

# THE NEA (NON-EXAMINATION ASSESSMENT)

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# THE NEA (NON-EXAMINATION ASSESSMENT)

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THE ITERATIVE DESIGN  
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THE NEA

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# INTRODUCTION TO THE NEA

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

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

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

**Ask your teacher for guidance, regarding the number of design sheets you need to hand in, as this varies between examination boards.**

Spend between 30 to 35 hours on the NEA, which includes the manufacture of the final prototype.

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# CAN YOUR TEACHER HELP YOU?

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Your teacher cannot give you direct help or personalised feedback. This includes correcting your work and giving specific sample answers.

Your teacher cannot tell you how to improve your work, in order to achieve better marks. However, teachers can give generic feedback (general advice). This could include the following:

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.



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# WHERE CAN I FIND GENERAL HELP?

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You can use technologystudent.com for general help, with your NEA and all examination work / revision. This website is free to use (including the mobile apps) and is available 24 hours, everyday of the year.

**CLICK ON THE LINK BUTTONS BELOW, TO GO TO THE IMPORTANT SECTIONS.**

**THE NEA SECTION**



**THE MOBILE APP SECTION**



**THE DESIGNER SECTION**



**THE REVISION SECTION SECTION**



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# WHAT IS ITERATIVE DESIGN?

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This is the process of continual improvement, of a concept, prototype, design or product. 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 is a CYCLICAL approach to the development of a product.

There are four 'cycles' of development

Tap the image below for detail.



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## WHAT IS ITERATIVE DESIGN?

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Iterative Design works at it's best, when a student understands how to use 'DESIGN TOOLS', in the development of a product.

Below are **some** 'design tools'.

SKETCHING, CAD, 3D DESIGN, MODEL MAKING, QUESTIONNAIRES / SURVEYS, USING PHOTOGRAPHIC / VIDEO EVIDENCE, RECORDING FEEDBACK, USING FEEDBACK, PRODUCING WORKING DRAWINGS, CRITICAL ANALYSIS, MATERIALS TESTING, PRODUCT TESTING, RELEVANT, RESEARCH SKILLS, EVALUATIVE SKILLS, MARKETING, CUSTOMER PROFILING, WRITING A PROBLEM AND BRIEF, WRITING A SPECIFICATION, COMPOSING AN INSPIRATIONAL, MOODBOARD, PLANNING SKILLS, MATERIAL SELECTION, COLLECTING ANTHROPOMETRIC DATA LEADING TO AN ERGONOMIC DESIGN, HEALTH AND SAFETY, MANUFACTURING PROCESSES

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## USING DESIGN TOOLS?

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**Example 1:** If you understand the purpose of a questionnaire / survey, you will be able to decide when to use this tool during designing (and how many times). This applies to each 'design tool', including CAD, thumbnail sketching, model making etc.....

**Each design tool can be utilised many times, during the iterative design process.**

**Example 2:** 'Feedback'. If you know 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.

There is no set way of designing. You have the freedom to use the 'design tools', at any time, whilst solving your design problem.

**Tap the image**  
below for detail -  
design tools.



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# THE NEA – CYCLE ONE

## DESIGN PROBLEM TO SPECIFICATION

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**Cycle One** is outlined below. The following slides will take you through each stage / aspect.

**Tap the image** below for detail / samples

 = EXPLORE     = CREATE     = EVALUATE



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# 1. DESIGN PROBLEM IDENTIFIED

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Begin by investigating the selected **CONTEXTUAL CHALLENGE** (supplied by the Examination Board), to identify design possibilities / design problems. Consider these in-depth. One way of going about this is seen below. **From your selected Contextual Challenge, you need to identify a design problem, for you to solve.**

Tap the image below for more detail

## ANALYSING THE CONTEXTUAL CHALLENGE STUDENTS WILL IDENTIFY DESIGN POSSIBILITIES

WORLD ASSOCIATION OF TECHNOLOGY TEACHERS

<https://www.facebook.com/groups/204604419322/>

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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 and focused, potential accidents, dropping the device.

### WHEN STANDING / WALKING

### 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 stationary equipment, when stretching, sat in a chair etc.....

### 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.

### 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.

### 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, stationary rest or accessory, to enable working without a table.

### "WORKING COMFORTABLY WITHOUT A DESK OR TABLE"

### 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.

### 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.

### 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.

### 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.

### 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.

### 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 exhibition injury.

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# AN ALTERNATIVE LAYOUT - WORKING FROM A CONTEXTUAL CHALLENGE

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This is an alternative way of analysing the Contextual Challenge. Text and images have been used.

**IMPORTANT – DO NOT COPY THE LAYOUT – DEVISE YOUR OWN LAYOUT!!!**

Tap the image below for more detail

**INITIAL ANALYSIS OF A CONTEXTUAL CHALLENGE**  
WORLD ASSOCIATION OF TECHNOLOGY TEACHERS <https://www.facebook.com/groups/2486244143222> www.technologystudent.com © 2019 V Ryan © 2019

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

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

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

Students often work, relaxing on a sofa, in front of the TV.

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

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

Even the best chairs do not always prevent backache, if an accessory needed?

Finding a comfortable working position, is not easy (a folding 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.

Students frequently complete their work, sit at a desk.

For ALL your AQA needs, go to [www.technologystudent.com](https://www.technologystudent.com)

**WRITE YOUR SELECTED CONTEXTUAL CHALLENGE HERE**  
Students working  
At home.

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

Desk can become extremely unstable, however hard we try to keep them organised.

Working at home inevitably means using a keyboard.

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

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

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

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

What study aids / equipment, used traditionally or adaptively, to ensure effectiveness?

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

Could a soft and universal drink holder be the solution?

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# STILL HAVING PROBLEMS IDENTIFYING A PROBLEM TO SOLVE?

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At its most interesting, design involves innovation and imagination. Even a simple design problem can lead to the development of an innovative product.

If you are finding it difficult to identify a problem from the Contextual Challenge, follow the link button below, to see some examples of design problems being found in everyday activities.



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## 2. PROVE A PROBLEM EXISTS

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Once you have identified a 'problem' to solve, you must write a clear statement / short paragraph describing / explaining it.

**Tap the link button** for an example design problem.



Then, you must provide evidence that the problem is one that is worthwhile solving. This is often achieved through the use of a survey / questionnaire.

**Tap the link button** for an example of proof / evidence.



Tap the blue button for the next slide / page.



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# PRESENTING THE PROBLEM AND EVIDENCE

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Below is a sample presentation of the 'problem' and 'evidence'. Both are presented clearly. Think carefully about how you can present your sheet. Do not copy the sample.

**Tap the image for an example layout.**

## 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

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### 3. TYPICAL CUSTOMER / POTENTIAL USER PROFILE SHEET

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It is now time to clearly identify your client and potential customers / target group.

Name the client (where possible) and write a little about their background.

**E.G.** *“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”.*

Jeff Smith



**Tap the image** for more detail.

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## FURTHER CLIENT / CUSTOMER DETAILS TO INCLUDE

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### DESIGN REQUIREMENTS

Carefully describe the general requirements of the client.

### CLIENTS DESIRED PRODUCT OUTCOME

After discussion with the client, describe the agreed final outcome.

### POTENTIAL RANGE OF CUSTOMERS

Describe / explain the range of potential customers. For example, the final design / solution may benefit not only the client but teenagers, office workers, pupils working on homework etc.....

**Tap the image** for more detail.



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## 4. WRITING A DESIGN BRIEF

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Having identified a design problem and a client / potential customers, it is time to write a Design Brief,

The 'design brief' follows the 'problem' and states clearly how you intend to solve the design problem. It is usually a simple statement or a short paragraph.

**EXAMPLE 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.

**Tap the link buttons**  
for help in writing a  
design brief



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# PRESENTING THE CLIENT PROFILE AND DESIGN BRIEF

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The Client Profile and Design Brief should be presented clearly. An example is shown below. Do not copy the layout – produce a simple and individual layout for your work.

**Tap the image for more detail.**

TYPICAL CUSTOMER / POTENTIAL USER PROFILE SHEET	
<p>Below is a description of a specific client. He has commissioned the design and manufacture a prototype of my product.</p>	<p><b>POTENTIAL RANGE OF CUSTOMERS</b></p>
<p><b>SPECIFIC CLIENT</b></p>	<p><b>Pupils / students</b> - working on homework.</p>
<p><b>Jeff Smith</b></p>	<p><b>Pupil quote:</b> I gets lots of home work and like working in front of the fire, not at a desk.</p>
	<p><b>Office workers and Clerical workers</b> - paper work taken home for completion.</p>
<p><b>BACKGROUND</b></p> <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>	<p><b>Clerical worker quote:</b> I take too much work home and like working whilst sat on an easy chair. I work at a desk, all day long.</p>
<p><b>DESIGN REQUIREMENTS</b></p> <p>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 at 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, reading work on a board on my lap, leads to back and neck aches.</p>	<p><b>Anyone</b> - who prefers to be sat in a relaxing position, whilst reading.</p> <p><b>Parent quote:</b> I like reading and writing letters when sat on a comfortable chair and in the same room as my children.</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>
	<p><b>EXERCISE BOOKS</b>      <b>CLIPBOARD</b>      <b>EXERCISE PAPER</b>      <b>ART SKETCH BOOK</b>      <b>READING BOOK</b></p> 
<p><b>CLIENTS DESIRED PRODUCT OUTCOME</b></p> <p>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.</p>	<p><b>DESIGN BRIEF</b></p> <p>I am going to design a suitable 'stationary rest', for use when sat on an easy chair or sofa, 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 stationary 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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## 5. FOCUSED ANALYTICAL RESEARCH OF EXISTING PRODUCTS

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The time has come, for you to research.

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.



**Tap the image** for more detail.

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# HOW TO PRESENT THE ANALYSIS OF EXISTING PRODUCTS

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**Tap the image for more detail.**

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



**What are the interesting functions?**

*Allows writing in a formal setting as this chair would normally be seen in a classroom.*

**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?**

*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.*

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

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

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## 6. USING A MOOD BOARD FOR ANALYICTICAL RESERACH

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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 therefore be a very useful research tool.

**Tap the image** for more detail about discussions with clients, leading to a moodboard



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# SAMPLE - MOOD BOARD FOR ANALYICTICAL RESERACH

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

**Tap the image for more detail.**

## ANALYTICAL RESEARCH - MOOD BOARD

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 chrome 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.



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## 7. JUSTIFIED SPECIFICATION

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A specification is an **important** summary of the key points / issues, identified by your initial 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 final design. It may be more than one page.

**Tap the image for a more detailed explanation.**

PRODUCT EASY CHAIR WRITING REST	MY SPECIFICATION	MY SIGNATURE: _____
<i>My Product Specification is written below. It is a cheat list that will help me develop my product. It has been checked and agreed with my client / customer.</i>		CLIENT SIGNATURE: _____
SPECIFICATION POINT	EVIDENCE FROM RESEARCH - JUSTIFICATION	FURTHER JUSTIFICATION
<b>POTENTIAL CUSTOMERS:</b> The 'writing rest' must be useful and appeal to a wide range of potential customers.	This is shown by my initial research (pages/10-11) 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.
<b>FUNCTIONS - EASE OF USE:</b> This '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.
<b>FUNCTIONS - LIGHTING:</b> 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, 'It has an LED light that can be focused directly where the user wants it'.	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.
<b>LIGHTWEIGHT:</b> The writing rest should be lightweight.	My research into existing 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.
<b>ADJUSTABLE:</b> 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 like the adjustability especially the height adjustment. This feature could be useful'.	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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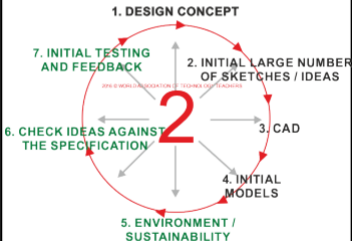
# THE NEA – CYCLE TWO FROM DESIGN CONCEPT TO INITIAL TESTING

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**Cycle Two** is outlined below. The following slides will take you through each stage / aspect.

**Tap the image** for a more detailed explanation.

 = EXPLORE     = CREATE     = EVALUATE



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# 1. DESIGN CONCEPT and 2. INITIAL LARGE NUMBER OF SKETCHES / IDEAS

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The design concept is slowly teased from the design brief, using a wide range of initial sketches, with limited notes. **Thumbnail sketches**, allow the designer to be creative without worrying about detail. Creativity can 'flow' and ideas are put down on paper quickly.

**Tap the image** for a more detailed explanation.

1. BASIC DESIGN

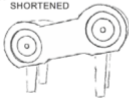


2. LEGS ADDED



MP3 player –thumbnail sketches

3. LEGS ON LEFT SHORTENED



4. LEFTHAND SPEAKER ENLARGED



Tap the blue button for the next slide / page.



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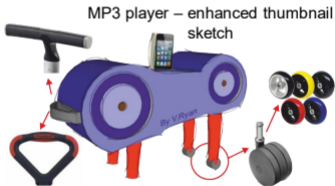


# THUMBNAIL SKETCHES USED TO DEVELOP AN IDEA

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This more detailed thumbnail sketch, has been enhanced by adding colour/ shade. Further to this, detail has been included through the use of images, collected from the internet. This is a quick and time saving way of adding detail to a simple sketch. Do not forget to add notes to each sketch (this is often necessary).

**Tap the image** for a more detailed explanation.



Tap the blue button for the next slide / page.



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## LINKS TO EXAMPLE PAGES INCLUDING SKETCHES

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**Tap on the link buttons** to go to example design sheets including sketches and a detailed explanation of the layout.



Tap the blue button for the next slide / page.



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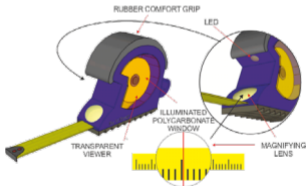


### 3. CAD (Computer Aided Design)

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Select some of your ideas, after consultation with designers, stakeholders and potential customers and draw them using CAD. This will allow you to rotate, zoom in etc... and begin to refine your designs. Export a variety of views to your design folder / PowerPoint, adding more detailed notes to explain your ideas. Be prepared at any point to return to sketching and the seek feedback from others (see point 7).

**Tap the image** for a more detailed explanation.



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## CAD - CONTINUED

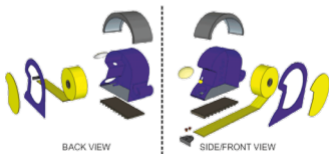
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More detailed designs have been produced using CAD. This allowed the focussed group to view a detailed model. In client and focus group meetings, the design can be rotated, disassembled. It can be projected onto a large screen, enabling all to see the design close up.

Colour schemes can be tried out, applying colours immediately to the model. This allows immediate feedback from the focussed group.

With CAD it is possible to zoom in, to see minute detail.

**Tap the image** for a more detailed explanation.



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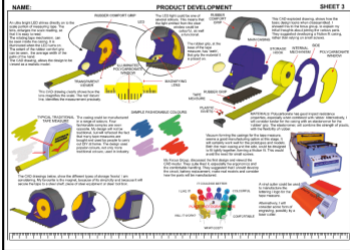


# CAD - CONTINUED

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Below is a sample CAD design sheet. CAD allows the design to be drawn once. Then, the it can be developed, by adding, modifying, experimenting etc... without having to redraw the design by hand, every time it is changed / updated. Progress can be swift.

**Tap the image for a more detailed explanation.**



Tap the blue button for the next slide / page.



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# 4. INITIAL MODELS

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Make models to help you visual your ideas, to test them out, to check the ergonomics, to show to potential customers. Take a photographic record of your models for your design folder.

This design sheet shows the further development of a 'tape measure', through testing models. This shows how useful a model can be, in identifying additional design problems and working towards solutions.

Tap the image for a more detailed explanation.

NAME:	PRODUCT DEVELOPMENT	SHEET 5
 <p>The model tape measure seen in the photograph below gave positive results. The sliding mechanism in the front. The rubber tip and bottom pins feel comfortable due to the shape.</p> <p>The position of a sensor or a mechanical switch, to turn on the LED light, will require to be considered. The ergonomic design will need to ensure that the sensor can be reached and operated easily.</p> <p>30mm</p> <p>70mm</p> <p>100mm</p>	<p>The tape measure has been modified to include a push button switch. This can be actuated easily by one finger. Easy and simple actuating on and off the LED in the model.</p> <p>In possible problem, is that the switch could be pressed by accident, for too easily.</p> <p>A slide switch requires a position or an angle. The type of motion is ready to be actuated by accident.</p> <p>A light / dark sensor could automatically turn on the LED after detection to required movement or motion cannot be needed, as the LED will come on after the tape measure is placed in a bag, for instance.</p> <p><b>PUSH-BUTTON SWITCH</b></p> <p><b>SLIDE SWITCH</b></p> <p><b>LIGHT/DARK SENSOR</b></p> <p>The rubber 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 more comfortable and means the tape measure can be held more securely.</p> <p>Retainable pins. Center pushed out of the beam, when required.</p> <p>Sealing the model top edge is a problem. The tape does not fit on the surface of the material being measured. It slightly extend, making the measurement inaccurate.</p> <p>The grip at the end of the tape does its job and allows the tape to be pulled out of the tape-measure casing.</p> <p>The tape is recessed, when the end grip, top or top of the material, rather than gripping the material.</p> <p>Developing an over-type of end grip, that securely fits on top of the material, may be the solution.</p> <p>One possible solution, is to redesign the end grip. The new design below has been modified with the material used at the same time, grip the end of the material securely.</p> <p><b>TRIM GRIP</b></p> <p>The rubber vented design, gives a naturally accurate view of the measured design.</p> <p>The thumb grip has been added in addition to the ergonomics being improved, the tape measure is more aesthetically pleasing.</p> <p><b>OPEN</b> <b>CLOSED</b></p> <p><b>TRIM GRIP</b></p> <p><b>SPRING</b> - Abrasive measure 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 pushing a button, working in the opposite way.</p>	

Tap the blue button for the next slide / page.



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## USEFUL LINKS – ABOUT MODELS

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Tab on the link buttons below to go to very useful information and examples of models



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## 5a. ENVIRONMENT / SUSTAINABILITY

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At almost every stage, include your knowledge of the environmental needs and requirements of the manufacturer, potential customer and the Law. Also, display your understanding of the 6 Rs (Reduce, Rethink, Refuse, Recycle, Reuse, Repair). Notes referring to the environment and sustainability, should appear regularly, throughout your entire design work.

**Tap the link buttons** for environmental issues to be referred to, on your design sheets

Mobile App covering major environmental issues



Links to website pages covering major environmental issues



Tap the blue button for the next slide / page.



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## 5a continued. ECONOMIC AND SOCIAL EFFECTS

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In addition to the previous page / slide, it is important that you: "*display a full understanding of the impact on society including; economic and social effects*". **Essentially, what this means, is that you mention some key economic and social terms and how they effect your product. The link to a detailed App (below), will take through a vast range of issues.**

**Select some issues that apply to your product and discuss each one, as you work through the NEA.**

**Tap the link buttons**  
for Economic and  
Social Effects.



Tap the blue button for the next  
slide / page.



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## 6. CHECK IDEAS AGAINST THE SPECIFICATION

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### REMEMBER WRITING YOUR SPECIFICATION?

Check your ideas and models against the specification you wrote in the **cycle one**. This should be a continuous process.

Carefully checking that you are keeping to the specification your agreed with your client, will ensure that you do not stray away from the design problem you are trying to solve.

It is a good idea to refer to the way your designs meet the specification, or the way they need developing, in order to meet the specification. Do this by adding notes alongside the sketches, images of models etc.....

Tap the blue button for the next slide / page.



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## 7. INITIAL TESTING AND FEEDBACK

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You should be asking for feedback from your client or a focus group, at any point of the iterative design process. This should also be repeated as many times as you feel there is a need, to help in the development of your ideas / designs. There are many different forms including, surveys, questionnaires and focus groups, but one of the most effective is quick written feedback, signed and dated from potential customers / clients. You could also video feedback or record as an audio file.

**Tap the image** for a more detailed explanation.

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.



Tap the red button to return to the Contents page



# CYCLE THREE - FROM IMPROVED DESIGNS TO INITIAL EVALUATION / CONCLUSIONS

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**Cycle Three** is outlined below. The following slides will take you through each stage / aspect.

**Tap the image** for a more detailed explanation.

 = EXPLORE     = CREATE     = EVALUATE



Tap the blue button for the next slide / page.



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# 1. IMPROVEMENTS TO SELECTED DESIGNS

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After receiving feedback and having carried out a survey of your initial ideas, select two, three or four for further development. This will involve more detailed drawings, models, feedback, testing etc... An example development sheet is shown below.

Tap the image for a more detailed explanation.

**NAME:** **PRODUCT DEVELOPMENT** **SHEET 6**

**Weld and Ingot tape measure.** Shows measuring via the top and a digital display.

**Buttons can be used independently or together.**

**GENERAL DESCRIPTION**  
Product made using a 3D printer. It uses tape measure with digital display. Its digital screen will show up to 100 measurements. The largest 8" display means that measurements can be read easily. Measurements can also be read directly from the top, through the magnifying glass.  
Other features include auto measurement hold function and auto shut off. It uses battery power. Dimensions: 11 x 14 x 14 x 10 x 10cm. Top measure length: 100cm accuracy: 1 inch/25.4mm.

**8.88cm  
3.48inch**

**Model Components:**  
VACUUM FORMING (top cover)  
MDF  
STYROFOAM  
POLYSTYRENE  
SHELLAC  
TRANSPARENT PEPPER TUBE  
TRANSPARENT PEPPER TUBE  
TRANSPARENT PEPPER TUBE  
TRANSPARENT PEPPER TUBE

**Model Description:**  
The function buttons will allow easy selection of various features. Each function button will be checked as a double-check feature. The buttons have been positioned so they cannot be touched accidentally.

**Model Description:**  
The size for a 100cm button has been accurately measured. The size clearly displays both imperial and metric scales.

**Model Description:**  
This design has a wide, adjustable casing, capable of extending, angles and knots. It can also be extended and used in the same way. The casing is ergonomically designed, to fit the hand comfortably.

**Model Description:**  
A split reel is a typical addition to the tape measure and is compulsory to function.

**Model Description:**  
It will be used by a range of users, including students, parents and first aid workers.

**Model Description:**  
To check and other potential concerns of the design, many tests were carried out. They were a real test for general use, although it was not the best of the best.

**Model Description:**  
They suggested only one scale necessary and that having two was more of a gimmick than a useful addition.

**Model Description:**  
The potential clients also felt that a small sign was useful to have during construction, but not enough for professional level people.

**Model Description:**  
The shape was deemed to be more than a good ergonomic design, so it was not entirely comfortable in the hand.

**Model Description:**  
The way to use the split reel was intended to be difficult to use and use.

**Model Description:**  
I made a model from a variety of modeling materials including:  
Styrofoam  
Polystyrene  
Wood  
MDF  
Transparent paper  
Transparent paper tape

**Model Description:**  
When making the model was found to be bulky and extremely uncomfortable to hold. However, it was very stable. It is 10 cm wide. The largest was found to be the wrong position for proper viewing. The function buttons were able to use and the display was in the right position for normal viewing. The two scales, were adjusted to sit together, and when one was on, the other got in the way.  
The model design needs further development. If this is to be a successful design, if the design is developed further, the rest of the scale discrepancy of the tape measure, in readiness for testing, will be sorted.

Tap the blue button for the next slide / page.



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# FOCUSED QUESTIONNAIRES

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Questionnaires are a very useful research 'tool'. If the right questions are asked, the findings can help to 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.

**Tap the image** for a more detailed explanation.

## ANALYTICAL RESEARCH OF POTENTIAL CUSTOMERS

## QUESTIONNAIRE

The information I gain from my questionnaire will help me design my writing rest.

### SAMPLE QUESTIONNAIRE

#### QUESTIONNAIRE

1. Would a writing rest be of use to you at home? YES  NO
2. Would a writing rest be of use to you at work? YES  NO
3. Which one of the writing rests shown below has the most features / functions that you require?

A



B



C



D



4. With reference to your selected product from question 3, describe the features / functions you find the most interesting?

Link to Amazon UK Internet:

If you use LED light that can be dimmed directly when the user needs it.

Do not have a writing rest that is a solution to solve from.

This will be a good fit a person that it does not sell only.

5. What would you be prepared to pay for a quality writing rest? Select one from the range below. Use your choice.

£5 - £10



£10 - £15



£15 - £20



£20 - £25



6. What do I want in a pen holder?

REPRESENT



NOT BE LED



DARKENED



POP UP



### REASONING BEHIND THE QUESTIONS

This is a copy of the questionnaire I gave to fifty people. I wanted to find out specific information:

Questions 1 and 2 will help determine if my product is likely to be used at home and work.

Questions 3 and 4 identifies the most popular features according to potential customers.

Question 5 will provide information about the most popular price range, genuine potential customers are prepared to pay.

Question 6 is about the style of writing rest that customers may want to purchase.

### CONCLUSIONS / SUMMARY OF RESULTS

1. Would a writing rest be of use to you at home? 85%

2. Would a writing rest be of use to you at work? 22%

3. Which one of the writing rests shown below, has the most features / functions that you require?

4. With reference to your selected product from question 3, describe the features / functions you find the most interesting?

Most popular features and functions:

LED Light  
62%

Image / pictures  
9%

Groove for pen  
29%

Tap the blue button for the next slide / page.



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## 2. ANALYTICAL RESEARCH OF POTENTIAL CUSTOMERS - ERGONOMICS

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Ergonomic research - In order to limit the amount of research carried out and to eliminate irrelevant research, there is another approach. The ergonomic research in the example below, is focussed on the client and acquiring only essential anthropometric data.

**Tap the image** for a more detailed explanation.

### 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.

By V. Ryan

PURPOSE	A	B	C
Person A	1000	750	450
Person B	1050	780	480
Person C	1100	810	510
Person D	1150	840	540
Person E	1200	870	570
Person F	1250	900	600
Person G	1300	930	630
Person H	1350	960	660
Person I	1400	990	690
Person J	1450	1020	720
Person K	1500	1050	750
Person L	1550	1080	780
TOTALS			
AVERAGE			



PURPOSE	D	E
Person A	80	180
Person B	85	185
Person C	90	190
Person D	95	195
Person E	100	200
Person F	105	205
Person G	110	210
Person H	115	215
Person I	120	220
Person J	125	225
Person K	130	230
Person L	135	235
TOTALS		
AVERAGE		

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# 3. MATERIALS TESTING

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
Testing the materials you are using or intend to use is vital. When you are making models or simply sketching, you may feel it is the right time to test materials. Alternatively, materials testing on a separate design sheet or two. Below is a sample design sheet, concerned with testing and evaluating a specific design.

Tap the image for a more detailed explanation.


NAME: \_\_\_\_\_ TESTING OF FINAL DEVELOPED IDEA SHEET 2

**MATERIAL TESTING**


**HARDNESS TEST**  
A sample of styrofoam was tested using a piece of homemade equipment. A standard weight vertically using force to deform a sample. The weight was dropped down the tube and the impact damage recorded.



The styrofoam sample had a dent, which the impact took place. No dent formed in the steel. Overall, very little denting took place.



The equivalent size and thickness of a piece of very high impact polystyrene was tested in exactly the same way. The dent recorded from the impact was outdoors and a small piece in the ring of the impact point.




Conclusion: the styrofoam was the most appropriate material to select for the testing of the tape measure. Survival of needles and sharp from needles also was more likely. Therefore this the material properties outlined in my specification.


**COLOUR SELECTION**  
Inference: one finished specification students at the local college. The range of colours or effect. The selection of colours was well received, with blue being the most popular.

When asked if the colour scheme was the most important factor in the operation / function, 50% said that the tape measure operation/function was the priority.


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




**TESTING KEVARS**  
When testing a sample of kevlar with a scissors, I found that it was extremely difficult to cut and often it was over the force of the scissors to break.



**TESTING RUBBER**  
When testing rubber, I cut extremely easily with a scissors. Very little effort was required.




**TAPE EXTENSION TEST**  
The tape was extended using a stage and a weight of 50 grams (added). The tape extended with a was extended by 15mm. A thin hole to shape.




The force gauge agreed that the tape accurate, as most tapes they had used. Lighter tape at a light hour. This fully a specification requirement.

Spec materials is very important as a small tape, that loses its shape, leads to a loss in accuracy and therefore the cost. The specification states in the input of the design being important.

**CONDUCTIVITY TEST**  
I carried out a simple and safety test with a sample of insulating material. This material showed that I did not conduct current at all, making it safe to use in a high voltage situation. Although the use of safety health and safety risk, the specification will prevent an electrical short circuit, which is a potential hazard.



**END GRIP TEST**  
The redesigned and grip worked well when tested. It is out of the body, the end grip remained in position while the tape was being used, or a special measuring tool.



The metallic grip remained stable and held when in use, allowing it to be accurate measurement.

Tap the blue button for the next slide / page.



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## MATERIALS TESTING - LINKS

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Below are links to resources that will help you decide on the types of tests you need to carry out on your designs / initial prototypes.



Tap the blue button for the next slide / page.



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## 4. ENVIRONMENT, ECONOMIC AND SOCIAL ISSUES

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At almost every stage, include your knowledge of the environmental, economic and social needs AND requirements of the manufacturer, potential customer and the Law. How will the ideas you are developing fulfil any environmental, economic and social needs?

**Tap the link buttons** for environmental, economic and social issues.

Mobile App covering  
Economic and Social  
Effects.



Mobile App covering  
major environmental  
issues



Links to website pages  
covering major  
environmental issues



Tap the blue button for the next  
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## **6. CLIENT / TARGET MARKET** **INPUT / FEEDBACK**

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Questionnaires / surveys / customer testing - all will provide valuable knowledge and suggestions for improvements. Consider written feedback, audio recordings, video recordings etc....

SEE PREVIOUS SLIDES REGARDING  
HOW THIS CAN BE ACHIEVED.

Tap the blue button for the next  
slide / page.



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## 7. INITIAL EVALUATION / CONCLUSIONS

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Write an evaluation / summary of what you have found and what you think you need to do, to make progress with **ONE** selected idea / design. You should also evaluate your ideas as they take shape.

Select what you and your client consider to be the best idea. Evaluate it – what is good (meets the specification) and what needs to be improved (in order to meet the specification)

**Tap the link button** for information on evaluating an idea



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# CYCLE FOUR - FROM SELECTED IDEA TO EVALUATION AND MODIFICATIONS

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**Cycle Four** is outlined below. The following slides will take you through each stage / aspect.

**Tap the image** for a more detailed explanation.

 = EXPLORE     = CREATE     = EVALUATE

1. ONE IDEA TO BE FULLY DEVELOPED.



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# 1. ONE IDEA TO BE FULLY DEVELOPED.

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Develop one final idea, through model making, CAD, Feedback, Sketching, etc.....

This example design / development sheet below, shows the final design from conception to developed final idea. Again a combination of sketches, colour rendered drawings and models have been used. Detailed notes are included on each of the design sheets. A number of development sheets will be needed.

Tap the image for a detail.

**NAME:** \_\_\_\_\_ **PRODUCT DEVELOPMENT** **SHEET 7**

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

**PUSHER GRIP**

**CONTROL MECHANISM**

The smooth stroke of the tape measure is the average final efficiency. The design has been designed with ergonomics in mind, allowing the whole weight of the tension release button.

The simple colour scheme is typical of high visibility products. This design will be manufactured for the entire range of pressure gauges, in a variety of sizes.

**STYROFOAM MODEL**

The finished model (left) shows how the tape of the system can be manufactured easily and safely being easily retracted for the conventional way in which the tape is secured to the casing. Manufacture of the model is a very simple process. Some other materials which are prone to wear and tear. A thermoplastic which is suitable for use in a variety of sizes. Both of these could be replaced by using a more durable material. This will be done and will be done before the final model is produced.

**TESTING OF EXISTING SIMILAR TOOL MEASURES**

When testing the tool on the tape, it was found that it was virtually impossible to break the one-way lock. The reason for this is because the rubber is a highly elastic material and will stretch with use. It will not be damaged by the pressure applied. When testing, the tape was found to be a very good material. It was found that it was a very good material. It was found that it was a very good material. It was found that it was a very good material.

**POTENTIAL WEAK POINT**

The main weak point is the rubber strap. This is a very weak point. It is a very weak point. It is a very weak point. It is a very weak point. It is a very weak point.

The colour scheme incorporated the use of fluorescent materials. These materials have the potential to be used in a variety of sizes and colours. This means that the tape could be used in a variety of sizes and colours.

The device includes both a pusher and a button. The pusher is used to extend the tape and the button is used to retract it. The pusher is used to extend the tape and the button is used to retract it.

The scale includes both metric and imperial. The imperial scale is a standard 1500mm (150cm) scale. Potential customers could choose between imperial units or a combination scale.

**PLAN VIEW OF DEVELOPED TINY MEASURE**

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## 2. FINAL DRAWINGS

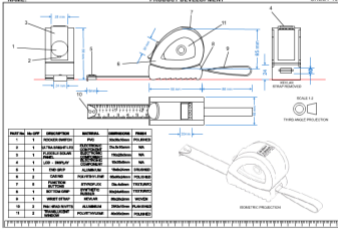
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Produce the necessary working drawings to manufacture the product, including parts lists.

The working drawing is a detailed sheet that shows the product as a series of accurate views, drawn to scale. The front, side and plan views are normally drawn. In addition, a 3D isometric drawing is included, to give extra detail.

Tap the image for a more detailed explanation.

NAME: \_\_\_\_\_ PRODUCT DEVELOPMENT SHEET 10



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# THE MANUFACTURING SPECIFICATION

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Before manufacturing your prototype, you may need to produce a Manufacturing Specification (check with your teacher). This sheet explains the scale of manufacture and manufacturing systems, the final product description, quality assurance / control and assembly details

Tap the image for a more detailed explanation.

## MY MANUFACTURING SPECIFICATION

### SCALE OF PRODUCTION AND THE MANUFACTURE OF MY PRODUCT

Choose one of the industrial scales of manufacturing listed below. It explains 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 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, if it is designed to be disassembled easily for reworking at the end of its useful life.

### STANDARD COMPONENTS TO BE USED DURING MANUFACTURING



PVA Glue



CSK screws



Panel pins



Pin hinges



Two Speaker Grilles



Left and Right Speakers

### PRODUCT DESCRIPTION

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

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

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

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

### FINAL IDEA



### 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.

### 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 final system.

Tap the blue button for the next slide / page.



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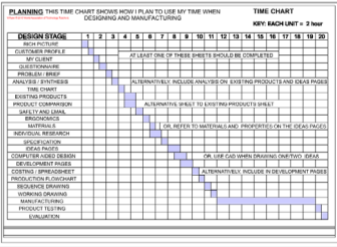


# PRODUCTION PLANS

V.Ryan © www.technologystudent.com 2019

**THE TIME CHART:** this has all the stages of **manufacture** down the left hand side and the time allocated to each stage represented by shaded areas. The shaded areas usually represent hours. **REMEMBER TO KEEP TO THE STAGES OF MANUFACTURING!!! FOR YOUR NEA**

Tap the image for a more detailed explanation.



Tap the blue button for the next slide / page.



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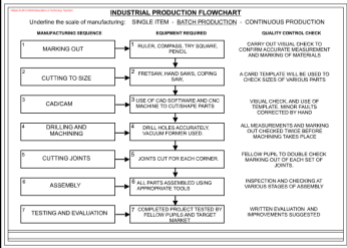


# PRODUCTION PLANS

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**PLANNING - USING A FLOWCHART:** A flowchart is an excellent way of planning a project. Each stage of the project is set out as a sequence of events. **REMEMBER TO KEEP TO THE STAGES OF MANUFACTURING!!! FOR YOUR NEA**

Tap the image for a more detailed explanation.



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### 3. FINAL PROTOTYPE MANUFACTURED

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Keep a photographic record of every stage of manufacture. Describe each stage of manufacture and consider how each stage can be made more efficient.

**Tap on the link buttons** below, for general guidance on producing a log book of manufacture. (ask your teacher if this is required by your examination Board



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## 4. FULL TESTING BY FOCUS GROUP AND CLIENT

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The final product should be fully tested by the client / focus group / potential customers and your self. Keep a record of all testing and suggestions.

**Tap the image** for a more detailed explanation and samples.

TESTING AND EVALUATE –  
WHY?



SAMPLE TESTING AND  
EVALUATION SHEET 1



SAMPLE TESTING AND  
EVALUATION SHEET 2



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slide / page.



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## **5. FINAL EVALUATION AGAINST SPECIFICATION**

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In addition, you may want to produce an evaluation sheet that evaluates your final prototype against each of your specification points

## **6. FINAL IMPROVEMENTS AND MODIFICATIONS**

What future modifications have been suggested by the potential customers, focus group / client? What modifications do you think you could make to the next prototype

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## TWO PIECE ROTATING ITERATIVE DISK

(an Aid to the Iterative Process)

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Composed of two disks, allowing rotation between each of the iterative cycles. An aid to pupils in deciding on the next stage. Pupils simply rotate the top disk (CLOCKWISE OR ANTICLOCKWISE), to help them decide on the next stage / design tool, according to their individual NEA projects.

**Tap the image** for more information including a printing pdf of the disks



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