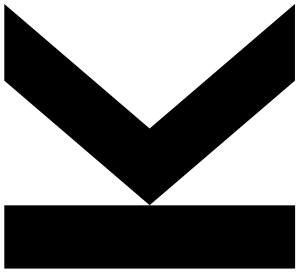
KV HUMAN/COMPUTER INTERACTION
UNIT 0



Gabriele Kotsis, Paul Grünbacher, Klaus Miesenberger

Winter Term 2022/2023

Thursday, October 6 2022, 10h15-11h00

Course Organization

- Objectives
- Topics
- Time Table
- Participation and Grading

What is HCI?

- Why HCI?
- Who are the users?
- What's a good user interface?
- HCI as an interdisciplinary subject

Literature

COURSE ORGANISATION

- Thursday, 10:15-11:45
- Hybrid mode
  - Lectures given in person in classroom and broadcasted via zoom (no recording)
  - Accompanying material (lecture slides, reading, discussion boards, educational videos, exercises …) via moodle
- Workload: 3 ECTS = 3 x 25 x 60 minutes = 4500 minutes

  Attending Lectures 13x90 = 1170 minutes

  Challenges 3x12x60 = 2160 minutes

  Self Studies, Learning 13x90 = 1170 Minutes

OBJECTIVES

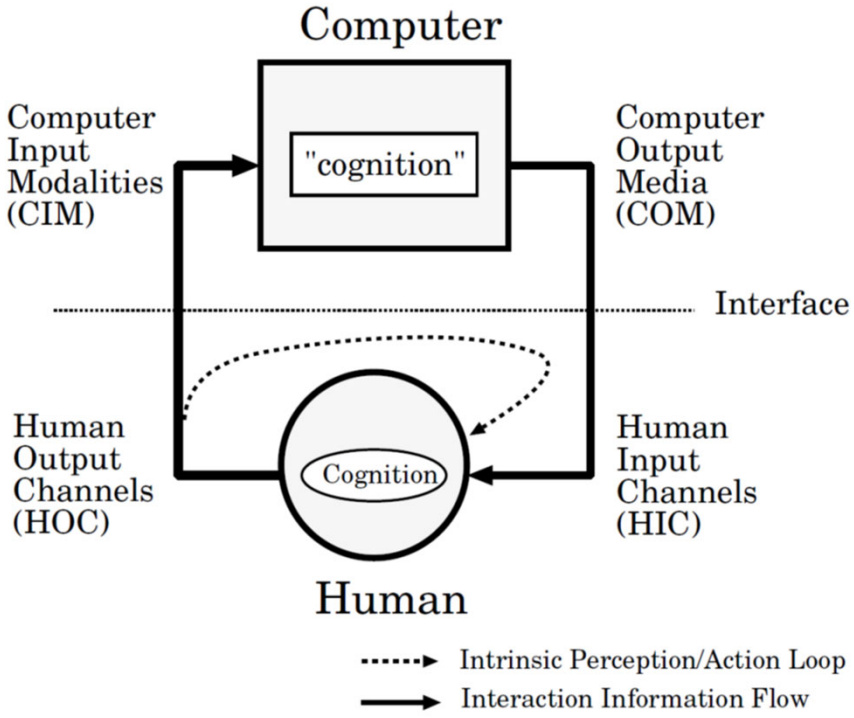
- Students will become familiar with the basics of human computer interaction from a **scientific and practical** point of view

- Students will understand how to **model** relevant aspects of HCI

WHAT IS A MODEL?

- A model is a simplified (abstract) representation of an entity, system, phenomenon, process, …

Example of a model:

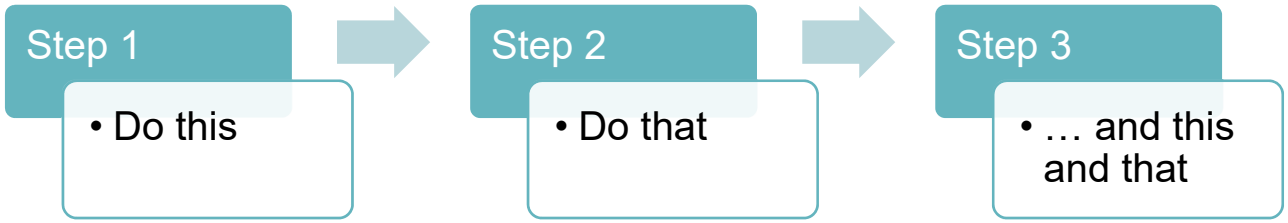


OBJECTIVES

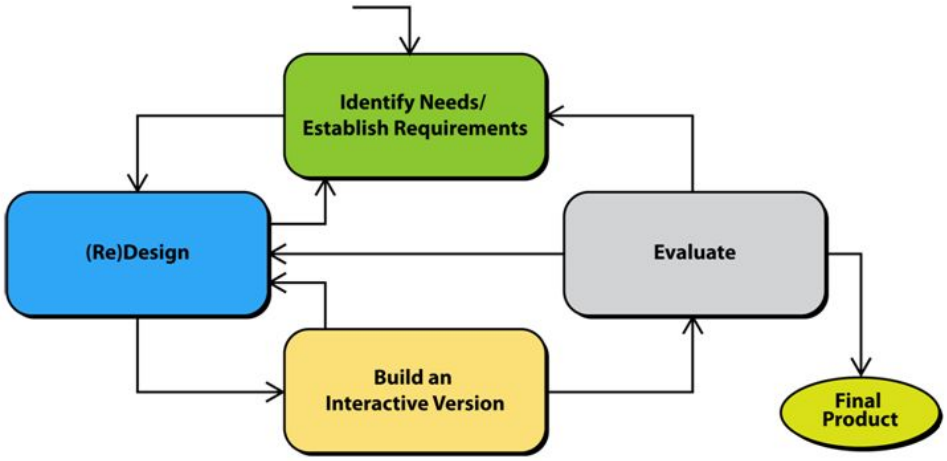
- Students will become familiar with the basics of human computer interaction from a **scientific and practical** point of view
- Students will understand how to **model** relevant aspects of HCI
- Students will be able to apply **methods** for the design, implementation, and evaluation of interfaces

WHAT IS A METHOD?

- a particular systematic or established procedure for accomplishing or approaching something



- In our context: “something” in the HCI lifecycle of design, implementation and evaluation



OBJECTIVES

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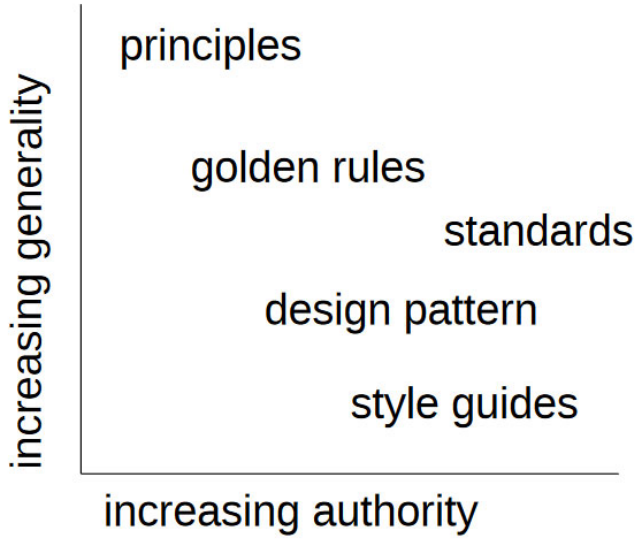
- Students will be able to apply **methods** for the design, implementation, and evaluation of interfaces
- Students will consider HCI **principles and rules** in their future projects

WHAT ARE PRINCIPLES AND RULES?

- Principles: abstract design rules
- Golden rules and heuristics: more concrete than principles
- Standards: (very) detailed design rules
- Design pattern: generic solution for a specific problem
- Style guides: provided for devices, operating systems, widget libraries

Generality: applied to many design situations or focused on specific application situation



Authority: whether or not a rule must be followed or whether it is just suggested

COURSE TOPICS

- Interaction Capabilities of Humans and Machines (GK)
- HCI Models (GK)
- Designing and Implementing User Interfaces (KM)
- Evaluating User Interfaces (PG)

TOPIC: CAPABILITIES OF HUMANS AND MACHINES

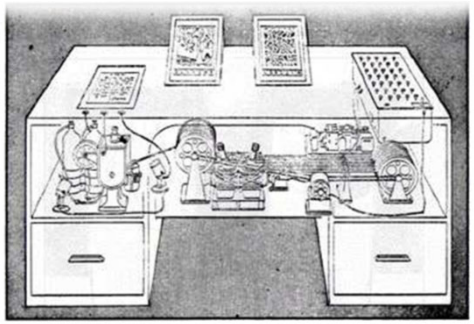
- **Human IO capabilities**
  - Human Perception
  - Human Attention
- **Computer IO devices**
  - Text/speech/data entry devices (keyboard, scanning, voice input, …)
  - Positioning and pointing (2D, 3D)
  - Displays and printers (2D, 3D)
  - Physical controls, implicit input, sensors and other special devices
- **Humand and Machine Information Processing**
- **Advanced Styles of Interaction**

TOPIC: HCI BASICS AND MODELS

- Interaction Types and Paradigms
  - Commands
  - Menues and forms
  - Direct manipulation 2D (WIMP)
  - Direct manipulation 3D (VR, AR, NUI)
  - Implicit versus explicit interaction
- Types of models
  - Behavioral, qualitative, and quantitative aspects
  - Formal, analytic, Explorative / descriptive, predictive
- When and how to apply models
  - Fitt´s Law, Steering Law, Hick´s Law, state model, GOMS, KLM, …

TOPIC: HCI AS A SOCIAL/ CULTURAL PROCESS

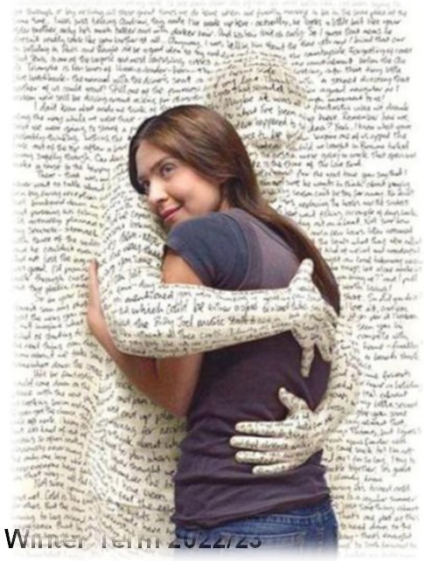
- **Digital Transformation and HCI**
  - History
  - The social role: digital transformation
  - Why

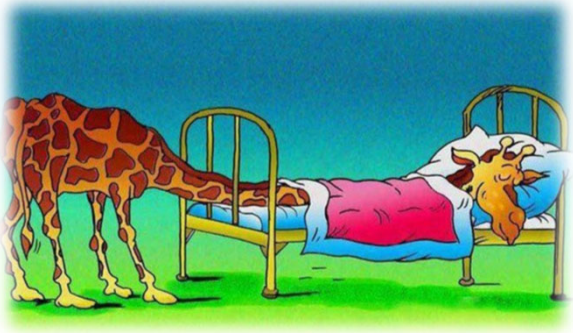


Memex in the form of a desk would instantly bring files and material on any subject to the operator's fingertips. Slanting translucent viewing screens magnify supermicrofilm filed by code numbers. At left is a mechanism which automatically photographs longhand notes, pictures and letters, then files them in the desk for future reference (LIFE 19(11), p. 123).

HCI supports success of ICT

Success of ICT demands for HCI

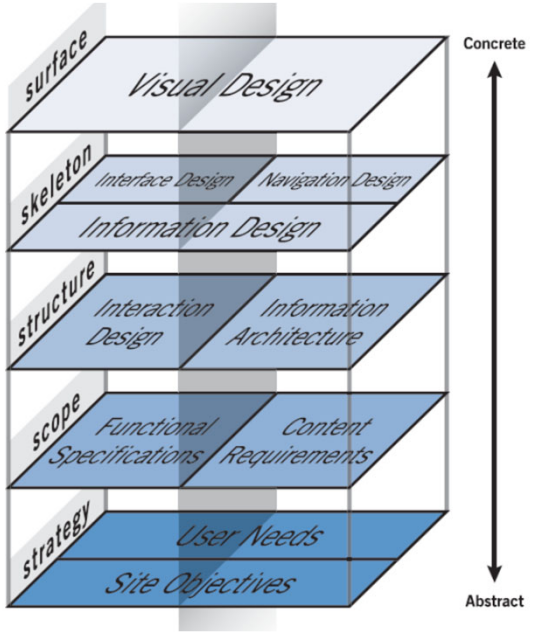


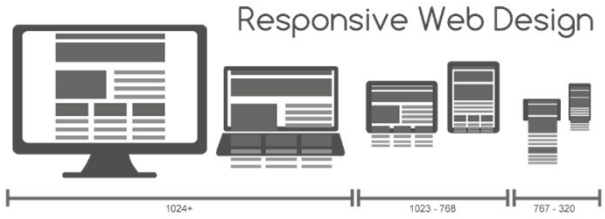


TOPIC: DESIGNING AND IMPLEMENTING HCI

- **"A bit of theory …"**
  - Gulf of execution and evaluation
  - Mental/Conceptual model
  - Affordance: signifier, metaphor
- **The Process of HCI**
  - The steps
  - Methods and tools
- **Design and Implementation**
  - Concepts
  - Libraries
  - Tools

Design Challenge





TOPIC: EVALUATING INTERACTIVE SYSTEMS

- **Why do we need to evaluate?**
  - Testing the usability and functionality of a system
  - Assessing the effects of interfaces on users
  - Revealing specific usability problems
- **Part I: Expert Evaluations of Designs**
  - Cognitive Walkthroughs
  - Heuristic Evaluation
- **Part II: Evaluation Through Participation of Users**
  - User Studies
    - Observational Techniques
    - Query Techniques
  - Controlled Experiments

Evaluation Challenge

TIME TABLE

Date	Topic	Lecturer
06.10.2022	Introduction	GK, KM, PG
13.10.2022	Human and Computer I/O Capabilities	GK
20.10.2022	Interaction Types and Paradigms	GK
27.10.2022	HCI as a (social and cultural) Process	KM
03.11.2022	HCI Models	GK
10.11.2022	Human and Machine Information Processing	GK
17.11.2022	Designing Interactive Systems I	KM
24.11.2022	Designing Interactive Systems II	KM
01.12.2022	Implementing Interactive Systems	KM
15.12.2022	Evaluating Interactive Systems I	PG
12.01.2023	Evaluating Interactive Systems II	PG
19.01.2023	Advanced Topics	GK
26.01.2023	Oral Exam (8-12:00)	GK, KM, PG

PARTICIPATION AND GRADING

- Who can participate?
  - Computer Science
  - Free elective for others
- Course components
  - Lecture, discussion, case studies
- Grading
  - 3 Challenges in groups (4-5 people) during the semester, max 25 points each
  - 1 Oral Exam (individually) at the end of the semester, max 25 points
  - Requirements for a positive grade
    - Complete at least two challenges with a score higher than 15
    - Pass the oral exam with a score higher than 15
  - Distribution of Grades
    - Reach at least 90 points in total -> “Sehr Gut”
    - Reach at least 80 points in total -> “Gut”
    - Reach at least 65 points in total -> “Befriedigend”
    - Reach at least 55 points in total -> “Genügend”

WHY HCI

- Shift from CHI to HCI

- 1980s desktop metaphor, guidelines, task-oriented
- 1990s workspaces, user->human, participatory design
- 2000s wide range of application and technology, cultural differences, users -> actors, participants
- 2010s implicit interaction, tangible interfaces
- 2020s ??

ONCE UPON A TIME …

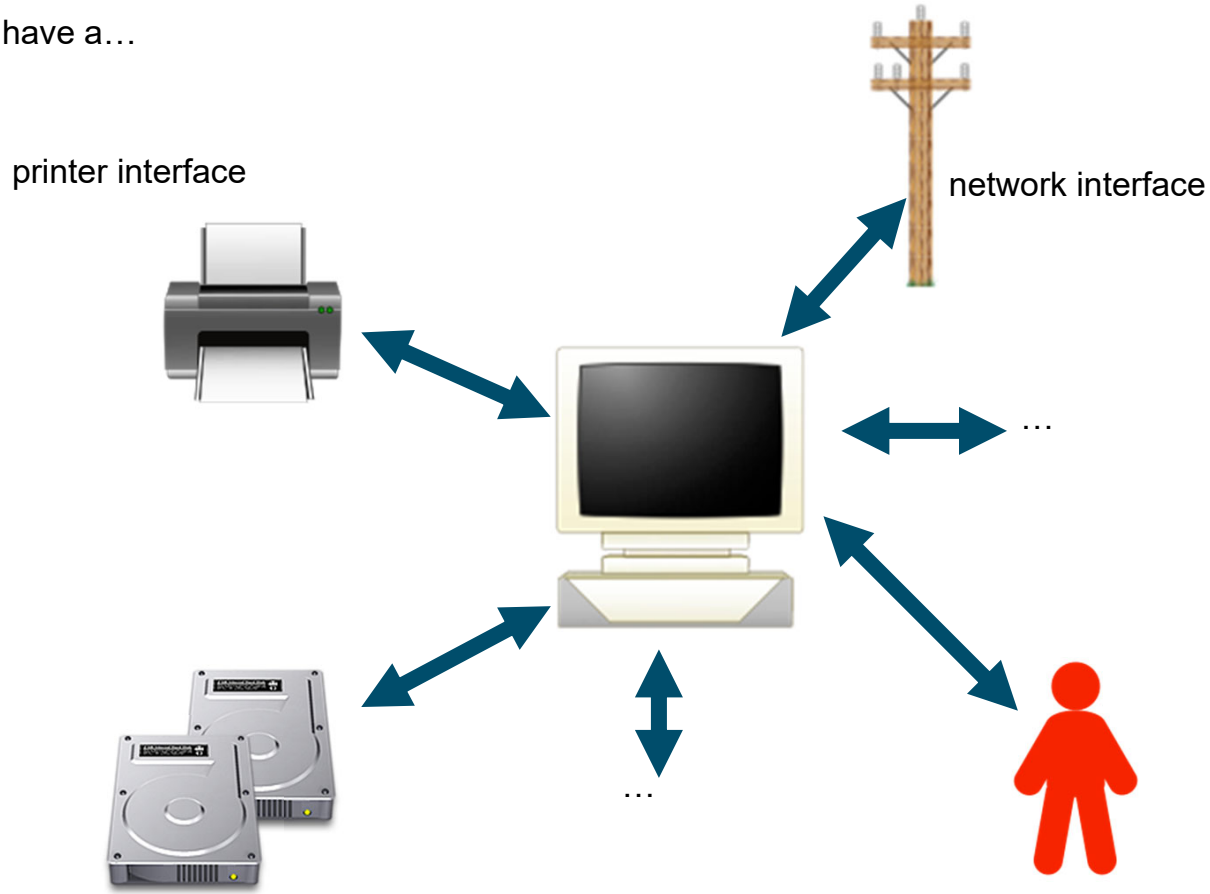
- Programmers develop user interfaces
- “Computer-centric” approach

```
WRITE("number of values:");
READ(n);
```

- Hard-wired business processes
  (programmer specifies the required steps)
- User = source of information
  (in case the program needs more data)
- Input prompts. Program acts, users react.

THE “USER INTERFACE”

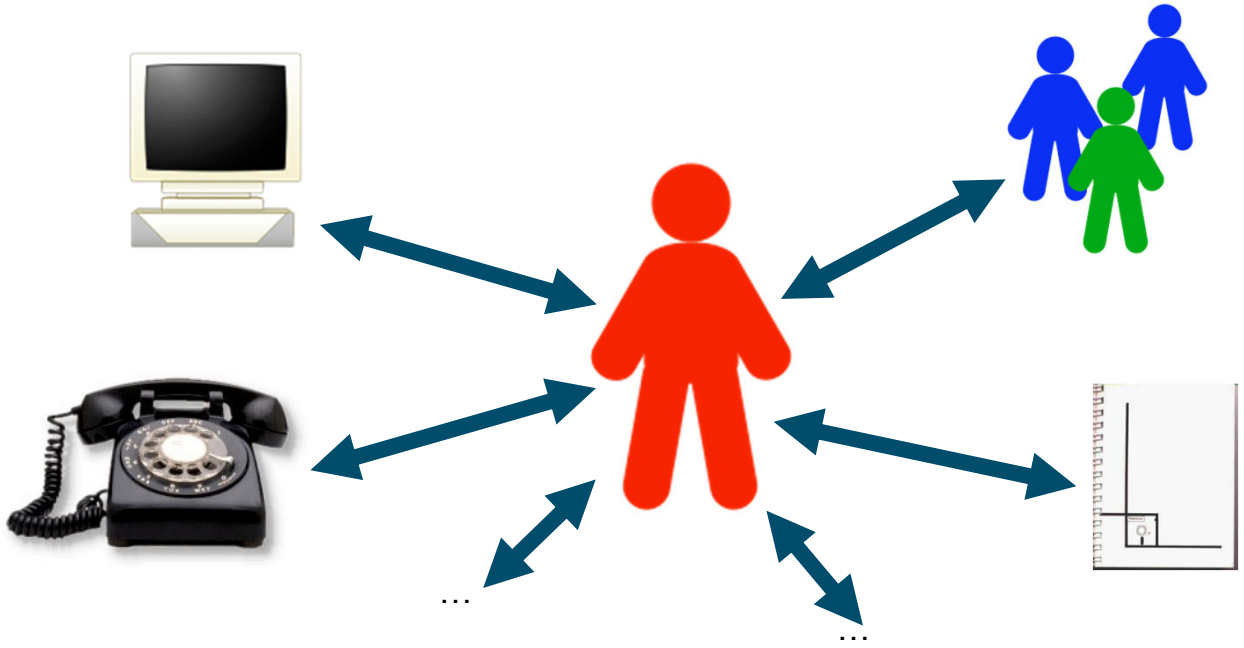
Computers have a…



… AND TODAY?

- UI developed by specialists
- Business processes in the real world
  contain many tasks that are done in parallel.
- User-oriented design, starts with users, helps them to perform their tasks.
  Observation: users are intelligent beings.
- Computer used as a problem solution tool.
- Users have many interfaces with their environment.

INTERFACES OF USERS



the Human/Computer Interface

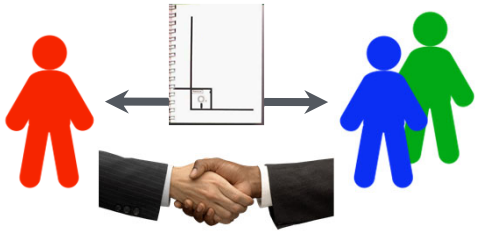
Humans first…

CONSEQUENCES OF THE NEW PERSPECTIVE

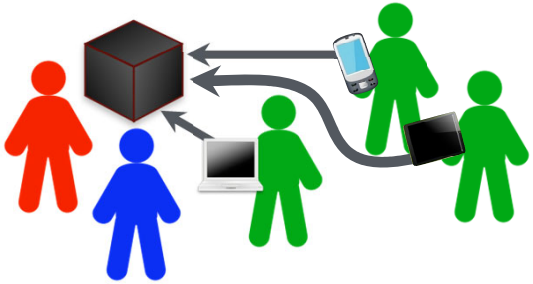
- Guidance of users is the exception
- Metaphors from the real world (documents, tools)
- User-centered design begins with the users' demands instead of the algorithms
- New hardware as immediate physical interface
- New programming techniques (event-oriented programming, OOP, components, plug-in architectures, agents, …)
- Cooperation with experts from other fields

WHO ARE THE USERS?

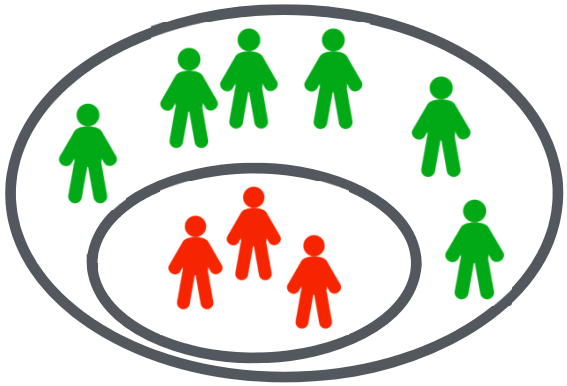
Classic client/developer contract



Public interface



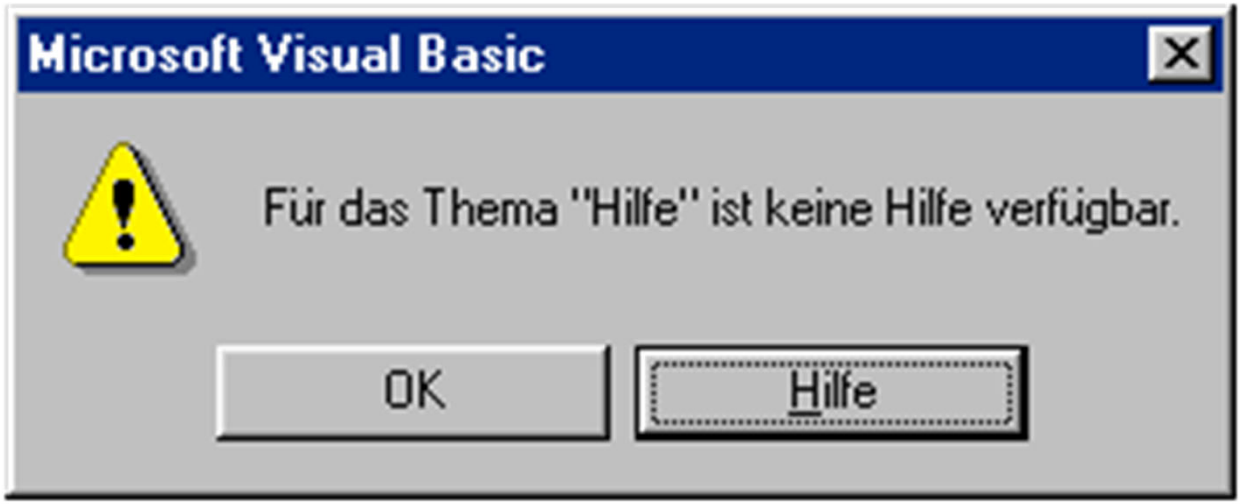
Software for the open market



Tools for the team

WHAT'S A GOOD USER INTERFACE?

- There is no absolute "right" or "wrong".
- Quality of a user interface depends on the users' judgement.
- Different groups of users have different skills, requirements, goals, tasks, …
- Usage context matters.
- Significant differences between:
  - "professionals" and "amateurs"
  - individuals and organizations



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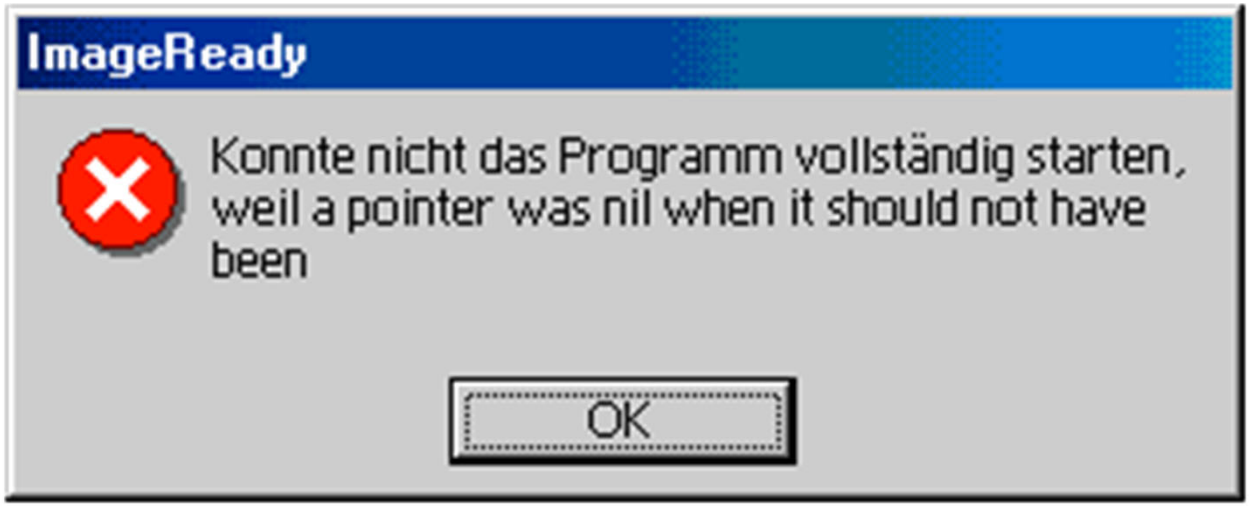
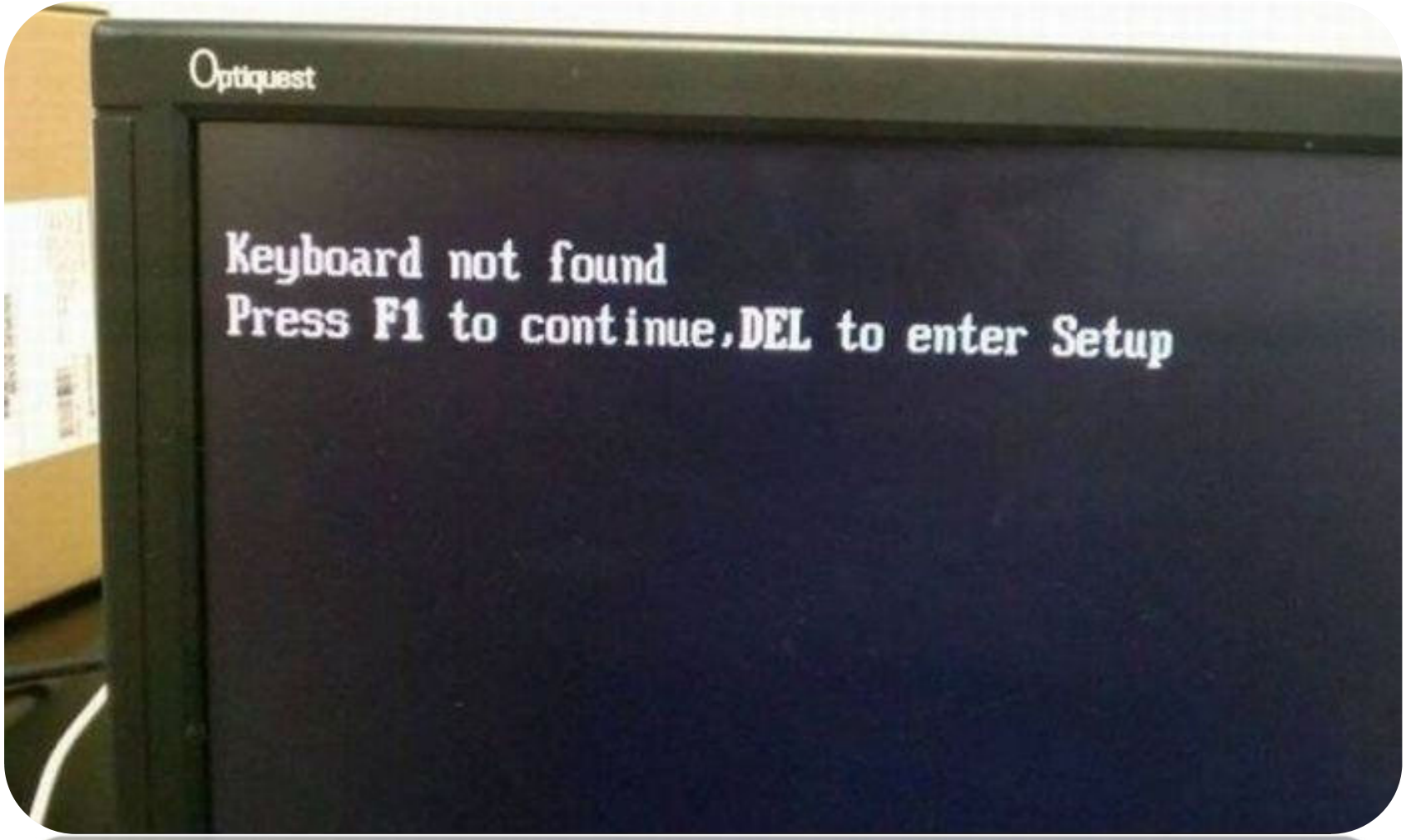



Optiquest
Keyboard not found
Press F1 to continue,DEL to enter Setup

WHAT'S A GOOD USER INTERFACE?

- Quality criteria

	Professionals	Amateurs	Individuals	Organizations
Speed	👍	👍	👍	👍
Consistency	👍	👍	👍	
Effectiveness				👍
Efficiency	👍		👍	
Profitability				👍
Learnability		👍		
Versatility	👍			
Simplicity		👍		
Power	👍			

POOR UI DESIGN IS A MAJOR COST FACTOR

Assumptions:

- “bad” UI costs 1 minute per hour
- used 3 hours per day
- 200 working days per year
- 2000 employees
- 60KEUR per employee and year

Effects:

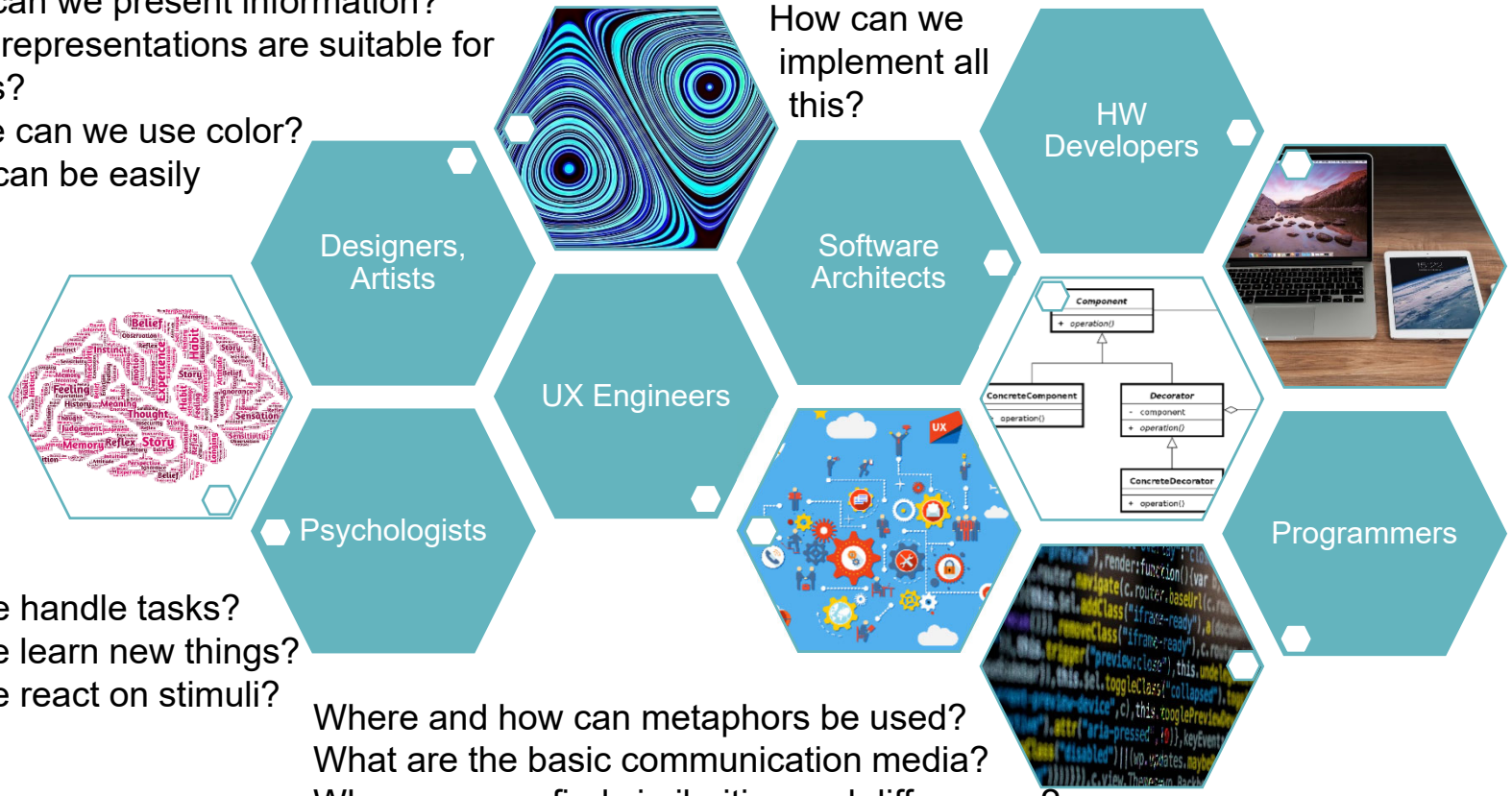
- 3 minutes per day and user
- 10 hours per user and year.
- 100 working hours lost every day, i.e. 12.5 employee equivalents
- 0.75 Mio Eur loss per year

HCI AS AN INTERDISCIPLINARY SUBJECT

In which ways can we present information?
Which types of representations are suitable for which purposes?
How and where can we use color?
Which shapes can be easily understood?

Which types of data do we need to process?
What are the business processes?
How can we break the system into manageable parts?
How can we connect the UI with the rest of the system?

How can we implement all this?



How do people handle tasks?
How do people learn new things?
How do people react on stimuli?

Where and how can metaphors be used?
What are the basic communication media?
Where can we find similarities and differences?
Which general guidelines can be established?

LITERATURE

- **Dix, Finley, Abowd, Beale: Human-Computer Interaction, Prentice Hall, 3rd ed. 2003**
- Balzert: Software-Ergonomie, Teubner 1991
- Norman: Emotional Design – Why We Love (or Hate) Everyday Things, Basic Books, 2004
- Preim, Dachselt: Interaktive Systeme (Band I und II), Springer 2010 and 2015
- Shneidermann: Designing the User Interface: Strategies for Effective Human-Computer Interaction, Pearson, 2009