Web

Master 1 IFI

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Unit 7

Web Ergonomics

Agenda

- Introduction: What is Ergonomics?
- Integrating Ergonomics in the Web Software Life Cycle
- User-Centered Web Design
- The Ergonomic Mock-Up
- User Interface Audit, Heuristic Evaluation
- User Tests

Introduction

- Ergonomics (or Human Factors) is the scientific discipline concerned with the understanding of **interactions** among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design to optimize **human well-being** and overall **system performance**.
- Etymology: from Greek ἔργον, "work", and νόμος, "(natural) law"
- Three main fields of research:
  - Physical Ergonomics
  - **Cognitive Ergonomics**, which studies usability, human-computer interaction (HCI), and user experience engineering
  - Organizational Ergonomics
- Interaction happens necessarily through the User Interface!

The Current Paradox

- New technologies become more and more pervasive

- Users are less and less competent

- Software with ever-increasing functionality, but <40% exploited

- The introduction of new software/devices often brings about a decrease in productivity

- In projects with a strong technological component, the human factor is too often forgotten

- What does the user buy?

    - A technology?

    - A product?

    - Or rather what these allow him/her to achieve!

In Practice

- Ergonomists contribute to the design and evaluation of
  - Tasks
  - Products
  - Contexts
  - Systems
- Their goal is to make them compatible with
  - Needs
  - Competences
  - Limits
  … of human beings

The Role of Ergonomics

Sponsor

Developer

Marketing

…

Ergonomics

User

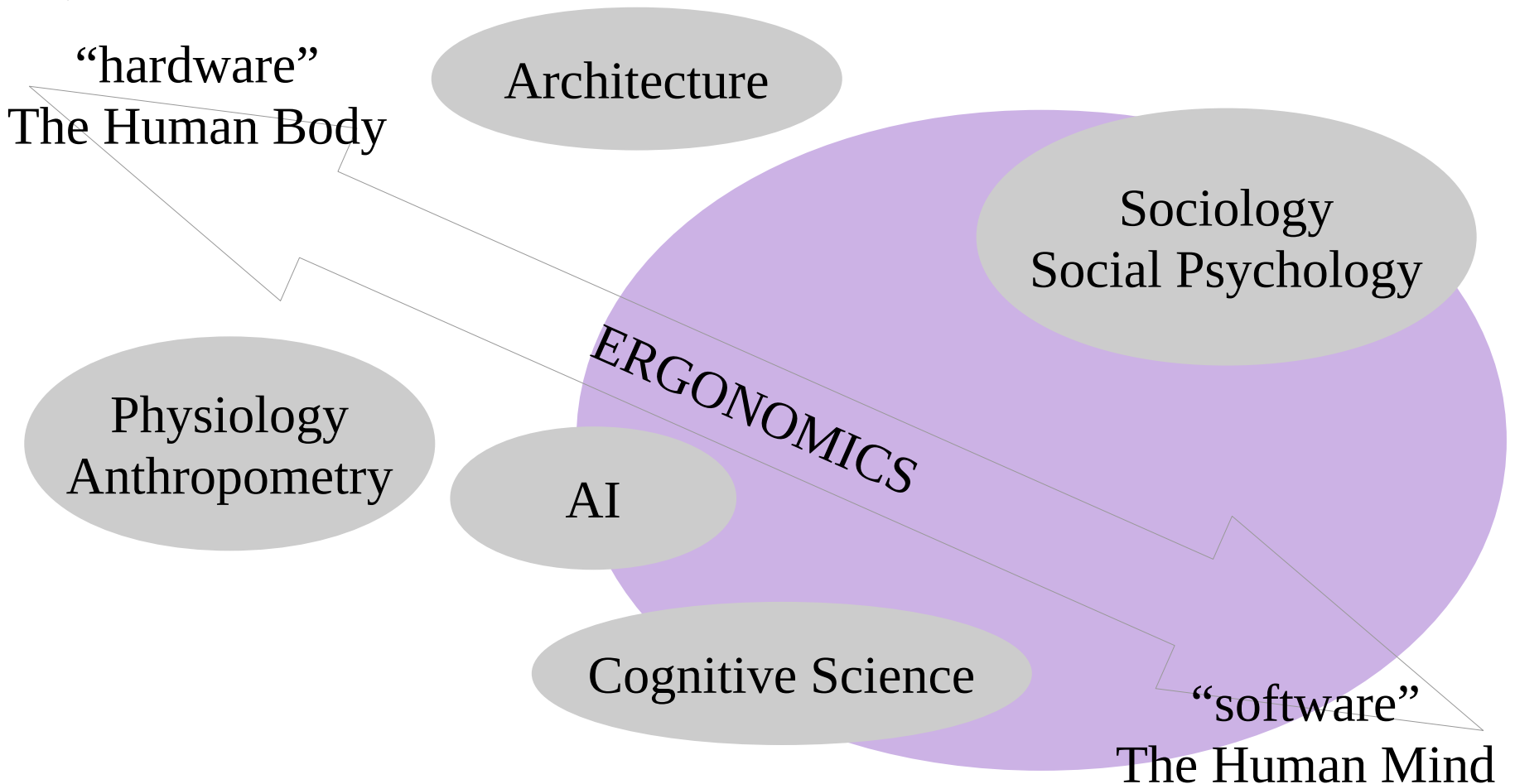Application
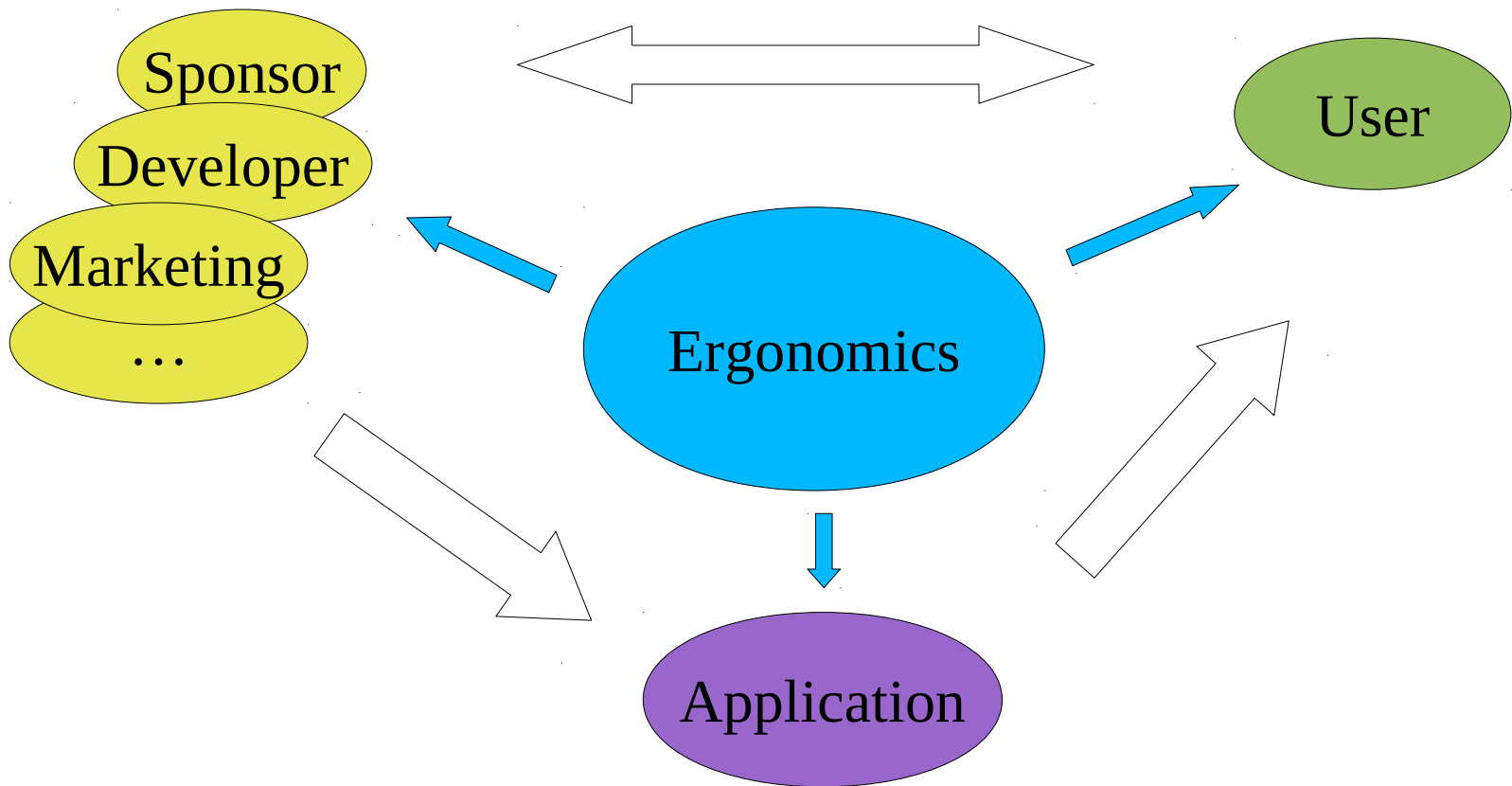
Ergonomics and Innovation

- The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it [Weiser, 1991].

- An ergonomic product is transparent as a pair of spectacles

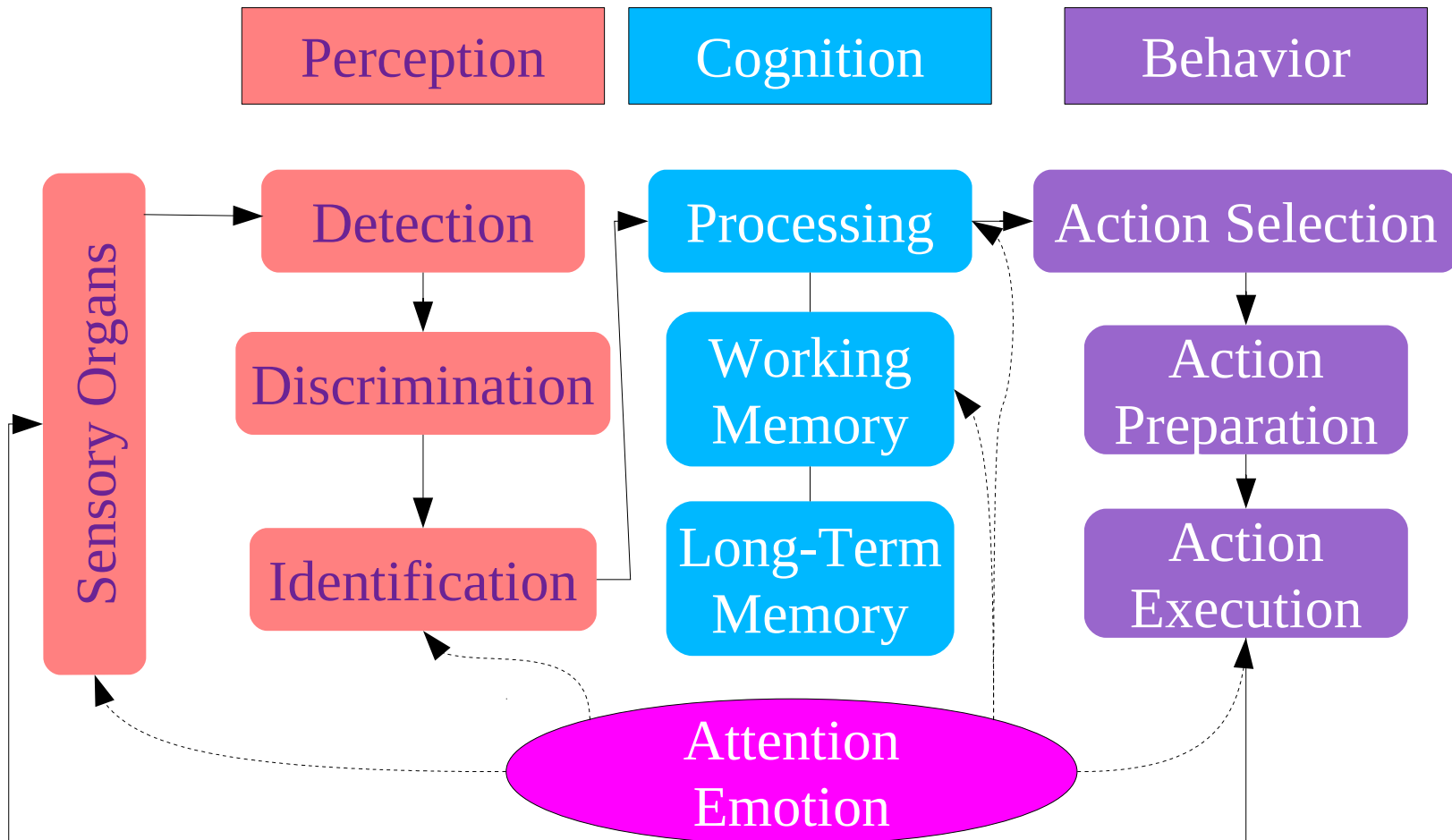- It allows the user to focus on their end, not on the means to achieve it

At the Intersection of Several Disciplines

"hardware"
The Human Body

Architecture

Sociology
Social Psychology

Physiology
Anthropometry

ERGONOMICS

AI

Cognitive Science
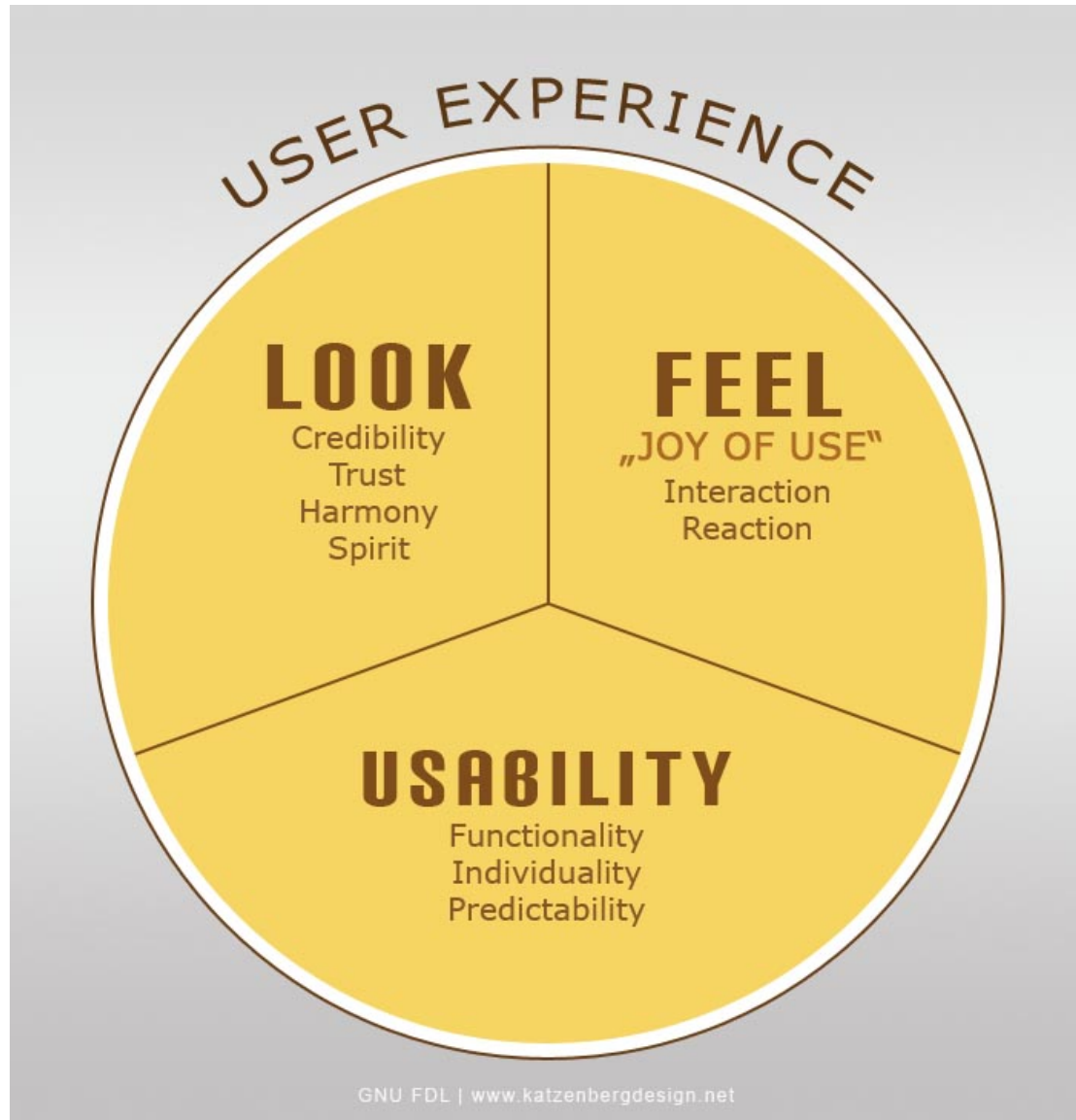
"software"
The Human Mind

Cognitive Science
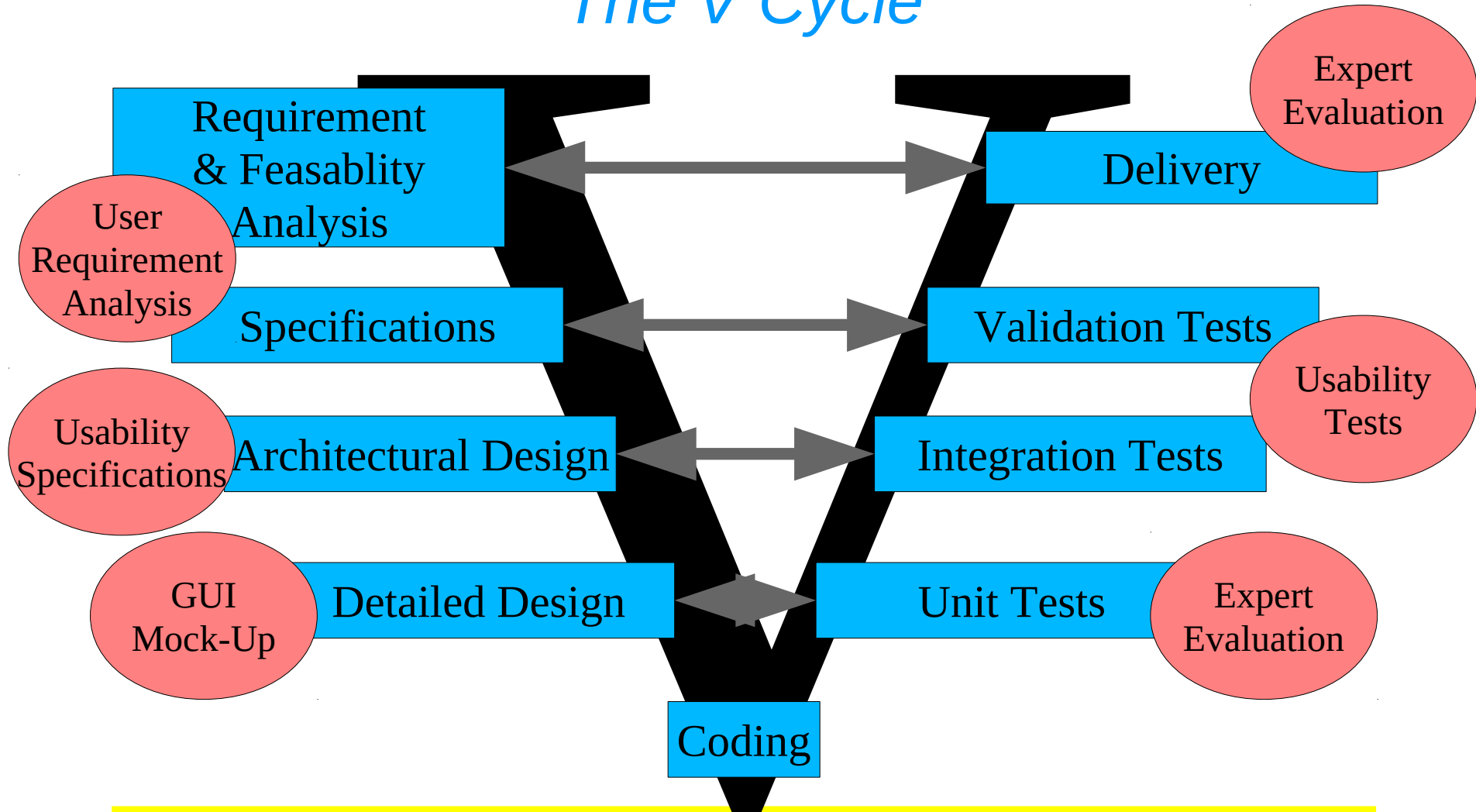
- Vision and Perception
- Attention
- Comprehension
- Learning
- Memory
- Problem Solving
- Impact of factors like stress, fatigue, …

Human Information Processing

USER EXPERIENCE

LOOK
Credibility
Trust
Harmony
Spirit

FEEL
„JOY OF USE"
Interaction
Reaction

USABILITY
Functionality
Individuality
Predictability

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The V Cycle

Types of Interventions

- Interventions in the full process (Design Ergonomics, ROI 1:100)
  - Design
  - Implementation
  - Validation
- Punctual Intervention on a finished product
  - Evaluation: correction or surface ergonomics (ROI 1:10)

- If you can't afford the time to do it right, how are you going to find the time to fix it up?
- Ideally, 10% of a project's budget should be allocated to interface optimization

ROI for an E-Commerce Site

- On-line sales increase up to 80%

- Market share improvement

- Traffic increase

- Brand image improvement

- User satisfaction

- Client fidelity

ISO 9241 Standard

- Multi-part standard covering ergonomics of HCI
- ISO 9241-210: Ergonomics of human-system interaction
- Provides guidance on human-system interaction throughout the life cycle of interactive systems
  - More effective: achieve the stated objectives
  - More efficient: in a minimum of time, with a minimum of effort
  - More satisfactory: with a pleasing interaction
- Usability is defined with respect to
  - Target population (having well-defined characteristics)
  - Well-defined objectives
  - Well-defined context

Design Phase

When designing an interface, modeling allows to optimize 3 axes:

- User Modeling
  - Methods: interviews, questionnaires, Focus Groups, Card Sorting...
  - Goals: know the expectations, previous level of expertise, wishes, opinions...
- Task Modeling
  - Methods: MAD, cognitive walkthrough...
  - Goals : identify info architecture and ideal sequence of actions
- Context Modeling
  - Methods: interviews, scenarios, benchmarking...
  - Goals: identify the cognitive, environmental, social context

Implementation Phase

- During interface implementation, it is important to check the respect of basic criteria of ergonomics (usability)

- Use a check-list.

- Principles are often based on common sense

- The choice of an analysis check-list is critical for success.

Validation Phase

- On a finished product (or beta), it is possible to run user tests to study HCI
- Several methods may be used
  - Conventional Tests, recording data such as task execution time and errors
  - Tests with log file recording
  - Eye Tracking Tests
  - Post-Test: evocation, satisfaction questionnaires, comprehension tests
- Performing comparative tests of several prototypes allows to identify the one yielding best performance

User-Centered Interface

- Take into account the specificities of human cognitive functioning
  - Vision, attention, memory, …
- Know the "universal" ergonomic rules
  - Formatting, colors, error messages, …
- Thing the architecture of contents and navigation in the interface from the user's viewpoint
- If possible, work our user profiles (Personas) before the project starts

Basic Principles of Ergonomic Interfaces

- Simplicity: remove rather than add → each additional function is a danger for the user to make a mistake → study user needs

- Intuitiveness: the user can tell how the product works just by looking at it → functions remind something the user knows

- Consistency: similar functions keep the same place, the same name, the same logic, the same behavior throughout the screens

- Least surprise: the user should never be surprised by the results of his/her actions

- Fairness: the more serious and irreversible the consequences of an action, the harder it should be to be taken, to avoid mistakes

- Tolerance: give the user the freedom to be mistaken, to change his/her mind and back up (undo, trash, go back to initial configuration)

Grice's Cooperative Principle

- Describes how people achieve effective conversational communication in common social situations
- How listeners and speakers act cooperatively and mutually accept one another to be understood in a particular way
- Introduced by Paul Grice in his pragmatic theory through maxims:
  - Do not say what you believe is false / that for which you lack adequate evidence (Quality)
  - Make your contribution as informative as is required for the current purposes of the exchange, but not more (Quantity)
  - Be relevant (Relation)
  - Be perspicuous (Manner) → avoid obscurity, avoid ambiguity, be brief, be orderly

The Notion of Affordance

- Developed by psychologist James J. Gibson (1979)
- What the environment provides or furnishes the animal
- Needs control the perception of affordances (selective attention) and also initiate acts
- Donald Norman (1988) appropriated the term in the context of HCI
- Those action possibilities that are readily perceivable by a user
- Affordances depend
  - not only on the physical capabilities of an actor
  - but also on their goals, beliefs, and past experiences.
- "To afford" has shifted in meaning to "to suggest", "to invite"

Mock-Up

- To mock-up an interface means
    - To formalize a concept, an aspect, a functioning
    - To present to brainstorm, specify, validate
    - Evaluate the ergonomics, feasibility, cost
- Prototype:
    - Designed on the real platform and may be connected to fictive or real data
    - Often a beta version of the final product
- Mock-Up:
    - Implemented on a different system (even on paper)
    - No connection to databases
    - No reusable code

Heuristic Evaluation / User Interface Audit

- Simple and inexpensive

- Based on a check list

- The choice of a check list has a big impact on the quality of the audit

- The items of the check list are often based on common sense, but often UIs lack it

- The check list may be used during the development of a UI of on a finished product (with a lesser ROI)

- Oftentimes, the audit is followed by other interventions, like user tests

GUI SCREEN DESIGN CHECKLIST

	Yes	No	N/A	Remarks
Window Components (including menus and screen titles)				
Is the correct window type used (e.g., primary window, dialog box, property sheet)?				
Are basic components (e.g., title bars, horizontal and vertical scroll bars) used consistently and according to established standards?				
Does the screen title identify the information in the current window or display the item name of the command button that invoked the window?				
Is a status bar used to display useful information about the current screen as well as context-sensitive help for the current menu bar item, tool bar item, or graphical object?				

User Tests

- UI audits do not guarantee solving all ergonomics problems
- Modeling users and prototyping base on the principle of ergonomics may not be sufficient either
- Even from a strategical point of view, it is sometimes crucial to have real data on user behavior
- Setting up a user test requires knowing some methodological bases
- The success of the test depends on the choice of the hypotheses and of the variables which follow from them
- A user test is the only way to have objective data on the effectiveness and efficiency of the UI as well as on the satisfaction of the users