

Grundzüge der Wirtschaftsinformatik *Introduction to Business Information Systems*

Unit 8

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

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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

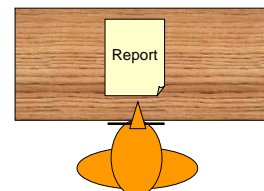
- **Overview**
- Word Processors
- Spreadsheet Software
- Graphics Software
- Databases and Database Management Systems
- Data Compression
- Computer-supported Collaborative Work (CSWC)

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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

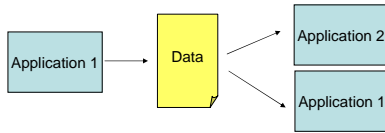


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Goals and Benefits of Office Software

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

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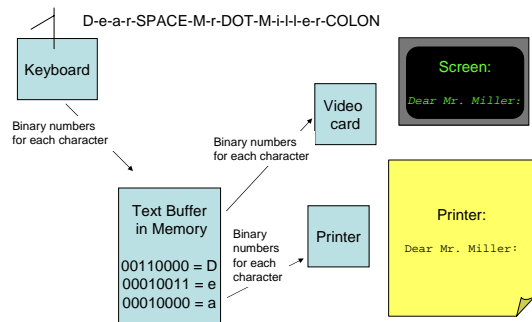
Word Processing

- 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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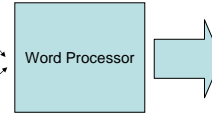
Mail Merge

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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Structure of the Unit

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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 |

$=\$A\$1+B1$ $=\$A\$1+B2$ $=\$A\$1+B3$ $=\$A\$1+B4$ $=\$A\$1+C1$ $=\$A\$1+C2$ $=\$A\$1+C3$ $=\$A\$1+C4$ $=\$A\$1+D1$ $=\$A\$1+D2$ $=\$A\$1+D3$

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Absolute and Relative References

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

$=\$A1+B1$ $=\$A1+B2$ $=\$A1+B3$ $=\$A1+B4$ $=\$A1+C1$ $=\$A1+C2$ $=\$A1+C3$ $=\$A1+C4$ $=\$A1+D1$ $=\$A1+D2$ $=\$A1+D3$

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Absolute and Relative References

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

$=\#REF!+B1$ $=\#REF!+B2$ $=\#REF!+B3$ $=\#REF!+B4$ $=A\$1+C1$ $=A\$1+C2$ $=A\$1+C3$ $=A\$1+C4$ $=B\$1+D1$ $=B\$1+D2$ $=B\$1+D3$

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Formulae in MS Excel: AVERAGE

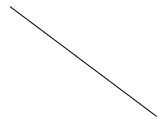
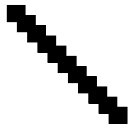
- = AVERAGE (1,2,3,5)
- = AVERAGE(B1:B5)
- = AVERAGE (B1, A3, A4)

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Graphics Software

- Pixel-based
- Vector-based

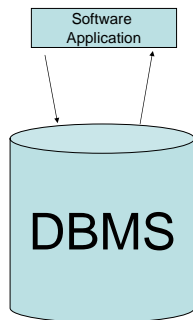


Structure of the Unit

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- Computer-supported Collaborative Work (CSWC)
- Security: Encryption and Digital Signatures

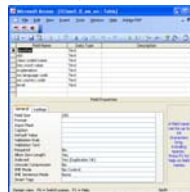
Database Management Systems (DBMS)

- 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.

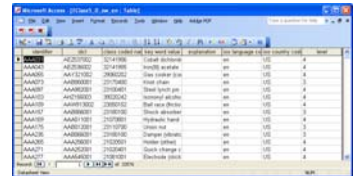


Database Management Systems

- 1) Designing the schema (structure)



- 2) Entering data



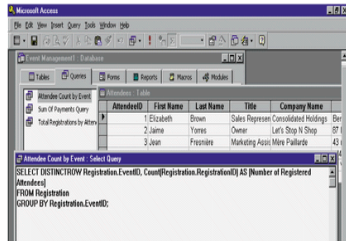
- 3) Querying the database

„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)

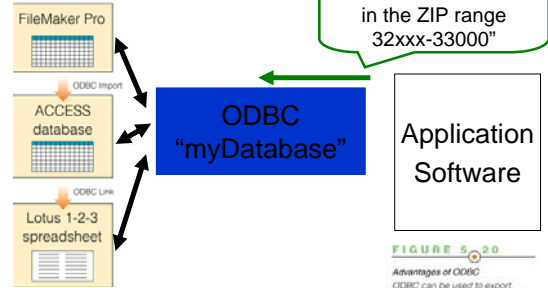


FIGURE 5.20

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

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

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Database

DBMS
ODBC
SQL

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Structure of the Unit

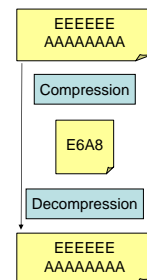
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Data Compression

- 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

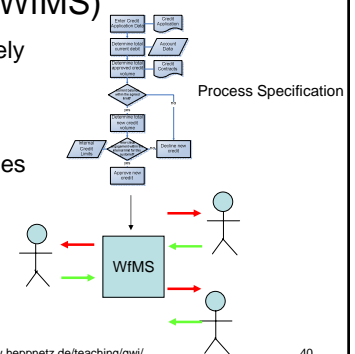
- How can computers support the collaboration of human actors?
 - Communication
 - Teamwork
 - Knowledge Management

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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

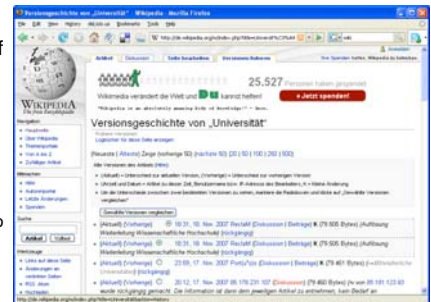


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Why do Wikis work?

- 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

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Thank you!

The slides and additional materials will be available at

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Bonus Track ☺

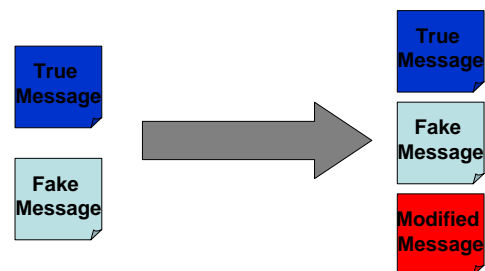
Encryption and Digital Signatures

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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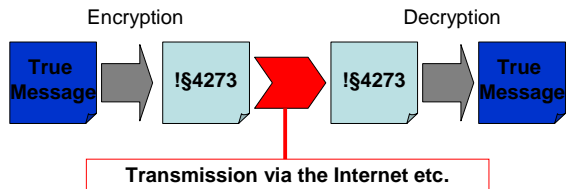
Risks in Open Networks



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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 → BCCB → ABBA

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Frequency of Characters

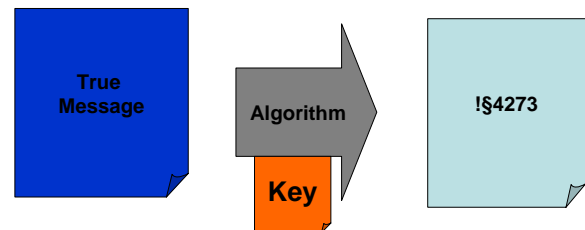
A = 2 %
 E = 20 %
 I = 13 %
 x = 0.04 %
 Y = 0.2 % etc.

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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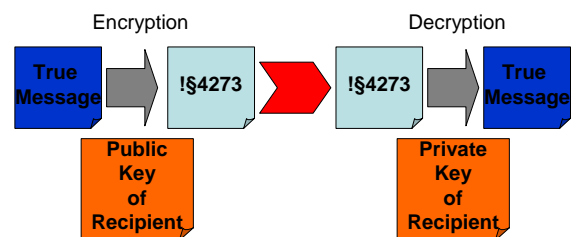
How do you transmit the private key?



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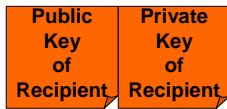
Asymmetric Encryption



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Pair of Keys



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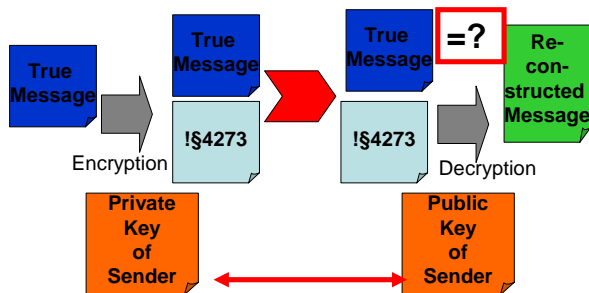
Hybrid Approach

- 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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