

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

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

2

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.

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

3

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?

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

4

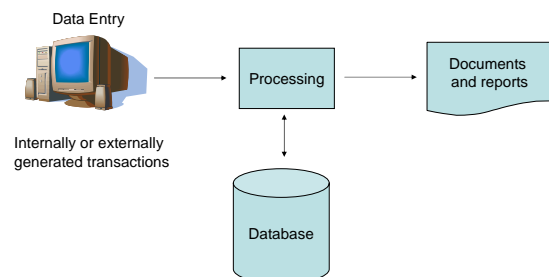
Structure of the Unit

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

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

5

Transaction Processing



Cf. Stair / Reynolds

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

6

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?

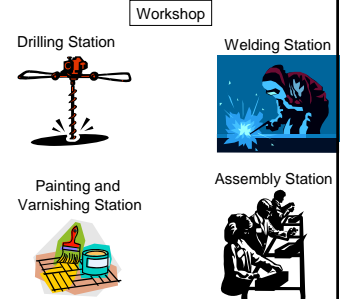
<http://www.heppnetz.de/teaching/gwi/>

7

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



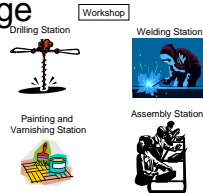
<http://www.heppnetz.de/teaching/gwi/>

8

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



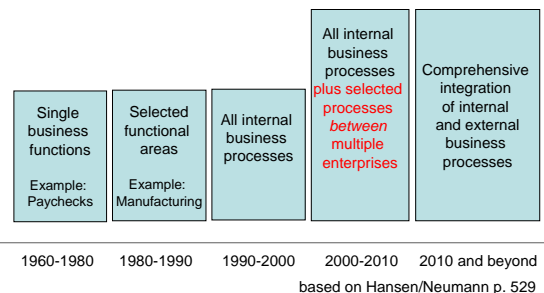
Output: Production Plan

- What should be done when on which station?
- Can we meet the promised delivery dates?

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

9

Evolution of Integrated Business Information Systems



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

10

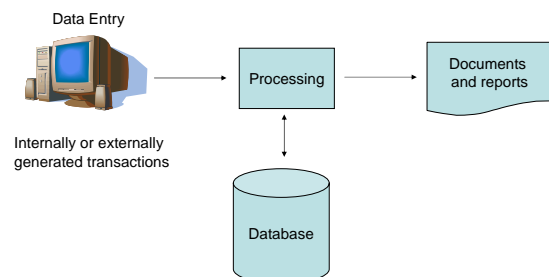
Structure of the Unit

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

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

11

Transaction Processing Systems

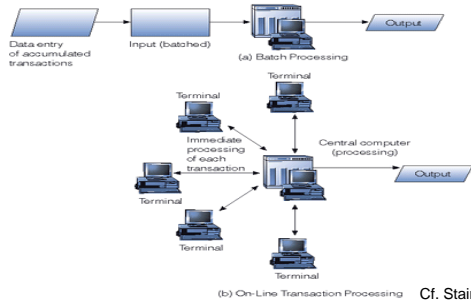


Cf. Stair / Reynolds

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

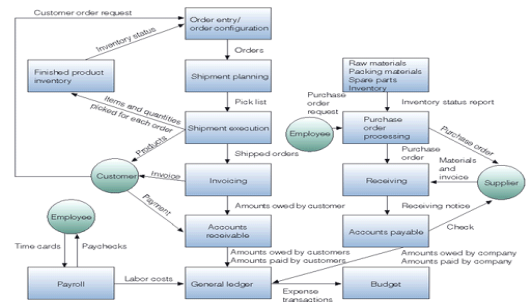
12

Batch versus On-Line Transaction Processing



Cf. Stair/Reynolds
<http://www.heppnetz.de/teaching/gwi/> 13

Integration of a Firm's TPSs



Cf. Stair/Reynolds
<http://www.heppnetz.de/teaching/gwi/> 14

Structure of the Unit

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

<http://www.heppnetz.de/teaching/gwi/> 15

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?)

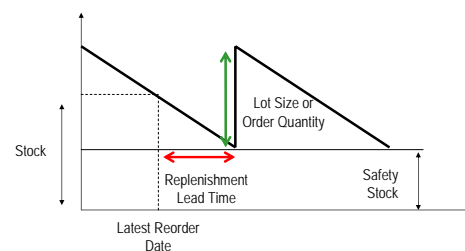
<http://www.heppnetz.de/teaching/gwi/> 16

Safety Stock

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

<http://www.heppnetz.de/teaching/gwi/> 17

Inventory Management: Reorder Time



cf. Wigand et al. (2003)
<http://www.heppnetz.de/teaching/gwi/> 18

ABC Analysis

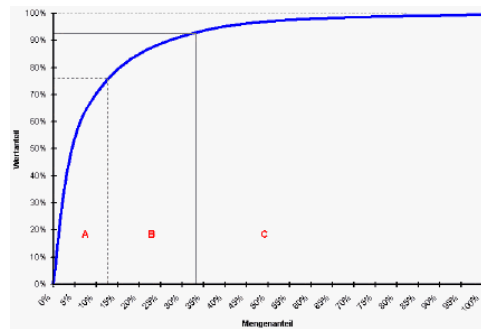
- Classification of Products and Parts into
 - A: Important and huge part of the inventory value
 - B: Medium importance and impact on the inventory value
 - C: Low importance, low impact on the inventory value
- Can be done automatically
- Important for Sourcing Strategy
 - Single vs. multiple sourcing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

– Focus of improvement efforts to category A parts

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

19

ABC Analysis (2)



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

20

XYZ Analysis

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

Category	Amount and cause of variance	Predictability
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

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

21

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

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

22

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

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

23

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



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

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.

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

25

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 requirements
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	

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

26

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

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

27

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

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

28

Structure of the Unit

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

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

29

MRPII – Manufacturing Resource Planning

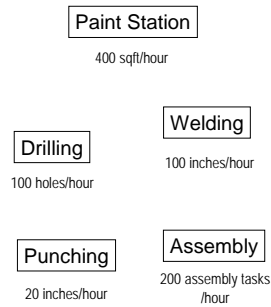
- Includes requires workstation time, employees, and other resources.
- Capacity restrictions are included in the planning process.

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

30

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?

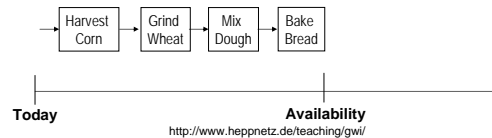


<http://www.heppnetz.de/teaching/gwi/>

31

Forward Scheduling

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

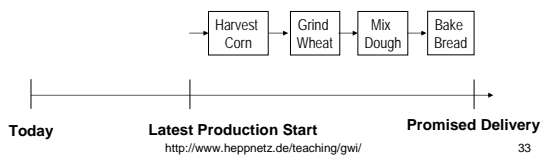


<http://www.heppnetz.de/teaching/gwi/>

32

Backward Scheduling

Goal: Determine latest production start for a given delivery date



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

33

Structure of the Unit

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

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

34

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.

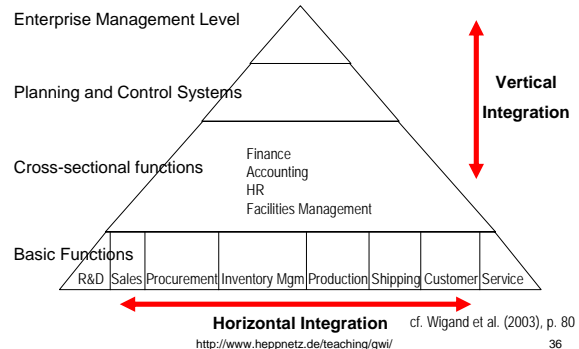
But:

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

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

35

Process Integration



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

36

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*

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

37

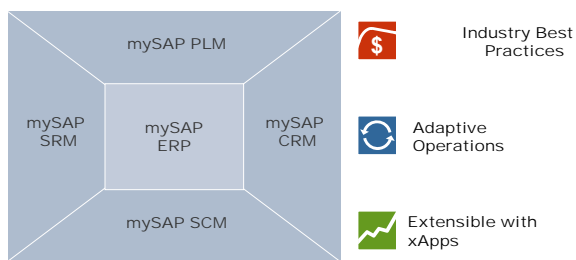
ERP: One Integrated Planning System

- 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

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

38

mySAP Business Suite



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

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

39

Advantages of ERP

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

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

40

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>

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

41

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.

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

42

Thank you!

The slides and additional materials will
be available at

<http://www.heppnetz.de/teaching/qwi/>