

Production management

Notes from the a.y. 2021/2022 course held by Prof. Andrea Chiarini

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1 Organizations

Organizations are systems that take resources as inputs (e.g. raw materials, electricity, manpower, etc.) and output products while creating value.

Definition 1.1 (Function)

A **function** is a grouping of staff based on a shared function in the organization. A function may contain one or more processes.

Definition 1.2 (Process)

A **process** is a sequence of interdependent and interlinked activities that convert inputs into outputs.

Processes can be **mono** or **single** line, meaning that the process steps are done sequentially without time delays between the ending of a step and the beginning of a following step, or they can have multiple lines working in parallel. Furthermore a process can be **convergent**, meaning that multiple lines converge into a single one that produces a single output, or **divergent**, meaning that at the end of the process multiple different outputs.

Definition 1.3 (Activity)

An **activity** is a unit of work inside a process, which can be elementary tasks or subtasks, always defined on a measurable amount of time.

Definition 1.4 (Management system)

A **management system** is a combination of functions, processes and procedures that is used to establish a strategy to reach some goal.

Definition 1.5 (Industrial plant)

An **industrial plant** is the physical place (**factory**), made up of offices, warehouses, production buildings, etc., where manufacturing happens. In some cases the same term is applied to big machinery.

Definition 1.6 (Shop floor)

The part of the industrial plant where production actually happens is called **shop floor**.

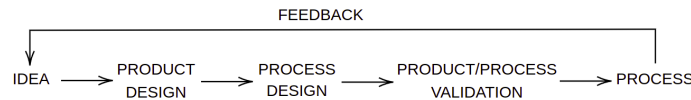
Industrial plants are classified based on the ratio between the fixed costs of the plant C_{fi} and the variable costs of labor, C_{vl} :

$$\frac{C_{fi}}{C_{vl}}$$

If the ratio is greater than 1 the industrial plant is defined **capital intensive** while if the ratio is lesser than 1 the industrial plant is defined **labor intensive**.

Another classification of industrial plants is with respect to production, which can be **intermittent**, when there is a medium-low volume of many different products being produced, or **continuous**, when there is a high volume of few standardized products. Intermittent is often labor intensive while continuous is often capital intensive.

1.1 Design department



All design steps happen, in some measure, at the same time as the steps preceding and following them. Feedback from production or from the market leads to continuous improvement of both process and product.

Definition 1.7 (Time-to-market)

The time between the conception of the initial idea and the start of production is called **time-to-market**.

An idea can be broken down in three main steps:

1. **Design goals**: analysis of the customer needs.
2. **Break-even analysis**: calculation of the amount of products that need to be sold to offset production costs.
3. **Planning**: Laying out the design flow in the allotted design time.

Design goals are analyzed using **QFD analysis** and **KANO models**. The process is broken down in several steps:

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- Identification of the quality characteristics, which are called **VOCs** (Voice Of the Customer).
 - Translation of the fuzzy VOCs into **CTQs** (Critical To Quality) characteristics, i.e. the points that the customer really wants in the product.
 - Prioritization of the CTQs using QFD or KANO, as well as involving the customers.
 - Evaluation of how well each CTQ can be implemented and improved using QFD.