

DESIGN AND TECHNOLOGY - THE NEA

WORLD ASSOCIATION OF TECHNOLOGY TEACHERS



**Helping Design and Technology Teachers
around the World**



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IMPORTANT LINKS - FOR A SUCCESSFUL DELIVERY OF THE COURSE

ITERATIVE DESIGN AND THE NEA

<http://www.technologystudent.com/designpro/despro1.htm>

DETAILED CONTENT AND EXERCISES FOLLOWING THE GCSE SPECIFICATION

http://www.technologystudent.com/despro_fish/new_maths1.html

DESIGNERS, DESIGN MOVEMENTS AND COMPANIES

http://www.technologystudent.com/despro_fish/Designer1.html

MATERIALS, EQUIPMENT AND INDUSTRIAL PROCESSES

http://www.technologystudent.com/despro_fish/materials_main1.html

<http://www.technologystudent.com/equip1/equipex1.htm>

GRAPHICS, DRAWING TECHNIQUES AND INDUSTRIAL PROCESSES

http://www.technologystudent.com/despro_fish/graphics_main1.html

MATHEMATICS AND DESIGN AND TECHNOLOGY

http://www.technologystudent.com/despro_fish/new_maths1.html

TOTAL REVISION - FOR EXAMINATIONS

http://www.technologystudent.com/despro_fish/new_revison1.html

http://www.technologystudent.com/despro_fish/vid_channel2.html

A GUIDE TO THE NON-EXAM ASSESSMENT NEA

50% OF TOTAL MARKS OF THE GCSE

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The NEA is a single task that contributes 50% of all marks for the Design and Technology GCSE.

Students will be given a choice of a number of **Contextual Challenges** (themes). They will research and investigate one or more of these themes, in order to find a design problem to solve.

Students will consider the design problem, from the point of view of a potential client / customer, leading to a design brief and specification. Then, they will produce a series of designs and develop one or more, leading to a final manufactured prototype. This will be fully tested and evaluated.

Students will produce a portfolio (written or digital), of approximately twenty design sheets. Examination boards recommend that students do not exceed twenty sheets and spend between 30 to 35 hours on the NEA, which includes the manufacture of the final prototype.

PLEASE NOTE:

IT IS THE TEACHERS RESPONSIBILITY TO FOLLOW ALL REGULATIONS
AND GUIDANCE FROM THE EXAMINATION BOARDS. THIS
PRESENTATION / DOCUMENT IS MY INTERPRETATION.

PLEASE READ THE FOLLOWING:

The appropriate examination board specification.

AND ESPECIALLY:

Instructions for conducting non-examination assessments 2017-2018
<https://www.jcq.org.uk/exams-office/non-examination-assessments/in>

HELP THE TEACHER CAN and CANNOT GIVE TO STUDENTS

Teachers cannot give students direct help or personalised feedback. This includes correcting student work and giving specific sample answers.

Teachers cannot tell students how to improve their work, in order to achieve better marks (according to the marking criteria).

Teachers can give generic feedback (general advice). This could include the following (read your specification):

Advice on the resources that could be used.

If a student has missed out an important section, the teacher can draw this to the student's attention.

Teachers can explain key words and phrases, that students may not be sure about.

There are a variety of ways of providing classes with 'generic' feedback.

YOU MUST READ YOUR SPECIFICATION FOR DETAILED GUIDANCE

SUMMARY - TEACHERS CAN GIVE ONLY GENERIC ADVICE NOT PORTFOLIO OR STUDENT SPECIFIC ADVICE.

**THE SLIDES THAT FOLLOW WILL PROVIDE GENERAL /
GENERIC ADVICE.**

**THE SLIDES DESCRIBE WAYS STUDENTS CAN PROGRESS
THROUGH THE NEA.**

**SAMPLE PAGES FROM A RANGE OF PROJECTS ARE USED
THROUGHOUT THIS POWERPOINT, TO SUPPORT THE
INDEPENDENT WORK OF STUDENTS.**

WHAT IS ITERATIVE DESIGN?

HOW IT CAN BE APPLIED TO THE NEA?

HELPFUL LINK

http://www.technologystudent.com/despro_flsh/iterative1.html

HOW ITERATIVE DESIGN WORKS

Iterative design is the process of continual improvement, of a concept, prototype, design or product. It is a **CYCLICAL** approach to the development of a product, whereby a design is improved by frequent testing, client feedback, focus groups, materials testing, prototype testing, design development and evaluation, until a final refined / developed design/product is reached.

It differs from the linear approach to design, whereby the designer goes through a number of predefined stages, one at a time, until a conclusive design is reached.

The Iterative Design Cycle works at it's best, when a student understands how each of it's individual components (we call them '**DESIGN TOOLS**') can be used, to help in the design and development of a product.

HELPFUL LINK

http://www.technologystudent.com/despro_flsh/iterative1.html

HERE ARE SOME DESIGN TOOLS

CUSTOMER PROFILING WRITING A PROBLEM AND BRIEF WRITING A SPECIFICATION

COMPOSING AN INSPIRATIONAL MOODBOARD SKETCHING CAD 3D DESIGN

MODEL MAKING PLANNING SKILLS WORKING DRAWINGS etc... QUESTIONNAIRES / SURVEYS

USING PHOTOGRAPHIC / VIDEO EVIDENCE RECORDING FEEDBACK

USING FEEDBACK TO DEVELOP A DESIGN RELEVANT RESEARCH SKILLS CRITICAL ANALYSIS

MATERIAL SELECTION MATERIALS TESTING PRODUCT TESTING

COLLECTING ANTHROPOMETRIC DATA LEADING TO AN ERGONOMIC DESIGN HEALTH AND SAFETY

MANUFACTURING PROCESSES EVALUATIVE SKILLS MARKETING INCLUSIVITY

THERE ARE MANY MORE DESIGN TOOLS - CAN YOU NAME SOME?

STUDENT EXERCISE

CAREFULLY STUDY THE SAMPLE ITERATIVE DESIGN SHEET ON THE NEXT SLIDE. YOUR TEACHER MAY HAVE A PRINTED VERSION FOR YOU TO STUDY.

WHAT DESIGN TOOLS / TECHNIQUES DO YOU SEE BEING USED ON THIS SINGLE PAGE?

YOU SHOULD FIND, A VARIETY OF DESIGN TOOLS / TECHNIQUES HAVE BEEN UTILISED.

THIS IS A TYPICAL EXAMPLE OF THE ITERATIVE DESIGN ASPECT OF THE NEA.

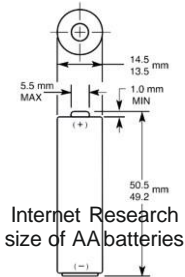
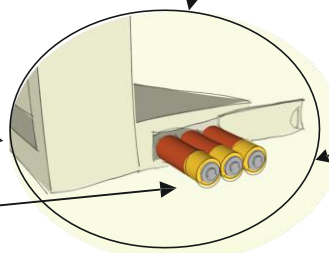
HELPFUL LINK

http://www.technologystudent.com/despro_flsh/iterative1.html

MEMPHIS STYLE MP3 PLAYER - SAMPLE ITERATIVE DESIGN SHEET



The system has a built in transformer, which means it can be plugged into a mains supply (240 volts). Batteries fit into either base unit, providing power when playing the system outside.



The MP3 station has two headphone sockets. This allows two people to listen to the same music, without disturbing other people in the room.



Each speaker arm, can be altered to any angle between 0 to 90 degrees. I tested this aspect with the model. This means that the sound can be directed in almost any direction, ideal for a party. If two people are sat at different sides of a room, the speakers can be independently angles for perfect listening.

The anthropometric data collected on hand sizes, has been applied to the mp3 player, so that it is easy to adjust.

Focus group suggestion - INCLUSIVITY - the mp3 player can be controlled by a range of smart phones through a freely available app. It has its own control pad, in a range of sizes of button sizes. It also has voice control. Ideal or people who are short sighted or have arthritic hands/fingers.

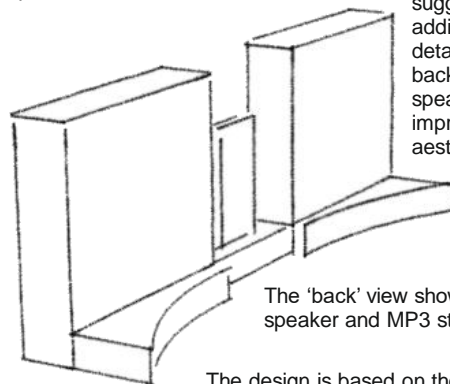
My client suggested making it possible to angle the speakers, so that the sound could be focussed on any point in the room.

SPEAKER ARMS



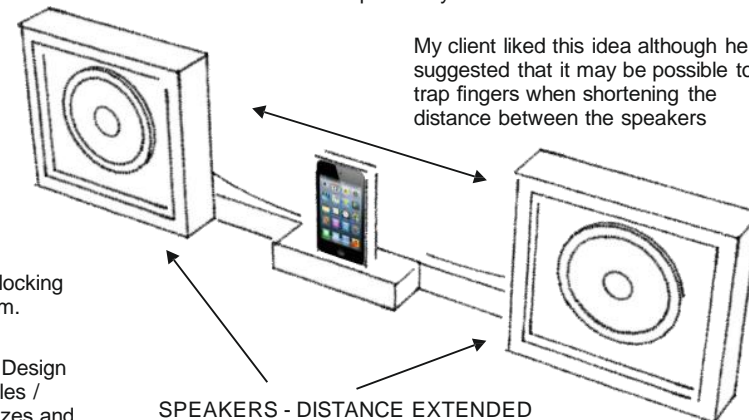
The MP3 system is stable and very unlikely to be knocked over. It will be designed to conform to British and European safety standards.

My client suggested adding artistic detail to the back of the speakers, improving the aesthetics.



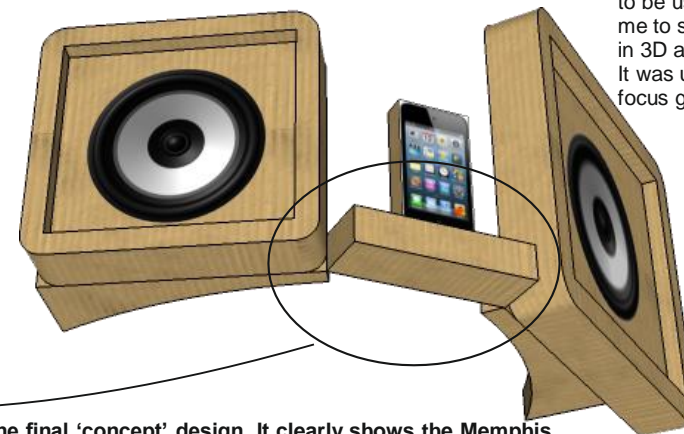
The design is based on the Memphis Design Movement. The speakers are rectangles / squares and they could be different sizes and colours, producing an unusual design.

The distance of each speaker from the docking station, can be altered independently of each other.



My client liked this idea although he suggested that it may be possible to trap fingers when shortening the distance between the speakers

The card model proved to be useful. It allow me to see the product in 3D and to handle it. It was useful with my focus group



This is the final 'concept' design. It clearly shows the Memphis influence. It is colourful, unusual and the speakers are different sizes, although they deliver equal sound volumes.

My research shows that high density polystyrene is the best choice for the casing, due to it's physical properties. Injection moulding being the manufacturing process.



My focus group of potential clients like this concept. However, they suggested that the mp3 player could be manufactured in a number of styles, whilst at the same time keeping the same shape / form. This would give the product a wider appeal.

CLICK ON THE LINK BELOW FOR A THREE MINUTE VIDEO THAT EXPLAINS ITERATIVE DESIGN

<https://www.youtube.com/watch?v=eWcFFmtIBt4>



COMPLETE ITERATIVE DESIGN CYCLE

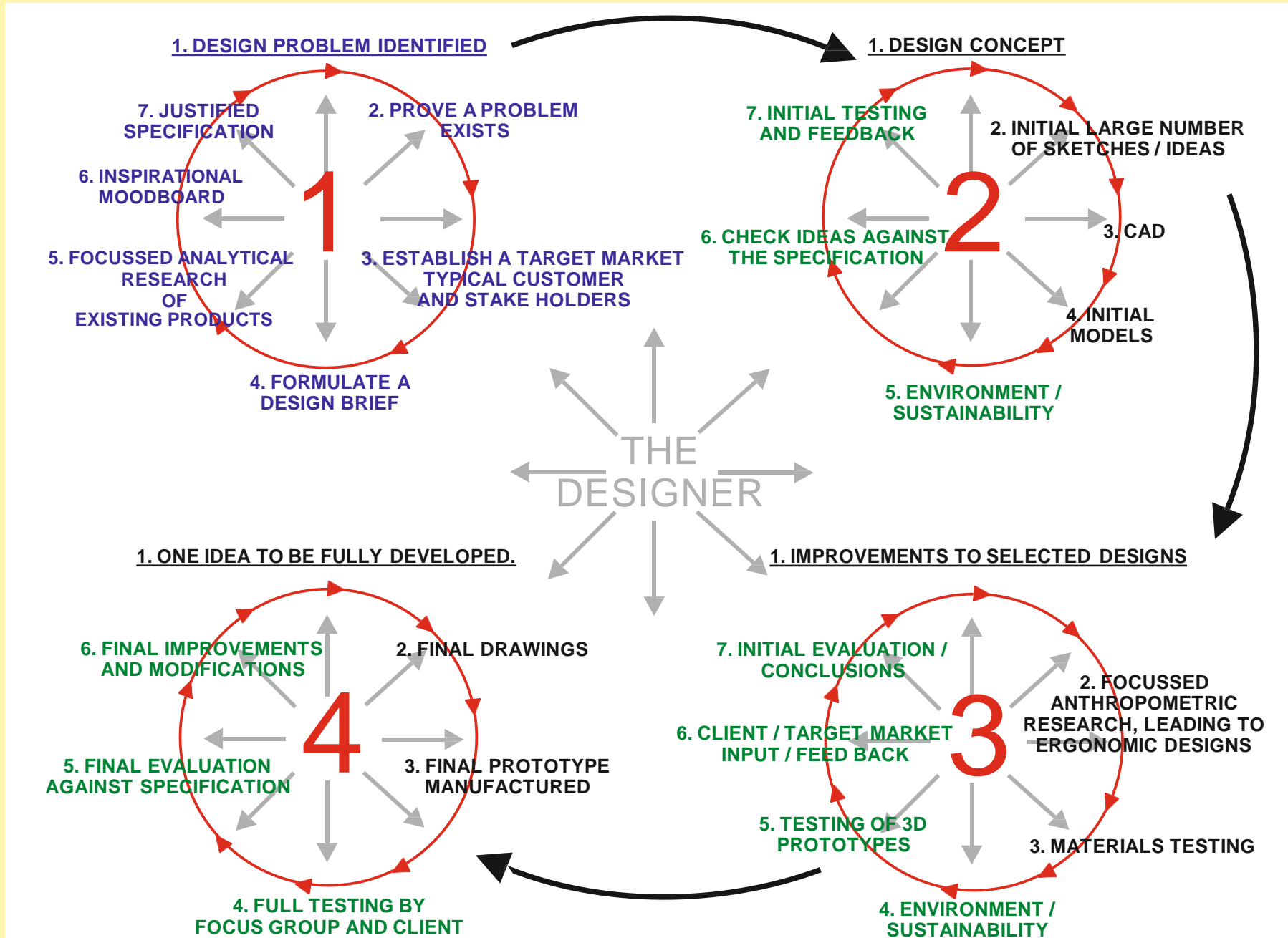
 = EXPLORE

 = CREATE

 = EVALUATE

HELPFUL LINK

http://www.technologystudent.com/despro_flash/iterative1.html



HOW ITERATIVE DESIGN WORKS

HELPFUL LINK

http://www.technologystudent.com/despro_flsh/iterative1.html

Example 1: If a student understands the purpose of a questionnaire / survey and how to conduct one, he/she will be able to decide when to use this tool when designing (and how many times). This applies to each 'design tool', including CAD, thumbnail sketching and model making. Each design tool can be utilised many times, during the iterative design process.

Example 2: The 'design tool' called 'feedback'. If a student knows how to record feedback, what to ask potential customers and stakeholders and how to turn the gained knowledge into an improved design, this skill can be used regularly, during the iterative design process.

There is no set way of designing. The student has freedom to use the 'design tools' at his/her disposal at any time, whilst designing at product.

HOW MANY PAGES FOR EACH CYCLE OF ITERATIVE DESIGN?

HELPFUL LINK

http://www.technologystudent.com/despro_flsh/iterative1.html

The number of design sheets in each 'cycle' of the iterative process will vary. This will depend on the approach taken by the student and the context / design problem he/she is working on. Some students will produce more initial designs (cycle two), whilst other students will spend longer on the development of ideas and consequently produce more design sheets for cycle three. This is due to the flexibility of the iterative design process.

CYCLE ONE - 5 to 8 SHEETS

CYCLE TWO - 5 to 8 SHEETS

CYCLE THREE AND FOUR - 10 SHEETS

HOWEVER - THE TOTAL NUMBER OF DESIGN SHEETS FOR THE ENTIRE PORTFOLIO SHOULD BE APPROXIMATELY 20

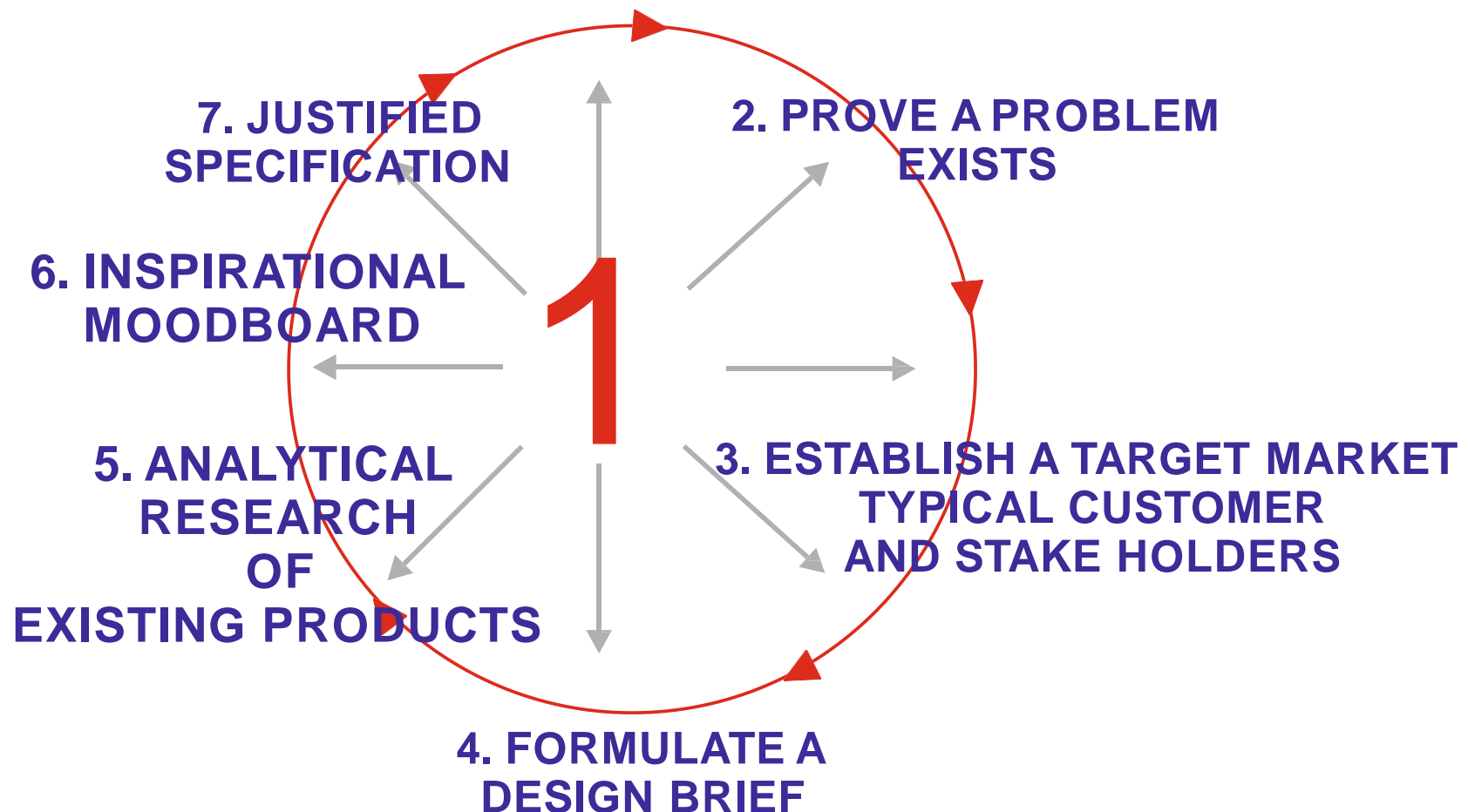
CYCLE 1

IDENTIFYING & INVESTIGATING DESIGN POSSIBILITIES

HELPFUL LINK

http://www.technologystudent.com/despro_flsh/iterative2.html

1. DESIGN PROBLEM IDENTIFIED



CYCLE ONE COVERS THE EXAMINATION BOARDS 'OBJECTIVES' OUTLINED BELOW

AQA

AO1: Identify, investigate and outline design possibilities to address needs and wants.

A03: Analyse & evaluate

OCR

Explore (AO1)

1. Identifying requirements
2. Learning from existing products and practice

EDEXCEL

Component 2

- 1.1 Investigation of needs and research
- 1.2 Product Specification including a Design Brief

WHAT SHOULD BE INCLUDED IN THIS 'CYCLE'?

HELPFUL LINK

http://www.technologystudent.com/despro_fish/iterative2.html

Begin by investigating the selected CONTEXT to identify design possibilities / design problems. Consider these in-depth.

A client / potential customer is identified, as well as a suitable justified design problem, that will be solved through the portfolio.

The needs and design requirements of the client / potential customer are defined, after a enquiry and analytical research

The inspirational work of designers and design movements are considered.

Produce a Design Brief and Justified Specification.

HELPFUL LINKhttp://www.technologystudent.com/despro_flsh/iterative2.html

THE NEXT TWO SLIDES SHOW ONE WAY OF INVESTIGATING A CONTEXTUAL CHALLENGE.

SAMPLE CONTEXT - “WORKING COMFORTABLY WITHOUT A DESK OR TABLE”

EXERCISE - IDENTIFYING A GENUINE DESIGN PROBLEM

THE LINK BELOW WILL TAKE YOU TO ANUMBER OF PROBLEM / DESIGN CARDS. THEY SHOW HOW A PROBLEM CAN BE IDENTIFIED AND A SIMPLE DESIGN BRIEF WRITTEN.

http://www.technologystudent.com/despro_flsh/new_prob1.html

IDENTIFYING & INVESTIGATING DESIGN POSSIBILITIES STARTING WITH A CONTEXT

SAMPLE CONTEXT - WORKING COMFORTABLY WITHOUT A DESK OR TABLE

HELPFUL LINKS http://www.technologystudent.com/despro_flash/new_prob1.html
http://www.technologystudent.com/pdf14/POSTER_FIND_PROBLEM1.pdf

There are many ways of analysing a contextual challenge. Below is just one example. Quite simply write the context in the centre of a design sheet and identify design opportunities.

Design possibilities identified and thoroughly explored.

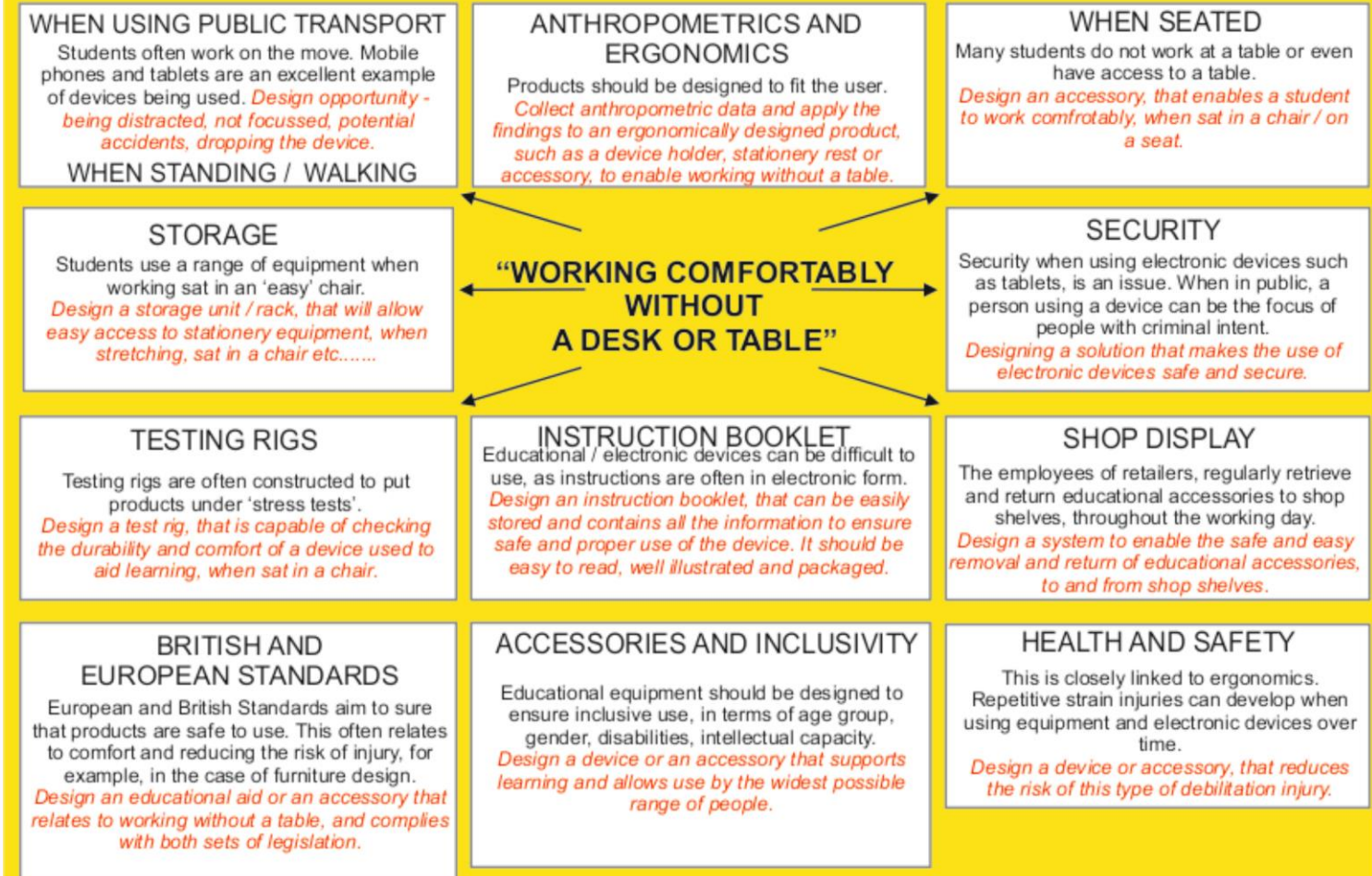
In this example, the main theme(context) has been written in the centre of the page.

Various design opportunities have been written around the page.

The '**BLACK**' ink highlights a possible area for further investigation.

The '**RED**' writing indicates a potential problem(s) to solve.

ANALYSING THE CONTEXTUAL CHALLENGE STUDENTS WILL IDENTIFY DESIGN POSSIBILITIES



ANALYSING THE CONTEXTUAL CHALLENGE STUDENTS WILL IDENTIFY DESIGN POSSIBILITIES

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WHEN USING PUBLIC TRANSPORT

Students often work on the move. Mobile phones and tablets are an excellent example of devices being used. *Design opportunity - being distracted, not focussed, potential accidents, dropping the device.*

WHEN STANDING / WALKING

ANTHROPOMETRICS AND ERGONOMICS

Products should be designed to fit the user. *Collect anthropometric data and apply the findings to an ergonomically designed product, such as a device holder, stationery rest or accessory, to enable working without a table.*

WHEN SEATED

Many students do not work at a table or even have access to a table. *Design an accessory, that enables a student to work comfortably, when sat in a chair / on a seat.*

STORAGE

Students use a range of equipment when working sat in an 'easy' chair. *Design a storage unit / rack, that will allow easy access to stationery equipment, when stretching, sat in a chair etc.....*

“WORKING COMFORTABLY WITHOUT A DESK OR TABLE”

SECURITY

Security when using electronic devices such as tablets, is an issue. When in public, a person using a device can be the focus of people with criminal intent. *Designing a solution that makes the use of electronic devices safe and secure.*

TESTING RIGS

Testing rigs are often constructed to put products under 'stress tests'. *Design a test rig, that is capable of checking the durability and comfort of a device used to aid learning, when sat in a chair.*

INSTRUCTION BOOKLET

Educational / electronic devices can be difficult to use, as instructions are often in electronic form. *Design an instruction booklet, that can be easily stored and contains all the information to ensure safe and proper use of the device. It should be easy to read, well illustrated and packaged.*

SHOP DISPLAY

The employees of retailers, regularly retrieve and return educational accessories to shop shelves, throughout the working day. *Design a system to enable the safe and easy removal and return of educational accessories, to and from shop shelves.*

BRITISH AND EUROPEAN STANDARDS

European and British Standards aim to ensure that products are safe to use. This often relates to comfort and reducing the risk of injury, for example, in the case of furniture design. *Design an educational aid or an accessory that relates to working without a table, and complies with both sets of legislation.*

ACCESSORIES AND INCLUSIVITY

Educational equipment should be designed to ensure inclusive use, in terms of age group, gender, disabilities, intellectual capacity. *Design a device or an accessory that supports learning and allows use by the widest possible range of people.*

HEALTH AND SAFETY

This is closely linked to ergonomics. Repetitive strain injuries can develop when using equipment and electronic devices over time. *Design a device or accessory, that reduces the risk of this type of debilitation injury.*

AN ALTERNATIVE LAYOUT TO IDENTIFYING THE CONTEXTUAL CHALLENGE

GUIDANCE


Write your selected contextual challenge in the centre of the page. Then, add associated images / sketches of situations.

Above each image, include a brief description AND a potential design opportunity, below.

INITIAL ANALYSIS OF A CONTEXTUAL CHALLENGE

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Some students work with a laptop outside, in good weather.




What problems do they face? Working comfortably, when sitting or lying on the grass.

Students working, using a desk, outside, on a sunny day.




What problems do they face? Breezy / windy conditions, the sun...

Office quality chairs are often used at home, when studying.



Even the best chairs do not always prevent backache. Is an accessory needed?


Student often work relaxing on a laptop, in front of the TV.



Finding a comfortable working position, is not easy. Is a reading aid needed?

GUIDANCE
Write your selected contextual challenge in the centre of the page. Then, add associated images / sketches of situations, in each space. Above each image, include a brief description AND a potential design opportunity, below.

Homework often involves reading books.



Keeping the book open at the right page, can be a problem.

WRITE YOUR SELECTED CONTEXTUAL CHALLENGE HERE

Students working At home


Students frequently complete their work, sat at a desk.



Desks can become extremely untidy, however hard we try to keep them organised.


For ALL your AIGA needs, go to: http://www.technologystudent.com/boards/igap_boards/

Working at home inevitably means using a keyboard.



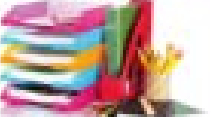
Keyboards can become uncomfortable to use and be awkward to store when not in use.

Often, the things we use when studying, are not "inclusive".




What study aids / equipment, need redesigning or adapting to ensure inclusivity?

Desktop organisers can be very useful, but there are so many.



Could a single organizer be designed, that holds everything you need?

Most people like a soft drink, tea or coffee when studying. But, a spill can ruin work.

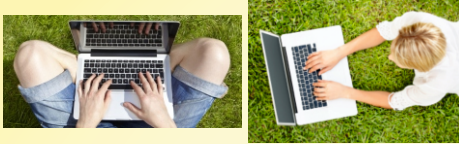


Could a safe and universal drinks holder be the solution?

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INITIAL ANALYSIS OF A CONTEXTUAL CHALLENGE

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For **ALL** your NEA needs, go to:

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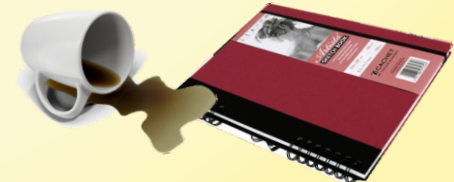
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Could a safe and universal drinks holder be the solution?

HELPFUL LINKhttp://www.technologystudent.com/despro_fish/new_prob1.html

THE NEXT TWO SLIDES EXPLAIN A WAY OF CLEARLY IDENTIFYING THE DESIGN PROBLEM, THAT HAS BEEN SELECTED BY INVESTIGATING THE CONTEXTUAL CHALLENGE - AS SEEN IN THE TWO PREVIOUS SLIDES .

SAMPLE CONTEXTUAL CHALLENGE - “WORKING COMFORTABLY WITHOUT A DESK OR TABLE”

CLEAR IDENTIFICATION OF THE DESIGN OPPORTUNITY

This is an example of a design sheet that refers to the selected design opportunity. It clearly identifies the specific design problem, stemming from the contextual sheet.

HELPFUL LINK http://www.technologystudent.com/despro_fish/new_problem1.html


This sheet clearly identifies the selected design opportunity.

Potential clients are referenced.


Evidence that the problem is a genuine problem worth solving, is achieved through a questionnaire. A justified need.

THE PROBLEM / SITUATION / IDENTIFICATION OF NEED

THE PROBLEM



Most of my friends complete their home work, sat on a chair or settee, in front of the TV. Or they work in their bedroom, sat on an 'easy' chair. They rest their paper on a board, which rests on their knee / lap. The problem is that it is difficult to support paper and consequently to write neatly, even if work is supported on your knee. Office workers who take work home, also have this problem, when working in a more relaxed way, such as this.



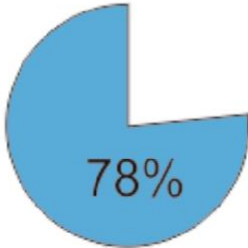
Lighting is also a problem. The light source never seems to be in the right position for work and a shadow is cast preventing work being seen properly. This is irritating and probably harmful to eyesight, if working for sometime.

Working with a board resting on a knee or lap, is not the most comfortable position. It eventually causes neck and back ache and results in a lack of concentration and focus. This inevitably affects the quality of work.

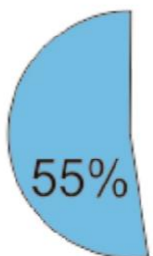
PROOF / EVIDENCE

I carried out a survey of fellow pupils and teaching staff, to identify the percentage who regularly complete written work by resting their work on their knees / lap. Also, if there is a genuine demand for a 'device' / writing aid, which allows the user to work comfortably, whilst supporting work in this way.

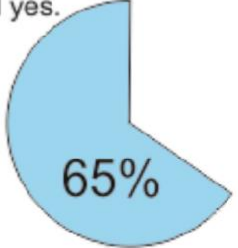
1. 50 Year 11 pupils and 50 teachers were asked, 'do you regularly rest work on your knees / lap, whilst completing it?' 78 % said yes.



2. 50 Year 11 pupils and 50 teachers were asked, 'have you ever suffered from neck / back ache when, resting work on your knee / lap?' 55% said yes.



2. 50 Year 11 pupils and 50 teachers were asked, 'would you purchase a reasonably priced product, that solved the design problem?' 65% said yes.



Objective 1: Identification of a Need or Opportunity Leading to a Design Brief

THE PROBLEM / SITUATION / IDENTIFICATION OF NEED

THE PROBLEM



Most of my friends complete their home work, sat on a chair or settee, in front of the TV. Or they work in their bedroom, sat on an 'easy' chair. They rest their paper on a board, which rests on their knee / lap. The problem is that it is difficult to support paper and consequently to write neatly, even if work is supported on your knee. Office workers who take work home, also have this problem, when working in a more relaxed way, such as this. Lighting is also a problem. The light source never seems to be in the right position for work and a shadow is cast preventing work being seen properly. This is irritating and probably harmful to eyesight, if working for sometime.



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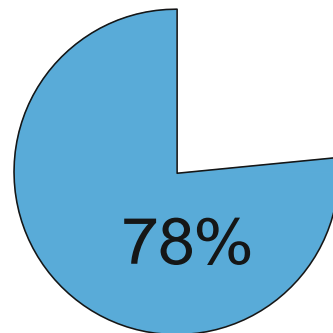
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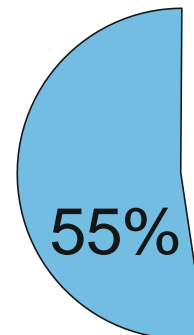
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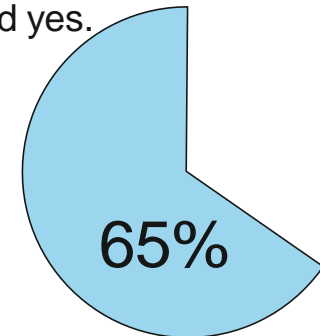
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Objective 1: Identification of a Need or Opportunity Leading to a Design Brief

THE NEXT TWO SLIDES SHOW AN EXAMPLE OF IDENTIFYING A SPECIFIC CLIENT, PRESENTING THE CLIENT NEEDS / REQUIREMENTS AND A DESIGN BRIEF.

SAMPLE CONTEXTUAL CHALLENGE - “WORKING COMFORTABLY WITHOUT A DESK OR TABLE”

A user/client has been clearly identified. The student has undertaken a comprehensive investigation of their needs and wants, with a clear explanation and justification.

HELPFUL LINK

http://www.technologystudent.com/despro_fish/cus1.html

This design sheet clearly identifies the client / user. A potential wider range of users have also been identified.

Needs and wants of the client are discussed and justified.

Design Brief which clearly justifies how they have considered their user/client's needs and wants and links directly to the context selected

TYPICAL CUSTOMER / POTENTIAL USER PROFILE SHEET

Below is a description of a specific client. He has commissioned the design and manufacture a prototype of my product.

<p style="text-align: center;">SPECIFIC CLIENT</p> <p style="text-align: center;"><i>Jeff Smith</i> BACKGROUND</p> <div style="display: flex; align-items: center;"> <div> <p>Office manager for a local college. Needs to work at home and prefers to work sat on an easy chair, with the work supported on his lap. Also works at a desk, when at his workplace.</p> </div> </div> <p style="text-align: center;">DESIGN REQUIREMENTS</p> <p>Client view and opinion: <i>'I need a device or system that enables me to work in a more comfortable seating position. I do not want or need to work at a desk all the time. I like to be sat with the rest of the family, when I am reading through reports or writing memos and letters. There are even times at work, when I am in a meeting and I need to take notes, when sat on an ordinary chair. I do not need to work always at a table, in an office. However, resting work on a board on my lap, leads to back and neck ache.'</i></p> <p>CLIENTS DESIRED PRODUCT OUTCOME</p> <p><i>'I would like a lightweight device that allows me to write neatly and yet allows me to sit in a comfortable easy chair. In addition, I need an adjustable light source, so that I can focus the light where I need it.'</i></p>	<p style="text-align: center;">POTENTIAL RANGE OF CUSTOMERS</p> <p>Pupils / students - working on homework.</p> <p>Office workers and Clerical workers - paper work taken home for completion.</p> <p>Anyone - who prefers to be sat in a relaxing position, whilst reading.</p> <p>Pupil quote: <i>'I gets lots of home work and like working in front of the fire, not at a desk'.</i></p> <p>Clerical worker quote: <i>'I take too much work home and like working whilst sat on an easy chair. I work at a desk, all day long'.</i></p> <p>Parent quote: <i>'I like reading and writing letters when sat on a comfortable chair and in the same room as my children'.</i></p> <p>These are examples of the type of products that people hold / use when working and reading at home. If these are used whilst sat in an easy chair, back and neck ache can result.</p> <div style="display: flex; justify-content: space-around; text-align: center;"> <div>EXERCISE BOOKS </div> <div>CLIPBOARDS </div> <div>EXERCISE PAPER </div> <div>ART SKETCH BOOK </div> <div>READING BOOK </div> </div> <p style="text-align: center;">DESIGN BRIEF</p> <p>I am going to design a suitable 'stationery rest', for use when sat on an easy chair or settee, when sketching, writing and reading. It will have an adjustable light source, to illuminate the paperwork on the rest. It will be easy and comfortable to use. The innovative stationery rest will help prevent back and neck ache.</p> <p>It will be suitable for a range of users and a broad age range, making writing, reading and sketching away from a table, a pleasure.</p>
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TYPICAL CUSTOMER / POTENTIAL USER PROFILE SHEET

Below is a description of a specific client. He has commissioned the design and manufacture a prototype of my product.

SPECIFIC CLIENT

Jeff Smith

BACKGROUND



Office manager for a local college. Needs to work at home and prefers to work sat on an easy chair, with the work supported on his lap. Also works at a desk, when at his workplace.

DESIGN REQUIREMENTS

Client view and opinion:

'I need a device or system that enables me to work in a more comfortable seating position. I do not want or need to work at a desk all the time. I like to be sat with the rest of the family, when I am reading through reports or writing memos and letters. There are even times at work, when I am in a meeting and I need to take notes, when sat on an ordinary chair. I do not need to work always at a table, in an office. However, resting work on a board on my lap, leads to back and neck ache.'

CLIENTS DESIRED PRODUCT OUTCOME

'I would like a lightweight device that allows me to write neatly and yet allows me to sit in a comfortable easy chair. In addition, I need an adjustable light source, so that I can focus the light where I need it.'

POTENTIAL RANGE OF CUSTOMERS

Pupils / students - working on homework.

Pupil quote: *'I gets lots of home work and like working in front of the fire, not at a desk'.*

Office workers and Clerical workers - paper work taken home for completion.

Clerical worker quote: *'I take too much work home and like working whilst sat on an easy chair. I work at a desk, all day long'.*

Anyone - who prefers to be sat in a relaxing position, whilst reading.

Parent quote: *'I like reading and writing letters when sat on a comfortable chair and in the same room as my children'.*

These are examples of the type of products that people hold / use when working and reading at home. If these are used whilst sat in an easy chair, back and neck ache can result.

EXERCISE BOOKS



CLIPBOARDS



EXERCISE PAPER



ART SKETCH BOOK



READING BOOK



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DESIGN BRIEF

I am going to design a suitable 'stationery rest', for use when sat on an easy chair or settee, when sketching, writing and reading. It will have an adjustable light source, to illuminate the paperwork on the rest. It will be easy and comfortable to use. The innovative stationery rest will help prevent back and neck ache.

It will be suitable for a range of users and a broad age range, making writing, reading and sketching away from a table, a pleasure.

THE NEXT SET OF SLIDES SHOW THE PRESENTATION OF ANALYTICAL RESEARCH.

1. EXISTING DESIGNS TO AID FUTURE PRODUCT DESIGN
2. QUESTIONNAIRE TO INFORM FUTURE DESIGNING
3. ANALYTICAL MOOD BOARD
4. ANALYTICAL RESEARCH SPECIFIC TO THE CLIENT
5. JUSTIFIED SPECIFICATION.

DESIGN BRIEF - 'stationery / writing rest', for use when sat on an easy chair or settee, when sketching, writing and reading.

ANALYTICAL RESEARCH OF EXISTING PRODUCTS

HELPFUL LINK

http://www.technologystudent.com/despro_fish/focusres1.html

When researching existing products, it is important to focus on those that may contribute in some way, to a new or improved design.

Existing or similar products, may have functions and features you find of interest or partly solve the design problem you are working on. Carefully analysing your research findings, could help you design a successful, innovative product.

If you identify an interesting function or feature, the next stage is to determine why the function / feature has been included.

RESEARCH AND ANALYSIS OF EXISTING PRODUCTS

What are the interesting features?

The interesting feature of this 'stationery rest' is that it fits firmly on to the chair and does not 'wobble' or move, when in use. It is also slightly at the side of the chair allowing comfortable use. However, one big negative is that it is for right handed people. A second left handed version would have to be bought. This is another negative.

http://www.alibaba.com/product-detail/wood-school-chair-with-writing-board_1130856362.html



Is the size, weight and shape important?

The product is lightweight and easy to fit and take off the chair. The shape allows the arm of the user to rest comfortably, providing a good writing position.

What does the target market find interesting about the product.

My potential customers do not like the stationery rest, as it is not for an easy chair. However, in a formal setting of a classroom it is ideal.

What materials have been used in its construction and why? Is the cost of the product a factor in its success?

The stationery rest is manufactured from plywood. This is ideal as it does not warp or twist out of shape. It provides a firm surface for writing and sketching.

Both the chair and the stationery rest cost £18.00. This is an extremely good price and is one reason for its success.

Summary of conclusions:

It must be possible for right and left handed people to use my product, with equal comfort.

It must be firm and not move at all, when being used. A good writing position is vital.

Plywood could be the ideal material for the writing / sketching surface. The cost must be relatively low. This definitely helps the sales of the device seen above.

The product must be lightweight and easy to move.

What are the interesting features?

This Lap Rest is a simple idea. The main feature of interest is that the stand rests between the users legs, keeping it stable. This could be used even when sat on an easy chair. The basic structure makes it easy to manufacture. However, would it be uncomfortable to keep under your legs? for a sustained amount of time.

What are the interesting functions?

The rest is set at one angle and can be used for resting paper, a magazine or book and even a laptop.

What does the customer / target market find interesting about the product.

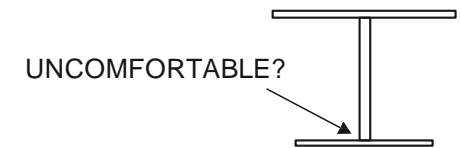
My specific client said that this product looked quite good, although he suggested that it may be uncomfortable to use for a prolonged time.

What materials have been used in its construction and why?

Polypropylene is a good choice because it is lightweight and can be moulded to form a complex shape.

Summary of conclusions:

I must keep my design simple, so that it is easy to use and manufacture. Although the rest above is set at one angle, I may design one that can be altered. My product must be lightweight, possibly manufactured from polypropylene. The product will be easy to clean, if polypropylene is used. Injection moulding is an ideal process, for manufacturing a one piece product. If injection moulding is the selected manufacturing process, large numbers of the product should be made, to keep costs as low as possible. An adjustable product is needed so that the product has a large range of potential customers.



Is the size, weight and shape important?

The size and weight are ideal, as it could be stored easily when not in use.

Is the cost of the product a factor in its success?

The product costs £22, which reflects the cost of injection moulding small numbers.

RESEARCH AND ANALYSIS OF EXISTING PRODUCTS

What are the interesting features?

This adjustable 'rest' has some very interesting features. It is fully adjustable, ensuring the comfort of the user.

One limiting feature, is that the frame may restrict arm and elbow movement, in certain circumstances.

It does not interfere with leg movement, although it may be a little difficult to move, due again to the frame.

What are the interesting functions?

The range of adjustment, which allows the user to work when lying or sat down. Also, the fact that it can be folded away unlike many other frame based writing rests. Storage when the product is not in use is another interesting function. This product will 'fit' around most people as it ergonomically designed.

What does the target market find interesting about the product.

My client quite liked this design. He said, 'I like the adjustability especially the height adjustment. This feature could be useful'.

The product is environmentally friendly as the materials can be recycled.

What materials have been used in its construction and why? Is the cost of the product a factor in its success?

Lightweight aluminium tube is used in the products construction.

Aluminium can be recycled as well, making the product sustainable

The cost of this product is a negative, as it is very expensive at £82.00. There are many cheaper products on the market, although in most cases they are not adjustable.

Summary of conclusions:

An adjustable frame, could allow for a large range of potential users, of different ages. Lightweight aluminium will be considered for my product, if I design a frame based system.

Aluminium is recyclable and this product can be dismantled easily, making it environmentally friendly. A sustainable product.

I will keep the costs down, as a very expensive product, may price itself out of the market and not be bought in quantities.

ADJUSTABLE LAP REST



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ANALYTICAL RESEARCH OF POTENTIAL CUSTOMERS

HELPFUL LINK

http://www.technologystudent.com/despro_flsh/focussedq1.html

Questionnaires are a very useful research 'tool'. If the right questions are asked, the findings can help guide the development of a product.

The key is to ask the right focussed questions and to analyse the findings carefully.

The questions should be targeted and direct, not general. Only ask relevant questions.

For example, asking potential customers of a house alarm system, 'how many zones (rooms) must the alarm cover protect?' is a direct and necessary question. It will help you to determine how many inputs (sensors) the alarm circuit requires. However, asking potential customers, 'do you want the alarm to be loud?', is far too generalised and will not return important research findings.

Asking questions that help you determine the needs or requirements of the customer, also helps the designer to focus on important research information.

ANALYTICAL RESEARCH - MOOD BOARD

HELPFUL LINK

http://www.technologystudent.com/despro_fish/anmood1.html

A mood board can be extremely useful as a research tool, especially when working closely with a client / potential customer. For example, 'my' client wants me to design a writing rest for an easy chair. When talking to him in order to determine the overall style of the design, it is obvious that he has an interest in art movements such as; Art Deco and Bauhaus. By building up a 'reasoned' mood board on these art movements, I will be able question my client as to which style or features he would like to be applied to the writing rest.

The mood board will not only be composed of pictures but also text that explains the reason for including the pictures. The text will also explain which art movement features, are of interest and may be applied to the design.

ANALYTICAL RESEARCH – MOOD BOARD

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When talking to my client in order to determine the overall style of the design, it became obvious that he has an interest in Art Movements such as; Art Deco and Bauhaus. By building up a reasoned mood board on these art movements, I will be able question my client, as to which style or features he would like to be applied to the writing rest. The mood board will be a very useful research tool.

ART DECO

The buildings have features such as symmetry, curves and shapes that could transfer to a writing rest. The patterns and shapes could be applied to decorate the final product. Further to this, the style of the furniture and the materials used, could influence my design.

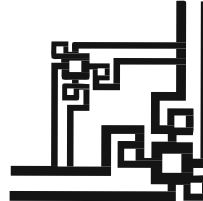
These buildings reflect perfect symmetry that could be applied to my product. I like the chrome effect of the Empire State Building.



These geometrical shapes are typical Art Deco. I like the colours and shapes, as they could provide my product with an authentic style.



The corners and straight patterns could be used on the writing surface.



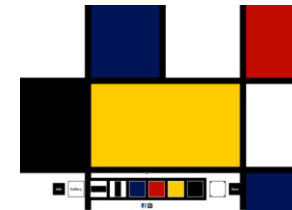
My product could be manufactured from these materials. I like the veneered surface on the table. The use of chromed steel on the chairs is effective.



BAUHAUS

Bauhaus is a modernist style, that could be applied to my innovative product. In its day, Bauhaus design was new and refreshing. This design movement experimented with new materials, which could be what I need to do when designing my product.

Bauhaus shapes and patterns are attractive and are still regarded as modern and up to date. My client has pictures like these on his office walls.



I like the unusual style and especially the handles on these kettles. Handles may be needed on my writing rest.



I need a light source on my writing rest. The flexible stem on the first light and the way it is clamped to the surface, could be what I need for my product. The focussed light of the second stand could work on my product. Both lights are stylish and modern.



The shape of the frame of these pieces of Bauhaus furniture could influence my design.



ANALYTICAL RESEARCH OF POTENTIAL CUSTOMERS

HELPFUL LINK

http://www.technologystudent.com/despro_fish/ergorest1.html

Ergonomic research can sometimes be quite generalised. However, in order to limit the amount of research carried out and to eliminate irrelevant research, there is another approach. The ergonomic research in the following example, is focussed on the client and acquiring only essential anthropometric data.

The next example, shows anthropometric data being collected for the design of a 'writing rest' for an easy chair. This is called Primary Research, as it involves the designer / researcher carrying out his / her own research and not taking existing research from books or the internet.

ANALYTICAL RESEARCH OF POTENTIAL CUSTOMERS

ERGONOMICS PRIMARY RESEARCH

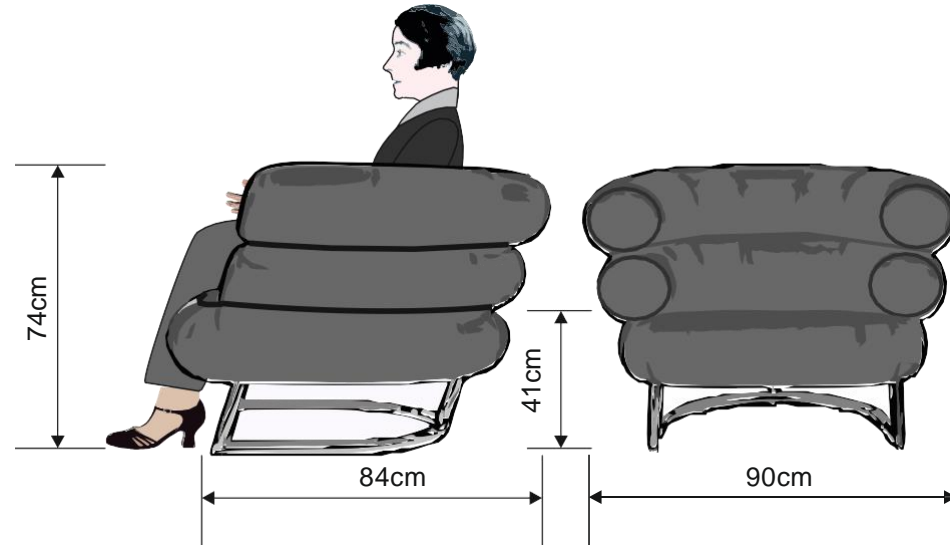
I collected primary research for three important measurements, relating to my product.

Average comfortable reach length (A): I need this data so that the writing rest I design is not too large. The rest must fit within the arm reach of most people.

Average seating height (B): I need this measurement because this distance may influence the design of the writing rest, especially if the rest attaches to a chair.

Average body width (C): I need this measurement, so that I ensure that the rest is a suitable width for the largest range of users.

Average hand width (D) and length (E): I need these measurements because they will help me work out the size of the writing rest and how it can be handled.



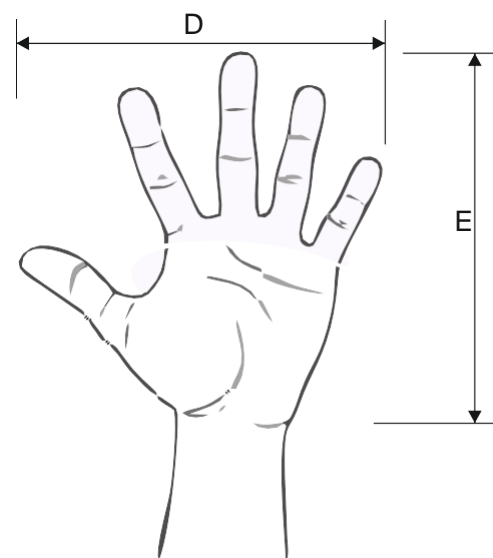
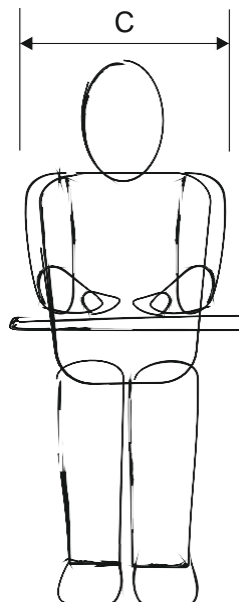
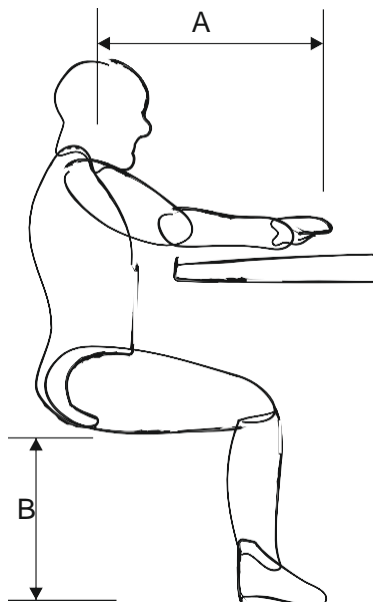
Typical easy chair used by my specific client. The type of chair the writing rest will be designed to fit. Ergonomic data will be required so that the rest can be successfully designed.

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PUPIL/PERSON	A	B	C
Person A	600mm	450mm	500mm
Person B	534mm	436mm	522mm
Person C	589mm	425mm	515mm
Person D	590mm	395mm	506mm
Person E	610mm	412mm	545mm
Person F	500mm	423mm	534mm
Person G	615mm	428mm	535mm
Person H	602mm	422mm	560mm
Person I	590mm	480mm	545mm
Person J	595mm	435mm	577mm
Person K	605mm	456mm	561mm
Person L	625mm	400mm	400mm
TOTAL(S)	7055mm	5162mm	6300mm
AVERAGE	588mm	430mm	525mm



PUPIL/PERSON	D	E
Person A	155mm	82mm
Person B	149mm	59mm
Person C	152mm	52mm
Person D	145mm	70mm
Person E	139mm	75mm
Person F	135mm	76mm
Person G	142mm	81mm
Person H	147mm	78mm
Person I	152mm	70mm
Person J	148mm	72mm
Person K	153mm	81mm
Person L	135mm	76mm
TOTAL(S)	1752mm	872mm
AVERAGE	146mm	72.6mm

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THE JUSTIFIED SPECIFICATION

HELPFUL LINK

<http://www.technologystudent.com/designpro/newspec1.html>

A 'specification' is a summary of the key points, identified by your research and analysis. Your research should be in detail. Now is the time to draw all the research / evidence together, in a clear specification. The specification can be a list of key points / sentences, that help to determine the future design and development of the product.

When writing a specification, refer where possible, to the research you have carried out. You could refer to specific research pages such as, the problem / brief page, the existing products pages, ergonomics and questionnaire pages. You should consider including 'quotes' from your potential customers and / or referring to page numbers. Usually, each specification point is justified by referring to aspects of your research or the design requirements.

One way of setting out a 'justified' specification is shown next. In the first column a specification point is written as a sentence(s). In the second column, the point is justified by referring back to specific research findings. Further justification for each specification point, can be added in a third column. The third column, makes reference to how each specification point will inform future design developments.

HELPFUL LINK

<http://www.technologystudent.com/designpro/newspec1.html>

**COMPREHENSIVE
DESIGN SPECIFICATION**



**JUSTIFICATION
LINKING TO THE NEEDS AND
WANTS OF THE CLIENT/USER**



**FULLY INFORMS SUBSEQUENT
DESIGN STAGES**



PRODUCT: EASY CHAIR WRITING REST		
<i>My Product Specification is written below. It is a check list that will help me develop my product. It has been checked and agreed with my client / customer</i>		
MY SPECIFICATION		
MY SIGNATURE: _____		
CLIENT SIGNATURE: _____		
SPECIFICATION POINT	EVIDENCE FROM RESEARCH - JUSTIFICATION	FURTHER JUSTIFICATION
POTENTIAL CUSTOMERS: The 'writing rest' must be useful and appeal to a wide range of potential customers.	This is shown by my initial research (page/slide 1), when investigating the design problem and brief. The questionnaire shows that both pupils and teachers are interested in this product.	Furthermore, if I design a writing rest that appeals to a wide age range, it is more likely to sell successfully, in large numbers.
FUNCTIONS - EASE OF USE: The 'writing rest' must allow the user to write and read comfortably, whilst sat in an easy chair.	A majority of people I asked about reading and writing whilst sat in an easy chair, said that this was difficult and often uncomfortable (see design problem / brief and potential customer sheets). An easy to use reading / writing rest could solve this problem.	Many of my friends have said that the writing rest must be easy and comfortable to use. This is a priority.
FUNCTIONS - LIGHTING: The 'writing rest' should have an integrated light source.	When questioning people about the design problem, many said that the light source was essential. A quote from the detailed questionnaire says about an existing product, <i>'It has an LED light that can be focussed directly where the user wants it'</i> .	When reading or writing whilst sat on a easy chair, the room light source often casts a shadow. This makes reading difficult and sometimes unpleasant.
LIGHTWEIGHT: The writing rest should be lightweight.	My research into existing/similar products, suggests that a successful writing rest must be lightweight (see existing products section of my research).	A light weight writing rest will be comfortable on the knees and be easy to carry around and store, when it is not in use.
ADJUSTABLE: The writing rest should be adjustable, allowing individuals to set it up to suit their seating position.	My research into existing products and ergonomics, shows that adjustability is essential. The client said about one of the existing products, <i>'I like the adjustability especially the height adjustment. This feature could be useful'</i> .	If the product is adjustable, this can be considered to be 'inclusive design', because a wide range of people will be able to use it.

PRODUCT: EASY CHAIR WRITING REST

MY SPECIFICATION

MY SIGNATURE: _____

*My Product Specification is written below. It is a check list that will help me develop my product.
It has been checked and agreed with my client / customer*

CLIENT SIGNATURE: _____

SPECIFICATION POINT

POTENTIAL CUSTOMERS: The 'writing rest' must be useful and appeal to a wide range of potential customers.

FUNCTIONS - EASE OF USE: The 'writing rest' must allow the user to write and read comfortably, whilst sat in an easy chair.

FUNCTIONS - LIGHTING: The 'writing rest' should have an integrated light source.

LIGHTWEIGHT: The writing rest should be lightweight.

ADJUSTABLE: The writing rest should be adjustable, allowing individuals to set it up to suit their seating position.

EVIDENCE FROM RESEARCH - JUSTIFICATION

This is shown by my initial research (page/slide 1), when investigating the design problem and brief. The questionnaire shows that both pupils and teachers are interested in this product.

A majority of people I asked about reading and writing whilst sat in an easy chair, said that this was difficult and often uncomfortable (see design problem / brief and potential customer sheets). An easy to use reading / writing rest could solve this problem.

When questioning people about the design problem, many said that the light source was essential. A quote from the detailed questionnaire says about an existing product, *'It has an LED light that can be focussed directly where the user wants it'*.

My research into existing/similar products, suggests that a successful writing rest must be lightweight (see existing products section of my research).

My research into existing products and ergonomics, shows that adjustability is essential. The client said about one of the existing products, *'I like the adjustability especially the height adjustment. This feature could be useful'*.

FURTHER JUSTIFICATION

Furthermore, if I design a writing rest that appeals to a wide age range, it is more likely to sell successfully, in large numbers.

Many of my friends have said that the writing rest must be easy and comfortable to use. This is a priority.

When reading or writing whilst sat on a easy chair, the room light source often casts a shadow. This makes reading difficult and sometimes unpleasant.

A light weight writing rest will be comfortable on the knees and be easy to carry around and store, when it is not in use.

If the product is adjustable, this can be considered to be 'inclusive design', because a wide range of people will be able to use it.

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SPECIFICATION POINT

ERGONOMICS: The 'writing rest' must be suitable for use with a wide range of easy chairs, and by the widest possible range of potential customers.

ERGONOMICS: The light should be adjustable, so that it can be focussed on the page being read by the user.

SAFETY: The product must be safe to use, even when being adjusted.

LIFE CYCLE AND SUSTAINABILITY: The writing rest will be manufactured from sustainable materials such as recycled and reclaimed materials (aluminium, natural woods and recyclable plastics, including polypropylene). Also, the materials will be reclaimed at the end of its useful working life.

AESTHETIC APPEARANCE (SHAPE, COLOUR, TEXTURE): The writing rest will be designed in a 'Bauhaus' style, as preferred by my main client.

EVIDENCE FROM RESEARCH - JUSTIFICATION

The 'ergonomics' page shows a typical chair used by my main client. The dimensions / measurements of easy chairs are similar.

My main potential customer / client said, '*In addition, I need an adjustable light source, so that I can focus the light where I need it.*'

The existing writing rest shown on page 8 of my research, has a potential to trap fingers. This must not apply to my design.

My research into existing products, shows that it is possible to manufacture the writing rest from recyclable materials, making the product a sustainable and environmentally friendly.

The majority of the potential clients who completed the questionnaire elected 'Bauhaus' as the preferred style (see questionnaire results).

FURTHER JUSTIFICATION

A writing rest that is only suitable for one or two easy chairs, will not be successful as a commercial product. It must fit a range of easy chairs, so that its full commercial potential can be reached.

Commonsense suggests that the light source should be fully adjustable. One setting is unlikely to suit all the potential customers.

Existing adjustable products have the potential to trap fingers. This would not only be a design fault, but it may lead to the product having to be withdrawn from shops, due to health and safety concerns and concerns regarding litigation.

Using recyclable materials will enhance the environmental 'credibility' of the product. At the end of its life cycle, it will be dismantled and all possible materials up-cycled to new products.

The writing rest will be a simplistic, functional and a thoughtful modern design. It will be modernist in appearance and be available in a range of colours. The writing board will be distinctive and impressive to look at, as demanded by the Bauhaus style.

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SPECIFICATION POINT

COST: The writing rest will be 'batch' manufactured on a production line, for £10 - £15.

EVIDENCE FROM RESEARCH - JUSTIFICATION

My questionnaire research clearly finds that this is the most popular price range as determined by potential customers (see questionnaire).

FURTHER JUSTIFICATION

This price includes materials and labour costs, tools and equipment requirements. A profit margin will be added by the retailer.

ADDITIONAL SPECIFICATION POINTS:

TIME SCALE AND PLANNING: The products design and manufacture will be completed within a two month period. The writing rest will be manufactured in three stages. First, a basic model will be made to help with the initial development of the product. This will be followed by a more sophisticated model, developed after customer and focus group discussion / feed back. Finally, after full development, the actual product will be manufactured to the highest quality standards.

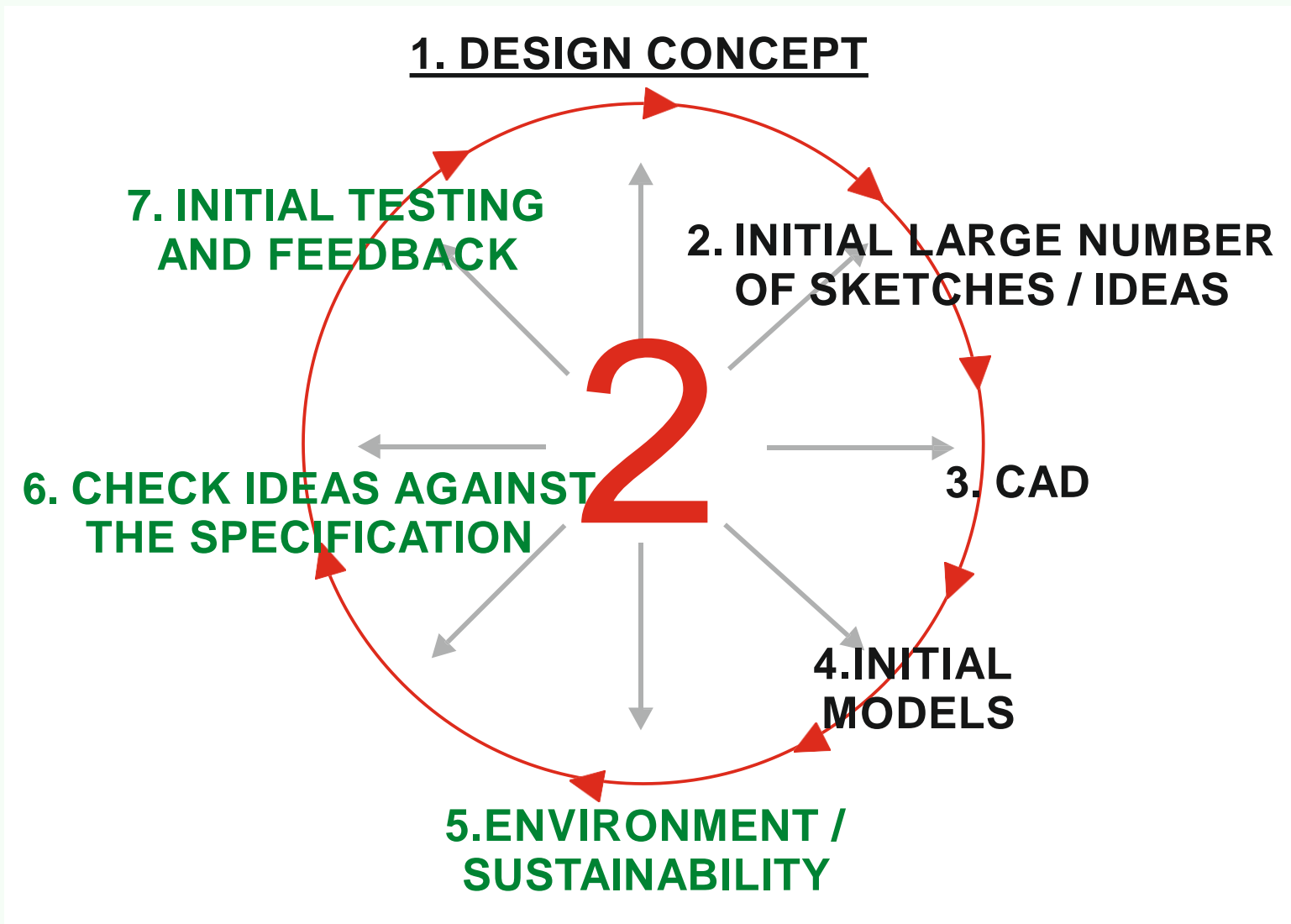
QUALITY CONTROL, QUALITY ASSURANCE, PRODUCT TESTING: The components will be manufactured to the highest possible standard and checked for faults before assembly. The final product will be tested, for full functionality and overall quality of manufacture. The client will be asked to inspect the product and alterations made where necessary. The product will be guaranteed.

HEALTH AND SAFETY: Health and Safety regulations will be adhered to during the manufacturing process. When manufactured, the writing rest will be rigorously tested for safe use. British Standards and European Standards will be applied.

CYCLE 2

THE DESIGN CONCEPT AND INITIAL IDEAS

HELPFUL LINK http://www.technologystudent.com/despro_flsh/iterative3.html



CYCLE TWO COVERS THE EXAMINATION BOARDS 'OBJECTIVES'
OUTLINED BELOW

GENERATING DESIGN IDEAS

HELPFUL LINK

http://www.technologystudent.com/despro_flsh/iterative3.html

AQA

AO2: Generating Ideas

Design & make prototypes that are fit for purpose

AO3: Analyse & evaluate

OCR

Create (AO2)

Design and make prototypes that are fit for purpose

Critical thinking

EDEXCEL

2.1 Design ideas

2.2 Review of initial ideas

2.4 Communication of design ideas

GENERATING DESIGN IDEAS

HELPFUL LINK

http://www.technologystudent.com/despro_fish/iterative3.html

GENERATING IDEAS - AN INTEGRATED APPROACH

Generating a range of ideas should be achieved through employing a range of design tools, over a number of design sheets. Design is not always linear, such as, an ideas sheet followed by a CAD sheet, then health and safety etc... Designers usually work in an integrated fashion, with many areas appearing on an individual design sheet.

For example, a design sheet may include sketches, evidence of model making and testing, CAD, reference to the environment, experimentation, client/customer opinions and feedback and a even a summary of findings.

THE NEXT TWO SLIDES SHOW A CHECK LIST OF DESIGN TOOLS, THAT COULD BE REGULARLY 'TICKED', AS PUPILS WORK THROUGH THE DESIGN AND DEVELOPMENT OF A PRODUCT.

THIS IS TO ENSURE THAT PUPILS USE A WIDE RANGE OF DESIGN TOOLS / TECHNIQUES, SUPPORTING ITERATIVE DESIGN

MOST TEACHERS WILL PRODUCE THEIR OWN CHECKLIST.

CHECK LISTS - HAVE YOU MENTIONED OR INCLUDED THESE REGULARLY ?

The check list shown opposite, can be used to ensure that students employ a wide range of skills and design strategies, when generating and developing ideas / designs.

A student places a tick against the statements in the check list, as and when he/she uses them. Most of the statements should have multiple ticks alongside, after the completion of a range of design sheets. Gaps may indicate a need to revisit design work.

MENTIONED ANTHROPOMETRICS AND ERGONOMICS	✓✓✓	DESCRIBED MANUFACTURING PROCESSES: INJECTION MOULDING ETC...	
INCLUDED NOTES ON STYLE / AESTHETICS	✓✓✓✓✓✓	INCLUDED COSTS TO MANUFACTURE AND PRICE TO CUSTOMER	
HEALTH AND SAFETY ISSUES DISCOVERED AND RESOLVED?	✓✓	REFERRED TO THE SPECIFICATION REGULARLY	✓✓✓✓✓✓✓✓
INCLUDED A RANGE OF IDEAS?	✓✓✓✓✓✓	EXPLAINED METHODS OF CONSTRUCTION OF IDEAS	
INCLUDED PHYSICAL MODELS AND CAD MODELS	✓✓✓	REFERRED TO PROPERTIES OF MATERIALS	
ADDED CUSTOMER / CLIENT VIEWS	✓✓✓	USED CAD - COMPUTER AIDED DESIGN	✓✓✓✓✓✓
USED SKETCHES, EXPLODED VIEWS, SECTIONAL VIEWS, ORTHOGRAPHIC PERSPECTIVE ETC...	✓✓✓✓✓✓	DISCUSSED DISASSEMBLY OF IDEAS AND MODELS	
APPLIED SIZES TO SKETCHES - LENGTH, HEIGHT AND DEPTH	✓✓✓✓✓✓	INCLUDE PHOTOGRAPHIC EVIDENCE E.G. WHEN TESTING MODELS	✓✓✓
EXPLAINED PROBLEMS FOUND WHILST SKETCHING / MODELLING	✓✓✓✓✓✓	INCLUDE THE VIEWS OF OTHERS, INDIVIDUALS AND FOCUS GROUPS	✓✓
SOLVED ANY PROBLEMS? WHILE SKETCHING / MODELLING	✓✓✓✓✓✓	DEMONSTRATE TECHNICAL UNDERSTANDING	✓✓✓✓✓
CONTINUOUS EXPERIMENTATION AND TESTING	✓✓✓✓✓✓	INCLUSIVITY	✓✓✓✓✓
EVALUATED IDEAS AND MODELS	✓✓✓✓✓✓✓✓		
DISCUSSED ENVIRONMENT ISSUES E.G. LIFE CYCLE - SUSTAINABILITY	✓✓✓		

Additional statements can be added, to suit the approach used by schools/ Design and Technology departments

CHECK LISTS - HAVE YOU MENTIONED OR INCLUDED THESE REGULARLY ?

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MENTIONED ANTHROPOMETRICS AND ERGONOMICS		DESCRIBED MANUFACTURING PROCESSES: INJECTION MOULDING ETC...	
INCLUDED NOTES ON STYLE / AESTHETICS		INCLUDED COSTS TO MANUFACTURE AND PRICE TO CUSTOMER	
HEALTH AND SAFETY ISSUES DISCOVERED AND RESOLVED?		REFERRED TO THE SPECIFICATION REGULARLY	
INCLUDED A RANGE OF IDEAS?		EXPLAINED METHODS OF CONSTRUCTION OF IDEAS	
INCLUDED PHYSICAL MODELS AND CAD MODELS		REFERRED TO PROPERTIES OF MATERIALS	
ADDED CUSTOMER / CLIENT VIEWS		USED CAD - COMPUTER AIDED DESIGN	
USED SKETCHES, EXPLODED VIEWS, SECTIONAL VIEWS, ORTHOGRAPHIC PERSPECTIVE ETC...		DISCUSSED DISASSEMBLY OF IDEAS AND MODELS	
APPLIED SIZES TO SKETCHES - LENGTH, HEIGHT AND DEPTH		INCLUDE PHOTOGRAPHIC EVIDENCE E.G. WHEN TESTING MODELS	
EXPLAINED PROBLEMS FOUND WHILST SKETCHING / MODELLING		INCLUDE THE VIEWS OF OTHERS, INDIVIDUALS AND FOCUS GROUPS	
SOLVED ANY PROBLEMS? WHILE SKETCHING / MODELLING		DEMONSTRATE TECHNICAL UNDERSTANDING	
CONTINUOUS EXPERIMENTATION AND TESTING		INCLUSIVITY	
EVALUATED IDEAS AND MODELS			
DISCUSSED ENVIRONMENT ISSUES E.G. LIFE CYCLE - SUSTAINABILITY			

THE NEXT THREE SLIDES PROVIDE LINKS TO IMPORTANT SKILLS, TECHNIQUES AND DESIGN STRATEGIES, THAT ARE REQUIRED THROUGHOUT THE DESIGN AND DEVELOPMENT PAGES OF THE PORTFOLIO.

THEY ARE CENTRAL TO ITERATIVE DESIGN.

THE LINKS MAY BE USEFUL, AS THEY LEAD TO A RANGE OF TECHNIQUES THAT STUDENTS CAN / SHOULD USE THROUGHOUT THE NEA.

DRAWING AND SKETCHING SKILLS THAT COULD BE USEFUL FOR THE INITIAL IDEAS AND DEVELOPMENT

DURING CYCLE 2 (GENERATING IDEAS) THERE WILL BE A NEED TO APPLY A RANGE OF DRAWING AND SKETCHING SKILLS. THE LINKS BELOW MAY PROVE USEFUL WHEN DEVELOPING THESE NECESSARY SKILLS.

SHADING TECHNIQUES

http://www.technologystudent.com/despro_flsh/graphics_shade1.html

PERSPECTIVE DRAWING

http://www.technologystudent.com/despro_flsh/graphics_perspective1.html

ISOMETRIC DRAWING

http://www.technologystudent.com/despro_flsh/graphics_iso1.html

ORTHOGRAPHIC DRAWING

http://www.technologystudent.com/despro_flsh/graphics_ortho1.html

EXPLODED VIEWS

http://www.technologystudent.com/despro_flsh/graphics_exviews1.html

THUMBNAIL SKETCHES

http://www.technologystudent.com/despro_flsh/thumbnail1.html

<http://www.technologystudent.com/designpro/thumbnail2.html>

CARD COMPOSITE DRAWINGS

<http://www.technologystudent.com/designpro/drawtec5.htm>

KEY AREAS / TECHNIQUES TO INCLUDE / COMMENT ON, DURING THE GENERATION OF IDEAS AND PRODUCT DEVELOPMENT

USING MODELS TO GENERATE AND TEST INITIAL IDEAS

http://www.technologystudent.com/despro_3/cardmod1.html

http://www.technologystudent.com/despro_3/cardmod2.html

http://www.technologystudent.com/despro_fish/prodevp4.html

http://www.technologystudent.com/despro_fish/graphics_model1.html

BLOCK MODELLING

http://www.technologystudent.com/despro_fish/graphics_block1.html

THE ROLE OF A FOCUS GROUP IN HELPING TO GENERATE IDEAS

<http://www.technologystudent.com/despro2/focgrp1.html>

WORKSHOP TESTING OF MATERIALS TO HELP GENERATE IDEAS

http://www.technologystudent.com/despro_fish/matsres2.html

ENVIRONMENTAL FACTORS TO KEEP IN MIND

<http://www.technologystudent.com/prddes1/lifecy1.html>

http://www.technologystudent.com/prddes1/life_energy1.html

<http://www.technologystudent.com/prddes1/closetloop1.html>

<http://www.technologystudent.com/prddes1/repair1.html>

KEY AREAS TO INCLUDE / COMMENT ON - DURING THE GENERATION OF IDEAS AND PRODUCT DEVELOPMENT

DURING CYCLE 2 (GENERATING IDEAS) THERE WILL BE A NEED TO EMPLOY DIFFERENT TECHNIQUES. THE LINKS BELOW MAY PROVE USEFUL WHEN DEVELOPING THESE NECESSARY SKILLS.

MATERIALS - THEIR THE PROPERTIES, METHODS OF JOINING AND MANUFACTURING PROCESSES

<http://www.technologystudent.com/joints/joindex.htm>

<http://www.technologystudent.com/equip1/equipex1.htm>

DESIGN MOVEMENTS AND DESIGNERS,

http://www.technologystudent.com/despro_flsh/Designer1.html

QUESTIONNAIRES AD PICTOGRAMS - HOW TO USE IN THE INITIAL IDEAS

http://www.technologystudent.com/despro_flsh/graphics_stats1.html

ANTHROPOMETRICS AND ERGONOMIC FACTORS

<http://www.technologystudent.com/designpro/ergo1.htm>

FOLLOWING - ARE A SERIES OF DESIGN STRATEGIES, THAT WILL BE USEFUL TO PROMOTE DESIGN THINKING, BEFORE EMBARKING ON GENERATING IDEAS.

DESIGN STRATEGY ONE

GENERATE AN INITIAL DESIGN AND CONTINUE TO DEVELOPMENT

HELPFUL LINK

http://www.technologystudent.com/despro_fish/basic_dev2.html

Instead of producing an Ideas section followed by the Development section, combining both is an alternative approach. Each design sheet should start with an initial idea and include some development.

Produce at least 4 ideas / basic development sheets.

Each sheet should include CAD drawings or hand sketches (a combination of both CAD and sketches) of an idea from different angles.

Add detailed notes to each sketch.

Show how you have developed your basic idea.

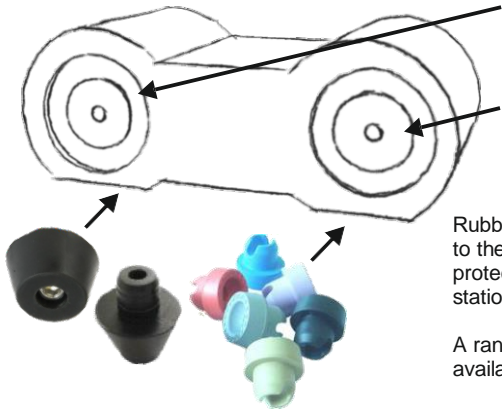
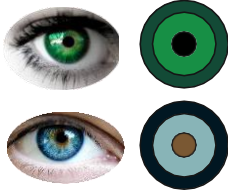
Then select 1 idea and produce 4 more pages of detailed development.

The idea below began with me selecting an existing product, from the range of images available on the Internet. You only need to like the basic / overall design and main features. It may be that you only like the shape. Once the basic idea has been selected, start sketching, adding features and functions as they occur to you, as you draw

MEMPHIS STYLE MP3 PLAYER - IDEA 1

This is my initial design. It has two powerful speakers and is designed to look like 'alert' eyes. The design is symmetrical and can be positioned on almost any flat surface.

I have used 'real' eyes to develop a simple colour scheme for the speakers



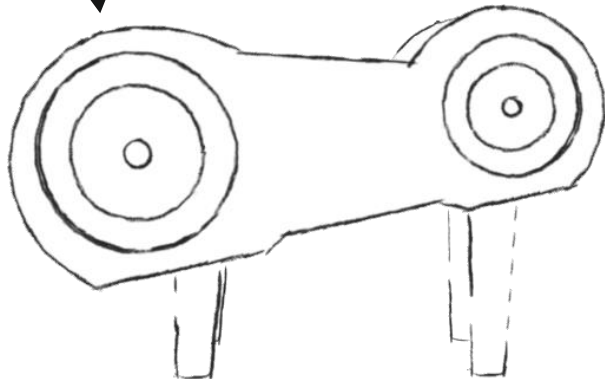
Rubber stoppers could be fixed to the underneath. These will protect any surface the MP3 station is placed on.

A range of colours are available.

I have increased the size of the lefthand speaker, to compensate for the shorter legs. Again, this is what you would expect of a Memphis style design.

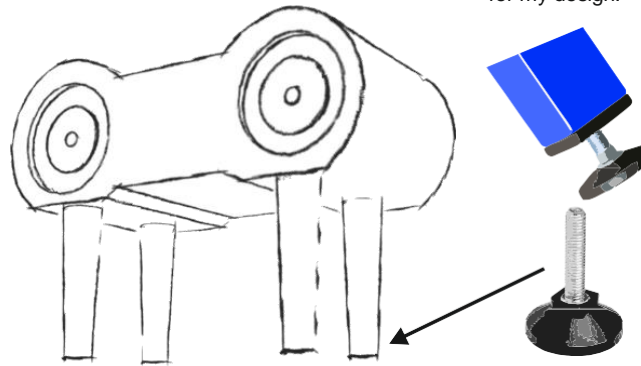
The MP3 station will be supplied with a multi-coloured remote control.

I will develop the shape so that it is more ergonomic.

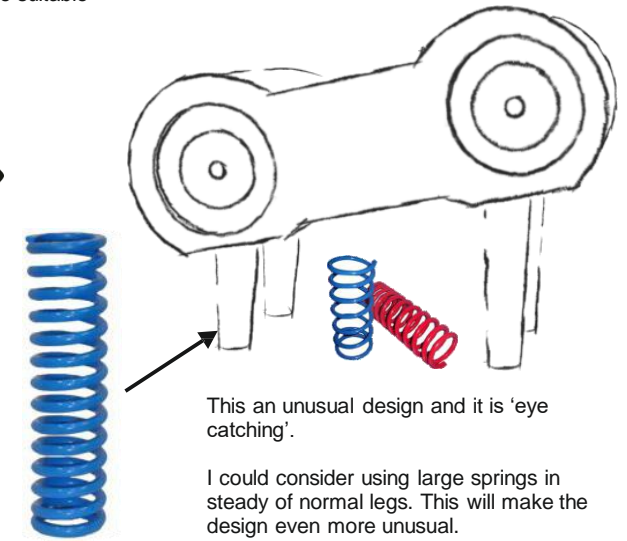


I have added 'retro', 1960s styled legs. These will be adjustable, so that the height of the MP3 station, is level with a seated person. The legs add to the style and appearance.

A range of adjustable feet exist that would be suitable for my design.



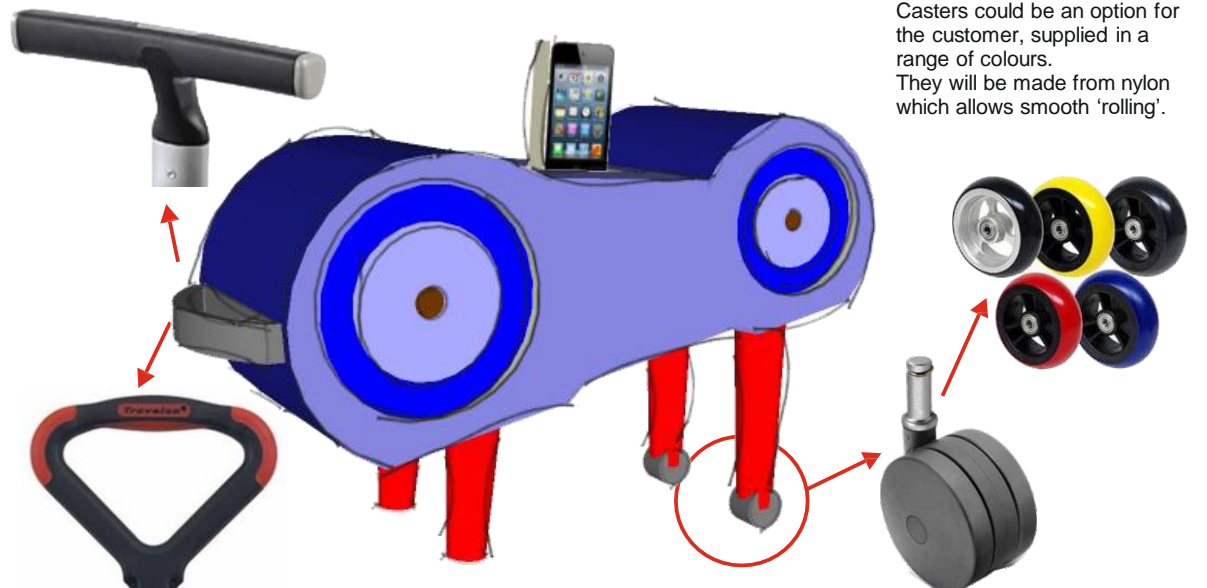
I have altered the length of the legs, so that the left hand side is lower and the MP3 is at an angle. This makes it look unusual, rather like you would expect of a Memphis style.



This an unusual design and it is 'eye catching'.

I could consider using large springs in steady of normal legs. This will make the design even more unusual.

I will consider adding an ergonomic handle. This will be used to lift the left hand side of the MP3 station and the unit can then be moved, with the right hand legs resting on castors.



Castors could be an option for the customer, supplied in a range of colours. They will be made from nylon which allows smooth 'rolling'.



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DESIGN STRATEGY TWO

GENERATING A DESIGN BY STARTING WITH THE PROPERTIES OF A MATERIAL

HELPFUL LINK

http://www.technologystudent.com/despro_fish/devidea3.html

One way of developing an idea for a product, is to consider the properties of a material first. Select a material and list its physical properties. Then, select one or more properties and start designing.

EXAMPLE: Thin plywood can be forced to form a curve, but eventually it will split. Also, normal plywood tends to resist bending. However, flexi-ply is composed of layers of thin plies. This means that it will bend into various 'curved' shapes, quite easily.

The material fact card opposite, outlines the basic physical properties of flexi ply.

The 'flexibility' of flexi ply, allows a designer to develop an unusual product (see following design sheet).

MP3 PLAYER - IDEA 2

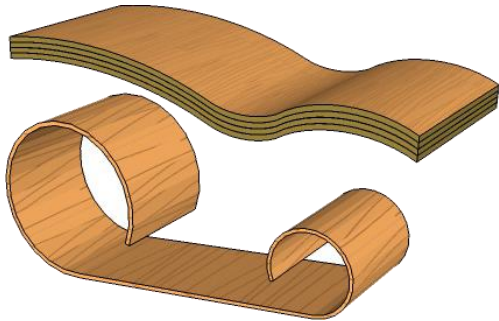
I have decided to select a material first and then develop an initial design, based on the materials properties.

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Flexi ply is a 'flexible' form of plywood. It can be formed into 'curved' shapes with relative ease. It is quite light and strong. Plus, it has a natural wood finish.

Composed of several layers of thin plies.

I intend to use this property of flexibility, to help me form an initial design / idea.

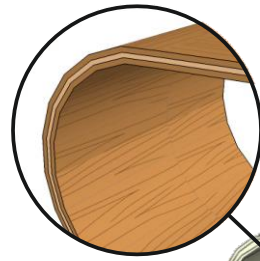


I think this simple shape is aesthetically pleasing. It avoids sharp edges and corners.

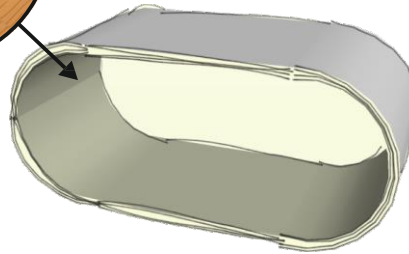
A docking station will be added to the top. This will be centrally located.

The unit is at a convenient and comfortable height for an average user.

Flexi ply is a good electrical insulator. This means that the unit will meet and exceed electrical safety guidelines and regulations.



The curved layers of flexi ply can be clearly seen. The flexi ply has been formed into a shape that could not be produced by any other wood based product. A jig could be made to hold the layers of flexi ply together whilst gluing.



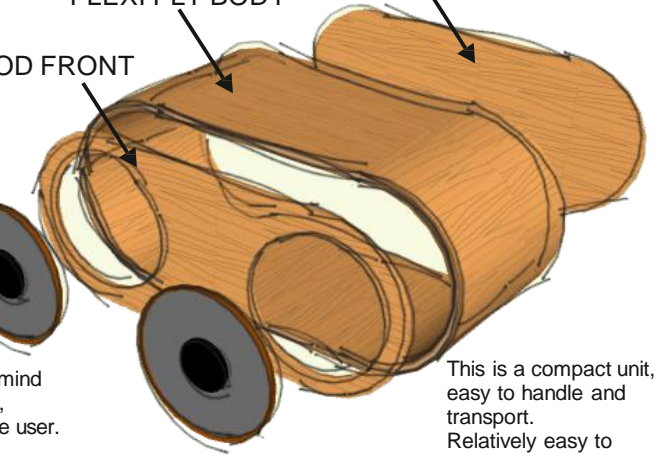
SPEAKERS

The two speakers remind me of two giant eyes, staring forward, at the user.

PLYWOOD BACK

FLEXI PLY BODY

PLYWOOD FRONT

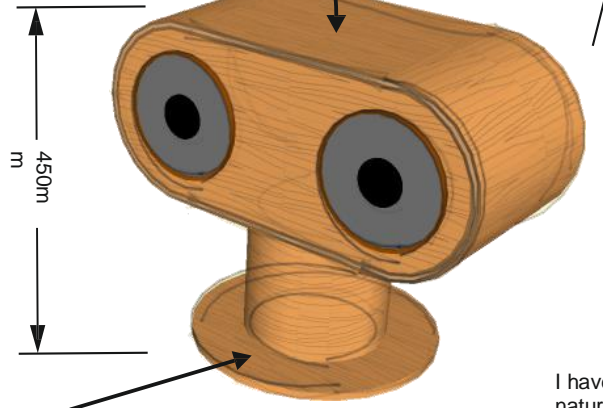


This is a compact unit, easy to handle and transport. Relatively easy to disassemble at the end of its useful life time. The materials can then be recycled.

The beech finish gives a light brown, grained finish. It is a natural finish and the materials can be recycled at the end of its life cycle.



400mm



CYLINDRICAL COLUMN

RETRACTABLE MAINS LEAD

450mm

Simple large buttons have been added, to control the unit (inclusive design). They are 'retro' in style and very easy to use (ergonomically designed). The unit will also be sold with a sophisticated, programmable hand held control unit.

I have taken advantage of the natural flexibility of flexi ply to form an individual and unique design.

Retractable mains lead, retracts back into the column / stand automatically. It only extends to the amount wanted by the user. When unplugged, it winds back into the column automatically. This is a safety feature.

The cylindrical column is lightweight and lifts the speakers to a good ergonomic height for a seated user.

The column adds further, to the shape and form of the overall design, without over complicating it.

I have added a base to ensure stability. It will stop the unit from 'toppling over', if knocked or pushed.

CLIENT OPINION: My client likes this simple and yet stylish design. It could be manufactured within the budget allowed (£50). The products life cycle has been assessed and consequently, material that can be recycled has been used. It can be disassembled easily, as there are very few parts / components (with the exception of the electronic components). Overall, my client likes the style of the design.

DESIGN STRATEGY THREE

GENERATING A DESIGN BY STARTING WITH AN ICONIC / INSPIRATIONAL DESIGN

HELPFUL LINK

http://www.technologystudent.com/despro_fish/devidea4.html

One good way of designing a new product, is to select a recognised iconic or well known design. Alternatively, you could select a design that inspires you. Then, redesign or develop it further, to incorporate new functions and features.

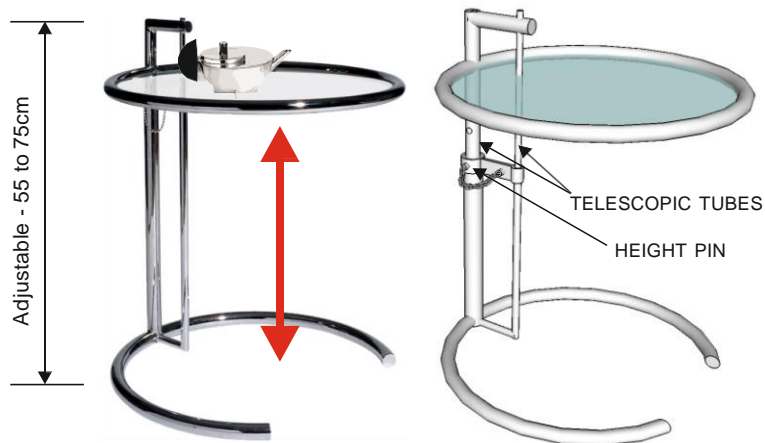
The E1027 Table was designed in 1929 and is still manufactured today. It looks as 'modern' today as it did when it was originally designed. It is another Eileen Gray piece of furniture, that has become a design icon/classic.

IDEA 3 - DEVELOPED FROM AN INSPIRATIONAL / ICONIC DESIGN

ORIGINAL ICONIC / INSPIRATIONAL DESIGN

The E1027 Table was designed in 1929 and is still manufactured today. It looks as 'modern' today as it did when it was originally designed. It is an icon/classic design by the famous designer Eileen Gray.

An adjustable table composed of two 'telescopic tubes'. These slide to the required height and a pin on a chain is used to lock them in position. High grade tubular stainless steel and tempered glass, provide a quality finish.

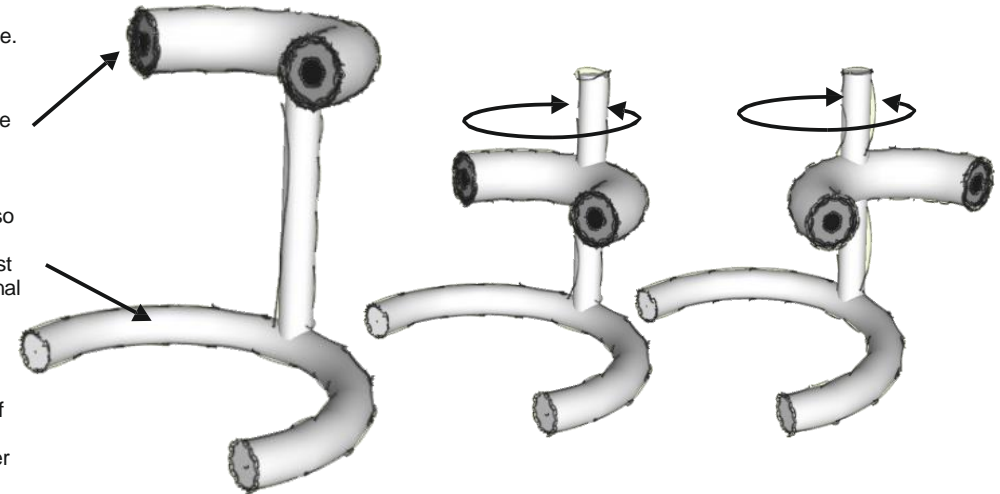


This is my first design. This could be manufactured from stainless steel tube, although the diameter is larger than the original piece of furniture.

The speakers are inside the tube at the top.

I have designed the base so that it is more like a semicircle, rather than the almost complete circle of the original iconic design.

My customer quite likes this way of selected an iconic design and then modernising it, by adding a speaker system.

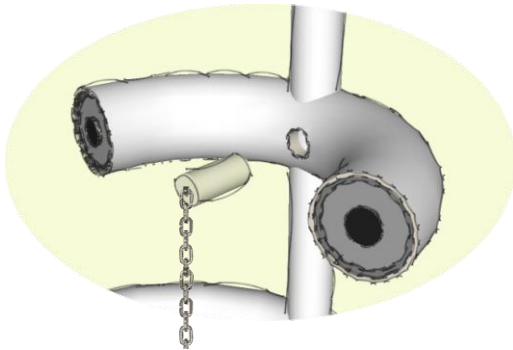


Like the original design, the top tube can slide up and down the main vertical tube. It could even be designed so that it can revolve, without a need for the entire stand to revolve.

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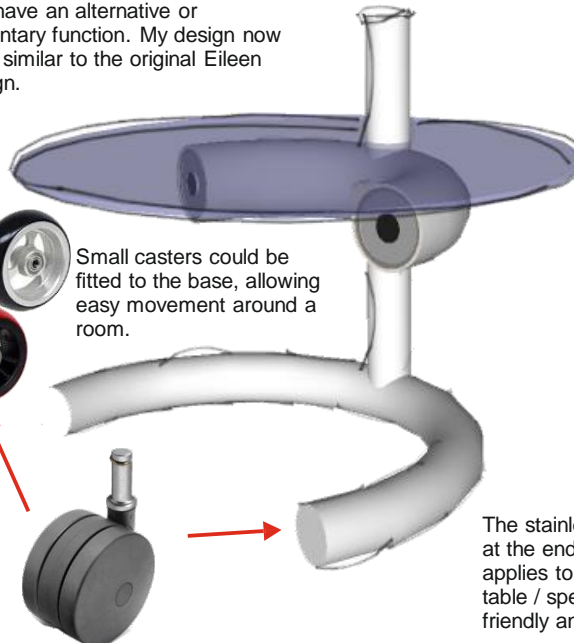
The original E1027 table had a pin on a chain to fix the height of the table top. I have adopted the same technique. The stainless steel pin locks the adjustable speakers at the desired height. Alternatively, I could use one of the locking devices seen below.



A transparent or translucent toughened glass table top could be placed above the speakers. This would mean that the speakers have an alternative or complementary function. My design now looks very similar to the original Eileen Gray design.



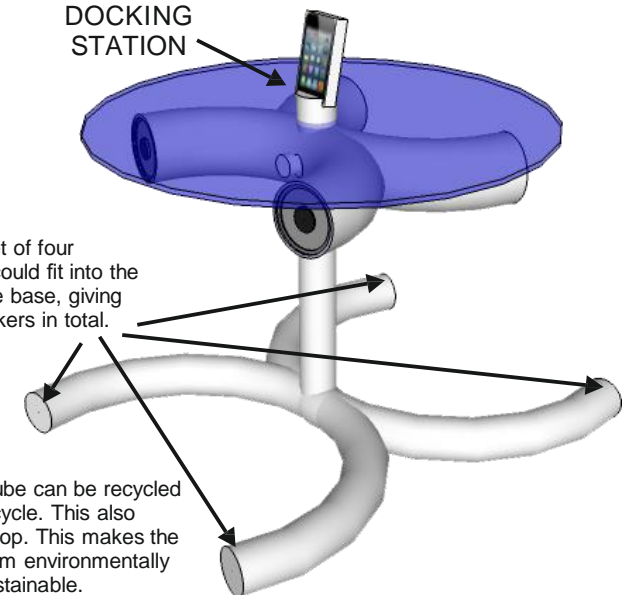
Small casters could be fitted to the base, allowing easy movement around a room.



I have added a second set of speakers (four speakers in total at the top).

The wide base ensures that the table / speaker system will be very stable and virtually impossible to knock over.

DOCKING STATION



Another set of four speakers could fit into the ends of the base, giving eight speakers in total.

The stainless steel tube can be recycled at the end of its life cycle. This also applies to the glass top. This makes the table / speaker system environmentally friendly and even sustainable.

DESIGN STRATEGY FOUR

GENERATING A DESIGN USING THUMBNAIL SKETCHES

HELPFUL LINKS

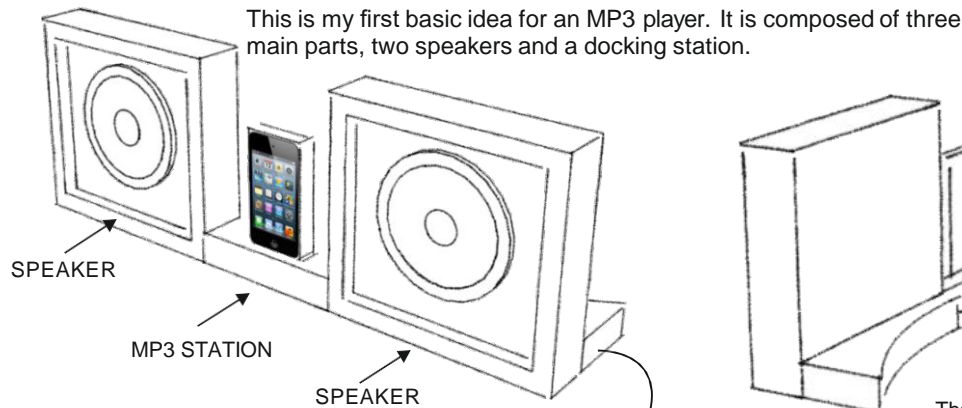
http://www.technologystudent.com/despro_fish/thumbnail1.html

<http://www.technologystudent.com/designpro/thumbnail2.html>

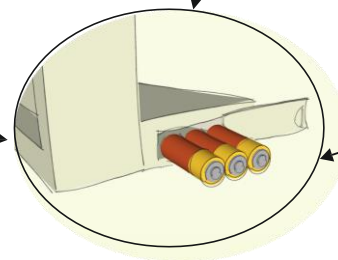
Thumbnail sketches are simple outline drawings of initial ideas, for a product. Usually, they are not detailed, although they may be labelled or include brief notes. Limited colour is sometimes applied. The sketches are drawn relatively quickly, with a pencil, pen, felt pen or any media that the designer feels comfortable using.

Thumbnail sketches, allow the designer to be creative without worrying about detail. For example, there is no need to consider how materials will be joined or even what material can be used. In this way creativity can 'flow' and ideas are put down on paper quickly. Thumbnail sketches are generally used in the early stages of the design process, although they are sometimes used when developing an idea.

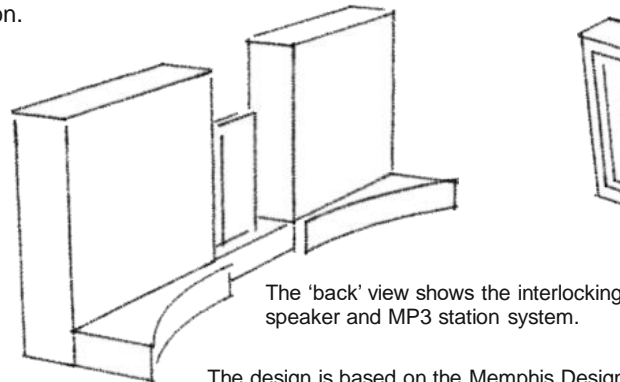
USING THUMBNAIL SKETCHES TO DEVELOP AN IDEA - IDEA 4



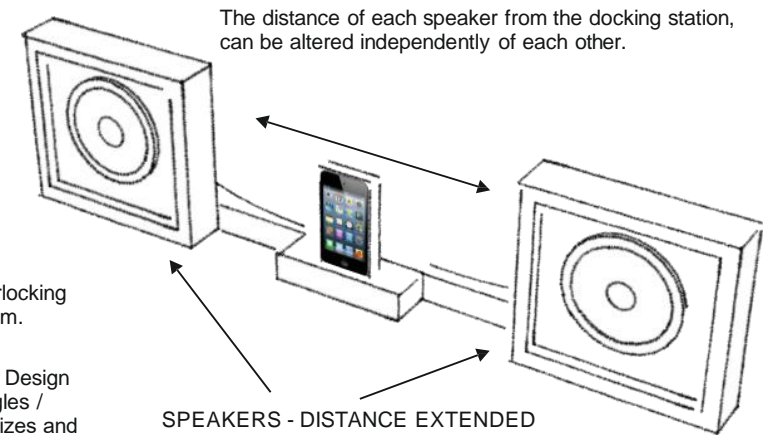
The system has a built in transformer, which means it can be plugged into a mains supply (240 volts). Batteries fit into either base unit, providing power when playing the system outside.



6 AA batteries are needed for use away from mains electricity.



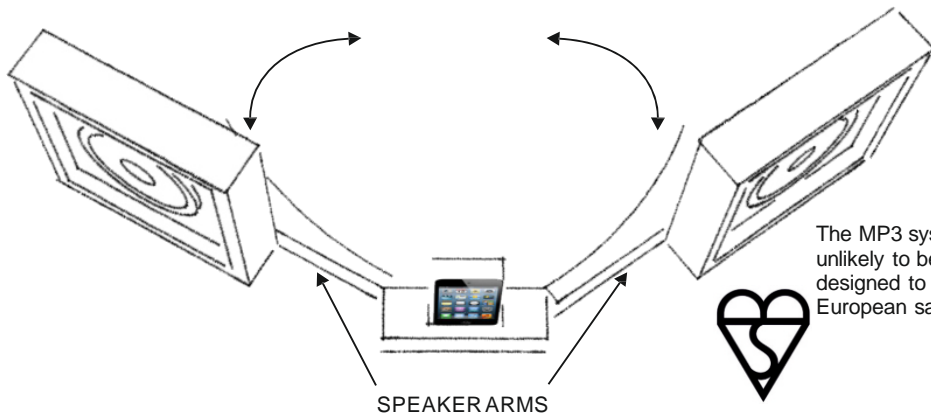
The design is based on the Memphis Design Movement. The speakers are rectangles / squares and they could be different sizes and colours, producing an unusual design.



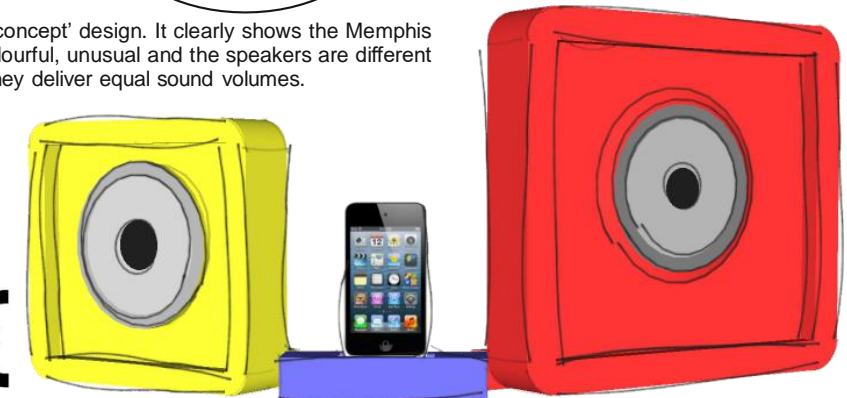
The MP3 station has two headphone sockets. This allows two people to listen to the same music, without disturbing other people in the room.



Each speaker arm, can be altered to any angle between 0 to 90 degrees. This means that the sound can be directed in almost any direction, ideal for a party. If two people are sat at different sides of a room, the speakers can be independently angles for perfect listening.



The MP3 system is stable and very unlikely to be knocked over. It will be designed to conform to British and European safety standards.



DESIGN STRATEGY FIVE

GENERATING A DESIGN USING MODELS

HELPFUL LINKS

http://www.technologystudent.com/despro_3/cardmod1.html

http://www.technologystudent.com/despro_3/cardmod2.html

http://www.technologystudent.com/despro_fish/prodevp4.html

http://www.technologystudent.com/despro_fish/graphics_model1.html

At any point during this design cycle, make models which will help you visualise your ideas, to test them out, to check the ergonomics and to show to potential customers. You may have other reasons to manufacture initial models. Take a photographic record of your models for your NEA.

IDEA 5 - MP3 PLAYER / STATION - SCALED MODEL - SCALE 1:2

CORRUGATED CARD MODEL

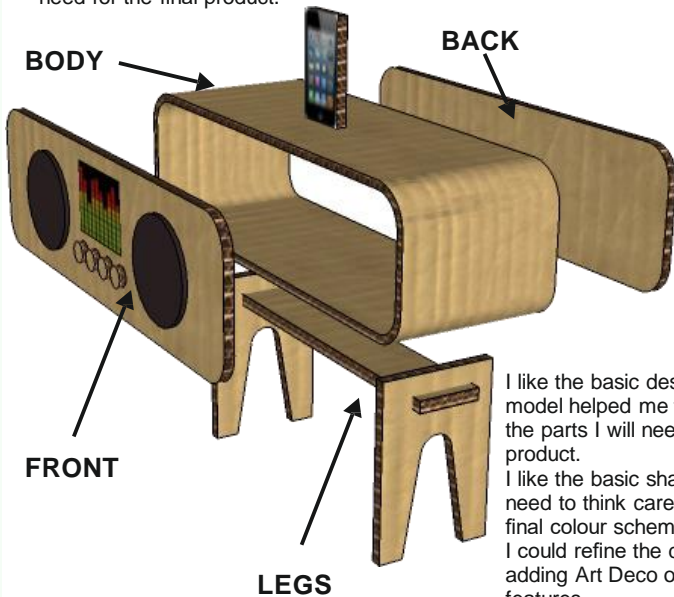
I modelled one of my ideas using corrugated card. I made a rough model so that I could test my basic design. The corrugated card was recycled from boxes and I found it ideal for the first stage of modelling.

This is the front of my MP3 station. I added two disks that represent the speakers. They were made from the same corrugated card and painted. This helped me experiment with the positions of each speaker, the equaliser and controls.

I tried round buttons and used clipart as the graphic equaliser. I decided on the best arrangement for the buttons, speakers and equaliser and glued the parts together using PVA.

Go to <http://www.technologystudent.com/designpro/despro1.htm> for detailed information on the iterative design process including model making.

When the main parts were ready, they were glued together, with the aid of a limited amount of sellotape. This helped me work out the number of parts I will need for the final product.

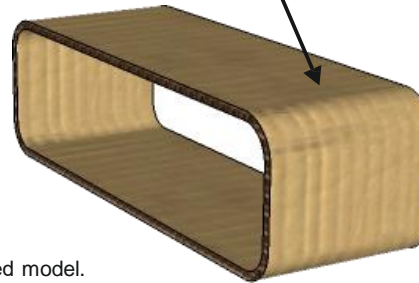


I like the basic design. Making the model helped me to think about all the parts I will need for the real product. I like the basic shape, although I will need to think carefully about the final colour scheme. I could refine the detail, possibly adding Art Deco or even Memphis features.

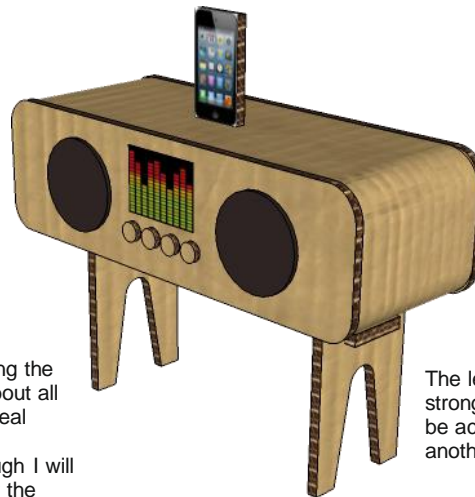


Basic equipment needed for making the model. PVA, sellotape / double sided tape and craft knife and safety ruler.

The body of the MP3 station was the most difficult to make. The corners were made by folding each corner with the aid of a steel ruler and steel tube. This gave the size of curve I needed. I used sellotape to hold the piece together. I quite like the width and height measurements, although I may alter the depth, so that it is slender in appearance.

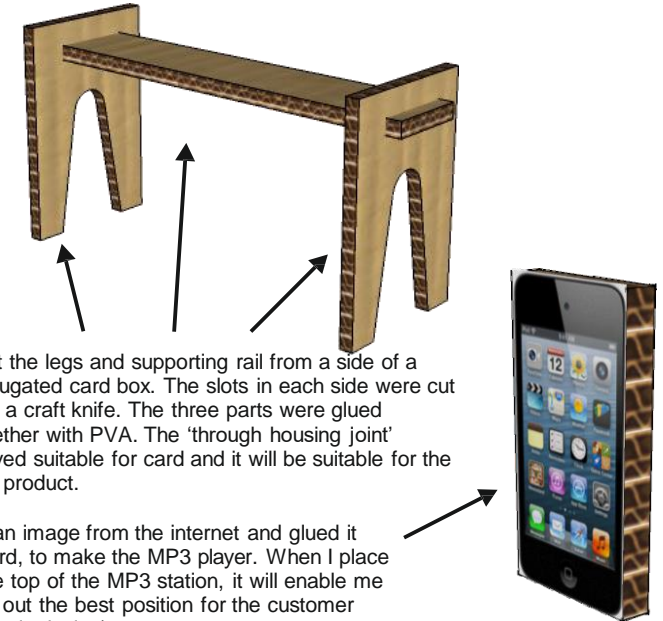


This is the final scaled model. It measures 350mm X 130mm X 270mm. It is approximately half full size.



The legs may need to be stronger and this could be achieved by adding another rail.

Making the model made me think about the materials I could use for the final product. This design would be best suited to plywood including flexibly, as it has all the properties I need.



I cut the legs and supporting rail from a side of a corrugated card box. The slots in each side were cut with a craft knife. The three parts were glued together with PVA. The 'through housing joint' proved suitable for card and it will be suitable for the real product.

I used an image from the internet and glued it onto card, to make the MP3 player. When I place it on the top of the MP3 station, it will enable me to work out the best position for the customer (ergonomic design).

My first scaled model sitting on a work bench. This shows the size of the model.



FOCUS GROUP SUGGESTIONS

A focus group composed of other pupils, suggested putting the buttons on the top, making it easier to access them. It was suggested that legs may not be needed, but they could be an option. The MP3 player may be more popular if it was supplied in a range of colours.

DESIGN STRATEGY SIX

DEVELOPING A DESIGN FROM A THEME

HOW TO INCORPORATE THE STYLE OF A WELL KNOWN DESIGNER IN A FINAL DESIGN

HELPFUL LINKS

<http://www.technologystudent.com/designpro/devtheme4.html>

<http://www.technologystudent.com/designpro/devtheme1.html>

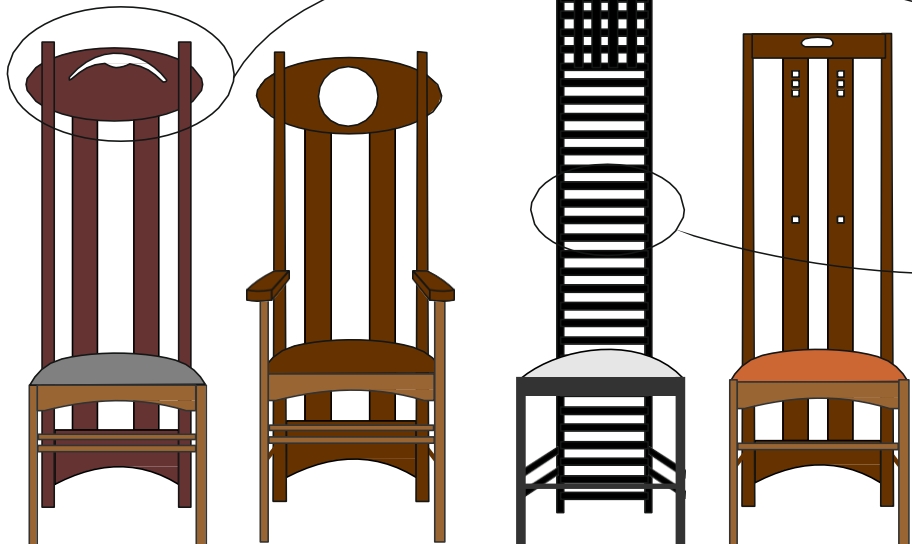
<http://www.technologystudent.com/designpro/devtheme2.html>

Product designers sometimes select features from a design movement or the work of a known designer, and apply them to their own designs. For example, the work of Charles Rennie Mackintosh has many recognised features. Some of the features he developed are regularly applied to modern designs. He used stain glass and ceramic tiles as decoration. Mackintosh utilised a combination of design principles derived from Art Nouveau, the Arts and Craft Movement and Japanese design. Many of his designs are regarded as examples of early modernism.

DEVELOPMENT SHEET - HOW I INTEND TO INCORPORATE MY CHOSEN DESIGN THEME IN MY FINAL DESIGN

THEME - CHARLES RENNIE MACKINTOSH

FEATURES:



Argyle Chair
1897

High Back
Chair
1899

Hill House
Chair
1903-1903

INGRAM
CHAIR
1903

Charles Rennie Mackintosh was an architect and interior designer from the late Nineteenth and early Twentieth Century. He designed several classic chairs. I have identified the parts that I like, and I intend to incorporate these features in my storage design.

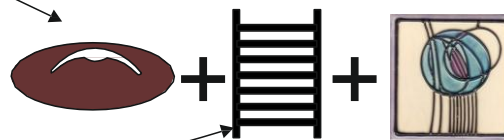
I intend to use stain glass and ceramic tiles, inspired by Charles Rennie Mackintosh.

STAIN GLASS AND CERAMIC TILE DESIGNS



DEVELOPING MY DESIGN:

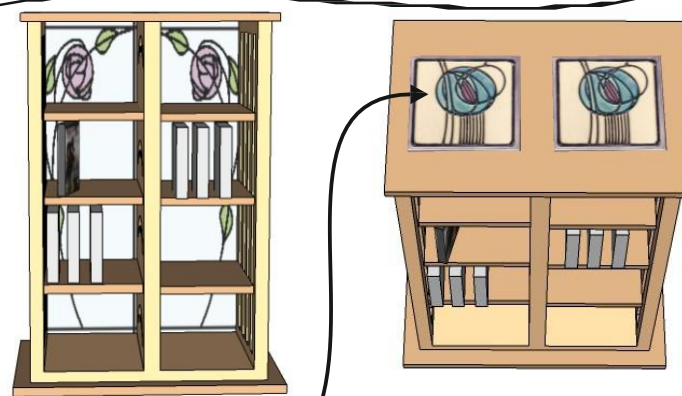
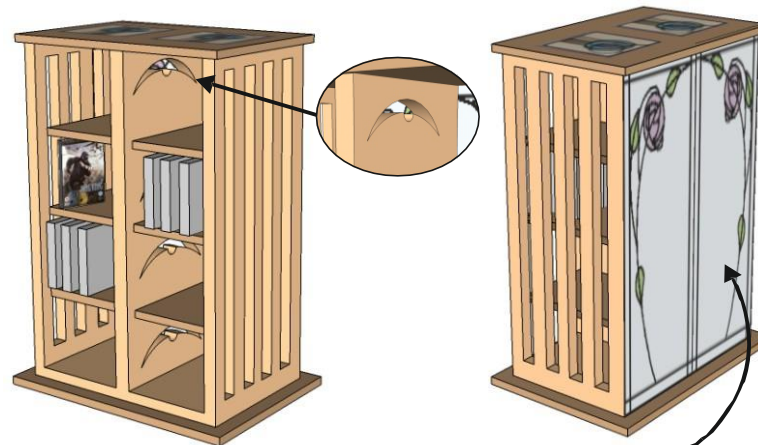
MACKINTOSH FEATURES



SHAPES FROM
SEAT BACKS

MACKINTOSH
ROSE TILE

My DVD / CD storage unit has many of the features seen in the designs of Charles Rennie Mackintosh. The storage unit will have a stain glass back. Mackintosh style ceramic tiles will be positioned on the top. Slots, similar to those seen in his chair designs, will also feature on the sides of the storage unit.



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DEVELOPMENT SHEET - HOW I INTEND TO INCORPORATE MY CHOSEN DESIGN THEME IN MY FINAL DESIGN

THEME - ART DECO

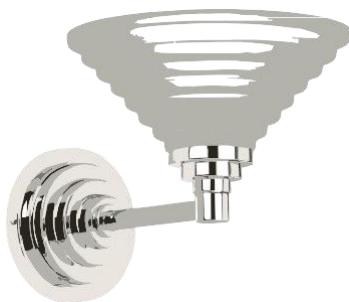
FEATURES:

My favourite design period is Art Deco. It was an era of ornate style and decadence and style. Designs from this era exhibits geometrical shapes, substantial angles and generous curves. They also displayed subtle and delicate features and colour schemes.

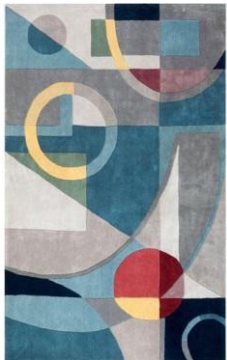


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These are two typical Art Deco patterns. Art Deco patterns tend to have: distinctive circular patterns, bold straight lines and subtle use of colour and shade. They often look rather abstract.



DEVELOPING MY DESIGN:

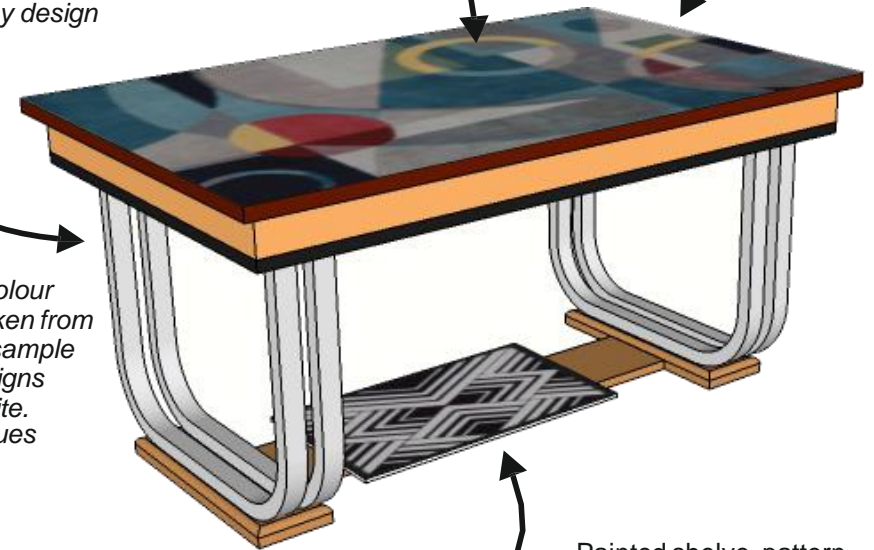
I like the way chromed steel tube has been used and I will apply a similar geometrical shape to my design

The overall colour scheme is taken from some of the sample Art Deco designs drawn opposite. Greys and blues dominate

I have tried to keep this design in keeping with the Art Deco style. Geometrical shapes, the use of chromed steel, a subtle colour scheme with a touch of 'modernism', have been included to deliver a distinctive design.

Circle taken from the chair design and incorporated in the table top.

I have taken a geometrical pattern and colour scheme, typical of Art Deco and applied to the table top.



Painted shelf. pattern taken from a popular 1930s Art Deco pattern.

NOW IT IS TIME TO PRODUCE 5 TO 8 DESIGN SHEETS OF INITIAL IDEAS. EACH SHEET SHOULD DISPLAY A RANGE OF TECHNIQUES AND STRATEGIES. A VARIED RANGE OF DESIGNS SHOULD BE PRESENTED.

REMEMBER - A COMPLETE NEA PORTFOLIO SHOULD BE APPROXIMATELY 20 SHEETS

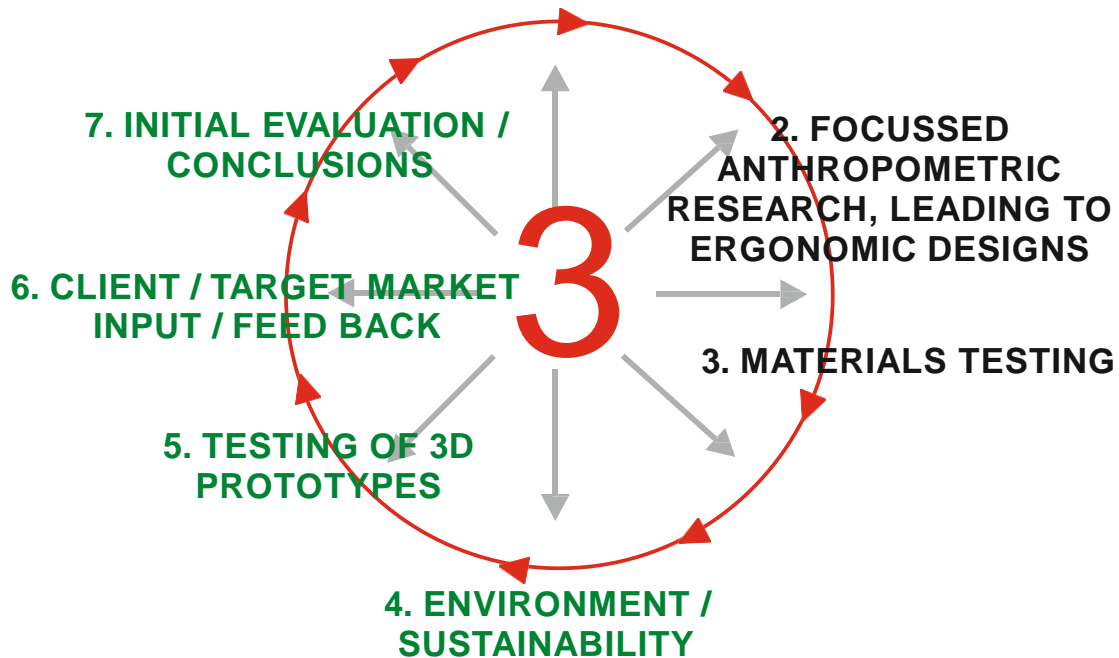
CYCLES 3 and 4

DEVELOPING DESIGN IDEAS TO ONE FULLY DEVELOPED IDEA

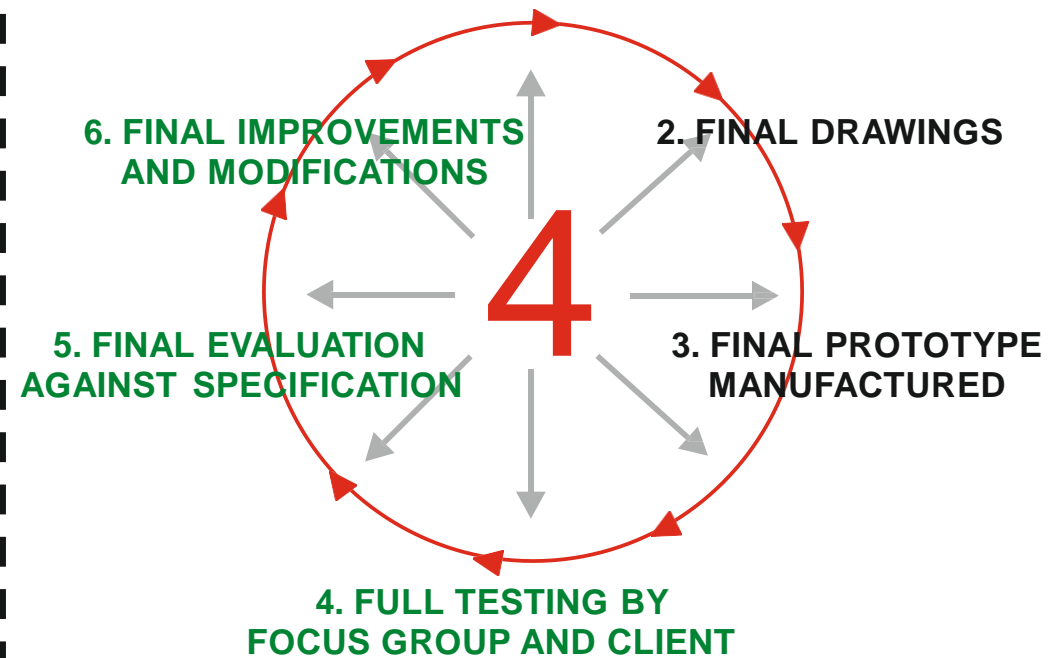
HELPFUL LINK

http://www.technologystudent.com/despro_fish/iterative4.html

1. IMPROVEMENTS TO SELECTED DESIGNS



1. ONE IDEA TO BE FULLY DEVELOPED.



CYCLES THREE AND FOUR COVERS THE EXAMINATION BOARDS 'OBJECTIVES' OUTLINED BELOW

DEVELOPING DESIGN IDEAS - IMPROVEMENTS TO SELECTED DESIGNS

AQA

A02: Design & make prototypes that are fit for purpose

Developing design ideas

A03: Analyse & evaluate

OCR

Development of design ideas into a chosen design

Critical thinking

Demonstrate and apply knowledge and understanding of –
technical principles, designing and making principles

A03: Analyse & evaluate

EDEXCEL

2.3 Development of design ideas into a chosen design

2.4 Communication of design ideas

2.5 Review of chosen design

4.1 Testing and evaluation

CYCLE 3 and 4: IMPROVEMENTS TO SELECTED DESIGNS LEADING TO ONE FULLY DEVELOPED IDEA

HELPFUL LINKS

http://www.technologystudent.com/despro_flsh/iterative4.html

http://www.technologystudent.com/despro_flsh/iterative5.html

http://www.technologystudent.com/despro_3/integrate1.html

http://www.technologystudent.com/despro_3/integrate2.html

http://www.technologystudent.com/despro_3/integrate3.html

http://www.technologystudent.com/despro_flsh/prodevp4.html

http://www.technologystudent.com/despro_flsh/prodevp5.html

http://www.technologystudent.com/despro_flsh/prodevp6.html

http://www.technologystudent.com/despro_flsh/prodevp7.html

http://www.technologystudent.com/despro_flsh/prodevp8.html

By now the student will have produced several design sheets containing a range of initial ideas. Students will have used a range of ‘design tools’ such as, client feedback, focus group discussions, surveys, model making, different presentation techniques etc.....

Select two or three ideas for further development. This will involve more detailed drawings, models, feedback, testing etc...(a range of design tools).

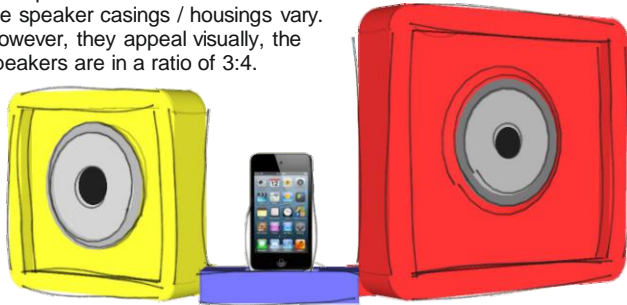
NEXT ARE TWO SAMPLE DESIGN SHEETS, SHOWING THE DEVELOPMENT OF THE MP3 PLAYER SHOWN ON EARLIER SLIDES.

TAKE PARTICULAR NOTE OF THE MANUFACTURING SPECIFICATION, AS SOME EXAMINATION BOARDS EXPECT TO SEE THIS SHEET, REFLECTING THE FINAL DESIGN.

SELECTED IDEA FOR FURTHER DEVELOPMENT

This is the idea that I will develop further. It is a simple design that I think will appeal to a wide range of customers.

The speakers are the same size but the speaker casings / housings vary. However, they appeal visually, the speakers are in a ratio of 3:4.



COLOUR SCHEME



The colour wheel shows the range of colour schemes available to potential customers. Customers can select from a range in a shop or from the online website.

I have decided on bright, lively colours, that reflect the Memphis Design Movement.

RUBBER FEET / STOPPERS



Cheap rubber feet will be fixed to the MP3 station, to ensure that it does not damage any surface it is placed on. The feet absorb vibration from the speakers, giving a deeper and purer sound.



ERGONOMICS

My speaker system is designed to be positioned at hearing level. This allows the listener to hear the clear digital music. See table of results

When playing at a party or to more than one person, the speakers can be angled, to project the sound over a wider area.

A headphone jack plug is also available, for personal comfort and quiet listening.

The system is designed to be lightweight, allowing safe movement and transport.

KNOCK DOWN JOINT

This knock down joint is a possibility. It will provide a reasonably strong joint, although it will take five minutes to assemble each corner.

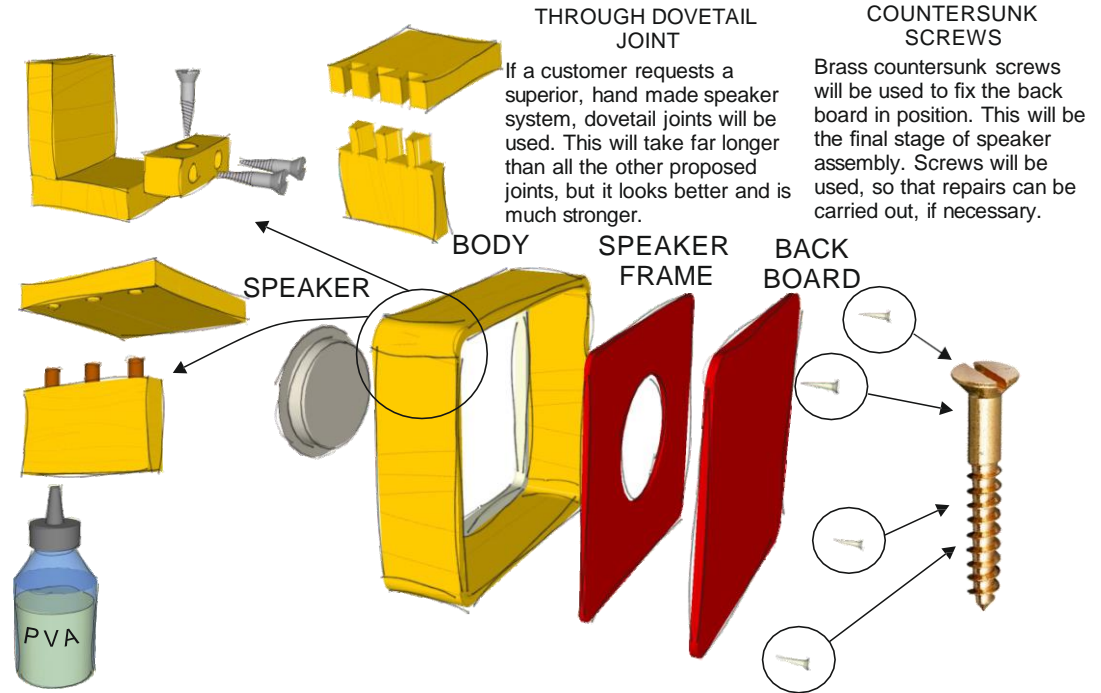
DOWEL JOINT

Dowel joints are quick and easy to construct, especially using a template to line up the dowels with the holes. This is the most likely joint, as it is strong and quick to construct. This joint is the most cost effective method.

PVA will be used to permanently fix the speaker frame to the body. Alternatively, contact adhesive could be used.



JOINTS AND FITTINGS

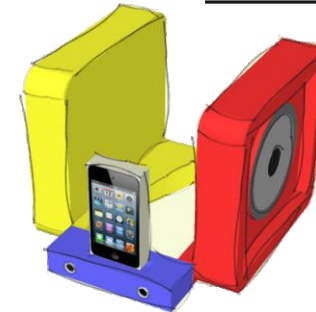


THROUGH DOVETAIL JOINT
If a customer requests a superior, hand made speaker system, dovetail joints will be used. This will take far longer than all the other proposed joints, but it looks better and is much stronger.

COUNTERSUNK SCREWS
Brass countersunk screws will be used to fix the back board in position. This will be the final stage of speaker assembly. Screws will be used, so that repairs can be carried out, if necessary.

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TRANSPORT

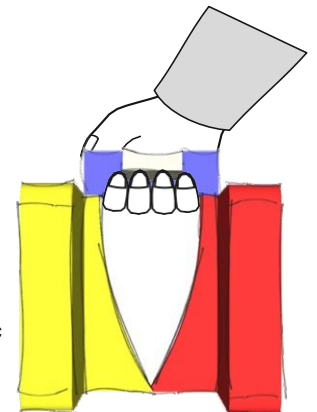


An unexpected bonus of the folding speaker system, is the convenience of storage. When folded right back, the entire system forms a cube. This is ideal if the system is stored each night, or put away for security.

The MP3 station is designed to be strong enough, to be carried in one hand.

When the speakers are folded back, the entire system becomes entirely transportable.

Tracks can be loaded directly onto the station, so that music can be played, whilst the system is carried.



PUPIL/PERSON	A
Person A	1350mm
Person B	1490mm
Person C	1520mm
Person D	1400mm
Person E	1390mm
Person F	1350mm
Person G	1420mm
Person H	1470mm
Person I	1380mm
Person J	1480mm
Person K	1400mm
Person L	1350mm
TOTAL(S)	17000mm
AVERAGE	1416mm

MY MANUFACTURING SPECIFICATION

SCALE OF PRODUCTION AND THE MANUFACTURE OF MY PRODUCT

Choose one of the industrial scales of manufacturing listed below. Explain how it has influenced the design and manufacture of your product.

One off / Prototype:

Batch Production: ✓

Continuous Production:

Just In Time:

My speaker system will be batch produced, when it is manufactured in a factory. Consequently, it can be used assembled easily with screws, panel pins and other standard components. The way it is assembled has been simplified, so that it can be put together quickly. Readily available materials such as MDF will be used. It is designed to be disassembled easily for recycling, at the end of its useful life.

PRODUCT DESCRIPTION

My speaker system is aimed at teenagers. The design has been influenced by the Memphis Design Movement. It is brightly coloured and unusual in shape and form.

It has been designed so that it folds up and can be carried from one location to another.

Recycleable and sustainable materials will be used, so that it is as environmentally friendly as possible.

Standard components will be used to reduce development and manufacturing costs and the final price to the customer.

QUALITY ASSURANCE/ CONTROL AND MY PRODUCT

I will set up a quality checking system, to ensure that the product is manufactured to the highest possible standards.

Materials will be visually checked, so that only the best materials are used. Materials with imperfections will be rejected / recycled. The materials will be tested for strength and durability, before the manufacturing process begins.

The quality of manufacturing will be checked at every stage, with faults being identified and corrected.

The finished product will go through extensive tests and checks, before being passed on to the customer.

STANDARD COMPONENTS TO BE USED DURING MANUFACTURING



PVA Glue



CSK screws



Panel pins



Pin hinges

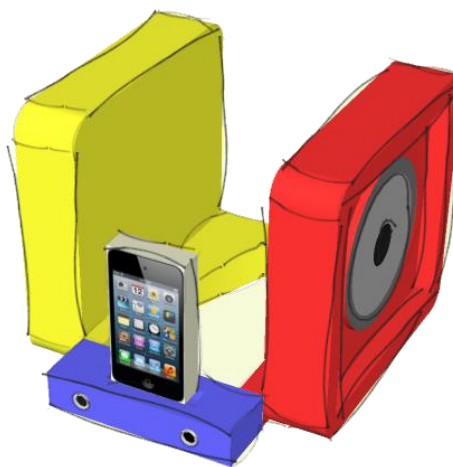


Two Speaker Grills

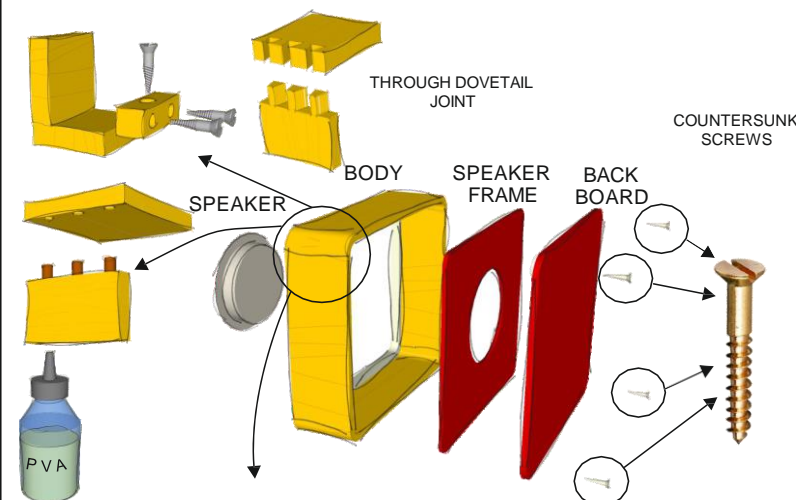


Liteair Speakers

FINAL IDEA



ASSEMBLY AND CONSTRUCTION



The exploded drawing shows the assembly / construction of each of the speakers. Standard components and manufactured parts are combined to produce the mp3 system.

NEXT IS A MATERIALS TESTING SHEET. IT MAY BE NECESSARY FOR STUDENTS TO TEST MATERIALS. HOWEVER, IT MAY ONLY BE NECESSARY TO USE ONE OR TWO OF THE TESTS AND THESE CAN BE INTEGRATED WITH OTHER DESIGN WORK. THERE MAY NOT BE A NEED FOR A SEPARATE MATERIALS TESTING SHEET.

PROPERTIES OF MATERIALS

<http://www.technologystudent.com/joints/matprop1.htm>

<http://www.technologystudent.com/joints/matprop2.htm>

HELPFUL LINKS

MATERIALS TESTING

<http://www.technologystudent.com/joints/htest1.html>

<http://www.technologystudent.com/joints/tensile1.html>

<http://www.technologystudent.com/joints/conduct1.html>

<http://www.technologystudent.com/joints/toughness1.html>

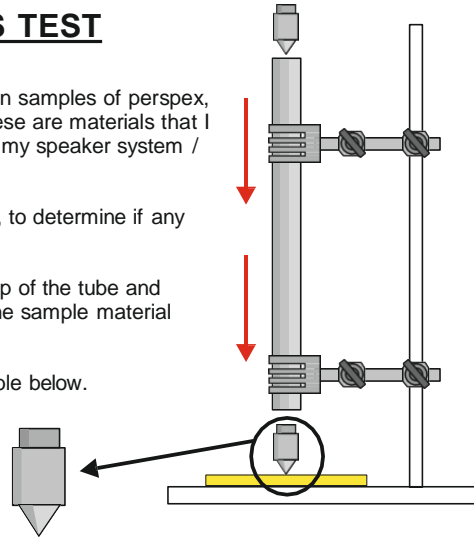
HARDNESS TEST

I carried out a hardness test on samples of perspex, pine, aluminium and steel. These are materials that I may use, when manufacturing my speaker system / MP3 station.

I tested each piece of material, to determine if any are suitable for my project.

The 'slug' was loaded at the top of the tube and released, so that it impacted the sample material below.

I recorded the results in the table below.



RESULTS

MATERIAL	RESULT	DESCRIPTION
PERSPEX	FAIR	MEDIUM SURFACE DAMAGE
PINE	FAIR	DEEP INDENT MINIMUM SURFACE DAMAGE
ALUMINIUM	GOOD	MINIMUM SURFACE DAMAGE
STEEL	GOOD	MINIMUM SURFACE DAMAGE

SUMMARY

All these materials are suitable for my product, as they will resist knocks and drops.



I carried out further hardness tests on the range of materials, using a centre punch and a ball peen hammer.

Although not a scientifically accurate test, all the materials performed well.

In order of hardness - steel, aluminium, perspex and pine.

These results confirm the findings of the hardness test above.

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DRILLING TEST

I drilled each sample with a 4mm bit, using a bench drill.

The most difficult to drill was the steel, as it created sharp swarf.

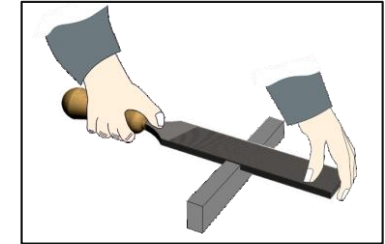
The perspex had to be protected with masking tape, in case it shattered. It drilled relatively easily, but with care.

The pine drilled easily but created dust.



MATERIAL	RESULT	DESCRIPTION
PERSPEX	MODERATE	TENDENCY TO SPLIT, IF MASKING TAPE NOT USED
PINE	EASY	EASY TO DRILL, DUST/CHIPPINGS CREATED
ALUMINIUM	MODERATE	SOFT METAL, EASY TO DRILL WITH CARE
STEEL	DIFFICULT	DIFFICULT TO DRILL, CREATES SHARP SWARF

FILING TEST



The steel was the hardest to file and required a lot of effort. The finish was relatively smooth although teeth marks could be seen.

The pine filed easily, although it did not produce a good finish.

The aluminium filed easily as well. The finish was quite good. Teeth marks could be seen.

The perspex filed easily and the finish was reasonably smooth.

SMOOTHING / FINISH TEST



I used wet and dry paper / glass paper to finish a side of each sample. All produced a good finish, smooth to the touch. The hardest material to smooth was steel, because it took longer than the other materials. Steel will rust if the surface is not protected with paint or lacquer.

Any of these materials will give the finish I need for my project.

WEIGHT TEST

I weighed the samples. The results clearly showed pine weighing less than all the other materials.

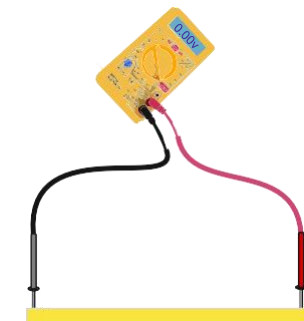
I will consider using pine for the casing of my MP3 station, although both perspex and aluminium are possibilities. Steel is the least likely to be used.

- STEEL
- PERSPEX
- ALUMINIUM
- PINE



CONDUCTIVITY TEST

I carried out a simple conductivity test on the samples. The only insulator was perspex. The volt meter showed that it did not conduct electricity current at all. Perspex will also offer protection from 240 volts main electricity and batteries



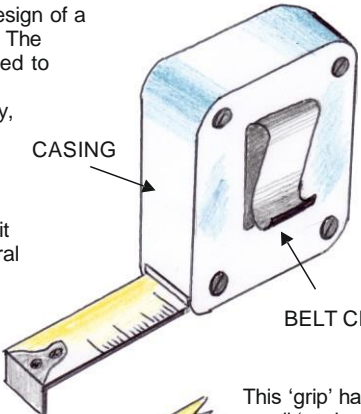
THE FOLLOWING TEN DESIGN SHEETS SHOW THE DESIGN AND DEVELOPMENT OF AN INNOVATIVE 'TAPE' MEASURE. A RANGE OF DESIGN TOOLS HAVE BEEN USED ON THE DESIGN SHEETS.

AS A BASIC GUIDE - THE FIRST 4/5 DESIGN SHEETS SHOW A RANGE OF IDEAS, THEN ONE OR TWO ARE SELECTED FOR FURTHER DEVELOPMENT, WITH ONE FINAL DEVELOPED IDEA BEING SELECTED, RESULTING IN A WORKING DRAWING.

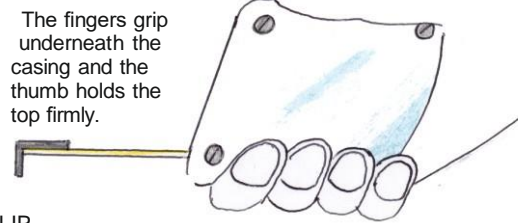
THIS SELECTION OF DESIGN SHEETS IS A SAMPLE OF ITERATIVE CYCLES 2, 3 AND 4 (WITHOUT THE FINAL TESTING AND EVALUATION)

This is a standard design of a basic tape measure. The clip has been designed to grip a belt. The tape rewinds automatically, but in this case too quickly (health and safety issue). The tape tends to develop faults, after it has been used several times.

PRESSED STEEL CASING

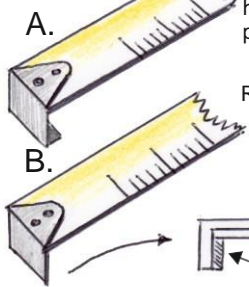


The casing shape has been ergonomically redesigned, so that it can be held in the hand comfortably.



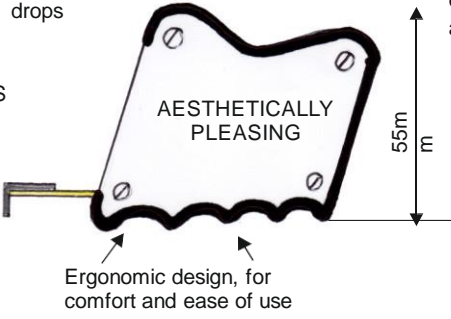
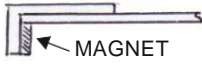
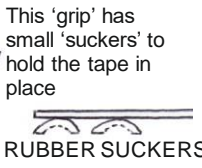
Below the ergonomic shape is clearly seen. The top and underneath have a rubber layer, to make the tape more comfortable to hold. In addition, it provides improved protection against knocks and drops

These are alternative tape measure 'ends'.



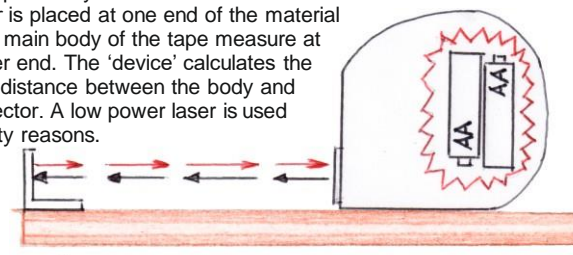
A has a small 'lip' that grips the underneath of the materials being measured.

B has a magnetic end that attaches firmly to steel.

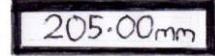


Ergonomic design, for comfort and ease of use

This is a 'radical' developed design, with the steel tape being replaced by a distance sensor. A small reflector is placed at one end of the material and the main body of the tape measure at the other end. The 'device' calculates the precise distance between the body and the reflector. A low power laser is used for safety reasons.



The distance is digitally displayed in a small LCD screen.



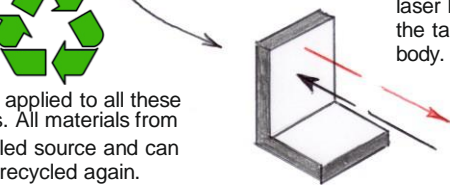
A back light allows use in dark spaces or poor light conditions.

LIFE CYCLE
All designs have a life cycle - a guaranteed for five years.

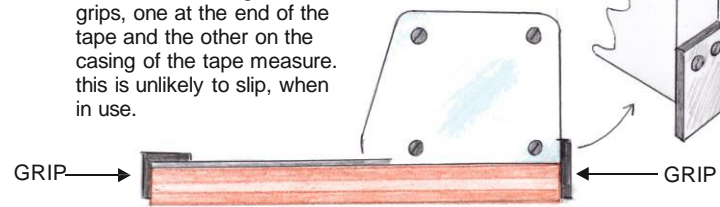


Symbol applied to all these designs. All materials from a recycled source and can be recycled again.

Reflector showing laser bouncing back to the tape measure body.



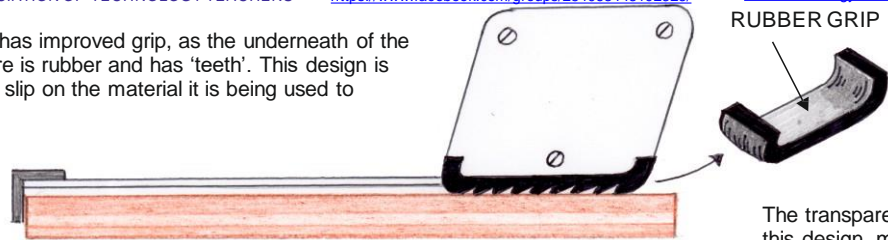
This updated design has two grips, one at the end of the tape and the other on the casing of the tape measure. This is unlikely to slip, when in use.



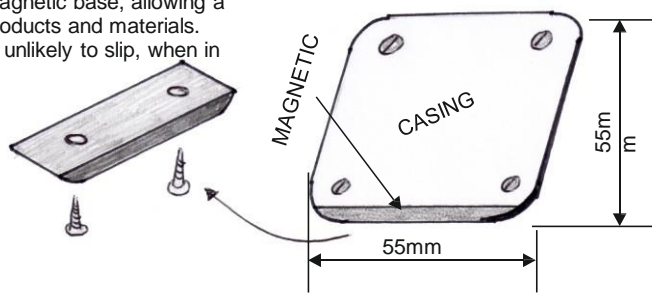
The grip on the casing slides up and down. Once the tape is retracted into the casing, the grip can also be retracted, allowing easier storage. No sharp edges visible.

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This design has improved grip, as the underneath of the tape measure is rubber and has 'teeth'. This design is less likely to slip on the material it is being used to measure.

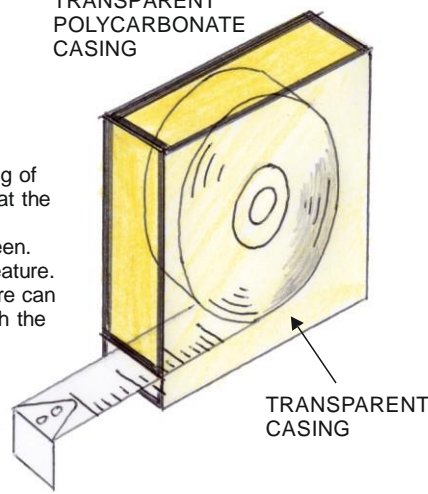


This design has a magnetic base, allowing a secure fix to steel products and materials. This means that it is unlikely to slip, when in use on steel.



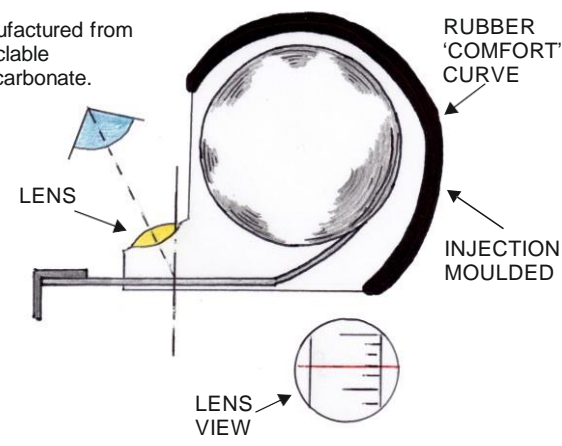
The transparent casing of this design, means that the internal workings / mechanism can be seen. This is an aesthetic feature. Also, the tape measure can be read easily, through the casing.

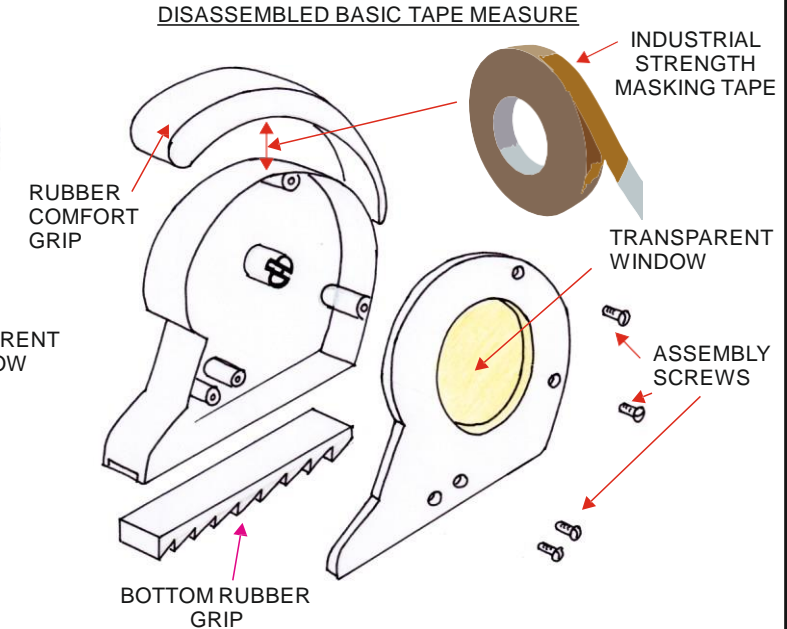
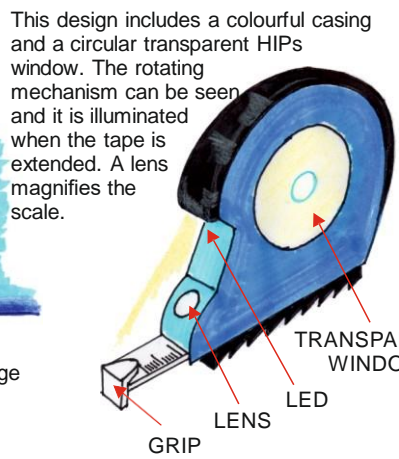
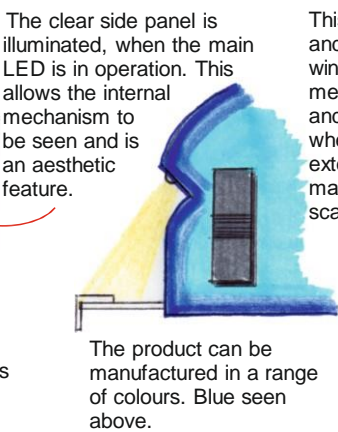
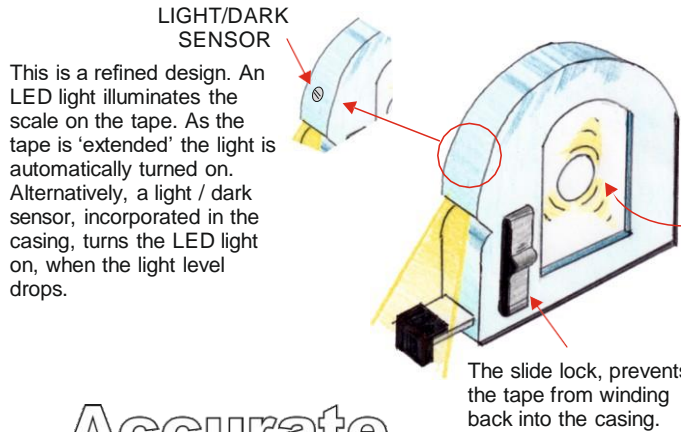
TRANSPARENT POLYCARBONATE CASING



The transparent body has been developed a little further. It is a more ergonomic design. The body has a built in lens, which magnifies the scale, allowing easy reading of the measurement.

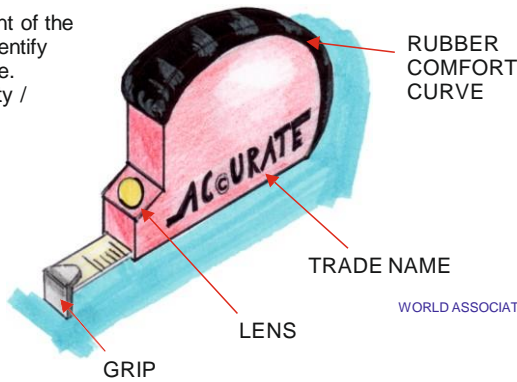
Manufactured from recyclable polycarbonate.





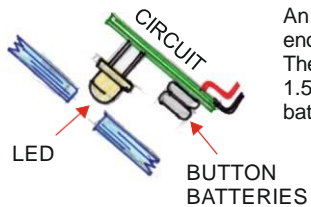
Accurate
Accurate
ACCURATE
 ACCURATE

These are an early development of the writing style. This will clearly identify the manufacturer or trade name. The style must reflect the quality / high standard of manufacture.



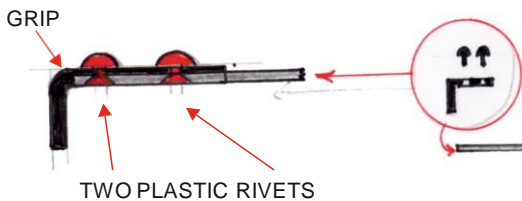
The drawing above, shows the disassembled casing. The two sides are held together by small M4 countersunk screws. This allows for repairs to be carried out and for the coin batteries to be replaced. Industrial strength double sided tape, permanently holds the rubber bottom grip and the rubber comfort curve, to the casing.

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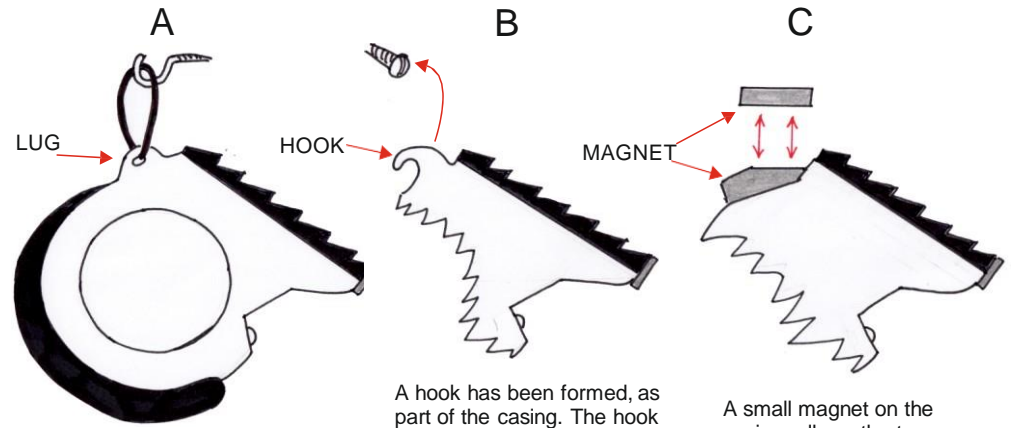
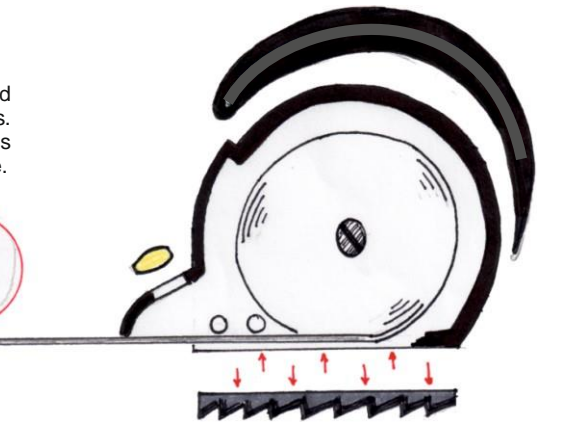


An ultra bright LED will provide enough light to illuminate the scale. The circuit will be powered by two 1.5v button / coin batteries. The batteries will be replaceable.

The grip at the end of the tape, could be attached permanently to the tape by colourful plastic rivets. these will be an attractive feature. Even luminous rivets could be used, making the grip more visible.



Steel, aluminium and even copper rivets could be used to secure the grip to the tape.

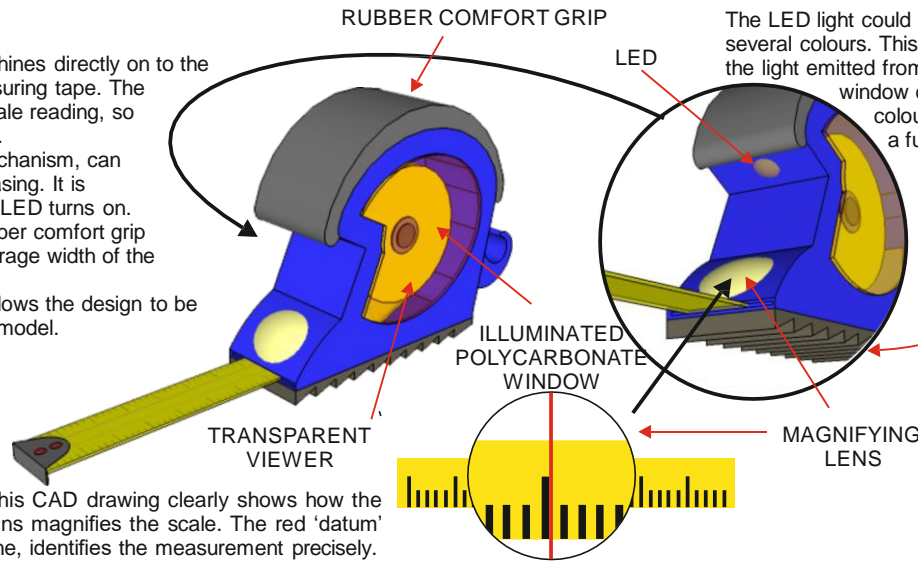


The casing has an additional 'lug', which has been drilled. A small loop of leather / textile material can be used to hold the tape measure, from a standard hook.

A hook has been formed, as part of the casing. The hook has been positioned so that the tape measures centre of gravity, allows it to hang securely.

A small magnet on the casing, allows the tape measure to be held securely underneath any steel workshop shelf.

An ultra bright LED shines directly on to the scale portion of measuring tape. The lens, enlarges the scale reading, so that it is easy to read. The rotating tape mechanism, can be seen inside the casing. It is illuminated when the LED turns on. The extent of the rubber comfort grip can be seen, the average width of the palm of the hand. The CAD drawing, allows the design to be viewed as a realistic model.

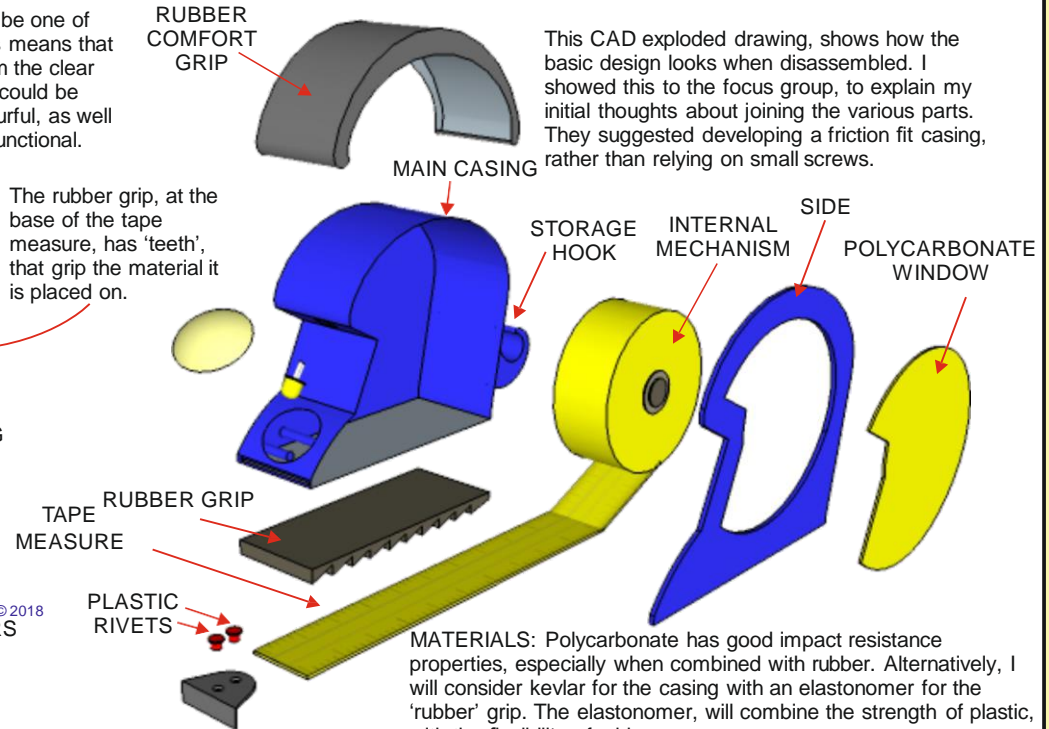


This CAD drawing clearly shows how the lens magnifies the scale. The red 'datum' line, identifies the measurement precisely.

The LED light could be one of several colours. This means that the light emitted from the clear window could be colourful, as well a functional.

The rubber grip, at the base of the tape measure, has 'teeth', that grip the material it is placed on.

This CAD exploded drawing, shows how the basic design looks when disassembled. I showed this to the focus group, to explain my initial thoughts about joining the various parts. They suggested developing a friction fit casing, rather than relying on small screws.

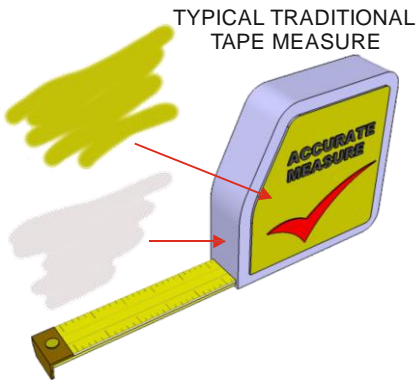


MATERIALS: Polycarbonate has good impact resistance properties, especially when combined with rubber. Alternatively, I will consider kevlar for the casing with an elastomer for the 'rubber' grip. The elastomer, will combine the strength of plastic, with the flexibility of rubber.

Vacuum forming the casings for the tape measure, seems a good manufacturing option at this stage. It will certainly work well for the prototypes and models. Both the main casing and the side, could be designed to fit tightly together, forming a friction fit. This would avoid the need for small screws.



SAMPLE FASHIONABLE COLOURS

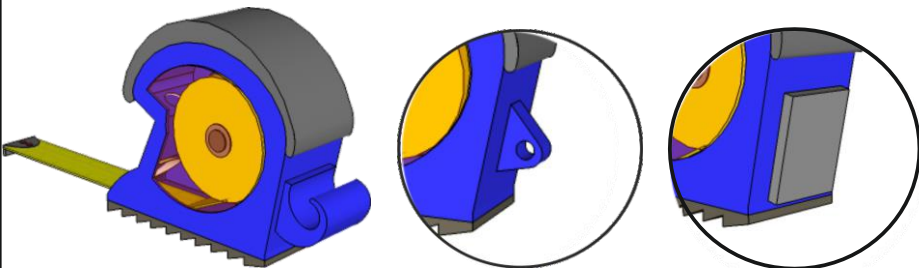


The casing could be manufactured in a range of colours. Four fashionable samples are seen opposite. My design will not be traditional, but will reflected the fact that many tape measures are bought and used by people to carry out DIY at home. The design uses popular colours, not only more traditional colours, used in industry.



My Focus Group, discussed the first design and viewed the CAD model. They quite liked it, especially the ergonomics and the comfortable handling. They suggested that I should develop the circuit, battery replacement, make real models and consider how the parts will be manufactured.

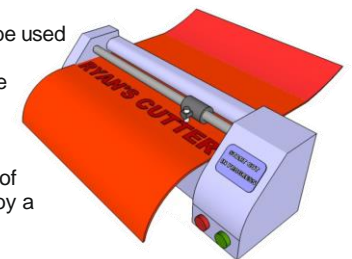
The CAD drawings below, show the different types of storage 'hooks' I am considering. My favourite is the magnet, because of its simplicity and because it will secure the tape to a steel shelf, piece of steel equipment or steel tool box.



IT COULD BE BETTER



A vinyl cutter could be used to manufacture the lettering / logo for the tape measure.



Alternatively, I will consider some form of engraving, possibly by a laser cutter.

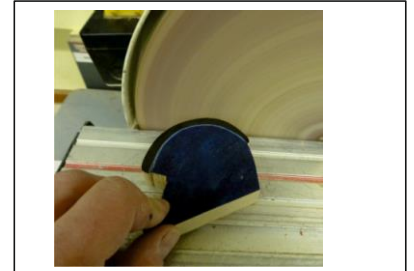
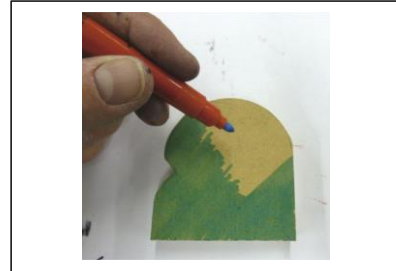
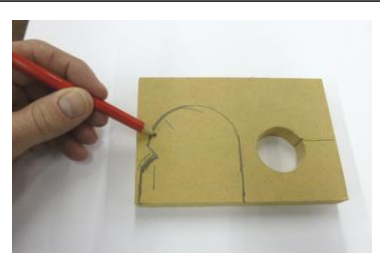
I made a series of basic models, from MDF and High Density Polystyrene. This allowed me to experiment with the initial shape. I changed the shape of idea 1 slightly as a result of cutting the material. See below, compared to the original sketch

I also changed the proportions of each part of idea 2, when I started to draw the basic design on to the MDF. I made the idea slightly higher, to accommodate the rubber hand grip. This gave the tape measure a more balanced look.

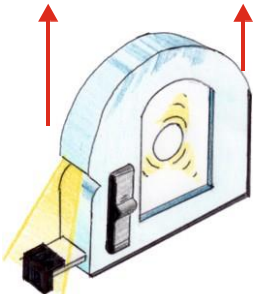
Applying colour and shade to each of the MDF models, allowed me to judge how the colour scheme enhanced to model and how it may look on the full sized product. Brighter, less traditional colours were more appealing.

The basic models helped me refine the 'ergonomics'. I handled the models and tried them out, in the normal tape measure holding position. The first idea was less comfortable than the 'rubber gripped' second idea.

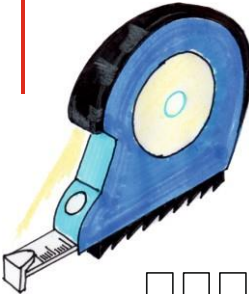
Using the sanding disk, I was able to experiment with the shape of the 'grip', until it felt comfortable. I tried filing by hand, to produce individual finger grips. This added to the time of manufacture and did not feel any more comfortable.



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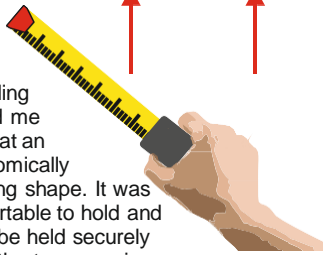
The shape arrived at through modelling, is taller, as the model was more aesthetically pleasing, when altered.



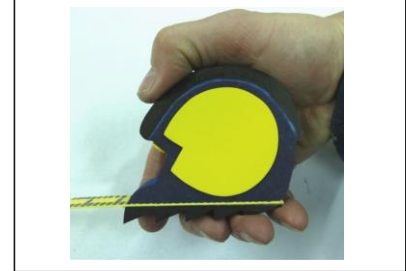
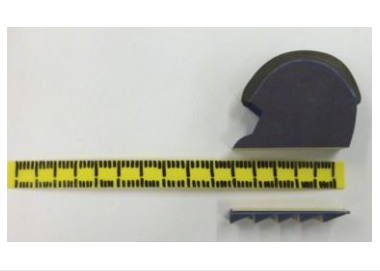
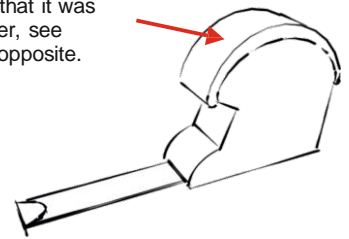
I was able to test each of the colours suggested on previous design sheets. They are all suitable.



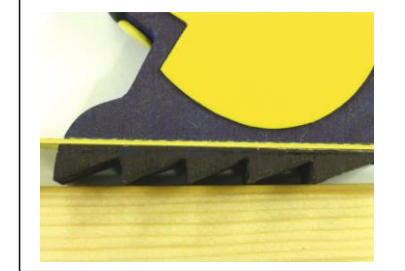
Modelling helped me arrive at an ergonomically pleasing shape. It was comfortable to hold and could be held securely when the tape was in use.



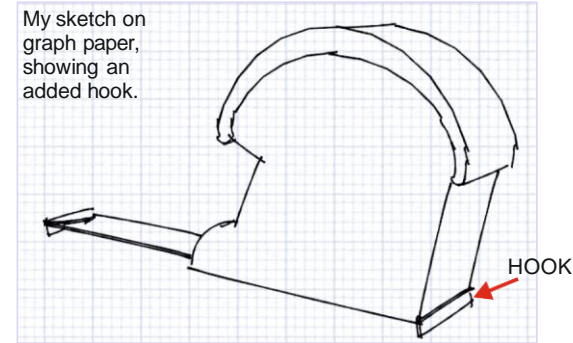
I altered the rubber grip so that it was smoother, see sketch opposite.



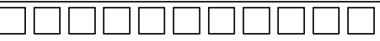
A potential customer tested the completed model. He like the potential for a soft grip and the holding position. However, he felt the bottom grip may not be completely effective, when the tape measure is in use.



The rubber grip at the bottom of the casing looks good, but when tested it tended to slip. This was due to the tape measure being lightweight. An alteration is sketched opposite.



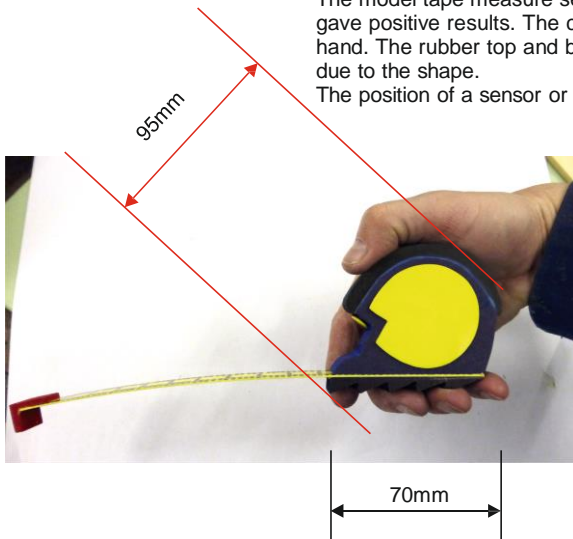
A potential solution is to add a 'hook' to the bottom of the tape measure casing. This could be used to hook on to the opposite end of the material being measured. The combination of the rubber grip and hook, may ensure the tape measure does not slip when being used.



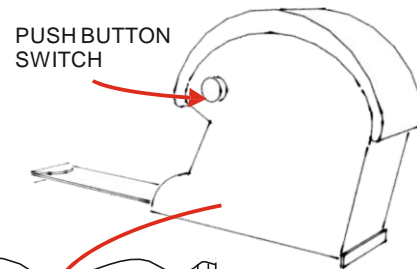
Drawing the scale on to the polystyrene modelling material, made me consider the type of scale that should be used. It is possible to manufacture the tape, so that there are alternative scales (CM, mm, imperial etc...) The customer could choose which scale suited him/her.

The model tape measure seen in the photograph below gave positive results. The casing felt comfortable in the hand. The rubber top and bottom grips feel comfortable due to the shape.

The position of a sensor or a mechanical switch, to turn on the LED light, will need to be considered. The ergonomic design will need to ensure that the 'switch' can be reached and operated easily.

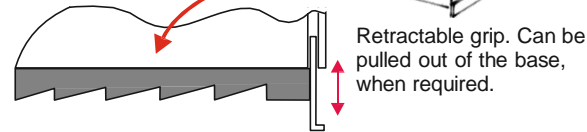
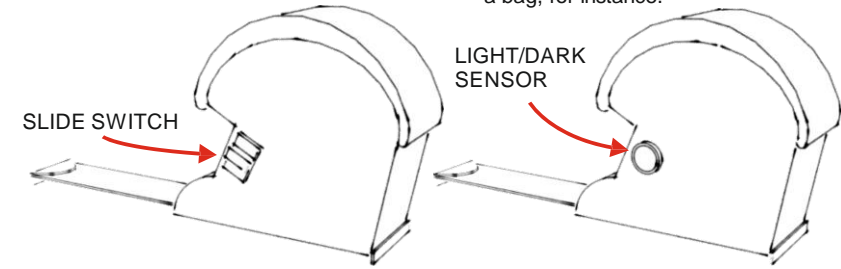


The tape measure has been modified to include a push button switch. This can be activated easily, by one finger. Easy and simple switching on and off of the LED is the result. A possible problem, is that the switch could be pressed by accident, far too easily.

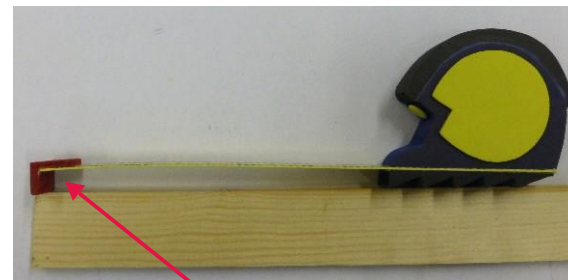
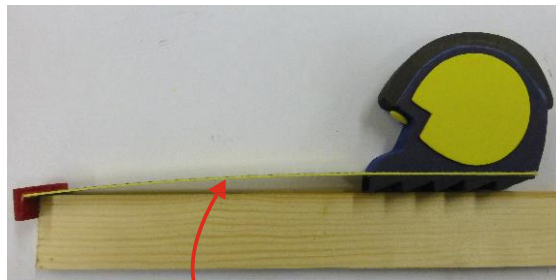


A slide switch requires a positive on and off. This type of switch is likely to be activated by accident.

A light / dark sensor could automatically turn on the LED, when illumination is required. However, a 'master' switch will be needed, as the LED will come on when the tape measure is placed in a bag, for instance.

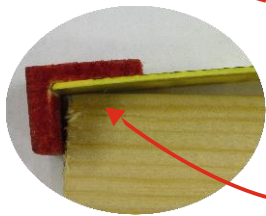


The refined design below, is a result of testing the model. The small change to the top rubber grip, allows the 'thumb' to fit into the grip. This is even more comfortable and means the tape measure can be held even more securely.

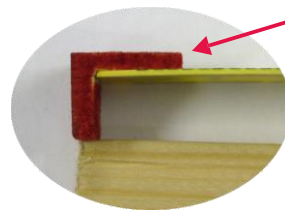


Testing the model highlighted a problem. The tape does not sit flat on the surface of the material being measured. It is slightly raised, making the measurement inaccurate.

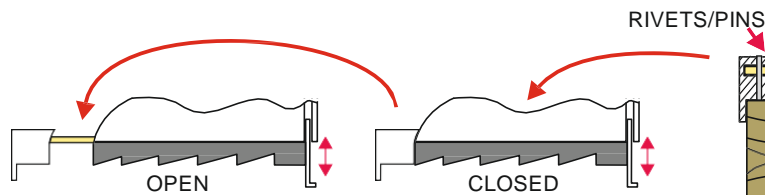
The 'tape' was level, when the end grip 'sat' on top of the material, rather than gripping.



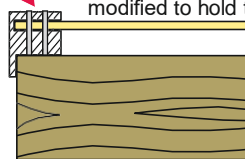
The grip at the end of the tape does its job and allows the tape to be pulled out of the tape measure casing.



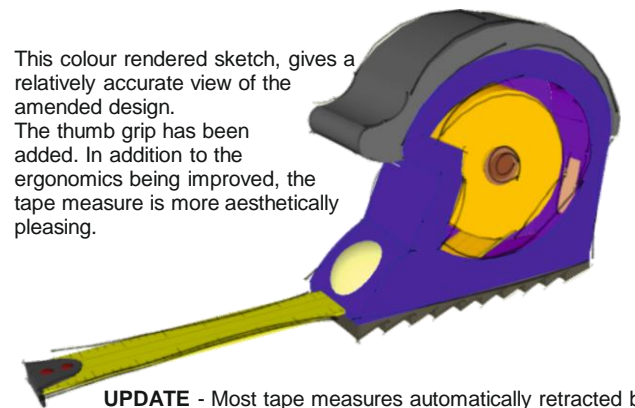
Developing a new type of end grip, that securely sits on top of the material, may be the solution.



One possible solution, is to redesign the end grip. The one shown below has been modified to hold the tape level with the material and at the same time, grip the end of the material securely.



This colour rendered sketch, gives a relatively accurate view of the amended design. The thumb grip has been added. In addition to the ergonomics being improved, the tape measure is more aesthetically pleasing.



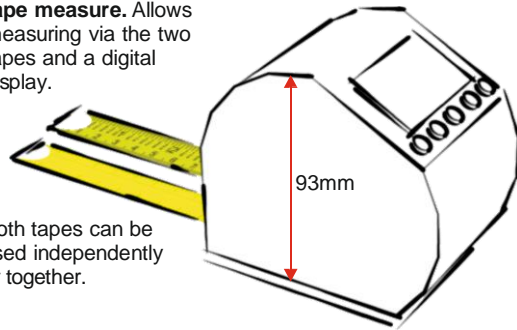
UPDATE - Most tape measures automatically retract back into the casing, when the tape is released from the edge of the material. However, the tape measure could be designed, so that the tape stays extended automatically and has to be released by pressing a button (working in the opposite way).

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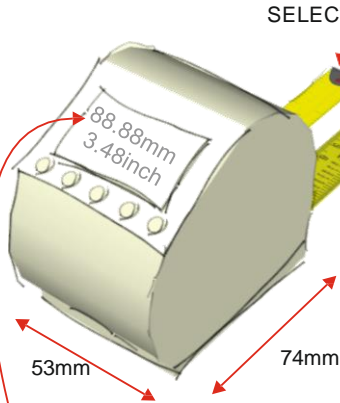
Metric and imperial tape measure. Allows measuring via the two tapes and a digital display.

Both tapes can be used independently or together.



GENERAL DESCRIPTION

Robust metric and imperial, 5 metre tape measure with digital display. Its digital memory will save up to 99 measurements. The large LCD Display ensures that measurements can be read easily. Measurements can also be read directly from the tape, through the magnifying lenses. Other functions include; last measurement hold function and auto shut off to save battery power. Dimensions W x H x D 74 x 93 x 53mm. Tape measure length 5m. Measuring accuracy, 1 hundredth of a mm.

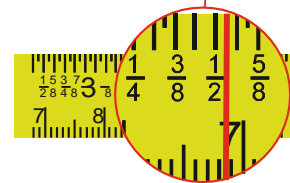
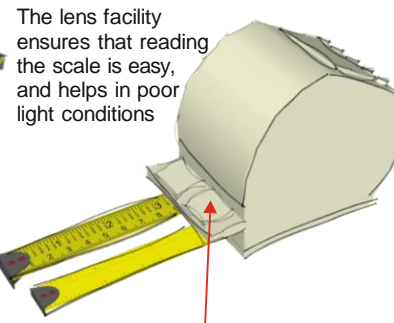


8.88cm
3.48inch



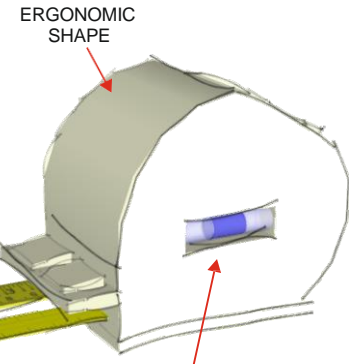
The **function buttons** will allow easy selection of various features. Each function button will be allocated a dedicated feature. The buttons have been positioned so that they cannot be 'knocked' accidentally.

SELECTION OF SCALES

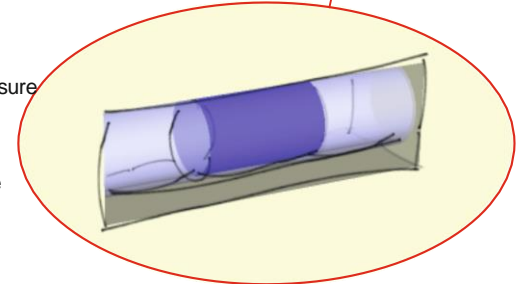


The lens has a **RED datum line** that accurately indicates the correct measurement. The lens clearly displays both imperial and metric scales.

This design has a robust polycarbonate casing, capable of surviving drops and knocks. It can also be recycled at the end of its useful working life. The casing is ergonomically designed, to fit the hand comfortably.



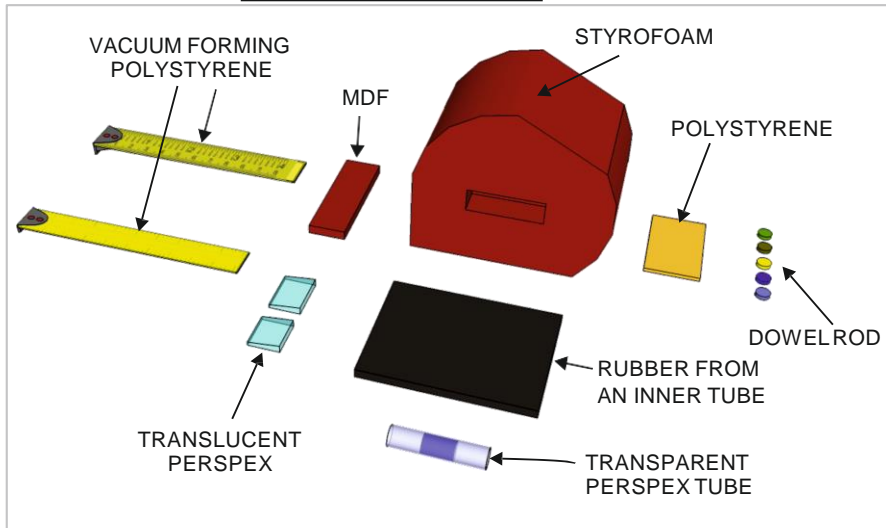
EASY TO SEE SPIRIT LEVEL



A spirit level is a logical addition to the tape measure and it complements its functions.

It will be used by a range of trades, including builders, joiners and DIY enthusiasts.

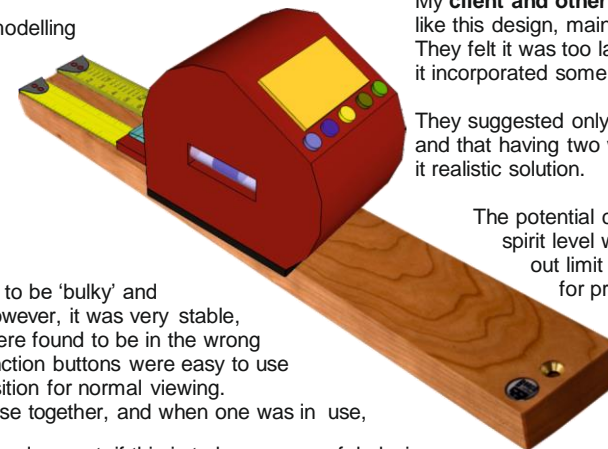
MODEL COMPONENTS



I made a **model** from a variety of modelling materials including:

- Styrofoam
- Polystyrene
- Dowel rod
- Rubber
- MDF
- Translucent perspex
- Translucent perspex tube

When tested, the model was found to be 'bulky' and relatively uncomfortable to hold. However, it was very stable, due to its wide base. The lenses were found to be in the wrong position for proper viewing. The function buttons were easy to use and the display was in the right position for normal viewing. The two scales, were awkward to use together, and when one was in use, the other got in the way. The overall design needs further development, if this is to be a successful design. If the design is developed further, the end of life cycle disassembly of the tape measure, in readiness for recycling, will be a priority.



My client and other potential customers did not like this design, mainly due to its overall size. They felt it was too large for general use, although it incorporated some good features and functions.

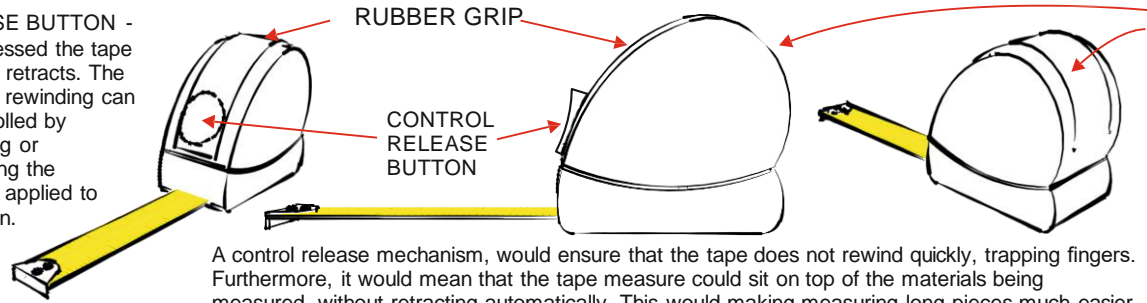
They suggested only one scale was necessary and that having two was more of a 'gimmick' than it realistic solution.

The potential clients also felt that a small spirit level was useful to those carrying out limit DIY, but not accurate enough for professional trades people.

The shape was deemed to be less than a good ergonomic design, as it was not entirely comfortable in the hand.

The 'easy to see' spirit level was referred to as 'difficult' to see and use.

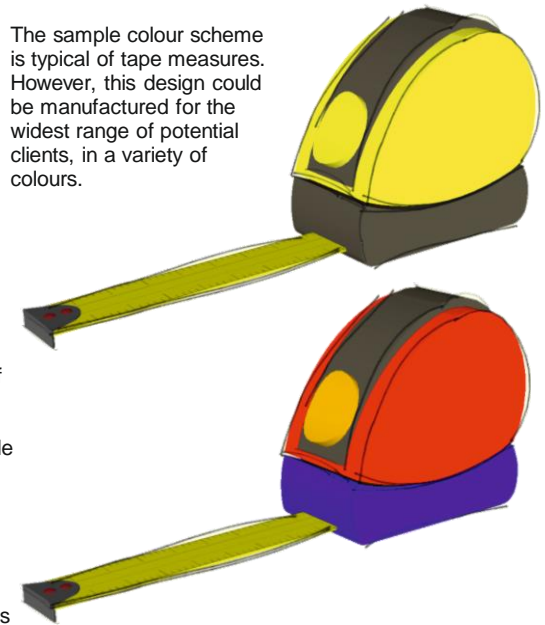
RELEASE BUTTON - when pressed the tape measure retracts. The speed of rewinding can be controlled by increasing or decreasing the pressure applied to the button.



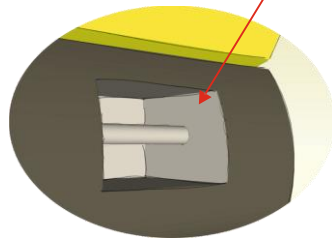
A control release mechanism, would ensure that the tape does not rewind quickly, trapping fingers. Furthermore, it would mean that the tape measure could sit on top of the materials being measured, without retracting automatically. This would making measuring long pieces much easier.

The smooth shape of the casing fits the average hand comfortably. The shape has been designed with ergonomics in mind, allowing for easy reach of the 'control release' button.

The sample colour scheme is typical of tape measures. However, this design could be manufactured for the widest range of potential clients, in a variety of colours.



CAD REPRESENTATION OF STRAP HOLDER



The small slot at the back of the tape measure is for a strap, for looping round a hand, or for hanging up the tape measure. I looked at two existing tape measures, both used this system, for securing the tape to the hand during use and for hanging up, for storage.

STYROFOAM MODEL



The styrofoam model (left), shows how this type of system can be manufactured easily and initial testing would suggest that the mechanical way in which the strap is secured to the casing, needs little refinement, as it is very strong. However, some straps are manufactured from rubber or a synthetic rubber material, which is prone to wear and tear. Alternatively, a more reliable woven textile material is used. Both of these could be replaced by using woven kevlar. This will not break and will resist most forms of extreme wear and tear.

TESTING OF EXISTING / SIMILAR TAPE MEASURES

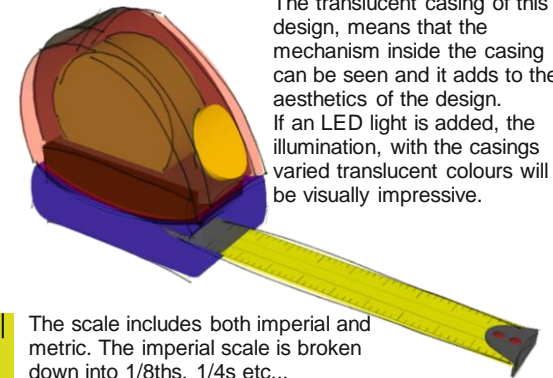


POTENTIAL WEAK POINT

If a tear / split develops on the rubber strap, it will soon fail. However, the overall existing design is very reliable.

This colour scheme incorporates the use of translucent elastomers. These materials have the combined properties of 'plastic' and 'rubber'. This means that the tape measure should survive everyday knocks and blows.

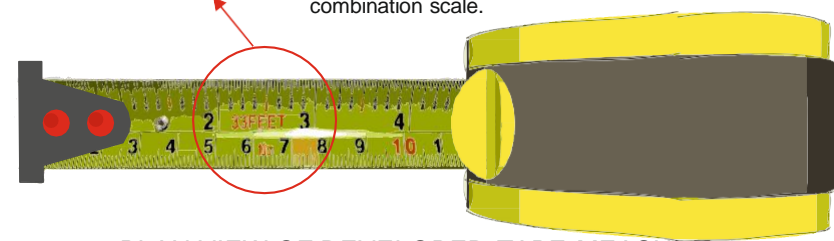
The translucent casing of this design, means that the mechanism inside the casing can be seen and it adds to the aesthetics of the design. If an LED light is added, the illumination, with the casings varied translucent colours will be visually impressive.



When testing the two types of strap, it was found that it was virtually impossible to break the one made from the woven textile. However, the rubber / synthetic rubber strap could break with ease, if a small tear developed first. In a working environment, where chisels, craft knives and tools of this nature, may come in contact with the strap, rubber is not a good selection (even though it has a comfortable feel). A further development could be to make the strap retractable, rather like the tape measure. The strap could retract into the casing, when the tape measure is in use.



The scale includes both imperial and metric. The imperial scale is broken down into 1/8ths, 1/4s etc... Potential customers could choose between, imperial, metric or a combination scale.



PLAN VIEW OF DEVELOPED TAPE MEASURE

This developed idea has a combination of several improvements, from previous design pages.

The Control Release Button also has an LED. This illuminates the tape measure, until the button is pressed retracting the tape. The LED will not be ON, when the tape is fully retracted. The circuit controlling the LED, has a built in timer, which automatically turns off the power, after a predetermined time, conserving the battery. A solar panel on the top grip, charges up the batteries, in the same way as a solar powered calculator works.

A previous design has a magnifying lens, to help view the scale. This has been dropped as the tape is quite wide and the measurement is clearly seen, when the tape is in use.

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A scale including imperial and metric measurements has been included. This will satisfy the requirements of most potential customers. Although the metric system dominates most industries, the imperial scale is still used.

A flexible solar panel has been added to the top grip. This technology already exists

Existing solar panel technology has been applied to the top of the tape measure, ensuring that the batteries are always recharged. Consequently, the batteries never need replacing.

Transparent / translucent panels, illuminated by an internal set of LEDs. This allows the internal mechanism to be seen, adding to the designs aesthetic appeal

EXISTING FLEXIBLE SOLAR PANEL TECHNOLOGY

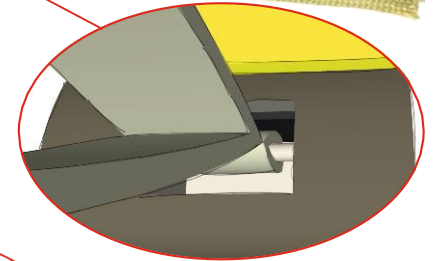


Suntrica, flexible solar panel envirogadget.com



Flexible-Solar-Panel.jpg cheapsolarpanelsforsale.com

The kevlar strap is secured in a time tested fashion, looped around a steel / aluminium pin, held in place by the two sides of the casing. Kevlar watch straps already exist.

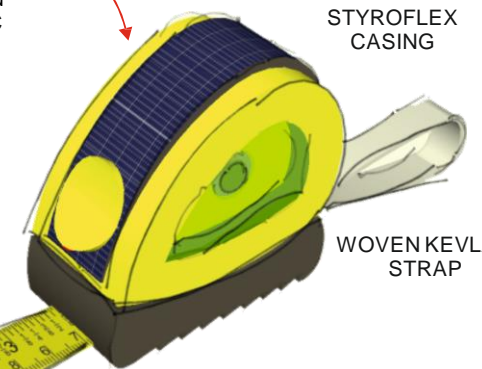


This sketch shows that developed idea, with a flexible solar panel.

The casing material will need a combination of mechanical properties including; toughness, high wear resistance and a certain amount of elasticity. THERMOPLASTIC ELASTOMERS (TPE) will meet these properties.

STYROFLEX CASING

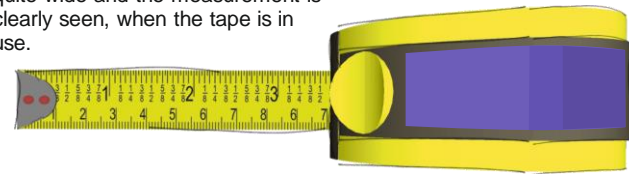
The main material for the casing will be the elastomer, Styroflex because of its physical properties. It has good tensile strength and are tear resistance. It resists chemicals and ink / paint. It has good properties of flexibility and resistance to compression. After bending, it tends to return close to its original shape / form. It can be reprocessed / recycled by raising its temperature above melting point.



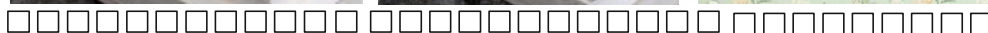
WOVEN KEVLAR STRAP

Styroflex can be reformed during the melting process, unlike many other forms of plastics. It can be extruded, blow moulded and injection moulded. It can be remoulded, if the temperature is raised until the TPE becomes soft and pliable.

The casing will be manufactured through either vacuum forming of injection moulding.

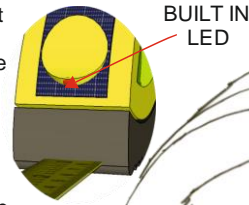


I made a detailed model and carried out some initial tests, to confirm that the design was worth developing further. Although not a 'working' model, results from the basic testing, suggested that the design had promise.



I have developed my clients and potential customers favourite design on this design sheet.

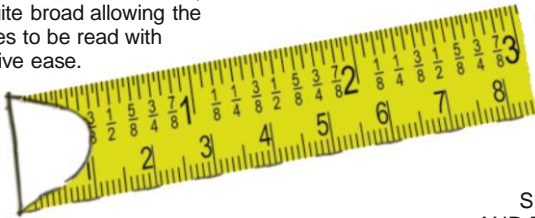
The **ultrabright LED** light is part of the rocker switch. When the tape is extended it illuminates automatically. A timer circuit controls the length of time the LED stays on. The flexible solar panel recharges the internal batteries.



BUILT IN LED

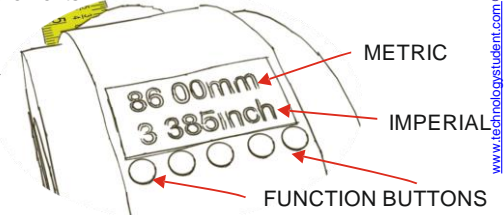
A **digital display** has been included, allowing the user to view the measurement directly from the tape or the display. Although the display shows both metric and imperial measurements, it can be set to display the users preferred system. The buttons control a range of features, including last measurement recall and a memory capable of storing 99 measurements.

A **dual scale** has been included, showing both metric and imperial systems of measurements. The tape is quite broad allowing the scales to be read with relative ease.



The **kevlar strap** is now retractable, housed inside the styroflex bottom grip. A **rubber bottom grip** (see above), is comfortable in the hand and grips the material it is placed on, when measuring.

RUBBER BOTTOM GRIP



METRIC

IMPERIAL

FUNCTION BUTTONS

A **disassembled version** of the tape measure is below. This shows the major parts, as an exploded view.

ROCKER SWITCH WITH INTEGRATED LED

DUAL SCALE TAPE MEASURE

SOLAR PANEL AND DIGITAL DISPLAY INTEGRATED WITH STYROFLEX

TRANSLUCENT SIDE PANEL

HIGH IMPACT (HIGH DENSITY) POLYSTYRENE CASING

STYROFLEX BOTTOM GRIP WITH INTEGRATED STAINLESS STEEL STRAP PIN

KEVLAR STRAP

The high density polystyrene casings are injection moulded. Small screws hold the two sides together, allowing them to be disassembled, for recycling after many years of use. The tape measure is designed to be affordable, tough and accurate. It is also ecologically sound, having been carefully designed and manufactured from recyclable materials.

An **improved tape end** means that the tape is level when being used.

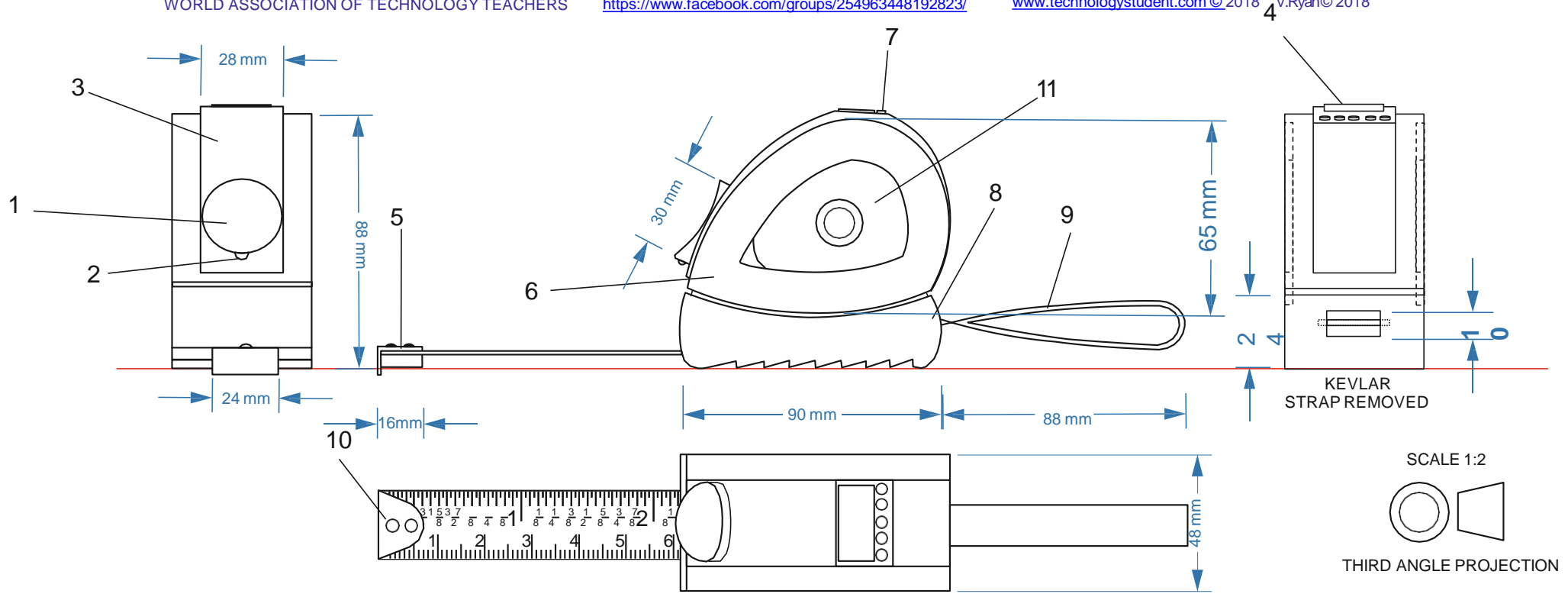
The level tape, leads to a more accurate measurement being taken.

THE FINAL DESIGN

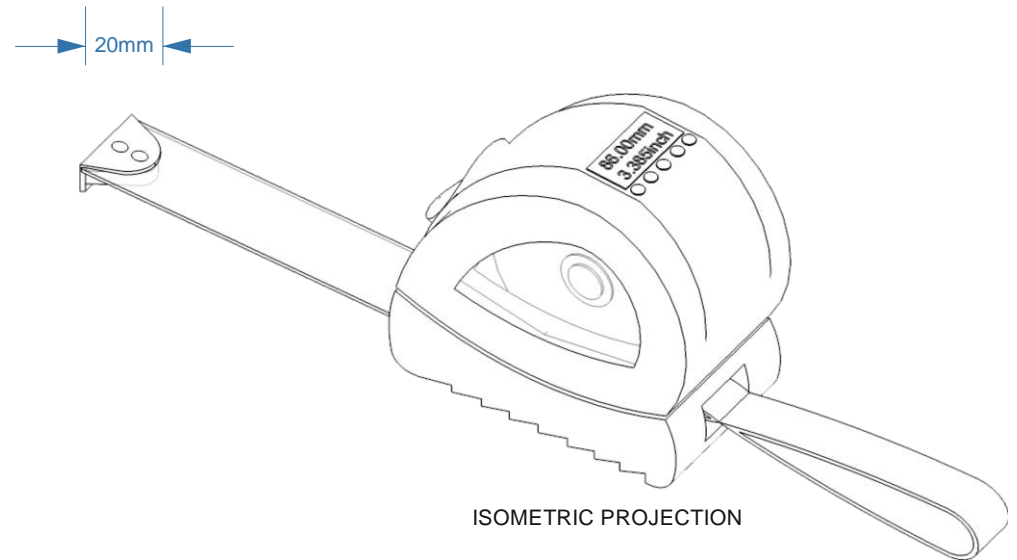
My client is very happy with this design as it meets most points of the specification. The client was consulted at every stage, especially during the development stage of the design process.

My **focus group** selected the basic design from a selection of ideas. They were very positive about the consideration given to the products life cycle and its end of life recycling. The use of rechargeable batteries, in combination with the solar panels, was positively received.

The model was extremely comfortable to hold in the hand and the switch was easy to use. This is due to the time devoted to developing the ergonomic shape/form, derived from anthropometric data. My client liked the combined use of styroflex and the flexible solar panel. The rechargeable batteries should never need replacing and this also applies to the ultra bright LED.



PART No	No OFF	DESCRIPTION	MATERIAL	DIMENSIONS	FINISH
1	1	ROCKER SWITCH	PVC	30x26x10mm	POLISHED
2	1	ULTRA BRIGHT LED	ELECTRONIC COMPONENT	Dia.5x10xmm	N/A
3	1	FLEXIBLE SOLAR PANEL	ELECTRONIC COMPONENT	110x28x3mm	N/A
4	1	LCD - DISPLAY	ELECTRONIC COMPONENT	15x25x5mm	N/A
5	1	END GRIP	ALUMINIUM	16x8x24mm	BRUSHED
6	2	CASING	POLYETHYLENE	65x90x24mm	POLISHED
7	5	FUNCTION BUTTONS	STYROFLEX	Dia.4x8mm	TEXTURED
8	1	BOTTOM GRIP	SYNTHETIC RUBBER	90x24x48mm	TEXTURED
9	1	WRIST STRAP	KEVLAR	88x26x2mm	WOVEN
10	2	PAN HEAD RIVETS	ALUMINIUM	DIA3x15mm	PLANISHED
11	2	TRANSLUCENT WINDOW	POLYETHYLENE	40x35x2mm	POLISHED



MANUFACTURE THE FINAL PROTOTYPE

HELPFUL LINKS

http://www.technologystudent.com/designpro/eg_prodlog1.html

<http://www.technologystudent.com/designpro/prodstate1.html>

IT IS GOOD PRACTICE TO KEEP A PRODUCTION LOG OF THE MANUFACTURE OF THE FINAL PROTOTYPE. THE LINKS ABOVE GIVE GUIDANCE ON THIS. MARKS ARE NOT AWARDED FOR THE PRODUCTION LOG, BUT THE PHOTOGRAPHS AND COMMENTS THAT ARE RECORDED, WILL INEVITABLY BE USEFUL WHEN WRITING THE EVALUATION.

FINAL TESTING AND EVALUATING

HELPFUL LINKS

http://www.technologystudent.com/despro_fish/evalintegr1.html

http://www.technologystudent.com/despro_fish/testeval1.html

http://www.technologystudent.com/despro_fish/testeval2.html

<http://www.technologystudent.com/designpro/eval1.htm>

FOLLOWING ARE THREE SLIDES OF WRITTEN ADVICE AND GUIDANCE, REGARDING EVALUATING AND TESTING A FINAL PROTOTYPE / PRODUCT.

THERE ARE THREE SLIDES SHOWING TESTING BY A CLIENT/ POTENTIAL CUSTOMER

THERE ARE ALSO TWO SLIDES SHOWING POSSIBLE LAYOUTS TO A FINAL EVALUATION, WHICH IS THE STUDENT'S EVALUATION, INCLUDING HIS/HER VIEWS /OPINIONS.

REMEMBER - TO TEST THE PRODUCT AGAINST THE ORIGINAL SPECIFICATION.

FINAL TESTING AND EVALUATING

HELPFUL LINKS

http://www.technologystudent.com/despro_fish/evalintegr1.html

http://www.technologystudent.com/despro_fish/testeval1.html

http://www.technologystudent.com/despro_fish/testeval2.html

<http://www.technologystudent.com/designpro/eval1.htm>

AQA

AO3: Analyse and evaluate:

OCR

Evaluate (AO3)

EDEXCEL

4.1 Testing and evaluation

Designers analyse and evaluate their finished products or prototypes in order to test whether they work well and if the design can be improved.

IT IS IMPORTANT TO EVALUATE YOUR WORK CONSTANTLY DURING THE PROJECT.

Evaluation can take a variety of forms:

General discussion with other students, focus groups and the client.

Questionnaires / surveys carried out at any time during the project.

Your personal views, what you think of existing designs.

Most important of all - what do you think of your designs, prototypes and finished product ?

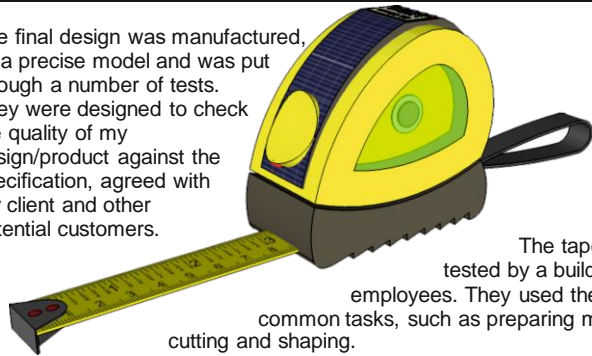
Can you think of any other ways of evaluating your work ?

CONSIDER THE FOLLOWING POINTS WHEN WRITING YOUR FINAL EVALUATION

1. What do you think of the overall design? What changes would you make?
2. Are you happy with the materials you chose? Would you make adjustments next time?
3. Is the colour scheme/style exactly what you expected? What alterations would you make?
4. Did the project take too long to make? Would this alter the cost of manufacture?
5. Would it be easy to set up a production line for the manufacture of your solution?
6. Is your solution safe? Could it be made safer?
7. Are the techniques you used to make your solution adequate or would you use a different range of manufacturing techniques?
8. Is the solution the right size/shape?
9. What are the views of other people regarding your design?
10. Does it work? What changes are required?

The final evaluation and testing is often NEGLECTED, because it is the last part to any design and make project. Do not make the mistake of completing it quickly or not doing it at all. The final evaluation is usually relatively easy to write and is awarded significant marks.

The final design was manufactured, as a precise model and was put through a number of tests. They were designed to check the quality of my design/product against the specification, agreed with my client and other potential customers.



GENERAL TESTING

The tape measure was tested by a builder and his four employees. They used the tape on common tasks, such as preparing materials for cutting and shaping.

Their all agreed that the tape measure had potential for future development. Four of the five workers said it was comfortable to use, especially when held in the hand, as shown below. One suggestion was that two versions should be developed, one with an LED light and one without.



ERGONOMICS TESTING

PHOTO A



PHOTO B



An ergonomics test, was one of the most important aspects of the testing and evaluation, of the final tape measure design. It was tested in two 'dimensions';

A - Holding the tape, as it would normally be held for setting up for measuring.
B - Holding the tape measure and operating the LED rocker switch.

A Focus Group composed of ten people were asked to test the ergonomics. Seven members found the ergonomics to be 'very good', three found the ergonomics to be 'good'. Overall, I am pleased with the general findings of the focus group, as the specification stated that good ergonomics was a priority.

SCALE - READABILITY TEST



The builders carrying out the general test, agreed that the scale was very useful, especially the imperial scale. The imperial scale has been used less and less, over the years, due to the metric system becoming dominant. When used by builders, the fact that the imperial divisions were clear and easy to read, was a plus. This meets one of my specification requirements.

GROUP MEMBER	VERY GOOD	GOOD	FAIR	POOR
1	✓			
2		✓		
3	✓			
4	✓			
5		✓		
6	✓			
7	✓			
8	✓			
9		✓		
10	✓			
SUMMARY	7	3	0	0

LED LIGHT TEST

A general test and a scientific test were carried out.

The tape measure was used in a shaded place, to test the illumination of the LED and the ability of a user to view the measuring scale.

A light meter was used to measure the light intensity of the ultra bright LED

All members of the focus group found the LED illumination very useful, when measuring in poor light conditions. One suggestion was that the LED could be used as a general light source.

FLEXIBLE SOLAR PANEL TEST

A sample solar panel was tested and it was shown capable of recharging the batteries, in normal lighting conditions, in one hour.

When tested for discharge, it illuminated the LED for 10 minutes nonstop use. The manufacturers claim that the panel collects 90% of ambient light, efficiently charging the batteries.

Given that the LED will not be constantly used and that the tape measure would normally be in room level lighting conditions - the conclusion is that this illumination system will be successful.

The environmental aspect of my specification has been partly met.

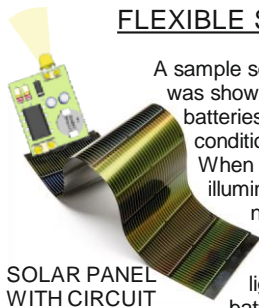
TM-201L LUX/FC LED LIGHT METER

I used the light sensor to find the LED white light Luminous Intensity Measurement.

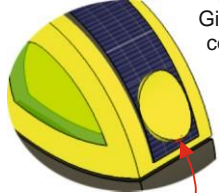


The circuit was tested, outside the casing, shining the LED light directly at the light meter. The LED achieves 1270 lux, providing enough light to view the scale in darkness.

The use of an LED to illuminate the tape, helps meet the specification requirement 'ease of reading' and aids accuracy.



SOLAR PANEL WITH CIRCUIT



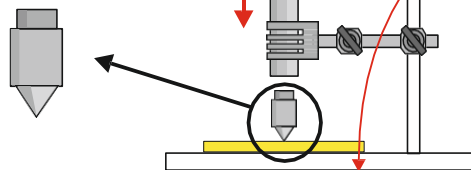
ULTRABRIGHT LED



MATERIAL TESTING

HARDNESS TEST

A sample of styroflex was tested using a piece of homemade equipment. A steel tube was held vertically, using science lab clamps. A 'turned' 100g weight was dropped down the tube and the impact damage recorded.



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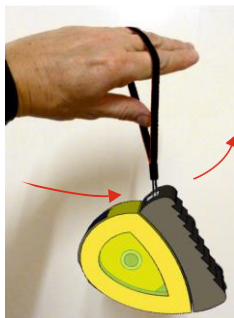
The styroflex sample had a 'dint', where the impact took place, but it had not cracked. Overall, very little deformity took place.



The equivalent size and thickness of a piece of HIPS High Impact Polystyrene was tested, in exactly the same way. The piece cracked from the impact area outwards and a small piece broke away at the impact point.

Conclusion: the Styroflex was the most appropriate material to select for the casing of the tape measure. Survival of knocks and drops from everyday use was more likely. Styroflex fits the material properties outlined in my specification.

SWING TEST



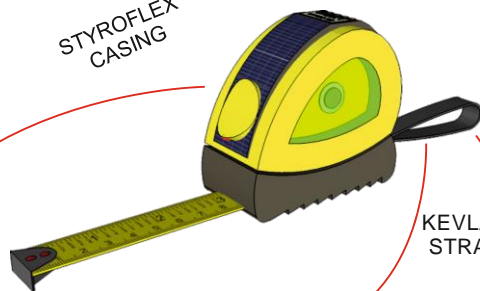
The kevlar strap of the model was put under stress, by swinging the tape measure round at speed. Although not scientific, it is a realistic test, as this may happen during its lifetime. The strap survived and showed no sign of fatigue. This was repeated fifty times.

CONDUCTIVITY TEST



I carried out a simple conductivity test on a sample of casing material (styroflex). The meter showed that it did not conduct current at all, making it an excellent insulator. Although the low voltage batteries do not carry a direct health and safety risk, the styroflex, will prevent an accidental short circuit, which is a potential fire hazard.

STYROFLEX CASING



KEVLAR STRAP



TESTING KEVLAR

When testing a sample of kevlar, with a scissors, I found that it was extremely difficult to cut and after a short time the scissors became blunt.

Kevlar is the best choice for the strap, as it will withstand cutting, unlike the rubber which will fail, if it becomes torn or damaged in any way. Kevlar fulfils the material properties outlined in my specification.

TESTING RUBBER

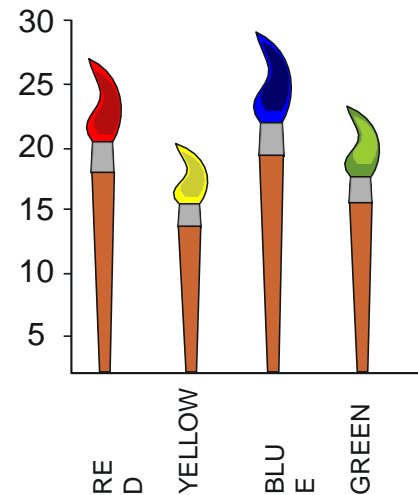
When testing rubber, it cut extremely easily with a scissors. Very little effort was required.

COLOUR SELECTION

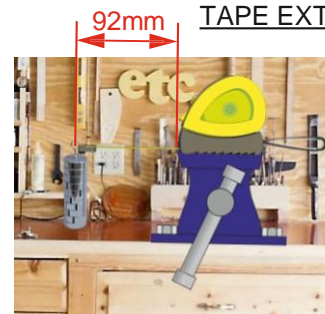
I showed one hundred construction students at the local college, the range of colours on offer. The selection of colours was well received, with blue being the most popular.

When asked if the colour scheme was the most important factor or the operation / functions, 92 said that the tape measures operation/functions were the priority.

My specification states that the colour scheme will be important. However, the survey suggests function before aesthetics in of greater importance.



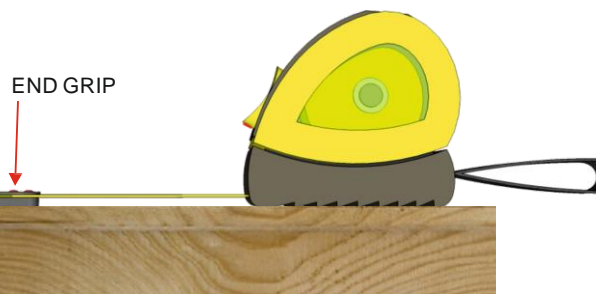
TAPE EXTENSION TEST



The tape was extended stage by stage and a weight of 50 grammes attached. The tape stayed level until it was extended by 92mm, it then lost its shape. The focus group agreed that this was acceptable, as most tapes they had used, failed even at a light touch. This fulfils a specification requirement.

Tape extension is very important as a 'weak' tape, that loses its shape, leads to a loss in accuracy and infuriates the user. The specification refers to this aspect of the design being important.

END GRIP TEST A standard problem emphasised in the specification, is that the tape end grip tends to slip off the material. This usually happens, just when it is time to read the scale. An improved design was specified.

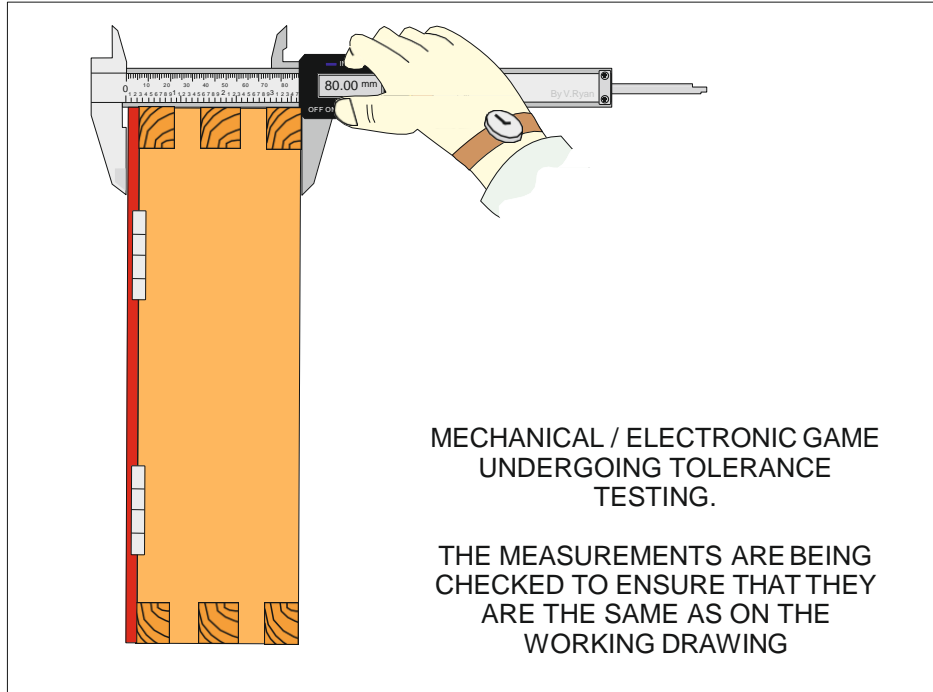


The redesigned end grip worked well when tested. In 9 out of 10 tests, the end grip remained in position whilst the tape was being used, on a typical measuring task.

The metallic tape remained straight and level when in use, allowing a more accurate measurement.

PRODUCT TESTING

PHOTOGRAPH OF TESTING



DESCRIPTION OF TESTING

My electronic / mechanical childrens toy was tested for a week in a school nursery. It was used every school day and still worked at the end of the time period.

The children were taught how to use the 'maze' game, especially how the handles operated. They were not shown how to replace the batteries as this was regarded as being unsafe.

The rechargeable batteries are small and should be replaced by an adult. The life span of the batteries was recorded.

The game was deliberately dropped twice to check its robustness and survivability. It was checked for splinters and small pieces breaking away (these would be a hazard for young children).

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FINDINGS OF THREE TESTERS

PERSON 1: TEACHING ASSISTANT (SUPERVISING)

As expected it got some rough handling and was dropped once or twice. The batteries had to be replaced. This was difficult as a screwdriver was required. This could be regarded as a safety feature, to prevent young children opening the circuit compartment, but it was still inconvenient. The children enjoyed the game and some continuously played with it. The game is slightly addictive, for some young children.

Overall, it is a good game, worthy of further development.

PERSON 2: STATEMENTS FOR ONE YOUNG CHILD

Did you enjoy the game?

Yes.

How long did you play the game for?

30 minutes.

Did your friends like the game? *Some liked it.*

Some found it a little boring after a while.

Would you play the game again?

Yes.

PERSON 3: ADULT TESTER

I found the handles for moving the mechanical parts of the game a possible weak point. With force, they may break away. A small handle could be swallowed by a very young child.

The circuit worked well and without a screwdriver, it is impossible to open the circuit and battery compartment. This is a good safety feature as it stops young children damaging the circuit or taking out the small batteries.

I saw children enjoying the game.

Young children should play this game only when supervised.

PRODUCT: EASY CHAIR WRITING REST

MY EVALUATION AGAINST THE SPECIFICATION

My Product Specification is written below. It is a check list that will help me develop my product.

It has been checked and agreed with my client / customer

**SPECIFICATION
POINT**

EVALUATION AGAINST EACH SPECIFICATION POINT

POTENTIAL CUSTOMERS: The 'writing rest' must be useful and appeal to a wide range of potential customers.

FUNCTIONS - EASE OF USE: The 'writing rest' must allow the user to write and read comfortably, whilst sat in an easy chair.

FUNCTIONS - LIGHTING: The 'writing rest' should have an integrated light source.

LIGHTWEIGHT: The writing rest should be lightweight.

ADJUSTABLE: The writing rest should be adjustable, allowing individuals to set it up to suit their seating position.

**SPECIFICATION
POINT**

EVALUATION AGAINST EACH SPECIFICATION POINT

ERGONOMICS: The 'writing rest' must be suitable for use with a wide range of easy chairs, and by the widest possible range of potential customers.

ERGONOMICS: The light should be adjustable, so that it can be focussed on the page being read by the user.

SAFETY: The product must be safe to use, even when being adjusted.

LIFE CYCLE AND SUSTAINABILITY: The writing rest will be manufactured from sustainable materials such as recycled and reclaimed materials (aluminium, natural woods and recyclable plastics, including polypropylene). Also, the materials will be reclaimed at the end of it's useful working life.

AESTHETIC APPEARANCE (SHAPE, COLOUR, TEXTURE): The writing rest will be designed in a 'Bauhaus' style, as preferred by my main client.

MY EVALUATION

POSITIVE POINTS

I like the overall design of my project. It is a suitable game for a young child as it helps in the development of hand/eye coordination. The game and its container are safe as the edges are not sharp and there are no small pieces that could be swallowed.

The joints are accurate and hold the sides together permanently. The wood is pine and this is quite cheap to buy and yet strong and able to withstand everyday knocks.

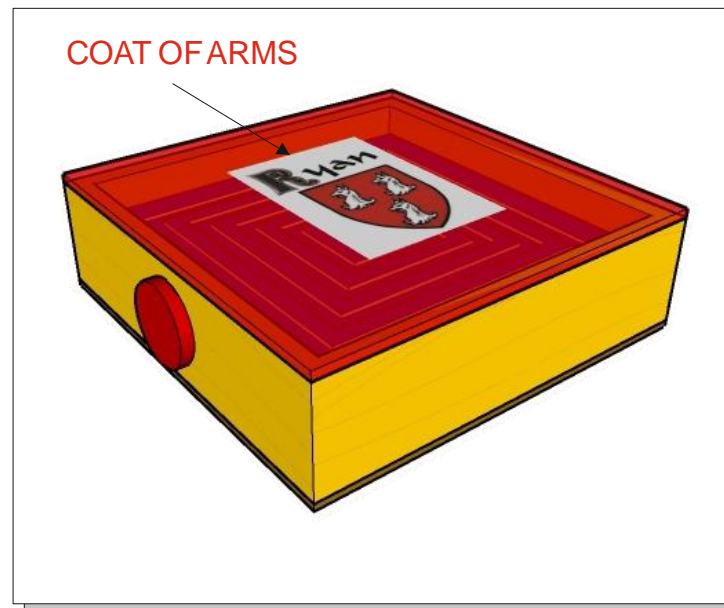
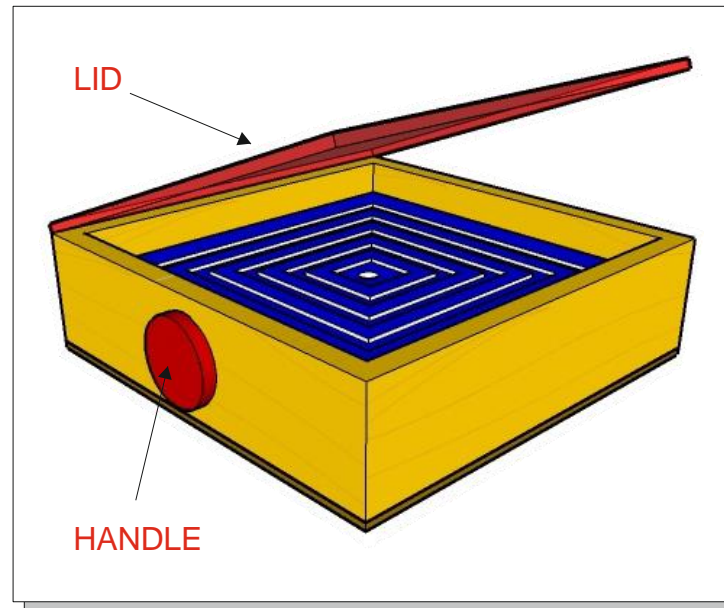
I like the colour scheme as it reflects the results of my questionnaire. The perspex lid is red as this was found to be the favourite of children aged 5 to 9 years of age.

The lid closes quite smoothly and the butterfly hinges work well. The translucent lid allows the internal maze to be seen and the pattern looks quite interesting.

I like the position of the coat of arms. This has been machined on a CNC machine.

Overall the game works well. The maze is complex but with effort it can be beaten.

PRODUCT PHOTOGRAPHS



IMPROVEMENTS

Although I like my maze game it could be improved and be even better:

A selection of woods could be available so that parents could choose the type they like best. A wood such as mahogany would increase the price but I think parents would be prepared to pay a higher price for a quality product.

A selection of handle shapes would allow the user to choose the shape they like best. The game could be supplied with a variety of shapes making the game more interesting to look at and play.

Customers could select lids from a range of colours including translucent and transparent perspex.

The coat of arms could be chosen by the customer to reflect the family name. This would personalise the product and lift the price of sale.

In future the maze game could be based on a rectangular, circular or even triangular shape.

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IMPORTANT LINKS - FOR A SUCCESSFUL DELIVERY OF THE COURSE

ITERATIVE DESIGN AND THE NEA

<http://www.technologystudent.com/designpro/despro1.htm>

DETAILED CONTENT AND EXERCISES THAT FOLLOW THE GCSE SPECIFICATION

http://www.technologystudent.com/despro_fish/new_maths1.html

DESIGNERS, DESIGN MOVEMENTS AND COMPANIES

http://www.technologystudent.com/despro_fish/Designer1.html

MATERIALS, EQUIPMENT AND INDUSTRIAL PROCESSES

http://www.technologystudent.com/despro_fish/materials_main1.html

<http://www.technologystudent.com/equip1/equipex1.htm>

GRAPHICS, DRAWING TECHNIQUES AND INDUSTRIAL PROCESSES

http://www.technologystudent.com/despro_fish/graphics_main1.html

MATHEMATICS AND DESIGN AND TECHNOLOGY

http://www.technologystudent.com/despro_fish/new_maths1.html

TOTAL REVISION - FOR EXAMINATIONS

http://www.technologystudent.com/despro_fish/new_revison1.html

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