The impact of ICT on manufacturing
Exam expectations

You are expected to know about how ICT is used to aid manufacturing both in school and in industry so always expect questions in exam to relate to this topic.
CAD/CAM - benefits

- Repeatability
- Easier data storage and retrieval
- Quick changes/set-ups
- Reduce labour costs
- Flexibility
- Full automation capability
CAD/CAM - drawbacks

- Security of data
- Risk of data corruption
- Initial investment – plant and training

- Don’t refer to job losses
Computer Aided Manufacture

- Printers
- Knife cutters
- Milling/engraving machines
- Routers
- Lathes
- Laser-cutters
- Embroidery machines
- Rapid prototyping
Digital printers

- Used for one-offs/prototypes
- Small print runs
- Direct onto fabrics/carpets
- Large areas
- Transfer printing
- Sublimation printing
Vinyl cutters

- Signs (especially vehicles)
- Graphics on prototypes
- Iron-on vinyl (T-shirts)
- Masks for stencilling/sandblasting
- Labels for prototypes
- Card nets for prototypes
- Decoration on ceramics
Knife cutting and creasing

- Used for small scale production of cartons
- Samples and small batch production
Milling/engraving machines

- Cutting flat (2D) shapes in rigid materials
- Engraving copper board for electronics
- Signage name plaques etc.
- Raised forms (3D)
Routers

- Used mainly on timber (MDF) and rigid foams
- 3 axis – partial 3D
- 4 axis – turns material to get full 3D
- 5 axis – full 3D, much better detail
Lathes

- Work revolves against cutter
- Cylindrical
- Conical
- Spherical
Laser cutters

- Very accurate cutting for sheet materials
- Engraving
- Small scale machines found in schools
Plasma cutting

- Used for cutting sheet metal
- Not found in schools
Water jet cutting

- Fine cutting of metal sheet
- Again, not found in schools
Embroidery Machines

Detailed designs on fabric
- Text & graphics
- Repeat patterns
Rapid Prototyping

Prototype built up layer by layer –
Stereo lithography
- 3D printing
- 3D layering
Impact of ICT on manufacturing

Further than CAD/CAM

- Electronic Data Interchange (EDI)
- Electronic Product Definition (EPD)
- Product Data Management (PDM)
Electronic Data Interchange

Sales Information Network

Retail Outlet
- Value Proposal
- Order placement
- Sales Data
- Inventory Data

Value Planner
- “Office Revolution”
- HSN

Manufacturer
- EDI Migration in Progress
- Order Placement
- Market Information
- Product Information
- Manufacturing Information
- Billing/Payment Data

Consumer
- Web
- Undelivered Rate Under 0.001%
- Order Placement and Shipping 365 Days a Year

HCC
- Order Management System
- Database Management

Marketing System
- Sales Data Processing
- Demand Forecasting Support
- Retail Support

CAPS
- Shipping Orders
- Finance/Accouting

Logistics Center East
- Inventory Data
- Sales Results Data

Web
Electronic Product Definition

- Product and process data stored electronically on one database
- Total Product Modelling (TPM)
- Virtual Product Development (VPD)
- Virtual Manufacturing
Electronic Product Definition

Release mechanisms:

- Who sees information?
- When is it available?
- What form is the information in?
Product Data Management

Gerber Garment Technology Inc.

- Up to date information for both manufacturers and retailers
- Instant changes to all concerned parties
- World wide potential
- Quality monitoring via remote cameras
Product Data Management

Allows manufacturers to:

• Start with an illustration and build product information around it
• Customise specification sheets to suit their manufacturing needs
• Use digital camera to show construction details
• Manage concurrent design, development, merchandising and production
Product Data Management

Allows manufacturers to:

• Communicate manufacturing data next door or world wide
• Record and monitor all costs
• Monitor quality assurance
• Reduce product time-to-market
• Successfully use quick response manufacturing techniques
Product Data Management

Allows manufacturers to:

• Respond to five or more new “seasons” in a year
• Right product at the right time
Remote manufacturing

• Very common especially in the printing industry
• Maximises savings by manufacturing abroad
Advantages include:
• Time saved travelling
• Costs
• Face to face
• Observe facial/body language
• Several locations can be linked together

Disadvantages include:
• Time differences
Just in Time

- Shared information systems
- Reduced lead times
- Less finance tied up in stock
Automation

• Numerous interlinked sub-systems centrally controlled
• Use of robots for repetitive/dangerous tasks
• Monitoring/measuring
• Logistics
Flexible Manufacturing

• Benefits of one-off production at mass production prices
• Only possible with ICT
Computerised measuring

• Very complex measuring tasks can be undertaken at various stages of manufacturing
Compression testing

- Ensuring the structures can withstand pushing forces
• Ensuring structures can withstand pulling forces
Simulated destruction testing

• Software can simulate how structures will perform under impact loads
• This is a cheaper option than destructive testing
Product testing

• Extensive testing can be undertaken in controlled conditions
Stress analysis

- Components can be tested at many stages of the design and manufacturing stages
Simulated fatigue testing

- Saves time and costs as components can be tested before manufacture
- Uses finite element analysis software
Accelerated wear testing

• Wear testing can be performed with materials and finished products
Logistics

- As well as design and manufacturing applications, the whole supply chain needs to be carefully planned and managed.
Supply chain management

• Ensuring that materials are at the point of processing, products and components are made on schedule and delivered to the customer on time is essential for efficient manufacturing

ICT makes a major contribution to this