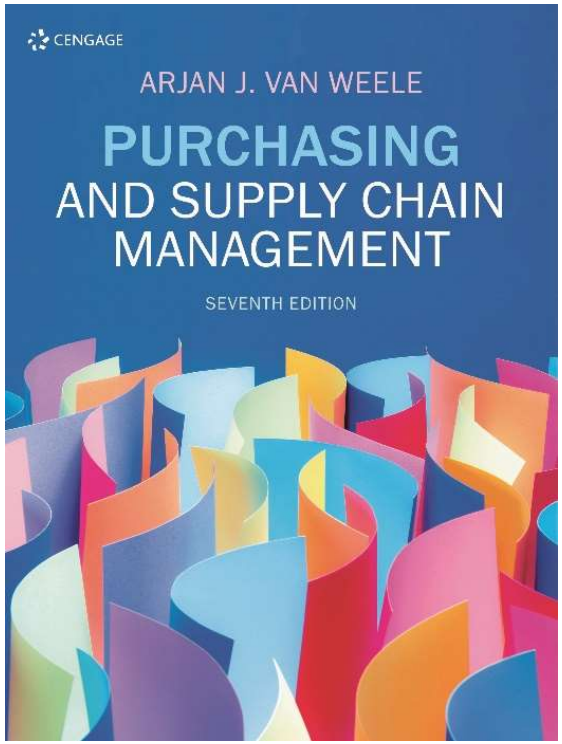


MASTER OF SCIENCE IN BUSINESS ADMINISTRATION

Procurement & Supply Chain
Prof. Corrado Cerruti

Chapter 11

Purchasing, logistics and supply chain management

CENGAGE Learning™

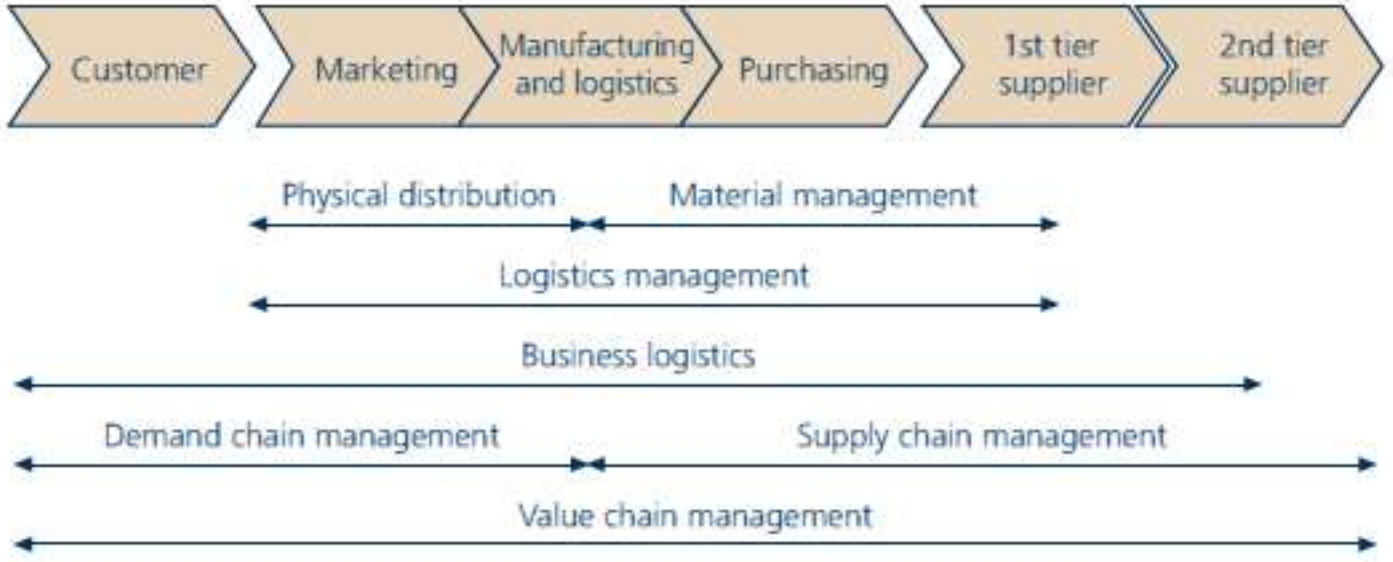
For use with Purchasing and Supply Chain Management 7th Edition by Arjan J. van Weele (9781473749443)

Learning objectives

- The definition of supply chain management and the basic supply chain concepts.
- The most important steps in the materials planning cycle.
- How supply chain activities can be structured within organizations.
- Characteristics of just-in-time scheduling and purchasing.
- The most important elements of a purchasing information system.

Definitions and concepts

FIGURE 11.1 The business chain and related items



Definitions and concepts

- Materials management encompasses all materials related activities aimed at optimising the incoming materials flow from the supplier to production.
- Logistics management encompasses all materials flows, from the flows of purchased materials into a facility, through the manufacturing process, and out to the customer.
- Supply Chain Management (SCM) is a connected series of activities which is concerned with planning, coordinating and controlling material, parts, and finished goods from suppliers up to the customer.
- Purchasing and Supply management can be seen as an integrated part of SCM.

Materials requirements planning

- MRP starts in the sales department with drawing up a sales plan, providing an estimate of the volume to be sold. MRP is the input for the **manufacturing planning and control system** consisting of:

  - **Master planning**
    Plans at the level of the product families (product groups) are established. Customer orders, sales plan, planned stocks of finished products and the production and purchasing plans are linked together.
  - **Manufacturing Resources Planning (MRP-II)**
    Records the Manufacturing Resources needed to realize the master plan.

Materials requirements planning

- **Master production scheduling (MPS)**
  Translates the master plan into specific materials requirements. MPS provides the input for calculating the net materials requirements.
- **General capacity testing**
  The MPS should be tested for capacity limitations and this should be done for all potential bottleneck capacities.
- **Materials requirement planning (MRP-I)**
  The materials requirements planning explodes the requirements from the MPS level on a weekly basis, step by step, in accordance with the bill of materials.
- **Capacity requirements planning**
  Conceptually comparable with materials requirements planning. The current and planned manufacturing orders from the MRP provide the input for the detailed production line planning.

Figure 11.2 The external structure on a macro level

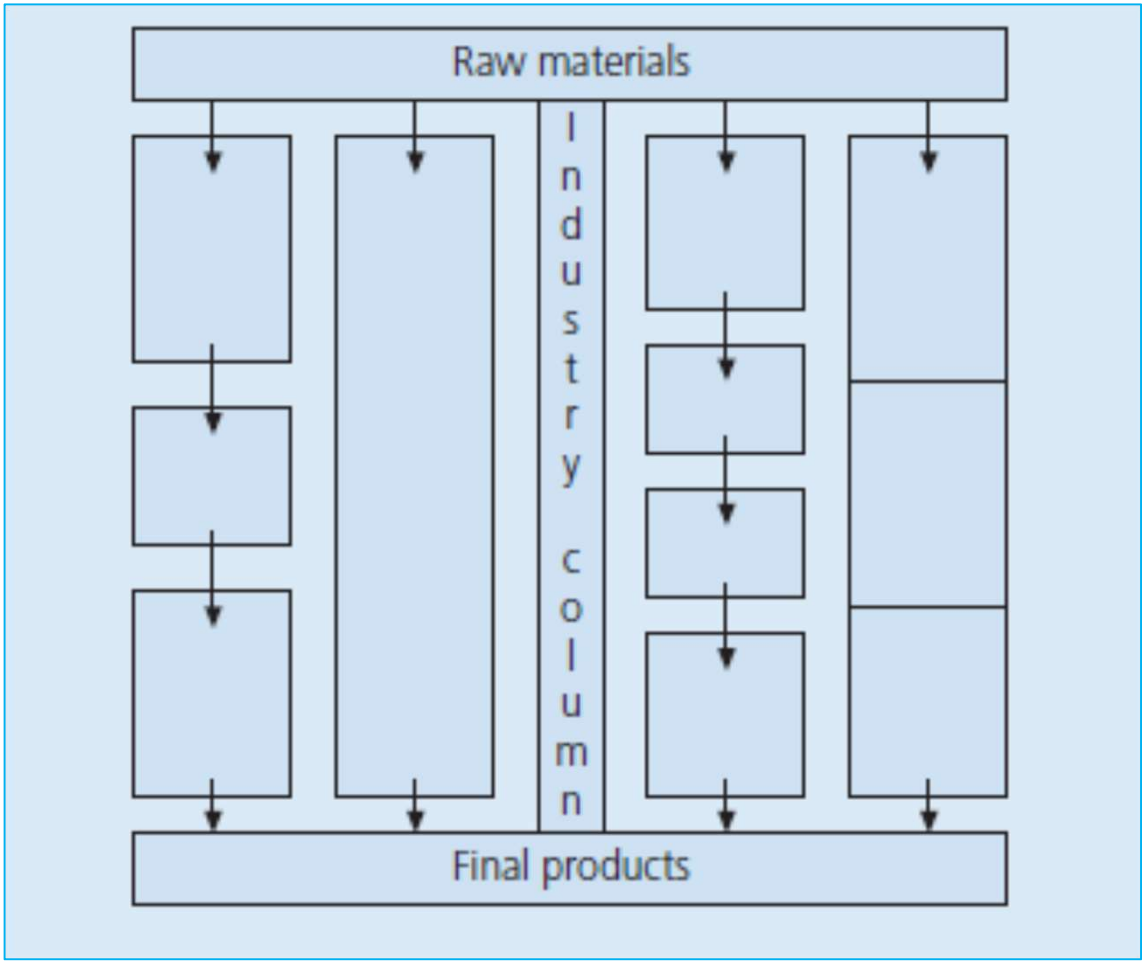
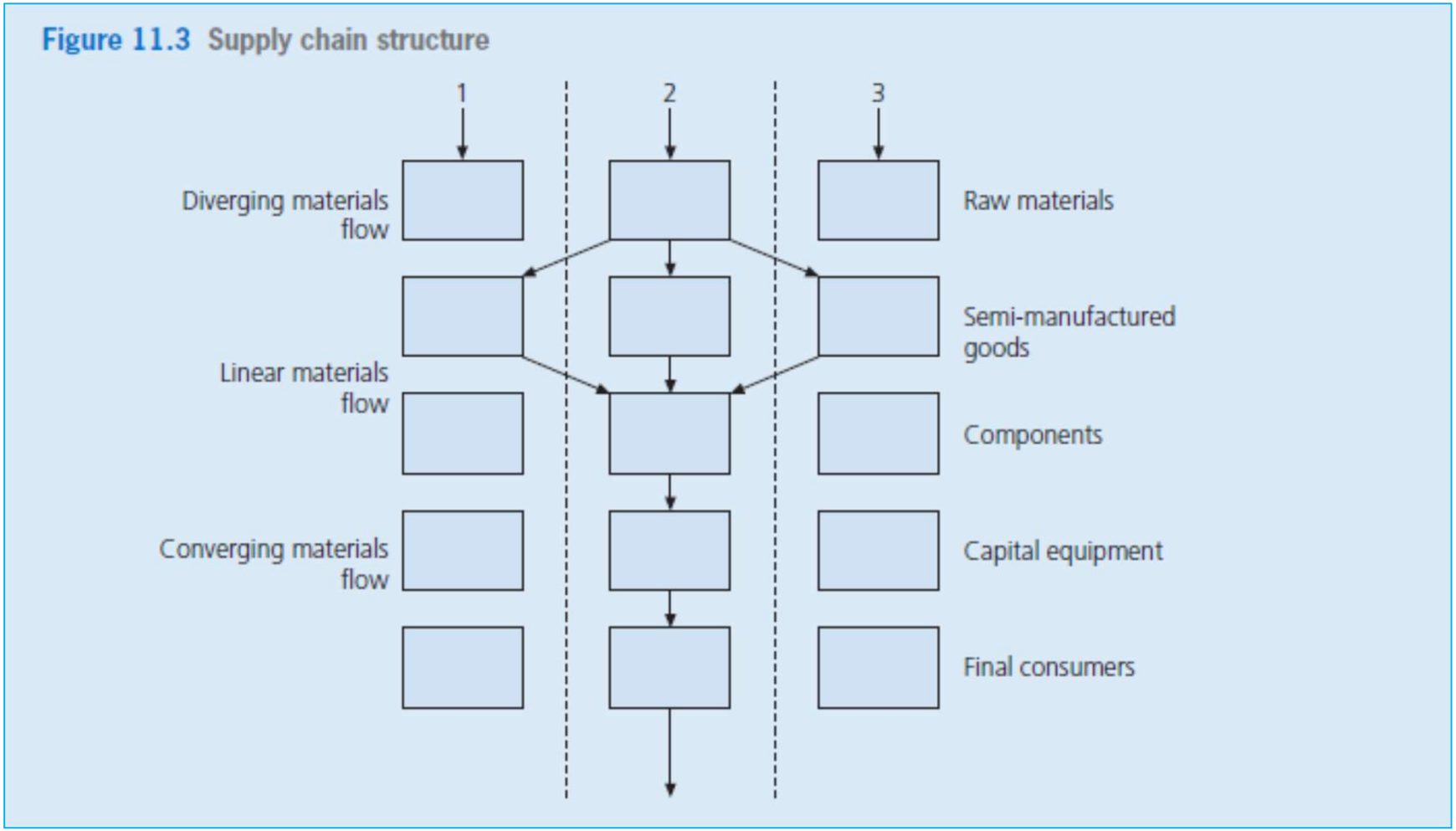


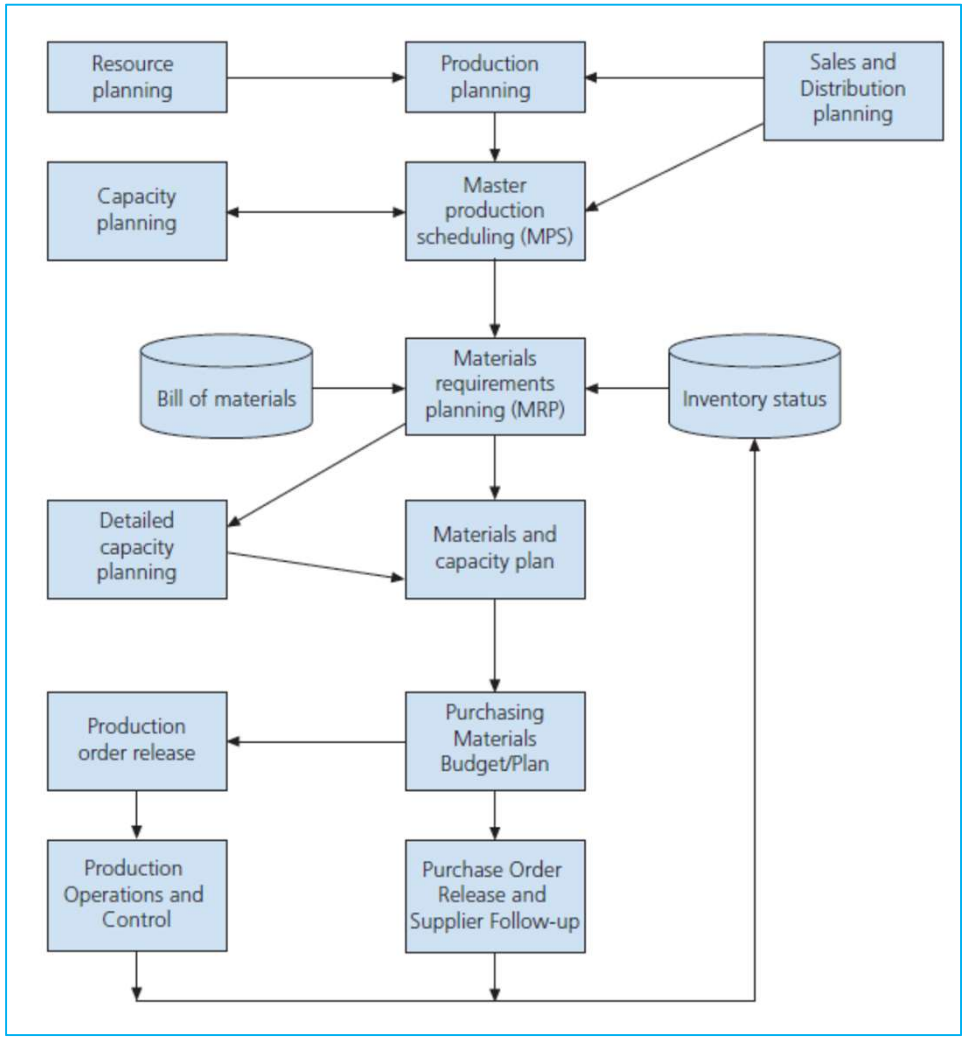
Figure 11.3 Supply chain structure



Materials requirements planning

- **Order release**
  Order releases change the status of the manufacturing orders from ‘planned’ to ‘released’. The decision to release is based on the availability of the required materials and capacity.
- **Priority management**
  The priorities are directly derived from the MPS. Each unit receives a priority sheet which lists all manufacturing orders for that line or machine center.
- **Capacity Management**
  Waiting times per processing group have to be controlled. Input/output reports have an important function: to compare the realized output for a production unit against its planned output.

Figure 11.4 Manufacturing planning and control system



Adapted from Vollman et al. (1984, p.25).

Materials requirements planning

Difference between MRP-I and MRP-II

- **MRP-I** stands for materials requirements planning; aims at releasing and managing manufacturing orders and purchasing requisitions.

- **MRP-II** stands for manufacturing resources planning, an integrated system that controls relevant materials flows and production capacity while also taking into account the relationship between these materials flows and the required capacity.

Basic logistics structures

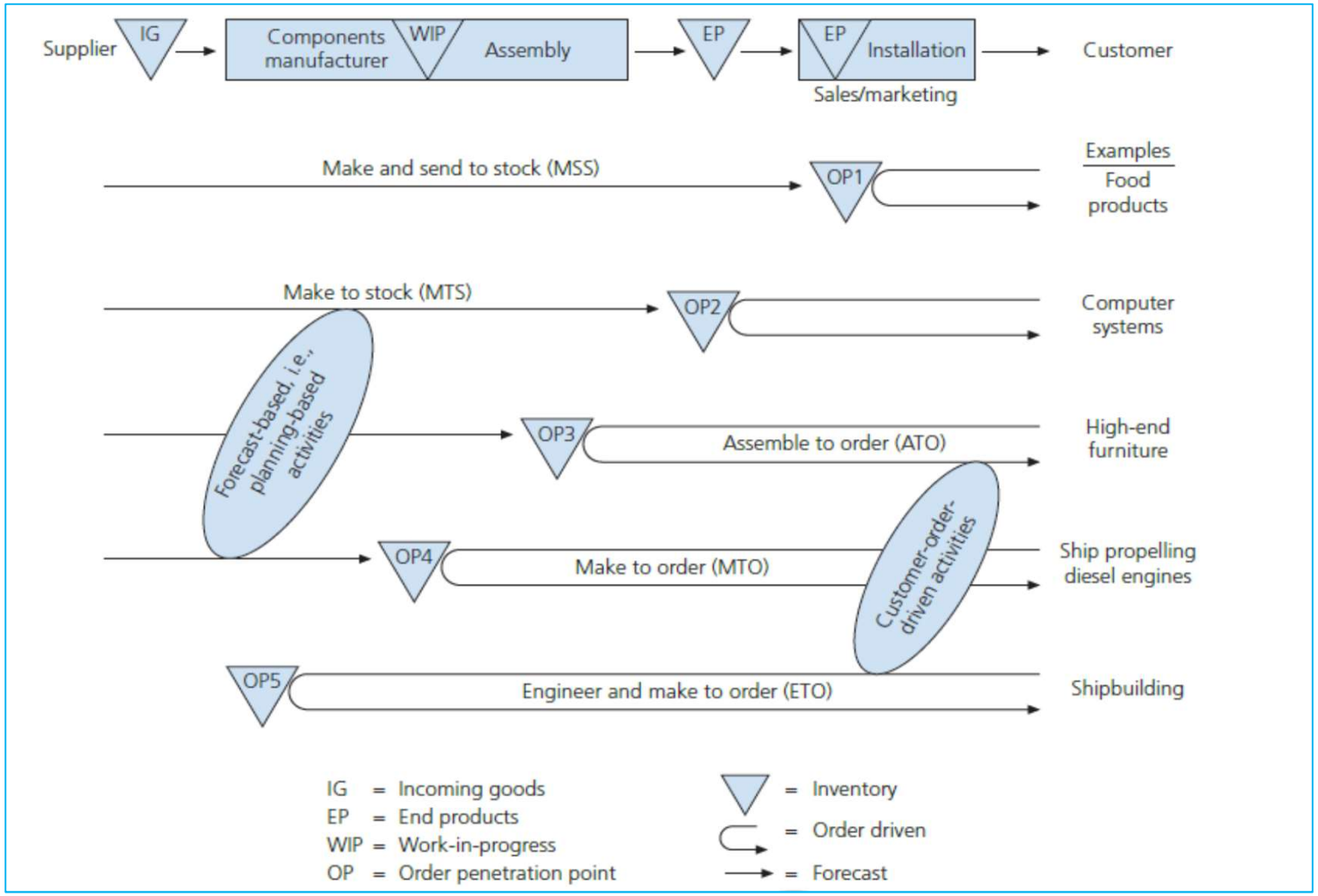
- Order decoupling point (or order penetration point):
  - Indicates how deeply the customer order penetrates the firm's materials planning systems.
  - Defines from what moment on a production order becomes customer specific.

Basic logistics structures

Five basic manufacturing and logistics structures

1. Making and sending to stock (MSS)	• Products are manufactured and distributed to distribution points which are dispersed and located close to the customer. E.g. sweets, foods, beverages.
2. Making to (central) stock (MTS)	• Finished products are kept in stock at the end of the production process and are from there shipped to geographically dispersed customers. E.g. dairy products.
3. Assembly to order (ATO)	• Only systems elements, modules or subassemblies are in stock at the manufacturing center, whereas final assembly takes place based on a specific customer order. E.g. cars, computers.
4. Making to order (MTO)	▪ Only raw materials and components are kept in stock. Every customer is a specific project. E.g. beer and lemonade cans, basic construction materials
5. Engineering and making to order (ETO)	• No stock at all. The purchase and order of materials takes place based on the specific customer order. E.g. construction companies and shipyards.

Figure 11.5 Customer order decoupling point (CODP): the deciding factor for an effective logistics structure



Source: Hoekstra and Romme (1985).

Just-in-time management (JIT)

Characteristics of JIT management:

JIT

All materials and products become available at the very moment when they are needed in the production process, not sooner and not later but exactly on time and exactly in the right quantity.

Major objective

Continuously tackle and solve manufacturing bottlenecks within, and interfaces between, consecutive steps in the manufacturing process.

Just-in-time management (JIT)

Order Quantities and batch sizes

Economic Order Quantity: where the sum of inventory costs and ordering costs is lowest

Camp's formula: $Q_o = \sqrt{((2S \times C_o)/C_i)}$

S= fixed usage per period
Q= order quantity
C_o= costs per order
C_i= inventory carrying costs for one unit during one unit time

Just-in-time management (JIT)

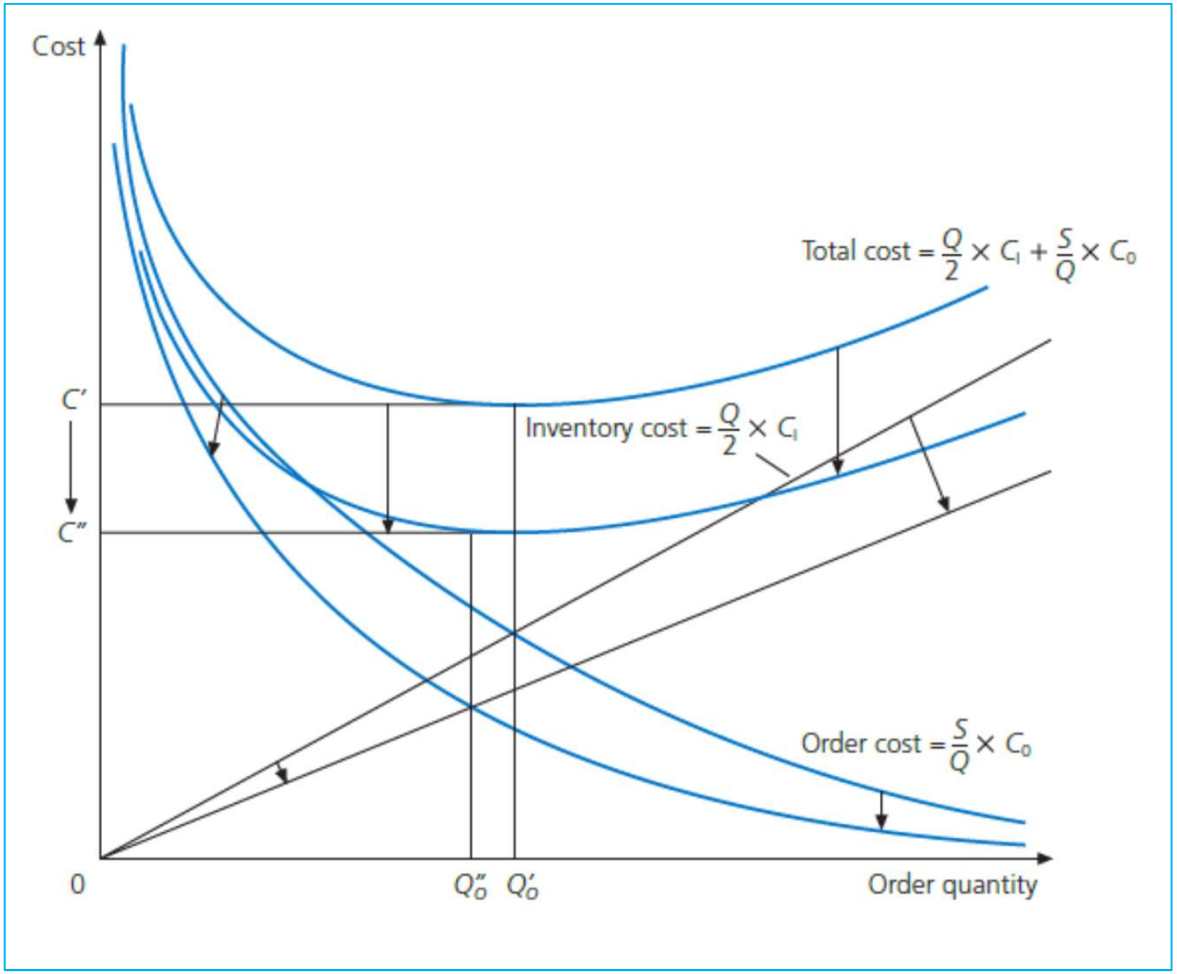
Conditions Camp's formula:

- The consumption of the component at hand is fairly stable
- The consumption of the component is evenly spread over the course of time
- The delivery time of the product is fixed and not due to fluctuation
- the ordering costs per order are fixed
- the inventory carrying costs do not depend on the ordered quantity

JIT basically challenges each of these assumptions. E.g. order-related costs are analyzed in terms of costs related to:

- Negotiations with the supplier
- Administrative processing
- Follow-up and expediting of orders
- Incoming and quality inspections

Figure 11.6 Towards a reduction of the economic order quantity



For use with Purchasing and Supply Chain Management 7th Edition by Arjan J. van Weele (9781473749443)

Just-in-time management (JIT)

- ***JIT production and scheduling cannot be successfully implemented without a zero defects philosophy***

- JIT and zero defects need to go hand-in-hand:
  - Smaller batches make it necessary to detect quality defects at an early stage
  - JIT must be supported by all functions within the company
  - Adopting JIT will take time (It took Toyota 15 years to implement the KANBAN philosophy)

Just-in-time management (JIT)

Table 11.1 Differences between the traditional approach and the JIT approach in purchasing

Purchasing activity	Traditional approach	JIT approach
Supplier selection	Minimum of two suppliers; price is central	Often one local supplier; total cost is central
Placing the order	Annual contract; deliveries called as needed	Multi-year contract; deliveries called as needed
Change of orders	Delivery time and specifications often changed at the last moment	Delivery time and specifications fixed, quantities are adjusted within predetermined margins if necessary
Follow-up of orders	Many phone calls to solve delivery problems	Few delivery problems thanks to sound agreements; quality and delivery problems are not tolerated
Incoming inspection	Inspection of quality and quantities of most deliveries	Initial sample inspections; later, no inspections necessary
Supplier assessment	Qualitative assessment; delivery deviations of sometimes up to 10% are tolerated	Deviations are not accepted; price is fixed based on open calculation
Invoicing	Payment per order	Invoices are collected and settled on a monthly basis

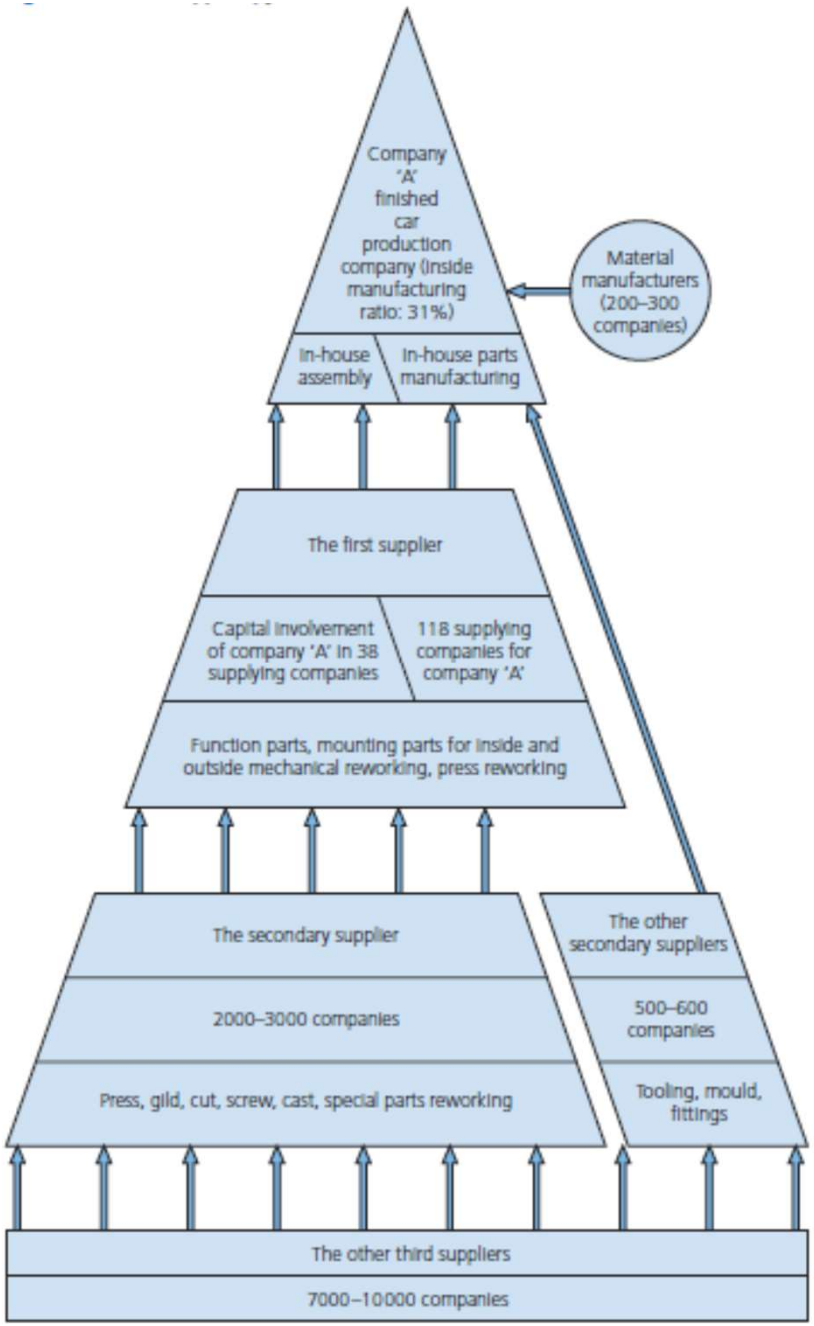
Consequences for suppliers

- Advantages of JIT for a supplier
  - **Supplier is able to plan his production volume much better** because he's informed regularly about the quantities to be delivered.
  - **Administrative savings:** supplier's and customer's production and materials planning systems are linked through electronic information systems (like EDI).
  - Constant communication on quality and costs improvements can **lead to product and process innovation.**
  - Investment policy: **JIT contracts are signed for a long period** of time and guarantee a certain volume and turnover over that time period.

Consequences for suppliers

- Disadvantages of JIT for a supplier
  - It may result in a **pyramid shaped** structure with a **strong hierarchy** in the different links of the supply chain. The large manufacturers at the top of the pyramid impose their demands ruthlessly on the often smaller first tier suppliers.
  - It takes **time (and money) to deliver at zero defects** or to produce zero defects. These investments come at the expense of the supplier.
  - Supplier can become **very dependend** on only one manufacturer. This can become a threat to its continuity.

Figure 11.7 The supplier pyramid



Consequences for suppliers

- *JIT and supplier selection*
- Suppliers located near the JIT-partner are in an advantageous position
- Business based on open calculation
- 'Quality on Time'
- Supplier classification:

On time delivery	Quality delivery
A= excellent	1= excellent
B=good	2= good
C= inadequate	3= inadequate

Example: **C1** supplier provides high quality but does not always deliver on time

Elements of the purchasing information system

- Most important elements of a purchasing system:
  - Requisitioning and ordering
  - Product, supplier and contract database
  - Order follow up
  - Delivery
  - Invoice handling and payment

Figure 11.8 Major elements of a purchasing information system

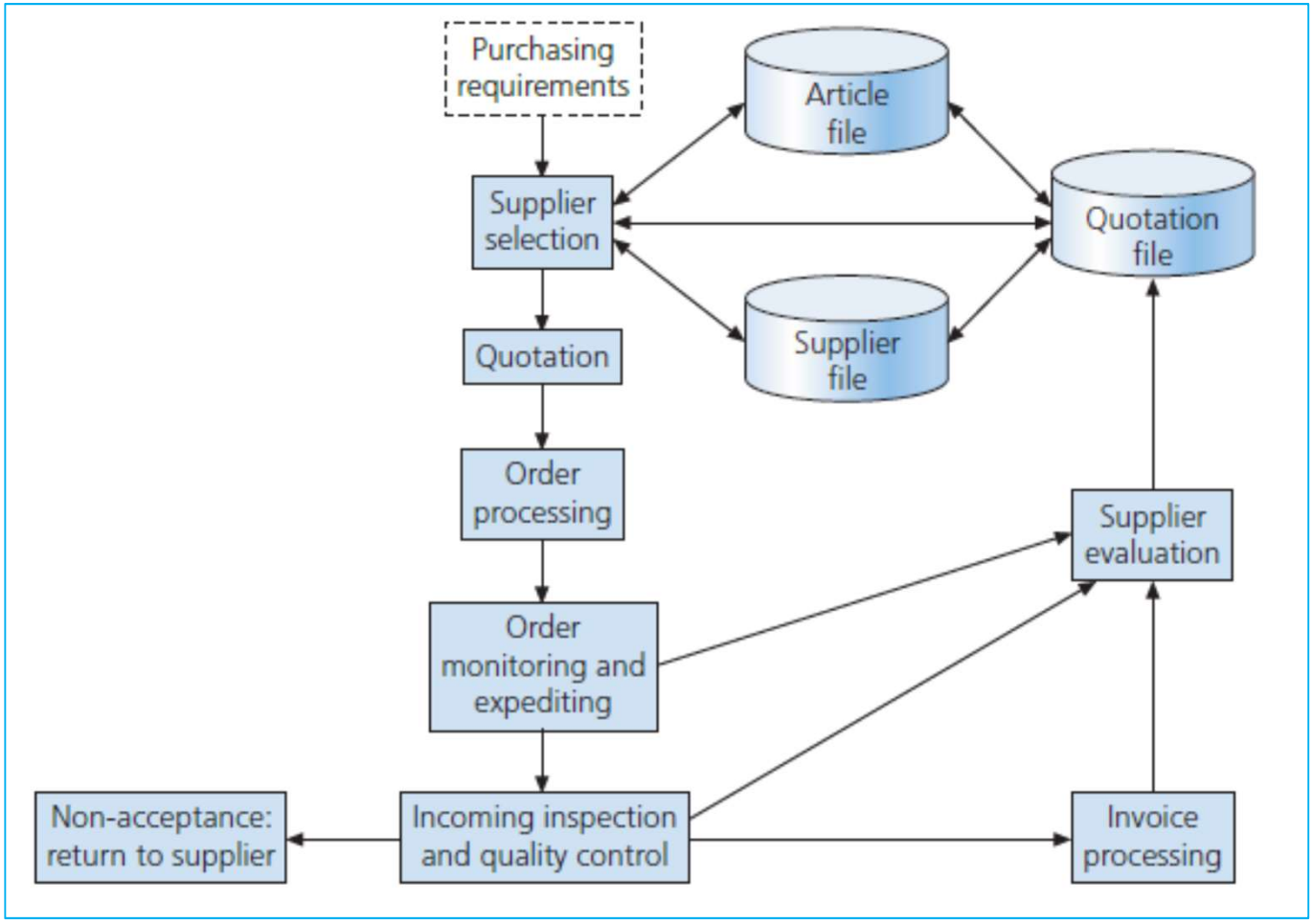


Figure 11.9 E-procurement systems result in a significant reduction of the traditional order-to-pay cycle

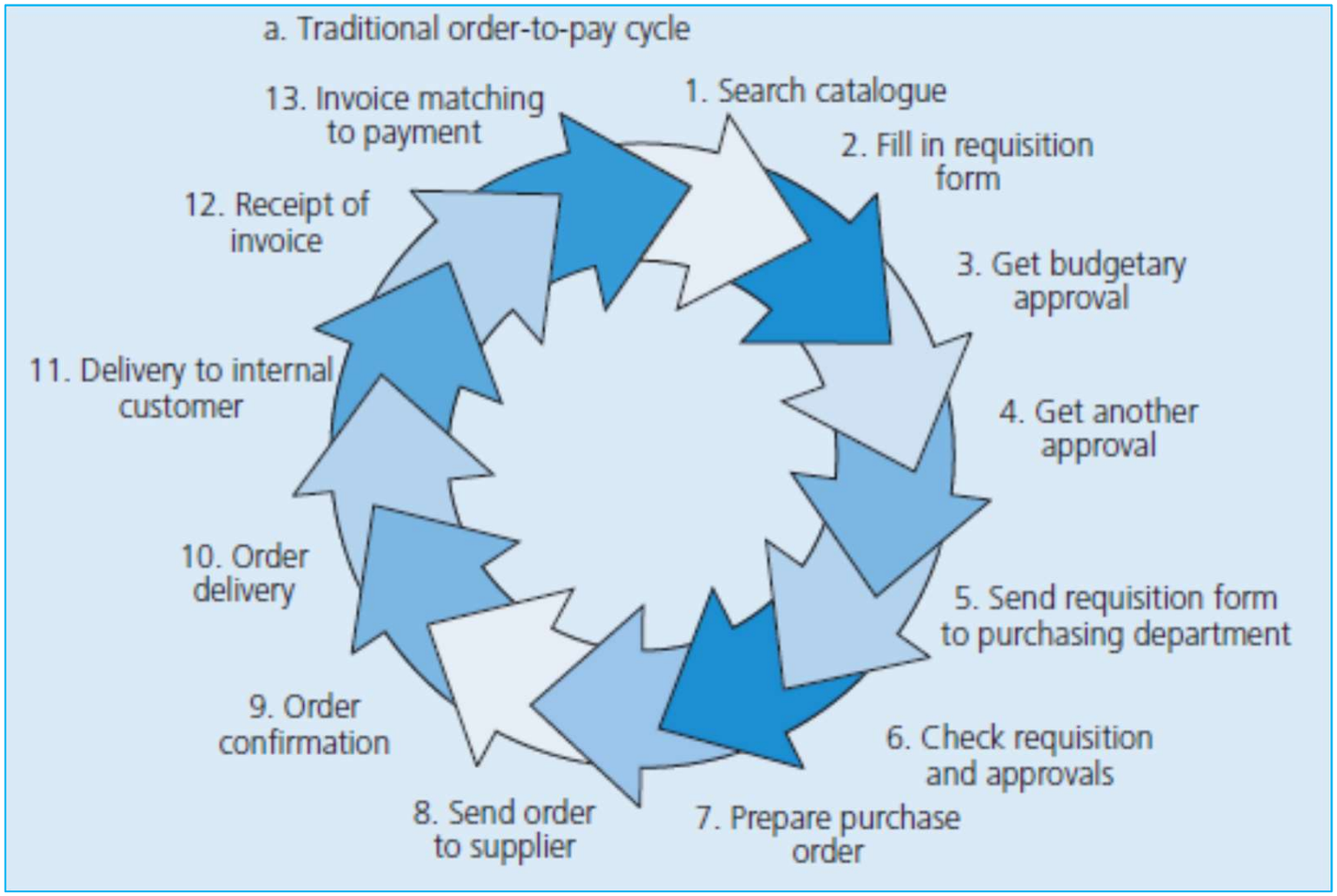
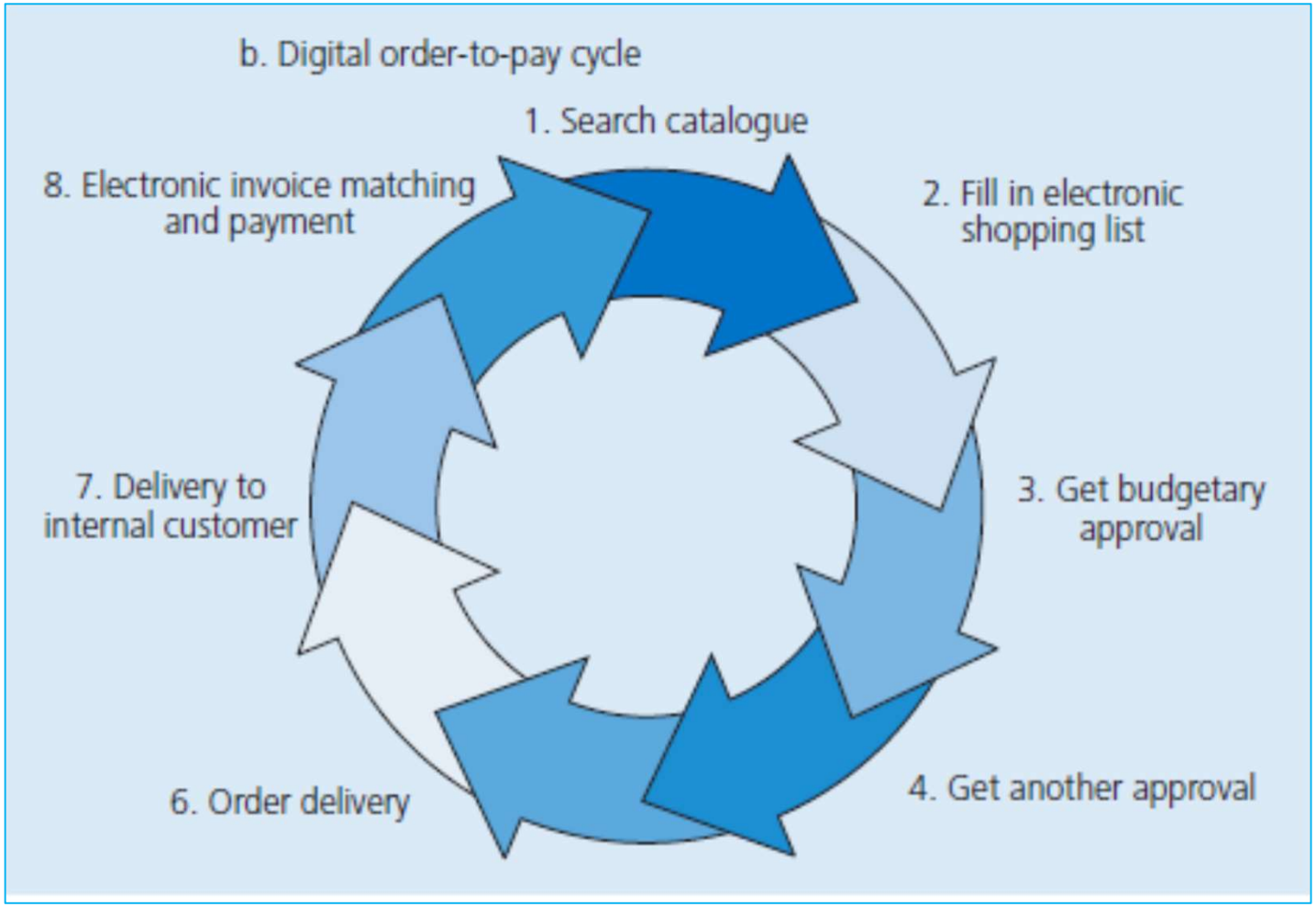


Figure 11.9(2) E-procurement systems result in a significant reduction of the digital order-to-pay cycle



Coordination problems

- Some typical problem situations between purchasing and logistics:
  - Lack of well defined specifications
  - Lack of standardization
  - Frequent changes in materials planning
  - Unreliable planning information
  - Insufficient integration of purchasing in logistics management

Summary

- The relationship between purchasing, materials planning and logistics has been discussed.
- Five different structures may underlie a company's production and logistics activities.
  - Make and send to stock (MSS),
  - Make to stock (MTS),
  - Assemble to order (ATO),
  - Make to order (MTO)
  - Engineer and make to order (ETO)
- Central element has been the order penetration point.
- Most available ERP systems are capable of supporting the operational, transactional purchasing activities.