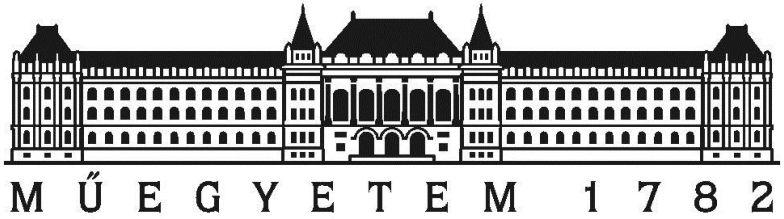

Ergonomics

Spring 2019

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Department of Ergonomics and Psychology

The concept of Ergonomics

- **ergos** (work) + **nomos** (laws) = **ergonomics**
19th century, Wojciech Jastrzebowski

- **Ergonomics = Human Factors**

- Human Factors, Human Engineering, Human Factors Engineering, Man-Machine Engineering, Human-Machine Interface (HMI) Engineering, Human-Machine Interaction Design, Human Centered Design, Usability Engineering, etc.

A definition of Ergonomics

Sanders and McCormick:

„Human factors" (ergonomics)

- **discovers and applies** information about human behavior, abilities, limitations and other characteristics
- **to the design** of tools, machines, systems, tasks, jobs, and environments
- for **safe**, **comfortable**, and **efficient** human use.

The goals of Ergonomics

The three main optimizational goals of ergonomics:

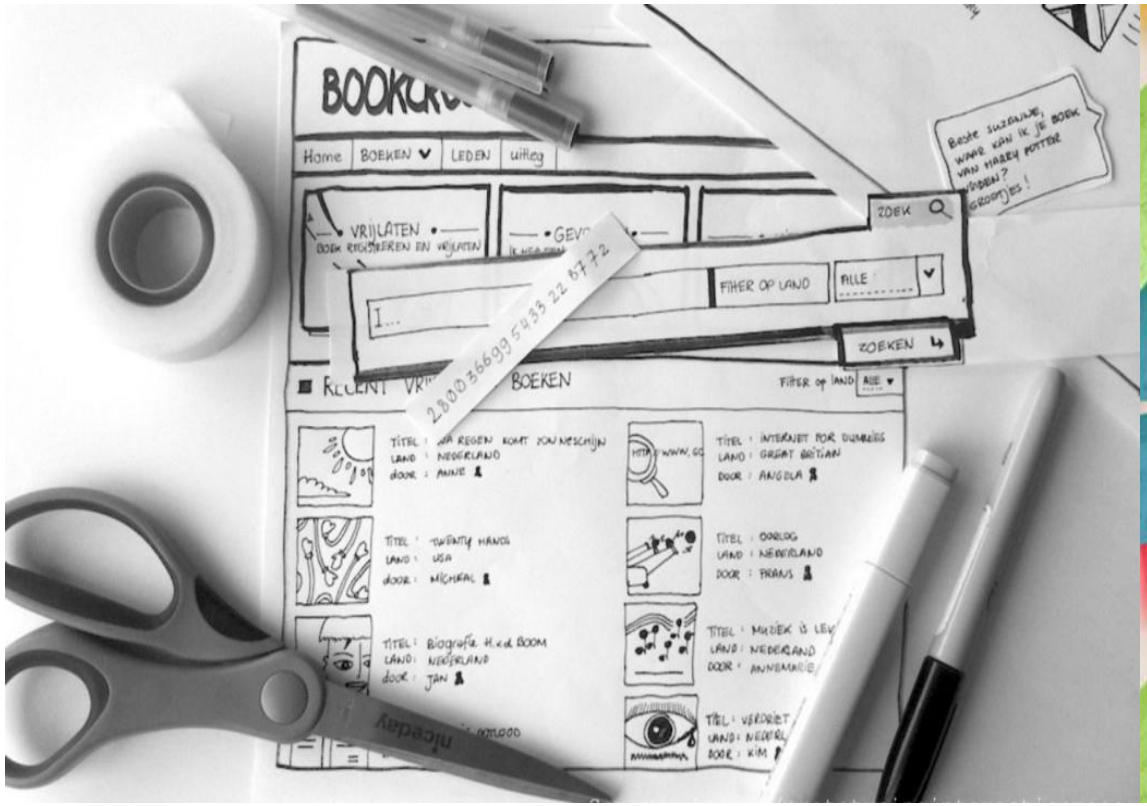
- ***Safety***
- ***Comfort***
- ***Efficiency***

Course Overview

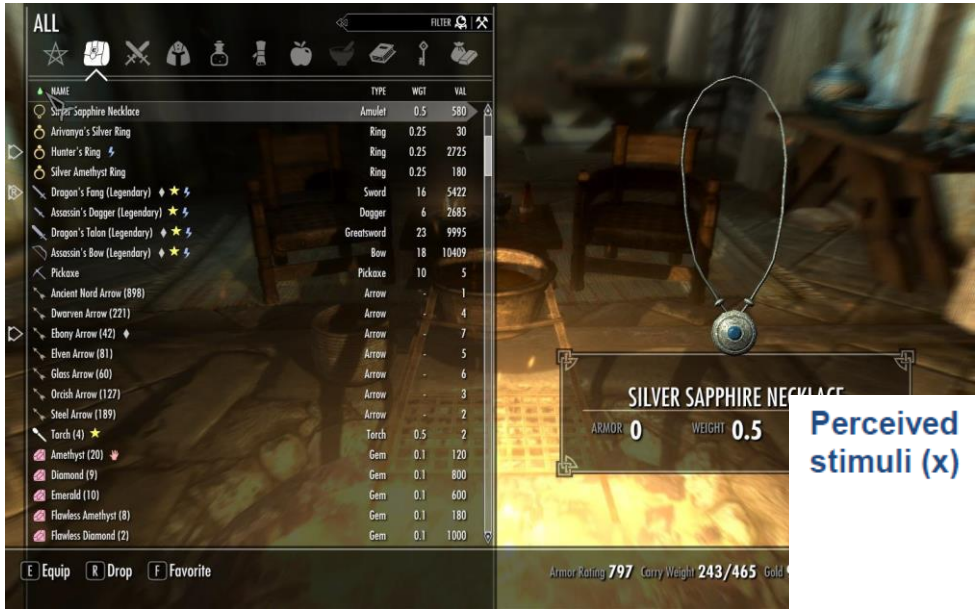
Special users / Design for All

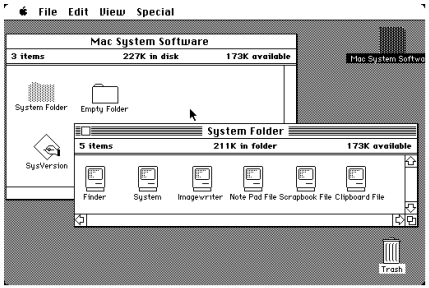
Human-Computer Interaction evaluation

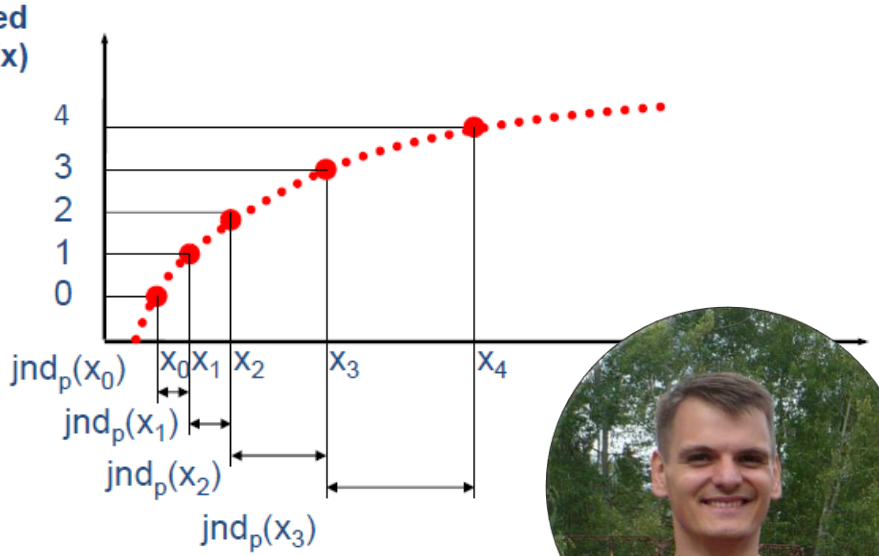
Human-Computer Interaction methods and hands-on experience



Psychology and Ergonomics

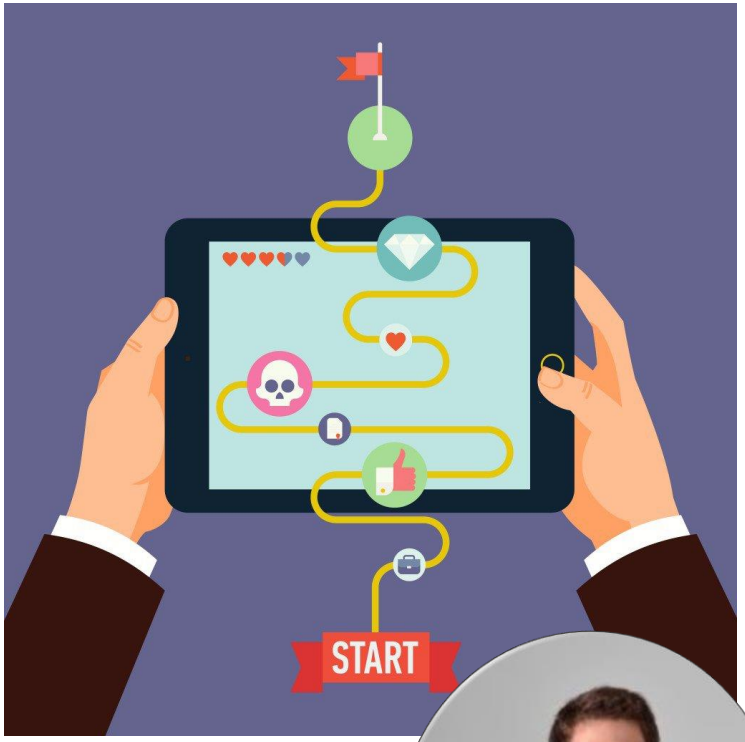




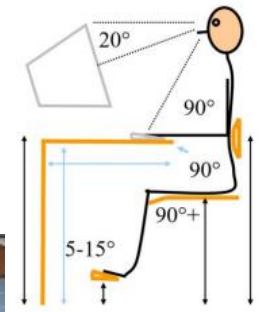


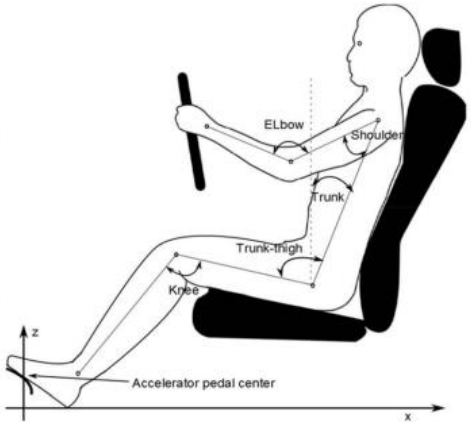
Human-Computer Interaction: Eye-tracking

Product experience and gamification

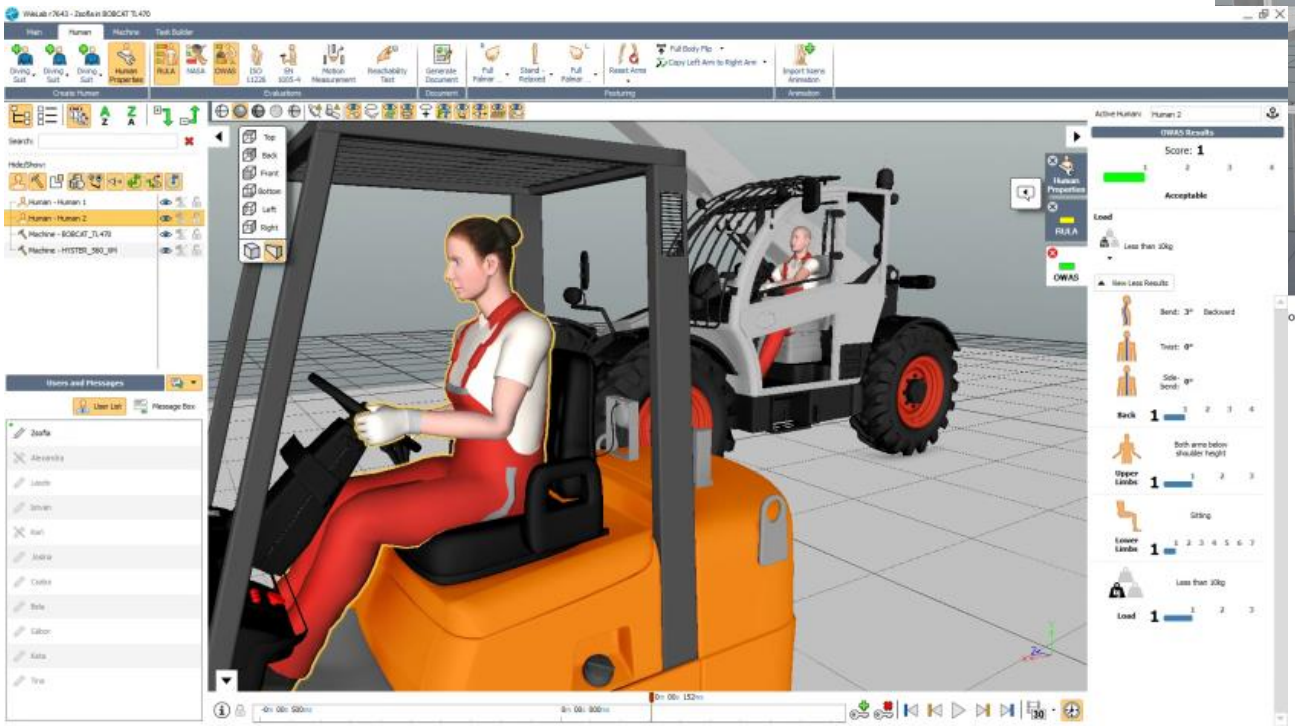


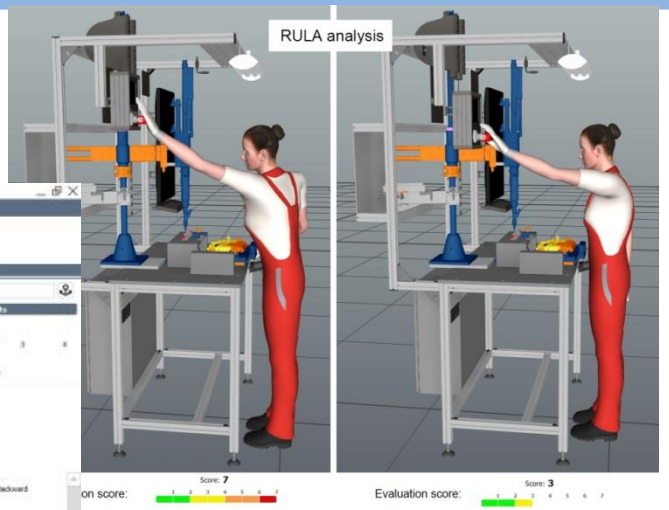
Ergonomics in vehicle design



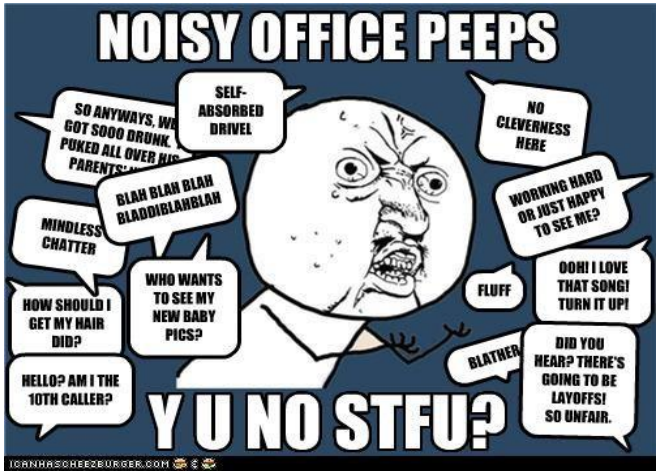


Evaluation of industrial workplaces with ViveLab





Office ergonomics



Shopping experience

Course requirements

- A **written exam** and an **Assignment** (homework)
- Mark: 50% written exam 50% assignment
- Course homepage: **http://goo.gl/br4TRM** (Moodle)

Written exam

- Some test questions (a, b, c or d)
- Questions requiring short answers (1-2 paragraphs and/or drawing)
- Have to reach at least 40% of maximum points to pass

Course requirements

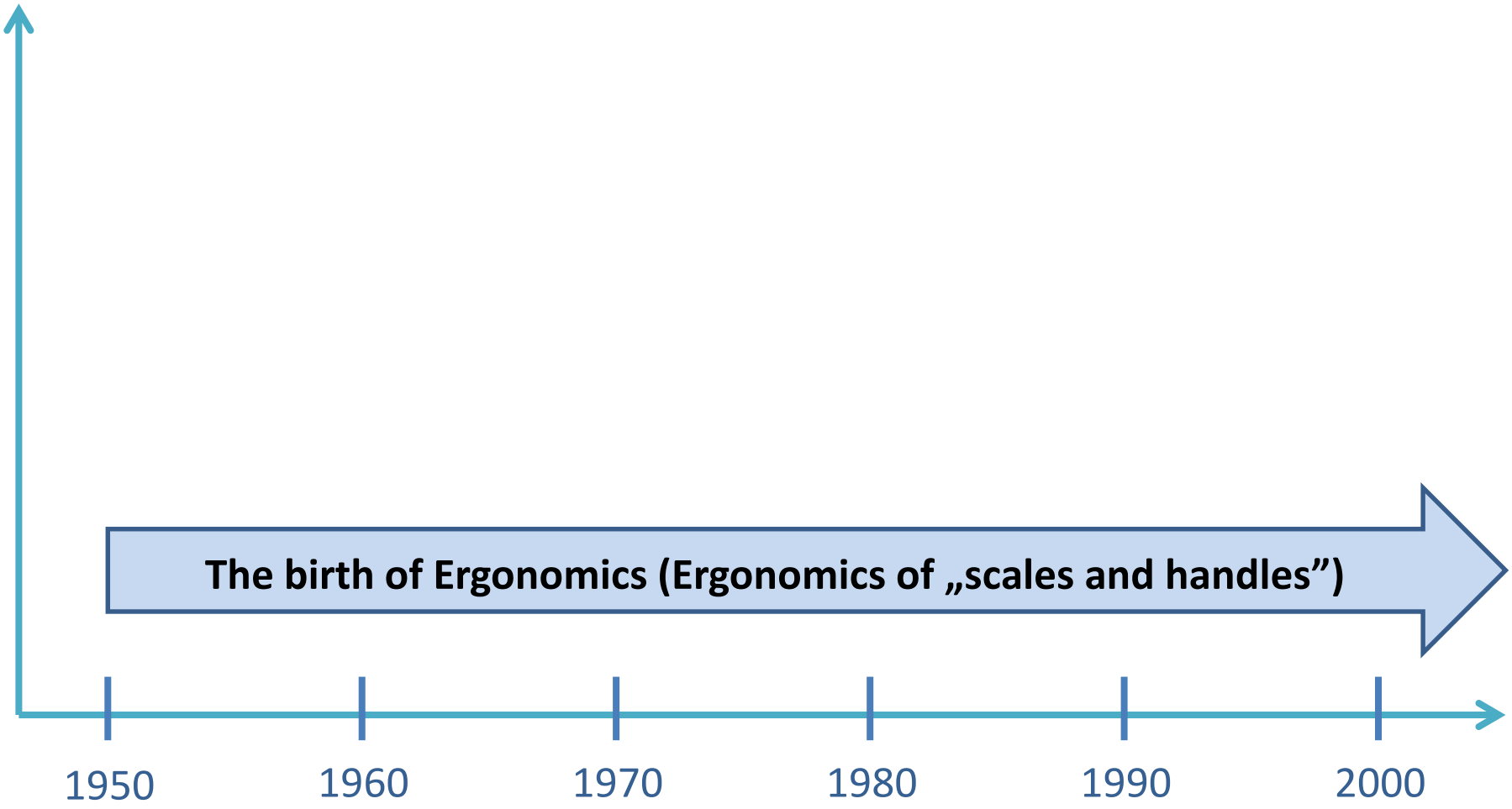
Assignment (homework)

- Done individually or in pairs
- You should aim for 2-3 pages. If needed for reasons of clarity (additional screenshots or pictures of the flat) it can exceed these page limits
- 4 topics to choose from:
    1. Evaluation of a flat's room from ergonomic aspects
    2. Evaluation of a workroom (e.g. classroom) from ergonomic aspects
    3. Evaluation of a website from ergonomic aspects
    4. Any other ergonomics related topic you can think of (consult with Dr. Sarolta Tóvölgyi first!!)
- Exactly the same topic can only be done by one pair or a single individual: http://goo.gl/Cz5Yzo (link also in syllabus on Moodle)

- **Deadline**: 25th April 2019 via email: tovolgyi@erg.bme.hu

The history of Ergonomics

The history of Ergonomics

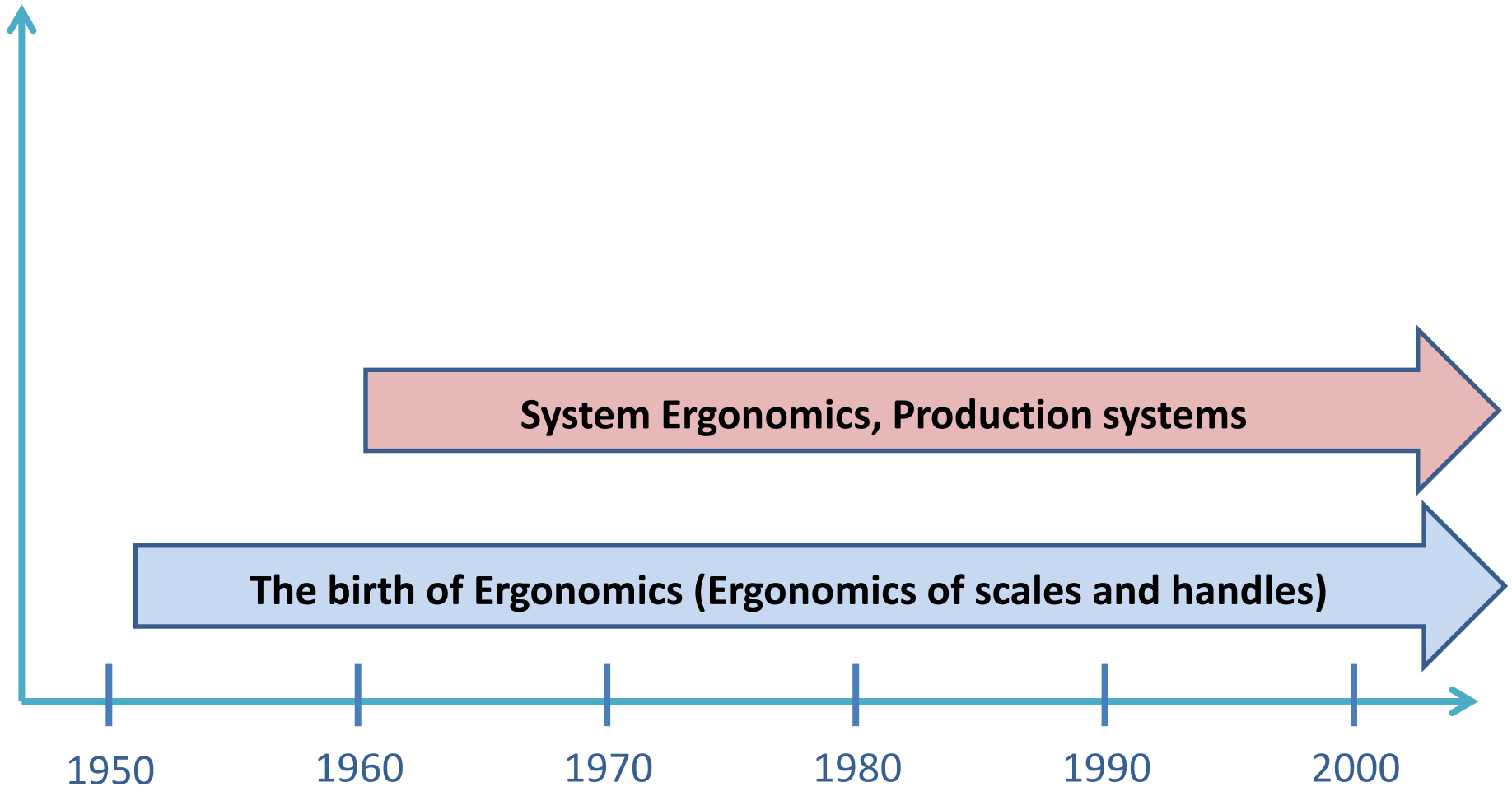


1. Ergonomics of „scales and handles”

- World War II: at least 400 aircraft losses due to bad cockpit design (mostly due to upgrades during the war)
- Engineering Psychology labs are established

- Research is focused on designing the best interface based on anthropometric data and a few sensory thresholds
- Next big boost: space race
- Handle design checklist

The history of Ergonomics

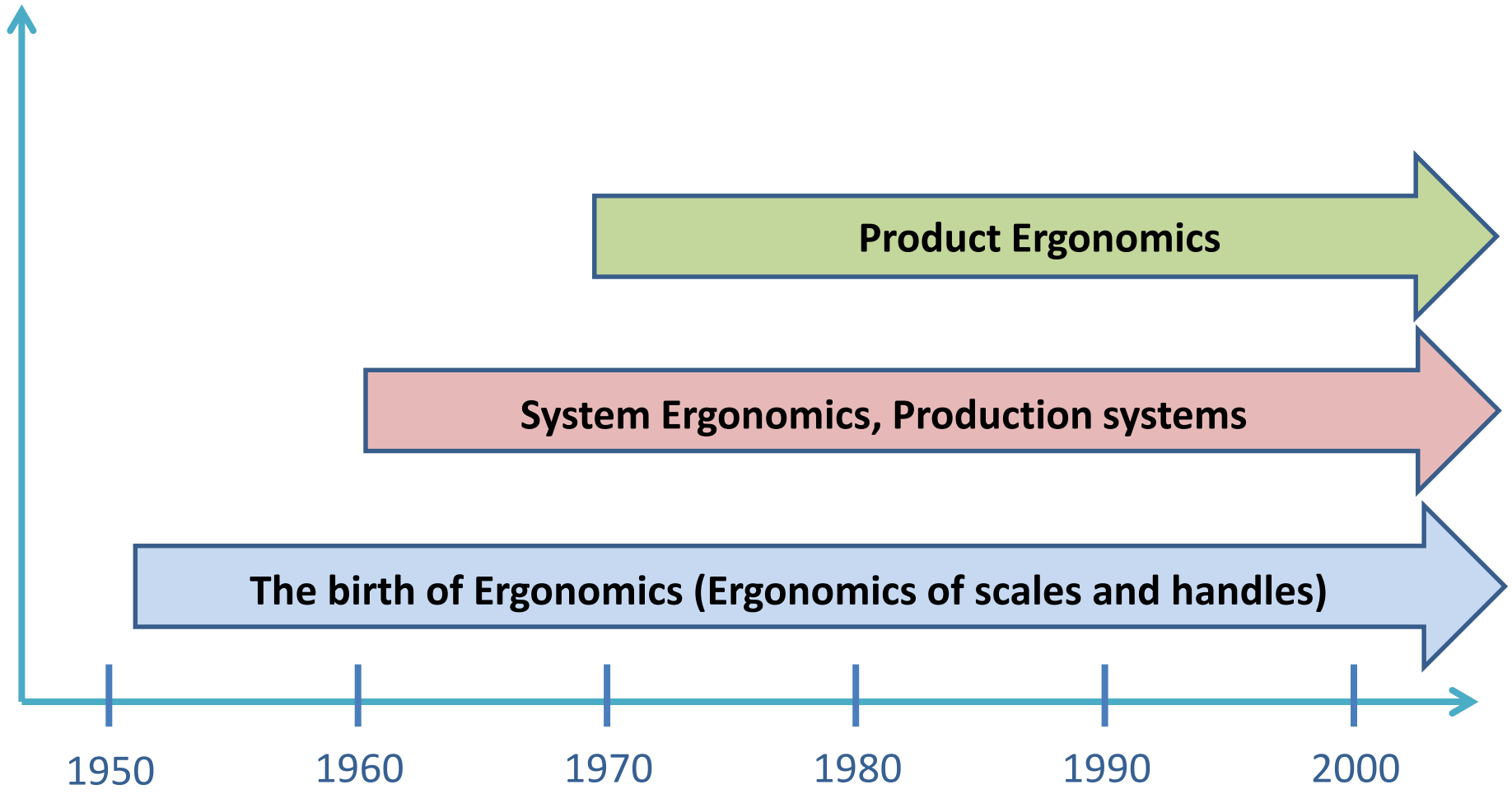


2. System ergonomics (industrial ergonomics)

- Corporations „discover” ergonomics
- Optimization of **tools**, **work processes** and the **environment** itself lead to increased efficiency, safety and comfort
- Everything designed for the „average user”

- Research is focused on whole systems not only „handles” – man-machine system optimization
- Ergonomics „breaks free” of exclusive military founding

The history of Ergonomics

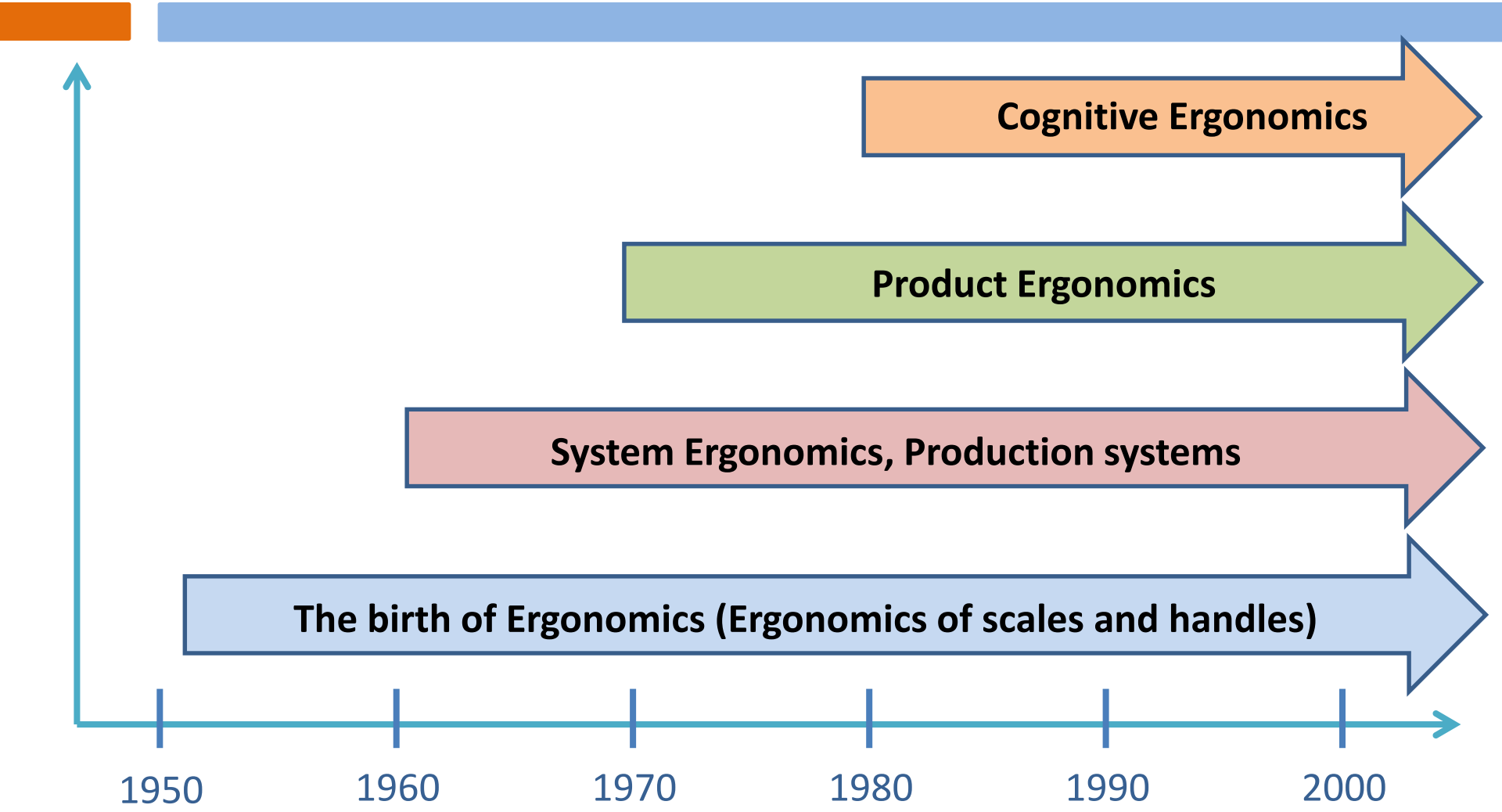


3. Product Ergonomics

- The ergonomic approach spreads to other areas: education, sports, transportation
- The product itself is in the center of attention

- Products are not only designed for a hypothetical average user – diversification starts to happen – user groups (rich, poor, disabled, gender, ethnicity)

The history of Ergonomics

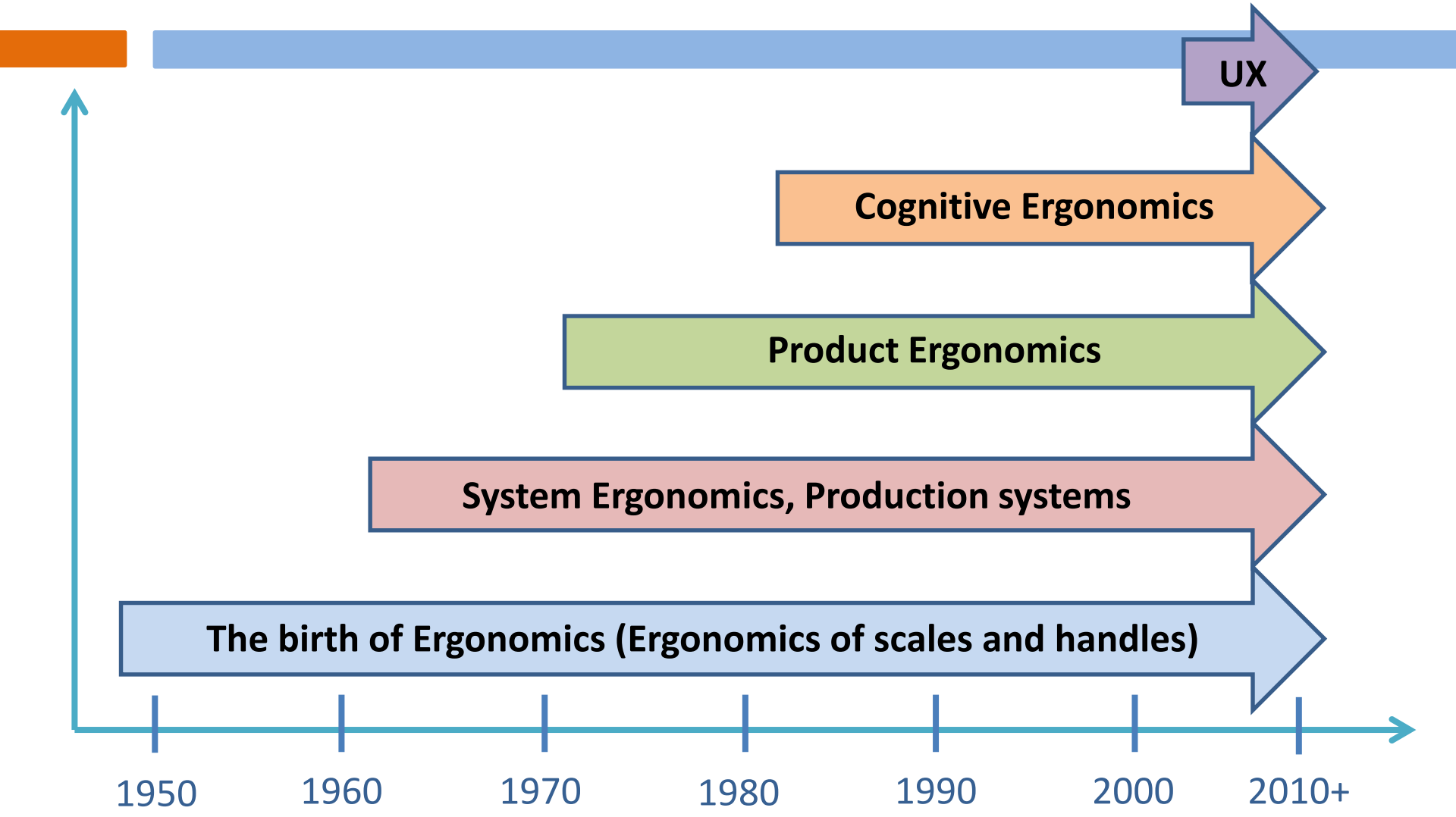


4. Cognitive Ergonomics

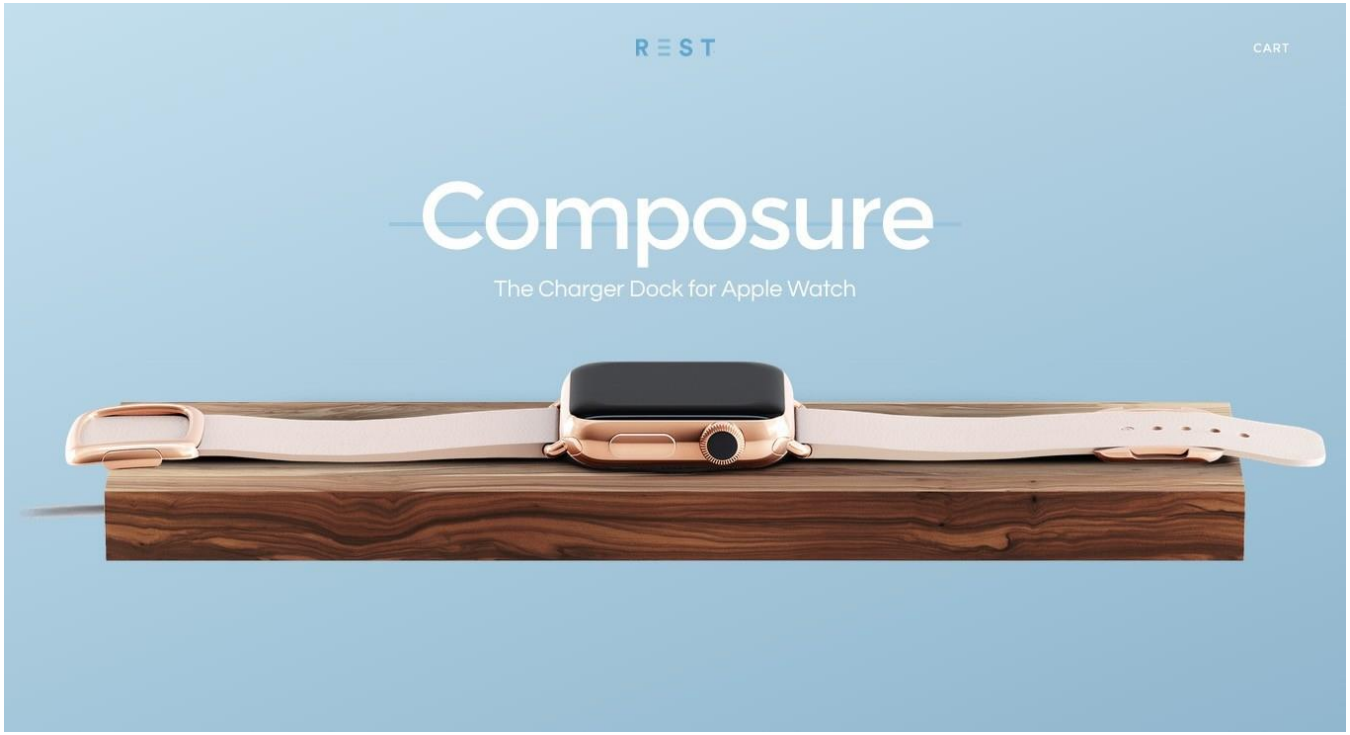
- Catastrophes that were caused by human error: Three Mile Island, Chernobyl, Challenger
- Personal Computers become common – software ergonomics

- The focus of research is similar to that of „scales and handles”, but this time the most important aspects of interface design are cognitive factors (e.g. memory and attention span) not sensorimotoric properties

The history of Ergonomics extended



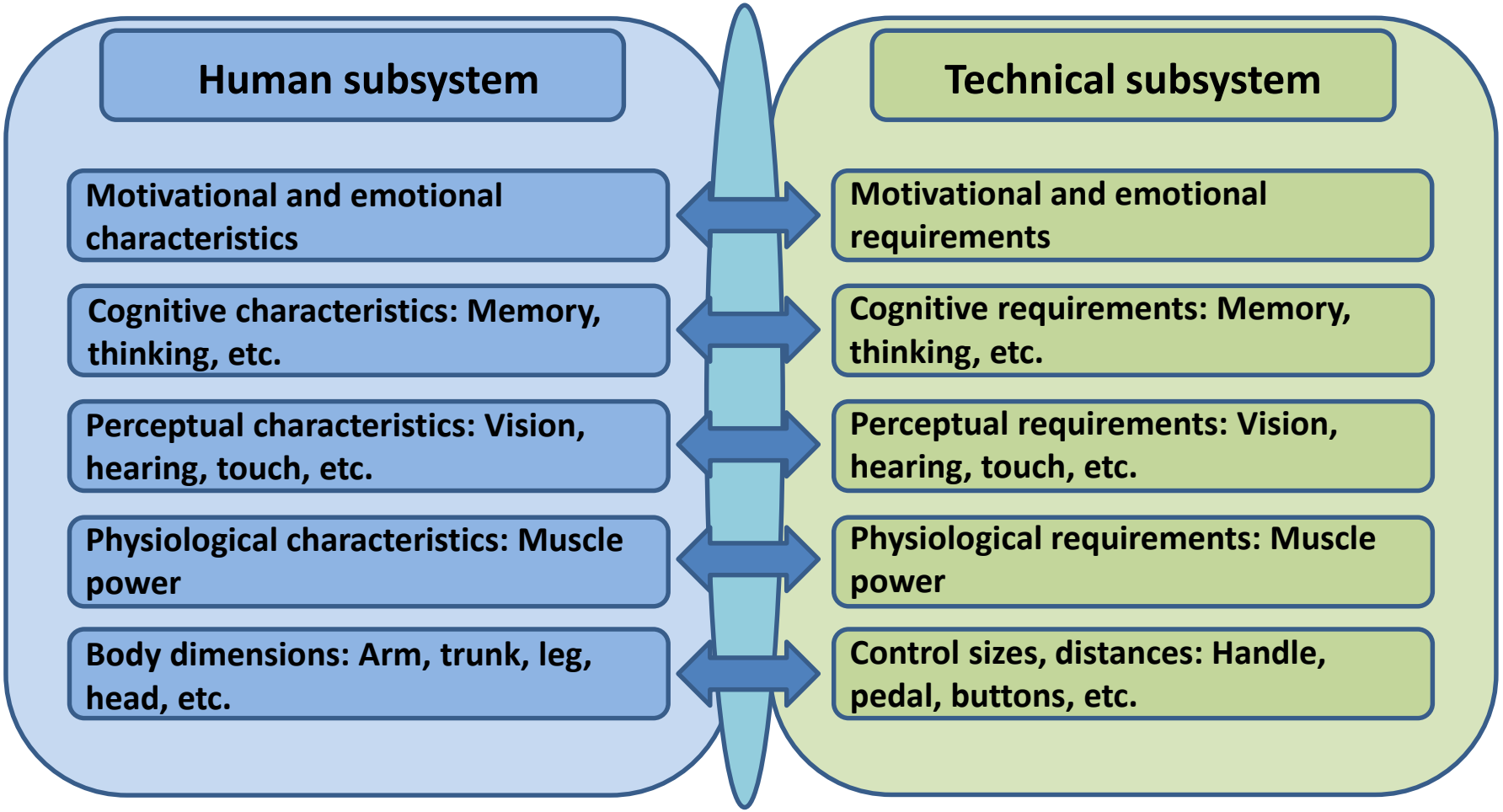
?5.? User Experience



- **Emotional response** comes first in every situation (read at: Zajonc). If that first emotion if good, more likely the customer will buy our product.

Human-Machine System analysis

Human-Machine System analysis



Human-Machine Systems

A HMS always has
- a **human subsystem**,
- a **technical subsystem,**
- and a **user interface(UI)**.

- These subsystems can further be divided into smaller and even smaller elements as necessary depending on the particular **aim of the analysis**.
- If the human subsystem and the technical subsystem are not compatible, the particular activity may **not be safe, comfortable** and **efficient** and therefore the user may experience increased stress (more about stress in a later lecture)

Human-Machine Systems analysis

- **Motivational and emotional requirements**
- **Cognitive requirements** (memory, attention, etc.)
- **Perceptual requirements** (vision, hearing, etc.)
- **Physiological requirements** (e.g. muscle strength or motoric finesse)
- **Control sizes, distances**

- **User Interface**

Human-Machine Systems analysis

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