

# TECHNOLOGYSTUDENT

## MOBILE REVISION

### SCALES OF PRODUCTION

This mobile revision pdf is based on detailed work found in the 'Product Design' section.

Tap on the green link button below to go to the complete website section



Tap the blue button to view all scales of production covered by this Revision PDF



# PRODUCTION

Tap on the 'Scale of Production' for information

1. Single Item / One Off / Prototype

2. Batch Production

3. Continuous Production

4. Just in Time

5. Lean Manufacture

6. Computer Integrated Manufacture

7. Remote Manufacturing

8. Flexible Manufacturing System  
(FMS)

9. Globalisation

10. Ergonomic Production  
Lines

# WHAT IS ONE OFF PRODUCTION?

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One off production is the manufacture of a single product/item.

This can include large scale projects, such as a bridge, ship, stadium, multi-storey building or tower, Other examples of one offs are - specialist jewellery, made to measure clothing, bespoke furniture and many more.

Specialist companies manufacturing 'one offs', usually employ skilled staff.

**Tap the image for more information**



TOWER  
STRUCTURE



SPECIALIST  
JEWELLERY



BESPOKE  
CHAIR

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Tap the red button to return to the Contents page



# EXAMPLE - ONE OFF PRODUCT

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This folding lounge chair is a 'one off' product. It has been manufactured by a skilled worker. Specialist tools and equipment have been used.

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This is the only lounge chair of its type, every part has been hand made.



## MORE EXAMPLES

PROTOTYPES

SPECIALIST MODELS

HANDMADE ITEMS

SPECIALIST ENGINEERING

ONE OFFS

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Tap the red button to return to the Contents page



# CHARACTERISTICS OF ONE OFF PRODUCTION

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1. Small specialist companies.
2. A skilled workforce - eg. engineering / cabinet making.
3. Specialist materials often used. eg. specialist modelling materials.
4. High quality products manufactured.
5. Products expensive, due to the level of skill required to manufacture them and cost of specialist materials.
6. A high standard of quality control.
7. Products manufactured for a specialist market / clientele.

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Tap the red button to return to the Contents page



# WHAT IS BATCH PRODUCTION?

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When tens, hundreds or even thousands of the same product, are manufactured on a production line, this is called Batch Production.

Batch production takes place on a production line. A production line is one stage of manufactured followed by another stage. A production line can be made up of several or hundreds of different stages.

Companies tend to order batches of products. Customers usually order one.

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SPECIAL EDITION  
CAR



KNOCKDOWN  
FURNITURE



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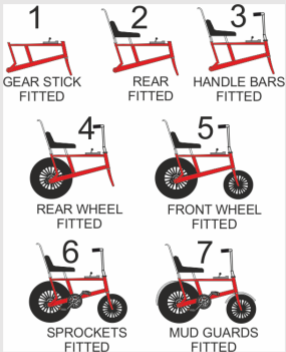
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# BICYCLE - BATCH PRODUCTION

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# CHARACTERISTICS - BATCH PRODUCTION

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Production line is set up.

One task for each stage of manufacture.

Semi skilled or unskilled workers -  
Flexible workforce.

Production line can manufacture  
different products.

Production line runs for a limited time.

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Tap the red button to return to the  
Contents page





# WHAT IS CONTINUOUS PRODUCTION?

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When a product is continuously manufactured, 24 hours a day and 365 days a year, on a production line, this is called Continuous Production.

Continuous production usually takes place on a semi automated production line. It often involves 'shifts' of workers, so that manufacturing is non-stop.

Continuous production ensures that there is a continuous supply of a product with no interruptions or interruptions kept to a minimum..

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NEWSPAPER PULP



CHEMICALS



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Tap the red button to return to the Contents page



# NEWSPAPER PRINT- CONTINUOUS PRODUCTION

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1.



Pine / spruce trees cut down.

3.



Tree trunks transported to pulping mill.

4.



Wood processed into pulp.

STARCH  
+  
AGENTS

5.

Newsprint manufactured in large rolls - for newspapers.



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Tap the red button to return to the Contents page



# CHARACTERISTICS - CONTINUOUS PRODUCTION

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Semi-automated production line.

Skilled and unskilled workers.

Production line runs 24 hours a day,  
365 days a year.

A high level of investment in machinery and equipment.

Quality control at every stage of production.

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Tap the red button to return to the Contents page



# ANOTHER EXAMPLE - CONTINUOUS PRODUCTION

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If a design is to be manufactured by continuous production (sometimes called LINE production) the factory / production line will operate continuously day and night. In this way thousands of the product can be manufactured. All machines are arranged on the factory floor so that the product is passed from machine to machine.

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Tap the red button to return to the Contents page



## WHAT IS JUST IN TIME (JIT) ?

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Just in Time, is a system of organisation used by some manufacturers.

JIT, also called Lean Manufacture, is a system that relies on purchasing just enough materials to manufacture a batch of products, once an order from a customer has been placed. Over ordering or storing materials is not permitted.

JIT aims to eliminate waste and to speed up the supply of products to the customer.

JIT relies on the manufacturing company having a very good business relationship with suppliers and distributors. Delays must not happen.

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for more information



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Tap the red button to return to the Contents page



# JUST IN TIME - AN EXAMPLE

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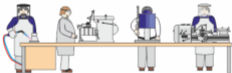


Order for batch of manufactured products arrives. Materials for production line ordered.

Materials arrive within 24 hours.



Materials pass down the production line and the batch is manufactured.



Batch distributed to customer.



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Tap the red button to return to the Contents page



# JUST IN TIME COMPANIES

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TOYOTA



HARLEY DAVIDSON



DELL



APPLE



Tap the red button to return to the  
Contents page



# LEAN MANUFACTURING

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Lean manufacture is often regarded as being pioneered by Japanese companies, such as Toyota in the 1990s. It has also been developed by US companies such as Dell and Xerox. This system or philosophy, is now being used around the world.

Lean Manufacturing is a set of principles, aimed at reducing the cost of manufacture, scaling down or eliminating waste and improving levels of productivity, with the final product continually improving. It involves full commitment by everyone in a company / organisation. It is a system or philosophy that is utilised by manufacturing industry, retail businesses, distribution and a range of other business types.

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information



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page on this production system



Tap the red button to return to the  
Contents page





# LEAN MANUFACTURING

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A combination of different production systems and industrial principles. Including: just in time, continuous improvement, accurate first time manufacture, flexible manufacturing, automation (CIM), quality control and quality assurance. Optimisation of the flow of work, simplifying the company operational structure and reducing waste at every stage, are also core principles.

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Tap the red button to return to the Contents page



# LEAN MANUFACTURING

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## LEAN MANUFACTURING - REVISION DIAGRAM



Tap the red button to return to the Contents page



# COMPUTER INTEGRATED MANUFACTURE (CIM)

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This is the complete automation of a manufacturing facility such as a factory. All functions are under computer control. This starts with computer aided design, followed by computer aided manufacture, followed by automated storage and distribution. One integrated computer system controls all that happens.

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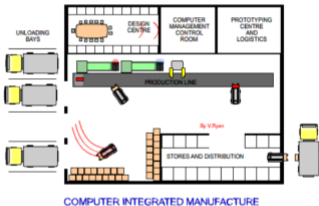


# CIM

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The factory below manufactures DVD / CD Storage units

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Tap the red button to return to the Contents page

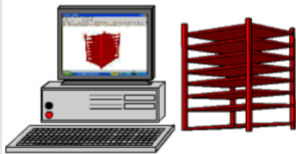


# EXAMPLE OF CIM

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The DVD storage unit is manufactured through Computer Integrated Manufacture. It has been designed using CAD software and first prototyped on a 3D printer. 'Mass' manufacture depends on the use of injection moulding machines, which are constantly monitored by the computer system. Distribution of the finished product is tracked by the system.

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By V.Ryan

Tap the red button to return to the Contents page



# REMOTE MANUFACTURING

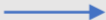
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When designing and manufacturing it is usual to carry out these functions in the same place. For instance, for many decades the car manufacturing industry in the UK designed and manufactured cars on the same site.

Today it is common to have designers in one country sending their designs across the world to another country where manufacturing takes place. This is part of what is known as the global economy.

Often it is cheaper to manufacture products in the Far East, in countries such as China whilst designing in Europe or the USA.

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information**



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# REMOTE MANUFACTURING

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A typical example - The book publishing industry in the UK has seen a shift in its printing (manufacturing) from Europe to Hong Kong or Korea. However, the layout design and content of books remains in the UK.

A book is written by its author in Manchester. It makes sense to write and complete all the layout and planning in the UK. Then all the details and information can be sent electronically to the printing works in Hong Kong. It is cheaper to print in the Far East and then transport the books back to the UK for sale. This called remote manufacturing.

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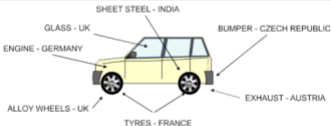
# REMOTE MANUFACTURING

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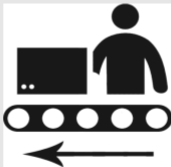


# FLEXIBLE MANUFACTURING SYSTEMS (FMS)

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A Flexible Manufacturing System is one that can be changed or adapted rapidly to manufacture different products or components at different volumes of production. Flexible manufacturing systems are usually seen at their most efficient when manufacturing components rather than finished products.

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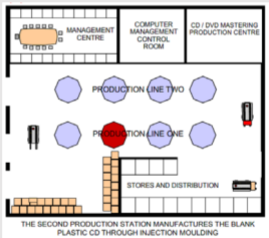


# FLEXIBLE MANUFACTURING SYSTEMS (FMS)

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This CD/DVD manufacturing plant- each production line is automated. Each production line can manufacture different CDs/DVDs and different qualities of each. The factory is flexible,

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Tap the red button to return to the Contents page



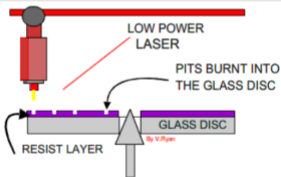
# DETAILED EXAMPLE OF FLEXIBLE MANUFACTURING

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Music is transferred on to a MASTER CD which will eventually be used to manufacture thousands of CDs. This is an example of flexible manufacture, because the production line must be capable of quickly switching to another 'group' or 'artist' and be able to switch between low volume and high volume production

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# WHAT IS GLOBALISATION?

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Globalisation can be summed up by the term 'world trade'. People are now familiar with products that are made by countries, other than their own. Without globalisation, this would not have been possible. Globalisation means that there is free movement of products, services and capital, across the borders of the world, helping the world economy to grow. The worlds modern transport infrastructure, now means that the flow of labour around the world, especially skilled labour is relatively quick

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# GLOBALISATION, DESIGN AND MANUFACTURING

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Another feature of globalisation is the internationalisation of design, manufacturing and the market place. In simple terms, a product may be designed in one country, with the manufacture of its component parts and final assembly taking place in a number of countries, across the world. The market place for the product may also be international.

**Tap the image** for more information

## CAR MANUFACTURE

**ENGINE  
MANUFACTURED  
IN**

**TYRES  
MANUFACTURED IN  
FRANCE**

**ALLOY WHEELS  
MANUFACTURED  
IN RUMANIA**

**SUSPENSION  
SYSTEM  
MANUFACTURED IN**

**GLASS MANUFACTURED IN  
GERMANY**

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Tap the red button to return to the Contents page



# GLOBALISATION, DESIGN AND MANUFACTURING

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## **Advantages of globalisation:**

Cheaper products.

Increased availability and variety of products.

Cultural diversity, as people move around the world following employment.

Flow of technical skills from one region of the world to another, filling skill gaps.

Increased trade and corresponding economic success.

## **Disadvantages of globalisation:**

Increased pollution and environmental damage, as the world makes economic progress.

Some companies move their manufacturing to countries where labour is cheap. Working conditions and Health and Safety decline as a result.

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# EXAMPLE OF GLOBALISATION

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A directors of a venture capital company based in the UK, decide to initiate design work on a new product, a flexible mobile phone. The phone will be sold in several countries. It is designed in Italy, prototyped in Germany, Manufactured in China and transported around the world for sales in shops and online retailers

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# ERGONOMIC PRODUCTION LINES

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An Ergonomic Production Line, is designed around the workers. A poorly designed workstation can lead to injuries and inefficient working practices, which are costly to the company. This is why leading manufacturers, continue to incorporate ergonomics, in the design of their production lines.

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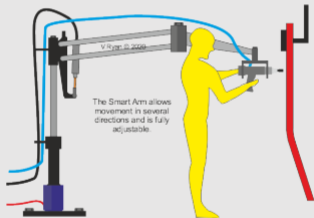


# ERGONOMIC PRODUCTION LINES

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Motorised Smart Arms, are an example of a specialised ergonomically designed piece of equipment for a production line. It allows the worker to fit a van door to a vehicle frame without much physical effort, allowing the operator to focus entirely on his / her work. This helps avoid strain to the back, shoulder and arms.

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Tap the red button to return to the Contents page

