

# Core Technical Principles New and emerging technologies

## A: Automation

Repetitive tasks in mechanised assembly lines are now frequently carried out by robots, meaning people no longer need to carry out monotonous and tedious tasks. Automated systems produce products of a consistent high quality at a low product cost because of the numbers of products they can produce quickly. However, they are very expensive to set up, they require a specialist workforce and if the system breaks down it can be very expensive to repair. The modern automated manufacturing workplace is designed and organised to make sure people get the products they want, in the correct numbers and when they want them.

## B: Robotics

Robot arms are now extensively used in many industries. They can do many jobs on the production line by being provided with different tools. The tasks that they can perform include welding, spray painting, assembly tasks, pick-and-place tasks, packaging and labelling, as well as product inspection. They perform tasks with high speed and precision that make the initial high costs worthwhile for many industries.



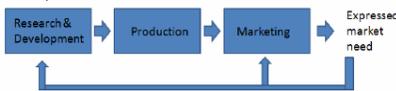
## C: Technology push

This is where new technology or materials are developed and designers take this as an opportunity to design new products. The Apple iPad is an example of product development through technology push. What is often noticeable about products developed through technology push is that consumers didn't know they wanted a product until after it has been launched.



## D: Market pull

This is where users want a product to be improved or redeveloped to meet their needs. Market research is carried out and analysed in detail to identify what needs exist and how existing products can be improved or reinvented to meet those needs. The car industry has seen the redevelopment and re-launch of some iconic models from the 1950s and 1960s, such as the Volkswagen Beetle, the BMCs Mini and the Fiat 500.



## E: CAD and CAM

Computer Aided Design (CAD) allows designers to draw, design and model on screen and, if linked to a compatible machine, allows Computer Aided Manufacture (CAM). CAD allows products to be designed in one location and made at a factory in another location or another part of the world. CAM allows faster production and economical use of raw materials.



Opportunities to make parts for all sorts of equipment have been created by the development of 3D printing. Small-scale car production is now being developed where all the exterior body parts are 3D printed and assembled.

## F: Flexible Manufacturing Systems (FMS)

A flexible manufacturing system is a system where production is organised into cells of machines performing different tasks. A range of **computer numerically controlled (CNC)** machines are put in each cell, such as a CNC miller and a CNC lathe. The parts that are manufactured in a cell are generally handled by a material handling system that could be a robot arm.

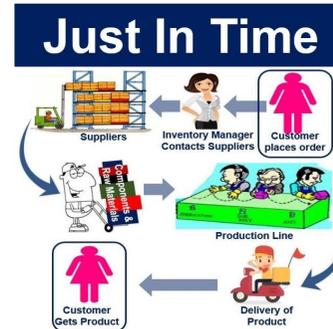
Advantages of flexible manufacturing systems are:

- high flexibility
- they can produce different products simultaneously
- they can be set up to produce new products quickly, saving time and effort

## G: Just in Time (JIT)

Just in time production is a method of organising a factory so that materials and components are ordered to arrive at the product assembly plant just in time for production. Many companies operate JIT systems, such as Nissan, Toyota and Dell. It helps to create **lean manufacturing**, which means it focuses on giving customers value for money by reducing waste. The advantages of JIT production and lean manufacturing are:

- a reduced need to keep large stockpiles of components and materials
- less space needed to keep stocks of components and materials
- smaller numbers of finished products to be stored and put into stock
- less waste



## H: Key words

- Automation: the use of control systems for operating equipment such as machinery and processes in factories; this reduces human input
- Technology push: when new technology or materials are developed and designers take this as an opportunity to design new products
- Market pull: when users want a product to be improved or redeveloped to meet their needs

## Revision Checklist

I understand the impact of new and emerging technologies on the design and organisation of the workplace

I understand the role of robotics in manufacturing

I understand the difference between technology push and market pull

I understand the advantages of flexible manufacturing systems

I understand the advantages of just in time production

## Test yourself

1. Explain why robots are used in many modern industries.
2. Give **two** examples of products developed as a result of technology push.
3. Explain the advantages and disadvantages of just in time and lean manufacturing systems.