R105

LO2: Requirements of a Design Specification
Develop an understanding of the content of a design specification

PRODUCT SPECIFICATION

Learning Objective:

Understand the requirements of design specifications for the development of a new product.

D Demonstrate a detailed knowledge of Design Specifications and how this can help develop a new product.

M Demonstrate a some knowledge of Design Specifications and how this can help develop a new product.

P Demonstrate a limited knowledge of Design Specifications and how this can help develop a new product.

Section A

A designer must make sure products meet the product specification. The product specification should be directly influenced by the analysis of research. This will ensure quality of design and that the end product is fit for purpose.

User Needs refers to all the different areas a design must consider when designing for a particular target market. The customer will have great influence over the way a product is designed and develops. As a product is designed it is normal for potential customers to be questioned about the type of product or design that they prefer. For example, when designing a mobile phone a design team will show potential customers several designs and make changes according to their likes and dislikes.

A specification is a statement that tells the designer exactly what the product has to do and what the design requirements are. A specification should include:

- *product function*
- *overall dimensions*
- *materials*
- *an outline of the appearance of the product*
- *user requirements*
- *details of the source of power (if needed)*
- *anthropometrics and ergonomics*
- *possible production levels*
- *legal requirements*
- *environmental considerations and requirements*

Section B

Product requirements are what a product has to meet/ must do. Common requirements are:

- Function – what a product's purpose/ job is
- Features – what makes a product unique and sellable
- Performance – how well it completes its function
- Target Market – how it appeals to its customers
- Working Environment – how it is suitable for where it will be used
- Constraints – what is must do or must not do
- Aesthetics – what it will look like
- Ergonomics – how its comfortable and safe to use
- Lifecycle – what environmental impact it makes (and how that can be reduced)

Section C

Keywords & Terms

- Function – what a product's job is
- Features – what makes a product unique and sellable
- Performance – how well it completes its function
- Target Market – how it appeals to its customers
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Section D

Aesthetics refers to the shape and form of a product. This may determine the layout of circuits or mechanisms etc.. inside it. Products are often designed to look stylish. The style applied to the outside of a product can quite easily influence the technology inside it. Aesthetics can also alter the production / manufacturing techniques through which it is made.

Anthropometrics is the study of the sizes of people in relation to products. For example, chairs used in schools need to be suitable for the average size of pupils in the schools.

Ergonomics is the relationship between people and the products which they use. Anthropometric data is used to help design products to meet ergonomic needs. Ergonomics also considers the force a person can apply, for example when using a tin opener, or the pedals of a car.

Benefits and Features may look at the number of functions a product has to perform and how these will inevitably affect its design. Exactly what is the product going to do.

MANUFACTURING CONSIDERATIONS

When manufacturing a product, there are several considerations that need to be planned for. There considerations often include:

- Standard Components & Stock Forms
- Supply Chains
- Durability and Maintenance
- Product Safety
- Costs and Budget




Section A

A **standard component** is usually an individual part or component, manufactu thousands or millions, to the same specification. These are often bought in bulk and saves companies money, rather than them trying to make their own. The sizes of standard components are often internationally recognised, making manufacturing easier to communicate. Examples of standard components would be; nuts, bolts, hinges, panel pins and screws, etc

A **stock form** is when a raw material has ben machines/processed into a stock/standard size, shape or form. This can be easily used during manufacturing on a production line. Like standard components, buying in these stock forms is often easier and cheaper that companies trying to create their own and are internationally recognised

Section B

Supply Chains are the process a product goes through, from sourcing the materials to being distributed to the consumer. Examples of stock forms would be; sheet of aluminum, acrylic rod, pine dowel, sheet of MDF, etc. Supply chains are effected by many things, including:

- Smaller/less equipped factories would impact the amount of products you could make
- Availability/ cost of materials
- Amount of warehouse storage/ budget to buy/rent warehouse space
- Size of distribution team would effect how many products and distance of product travel

Section C

Product safety is a key consideration of any designer. Products not being safe can result in a range of consequences, which designers obviously want to avoid! There could be public product recalls, which as well as being expensive to do can cause a poor reputation to customers. There could also be law suits which can result in fines and even criminal charges. Products can be made to be safe, in a variety of ways. Including;

- Consistently passed testing and standards (British and European)
- Non-toxic finishes and materials
- Suitable for the market (age appropriate, etc)
- Error Proofing
- Suitable warnings and instructions

Section D

How **Durable** something is, is how long that product/ material can last. Generally the more durable something is the better! Customers and manufacturers are more likely to buy a durable product than one that isn't going to last. So often designers will make products that are as durable as possible. Products can be made more durable when they are maintained. This can be done by:

- Repairing
- Replacing parts (disassembly)
- Not over-using a product/ using it in correctly
- Storing and caring for a product correctly

However, there is something called **Planned Obsolescence.** This is where products are supposed to "die" after a certain period of time. This can be for loads of different reasons, including; profit, not able to make a product last an extended period, etc. Examples include: light bulbs, disposable cutlery, printer ink, phones, etc

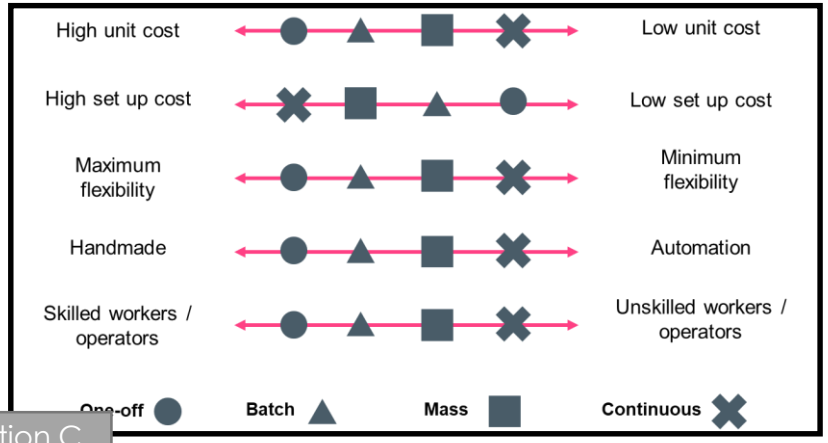
SCALE OF PRODUCTION

The way products are manufactured depends on the quantity required. For example, cars are continually manufactured in hundreds of thousands , a prototype is a 'one off' (just one made) and DIY furniture is made in batches of thousands or hundreds. There are five main types of production and they are described in the table.

Section A

SCALE OF PRODUCTION	SAMPLE PRODUCTS	DESCRIPTION / DETAIL
Just-In Time	automobile manufacturing,, fast food restaurant production, on-demand publishing, etc.	Just in time production means just that. This involves the arrival of parts at just the exact time that they are required in the factory. This means that less storage space is needed at the factory, so saving space at the factory. If the flow of parts is stopped or is late the line will stop and this production technique could then become very costly.
Continuous/Automation	screws, bricks, food products, etc	This is where a product is continuously produced over a period of hours, days, weeks or even years to meet a constant demand. This kind of production means the product will often be quite reasonably priced although the set up cost will be high.
Mass	Car, (The technique was first implemented by US automobile pioneer Henry Ford in 1908, for the manufacture of the Model T Ford)	Mass production involves the product going through many stages of a production line. There are workers and machines at certain stages along the line that are responsible for making certain parts of the product. This means the product is often made over days or even weeks depending how complicated it is. This product is often quite reasonably priced due to the large scale production techniques used. However if a problem occurs it will stop the whole line of production. High set-up costs and low unit costs characterise mass production
Batch	chair, newspapers, books, electrical products, etc.	This is when a series of products which are all identical are made jointly in either large or small numbers. Once these have products have been made once more of the same products may be made using the same equipment. •Patterns, templates or jigs are used to increase efficiency. Production lines are flexible and generally have shorter lead times.
Single item / One off	Prototypes specialist models handmade items specialist engineering one offs, etc.	This is when only one product is made at a particular time. This one off product could be a prototype a one off object or a handmade object. Prototypes are classified as one-off products and 3D printing is often used to manufacture prototypes. Prototypes are made to see if a product works before it goes into large scale production. One off production takes a long time and often means it is expensive.

Section B

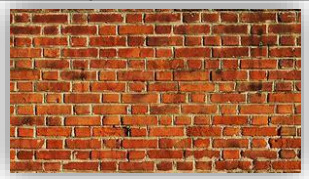


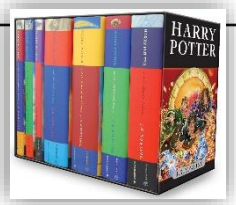
Section C

Jigs and patterns can be made or bought in to expedite a certain process. They can help to perform repetitive or awkward tasks accurately

CNC stands for Computer Numerical Control., these are **CAD/CAM** machines like laser cutters and CNC router. These machines are often used in batch production because they are accurate and efficient but also flexible.

- CAD= Computer Aided Design
- CAM = Computer Aided Manufacture





REGULATIONS AND SAFEGUARDS

Section A

Copyright is similar to a patent but it apples to books, plays, music, software, artwork, architectural drawings, maps and similar works. You don't need to apply for copyright as your work will be protected as soon as you create it. Copyright means that nobody can copy or steal your work, but you could rent/ license it someone for a fee.

Section B

Patents are legal documents that companies apply for to ensure that their deign ideas/ inventions can not be used or stole by another competitor. They are import because a company that spends a lot of time and money developing a new idea will then be able to profit from its sale. Patents only last for a certain length of time, and you can get UK patents, EU and worldwide patents.

Section C

A **Registered Design** protects the external shape of the product. It gives the owner the right to stop anyone copying the external design of their product, within their geographical jurisdiction. In the US similar protection to that offered by registered design rights is referred to as a design patent.

Section D

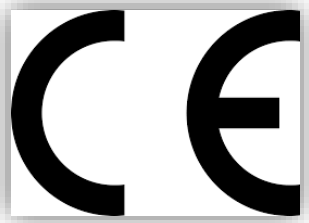
A **Trademark**, is a recognizable sign, design, or expression which identifies products or services of a particular source from those of others, although trademarks used to identify services are usually called service marks.

Section E

British standards are an agreed way of doing something. This could be about making a product, managing a process or delivering a service. They give companies guidelines about how to do things better and safer. Examples of British standards are ISO 9001 Quality Management, ISO 14001 Environmental Management, ISO 45001 Occupational Health and Safety.

It is important for companies to work to British Standards because it makes them safe to work for, and it improves their reputation for quality, sustainability and safety.

Section F



The **CE mark** is a mark that you will find on the back of most products. It means that the product have passed a number of strict safety, electrical and durability tests. If a product has this mark it can be legally sold in EU countries and customers can have trust that they are buying a good quality safe product.

This is important for a product to get because if they don't their product might not be allowed to be sold in certain countries and even if it is, customers may not have enough trust to buy it.