

Here's what you need to know...

about the analysis and evaluation of existing products.

See *Design & Make It! Resistant Materials Technology* Revised pages 30–31, 76–77 and 112–115 (22–23, 68–69 and 104–107 earlier edition).

KEYWORDS

Do you know what the following terms mean?

- Product analysis
- Product evaluation
- Design principles
- Critical judgements

WWW.

Go to:
www.howstuffworks.com/
www.baddesigns.com/canopen.html



The Analysis and Evaluation of Existing Products

Designers study existing products to learn more about how they were designed and made, and to see if they can find ways of improving them. This is known as product analysis and product evaluation.

Product analysis involves studying and describing an object under different headings, such as its size, material or colour, or its different components.

Product evaluation involves testing a product in terms of its effectiveness, e.g. how well it performs, where it might be improved, its strengths and weaknesses, etc. This is known as performance testing.

Design Principles

When analysing and evaluating a product, designers study a range of design principles. These include its:

- form – its three dimensional shape.
- function – what it is supposed to do.
- materials – what it is made from and how it is manufactured.
- component parts – the different parts it is made up from.
- colour and texture – what it looks and feels like.
- decoration – added pattern or other parts that are not essential to its working.
- aesthetic appeal – the things that make it pleasing to look at, own and use.
- ergonomic and anthropometric data – its size and method of operation in relation to the capabilities of its intended users.



Finding Out How Well Products Work

To evaluate how well products work designers devise a number of performance tests. For example:

- how much dust will a vacuum cleaner pick up?
- how easy is it to program a video recorder?
- how durable is a child's toy?
- how comfortable is a chair to sit on for a long time?

Some of these tests are a matter of fact, for example, the weight of dust collected, the number of hours a battery lasts, etc. Others are a matter of opinion, for example, the look of a piece of jewellery or the appeal of an item of furniture.

Making Critical Judgements

When all the information about a product has been gathered together a final judgement can be made. Being critical is not just about saying what is wrong with something. There may be good and bad points about a design – it may work well in one respect, but badly in another.

If several designs of a similar product are being evaluated (e.g. a range of torches) it might be possible to compare them and reach a conclusion about which is the most successful overall for a particular application. However, the main purpose of the exercise is to give the designer ideas for other new or improved products.



Written Question

Spend about 4 minutes answering the following question. You will need some paper and something to write with.

You have been asked to analyse and evaluate the design and manufacture of a child's pushchair.

Suggest and outline two performance tests you could carry out to learn more about its stability and portability.

(4 marks)



Here's what you need to know...

about the analysis of aesthetic and functional design requirements.

See *Design & Make It! Resistant Materials Technology* Revised pages 30, 50–51 and 114–117 (22, 42–43 and 106–109 earlier edition).

KEYWORDS

Do you know what the following terms mean?

- Aesthetics
- Function

WWW.

Go to:
www.dyson.co.uk/tech/dysoncyclone/default.asp
www.designcouncil.org/betterbydesign

Aesthetics and Function

What are Aesthetics?

Aesthetics are all about how people respond to things through their senses. What we see, hear, taste, touch and smell can be pleasant or distressing experiences. We also respond to harmony and contrast.

Different people like and dislike different shapes, colours, patterns, harmonies and contrasts, etc. This is called personal taste. Because of this, different product designs are needed to satisfy the tastes of a range of people.

Our preferences for different aesthetic experiences are partly determined by our lifestyle – the particular things we choose to do, where we do them and the products we use. While one person might look for aggressive, angular and brightly coloured shapes and forms that suggest danger and adventure, another person might be more interested in softer, smoother, more subtle shades that suggest comfort and security.

It is important for designers to take potential users' aesthetic preferences into account when developing a new product.

What is Function?

The function of a product means the things it is intended to do. A cup is made to hold liquid. A watch needs to tell the time accurately, and be small and light enough to wear on your wrist.

Many objects have more than one function. For example, cups can also be used to measure ingredients. Other cups are used as trophies or as souvenirs, so aesthetic appeal can be a very important part of an object's function.

Designers need to create products that will perform a wide range of functions for different users.



Written Question

Spend about 7 minutes answering the following question. You will need some paper and something to write with.

- i) Explain what is meant by the term 'aesthetics'. (2 marks)
- ii) Study this photo of a plastic watering can. Identify three functional requirements relating to how well it carries water and two requirements concerning its aesthetics. (5 marks)



Here's what you need to know...

about analysing the work of past and present designers.

See *Design & Make It! Resistant Materials Technology*

Revised pages 6–9, 30–31, 46–49, 76–77, 112–115 and 117 (22–23, 38–41, 68–69, 104–107 and 109, earlier edition).

KEYWORDS

Do you know what the following term means?

- Reproduction

WWW.

Go to:
www.designmuseum.org/
www.vam.ac.uk

Products and Designers from the Past and Present

Learning From the Past

As well as looking at recent or current products, designers look back at things created in different times and for different cultures. Studying what these products were used for, how they worked and how they were made, gives insights into people's lifestyles in the past and the design solutions that were available at the time. Sometimes these can give insights into ways of solving similar problems today.

Living in the Past

Many of today's designs deliberately take on the appearance of products from the past. Many people like to live and work in surroundings that remind them of products and interiors that were fashionable decades, or even centuries, ago. Indeed, some designs even echo the world of the ancient Egyptians, Greeks or Romans. People are often willing to pay extra to own things that make them think of past times.

For example, this piece of modern furniture shown on the right looks like something that might have been made in the 18th century. In those days it would have been hand-made using high-quality materials, so could only have been afforded by the wealthy. Today's reproductions are machine-made in quantity, sometimes using composite and synthetic materials.



This table lamp is also modern. It has been designed and made to look like a style of lamp produced by an American company called *Tiffany* at the turn of the 20th century, soon after the introduction of electric lighting. It is very decorative and uses organic shapes and motifs based on plants and animals. Designers like Rennie Mackintosh and Antonio Gaudi used these types of flowing styles in some of their work. This style of work is called Art Nouveau.

The radio on the far left was originally mass-produced in the 1930s using one of the first plastics widely available. Its shapes, forms and colours are very warm and friendly, and many people prefer this to the more angular black and silver 'boxes' that modern electronic products often come in.



Written Question

Spend about 12 minutes answering the following question. You will need some plain paper and something to write and draw with.

- Identify a product that was either designed and made in a previous time, or is modern, but based on designs from a previous time. It might be something you have at home or have seen in a book or magazine. Produce a 2D or 3D coloured sketch of it. If necessary add notes to help describe it. *(8 marks)*
- State from what past period you think it has been influenced by, and explain what colours, forms, etc., identify it as coming from that particular era. *(4 marks)*

From Past to Present

Other products we use today are not direct copies of products from the past, but are freely influenced by them. Sometimes they mix shapes, colours and materials from products from a number of different eras and create new forms that could only be produced today.

For example, this modern salt and pepper set uses colours and patterns taken from the 1920s, which in turn were influenced by ancient Egyptian designs. They have now been applied to forms that could only be produced in quantity using today's production technologies.



Here's what you need to know...

about using freehand drawings to sketch products in 2D and 3D.

See *Design & Make It! Resistant Materials Technology*

Revised pages 19, 94–7 (86–9 earlier edition)

KEYWORDS

Do you know what the following terms mean?

- Annotation
- Plan
- Elevations
- Orthographic projection
- Two-dimensional (2D)
- Three-dimensional (3D)
- Isometric drawing
- Perspective
- Crating
- Scale

WWW.

Go to:

www.bentley.com
(go to the Gallery)
www.adobe.com
www.cadopia.com/

Using Sketches

Designers often use sketches, both to draw existing products and to develop ideas for new ones. These sketches can then be shown to, and discussed, with other members of the design team.



Sometimes they find it difficult to keep up – their thoughts flow quicker than they can sketch. There certainly isn't time to use rulers, technical drawing aids or a computer!

Adding Labels

Another way to speed up the process of recording a product on paper is to use annotations, or 'labels', alongside a sketch. For example, it might be quicker to label part of a product sketch with the words 'dark green', than it is to find the right shade of pencil or felt-pen to colour it in. As well as words, numbers can be added to indicate quantities, sizes, etc.

2D Freehand Drawing Techniques

Designers use a variety of methods to show the product they are sketching. They might sketch a plan or an elevation, or both together (i.e. a rough orthographic projection). These are 2D freehand drawing techniques.

3D Freehand Drawing Techniques

Alternatively, designers might use 3D freehand drawing techniques, using simple isometric or perspective projections. These are more difficult, so they use the method of 'crating'. This involves sketching a rectangular box and fitting the product being sketched inside it. Curved shapes and forms can be contained in a 'crate'. Another approach is to use a wire-frame model.

Specially printed grid-paper can be used as an underlay to make construction of 3D sketches easier.

Other Freehand Drawing Techniques

Remember, it is not always necessary to sketch the whole product each time. Designers often focus on one part of the product and just sketch that. They may sketch the part much larger than it will be in reality, i.e. change its scale. Other techniques they use include 'cut-away' sketches and 'exploded' sketches.

Written Question

Answer the following question on plain paper.
Do not spend more than 20 minutes drawing your answer.

You have been asked to sketch some initial design ideas for a new torch. It is to be used as a 'prop' in a science fiction film set in the near future.

Produce at least two annotated sketches that show the development of one idea. Include at least two of the following techniques:

- an orthographic freehand drawing (2D plan and elevations).
- a 3D freehand drawing (isometric or perspective).
- a freehand drawing showing a detail.
- a cut-away or exploded freehand drawing.

As you sketch your ideas you should include notes about:

- how the torch will be held.
- how it will be switched on and off.
- what shape and size of bulb will be used.
- how the source of power can be replenished.
- the materials that might be used, and how it might be made.

Note that marks will be awarded primarily for the appropriate use and quality of your sketching and the techniques you use rather than for the product you design. (20 marks)



Here's what you need to know...

about design specifications.

See *Design & Make It! Resistant Materials Technology* Revised pages 9 and 16–17 (10–11 earlier edition).

KEYWORDS

Do you know what the following term means?
 ● Design specification

Design Specification

The design specification is a list of requirements or criteria for the final product. If these requirements are not clearly expressed, understood and agreed by everyone involved from the start, then the final product is unlikely to be successful. The last thing anyone wants is something that is expensive to make, that no one wants and that doesn't work as intended.



The design specification has a big influence on the design of products. This list of requirements for a product helps ensure that the client, manufacturer and user all get the product they want, i.e. one that is profitable, saleable, easy to make and works well in use.

Requirements

The design specification will cover a wide range of requirements, from things like size, weight, appearance and function to durability, safety and environmental standards. The specification states what aspects of the design are fixed (e.g. 'must be 30mm wide'), and where there is room for the designer to make decisions within acceptable limits (e.g. 'must be between 400 and 500gm in weight').

The client will want to be sure that the specification covers necessary requirements to make sure that the product will be desirable to the particular target consumer group, and can be sold at a cost that will be profitable over a certain time-scale or production run.

The manufacturer will want to be sure that, as far as possible, the materials required are ones that are readily available, and that they can be worked using existing equipment without the need for further training.

The client, manufacturer and designer will all want to be sure that the product is suitable for the potential customer, and works in the way it is intended to.

Checking Design Proposals

During the product development process the designer will come up with many ideas and proposals. These need to be regularly tested and checked against the design specification to ensure they meet the requirements of the client, manufacturer and user. If for any reason they don't, they need to be redeveloped until they do meet the specification.

The final quality of a product is largely dependent on the quality of the original design specification that was produced.

Design Specification
 The mug should be an unusual shape and appeal to children



Written Question

Spend about 55 minutes answering the following question. You will need some plain paper and something to write and draw with.



a) The design team for a new clock are preparing a draft design specification checklist for a meeting with the client and manufacturer.

The following have already been decided:

- 1 The clock must appeal to the 8–14 year age group.
- 2 10,000 will be manufactured.
- 3 It must be cheap to produce so it can be sold at a low price.

To achieve this a minimum number of features will be included.

For each of the three statements (1–3) above, explain to what extent it provides the designer with restrictions or opportunities to take decisions about the clock. *(6 marks)*

b) Use the information in the specification above to help you sketch three different design ideas for a clock. Add notes to explain your sketches and provide an evaluation of each idea.

A total of 18 marks will be awarded for:

- three different ideas *(3 x 3 marks)*
- quality of sketching *(3 marks)*
- quality of notes *(3 marks)*
- quality of evaluation *(3 x 1 marks)*

c) Choose one of your ideas from b).

- i) Use notes and sketches to show how the clock would be manufactured. *(15 marks)*
- ii) Use freehand drawing techniques to produce an orthographic sketch of the clock, with dimensions, and a coloured 3D sketch. *(15 marks)*

Here's what you need to know...

about ensuring quality by evaluating product design and manufacture.

See *Design & Make It! Resistant Materials Technology* Revised pages 9 and 20–25 (13–17 earlier edition).

KEYWORDS

Do you know what the following terms mean?

- Quality assurance
- Quality control

WWW.

Go to:
www.designcouncil.org/betterbydesign

Testing and Evaluation

Quality Assurance

Manufacturers and designers need to ensure that the products they design and make are of good quality. The term 'quality assurance' is used to describe all the precautions, procedures and tests undertaken before, during and after production. This is discussed further in Topic 8 Section 4.



Testing It Out

During the development of a new product designers are constantly testing and evaluating their ideas to identify and suggest areas for improvement and refinement. They use a variety of techniques and methods to achieve this.



Models, mock-ups and prototypes of new designs are regularly tested against the requirements of the specification. These tests might be physical, e.g. concerned with size, strength, weight, or more a matter of opinion, e.g. ease of use, colour, texture, etc. Such tests often need to be specially devised according to the product and the information required.

These models, mock-ups and prototypes may be of a different size to the final product, or perhaps made in a different material. Sometimes only parts of the product are modelled in order to test out a specific aspect of the design. ICT is often used a great deal in the collection, analysis and presentation of this information.

It's Not For You

During these tests the design team needs to remember that the product is not for their own personal use. They need to consider the needs and views of the client, manufacturer, retailer and the target user. Will the new product be better and more desirable than others already on the market? During the development phase, surveys and interviews will be undertaken to assess how well a new product compares with others.



Better Make it Better

Methods of production will also need to be tested to find the most effective. Different materials and processes might be quicker, cheaper or more accurate and reliable. This sometimes involves making special tools, jigs and measuring devices.



Written question

Spend about 6 minutes answering the following question. You will need some paper and something to write with.

Study the photograph on the right of a working 3D model of a design for a vacuum cleaner. Suggest three ways in which the working 3D model could be used to test out different aspects of the design. (6 marks)

