Vorlesung 1, den 21. Oktober 1999

1 **Donnerstag, den 21. Oktober 1999**

UNIVERSITÄT DES SAARLANDES

Einführung in die Kognitive Ergonomie

Wintersemester 1999/2000

1. Scope and Goals
2. General Framework
3. Case Study
4. Mental Models

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Scope and Goals

What Can You Do Later? (1)

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Subject: Ergonomie-Projekt
Date: Wed, 20 Oct 1999 11:09:01 +0200

Hallo Herr Jameson,

mein Name ist Hans Schmidt und ich habe vor ca. 2 Jahren Ihre Vorlesung "Einführung in die kognitive Ergonomie" gehört. Mittlerweile arbeite ich als Führungskraft bei der Entwicklung einer von Grund auf neu entwickelten Standardsoftware für mittelständische Unternehmen. Unserer System soll Geschäftsprozesse aus allen relevanten betriebswirtschaftlichen Bereichen (Lager-Logistik, Einkauf, Verkauf, Disposition, Produktionsplanung und -steuerung, Finanzbuchhaltung und Kostenrechnung) abdecken.

3 What Can You Do Later? (2)

Die meisten der aktuell verfügbaren Produkte in diesem Marktsegement zeichnen sich durch eine meist archaisch anmutende Oberfläche aus. Die Ziele des Benutzers und die damit einhergehenden Anforderungen an die Softwareergonomie waren (und sind für viele Mitbewerber immer noch) kein Thema - nur die Funktionalität zählte.

Einer unserer wesentlichen Erfolgsfaktoren soll die Ergonomie unseres UI sein. Wir wollen uns an dieser Stelle maßgeblich von unseren Mitbewerbern unterscheiden. Aktuell sind wir dabei unterschiedliche Optionen auszuloten wie wir dieses Ziel erreichen können. Ich könnte mir verschiedene Szenarien vorstellen wie wir Zusammenarbeiten könnten.

...

Mit freundlichen Grüßen
Hans Schmidt

Types of System 4

What types of system are we talking about?

- Computer workplaces
- Technical appliances
- Instructional systems
- Entertainment systems
- Communication systems

5 Types of Decision

What kinds of decision do we want to be able to make?

- *Selection*
  - Which available system is best?
    - For this purpose, in this context
- *Evaluation*
  - How good is this specific system?
    - Where are the problems?
- *Design*
  - How should the desired system work and look?

Evaluation Criteria (1) 6

According to what criteria should we evaluate systems?

1. *Speed of execution*
   How quickly can $\mathcal{U}$ perform tasks with $\mathcal{S}$?
2. *Speed of learning*
   How quickly can $\mathcal{U}$ *learn* to perform tasks with $\mathcal{S}$?
3. *Number and severity of errors*
   How often do errors occur, and how serious are they?
4. *Mental load*
   Does $\mathcal{U}$ have to think carefully and keep a lot of information in mind while using $\mathcal{S}$?

7 Evaluation Criteria (2)

5. *Functionality*
   How many different tasks $\mathcal{U}$ perform with $\mathcal{S}$?
6. *Quality of results*
   How good are the results of $\mathcal{U}$'s task performance with $\mathcal{S}$?
7. *Robustness*
   How well can $\mathcal{S}$ deal with unusual situations?
8. *User satisfaction*
   How well does $\mathcal{U}$ like using $\mathcal{S}$?
9. *Productivity*
   Does $\mathcal{S}$ increase $\mathcal{U}$'s work output, relative to $\mathcal{U}$'s work input?

Types of Factors 8

What types of factors do we have to consider?

1. *Physical factors*
   Are $\mathcal{U}$'s actions physically difficult?
   Are $\mathcal{S}$'s messages easily perceivable?
2. *Interface factors*
   Can $\mathcal{U}$ perform his actions in a direct and natural manner?
   Does $\mathcal{S}$ tell $\mathcal{U}$ what $\mathcal{U}$ wants to know?
3. *Social factors*
   Does $\mathcal{S}$ fit into the social context in which it is used?

9 Book Chapters for This Course

Part I Foundations

Chapter 1 - The Human

Chapter 2 - The Computer

Chapter 3 - The Interaction

Part II Design practice

Chapter 4 - Usability Paradigms and Principles

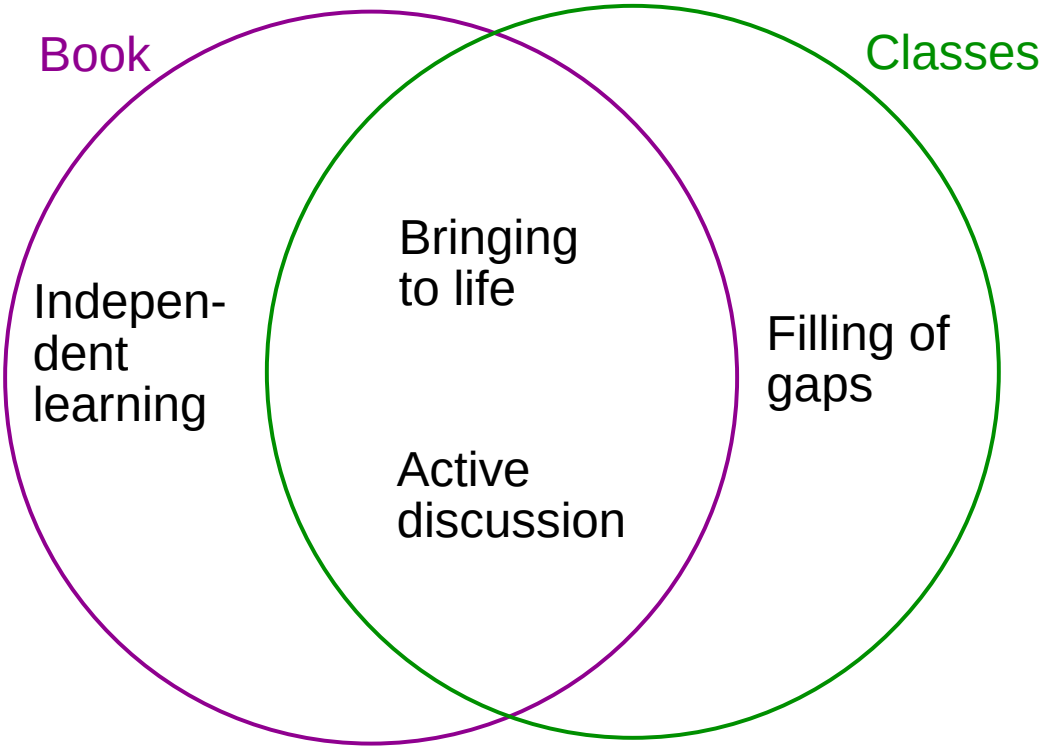
Part III Application areas

Chapter 15 - Out of the Glass Box

Note

Each week, we will typically read parts of two or three different chapters, so as better to appreciate the relationships

Relationship Between Classes and Book 10



11 Reading Assignment for Class 2 (1)

Chapter 3 - The Interaction

Overview

3.1 Introduction 103

3.2 Models of Interaction, p. 104

A useful general framework, discussed at some length during Class 1

Design Focus: VCR, p. 109

[End] p. 109

Chapter 1 - The Human

1.4 Thinking: Reasoning and Problem-Solving, p. 36

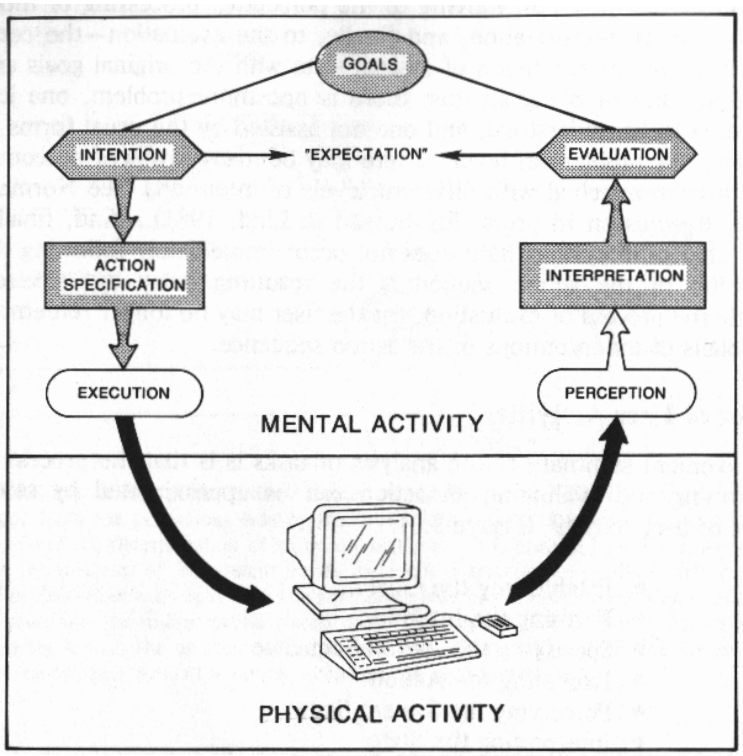
Relevant at many points to the Kegworth discussion

Discussed in part in Class 1

[End] p. 48

Framework and Case Study

Norman's General Framework 12



Norman, D. A. (1986). Cognitive engineering. In D. A. Norman and S. W. Draper (Eds.) (1986). *User centered system design: New perspectives on human-computer interaction* (pp. 31–61). Hillsdale, NJ: Erlbaum.

13 Questions About the Kegworth Disaster

1. How can the pilots' error be understood in terms of Norman's framework?
2. What types of factors contributed significantly to the disaster?
3. Can better system design prevent things like this from happening?

Mental Models

Definitions of "Mental Model" 14

What is a mental model?

- *Norman (1988, p. 17):*

  ... the models people have of themselves, others, the environment, and the things with which they interact.

- *Jameson (Oktober 21st, 1999):*

  $\mathcal{U}$'s mental model of a system $\mathcal{S}$ is a set of beliefs about

  - $\mathcal{S}$'s (perhaps unobservable) structure
  - how $\mathcal{S}$ works

  Mental models are used to explain *observable* events in terms of *unobservable* structures and events

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Characteristics of Mental Models

1. What are some typical characteristics of mental models?

- Incomplete
- Partial
- Subject to change
- Possibly inconsistent
- Based on imperfect observation and inference

2. What are mental models good for?

- *Predicting* what will happen when $\mathcal{U}$ performs some action for the first time
- *Understanding* what has happened when $\mathcal{S}$ shows some unexpected behavior

Formation of Mental Models (1)

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How do people form mental models?

Norman (1988, p. 17):

> People form mental models through experience, training, and instruction.
>
> The mental model of a device is formed largely by interpreting its perceived actions and its visible structure.

Norman, D. A. (1988). *The psychology of everyday things.* New York: Basic Books.

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Formation of Mental Models (2)

Design model

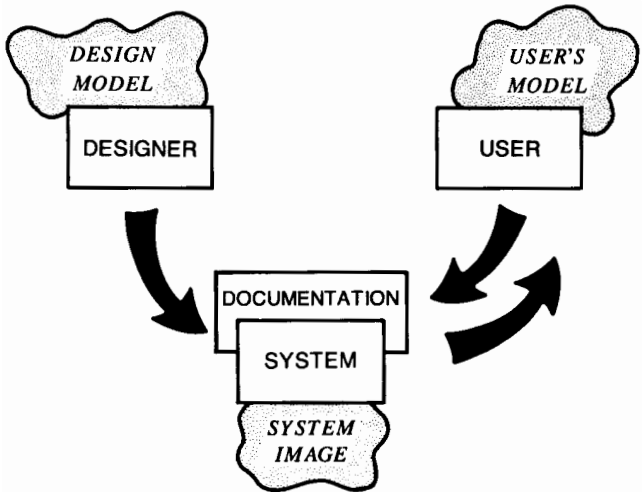
The designer's conceptual model, on which the design of $\mathcal{S}$ is based

User's model

The model that $\mathcal{U}$ develops on the basis of experience with $\mathcal{S}$

System image

All aspects of $\mathcal{S}$ that $\mathcal{U}$ experiences



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