

# Pearson Edexcel Design and Technology NEA Q and A 9DT0/02 17th Oct 2023

First teaching in 2017

First assessment 2019



# Agenda

## Aim

To review the submission for this series and to discuss successful strategies to build on future performance

- The iterative issue.
- Review 2023 submission.
- Pre submitted questions.
- Q and A session.

# 2023 Submission Review

## Grids 1-11



# REVIEW

## Grid 1 Identification of Design Possibilities

The submission in this criterion was at a lower level than expected. Candidates often attached a client to a design scenario or chose 6 scenarios with disparate clients. We saw little real client / stakeholder dialogue used to 'hone' a design intention.

In the worst cases the candidate's opening line was "I am making a storage cupboard for my brother".

In the best cases the candidate had a client and explored the client's needs, wants and values.

### Do

- ✓ Undertake real client dialogue.
- ✓ Explore client's needs

### Don't

- ✗ Attach a client to a scenario or simply state what you are to make.
- ✗ Identify many differing clients and choose one with little justification.

# REVIEW

## Grid 2 Investigation of needs and research.

In many cases the research was too generic, text-book and on occasions irrelevant. The research must have a focus on the proposal and be driven by client/stakeholder dialogue. The candidate should research relevant areas, liaise with the client and be selective in the research undertaken. The key word in the top assessment level is **Perceptive!**

### Do

- ✓ Undertake real client dialogue.
- ✓ Explore client's needs
- ✓ Be selective in the research

### Don't

- ✗ Submit generic or irrelevant research.
- ✗ Ignore the client or stakeholders
- ✗ Omit vital elements that will affect the specification e.g., size of site footprint of furniture.

# REVIEW

## Grid 3 Specification

**In this assessment grid the candidates must ensure that the specification points are relevant (not generic), focussed on the client and have measurability in the points that would enable testing and an evaluative commentary. The candidate should re-work the brief as a result of client narrative.**

### Do

- ✓ Undertake real client dialogue.
- ✓ Submit relevant measurable spec points.
- ✓ Suggest how the specification might be tested.
- ✓ Do submit a re-worked brief.

### Don't

- ✗ Be vague or generic.
- ✗ Omit measurable elements based on the research.

# REVIEW

## Grid 4 Design ideas.

The centre assessments were generally lenient. To achieve higher levels candidates need to produce a wide range of designs that address the specification and meet the needs and wants of the user. They must detail sub systems alternatives. Designs may change and develop through consultation with the client and by appraising them against the specification. Initial modelling alongside focused and selective research could play a part within this process to show how designs may evolve.

### Do

- ✓ Undertake real client dialogue.
- ✓ Submit sub-assembly designs.
- ✓ Include technical annotation illustrating knowledge and understanding.

### Don't

- ✗ Submit holistic designs
- ✗ Omit client/stakeholder narrative
- ✗ Submit vague/generic client feedback. (The word nice should be banned!)

# REVIEW

## Grid 5 Development of design ideas.

This section was slightly leniently handled by the centres but is much improved as they are using modelling to good effect to test aspects of the proposals. In the best cases the candidates model and then use these models as visual prompts to promote discussions with the client or stakeholders to trigger further iterations of the proposal. This again evidences the client designer relationship and hence the iterative design process.

### Do

- ✓ Undertake real client dialogue.
- ✓ Model to test aspects of the design and promote client narrative not just a final model.
- ✓ Undertake further research where necessary, perhaps post client dialogue.

### Don't

- ✗ Just produce a step-by-step CAD drawing.
- ✗ Submit simplistic developments such as colour changes.
- ✗ Fail to explain development with analytical annotation.



# REVIEW

## Grid 6 Final design solution.

**This section is improved partially as a result of CAD packages, but candidates must ensure that they edit the drawings. The key to unlock the highest levels of the assessment criterion is enabling third party manufacture and detailing technical elements along with calculations regarding quantities and costs.**

### **Do**

- ✓ Undertake real client dialogue.
- ✓ Submit detailed drawings to enable accurate third-party manufacture
- ✓ Show complex details with appropriate communication techniques e.g., exploded view.
- ✓ Submit a manufacturing specification that details operations on each part.

### **Don't**

- ✗ Submit unclear small-scale drawings with little detail and unedited dimensions.
- ✗ Submit plans for production that are largely descriptive.

# REVIEW

## Grid 7 Review of development and final design

This section is where the candidates must undertake an intellectual analysis of the work they have undertaken so far. The commentary must be analytical and evaluative and must not be simply descriptive. In the best cases there should be strength and weakness analysis that provides balance and should consider all factors such as materials, processes, techniques and have reference to feedback. The evaluative element must be balanced and ensure that any conclusions undertaken can be supported. The centre assessment was often lenient.

### Do

- ✓ Undertake real client dialogue.
- ✓ Provide a balanced overview as a result of the dialogue with the client/stakeholders.
- ✓ Use analytical language (again ban the word nice!)

### Don't

- ✗ Simply describe the product.
- ✗ Omit feedback from the client and interested users.

# REVIEW

## Grid 8 Communication of design ideas

This section was generally well done, and many candidates accessed the highest levels of the assessment criterion. We often saw all aspects of the communication techniques referred to and often at a high level. Where the performance was less good it **was** often as a result of poor sketching technique/communication.

### Do

- ✓ Use spontaneous sketching to show client interaction.
- ✓ Show CAD skills to illustrate detail.
- ✓ Use technical language to describe detail.

### Don't

- ✗ Produce very limited design sketches.
- ✗ Submit naïve and simple annotation.

# REVIEW

## Grid 9 Tools and equipment

This assessment criterion was often very polarised with very good performances or a lack of demanding A level processes. Where candidates had modelled products, they were often at a low level and on occasion relied heavily on a CAM output with limited interlocking parts.

### Do

- ✓ Undertake real client dialogue.
- ✓ Utilise demanding A level skills.
- ✓ Select processes and tools that show sound technical understanding.

### Don't

- ✗ Submit simplistic outcomes using limited skills and processes.
- ✗ Submit work wholly CAM produced without complexity.

# REVIEW

## Grid 10. Quality and accuracy.

This section should be characterised by demonstrating high level making skills that evidence accuracy, leading to a quality artefact that is a fully functioning prototype that meets the end user needs identified in the specification. We should also see candidates not being afraid to consult with the interested parties and amend the design during the manufacturing as a result of this consultation or indeed in response to issues during the manufacturing process, therefore evidencing an iterative approach during the process of manufacture.

### Do

- ✓ Undertake real client dialogue, illustrate an iterative process.
- ✓ Undertake A level demanding manufacturing techniques and making skills.
- ✓ Produce an accurate prototype that is well executed and finished.

### Don't

- ✗ Submit simple outcomes.
- ✗ Submit inaccurate scale models

# REVIEW

## Grid 11. Testing and Evaluation

In this section we are looking for the candidate's ability to discern the difference between testing and evaluating. The notion of testing implies putting the product into service and considering its success and limitations, especially in terms of the specification and the clients' needs wants and values, whereas in the evaluation phase we are looking for a critical review including strengths and weaknesses which will then give a balanced conclusion supported by all of the analysis undertaken. This could lead to further suggested modifications, illustrating a post manufacture iterative approach.

### Do

- ✓ Undertake real client dialogue. Or use interested stakeholders.
- ✓ Use the specification to explore success and be balanced.
- ✓ Undertake testing in-situ and analytically evaluate showing balance. Suggest post manufacture modifications. Be iterative!

### Don't

- ✗ Be descriptive and possibly lacking in analysis.
- ✗ Omit to undertake a testing regime based on the specification.

# Pre submitted questions. 17th Oct

- **Phil Harvey Investigation section.**

The very first part, the opening of the project. What exactly are the exam board looking for when investigating possibilities? Is it very open looking at all possible A level projects or meeting a client and investigating their needs. I seem to have had contradicting information and need clarity.

**The next slide will hopefully deal with this.**

Also, the final design/manufacturing plan, what does a top mark example look like and what is expected.

**I will hopefully exemplify this.**

- **Therese Williams**

Has the requirements changed, have the standards gone up.

**The requirements have not changed; however, the standard has returned to the 2019 standard.**

Current up to date exemplars are needed as the ones the exam board have provided in the past are not to the perceived standard that the adjusted marks indicate.

**New exemplars are being worked on and should be available in November. However, the standard is still set at 2019 levels.**

# Pre submitted questions. 17th Oct

**Sonya O'Neill**

I need to have a greater understanding of the standard expected as despite doing the online module and looking at exemplar we are still off- need to get on track.

**I hope that this brief do, and don't analysis will help, and further exemplars will be posted on the web-site in due course.**

**C McElduff**

Investigation section and the evaluation section.

**We have some slides to deal with these sections.**

**James Housego.**

General support; Manufacturing section;

**Again, we have some slides that deal with this section with some good examples and some intermediate performances.**

**Nicola Farrance.**

What are realistic expectations of students within given time frame and demands of other subjects, what are the key things in each section to ensure a good solid grade? up to date examples provided by exam board.

**I hope that we have provided slides in the introduction to help with this.**





# Intermediate performances

## Issue Investigation

- Issues:**
- Head safety
    - Crash protection
    - Crash prevention e.g. improving visibility
  - Transportation
    - Secure transportation
    - Easy of use
    - Adaptability for different bike sizes and shapes
  - Storage
    - Easy access
    - Multi purpose
    - Weatherproofing
    - Ability to store when not in use e.g. fold away
  - Repairs and maintenance
    - Longevity
    - Lightweight
    - Important tools
    - Easy to use
    - Disassembly / assembly
  - House maintenance
    - Adaptability / compatibility
    - Music
    - Storage services
    - Records
    - CDs
    - Tapes
    - Video / film
    - Streaming services
    - Size constraints
    - Safety
    - Security
    - Any special requirements
    - Water and fire resistance

## Design Ideas Investigation

- Issues around workspace:
- Work
    - Organisation
    - Filing systems
    - Colour code
    - Compartment
  - Time managing
    - Planning
    - Simple
  - Communication
    - Talking
    - Sharing work
  - Storage
    - Different sized items
    - Storage
    - Household
    - Easy of use
    - Accessibility
    - Compatibility
    - Item accessibility
    - Locks
    - Alarms
    - Right - not easy to see
  - Personal
    - Entertainment
    - Music
    - CD
    - Tape
    - TV
    - Aerial
    - Streaming
    - DVDs, Blu-ray
    - Storage
    - Planning

## Client and Target Market Group Investigation

My client works from his computer and laptop at home. This requires that he has a station which he works from. To store all of his work and personal projects he needs a lot of storage, so it is also used for entertainment purposes such as watching TV and listening to music there are a lot of powered devices - resulting in a lot of cables and a large extension lead. Storing all of these electric devices as well as any work and personal projects requires a lot of organised storage. As the desk surface holds his monitor, laptop, speakers and any papers a large surface area is required. Although my client has organised work and personal projects in folders on a shelf the folders themselves are not organised and it can still take some time to find the correct paper.

## Initial Design Brief

- Concept:
- Multi-functional desk / workspace
- Function:
- Provide a clean working space
  - Organisation, storage and filing systems
  - Antistatic
  - Easy of use
  - In keeping with environment
- Additional considerations:
- Ergonomics
  - Aesthetics
  - Materials
  - Lighting solutions
  - Monitor and laptop storage / solutions

The candidate introduces some scenarios and then tries to 'find' a client. Missed opportunities!!

Then states the intention of a desk/workspace Again Missed opportunities!

## Identifying a Client

After identifying 3 possible design ideas I began to look for a client. After considering the different ideas I settled on workspace as I think this is the most interesting option as they can be multi-functional and therefore offer more diversity in design options and allow the client the most freedom. This would also allow me to market to a potentially larger range of consumers.

## Client Design Brief Needs, Wants, & Values

My Client ranked his values in this order: efficiency and functionality, aesthetics, sustainability, budget for the following reasons. Shaun competes at an international level for Team GB therefore the most important aspect of a product for him is its functionality and efficiency. This is because he needs a product that can **reliably** turn his boat during a training session or a race. If this product would not work perfectly, then Shaun would lose time during his race, which would hinder his chances to be successful. Furthermore, the product must also be as **light** as possible. This is because boats at any competition must weigh a certain amount. If the boat is too light, then the paddler will get disqualified but on the other hand, if the boat is too heavy, then it will slow down the athlete because the boat will be submerged more which will result in a larger surface area of boat to water contact which creates higher resistance and slows down the paddler. Therefore, the product can not be too heavy otherwise it will minimize Shaun's chances. The product must also be fully **waterproof/ water resistant**. This is to mitigate any damage that could be caused to the mechanism if the boat were to capsize. This is one of the most important aspects that my product needs to have as a malfunction in an electronic system could not only eliminate any way of steering the boat afterwards but would be extremely dangerous for Shaun. This is because lithium polymer batteries contain the metal lithium (Li) which is extremely reactive with water. The reaction that takes place is an exothermic reaction which means that it produces heat. Flammable hydrogen gas and extremely intense light is also produced which is very dangerous as it could cause a Shaun's clothes to catch on fire. The product must also be easy to operate and must not get in the way of paddling. To make the product efficient I must consider the **gearing ratio of the rudder wheel** because the smaller the rudder wheel will be, the faster the boat will turn, however if it is too responsive it will be very hard to control.

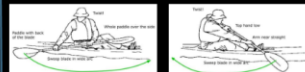


My client's next most important value was the aesthetics of the product. This is because even though the aesthetics of a product don't always directly affect performance, functionality, and efficiency, it can affect the durability and longevity of the product which essentially makes the product non-functional as durability comes under functionality. If a product is made from unpainted ferrous steel and is a subject to moisture, then it will rust. This will make the product look disregarded over time which will also lose its structural integrity as ferrous metals become weaker when they begin to rust. This is also a reason why long-term aesthetics should be taken into consideration when choosing materials and producing designs.

My client does not value sustainability of the product as it is a **single production**. This means that only one final product will be made which vastly limits the amount of wasted materials that could end up interfering with nature. On the other hand, my client wishes that if the product was to be **produced in mass**, then the materials used should be revaluated to become more 'environmentally friendly'.

## Design Problem

My Client needs a way to steer his kayak. In a flatwater kayak the boat is steered by a rudder that is located at the back of the boat that is rotated by a pulley system operated by your feet. My client has been paralysed from the waist down hence cannot easily turn a boat. This leaves him having to turn the boat using 'sweep strokes' which are a commonly used technique in white water.



However, sweep strokes are an ineffective way to turn flatwater kayaks. This is because flatwater kayakers are a lot longer and thinner than white water boats which makes them less agile as they sit lower in the water. Sweep strokes also prevent you from paddling properly as you must sacrifice speed for maneuverability.

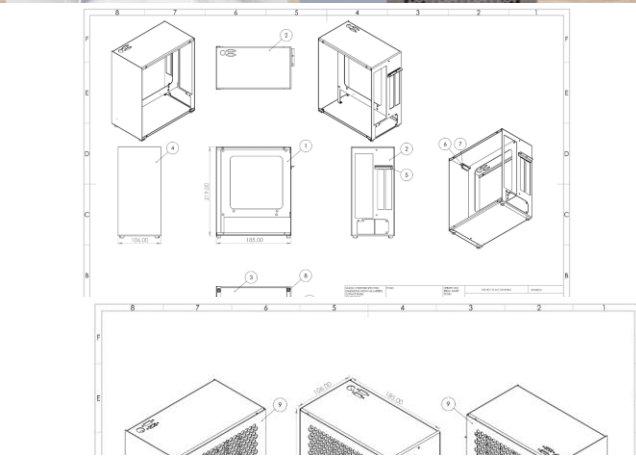
My client wanted the product to help him turn his boat while paddling. He also requested the product to be as lightweight as possible as a heavier product would dramatically slow him down. He also wanted it to be 'easy to use' while kayaking.

- Product Requirements
- Aspects I need to consider
- Conditions

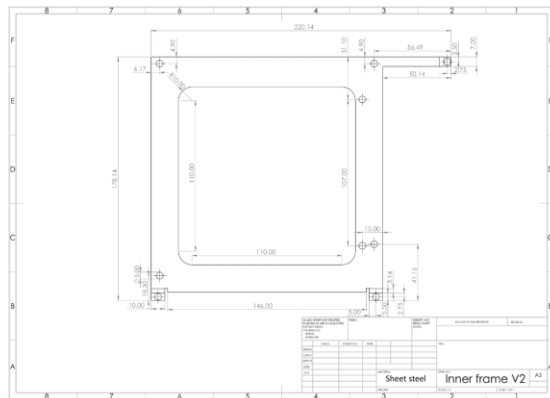
Shaun's least important value is budget. This is a fact due to Shaun being a sponsored athlete. This means that his kayaking expenses are paid for which is essential when he needs premium equipment to compete on an international level.

Here the candidate has from the outset suggested the direction of travel, but it may have been better to talk with the client and stakeholders (trainer, teammates) and started to examine the everyday needs wants and values to enable a exploration of other real design possibilities.

# Exemplar Final Design



Technical Drawing 1

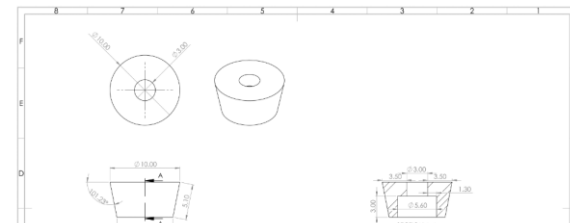


Candidate shows overall final visual and then goes on to detail Final assembly, parts. With a sectional view where necessary. Cutting list and costs and an operational specification.

Technical Drawing 8



Cutting list



Part number	Part name	Material	Dimensions (mm)	Quantity	Supplier	Cost	Other
1	Inner frame	Steel sheet	1x180x221	1	eBay	£26	
2	Top-rear panel	Steel sheet	1x115x411	1			
3	Bottom panel	Steel sheet	1x115x181	1			
4	Front panel	Steel sheet	1x106x229	1			

## Production processes risk assessment

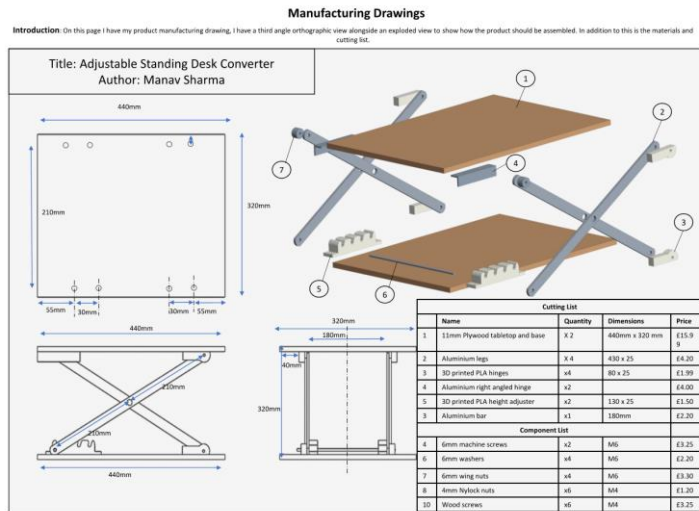
Process	Task	Severity	Frequency	How often	Control Measures	Residual Risk	Control Measures	Residual Risk
User safety	Assembly of frame	2	2	4	Assembly of frame is a simple task. If a user is not careful, they may not be able to assemble the frame correctly. This could result in the frame being damaged or the user being injured.	Assembly of frame	2	2
	Assembly of top-rear panel	2	2	4	Assembly of top-rear panel is a simple task. If a user is not careful, they may not be able to assemble the top-rear panel correctly. This could result in the top-rear panel being damaged or the user being injured.	Assembly of top-rear panel	2	2
	Assembly of bottom panel	2	2	4	Assembly of bottom panel is a simple task. If a user is not careful, they may not be able to assemble the bottom panel correctly. This could result in the bottom panel being damaged or the user being injured.	Assembly of bottom panel	2	2
	Assembly of front panel	2	2	4	Assembly of front panel is a simple task. If a user is not careful, they may not be able to assemble the front panel correctly. This could result in the front panel being damaged or the user being injured.	Assembly of front panel	2	2
Material	Assembly of frame	2	2	4	Assembly of frame is a simple task. If a user is not careful, they may not be able to assemble the frame correctly. This could result in the frame being damaged or the user being injured.	Assembly of frame	2	2
	Assembly of top-rear panel	2	2	4	Assembly of top-rear panel is a simple task. If a user is not careful, they may not be able to assemble the top-rear panel correctly. This could result in the top-rear panel being damaged or the user being injured.	Assembly of top-rear panel	2	2
	Assembly of bottom panel	2	2	4	Assembly of bottom panel is a simple task. If a user is not careful, they may not be able to assemble the bottom panel correctly. This could result in the bottom panel being damaged or the user being injured.	Assembly of bottom panel	2	2
	Assembly of front panel	2	2	4	Assembly of front panel is a simple task. If a user is not careful, they may not be able to assemble the front panel correctly. This could result in the front panel being damaged or the user being injured.	Assembly of front panel	2	2
After sale	Assembly of frame	2	2	4	Assembly of frame is a simple task. If a user is not careful, they may not be able to assemble the frame correctly. This could result in the frame being damaged or the user being injured.	Assembly of frame	2	2
	Assembly of top-rear panel	2	2	4	Assembly of top-rear panel is a simple task. If a user is not careful, they may not be able to assemble the top-rear panel correctly. This could result in the top-rear panel being damaged or the user being injured.	Assembly of top-rear panel	2	2
	Assembly of bottom panel	2	2	4	Assembly of bottom panel is a simple task. If a user is not careful, they may not be able to assemble the bottom panel correctly. This could result in the bottom panel being damaged or the user being injured.	Assembly of bottom panel	2	2
	Assembly of front panel	2	2	4	Assembly of front panel is a simple task. If a user is not careful, they may not be able to assemble the front panel correctly. This could result in the front panel being damaged or the user being injured.	Assembly of front panel	2	2
Warranty	Assembly of frame	2	2	4	Assembly of frame is a simple task. If a user is not careful, they may not be able to assemble the frame correctly. This could result in the frame being damaged or the user being injured.	Assembly of frame	2	2
	Assembly of top-rear panel	2	2	4	Assembly of top-rear panel is a simple task. If a user is not careful, they may not be able to assemble the top-rear panel correctly. This could result in the top-rear panel being damaged or the user being injured.	Assembly of top-rear panel	2	2
	Assembly of bottom panel	2	2	4	Assembly of bottom panel is a simple task. If a user is not careful, they may not be able to assemble the bottom panel correctly. This could result in the bottom panel being damaged or the user being injured.	Assembly of bottom panel	2	2
	Assembly of front panel	2	2	4	Assembly of front panel is a simple task. If a user is not careful, they may not be able to assemble the front panel correctly. This could result in the front panel being damaged or the user being injured.	Assembly of front panel	2	2

## Manufacturing specification

Part number	Part name	Material	Reason for material	Size	Tolerance
1	Inner frame	1 mm steel sheet	1 mm steel sheet is strong enough to carry the weight of components. It is easy to manipulate in manufacturing. It is cheap and 100% recyclable.	220.14 x 178.14 x 1 mm	±0.5mm tolerance to ensure components can fit correctly
2	Top and back panel	1 mm steel sheet	Same as above	410.5 x 114.28 x 1 mm	±1mm tolerance for good fit
3	Bottom panel	1 mm steel sheet	Same as above	181 x 114.28 x 1 mm	±1mm tolerance for good fit
4	Front panel	1 mm steel sheet	Same as above	228.36 x 106 x 1 mm	±1mm tolerance for good fit
5	PCI bracket	1 mm steel sheet	Same as above	43.57 x 13.34 x 1 mm	±0.5mm tolerance to ensure GPU can be screwed on properly
6	Female front panel attachment	1 mm steel sheet	Same as above	36.28 x 8.5 x 1 mm	±0.25mm tolerance for tight fit
7	Male front panel attachment	1 mm steel sheet	Same as above	20 x 14.07 x 1 mm	±0.25mm tolerance for tight fit
8	Rubber feet	Resin	3D printing is an additive process which has no waste material. Elastic properties are similar to rubber to stop case from moving and prevent scratches on table.	±10 to ±0.01 x 5 mm	±1mm tolerance for balanced feet
9	Side panel	2mm acrylic	Easy to laser cut out repeating hexagonal vent pattern which is hard to do with other materials and machines available. 2mm is strong enough to not flex much with vent holes cut out.	215 x 184 x 2 mm	±1mm tolerance for good fit

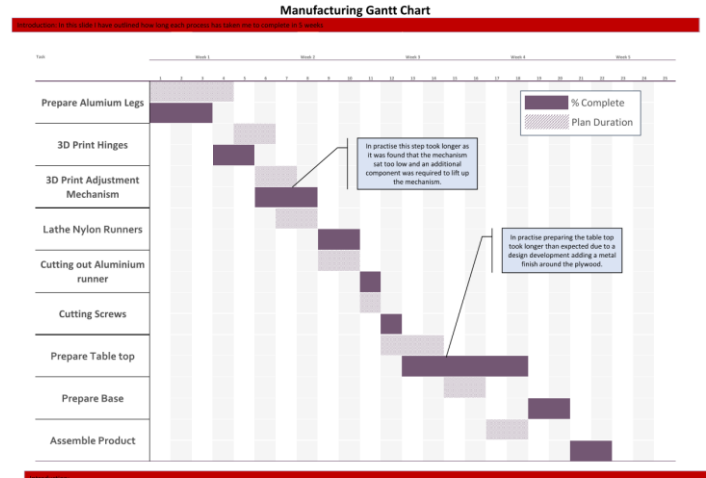


# Intermediate performances

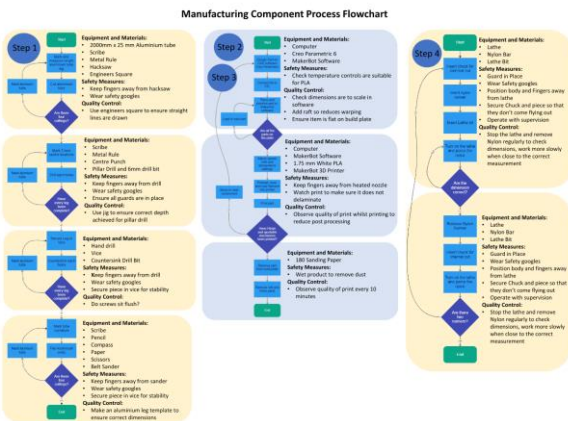


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Here we see the candidate producing a good overall working drawing, but it lacks details about the parts and the fixings etc.

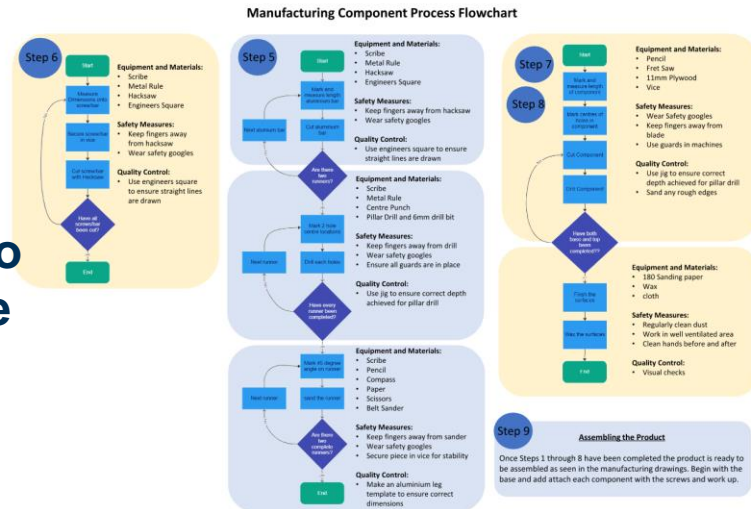


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The flow and Gantt charts have some merit and do help explain some of the operational requirements. but the work lacks detail.



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# Exemplar testing and evaluation

## FINAL EVALUATION

### ACHIEVING A POINT THAT MEETS MEAL

- My client expressed satisfaction with the product, which met all of their needs, wants, and desires, as evidenced by the feedback of my specification criteria except for one regarding weight. The product was also considered within the designated time frame and budget. Additionally, the final product closely resembled the Fusion 360 design and sketches, conforming to visual accuracy. The product's unique curved corner edges, graphical patterns, and the immovable nature of the rubber wood contributed to its sleek and clean appearance. The wood had no cracks or knots that could hinder the manufacturing process, which was smoothed through quality control checks. The grain of the material and rubber wood also contributed to a beautiful finish, with the task of stain enhancing the wood's patterns. The product's components and features were durable and strong, and the overall aesthetic was pleasing.



### ACHIEVING A POINT TO IMPROVE

- Areas for improvement include finding ways to utilize the board better by potentially turning it into a cabinet for storage purposes. The weight of the product is also a weakness that could be addressed by choosing lighter wood such as poplar or basswood and reengineering the measurements to create a smaller product. Finally, finding an alternative way to manufacture the curved corners is necessary as it took multiple attempts to create and clean bending could be a viable solution.

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### ITERATIVE DESIGN PROCESS

The process of creating a design solution for the client involved several phases, with each one unique challenges and requirements. Below is a description of the phases from the design process.

### FINAL PRODUCT PRESENTATION

1. **DESIGN** - The design phase is the first and most critical phase of the design process. It involves defining the problem, identifying the requirements, and creating a conceptual design. The design phase is the most time-consuming and expensive phase of the design process.
2. **ANALYSIS** - The analysis phase is the second phase of the design process. It involves analyzing the design to determine if it meets the requirements and if it is feasible. The analysis phase is the most critical phase of the design process.
3. **DESIGN** - The design phase is the third phase of the design process. It involves creating a detailed design that meets the requirements and is feasible. The design phase is the most time-consuming and expensive phase of the design process.
4. **ANALYSIS** - The analysis phase is the fourth phase of the design process. It involves analyzing the design to determine if it meets the requirements and if it is feasible. The analysis phase is the most critical phase of the design process.
5. **DESIGN** - The design phase is the fifth phase of the design process. It involves creating a detailed design that meets the requirements and is feasible. The design phase is the most time-consuming and expensive phase of the design process.
6. **ANALYSIS** - The analysis phase is the sixth phase of the design process. It involves analyzing the design to determine if it meets the requirements and if it is feasible. The analysis phase is the most critical phase of the design process.



### LIFE-CYCLE ANALYSIS

I have created a life cycle analysis chart for my product to evaluate its environmental impact. The analysis will include an assessment of the raw materials, manufacturing process, packaging, distribution, use, and disposal of my product. Through this analysis, I will be able to determine the overall environmental impact of my product and make informed decisions to minimize any negative effects.

### MANUFACTURING

- The types of wood I used in my product were:
- 1. Rubberwood** - It is a light-colored medium-density hardwood obtained from the Para rubber tree (*Hevea brasiliensis*), usually from trees grown in rubber plantations. Rubberwood is commonly referred to as "environmentally friendly" wood, as it makes use of plantation trees that have already served a useful function (as a latex tree) fairly cheaply.
- 2. Basswood** - It is a light-colored softwood from the European linden tree (*Tilia cordata*). It is known for its softness and ease of workability, making it a popular choice for carving and turning.
- 3. Oak** - It is a hard, durable hardwood from the oak tree (*Quercus*). It is known for its strength and longevity, making it a popular choice for furniture and flooring.

Finally, I utilized vinyl in my product, which is produced from petroleum-based feedstocks. While vinyl is a durable and versatile material, it is not biodegradable and can release volatile organic compounds (VOCs) when used. However, the vinyl used in my product was a low-VOC formulation, which helped to minimize its environmental impact.

### DISPOSAL

The disposal of my product is a critical consideration in its life cycle analysis. As the product is made from natural materials, it is biodegradable and can be composted or recycled. However, the product also contains some synthetic materials, such as the vinyl and the metal hardware, which may not be biodegradable. Therefore, the product should be disposed of in a way that minimizes its environmental impact.

### USE

Regular cleaning and maintenance can extend the life of my product. The product should be cleaned with a soft cloth and mild soap, and the wood should be oiled regularly to maintain its finish. The product should also be kept away from direct sunlight and moisture to prevent warping and discoloration.

It is also worth noting that if any part of my product is damaged or disposed of, it should be done so in an environmentally responsible way. The product should be recycled or composted, and any metal hardware should be recycled separately.

The distribution of my product was minimal due to its custom and one-time nature. There were only two distributor methods involved, with the first being the transportation of raw materials from the workshop to the client's school. The second method was delivering the finished product to the client's school, which was done via a courier service.

NAME: Ho Zhi Le CANDIDATE NUMBER: 1140 ALICE SMITH SCHOOL CENTRE NUMBER: 94022 SHEET NUMBER: 74

The candidate undertakes a range of tests and also undertakes testing against the specification. The client is the user and so user group testing is also undertaken. The candidate does submit an LCA which is a little more bespoke than a generic software led approach, it is a pity that more was not made of the modification element.

## EVALUATION & TESTING AGAINST SPECIFICATION

In the sheet, the client is the user and so user group testing is also undertaken. The candidate does submit an LCA which is a little more bespoke than a generic software led approach, it is a pity that more was not made of the modification element.

SPECIFICATION POINTS	EVALUATION	HOW I TESTED IT ?	EVIDENCE	SCORE
FORM (F)				
1. The product's design should incorporate elements inspired by the Bauhaus and Art Deco movements.	My product is influenced by both design movements, but the Bauhaus movement is more prominent in the design of the product.	I conducted a quick visual test by looking at the product and comparing it to the Bauhaus and Art Deco movements.		5
2. The product should be made from sustainable materials.	I used rubberwood and basswood, which are sustainable materials.	I conducted a visual test by looking at the product and comparing it to the Bauhaus and Art Deco movements.		5
FUNCTION (F)				
1. The product should be designed to support the activity of the client.	My product is designed to support the activity of the client, which is to use it as a desk or table.	I conducted a visual test by looking at the product and comparing it to the Bauhaus and Art Deco movements.		5

## EVALUATION & TESTING AGAINST SPECIFICATION

In the sheet, the client is the user and so user group testing is also undertaken. The candidate does submit an LCA which is a little more bespoke than a generic software led approach, it is a pity that more was not made of the modification element.

SPECIFICATION POINTS	EVALUATION	HOW DO I TESTED IT ?	EVIDENCE	SCORE
USER REQUIREMENT (UR)				
1. The product should be made from sustainable materials.	I used rubberwood and basswood, which are sustainable materials.	I conducted a visual test by looking at the product and comparing it to the Bauhaus and Art Deco movements.		5
MATERIAL & COMPONENT REQUIREMENTS (MCR)				
1. The product should be made from sustainable materials.	I used rubberwood and basswood, which are sustainable materials.	I conducted a visual test by looking at the product and comparing it to the Bauhaus and Art Deco movements.		5
SCALE OF PRODUCTION & COST (SPC)				
1. The product should be made from sustainable materials.	I used rubberwood and basswood, which are sustainable materials.	I conducted a visual test by looking at the product and comparing it to the Bauhaus and Art Deco movements.		5
SAFETY STANDARDS (SS)				
1. The product should be made from sustainable materials.	I used rubberwood and basswood, which are sustainable materials.	I conducted a visual test by looking at the product and comparing it to the Bauhaus and Art Deco movements.		5

NAME: Ho Zhi Le CANDIDATE NUMBER: 1140 ALICE SMITH SCHOOL CENTRE NUMBER: 94022 SHEET NUMBER: 76

## TESTING & INTERACTION WITH CLIENT



1. The product should be made from sustainable materials.
2. The product should be made from sustainable materials.
3. The product should be made from sustainable materials.
4. The product should be made from sustainable materials.
5. The product should be made from sustainable materials.

## CHALLENGES AND SOLUTIONS

- 1. SCALE OF THE PRODUCT:** The product was too small for the client's needs, so I had to increase the scale of the product. I did this by increasing the length and width of the product, which allowed it to be used as a desk or table.
- 2. DESIGNING A CURVED CORNER:** The client wanted a curved corner, but I was not sure how to achieve this. I decided to use a curved piece of wood, which I cut to the shape of the corner. This allowed me to create a curved corner that was both functional and aesthetically pleasing.
- 3. ATTACHING THE CORNER:** The client wanted the corner to be attached to the main body of the product. I decided to use a combination of glue and screws to attach the corner, which allowed me to create a strong and durable joint.
- 4. FINISHING THE PRODUCT:** The client wanted the product to have a finished look. I decided to use a combination of sandpaper and wood stain to finish the product, which allowed me to create a smooth and attractive surface.

NAME: Ho Zhi Le CANDIDATE NUMBER: 1140 THE ALICE SMITH SCHOOL CENTRE NUMBER: 94022 SHEET NUMBER: 77



# Intermediate performances

## Final Client feedback & personal feedback



I sent pictures of my final model to my client so her and the Parish Council could see the idea we talked about as a model.

I asked her what she thought about the model being an attempted visualisation of what we'd decided, and I also explained my errors with the making of the roof to her.

My client's final feedback is that she likes the model and how it looks. She said that the sheltered walkway area with the doors underneath it in the centre of the building was nice because it was a covered way to move around each part of the area. She also liked the wooden beams I added because of the way they bring the fabric and brick together and it makes the overhanging canopy roof seamless with the surroundings because it's got supports under it.

Although, my client did say that if it didn't have smaller windows on the main building area after looking at my model because despite saying she likes the natural light she just would rather prefer smaller windows that didn't take up so much room on the walls all around.

Previously, in this area of the Memorial Field there was a boring, inefficient and insufficient changing room block which had been neglected by the community, therefore harming the community too in the form of local the sporting teams. With the funding of the Parish Council and everyone who helped to raise money I think I have designed a place that could replenish the area. Socially, I wanted the area to appear more friendly and lighter instead of boring and blocky. However, I did still want it to fit in nicely with the surrounding living areas and itself generally, because as a village it's not particularly modern. With the materials that I used I think I achieved that because the fabric roof is new but not too extravagant for the village whereas the brick for the walls will result in it blending in nicely with the rest of the village. I aimed to help create a more social space by adding the connected gaps between my two buildings so there's walking space and easy access to the doors that are on both sides. As well as adding the canopy in general, to me it creates a social space because that area sheltered from the weather so parents could stand under there and socialise whilst their children play football. Ethically and morally, I just wanted my design to be the most efficient and comfortable for anyone that could be using it. This is why I added lots of windows around the building for lots of natural light, had a main hall that was a taller building to maximise its potential in terms of being rented out for activities and having the gap in the middle to allow people to comfortably walk between buildings without having to go all the way around and to provide that shaded, more social area. Environmentally, the impact is minimal because I made sure to research what I'd be using beforehand to make sure that the materials I selected are durable and wouldn't need to be replaced because they stand for such a long time. Proof of that being the nearby brick houses throughout the village which have been there many years. Socially, the impact will be positive because the sports teams will comfortably be able to use the facilities and more games can take place on the field now, and the main hall will be in use for the council and likely host social gatherings and clubs run by people in the village. Morally, it doesn't have any major impacts apart from the buildings should hopefully just rejuvenate the area. It tackles the issues given but not any grander scheme issues within the village.

**Personal final feedback:**  
I am satisfied with how my design came out. I felt like I had good communication with my client and with her guidelines a nice hypothetical pavilion/social area was made. My only problems still the roof and if I was to do it again, I would've stuck with the sanding down polystyrene into the right shape technique.



**Testing:**  
When it came to testing the final model, I tested the accessibility of the doors and overall area I could get to with a scale acrylic figure who represents the over-aged size person. The figure fit easily through the doors which is good because it hopefully means that the door diameter, I picked out are inclusive enough for anyone in the Village.

I also have tested this in terms of looking back at my specification and comparing, 1.1-1.3 of my specification has been met through my design because it's measurable through the fact that there is a lot of space inside my main building for activities and places to store things (1.1). I didn't end up adding ramps because my model was very on the ground so a ramp wouldn't be needed for wheelchair access, but on the real building it would be likely more raised so a ramp would need to be added then (1.2). There is also a lot of room for plenty of people, (1.3). It also was designed to be interesting but with the intent of function coming first (2.1), the building fits in well with the surroundings due to the materials and isn't too tall (2.2). Provides some areas of shade because of the canopies (2.3) and has lots of natural light because of the big windows (2.4). (3.2) tests well too because it is made from realistic materials that are suitable for this area as well as affordable for area (4.1) the building does appear like it'd be comfortable for the people plus comfortably fit them inside. That can be tested through the placements of the acrylic people models. (4.2) because my building is constructed with durable materials that last for many years in most weather, as shown by the old brick houses. (5.1) Also is done well because my design doesn't take up the whole plot of land but instead utilises some of it to create social spaces.



## Final Prototype Evaluation

Specification	Designer Evaluation	Client Feedback	Changes During Production	Further Improvements
My client would like for the product to be aesthetically pleasing, particularly something that adds to the overall appearance of the kitchen area. After discussing this with my client, she would like to have either the aged modernism or modernism style.	My product has a simple curved aesthetic which not only fits my client's preferences but also fits well into the kitchen area.	Yes I have seen images of the product in use and can see that it serves its intended purpose.	The overall aesthetic of my product has had minimal changes from its design. However, I have still made some small changes like where the top section sits slightly closer to the back which I intended and to simplify the design. Also the chopping board compartment was removed towards the very end of the design phase as I realised that the product would not be big enough to facilitate the storage section.	To achieve a higher level of aesthetic, I would want to use the correct machines and tools in manufacture as this would allow me to achieve perfectly even corners using the fine ply. Furthermore, I would also like to make the lid out of the same material of the handle (not wood/bamboo natural wood as) before this would improve the look of the lid as it is made of banded ply which means that the layers are visible. The natural wood would not look as neat-made which therefore would suit the overall aesthetic of the product.
The client is happy to see us on to CVS which means that the	In-house production. This one would definitely be attractive.	My client states that I would now use for £1000 for the	No changes were made to this part of the specification as I	To improve the cost of my product, I would have to reduce

## Client Feedback – testing the prototype

Question	Answer	Key outcomes
Does the design work?	Yes I have seen images of the product in use and can see that it serves its intended purpose.	This is good as my design aims have carried through to the final product with it functioning to a high degree.

## Life Cycle Assessment

There are two types of product life cycles with one being the 'cradle to grave' which is when a product is not recycled at the end of its useful lifespan. The other product life cycle type is 'cradle to cradle' which means that once a product has come to the end of its use, the materials are recycled. Another name for this is the 'closed loop' system as the materials from the product can either be recycled and made into new products or can be returned to the environment as biodegradable waste. An example of this would be an aluminum can which can be recycled infinitely into other aluminum products, however doing this, still requires the energy to melt and form the aluminum.

When manufacturing products, there is always going to be certain impacts on the environment, for example, the extraction of material from the earth (cradle) which may also need processing (e.g. metal needs to be smelted to extract pure metal from its ore state). Furthermore, the product is then manufactured and distributed using many different methods of transportation like trains, lorries and ships. Finally, it is used and then recycled or disposed of (grave).

Environmental impact of my product - Firstly, My product is made almost entirely from man made wooden board which is a very sustainable material and is also a more efficient use of natural wood which means that in production and its source, it causes minimal harm to the environment. Additionally, to bond the material I have only used PVA glue which is non-toxic and biodegradable which means that the main body of the product is fully recyclable and biodegradable. I have also used scrap hardwood to create the lid handle which is an eco friendly way of using up material that you already have instead of purchasing more and is also recyclable and biodegradable. Lastly, I have used rubber for the bottom of the product to ensure that it isn't easily damaged by water or any spillages which helps increase the useful lifespan of the product and although rubber isn't biodegradable, it can be recycled.

## Final Prototype



I placed my product in areas that it would normally be which shows how its size allows it to fit into most kitchens.

The bottom picture shows that the dimensions of the product do not intrude upon the overall working area of the worktop as it can be placed in a corner facing outwards or against the back wall to save further space.



If chopping boards are not used, the back section can store any items that need to be stored out of harms way, hence the lid



This area stores the range of chopping boards for the home cook

### Main Product Overview

These images show my final product in the kitchen area which helps show the size of the product and also helps to show how the product fits into its intended area. The images also show the various storage applications that my product is capable of with the different storage sections offering lots of versatility



These images show all of the separate storage sections and how they can be used. For instance, pairing knives and cheese knives can be stored in the side sections. The front section can be used for storage of herbs and spices or even coffee making paraphernalia.

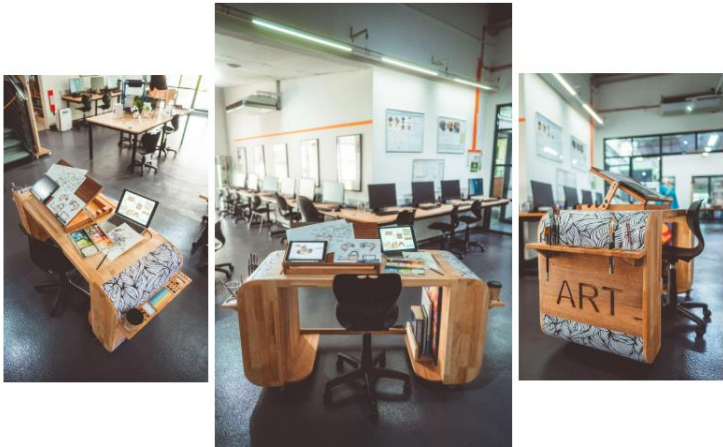


The candidate here produces a largely descriptive evaluative commentary with a number of missing elements. The work has some testing using the scaled figure and also some client input. The LCA is not clear.

In this example the candidate does undertake some more testing and uses the client and specification, but the work is not analytical or balanced.

# High quality Manufacture

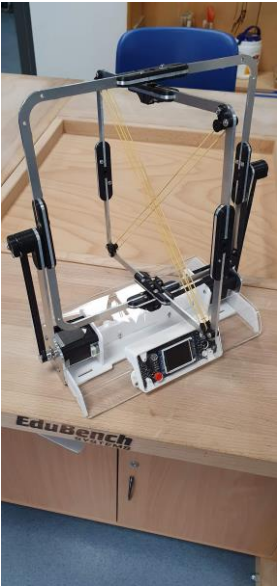
FINAL PRODUCT



Design Drafting desk



Deco Record storage



Rotational moulder



Laminated storage



Organic cafe



# Visual Drawing 1



### INITIAL IDEA 1

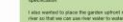
### INITIAL IDEA 3



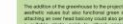
Handwritten note:  $\frac{1}{2} \times 1000$



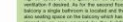
100



the trees could also provide shade afternoon time and also has enough space outdoor use is. The open air hall also would be convenient to observe view the



Through social media, I also used a lot of glass to put an emphasis on the interior spaces created while the exterior looks dark.



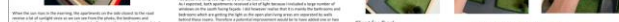
As for the model, latex wood could be used.



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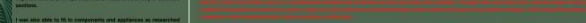


...the three corners are easy to use and the ease in getting windows in is a real natural light into the open-plan living area. This is advantageous as it means that occupants living in these apartments will not need to rely much on artificial lighting which is better for the environment and will reduce the energy bills. We decided to use the same design for the building corner they tend to be vacant in the middle of the site.



endpoints were not necessary, to much light as through this result, as can be seen in the photo this is mostly due to the lower cut everything above a blocking a bit of light from reaching the denser parts of the building. And to label this everything for aesthetic and functional purposes as it gives the building a clear look (since it components having appeared in detail the cut's path relative to the building). These games are brought into the world through the building itself, and even through the day it is more easily built. To continue, the potential importance of that I could make in the building to further enhance the natural light entering the building would be to add a more subtle, therefore, the building would be able to be built.

**Conclusion**



join in the further research sections at least components such as lifeline doors and curved roofing is used in the model seen above.



100% and 200% rise in one  
assessable component



↓



**Candidate shows evidence of good evaluative commentary and well-made final model.**



**Candidate shows a good range of ideas and evidence of some sub-systems design**

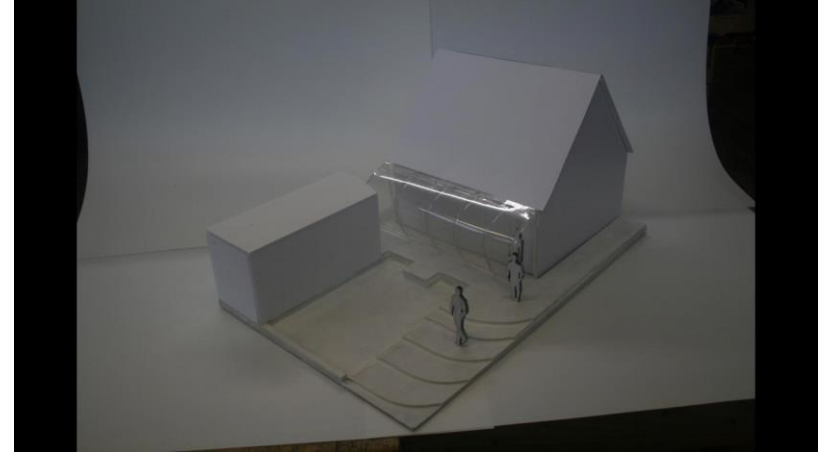




# Intermediate Manufacture



**Scale model stool**



**Extension**



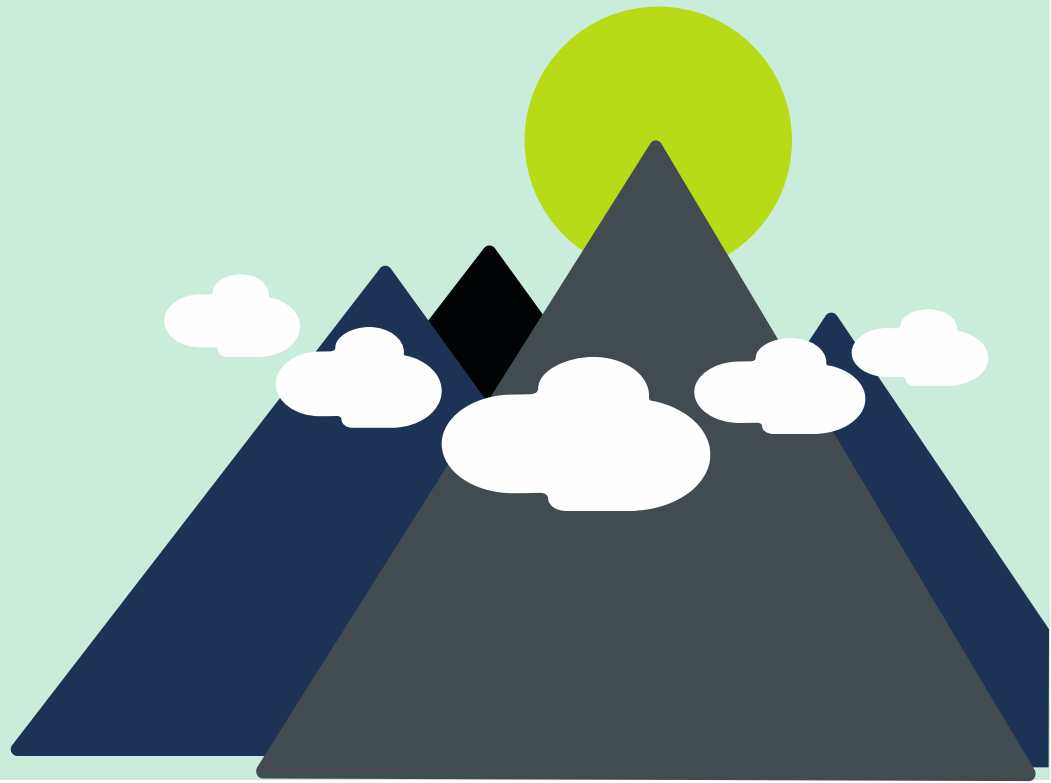
**Storage  
solution**



**Extendable table**



## Q and A session



# Your Subject Advisor

**Evren Alibaba**

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You can sign up for Evren's  
e-updates by completing this  
[online form](#)



We also have an online [community](#) especially for Design and Technology teachers.

# Range of ideas and development







# Depth of Research

The candidates should always remain focussed and select the relevant research, if we see very 'text-book', in style research this will be mentioned in the E9 report. It is imperative that the candidates do not submit irrelevant or generic research.

Secondary research			
Method	Source	Pros (+)	Cons (-)
Internet	Google, Microsoft edge, Firefox	Lots of information available on the internet	Some information may be incorrect, trusted websites will have to be used to collect correct information.
Magazines	Local newspapers as well as shops like Tesco, Waitrose	Newspapers are packed full of information that can be used to research the product	Most newspaper columns wont be useful therefore not providing the information required
Scientific data	Human comparison to products, anthropometrics	Using anthropometrics can determine how big a product will be in comparison to a person, this will help determine the correct dimensions for a product as well as adding any accessories	Some data may be difficult to comprehend, bad illustrations could cause confusion and lead to bad assumptions of dimensions.
Journals	Libraries, book collections	Books created by specialists on certain topics will contain very in depth information about the design process of a product, actual production and the creation of the final product	Some libraries may not contain the information required
Encyclopaedia	An encyclopaedia book, websites such as Wikipedia	A large sum of information can be gathered quickly by using the internet but an encyclopaedia is a more trusted source of information	Anyone can change the information so you have to be vigilant and not note down false things.
Books	Libraries and shops	Most books can be relied upon that there information is correct whereas the research books from the library can only be lent out for a certain amount of time	There may not be enough books with the information required to complete the research, books from the library can only be lent out for a certain amount of time

Research table

6

The candidate here produces some very simplistic research and generic descriptions. We do see some client commentary but again it lacks real analysis.

Material	Advantages	Disadvantages	Sustainability	Price comparison
Hardwoods	There is a wide range of advantages for using hardwoods in my design, using hardwoods would make my design durable as well as aesthetically pleasing.	Hardwoods are generally more expensive because they take many years to grow, if the wood is not finished correctly it could be damaged if it comes into contact with a liquid.	Hardwoods take many years to grow and mature, furthermore trees are not replanted fast enough. Transporting the trees to the factory as well as the machinery used to produce the wood all use fuel and electricity	Hardwoods are expensive due to their long time to grow and mature as well as their durability
Softwoods	Softwoods take much less time to mature than hardwoods, some softwoods take as little as 25 years. Therefore they are much less expensive to grow and buy.	Softwoods are not as strong or durable as most hardwoods, hence their name, they take less time to grow. Softwoods have a wider grain width therefore making it less sought after. They can often warp over a long period of time.	Softwoods are more sustainable than hardwoods because they grow and mature much more quickly, however because softwood is weaker it is more prone to warping and being damaged possibly deeming it unsustainable	Softwood is much cheaper than hardwood due to its fast grow time, it would be a good option for my project as it wont cost a large amount.
Manufactured woods	Manufactured woods can be a recycled wood such as chip board or MDF. They can be made from wood chips and dust, certain woods such as plywood are both strong and cheap.	Many manufactured woods may give off the impression of low quality. Personally I would go for plywood over other materials due to its durability. It could be hard to work with and cut manufactured boards due to their strength.	Manufactured boards are generally made from recycled materials, woods that have been already used in another product. Reusing old wood is more sustainable than importing new material from other countries.	Manufactured woods are much cheaper than softwoods and hardwoods
Steel	Stainless steel does not corrode or rust therefore it'll have a long lifespan.	I have not worked with metal that much, I have manipulated it and warped it however I have never cut. I would need to learn how to safely do so. Steel can also be a hard material to work with.	Stainless steel is generally 60% recyclable, however the process of production requires a lot of energy	The price of steel has increased due to covid-19 delays and Brexit, steel is an expensive material due to its strength.

Materials research

#### Client feedback

Manufactured woods sound good due to their strength and low cost however I'm not a fan of their low quality look therefore I think softwoods could be a better choice of building material, hardwood would also be a good choice but it is quite expensive and heavy

#### Conclusion

My client prefers the soft and hardwood over the manufactured material due to the aesthetics and quality of the material.

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#### RESEARCH INTO BRIQUETTES

Before I have included some of the many advantages of using wood briquettes on the fire.

Wood briquettes have a lower ash and sulphur content, comparable to fuel. The CO2 balance is even because the wood briquettes release just as much CO2 as the atmosphere as the trees they once were did.

Briquettes have a higher energy content per cubic foot due to their high density which means less storage space is needed and more heat is released per lb.

Regular firewood naturally contains moisture, bark, knots and more which can make the burning of the wood irregular and difficult to control. But due to the large amounts of compression wooden briquettes burn evenly and in a controlled way.



When briquettes burn they only leave 1% of their original volume as ash which means that you don't have to empty the stove as often.

Briquettes produce much less smoke than regular firewood logs.

Although there are many advantages of wood briquettes there are also some disadvantages to using them compared to regular firewood.

Briquettes lack the aesthetic appeal of regular fire logs.

Briquettes also don't offer the same range of aromas that natural logs do. Briquettes have to be kept in a dry place because if they expand if they get wet.

Briquettes are made in a variety of different shapes and sizes, depending on the user. Briquettes are also made from a mixture of wood types and are not usually made from one specific type of wood. Some briquettes have a hole in the middle of them. This is partially because they have been made by a screw extruder and not by a hydraulic press but it also makes the briquettes dry faster and burn better due to the increased surface area.

Some dust can cause serious health problems, it can cause asthma, which carpenters and joiners are four times more likely to get compared with other UK workers. The Control of Substances Hazardous to Health (COSHH) Regulations 2002 link to external website require that you protect workers from the hazards of wood dust.

Hardwood dust can cause cancer, particularly of the nose and sinuses and dust contains the fine particles that are most likely to damage the lungs.

**Key Reasons to use Briquettes:**

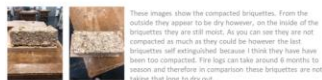
- Easy to use and Transport
- Light up quickly
- Breaks up easily for smaller stoves
- More cost effective than normal logs
- Obscured - Safe for open fire cooking
- Very little smoke
- Very little ash



#### FURTHER TESTING - FLOUR AND WATER 2

So far the only briquettes that have bonded together are the flour and water briquettes. However, these were small circular briquettes as opposed to the other briquettes I have made which have been much larger and rectangular. The small briquettes, although being held together were so densely compacted that they did not burn. So my intention is to make the flour and water mixture again but make the briquettes the same size as the other tests to make this a fair test.

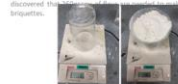
I began by remaking the flour and water mixture by adding 260grams of flour with two cups of water. I then mixed it in the stove and brought it to a boil. Then I took the flour glue and added it into speedwell and used the wooden jig that I used to make the other test briquettes. To ensure they were the same shape and size for the fastest result. Once again the briquette compressed well and held together. I left it to dry for a few days and then came back to it. Like the small round briquettes from the outside the briquette appears to be completely dry but once you cut open the briquette the inside is still moist. From my previous research I discovered that many briquettes are manufactured with a hole in the middle to increase the surface area which makes drying the briquettes more effective as the moisture can dry out.



These images show the compacted briquettes. From the outside they appear to be dry however, on the inside of the briquette they are still moist. As you can see they are not compacted as much as they could be however the test briquettes self extinguished because I think they have been too compacted. The logs can take around 6 months to season and therefore in comparison these briquettes are not taking that long to dry out.



I also decided to work out the cost of manufacture for one of these briquettes. Flour is a much cheaper alternative to wallpaper paste and commercial glue. I weighed a plastic cup and then weighed the same cup with the required amount of flour in it to make one briquette. I discovered that the cost of one briquette is:



1.5kg bag of plain flour = £0.60p

I then calculated how many briquettes could be made out of the bag of flour.

1300/260 = 5.7 briquettes per bag of flour.

£0.60p/5.7 briquettes = £0.105

One briquette therefore costs £0.10p to manufacture.

I compared this to the average cost of fire logs that are on the market.

For 100 logs you would pay on average £80. This would cost an £0.80p per log which makes the flour briquette 70p cheaper. Although this appears cheaper, we do not know how long they burn for. Depending on how long they burn for they may not be too much cheaper at all if they burn much quicker than the fire logs.

#### RESEARCH INTO MATERIALS

I decided it would be beneficial to research into some possible materials that I can make my briquetting press from. I have chosen three metals and three woods because from my market research I discovered that there is a mixture of wood and metal briquetting presses on the market.

Pros of Teak	Cons of Teak	Pros of Pine	Cons of Pine
Resistant to bacteria	Difficult to purchase because of the risk of the tree	Low Cost	Low Cost
Resistant to warping	Expensive to buy	Paints well	Prone to scratches and dents
Resistant to cracking and splitting	Can split and split easily because of its grain	Resists staining	
Excellent for outdoor use			
Pros of Stainless Steel	Cons of Stainless Steel	Pros of Oak	Cons of Oak
Highly Durable	High cost	Very Durable	Very Durable
Easy to maintain	High quality machines needed to turn	Resistant to warping	Could warp and crack easily
Resistant to fire and heat	Difficult to cut	Widely available	Heavy
Aesthetically pleasing	High cost of raw material	Good at staining for outside use	
Easy of installation			
Pros of Mild Steel	Cons of Mild Steel	Pros of Aluminium	Cons of Aluminium
Highly available	Not strong under high stress	Corrosion Resistant	Resistant to corrosion but can be oxidized
Easy to shape	Heat treatment affects the surface in the heat	Lightweight	Accessible to tools
Resistant to rust	Rusts easily	Highest strength to weight ratio of any metal	Relatively Expensive
Resistant to easy to weld	Hard to weld	Non magnetic	
Resistant to easy to weld	Hard to weld	Recyclable	

Whereas here the work lacks some focus and relevancy



# Specifications

## The specifications should be exactly that, specific!!

### Initial Specification

Specification	Point	Supporting Research/ Justification	Next Steps/Testing
Function/Purpose	<ul style="list-style-type: none"><li>My product must be able to keep the user productive when working from home</li><li>My product must increase concentration and organization</li><li>My product must be multifunctional</li><li>My product must be able to be used in any environment where the user is working from home</li></ul>	Though my stakeholder interview and questionnaire I managed to gather the following information on what my product must achieve to help my user and potential customers with working from home. This was done by asking them what their main struggles were and what they think the best solution for that is. Furthermore, by completing my existing product research I managed to gather ways in which products on the market already fight against these issues and how I can integrate these features into my product	The next steps to make sure this specification point is full met is by completing some initial models to test the mechanical features that my product will include. Furthermore, once these models have been completed, I will go to my stakeholder and ask for their opinion on what I can integrate into the product to make sure it reaches all the functions it needs to.
Form	<ul style="list-style-type: none"><li>My Product must be aesthetically pleasing</li><li>My product must be appealing to the 16 to 30 age range</li><li>My product must have a minimalist look</li><li>My product must be up to date with current trends</li><li>My product must have a good finish</li><li>My product must be a dark natural color</li></ul>	By completing my site visit and questionnaire I have gathered that my products environment is either in the client's bedroom or home office. Furthermore, my questionnaire showed that the most common use for this product would be a student either in school or college so therefore my product must be appealing to the 16- to 30-year-old age range. From looking at my existing product research I found that the best-selling products in the working from home market were minimalist.	The way to move forward with these specification points is by researching current trends to make sure my product will be appealing to my target market. Furthermore, I also need to complete some material research to use what material will work best with my product and which material is most aesthetically pleasing.
Durability	<ul style="list-style-type: none"><li>My product must be able to be used by the client for at least one hour a day</li><li>My product must be able to withstand heavy weight from items such as textbooks and computers</li><li>My product must have a life span of at least 10 years</li></ul>	By using my questionnaire I have gathered the information that my potential clients will be using my product for a minimum of an hour a day. Furthermore, as my product will be used in my client's bedroom from the site visit, I was able to see the things my stakeholder had around their working area. These consisted of books and electronics. Therefore, my product must be able to hold these items.	The next step with this specification point is by completing a wide range of test to check the strength and durability of my materials and product. These tests will include testing how many textbooks my product will be able to hold and for how long
Cost	<ul style="list-style-type: none"><li>My product must be within the price range of £10 to £30 for a small product and not exceed £300 for a larger product</li><li>When manufacturing my product, I must keep costs to a minimum of raw materials and manufacturing techniques</li><li>My product must be affordable and be well priced within the market and competition</li></ul>	This information was gained from my questionnaire/ stakeholder interview and existing products on the market. The questionnaire one question was about how much would the client be willing to pay for a product in this price range. The main answers consisted of a range of 20-30 pounds. In addition, looking at my existing products the price range of those products was very similar to the questionnaire answers. This consistency shows that the right price range for my product is £20-£30.	To complete this specification point I must do some research and choose the cheapest materials which will still be high quality for my product. Furthermore, I must use the cheapest manufacturing techniques to keep costs down as much as possible. In addition, I will be looking at my product and see how much they are charging for their product in the same market area as mine.
Methods of Production	<ul style="list-style-type: none"><li>My product must be mass produced</li><li>My product must not be larger than 140cm*70cm</li><li>My product must be available in both online and retail stores</li></ul>	This information was gathered from both my existing product research and site visit. From completing my existing product research, I have found that products in the working from home category are mass produced. Furthermore, they are also both available both online and in retail stores which my product will be as well. In addition, from completing my site visit in my client's bedroom I have gathered that my product must not be larger than 140 cm * 70 cm.	To be able to complete this specification I must consider what materials which fit the size requirements of my specification. To do this I must complete a material research slide which will highlight what materials would work for this specification area. In addition, by completing my site visit in my client's bedroom I have gathered that my product must not be larger than 140 cm * 70 cm and sell online and in retail stores.

### Specification

<b>1) Introduction</b> My specification will list out the main considerations and factors when manufacturing my product. The importance of each factor is listed out in order where function is the most important. Because in a factory, the products needs to be functional to improve efficiency but also serve the purpose of the product and the reason it exists. On the other hand, aesthetics is least important because the design of the product should be basic and minimalist.	<b>2) Quality</b> The factor that this is the second most important is the hierarchy of quality. This is suggested by both my client and user group, as it is a priority to maintain a high-quality product. This will also improve the durability of the product as well, increasing the usage life for my product making it more cost-effective. Moreover, this is also key for manufacturing of the product where each component should be made accurately so the finished will function, with consistency including the materials as well as the depth of each unit and both. Furthermore the final of the product needs to be exceptional, there should be any visible scratches or dents on the surface. <b>Quantitative Data:</b> The size of each part must be accurate tolerance ±0.5mm, so the surface of each part will be smooth and will be even. <b>Qualitative Data:</b> The quality of my product can be analyzed and reviewed by other students as well as my client where they give me opinion and provide feedback for my product and whether the quality has reached his standards. <b>How to test:</b> To test the quality of the product impact the product whether are there any potential defects such as a joint not fully sealed.	<b>4) Cost</b> The client with business, their goal is to maximise revenue and minimise cost. So I think that cost is important to any business, but not the most important. As suggested by both my client and user group, it is important to make the cost of manufacturing my product making it more cost-effective. Moreover, this is also key for manufacturing of the product where each component should be made accurately so the finished will function, with consistency including the materials as well as the depth of each unit and both. Furthermore the final of the product needs to be exceptional, there should be any visible scratches or dents on the surface. <b>Quantitative Data:</b> The cost of materials used, as well as the wasted materials during the manufacturing process. Where this will be used to calculate the price of the product and whether the my client and user group, reviewing whether it is too expensive.
<b>1) Function</b> The main purpose of my product is to provide protection to the product inside from insects. One tangible feature is the protection from various environmental factors such as dust, UV, heat and rain. This will prevent the plastic inside from being affected and ruining the quality of the product including spoiling the color and finish of the plastic. As an engineering, quality of the plastic. There are a few features, which are essential to the product including a modular part holder which can be used for different products, this will help increase the duration of use for the product. The main aim of this product is to provide protection to the product inside to maintain a pristine quality throughout from the manufacturing process all the way to the customer. <b>Quantitative Data:</b> The information that can be measured are the environmental data of the factory interior and outdoor, where the packaging is used, including temperature, humidity, dust, UV, noise. These data will allow me to understand what kind of environment the packaging must be able to withstand. Also, another piece of important information is the dimensions of the product that my packaging will be used for. <b>Qualitative Data:</b> Before the product's deadline is reached the user should be able to use and test the product to review how the product fits with their purpose and usage. And they will be able to give feedback in terms of verbal communication.	<b>3) Scale of Production</b> The most important factor in my opinion is the scale of production. The main body of this product can be produced for mass production. However the product holder might have to be made in batch production to fit different products, depending on the company. This serves as a very important factor for my product because usually they require larger numbers of packaging. Depending on the size of the company, it may differ from several 100s to several 1000s of packaging. In order to meet the scale of mass production, I need to use processes which is automated including CNC milling and injection moulding. For the assembly process, the product should be easy and fast to assemble, where there should be clear lines to faster together using rivets and bolts. <b>Quantitative Data:</b> The manufacturing process can be represented using a Gantt Chart.	<b>5) Durability and Maintenance</b> In terms of packaging, it is important for it to be tested. As it will help reduce the cost in the long term, by the company not having to repurchase as often. In order to make the product durable, the materials will have to be strong and withstand shocks for long periods of time, also the quality has to be good to have strong protection. And eventually everything degrades, so the parts will need to be replace, so in order to make my product replaceable, the parts will need to be removable using temporary joints techniques such as rivets and bolts. <b>Qualitative Data:</b> When my product is built, I will let my client evaluate whether the packaging is durable and up to standard, including the overall design and structure of the packaging itself. <b>How to test:</b> Move the product around the factories including questions on rough terrain. And inspect the joints around the frame and also the product holder.

### Standard Consideration

According to The Institute Standards Institute (ISI), in order to evaluate the safety and quality of the product, the product needs to be properly tested in different areas and scenarios. Including the stability of the product where how easy the product can be loaded over. Also to evaluate the quality how the product is made, the durability of the product needs to be tested using a impact test.

### Design specification

**Purpose:**  
The product is going to be a desk for the drama department for use during performances with the ability to also be used by examiners during exams. With this in mind, the product must have a clear area which can hold and support a room's pro lighting panel; support or include some form of lighting element; a place to put the monitor; some form of cable management and be easily transportable or storable. This is essential to the success of the product.

**Form:**  
The product should look professional and appear to be a commercial product with fitting color schemes and design elements tailored to the clients desires and following research of ergonomics, the client stated within the interview that they would like the product to look professional and classy and to impress others. Aesthetically like this is desirable and not completely required.  
The desk must be created in correlation to the anthropometric data researched to ensure that the desk can be appropriately used. I.e. the seated knee height must be measured with the 95th and 90th percentile in mind to ensure the majority of users can sit comfortably under the desk. This means that I must consider the seated knee height in the product and make the product to be at least between 450mm to 600mm for optimal ergonomics.  
The desk must be able to hold paper for notes and lighting cues as mentioned by the interviewed user; which means there must be some form of compartment which allows the storage of at most 200mm x 270mm paper. This is needed because the client talked about how there is never anywhere to safely place down performance and lighting notes.  
The product will have to fit at the back of the south hall, so space will be limited. The product must be either reusable or complete to the space at the back of the hall. This can be frequently tested through the products development.  
The product should be no heavier than 50kg so that the product is still viable to be moved around with relative ease, or have some form of mechanism which allows the product to be transported easily as specified by the client.

**Functions:**  
The product must primarily be able to hold a lighting panel which operates the lights for the stage. The desk must be strong enough and/or have enough support to hold the lighting panel for extensive periods of time.  
The product must be durable to withstand the chance of being attacked/reused by children, as it will not whilst using the lighting panel.  
The product should have some form of holding area for notes and lighting notes which can be referred to during performances which is at least 200mm x 270mm to fit on a piece of paper.  
The product should be able to hold a weight up to only with the lighting unit being at pig itself, this means that the product should ideally hold up to 10kg besides the intended lighting unit.  
The product should have some foldable compartment which allows for easier storage.  
The product will have a LED light to make the product stand out in the dark.  
The client insisted that transport was a very important value, so the product must have some features which allow the product to be transported around. This is a requirement as it was specifically required by the client.

**User requirements:**  
The product must have to be practical and reliable so that the client can use it whenever for whatever purpose the desk is, this was specifically mentioned by the client so it is essential that this is met.  
The product must be able to withstand and reliably hold a lighting unit (pig) and a computer for an extensive amount of time, to the point of holding it for days at a time so requires a strong and stable foundation.  
The product will have a link to the entirety of performing arts, as the client wanted the product to not only represent drama through its aesthetics, but also music and dance.  
The product must be easy to clear from spillages from drinks or crumbs from snacks that the user may have depending on the situational usage of the desk that it can easily be maintained and cleaned. Varnishing or other kinds of finishes would make the product easier to clean.  
The product needs to be light enough to be moved around and from locations that the client requires it, but it also doesn't necessarily need to be carried depending on the chosen design. If the final desk is foldable or modular, then it should weigh no more than 50kg to ensure it can be moved.

**Performance requirements:**  
The product must be able to be easily set up and moved about to different locations with ease without using any wear or breaking. The product won't be used in harsh conditions, but moreover will likely be the recipient of rough handling, so the product would have to be strong and durable to ensure that this has no lasting effect on the product.  
The product should have some form of mechanism which is secure and doesn't cause the product to collapse upon compiling. This is for safety and performance purposes.  
The product must be able to hold the weight of at least a lighting unit, computer and several sheets of paper without showing stress or breaking under the weight, once again the product should be sturdy and durable.  
The product must provide a safe bright light from LED's which do not cause glare or shine too bright as to cause strain on the eyes.  
The product must have some form of mechanism or feature which allows the organisation of wires and cables, making them neat and tidy compared to where they are originally thrown around all over the work station.  
The product should be protected with some form of dust cover such as a varnish.

### Material and component requirements:

1) The product should be made of lightweight materials so that the client will be able to transport and move the product around to several locations without exerting too much energy on the process. -referencing to use desk weights, the product should weigh between 20kg and 50kg to ensure transport by at most two people. Using lightweight materials also minimise the risk posed to the students if the product were to somehow collapse or a piece fall off.  
2) The product will have to be created with durable materials such as plywood as it will be used for long periods of time according to the client. This means that any weight must be sustained by the product appropriately for an extensive amount of time without breaking or collapsing in on itself.  
3) The product should mix together different materials to create a more unique and professional looking product, such as gaining the strength and support from aluminium tubing metal while also utilising the varnishing capabilities of plywood.  
4) The product must be made of materials which are high quality and look aesthetically pleasing which are viable to have a finish applied. Some want the product to be protected by some form of finish such as varnishing, the materials must be able to still look professional with a coat of finish applied. Depending on the desired aesthetics through input of my client, I may have to stain the chosen wood with a different colour, so materials which take stain well are also highly valued.  
5) Any additional modular components of the product must use internal components or can be easily hidden within the product due to the lack of available space at the back of the hall. This also keeps all components together.  
6) The light used must be strong enough to provide a sufficient lighting source to illuminate the area.

**Sizes:**  
1) The desktop should be at least 1350mm x 600mm to be big enough to hold the lighting panel, monitor and an array of papers depending on what the client wishes to use at a given time.  
2) The height of the desk must be within the boundaries of 900mm to 1050mm to conform to the researched anthropometric data and to suit a wide variety of users for the product. Using a measurement which caters towards the higher end of the range would also allowed inclusivity for wheelchair users too, who will also be able to fit under the desk comfortably.  
3) The product will need to be constantly checked throughout the project and positioned within the desired client location to ensure that it fits perfectly in place without blocking entry or exit.  
**Safety:**  
1) The product must be made of non-toxic materials and finishes to ensure that the materials used pose no threat towards the client and possible users of the product.  
2) The product must be free of any sharp edges, so the user is not hurt whilst using the product.  
3) The product will be subject to risk assessments throughout the development process and appropriate safety gear will be used whenever handling materials or tools.  
4) When assembling any modular components of the product, it should be free of any areas which pose the risk of becoming hand traps or tools.  
5) The product must be strong and durable enough to withstand prolonged usage with weight applied for at least 5 years to ensure that the client or any users do not get hurt by the product collapsing.

**Quality:**  
1) The product should be made to a tolerance of ±0.5mm so it all fits together when assembled and also ensures the overall quality and accuracy of the product as originally planned.  
2) The product must be made to a high quality standard, with the materials which have had a finish applied to protect it.  
3) The product will be able to hold the weight of a lighting unit for an extensive period of time without collapsing or breaking for at least 5 years time.

**Scale of production:**  
The product should be made via processes that enable the product to be made in batch production. Although my product is a one-off for my client, the product will be made by processes that can be easily replicated, such as CNC machining, drilling using a jig or injection moulding, which would lead the product to be made via batch production.  
As the product is going to be tailored to my clients specific needs, the processes of a one-off design should take priority and be required while the aspects of batch production should be instead a desirable attribute. It may be decided to draft two versions of the product which could be mass produced while tailoring the actual product specifically to the client, providing two options.

**Cost:**  
As discovered in my research, the average value of a desk reaches from €90-€220 depending on the functions. My product should reach a level of quality similar to this price value which can be achieved through the use of careful planning, high quality materials and careful construction and manufacturing.  
The cost of the product would vary depending on the types of materials that are chosen, for example wood like ash and oak will tend to cost more than common metals such as aluminium and steel. The cost of the product will increase or decrease depending on the materials ultimately chosen.

**Sustainability:**  
1) Selection of materials should consider the amount of waste will be produced, whether the materials are recyclable or whether the materials can be reused in other products.  
2) The product is planned to be made of wood, so to counteract the sustainability concerns about deforestation, the wood used should be FSC, which comes from a managed forest where more trees are planted per cut down tree.  
3) The lifespan of the product should be around 5 years depending on the products which are used.