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OCR
Oxford Cambridge and RSA

GCSE (9–1)

Exemplar Candidate Work

DESIGN AND TECHNOLOGY

J310
For first teaching in 2017

J310/02/03 Summer 2019 examination series

Version 1

www.ocr.org.uk/designandtechnology

Contents

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Introduction

These exemplar answers have been chosen from the summer 2019 examination series.

OCR is open to a wide variety of approaches and all answers are considered on their merits. These exemplars, therefore, should not be seen as the only way to answer questions but they do illustrate how the mark scheme has been applied.

Please always refer to the specification https://www.ocr.org.uk/Images/304658-specification-accredited-gcse-design-and-technology-j310.pdf for full details of the assessment for this qualification. These exemplar answers should also be read in conjunction with the sample assessment materials and the June 2019 Examiners' report or Report to Centres available from Interchange https://interchange.ocr.org.uk/.

The question paper, mark scheme and any resource booklet(s) will be available on the OCR website from summer 2020. Until then, they are available on OCR Interchange (school exams officers will have a login for this and are able to set up teachers with specific logins – see the following link for further information http://www.ocr.org.uk/administration/support-and-tools/interchange/managing-user-accounts/).

It is important to note that approaches to question setting and marking will remain consistent. At the same time OCR reviews all its qualifications annually and may make small adjustments to improve the performance of its assessments. We will let you know of any substantive changes.

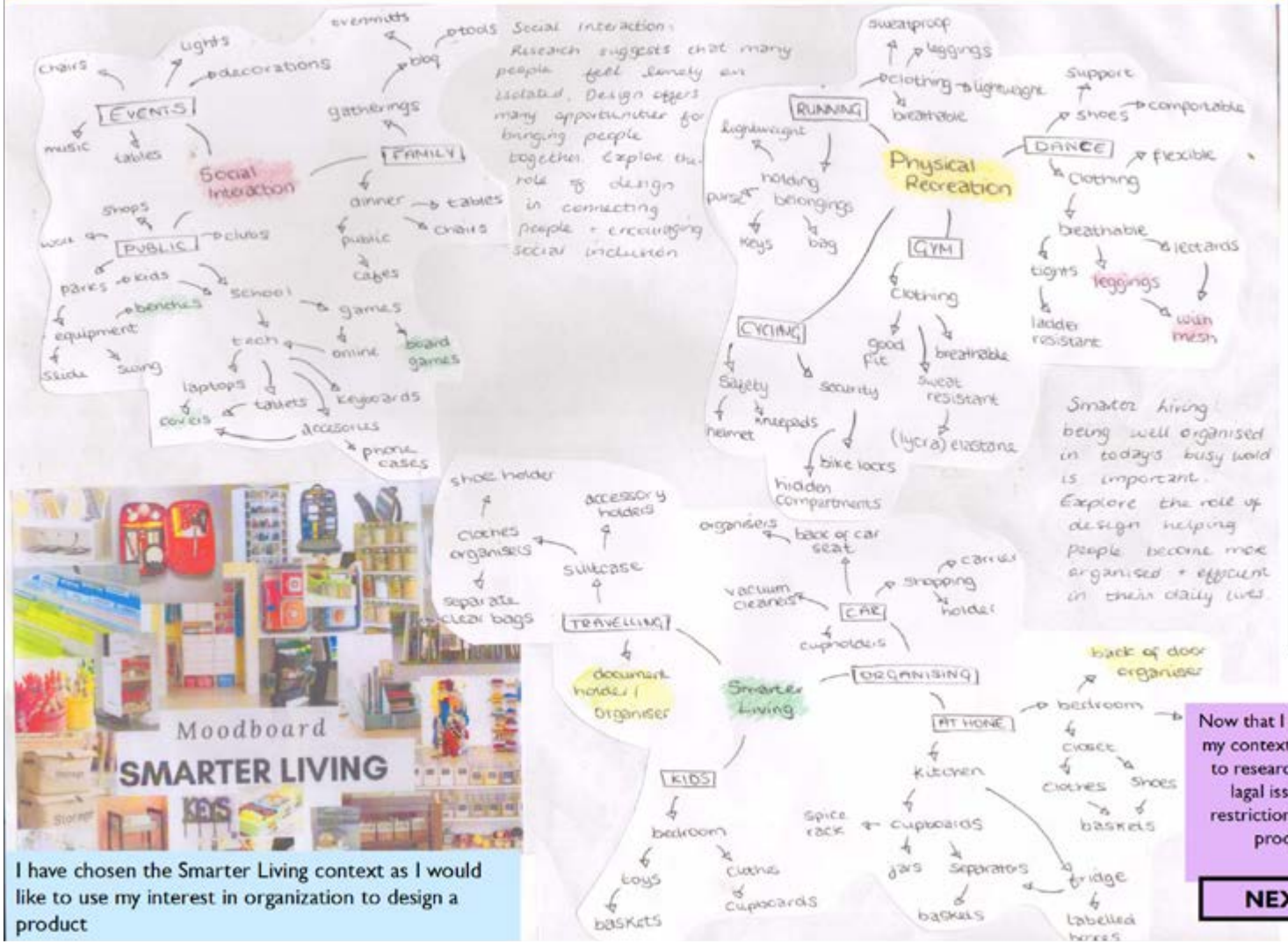
STRAND 1

Exemplar 1

18/20 (Mark Band 4)

ANALYSIS OF CONTEXTS

Using mind maps I analysed the three contexts. For **Physical Recreation** I focused on products that could be used within the sport: clothing for example. For **Smarter Living** I started to look at places you can be organized and then went onto products that can help you. **Social Interaction** was quite difficult, but I came up with ideas of items or places where a product could be used e.g. the park



I have chosen the Smarter Living context as I would like to use my interest in organization to design a product

Now that I have picked my context I am going to research into the lagal issues and restrictions of travel products

NEXT

RESEARCHING AN AIRPORT

I have decided to make a travel product to store liquid items so I visited Manchester Airport, and visited a few sites online to find out the information that I would need before creating a product, as it will require certain regulations.

If liquids are taken in hand luggage:

- Containers must hold no more than 100ml
- Containers must be in a single, transparent, resealable plastic bag, which holds no more than a liter and measures approximately 20cm x 20cm
- Contents must fit comfortably inside the bag so it can be sealed
- The bag must not be knotted or tied at the top
- You're limited to 1 plastic bag per person
- You must show the bag at the airport security point.

Taken from https://www.gov.uk/hand-luggage-restrictions

Important measurements

- Passports
  – 12.5 x 8.8 cm
- Average travel bottle
  –

Product checklist:

- Maybe have a few elastic straps that hold 100ml bottles?
- Must measure around 20cm x 20cm and made of a plastic material
- Must be spacious to allow all products to fit comfortably
- Should be fully sealed so use a zip
- Be easily detachable from a larger product and maybe hold passports for efficiency?

I am going to create a design brief and look into the needs and wants of my stakeholders

NEXT

Design Brief : Design a product that can be used to organize luggage or documents when travelling and allow belongings to accessed easily and efficiently. It should be suitable for a wide as possible target market but is aimed at adults and parents, who can use it during the journey as well as at their destination.

Anthropometrics: the study of the sizes of the human body, primarily the sizes of body parts such as the hand and the shape.

Ergonomics: understanding the interactions between people and the things they do and the objects they use.

In anthropometrics, you either fit the 5th, 50th or 95th percentile. The 50th percentile is the average sizes, 5th is smaller than average and 95th is larger the average. I need to ensure that my product is designed in a way to fit the 5th to 95th percentile so that it available to the largest possible audience.

Ergonomic design aims to improve comfort, efficiency, satisfaction and health and safety. The product I design should try to meet these requirements. However, it must be balanced with the aesthetics, function, market and target environment of my chosen design and product.

INTERVIEWS

#	Age	How often they travel abroad	Carries a cabin bag?
1	21-30	Once every couple years	Yes
2	21-30	More than twice a year	Most of the time
3	41-50	Once every couple years	Yes
4	41-50	Once a year	Yes
5	31-40	Once a year	Yes
6	41-50	Once every couple years	Sometimes

Worst Part	Max. spending limit	Things they carry
Losing boarding pass in bag	£20	Passport
Travel arrangements	£40	Passport and phone
Delayed flights	£41+	Personal ID
Customs	£30	Travel Documents
Losing suitcase/ belongings	£20	Insurance and cash
Security checks	£15	Passport and portable charger

Primary User

[redacted]

(My mum, a parent, an adult and a frequent traveler)

Stakeholders

- Other adults and parents (e.g. teachers)
- Travelers
  - Business
  - Pleasure
  - Backpackers
  - Parents
  - Exchange students
  - Group travel and tour companies
- Suitcase companies (could sell as accessory)
- Manufacturers
- Suppliers (what materials needed?)
- Airports (could sell in shops)
- Insurance companies (for when belonging do get lost)

I interviewed my mum, her coworkers and a couple of teachers in school to find out what their opinions were on travelling and what they found most problematic.

Interview results

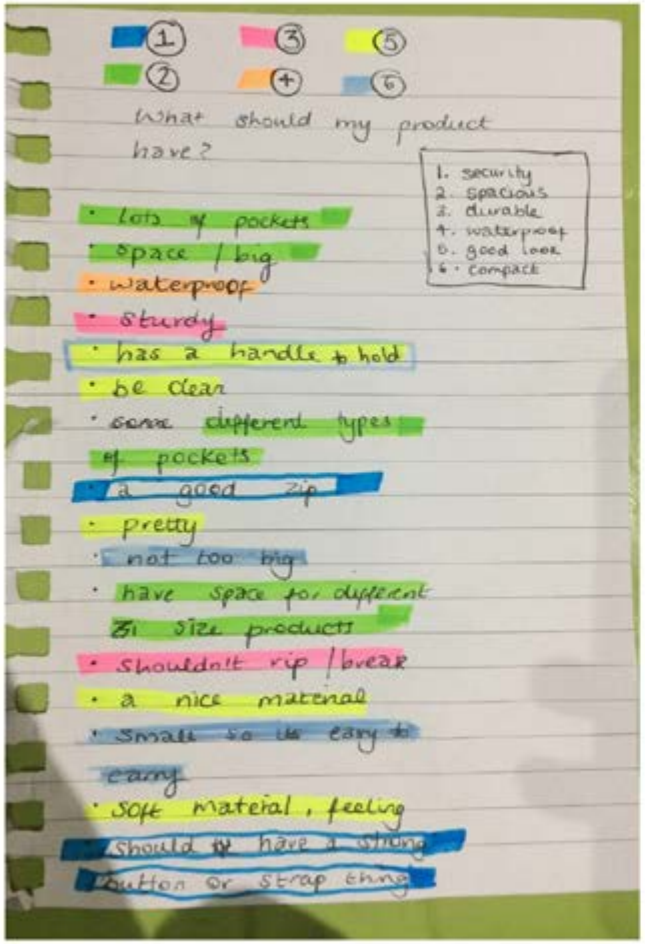
The average age of my target market is 31 to 40 and 7 out of 8 go on holidays abroad. They all carry their own documents and all have hand carry. Most people say the worst parts of travelling are losing documents, losing luggage and carrying items through customs. They also said they'd spend an average of up to £25 on a product of this kind.

I have looked at the properties my stakeholders would like to have on my product and am going to summarize them

NEXT

DESIGN BRIEF AND STAKEHOLDERS

I talked to my mum (primary user) and had conversations with my friends who recommended some factors that are necessary for my product and created a checklist that I can refer to during my design and making processes.



I also had some pricing and product ideas from my previous interviews:

This table will be used as a checklist as I analyze, design and create. I will put 'Y' for yes, 'N' for no and 'D' for it depends on...

NEEDS CHECKLIST:

1. Carries documents and/or luggage **securely** e.g. has a good quality zip or Velcro strap.
2. Has enough **space** to carry a good amount of products
3. Must be **durable** and good quality
4. Must be **waterproof** in case any spills occur
5. Must look good and/or be **aesthetically pleasing**
6. Easy to carry/ **compact**

What my Target Market needs:
I should aim for a product that can sell from £10 to £20 and can solve the problems of losing belongings or the hassle of sorting out items for customs

	N1	N2	N3	N4	N5	N6	Total:
	Yes...	Or no?					

I have looked at the properties my stakeholders would like to have on my product and I will now give an overview of my primary user and stakeholders

NEXT

SUMMARY OF USER NEEDS

MY PRIMARY USER AND STAKEHOLDERS

My mum is my primary user and as a family we usually travel to European countries such as Switzerland or Spain (short-haul) as well as India (long-haul)

As we visit our family, she doesn't usually take many toiletries as our houses abroad will have them – with the exception of necessities and makeup

When we go on long haul flights there is usually a layover and a second customs check. I need to ensure that my product is accessible both time.

A picture of my family and I visiting our family in Switzerland in Summer 2018

My mum is usually in charge of the passports and she has a little bag that she carries it in (image on left) that is put in her handbag. However, when going through customs, she has to take out all of the passports as well as her liquid products, and this could be time consuming especially when in a queue that is moving quite quickly

Now I am going to assess existing products that help you to be organized when traveling.

NEXT

ANALYSIS OF EXISTING PRODUCTS

Fold out cable holder

Use: Bag to keep cables organised and prevent them from tangling

Pros: organised compartments (N5), lots of space (N2), travel suited as its not bulky

Cons: no zips – not too secure, one strap may not keep it together (possibly an elastic band?)(N1), looks like a thin material/ not too strong (N3)

Passport and document holder

Use: A small holder for documents, passports and boarding passes for when you go on holiday and want to keep everything compact

Pros: organised compartments (N5), lightweight (N6), small (easy for travel) (N6)

Cons: Limited space (N2), not secure enough (N1), is it waterproof? (N4)

Backpack organiser

Use: organise individual items in a backpack, a bag that does not usually have separate compartments.

Pros: very organised compartments (N2), fits quite well in most backpacks (N6), quite aesthetically pleasing (N5), looks like quite durbale material (N3)

Cons: might not fit all bags (N6), only one variety of compartments (N2)

Fold out makeup-bag

Use: Bag to keep make up items (such as brushes, powders and liquids) compact and organised for travelling

Pros: organised compartments (N5), lots of space (N2), zipped areas for security (N1)

Cons: not suitable for travel as it is bulky (N6), one Velcro strap may not keep it together (possibly an elastic band?)(N1), looks like a thin material/ not too strong (N3)

I liked the fold out bags best as they have lots of compartments for individual products and can become compact. It is also useful to my primary user as she needs something to keep a lot of products organised during travel.

Suitcase clothes holder

A collapsible shelving unit for clothes that can be hung up inside a cupboard when travelling

Pros: Easy to use, compact- good for storage (N6),

Cons: might not fit all suitcases (N6), limited storage size (N2), might not be completely stable due to its flexible mesh material- could collapse if suitcase is upright (N3).

I have analysed a variety of products using my grading system from slide 5 and picked some models, which I will find existing products of, and assess further.

NEXT

DETAILED ANALYSIS OF EXISTING PRODUCTS

Most toiletry and makeup bags are quite compact and small to ensure it doesn't take up too much space when travelling. However some bags that are used at home on a daily basis are larger to allow more space and compartments. I am going to make mine a larger one that can be folded into a compact version.

This one has 23 compartments, an adjustable shoulder strap, and measures 10.6 x 6.3 x 11 inches.
It is also made of water-resistant polyester to prevent spillages and leaks. It is quite big and could be just a bag itself.

This one is similar in style to the one above however it smaller/ thinner at 11.4 x 7.9 x 1.9 inches. This is a more suitable measurement for my prototype.
It has a buckle to keep it secure when rolled up.

Following a similar design again, this hanging bag measures 8.5 x 8.2 x 3 inches which is shorter and slimmer. It has side pockets for smaller items too.
It also has a flat bottom so it can stand up when zipped up and is made nylon fabric for strength and elasticity

Properties I can use;

- Water-resistant polyester
- Nylon fabric
- A buckle or zip to keep it secure
- A measurement around 8 x 8 x 3 inches
- Create a flat base?
- Different sized compartments to fit a range of items
- Any handles should also be measured according to the anthropometric size for the 5th to 95th percent

I have picked some properties of existing products of my chosen model and figured out which ones would be useful to my own product and I am going to analyse some materials which could also be used on my product. I also found out the measurement regulations in slide 4, so I will need adapt my design to those measurement.

NEXT

I analysed four materials (three synthetic and one natural) and picked out properties of each material that could be used on my product.

NYLON

Nylon is non- absorbent (N4) which would be suitable for my product as I would like to store liquids such as shampoo and perfume in my product. It is also very strong and durable (N3)which will help it to withstand weight of bottles and items that are stored and it's resistant to chemicals which will would be useful if there are any spills. However, nylon can be easily stained which could be a problem if something did spill.

Popular uses

- Tents
- Seat belts
- Rucksacks
- Umbrellas
- Life jackets

POLYESTER

Polyester is also non-absorbent, strong and durable like nylon (N3+4). It also has a good handle which would give my product a good feeling (N5). It also won't stretch so it can hold product with weight and it will not break. However, it is not a breathable material.

Popular uses

- Bedding
- Boat sails
- Clothing
- Carpeting

Properties that would benefit my product

- Water-resistant
- Non-absorbent
- Good handle
- Durability
- Strength
- Easy to sew
- Quick drying
- Resistant chemicals

ACRYLIC

Acrylic is water-resistant and quick drying which would be very suitable qualities for my product as it can help to prevent stains and leaks if anything spilled (N4). It is also strong and chemical resistant like nylon. (N3)

Popular uses

- Ski jackets
- Outdoor furniture
- Cleaning cloths
- Rugs

LINEN

Linen is a strong fabric like the three other materials. It also won't stretch like acrylic. Linen also has a natural lustre. Which will be useful as it will help it to be more aesthetically pleasing. It is also easy to handle and sew will make it easier to make the product itself.

Popular uses

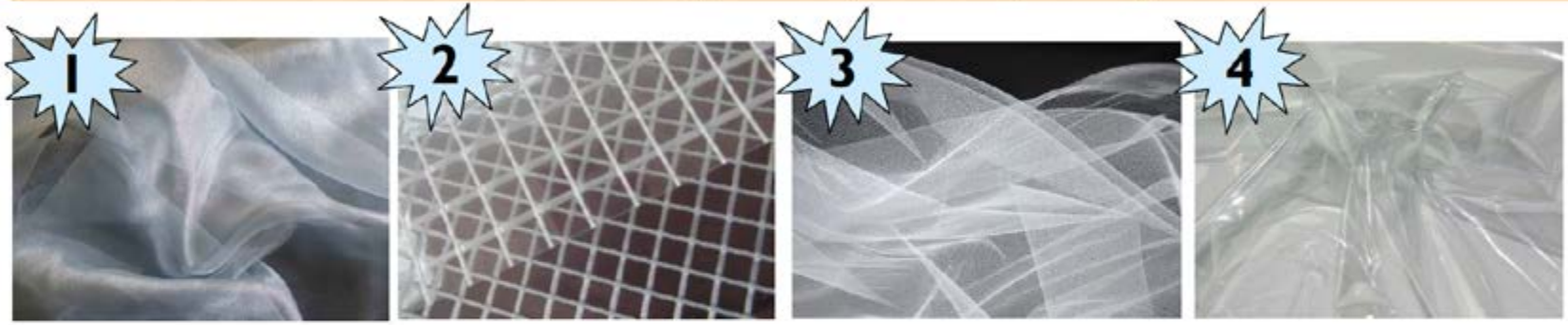
- Tents
- Canvas
- Wallpaper
- Bed sheets
- Table coverings

RESEARCHING MATERIALS AND THEIR PROPERTIES

Am I also going to look at some clear materials…

NEXT

I also looked at some clear materials that can be used on my product as I plan on it being see through/clear



Silk organza | Clear PVC mesh | Tulle | Clear PVC

	1.	2.	3.	4.
Waterproof?	No	Yes	Yes	Yes
Follows airport restrictions	No	No	No	Yes
Easy to sew?	Midmost	No	No	No
Good handle?	Yes	Yes	Midmost	Yes
Strong?	Yes	Yes	Yes	Yes
Durable?	Yes	Yes	Yes	Yes
Low price? (£/m²)	No	Yes	Midmost	Yes

KEY:
- No
- Yes
- Midmost

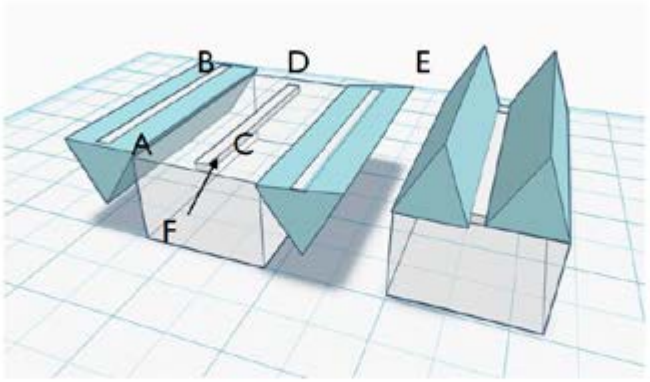
I think Clear PVC will be best for my product as it has all good and desirable properties except from how easy it is to sew.

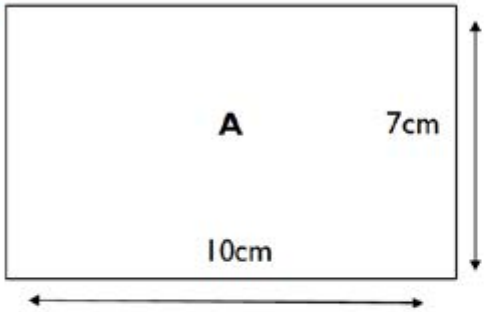
Now that I have looked at a variety of materials, I am going to start brainstorming some ideas…

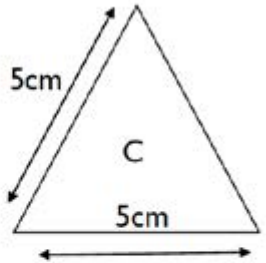
NEXT

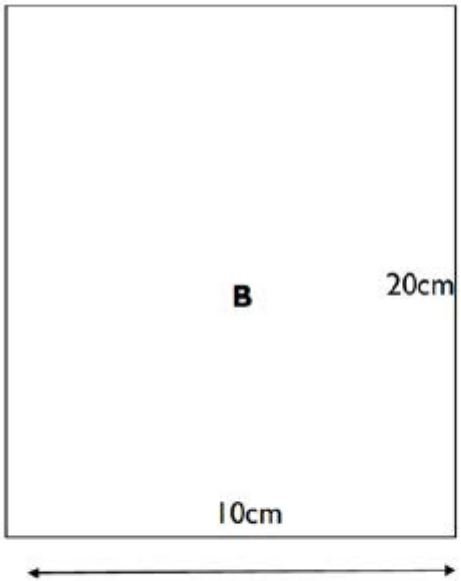
CLEAR MATERIALS

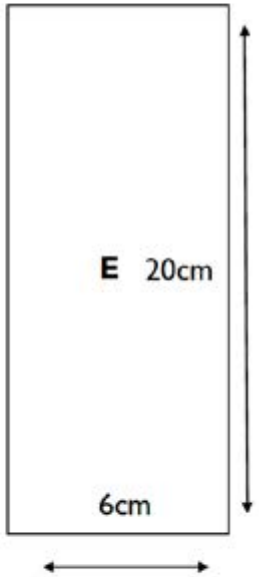
Using my different prototypes I figured out the final sizing of my product

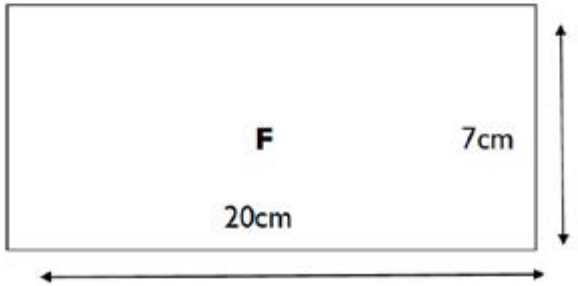


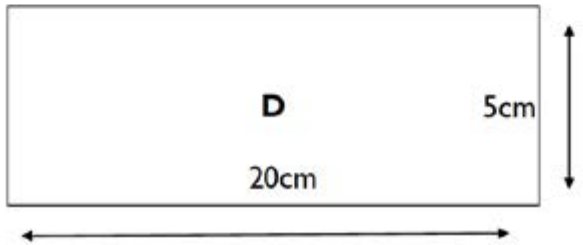


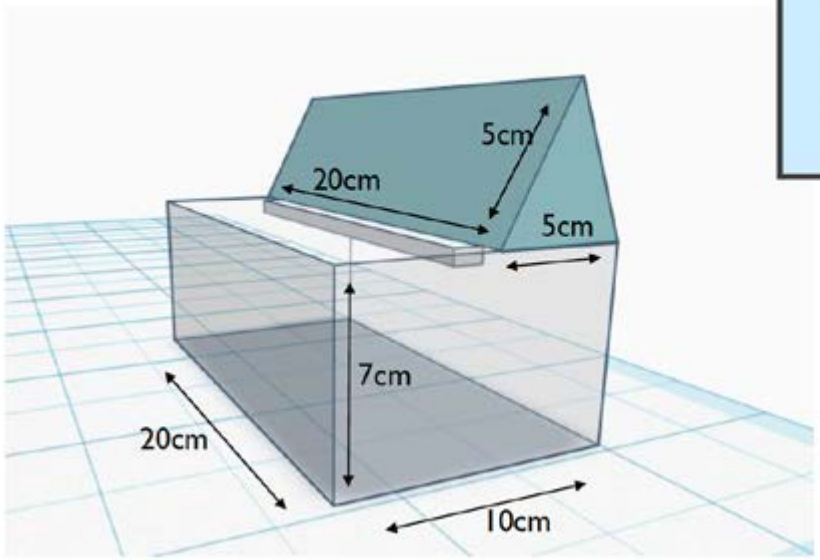












TECHNICAL SPECIFICATION

Examiner commentary

This candidate has used a series of detailed mind maps to fully explore each possible context. Challenging problems have been highlighted before settling upon the 'Smarter Living' context.

A clear brief is presented which also identifies a broad yet detailed range of stakeholders and a primary user. The investigations that follow fully consider these actual people. The stakeholder requirements are not presented formally on a separate page but can be found on pages and are coded for reference later during development.

Analysis of existing products includes hands on investigation. Investigation into technical requirements included materials and data about the products that would need to be carried in the bag. Although, even though there could be more purpose bringing some of these explorations in throughout the development of the design solution rather than at the start, there is still relevance.

The technical specification however would struggle struggle to communicate the requirements of the design solution to a third party.

Exemplar 2

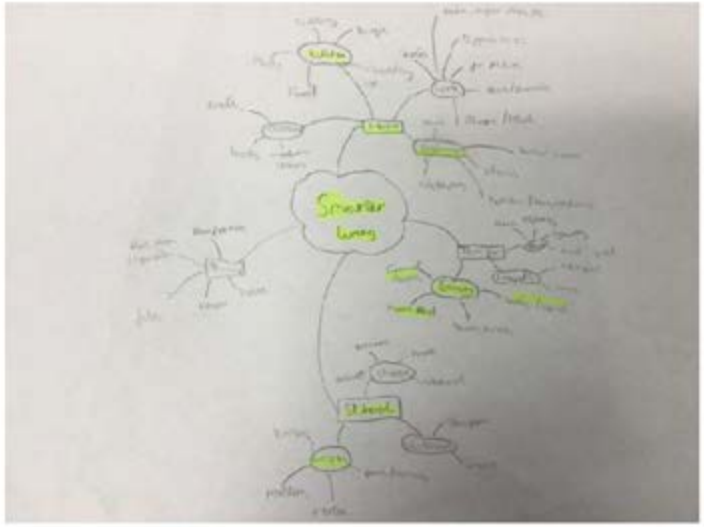
13/20 (Mark Band 3)

We had a choice of three titles requiring specific requirements. I made three spider diagrams showing the type of people it could be for, whereabouts it could be used for and finally what could it be used for to give a basic general idea of what could be made. I was more focused on the 'Smarter Living' question asking to design and make something to help people be more organised so I made that one more complex compared to the other two

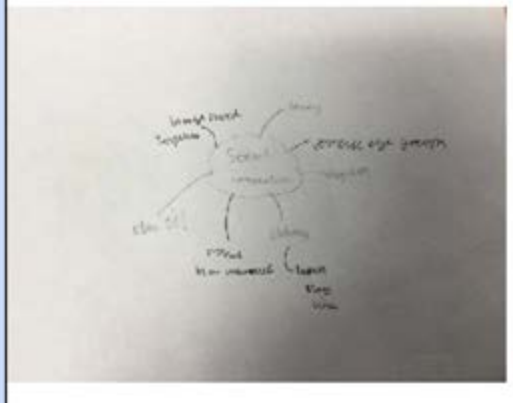
1. Smarter Living
Being well-organised in today's busy world is important. Explore the role of design in helping people become more organised and efficient in their daily lives.
2. Recreational activities such as cycling, running, aerobics and team sports are becoming increasingly popular with people of all ages. Explore the role design can play in enhancing the experiences for people who participate in these kinds of activities.

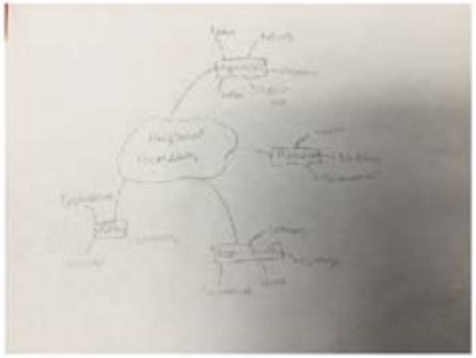
3. Social interaction
Research suggest that many people feel lonely or isolated. Design offers many opportunities for bringing people together, facilitating the engagement of people formally and informally. Explore the role design can play in 'connecting' people and encouraging social inclusion,

Explore Context



I highlighted the potential ideas





Design Brief

Intro: Looking into Smarter living in more depth.

Potential Ideas for Context 2: Smarter Living
Theses are some of the possible ideas showing what it could be used for and shows some of the other potential ideas

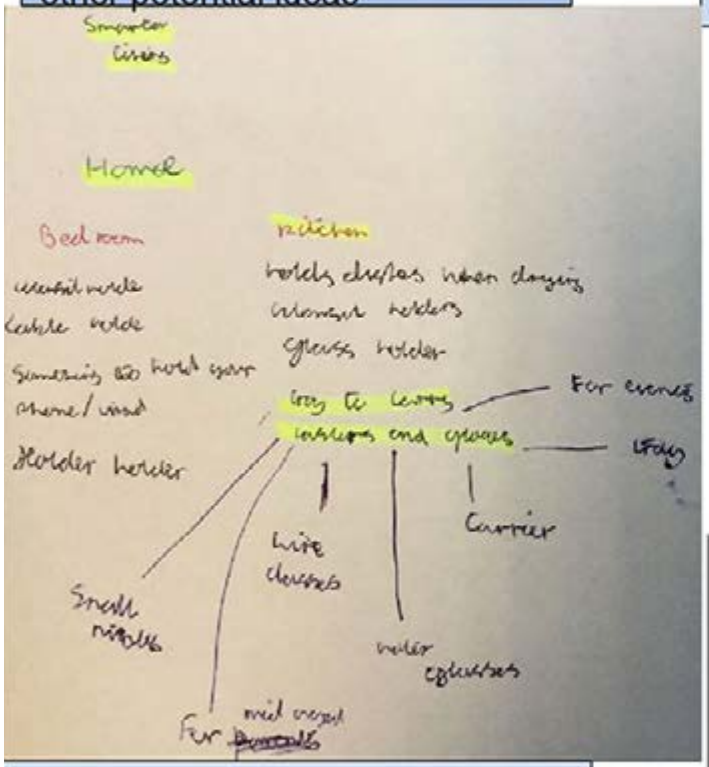
Design a product that helps to organize wine glasses during events indoors or out.
It should be suitable for carrying all sorts of shapes and sizes of wine glasses for a broader use heat different events.

Primary user
- My Parents

Other stakeholders
- Other parents
- Shop owners
- Timber company
- Manufacturer
- Event holders
- Guests

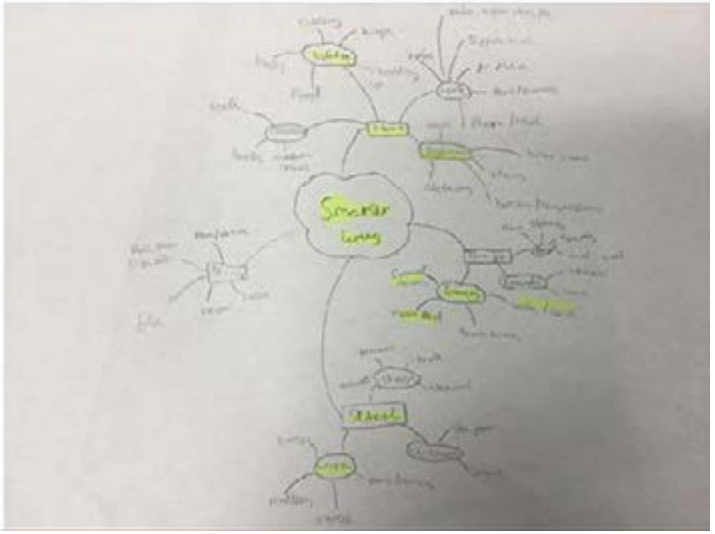
Image of 6 upturned wine glasses in base supported wooden tray

Image of 4 wine glasses in beck support wooden tray with a bottle of wine



this idea came to me as I usually go around after an even giving out or receiving wine glasses but could only take a few at a time.

Image of 8 wine glasses in neck supported wooden tray



Intro: exploring existing products.

Initial Investigations

Primary users [redacted] and [redacted]

[redacted] and [redacted] want a product that can hold multiple glasses and other items. They also want it to look attractive so it can be out on display. It must be durable and last many uses.

All the short term items all look nice theses items are on display. these short term products are much more stylish than practical as it only holds limited selected items.
The long term solution is the opposite as it is much more dull and made of not very attractive materials. So opposite to the short term item this long term solution is much more practical than stylish as it holds multiple items.

Location displayed here:

Analysis of existing products:

Deep to hold items securely

Attractive design

Mulitbull slots

Handels for portability

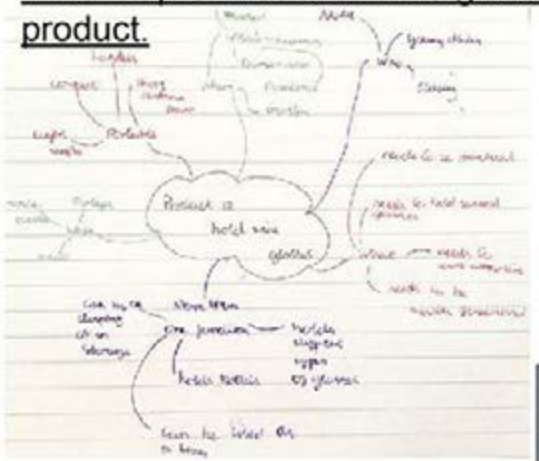
Handles for portability

No set item slot

Image of wine glass storage box

Image of 4 wine glasses in beck support wooden tray with 2 bottles of wine

Mind map of ideas for wine glass holding product.



Durable materials

Light weight

Long lasting materials

Holds items securely

Holds multiple items

Next step: evaluating existing products

Initial Investigations

Metal tray

easy to hold. light weight can hold a few glasses. Polished metal effect makes it looks nice.
Glasses not secure so can only hold them for very short periods. Only can be used as a tray.

Green=positive
Red=negative

More analysis of Existing product:

Image of 4 wine glasses in beck support wooden tray with 2 bottles of wine

wine glass and bottle holder

Looks of shining wood and dull metal makes it look very nice and attractive. Holds wine bottles and food as well. Can be used for short and long periods of time.
Not for very long periods of time. Only holds set items.
Only holds a few items at one time.

Strengths to consider:

Lightweight - keep it to a minimum weight as weight of glass will make increase it hugly.
Hold multiple items - make it so it hold multiple glasses and other items.
On and off display - to be functional but also make it stylish so it can be on display.
long and short term - make it so it can hold items for long periods of time but also bee out on display for short periods of time.

Image of 8 wine glasses in neck supported wooden tray

Wooden slotted wine glass tray

Gleaming wood makes it looks attractive, hold several glasses and space in the middle for other items.
Only can be used for short periods of time. Slots are limited to only wine and champagne glasses.

Next step: primary user and stakeholders needs and wants.

Image of wine glass storage box

long term glasses holding box

Holds multiple types of glasses for long periods of time. Lightweight. Portabel. comfortable to carry as of handels.
Material does not look nice.
only holds set sized items.
won't last as long as other materials

Intro: The primary user and stakeholders needs and wants

Stakeholder/ Technical Requirements

After interviewing the primary users ([redacted] and [redacted]) and some other stakeholders I made a list of the needs and wants the they would like to help with my product.

Primary users [redacted] and [redacted]

Stakeholders needs and wants

1. Holder must be portable
2. Holder must carry other items
3. Holder must be compact to store away
4. Holder must look attractive
5. Holder must hold glasses for long periods of time
6. Holder must hold many glasses
7. Holder must hold different types of glasses
8. Holder must be durable
9. Holder must be able to be used over long and short periods of time
10. Holder must be easy to carry
11. Holder must be lightweight
12. Holder must be a comfortable size
13. Holder could be used for other uses
14. Holder must not damage items being carried
15. Holder must be able to carry the weight of the load

Primary Users Needs (PUN)

S1 - Glasses Holder must be portable and easy to carry.

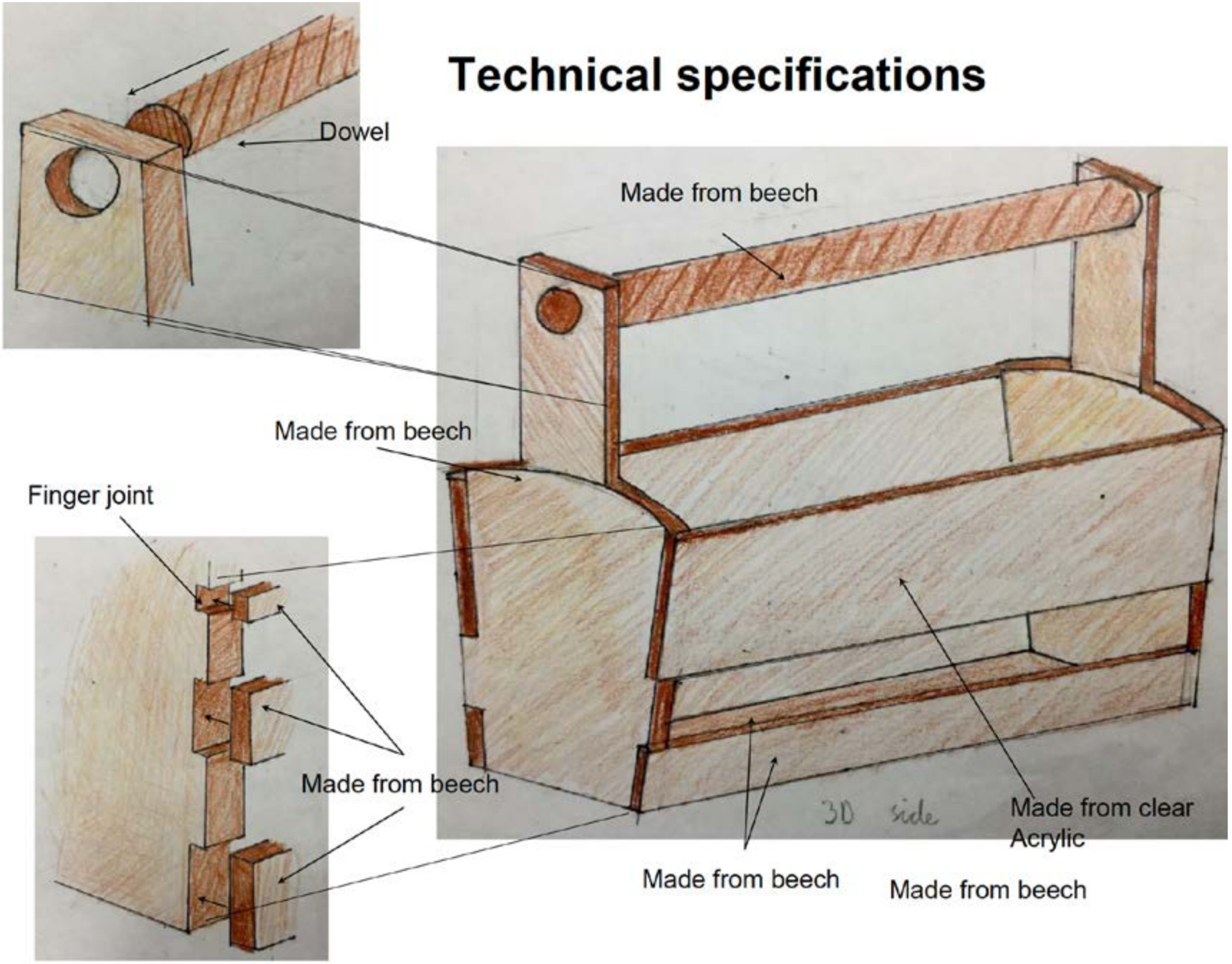
S2 - Glasses Holder must be able to carry other items.

S3 - Glasses Holder must be easy to store away.

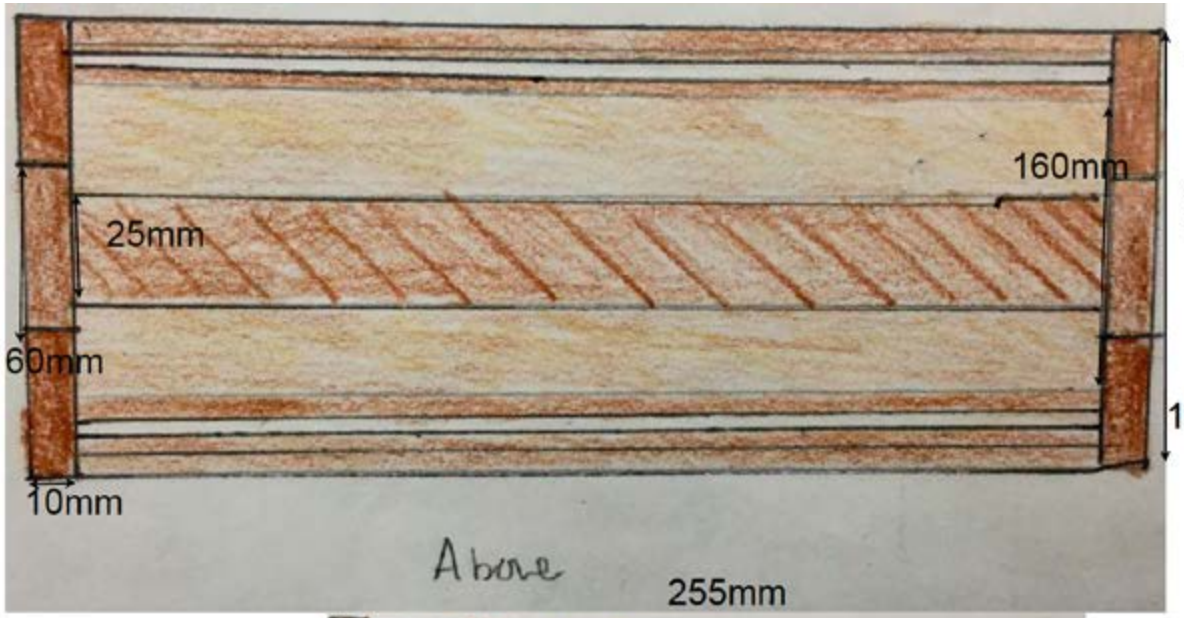
S4 - Glasses Holder must look attractive.

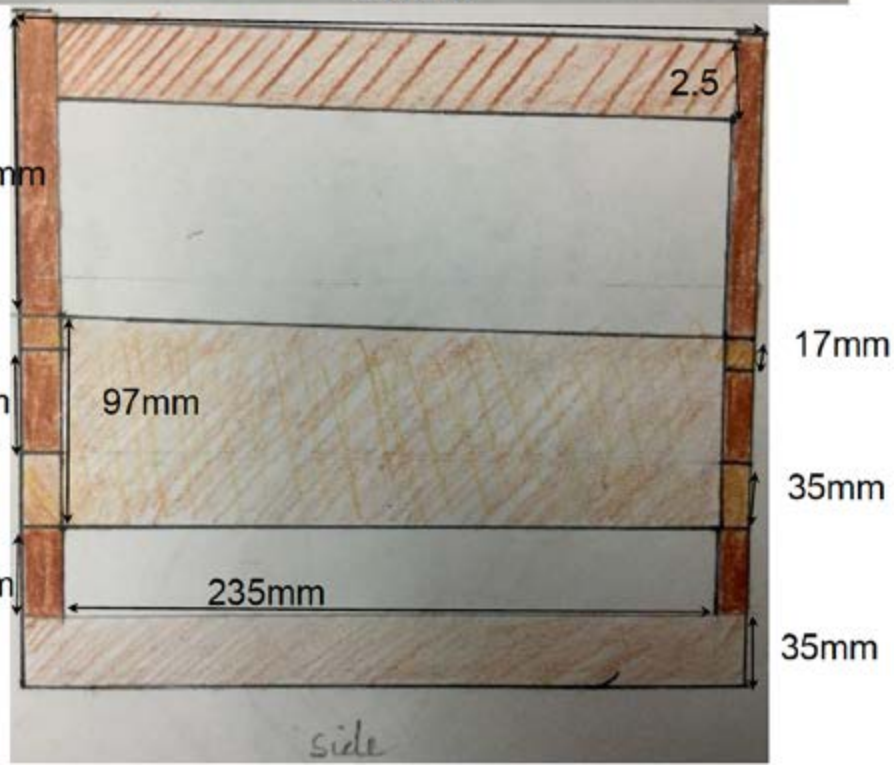
S5 - Glasses Holder must hold many glasses for long periods of time.

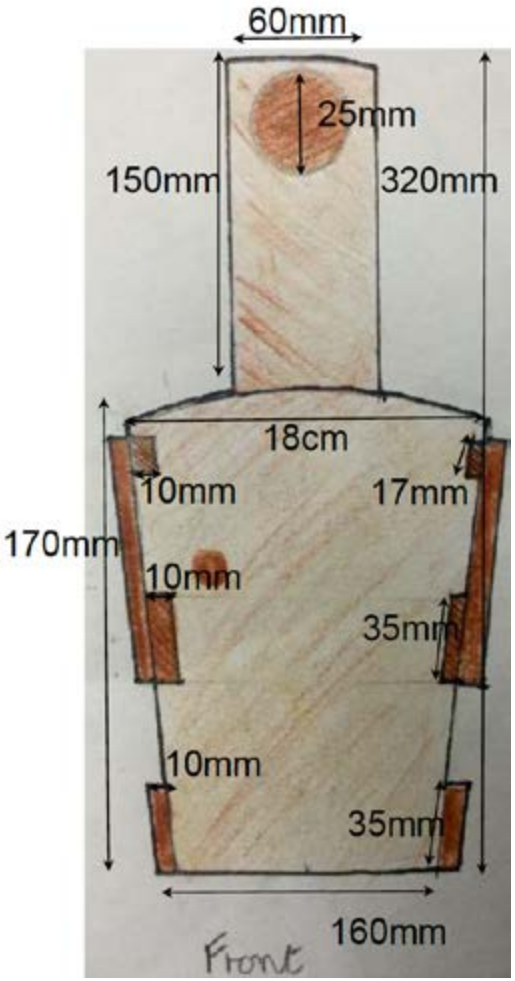
Next step: initial ideas.


Technical specifications
Dowel
Made from beech
Made from beech
Finger joint
Made from beech
3D side
Made from clear Acrylic
Made from beech
Made from beech

Technical specifications







Technical Specification

Part No.	Description	Material	Form of supply	Think's (mm)	Length (mm)	Width (mm)	Amount
1	Colourless upper side	Acrylic	Board	10	240	100	2
2	Wooden base side	Beach	Strip	10	260	40	4
3	Wooden handle	Beach	Rod	25	260	20	1
4	Wooden front	Beach	Board	10	180	320	2
5	Small upper side	Beach	Strip	10	260	20	2
6	Base	Beach	Board	10	260	160	1

Examiner commentary

This candidate also focused on the 'Smarter Living' context after using mindmaps to explore each context.

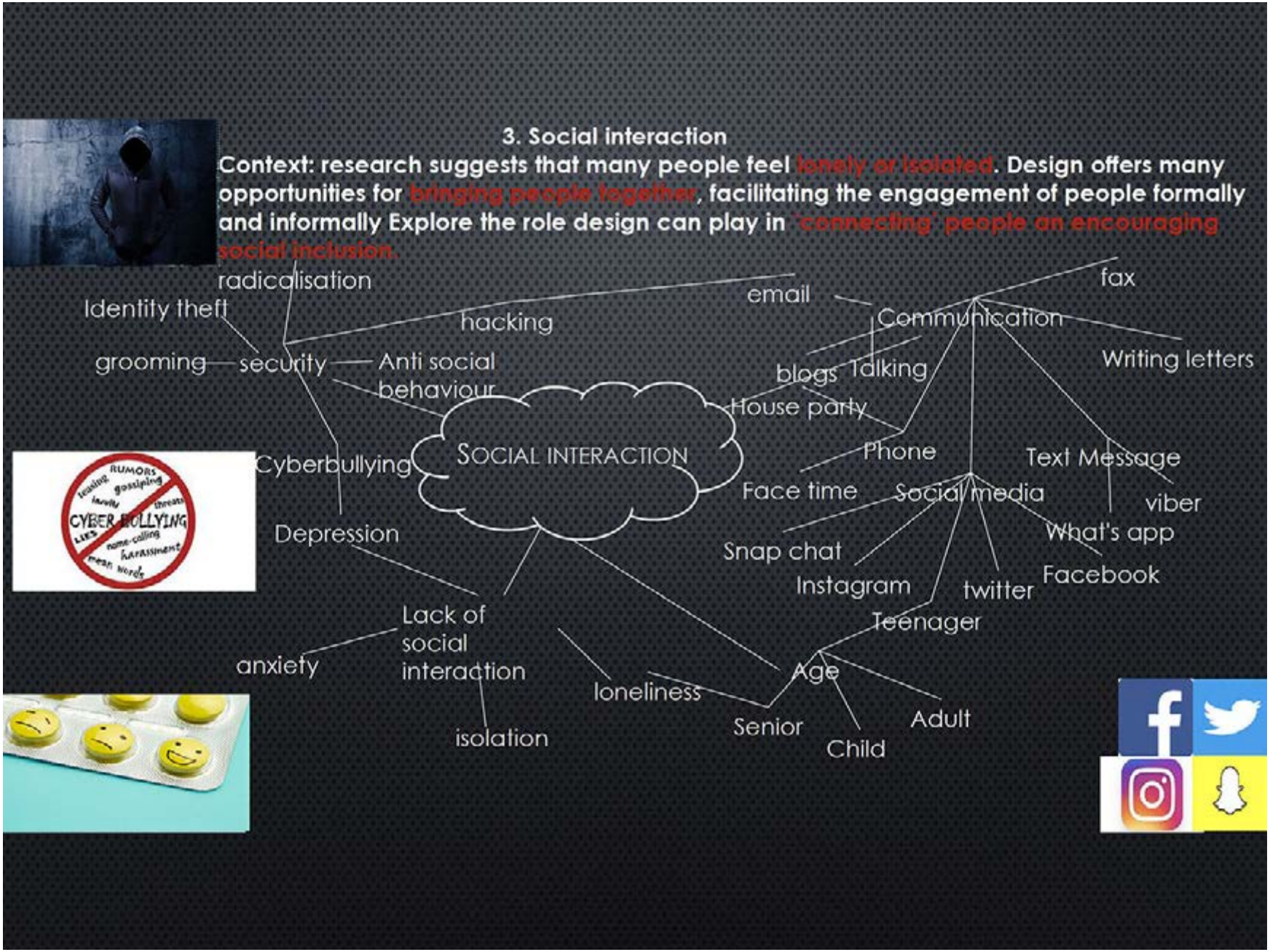
The brief is clear, however, the list of stakeholders includes several generic groups and it is unclear whether actual face to face investigation has been carried out with the stakeholders/users.

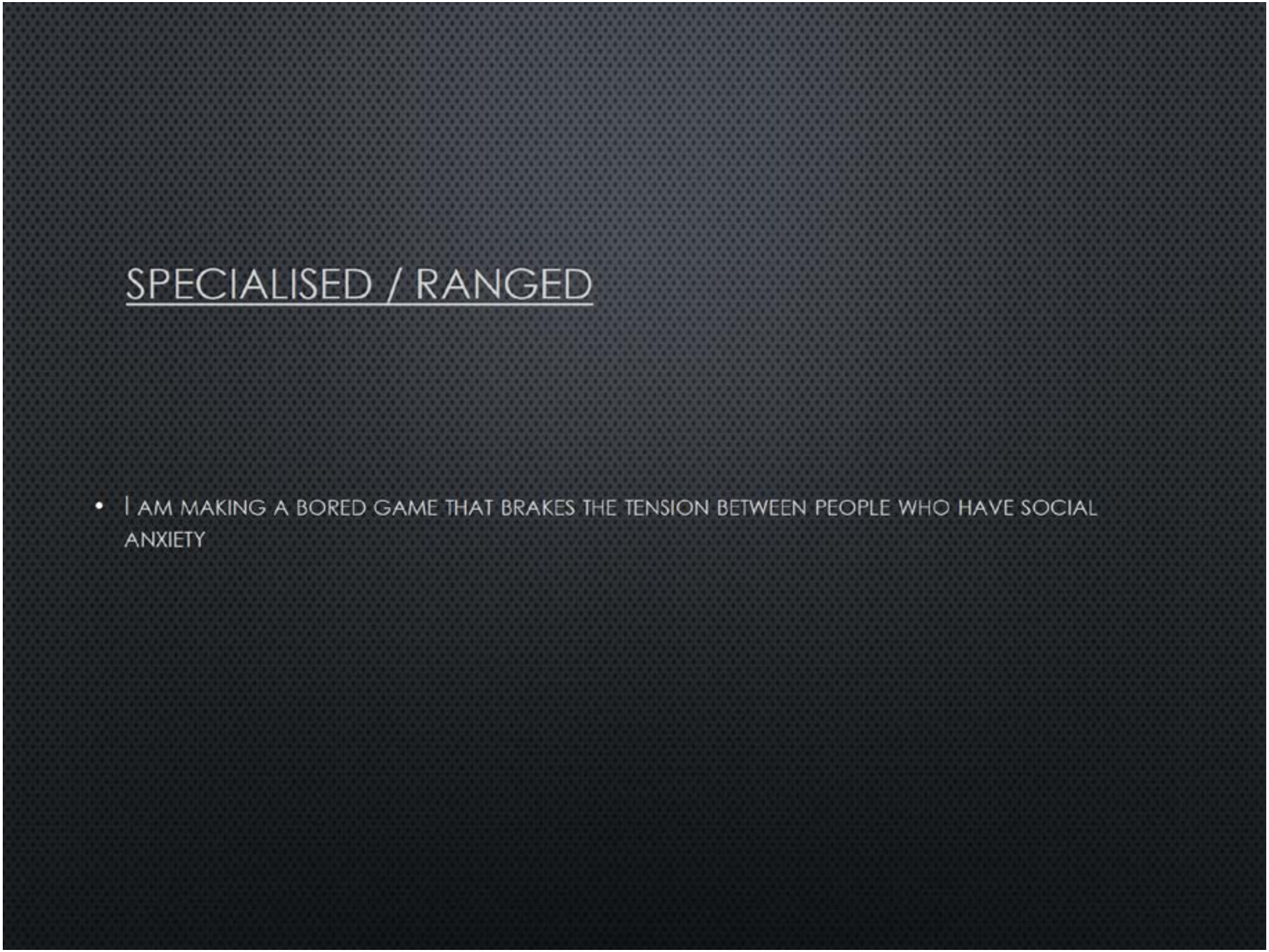
The investigations of existing products are secondary and would have benefitted from some 'hands on' exploration. Some key technical information about the sizes of a glass and a bottle were identified during development, but only focused on a single example of each. As the product is to be carried, you would expect to see some anthropometric/ergonomic investigation for a higher band mark.

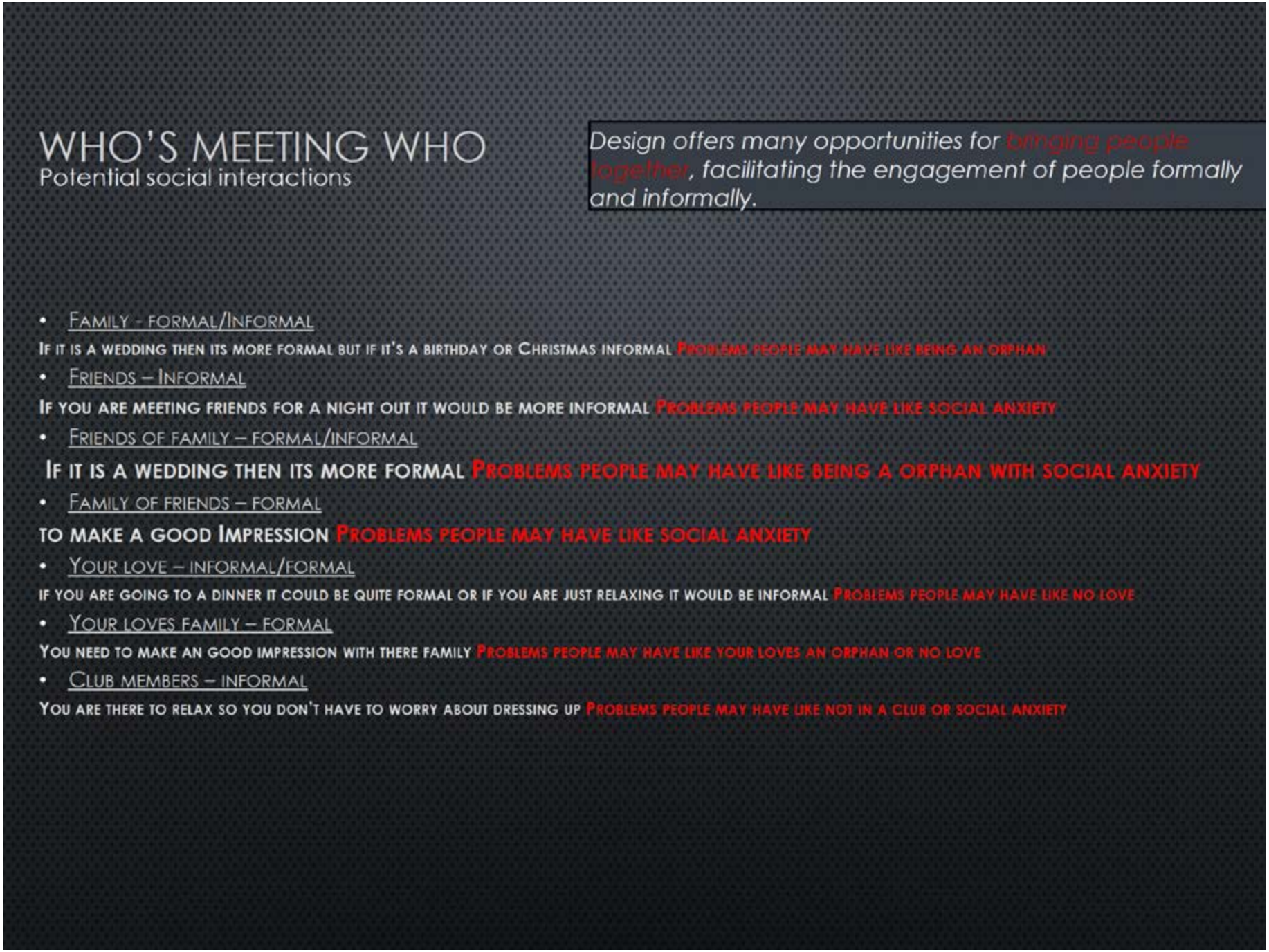
The technical specification despite not using CAD demonstrates good levels of accuracy and would communicate most requirements to a third party.

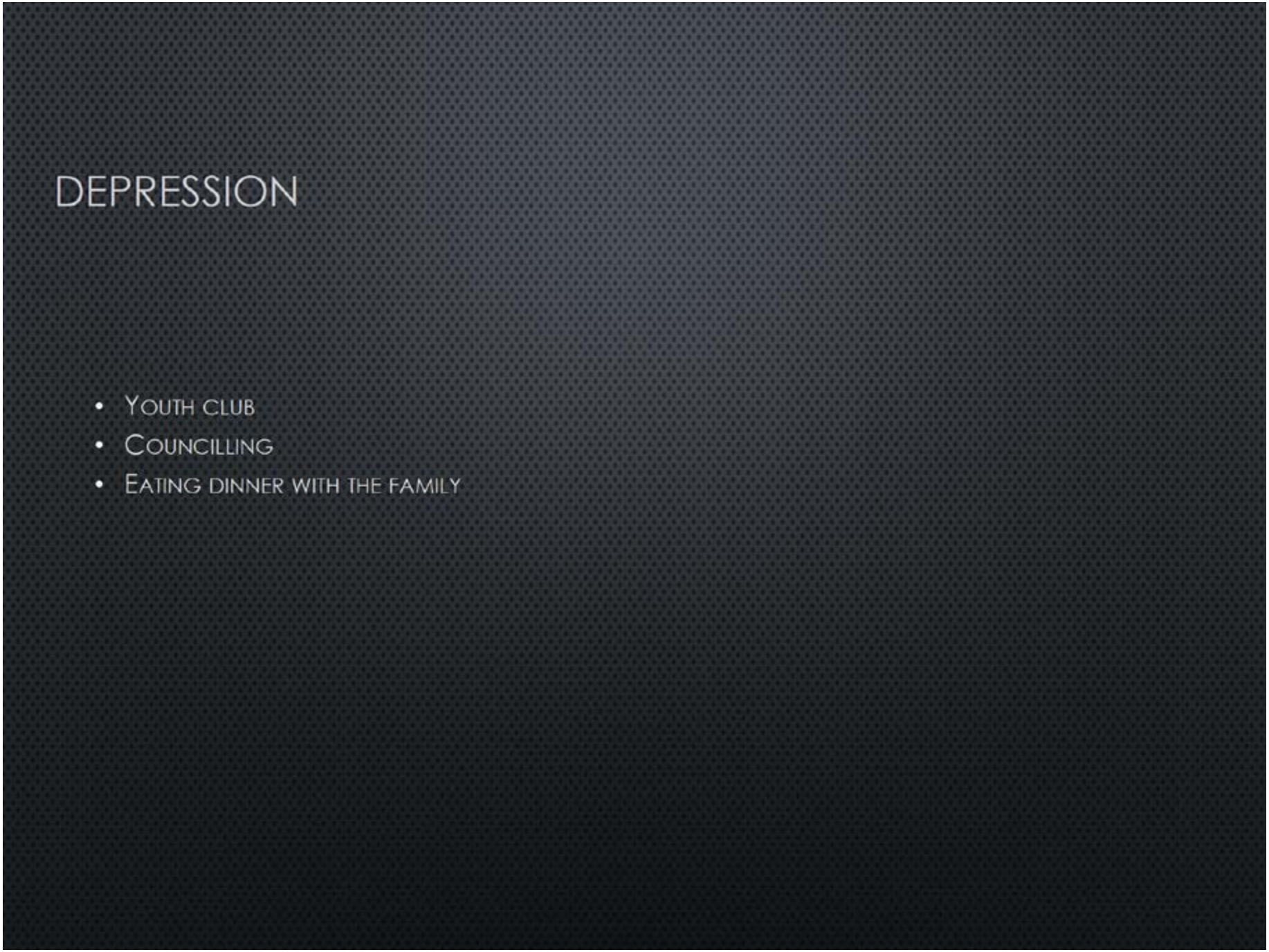
Exemplar 3

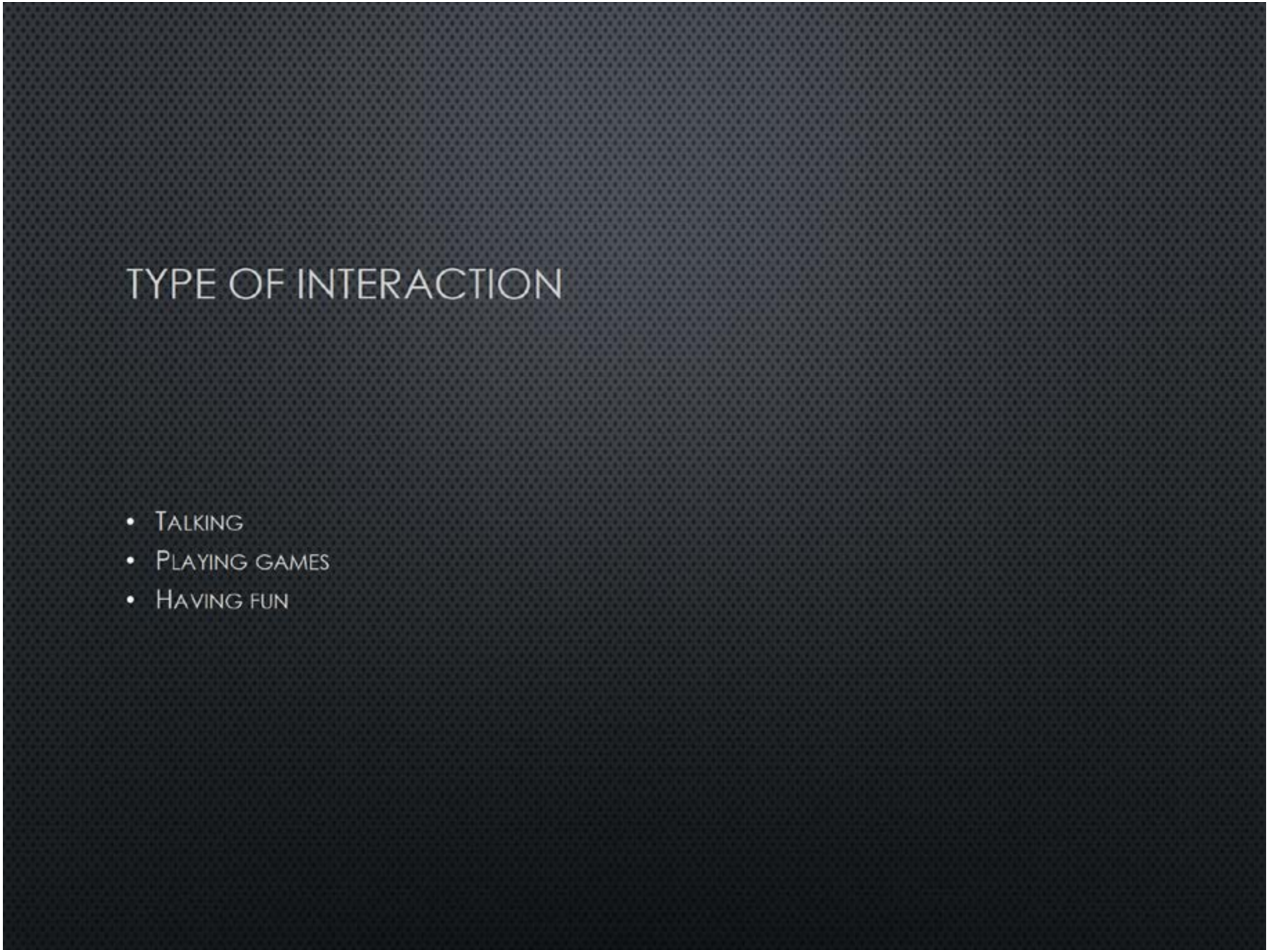
5/20 (Mark Band 1)

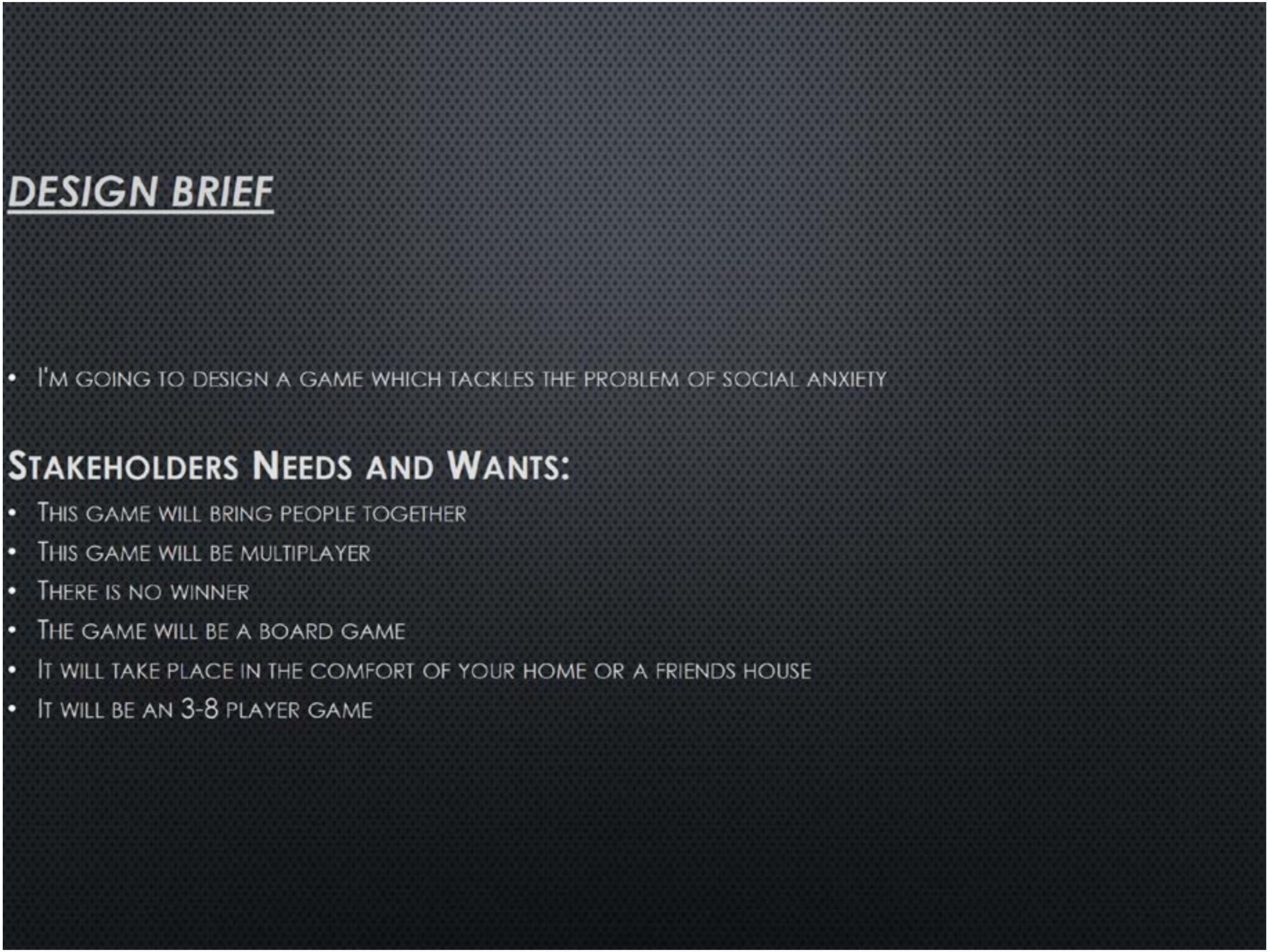


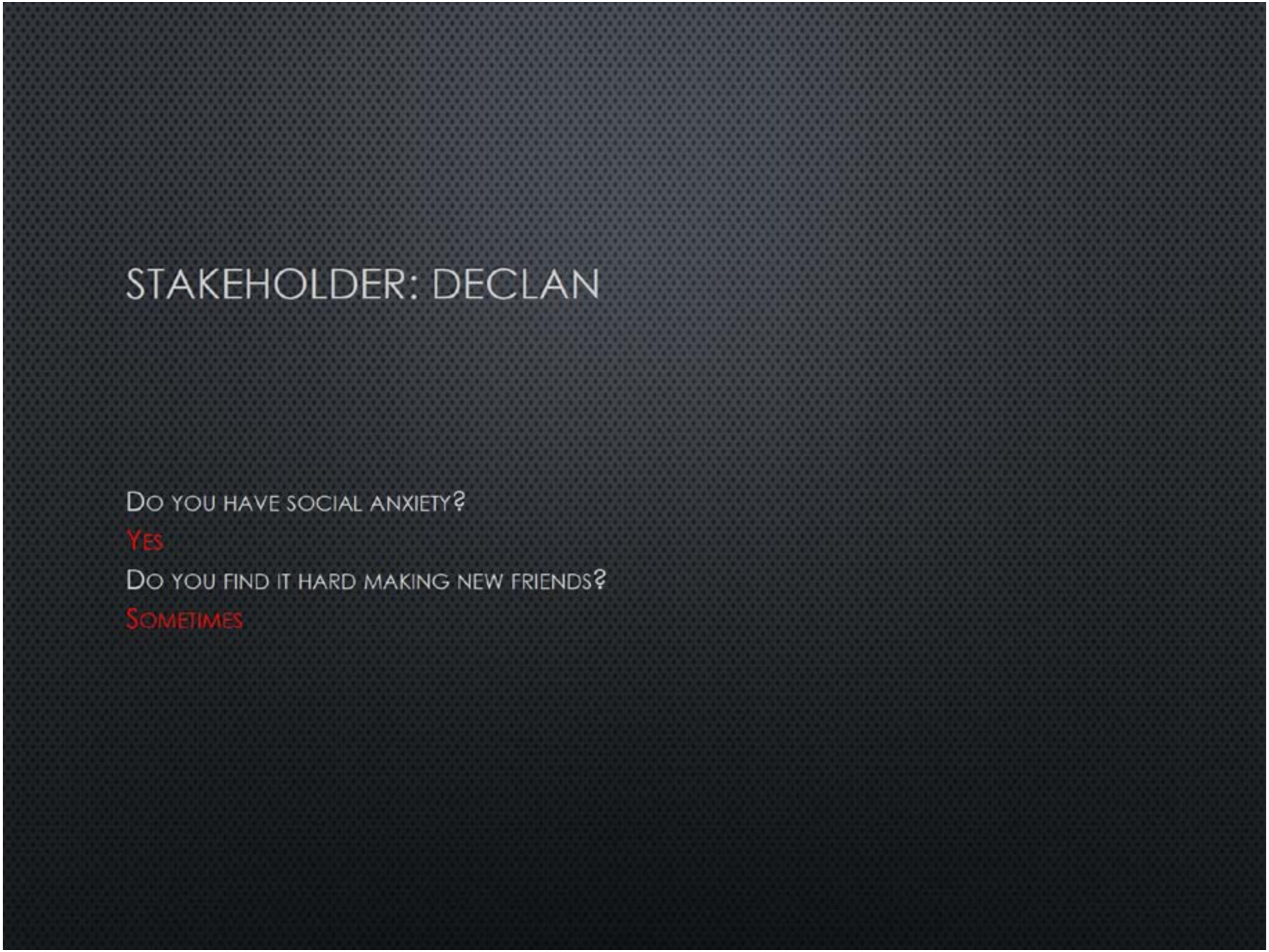

SPECIALISED / RANGED
• I AM MAKING A BORED GAME THAT BRAKES THE TENSION BETWEEN PEOPLE WHO HAVE SOCIAL ANXIETY


WHO'S MEETING WHO
Potential social interactions
Design offers many opportunities for bringing people together, facilitating the engagement of people formally and informally.
• Family - formal/Informal
If it is a wedding then its more formal but if it's a birthday or Christmas informal Problems people may have like being an orphan
• Friends – Informal
If you are meeting friends for a night out it would be more informal Problems people may have like social anxiety
• Friends of family – formal/informal
If it is a wedding then its more formal Problems people may have like being a orphan with social anxiety
• Family of friends – formal
to make a good Impression Problems people may have like social anxiety
• Your love – informal/formal
If you are going to a dinner it could be quite formal or if you are just relaxing it would be informal Problems people may have like no love
• Your loves family – formal
You need to make an good impression with there family Problems people may have like your loves an orphan or no love
• Club members – informal
You are there to relax so you don't have to worry about dressing up Problems people may have like not in a club or social anxiety


DEPRESSION
• YOUTH CLUB
• COUNCILLING
• EATING DINNER WITH THE FAMILY




DESIGN BRIEF
• I'M GOING TO DESIGN A GAME WHICH TACKLES THE PROBLEM OF SOCIAL ANXIETY
STAKEHOLDERS NEEDS AND WANTS:
• THIS GAME WILL BRING PEOPLE TOGETHER
• THIS GAME WILL BE MULTIPLAYER
• THERE IS NO WINNER
• THE GAME WILL BE A BOARD GAME
• IT WILL TAKE PLACE IN THE COMFORT OF YOUR HOME OR A FRIENDS HOUSE
• IT WILL BE AN 3-8 PLAYER GAME


STAKEHOLDER: DECLAN
DO YOU HAVE SOCIAL ANXIETY?
YES
DO YOU FIND IT HARD MAKING NEW FRIENDS?
SOMETIMES

PRODUCT ANALYSIS

Cluedo is a mystery board game in which players race to discover the murderer, the weapon, and the place of the crime.

TWISTER IS A LARGE BORED GAME IN WHICH PLAYERS HAVE TO PUT THERE HANDS OR FEET ON THE CORRECT COLOURS OF THE BORED YOU ARE TOLD WHAT HAND OR FOOT, LEFT OR RIGHT, RED, BLUE, YELLOW AND GREEN.

Snakes and ladders is a 2-4 player game,
you roll the dice and whatever number you land on is the amount of times you move along the bored.

DUNGEONS & DRAGONS

Dungeons & Dragons (abbreviated as D&D) is a fantasy tabletop role-playing game (RPG) originally designed by Gary Gygax and Dave Arneson. It was first published in 1974 by Tactical Studies Rules, Inc. (TSR). The game has been published by Wizards of the Coast (now a subsidiary of Hasbro) since 1997.

Examiner commentary

In this exemplar the candidate has focused on the 'Social Interaction' context. A single mind map has been used to explore a context, but it is not clear which areas offer potential.

The candidate has not provided details of a primary user or other stakeholders.

Initial investigation is limited to some secondary analysis of some other board games and only a basic list of needs is presented.

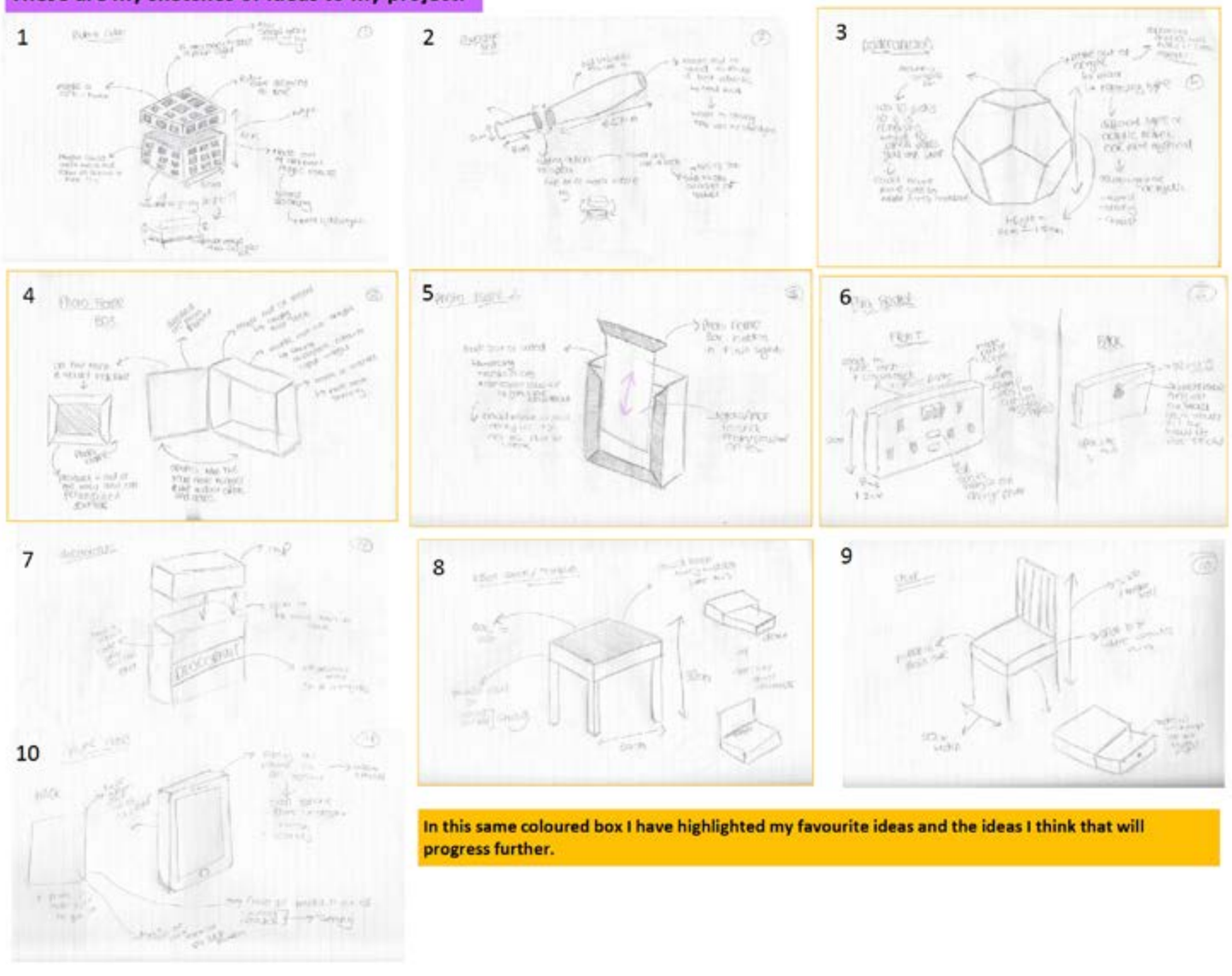
To move up a mark band this candidate would have at least needed to have gathered some information on materials and produced a technical specification.

STRAND 2

Exemplar 4

21/24 (Mark Band 4)

These are my sketches of ideas to my project:



In this same coloured box I have highlighted my favourite ideas and the ideas I think that will progress further.

Ideas

PUN	1	2	3	4	5	6	7	8	9	10
	Rubik cube	Rounders bat	dodecahedron	Photo frame 1	Phot frame 2	Plug socket	deodorant	Foot stool	Chair	Phone case
Togetherness of items	★★★☆☆	★★★☆☆	★★★★★	★★★★☆	★★★★☆	★★★★☆	★★☆☆☆	★★★★☆	★★★☆☆	★★☆☆☆
adaptable	★★★☆☆	★★★☆☆	★★★☆☆	★★★★★	★★★★★	★★★★☆	★★★☆☆	★★★★★	★★★☆☆	★★★☆☆
Hidden In Plain sight	★★☆☆☆	★★★☆☆	★★☆☆☆	★★★★★	★★★★★	★★★★☆	★★★☆☆	★★★★★	★★★★☆	★★★☆☆
Descent sizing	★★★★☆	★★★★☆	★★★★★	★★★★☆	★★★★☆	★★★☆☆	★★★☆☆	★★☆☆☆	★★☆☆☆	★★★☆☆
Usability to open	★★★★☆	★★★★★	★★★★★	★★★★☆	★★★★☆	★★★☆☆	★★★★☆	★★★☆☆	★★★☆☆	★★☆☆☆
Total	16	18	**20**	**22**	**22**	18	16	**20**	14	13

Deciding which idea to take forward

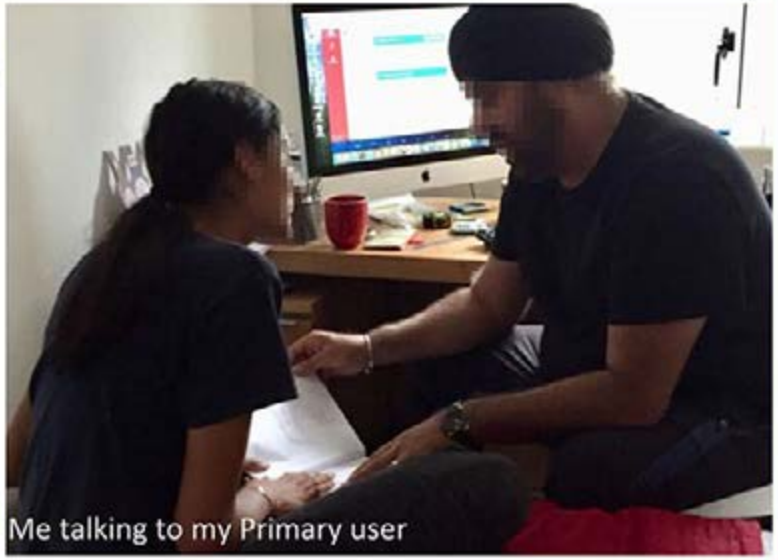
I showed my ideas to [redacted] (primary user) :

I had a meeting with him on the weekend and showed him my best 4 ideas (which I found out from the table above).

He really liked ideas 4 and 5 (the phot frames) as they would be good to put anywhere. And they looked fairly easy to use in my sketches. However number 4 if it was to open like a door you could see the hinges so I would have to think about that a find a way to hid it.

He also did like number 3 but he did not understand how it would open and how it work. So if I was to carry on this project I would have to think about that. He also liked the way it looked as it looks extraordinary because of the shape.

He did not really like the idea of the footstool (8) because it is to simple and it would be easy to see that there is drawer on it but he did that you could cover it with fabric. But overall he did not really like this idea



Me talking to my Primary user

First model

First Models of my bets 3 ideas :

I made the models of these 3 ideas and talked to a primary user to see which one was the best to carry forward as a project

Photo frame 1:

- Overall my primary user did not like the concept of this idea.
- He did like the fact it was disguised as a photo frame as you can put it almost anywhere.
- He did not like how it opened as if it had hinges they may be visible and it would be easy to tell.
- He said it would be better if it had a photo frame stand.
- He also said if it had organizer pockets it would be better as it would not make a mess.

Dodecahedron:

- Overall my primary user did not like the ideas mainly due to what it was disguised as.
- He did not like how it would open up as it could be very obvious.
- However he did give me an idea to make it into a box for your things as well as having a phone charging unit as most people have phones.
- He did like the idea of the shape as people would not know what it would be.

Photo Frame 2:

- My primary user really liked this idea
- He like the way it opens as you would not be able to see how it opened at first glance (if the product is complete)
- He would like if it had a photo frame stand
- He does like the idea of it having a charging unit and organizer pocket inside the frame.
- He did not like how all of the front of the frame came off but id only one side of the frame and the glass in the middle came off. I said I was not sure it I could do that but I would try

Me talking to a primary user

Next step:

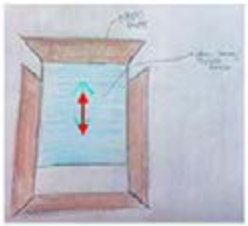
- I am going to carry forward photo frame 2 (idea 5)

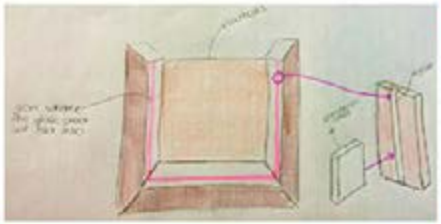
I have found out some new ideas my stake holder wants to add in such as:

- Maybe a phone charger socket
- Organizers holes

Iteration 1

Sketches:





These are my sketch to improve on how it would open as that was a problem on my initial sketch.

My idea for it to open and close it the on the frame of the photo frame there is groove that goes all the way around this grove is for the gals cover of the photo so it stays in place

Advantages of this:
- Easy to open and close
- The mechanic of this is hidden and not seen how it opens

Disadvantages:
- Too easy to open

I had a talk with my primary user too see if there we any more improvements that could be made and the main points were:
- Size of frame - make it smaller.
- The thickness of the whole frame as if it too thick it will look suspicious.
- How thick the frame of the photo frame is
- But liked the idea of how it would open and close
- He really likes the idea of having a phone charging unit but I said it may not be possible as there will be no room to put it.
- He did really like the general design of it and how it could work so there is no real redesign of it.

Me talking to my stakeholder

Through the internet I have found the average/most common size for a photo frame is **6 x 4 inches** not including the frame of the photo frame.

Research:

What is the size of a standard photo?

Yes, 4x6 is a standard and most common 35mm picture format. Other standar 5x7, 8x10, 8.5x11(letter size), 11x14, 16x20, **24x36**, etc. There are many more between standard sizes which are not so common. However, remember, these U$ standards.

To find out the thickest I could make the photo frame I went around by house measuring the thickness of each frame.

Through the results I have found out that the thinnest was under 2cm and the thickest was **3.5 cm**.
This means that thickest I can make my frame is around about **3.5 cm**

Using the same photo frames I measured the width of the each frame to see how wide or marrow I would make mine.

I found out that the thicker the photo frame was the thinner the width the frame of the photo frame was.
Thickest = 4cm
Thinnest = **1.8cm**

Model:

The model did not have the **photo frame stand** which I need to add into my next model
The good things about it is that my idea about the groove does work in the model. Here is a 8 second video of it. I do need it improve on the **smoothness of how it goes on.**

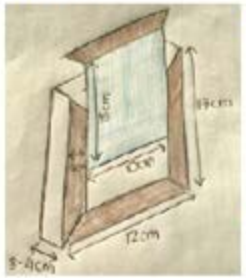
PUN	
1	✓
2	✓
3	✓
4	✗
5	✗
6	✗
Total	3/6

Also another way to test if the model was Good was by if they meet up with the PUN (primary user needs).

Next step:
- Make a model of the thickness and frame width too see if it looks good
- Make the model the sizing of 6 x 4 inches to see it is the right size.
- Maybe try and add in a charging unit (very unlikely)
- Smoothness of the photo frame when it opens and closes

Iteration 2

Sketch:



This sketch has all the measurements I found out from my research and I am going to make a model of it so see if there are an faults that I can work on and to see if the general design of it is good.

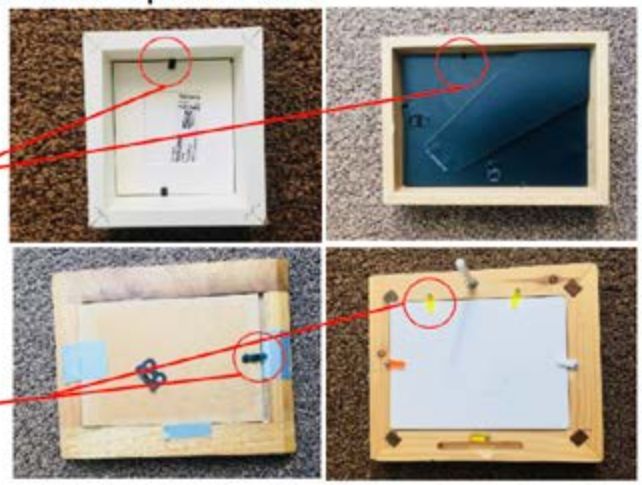
Model:

In my model I used the correct sizing's and I added a photo frame stand as I needed one and did not have one last time. I also found out that the stand did not really hold up the frame as it kept sliding. (probably because it's made out of card)

Research on how to hold the photo in the photo frame:

I went round and found the same 4 photo frames again to see how the phot held and this is what I saw:

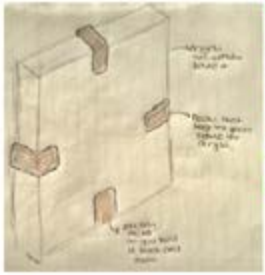
This way of holding the photo in is good as you could stick this to the clear acrylic thick instead of the wood.



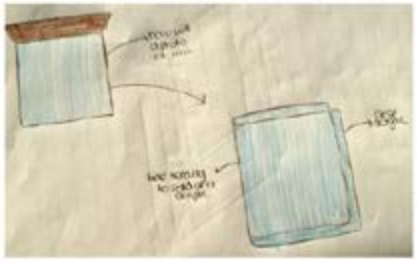
These are clips that rotate to hold the picture. This would not be good form my product because this need to fastened on the wood as in my product there is a gap in between the wood and the photo.

So I think that the metal tables are the best thing so far to hold the photo n the frame

Initial sketches to hold the photo in the frame:



After looking at the frames. I saw some metal tabs which inspired this idea. I came up with it and after looking on the internet I found out the names of the metal tabs called **flexible points**



This ideas is where acrylic is bend so a photo can slide between the 2 pieces of acrylic. This idea is from acrylic being bent by **line bending.**

Testing my model:

Another way to test to see if the model was descent is to see if that if it meet up with the primary user needs.

PUN	
1	✓
2	✓
3	✓
4	✓
5	✓
6	✗
Total	5/6

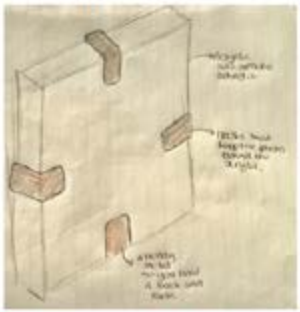
Since I made this model to scale I tried to put some general items like a phone and a purse/wallet to see it they fit and with the picture above you can see that they fit with ease and it is still able to close.

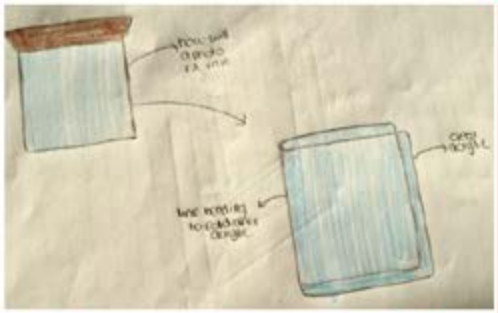
But in this model I found a fault which is there is no way for a photo to be paced in the photo frame. Where the photo will go I have modelled out of card. So I need to find out how I will have to put in the photo.

Next step:

- Make models on the sketches on how the photo is going to go in the frame
- Test the models to see if they work

Sketches:





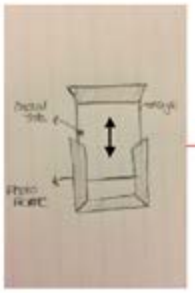
These are my ideas that I have come up from my research on how it will keep the photo in the photo frame.

Models:

These are the two models I have made. I made these to see if the models would keep a sheet of paper in them. The sheet of paper would act as photo. I di not make them out of the real materials as the point of these models are to see if they can hold a sheer of paper.

Testing Model 1:

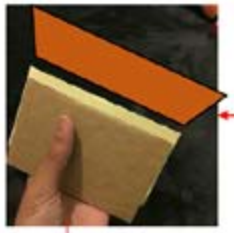
As you can see this model hold the sheet of paper well. And also even if the metal tabs overlap they can be hidden in between the wood when you open and close it . Like shown in the sketch below.



Testing Model 2:

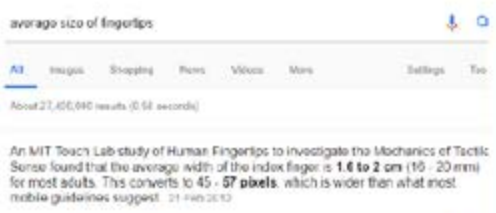
As you can see in the second photo the paper slips out but in the first one it stays in. the paper slips out as there is no place for it too rest. So if I was too use this idea I would have to have the acrylics the same way in the first photo and have one side of the frame on top so there is 2 ways for the photo too slip out and not 3. 9shown below)

I think that model 1 works better to keep the paper in place and also it take sup less room in thickness as model 2 is a double layer of acrylic and will take up the room in side where you sore items.



Research:

As I made this model I realized when you would open it you use some of your fingertip too grip it so this means I cannot have the acrylic level with the wood. So I need to have space for my finger to grip on then have the acrylic glued on .



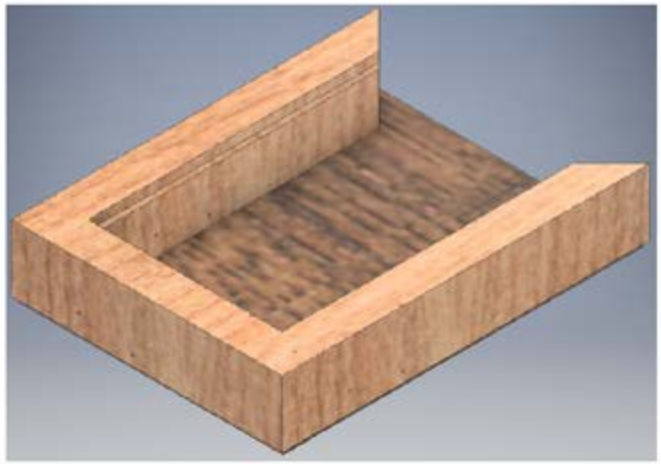
I have found out in my research the average size of finger tips is **16 – 20 mm.** Shown in the photo above I only use ¼ to ½ of my finger tip. So ¼ of 20mm is **5mm** so will leave **5mm** room for finger to grip and open the frame.

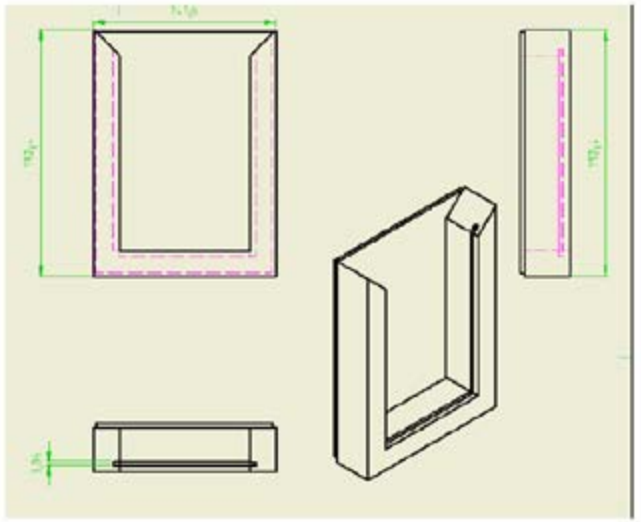
PUN	
1	✓
2	✓
3	✓
4	✓
5	✓
6	✓
Total	6/6

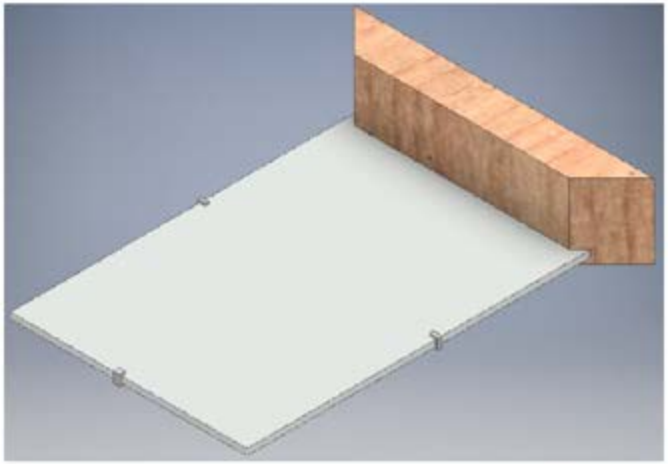
Next step:

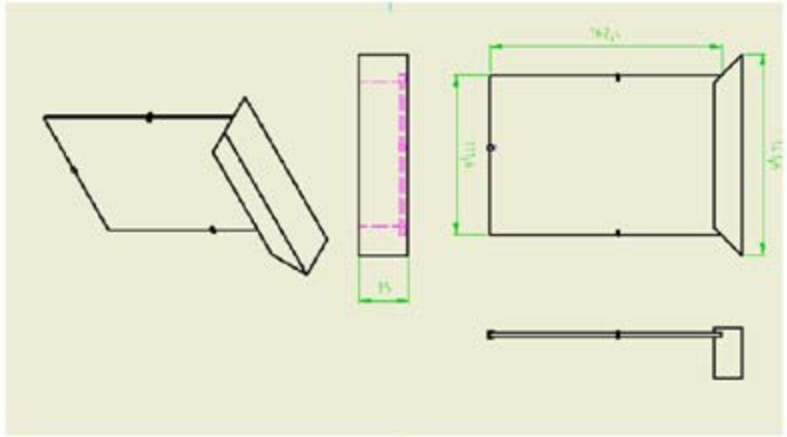
- Start sketching up my product on CAD as it has finished most iterations.
- Add in the new measurements (5mm) I have found out into my sketches.
- Add this information into my CAD sketches

Iteration 3









Part	Material	notes
Frame	20 x 30 mm Pine	Band saw to size. Rout grooves. Sand smooth, then put wax coat
Back	3mm MDF 19cm x 14cm	Laser Cut
Front – where photo is held	3mm Clear Acrylic	Laser Cut

Final design/Technical specification

37

Examiner commentary

This candidate has generated a range of ideas that avoid fixation and used quick sketch modelling to establish potential approaches by discussing them with their primary user.

The developments that follow are progressive and a tick system is used to show how the development is gradually meeting the requirements. With ongoing commentary and interactions with the user, demonstrating their ongoing thinking.

The final design solution has clearly evolved from the earlier developments but would have benefitted from a more thorough/critical method of checking it against the requirements before presenting the final design.

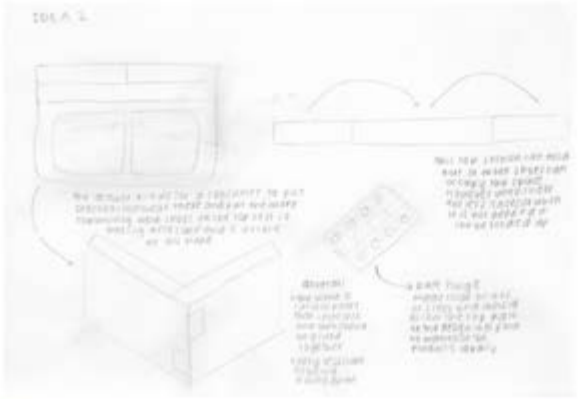
Exemplar 5

16/24 (Mark Band 3)

Initial ideas

After outlining the requirements that my stakeholders and my primary user specified for the design in my design brief and examining similar products that were already on the market I started to sketch some of the ideas for my final prototype. The main things I had to consider for my design were accessibility and a space saving element. After sketching the different designs I decided that I had to evaluate each one and show my best designs to my primary user and potentially some stakeholders.

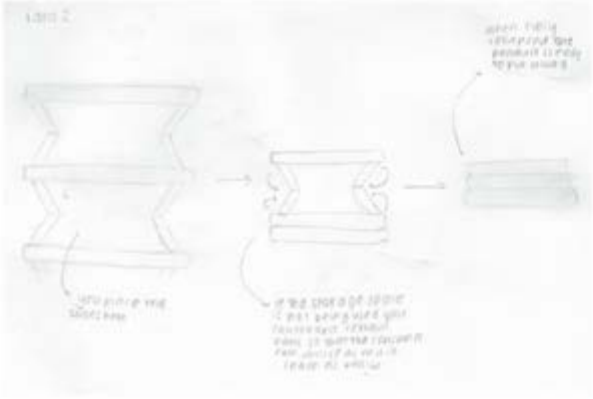
Idea 1



In this design, I like the fact that the top component can expand as it can accommodate more shoes. I also like the fact that the top component can be used to display your favourite shoes or make your shoes that you wear often more easily accessible. However the bottom component that acts like a cupboard can hide your more worn out shoes. It also allows all your shoes to be kept in one place which my primary user stated was a problem with her current organisation system for her shoes.

However , the problem with this design is that it isn't very compact and although the top component can expand , an issue would be that it is quite a bulky product. Also my primary user never specified that she wanted to hide her more worn out shoes and mainly emphasised the idea of accessibility.

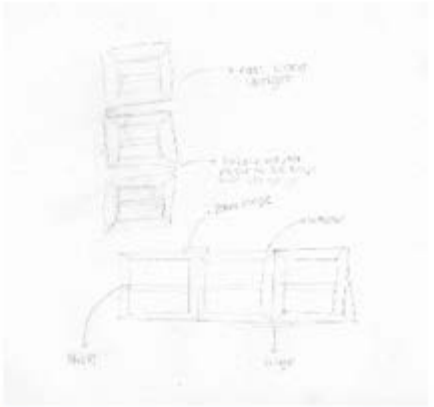
Idea 2



I like in this design the fact that it is entirely collapsible and when it is collapsed and it is fairly compact. I also think it is a rather unique design as when I was looking for existing products I didn't find many products that were completely collapsible. I also think it has the capacity to store a lot of shoes as it has two tiers. Unlike idea one, this would allow all of the shoes to be easily accessible and visible at all times which is one of the requirements my primary user emphasised. I also think that it isn't a very big product and is more economically viable as it doesn't use a lot of wood compared to some of my other designs.

However, I think the biggest problem with this design is that it would use a lot of hinges because of the two tiers and might be very time consuming to construct.

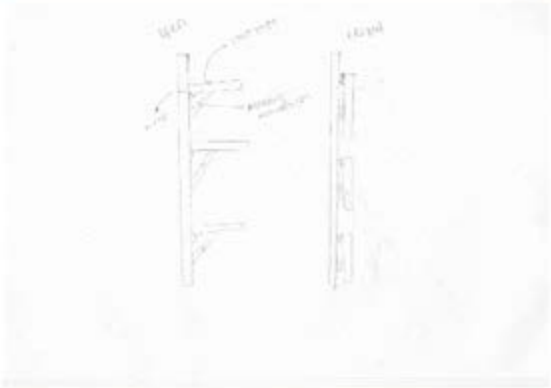
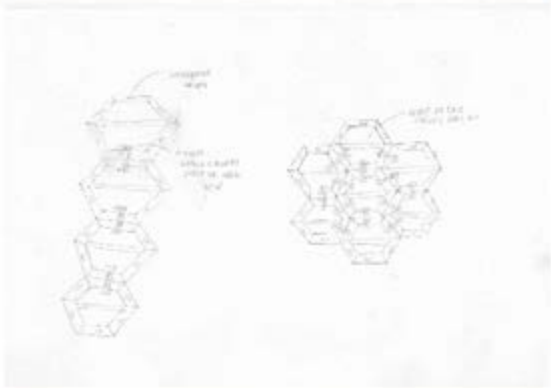
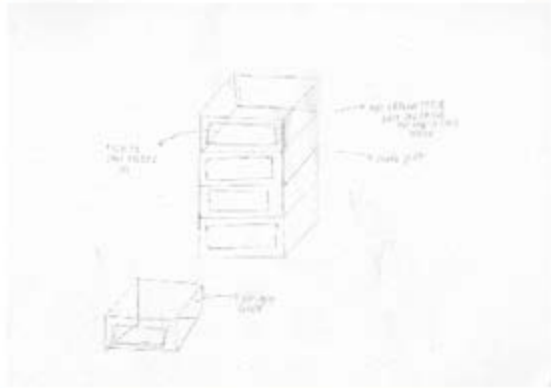
Idea 3



In this deign, I like he fact it can be used in your home, vertically or horizontally and the fact that it has a shelf in the middle to increase the capacity of shoes it can hold. I also like the fact that it would be very easy for a user to grab their shoes which fulfils the criteria laid out in my design brief. I also didn't see any design that can be used horizontally and vertically.

However, from face value this design does look like any other storage unit on the market. I also think it would be slightly difficult to switch the product from standing vertically and horizontally.

Initial ideas

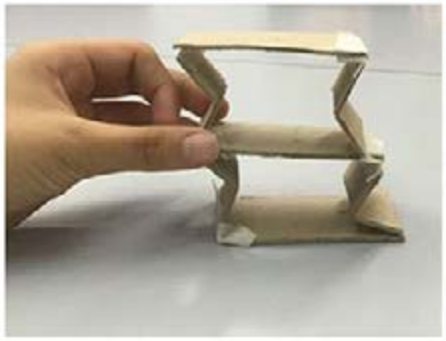
Idea 4	Idea 5	Idea 6
		
For this design I like the fact that it can allow the user to store their shoes in a very visible way. I think the idea of shelves makes it very easy for a user to quickly grab their shoes. I also think that if the user isn't using one shelf they can easily close it. This design is also quite unique as I didn't see anything resembling it when I was previously looking at existing products	I really like the versatile deign of idea 5. Although there are other hexagonal/ honeycomb shaved product on the market (as shown in my existing product analysis), I think that the idea of making each hexagonal unit detachable is quite unique. I think it would definitely fit the space saving requirements that my user told me about and would be very versatile in different people's houses.	I think that this design's simplicity is nice. I like the fact that each shoe is visible and has its own compartment which is reminiscent of a shoebox. The nature of each rectangle component would allow the user to keep all of their shoes in the same place or put some in a wardrobe and others in the hallway for example.
However, I think this design would be rather bulky and the shelves would stick out a lot which wouldn't fit the space saving requirement in my design brief. I don't think it has as much capacity to fit the same number of shoes as my other designs , and if it did it would be far too tall.	However, I think that the detachable nature of each hexagonal component may be the design's downfall. I think it would be very hard to switch the design from being used vertically to it being a honeycomb shape, as the user would have to use the dowels to attach each side to one another.	However, I think the fact that each unit isn't attached to each other in anyway and is simply stacked on top of each other is a flaw in the design. tHis is because it would be easy to knock the stacked units over. I also don't think it is a particularly unique designs and it would be hard to store tall bots for example.

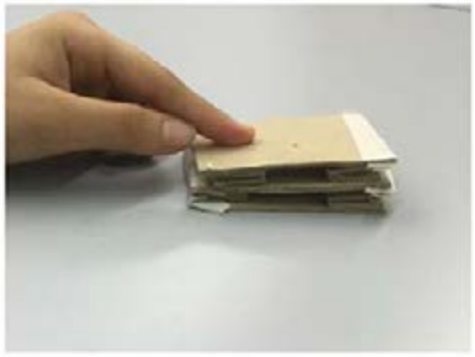
After evaluating the six designs I created for my storage unit, I decided that I want to create models for idea 1 and idea 2 as my next step and ask my primary user what her opinions are on each design, show her the models that I have to create and ask her which one she'd prefer.

First iteration

I talked to my primary user about two of the ideas that I made models of to see what she thought about them. For the first design she said that although she liked the expanding idea of the top half, she thought it wouldn't be practical. When it is fully expanded to hold the maximum number of shoes it is slightly inconvenient and takes up valuable space. Also the concept of drawers on the bottom half would mean that the shoes wouldn't be visible which was one of her key needs in a product that could store her shoes. In my survey one of her main concerns of shoe organization was that if the shoes were not visible she wouldn't get the most amount of use as them as she could. Overall my primary user didn't think that the first design would suit her need overall and would be too bulky as she is living in a small space.

I also asked my primary user about the number of shoes she owned and I categorised every one. She said although she wanted the shoe storage system to store at least 9 pairs of shoes she said she wanted the storage system to be used for shoes that she wore most often which is why she wanted the product to make shoes easily accessible. Although she has some high heels she said her most worn shoes were her flats and trainer so the design didn't have to accommodate for example tall boots or high heels.



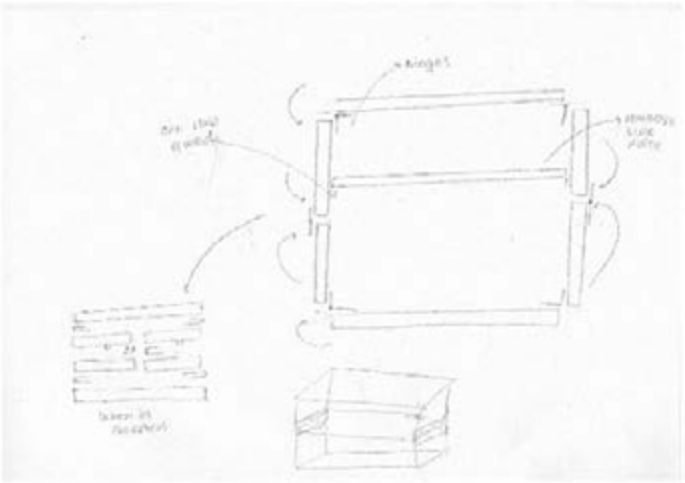


For the second design, my primary user said that overall she preferred the second design better than the first one. She liked the concept that you could completely fold up the product to make it completely compact and easy to put away. She thought that this design would be more beneficial in her daily life as it was less likely to take up space and would also allow her to see all of her shoes at all times. She also liked the fact that, like the first design the user could adjust the product so that if part of the product was not being used you could easily collapse it so it doesn't have to take up more space than it needs to. After talking to my primary user I needed to

I also asked one of my stakeholders Aki and she said that she preferred the second design as she said it would be better for college students as they have small living areas and the first idea would get in the way. After talking to my primary user, I decided that I was going to go with the second design as the design fo my final prototype. However, now I also have to decided if I want to keep the two tiered nature of this design and if not how is it still going to accommodate as many shoes. To do this I will try to draw some sketches for alternative to this design.

Changing and testing my design

After discussing my design with my primary user I decided to try and test out the hinges I would potentially use in my final design, and I had to sketch some other options to my original design that have slight variations.



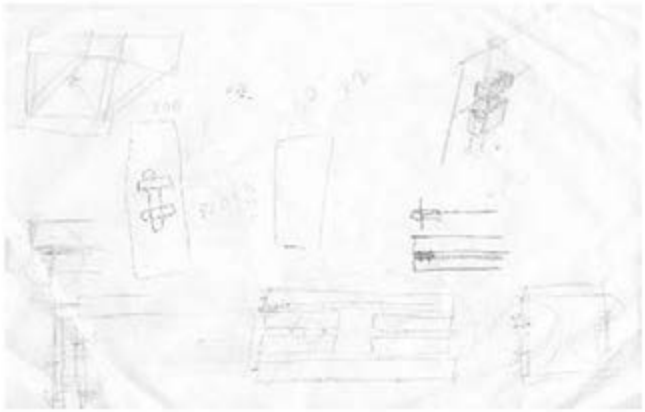
After evaluating my original design further I decided to come up with a slight variation to it so I would avoid using as many hinges as I previously intended. Instead of using 10 hinges in my final prototype, I decided to use six. And instead of making it have two tiers of collapsibility, I decided to only include one. However in order to make sure it could still hold the same amount of shoes I decided to add a middle shelf int the design that could slide in and out. As it doesn't have two tiers when it collapses in the newer design, it will be thinner and easier to store away so in the space saving capacity it will be even more effective.

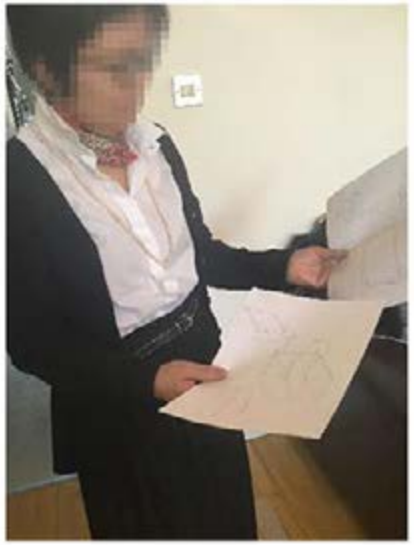
After adding a slight variation to my original design I decided to test out a hinge before I actually started making. To test out a hinge using the fretz saw I cut two pieces of scrap wood and I used a butt hinge to hinge the two pieces together. First I used a pencil to mark out where the score would go. Then I used a power drill to make a small hole and screwed the screws in. However when I did this I saw that when the two pieces stood together vertically if I was holding it, it would automatically bend inwards. Therefore from testing out hinges I learnt that I would have to make another variation to the design to make it effective, as otherwise the design would automatically collapse as there was nothing to stop the side pieces for going inwards.

Going on from this, I need to devise a solution to my problem to make sure the side pieces don't collapse inwards. To do this I need to create another variation from my original design. I also need to decide what kind of hinge Im going to use by investigating the materials I'm going to use for my final prototype. I have to now investigate different types of hinges to see which one will fit the requirements of my design. Th rebuttal hinge was very small so if I were to use it in my final prototype I would have to use a large quantity of them, so I may have to consider other types of hinges like a piano hinge or even a fabric hinge.

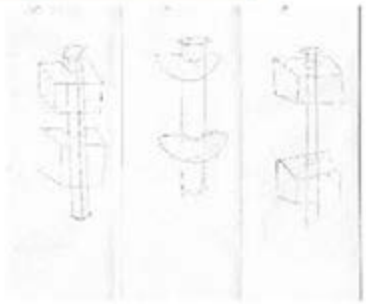
Second iteration

After testing the hinge on a scrap piece of wood,I decided to add a back piece or a lock mechanism of sorts to stabilise my product. However after talking to my primary user again I decided that I wanted to try and make a mechanism that would allow it to be stable and a middle piece that would prevent the product from lozenging without needing a back piece. My primary user said that she would prefer the design without a back piece and I realised that If I added a back piece it wouldn't fit my design brief as one of my criteria was compactness. So I decided to create a lock mechanism. I tried to draw various designs and show them again to my primary user.



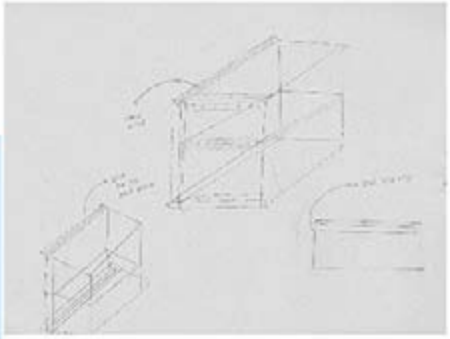


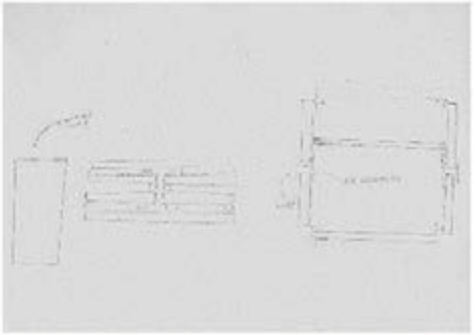
Here I am showing my primary user two sketches; one of the design altered to accommodate a back piece and the other a sketch of the design with a lock mechanism



I talked to my primary user about the disadvantages of using a lock mechanism and the fact that if I did add it the final product when collapsed would not fold completely flat. However my primary user said that she would still prefer the use of a lock mechanism as she believed that it would add another unique feature to the design and it would still be less bulky then adding a back piece.

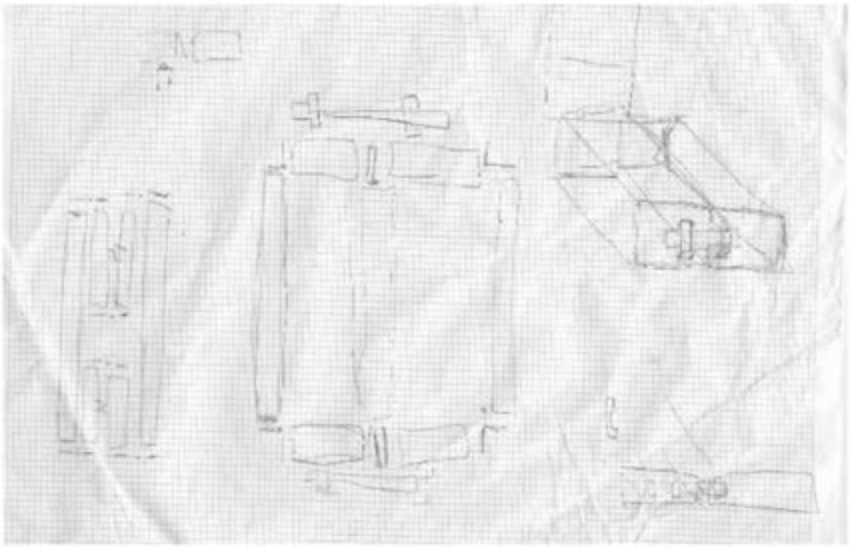
Here are some of the sketches I drew of potential lock mechanism I used. Although some are different shapes they all have the same premise. Each lock mechanism would allow the side pieces to stay upright while also still allowing the overall design to be collapsible. They would all involve using a long dowel and drilling a hole in a piece of wood to allow the dowel to slide through it.

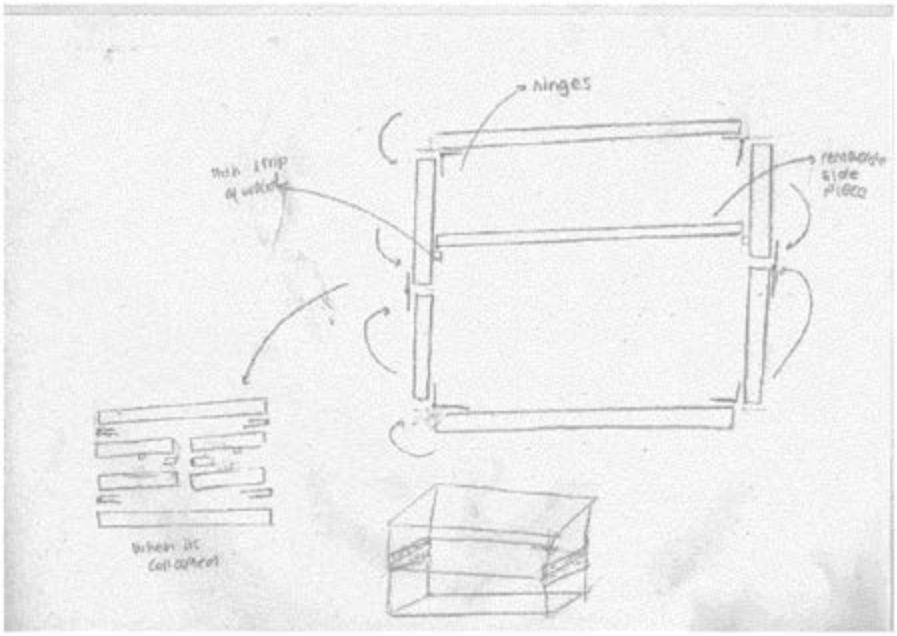


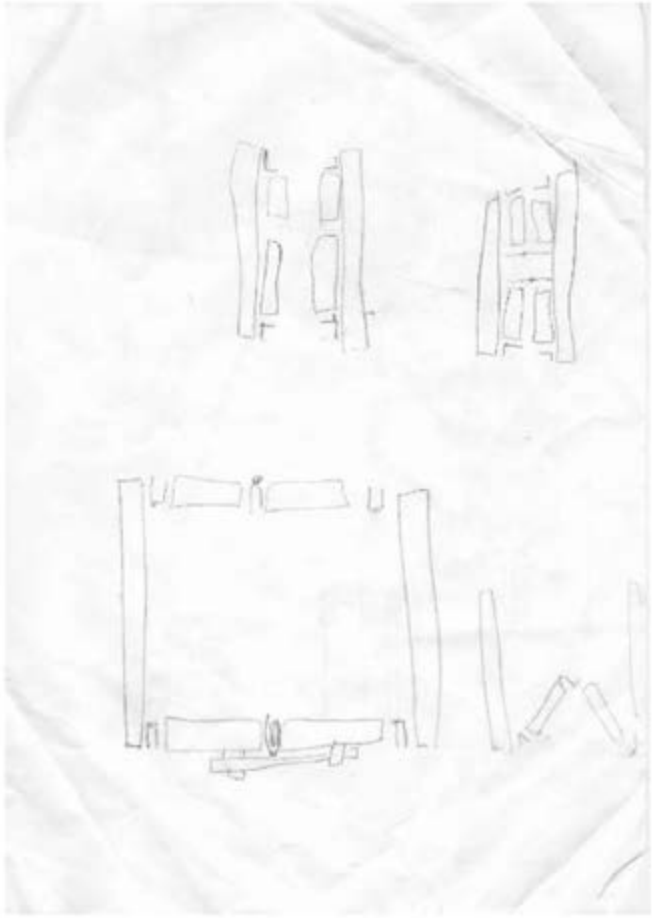


Here are the two sketches of the two different designs I showed my primary user. The one on the left is the one with the back piece. If I did include the back piece I would have to use a lot more wood than I would for the right. However with the left design there is more of a guarantee it would be stable. However as my primary user said that she preferred the design on the right I decided that I would have to include a lock mechanism. I also interview some stakeholders. One said that " I think the lock mechanism would make it easier for someone to assemble the product by themselves".

My final design

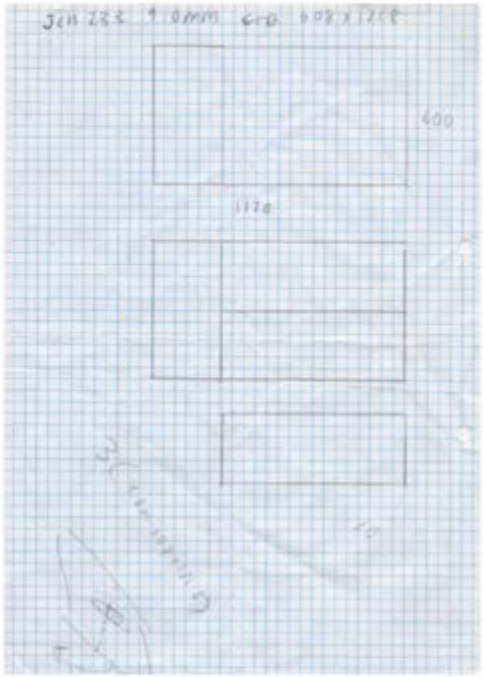


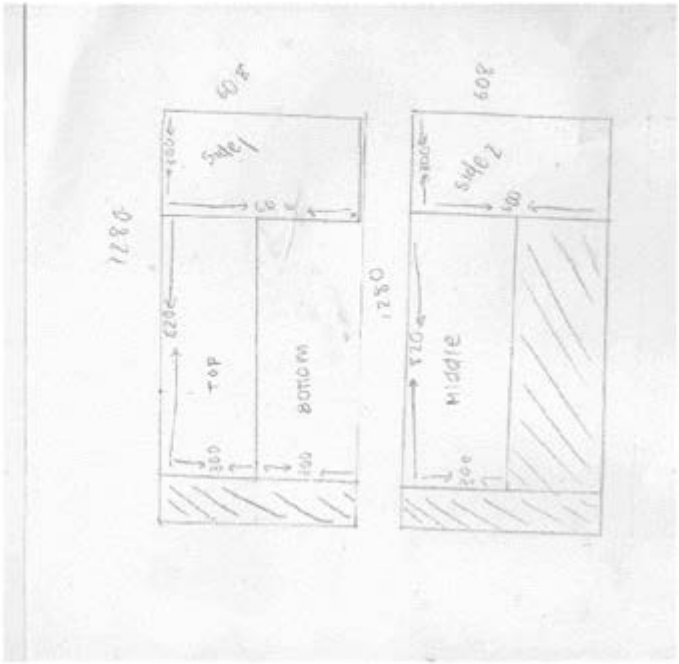




Third iteration

After finalising my design I had to talk to my primary user about where she wanted the shoe storage area to go and measure the space where it would go so I could know the exact measurements I needed and going on from that I could order the type of wood I needed. She said that the best place for the shoe storage area was just outside of her hallway and on the edge of her living room.I measured the area in which the shoe storage item would go which was 880mm and I decided that the length would have to be 820 mm so that it wouldn't be a tight fit. She also told me that when she wasn't going to use it she wanted it to be stored in an alcove next to her wardrobe. I measured the width of the alcove which was 340mm so I decide that the width of the side pieces and the top and bottom would be 3000mm. After that I researched that the pieces of wood they had in stock were each 608x1280mm. After deciding that the height of the side pieces were going to be 600mm I had to calculate the number of planks of wood I would have to order. I also measured the width of her shoes and calculated that each shelf could fit approximately three pairs of shoes.





If I was going to make the design that involves the back piece I calculated that I would have to order 3 608x1280mm pieces of wood. So I would be saving 608x1280 of wood by choosing the other design.

I calculated that:
The top piece would be:
300x820mm
The bottom piece would be:
300x820mm
The 2 sides would be:
(300x600) x 2
The middle piece would be:
300x 820mm

After doing these equations I discovered that although with the back piece I would have to order another piece of woo with this design I would be wasting:
1556480-1098000= 458480

Now I need to consider what type of materials I want to use and I need to create a making plan that will help me stick to my production time scale. I also need to evaluate the materials I will use and whether they are environmentally friendly. I need to investigate different hinges and evaluate different types of wood for example if I would prefer to use softwoods or hardwoods.

Examiner commentary

This example is less visual than the earlier one, although, even though there is detail within the text.

Although, even though there are only six initial ideas presented, they are detailed and their scope for challenge is discussed in depth. A sketch model is used to test/explore the chosen idea.

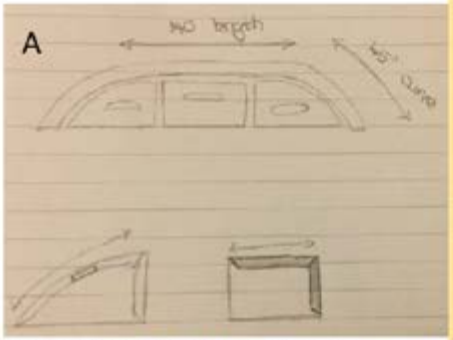
Progression from one iteration to the next is clear however, it is not clear how the design is meeting the requirements as it develops.

By focusing on a range of folding mechanisms the candidate is demonstrating critical thinking as they explore each method.

Exemplar 6

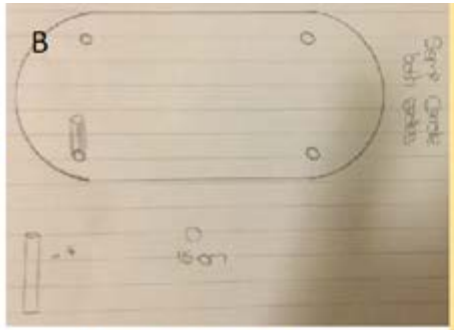
6/24 (Mark Band 1)

Initial Ideas



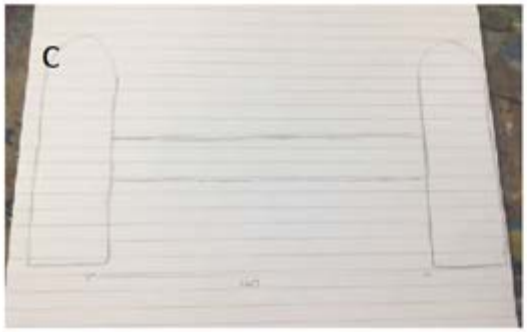
PU Feedback
- Good originality but not sure about the curve sides.
- Lose drawers - good for easy access.

Curved sides with a flat top for a seat
Three lose drawers with the handles cut at the top of the boxes
Made from wood



PU Feedback

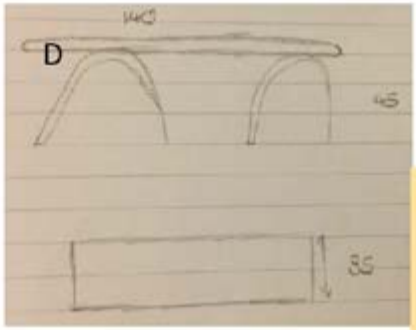
Two curved wooden surfaces
Four curved dulled metal legs



PU Feedback
- Nice to see the link with drawers and sitting on top, however this seems more like a bench.

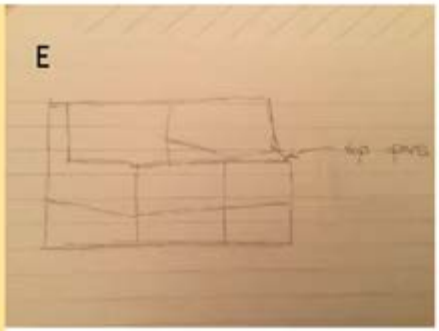
Simple thick sides to support the weight of a person
The long strand in the middle for people to sit on
Underneath for shoes and boots
Made from wood

PU Feedback
- A bit too 'random' for my liking.
- Nice idea. Originality is key.



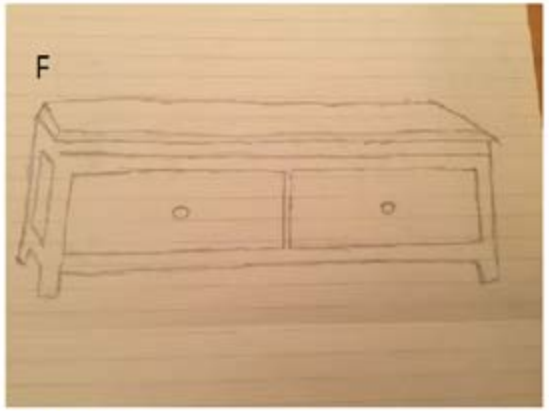
Wooden top
Curved legs with small circular metal feet underneath
This is an unusual design and different to the existing products that I looked at

PU Feedback
- Clear sketch.
- Wouldn't do high legs.



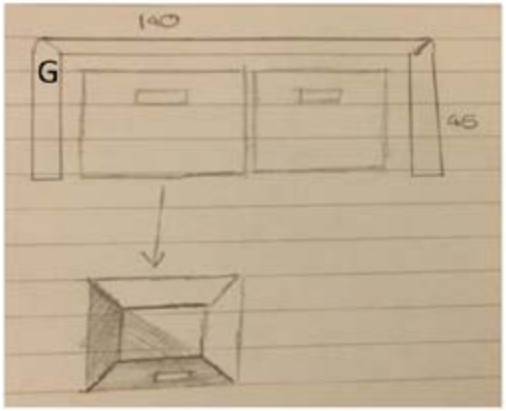
Fully made from wood
Metal hinges where the top opens
Fully made from wood
Joined with finger joints
In graves curve into the centre of the wood where there is a line in the middle of it

Initial Ideas



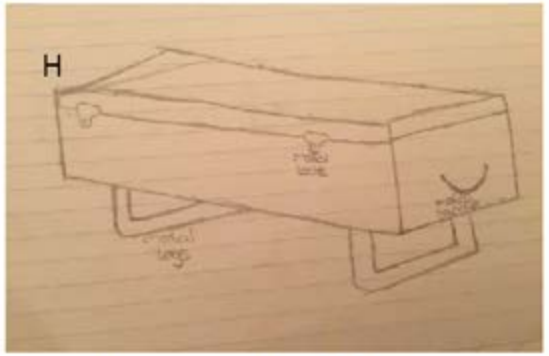
PU Feedback
- I like the idea of a soft seat, making it comfortable.
- Not sure about the dark colour though.

Dark black wood
2 Metal circular handles for the both the drawers
Soft material on top that goes with the dark wood but is also comfortable to sit on to act as a soft seat



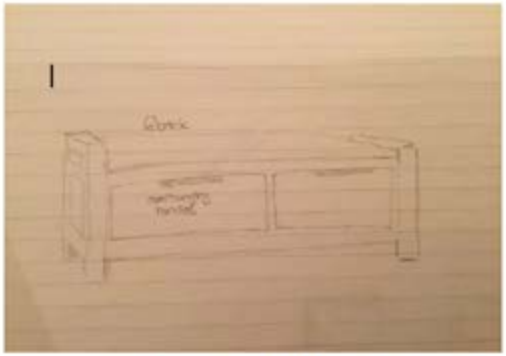
PU Feedback
- Simple and effective.
- Maybe wooden 'bench' and basket material for boxes.

Two loose drawer resting inside but on the ground
Curved wooden handles for the drawers
All wood



PU Feedback
- Nice modern idea.
- Reminds me of a briefcase!
- Quite complex using different pieces of wood.

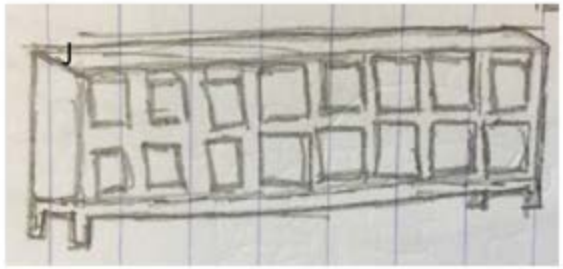
Two metal legs shaped into right angles
Two metal handles on each side in the shape of a semicircle
Two metal locks for a good look
Multiple pieces of wood put together and sanded down flat and shined to a great standard to reflect the light



PU Feedback
- Not many places to put things away.
- Probably something for the back door to put shoes in.

Thin metal right angled handles for the drawers
Four small circular feet to go under the legs
Light coloured cover for the top of it for a good look and also improved comfort
Square engraved into the side for style

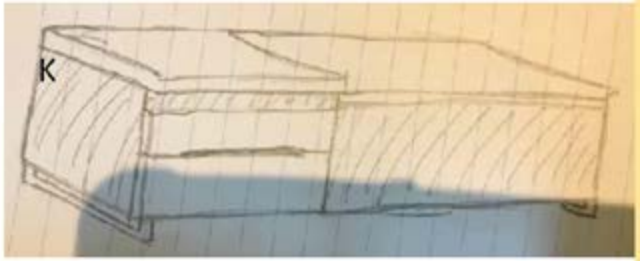
Initial Ideas



16 square spaces for the storage of any items of choice
Made from wood
Curved top edge

PU Feedback
- Probably too many spaces for storage.
- Too simple

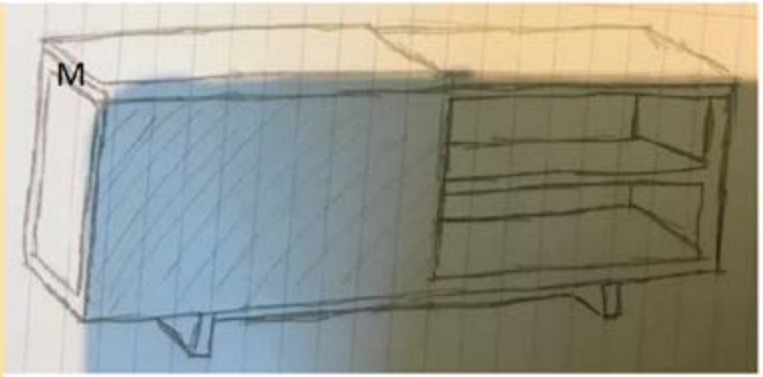
Not the neatest diagram!!



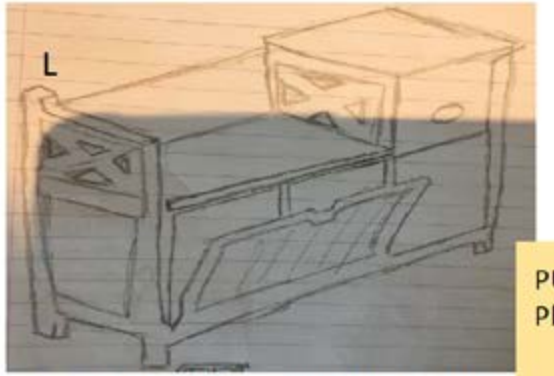
Three different colours (white, black, varnished wood)
Small square on top is white and the drawer underneath is also white with a black handle
Longer top piece on the right is black
Every other side is the varnished wood
Two square legs are made of metal with a shiny finish

PU Feedback
- Not sure if the combination works very well.
- Very nice sketch

PU Feedback
- Really like this idea.
- Nice idea to have drawers in different directions.



Made from wood
Push drawer on the left and shelves on the right
Wooden legs
Cushion top finish to the left top half for a soft area to sit on



Shelves on the Potomac right for a basket and above that is a drawer
All painted white except for the handle on the drawer, the seat above the storage area underneath and also the the section above the draw on the right

PU Feedback
Photomac??
- White could get very dirty, maybe a nice light blue.
- Good digram.

Design Development

PU Feedback
- Very simplistic.
- Possibly add a cushioned surface.

PU Feedback
- A good idea to show your experimental idea.
- May possibly be a good idea.

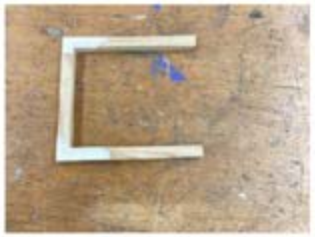
PU Feedback
- Quite thin.
- Straightforward to do.
- try and make more homely.

PU Feedback
- Also reminds me of a coffee table!
- Seems more of a table.

PU Feedback
- Could potentially end up as a coffee table.

PU Feedback
- Quite hard to see this.
- Diverse but manageable.

Design Development



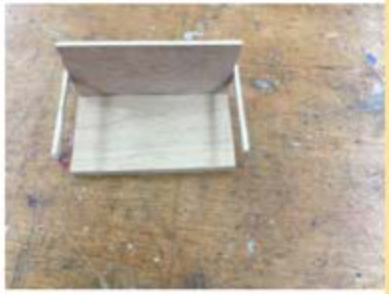
PU Feedback
- The idea of painting it white makes it very defined. Must be even when painting it though.

PU Feedback
- Don't have any drawers or shelves.

PU Feedback
- Not quite sure about the curved sides.
- Think about width between for the shelves.

PU Feedback
Don't understand this.

PU Feedback
- This has a very modern feel to it.
- Is more like a bench than a place for storage.



PU Feedback
Don't understand what this is, sorry.

On-going Idea Review

Primary User Needs:

S1- Look good

- Pleasing to the eye

S2- Easy to use

- No hassle to put things in and take things out

S3- Hold many things

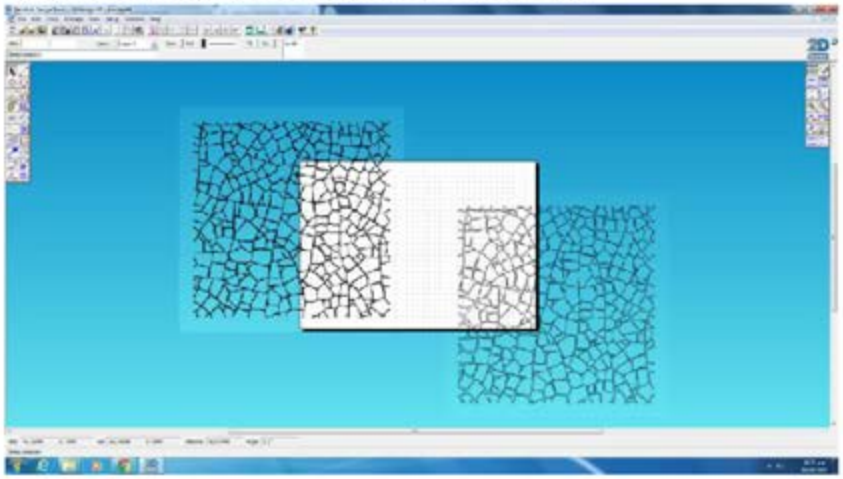
- Store clothes and object or different shapes

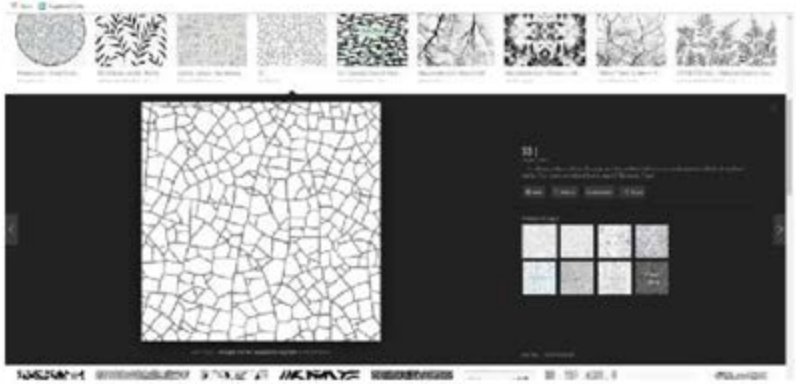
PUN	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Looks good	3	1	3	1	3	5	3	4	5	2	5	5	5	3
Easy to use	3	3	3	2	3	4	4	5	5	3	5	5	5	3
Holds many things	3	1	1	0	3	4	3	4	4	2	3	3	4	2
TOTAL	9	5	7	3	9	13	10	13	14	7	13	13	14	8

This page shows the 3 main things that the primary user is looking for within the product that is being made. (for it to look good, is easy to use so that there is no hassle, and for it to be able to stare anything that it is required to store.

Design idea development

This page shows the development of my design idea to include some print inspired by nature. This has been inspired by the designer: Bethan Gray



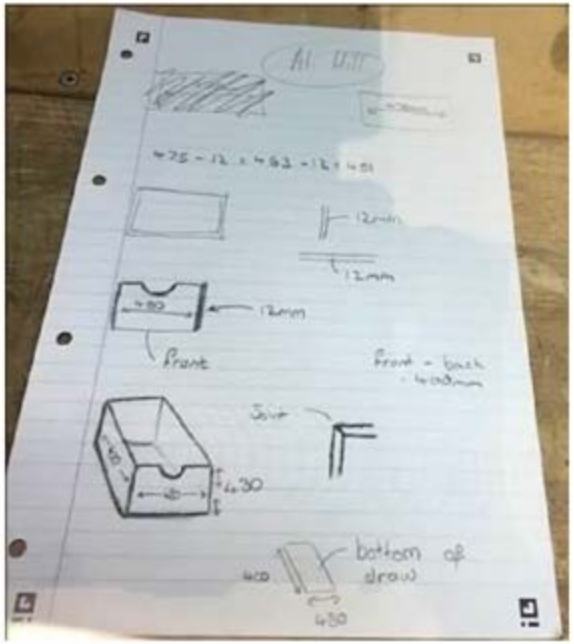


Ergonomics and anthropometric data:

The position of any handle for the drawers of the product will be important. I looked at heights for leaning over as well as hand width.

I also looked at sitting heights as these are also important.

Final Idea



Examiner commentary

While the initial ideas appear varied several are copies of products found earlier in their folder during the exploration of existing products.

The primary user needs (PUN) feedback is useful but lacks authenticity.

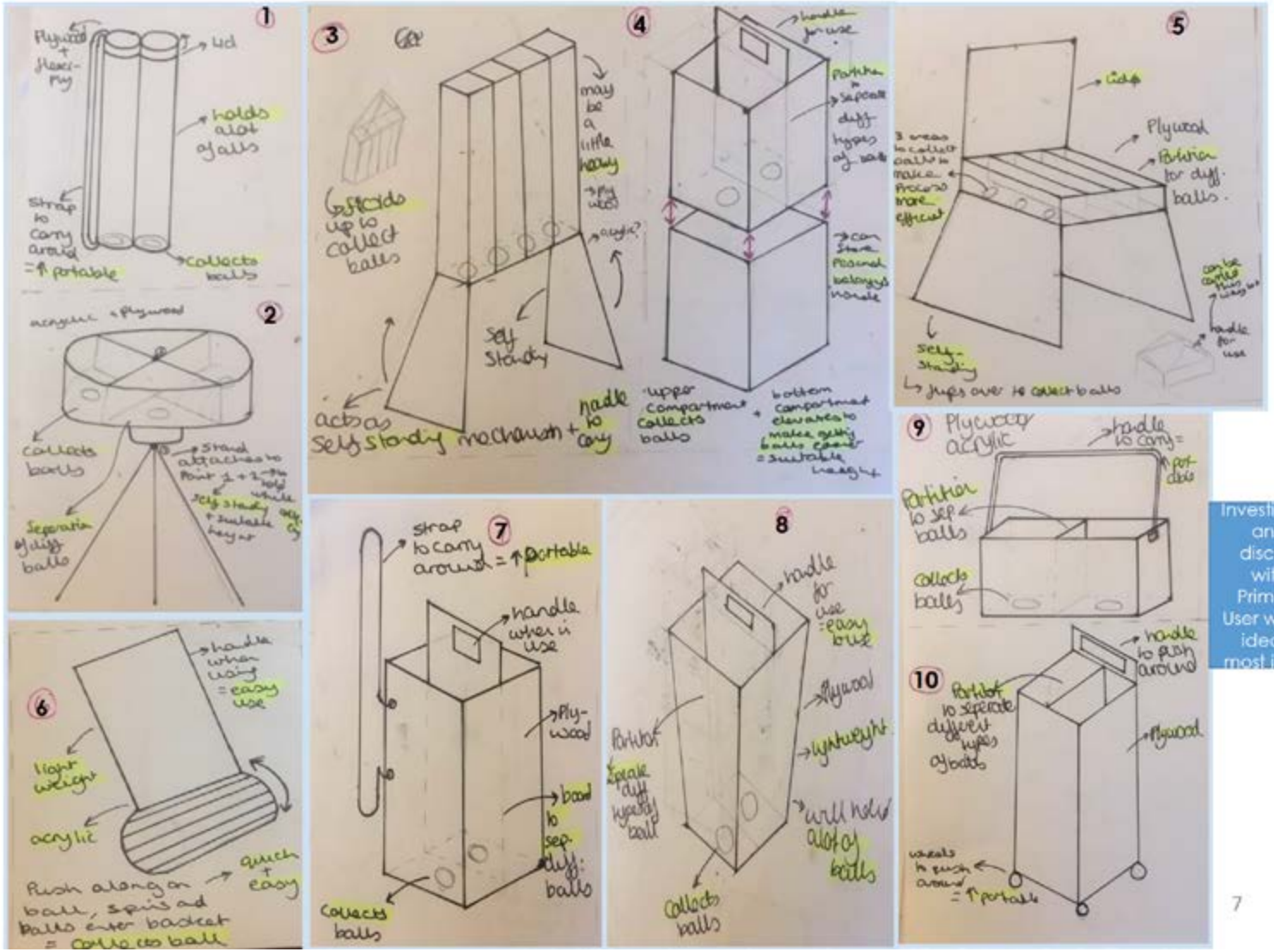
Development focuses on small sketch models of the initial ideas with no actual development of a chosen idea presented. It is not clear where the final design solution came from or how it meets the requirements. As a result the opportunities for this candidate to demonstrate critical thinking are limited.

STRAND 3

Exemplar 7

14/16 (Mark Band 4)

After my primary user interview and all my research, I drew out 10 initial designs based on my stakeholder requirements and primary user needs. When designing, My main objectives in mind were making sure the hopper has the function to collect balls and has a handle.



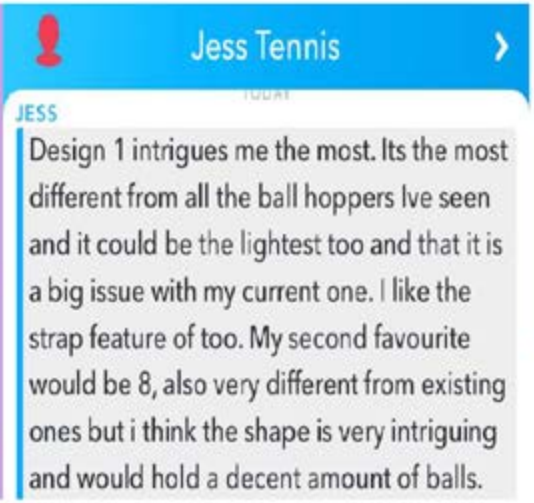
Primary User Needs Table Analysis...

To guide me as to which of my 10 initial designs I should take forward, I made a table to decide which would technically suit my Primary user's needs best. The way I set up the table allowed me to clearly identify which of my initial ideas would be best to take forward according to how well they meet my Primary User Needs.

According to the table, the best designs in terms of technicality would be 7 and 9.They follow the majority of primary user needs successfully. However, design 7's main disadvantage is that, with the weight of so many balls, it may not be so easy to carry and the incorporated strap may not distribute weight well enough for use to be comfortable. Similarly, the main design defect in 9 is portability, but the difference is that the shape of the box it most practical whilst playing, however when carrying, it will be impractical. Design 1,3,5 and 8 follow. 5 and 8 and have the same issue of portability. Contrary to this, design 1 and 3 may nit carry enough balls for the lesson. This would mean that my Primary User would have to take more breaks to recollect the ball during a lesson. However, by doing this Primary User Needs Table, it has highlighted the main weaknesses, as well as strengths in each of my designs.

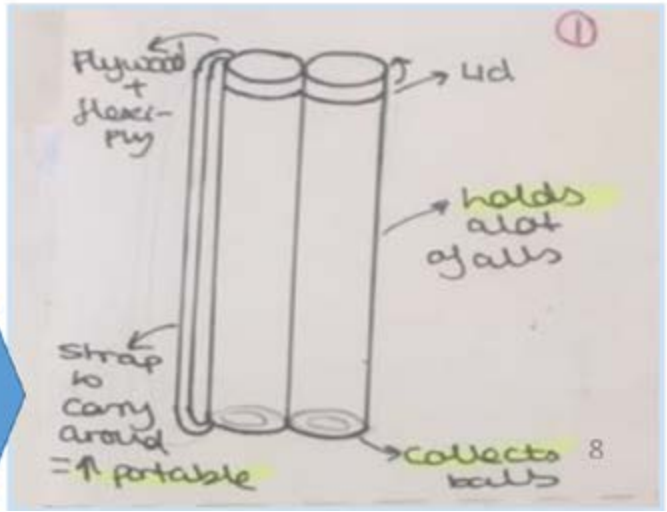
	A	B	C	D	E	F	G	H	I	J	K
1	PUN'S	1	2	3	4	5	6	7	8	9	10
2	PORTABLE AND EASY TO CARRY	5	3	5	5	2	5	3	2	3	5
3	SELF STANDING	5	3	5	3	5	3	5	5	5	3
4	DOESN'T DAMAGE THE TENNIS BALLS	5	5	4	5	5	3	5	5	5	3
5	PARTITION TO SEPARATE DIIFERENT TYPES OF BALLS	5	4	5	5	5	5	5	5	5	5
6	CARRIES ROUGHLY 50 BALLS	2	3	3	3	5	5	5	5	5	5
7											
8											
9	TOTAL	22	18	22	21	22	21	23	22	23	21
10											
11			: MEETS PUN'S NEED FULLY								
12			: MEETS PUN'S NEED PARTIALLY								
13			: MEETS PUN'S NEED MINIMALLY								

I also decided to get feedback from my Primary User as my table covered the technical practicality, but her opinion would consider things such as appearance that my table wouldn't highlight for me. I sent her an image of my designs and the PUNs table - here is her response...



Jess like design 1 the most as she felt the shape was most unique and felt it would be the most lightweight. It had scored highly too to I went with design 1 for my first iteration!

Begin Iterating Design 1

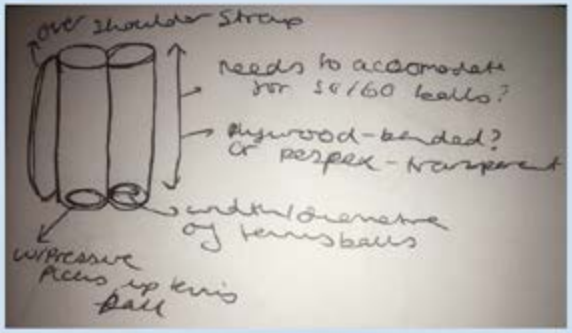


Critical Thinking - Investigating which design to develop ...

Design Development - Iteration of Design 1...

DESIGN 1

I began developing initial idea 1 by drawing a rough more detailed sketch of the product and how it would function...



I found parcel tubes around school and thought I could use them. Although I found a few, none of them would let my tenn's ball through prototype highlighted that if I used an already existing object like a pipe or a tube, it would be difficult to find one that has the correct diameter for a tennis ball or the correct height to carry enough balls, adapt and still make it look professional. Also if a vacuumed formed a Styrofoam mold for example, it would have to do it in two halves, meaning it would have two seams which isn't ideal aesthetically. This proved that manufacturing this design could be quite difficult as the only potentially successful material to use would be a thick type of cellophane (like the one I used in my prototype iteration). However, this isn't durable or professional looking at all.

I then set off on making a small prototype to see how the product would look and how practical it was

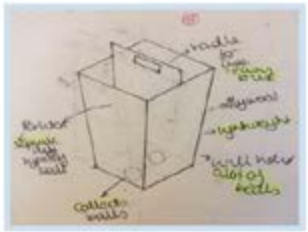
.As a quick prototype to see how the design would generally work, I used cellophane wrapped into a cylinder and sealed with cello tape. I used cello tape to imitate possibly adjustable fastens that could be used in my final prototype to tighten the prototype when collecting or loosening it when accessing the balls.

Begin Iterating Design 8

I eventually realised that this product design was far from ideal, although it scored one of the highest on my PUNs table. If I decided to develop this this designed my Primary User Need **1 - The ball hopper must be portable and easy to carry** and **5 - The ball hopper must hold roughly 50-60 balls** would be near contradictory as when you increased the number of balls the design is able to carry, the height of the product would increase. . It was clear that the design had little potential as it was near impossible to manipulate or adapt it to carry an adequate number of balls as .

Secondly, doing this iteration also highlighted that any of my designs had to be narrower at the bottom (for balls to go in bout not fall out)and wider at the top(so an arm could fit through and access all the balls). Therefore, I decided to scrap this design idea and opt for one that was more practical.

PUN	
P1	×
P2	✓
P3	✓
P4	✓
P5	×
3/5	



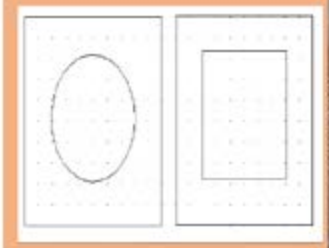
My primary user and I decided to move onto design 8 as it scored highly on the PUNs Table, the shape of design 8 carries a large amount of balls in the most efficient way and I felt it would be most suitable for my specification. Also its body was also narrower at the bottom and wider at the top – VERY IDEAL!

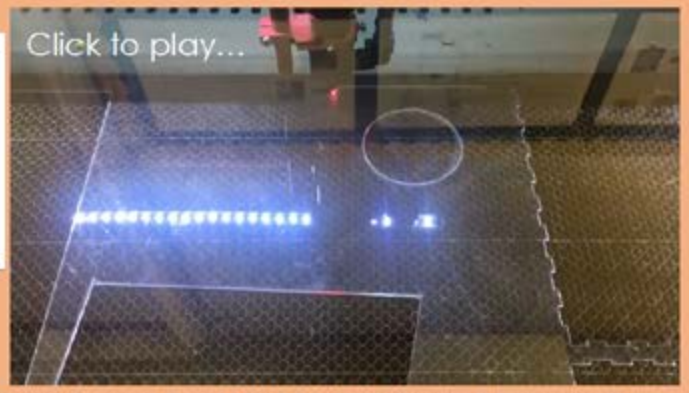
However, the main let down for design 8 was according to the PUNs Table is the portability of it. Therefore I will have to add or adapt features to ensure this is solved.

9

DESIGN 8 - BALL RECIEVER

Here, I am exploring which materials I should use, what shape my base (where the tennis balls go through) should be and the measurements for it. To begin with I measured an already existing ball hopper to see what the width of the base is and found it had a diameter of 30mm...





Therefore, using 2D design, I designed a square and circular base to test out the strength of Perspex and to figure out the correct measurements. I cut it out on 4mm Perspex on a laser cutter. However, when I came to test it out, I concluded that a 30mm wide diameter is too narrow. With a lot of pressure, the square base let the ball through but eventually broke too as Perspex is quite brittle: whereas the circular base didn't allow the ball to go through at all. My next step was to widen the base in plywood.

After an unsuccessful iIercompletely...

I went on to make a wider square and circular base in 4mm plywood. I widened the base by 3mm. However, when I came to cut it on the laser cutter, it didn't go through .
Intrigued, I researched what this could be and learnt that this was caused by natural irregularities in the plywood called knots due to things like broke limbs or rapid growth of the tree. They were unavoidable, but I was made aware. I attempted to complete the cut with a scalpel but it wasn't enough to completely cut through the plywood. Therefore, I used a different sheet of plywood to cut the bases to test out and improve.

The bands of defect in the plywood.

After adding 3mm to the hole in the base on 2d design, I cut it out in plywood on the laser cutter in a square and circular shape. The width was accurate enough to allow the ball through with some pressure (so it won't fall out of the ball hopper after it has enters) but not too much (so it is easy to use by my Primary User).

However, I also concluded that I'd definitely use a square base as, although I'd used the same diameter of 31.5mm, the circular base didn't let the ball through. It minimises friction between the ball and he ball hopper as the corners act as extra space. This would ensure that there is no damage done to the balls **(Primary User Need 3)** or to the ball hopper, allowing it to last longer as a product.

PUN	
P1	-
P2	-
P3	✓
P4	-
P5	-
1/5	

Begin Iterating the handle

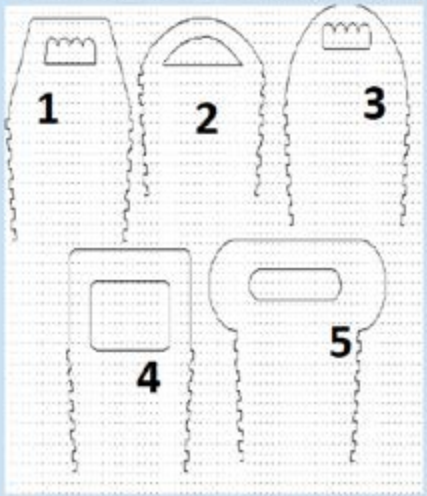
10

Design Development - Iteration of Design 8 (a) ...

DESIGN 8 – HANDLE

Next, I sketched out potential different handle designs, for my product to allow it to be as comfortable to carry as possible...

I then decided to draw them out on 2D design (CAD) to see how they'd actually look like, in a more realistic way...



I sent my Primary user some straps that would be compatible with my product and she selected these two.
https://www.shockstrap.com/blog/which-tie-down-webbing-is-better-polypropylene-nylon-or-polyester
https://www.amazon.co.uk/slp/shoulder-straps/orrstzppdocu?cu
After looking through reviews and details of each strap, she preferred these 2 as she felt they were the most comfortable, the most durable and the most fairly priced.

Jess I have sent a link to all the straps that would be potentially compatible with my product. Take a look at the reviews and product description and choose which you feel would be most convenient. Thank you.

I think these two would be the best. They have the best review and look the most comfortable in my opinion, which is quite important. They're also the most fairly priced so I'd definitely go for those :)

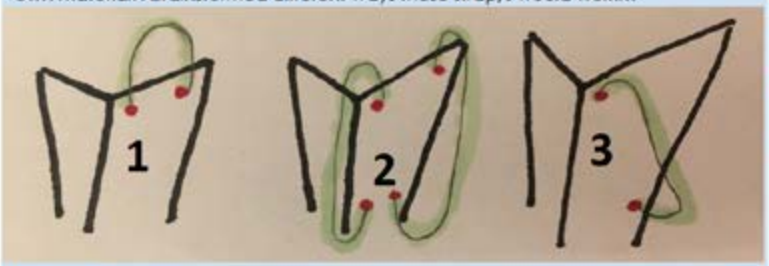
I then got some feedback from a friend of mine, an architecture student , to see which one she felt was most appropriate for my product
.

We concluded that the best would be handle design 3 as it was the most ergonomic, usable, aesthetic and efficient in its function.

Begin Iterating the straps

DESIGN 8 – STRAPS

However, after choosing the handle I wanted to add another feature to my product to allow it to be even easier to carry. I decided straps would be the best (from my initial idea 7). Having straps would really upgrade my design as it meant it was no longer handheld which is more comfortable and practical. It also offered users more options to use my product – a plus on a whole.
With time constraints, I decided to buy some straps instead of making them with my own material. I brainstormed different ways these strap/s would work...



In terms of the material of the strap, I decided that a webbed plastic would distribute the weight of the balls the best. I researched the best type of webbing...

Tie Down Property	Polypropylene	Nylon	Polyester
Overall Safety	*Poor*	*Fair*	*Excellent*
UV Protection	*Good*	*Good*	*Excellent*
Water Resistant	*Excellent*	*Fair*	*Excellent*
Break Strength (subject to change)	*Poor* 500 lbs.	*Good* 2,500 – 7,500 lbs	*Excellent* 5,000 – 10,000 lbs.
Abrasion Resistance	*Poor*	*Fair*	*Excellent*
Fiber Stretch	*Poor* 10%	*Fair* 20%-30%	*Excellent* 3%-12%

My research concluded that overall the polyester webbing is the b est. However, I wasn't going to carry 10000lbs with it and it had other unnecessary features. Straps of this type were quite expensive and weren't easy to find tool So instead, I went for the nylon webbing straps...
I searched for different types of straps on amazon. My search concluded that my straps definitely had to be adjustable so my product by anyone of any height and to be adjusted depending on comfort and convenience. Initially, I thought of buying some straps like in FIGURE 1 as they are padded, offering maximum support and comfort. However, this would only work in the form of the backpack example 2. It also seems a little out of place on tennis equipment. Therefore, I settled on the straps in FIGURE 2. They're lightweight, adjustable and can be used in multiple different ways. I ordered them in the widest available size as this would distribute the weight the best, making my product more ergonomic.

Figure 1

Figure 2

How would the straps be attached?

However, after a review from a peer, I had a EUREKA moment... Instead of permanently attaching my straps, I could have little hoops (possible strong rope knots) at 4 points like in example 2 and then the straps could in any arrangements and be taken on and off as wanted, offering more freedom to my users. This also meant that all of the above strap arrangements could be achieved, depending on the users preference.

11

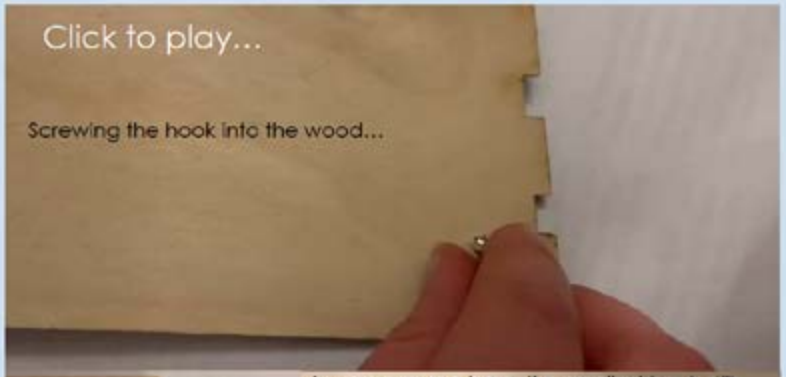
PUN
P1 ✓
P2 -
P3 ✓
P4 -
P5 -
2/5

Design Development - Iteration of Design 8 (b) ...

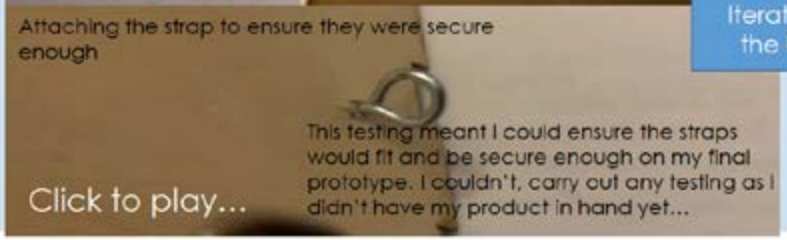
DESIGN 8 – ATTACHING THE STRAPS

In order to attach the straps, I decided I use some closed hooks and then attach the strap using the carabiner it comes with. I found a few different

I chose the smallest one as it meant it wouldn't stick out (into the 4mm plywood) into my ball hopper (which could damage the balls).



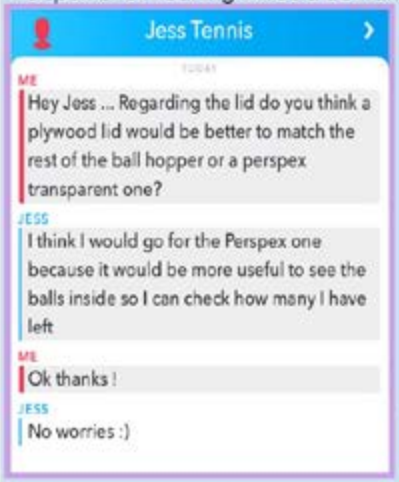
As you can see here, the smallest hook still sticks out on the other side of the wood. Therefore, when making my Final Prototype, I will add small wooden squares on the inside so it wont come into contact with the balls and possibly damage them

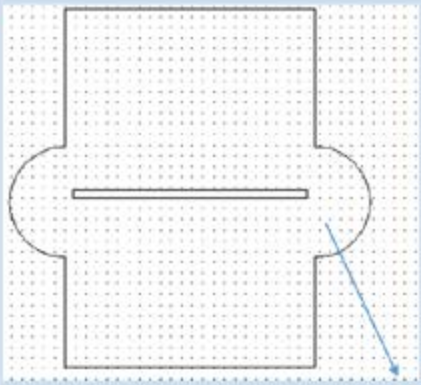


This testing meant I could ensure the straps would fit and be secure enough on my final prototype. I couldn't, carry out any testing as I didn't have my product in hand yet...

DESIGN 8 – LID

Having a lid was essential to my design as it meant users could ensure that their tennis balls were secure in the ball hopper and wouldn't roll out when being stored asked my Primary user whether shed prefer a woken lid to match the rest of the ball hopper or a Perspex one meaning it would be transparent. Here was her response...





Used as handles to lift the lid easily

I cut out the lid using the laser cutter in 2mm Perspex.
However, I soon realised that my design was wrong. I couldn't have the handles protruding on both sides if the product was to be carried on the users back..
Instead of printing a new one, I used a knife to snap it...

PUN	
P1	✓
P2	✓
P3	✓
P4	-
P5	-
3/5	

Begin Iterating the lid

Begin Iterating the body of the design

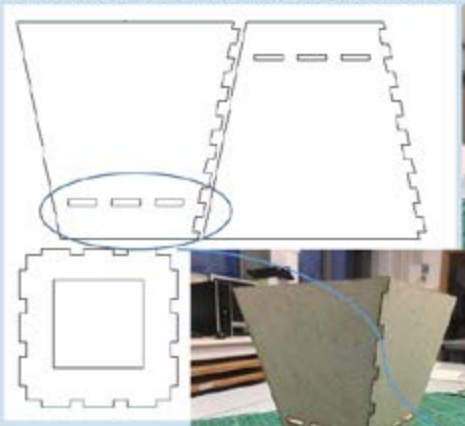
12

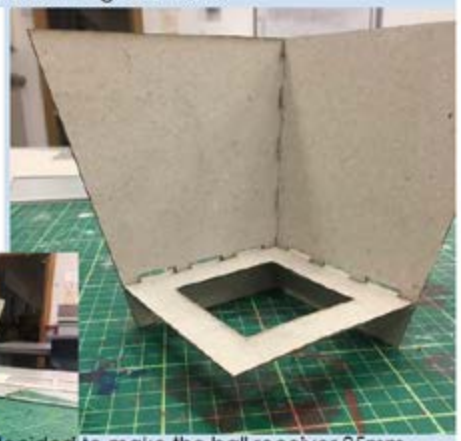
Design Development - Iteration of Design 8 (c) ...

DESIGN 8 – BODY

I then decided to make a smaller scale prototype that would allow me to understand the best possible measurements for the product and get a clearer idea of how my interlocking joints would work, particularly as the sides of the ball hopper would stand at an angle. It also allowed me to see how my prototype would look with the ball receiver and how it would work

I cut it on card first to ensure the joints match and fit together well.





I decided to make the ball receiver 25mm above the ground as it means the balls wouldn't hand from the bottom. It would also mean, when collecting the balls, it would stop the balls from rolling away

My prototype was successful and confirmed that this design had to potential and therefore, I continued to develop it.

DESIGN 8 – TAKING MEASUREMENTS

Similarly to my first design iteration of design 1, I noticed that Primary User Need 1 - **The ball hopper must be portable and easy to carry** and **5 - The ball hopper must hold roughly 50-60 balls** may clash a little because as you increase the number of balls the ball hopper increase, the weight of the ball hopper increases – THIS WAS INEVITABLE and I had little control over it in my design. However, I did some research on how to make object lighter and noted that one way of easing weigh off my user is to make sure the handle is as comfortable and that it can be grabbed with ease – as ergonomic as possible. So I measured the width of each of her pinkie, ring, middle and index fingers, as well as the total width of all of them(figure 1). To make the handle as comfortable as possible for my Primary User, I added a few mm as a leeway for movement for each partition

For practicality for whilst collecting the balls, I took measurements of the length between her fingertips down to the ground as this would be the ideal height of the ball hopper when holding the ball hopper and collecting the balls (figure 2). This came to 600mm.

Figure 1

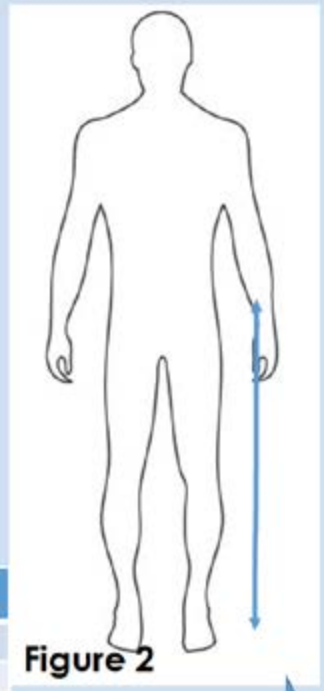


Figure 2

Consider the measurements

PUN	
P1	-
P2	✓
P3	✓
P4	✓
P5	-
3/5	

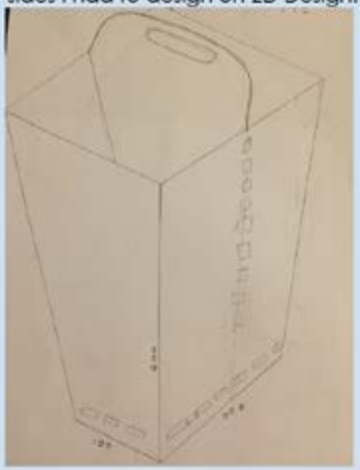
Begin designing the body on CAD

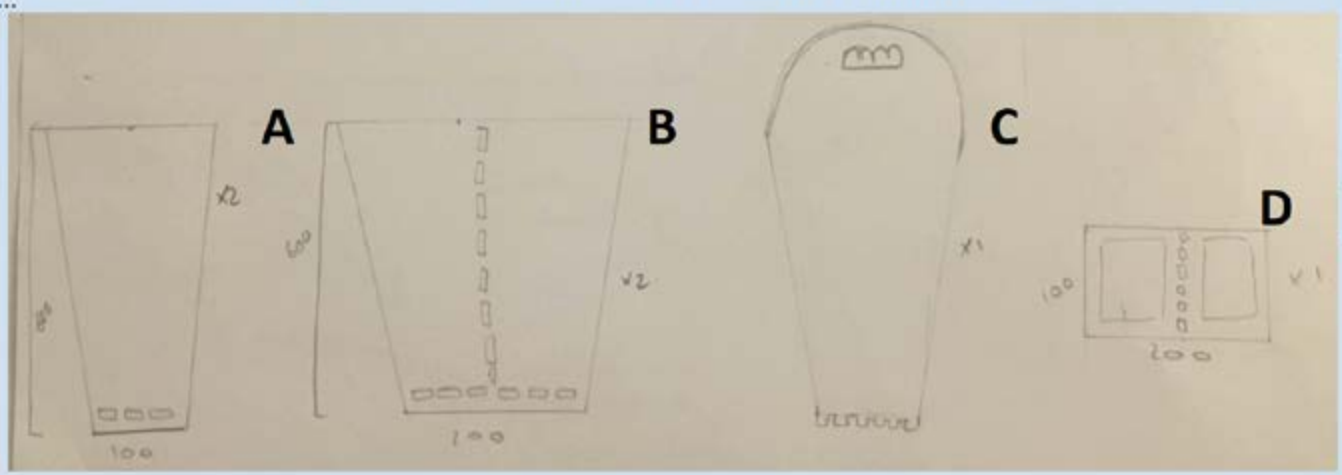
13

Design Development - Iteration of Design 8 (d) …

DESIGN 8 – THE MAIN BODY

After I had all my measurement that I needed and practised my finger locking joints, I sketched out my final design, measurements and break down of the different sides I had to design on 2D Design...





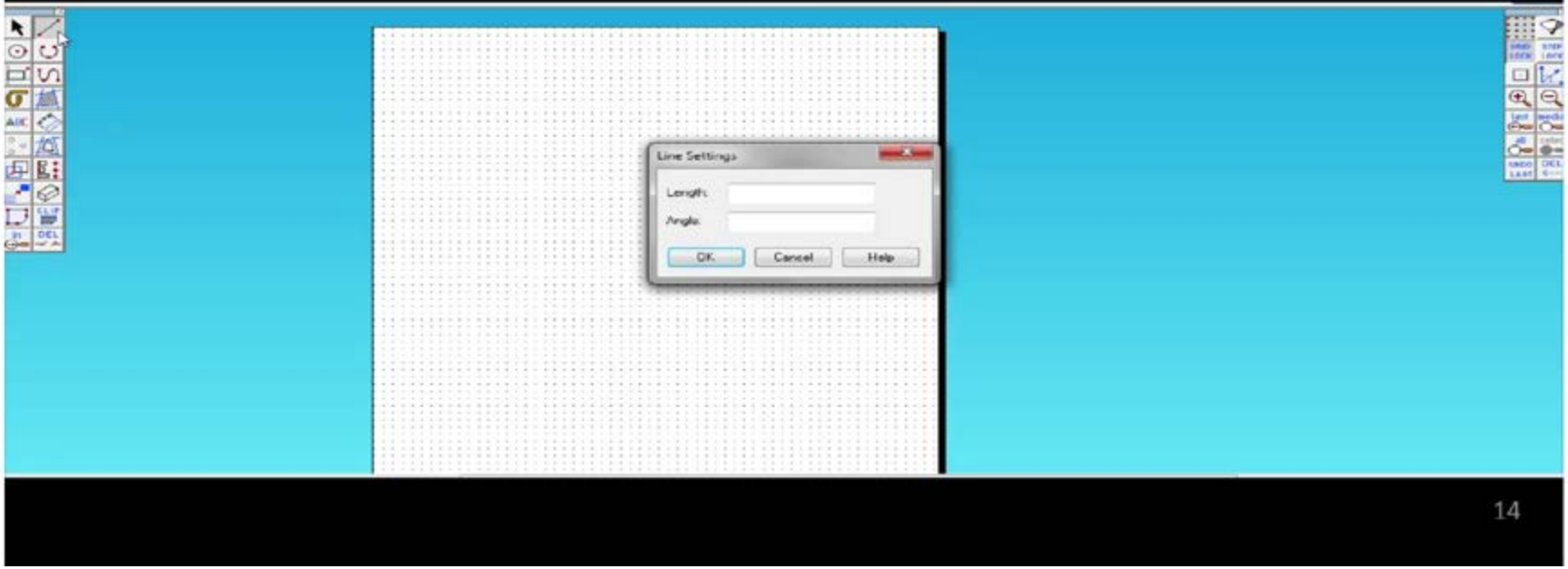
PUN

P1	✓
P2	✓
P3	✓
P4	✓
P5	✓

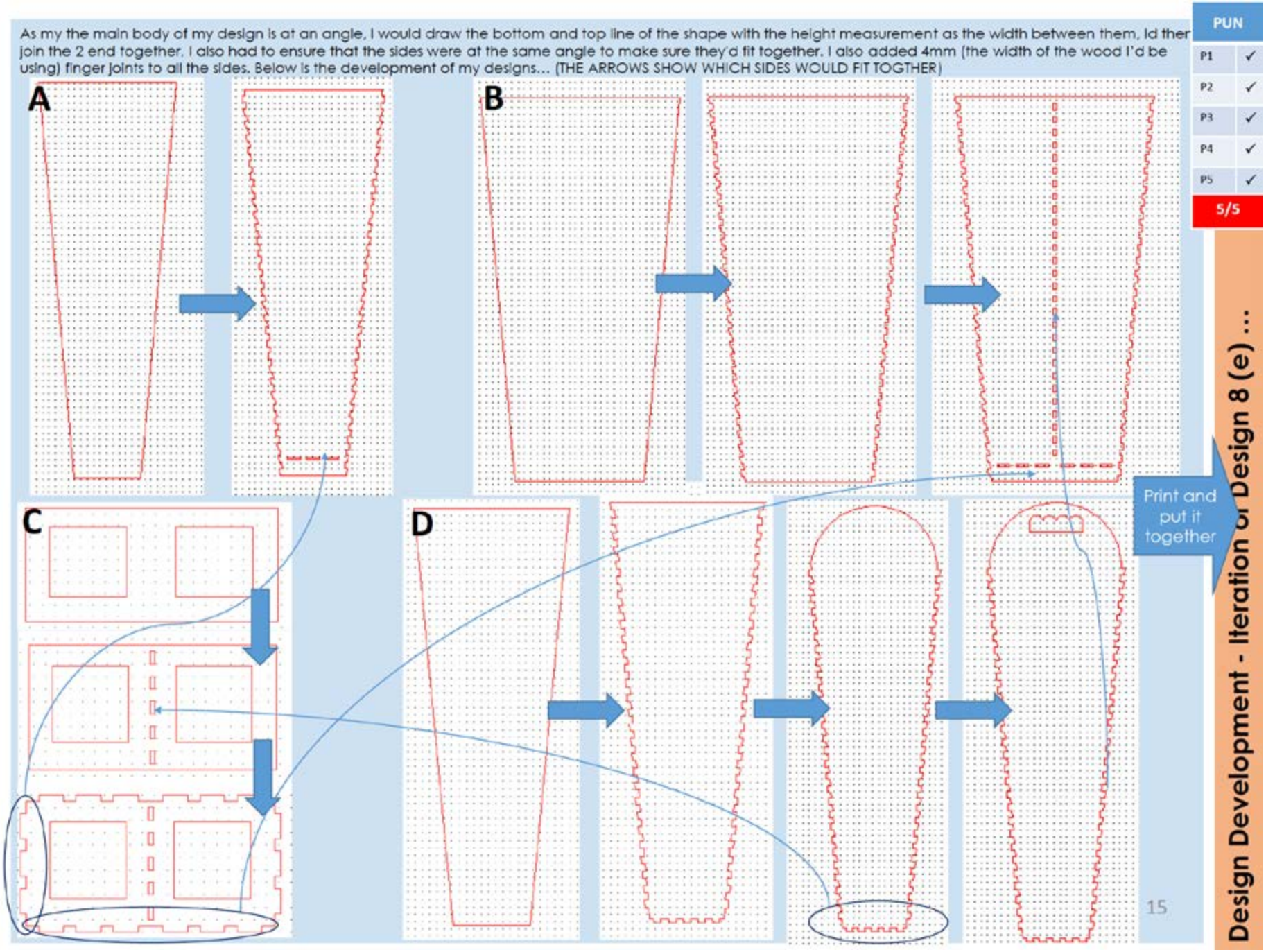
5/5

Here is a recording of how I would design the sides... (this one is of specifically side B)

Click to play...

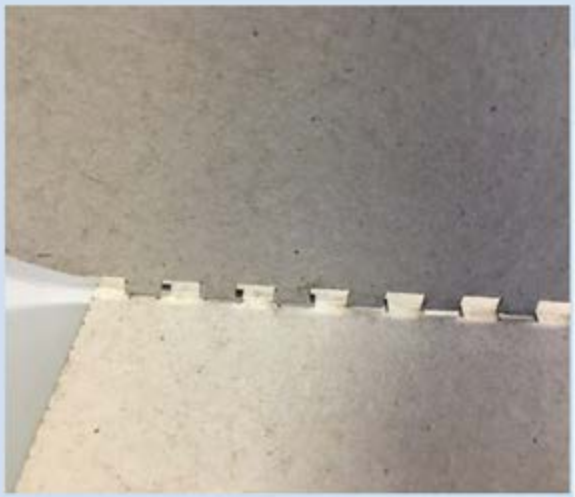


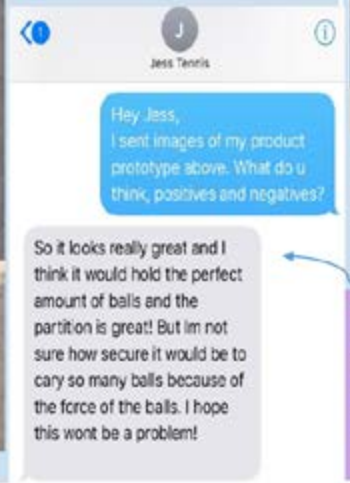
Design Development - Iteration of Design 8 (e) ...


As my the main body of my design is at an angle, I would draw the bottom and top line of the shape with the height measurement as the width between them, Id ther join the 2 end together. I also had to ensure that the sides were at the same angle to make sure they'd fit together. I also added 4mm (the width of the wood I'd be using) finger joints to all the sides. Below is the development of my designs... (THE ARROWS SHOW WHICH SIDES WOULD FIT TOGTHER)
A
B
C
D
PUN
P1 ✓
P2 ✓
P3 ✓
P4 ✓
P5 ✓
5/5
Print and put it together
Design Development - Iteration of Design 8 (e) ...
15

After having drawn them out on 2D design, I printed it out on card to ensure all the joints fit together. All four outer pieces to form the main box body fir together. It highlighted some issues too. I made the bottom line of joints on the sides (to fit into the ball reliever) 2mm instead of 4mm so they wouldn't fit into each other in when made in plywood. This was easily solved by a few adjustments to the files. My main issue was that my partition joints wouldn't fit into my sides. They'd fit in the top end but wouldn't in the bottom end and vice versa. I checked all my documents and they technically, in terms of measurements, they should fit. But they just didn't! The only reasonable explanation was that the joints were at an angle...

The only solution was t sit down and mark how much each joint had to move to fit...





After manipulating my files to match my findings, I printed another partition and it fit!

Finalising the whole design

The gaps between the joints were because a made the joints 4mm for the plywood and the card was of course much thinner so the joints stuck out. This wouldn't be the case in.
Obviously, I couldn't carry out any primary user testing as it was in card so it wouldn't work. However, as I had tested out my ball receiver in plywood, I already had confirmation it would work.

However, I sent images of this prototype to Jess to see if she had any improvements or concerns. Jess was really impressed and said it would be great as it would carry enough balls and was really happy with the partition. Her main concern was that when the ball hopper was full that potentially if it wasn't strong enough it would fall apart from the weight and pressure of the balls. I reassured her that although the card prototype did look flimsy. Id be using strong plywood and very strong wood glue too.

16

PUN	
P1	✓
P2	✓
P3	✓
P4	✓
P5	✓
5/5	

Design Development - Iteration of Design 8 (f) ...

Does it meet my stakeholder requirements?

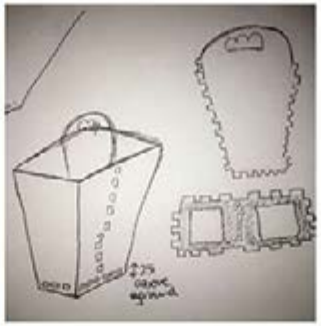
- ✓ The ball hopper must be durable and sturdy (withstand pressure and weight)
- ✓ The ball hopper should be light weight
- ✓ **The ball hopper must be portable and easy to carry**
- ✓ The ball hopper must be weather proof
- ✓ The ball hopper must be easy, quick and simple to use
- ✓ The ball hopper should withstand misuse
- ❑ The ball hopper should not have protruding feeble attachments
- ✓ **The ball hopper must be self standing securely**
- ✓ **The ball hopper must not damage the tennis balls**
- ✓ The ball hopper must collect balls efficiently
- ✓ The ball hopper must allow easy access to balls
- ✓ The ball hopper should have a lid
- ✓ **The ball hopper must have a partition to separate the different types of balls**
- ✓ **The ball hopper must hold roughly 50-60 balls**
- ✓ The ball hopper should fit in an average car boot

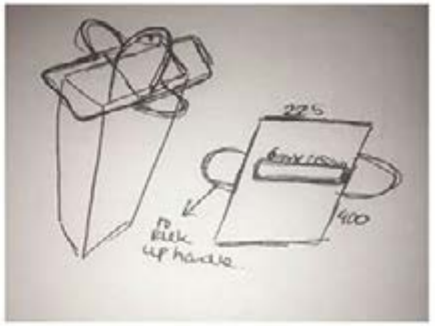
- ✓ The ball hopper should stand at an appropriate height
- ✓ The ball hopper could have a strap
- ✓ The ball hopper could be colour coded (relevant colour to the ball type)
- ✓ The ball hopper should be usable for all playing abilities
- ✓ The ball hopper should be attractive
- ❑ The ball hopper could have a theme
- ✓ The ball hopper should be made of plywood

So after my iteration, I finalised my design:

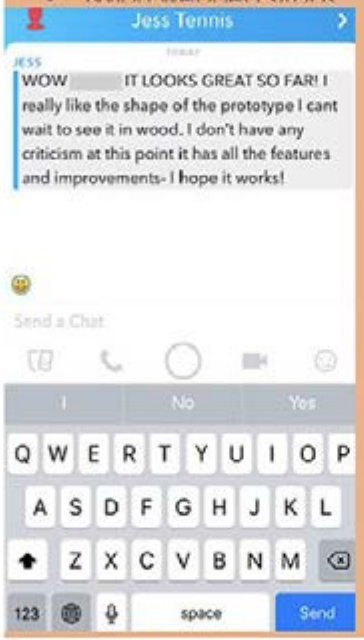
My final prototype will have :

- A 2mm Perspex Lid
- A varnished 4mm Plywood body with a partition in the middle that is attached to a handle
- A coloured ball receiver (to indicate the different ball types)
- Nylon webbed straps





PUN	
P1	✓
P2	✓
P3	✓
P4	✓
P5	✓
5/5	



Finally, messaged my Primary user these features and images of my card prototype for some feedback:
She was happy with the body of the prototype and agreed that all the features and improvements had been included in my design

Create a 'Final Design' proposal to show stakeholders

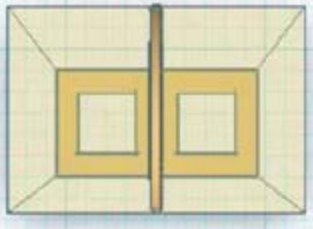
17

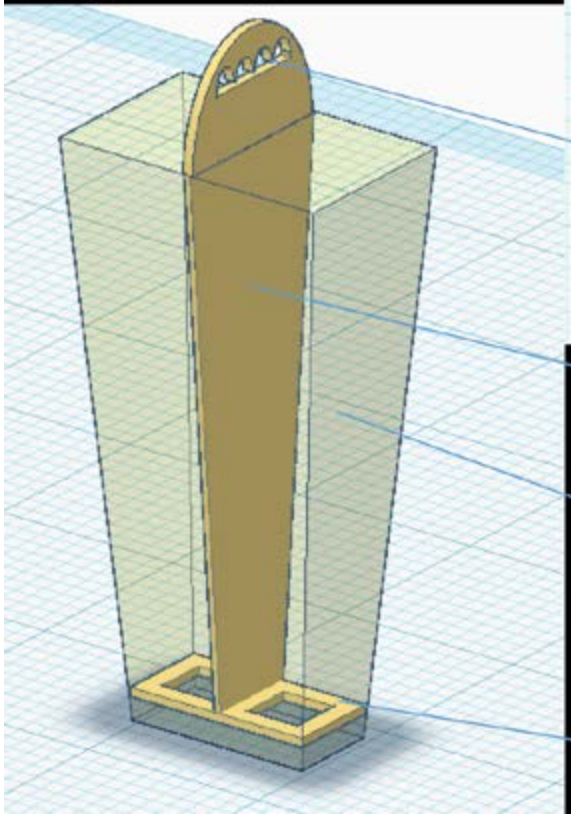
Development of final design - Finalising my design...

THE BALLER

THE BALLER offers an improved tennis coaching experience with a partition separating different types of balls and collecting system – a real game changer...

Click to play...





An ergonomic handle for comfort when moving around

Holds 50-60 ball roughly – Ideal for a tennis lesson or storage

A partition to separate different ball types – Ideal for a multi-ability session

Efficiently collects ball when pressure is exerted by handle. Designed to let balls in but not out.

18

Examiner commentary

This candidate has made excellent use of real time evidence to document their systematic approach to their development.

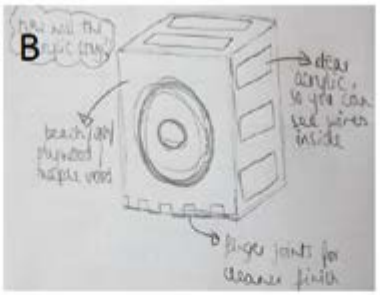
A range of experiments alongside their sketches and modelling consistently communicate their design thinking clearly alongside a detailed written account.

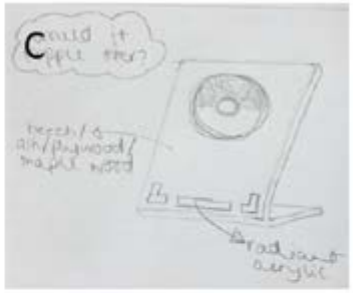
Formal presentation of their final design solution uses an animated video of their design that would clearly communicate its intentions to their stakeholders.

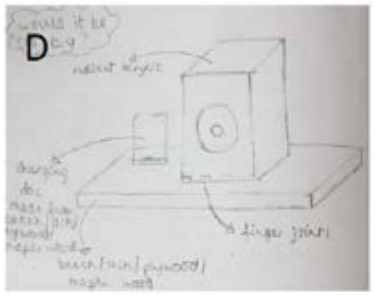
Exemplar 8

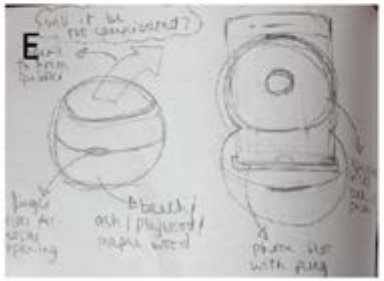
11/16 (Mark Band 3)

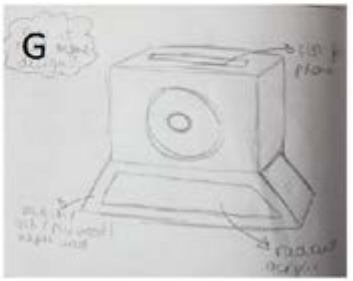
Initial Ideas

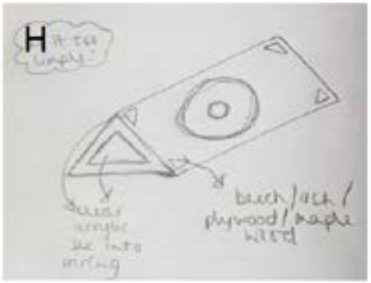


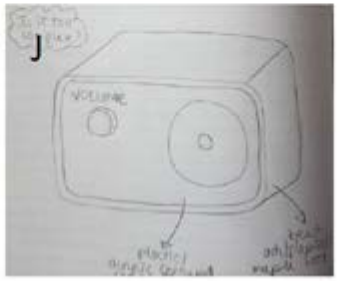


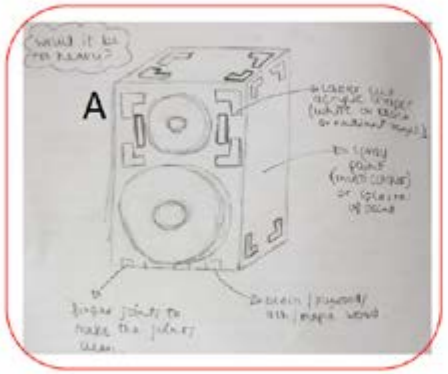


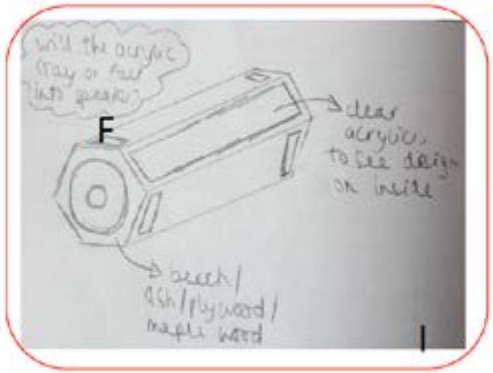












	A					F			I	
Weight (light)	*	**	*	***	***	**	***	*	**	***
Sound levels	**	**	**	**	**	**	**	**	**	**
Quality (sound)	**	**	**	**	**	**	**	**	**	**
Volume Control	***	***	***	***	***	***	***	***	***	***
Durable	**	*	*	*	*	***	*	*	**	**
Aesthet-ically pleasing	***	*	**	*	**	**	**	*	*	**
TOTAL	**13**	**11**	**11**	**12**	**13**	**12**	**13**	**9**	**12**	**14**

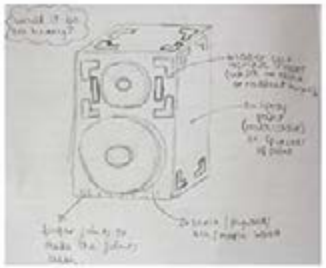
Explanation:
We had the Christmas holidays to create between 8-12 design ideas. I started by looking back at my stakeholders needs and wants so that I could incorporate them in my designs. After designing the main shapes I decided to annotate the sketches which meant it was easier to pitch my ideas quicker.

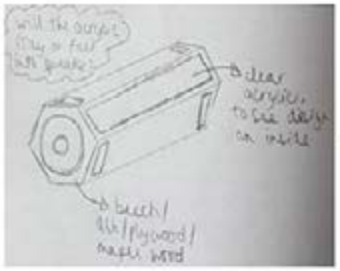
I have placed a red ring around the sketches that I prefer, and this makes it easier for me to pick them out quicker.

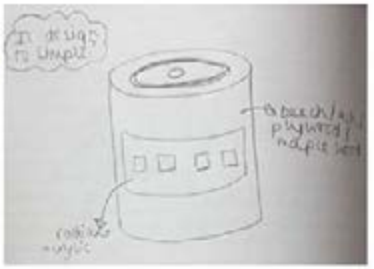
To decide which of my sketches have the best design and work the best I have created a table with my stakeholders needs and wants in and I have scored them out of 3 (I have used asterisks) *** being the highest and * being the lowest.

Next Step:
Get feedback from my stakeholder and choose 2 main ideas to focus on

Deciding Which Ideas to Take Forward





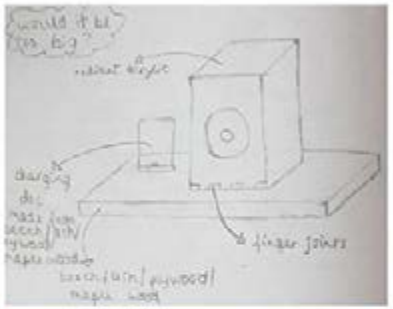


Showing my stakeholder my initial sketches

I met up with my stakeholder on Saturday evening and we spoke about my sketches and initial ideas from my exercise book.

We agreed that A and F were the better designs and he didn't like I as much because there is a speaker made in that shape with that design.

He quite likes the idea of the radiant acrylic and the basic shape of the box made out of good quality wood.



Although I really liked this idea we agreed that a charging doc would be kind of useless as people with different type of phones cant charge them.

Next Step:

Create models of the 3 chosen ideas and get more feedback.

Deciding Which Ideas to Take Forward

Model Designs

Model of sketch A:

Laser cut acrylic shapes (either white or radiant acrylic)

Different colored shapes to indicate the different colours of acrylic used

There are two speakers for optimum volume as well as aesthetics.

Model of sketch F:

Speaker is placed on the end of the housing for optimum sound.

Clear acrylic for view into the inside of the speaker.

Here are 3 model designs constructed with cardboard and I have used colour to indicate where the acrylic would be.

Model of sketch I:

Speaker is placed on the top of the housing as otherwise it wouldn't sit in the housing comfortably

Radiant acrylic shape with shapes cut out the inside for more modern design.

Next Step:

Improve models and make first prototype

Iteration A1

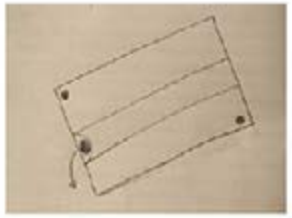
I am thinking of using recycled woods to make the main housing of the speaker and the safe inside. I will make the housing 24cm x 18cn and the safe 17cm x 11cm x 10cm.

This will leave enough space for small possessions to be stored in it. I am going to be using a spring release joint to keep the door secret without needing a handle.

I chose to use a spring release joint on the door of the safe as it doesn't make it obvious that there is a door so no handle is needed and it will make it easier for storage and transporting as you wont need to worry about a handle scratching anything or not being able to fit into small spaces perfectly.

The dimensions for the base of the sprin release are 5cm x 3cm.

This will help people of all ages have access to the safe which can be seen as an disadvantage as well as an advantage as this means anyone can have access to the items stored in the safe which means that the items are more likely to get stolen.



One of the only disadvantages is that the door will not have a lock on it which will also increase the chances of theft. I have drawn some diagrams of how it works.

Feedback form my stakeholder:

I met up with my stakeholder to talk about the changes I made on my design and we spoke about what he would want to store in the safe.

Things that we mentioned were:

- Chargers
- Money
- Watches
- Jewelry
- Sweets
- Phones

We agreed that these were appropriate items for keeping in a small safe, we discharged the ideas of drinks bottles, items of clothing and any larger items as these would not fit.

We measures out the dimensions and changed them a little to accommodate his needs. We also made sure that there was space for all the wiring for the speaker and any wires that need to enter or leave the speaker.

Next step:
Improve security of the safe

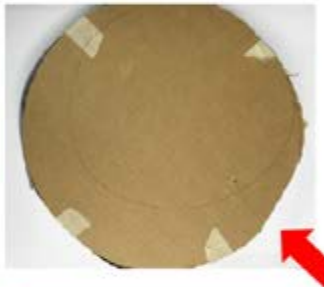
Iteration A1 + X

After the lesson on Wednesday I decided that my speaker housing was to simple and was very easy to make, I decided with help from the teacher that a circular speaker was a good and that I could still have a safe and it be big enough to fit my phone in it.

We also decided that my phone should have a platform at an angle in side the safe, this makes it easier to access your phone quicker if it is on a slight slope and there is not chance of it getting stuck as it won't be able to tilt or move.

I then met up with my stakeholder on Thursday night and we discussed these ideas. We made a final decision that the safe would be located under the speaker as this would act as the lid and it won't be obvious that it is there.

As I have the iPhone 7plus we needed the dimensions to be bigger than: 158.2 x 77.9 x 7.3 mm.



I thought this was a good example of keeping it simple and not making it obvious that it is there, I also liked the idea of using everyday items to disguise what it is.

Other people have also used clocks, plug sockets, books, fans and alarm clocks. I noticed that these items are things that everybody has in their house and that it can be very easy to hide things without people knowing, as it will look modern

I looked at some ideas online at different ways that people secretly store things around their house and I looked at what we had around the house but I couldn't find anything that was helpful.

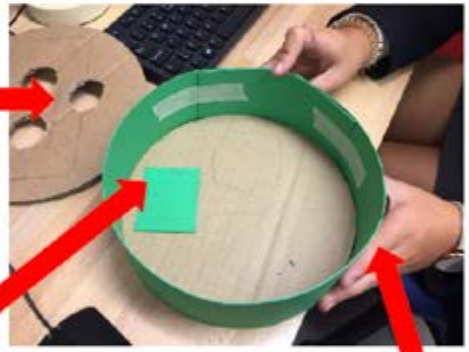
Online I did see that people store money and phones and other precious items in air vents in the walls of their houses.

Next step:
Figure out how the safe door will work.

I made a new model with the dimensions 210 x 210 x70. I made sure that an IPhone 7 plus would fit in with plenty of room for other things as well.

I made the format of them just like a bowling ball as it is easier to use two fingers and a thumb that just two fingers or one finger and one thumb.

The base of the speaker comes off and turns into a safe so I made finger holes 35mm in diameter so that people with a larger width of finger can still use it.



The speaker itself is 29mm deep and 61mm wide. This means that I can fit two speakers in. The circuit board is 53mm x 65mm and I can also fit this in the top with the speakers.

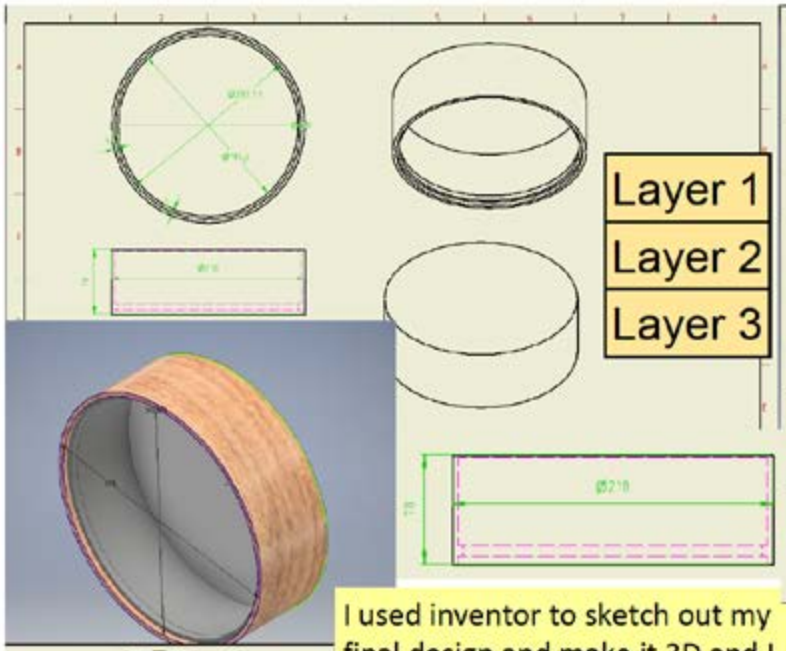
When you open the bottom of the safe, which is going to have a shelf for the base to sit on so that it doesn't collapse in and damage the contents, you will see the underside of the speakers and the circuit board. This is so that if someone does find the safe then they will just think that it is either broken or it was designed to do that.

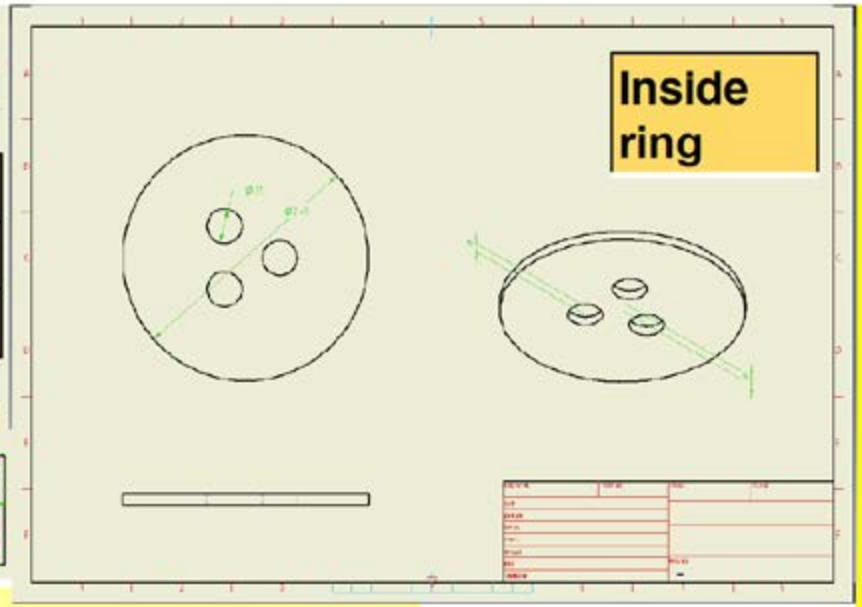
Extra Research:

I researched the size and the distance between the wholes and these are the sizes:
Diameter of finger wholes: 35mm x 35mm
Distance between the finger wholes: 10mm

Next step:
Draw out my final design on inventor.

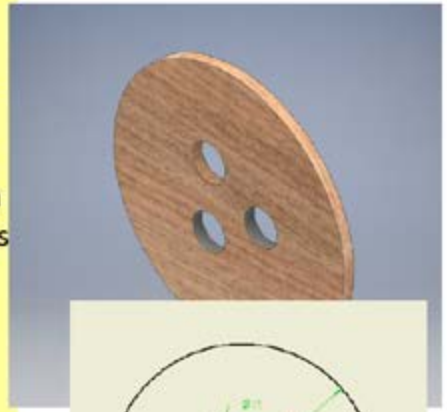
Iteration A2

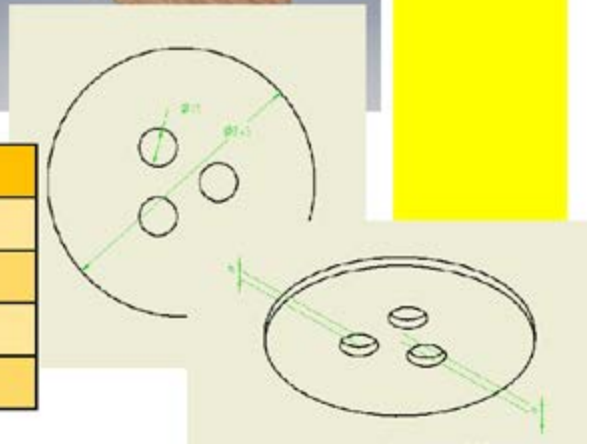




Materials and sizes

I used inventor to sketch out my final design and make it 3D and I used the materials tool to make the model look more like the finished product. I then converted it onto the contact sheet and used one of the tools to select the sections and measure them. I could then use these dimensions when I drew it out on 2D design to then be used on the router. I used the dimensions from investigating the size of items that my stakeholder wanted to fit in the safe and I combined them with the sized of wood that I had and made the final dimensions of the speaker housing.





Part	Material
Layer 1	Oak Block
Layer 2	Afrormosia
Layer 3	Jelutong
Inside ring	Acrylic

Examiner commentary

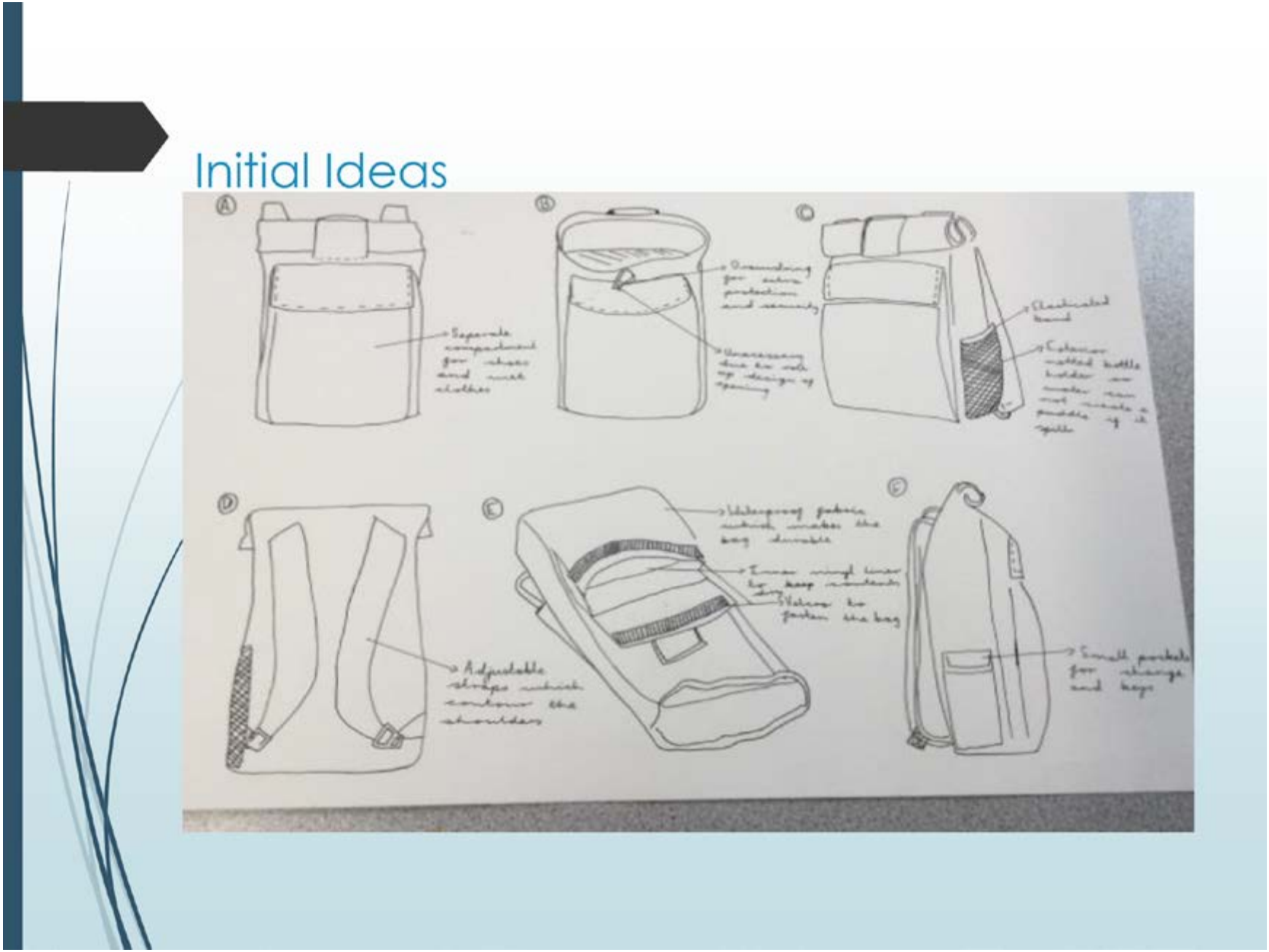
This candidate uses colour to help organise their development. Conversations with their primary user are easy to follow and its clear how these influence the development of the idea.

Informal sketching is good quality and modelling moves from card to more resistant materials.

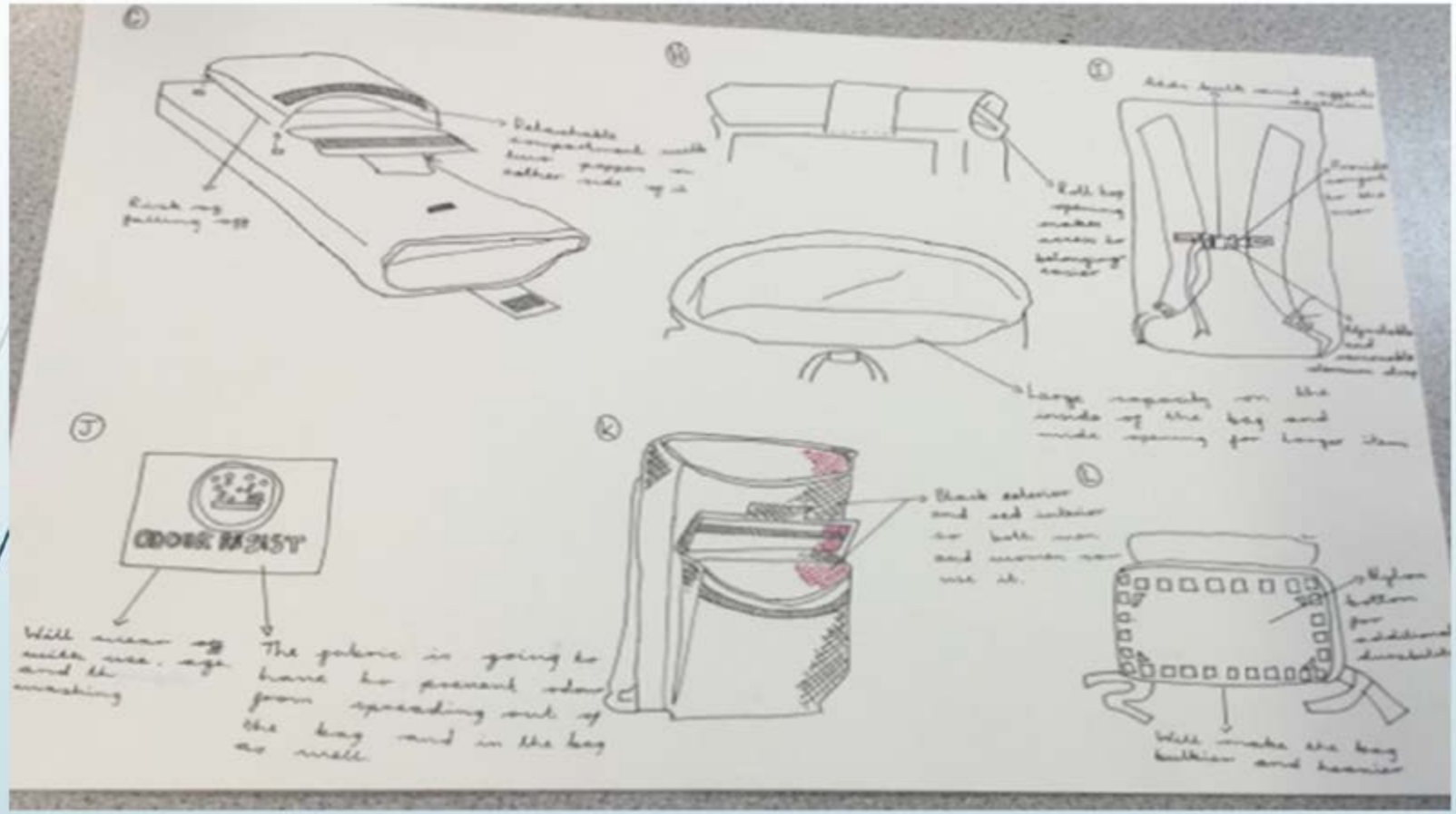
What limits their mark is a lack of a final design solution being presented. While it can be inferred from the technical specification it is no substitute for a standalone page that clearly demonstrates to the stakeholders the details overall look of the proposal.

Exemplar 9

5/16 (Mark Band 2)



Initial Ideas



Feedback from Initial Ideas

RESULTS OF THE STAKEHOLDERS VIABILITY QUESTIONNAIRE

The results of the four Stakeholder Questionnaires have been totaled and the results, shown on the table below, have been used to determine which features should be used on the final sports bag.

P.U.N.	A Separate compart-ment	B Drawstring	C External bottle carrier	D Adjustable straps	E Waterproof fabric	F Small pockets	G Detachable compartment	H Roll top	I Adjustable removable sternum strap	J Odour resistant fabric	K Unisex colours	L Nylon bottom
Total	80	68	84	78	83	75	73	80	64	57	77	61

Key:

The highlighted totals represent the top six scoring features to be used in the final sports bag design

In addition to asking the Stakeholders to complete the questionnaires, I also asked for any of their additional comments about my design sketches.

Jonathan really liked the idea of a detachable compartment but was concerned the poppers might rust, he also offered the idea of adding florescent strips so the user could be seen in the dark. Justine queried which would be the best fabric allowing for wet clothing, odour resistance and durability. Having looked at the options, including canvas, waterproof rubber, neoprene I have chosen a water resistant coated cotton twill for the exterior and a vinyl liner for the interior. Mike liked the idea of having a totally waterproof section for his wet swimming gear and suggested including a name and address label in the event of loss or theft. Jane thought the roll top opening, allowing for easy access and the bag to be made taller or shorter, was a really good design but didn't like the aesthetics or design of the sternum strap.

Next Stage

Design my prototype with the six most popular features.
Look at suitable fabrics and materials for bag.
Make prototype and test it.

Iteration 1- Paper Model

The purpose of this paper model is to see what measurements the bag will have when I come to make the bag out of fabric.

I decided to add a second compartment to my bag for sports wear.

I decided to add pockets to my bag as it will help to distribute the weight.

I will fix any problems by adjusting the design of my multi-purpose bag.

My primary user gave me some positive feedback because he said that he liked the size and shape of the bag.

Iteration 2 – Fabric Model

I decided that I would reuse a bag that I had brought with me to make a pattern template, so I unpicked the stitches and drew around the different parts to make my bag.

My primary user was pleased to see that I was reusing parts of the bag in order to make my pattern pieces for my product.

To fix any problems I will redraw and recut the pattern pieces that are needed.

I decided to make a pocket that will be on the front of the bottom half of my bag.

After I had took elements of the bag and adapted them slightly to create my own pattern I drew straight lines with tailors chalk 1.5 centimetres from the edge of the fabric and sewed the fabric pieces together to make the bottom half of my bag which is where the work items will be stored.

After I had took elements of the bag and adapted them slightly to create my own pattern I drew straight lines with tailors chalk 1.5 centimetres from the edge of the fabric and sewed the fabric pieces together to make the top half of my bag which is where the sports gear will be stored.

Iteration 3 – Additional pockets / fastenings

I will redraw around the templates that went wrong to fix any problems

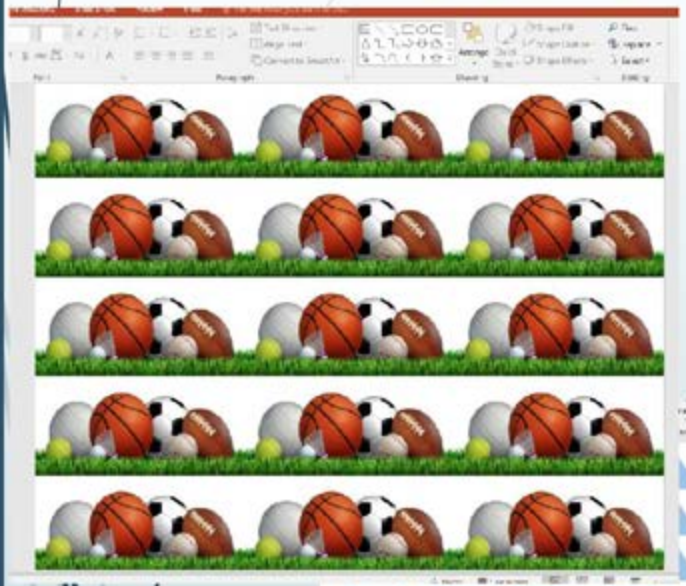
I decided that in order to make any additional pockets and fastenings I would have to reuse the bag that I had brought with me to make a pattern template, so I drew around the different parts to make this possible.

I decided to add a pocket, that will be patterned, to go on the bottom half of my bag at the front.

My primary user gave me positive feedback as he was pleased that I was reusing the bag that I brought into school.

I decided to add a pocket to put a water bottle if ever the user is carrying one with them whenever they are going to work.

Iteration 4 – Creating a fabric print/ Microencapsulation



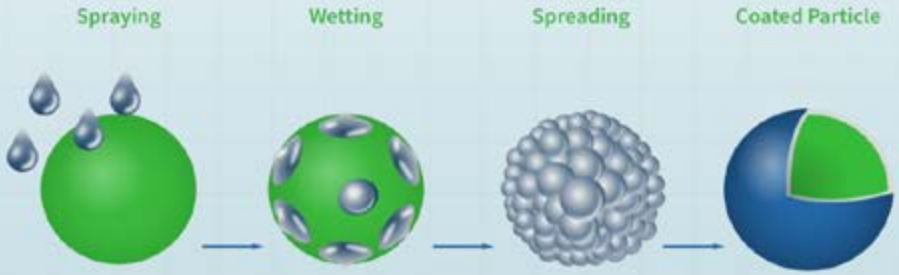
Microencapsulation is a process where pleasant odours get encapsulated in a tiny thin-walled natural or synthetic bubble.

The material inside the microcapsule is referred to as the core, whereas the wall is sometimes called a shell

I think that this will be a great addition to the properties of my bag because it will prevent the sweaty odour from your sports wear from escaping into the surrounding air.

It is mainly used to increase the stability and life of the product being encapsulated.

One downside of using this for my product is that it will eventually wear off through use and through washing the product.



Final Design

Needs:-

•Should not be greater than the person's weight because if it is heavy for the person to carry it could cause back problems.

•Have a padded back which should be the width of the person's back because it will be more comfortable for the user to wear.

•Have padded shoulder straps which are wide at the top and narrower at the bottom because it will feel more comfortable for the user.

•Have a strap that goes round your waist to stabilise objects because objects such as the users' water bottle could fall out

•Have pockets to distribute weight because it will make the bag less heavy to carry on their backs to their work or the gym.

•Made from durable material because the user can use the product for longer and that the material will not end up tearing whilst they are carrying things in the product.

•Have a netted water bottle pouch on the side of the bag because if water does come out it won't create a pool of water in the bottom.

•Has to be easy to transport because the user wants to carry the product to work and to the gym and doesn't want the product to be too big.

•External clips to secure objects because objects can be misplaced or damaged when being transported from place to place.

•Internal support, for example frames because then the product cannot become a different shape unless the frames inside the product are broken.

Examiner commentary

This example starts with some good quality sketches of their initial ideas but it is unclear which idea is to be developed.

The first paper model development helps with this but then further development is limited, with no evidence of the idea being tested and the problems that this would highlight.

At one stage the idea is a copy of an existing bag that has been dismantled which alters the intended design considerably.

The final design provides some clarity to a third party stakeholder.

STRAND 4

Exemplar 10

19/20 (Mark Band 4)

Planning the making of the final prototype

BOX

PROCESS	EQUIPTMENT	TIME (m)	HEALTH AND SAFETY	QUALITY CONTROL
Measure and saw box pieces		20 mins		Be aware of fingers and where you are holding the material
Clean edges of box pieces	Glass paper	10 mins	None	Wrap glass paper around a former. Vice or clamp.
Assemble box	Wood glue	15 mins	None	Get rid of excess glue around edges
Make sides of box smooth and even	Belt sander	10 mins	Wear goggles, tie hair back and use of dust extractors	Mark out before starting. Set appropriate angle and use guards
Make corners curved	Glass paper	15 mins	None	Wrap glass paper around a former. Vice or clamp.
Paint box (three layers)	White paint and paintbrush	40 mins	None	Wait for paint to dry in between layers and do rough sand between each layer to get rid of rough edges
Mark out and drill hole for speaker	Pillar drill	10 mins	Wear goggles, tie hair back and and make sure guard is up	Use center punch hole or pilot hole. Clamp if work is large.
Mark out and drill hole for pill escape	Pillar drill	10 mins	Wear goggles, tie hair back and and make sure guard is up	Use center punch hole or pilot hole. Clamp if work is large.
Mark out and drill hole for record clock	Pillar drill	10 mins	Wear goggles, tie hair back and and make sure guard is up	Use center punch hole or pilot hole. Clamp if work is large.
Mark out and drill hole for pill lid	Pillar drill	10 mins	Wear goggles, tie hair back and and make sure guard is up	Use center punch hole or pilot hole. Clamp if work is large.
Mark out and drill hole for circuit switch	Pillar drill	10 mins	Wear goggles, tie hair back and and make sure guard is up	Use center punch hole or pilot hole. Clamp if work is large.
TOTAL TIME: 2 HOURS AND 40 MINUTES				

Planning the making of the final prototype

FUNNEL AND PILL DROP BOX

PROCESS	EQUIPTMENT	TIME (m)	HEALTH AND SAFETY	QUALITY CONTROL
Make funnel mould		20 mins	Be aware of your fingers where you're holding the material. Wear goggles, keep your hair tied back and make sure there are dust extractors	Mark out using a try-square. Cut on waste side of line. Vice or clamp
Make corners curved and clean up sides	Glass paper and belt sander	20 mins	Wear goggles, tie hair back and use of dust extractors	Mark out before starting. Set appropriate angle and use guards. Wrap glass paper around a former. Vice or clamp.
Measure and saw delivery tube mould (which acts as delivery tube whist in vacuum former)	Junior hack saw	10 mins	Be aware of fingers and where you are holding the material	Mark out using try-square. Cut on waste side of line. Vice or clamp.
Make pill drop box mold		20 mins	Be aware of your fingers where you're holding the material. Wear goggles, keep your hair tied back and make sure there are dust extractors	Mark out using a try-square. Cut on waste side of line. Vice or clamp
Make pill drop box's corners curved and angled	Belt sander	10 mins	Wear goggles, tie hair back and use of dust extractors	Mark out before starting. Set appropriate angle and use guards
Vacuum form funnel mould and pill drop box mould	Vacuum former	10 mins	Plastic will be hot when moulded	Draft angles on mould, make sure mould is accurate, ensure there are no gaps in the seal
Cut out pill drop box and clean edges	File and plastic scissors??	10 mins	Be careful of file's sharp edges	Make sure you use right side of file
Cut out funnel and clean edges	File and plastic scissors??	10 mins	Be careful of file's sharp edges	Make sure you use right side of file
TOTAL TIME: 1 HOUR AND 50 MINUTES				

Planning the making of the final prototype

PILL STORAGE LID, RECORD CLOCK, TONEARM AND DELIVERY TUBES

PROCESS	EQUIPTMENT	TIME (m)	HEALTH AND SAFETY	QUALITY CONTROL
Design pill storage lid	2D Design (CAD software)	15 mins	none	Can use grid lock for accurate measurements. Ensure printing size is correct
Print pill storage lid	Laser cutting	10 mins	Extractor removes fumes	Check height of table is correct. Check power/speed.
Glue lid pieces together	Liquid solvent glue	10 mins	Be careful not to get glue on fingers	Make sure there is no excess glue that can be seen
Design tonearm	2D Design (CAD software)	25 mins	none	Can use grid lock for accurate measurements- ensure printing size is correct
Print tonearm	Laser cutting	10 mins	Extractor removes fumes	Check height of table is correct. Check power/speed.
Glue tonearm pieces together	Liquid solvent glue	10 mins	Be careful not to get glue on fingers	Make sure there is no excess glue that can be seen
Design record clock	2D Design (CAD software)	25 mins	none	Can use grid lock for accurate measurements- ensure printing size is correct
Print record clock	Laser cutting	10 mins	Extractor removes fumes	Check height of table is correct. Check power/speed.
Glue record clock together	Liquid solvent glue	15 mins	Be careful not to get glue on fingers	Make sure there is no excess glue that can be seen
Mark out and drill center hole in record	Pillar drill	10 mins	Wear goggles, tie hair back and and make sure guard is up	Use center punch hole or pilot hole. Clamp if work is large.
Design delivery tube	Space Claim	20 mins	none	Ensure all measurements are accurate
Print delivery tube	3D printing	300 mins (printing time)	Operated in well ventilated space	Make sure printing surface is level. Accurate CAD drawing. Model placed to minimize construction materials
Measure and saw extension delivery tube	Band saw	15 mins	Be careful of fingers, wear goggles and tie hair back	Make sure angles are correct and mark out lines before sawing
Glue delivery tube extension to 3D printed delivery tube	Hot glue gun	10 mins	Be careful of hot glue	Make sure no excess glue can be seen
TOTAL TIME: (excluding printing time) 3 HOURS AND 5 MINUTES				

Planning the making of the final prototype

CIRCUIT

PROCESS	EQUIPTMENT	TIME (m)	HEALTH AND SAFETY	QUALITY CONTROL
Solder circuit board components	Soldering	60 mins	Extraction, wear goggles, metal can be very hot	Minimal neat joints. Cover with heat shrink.
Solder all wires to circuit	Soldering	20 mins	Extraction, wear goggles, metal can be very hot	Minimal neat joints. Cover with heat shrink.
Attach speaker, batteries and switch to circuit	Soldering	20 mins	Extraction, wear goggles, metal can be very hot	Minimal neat joints. Cover with heat shrink.
Make two base blocks for battery and circuit	Junior hack saw	20 mins	Be aware of fingers and where you are holding the material	Mark out using try-square. Cut on waste side of line. Vice or clamp.
Neaten edges of both blocks	Belt sander	10 mins	Wear goggles, tie hair back and use of dust extractors	Mark out before starting. Set appropriate angle and use guards
Drill pilot screw holes for both base blocks	Pillar drill	15 mins	Wear goggles, tie hair back and and make sure guard is up	Use center punch hole or pilot hole. Clamp if work is large.
Screw circuit and battery casing onto base blocks	4mm screws and manual screwdriver	15 mins	Be aware of fingers with screwdriver	Ensure you have pilot holes for screws so they are not lose
TOTAL TIME: 2 HOURS AND 4O MINUTES				

FINAL ASSEMBLY

PROCESS	EQUIPTMENT	TIME (m)	HEALTH AND SAFETY	QUALITY CONTROL
Glue tonearm to box	Araldite rapid glue part A and Araldite rapid glue part B	10 mins	Wear gloves to avoid glue getting onto fingers	Make sure no excess glue can be seen
Glue funnel to box	Araldite rapid glue part A and Araldite rapid glue part B	10 mins	Wear gloves to avoid glue getting onto fingers	Make sure no excess glue can be seen
Glue pill drop box to box	Araldite rapid glue part A and Araldite rapid glue part B	10 mins	Wear gloves to avoid glue getting onto fingers	Make sure no excess glue can be seen
Glue speaker onto box	Araldite rapid glue part A and Araldite rapid glue part B	10 mins	Wear gloves to avoid glue getting onto fingers	Make sure no excess glue can be seen
Check speaker, switch and circuit are working	Digital multimeter	10 mins	None	Make sure you are looking at correct readings. Make sure positive and negative wires are in correct place
TOTAL TIME: 5O MINUTES				

TOTAL MAKING TIME (components added together)= 11 HOURS AND 5 MINUTES

Making the final prototype

BOX

Measure and saw parts for box

Finished pieces for box

Sand sides of box

Sand bases of box

Do dry assembly of box to check measurements

Assemble box using wood glue

Get rid of glue around edges and inside of box

Clamp together and leave to dry

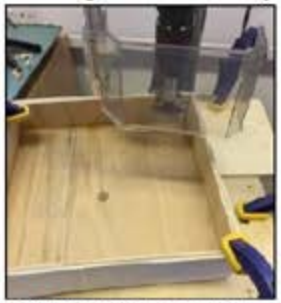
Belt sand sides of box to make sure they are even

Sand sharp corners of box to make curved

First layer of white paint

Sand first layer to get r of any rough patches

econd and third layer of paint



Drill hole for speaker

Drill hole for pill escape

Drill hole for record

Drill hole for pill storage lid

Drill hole circuit switch

Sand holes to make sure there are no rough edges

Making the final prototype

FUNNEL AND PILL DROP BOX

Draw out and saw funnel mold

Finished funnel mold

Sand around edges of mold

Drill hole for delivery tube

Saw tube that acts as delivery tube in mold

Sand rough edges of tube mold

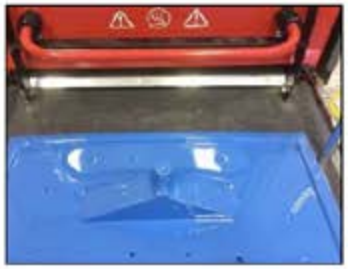
Measure and saw pill drop box mold

Belt sand mold at angle for sharp corners

Sand edges to curve mold's edges

Vacuum form molds using vacuum former

However the first attempt of funnel came out wonky and the plastic was shriveled at the tube



Vacuum funnel second attempt- successful this time

File funnel edges

Drill hole for delivery tube

File pill drop box

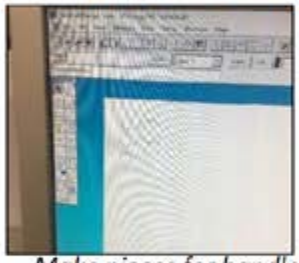
PILL LID, RECORD, TONEARM AND DELIVERY TUBES

Laser cut pieces for lid base

Glue base parts

Making the final prototype

Check lid fits in drilled hole



Make pieces for handle using 2D Design

Laser print handle pieces

Glue handle pieces together

Glue handle pieces together

Make tonearm using 2D Design

Laser print tonearm music notes and base

Glue music note pieces onto tonearm

Make tester record on 2D Design

Laser print on paper

Check measurements and appearance

Add indents for record using 2D design

Laser print record onto acrylic

Set up numbers to print on 2D design

Laser print numbers for record clock

Finished prints of numbers and record

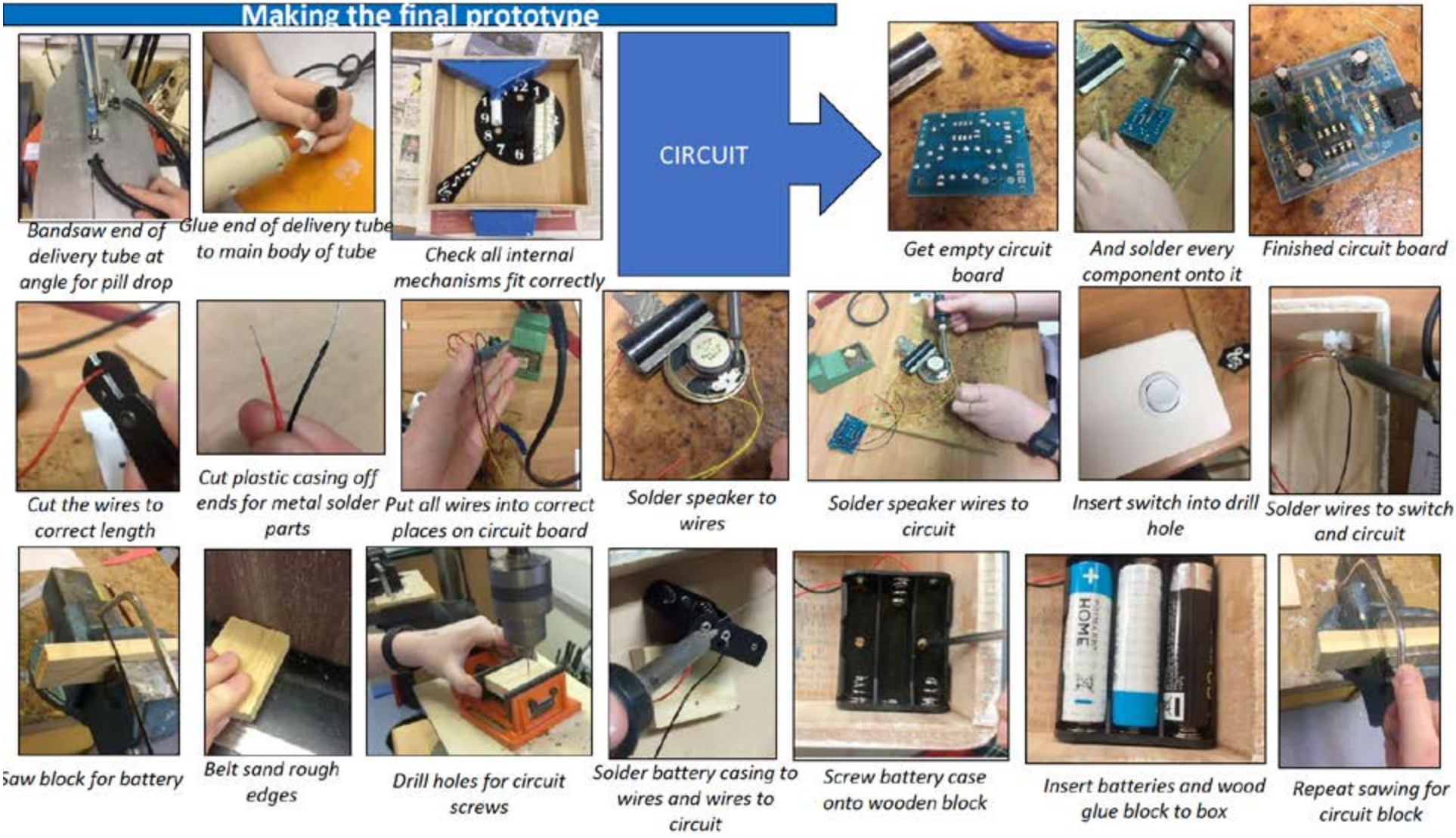
Glue numbers onto record

Drill center hole in record

Design delivery tube on Space Claim

3D print delivery tube

Finished result of delivery tube


Making the final prototype
CIRCUIT
Bandsaw end of delivery tube at angle for pill drop
Glue end of delivery tube to main body of tube
Check all internal mechanisms fit correctly
Get empty circuit board
And solder every component onto it
Finished circuit board
Cut the wires to correct length
Cut plastic casing off ends for metal solder parts
Put all wires into correct places on circuit board
Solder speaker to wires
Solder speaker wires to circuit
Insert switch into drill hole
Solder wires to switch and circuit
Saw block for battery
Belt sand rough edges
Drill holes for circuit screws
Solder battery casing to wires and wires to circuit
Screw battery case onto wooden block
Insert batteries and wood glue block to box
Repeat sawing for circuit block

Making the final prototype

Belt sand circuit block

Belt sand circuit block

Screw circuit onto circuit block

ASSEMBLING PARTS

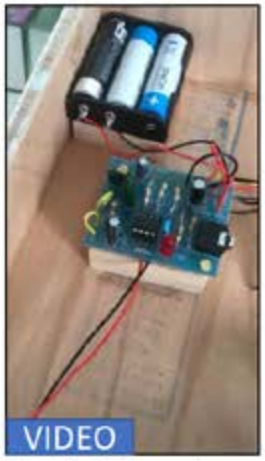
Glue tonearm to box

Glue funnel to box

Fit funnel into right place and hold whilst glue dries

Glue pill drop box onto box

Glue speaker into speaker drill hole



VIDEO

Test the circuit to make sure all components are working

VIDEO

Test speaker

VIDEO

Check to see if pill drops when product is on wall

Finished!

The final prototype- final product

Musical Memory










The final prototype- advertisement poster

I chose the my colours for the advertisement poster to be black and white. This is because I wanted my design to appear as retro and aesthetically pleasing to the eye. I used minimalistic and simplistic colours (not making colour scheme too complicated) as according to my research on Dieter Rams, "a good design is as little design as possible"

Musical Memory

The final prototype- viability

My technical specification (slide 28)

The storage lid is round instead of square- *I thought that it looked neater and fitted into the general design more to have a circular lid. It was also easier and quicker to make it circular with less room for error.*

The box is white instead of woody- *I was going to leave the box with a woody effect but I decided to paint it white to make it go with the wall more. This is to make it more subtle so that it looks like part of the house decoration rather than a pill-taking mechanism.*

The tonearm has added musical symbols- *I originally just had a plain tonearm but then I thought that adding music notes to it would make it more pleasing for the eye and give it a nicer appearance*

The speaker is on the bottom right instead of top left- *I moved the speaker because after looking at the box, I thought that it would look better there*

There is a handle on the storage lid- *I added a handle to the storage lid as I thought it would be easier for the carer or family member refilling the pills to open and close it.*

How is my final prototype different to my technical specification?

There is no picture projection- *I did not include this because it was too complex for GCSE level and I would have not been able to complete it within the given time process. I also thought that the record player appearance and music was enough aspects to make the pill-taking routine enjoyable for my primary user*

I added a switch- *Because adding servo motors is not at GCSE level I couldn't program a when I wanted the music to turn on. So to show how the music would turn on I added a switch so that I could manually turn it on and off*

The delivery tube is smaller in length- *the delivery tube was originally longer but because where the hole was placed on the box meant that I had to cut it shorter*

I added an extension delivery tube- *To enable the pill to successfully drop through the pill escape and into the delivery tube I needed to add another tube that was flexible so it could bend and meet up with the hole.*

Comparing my product with an existing competitive product on market

During my early stages of research I looked into pill boxes that are labelled with the days of the week. I wanted to compare this existing product with my product. Below I have listed the differences between what my product consists of and this existing design:

- *My product plays music for the primary user but this design does not*
- *My product has set times to take the medication during each day whereas this design only has the days of the week*
- *My product can be hung on a wall in the primary user's home/care home but this design is for portable use*
- *My product has a large funnel fitted at the back for extra pill storage whereas this design can only store a couple of pills per compartment*
- *My product appears to look like a record player for the primary user but the existing product only consists of many small compartments*
- *My product has a large pill drop box that can correctly anthropometrically fit the primary user's hand inside whereas this design's compartments are very small and therefore hard to access the pills from*

Examiner commentary

A detailed plan is presented over 3 pages which provide details on each process, the equipment required and an estimation of time to complete the final prototype. Although not a requirement the extra columns on health and safety and quality control help to demonstrate how the candidate will manage their making.

The making diary is organised and easy to follow and demonstrates all the tools, machinery and processes involved.

Clear images of the final product show the excellent accuracy and standard of finish which will provide impact to stakeholders.

Viability of the prototype is fully considered and the use of an advertisement poster helps to demonstrate their products potential to be marketable.

Exemplar 11

13/20 (Mark Band 3)

Technical Specifications:

CREATE: Design Communication

• The base of toolbox would be made out stainless steel as it is able to withstand high quantities of weight and as well as that it retains its anti – corrosive qualities for a longer period of times than other metals such as galvanized steel.
• The actual toolbox will be made out of galvanized steel as this will be the part that actually contains the tools and will have to be quite strong and another advantage is that galvanized steel is cheaper compared to stainless steel.
• The scissor jack mechanism will be made out of several small mild steel bars of the same size and will be attached to each other via bolts and nuts.
• The lid for the upper part of the product (The toolbox), will be made out of MDF and will be finished with a grey paint to aesthetically please the user/users.
• The toolbox will have to successfully move up and down and/or remain in different positions with ease while also being able to lock in place by use of either a hex nut or a wing nut (user's choice but preferably a wing nut).
• Even though my products main purpose is to have a working mechanism that moves up and down, it will also have to serve the user primarily as a tool storage unit.

Base	Galvanized steel	Already finished	I used galvanized steel here due to it's sturdiness and ability to withstand heavy weights. It will act as a support for my toolbox and if need be, extra storage.
Toolbox part	Galvanized steel	Already finished	I chose galvanized steel for the toolbox part for the same reason I chose it for the base part. It will act as a storage for tools.
Scissor lift mechanism	Mild Steel	Already Finished	I used mild steel due to it's availability and relative cheapness. This will be the primary part of my product and will be responsible for lifting and lowering my product.
Toolbox handle	MDF	Paint	Easy to work with and paint makes it aesthetically pleasing. Used for lifting and lowering.
Lid for toolbox	MDF	Paint	Easy to cut (band saw) and paint makes it aesthetically pleasing. Purpose is to protect the tools from falling out.
hinges	steel	N/A	These are mandatory for attaching my lid to my product so it actually works.
Brackets (optional)	Stainless steel	N/A	I could use these to attach my scissor mechanism to the toolbox , however there are other options available.

CREATE: Design Communication

How I made my 4th Prototype (Making Record):

4th Prototype (4th iteration but with the actual materials):

1.

Marking out 2 rectangles using a scriber and a square on galvanised steel One of them was 170 x 180 mm and the other one was 190 x 110 mm.

2.

Using vice shears to cut out the 2 rectangles.

3.

20190201_160522.mp4

Using the folding press I bent part of my 2 rectangles perpendicularly.

4.

I used a G clamp to clamp down one of my rectangles and used the nibbler to cut two 160 mm slits into both folds I had made in my metal with the folding press.

5.

I had used a pillar drill with a 4mm drill bit in order to drill 4 holes into both folds of the two metal rectangles.

6.

Using 3.5mm rivets, I pop-riveted the 4 holes that I drilled into my metal, in order to make a cuboid like shape.

7.

The cuboid I created to represent my base with working slits.

8.

I attached 2 mild steel bars to the slits in my 'base'.

20190122_123434.mp4

A video of how my mechanism works.

Making Record Of My Final Prototype Part 1:

CREATE: Final Prototype

I marked out a 280 x 250mm rectangle with a scriber and a steel rule on galvanised steel.

I used the vice shears in order to cut out the galvanised steel.

20190201_160728.mp4

Then I used the folding press to fold 2 parts of the rectangle.

Firstly I used a 6mm drill bit in the pillar drill in order to help cut my slits. I then used the nibbler to cut the slits in the steel rectangle I made in the 2 folded parts.

I then marked out a net of a cube without the top net as there is a part for the lid.

I then used the vice shears in order to cut out my net.

I also had included 40 x 15mm tabs on my net in order to help for when I pop rivet my net after folding it.

20190205_091258.mp4

I then used a metal folding bar in order to fold the tabs.

The finished net with folded tabs.

My net with the folding bar.

I then tightened my net into a table vice and used a metal folding bar and a mallet to fold the main sides of my net into a cube like shape.

20190208_154136 - Copy.mp4

Using the mallet with the folding bar.

I then had to cut a small rectangle of MDF that fit perfectly into the base of my net so that I was able to make sure that my folds were perpendicular and straight

The finished cube (not yet pop riveted though).

The cube without the piece of MDF.

I then joined the tabs together with the sides of the cube by drilling a hole with a 4mm drill bit then pop riveting them with a 3.5mm rivet

Making Record Of My Final Prototype Part 2:

CREATE: Final Prototype

Using a brass hinge as a template, I centre punched 3 holes into the cube with a 4mm drill bit.

Then, using a 3.5mm rivet, I pop riveted the hinge into my cube.

How the brass hinge works for my lid.

To make the lid I marked out a 170mm x 180mm rectangle into a piece of mdf that measured 10mm thick.

I then used a square to make sure the sides of my lid were right angles and perfect.

20190211_150636.mp4

I then used the band saw in the workshop in order to cut out my lid. The video is of my teacher (As we weren't allowed to use it) cutting out my lid using the band saw.

The final lid.

I then used a grey paint in order to paint my wood lid so that it is more aesthetically pleasing to the user as his favourite colour is grey.

I then used a hand drill to drill through the MDF lid in order too attach it to the hinge on the cube

Then using an odd leg calliper marked out a line on a bar of mild steel that was exactly in the middle of the bar. This will act as bars for the scissor lift mechanism.

I then used the vice shears to cut out 140mm x 25 mm bars for my scissor mechanism.

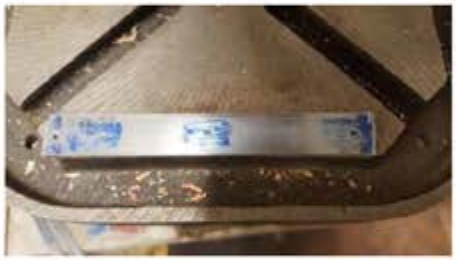
Then using the centre punch I marked out one of my 12 mild steel bars with 3 holes so i could use it as a template.

Making Record Of My Final Prototype Part 3:

CREATE: Final Prototype

Using the one mild steel bar I marked out as a template, I drilled 3 4mm holes while keeping the other bars in place with a hand vice.

Drilling the 3 holes, that I marked out with a centre punch, one at the one end, one at the other end and one in the centre.



My template with the drilled out holes. These will act as the bars that can move within each other to act as a scissor mechanism.

I put one of the mild steel bars over the other so that the holes match up and I can connect them together.

Attaching the mild steel bars together with bolts that were 15 mm long and had a circular head with a diameter of 10mm along with tightening the bolts with hex nuts.

I then attached the second set of mild steel bars by matching the hole on the end of the sides and then attaching them using the same sized bolts and hex nuts. I repeated this step 3 more times so that I had 2 scissor jack mechanisms each with 6 mild steel bars each.

Making Record Of My Final Prototype Part 3:

CREATE: Final Prototype

For reasons I will tell later, I needed to cut out 4 square washers in order to attach my scissor mechanism to my slits so that the bolts do not fall out of the slit.

Using the vice shears in order to cut out my 4 square washers.

Using a 6mm drill bit, i Drilled a 6mm hole into every washer.

My four square washers.

My four square washers attached to the bolts I am going to use to attach to my slits in the base of my product.

How my washers prevent my bolts from falling out of my slits. I used a grinder in order to smooth down my slits as using the nibbler I had made many rough edges. I then used hex nuts to stop my bolts from falling out the other end.

Attaching my scissor jack mechanism to my base.

Why I had to make my own washers:

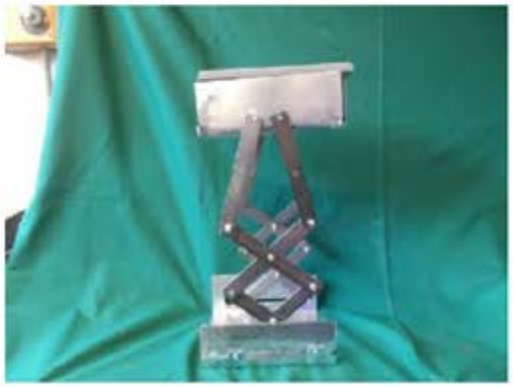
The reason I had to make my own washers was because the washers that were already provided to us by the school, were not big enough to prevent my bolts from falling out of the washers. I had to create my own larger washers so that my scissor lift mechanism was able to slide up and down smoothly without the bolts falling out.

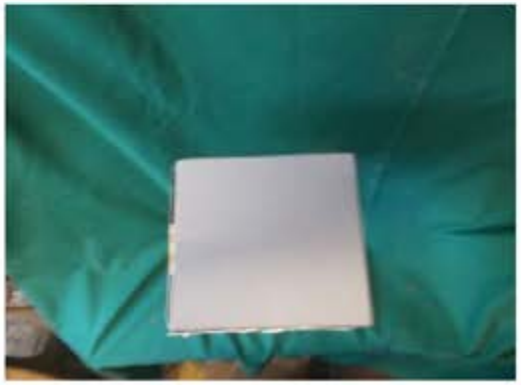
My Final Product:

EVALUATE

My product while the scissor lift mechanism is in it's extended position and the wing nuts are tightened so the mechanism doesn't collapse on itself.

My product while the scissor lift mechanism is in it's collapsed position. The wing nuts do no need to be tightened in this position as the product is already collapsed and does not need fixing to stay in position





My product in 2 different positions. Side view (Far left), Birds eye view (Centre), Angled back view (Far right). These pictures are just to give an extra view of the parts of my product

Examiner commentary

This candidate did not present a formal plan of making however some evidence was found within the technical specification.

A very thorough making record demonstrated their use of tools and machinery.

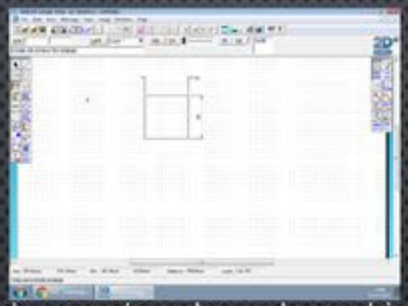
Small images of the final prototype made it difficult to assess the overall level of accuracy and finish. A moving product such as this would need a video to fully demonstrate its functionality.

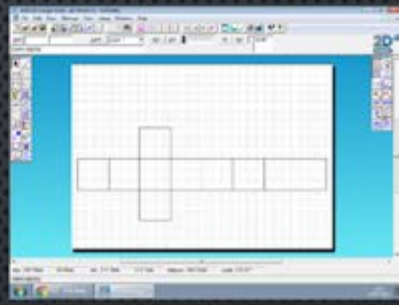
Viability was not overtly considered but an evaluation against the requirements was completed during the testing. However, this would also need to demonstrate an awareness of marketability for a higher mark.

Exemplar 12

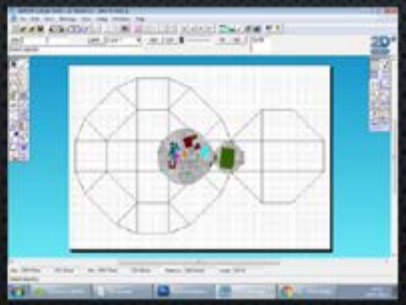
6/20 (Mark Band 2)

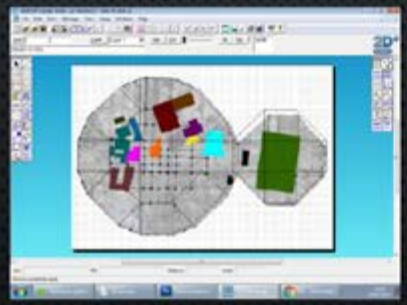
Making the board. When I first started to make my board I started by drawing it out onto a piece of paper and trying to do it by hand, the lines didn't come out exactly how I wanted them to, I shortly realised I could use C.A.D to help with this product do I decided to use 2D design to make my board, what I did was made a square 50 mm by 50 mm and copy and pasted them till I completed the outline.

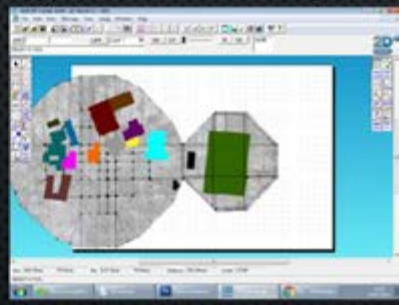




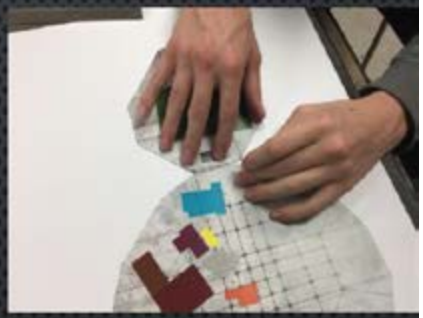
After I completed the outline of my board I changed my board graphics from Photoshop to a jpg and imported the jpg onto my 2D design web, after I imported the graphics onto the bored I had to use the lasso tool to cut of the white edges of the jpg and resized the graphics to match up with the web of the board, after I realised I couldn't match them up perfectly I decided to make 2 prints keeping the web the same size and move the graphics on the first one so it fits the bottom half and on the second print I matched up the graphics with the top.



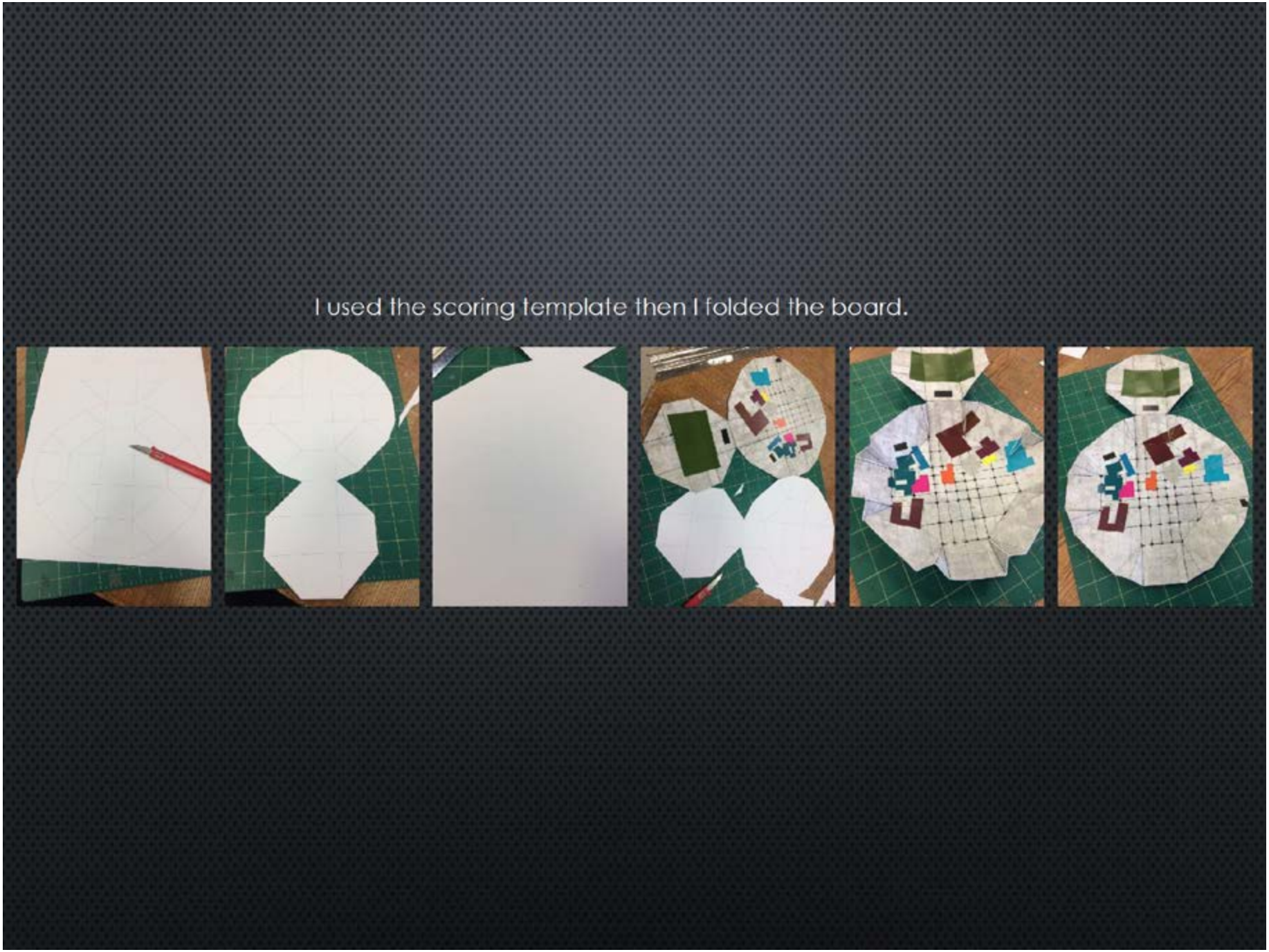




After I printed the product off I got out a cutting mat and a craft knife I then decided to cut out the body and stuck it onto the A3 piece of paper I was drawing on at the start so I could match the head with the body and then I cut the whole board out of the card to get it prepared for the final product.



After I cut out the bored I scored the inside of the board to make it fold into a octagon prism but I shortly realised that I had to score certain lines of both sides to fold it properly so I printed them off again and repeated the last paragraph but remembering to score both sides, when I went to score the other side of the board I realised I didn't know where to score because there was no markings. I reprinted the development net and used it as a scoring template. Photos are on the next slide.



Making cards

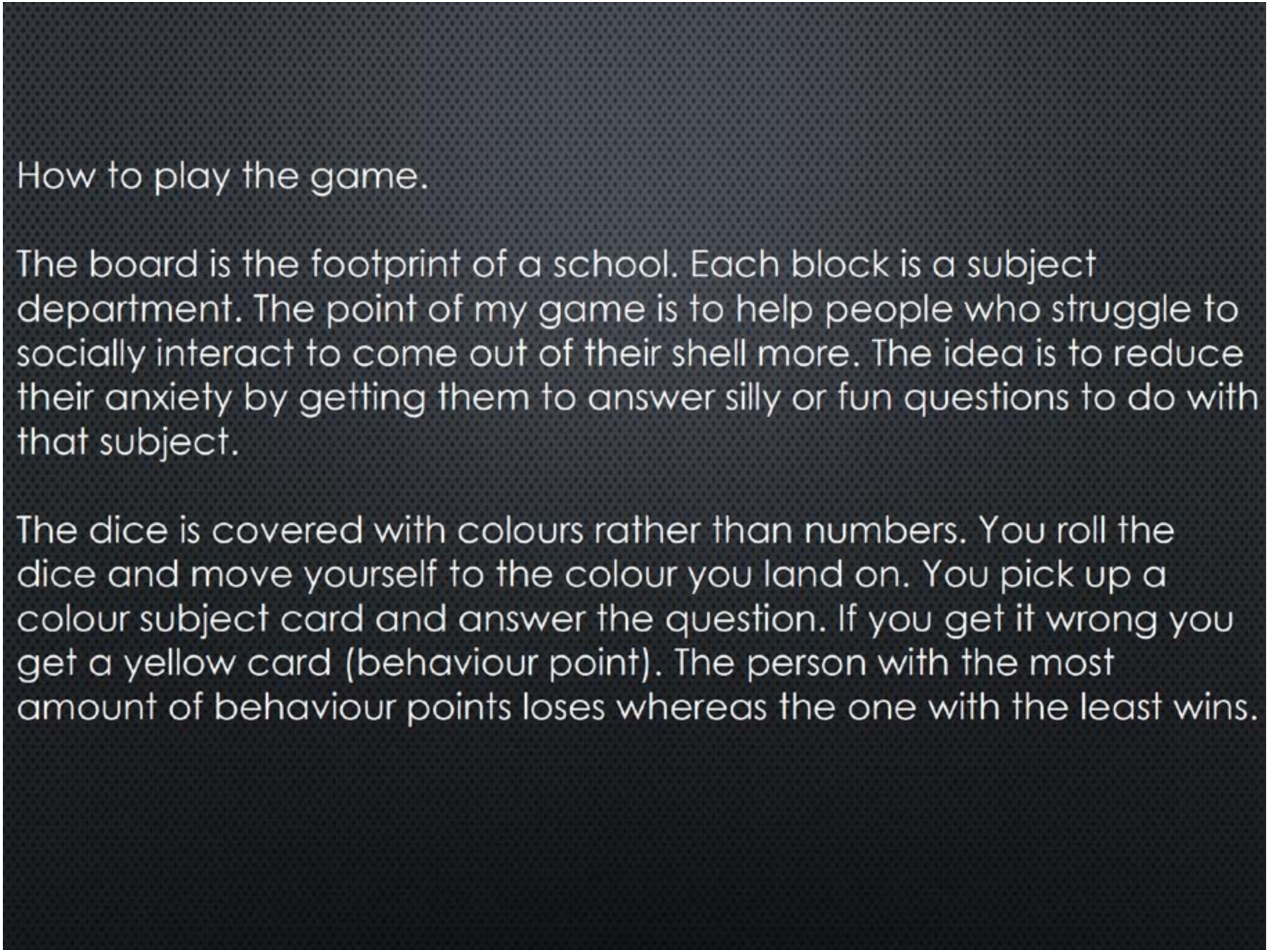
I started by going into 2D design and drawing the outline of my card with the rectangle tool. I then filled each card a different colour to represent the different subject departments. Next I found icons on Google images to match the subjects and the colours.




I positioned the icons in the middle of the cards. I copied and pasted the cards into a new document. I made the icons smaller and put them at the tops of the cards. This is the side for the questions. I printed the cards out on 220gsm white card.

I cut the cards out with the guillotine and stuck the front and back together with Pritt Stick.




How to play the game.
The board is the footprint of a school. Each block is a subject department. The point of my game is to help people who struggle to socially interact to come out of their shell more. The idea is to reduce their anxiety by getting them to answer silly or fun questions to do with that subject.
The dice is covered with colours rather than numbers. You roll the dice and move yourself to the colour you land on. You pick up a colour subject card and answer the question. If you get it wrong you get a yellow card (behaviour point). The person with the most amount of behaviour points loses whereas the one with the least wins.


Final Product
Question
Question
Question
Question
Question
Question

Examiner commentary

This candidate provided no making plan for their prototype.

The making diary helped to show digital design and manufacture.

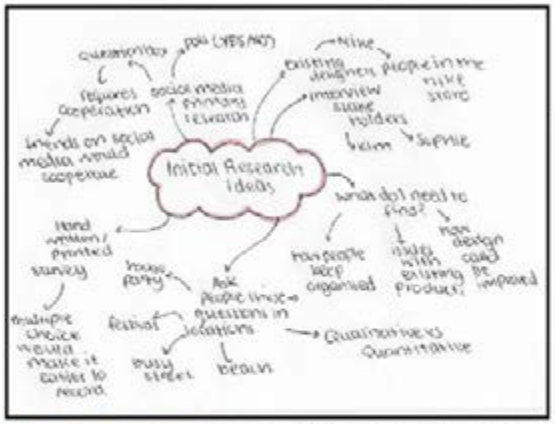
The quality of the final prototype was enough and was generally accurate considering the materials involved .

Viability of the final prototype was not considered.

STRAND 5

Exemplar 13

19/20 (Mark Band 4)



One of the locations I said my product would be used on the first slide is on a busy street.

TRENDY PRODUCTS:
In order to find out which existing products are most popular, **I went to Liverpool ONE** during my **summer** break to count the number of each bag that I saw being worn. The results show how many of each bag I saw after making observations for 30 minutes. I have ranked the bags in order of popularity.

Handbag	1. 267
Rucksack	2. 108
Man bag	3. 34
Drawstring bag	4. 24
Fanny pack	5. 17
Other	6. 5

I interviewed 2 of my peers to find issues with existing products and to help me find what is needed. I also asked my followers on Instagram to partake in a short survey to help me further obtain information.

Interview 1: [redacted] (15yo peer)

Do you feel organised?
Not really. I just like shove things in my pockets, and I don't like carrying bags as they hurt with too much stuff in and it's effort.
What do you feel could help you be more organised?
Maybe something that could keep belongings safe and neat as sometimes when carrying something in pockets stuff can fall out.
What do you usually use to carry belongings?
my jacket pockets, which are usually thin in summer and are not designed to carry things.
Any complaints?
my pockets are small and things rip some times my bags hurt my shoulders alot. Fake pockets are very annoying and my headphones get tangled.
Suggestions?
> Stronger reinforced pockets
> Better straps on bags as they hurt
> Actual bags should be lighter
> Something to organise earphones

To summarise [redacted] interview:
[redacted] is my primary user, and she explained in an interview I did with her that when going out has difficulty finding ways to carry belongings. She usually just stuffs her things in her pockets, which she is starting to find irritating and she would like a new way to store her things when going out. Problems that I discovered she faces with existing products include:
- Her pockets are too small and they can rip.
- Large backpacks hurt her shoulders
- Her headphones get tangled.

She suggested reinforced pockets, better straps on bags, a lighter bag, and something to organize earphones.

Interview 2: [redacted] (16yo peer)

Do you feel organised?
On a scale of 1-10, I feel that I am a 4, so no.
What do you feel could help you be more organised?
Time management for me needs to be improved, something that helps me keep my things in the right place at the right time
What do you usually use to carry belongings?
A rucksack when going to school, a handbag or pockets when going out.
Any complaints?
Things fall easily out of my pockets, which for girls are often extremely small. Bags can be left in places and are easily pickpocketed. Everything has to get shoved into rucksacks and handbags
Suggestions?
more pockets so that items go into specific places. Also, a bag where zips disappear could avoid pickpocketing. Less dark, warm people to find my sanitary items.

To summarise [redacted] interview:
[redacted] is my unorganized peer who feels that she struggles with time management, she often finds herself late to things and feels that something that keeps her belongings in the right place at the right time would her her. She uses either a rucksack, pockets or a handbag when going out. Things fall easily out of her pockets, she worries that she could be pickpocketed when using a handbag, and when she uses a rucksack or a handbag everything is shoved in. She would like more pockets for specific things, disappearing zips and somewhere to put sanitary items.

PRIMARY RESEARCH

My research from counting products in Liverpool one revealed to me that in the UK, Fanny packs, despite being a practical product, have certainly gone out of fashion, while masculine cross body bags and handbags are more popular. This has shown me that I should look at the best aspects of handbags and crossbody bags and incorporate them into a more fashionable new product, which shall put a new spin onto the classic 'waist/fanny pack.

SOCIAL MEDIA SURVEY:

I decided to use Instagram's poll and question feature to gather primary research about product needs relating to organization when going out. I thought that the information would be relevant as most of the people that have access to vote on my polls on the platform are teens, which would be the main consumer of my product along with young adults.

SURVEY

I asked my Instagram followers aged 14-17 what their ideal bag would be for going out in summer. The feedback included:

- A light bag
- Colourful and stylish
- Easy to carry
- Small but still able to carry belongings
- Lots of pockets
- Goes with outfits

Anthropometrics and ergonomics are aspects of designing a product that shall be taken into consideration when stakeholder needs are discussed.

ANTHROPOMETRICS

Anthropometric measurements are used to assess the size, shape and composition of the human body. Common methods used to gather these measurements, such as BMI, waist-to-hip ratio, skin-fold test and bioelectrical impedance. I will have to consider the size of my target markets torso (on average) when designing my product.

ERGONOMICS

Ergonomics is also something I will have to consider when designing my product and I should consider my target market during this process. It is the science of refining the design of products to optimize them for human use. Computers and related products, such as computer desks and chairs, are frequently the focus of ergonomic design.

THE NEED:

'The need' is describing the gap in the market that my product will fill. Through research I have discovered what is lacking regarding existing products and what people currently use.. The design of the classic waist bag that appeals to both male and females is **outdated**, although it is starting to make a comeback, the design of the bag just reminds people f the 80s and 90s. Other bags on the market do not accommodate to **both males and females**, and bags to carry belongings usually currently **only have one use**, they also **do not enhance organization** in any way. Most bags have pockets, but not many have organizers that specific items are meant to be held in. Also, allot of bags are **not aesthetically pleasing**, people find them **bland and they do not go with enough outfits.** Hand bags can **easily be pickpocketed from** or even snatched from the person, while backpacks are **too large for the summer**, while people only need to carry a few belongings.

WHAT GETS CARRIED?

When designing my bag/garment, a huge thing to consider is what I want to go inside, this is because if my bag is too small or too large for what needs to go in it, it limits the bags usability and versatility.

If I make my bag too small, it may not be able to fit essential items inside, whereas if it is too big, it will be uncomfortable, bulky and not stylish. Too large of a bag also means that unnecessary weight is carried around if the user is packing light on a particular day.

My garment does not just have to be a bag that carries essential items, as there are many different types of things that may require a bag to carry. These include:

- Pencil cases
- Makeup bags
- Utility bags
- Tool bags
- Survival kits

I asked my primary user [redacted] what items she would carry around on a summers day, she responded with essentials:

- Keys
- Phone
- Ear phones
- Money/purse
- Makeup items

We then decided that in order to carry the largest of phones, the bag would need to be at least 8x5, if it is to carry other items also. I need to take this into consideration when designing my product, but these are some of the things that a small bag would be suitable for.

My primary user and I also discussed what larger items someone may want to carry in summer, these included:

- A4 sized paper/ notebooks
- I pad
- Water bottle
- Head phones
- Portable speaker

We decided that a bag would have to be the size of a backpack or larger if it is to carry items like an ipad, which can be up to 12x9 inches, however she advised me that these types of items are not as essential as others when being out in summer, so the bag could compromise in size and not carry such large items

I asked my Instagram followers what I would need to consider when making a bag for the types of items below, they voiced their concerns in these responses.

@[redacted] : Sometimes if a make up bag heats up too easily, the makeup can melt.

@[redacted] : My pencil cases always end up really dirty from graphite marks and I don't know how to clean it.

@[redacted] : My bag for art supplies always rips because I keep scissors and a pair of compasses inside.

WHAT NEEDS TO GO IN THE BAG?

Waist/Fanny pack: worn around chest/back or waist with different compartments.

I have analysed 4 existing products relating to my design brief over the next few pages. This will help my identify a gap in the market and make sure my final product is new and innovative compared to what is already available.

Aesthetics: The classic 'fanny pack' is a product that became popular during the 1980's, it is known for being worn around the waist and is now being worn across the body. I feel that the design is slightly outdated as it has stayed fairly consistent since it's release with little variation until recent years. The photo shows a higher end bag with several bright colours and one pocket, which I believe is a more pleasing design than the classic monotone waist bag with several compartments.
Customer: Before the bag made a mainstream comeback, it was mainly used by middle aged tourists regardless of gender. It has however been made more popular by large brands during 2017-18 and has accessed a younger range of customers who wear the bag as more of a fashion accessory than for it's function
Cost: The cost can range from a £550 Gucci fanny pack to a £5 east Pak fanny pack. Although the Gucci bag has been more expensive to make and uses higher quality materials, there can be a huge mark-up depending on the reputation of a brand, with cheaper bags tending to be generally inexpensive to manufacture.
Environment: 'Fanny packs' are mainly used in hotter climates or during summer due to users not wearing large coats with access to pockets. The bags can also be waterproof to accommodate to beach users.
Safety: In regards to the bags safety and whether someone would be able to pickpocket an item from it, I think that it is fairly safe when worn in front of the body. However, I feel that if a user would like to wear it behind them on their upper or lower back, it could be easily opened with the user being oblivious due to it's large zip.
Size: The bag can vary from around 3-8 inches in height to 5-12 inches in width. Larger bags are becoming more popular as shown in the example, with many sporting large logos on (such as Nike and Louis Vuitton). This is because people wearing the bag usually no longer want to be as discreet as they did before.
Function: The bag was mainly used to avoid pick pocketers and keep belongings such as keys and money in a more discreet place, the idea is that if anyone is trying to reach into the area of the bag it would be noticed by the user due to the nature of it's position. The bag can be worn across the back or front of the body, and back or front of waist.
Materials: Most types of waist bags are made from fabric blends such as nylon and polyester which is a cheap strong option meaning that the bags can be widely accessible, however some brands like Louis Vuitton have began to manufacture these bags from higher end materials like leather, mainly for aesthetic purposes.

EVALUATION

I feel that the **'fanny pack'** is most relevant product for me to further analyse as it's properties are most similar to what I am thinking about making. The issue that I have found with the product is that it is **not versatile** enough, as it can only be used in one way. The design of the waist bag has also become **outdated**, meaning that it doesn't appeal to my target market of younger people. I give the product:

8/10

EXISTING PRODUCT ANALYSIS

Arm holder: For phone and other small items. Often used by runners and people doing other types of exercise.

Aesthetics: Looks good when someone who is doing exercise uses it but the design makes it limited to only these people. It is not commonly used by people going about everyday life due to this. Does not have much colour variation.
Consumer: The consumer is young adults who exercise. It is aimed at both genders. The product would be most popular among people who are interested in tech also as it is for someone listening to music.
Cost: Online, the product is mostly very cheap, with prices ranging from £5 to higher quality ones that area around £20, Features like waterproof casing for runners in the rain could make the product more expensive due to it's capabilities being more advanced. Branded versions of this product could also put a higher price onto it, like Nike or Underarmour.
Environment: More basic types of the product can only be used in good weather without risk of water coming into contact with the device, but more advanced versions are being made that can be used regardless of weather as they are waterproof.
Safety: The device is fairly safe as the phones pocket is sealed using a Velcro strap, stopping the device from falling out as the runner/ jogger is moving.
Size: The product is around 5 inches in width by 7 inches in height however the elasticated strap that holds the product to the arm depends on the anthropometrics and circumference of the users arm.
Function: The phone holder means that the person does not have to carry their device when doing exercise as sport clothes often have limitations in regards to what can be put in pockets without discomfort. The position of the strap on the bicep means that the user can listen to music using earphones without the hands intercepting the cord.
Materials: A Nike version of this product that I found is manufactured using neoprene, which is a family of synthetic rubbers with flexibility over a wide temperature range

EVALUATION

The sports phone holder is an effective product and is good at at what it does, however there is little room for variation within the market. The product is not versatile and is generally only used for one thing, which is for running/ jogging. This means that the market is allot smaller than a product which can be utilized by all people. However, a market being small is not always a bad thing, as a niche market can often help a business stand out. I give this product:

6/10

'Man bag' worn over the neck or across the shoulder and tight to the body.

Aesthetics: Usually, the man bag has a very plain design and is black or blue. This is to appeal to a more masculine user. Due to their use typically by 'scallys', the man bag has become a product that people see as being popular among lower class male teenagers.

Consumer: Originally, the bag was meant to appeal to mountaineers and hikers of both genders, however it has become popular among young males, and since the bag transitioning to this type of customer, it generally only appeals to these people.

Cost: Due to the bags not being available from high fashion retailers or using expensive materials, the bag is usually sold at around £10-£20 and usually costs around £5. Most brands that sell these types of bags sell them at low prices to appeal to people of lower finances.

Environment: The bag is usually used in summer due to people having a lack of pockets. Men's clothing generally has more practical pockets than women's, so although women need bags In colder months due to the fact that they carry more stuff and have smaller pockets, men usually don't.

Safety: I think that man bags are fairly safe, because they are positioned in a place on the body which means that someone would find it difficult to reach into the bag unnoticed. Because it is always around the neck or around the body, it cannot be snatched easily from the person like a handbag can, so there is a lower risk of theft. It is not as easily left somewhere as a handbag, this is because if the user wants to open the bag and retrieve an item from it, they can easily do it without putting the bag down.

Size: Larger versions of the bag style can be up to 7x10 inches, with the smallest versions being 3x4 inches. Larger man bags can generally fit more stuff in and can even fit things like food and drinks, with smaller man bags only being used for small items like money and a phone.

Function: Man bags are a way to store items when going out that men are more likely to use than women, giving the term

EVALAUTION

The masculine **cross body bag** is the 2nd product that I will further analyse. It is similar to the fanny pack however is shape means that it **ex** cannot be worn around the waist, only around the body or neck. It's design **does not appeal to girls**, and due to the fact that fanny packs are outdated, I have found through my research that girls are confined to handbags, which themselves present issues. It is also **not versatile enough** and can only be used for one thing. I give the product:

7/10

Small 'handbag' across the shoulder or on one shoulder. (Many variations).

Aesthetics: The classic handbag is used all year round comes and in many variations. It's aesthetics are usually quite feminine and appeals to female users more than it does to male users usually. They come in many different colours and patterns.
Consumer: The handbag is mainly used by females of all ages. Men often have larger pockets than females and need to carry less stuff, which is why handbags are more popular among females, especially in summer. Smaller types of handbags are more popular among younger girls as they tend to require less space and carry less items, for younger girls they can also be more of a fashion accessory than an essential.
Cost: Depending on cost and quality of materials, hand bags can cost anywhere from £10 to limited edition £50,000. I will be more interested in lower costs so that my product can appeal to a wider range of users, so a handbag would probably cost me around £10 to make, without utilizing economies of scale.
Environment: Most handbags are used in all weather and situations, with a wide range of locations that they can be used in. Smaller bags however are more popular in summer due to how they fit with an outfit, and people tending to require less stuff.
Safety: As far as bags go, I believe that handbags are unsafe. This because they can easily be opened and reached into, they can be snatched from someone's hand or shoulder, and they can easily be left somewhere if the user has to put the bag down to retrieve something from it.
Size: Hand bags can range from the smallest 3x5 inch bags, to huge 15x20 inch. It all depends on what and how much they are being designed to carry, and also how the designer wants the product to look in terms of fashion.
Function: Despite the name 'handbag' the product is usually worn on the shoulder or across the shoulder with longer strapped bags, however variations of the bag can be carried in the hand using a handle. My research is directed more at summer usage, and the smaller bags fit this more due to people usually needing to carry less and smaller belongings in Summer. People carry things like keys, phones, makeup, food & drink and other items in handbags.
Materials: Hand bags can be made from pretty much any material as their desired feel and quality range from product

EVALUATION

My last two products that I analysed are limited in variation and I have not found many issues with , so I will not be researching and analyzing them further. **The handbag** is an extremely versatile product that I found to be the most popular on a busy high street. It's one issue is that it **does not appeal to men** meaning that the market that handbags can access is made smaller by this limitation. I also feel that there are too many types of handbags on the market for me to be able to design a new innovative one. I give this product:

9/10

I chose to analyse another product similar to what I plan on designing, and after buying the product named the 'belt bag' from ale-hop. we investigated the best and worst features of the bag.

PRODUCT DISASSEMBLY: BELT BAG

How do the parts interact?

The bag acts as part of the belt, interrupting the strap, and the strap is sown onto the main part of the bag and cannot be removed.

What are the good and bad features?

There are reflective strips on either side of the zip which adds extra style, the material is waterproof and flexible so can be used in different scenarios , the strap is stretchy and stylish.

The flexibility of the material used in the main bag means that it is difficult to take items in and out of the bag, which could cause issues on the go. The buckle and exposed zip means that it provides no pickpocket avoidance. The strap is not detachable so can only be used in one way.

What has caused the product to succeed or fail?

The product can be used as a regular belt when not holding any items, however can also be used to carry the appropriate items that my primary user would like to carry. This aspect of the product makes it successful as it enables versatility and uses in different scenarios.

Are the materials appropriate?

I think the materials are highly appropriate for sports wear and active purposes, however the nature of the all black bag means that it can not be worn fashionably with many outfits. However, the functionality of the bag would not be the same if different materials were used.

What manufacturing process was used?

A flow line of work using sewing machines, which is machinery that I could have access to.

Belt Bag (ALE-HOP) £8

Aesthetics: 8/10
Cost: 9/10
Comfort: 8/10
Environment: 7/10
Safety: 8/10
Size: 8/10
Function: 9/10
Material: 10 /10
Total: 67/80

PRODUCT DISSASSEMBLY

Cotton canvas

- Low Luster
- Medium strength
- Absorbent
- Flexible
- Strong
- Easy to sew

Cotton canvas is the material m commonly used for products similar to mine. One limitation c this fabric is that it has no water resistance, and is also not as smooth as other material optior

Polyester

- Strong
- Resistant
- Water proof
- Durable
- Flexible
- Difficult to sew

Although polyester has many of my desirable qualities, it does not come in as high thickness variation as would be suitable for my bag. The bag will be too flimsy and difficult to sew if polyester is used.

I posted a photo of my neoprene to my Instagram, asking my followers aged 14-17 captioned with a poll asking whether the material is would be aesthetically suitable and pleasing to be used in a bag of my kind. 83% voted yes.

Nylon

- Weathering resistance
- Soft
- High melting point
- Abrasion resistance
- Strong
- Water resistance
- High drapability
- Difficult to sew

I have found nylon to have many of my desired properties, however I am concerned by its high drapability and difficulty to sew, which may make it unsuitable for my product.

Neoprene

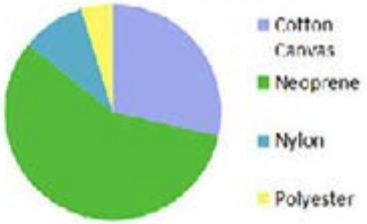
- Water proof
- Strong
- Smooth
- Flexible
- Good Handle
- Easy to sew
- Chemical resistant

Neoprene is most commonly used for things like laptop sleeves and wetsuits, however it has become popular to use the material in fashion in recent years.

Desirable material properties

- Water resistant
- Strong
- Durable
- Smooth
- Flexible
- Good handle
- Easy to sew
- Chemical resistant

I discussed with my primary user and peers the suitability of different materials for my product in a **group**. We voted, and the results are shown in the graph below.



I chose Neoprene as the material for my final product. It has all of the properties that I desired and can also come in many colours. I paid £5 for half a square metre, which I think is very affordable, as I am not planning to use most of the fabric I bought. I am planning to make a prototype out of toile, and develop this with a white and black iteration of my final design.

MATERIAL CONSIDERATIONS

TECHNICAL REQUIREMENTS

The only technical requirement I have found for my product is that it must be at least 3.5 x 7 inches to hold the largest phones. The actual bag size isn't as relevant compared to the users body, however the strap must be at least 1 metre long to comfortably fit all body sizes.

PRIMARY RESEARCH

After conducting several types of **primary and secondary research**, I feel that I am ready to begin designing a product that takes all my acquired market knowledge into consideration.

I have used these methods of primary research:

- Instagram **survey** asking what the ideal bag would be.
- **Interview with 2 teens.**
- **Counting items of clothing in a busy place.**
- Conducting a product **disassembly.**
- Instagram **survey** asking about what is carried in a bag.
- Instagram **survey** about materials.
- Group **discussion** about materials.

SECONDARY RESEARCH

I chose to conduct more primary research than secondary as I thought primary research would be more beneficial. However, I did:

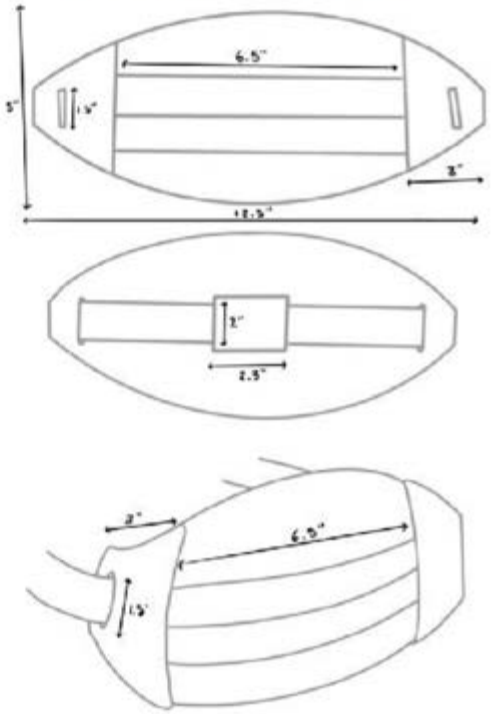
- **Analyse existing products using information that is already online.**
- **Research materials using text book and online information.**

My **technical specification** was made using an **iPad pro and apple pencil.** I used a software called **procreate**, which was the most appropriate due to the shape of the bag. I designed my bag to have a height of at least 5", so that a large iPhone of 3" in width can fit comfortably inside.

EVALUATION

From my research, I have found that there is a huge gap in the market for a product that carries items, that is highly versatile. Most current bags on the market are categorised by gender and style, whereas I think a bag that has a wide range of customers would be highly successful. The main material I will develop is neoprene, however I am considering experimenting with synthetic leathers.

TECHNICAL SPECIFICATION



I have decided to base my initial design ideas on the context of **smarter living** as a whole, followed by more focused designs based on my design brief. The design process I use will be to analyse existing products and find the gap in the market. I will take the best aspects of several designs. I will evaluate my progress after each step of the process.

OVERALL RESEARCH ANALYSIS

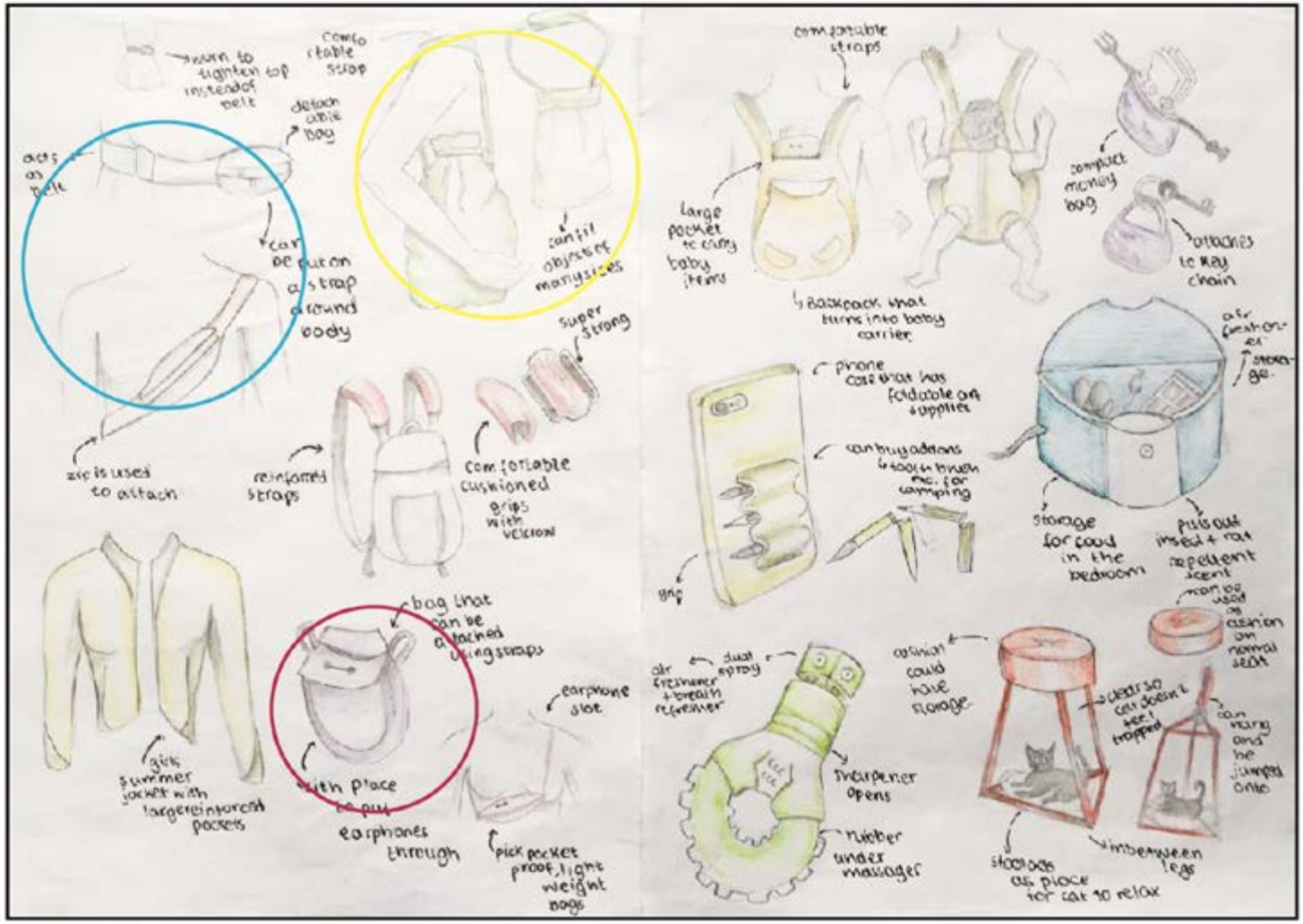
By researching gaps in the market through a survey, interviews and observations, and also analyzing existing products, I was able to generate 12 initial product ideas, 4 of which I will select to refine.

I will take the best aspects of the designs circled in red, and create a further 6 designs based upon these in the coming pages.

Why I like this design:
It is a modern take in a currently popular bag, and with the right development could be extremely multi-functional. It is also very versatile.

Why I like this design:
I think it is extremely fashionable, and would still be appealing to a wide range of ages, and the design is very unisex. It also has lots of room for innovation.

Why I like this design:
I think this design could be used in many different ways, while still being highly functional. It is also innovative as unlike other bags, it requires no straps or handle to wear.



The designs & explanations are colour coded

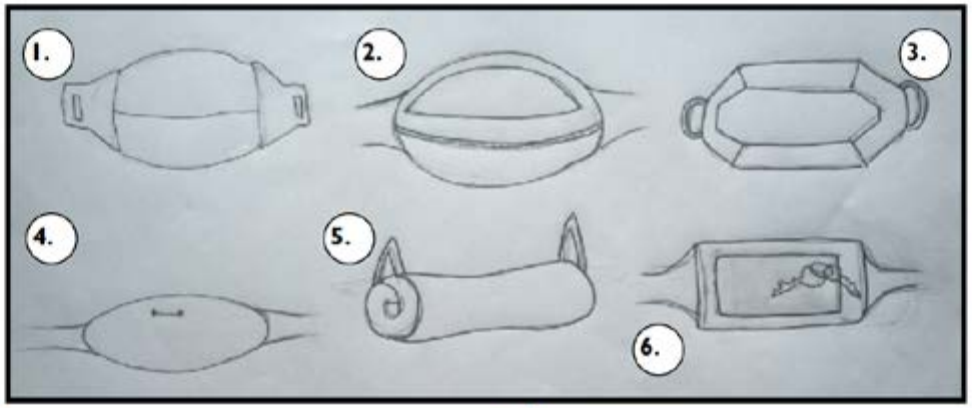
ITERATIONS – 'SMARTER LIVING'

I drew 6 potential products based on the market research I conducted, all similar with slightly different functions/designs. They are all bags designed to carry belongings in the summer, and there are advantages and disadvantages to each option, with each presenting challenges and opportunities.

1) This is my forefront design, as it is the most practical as well as being the most fashionable. It is pickpocket proof, as the zip is tucked under 2 flap and the strap can only be detached by the user from inside the bag. It is large enough to fit a mobile, and while being a plain black, white or grey, the USP would be that the strap is detachable, to fit different needs in terms of practicality and fashion, which is a feature that current bags on the market do not offer. The strap could come in different variations and colours depending on the users preference. This offers versatility, as the bag can look different every time it is used.

2) This design follows the blobject design movement, which makes it stand out from other bags on the market. It has a plastic window that belongings can be seen through, and an exposed zip. The strap is not detachable, and the window at the front may reveal valuable items, similarly to design 6, which is my main reason for not including a window in my final product.

3) This design is smaller than the others, which I believe could possibly limit it's limit it's capabilities in regards to holding a mobile and other large items. It has a panel at the front that is closed with Velcro that items can be tucked into, and the straps on either side are elastic and can be attached to anything, meaning that the strap is detachable.



4) This design is meant to be used mainly for sports and other recreational activities. It can be worn around the chest, or tightened and worn around the arm. My concern with this product is that the panel on the front may show valuable items that are in the bag, which the user may not want to be revealed. It is also slightly unoriginal compared to my other designs, as there are similar bags currently available.

6) This design is minimalist, with the zip being placed at the top part of the bag where it can't be seen. The hole in it is to be used to listen to music with the device still being in the bag. My worry with a hole is that it may be fairly outdated, as many users of headphones have began to switch to wireless technology, which would make the headphone wire hole useless. The strap is also non detachable.

5) This design is very different to my others in that it rolls up rather than having an opening. The strap would mean that it could be used across the body or over the shoulder like a handbag. My issue with this design is that the bag may be difficult to open and retrieve belongings from in busy pubic settings, and an item like a phone would be unlikely to fit inside.

EVALUATION

Although I feel that these designs are suitable, I would like to expand the style of bag more with my next designs, to be sure that this is the best option to carry forward.

FINAL DESIGN IDEAS

	1	2	3	4	5	6
Aesthetics	4/5	3/5	5/5	4/5	2/5	2/5
Practicality	5/5	3/5	3/5	5/5	3/5	4/5
Versatility	5/5	3/5	5/5	4/5	3/5	1/5
Primary User Rating	5/5	3/5	4/5	4/5	3/5	2/5
Total	19/20	12/20	17/20	17/20	12/20	9/20

I analysed my final 6 designs in this table, assessing different aspects of each bag and how suitable they will be.

STAKEHOLDER REQUIREMENTS

- Easy to use + access
- Fashionable
- Versatile- different uses
- Uses cheap materials
- Water proof
- Discreet
- Pickpocket proof
- Durable & well made
- Not easily left somewhere
- Comfortable
- Appropriate size
- Flexible enough for different body type
- Compact
- Pockets for specific items

I Feel that aesthetics, practicality and versatility take these requirements into consideration. I also asked my primary user to rate each bag.

SUSTAINIBLITY

Fashion is one of the main industries that contributes to waste pollution in the world, this is due to the fact that with trends constantly changing, items of clothing can become obsolete extremely quickly. Every season, fashion savvy people find new reasons to need a new wardrobe.

There is an aspect of design that could help this issue, as it's versatile qualities mean that only one bag needs to be bought, but can be worn in many different ways. This solution comes from a detachable strap. When customers buy a bag, they will buy it in simple colours, but have various options of straps to buy. The release of new straps and purchasing of them brings money in that is lost from the lack of obsolescence in the design of the product. This could be promoted as the bags USP to help it stand out from competition.

Image of hands holding the earth and a tree

DESIGN MOVEMENT

This bag design is inspired by the blobject design movement of the late 90s.

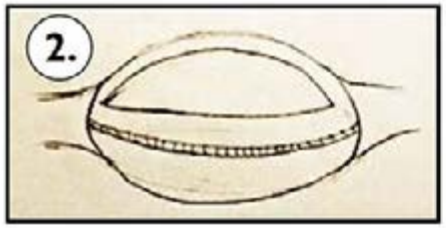


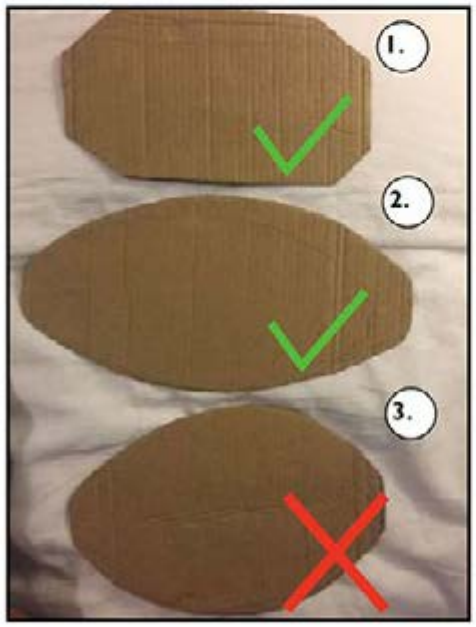
Image of Apple computer

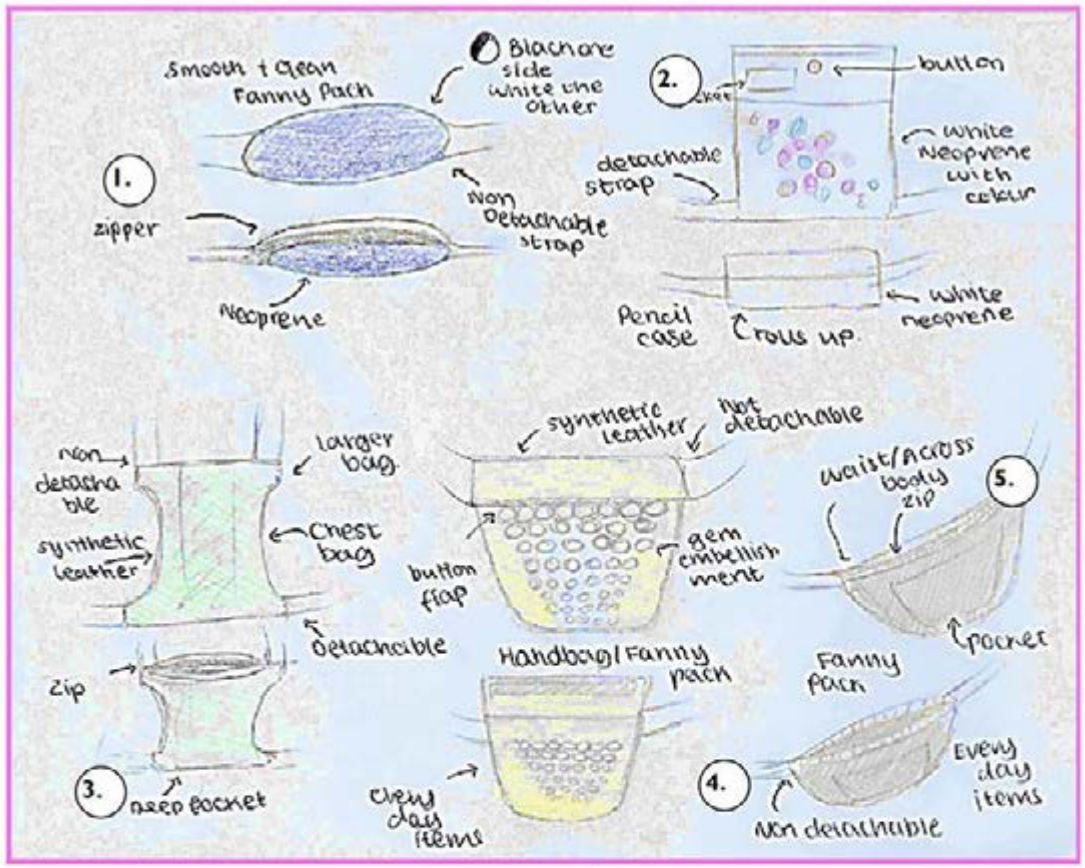
Example of a blobject, apple computer

RESEARCH

I have mainly used and will continue to use throughout this development. Primary research can be expensive and time consuming, but it has the benefit of being extremely focused and relevant to the business.

I cut out life-size versions of my 3 main design ideas, which I then asked my primary user [redacted] to model. She said that number 2 would be the most useful as it has the most space for belongings, however number 3 is the most fashionable and unique, which could be an advantage in a competitive market..





EVALUATION

I am happy with my progress so far, and I need to refine these designs into 2-3 more focused final prototypes. I will do this by making rough models of each design, using the same materials that I will for my final piece, to test it's suitability, as it is quite cheap and easy to use. My favourite design out of the 5 is currently number 2, but this is subject to change. After I have made the models, I will evaluate the best and worst aspects, and take them into consideration when designing a final product.

These are the 5 next designs that I will develop in the coming pages by making prototypes and models. I made them by taking the best qualities of my previous designs and making 5 new ones.

DESIGN IDEAS

HOW WILL I MAKE THE PROTOTYPES?

In order to make rough prototypes of each of my designs, I decided that although I will use my chosen fabric, I will not sew each design, to save time and resources. I will use pins to temporarily construct my designs.

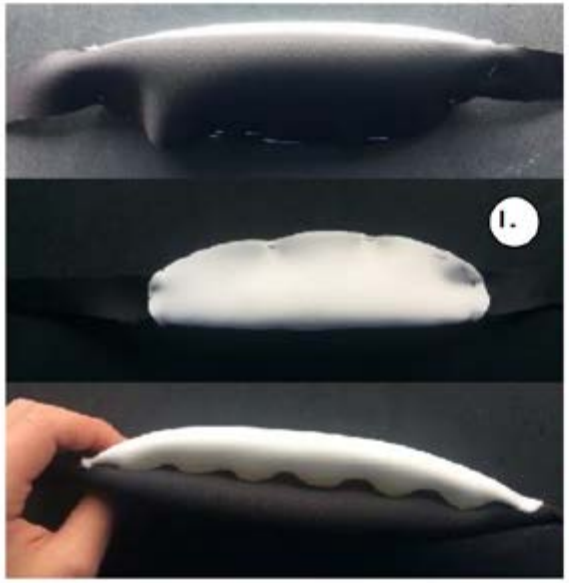
Here, I am cutting my fabric to use in my first design.

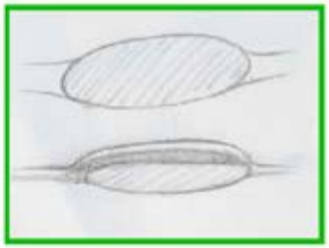
These are the pins I will use to construct it.

The first step is to place the pins so that they pinch both fabrics in two places, ensuring that they stay in. I do it in a line so that it can stimulate a line of stitching.

The fabric is pinned inside out, so that it can flip over and have a clean finish.

I will evaluate each of my prototypes at the end of the section.



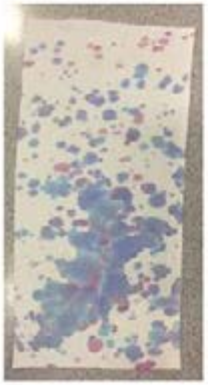


This is the first prototype that I made, it has a clean design and can switch between black and white for versatility. When I tested it, I found that due to it's small size, items are difficult to take in and out of it. It doesn't have a detachable strap and it has a zip at the top. It is made from black and white neoprene.

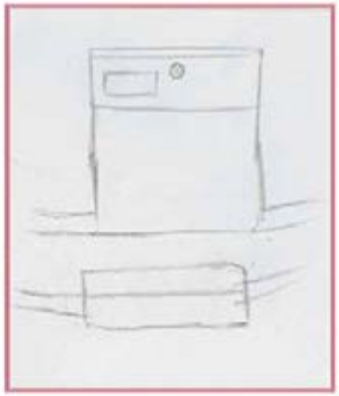
EVALUATION

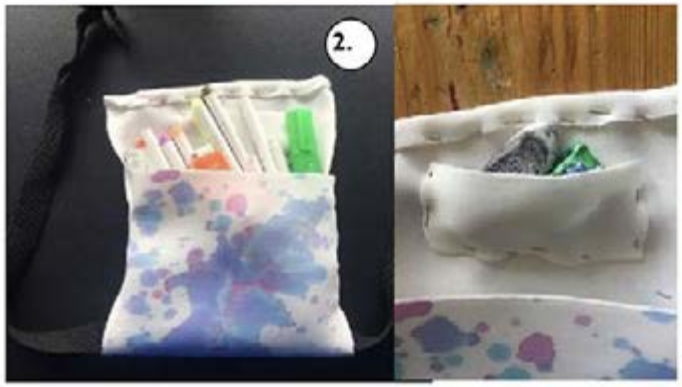
I will evaluate each design on a slide at the end of this section, however this bag is my first time constructing a bag from neoprene .I think the product has a good handle and is suitable for my purpose, however it may need some back support when carrying heavier items.

TESTING DESIGN SOLUTIONS



This bag is suited to being used as a pencil case, however it can be used to carry many different things. The strap is detachable and comes through the middle of the bag when it is rolled up. It is made of white neoprene but is dyed with blue and pink. I think that this bag was the easiest to construct. It has a small pocket under the flap, and the flap closes with a button.





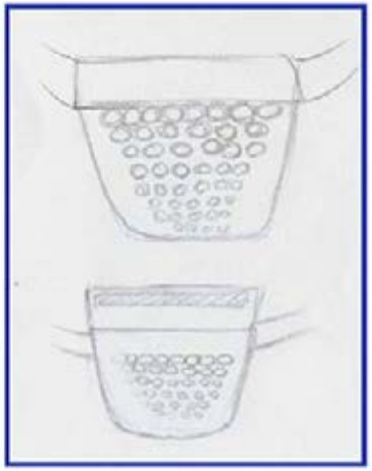
It can be worn around the waist or around the chest, but it can also be used as a pencil case without a strap. It fits with smarter living as the bag is an innovative take on a pencil case, which enables the user to be more organized and have more uses for a single product. The detachable strap also enables it to be versatile in fashion and practicality.

This bag is a take on a classic fanny pack. Its strap is non detachable and it is made from white neoprene. It can be worn around the waist & shoulder, and can also be used as a handbag. It has a zip in the top that opens to reveal several compartments. It is used as an everyday bag in summer to carry all small belongings.

This bag is a larger design that is worn in the front chest part of the body. The design is slightly more masculine than the others and would also be slightly more complicated to make. The bottom strap is detachable while the top one isn't, and the material is black synthetic leather. It can be used to carry larger items than the others however is quite thin in depth.

The bag is mainly used to carry valuable belongings in public due to the visibility of the bags opening.

This bag would be quite easy to manufacture, however the cost would be higher than other designs due to the embellishment on the front.



This design is similar to a hand bag in shape and size, but has similar features to a fanny pack in how its worn and the pocket. It has gem embellishment on the front of the bag which gives it a stylish look. The strap is non detachable and the bag is made from synthetic black leather. I had a 17 year old model test the bag as I found that this design was a high contender to be further developed.

I **tested** and found the **weaknesses** of each bag with my friend [redacted] who fits into my target market range, and we evaluated each bag.

Pros:
- Sleek design
- Comfortable
- Good Material
- White and black can switch
- Can be used during exercise

Cons:
- Too small to fit necessary items
- Non detachable strap
- Easily pickpocketed

Aesthetics: 9/10
Cost: 9/10
Comfort: 8/10
Environment: 7/10
Safety: 7/10
Size: 7/10
Function: 5/10
Material: 8/10
Total: 61/80

Pros:
- Detachable strap
- Fit large items in
- Innovative
- Difficult to pickpocket
- Can be used on the back

Cons:
- Difficult to put on
- Looks like baby carrier
- Thin material

Aesthetics: 6/10
Cost: 6/10
Comfort: 7/10
Environment: 8/10
Safety: 9/10
Size: 7/10
Function: 9/10
Material: 7/10
Total: 58/80

Pros:
- Stylish
- Practical size
- Comfortable

Cons:
- Strap is non detachable
- Expensive to produce
- Easy to pickpocket
- Thin Material

Aesthetics: 10/10
Cost: 6/10
Comfort: 9/10
Environment: 7/10
Safety: 7/10
Size: 9/10
Function: 9/10
Material: 8/10
Total: 65/80

Pros:
- Colourful
- Can be repurposed
- Can be worn without strap
- Innovative
- Several pockets
- Difficult to pickpocket

Cons:
- Could look shabby
- Items can fall out
- Too thick
- Difficult to use

Aesthetics: 8/10
Cost: 9/10
Comfort: 6/10
Environment: 8/10
Safety: 9/10
Size: 8/10
Function: 10/10
Material: 8/10
Total: 66 /80

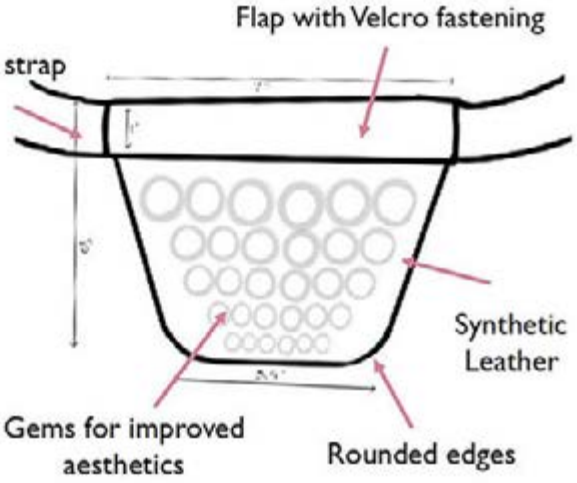
Pros:
- Practical size
- Comfortable
- Good material
- Could add colour
- Stylish

Cons:
- Not innovative enough
- Easy to pickpocket
- Non detachable strap
- Only goes with some outfits

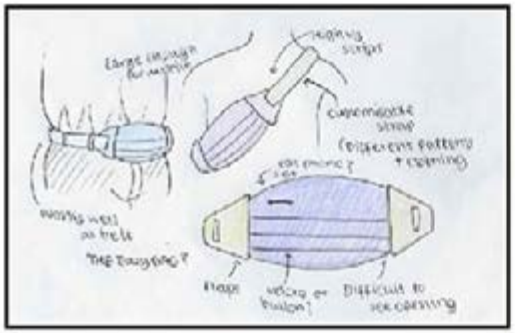
Aesthetics: 8/10
Cost: 9/10
Comfort: 9/10
Environment: 7/10
Safety: 6/10
Size: 8/10
Function: 8/10
Material: 9/10
Total: 64/80

CRITICAL THINKING & COMPARING SOLUTIONS

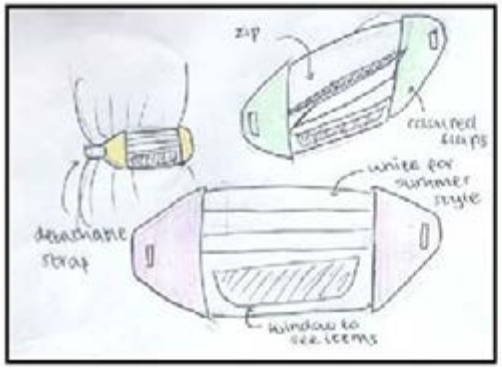
Me and my friend [redacted] chose to test my bag out doors in the park. It fared well during more active behavior as well as being stylish for an everyday outfit. I will consider aspects of this when doing my final design.



This is a CAD drawing of my gem design as it is my favourite out of all 5 designs..

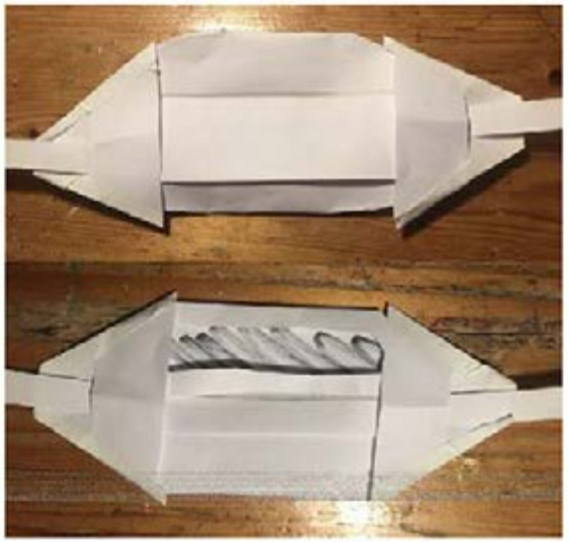


Aesthetics: 9/10
Cost: 8/10
Comfort: 9/10
Environment: 9/10
Safety: 10/10
Size: 7/10
Function: 9/10
Material: 9/10
Total: 70/80



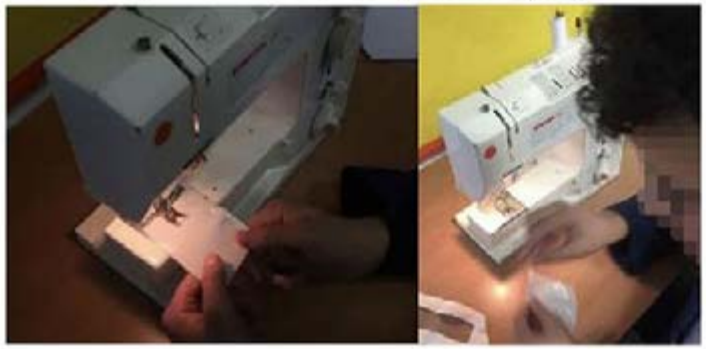
Aesthetics: 9/10
Cost: 7/10
Comfort: 9/10
Environment: 7/10
Safety: 7/10
Size: 8/10
Function: 9/10
Material: 10/10
Total: 66/80

I Made paper models of my final 2 iterations to help visualize the components of each bag, and how well I will be able to execute the design. This will also help me in mapping out the production steps of the bags. I think that these 2 final designs both have equally as much potential, but it depends on which one ends up the best after making it.



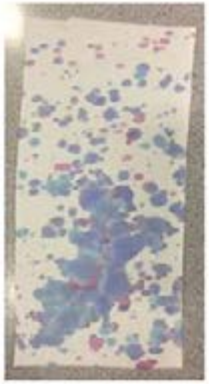
Cutting the pattern for the backpiece of my bag.

Sewing my lining to the back piece to hold the wadding, extra comfort and tension.



In order to ensure that my neoprene was compatible with the plastic material for a front panel, I first sewed a sample of the materials as a test. The results were successful.

I sewed the clear panel using a topstitch and a sewing machine. The finished panel is shown below.



I tested out some dying techniques for the next components on a scrap piece of fabric, but I found that I preferred the simplicity of all white.

I then painted a belt that I bought from amazon using purple and blue dye and a paintbrush. I found that a graphic print would look better, as the dye faded once dry.

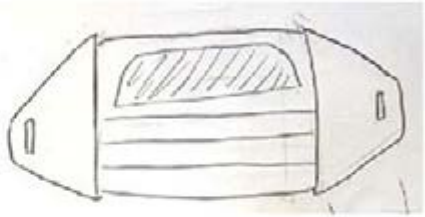
On the next page:
I will evaluate my finished iteration and explain what went well, and what I could improve. This is my last iteration before making my final product.

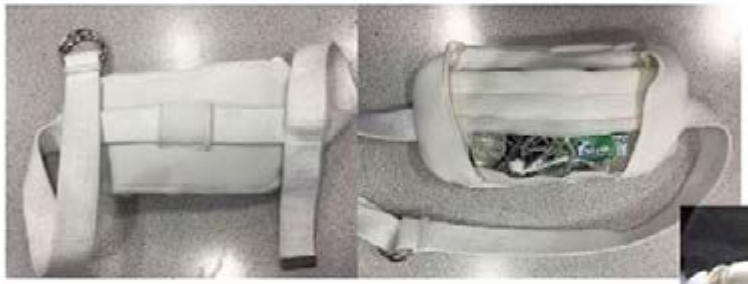
MAKING OF ITERATION

This is the finished white iteration of my product. On this page, I will assess the good and bad aspects of the bag, and what I will change in my final design. These are images of my primary user modelling and testing my bag by putting belongings in and out. We also tested to see if different positions would be comfortable while wearing the bag

What I like about the bag:

- The material is definitely suitable for it's purpose.
- It fits large items into it.
- The detachable strap.
- The magnetic strip.
- The flaps on either side.
- The reinforced backpiece adds stability and comfort.





COST:
The bag cost around £15 to make, and it has the included cost of the clear plastic, that I am hoping to take out for my final product.

What I'm going to change:

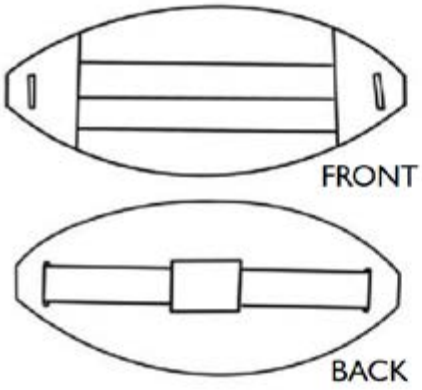
- I will use black neoprene instead of white, as it is more versatile and stylish. The white looks too similar to cricket knee pads.
- I will change the orientation of the flap so that it falls over the zip, making it more difficult to be pickpocketed.
- I will remove the clear panel, as it allows for little privacy of belongings, and may make it more desirable to be pickpocketed if holding valuable items.
- I will change the shape of the bag and make it more rounded at the edges.

Aesthetics: 10/10
Cost: 8/10
Comfort: 9/10
Environment: 6/10
Safety: 10/10
Size: 9/10
Function: 7/10
Material: 8/10
Total: 67/80

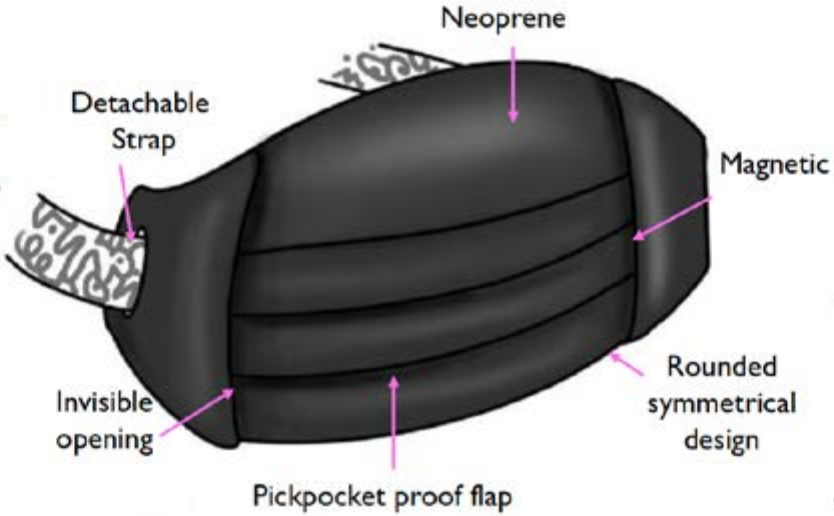
This is a comparison of the design of this iteration with the finished iteration. On the next page, I will show my finished design based of all my iterations, drawn using CAD.

FINAL ITERATION

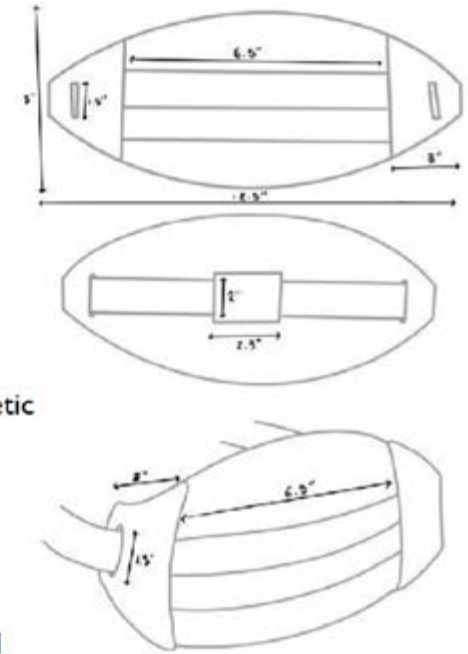
THE Eazy BAG



This is a cad drawing of my final bag. I used an apple pencil and iPad pro to do this, and the software I used is called 'procreate'. I think that it is highly suitable, and fits all of my criteria. It has my favourite aspects of each of the prototypes that I made.



Technical Specification



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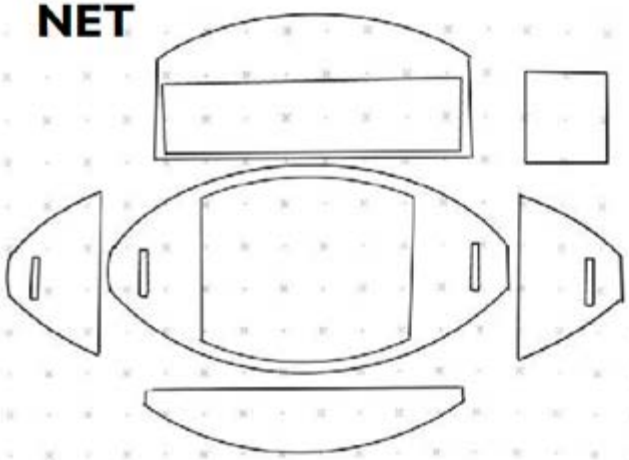
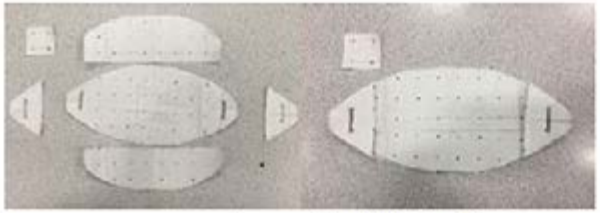


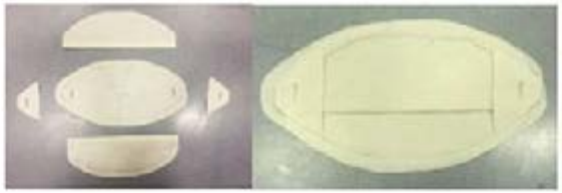
The first step to making this bag is to make a toile from cheap muslin ,which is a practice step that is used when making fashion garments.

I also coloured my bag in pink on procreate to test a different design. I think that it looks good, however only caters to a small target market, as it would be unsuitable for many people.

FINAL DESIGN



I cut out a pattern for my final design, leaving a seam allowance of 2 inches.



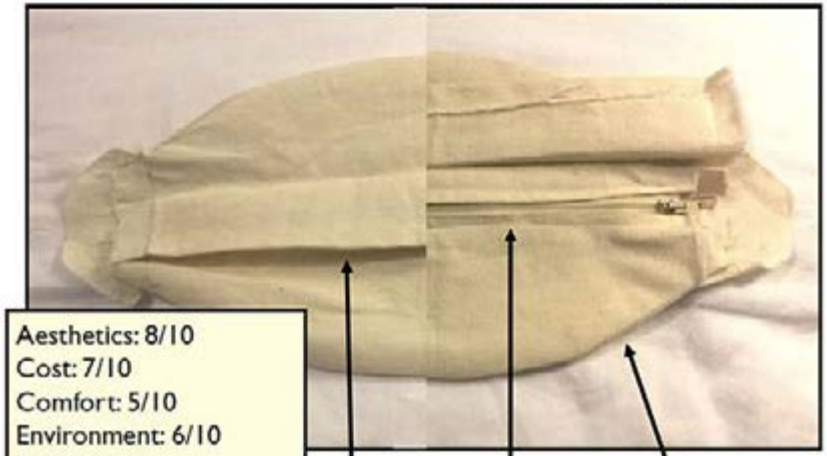
I then cut my design from my toile prototype using my pattern.

I then sewed each component together, using a zipper foot to sew my zip.

These are images of my primary user testing my toile. We identified several issues with the product that I could amend in my 2 final iterations, but we liked the overall design and concept.

After making a prototype toile bag, my primary user and I identified key aspects of the bag that required improvement, and consideration when making my final product. These include:

- The flap of my opening requires some sort of Velcro or fastening to go over the zip and ensure safety, I intend to add a strip of magnet to the fabric.
- The back piece of the bag is not stable enough to hold items while on a strap. I need to add interfacing and perhaps padding to the final version, I will test the interfacing and padding on a sample piece of fabric before adding to my product.
- The opening that the strap goes through needs to be made wider, so the detachable aspect of the product can be used more easily.
- Due to a flap covering the zip and there being no openings on the bag, I may consider adding a headphone wire hole to the bag.
- The flap could potentially be used as a phone holder if adapted.



Aesthetics: 8/10
Cost: 7/10
Comfort: 5/10
Environment: 6/10
Safety: 6/10
Size: 9/10
Function: 9/10
Material: 6/10
Total: 56/80

FINAL TOILE

THE Eazy BAG

THE FINAL PRODUCT

VIDEOS OF MY PRIMARY USER USING MY PRODUCT

What primary research have I conducted?

- Social media questionnaires
- Polls
- Town surveys
- Interviews
- Testing of products
- Analyzing existing products

This has all helped me to develop and evaluate my product.

These images show the bag in use by Adam. He put earphones, keys, a wallet and a phone into the bag, which is what would commonly carried in summer. We took the bag to town on a busy day, and it proved to be fit for purpose, carrying the necessary belongings with no issues or risk of pickpocketing.

MY BAGS MARKETABILITY:

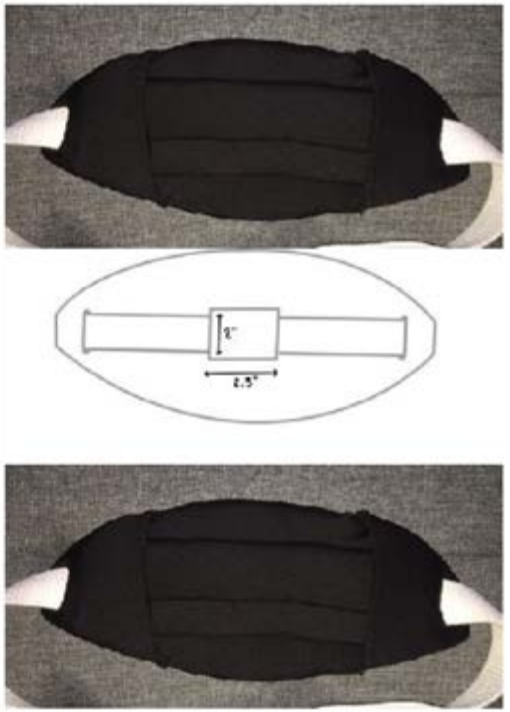
I think my bag would be extremely profitable, as it was cheap to make, and it incorporates all the best features of successful bags on the market, while still being new and innovative. The feature of the detachable strap is something that I feel would be highly successful with today's younger markets, who are constantly wanting to find products with multiple uses, saving money and resources. A use of less resources also helps reduce waste and benefits the environment, which is an extremely prevalent topic.

I **compared** my **final product** to my **technical specification** in the photo to the left, and each of the dimensions were unanimous. I used several **production techniques** to make my product, these include:

- Pattern drawing
- Sewing
- Cutting
- Pinning
- Hand sewing
- Hemming
- Ironing
- Dye techniques

I also used the following **machinery** in order to create my final piece:

- Sewing machine
- Heat press
- Iron
- Button hole sewer



I feel that my bag fits with the theme of **SMARTER LIVING**, and it allows users to not have the extra worries of belongings being lost or pickpocketed, while still allowing for a nice aesthetic, which is something important for may consumers who want to live smarter. The detachability of the strap also means that resources and money can be saved for the lack of a need to buy multiple bags from multiple brands.

Personal Ratings

Aesthetics: 8/10
Cost: 8/10
Comfort: 10/10
Environment: 9/10
Safety: 10/10
Size: 9/10
Function: 9/10
Material: 9/10
Total: 72/80

EVALUATION

PRIMARY USER INTERVIEW

- I conducted an interview with my primary user [redacted] to help me evaluate my product:
- **What are your favourite aspects of the bag?**

I like the material, as it is something I have never seen used in a bag before, as neoprene is versatile and very functional, with it being waterproof and flexible. I like that the strap is detachable and I'm very glad that it was included. It means that I can make the bag feel fresh and have it fit with many different outfits, while only needing to change this aspect. Although I like that the strap can be changed, I still really like the black and white one that you made, and would probably use it most often. I like that I can fit all of my belongings inside, I often leave the house in summer and struggle to find where to keep necessities like a phone and keys, because girls clothing especially doesn't usually come with suitable pockets for some reason. I think that it is really well made, and the fact that it gives you the peace of mind that it won't be pickpocketed would make it my go-to bag.

- **What would you change about the bag?**

I feel that although the simplicity of an all black bag brings and versatility and an edge to the product, it may seem slightly boring at times if I want to wear an accessory that is slightly more exciting or decorative. Perhaps a logo or a different colour/ design would improve the aesthetics of the design. However, I feel that the all black aesthetic is suitable for the first prototype, and could be improved with different versions. I think that also adding more pockets to the inside or outside of the bag would increase its functionality. Currently, all loose change and other items are kept in the same compartment, which could make it difficult to take items out.

PRODUCT REQUIREMENTS

- ✓ Easy to use + access
- ✓ Fashionable
- ✓ Goes with many different outfits
- ✓ Versatile- different uses
- ✓ Uses cheap materials
- ✓ Water proof
- ✓ Discreet
- ✓ Pickpocket proof
- ✓ Durable- well made
- ✓ Not easily left somewhere
- ✓ Comfortable
- ✓ Big enough for phone- appropriate size
- ✓ Flexible enough for different body types
- ✓ Compact

ADD ON PURCHASE?

If I were to further develop my bag further, I would develop an intuitive complementary purchase that could be sold with the bag. It would have a kit with blank straps on and different print making equipment's. This would enhance the users experience as it would allow them to be creative and add their own flare to the bag, while still having the option to buy one of our straps.

Primary User Ratings

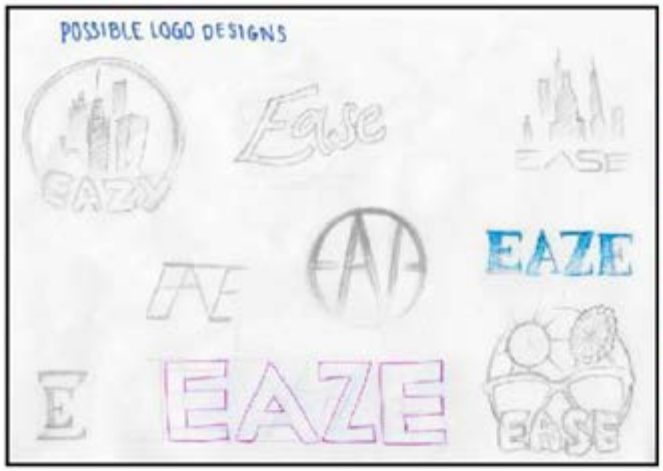
Aesthetics: 10/10
Cost: 8/10
Comfort: 10/10
Environment: 9/10
Safety: 10/10
Size: 9/10
Function: 9/10
Material: 10/10
Total: 75/80

I asked my 3 friends [redacted] and [redacted] who are all 15-18 **to test my bag and demonstrate it's uses**. I purposely used friends of different **ages, genders and sizes** to test and help me evaluate the bag, to ensure that it fits everybody comfortably. The feedback I received from them will contribute to my final page of evaluation.

EVALUATION

This is my finished product. On this slide, I will be evaluating what I would improve about the bag, but here are some of my favourite aspects.:

- The detachable strap for versatility with different outfits, comes in many different colours.
- Pickpocket proof, 2 flaps cover the zip with a magnet so the bag closes automatically.
- Stylish and new design.
- Material is flexible, breathable and waterproof.



1) An aspect of my bag I could have developed further is the possibility of incorporating other more obscure uses into the bag without changing it too much. I found that if I added buttons to the inside of the flaps, It could be used as a phone holder if interfacing is added. This would further make the bag more compatible with smarter living.

2) If I were to make this bag again, I would add a design element as shown to the left to enhance the aesthetics of the product. My current bag may not be seen as eye catching enough to a young every changing market. I added some designs to the bag in the photos to the left to see what it would look like. Whether it be these designs or a logo, I would definitely consider adding a print/ colourful design element.

3) One thing that I never included in my product that could've made the design more exciting was a logo. This could've been embroidered, or printed on using school machinery. Here, I am experimenting with different logos for my product or brand. I like the name 'ease', as it is about how everyday fashion can be easy, while still looking good. Some of these designs are inspired by existing logos, and some are more playful than others.

4) The last thing about my bag that I would consider changing, is that I would ass more pockets. This adds functionality and makes it easier to use, as items can be retrieved and stored more easily.

EVALUATION: WHAT I WOULD CHANGE

Examiner commentary

This candidate has systematically analysed their investigation throughout their folder. In this excerpt you can see a range of techniques used to organise and highlight their analysis such as summaries, colour coding and the level of language used within their written comments.

Ongoing evaluation is critical and reflects on the requirements constantly using a range of checklists and written comments with colour coding.

The final prototype has been thoroughly tested by a range of users/stakeholders to determine its fitness for purpose. Strengths and weaknesses of the final prototype could be presented more clearly though.

Suggestions for modifications are good but would have benefitted from more comprehensive suggestions that incorporated design optimisation.

Exemplar 14

13/20 (Mark Band 3)

Investigating Primary User Wants & Needs

Image of primary user

My primary user (Will)

Will has had to wake up early every day to get to school as he lives in the country side. He takes the car to school with his mum as she works at the same school. Will struggles to wake up in the morning because of homework. In addition he also does a lot of high intensity sport all week leaving him even more tired.

This is wills current alarm clock called a "docking station". He likes how he has multiple options of sounds to wake up to, and how it has two alarms in case you over sleep, however he doesn't like that the sound it makes is too loud and invasive to wake up to. He also likes that he can change the volume of the alarm. He would prefer if the alarm was a bit smaller as the docking station takes up the whole shelf

I interviewed my primary user to see what he thinks is important for a effective alarm clock

Variability
He believes that it is better to have an alarm clock that is customisable to fit with anyone. Because everyone is different in terms of sleep patterns, hearing and vision, etc. if all of the settings can't be altered, the alarm clock wont work well for some people.

Complexity
Will also thinks that an alarm clock that has too many controls and features might be too complicated for certain people, e.g. senior citizens. Its best to just keep the buttons and features to a bare minimum.

Aesthetic
Finally, one of the most important things to get right about the alarm clock is the visual appeal. If the alarm clock works great but the exterior isn't so great, people (especially students) won't buy it. The aesthetic should be kept minimal.

These are all of the possible places that the alarm clock could go in Will's room. It is important that the design doesn't stand out too much and fits in with surrounding objects

Windowsill:
- Trophy
- Pictures
- Light

Bedside:
- Current alarm clock
- Water bottle

Shelf:
- Picture
- Misc.

Desk:
- Desk tidy
- Stationery
- Small storage

Floor:
- Misc.

Investigating Stakeholder Wants & Needs

I started a group chat with some classmates talking about waking up early.

- I found out that most of my friends along with Will all have to wake up at around 6:00 AM to get to school. Most of my friends are extremely tired in the morning from having to wake up so early but also having to go to bed late due to school work
- We also brought up how it is usually dark when they get up. This is important because waking up to a light source helps energise the brain in the morning.
- We then started talking about our current alarm clocks and out problems with them
- One friend started talking about how the sound of the alarm is so invasive and sudden. This is bad as the alarm shocks you out of sleep which is a bad way to wake up, it is healthier to wake up gradually
- We decided that we would prefer to wake up to more ambient sound such as trees, waves, rain, etc. this would help waking up more calmly
- We also talked about how the artificial light should have blue light in it as blue light helps your brain wake up.

Survey responses and analysis

1. What is your age?

Most of the people who completed my survey were around 15 years old. This means that the design and packaging should have teenagers and millennials in mind.

2. Roughly how many hours of sleep do you get per night?

The average for hours of sleep per night was about 8 hours of sleep per night. This helps me get an idea of how intense the alarm should be as this is roughly the healthy amount of hours to sleep for this age group, e.g. If the average was 6 hours, the alarm should be more intense. However some people did say that they got around 6 hours of sleep, so it would be a good idea to take into consideration the ability to change the volume of the alarm to suit different sleep hours

3. Is it usually dark when you get up?

This question got mixed responses, but the vast majority said that it isn't usually dark when they get up. Because it is not usually dark when these people get up, the alarm clock won't interfere with peoples sleep cycles. Even though it isn't dark when most of these people get up, it is better to wake up to light than to wake up in the dark. For those who do wake up in the dark, the light should be bright enough to simulate natural light to wake up the brain

4. Is waking up an unpleasant experience for you?

The response to this questions was overwhelmingly yes. This alarm clock will be able to make waking up a less unpleasant experience. Rather than shocking you out of sleep, the alarm will have a much more calm approach to waking up.

Why?

The reasons why people found waking up so unpleasant mostly revolved around things like "I'm tired" or "I feel lethargic in the morning". As mentioned before, the light produced by the alarm should be able to the production of cortisol, the hormone responsible for keep you awake.

5. Are you a student or do you have a job?

The responses for this question were mainly students. This backs up the point that struggling to wake up in the morning is mostly a problem for students.

6. Do you often oversleep?

Surprisingly, more people oversleep than not. Because of this, it would be a good idea to make the alarm sound more than once, to ensure that the user wakes up and doesn't oversleep.

7. How much does you alarm cost?

These responses were very mixed in that some people's alarms cost about £10, some cost over £30, others use their phone, and others don't even use an alarm clock. Because of these mixed results, it'd be a good idea to price the alarm clock relatively low around the £20 mark. Due to the amount of people who just use their phone, the design of the product must be as simple as a smartphone clock to use.

8. Where do you put your alarm clock/phone a night?

These responses were also mixed but the vast majority of people put their alarm clock on a bedside table. The other place people put their alarm clocks are on a shelf. Both of these answers are good because the alarm needs to be in a place that is easily visible and audible from the bed.

9. Do you take your alarm clock away with you?

Roughly half of people said yes and half said no, however the majority of people don't take their alarm clock away with them. Because of the equal amount of people who take their alarm clock with them and those who don't, the alarm clock should have a rechargeable battery and a charging cable or disposable batteries.

10. What sound would you rather wake up to?

The vast majority of people said that they would rather wake up to ambient sounds, e.g. waves, rain, trees, however some people do like the beeping/buzzing of a regular alarm clock. Therefore, the design should have more than one alarm sound that can be chosen.

I shared the survey on social media to get as many people to complete it as possible.
This is the link to the survey:
https://www.surveymonkey.co.uk/r/YCCCLKX

Image of Survey Monkey logo

Existing Products

Criteria:
+ Ensures waking up (calmly)
+ Efficiency
+ Aesthetic appeal
+ Has a light source
+ Simple user interface

Conclusion for sizing:
I think that the ideal size for the alarm clock would be around 15 x 15 – 18 x 18 judging by the dimensions of these existing alarm clocks.

Image of Wake-up Light Alarm

Wake-up Light Alarm: (17 x 17 x 4cm)
This is an alarm used to simulate natural sunrise to wake up the user
+ Light turns on slowly. Ensures that you wake up calmly
+ Variety of alarm sounds. Allows more than one option
+ Minimal design. It will look good in a bedroom
- Confusing user interface. Far too many buttons
- Low quality speaker. The sounds that are produced don't sound realistic
- Warm white wake-up light. No blue light means that your brain doesn't become fully awake
- Clock light is always on. Disturbing at night

For these reasons, my clock should have a minimal user interface

Image of Rolling Alarm Clock

Rolling Alarm Clock: (13.3 x 8.9 x 8.9cm)
This alarm clock wakes up the user by forcing the user out of bed to find the alarm and turn it off
+ Gets you out of bed and moving. Instead of just putting the alarm on snooze
+ Ensures that you are fully awake, by making you walk around the whole room
- Very loud. Might wake up people nearby or pets
- Might get lost or stuck somewhere

I think that the idea that the alarm clock is mobile should be ruled out fir these reasons

Standard Digital Alarm Clock: (5.8 x 5.8 x 2cm)
A simple travel-size alarm clock
+ Simple user interface. Easy to use for all demographics
+ Can be switched to local time. No need to keep changing the time
+ Cheap
+ Minimal design
- Invasive alarm sound. Wakes you up immediately.
- Only sounds twice before stopping. There's a chance that you will oversleep

I think my alarm should wake the user up with more ambient sounds like the first alarm

Ambient Night Light: (15 x 16 x 15cm)
LED night light that can be used to get the user in the mood for sleep/ to wake up
+ Remote controlled. Easy to use
+ Wide variety of colours to chose from
+ Very minimal design. Wont stand out in a room
- Too big to fit on a bedside table or a shelf
- Requires a plug socket. Restricted placement.
- No clock so it can't turn on on its own

The colour changing aspect of this product can help the user customise the product, so I might incorporate it

Image of Ambient Night Light

Standard Alarm Clock: (17.4 x 12.2 x 6.4cm)
Standard analogue alarm clock
+ Ensures that you wake up
- Too loud. Irritating to people nearby
- Difficult to read at night. Time is unclear when trying to read the time at night

From this I gather that the alarm clock should gradually increase in volume and the display should be digital rather than analogue. Analogue display might also prove problematic as my primary user wears glasses

Image of Novelty Alarm Clock

Novelty Alarm Clock: (17.8 x 15.2 x 11.4cm)
Simple digital alarm clock but with a variety of novelty features
+ Would appeal to young children. Easy demographic
+ Simple UI. Easy to program time
- Poor aesthetic appeal. Wouldn't look very nice in a room
- Sudden noise made to surprise the user. Unhealthy way to wake up

Product Disassembly

The product that I decided to disassemble was a lamp. I liked this design as it is very basic and the concept of both my product and this product are similar in the sense that they both light up.

The mechanism that was used in the product was mainly spring-loaded, however the mechanism was quite complex. This gave me an idea of what kind of mechanism should be used to enable adjustability of the product.

The parts that held the product together

I removed the top of the lamp from the base of the lamp

The only tools I used for dismantling the product was a spanner and a flat-head screw driver. This was because the joining of the parts involved nuts and bolts and a small metal rod. This showed me that it is important for the product to be able to be dismantled for maintenance and disposal of the product.

The tools that I used to dismantle the product

Materials Research

Wood

Oak
- Easy to work with
- Looks nice even without finishing
- Few knots in the wood
- Quite expensive

Pine
- Soft wood (more prone to splitting/denting)
- No knots in the wood
- Quite cheap

Beech
- Harder to work with (close grain)
- Strong & hard – not relevant for the product
- Quite cheap

Copper	£4.35/kg
Aluminium	£1/kg
Steel	£0.70/kg
Concrete	300/tonne
Oak	£52.33/ft^3
Pine	£35/ft^3
Beech	£31.50/ft3

Metal

All metals are conductive and therefore could disrupt or short circuit the electronics in the product

Copper
- Aesthetically appealing
- Malleable (easy to work with)
- Relatively heavy

Aluminium
- Very cheap
- Malleable (easy to work with)
- Very light
- Reactive so it will corrode and lose aesthetic appeal

Steel
- Can corrode if not coated or stainless
- If plated, It will no longer have the same aesthetic appeal
- Strong & dense (difficult to work with)

Concrete
- Heavy
- Can be moulded (easy to make complex shapes, Less wastage (no cutting or smoothing
- Some people wouldn't like the appearance
- Cheap

An example of where concrete has been used for aesthetic purposes

Investigating Wider Issues

Regulations on the production of electronics

The UK has certain government regulations if you wish to produce electronic devices.
For example the regulations on electrical components:

Electrical components

Certain components of electrical equipment may in themselves be considered to be electrical equipment. In such cases, steps should be taken to ensure that they satisfy the requirements of the regulations - if they are to be supplied as separate items. This includes supply for retail sales and to other manufacturers for incorporation into other electrical equipment.

And the safety requirements for electrical equipment:

All electrical equipment must be:

- safe - there should be minimum risk that the electrical equipment will cause death or personal injury to any person or domestic animal, or damage to property
- constructed in accordance with good engineering practice in relation to safety matters
- designed and constructed to ensure that it protects against electric shock through protective earthing, double insulation or equivalent
- designed and constructed to conform with the principal elements of the safety objectives, which are in Schedule 3 of the regulations

From these issues I can gather information about regulations that this product must follow:
- The product must not use high voltages or electrical currents
- The product must have insulation around electrical components
- The packaging must be CE marked

This means that I will have to use low voltage batteries to power the electronics, which shouldn't be too problematic. The electronics would all be contained within the design so there wouldn't be any exposed electronics.

The product (or packaging) must also be CE marked to show that it complies with all of the regulations

CE marking is a visible declaration by you or your authorised representative that the electrical equipment satisfies all the provisions of the Electrical Equipment (Safety) Regulations 1994. Equipment bearing the mark will be taken as meeting the requirements and thereby entitled to free circulation throughout the EEA, provided that the equipment does in fact satisfy those requirements.

Sourcing Components

A problem which I encountered was sourcing the electronic components needed to fulfil the task of the clock, however I managed to find multiple UK based websites that can sell the components in bulk:

Image of Hobby Electronics logo

Image of Kitronik logo

Image of Mouser Electronics logo

Image of Amazon.co.uk logo

Image of Bitsbox logo

Image of ebay logo

Me and Will both decided that the product will most likely be made out of solid oak as it is a hardwood so it would be durable enough to not be dented in the case of the product falling, etc. The wood cannot be veneered as multiple layers of oak which are carved down using a CNC router would be used, therefore it must be a solid material. The part of the lamp which emit light will be made of white vacuum formed HIPS as it is thin enough to let light through and the plastic half can be vacuum formed from the wooden half to get an exact copy of the wooden half. The mechanism would be made of metal and plastic (acrylic, polycarbonate, etc.) as the parts of the mechanism must be smooth so that the mechanism will be able to move easily multiple times. The processes that I have used to create the product would most likely be used in mass production

Materials Research

For the first iteration of the product, my plan was to make the entire model out of vacuum formed plastic. I suggested this idea to my primary user and he didn't like the idea of this as he thought that the product would look cheap and stand out of the colour scheme of his room. He also thought that it would be too light and dent easily. Because of this, I started discussing more potential materials for the product to be made out of

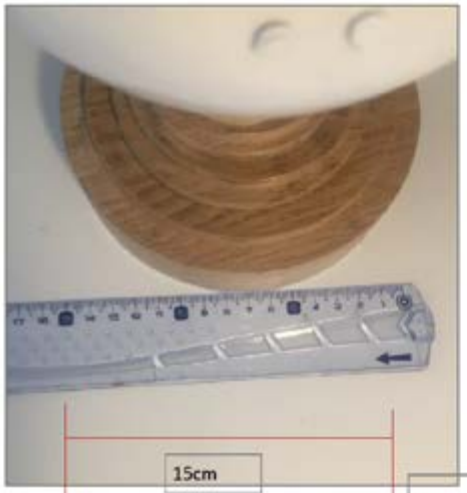
Testing & Evaluation #1

Sizing of the product

The finished product next to ruler to show size

25cm

3.3cm



15cm

The height of the entire product is about 25 cm. The size of the product has actually increased since some if the previous iterations by x1.5. This is because the product would have needed to have been scaled up in order to be cut on the CNC router without it destroying the whole thing.

The overall height is a bit smaller than the predicted height (17cm x 1.5). This is as a result of the weight of the head on the mechanism, causing it to be smaller by about 0.5cm or 5mm

The width also had to increase because of this so it went from 120mm to 150mm or 15cm.

The thickness of the base was also more than (2 x 1.5) as beforehand, the cover on the base wasn't taken into consideration.

Min. and max. brightness when waking up

Mechanism inside the product

Speaker inside the product

Quantitative analysis

The product would have had to produce about 200lux of light in order to wake the person up	The product can produce min. 159 – max. 199lux of light however with the assistance of the speaker, it should wake the user up
The alarm should be snoozed by pushing the top down using a mechanism	Using the aforementioned mechanism, the alarm clock can be pushed down and will move back up with the springs
The alarm clock should be able to make sound to also wake the user up	The alarm clock has a fitted speaker that will provide enough sound to wake the user up
The wake up time should also be adjustable	The buttons on the product allow for this (see video evidence on previous slide)

Testing & Evaluation #2

Positives

- The final prototype of the model contained all of the desired features for the product
- It will emit enough light to wake the user up
- The electronics worked correctly
- The overall product looked finished

My primary user also liked the fact that the product looked like a piece of wood as it adds to the natural theme of the product

Negatives

- The product ended up larger than it was designed so that the CNC router could cut it
- Some of the wires connecting to the clock display are visible through the front.
- The top was hard to push down due to friction between the plastic and the wood, therefore could break easily

Target Stores

The ideal stores that this product would be in would be electronics stores such as Curry's PC World as they sell similar devices (speakers, Alarm clocks, etc.). Also furniture stores like Habitat could also be suitable for the product as they sell a lot of products associated with lighting, which is the main feature of this product. I think that the product would sell best in these stores as the demographic of these stores matches that of the product

Image of lights sold by Currys PC World and Habitat

		Cost of labour (time taken)	
Oak, HIPS, Acrylic, Polycarbonate, Varnish	Circuit, Clock display, wires, buttons, battery, lights, speaker	3 x 40min sessions = 120min 2 hours overall 2 x 7.83(minimum wage)	
1 + 0.30 + 0.20 + 0.20 + 0.10 = £1.80	4 + 0.02 + 0.16 + 0.27 + 0.15 = 4.6	£15.66	£30

Primary user needs met

The alarm clock must be customisable – so that different users can change it to fit their requirements	✓
The alarm clock can't be too complex – if the alarm is too complicated then no one would use it	✓
The alarm clock must have an aesthetic appeal – so that it will fit in with other objects in the user's room but also be visually pleasing	✓
The alarm clock should make sure that you always wake up – this means that there will be no possibility of oversleeping	✓
The alarm clock must be affordable – to make sure that the users will definitely invest in it	✓

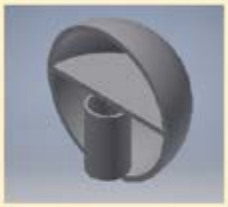
Testing & Evaluation #3

How would the final product be manufactured?

Head:

For the plastic half of the dome, I think that vacuum forming the dome would be the most efficient method as multiple shapes can be formed at a time and the cost of materials is very low. Also it would ensure that the dome is translucent

For the wooden half of the dome, I think that using a CNC router to cut out each layer size together would be efficient as more layers can be cut at once out of one piece of wood, therefore wastage can be reduced. To smooth the dome, I think that using the CNC router again would be efficient as the running costs are lower that other methods (i.e. lathe).



For the shelf, they should also be laser cut out of a sheet of polycarbonate top reduce wastage

The same should be done for the parts of the mechanism but with acrylic

Base:

For the wooden part of the base, I think that the process should be similar to the wooden dome as the concept is the same, however the smoothing process should be done at a lower resolution such that the steps are noticeable.

For the battery cap, I think that it should be laser cut out of a sheet of polycarbonate all at once to reduce wastage.

How does the product solve the design brief?

Design brief:
Design a product that assists the process of sleeping (going to sleep/waking up). The product must be able to wake up the user in a natural and healthy manner

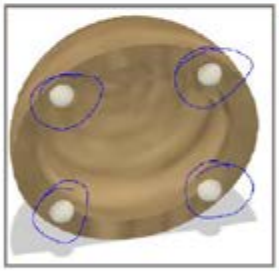
- The product does assist the process of waking up as it is an alarm clock
- The product does wake up the user in a natural and healthy manner by slowly increasing the brightness of the room as it is proven that light can help wake people up
- The product also plays natural/ambient sounds to aid the natural waking up process

How would I change this product for next time?

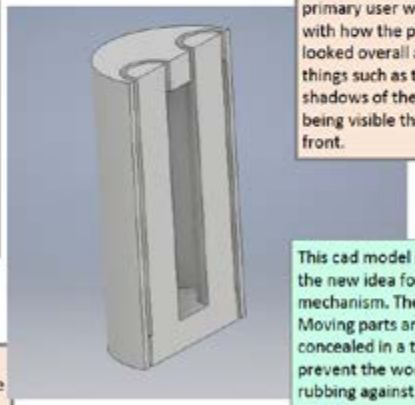
In terms of aesthetics, my primary user was happy with how the product looked overall apart from things such as the shadows of the wires being visible through the front.

Another problem that we noticed after the 'head' was difficult to push down and so was easily dislodged.

I made a CAD model to show a possible arrangement that would fix this problem (the light sources are circled in blue)



To fix this problem, I think I would make more than one light source within the 'head' of the lamp. This would reduce the visibility of wires.



In terms of aesthetics, my primary user was happy with how the product looked overall apart from things such as the shadows of the wires being visible through the front.

This cad model shows the new idea for the mechanism. The Moving parts are concealed in a tube to prevent the wood from rubbing against the plastic

Cost of materials	Cost of components	Cost of labour (time taken)	Total cost
Oak, HIPS, Acrylic, Polycarbonate, Varnish	Circuit, Clock display, wires, buttons, battery, lights, speaker	3 x 40min sessions = 120min 2 hours overall 2 x 7.83(minimum wage)	
1 + 0.30 + 0.20 + 0.20 + 0.10 = £1.80	4 + 0.02 + 0.16 + 0.27 + 0.15 = 4.6	£15.66	£30

Examiner commentary

As with the previous example, it is difficult to fully represent this strand as evidence is found throughout the entire folder.

The candidate demonstrates good levels of analysis throughout their folder and you can see particular examples of this where they analyse responses from their survey and the colour coding used to help analyse existing products.

Ongoing evaluation was mostly critical although it was not clear how it was meeting the requirements as it developed.

Feasibility testing was good but missing some physical testing and stakeholder feedback.

Design optimisation was strongly considered with possible solutions shown using CAD.

Exemplar 15

3/20 (Mark Band 1)

QUESTIONNAIRE RESULTS:

- Most people wanted a product that was easy to use/simple.
- It had to be less then £50.
- It had to be light so people could lift it from one surface to another.
- It should use materials that are good quality (don't look cheap and don't break).
- Some people wanted it to be made out of environmentally friendly materials (sustainable) but price was more important.
- Some wanted it to look modern (not like my prototype which has not been painted).

MY IDEA:

- I chose to make a cereal dispenser because the other ideas were not different enough to what is on the market already (e.g. ball launcher and activity alarm).

- The cereal dispenser was a good idea even though it is complicated and there are other products on the market. Like previous projects I have decided to design it for people with mobility issues and to make it more efficient than the traditional method and other products on the market. By making it use electronics it makes it creative and gives it a USP compared to other competitors.

PRODUCT ANALYSIS:

Simple design with dual containers.

The area is exposed unlike my design and a diagonal chute connects container to bowl.

Simple one container design is cheap

The area under the container and supports are modern and decorative

Three containers connected closely together

Overall this was a good competitor which my product is loosely based on

Dispensing area is efficient as cereal drains out and falls into bowl (resembles sweet containers you get in shops)

PRODUCT ANALYSIS- CEREAL DISPENSER

Image of Denny international cereal dispenser

Denny international cereal dispenser:
Pros: simple and modern styling (good in a modern kitchen or workspace)

Cons: only stores two, more could be a better mix; spoons and milk container attached would make the product more smarter.

Swivelling dispenser:
Pros: compact so could be stored better than others; looks decorative on a dining table.
Cons: could look more stylish, could feature electronics to help people with arthritis.

Conclusion: I have learnt from this page that the product needs to have more of a variety of storage (more than 2 containers) and needs to include features to help older generation/ the user.

MOOD BOARD: CEREAL DISPENSER

- Aesthetics:

PICTURES OF FINAL PROTOTYPE:

Re-used food containers (not carried through to the actual product)

The sensors

Electronics layer

Base layer

Plywood (for prototype old flooring was used)

Hole for CPU

FINAL EVALUATION:

- In future I will develop:
- The packaging (using cheap, eco-friendly materials, design using CAD programs)
- A better position for the CPU so it can be easily turned on and off, taken out and removed.
- Packaging of the motors and sensors because it was a tight fit which could be a problem with assembly.
- I could in the future develop different styles to fit different rooms and users
- I could develop different coloured paints or veneers to make the product look more aesthetic.

Examiner commentary

This folder demonstrates limited analysis overall. Their questionnaire results are only stated. Early analysis of existing products is generic with an indication of pros and cons used on the second page.

Ongoing evaluation was superficial and no feasibility testing was carried out.

A final evaluation provided some basic indication of possible improvements that could be made to the final prototype.

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