Human-Computer Interaction

1—Introduction

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WS 2010/2011

Dr. Jürgen Steimle
Jochen Huber
Mohammadreza Khalilbeigi
Simon Olberding

Technische Universität Darmstadt
Department of Computer Science
Telecooperation Lab

Lehrstuhl Telekooperation

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- Head: Prof. Dr. Max Mühlhäuser
- Telecooperation = targeted cooperation between and among *networked people*, *computers* and *things*
- Research Area: Ubiquitous Computing

Lehrstuhl Telekooperation: Research Fields

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Cooperation

- Peer-to-Peer Networks
- Smart Environments
- Ambient Learning & Knowledge Work

Interaction

- **Tangible Interaction**
- Smart Interaction
- Model Driven Interaction
- Talk‘n‘Touch Interaction

Protection

- Security in UbiComp
- Trust & Privacy Models
- Public Security

Tangible Interaction - Our Vision

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Make user interfaces

- more natural
- more playful
- “invisible”: more seamlessly integrated into the everyday world

→ Integrate user interfaces into objects of the everyday life

Who are we?

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- Dr. Jürgen Steimle
  - Studied CS at U Freiburg & U Lyon
  - Ph.D CS at TU Darmstadt
  - Post-Doc & Area head at TU Darmstadt
  - Research area: Tangible Interaction

Who are we?

TECHNISCHE UNIVERSITÄT DARMSTADT

- Dipl.-Inform., Dipl.-Math. Jochen Huber
  - Diplom, TU Darmstadt
  - Doctoral Candidate TU Darmstadt
  - Research area: Mobile multimedia interaction

Who are we?

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- Mohammadreza Khalilbeigi, M.Sc.
  - B.Sc. Intl. University of Kish
  - M.Sc. RWTH Aachen
  - Doctoral Candidate TU Darmstadt
  - Research area: Interactive surfaces

Who are we?

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- Simon Olberding, M.Sc.
  - B.Sc. & M.Sc. CS TU Darmstadt
  - Doctoral Candidate TU Darmstadt
  - Research area: Paper-based computing

And you?

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???

Organisation (1)

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- V2 Lecture, 2 SWS, 3 CPs
- No assignments
- Final exam
  - written or oral (depending on number of participants)
  - in German language
  - calendar week 9/2011 (Feb 28 – Mar 4)
- Registration via TUCaN is mandatory (starting Dec 1)
- Optional: practical lab course (vertiefendes Praktikum)
  - P4 Praktikum, 6 CPs
  - Topics will be announced next week

Organisation (2)

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- Course webpage
  - www.tk.informatik.tu-darmstadt.de -> Teaching -> WS 2010/11 -> HCI
  - Username: student
  - Password: hcistd2010

Literature

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- *Donald Norman:*
  The Design of Everyday Things (DOET)
- Yvonne Rogers, Helen Sharp and Jenny Preece:
  Interaction Design: Beyond Human-Computer Interaction
- Alan Dix et al.:
  Human-computer Interaction

Agenda

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- **Approaching Human-Computer Interaction: Example videos**
- Definition of HCI, Course Topics
- What is good/poor design?
- Design goals: Usability and User experience

Human-Computer Interaction: Example Videos

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- BumpTop 3D Desktop (U Toronto)
- Inflatable Mouse (KAIST)
- Microsoft Surface (Microsoft)
- CoScribe: Digital Pen and Paper (TU Darmstadt)
- Xpaaand: Rollable Display (TU Darmstadt)
- Wipe‘n‘Watch: Mobile Video Navigation (TU Darmstadt)
- Sixth Sense (MIT Media Lab)

Agenda

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- Approaching Human-Computer Interaction: Example videos
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- Design goals: Usability and User experience

Human-Computer Interaction

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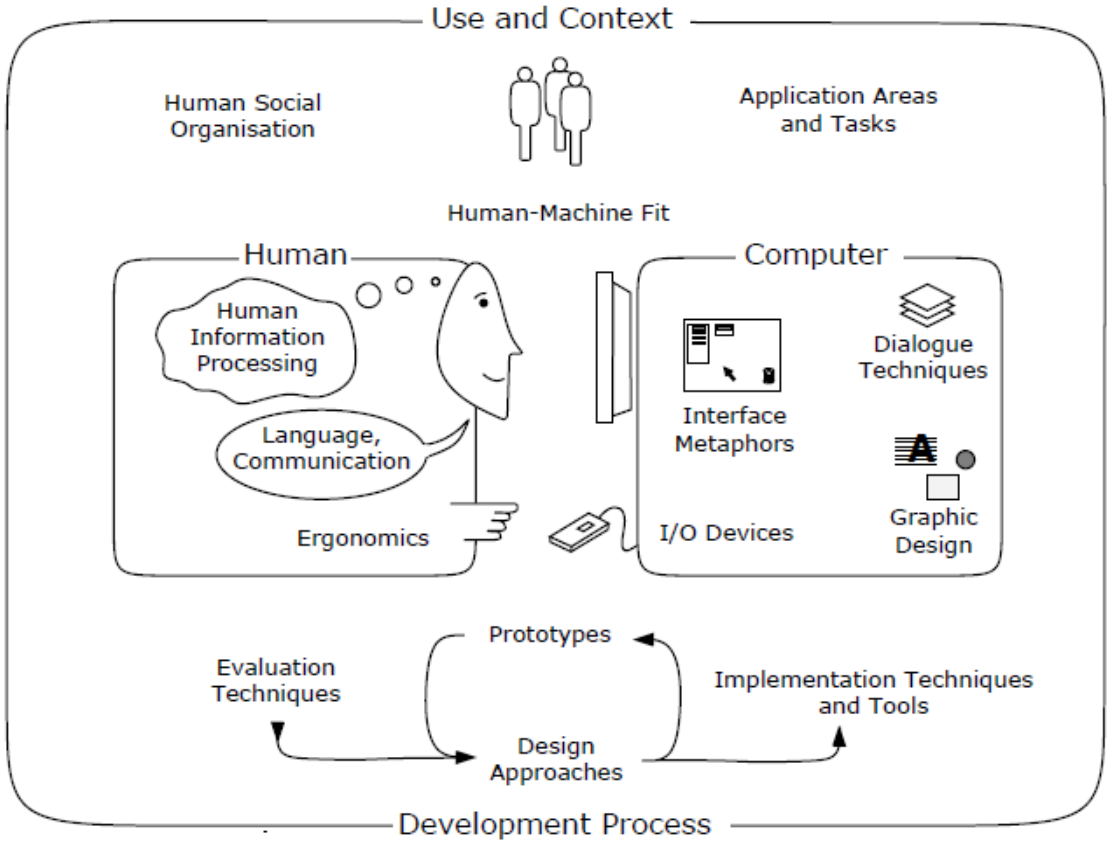
- Human-computer interaction is

> "[...] concerned with the design, evaluation, and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them."
>
> - ACM SIGCHI (1992)

Human-Computer Interaction (2)



Adapted from the ACM SIGCHI Curriculum for HCI (Hewett et al., 2002)

Involved Disciplines

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Academic Disciplines	Design Practices
• Computer Science	• Graphic design
• Informatics	• Product design
• Psychology	• Media design
• Social Sciences	• Industrial design
• Engineering	
• Ergonomics	

HCI Business

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- HCI consultancies emerge, e.g.
  - Nielsen Norman Group
    “The philosophy of the Nielsen Norman Group is simple: To help companies enter the age of the consumer, designing human-centered products and services.”, nngroup.com
  - Cooper
    “We‘ll help you define, design and deliver digital products and services that inspire your team, your customers and your bottom line.”, cooper.com
  - Digital District,
    “Wir unterstützen unsere Kunden dabei, effektiver und effizienter zu kommunizieren.”, digitaldistrict.de

Overview of Course Topics

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- Understanding „human factors“: Fundamentals from psychology and cognitive Science
  - Human Perception
  - Cognitive Models and Theories
  - Models of Interaction
- Being creative: User-centered design process
  - Rules and principles
  - Prototyping
- Types of user interfaces and technologies
  - Command-line interfaces
  - Graphical user interfaces, e.g. Mac OS und Windows
  - Post-desktop user interfaces: Interactive Surfaces, Mobile user interfaces, Pen-based user interfaces, Tangible user interfaces, Speech-based user interfaces
- Assessing and measuring user interface characteristics: Evaluation and User studies
  - Methods
  - Data gathering
  - Empirical data analysis

Agenda

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- Approaching Human-Computer Interaction: Example videos
- Definition of HCI, Course Topics
- **What is good / poor design?**
- Design goals: Usability and User experience

Activity

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- How many interactive computing systems do you use frequently?
- How usable are they?
- Why?

→ Interactive computing systems which are easy to use – from the users‘ perspective

Good and Poor Design (1)

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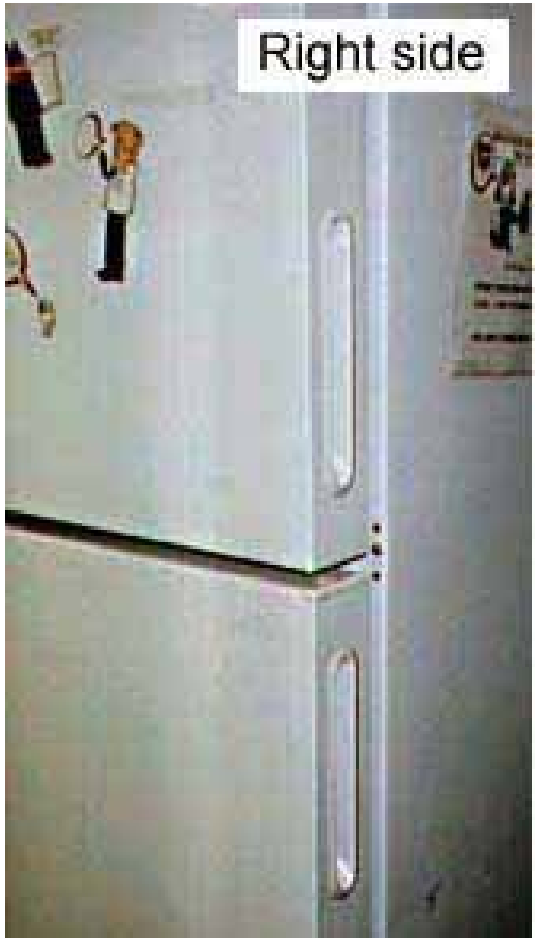
Good and Poor Design (2)



From www.baddesigns.com

Good and Poor Design (3)

Good and Poor Design (4)

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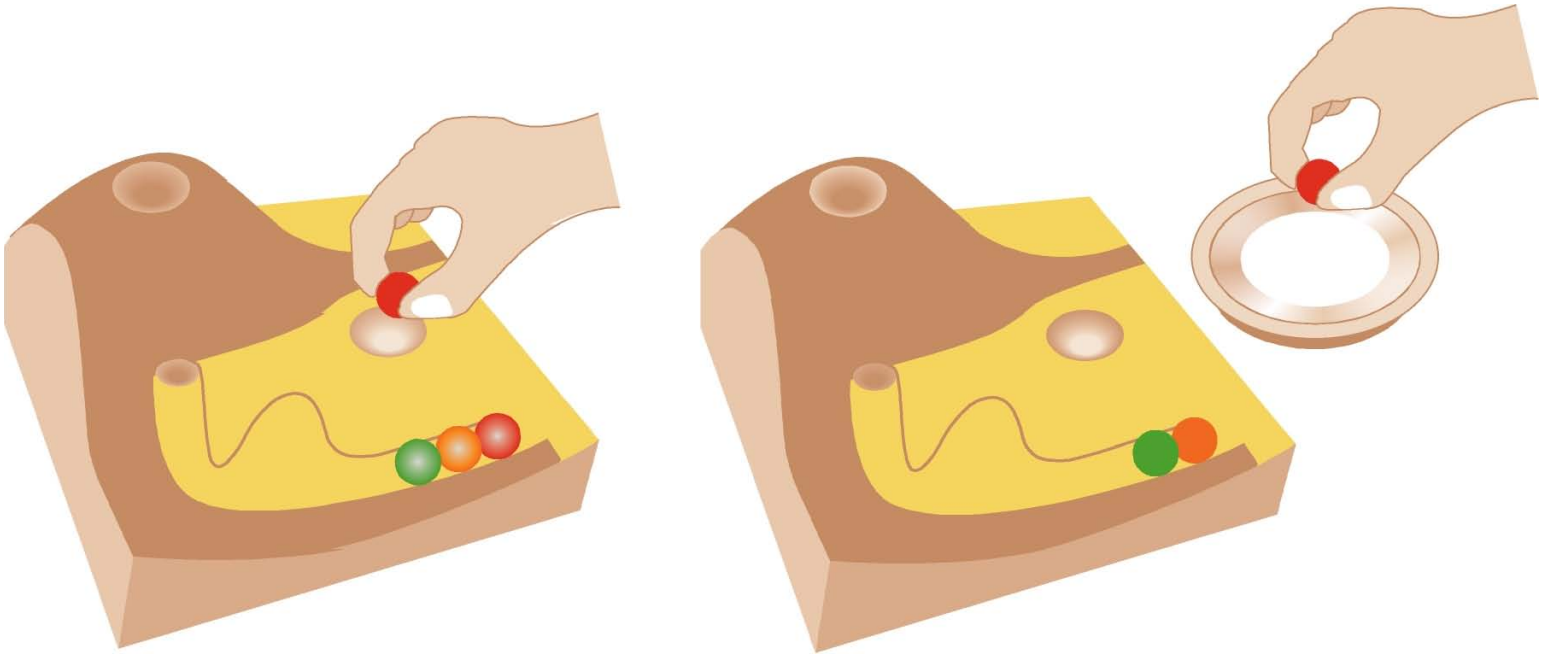
- The marble answering machine, Bishop 1995



Good and Poor Design (5)

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- Differences to traditional mailbox interfaces?
  - Haptic/tangible instead of audio
  - Familiar physical objects utilized to represent the messages
  - Amount of messages obvious
  - Requires only one-step actions
  - Simple but elegant design
- Drawbacks: robustness

→ *Where* will the product be deployed, *who* will be the users and *how* will it be used?

Good and Poor Design (6)

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- Today‘s more advanced “marble” answering machine? ☺

Activity

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- How does making a phone call differ when using
  - a public phone box or
  - a cell phone?
- How have these devices been designed to take into account
  - the *kind of users*,
  - the *type of activity* being supported, and
  - the *context* of use?

Process of Interaction Design

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- Identifying needs and establishing requirements
- Developing alternative designs to meet these
- Building interactive prototypes that can be communicated and assessed
- Evaluating what is being built throughout the process

Agenda

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- Approaching Human-Computer Interaction: Example videos
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- What is good/poor design?
- **Design goals: Usability and User experience**

Usability Goals (1)

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- **Effectiveness**
  "Is the product capable of allowing users to perform tasks accurately and completely?"
  (doing "right" things, good quality results)

- **Efficiency**
  "Once users have learned how to use a product to carry out their tasks, can they sustain a high level of productivity?"
  (doing things in the most economical way)

- **Safety**
  "What is the range of errors that are possible using the product and what measures are there to permit users to recover easily?"

Usability Goals (2)

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- **Utility**
  "Does the product provide an appropriate set of functions that will enable users to carry out all their tasks in the way they want to do them?"
- **Learnability**
  "Is it possible for the user to work out how to use the product by exploring the interface and trying out certain actions?"
- **Memorability**
  "What kinds of interface support have been provided to help users remember how to carry out tasks?"
- Emerging usability criteria provide *objective*, *quantitative indicators* (e.g. with respect to time)

Usability Metrics

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- Standardized, DIN EN ISO 9241-110
  - Effectivity
  - Efficiency
  - User satisfaction
- Mix of both, objective and subjective goals

Usability and User Experience

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- Historically HCI focused on usability goals
- Currently a paradigm shift is going on:
  user experience is recognized as a key aspect in HCI

  (But of course: Usability remains highly important)

User Experience (UX)

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- Behaviour of product, how it is being used
- How people feel about a product
- Design *for* a user experience, not the UX itself

> "[...] every product that is used by someone has a user experience: newspapers, ketchup bottles, reclining armchairs, cardigan sweaters."
>
> - Jesse Garrett (2003)

Activity

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- Apple‘s iPods are a phenomenonal success.
- Why?

Activity

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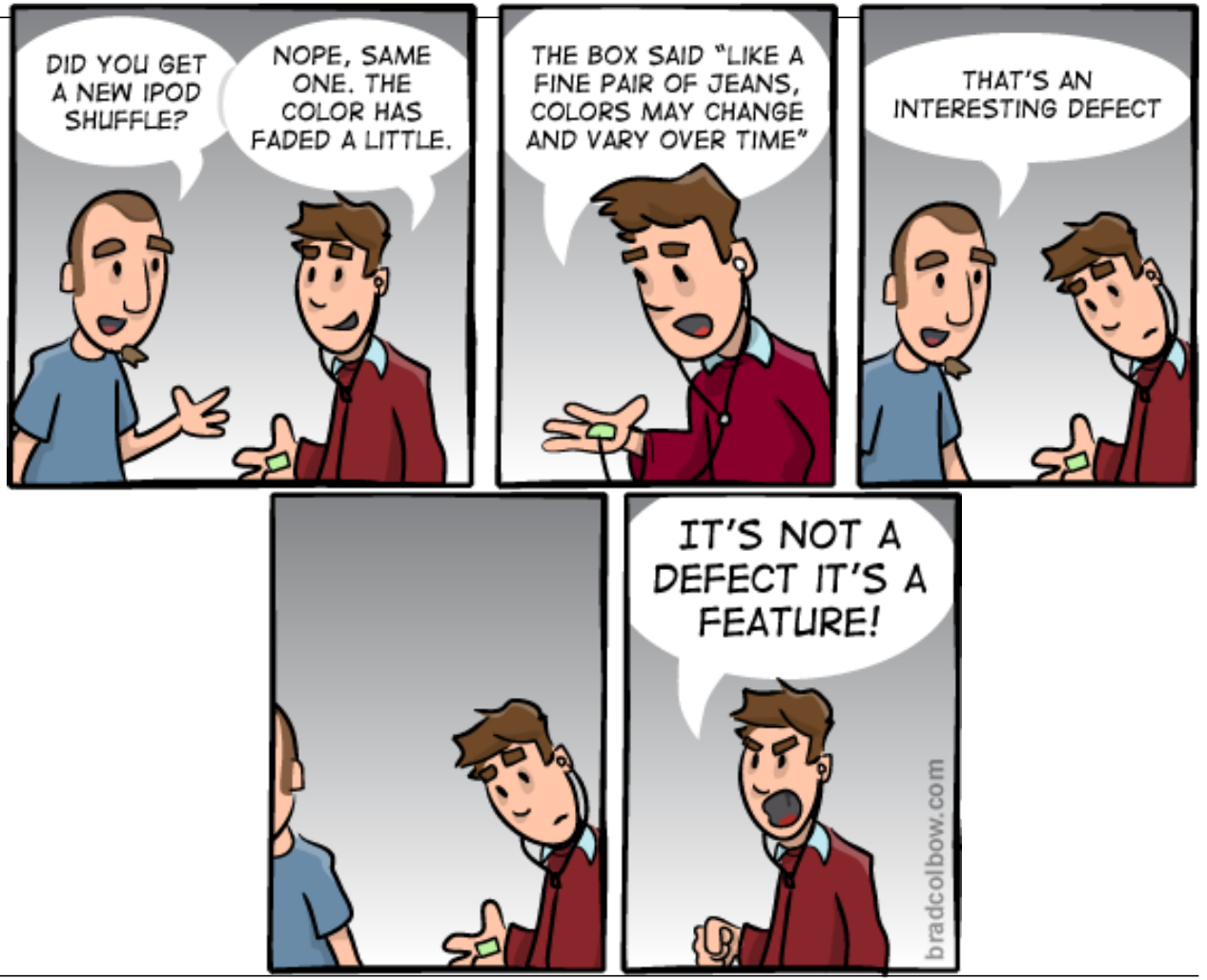
- Maybe another reason? ☺



User Experience: Example

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- Remote sketching and gesturing
  (by Marc Hassenzahl and Kathrin Völker)

User Experience Goals

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- satisfying
- enjoyable
- engaging
- exciting
- aesthetically pleasing
- supportive of creativity
- fun
- ...

- boring
- frustrating
- annoying
- ...

→ Subjective *qualities*

What to Take Home

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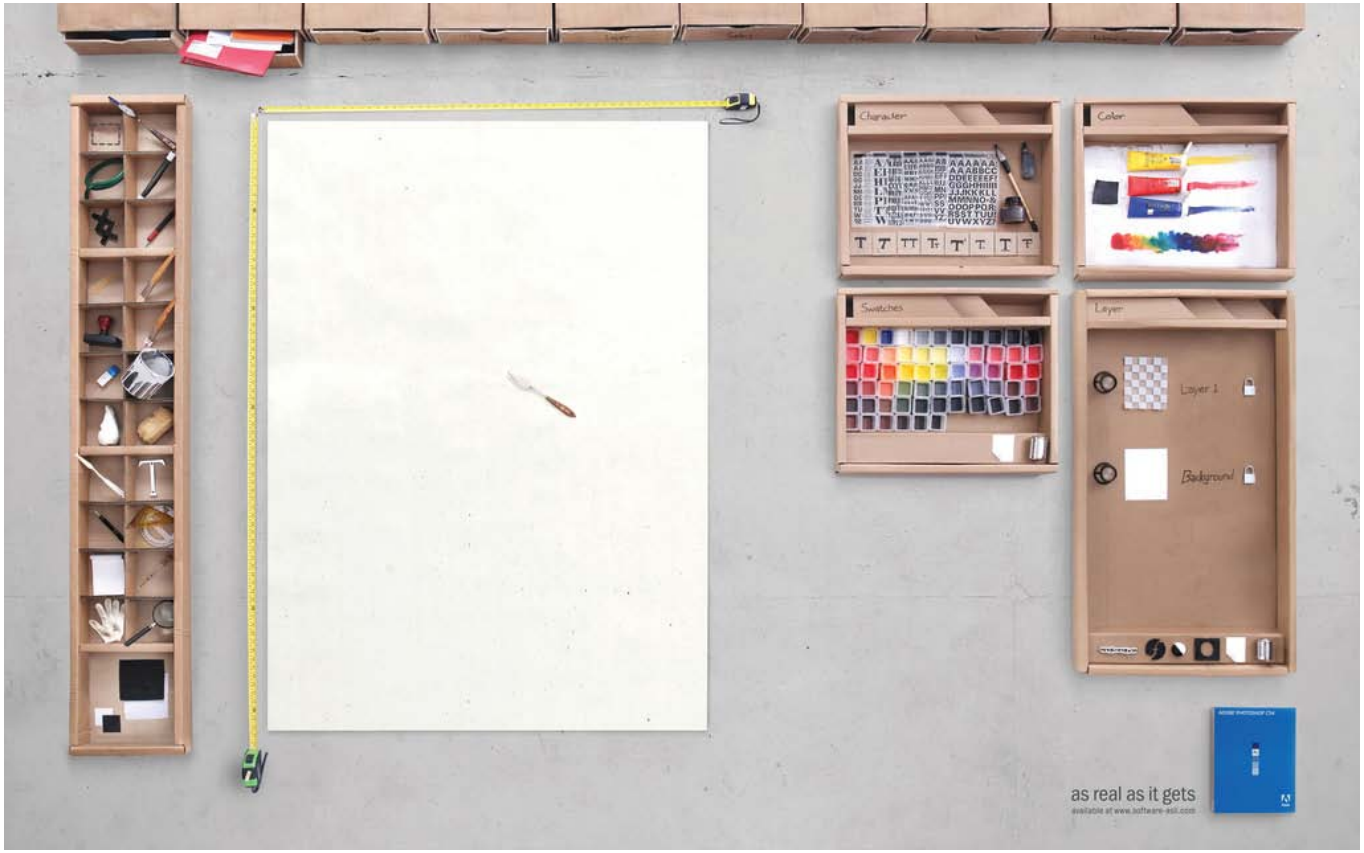
- Human Computer Interaction focuses on the human use of interactive computer system
- Usability and user experience goals are key factors for the design of good interactive products
- Remember interdependent factors like cultural differences, user groups, or context of use
- Suggestion: read chapters 1-3 from DOET until Nov 2

Good Design? ☺



"Real World Photoshop", Flickr photoset