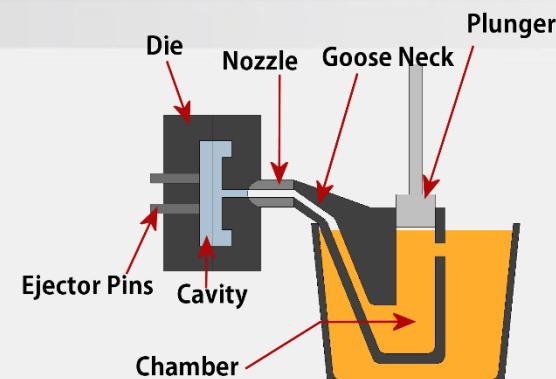
3) Fluid plastic is forced through die.

4) Extruded plastic section emerges.

Plastics 4: Molding/ Processes

Process 3 – Die casting

The shaping of metal or plastic articles by injecting molten material into the cavity of die.



- 1) Molten material flows into the chamber.

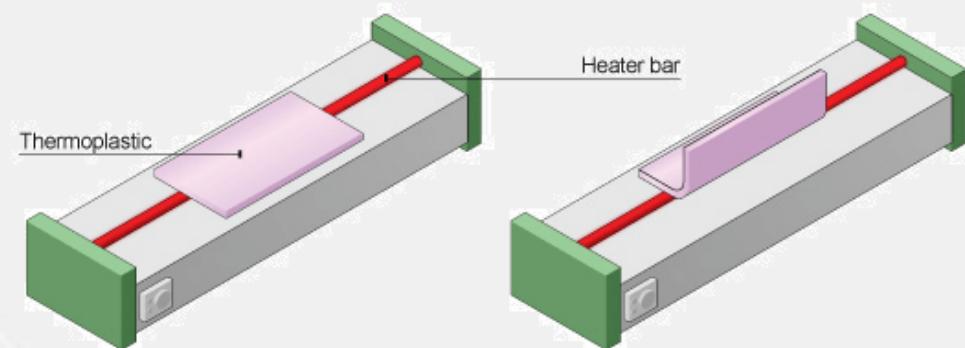
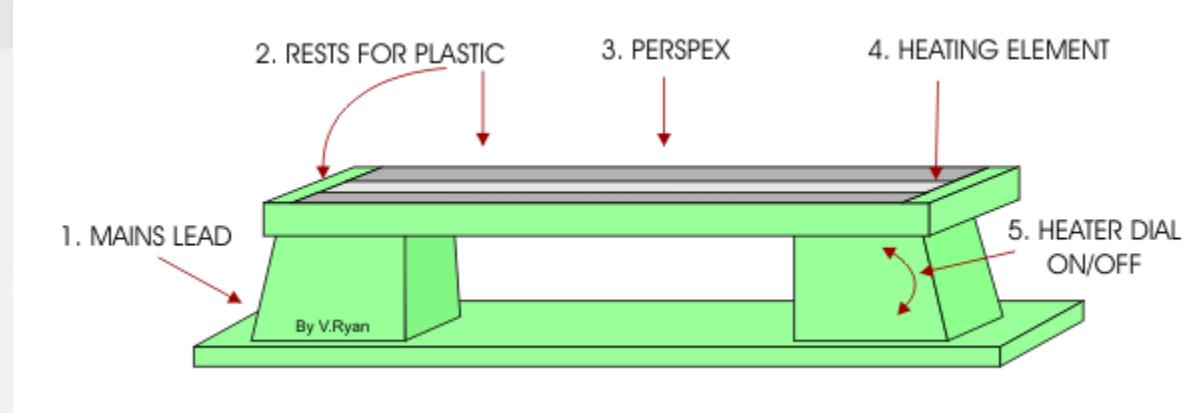
- 2) Plunger is used to force material in chamber to flow to die.

- 3) Plunger is withdrawn, & die is opened.

- 4) Solidified part is ejected.

Process 4 – Line bending

The shaping of plastic articles by placing on a heated metal wire.

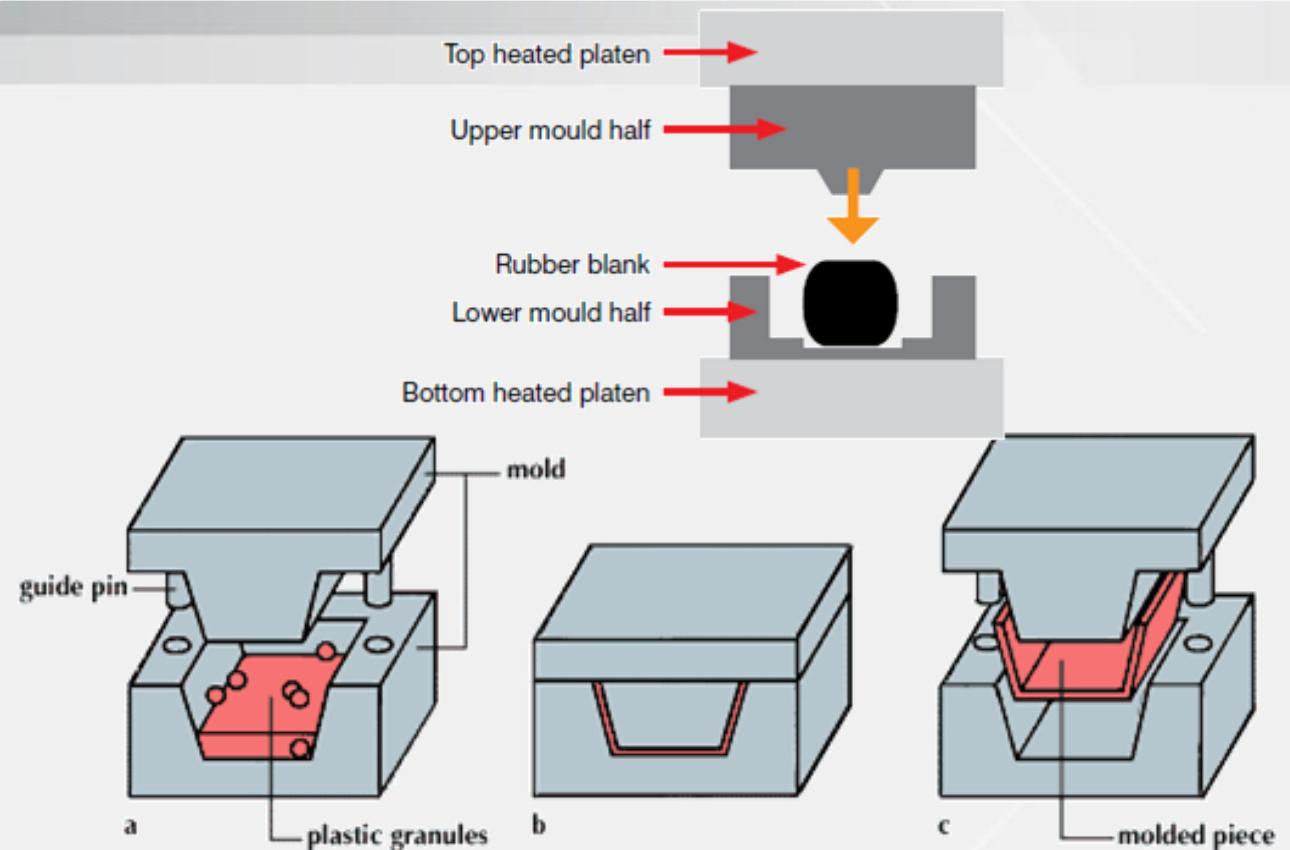


- 1) Line bender is turned on & the heater dial is turned toward on.
- 2) Plastic is placed on the metal wire.
- 3) Plastic is removed from the top of the metal wire & is then bent by hand.

Plastics 5: Molding/ Processes

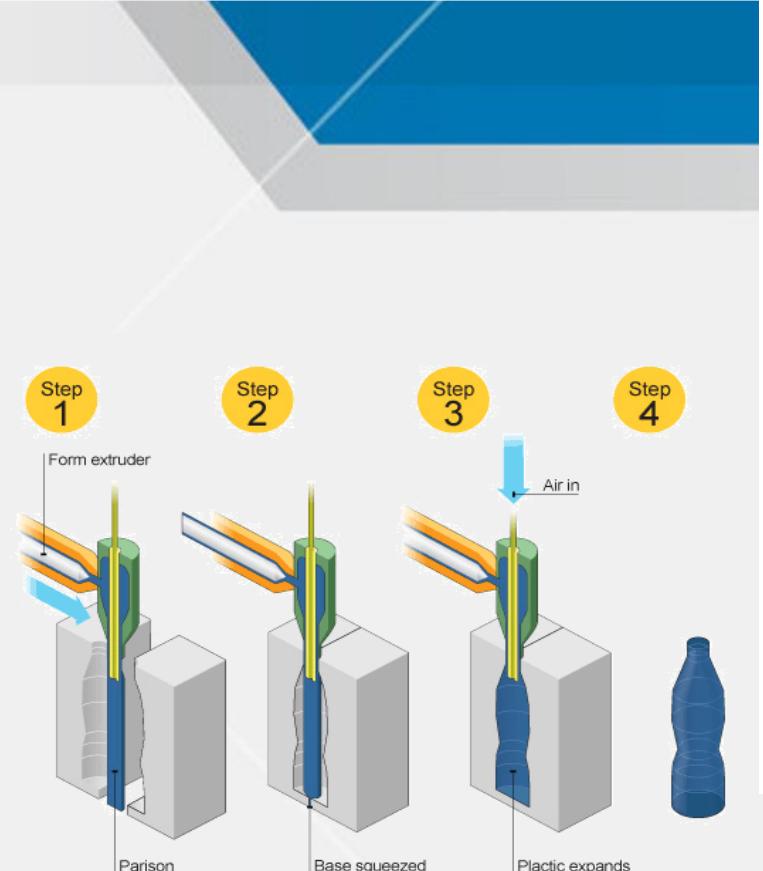
Process 5 – Press or compression molding

The shaping of plastic articles by applying heat & pressure.



Process 6 – Blow molding

The shaping of plastic articles by applying pressure with air.



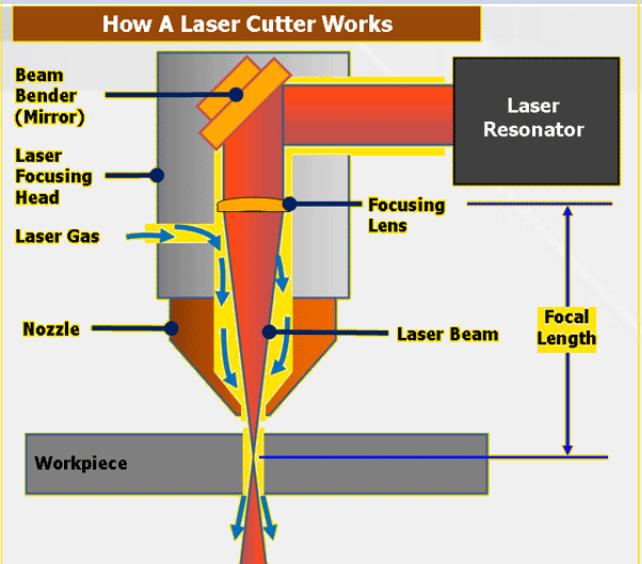
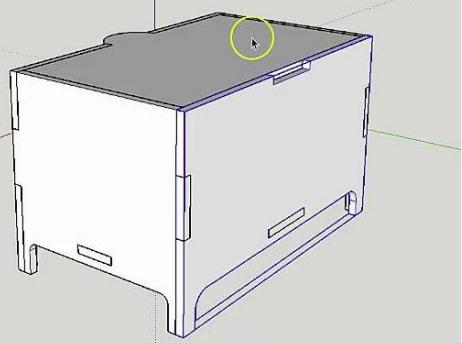
- 1) Plastic is placed & heated.
- 2) Upper mold is brought down to give shape to the plastic.
- 3) The upper mold is removed, & molded piece is removed.

- 1) Parison is inserted into mold.
- 2) Base of parison squeezed by mold.
- 3) Air blown in to parison, parison expands to fill mold.
- 4) Finished product is removed from the mold.

Plastics 6: Molding/ Processes

Process 7 – Laser Cutting

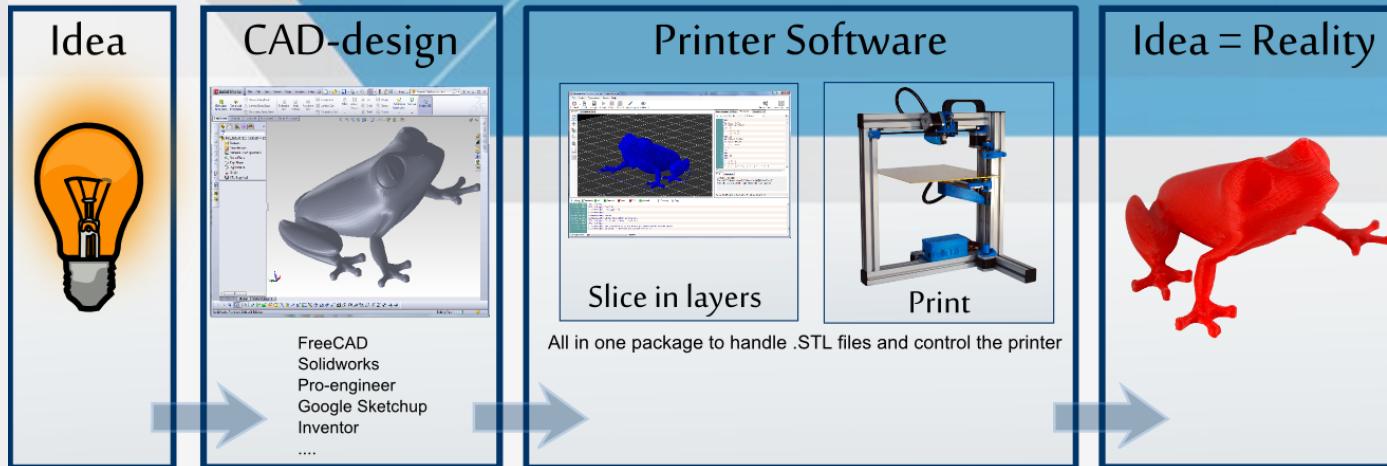
The cutting of plastic articles using a program & strong lasers.



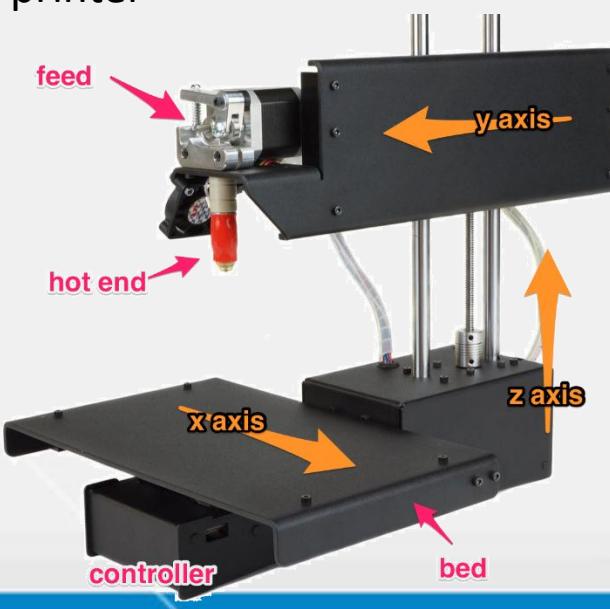
- 1) 3D model is made on the software.
- 2) The model is uploaded & downloaded into the laser cutter machine.
- 3) The laser cutter cuts the workpiece according to the user's choice.
- 4) The cut piece is removed.

Process 8 – 3D printing

The making of plastic articles, using a program, according to the user's wish.



- 1) Make the 3D model on CAD
- 2) The CAD is copied to the computer operating the 3D printer
- 3) Set up 3D printer
- 4) Wait for the 3D model to print the product.
- 5) Remove the printed object out of the printer



Plastics 7: Molding/ Processes

Process 9 – Vacuum forming

The shaping of plastic articles by heating them up.

1.



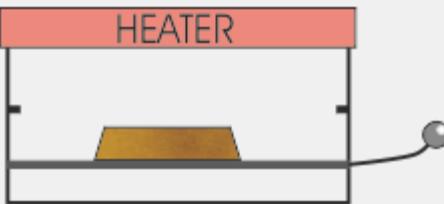
- 1) A suitable mold/ former is carefully manufactured.

4.



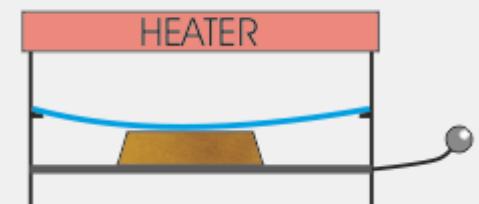
- 4) The electric heater is turned on to warm the plastic sheet.

2.



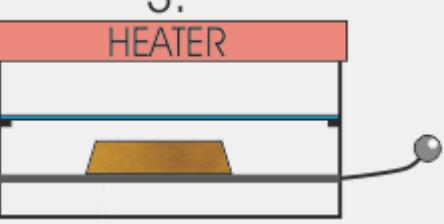
- 2) The mold is placed in the vacuum former.

5.



- 5) The plastic becomes flexible when heated.

3.



- 3) Plastic sheet is placed above the mold & clamped securely.

6.

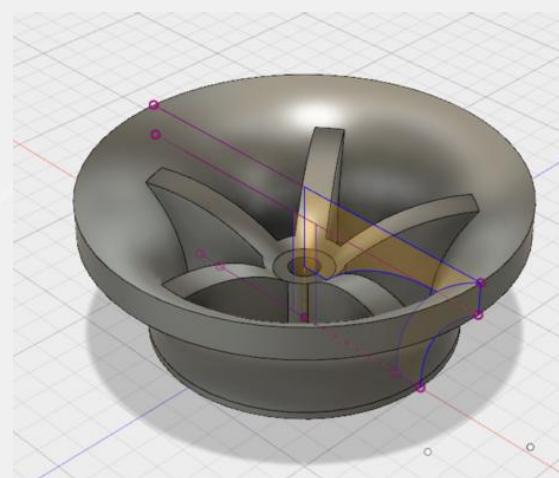


- 6) The air is pumped out of the area below the plastic & mold



Process 10 – X - Carving

The cutting of plastic article, using a program, according to the user's wish.



- 1) 3D model is made on the software.
- 2) The model is uploaded & downloaded into X-carve.
- 3) The drill bit cuts/ carves the workpiece according to the user's choice.
- 4) The cut/ carved piece is removed.



Finishing 1: Finishes

Finishes

Substance added to improve the look of the material & to protect it from the environment.

Varnish

A combination of a drying oil, a resin & a thinner or solvent, applied over wood stains for added gloss & protection.

Advantages

- Durable
- Protects wood from dirt, sunlight & water
- Easy to apply



Disadvantages

- Can dull over time
- Cleanup requires lacquer thinner or mineral spirits
- Bubbles might appear while mixing or applying

Waxes

- They are sold in liquid, paste, & solid stick forms & are available in clear, amber, white & a range of wood tones.

Advantages

- Can be applied over any other finish for a soft sheen
- Can be used with any type of wood
- Easy to apply



Disadvantages

- Lack of durability
- Very little protection against scratches & wear
- Do not enhance the look of wood

Shellac

A resin made from the lac bugs of Southeast Asia & is available in a variety of warm shades. It can be applied by spraying or brushing

Advantages

- Durable
- Non-toxic & natural
- UV-resistant



Disadvantages

- Scratches easily
- Dries very quickly, making it difficult to fix mistakes while applying
- May need several coats

Varnish:



Shellac:



Waxes:



Lacquer

- It is made from the sap of the lacquer tree, is utilized for an extremely intense gloss finish & is made available to apply by spraying or brushing.

Advantages

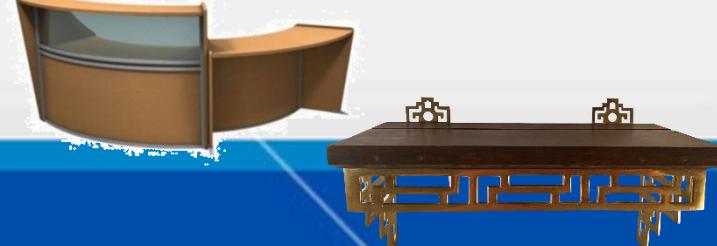
- Dries fast
- Extremely durable
- Less likely to deteriorate or crack



Disadvantages

- Low resistance to chemicals
- Can become scratched as it ages
- Discolors

Lacquer:



Finishing 2: Adhesives

Adhesive

Any non-metallic substance applied to bind two separate items together & resist their separation.

Polyvinyl Acetate Glue

It is also referred to as PVA & is the white glue typically sold for school use.

Advantages

- Very safe
- Non-toxic
- Easy to clean up
- Bonds in about one hour

Disadvantages

- It is not waterproof
- Not specifically designed for wood

Epoxy Adhesive

Epoxy glues are sold as two components that must be mixed to be used.

Advantages

- Water resistant
- Fills gaps
- Bonding times vary from very quick to 24 hours

Disadvantages

- Some epoxies are toxic
- Once the two components are mixed there is a limited time that the glue is useable
- Expensive

Aliphatic Glues

Aliphatic glues are also referred to as wood glues & include glues such as Elmer's Wood Glue & Titebond.

Advantages

- Non-toxic
- Joints are slightly flexible
- Easy Cleanup

Disadvantages

- Joints must be clamped or held under pressure for at least 30 minutes
- Joints are slightly flexible

Polyvinyl Acetate Glue:



Aliphatic Glues:



Epoxy Adhesive:



Polyurethane Adhesives:



Materials 1: Metals

Metals

A solid material which is typically hard, shiny, malleable, fusible, & ductile, with good electrical & thermal conductivity.

FERROUS Metals

They mostly contain iron & have small amounts of other metals or elements added, to give the required properties.

Properties:

- Magnetic
- Not resistant to corrosion
- Recyclable
- Hard
- Durable
- Strong

Examples:

- Vehicle scrap metal
- Demolition Site scrap metal
- Metal offcuts from manufacturing industries
- Steel
- Carbon steel
- Alloy steel
- Cast iron
- Wrought iron



Product Images:



NON-FERROUS Metals

They do not contain Iron & are not magnetic. They are usually more resistant to corrosion than ferrous metals.

Properties:

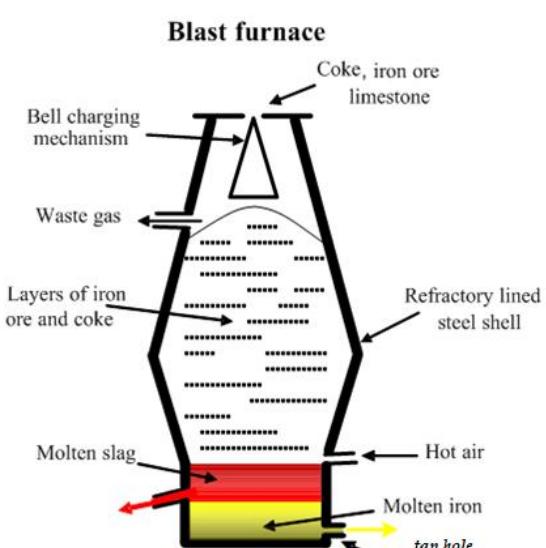
- Not magnetic
- Resistant to corrosion
- Malleable
- Rust resistant

Examples:

- Copper
- Zinc
- Aluminum
- Lead
- Nickel
- Cobalt
- Chromium
- Gold
- Silver
- Tin
- Brass



Product Images:



- 1) Iron oxide, limestone & coke (Carbon) are added into the blast furnace.
- 2) Hot air is pumped into the furnace. Oxygen reacts with coke to form carbon dioxide.
- 3) Limestone decomposes to give calcium oxide & carbon dioxide.
- 4) Carbon dioxide reacts with coke to produce carbon monoxide.
- 5) Carbon monoxide reduces iron oxide to iron & is oxidized to carbon dioxide.
- 6) Iron can be collected at the bottom as liquid. Carbon dioxide is released as a waste gas.

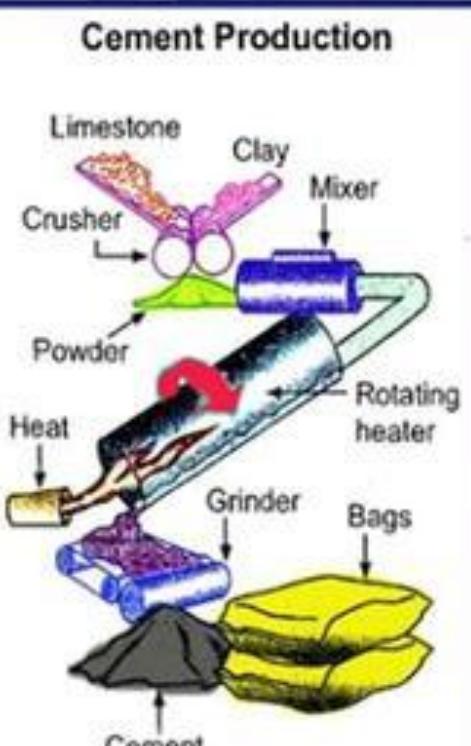
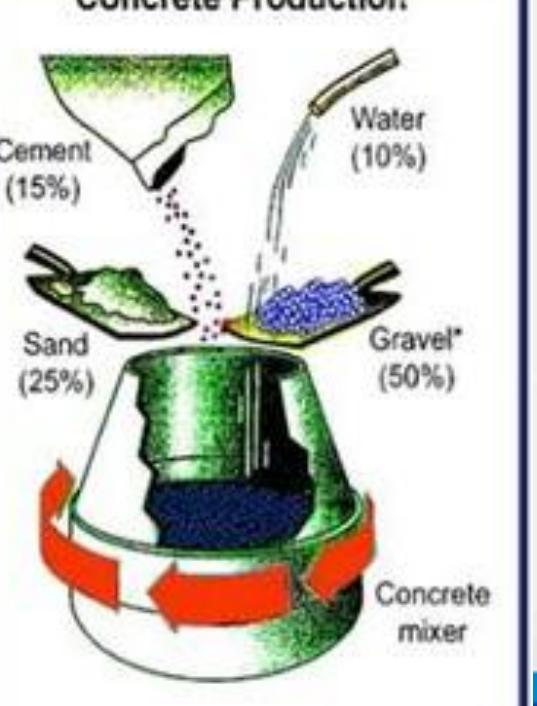


If all types of ferrous metals & non-ferrous metals were present in the workshop, Ferrous metals would be chosen as they are alloys & are strong. It is, at the same time, durable & recyclable.

Materials 2: Cement & Concrete

Construction Materials

Materials that are used during building construction for strength & durability.

CEMENT	CONCRETE
<p>They are made by heating powdered limestone with clay.</p> <p><u>Image:</u></p> 	<p>They are made by mixing cement with sand, water & aggregate (crushed rock).</p> <p><u>Image:</u></p> 
<p><u>Product Images:</u></p> 	<p><u>Product Images:</u></p> 
<p>Cement Production</p>  <p>RAPID HARDENING CEMENT:</p> <ul style="list-style-type: none"> - It is manufactured with such adjustments in the proportion of raw materials so that the cement produced attains maximum strength within 24-72 minutes. <p>QUICK SETTING CEMENT:</p> <ul style="list-style-type: none"> - Its quality is that it sets into a stone-like mass within a period of fewer than 30 minutes. <p>WHITE CEMENT:</p> <ul style="list-style-type: none"> - It may also be defined as, a special type of Portland cement which gives a milky or snow-white appearance when used. 	<p>Concrete Production</p>  <p>*Gravel = small stones</p>
<p>Wet lean mix concrete</p>	<p>Pervious or permeable concrete mix</p>
<p>C40 concrete</p>	<p>Roller-compacted concrete</p>
<p>C10 concrete, or Gen 1 concrete</p>	<p>Heavy-duty use concrete</p>

Materials 3: Smart Colors

Smart Colors

Pigments, that can be incorporated into paints, dyes, inks & plastics, that react to changes in their surroundings.

THERMOCHROMIC

They react to changes in temperature

Examples:

- Baby feeding products
- Kettles
- Steam irons
- Thermal warning patches
- Thermometers
- Printing effects on promotional items
- Toys

Product Images:



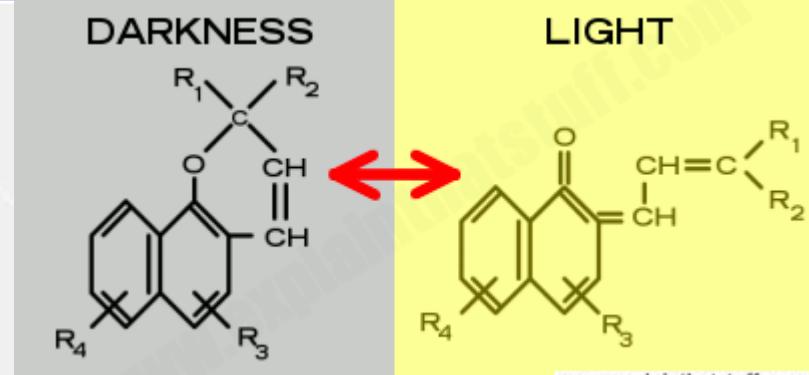
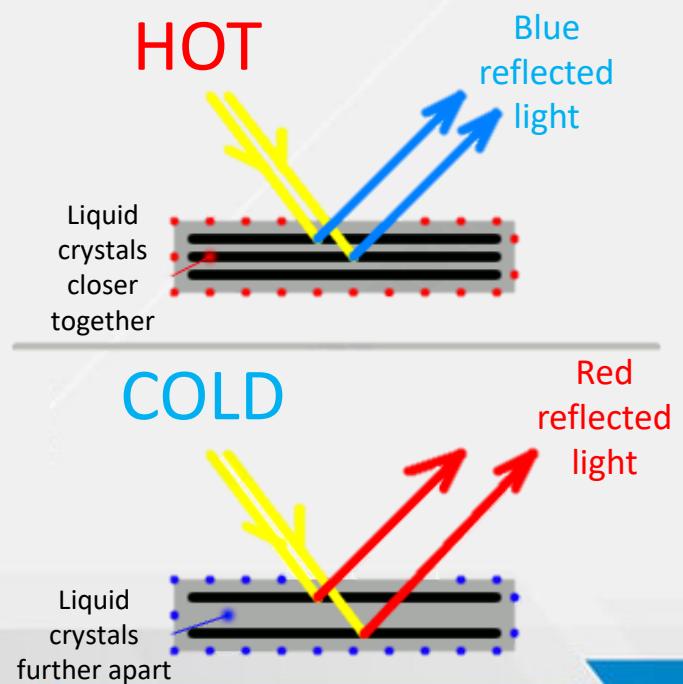
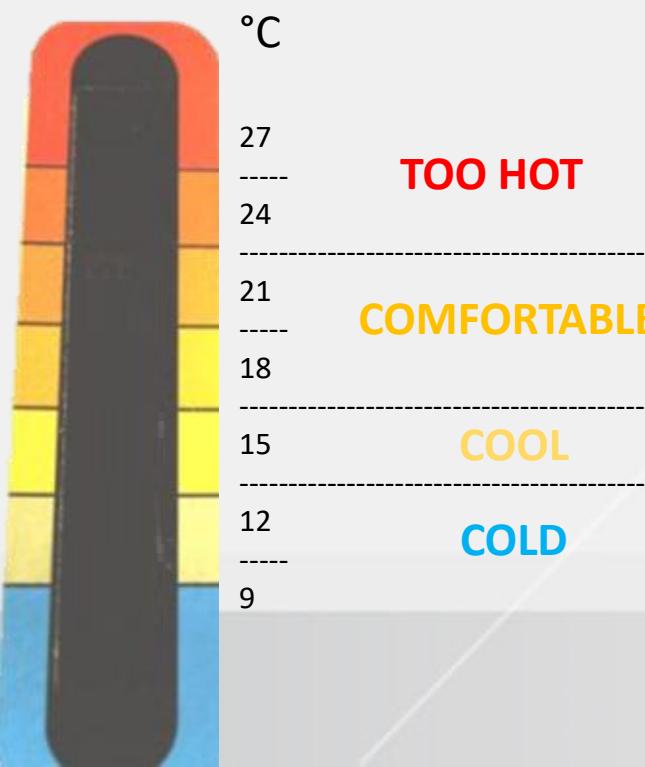
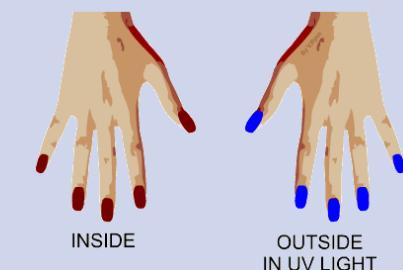
PHOTOCHROMIC

They react to changes in light levels

Examples:

- Sunglasses
- Inks
- Paints
- Dyes
- Nail polish

Product Images:



If all types of smart colors (Thermochromic & Photochromic) were present in the workshop, Thermochromic would be chosen as it looks good & is amazing. At the same time, it can work inside & outside.

Materials 4: Glass & Paper

Glass

A hard, brittle substance, typically transparent or translucent, made by fusing sand with soda & lime & cooling rapidly.

Float Glass

Properties:

- High degree of light transmission.
- Range of colors available.
- Can be created in different opacities

Uses:

- Windows in domestic housing
- Commercial applications



Product Images:



Paper

Material manufactured in thin sheets from the pulp of wood or other fibrous substances, used for writing, drawing, or printing on, or as wrapping material.



Trees are cut down.

The logs from the trees are taken to a mill.

The bark is taken off the logs



Toughened/ Tempered Glass

Properties:

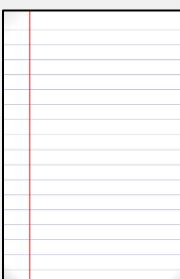
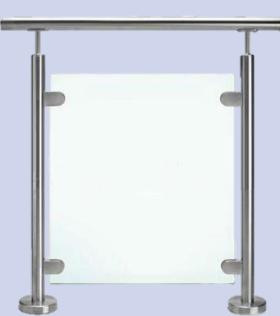
- Structural durability
- Thermal strength.
- withstand high temperatures
- Highly resistant to breakages (the panels stay together when broken)

Uses:

- Large windows
- Sports Arena
- Railings
- Tabletops
- Display Cases



Product Images:



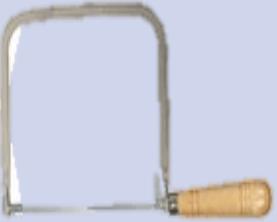
Chemicals are added to the pulp. The water is taken out of the pulp. Fibers from the wood are left over. The wood fibers are used to make paper.

The wood chips are boiled in water to make a thick wood pulp.

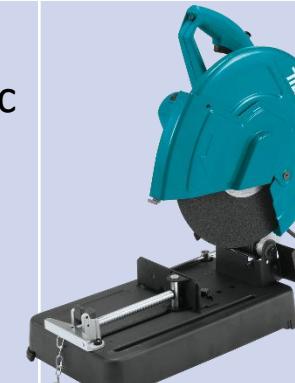
The wood is cut into very small pieces called chips.



Hand tools

<u>Tool</u>	<u>Use</u>	<u>Image</u>	<u>Tool</u>	<u>Use</u>	<u>Image</u>	<u>Tool</u>	<u>Use</u>	<u>Image</u>
Coping saws	Used for cutting curved shapes in wood or plastic.		Chisel	Used for carving or shaping wood.		Steel ruler	Used for measuring & marking out work.	
Try-square	Used for marking out straight line.		File	Used to smooth rough or sharp edges from metal or wood.		Hammer	Used to deliver high force on a small area	
Tenon saw	Used for cutting mortise & tenon joints & straight lines on wood.		G-Clamps	Used for securing work		Screw Drivers	Used to tighten & loosen the screw	

Machinery

Machine	Use	Image	Machine	Use	Image	Machine	Use	Image
Band Saw	Used to cut thicker sections of wood & plastic (sheets, blocks, tubes) in straight lines		Scroll Saw	Used to cut accurate curves in thin sheet wood & plastic.		Hot wire cutter	Used to cut/melt through materials such as polystyrene [aero board] by pressing a hot wire along it	
Disc & Belt Sanding Machine	Used to remove waste material & smooth the edge of wood & plastic sheets/ blocks		Electric Power Drill	Used with drill bits to quickly drill holes in wood, metal, plastic & concrete.		The Fretsaw	Used to cut curves in material	
Cordless Power Drill	Used with drill & screwdriver bits to make holes & drive in wood screws		Radial disc cutter	Used to cut wood, acrylic & PVC		The Pillar Drill	Used to drill larger pieces of material quickly & easily.	

Specification

Aesthetics:

The product must have simple and minimalistic aesthetics that are capable of matching with most interior designs. A minimalistic theme of aesthetics has been chosen due to its success seen in the making of products. On another note, some features of the product such as the colors of possible mood lights should be able to be changed by the user depending on what look for the product they desire, this also will give the user a personalized experience with the product. Additionally, smooth finishes of paint, metal plating and acrylic plastic can be used to enhance the appearance of the product. The aesthetics of the product must most importantly appeal to the target market; students and working adults.

Materials:

The materials that are going to be used are HIPS, teak and pine along with other materials such as cement. Cement might be used as it involves having to do a lot of processes and acrylic might be used as it is easy to work with. Plywood, on the hand, might be used as it is very strong and durable. Other materials used would be found brought-in items such as glass in LED bulbs. Veneers might also be used to cover the wood and make it aesthetically pleasing.

Theme & Inspiration:

The intended theme of this product surrounds the concept the two areas of lighting and storage, combined making a multifunctional lighting and storage bedside table unit.

Time Scaling:

14 weeks were given to complete the product which mean that time would be needed to be managed effectively and would need to take advantage of all the time with all the time provided.

Safety:

As the product will be used by many students, it is essential that precautions be taken to ensure their and all user's safety when interacting with the product. The product must never overheat to dangerous temperatures which could harm the user, there must be no sharp edges on the product and all electrical wires must be properly insulated. The product must be sturdy enough to prevent the product from falling over and strong enough to resist breaking.

Durability:

The product should be capable of having a lifespan of between 5 to 10 years depending on the user interaction with the product. The product could be made more durable by using finishes and strong adhesives which would help keep the project intact. The materials used should be easily available in the market to insure that the parts of the product are replaceable. This would help increase the durability of the project.

Ergonomics & Anthropometrics:

The product must be made convenient for the user and would be made, taking into account of the product safety. The product would be made as comfortable as possible.

Functions:

The function of my product will to be to serve as a multi-functional bedside table storage and lighting unit. It will provide an aesthetically pleasing source of light for the user, while assisting them to carry out other daily activities. Data from the questionnaire shows that most people used tablets, phones and cables a lot which meant that these needed to be implemented in the project.

Target Market:

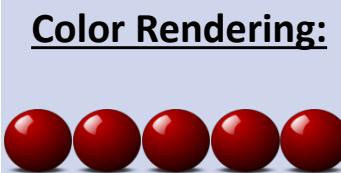
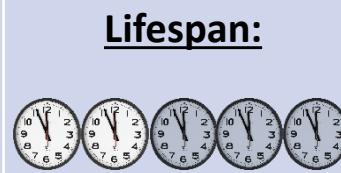
This product is targeted at middle school, high school and university students as well as working adults, though other age groups would be able to utilize the product if they wanted to. This is because the accumulation of clutter on the bedside table happens with everybody and therefore the product is capable of serving a purpose to everybody.

Different types of lighting technologies are being compared here in order to know what might be the best technology to use in the project.

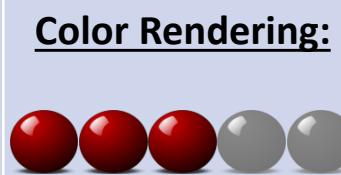
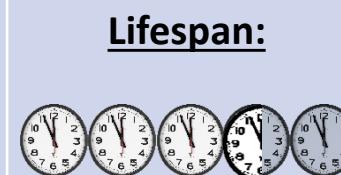
Candlelight



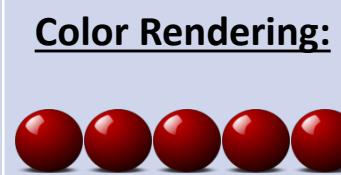
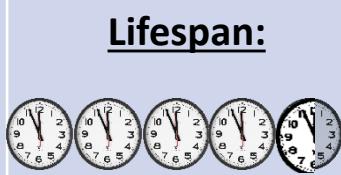
Incandescent Bulb



Compact Fluorescent Bulb

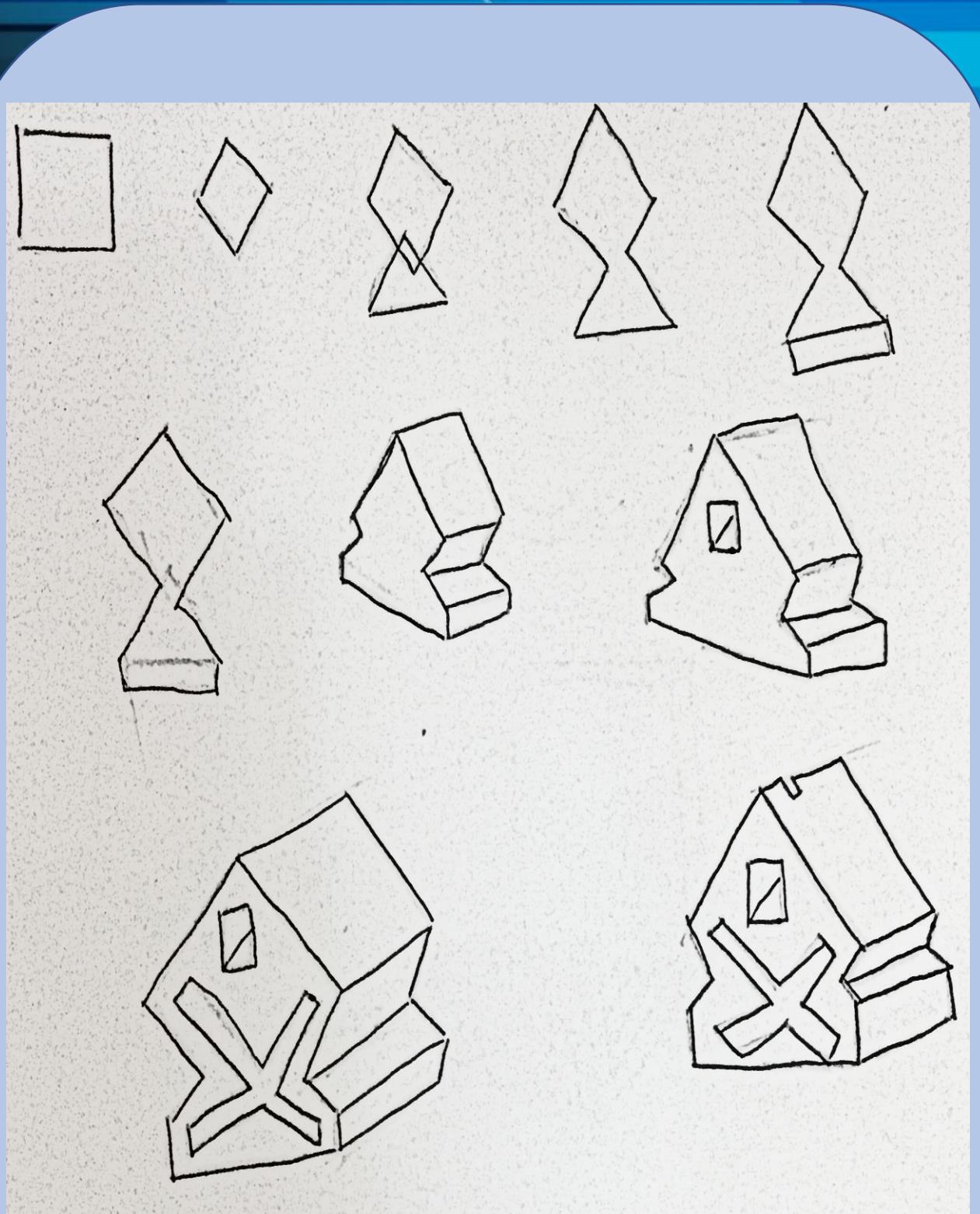


LED



After comparing candlelight, incandescent bulb, compact fluorescent bulb & LED bulb, LED should be used in the project as it is more efficient & has a higher lifespan. At the same time, it's color rendering is the same as the candle light and the incandescent bulb.

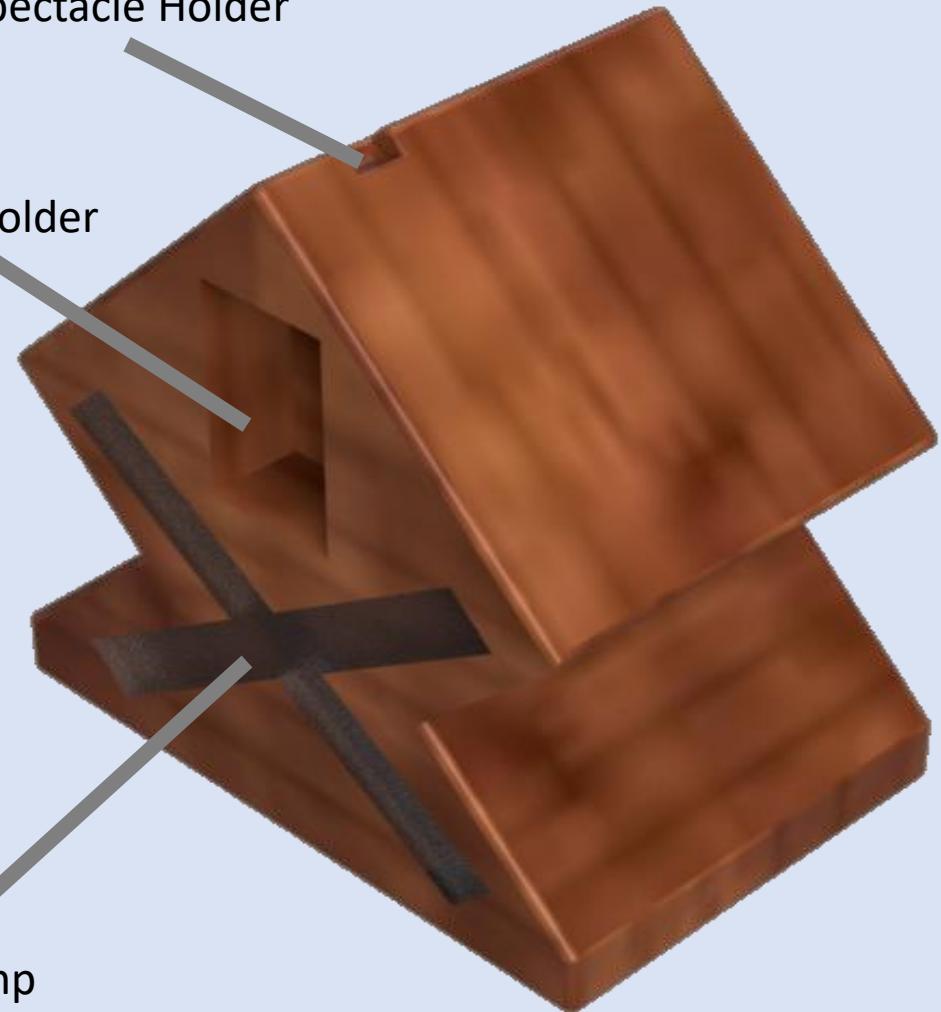
Idea 1 – Treasure Bed



Spectacle Holder

Mobile Holder

LED Lamp



Specification:

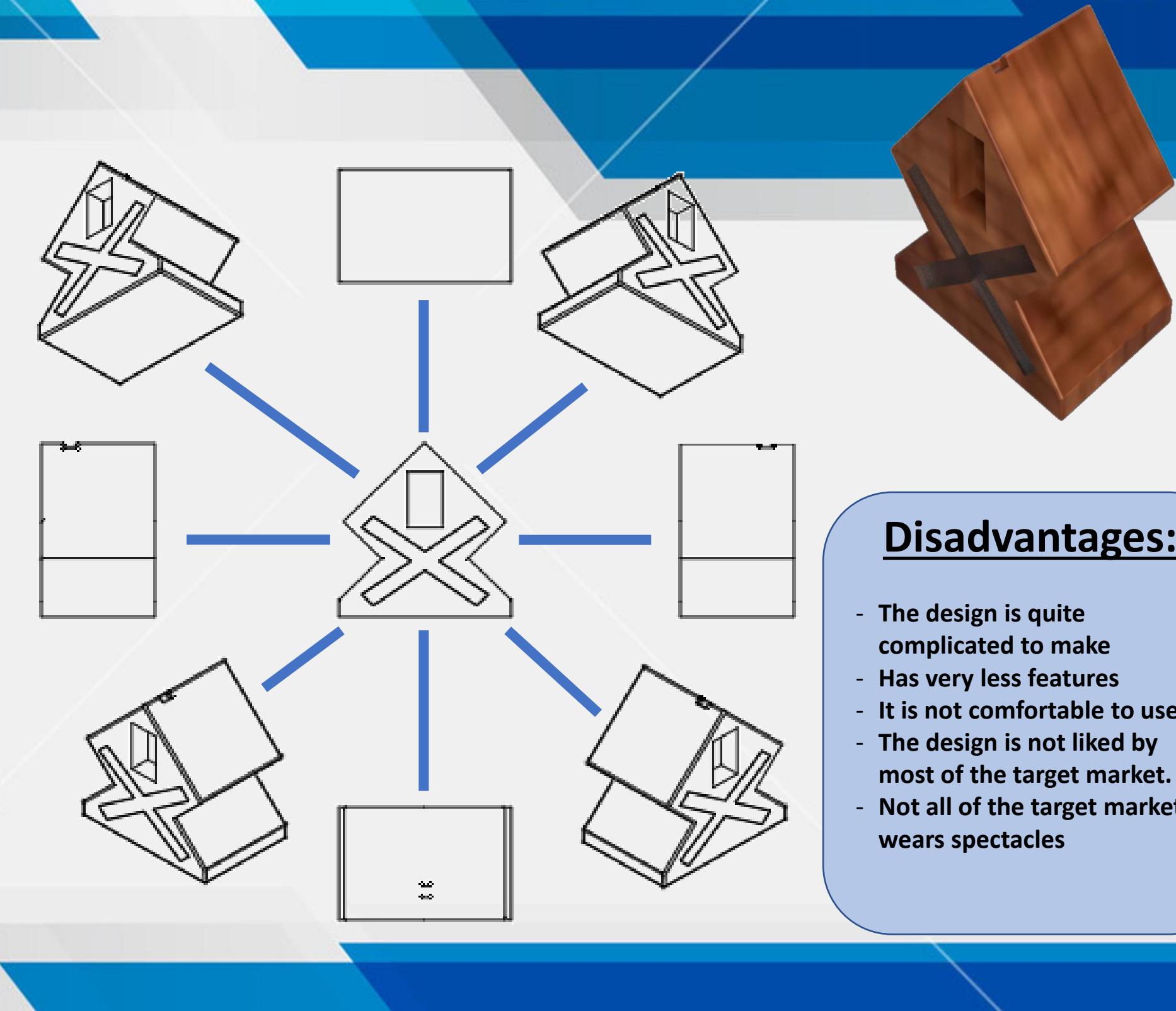
- Aesthetics: Match interior designs
- Materials: HIPS, Pine, Teak, Cement
- Theme & Inspiration: Lightning & Storage
- Size: Medium
- Safety
- Durability: 5 – 10 years
- Ergonomics & Anthropometrics: Comfortable to use
- Functions: Lightning, Tablets, Phones, etc.
- Target Market: middle school, high school, university students & working adults

Made in
Fusion 360

Idea 1 – Treasure Bed

Advantages:

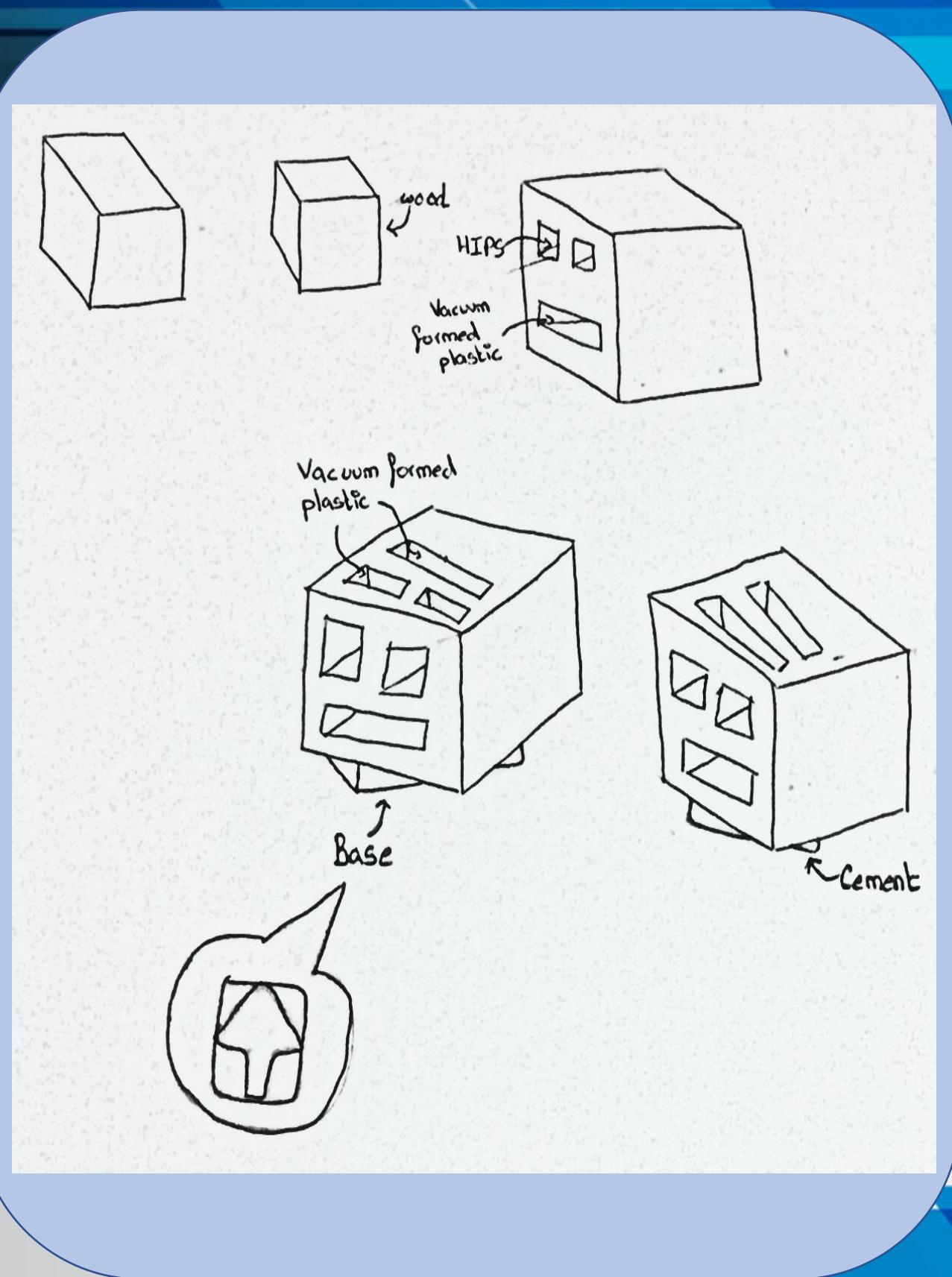
- It goes with the theme and inspiration of lightning and storage unit.
- It uses two different materials: HIPS and teak.
- Allows the user to store their mobile phone and spectacles.



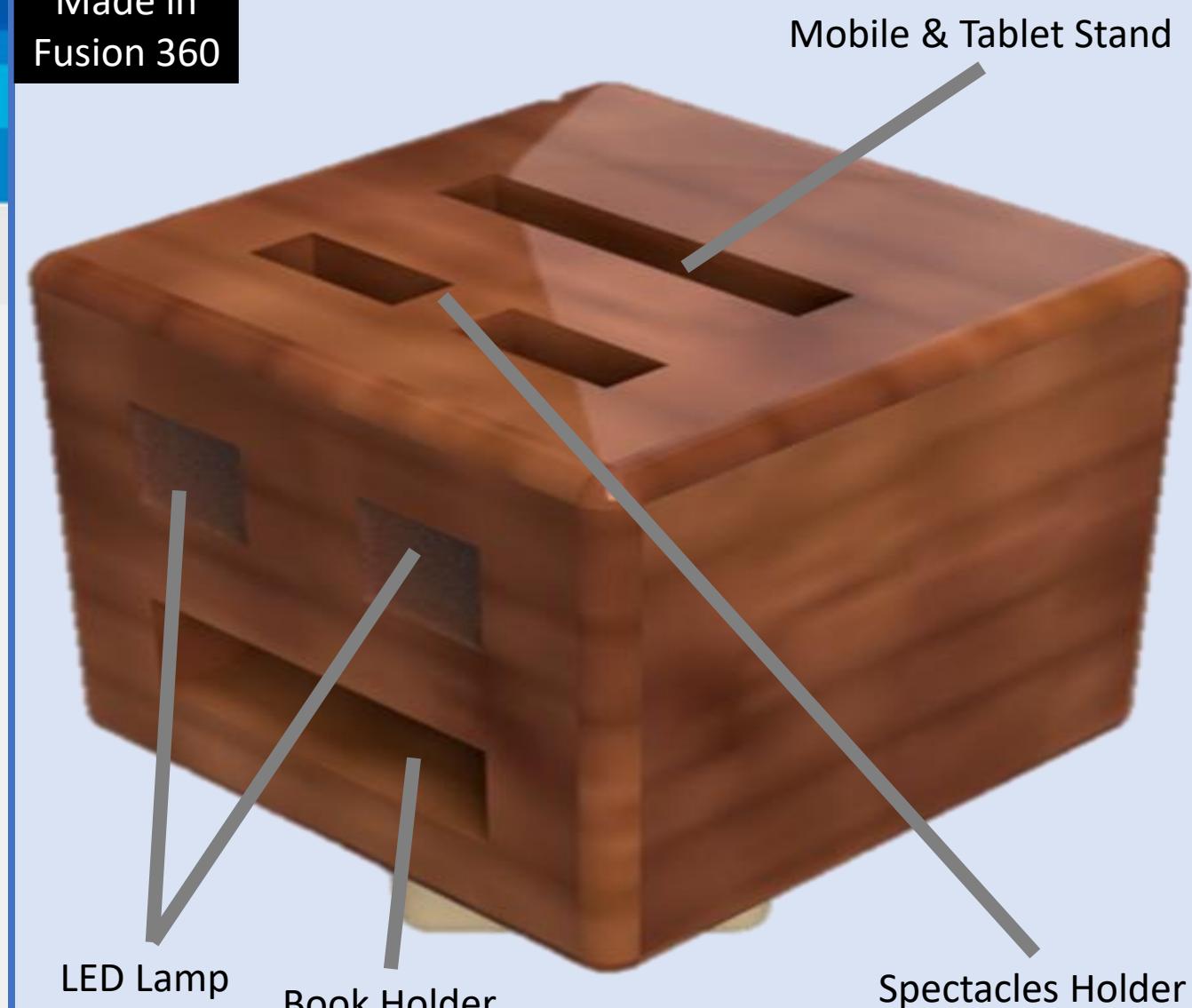
Disadvantages:

- The design is quite complicated to make
- Has very less features
- It is not comfortable to use
- The design is not liked by most of the target market.
- Not all of the target market wears spectacles

Idea 2 - RoboHead



Made in
Fusion 360



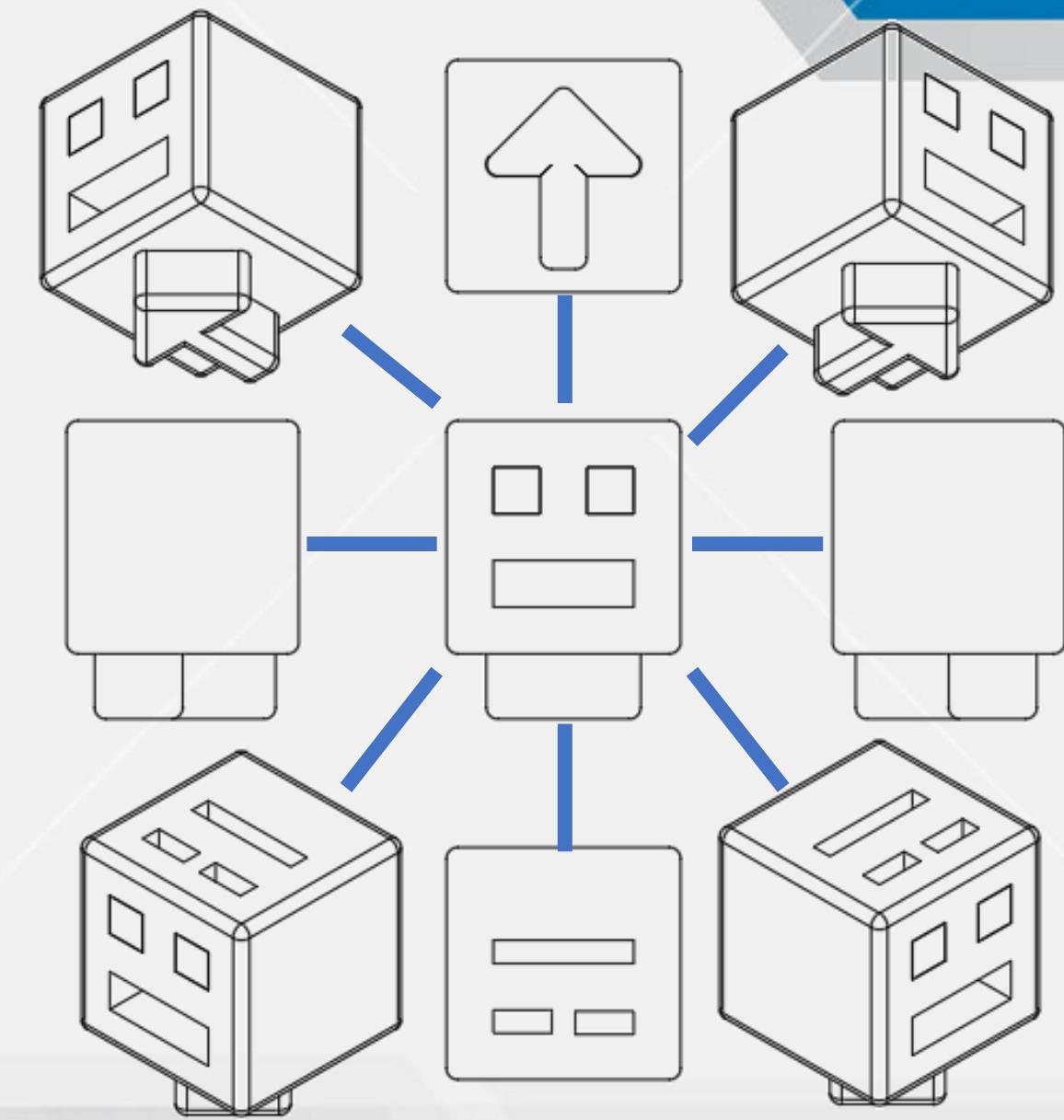
Specification:

- Aesthetics: Match interior designs
- Materials: HIPS, Pine, Teak, Cement
- Theme & Inspiration: Lightning & Storage
- Size: Medium
- Safety
- Durability: 5 – 10 years
- Ergonomics & Anthropometrics: Comfortable to use
- Functions: Lightning, Tablets, Phones, etc.
- Target Market: middle school, high school, university students & working adults

Idea 2 - RoboHead

Advantages:

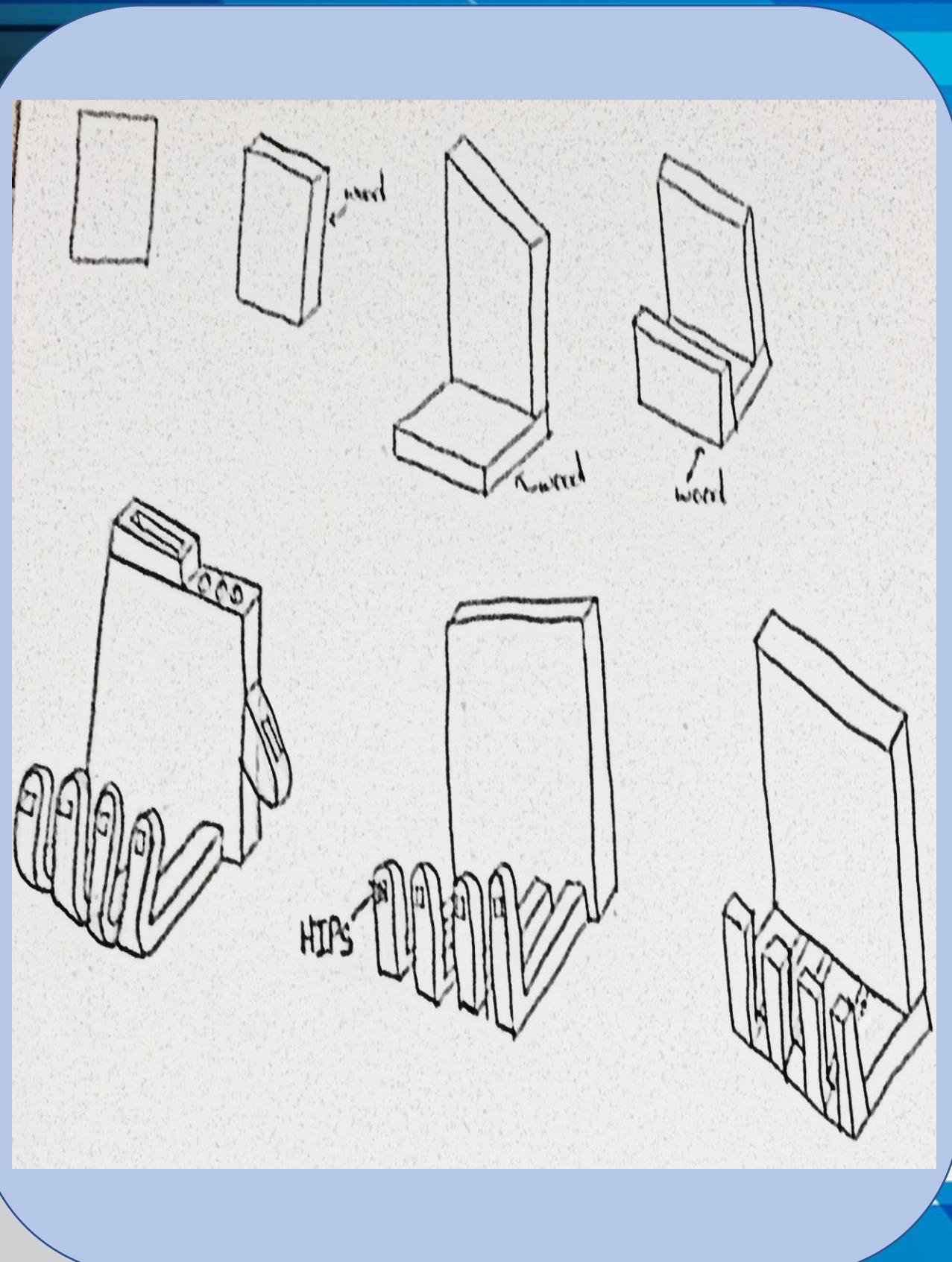
- The design is quite easy to make.
- It goes with the theme and inspiration of lightning and storage unit.
- The product is quite light which increases the safety of the product.



Disadvantages:

- Softwoods are not used to make the product.
- The face of the robot might not attract all the people in the target market.
- Not all of the target market wears spectacles

Idea 3 – Holding Hand



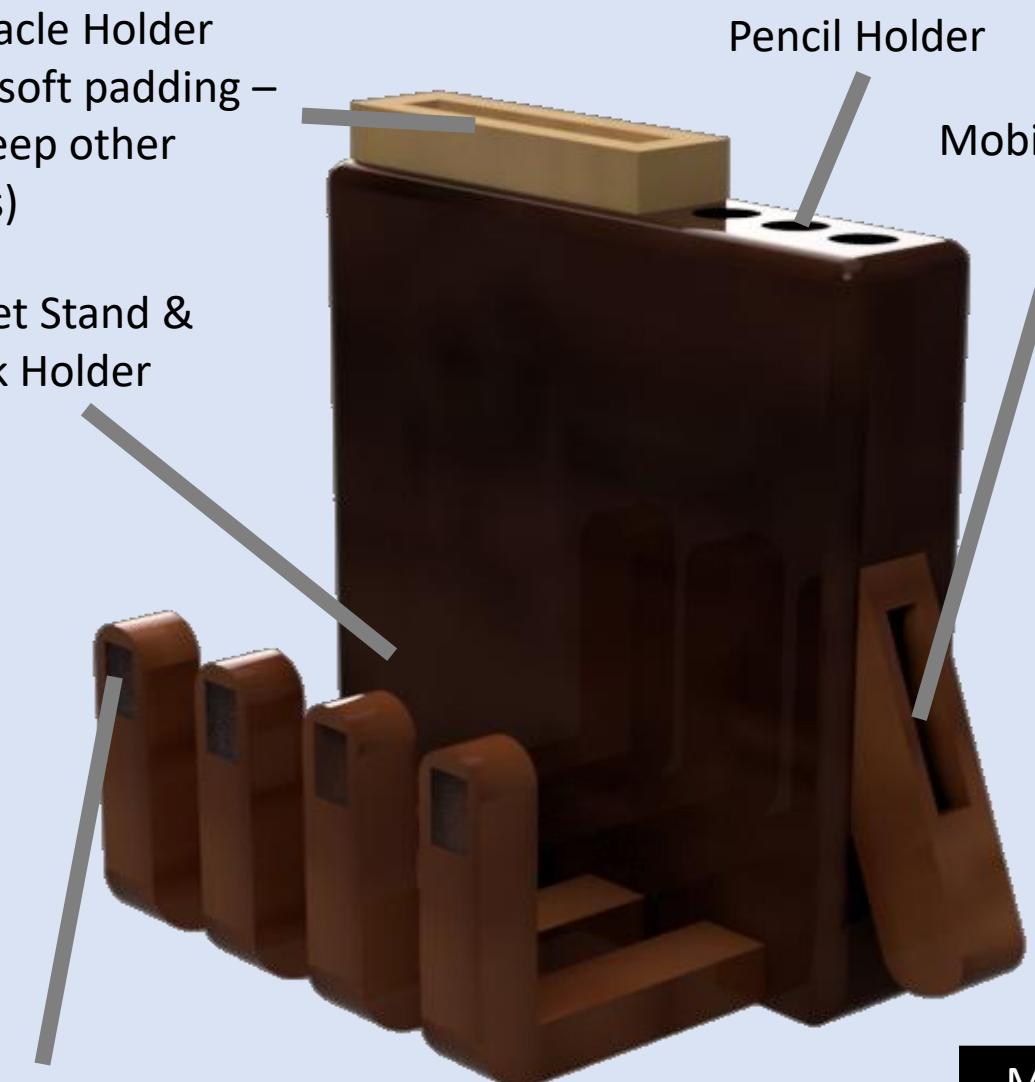
Spectacle Holder
(with soft padding –
can keep other
things)

Tablet Stand &
Book Holder

LED Lamp

Pencil Holder

Mobile Stand



Made in
Fusion 360

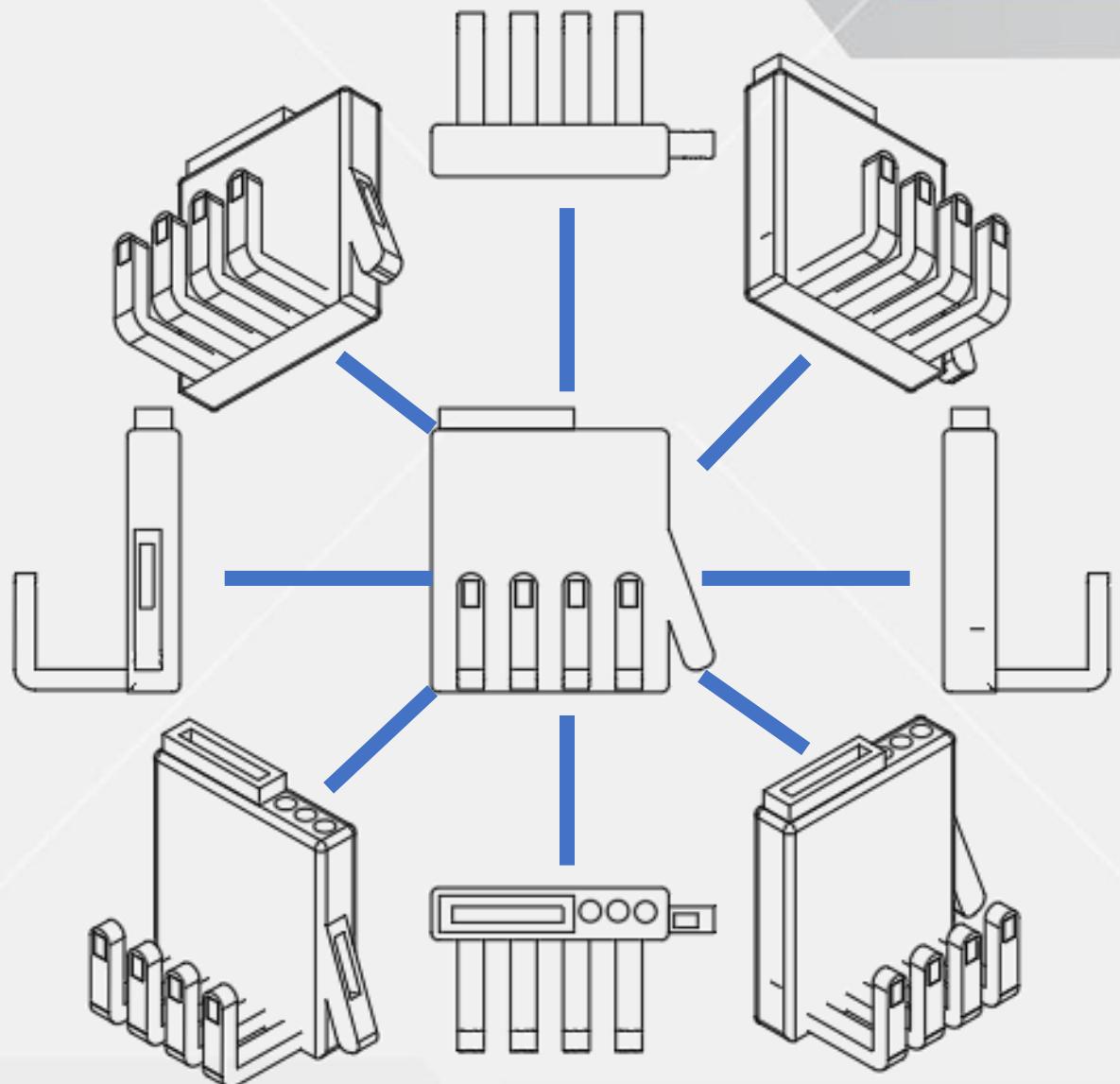
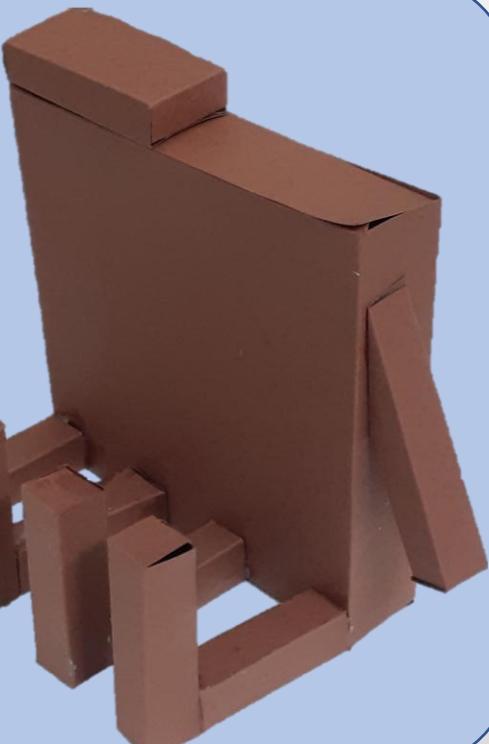
Specification:

- Aesthetics: Match interior designs
- Materials: HIPS, Pine, Teak, Cement
- Theme & Inspiration: Lightning & Storage
- Size: Medium
- Safety
- Durability: 5 – 10 years
- Ergonomics & Anthropometrics: Comfortable to use
- Functions: Lightning, Tablets, Phones, etc.
- Target Market: middle school, high school, university students & working adults

Idea 3 – Holding Hand

Advantages:

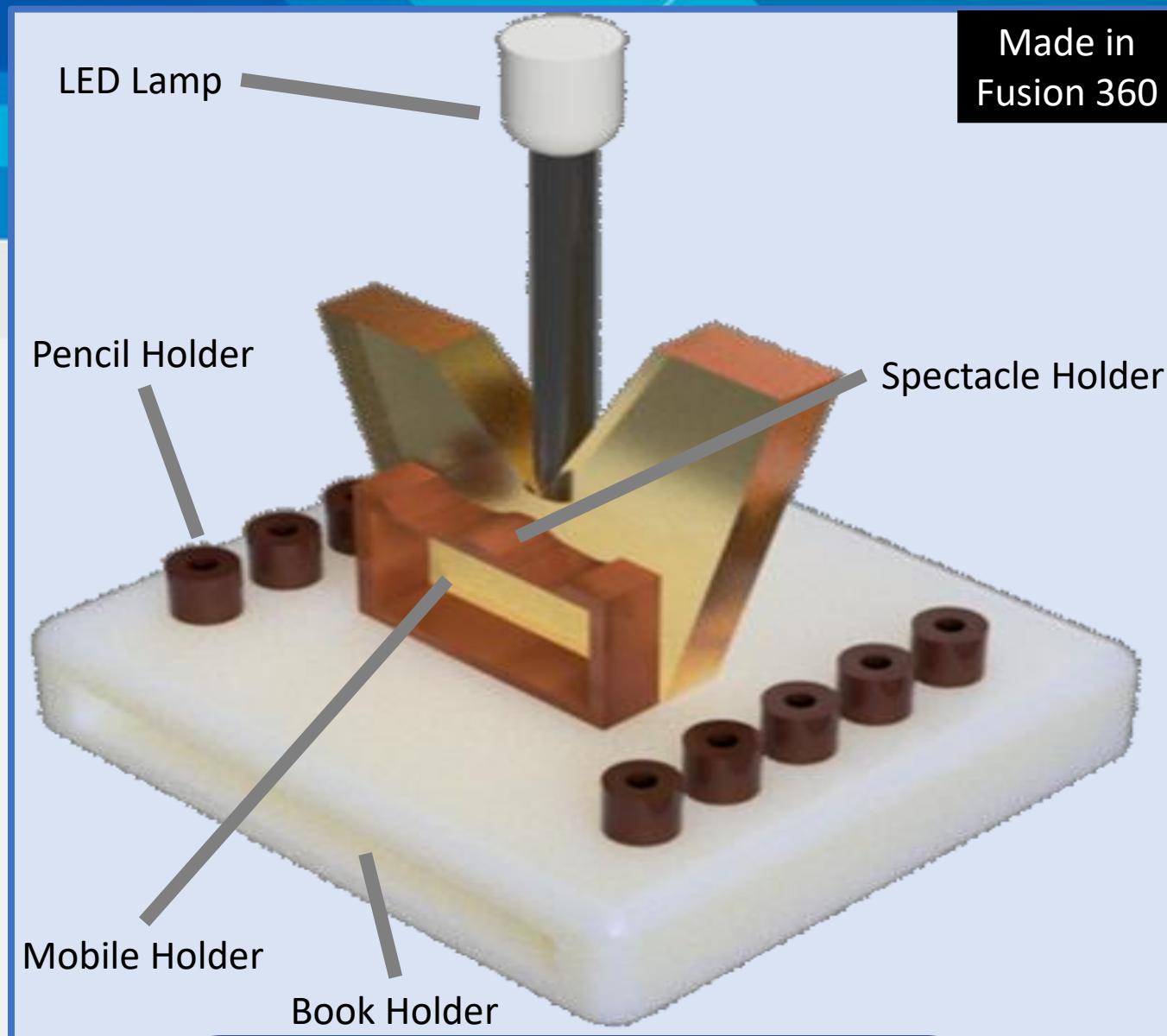
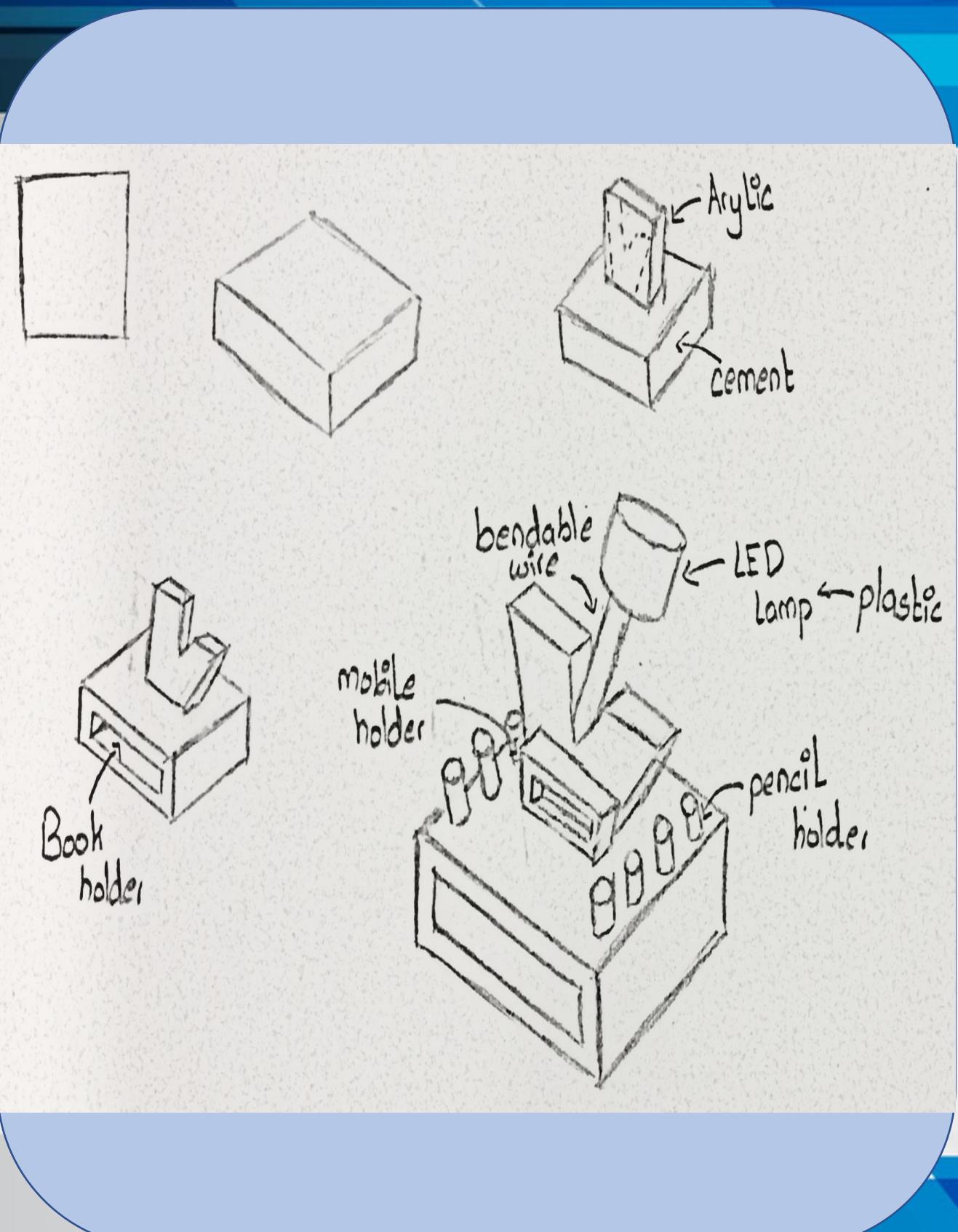
- Easy to make
- It is hung on the wall which increases space to keep other items.
- Can keep other things apart from spectacles.



Disadvantages:

- Light from the LED lamp would not be adequate to do anything.
- It would be difficult for the user to get their spectacles or other things kept on the top of the product.
- Keeping heavy books might be dangerous as the product is prone to damage or it might fall.

Idea 4 – The Stylish V



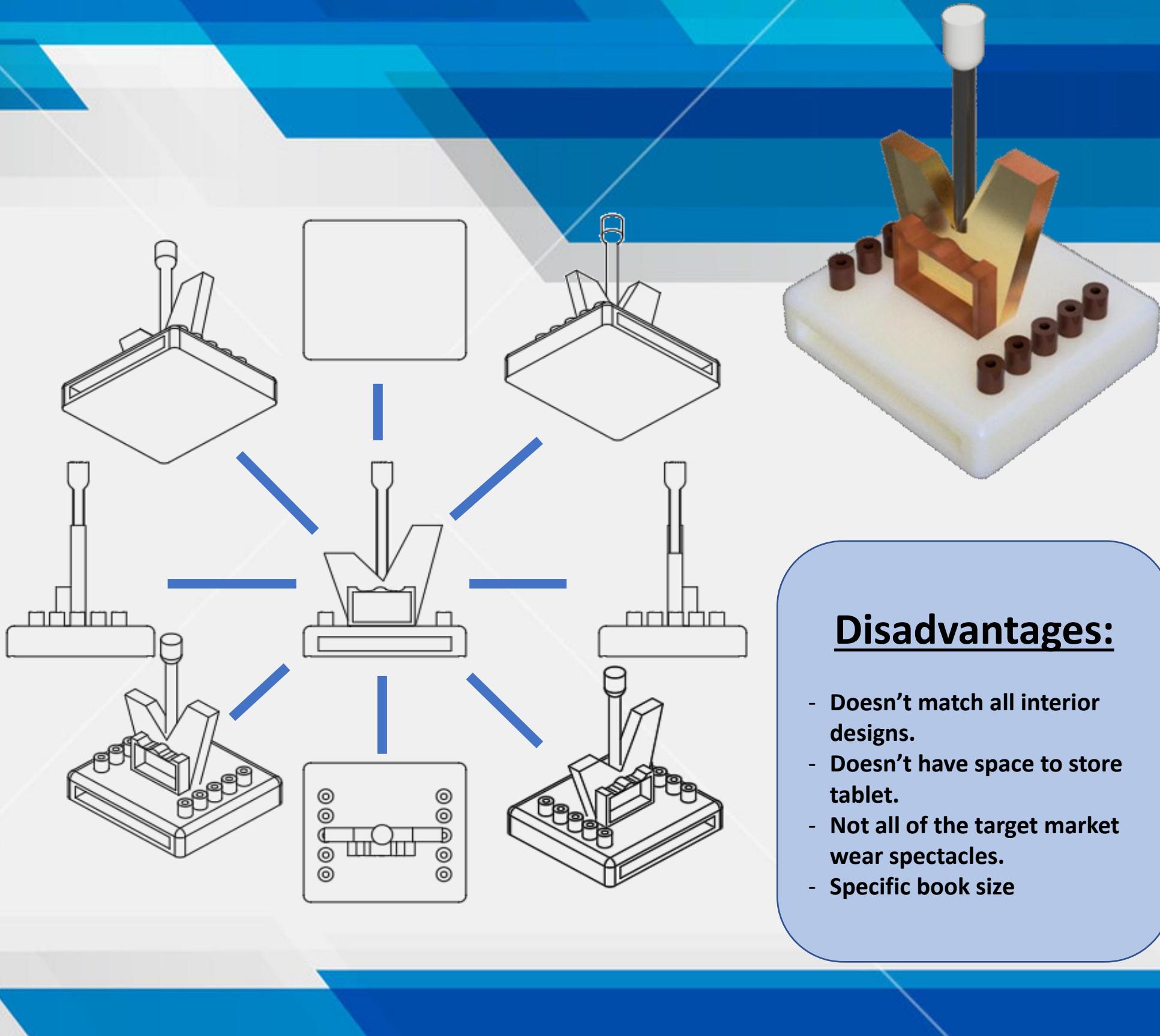
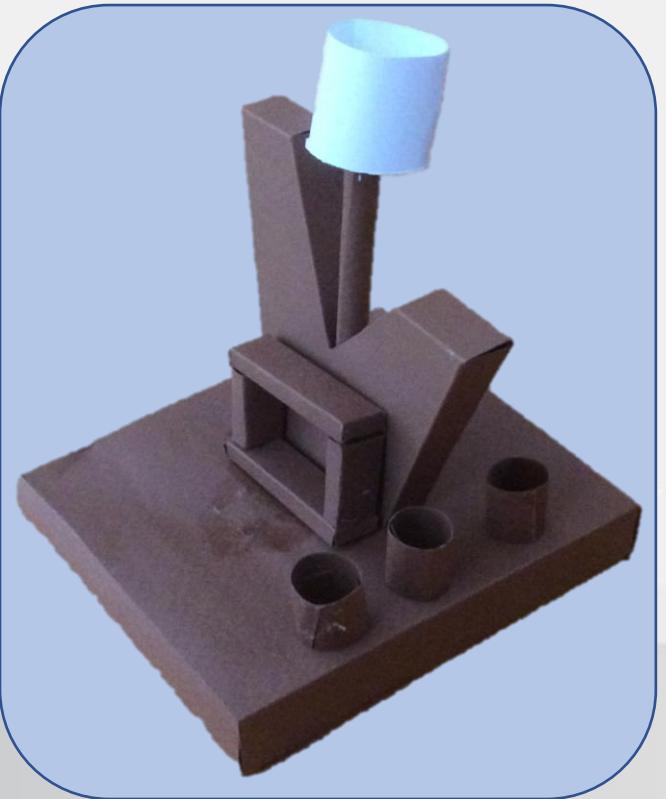
Specification:

- Aesthetics: Match interior designs
- Materials: HIPS, Pine, Teak, Cement
- Theme & Inspiration: Lightning & Storage
- Size: Medium
- Safety
- Durability: 5 – 10 years
- Ergonomics & Anthropometrics: Comfortable to use
- Functions: Lighting, Tablets, Phones, etc.
- Target Market: middle school, high school, university students & working adults

Idea 4 – The Stylish V

Advantages:

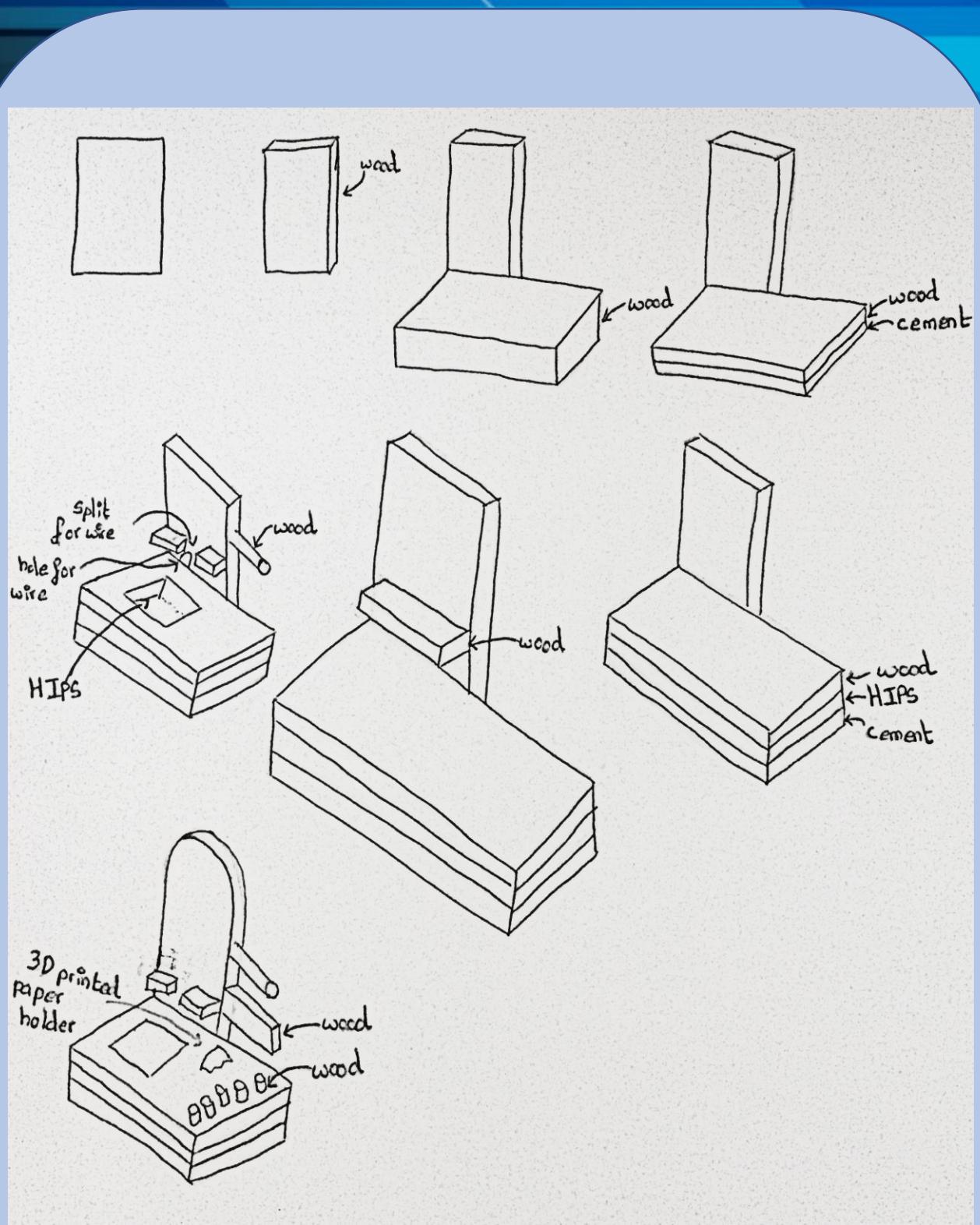
- The design is aesthetically pleasing.
- It goes along with the theme and inspiration.
- It is made of all the specified materials and is very easy to use.
- It can be used a decorative piece.



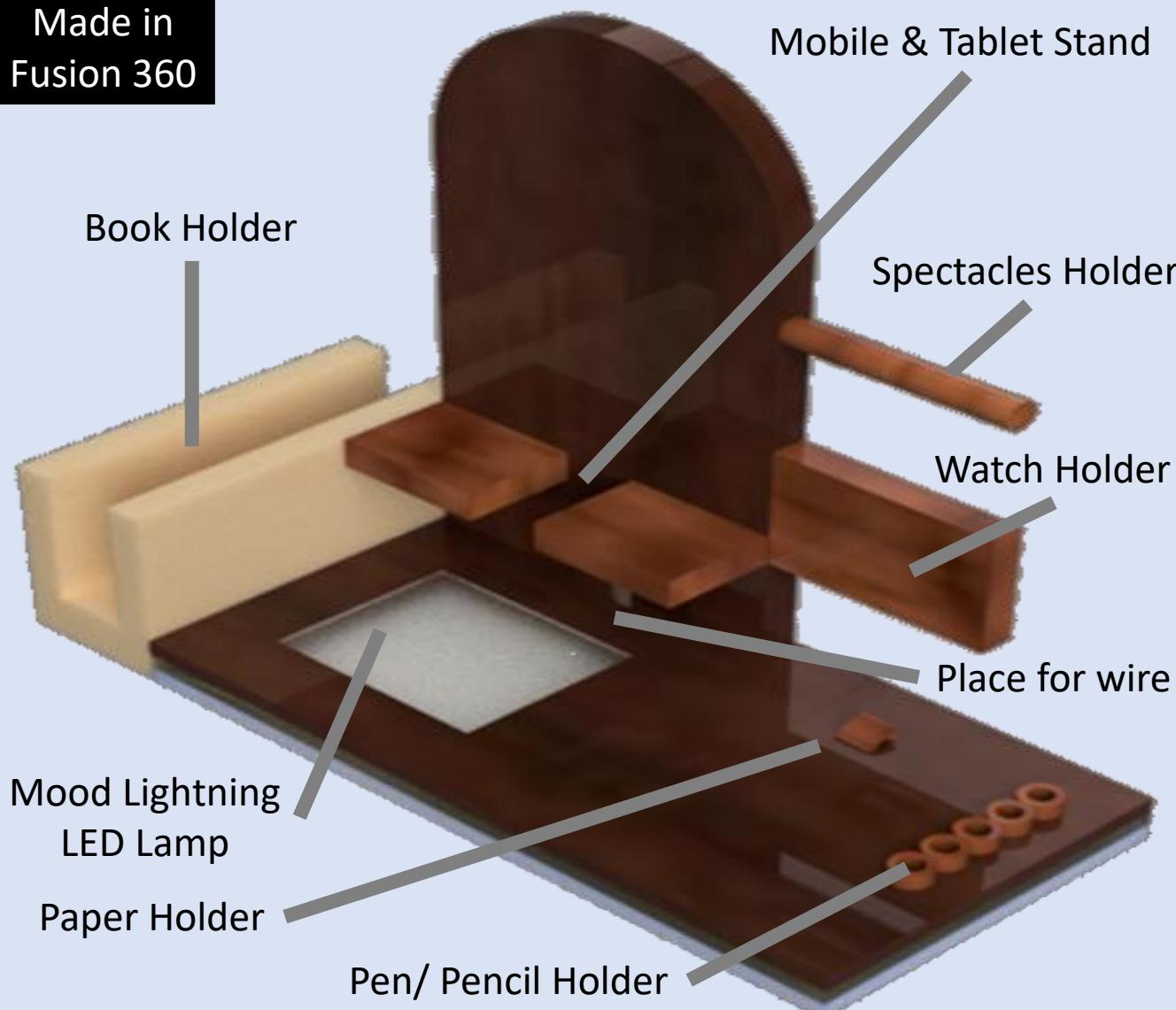
Disadvantages:

- Doesn't match all interior designs.
- Doesn't have space to store tablet.
- Not all of the target market wear spectacles.
- Specific book size

Idea 5 – Bedside Impressive



Made in
Fusion 360



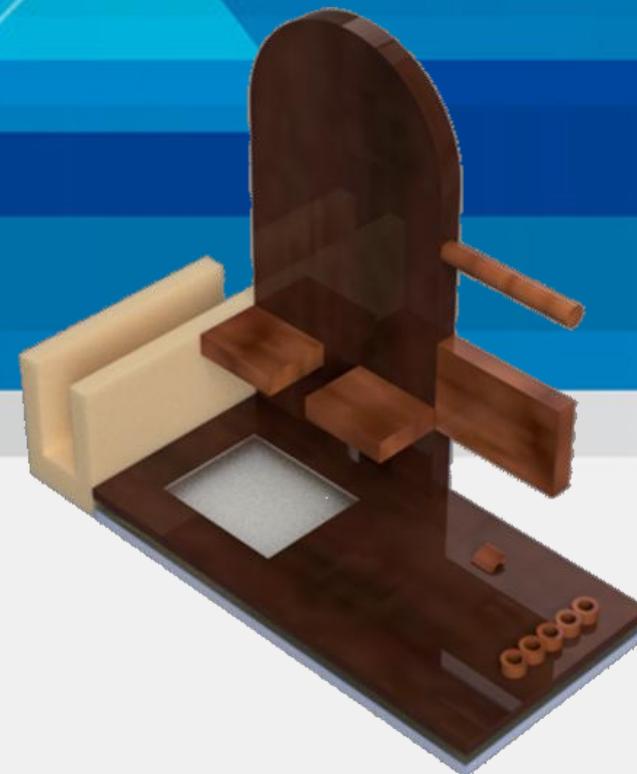
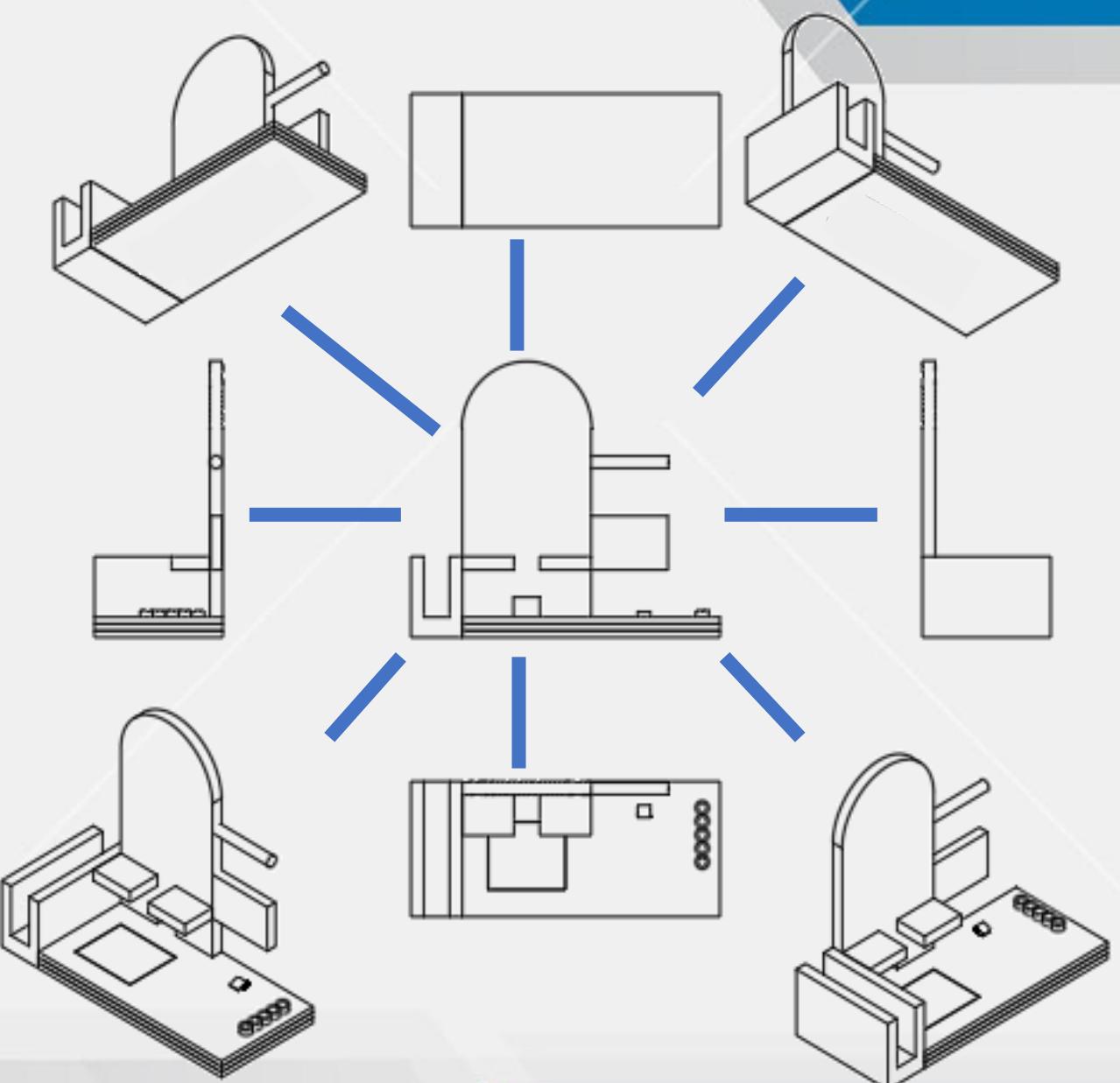
Specification:

- Aesthetics: Match interior designs
- Materials: HIPS, Pine, Teak, Cement
- Theme & Inspiration: Lightning & Storage
- Size: Medium
- Safety
- Durability: 5 – 10 years
- Ergonomics & Anthropometrics: Comfortable to use
- Functions: Lighting, Tablets, Phones, etc.
- Target Market: middle school, high school, university students & working adults

Idea 5 – Bedside Impressive

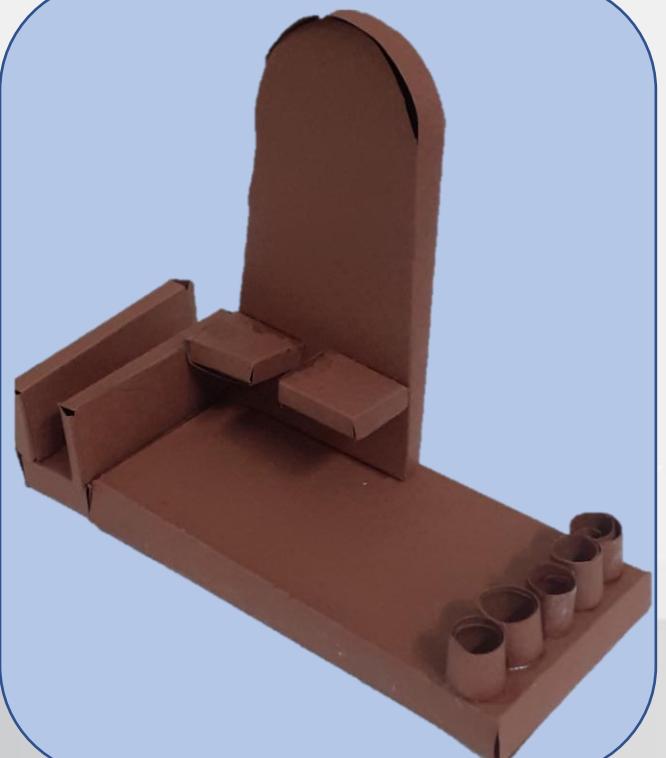
Advantages:

- Can match most interior designs.
- This idea includes all of the specified materials and uses cement.
- It goes along with the theme and inspiration.
- This idea has rounded of edges which increases safety.

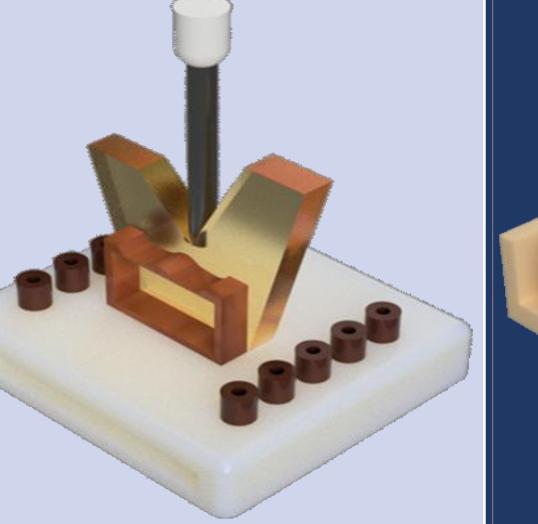


Disadvantages:

- This idea is large size.
- This idea is quite heavy which reduces safety.
- The durability of the product is in the lower band of 5 – 10 years.



Concept Screening: Summary

Treasure Bed	RoboHead	Holding Hand	The Stylish V	Bedside Impressive
 <p>Aesthetics: 6/10 Functionality: 4/10 Safety: 5/10 Durability: 7/10 Materials: 5/10 Target Market: 3/10 Ergonomics: 3/10 Overall Rating: 5/10</p>	 <p>Aesthetics: 7/10 Functionality: 9/10 Safety: 7/10 Durability: 7/10 Materials: 7/10 Target Market: 5/10 Ergonomics: 6/10 Overall Rating: 7/10</p>	 <p>Aesthetics: 6/10 Functionality: 8/10 Safety: 4/10 Durability: 5/10 Materials: 6/10 Target Market: 7/10 Ergonomics: 5/10 Overall Rating: 6/10</p>	 <p>Aesthetics: 8/10 Functionality: 7/10 Safety: 6/10 Durability: 6/10 Materials: 9/10 Target Market: 8/10 Ergonomics: 8/10 Overall Rating: 8/10</p>	 <p>Aesthetics: 9/10 Functionality: 10/10 Safety: 7/10 Durability: 8/10 Materials: 10/10 Target Market: 8/10 Ergonomics: 8/10 Overall Rating: 9/10</p>
<p>This product got a low medium rating due to its demand from the target market. Moreover, the ergonomics were one of the factors of why the target market's demand for this product went low. The safety is medium, and the functionality of the product is very little which again helped reduce the target market's demand for the product.</p>	<p>This product got a high medium rating due to its demand from the target market. The two main factors that pulled the rating down was the target market suitability and the ergonomics. Some said that the light given from the LED lamp was too little while others said that only a few books could be kept at a time.</p>	<p>This product got a medium medium rating due to its demand from the target market. Factors such as safety and durability reduced the rating. Some said that the safety and durability of the product were what they were looking for in the product after the functionality.</p>	<p>This product got a low high rating as the aesthetics and ergonomics of the product attracted a lot of the target market. Moreover, some were impressed by the number of materials that were implemented in the design. However, the safety and durability were some of the reasons of why the demand wasn't a 100%. Some were angry that only a few books could be stored.</p>	<p>This product got the highest rating due to the fact that it met most of the criteria set. Also, the fact that it had all the functions and amazing aesthetics that attracted most of the target market to this product. Though, this product wasn't a 100% rated, it got the highest rating due to the product being the most multi-functional. It has a lot of extra features such as the watch holder, stationary holder, etc.</p>

Final Idea: Improvements

After the decision over the final idea, the product should be improved to make the product more suitable and workable for its job.

Bedside Impressive

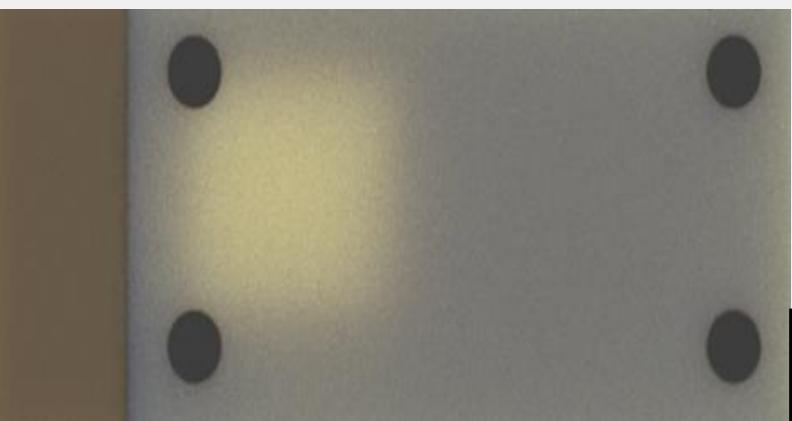


Problems

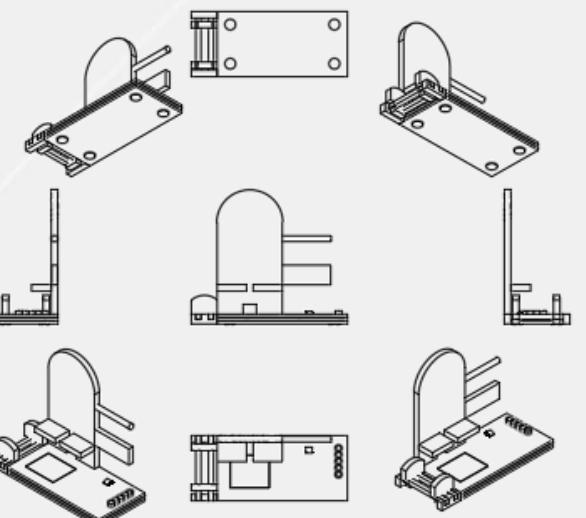
There are many glass bedside tables that make the product prone to slipping.

The book stand is going to be 3D printed which shall be a lot of waste of plastic and the 3D printer is small.

The cement layer is quite thin, making it very brittle and easy to break.

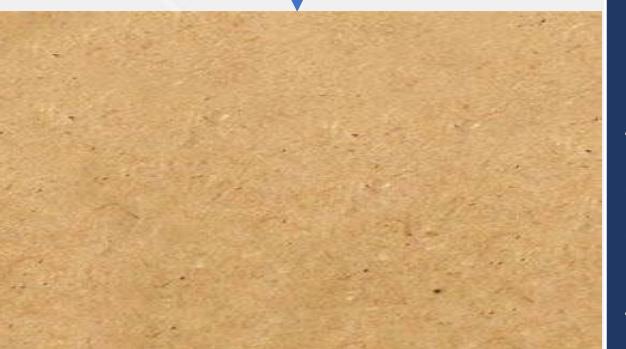


Made in Fusion 360



The 4 cylinders are rubbers that would increase friction with the bedside tables and make the product less prone to slipping.

The book stand got completely changed to something that is more suitable and is now made out of wood.



The cement gets changed to MDF as it is stronger than thin cement. It would also make it easier to work with.

Aesthetics: 9/10

Functionality: 10/10

Safety: 7/10

Durability: 8/10

Materials: 10/10

Target Market: 8/10

Ergonomics: 8/10

Overall Rating: 9/10

This product got the highest rating due to the fact that it met most of the criteria set. Also, the fact that it had all the functions and amazing aesthetics that attracted most of the target market to this product. Though, this product wasn't a 100% rated, it got the highest rating due to the product being the most multi-functional. It has a lot of extra features such as the watch holder, stationary holder, etc.

Development – Ergonomics & Shape Exploration

After the making of the CAD model of different designs, people were asked on their opinion on each shape. Some of the opinions are shown below:



"The rectangle is very simple and unattractive."



"The shape is attractive but the sides are pointed and are very simple."



"The shape is simple, yet elegant. It is also very attractive."



"The shape is very boring. I like the design; it is simple but attractive."



"The triangle shape was a smart idea, but it doesn't suit this product"



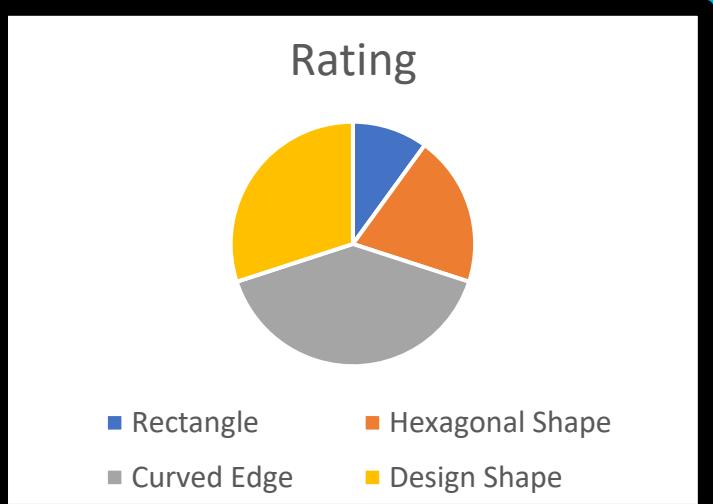
"The circle shape is simple and elegant but wouldn't suit this product and would be difficult to make the precise shape."



"The rectangle is very simple, yet elegant and attractive"



"The diamond shape is good but wouldn't look good on this product"

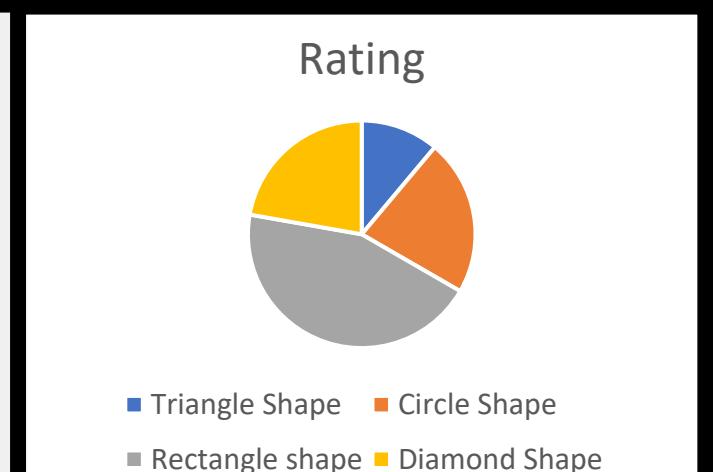


1) Which shape do you like?

Rectangle(1) Hexagonal Shape(2) Curved Edge(4)
Design Shape(3)

This question's purpose is to make sure that people like the design.

The results of the question show that the curved shape should be continued to be used.



1) Which shape do you like?

Triangle Shape(1) Circle Shape(2)
Rectangle Shape(5) Diamond Shape(2)

This question's purpose is to make sure that people like the design.

The results of the question show that the rectangle shape should be continued to be used.

Bedside Impressive



Made in Fusion 360

Aesthetics: 9/10

Functionality: 10/10

Safety: 7/10

Durability: 8/10

Materials: 10/10

Target Market: 8/10

Ergonomics: 8/10

Overall Rating: 9/10

This product got the highest rating due to the fact that it met most of the criteria set. Also, the fact that it had all the functions and amazing aesthetics that attracted most of the target market to this product. Though, this product wasn't a 100% rated, it got the highest rating due to the product being the most multi-functional. It has a lot of extra features such as the watch holder, stationary holder, etc.

Criterion 4: Development of proposed idea

Lo: To be able to develop the current idea to make it more aesthetically pleasing and more suitable to the specification.

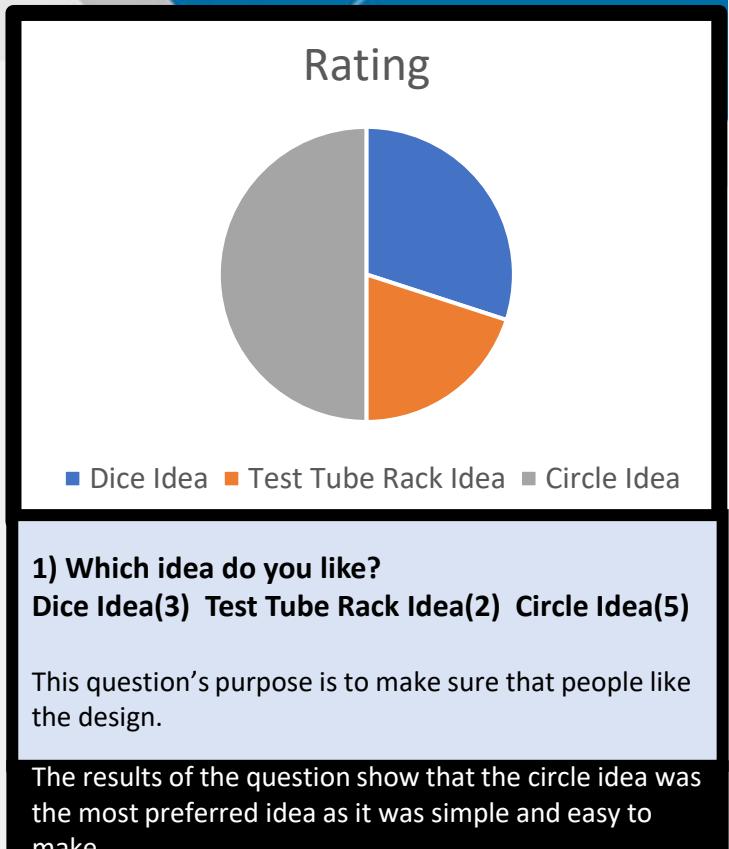
Development – Ergonomics & Shape Exploration



"The dice idea is very nice. It also makes the pencil holder very compact and gives place for other things."

"This idea makes me remember the test tube rack. I like the idea but this one takes up a lot of space."

"This is a very simple design which works and doesn't need a lot of time to make. It also looks good with the project."



Bedside Impressive



Aesthetics: 9/10

Functionality: 10/10

Safety: 7/10

Durability: 8/10

Materials: 10/10

Target Market: 8/10

Ergonomics: 8/10

Overall Rating: 9/10

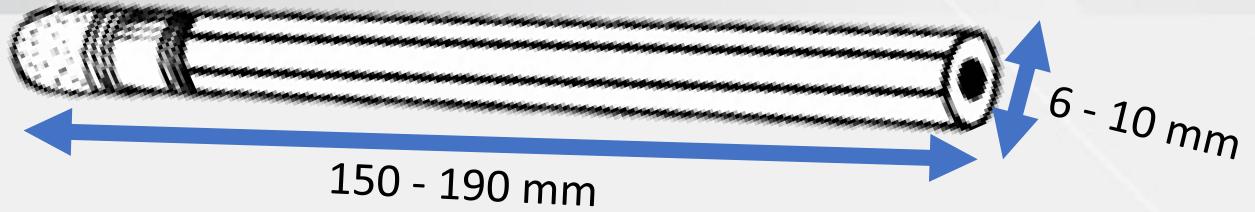
This product got the highest rating due to the fact that it met most of the criteria set. Also, the fact that it had all the functions and amazing aesthetics that attracted most of the target market to this product. Though, this product wasn't a 100% rated, it got the highest rating due to the product being the most multi-functional. It has a lot of extra features such as the watch holder, stationary holder, etc.

Criterion 4: Development of proposed idea

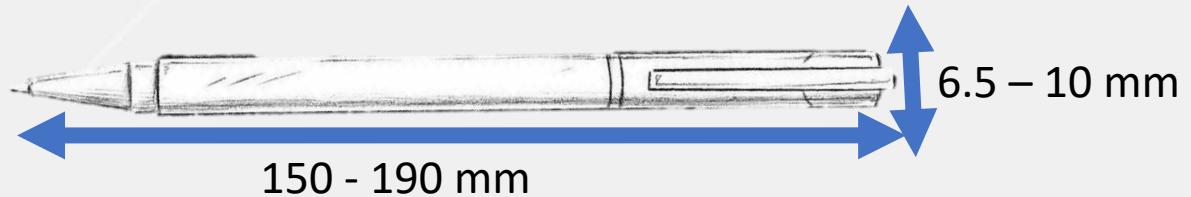
Lo: To investigate & research about the dimensions of the things that are being organized to help with the dimensioning of the product.

Dimensions and Sizes

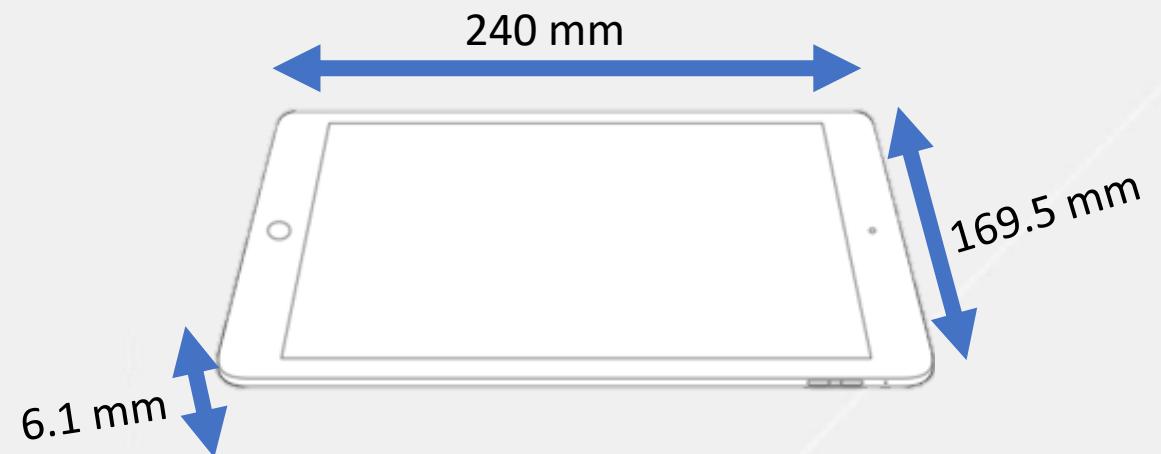
Pencil Dimensions:



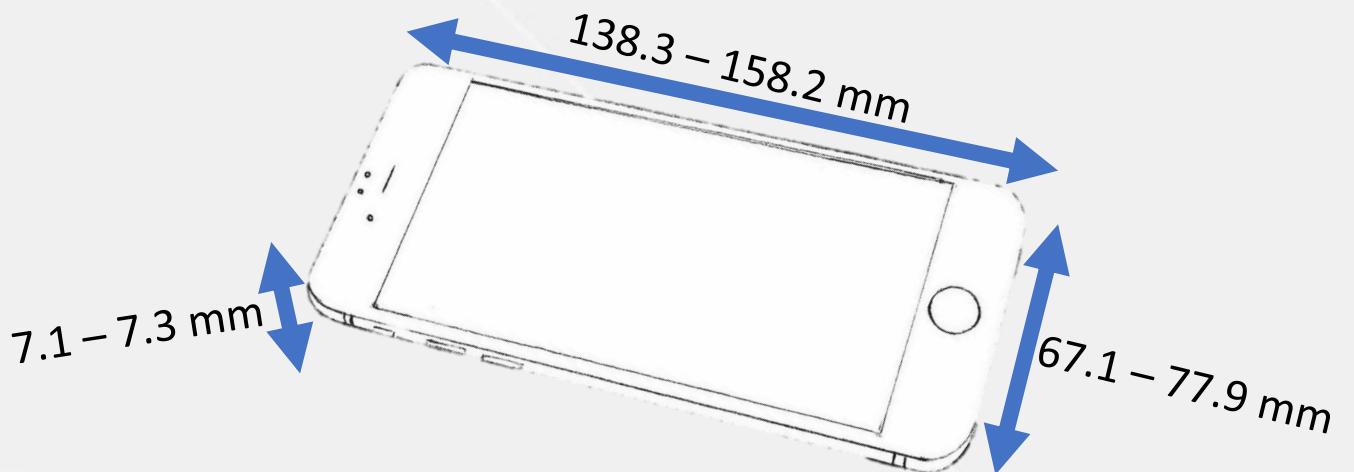
Pen Dimensions:



Tablet Dimensions:

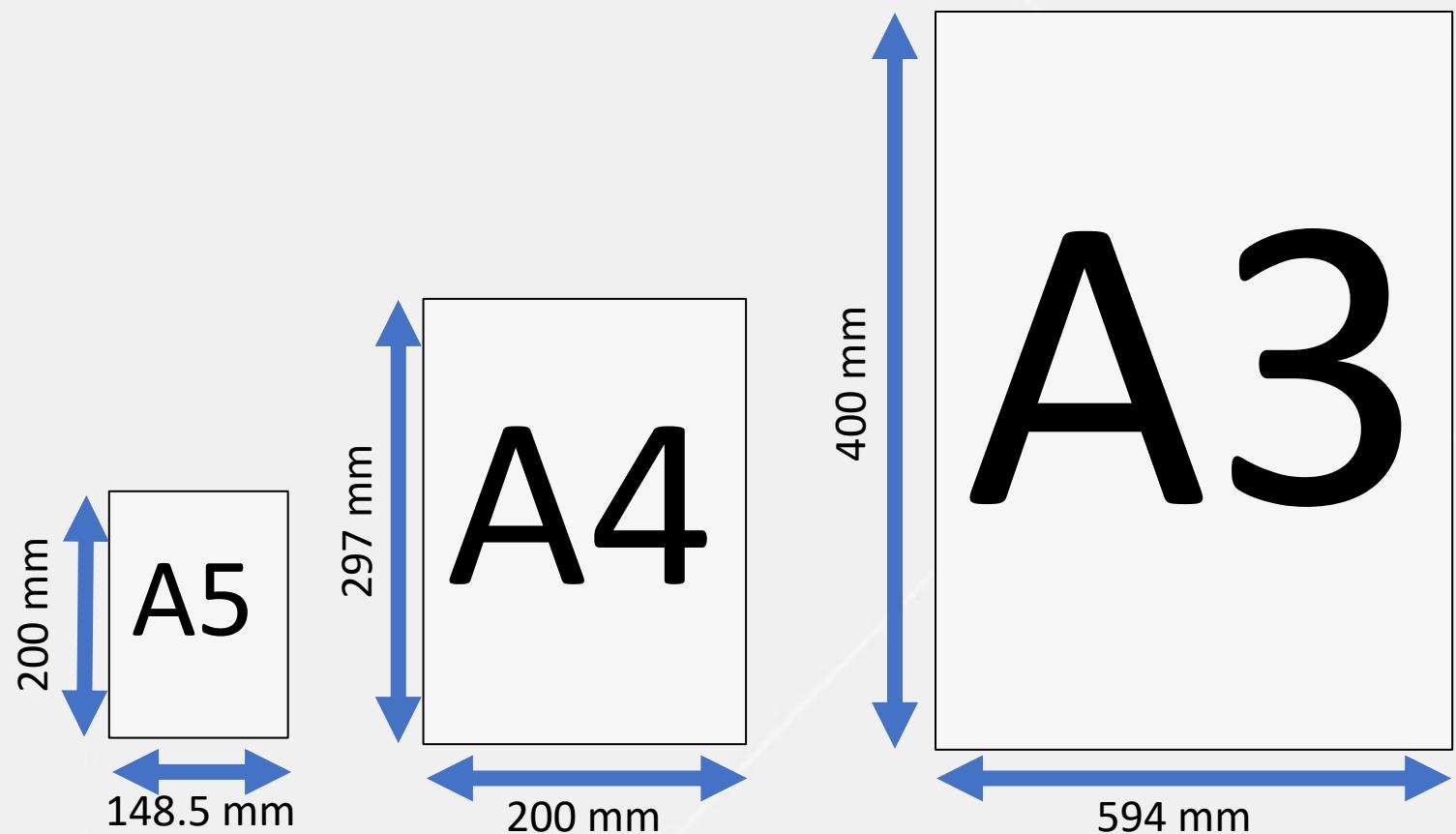


Mobile Dimensions:

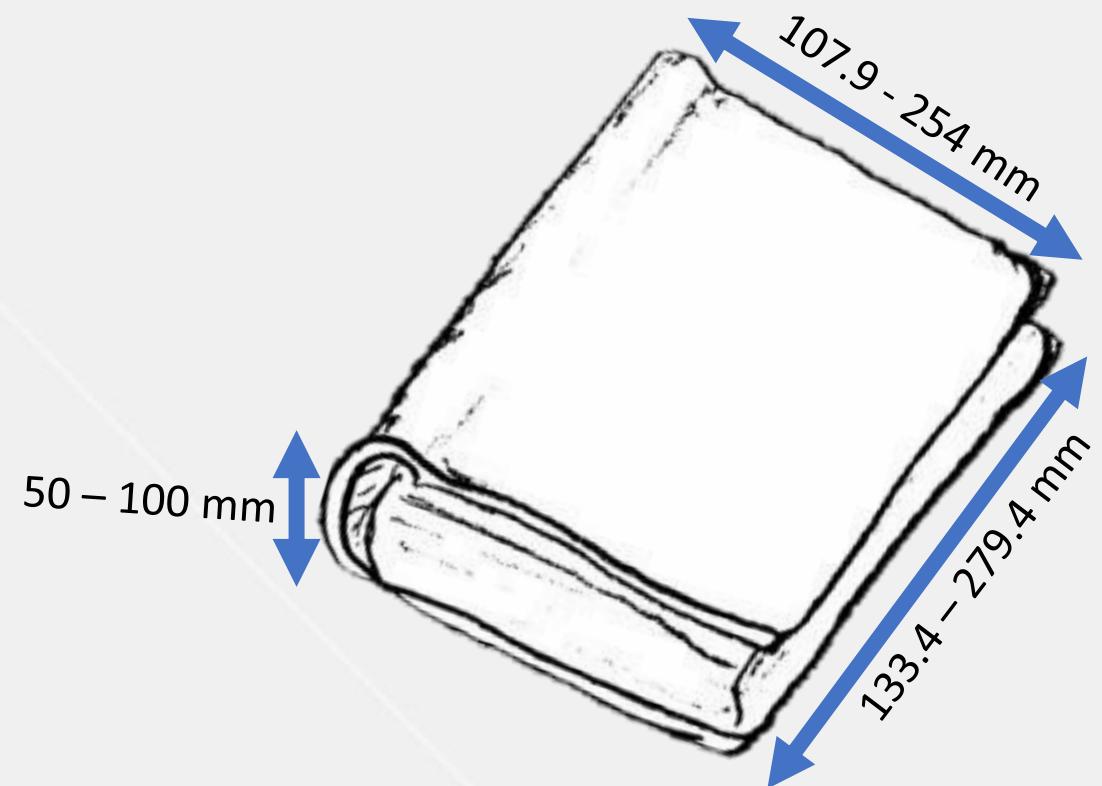


Dimensions and Sizes

Paper Dimensions:



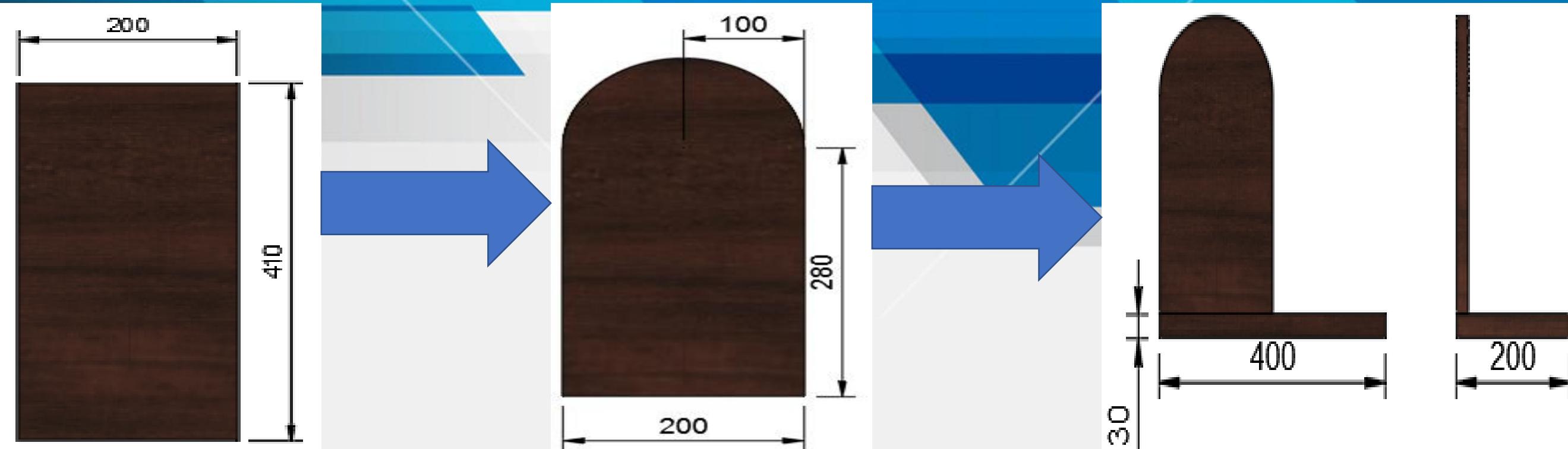
Book Dimensions:



Criterion 4: Development of proposed idea

Lo: To be able to develop the current idea to make it more aesthetically pleasing and more suitable to the specification.

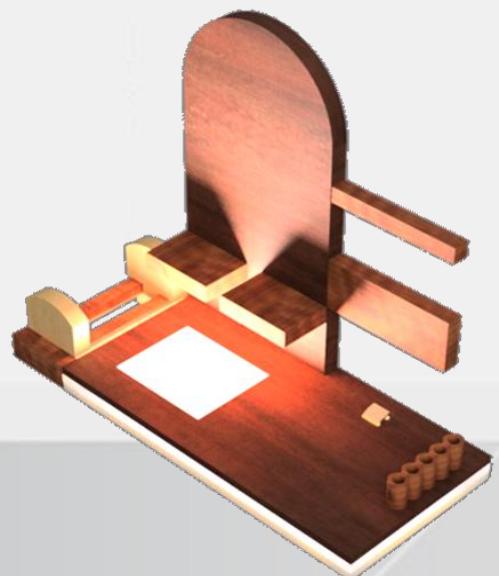
FUNCTIONS & DETAILING 1



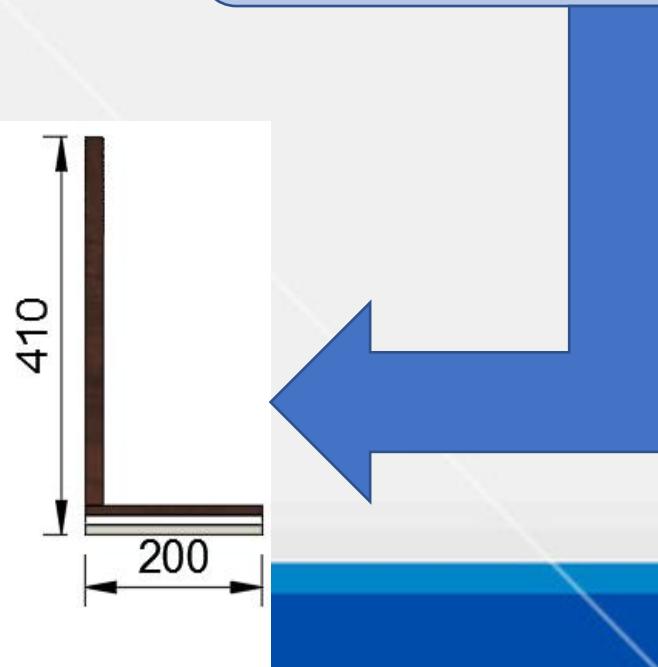
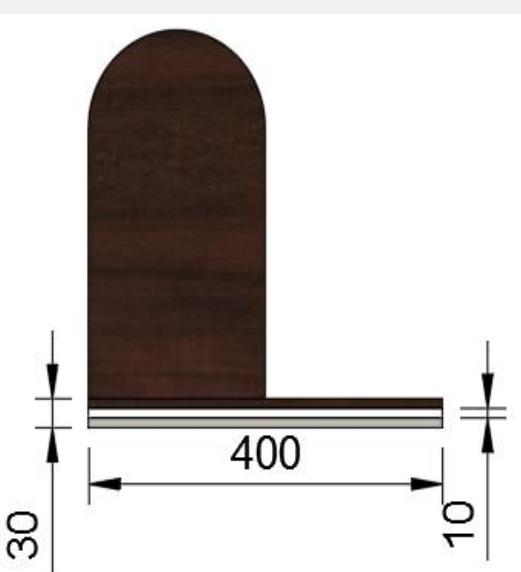
The basic starting shape of the product was a cuboid as it is the easiest shape to work with.

The shape wasn't very aesthetically pleasing, so the top was made more curved. This shape also got the highest rating in the questionnaire.

A full wooden base is added to increase the functionality of the product. This would allow more features to be embedded into the product.



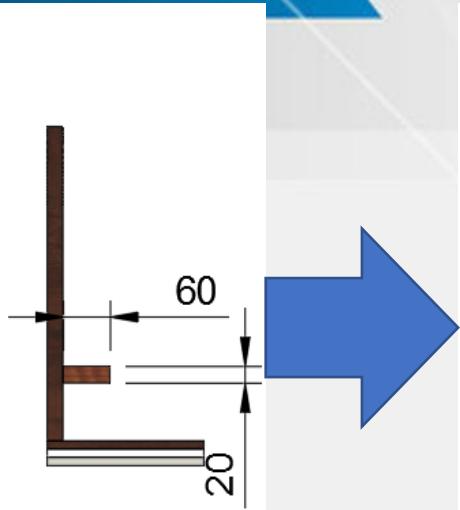
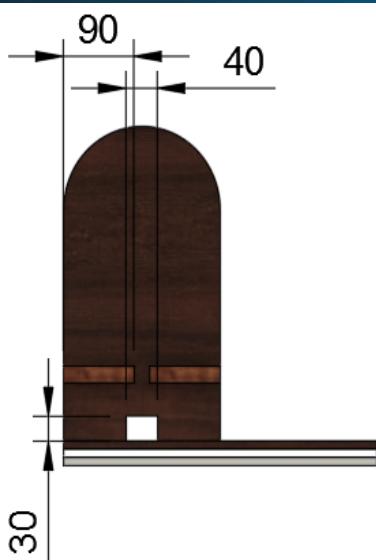
A full wooden base looked very simple. This got changed to three different materials: wood, HIPS and cement.



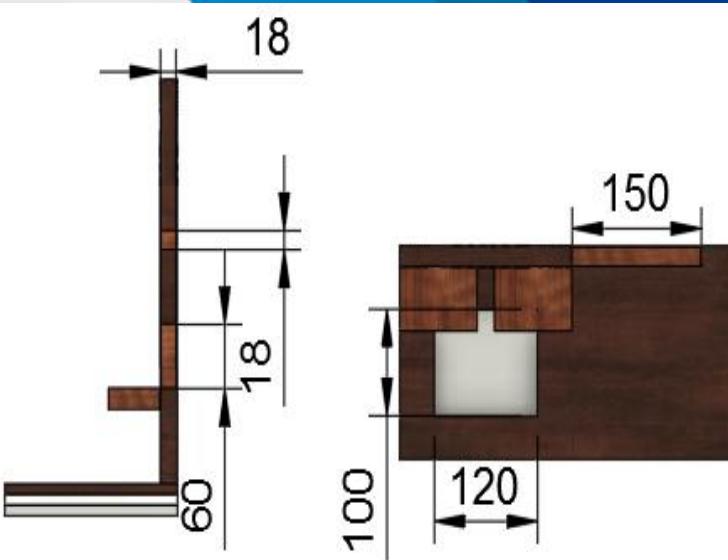
Criterion 4: Development of proposed idea

Lo: To be able to develop the current idea to make it more aesthetically pleasing and more suitable to the specification.

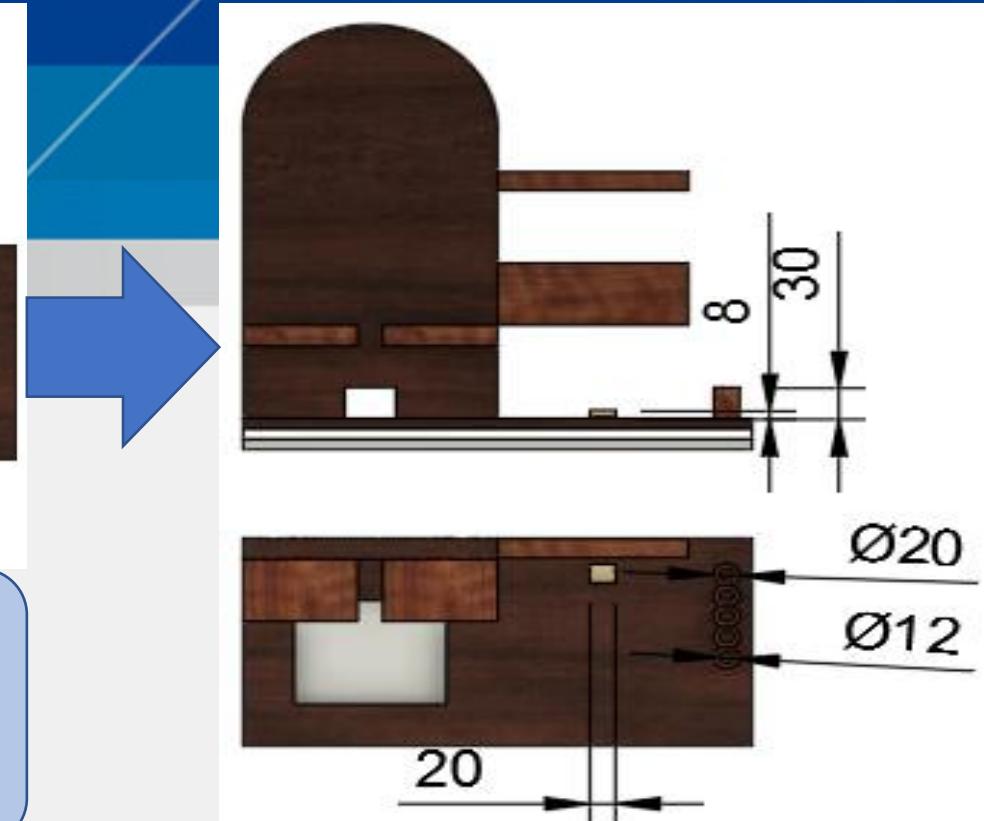
FUNCTIONS & DETAILING 2



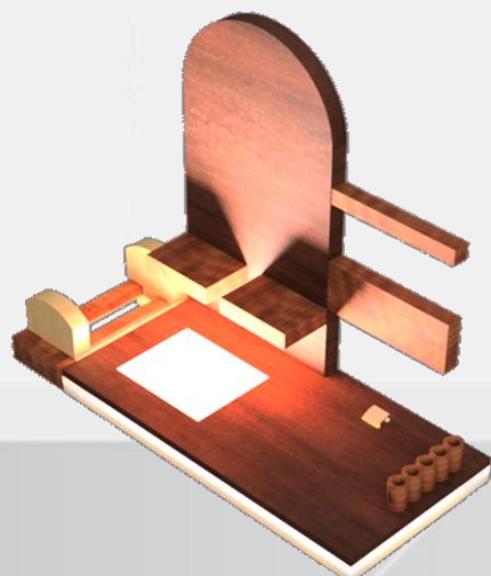
A hole is made, and 2 cuboids are added for the cables and to keep the user's iPad or mobile.



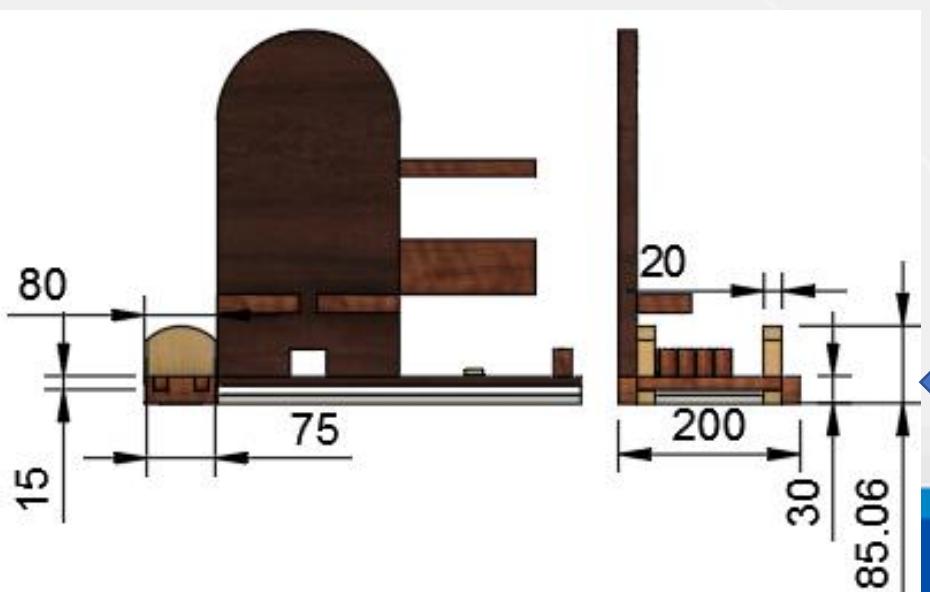
A square dowel and a cuboid is added to keep spectacles and watches. The wooden and HIPS base is cut for LED lightning.



A paper holder and 5 cylinders are added to keep pens, pencils and paper. The paper area could also be used as a place for reminders.



Finally, a book stand is added to keep books that the user reads or uses at night. This could include novels, story books, diaries, etc.



Model Analysis

This model was constructed mainly from brown paper as it gives freedom to bend into curves. Brown paper was utilized to increase the model's realism as wood is being used.

POSITIVES

- The brown paper used to make the product gives an elegant, classy and realistic appearance.
- The frosted HIPS has a pleasant appearance and contributes to including a variety of interesting textures in the product.
- The product is made in ratio to the real project.
- The 3 different base component line were drawn.

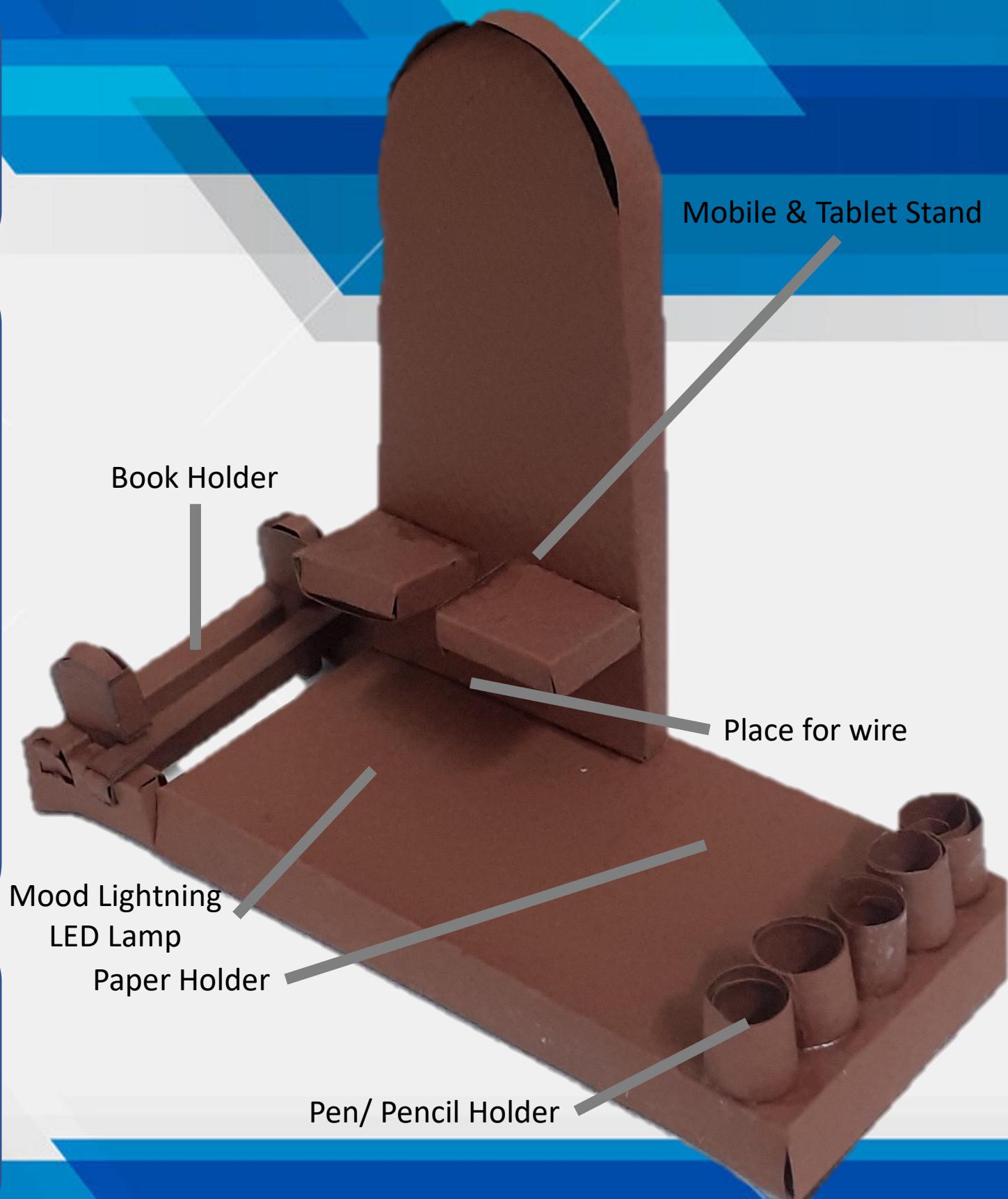
NEGATIVES

- There could be more color incorporated into the product design as it is mainly designed with wood.
- You can see through the frosted translucent HIPS, exposing inaccuracies in the internal design.
- The edges of the model should have been better filed to create a smooth finish for the model.
- The overall sizing of the product isn't appropriate for a bedside table.

IMPROVEMENTS

After the construction of the model, there are a variety of ways in which the product can be improved further in terms of aesthetics, ergonomics, features and functions.

- Two complete layers of varnish should be applied to ensure even and complete coating.
- The frosted HIPS panel must be made slightly opaquer by sanding it more.



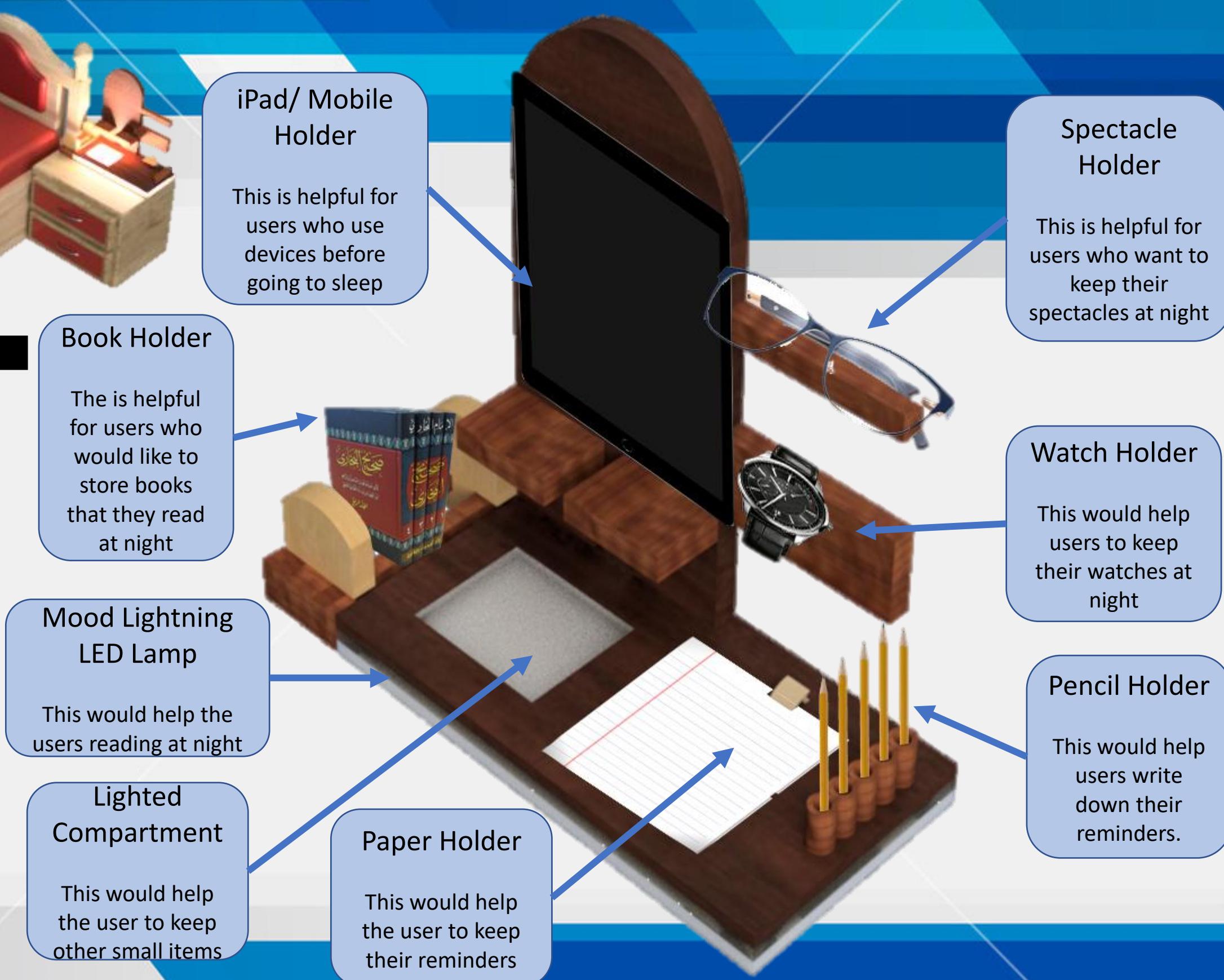
Criterion 4: Development of proposed idea

Lo: To be able to further communicate the final features and functions of the completed product.

FINAL IDEA: DETAILED VIEW



Made in Fusion 360



iPad/ Mobile Holder

This is helpful for users who use devices before going to sleep

Book Holder

This is helpful for users who would like to store books that they read at night

Mood Lightning LED Lamp

This would help the users reading at night

Lighted Compartment

This would help the user to keep other small items

Paper Holder

This would help the user to keep their reminders

Spectacle Holder

This is helpful for users who want to keep their spectacles at night

Watch Holder

This would help users to keep their watches at night

Pencil Holder

This would help users write down their reminders.

TESTING OF MATERIALS & PROCESSES

USING THE X – Carve

A simple CAD drawing is made on Fusion 360 and is tested on a piece of teak. This process was found to be very inaccurate and the drill bit for the x – carve wasn't the correct length. This wouldn't be used in the project.



FROSTING HIPS

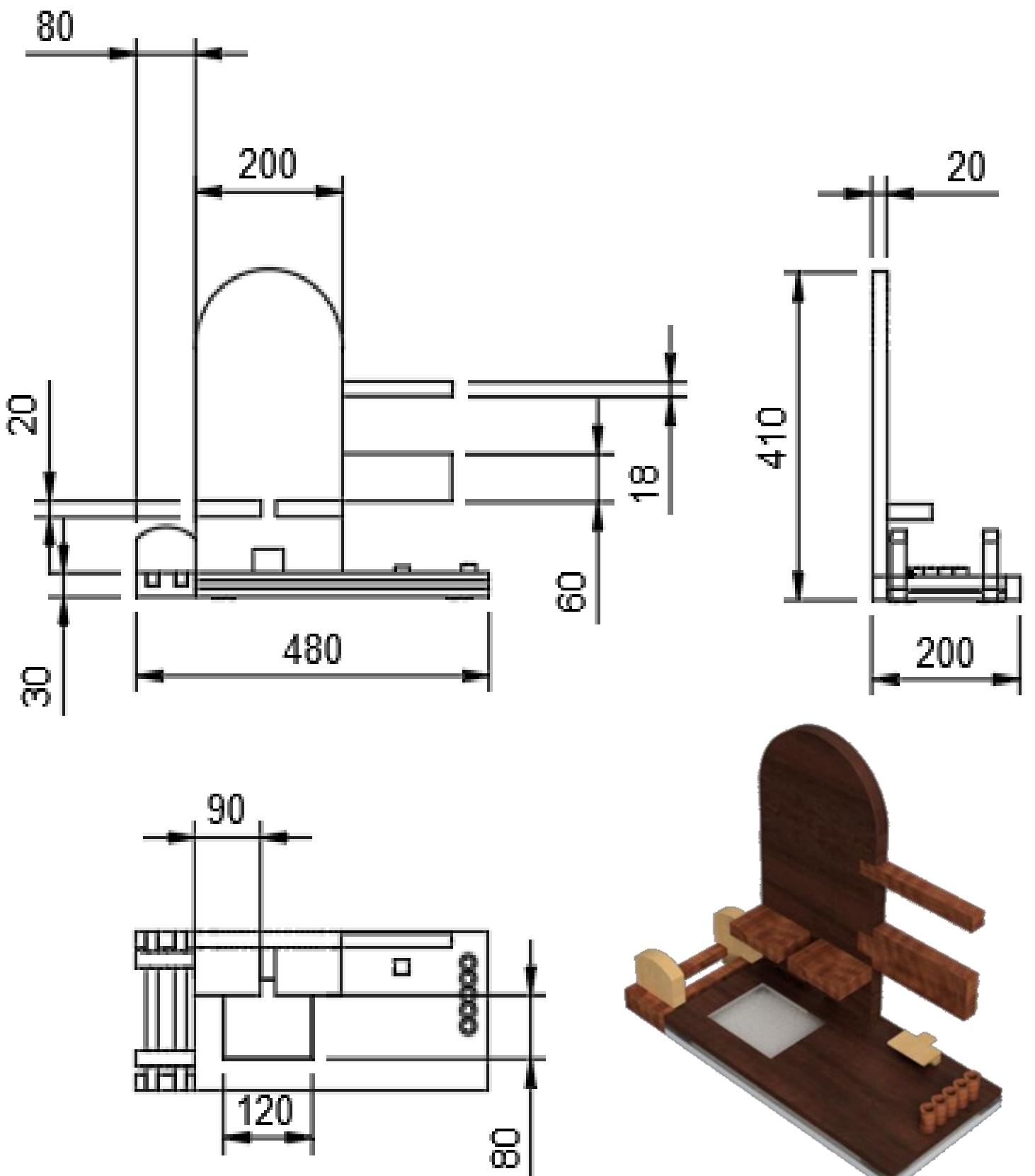
The HIPS was tried to be made translucent by scratching it with low grit sandpaper. Then, high grit paper was used to smooth the surface of the HIPS. This worked out quite well and would be used in the project.



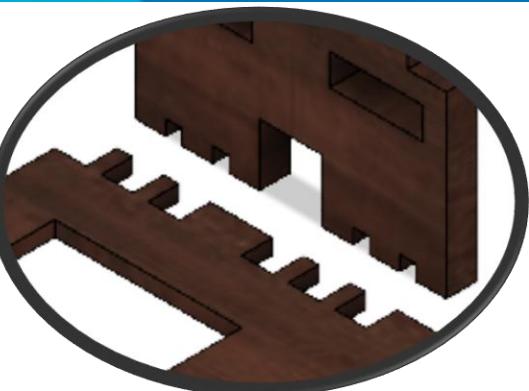
Criterion 5: Planning for production

Lo: To be able to develop the current idea to make it more aesthetically pleasing and more suitable to the specification.

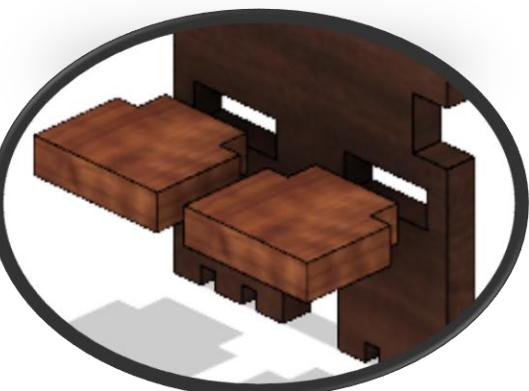
Working Drawing



Base to Back Body



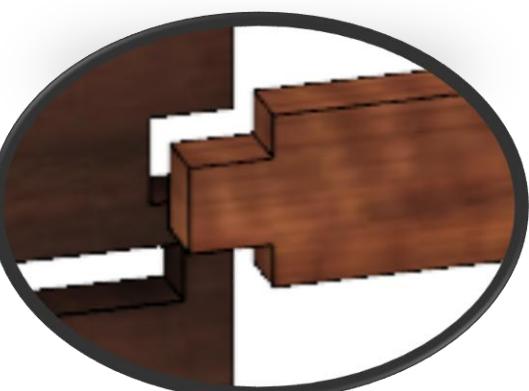
Phone Holder to Back Body



Spectacle Holder to Back Body



Watch Holder to Back Body

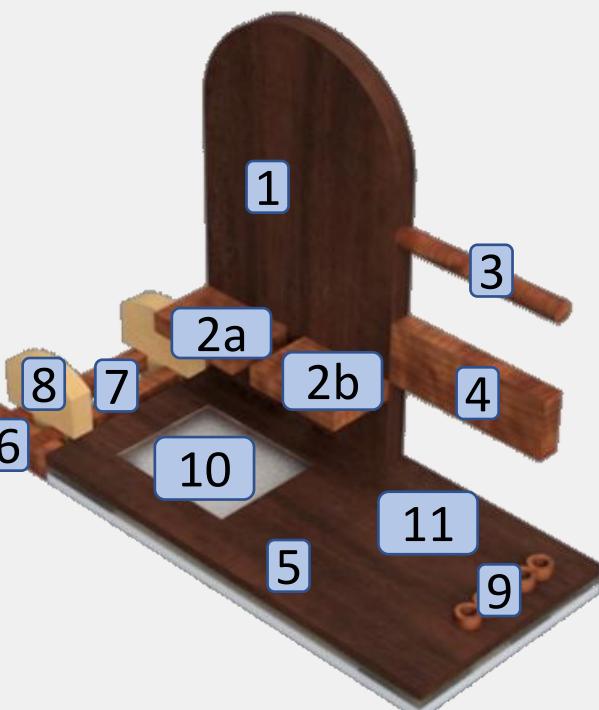


Criterion 5: Planning for production

Lo: To be able to understand to quantity of each material and which materials are needed to create the final product.

Cutting List

Component	Purpose	Dimension			Quantity	Material
		Length (mm)	Width (mm)	Depth (mm)		
1	iPad/ Mobile	200	390	20	1	Teak (Hardwood)
2	iPad/ Mobile	90	80	20	2	Pine (Softwood)
3	Spectacle Holder	175	20	20	1	Pine (Softwood)
4	Watch Holder	175	60	20	1	Pine (Softwood)
5	Base	400	200	10	3	Teak (Hardwood), Clear HIPS (Thermoplastics), MDF
6	Book Holder Base	80	30	20	2	Teak (Hardwood)
7	Book Holder Beam	200	15	15	2	Teak (Hardwood)
8	Book Holder Slider	75	90	20	2	Pine (Softwood)
9	Pencil Holder	15	40	15	5	Acrylic
10	Translucent Cover	100	120	10	1	Clear HIPS (Thermoplastics)
11	Paper Holder	20	20	10	1	Plastic
12	Copper Rod	5	5	60	1	Copper
13	Spring	7	7	40	1	Iron
14	LED Strip	10	3	1000	1	LED Lights
15	Name Tag	15	1	40	1	Aluminum
16	Furniture Pads	20	20	3	4	Rubber
17	Round-Head Screw	3	3	15	2	Steel



Criterion 5: Planning for production

Lo: To be able to further communicate the final features and functions of the completed product.

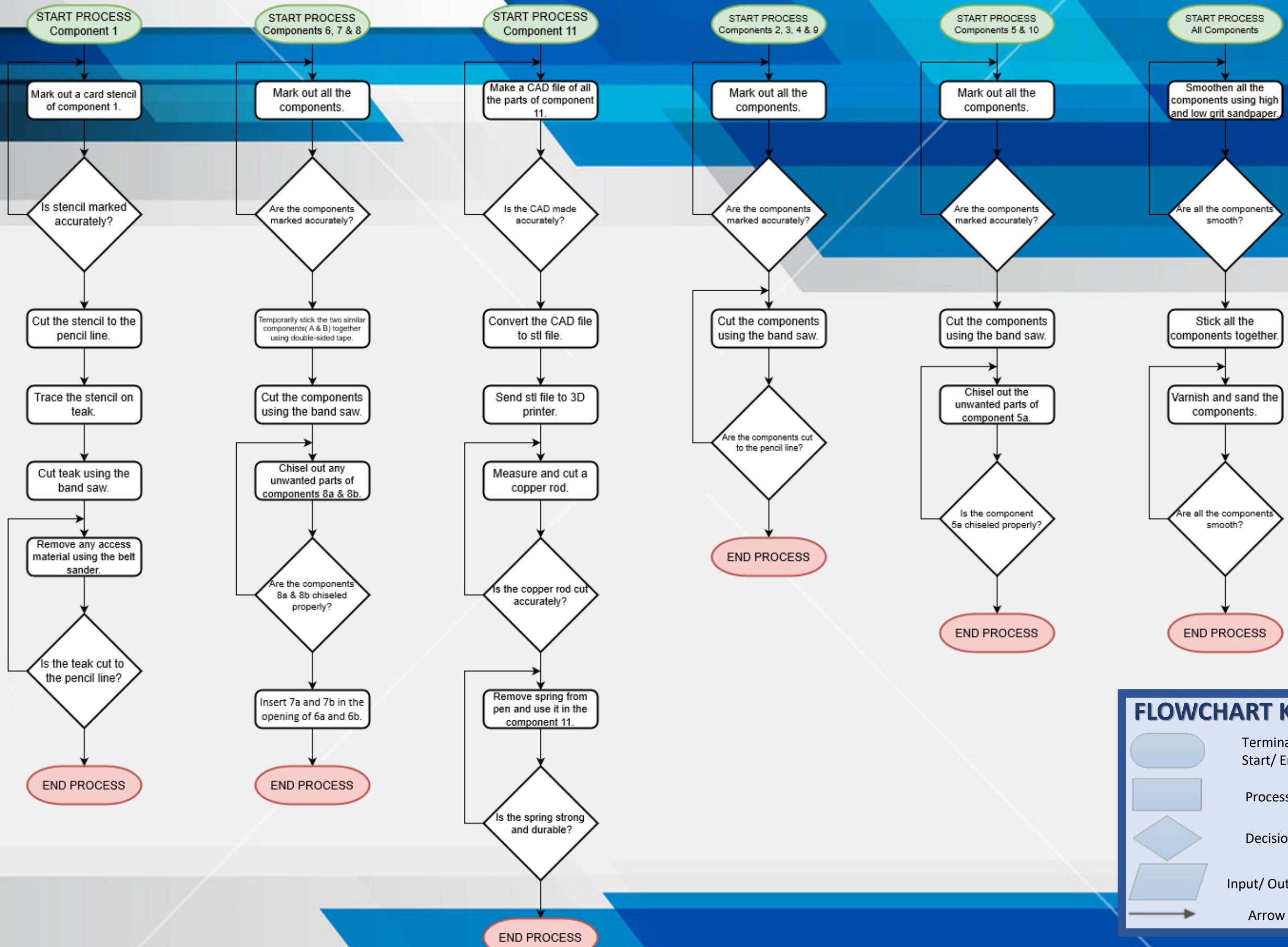
Manufacturing Plan

Stage	Component(s)	Hand Tools	Machinery	Processes	Quality Control	Safety	Estimated Time
1	1	Steel Rule, Pencil, Tri-square, Compass	Belt Sander, Band Saw	After marking out the outline on a card stencil and then cutting it out with scissors, it is traced onto teak. Cut the wood using band saw and use the belt sander to remove waste material and smooth surfaces.	Check if the component fits the card stencil perfectly.	Be careful not to cut hands with band saw. Goggles should always be worn to protect eyes from sawdust. A mask should be worn to prevent inhalation of saw dust.	1 hour
2	6a, 6b, 7a, 7b, 8a and 8b	Steel Rule, Pencil, Compass, beveled-edge chisel, sash clamp, bench hook, wooden mallet.	Band Saw	After marking both the components using a pencil, compass and steel rule, stick them together using double-sided tape. Using the band saw, cut both the components. Unwanted parts of 8a and 8b would be chiseled out using a beveled-edged chisel, sash clamp, bench hook and wooden mallet. Insert 7a and 7b in the opening of 6a and 6b.	Make sure the components that were lined up together properly. Make sure waste material is used on both sides of 8a and 8b to stop them from breaking while chiseling.	Be careful not to cut hands with band saw and chisel. Goggles should always be worn to protect eyes from sawdust. A mask should be worn to prevent inhalation of saw dust.	10 hours
3	11		3D printer	After making up a CAD for the paper holder, send the CAD to the 3D printer to be printed. A thin rod and a spring is brought from outside to be put in component 11.	Make sure the rod inserted doesn't stop the component from moving up and down.	Be careful to not touch the printed item directly after the machine stops. Allow the printed item to cool down.	2 hours
4	2a, 2b, 3, 4 & 9	Steel Rule, Pencil, Tri-square, Marker	Band Saw	After these components are marked out using a pencil/ marker, tri-square and steel rule, they are then to be cut out using the band saw.	Make sure the components are cut properly to the pencil line.	Be careful not to cut hands with band saw. Goggles should always be worn to protect eyes from sawdust. A mask should be worn to prevent inhalation of saw dust.	3 hours
5	5a, 5b, 5c & 10	Steel Rule, Pencil, Tri-square, beveled-edge chisel, sash clamp, bench hook, wooden mallet.	Band Saw	After marking all the components using a pencil, tri-square and steel rule, cut them using a band saw. The compartment in 5a should be chiseled out using a beveled-edged chisel, sash clamp, bench hook and wooden mallet.	Make sure the components are cut properly to the pencil line. Make sure waste material is used on both sides of 5a to stop it from breaking while chiseling	Be careful not to cut hands with band saw and chisel. Goggles should always be worn to protect eyes from sawdust. A mask should be worn to prevent inhalation of saw dust.	10 hours
6	All Components	Sandpaper, Varnish, Fast Adhesive		After sanding all the components, stick the components together. Add two layers of varnish and sand the components after every varnish.	Make sure the components are smooth and there aren't any sharp edges. Make sure there aren't any pencil lines visible.	Be careful not to cut hands with band saw and chisel. Goggles should always be worn to protect eyes from sawdust. A mask should be worn to prevent inhalation of saw dust or the fumes from the varnish spray. Wear gloves while spraying to protect yourself from sticking to the project.	4 hours

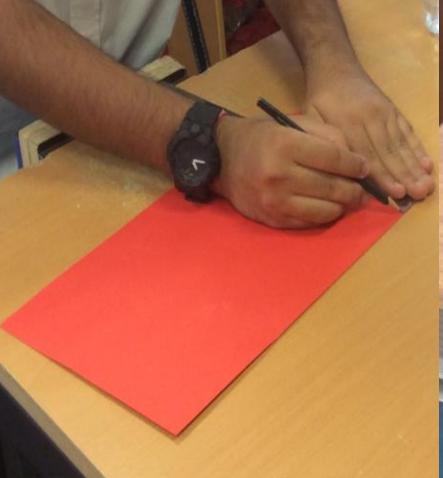
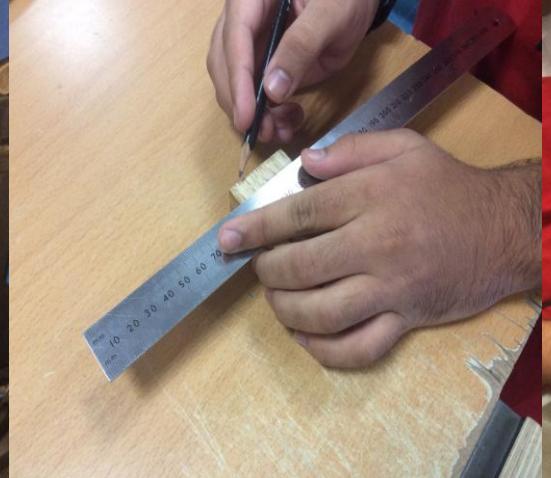
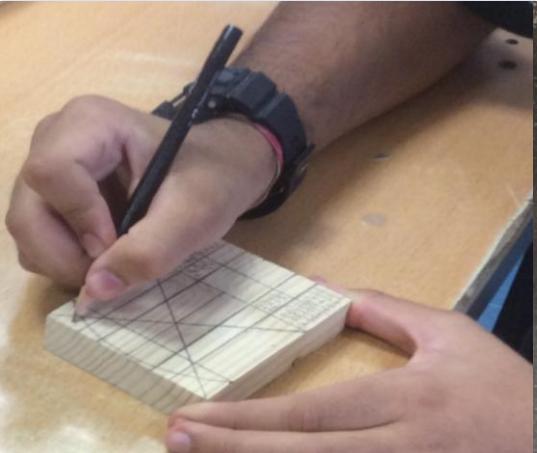
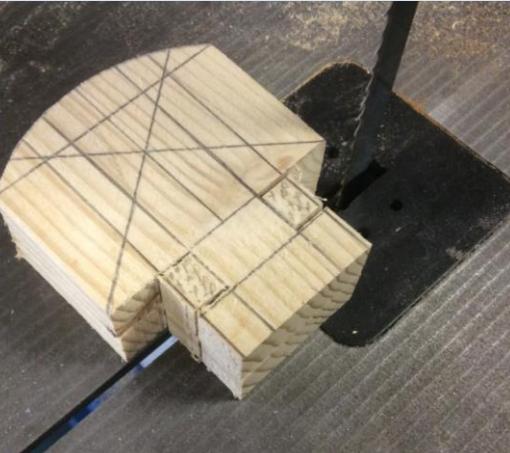
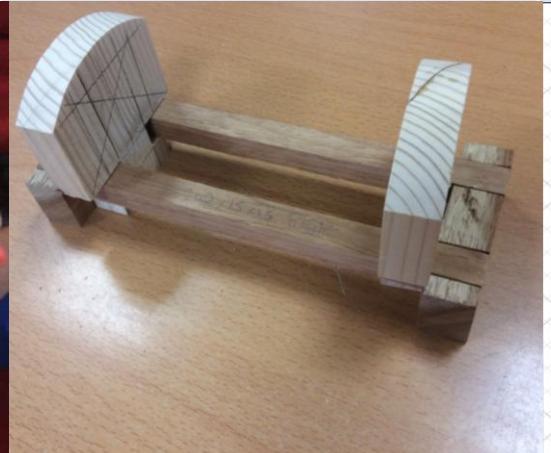
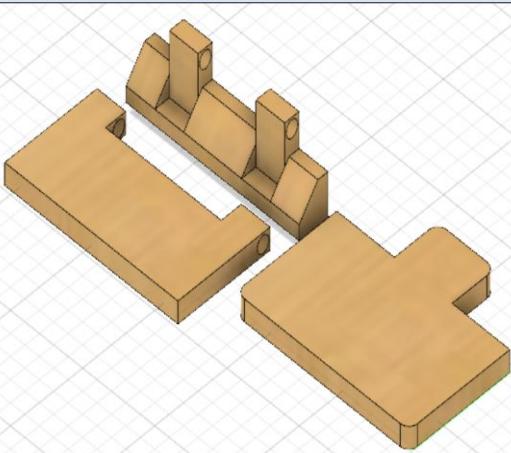
Criterion 5: Planning for production

Lo: To be able to further communicate the final features and functions of the completed product.

Manufacturing Plan - Flowchart



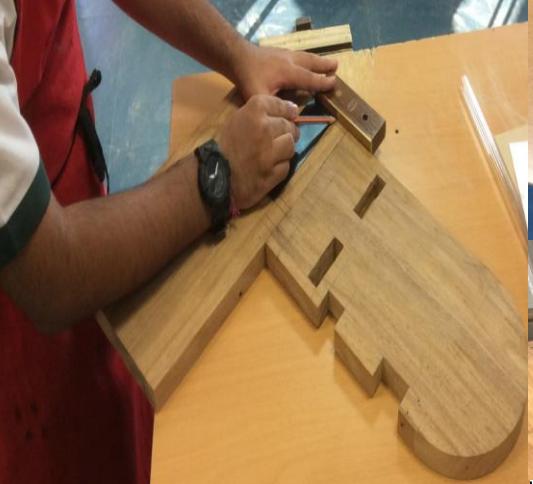
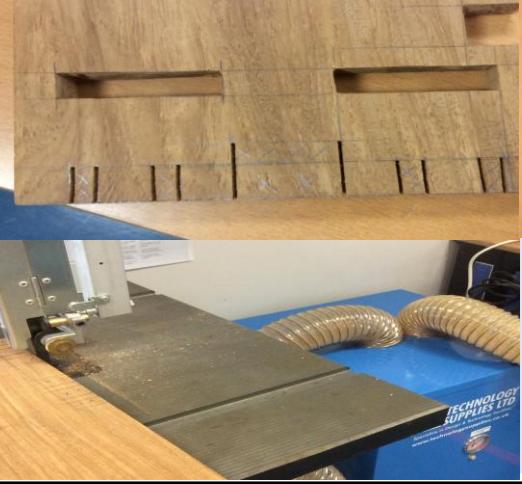
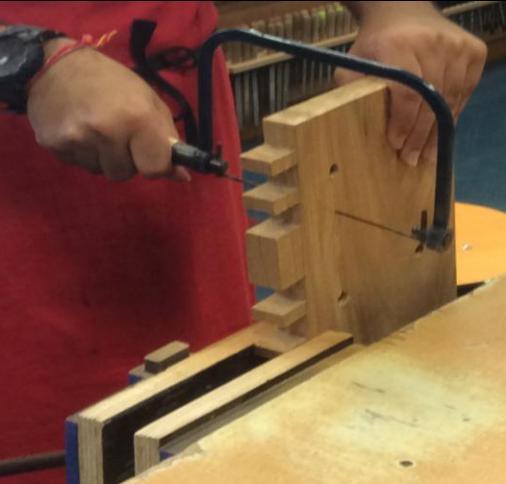
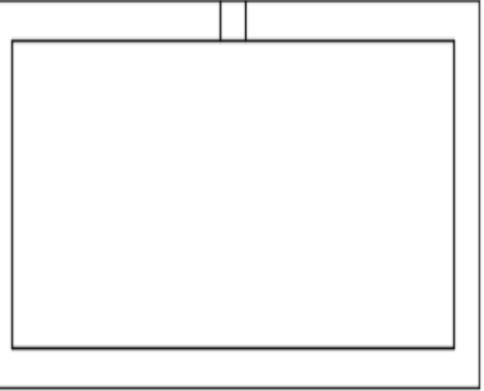
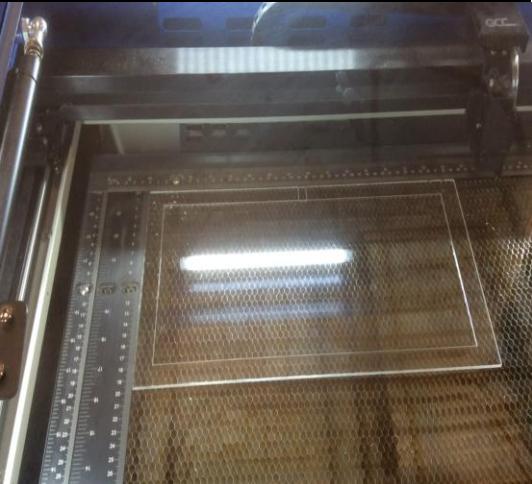
Diary of Making 1

				
1) An outline of component 1 is drawn on red card to create a stencil for marking out neatly on teak. A pencil, compass and steel rule are used. The stencil is neatly cut using scissors with a sharp edge. I made sure that the shape was accurate as any errors would affect the marking of the teak.	2) The component is then be marked using a pencil and the stencil and be cut using the band saw.	3) The remaining bits would then be removed using the belt sander.	4) On a piece of teak, component 6a is marked using a pencil, compass and steel rule.	5) Component 6a and 6b are cut on the band saw.
				
6) On a piece of teak, component 8a is marked using a pencil, compass and steel rule.	7) Component 8a and 8b are cut using a band saw.	8) Unwanted parts that couldn't be cut on the band saw was removed using a beveled-edge chisel, sash clamp, bench hook and a wooden mallet.	9) Component 7a and 7b are square dowels of size 15mm by 15mm which are inserted in the opening of 6a, 6b, 8a and 8b.	10) Component 11 is made on CAD – fusion 360

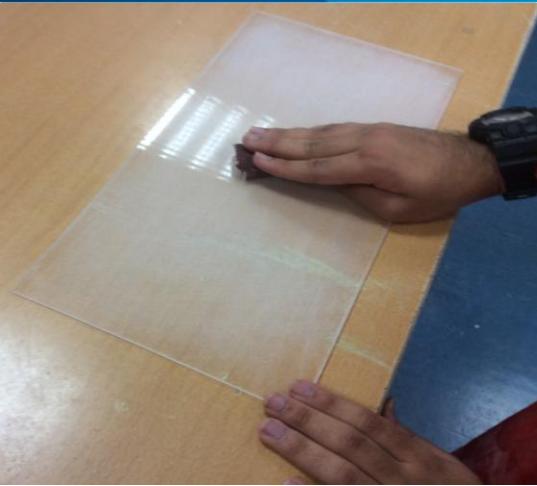
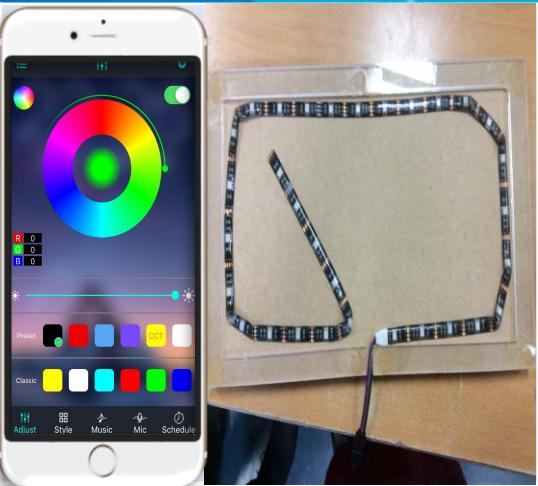
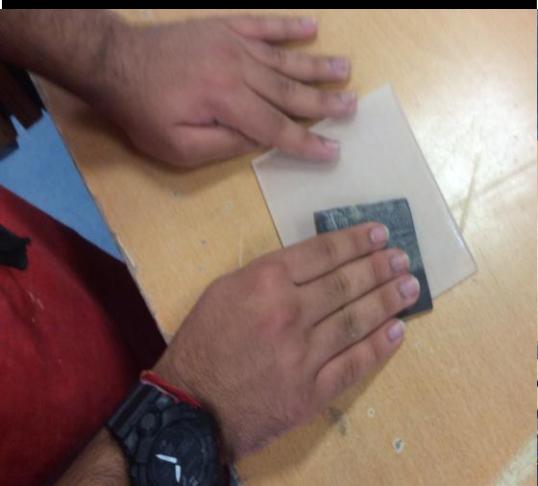
Diary of Making 2

				
11) Component 11 is sent to the 3D printer and is printed off.	12) A thin but strong dowel was needed in component 11 and therefore copper rod is used. Spring from a used pen fitted nicely into component 11.	13) The copper rod is inserted in the holes and paper holder is made. The copper rod is bent on both sides to stop the plastic from slipping out.	14) Component 1 is marked to make space for component 3 & 4, using a pencil, steel rule and tri-square.	15) Component 1 is cut on the band saw.
				
16) Extra bit are removed using the flat file.	17) Component 4 is marked to remove the extra wood, using a pencil, steel rule and tri-square.	18) Component 4 is cut using the band saw.	19) Component 1 is marked to make space for component 2a & 2b, using a pencil, steel rule and tri-square.	20) Component 1 is drilled using 8 mm bit.

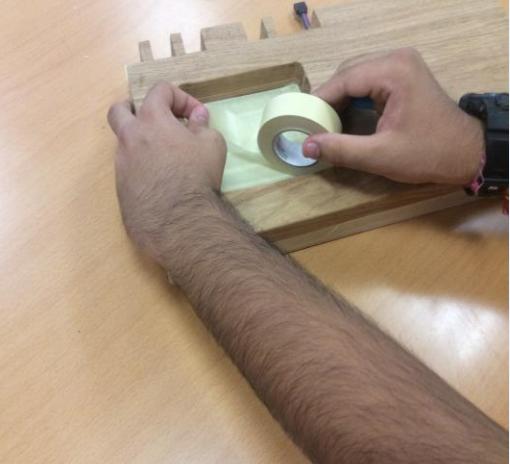
Diary of Making 3

				
21) The unwanted parts of component 1 are removed using a beveled-edge chisel and a wooden mallet.	22) Component 1 and 5a are marked for finger joint.	23) Component 1 and 5a cut using the band saw.	24) Component 1 and 5a are cut using the scroll saw.	25) Component 5a is marked, for a compartment, using a pencil, steel rule and tri-square. Component 5a is then drilled using 8 mm bit.
				
26) Component 5a is cut using a coping saw.	27) Component 5a is finished using a router	28) Component 5bii is made on CAD in Corel Draw.	29) Component 5bii is sent to the laser cutter to be cut.	30) All components are smoothed out using 30 grit sandpaper and palm sander.

Diary of Making 4

				
31) Component 5bii is made translucent by using low grit sandpaper to scratch a frosted texture.	32) Component 5b is smoothened by using high grit sandpaper	33) Component 5c and 5bii is glued together using universal fast adhesive.	34) LED lights are measured and cut. It is then peeled off and stuck to component 5c. The colors of LED strip could be changed using a mobile app.	35) A small piece of HIPS is cut using the band saw. This would increase the translucency of the lighted compartment.
				
36) The small piece of HIPS is made translucent by using low grit sandpaper to scratch a frosted texture.	37) The small piece of HIPS is smoothened by using high grit sandpaper	38) The small piece of HIPS is glued to component 5bii using universal fast adhesive.	39) Component 5bi is glued onto component 5bii using universal fast adhesive.	40) Component 5a is glued onto component 5b using universal fast adhesive.

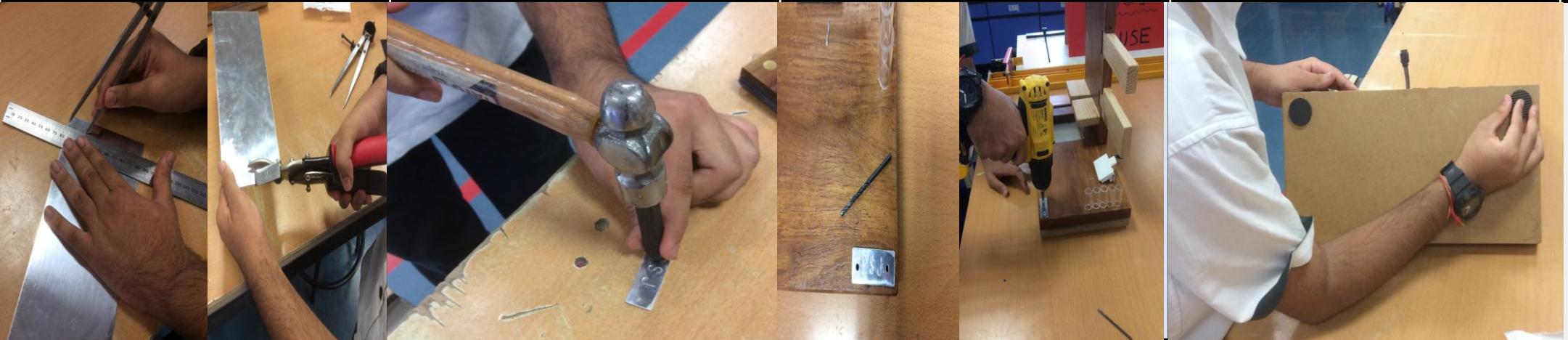
Diary of Making 5

				
41) Components 1, 2a, 2b, 3 & 4 are glued together using universal fast adhesive	42) All components are again smoothened using low grit sandpaper.	43) The plastic in base is covered with paper tape to stop the clear finish spray to affect the plastic.	44) Components 6a, 6b, 7a, 7b, 8a & 8b are smoothened using low grit sandpaper.	45) Components 6a, 6b, 7a & 7b are glued together using universal fast adhesive.
				
46) All components are sprayed with their first coat of clear spray.	47) After all components dry out, all components are smoothened with high grit sandpaper.	48) All components are sprayed with their second coat of clear spray.	49) After all components dry out, all components are smoothened with high grit sandpaper.	50) Component 9 is measured and cut using the band saw

Diary of Making 6



51) Component 9 is smoothened out using low grit sandpaper	52) Components 9 & 11 are glued onto component 1 using universal fast adhesive	53) Component 1 & 5a are glued together using universal fast adhesive at the finger joint.	54) Component 8a & 8b are twisted into component 7. As component 8a & 8b doesn't slide very well, component 7 is layered with sunflower oil	55) The book stand is velcroed on the side of the base
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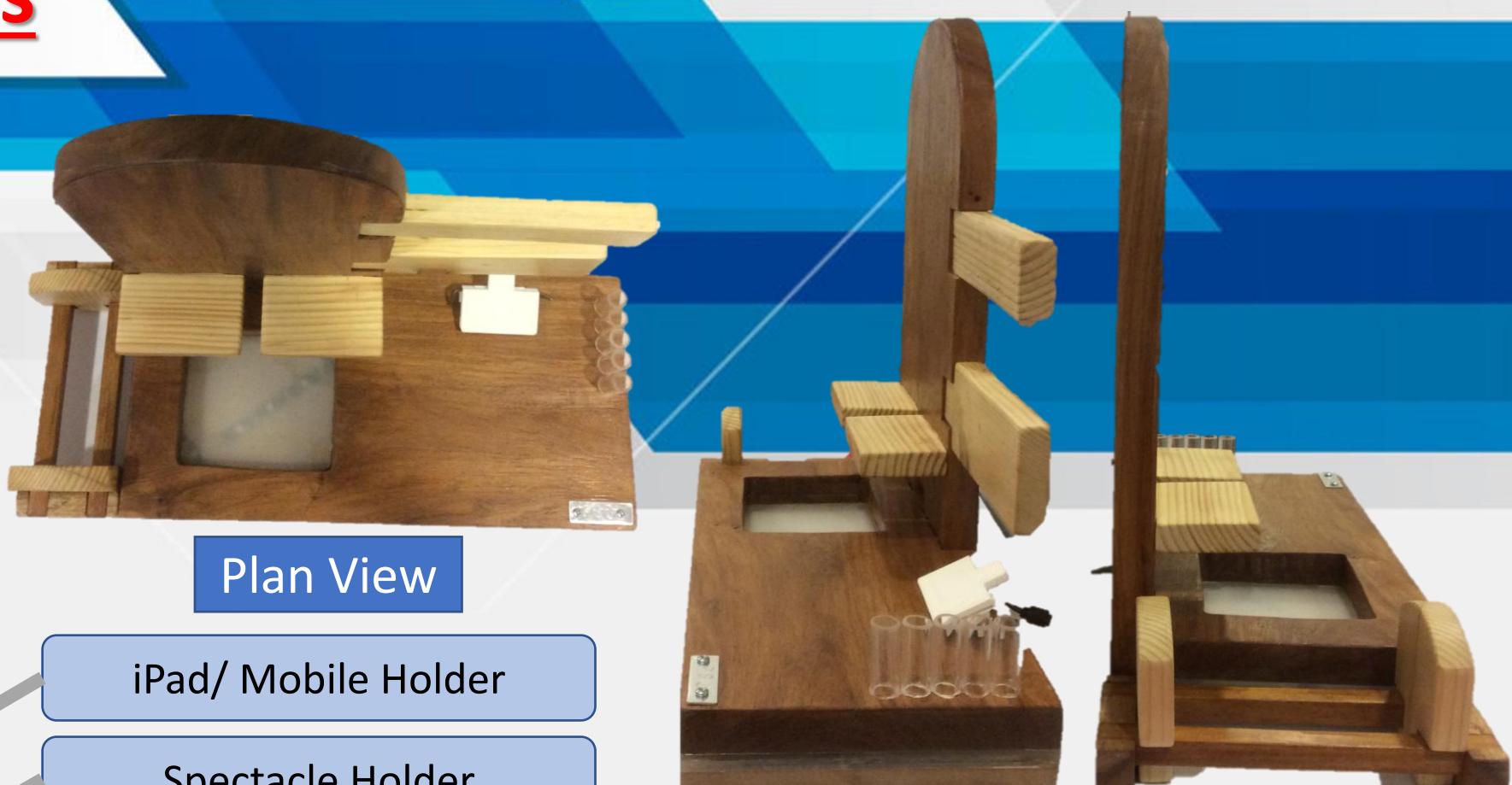


56) A piece of aluminum is measured and marked using a divider as a scribe. This is then cut using a straight-cut aviation snip.	57) 'PSJ' is stamped on the aluminum piece using a hammer and alphabet stamp.	58) The aluminum piece is screwed onto component 1	59) Self adhesive furniture pads are stuck to the bottom of the product to make it slip less.
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Final Product: Details

DESCRIPTION

The final product was created as shown in the development stages and was manufactured from HIPS, acrylic, teak, pine & aluminium . All surfaces were finished in order to improve the appearance of the product and make the product last longer. The final product is fully functional and includes features such as spectacle holder, lamp, mobile holder, book holder and more. The product resembles the 3D CAD model which was created previously. The product requires a power source for the mood – lightening lamp and to charge the devices.



Plan View

iPad/ Mobile Holder

Spectacle Holder

Book Holder

Watch Holder

Lighted Compartment

Pencil Holder

Paper Holder

Mood Lighting LED Lamp

Name Tag

Right Side View

Left Side View



Front View

Final Product: Images



Criterion 7: Testing and evaluation

Lo: To be able to collect feedback from a range of users from the target market, to get different opinions on the project.

User Evaluation

Name: Ayaan Age: 16 Target Market Sector: High School Student	Name: Bitar Age: 38 Target Market Sector: Businessman	Name: Alif Age: 50 Target Market Sector: Home Father	Name: Yonatan Age: 13 Target Market Sector: Middle School Student	Summary Of Positives: <ul style="list-style-type: none"> - The product is very functional and versatile, allowing users to store all of their items on their bedside table - The product organizes their items properly, making it easier for them. It takes care of the problem – which is clutter.
Positive: "I usually have a lot of clutter around my bedside area and this product is good as it allows me to clear and keep all my items neatly" Negative: "It is quite big and heavy"	Positive: "This product will help me organize my stationery and electronics that I will be using." Negative: "It is very large and heavy if I am going to be moving it around."	Positive: "This product is very functional and has many uses that I could potentially use to store my items on my bed side table." Negative: "The product is fairly large which could mean it wouldn't fit my table."	Positive: "I've always had a problem with organizing items on my desk, although this product makes life much easier for me." Negative: "It does take up a lot of space"	
Name: Hana Age: 21 Target Market Sector: University Student	Name: Tia Age: 32 Target Market Sector: Businesswoman	Name: Meera Age: 13 Target Market Sector: Middle School Student	Name: John Age: 20 Target Market Sector: University Student	Summary Of Negatives: <ul style="list-style-type: none"> - The product is quite heavy. - The dimensioning of the product doesn't fit all kinds of bedside tables. - The product should be available in different colors.
Positive: "There are many storage areas which will really help organize the clutter on my bedside table" Negative: "The product is quite big so it may not be able to fit on my bedside table"	Positive: "The product is very fit for function and can store a lot of things." Negative: "It is very big and wouldn't fit my bedside organizer and would have preferred to choose from a variety of colors."	Positive: "The product is extremely useful as it serves to be a multifunctional bedside organizer. I usually have so much clutter and find difficulties in finding items I place beside my bed. After using the product I find it much easier to store and find lots of my items" Negative: "Despite having so many functions I, the product seemed quite big on my bedside table"	Positive: "The product is versatile in terms of general usage thanks to the compartment for the devices. I also like the addition of the spectacle holder as I find it convenient." Negative: "It doesn't come in various sizes so it may not fit into most people's bedside table."	

Criterion 7: Testing and evaluation

Lo: To understand the market and people about their views on the project and their personal needs to attract more customers.

User Evaluation - Target Market – Kyle Baptista

"I loved the fact that it had a unique book holder. I have never seen this kind of book holder before. This would allow me to keep novels that I read before going to bed."

"Though the compartment could be used to store other things, such as keys, I would have liked it if you had included a key holder to hold my house keys."

"The paper allowed me to write my To Do list at night before sleeping. This, however, means that the paper would continuously be needed to be replaced. It would have been better if you would have added a whiteboard or something."

"I like the name tag as it personalizes it for everyone."

"I like the simple and natural look that you gave to the bedside organizer."

"I do not however like the fact that you used plastic in your project. I would have preferred a project that is completely biodegradable."

"The lights are easy to control via the application, allowing me to do a lot of things with the lights."



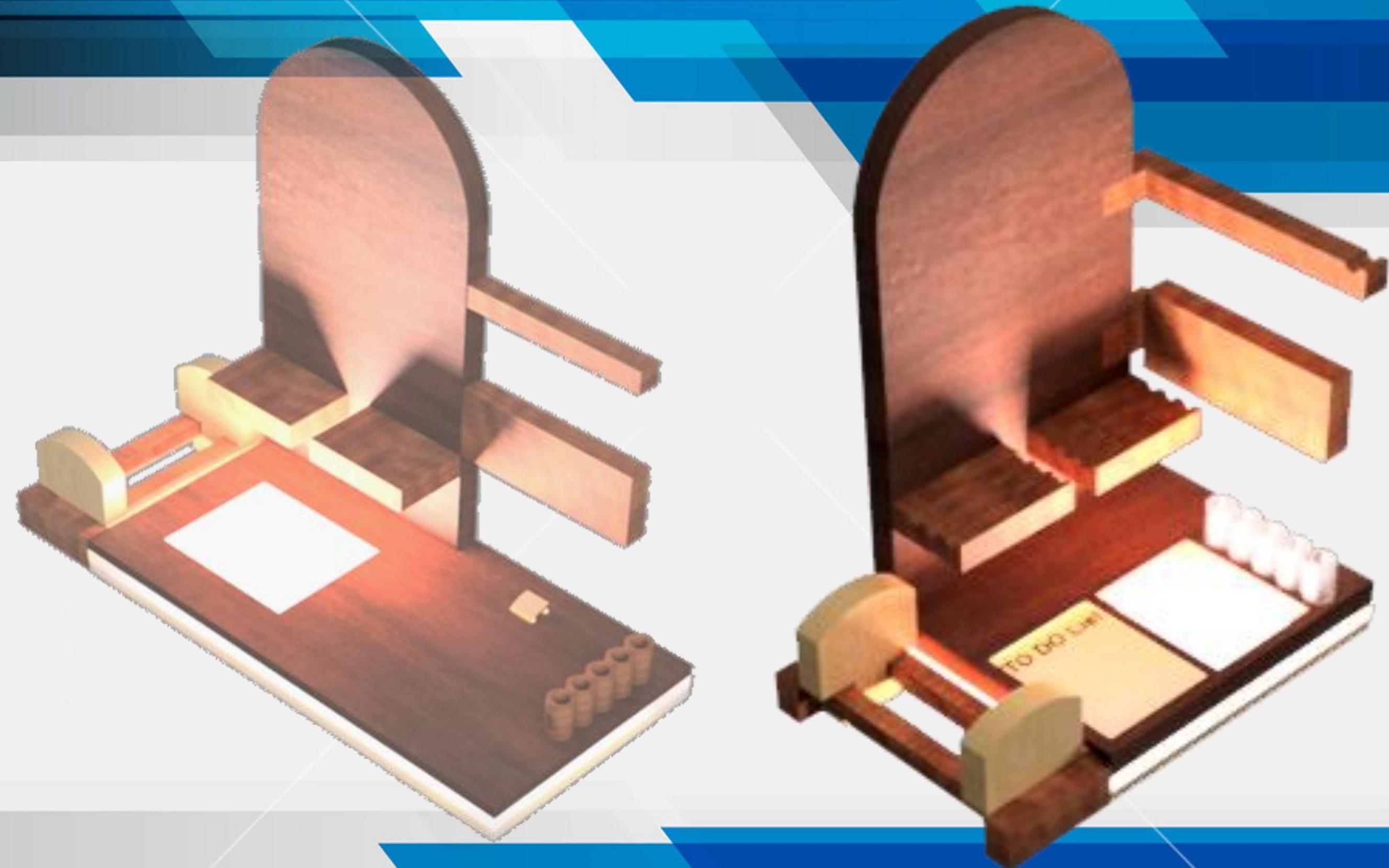
Criterion 7: Testing and evaluation

Lo: To be able reflect on the product based on the criteria outlined in the specification and enhance the product in the future.

Project Evaluation

Specification	Description	Rating				Evaluation
Aesthetics	Should match interior designs					The product can match with all bedroom interior designs. However, it could be made in a variety of different colors to increase the choice that the users have of the product.
Materials	Use HIPS, Pine, Teak, Cement					Most of the specification is met in terms of materials. MDF is used instead of cement as thin layer of cement is brittle compared to MDF.
Theme & Inspiration	Lightning & Storage					The product contains LED strips for light and can store a range of items, including tablets, phones, books, spectacles, watches, paper, stationary and other general things, making it ideal for users to buy.
Size	Small, Medium & Large					The product's sizing is quite big, making it less portable. It also doesn't fit in all bedside tables. The product should be made smaller and more compact.
Safety	Rounded corners, Lightweight					The product's edges and corners are all rounded off making it quite safe. However, it isn't lightweight, meaning that dropping the product on someone's foot would be painful. It is also unknown what may happen to the product if it is left switched on for prolonged periods of time and therefore a fuse should have been added.
Durability	5 – 10 years					The product can last up to 10 years. However, if treated roughly, the wear and tear might cause the product to last for 5 years or less.
Ergonomics & Anthropometrics	Comfortable to use					The product is quite comfortable and easy to use. However, due to the product being large, users with a shorter hand might be able to reach some of the functions while lying down.
Functions	Has lights & can hold tablets, phones, spectacles, etc.					All of the functions stated in the specification is present in the product. The product also has extra features including paper holder and a storage space. Some features could be added such as a key holder. The tablet or mobile are however at a risk of falling and therefore something should stop them from falling.
Target Market	Middle school, High school & University students & working adults					This product targets all the markets stated in the specification. Other target markets such as elderly people might also be interested in buying the product to organize their bedside tables.
Eco-friendliness	Should use recycled materials					This product is manufactured using MDF, teak, pine and aluminum which are biodegradable and therefore ecofriendly. LED lights were used to decrease the energy consumption of the product, making its use less expensive to the user and better for the environment. However, HIPS and acrylic are plastics which are non-biodegradable and aren't good for the environment. The LED strip also has parts made of plastic, making it non-biodegradable making it less eco-friendly.

Improved Project



Future Modifications 1

Made in Fusion 360



Veneering of Component 1 & 5a

Teak was a very heavy wood and the evaluation stated that the product should be made lighter. MDF isn't as heavy as teak. Veneering would allow the product to be lighter without removing the current looks. MDF would also be easier to work with and comes in varying dimensions, making it a better material to use.

Teak
Veneer

Teak
Veneer

MDF



Thickening of Component 5b

To stop the LED lights from showing, a layer of translucent HIPS would blur the LED lights further, making it less visible.

MDF with Teak
Veneer

4 Layers of
HIPS

MDF



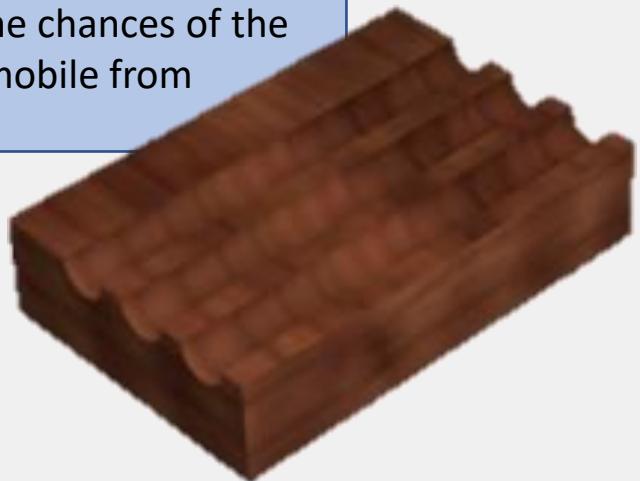
Addition of Fuse

As the product hasn't been tested for prolonged periods of time in different scenarios, an addition of the fuse would make sure that the product isn't destroyed during an electrical surge or the lights do not heat up to extensively.

Future Modifications 2

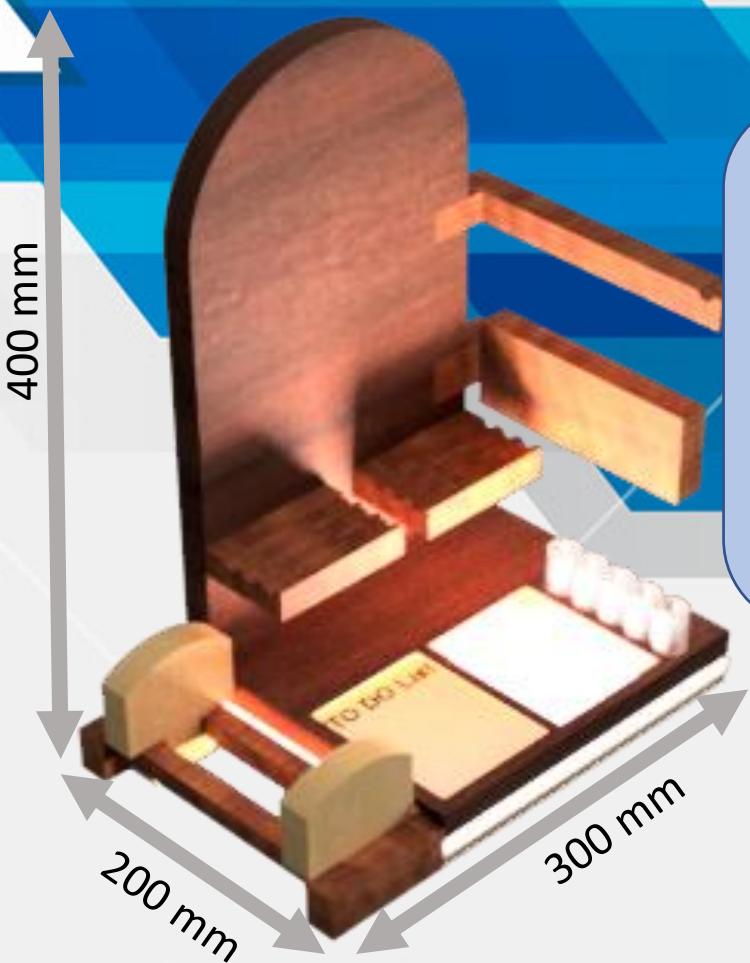
Grooves on Component 2

Grooves have been added onto components 2a and 2b to reduce the chances of the tablet and mobile from slipping.



Key Holder

The spectacles holder has been extended to include a key holder to the product to increase the functionality of the product.



Sizing

The sizing of the product has been reduced by moving some of the components around. Components 3 & 4 are bent to reduce the size of the product. The reducing of the size would allow the product to fit all bedside tables of the users.

Lighted Compartment

The compartment is made bigger to allow more items to be stored.

Whiteboard

The paper holder got completely changed to a whiteboard, as it could be used multiple times, instead of replacing the paper.

