

CAD/CAM

CAD/CAM: [Computer-Aided Design And Computer Aided Manufacturing]

It is the technology concerned with the use of digital computers to perform certain functions in design and production.

Computer Aided Design [CAD]

It is the use of computer systems to assist in the creation, modification, analysis, or optimization of a design.

The computer systems consist of

- **Hardware:** includes the computer, one or more graphics display terminals, keyboards, and other peripheral equipment
- **Software:** consists of the computer programs to implement computer graphics on the system plus application programs to facilitate the engineering functions of the user company.

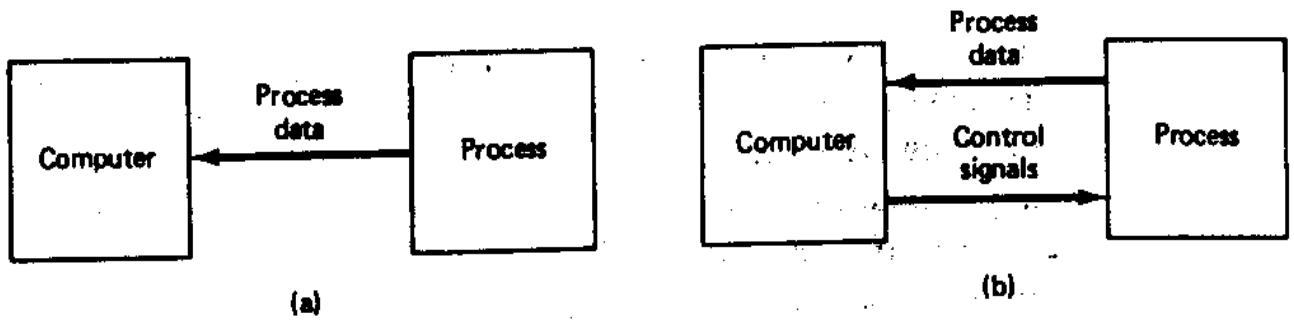
Examples:

stress-strain analysis of components
dynamic response of mechanisms,
heat-transfer calculations
numerical control part programming.

Computer-Aided Manufacturing [CAM]: it the use of computer systems to plan, manage, and control the operations of a manufacturing plant through either direct or indirect computer interface with the plant's production resources

1. Computer Monitoring And Control: These are the direct applications in which the computer is connected directly to the manufacturing process for the purpose of monitoring or controlling the process.

2. Manufacturing Support Applications: These are the indirect applications in which the computer is used in support of the production operations in the plant, but there is no direct interface between the computer and the manufacturing process.



(a) computer monitoring (b) computer control.

With computer monitoring the flow of data between the process and the computer is in one direction only, from the process to the computer.

In control, the computer interface allows for a two-way flow of data. Signals are transmitted from the process to the computer, just as in the case of computer monitoring.







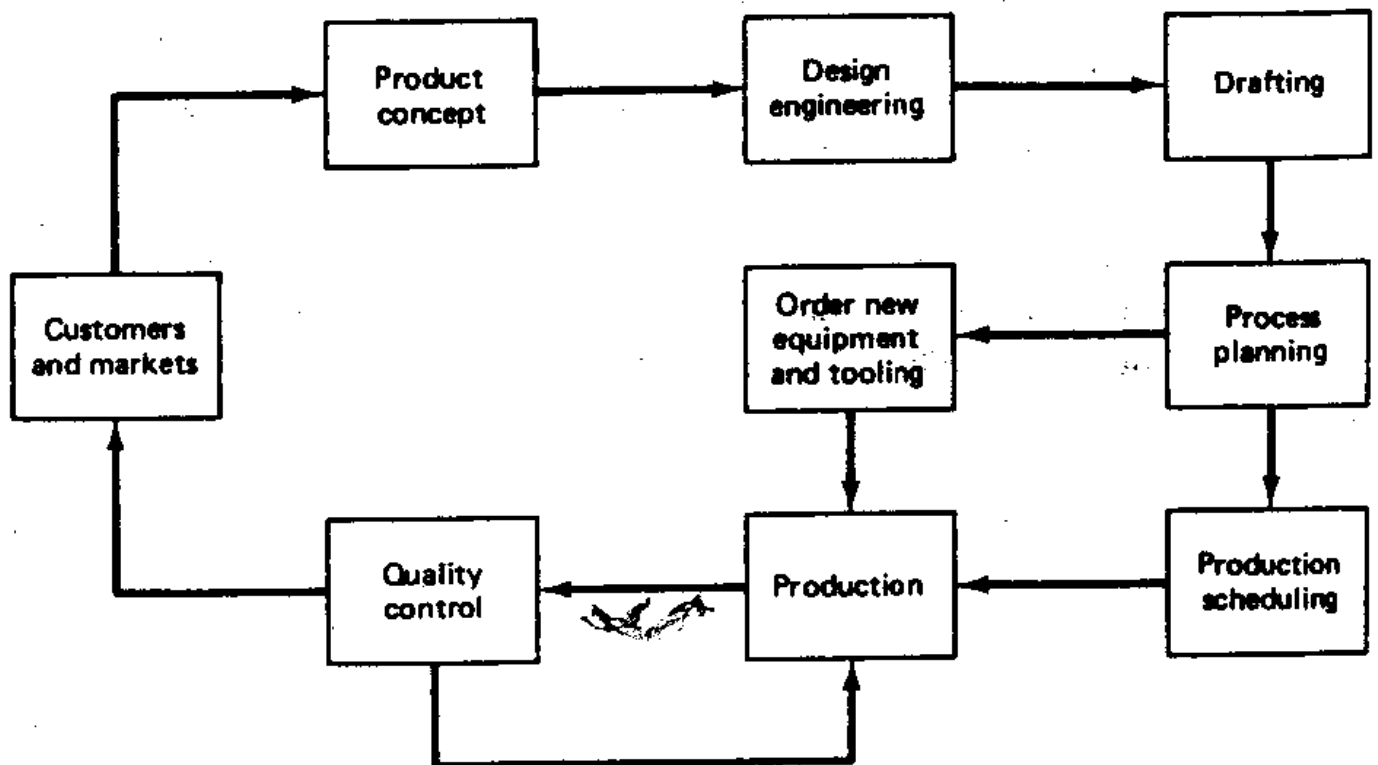
THE PRODUCT CYCLE AND CAD/CAM

product cycle:the various activities and functions that must be accomplished in the design and manufacture of a product.

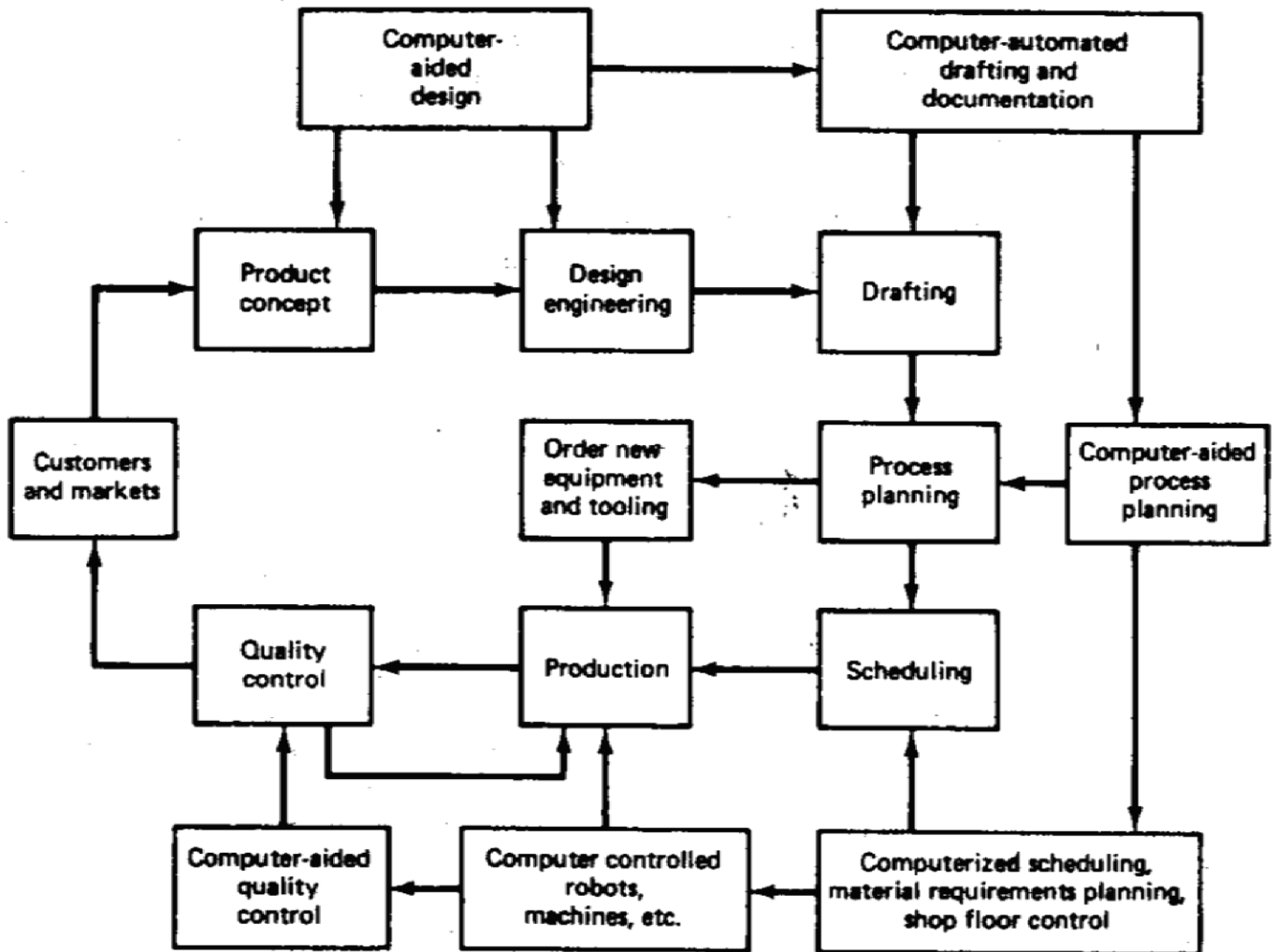
- ❖ **The product concept:** Whatever the product cycle is, it begins with an idea for a product. This concept is cultivated, refined, analyzed, improved, and translated into a plan for the product through the design engineering process.
- ❖ **Drafting:** The plan is documented by drafting a set of engineering drawings showing how the product is made and providing a set of specifications indicating how the product should perform.

The next activities involve the manufacture of the product.

- ❖ **Process planning**: it specifies the sequence of production operations required to make the product.
- ❖ **New equipment and tools**: Sometimes a new equipments and tools must be acquired to produce the new product.
- ❖ **Scheduling**: It provides a plan that commits the company to the manufacture of certain quantities of the product by certain dates.
- ❖ production
- ❖ quality testing
- ❖ delivery to the customer



Product cycle (design and manufacturing).



Product cycle revised with CAD/CAM overlaid

The impact of CAD/CAM is manifest in all of the different activities in the product cycle, as indicated in Figure above. Computer-aided design and automated drafting are utilized in the conceptualization, design, and documentation of the product.

Computers are used in process planning and scheduling to perform these functions more efficiently. Computers are used in production to monitor and control the manufacturing operations. In quality control, computers are used to perform inspections and performance tests on the product and its components.

AUTOMATION AND CAD/CAM

Automation is defined as the technology concerned with the application of complex mechanical, electronic, and computer-based systems in the operation and control of production.

there are differences in the way the product cycle is implemented for into four main categories

1. Continuous-flow processes:

Continuous dedicated production of large amounts of bulk product. Examples include continuous chemical plants and oil refineries

2. Mass production of discrete products:

Dedicated production of large quantities of one product (with perhaps limited model variations). Examples include automobiles, appliances, and engine blocks.

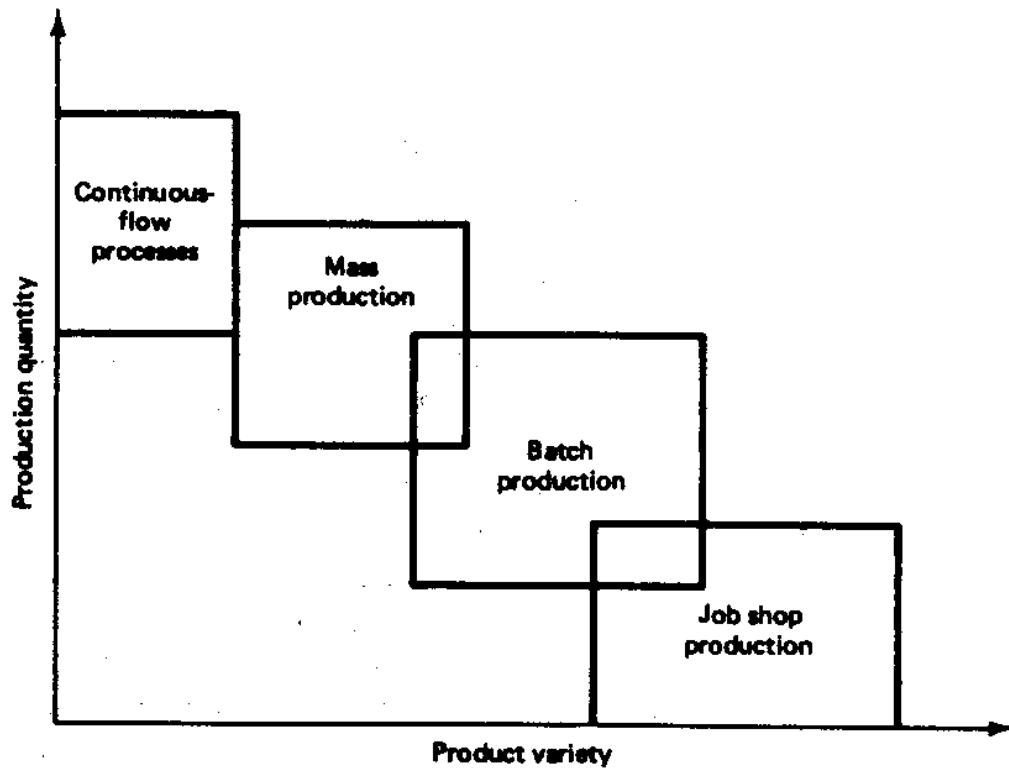
3. Batch production:

Production of medium lot sizes of the same product or component. The lots may be produced once or repeated periodically.

Examples include books, clothing, and certain industrial machinery.

4. Job shop production:

Production of low quantities, often one of a kind, of specialized products. The products are often customized and technologically complex. Examples include prototypes, aircraft, machine tools, and other equipment.



Four production types related to quantity and product variation