Grundzüge der Wirtschaftsinformatik
Introduction to Business Information Systems

Unit 9

Prof. Dr. Martin Hepp
http://www.heppnetz.de
mhepp@computer.org

http://www.heppnetz.de/teaching/gwi/

Structure of the Lecture

Unit 1: Introduction
Unit 2: Central Processing Units
Unit 3: Storage and Data Structures
Unit 4: Input and Output Devices
Unit 5: Software
Unit 6: Networks, Data Interchange, and the Internet
Unit 7: Design, Development, Deployment, and Operations of Information Systems
Unit 8: Office Applications
Unit 9: Enterprise Applications
Unit 10: Supply Chain Applications and E-Business
Unit 11: Management Support Systems
Unit 12: Exam Review

Assignment from last week

- WI1, pp. 525-605; IBIS, pp. 93-168
- Review the slides

WI1 = Hansen/Neumann: Wirtschaftsinformatik 1; WI2 = Hansen/Neumann: Wirtschaftsinformatik 2; IBIS = Wigand et al: Introduction to Business Information Systems.

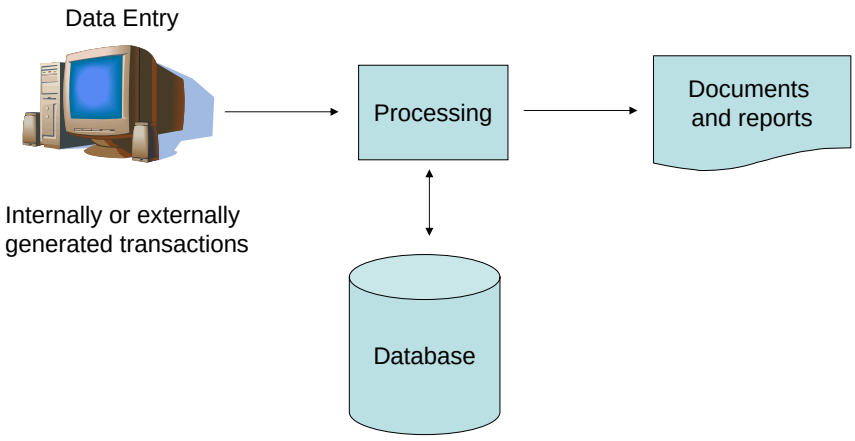
Link to the Previous Unit

- Last Unit:
  - What kinds of application software exist for typical office tasks?
- Today:
  - Which are key transactions in industrial enterprises?
  - How can software support such business transactions?
  - What is Enterprise Resource Planning (ERP) Software?

Structure of the Unit

- Overview
- Transaction Processing Systems (TSPs)
- Material Requirements Planning (MRP)
- Manufacturing Resource Planning (MRPII)
- Enterprise Resource Planning (ERP)

Transaction Processing



Cf. Stair / Reynolds

Example: Materials Requirements

Pending Orders:

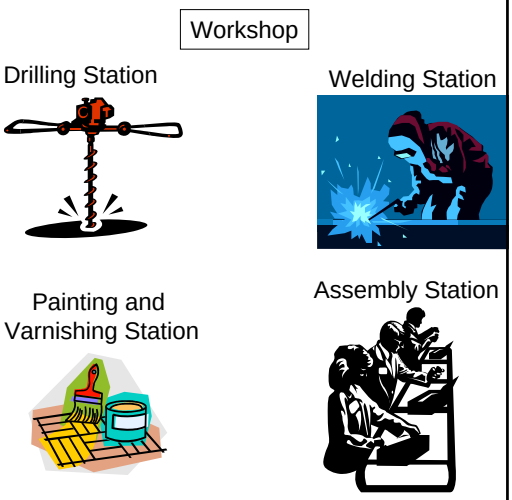
1. 200 wooden toy cars in blue
2. 12 unpainted metal items with 100 holes and 2 welded joints each
3. 100 m of fence, 4 welded joints per 15 cm

- Which parts, raw materials, and supplies do we have order?
- What is the ideal date for ordering?
- What is the ideal ordering quantity, taking into account future consumption, lot sizes, and quantity discounts?

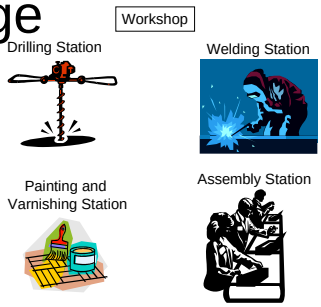
Example: Scheduling and Resource Usage

Pending Orders:

1. 200 wooden toy cars in blue, due Dec 10
2. 12 unpainted metal items with 100 holes and 2 welded joints each, due Dec 31
3. 100 m of fence, 4 welded joints per 15 cm, due Dec 20

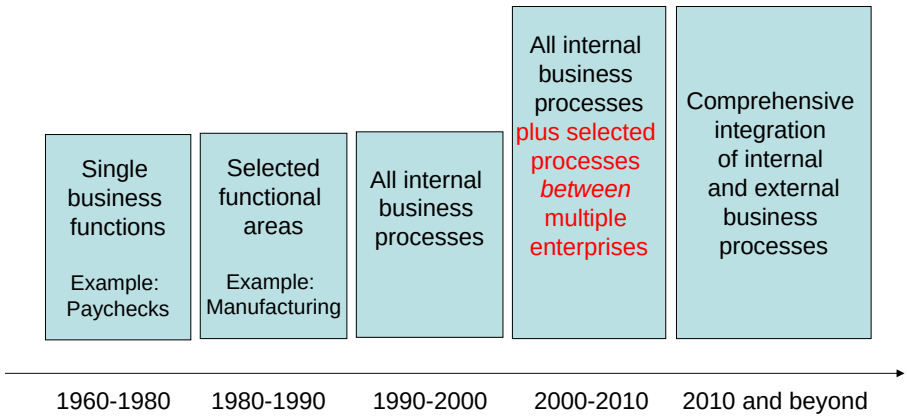


Example: Scheduling and Resource Usage



- Input
  - Quantities of output objects
  - List of tasks per object
  - Constraints on the order of execution of a task
    - Some tasks require completion of other task, some don't
  - Throughput per station per task
    - Example: One welded joint of 10 cm length blocks the welding station for 10 minutes
  - Promised delivery dates
- Output: Production Plan
  - What should be done when on which station?
  - Can we meet the promised delivery dates?

Evolution of Integrated Business Information Systems

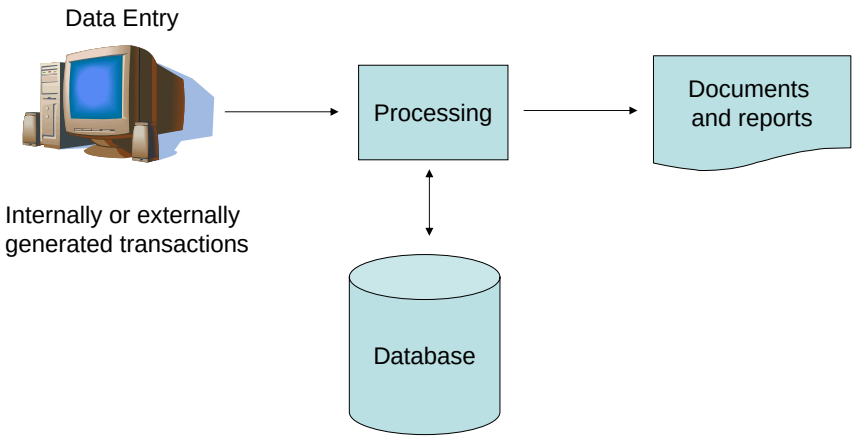


based on Hansen/Neumann p. 529

Structure of the Unit

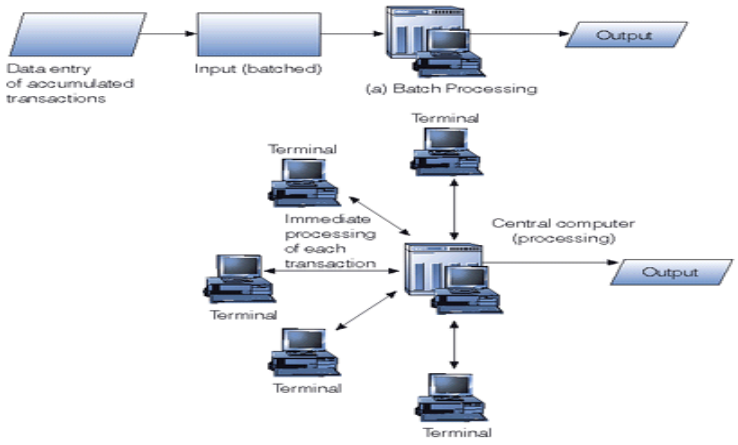
- Overview
- Transaction Processing Systems (TSPs)
- Material Requirements Planning (MRP)
- Manufacturing Resource Planning (MRPII)
- Enterprise Resource Planning (ERP)

Transaction Processing Systems



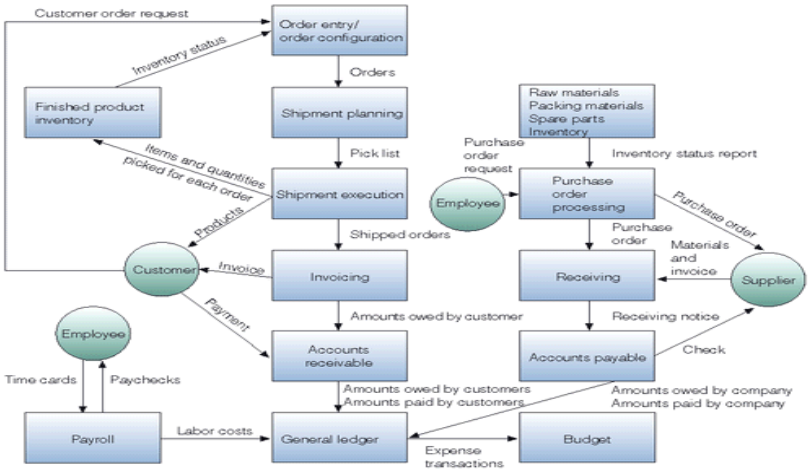
Cf. Stair / Reynolds

Batch versus On-Line Transaction Processing



Cf. Stair/Reynolds

Integration of a Firm's TPSs



Cf. Stair/Reynolds

Structure of the Unit

- Overview
- Transaction Processing Systems (TSPs)
- Material Requirements Planning (MRP)
- Manufacturing Resource Planning (MRPII)
- Enterprise Resource Planning (ERP)

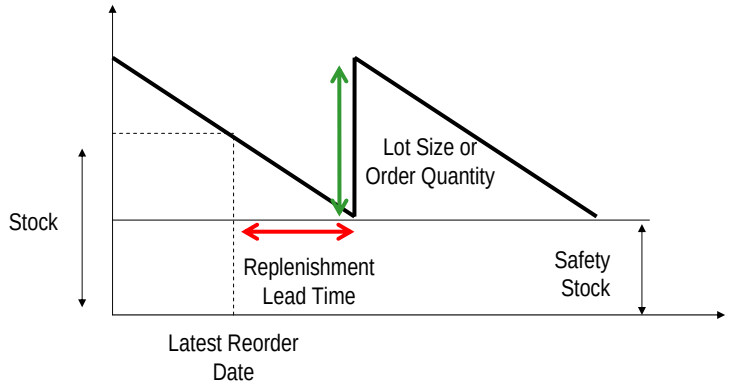
Inventory Planning: Stochastic vs. Deterministic

- **Stochastic:** Based on *past consumption*
  - requires a rather stable demand
- **Deterministic:** Based on *pending orders*
  - for varying demand or costly parts
  - more precise
  - delays production (why?)

Safety Stock

- Minimum inventory level; inventory should never fall below that limit
- Keeps production running
- Determined based on experience and statistical analysis

Inventory Management: Reorder Time

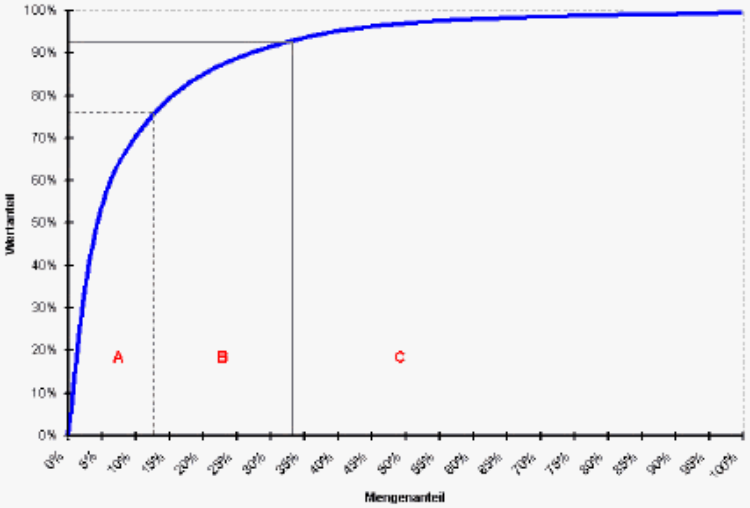


cf. Wigand et al. (2003)

ABC Analysis

- Classification of Products and Parts into
  - A: Important and huge part of the inventory value
  - B: Medium importantce and impact on the inventory value
  - C: Low importance, low impact on the inventory value
- Can be done automatically
- Important for Sourcing Strategy
  - Single vs. multiple sourcing
  - Type of reordering approach (stochastic vs. deterministic)
  - Focus of improvement efforts to category A parts

ABC Analysis (2)



XYZ Analysis

- Idea: Classify goods by the amount and cause of variance in demand

Category	Amount and cause of variance	Predictibility
X	Rather constant demand	High
Y	More significant variation in demand, often due to seasonal effects	Medium
Z	Lack of pattern in demand; „chaotic“	Low

Cf. Mertens

MRP –
Material Requirements Planning

- Idea: Use a computer to determine the amount of parts and raw materials, based on
  - pending orders and
  - inventory levels
- Demand between products can be interrelated
  - An item can be both a final product and a component for another type of product

MRP – Input

- Pending Orders
- Bill of Material (BOM): A list of all the parts that are needed for assembling a certain product
- Inventory status data

Example: Material Requirements Planning

Pending Orders

- 10 blue ball pens
- 20 black ball pens
- 10 assorted pens (2 blue, 3 black, gift box)

Inventory

- 17 springs
- 1 m of spring Wire
- 20 ink cartridges blue
- 10 ink cartridges black
- 10 body upper part
- 5 gift boxes

Bill of Materials

Blue pen: 1 spring, 1 body, 1 blue ink cartridge

Black pen: 1 spring, 1 body, 1 black ink cartridge

Spring: 10 cm of spring wire

Assorted pens: 2 blue pens, 3 black pens, 1 gift box

Material Requirements Planning

1. Decompose Master Production Schedule into required components
   - E.g. 5 Pens -> 5 pen bodies, 5 springs, 5 blue ink cartridges
2. Deduct available parts from resulting quantities
3. If a part cannot be further decomposed, take the respective quantity as a gross ordering quantity
   - might be adjusted due to lot size and more economical ordering quantities
4. If a part can be further decomposed, go through steps 1 and 2 until step 3 is reached.

Example: Material Requirements Planning

Pending Orders

- 10 blue ball pens, 20 black ball pens
- 10 assortment of pens (2 blue, 3 black, gift box)

Bill of Materials

Blue ball pen: 1 spring, 1 pen body, 1 blue ink cartridge

Black ball pen: 1 spring, 1 pen body, 1 black ink cartridge

Spring: 10 cm of spring wire

Assortment of pens: 2 blue ball pens, 3 black ball pens, 1 gift box

Pen body: 1 body upper part, 1 pen tip

Inventory

- 17 springs
- 1 m of spring Wire
- 20 ink cartridges blue
- 10 ink cartridges black
- 10 body upper part
- 5 gift boxes

ID	Part	Inventory	Pending orders	Net material require-ments
1	Blue ball pen	0	10	?
2	Black ball pen	0	20	
3	Assortment of pens	0	10	
4	Spring	17	0	
5	Pen body	0	0	
6	Spring wire	1m	0	
7	Blue ink cartridges	20	0	
8	Black ink cartridges	10	0	
9	body upper part	10	0	
10	Pen tip	0	0	
11	Gift box	5	0	

Special form of Bill of Materials: **Variant Parts Lists**

- **Problem:** The amount of BoMs can explode due to variants that are distinct only in a small detail
- **Idea:** Variants can be described by taking a existing part or final product and removing old and adding new parts
- Example:
  - Golf Turbo = 1 Golf Standard
    - 1 Standard Engine
    + 1 Turbo Engine

Advantages and Constraints of MRP

Advantages: Demand, inventory, ordering, and production is based on consolidated planning accross all levels of production

Disadvantages:

- Correct inventory data is key
- Use of machinery, workstations, and human resources is not included
- No support for production scheduling

Structure of the Unit

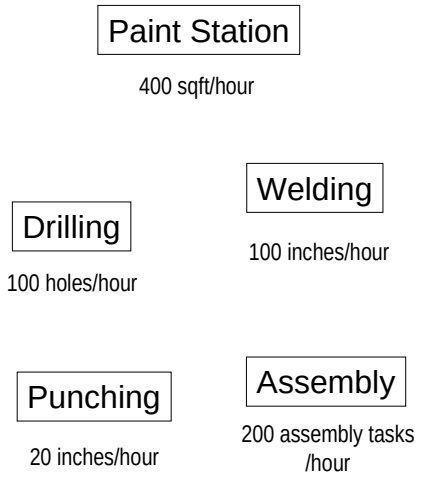
- Overview
- Transaction Processing Systems (TSPs)
- Material Requirements Planning (MRP)
- Manufacturing Resource Planning (MRPII)
- Enterprise Resource Planning (ERP)

MRPII – Manufacturing Resource Planning

- Includes requires workstation time, employees, and other resources.
- Capacity restrictions are included in the planning process.

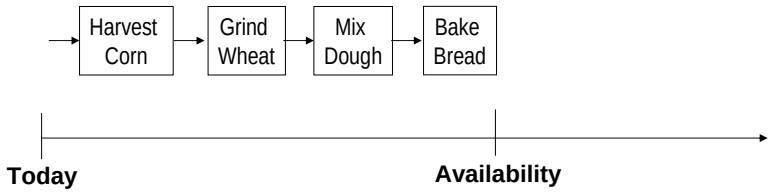
Production Planning Problems

1. In which order should a stack of pending orders be produced?
2. Should pending orders be split into batches?
3. If there is choice in the sequencing of tasks, which is the ideal sequence?



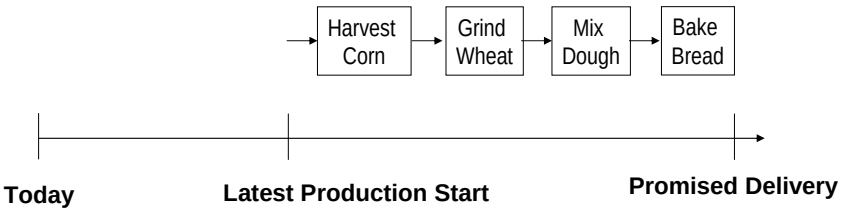
Forward Scheduling

Goal: Determine earliest availability date if production run is started today



Backward Scheduling

Goal: Determine latest production start for a given delivery date



Structure of the Unit

- Overview
- Transaction Processing Systems (TSPs)
- Material Requirements Planning (MRP)
- Manufacturing Resource Planning (MRPII)
- Enterprise Resource Planning (ERP)

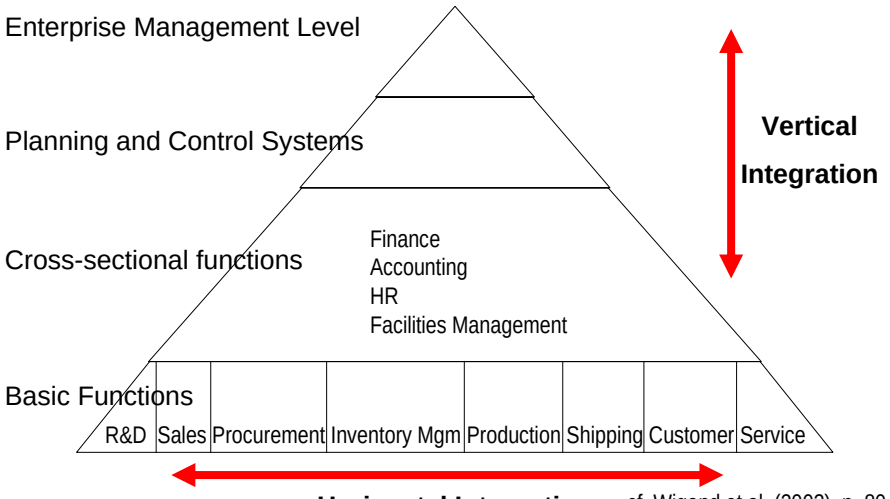
Enterprise-wide Planning Scope

- Due to the complexity and degree of interdependencies, local planning scope is inefficient. Examples:
  - ordering the same part for each order individually
  - ordering a part that is already on stock in another department
  - blocking one scarce workstation with an unimportant order
- Enterprise-wide planning will result in better decision-making regarding inventory, procurement, production, and scheduling.

But:

- This requires a consistent representation of **all data in the enterprise.**

Process Integration



cf. Wigand et al. (2003), p. 80

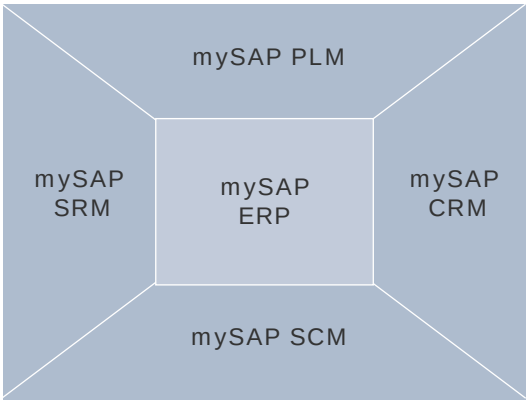
The Idea of Enterprise Resource Planning (ERP)

- Planning of the usage of resources *from the perspective of the overall enterprise.*
- Capital, machinery, parts, human resources,…
- Usually on the basis of ERP *software*

ERP: One Integrated Planning System

- One database and data model across the enterprise
  - e.g. human resource data and staffing data for production planning come from the same database
- Consolidated and harmonized planning on all levels
- Best Practise Process Library

mySAP Business Suite



Industry Best Practices

Adaptive Operations

Extensible with xApps

http://www.cio.com/research/erp/edit/erpbasics.html

Advantages of ERP

- Eliminates costly, inflexible legacy systems
- Improved technology infrastructure
- Improved work processes
- Increased data access for decision making

The Hidden Costs of ERP Deployment

- Training
- Integration and testing
- Customization
- Data conversion
- Data analysis
- Consultants ad infinitum
- Replacing your best and brightest
- Implementation teams can never stop
- Waiting for ROI
- Post-ERP depression

http://www.cio.com/research/erp/edit/erpbasics.html

Assignment for Next Week

- WI1, pp. 607-770; IBIS pp 161-167
- Thome/Schinzer/Hepp: Electronic Commerce und Electronic Business. Mehrwert durch Integration und Automation, 3rd edition, Vahlen, Munich 2005, Chapter 1.
- Review the slides

WI1 = Hansen/Neumann: Wirtschaftsinformatik 1; WI2 = Hansen/Neumann: Wirtschaftsinformatik 2; IBIS = Wigand et al: Introduction to Business Information Systems.

Thank you!

The slides and additional materials will be available at

http://www.heppnetz.de/teaching/gwi/