Chapter 1

The Production Paradigm

Evolution of Production Systems

- Ancient Systems
  - **basic planning, organizations and control**
  - **specialization of labor**
- Feudal Systems
  - **hierachical system (delegation)**
  - **land and labor as production input**
- European System
  - **double entry bookkeeping, cost accounting**
  - **Industrial Revolution: specialization, mass markets, mass production**
- American System
  - **interchangeable parts**
  - **steam power**
  - **assembly lines**

The Competitive Environment

- Status Quo of the American (and European) System(late 80s):
  - **production driven system**
  - **cost efficient production as the main goal**
  - **high quality standardized goods**
  - **Market is taken as given**

- Change towards a market-driven system
  - **more sophisticated consumers**
  - **short product life cycles**
  - **product variety increases**
  - **global competition and heterogeneous markets**

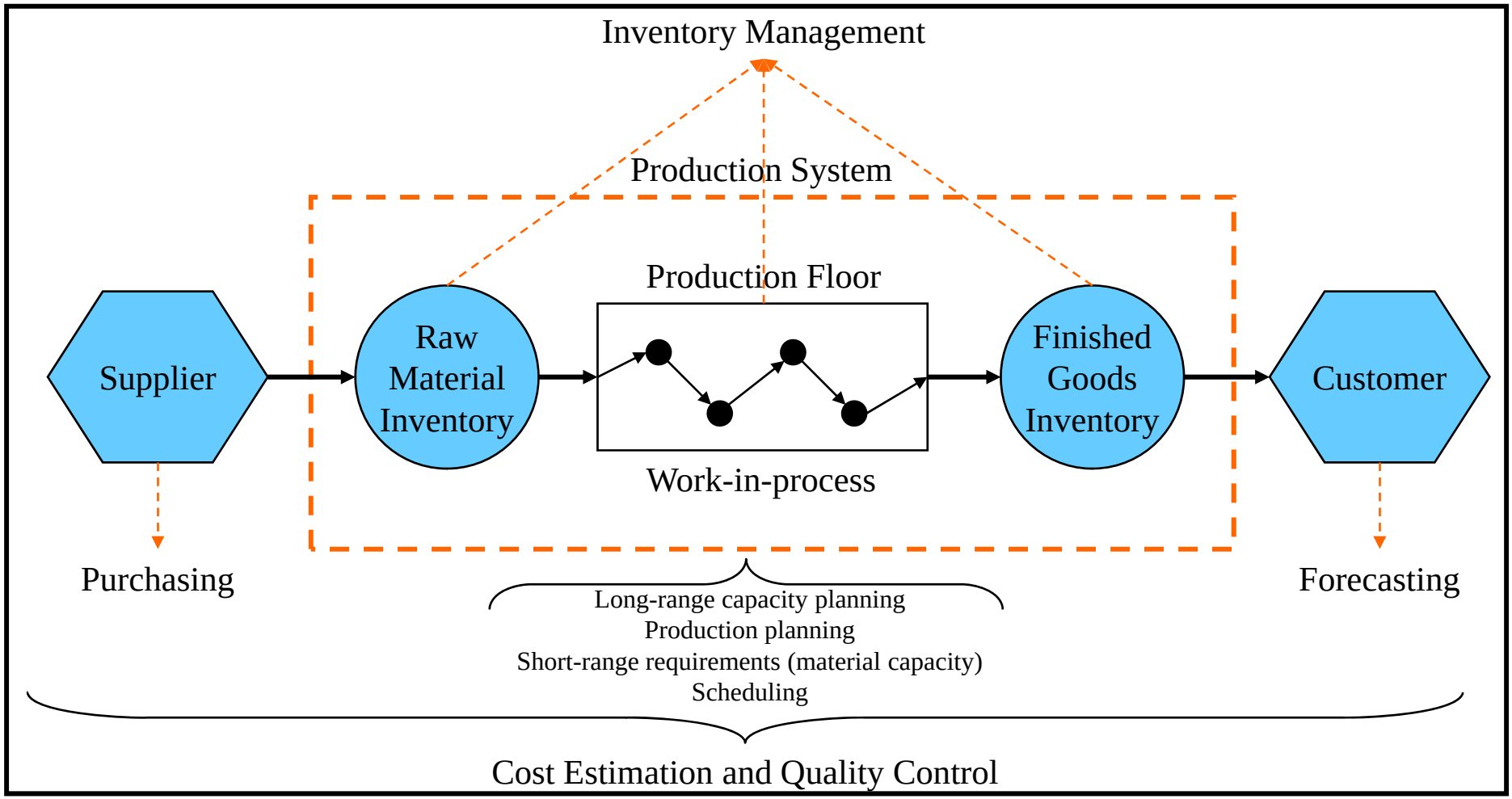
Production Systems

- Input → Output
- manufacturing firms
- service companies: Universities

- flow process in two parts:
  - **physical material**
  - **information**

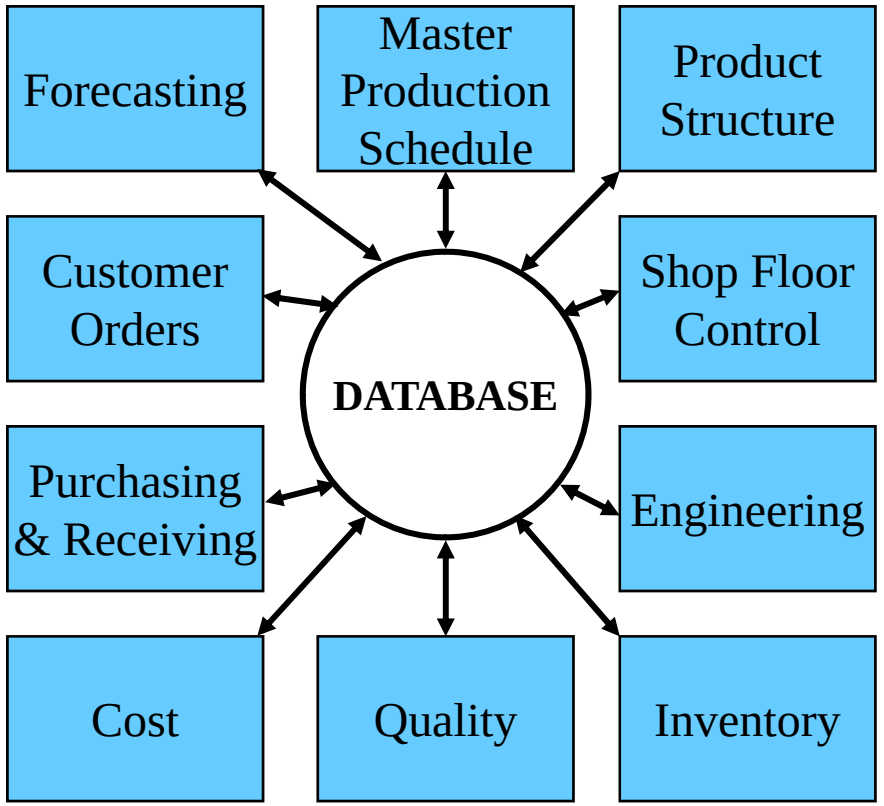
- coordination also with suppliers and distributors: supply chain management: recent emphasis on bi-directional information flow

Production Systems



Production Information System

The PPC function integrates material flow using the information system. Integration is achieved through a common database.



Building Blocks

- Objectives:
  - **Quality**
  - **Cost**
  - **Time**

- **These might be seen as the** fundamental objectives **of the firm**
- **induced by these objectives one might observe various** subordinate objectives **at different levels and parts of the company**
  - **more variability, high inventory**
  - **low unit costs, low inventory**
  - **high throughput, less variability**
  - **short cycle times, high inventory**
- Important to understand effects of individual incentives!

Building Blocks

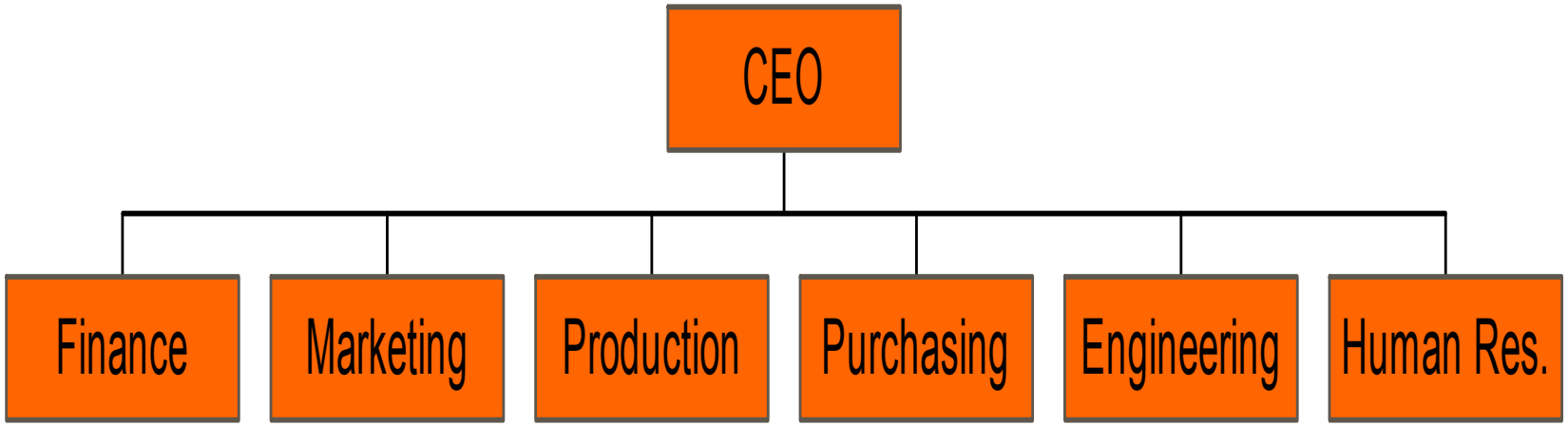
- **Physical Arrangement**
  - production volume and
  - product variety
  - determine **layout**
    - job shop (low-volume, high customized)
      - process or functional layout
    - flow shop (high-volume)
      - product layout

Building Blocks

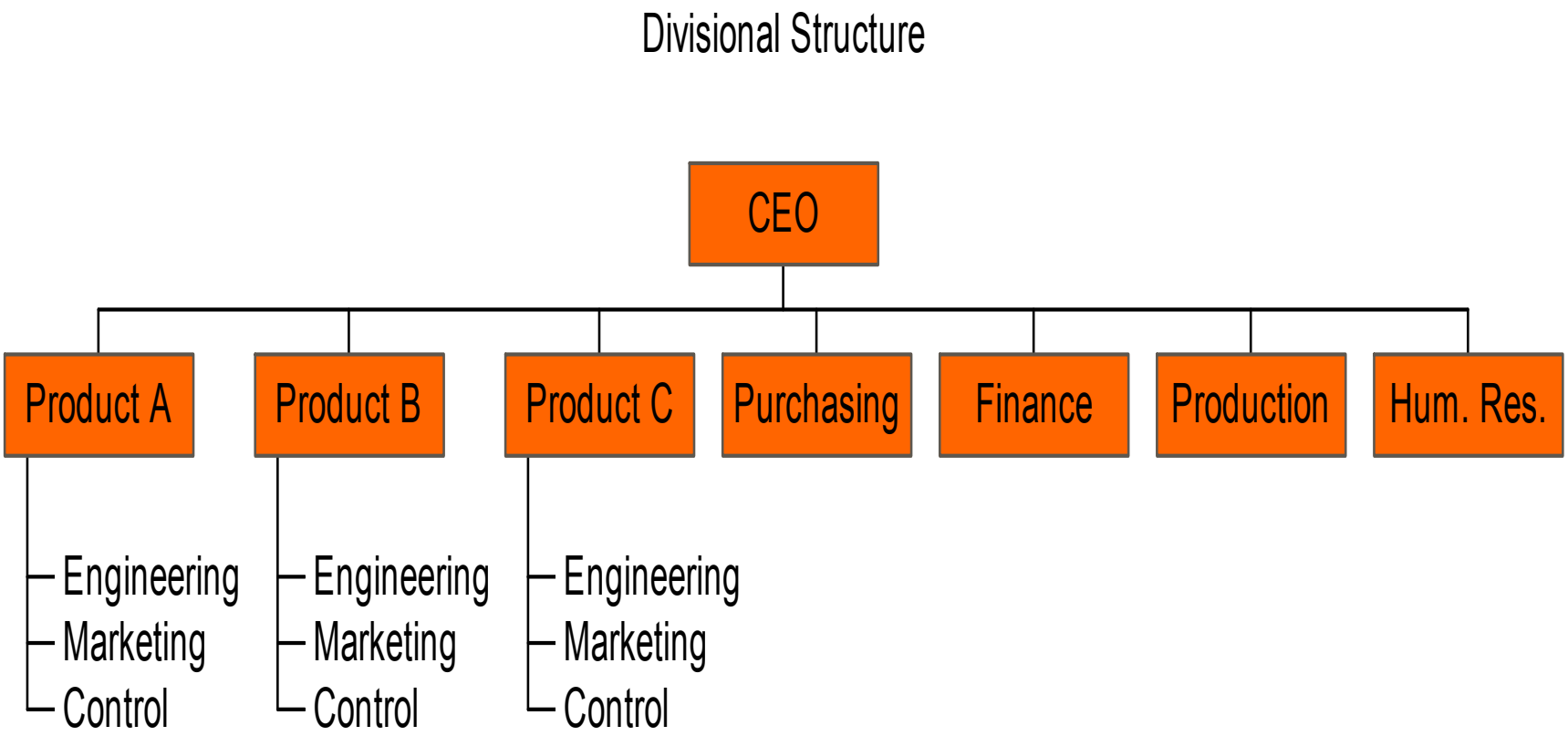
- **Organizational Arrangements**
  - **Functional Structure:** input oriented
  - **Divisional Structure:** output oriented (projects, services, programs, locations) strategic business units
  - **Matrix Structure:** one person-two bosses (input & output oriented)

Organizational Arrangements

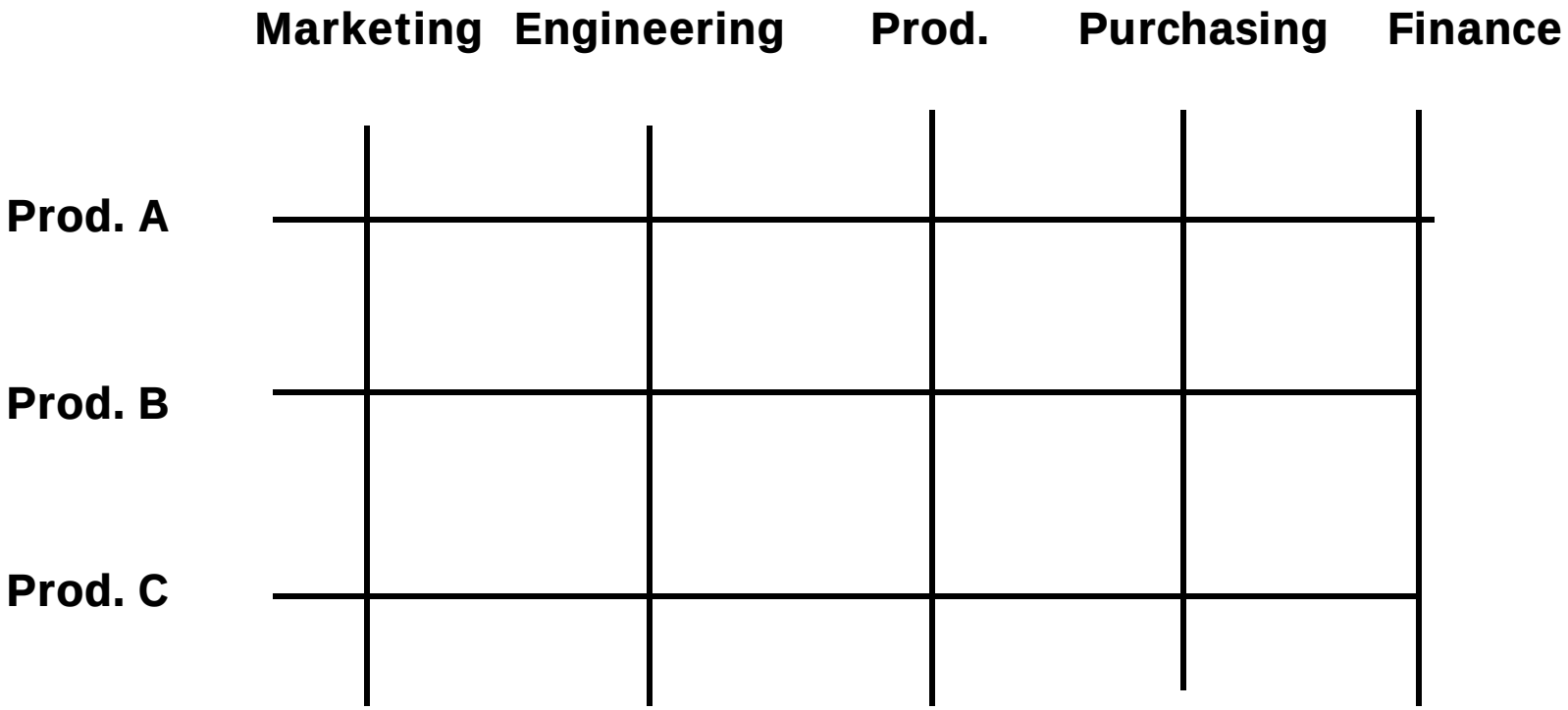
Functional Structure



Organizational Arrangements



Organizational Arrangements: Matrix

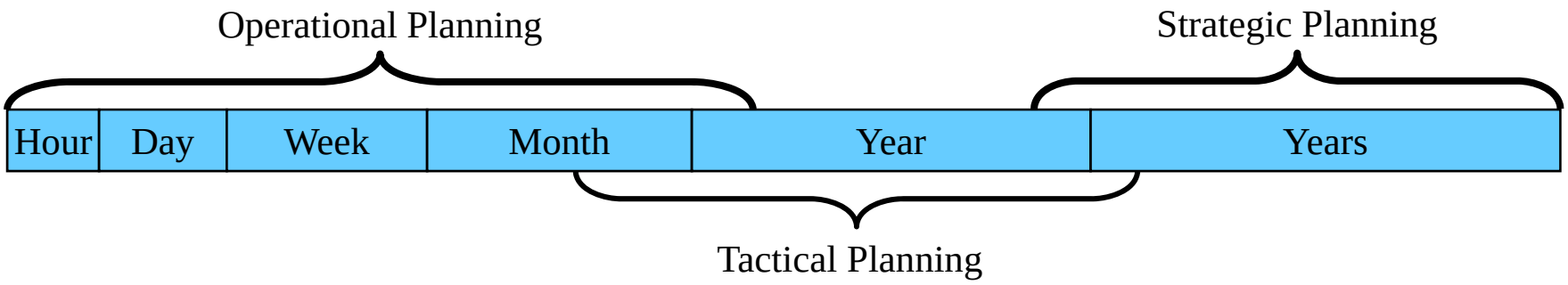


Production Planning and Control (PPC)

- Intergrated-material-flow-based information system
- based on a feedback loop (control theory)
- management of deviations
- art of selecting the appropriate mix of management technologies
- impact of organizational structure, life-cycle effects

Building Blocks

- **Planning horizons**



Building Blocks

⌘ Types of Decisions

	Long (strategic) top management	Intermediate (tactical) middle management	Short (operational) operational management
Time	three to ten years	six months to three years	one week to six months
Unit	dollars; hours	dollars; hours; product line; product family	individual products; product family
Inputs	aggregate forecast; plant capacity	intermediate forecast; capacity and production levels taken from long range plan	short range forecast; work force levels, processes; inventory levels
Decisions	capacity; product; supplier needs; quality policy	work force levels; processes; production rates; inventory levels; contracts with suppliers; quality level; quality costs	allocation of jobs to machines; overtime; undertime; subcontracting; delivery dates for suppliers; product quality