

# Grundzüge der Wirtschaftsinformatik *Introduction to Business Information Systems*

Unit 8

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<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

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## Assignment from last week

- WI1, pp. 323-523
- Review the slides

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

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## Link to the Previous Unit

- **Last Unit:**
  - Which security problems exist in networks, and what can we do to mitigate them?
  - Which methods and tools exist for designing and developing software for business problems?
  - Which notations exist for representing data structures and program execution?
- **Today:**
  - What kind of application software exists for typical office tasks?

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## Structure of the Unit

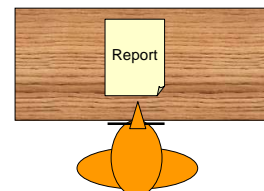
- **Overview**
- Word Processors
- Spreadsheet Software
- Graphics Software
- Databases and Database Management Systems
- Data Compression
- Computer-supported Collaborative Work (CSWC)

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## Characteristics of Office Tasks

- Weakly structured
- Ad-hoc
- Substantial information processing by humans
- Collaboration with others
- Constrained by availability of resources
- Individual preferences

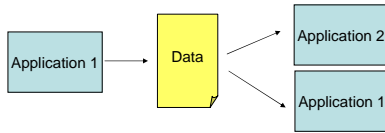


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## Goals and Benefits of Office Software

- Improve
  - Efficiency
  - Timeliness
  - Quality of information and decisions
- Improve data and process integration



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## Types of Office Tasks

- Exceptional cases that require individual solutions
  - Example: Planning a site visit by the CEO
- Domain-specific tasks that can only be modeled partially
  - Example: Preparing a quotation/offer
- Repetitive tasks that can completely be implemented as software
  - Example: Compute the total sales at the end of a day

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## Data Integration

- **Traditional, but bad:** Each application stores its documents and data by itself
  - Example: Program 1 cannot access any data from program 2
- **Better:** As above, but the applications understand file formats of other applications
  - Example: Program 1 can read and import data from program 2 (but there are redundancies)
- **Best:** One fact in one place!
  - Example: Applications use a shared database for storing their data

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## Structure of the Unit

- Overview
- **Word Processors**
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- Graphics Software
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- Data Compression
- Computer-supported Collaborative Work (CSWC)

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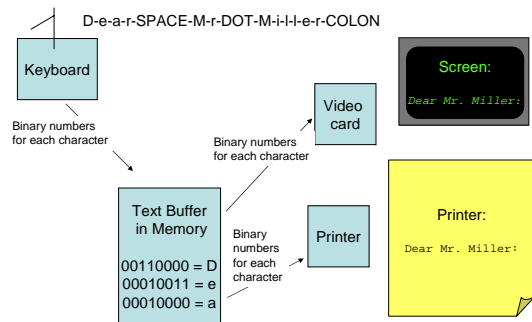
## Word Processing

- Software for entering, editing, and rendering textual information
- One of the first applications for using computers in offices (~1970s)
- Basic principle:
  - Keyboard converts characters and symbols into binary numbers and stores them in a buffer
  - Software displays the buffer or a part of the buffer
  - Software sends final buffer to a printer

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## Word Processing: Principle



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## WYSIWYG – What you see is what you get

```
<
LARGE>This text is
A
large<END_LARGE>,
R
ITALICS>this
G
italicized<END_ITALICS>,
E
nd <BLUE>this one is
S
et in blue<END_BLUE>.
H
ere is a picture <IMAGE
hhepp.jpg, size 100x200>
Explicit formatting instructions
```

t  
e  
x  
t



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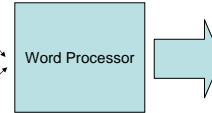
## Mail Merge

### Template

Dear <NAME>:  
I would like to invite you to my birthday party.  
Mary

### Data

Peter  
Judy  
Linda



Dear **Peter**:  
I would like to invite you to my birthday party.  
Mary

Dear **Judy**:  
I would like to invite you to my birthday party.  
Mary

Dear **Linda**:  
I would like to invite you to my birthday party.  
Mary

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## Spreadsheet Fundamentals

- Spreadsheet: An application that stores values and expressions in a matrix.
- Each expression can refer to the content of another cell
  - Example:  $A4 = A3 + A2$
- The software updates all computations immediately.

	A	B	C
1	No	Name	Price
2	1	Corvette	12056.00
3	2	Dodge	5000.72
4		Total	17056.72

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## Spreadsheet Fundamentals

	Column		
Row	A1	B1	C1
	A2	B2	C2
	A3	B3	C3
	A4	B4	C4

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## References and Formulae

	Column
Row	A1
	A2
	A3
	= SUM(A1:A3)

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## References and Formulae

	Column		
Row	A1	B1	C1
A2		=A1+B2	C2
A3		B3	C3
A4		B4	C4

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## Instant Refresh

	Column		
Row	A1	B1	C1
A2		=A1+B2	C2
A3		B3	C3
A4		B4	C4

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## Absolute and Relative References

- A1 – Column and Row are relative
- $\$A\$1$  – Column and Row are absolute  
– won't change when pasted into a new cell
- $\$A1$  – Column absolute, Row relative
- $A\$1$  – Column relative, Row absolute

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## Absolute and Relative References

	Column		
Row	A1	B1	C1
A2		= $\$A\$1+C1$	C2
A3		B3	C3
A4		B4	C4

$\$A\$1+B1$     $\$A\$1+D1$   
 $\$A\$1+B3$     $\$A\$1+C3$     $\$A\$1+D3$

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## Absolute and Relative References

	Column		
Row	A1	B1	C1
A2		= $\$A1+C1$	C2
A3		B3	C3
A4		B4	C4

$\$A1+B1$     $\$A1+D1$   
 $\$A3+B3$     $\$A3+C3$     $\$A3+D3$

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## Absolute and Relative References

	Column		
Row	A1	B1	C1
A2		= $A\$1+C1$	C2
A3		B3	C3
A4		B4	C4

$\#REF!+B1$     $\#REF!+D1$   
 $\#REF!+B3$     $A\$1+C3$     $\#REF!+D3$

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## Formulae in MS Excel: AVERAGE

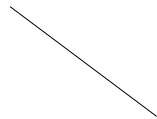
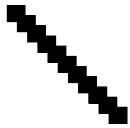
- = AVERAGE (1,2,3,5)
- = AVERAGE(B1:B5)
- = AVERAGE (B1, A3, A4)

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## Graphics Software

- Pixel-based
- Vector-based

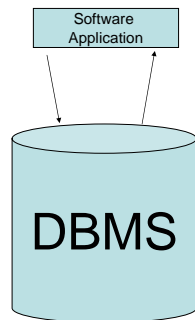


## Structure of the Unit

- Overview
- Word Processors
- Spreadsheet Software
- Graphics Software
- Databases and Database Management Systems
- Data Compression
- Computer-supported Collaborative Work (CSWC)
- Security: Encryption and Digital Signatures

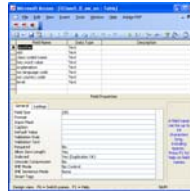
## Database Management Systems (DBMS)

- Software that allows storing and retrieving structured data
- The application or user does not have to think about how the data is actually stored.
- The database maintains additional structures that allow for quick access to the data.

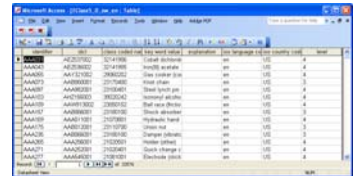


## Database Management Systems

- 1) Designing the schema (structure)



- 2) Entering data



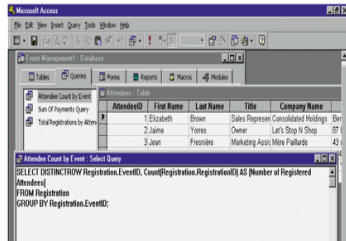
- 3) Querying the database

„Return all last names and telephone numbers of those customers that have a total sales volume > 500 Euro.“

## Structured Query Language (SQL)

FIGURE 5.15

Structured Query Language (SQL) has become an integral part of most relational database packages, as shown by this screen from Microsoft Access.



cf. Stair / Reynolds

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## Open Database Connectivity (ODBC)

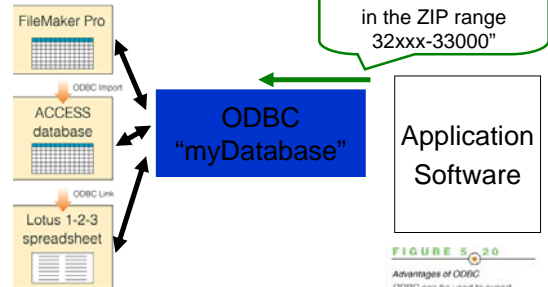


FIGURE 5.20

Advantages of ODBC  
ODBC can be used to export, import, or link tables between different applications.  
cf. Stair / Reynolds

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## Confused?

DBMS  
SQL  
Database  
ODBC

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## Database

DBMS  
ODBC  
SQL

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## Structure of the Unit

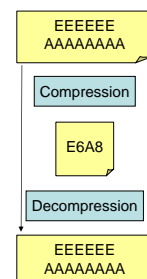
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- **Data Compression**
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- Security: Encryption and Digital Signatures

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## Data Compression

- A lot of data contains **redundancy**, i.e. repetitive patterns.
- Those can be abbreviated in order to reduce the file size.
- Simple algorithm: **Run-length encoding**
- Example:
  - EEEEEEEEEAAAAA could be written as E6A8 (= 6\*E, 8\*A)



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## Lossless vs. Lossy Data Compression:

- **Lossless:** All details of the original data can be restored
- **Lossy:** Some details are lost during the compression
- Example: ZIP
- Example: MP3, JPEG

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## CSWC

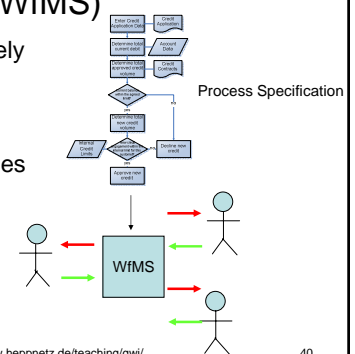
- How can computers support the collaboration of human actors?
  - Communication
  - Teamwork
  - Knowledge Management

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## Workflow Management Systems (WfMS)

- Software that actively coordinates the collaboration of individuals and systems in processes



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## Wikis

- Collaborative editing of documents over the Web with
  - with no need for software other than a Web browser
  - by everybody (without mandatory registration)
- First demonstrated by Ward Cunningham in 1994

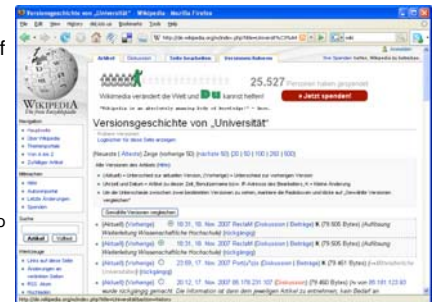


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## Why do Wikis work?

- Clever distribution of power between constructive and destructive users
  - Simple undo / revert
  - Large user base



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## Mindmapping

- Visual representation of terms and relations, mostly used for brainstorming and discussion
- Based on work by Tony Buzan (1971)



cf. Tony Buzan: An Encyclopedia of the Brain and Its Use, 1971

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## Assignment for Next 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.

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## Thank you!

The slides and additional materials will be available at

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

## Bonus Track ☺

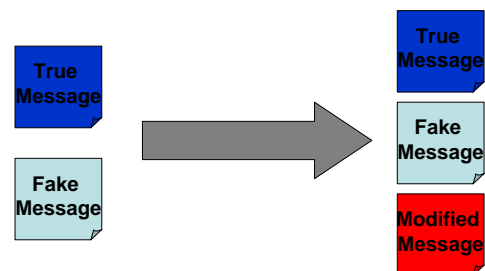
## Encryption and Digital Signatures

1. Protect your files and e-mails from unauthorized access.
2. Be sure that a message actually comes from the respective sender.
3. Make sure that the message has not been changed along the way.

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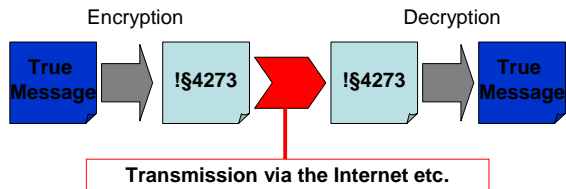
## Risks in Open Networks



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## Basic Principle of File Encryption



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## Simple Encryption Table

$A=B, B=C, C=D, D=E, \dots, Z=A$

ABBA  $\rightarrow$  BCCB  $\rightarrow$  ABBA

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## Frequency of Characters

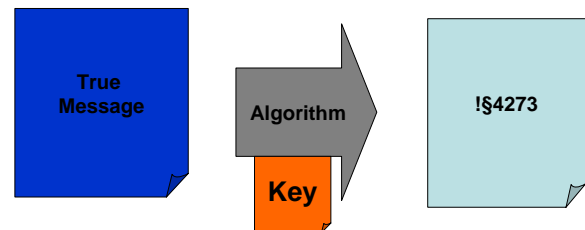
A = 2 %  
E = 20 %  
I = 13 %  
x = 0.04 %  
Y = 0.2 % etc.

Simple Character Substitution  
can be deciphered easily, as  
the frequency of each  
character remains available  
and can be used to  
reconstruct the code table.

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## Professional Encryption



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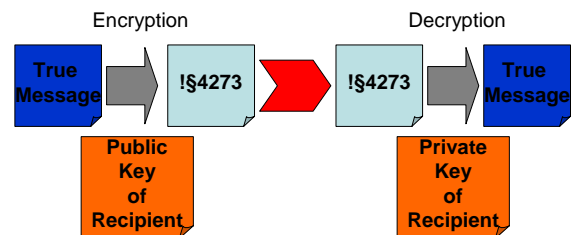
How do you transmit the private key?



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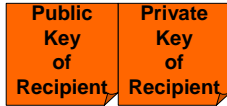
## Asymmetric Encryption



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## Pair of Keys



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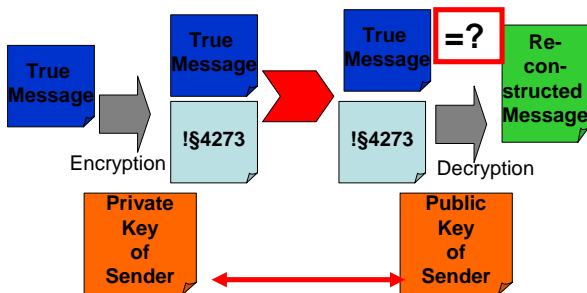
## Hybrid Approach

- Use asymmetric encryption to transmit a private key.
- Then use the private key for communications.
- Advantage: Much better performance.

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## Digital Signature



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How do you know that the public key is from the right person?



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## Certifying Authority (CA)

CA uses its **Private Key** to sign that Public Key A is the Public Key of Martin Hepp

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Thank you!

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