



Ergonomia

Designing work for humans in all their complexity: physical, cognitive, and social

Σχεδιασμός εργασίας για περίπλοκες ανάγκες του ανθρώπου:
φυσικές, γνωστικές και κοινωνικές

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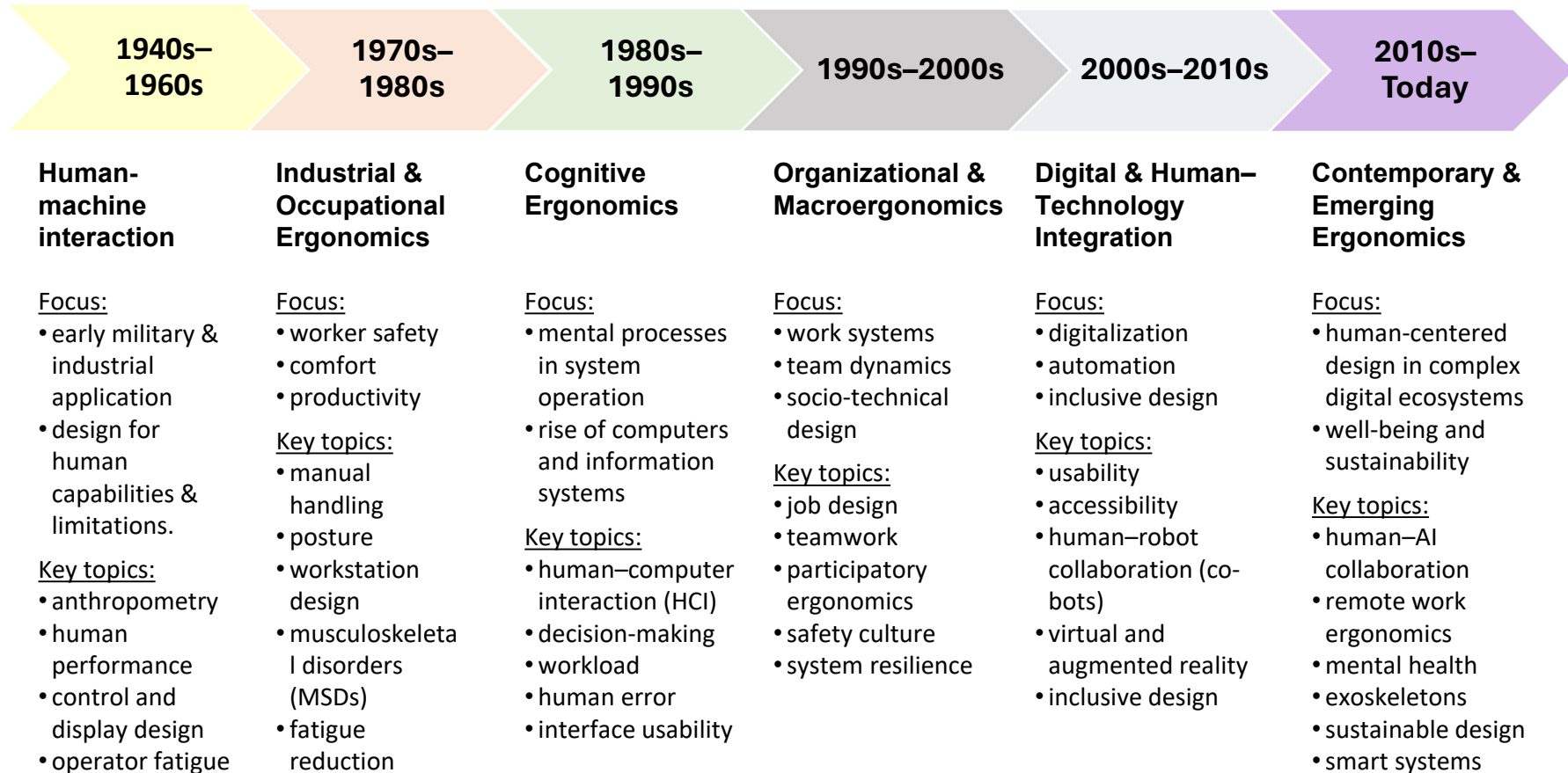
Founder of **Ergonomia SA**

Humans come first

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The Evolution of Ergonomics



Key Drivers of Change in Ergonomics

- Digital Transformation
- Hybrid and Remote Work
- Demographic and Workforce Diversity
- Sustainability and Human-Centered Design

Digital Transformation

Digital transformation encompasses

- Automation,
- Artificial Intelligence (AI), and
- Connected devices

are changing how we interact with work systems.

New

- cognitive demands,
- information overload, and
- algorithmic management

call for new ergonomic frameworks

Digital Transformation - Example

In logistics and warehouse operations, **AI-driven systems** now

- assign picking routes and
- monitor worker performance in real time.

While this optimizes efficiency, it may **increase cognitive load** because workers must

- interpret frequent **digital alerts** and
- adapt to **algorithmic pacing**.

A human-factors intervention might involve:

- Simplifying **on-screen notifications** to reduce information overload,
- Allowing workers to **adjust pacing** or **mute non-critical alerts**,
- **Training supervisors** to use system data for **coaching, not control**.



Takeaway (food for thought): Digital transformation requires **cognitive ergonomics** to ensure **humans remain in control of technology** — not the other way around.

Hybrid and Remote Work

Flexible workplaces has moved ergonomics beyond the office

- Home setups
- digital collaboration, and
- blurred boundaries between work and life

require holistic approaches that **integrate** :

- **Physical**
- **mental, and**
- **social ergonomics**

Hybrid and Remote Work - Example

In post-pandemic corporate environments, many professionals split time between home and office. At home, workstations are often improvised — laptops on kitchen tables, poor lighting, and extended screen time. Meanwhile, digital collaboration tools (e-mails, video calls, chat platforms) create **constant connectivity** and **fatigue**.

Ergonomic approaches:

- Providing remote **ergonomic self-assessment tools** and **virtual coaching**.
- Promoting **micro-breaks** and **posture change reminders**.
- Establishing policies for “**digital quiet hours**” (ώρες ψηφιακής ησυχίας) to preserve recovery time.



Take away: Hybrid work expands ergonomics into domestic and digital environments, requiring **holistic strategies** that blend physical, mental, and social dimensions.

Demographic and Workforce Diversity

- **Aging** workers,
- **gender diversity**, and
- **inclusive design** challenges

push ergonomics to consider ***human capability variability***



Designing for all, not for the “average” user.

Demographic and Workforce Diversity – Example

In manufacturing and healthcare,

- the workforce is aging — employees over 55 perform physically demanding tasks.
- younger workers bring new expectations about inclusivity and flexibility.

Ergonomic proposals:

- **Adjustable workstations** to accommodate varying heights and strengths.
- **Assistive exoskeletons** or lift-assist devices for older workers.
- **Inclusive interface design** that considers gender, language, and accessibility diversity.

Takeaway: Designing “for all, not for the average” means integrating universal design principles and enabling all workers to participate fully, safely, and with dignity.

Sustainability & Human-Centered Design

Ergonomics aims to **sustainable work systems**

designing jobs that **people can do**

- ***throughout their working lives***
- ***without harm or burnout***

Sustainability & Human-Centered Design

Example

In a global electronics assembly company,

High labour turnover was linked to **repetitive tasks** and **fatigue**.

By redesigning the work process

- **rotating tasks,**
- **optimizing lighting,**
- **improving micro-break scheduling**

the company reduced fatigue and labour turnover by over 20%.

At the same time, introducing **participatory workshops** allowed workers to propose layout changes that improved both efficiency and comfort.

Takeaway: Sustainable design is about **long-term viability**: creating work systems that **maintain productivity and worker health across years, not just shifts**.

Emerging Topics and Opportunities

- Digital Ergonomics / Human–AI Interaction
- Cognitive and Neuro-ergonomics
- Data-Driven Ergonomics
- Participatory and Co-Design Approaches

Digital Ergonomics / Human–AI Interaction

The challenge is how to make AI systems

- **transparent,**
- **trustworthy,** and
- **supportive**

rather than **stressful**

Digital Ergonomics / Human–AI Interaction

Example

In air traffic control and modern control rooms, AI assists operators by predicting potential conflicts. However, if the interface highlights too many alerts, human trust drops — operators either over-rely or ignore AI recommendations.

Intervention:

Through iterative interface design and usability testing, the alert system was simplified, using **color-coded priority** levels and **concise explanations** of AI reasoning.

The result: reduced mental workload and improved decision accuracy.

Takeaway: AI must be **explainable** and **predictable** to strengthen **trust**.

Ergonomics ensures that

the “**human–AI**” team functions as “**one intelligent system**”.

Cognitive Ergonomics and Neuroergonomics

With Cognitive Ergonomics and Neuroergonomics insights from neuroscience are used to design that:

- align with human attention,
- decision-making and
- predict fatigue & stress.

Cognitive and Neuroergonomics - Example

In automotive assembly, **wearable EEG** (Electroencephalography) and **motion sensors** were used in pilot studies to **detect operator fatigue and stress**.

Instead of punishing performance drops, supervisors used data to reorganize shifts and offer recovery breaks.

Takeaway: Neuroergonomic data can improve OSH, provided used **ethically and transparently to support people, not monitor them intrusively**.



Data-Driven Ergonomics

Wearables and sensors offer new ways to monitor:

- workload,
- posture, and
- fatigue

but

raise ethical and privacy questions

Data-Driven Ergonomics - Example

In large distribution centers,
wearable posture sensors monitor

- bending and
- twisting.

When analyzed at team level (not
individually),

the data helps redesign

- shelf height and
- lifting procedures

leading to **measurable reductions in
back strain.**



Takeaway: The principle is **data for prevention, not for surveillance.**

Analytics should guide system redesign, not personal discipline

Participatory and Co-Design Approaches

Workers must be

co-creators of ergonomic solutions,

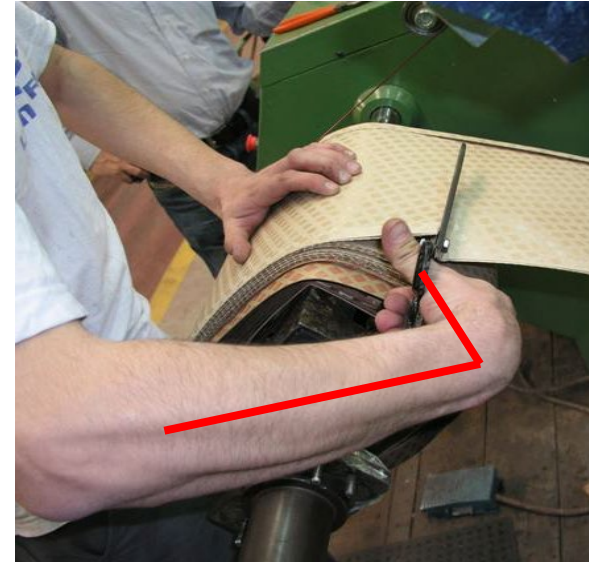
not passive recipients.

Engagement drives both **safety** and **innovation**.

Participatory and Co-Design Approaches – Example

Example:

In a transformer winding station, ergonomic work analysis in combination with proposals of the employees helped in a low-cost redesign of the work station resulting in increased productivity and reduced musculoskeletal strain.



Takeaway: Participation isn't a formality. It is the essence of contemporary ergonomics: co-creation ensures solutions are practical, accepted, and sustained.

Challenges Ahead

We must ensure **ergonomics keeps its *human-centered identity***.

Key challenges include:

- Translating data into **actionable insights** rather than **surveillance**.
- Ensuring **psychosocial factors** get as much attention as physical ones.
- Integrating **ergonomics into organizational strategy**, not just compliance.
nevertheless ESG may be an opportunity

Closing

While science & technology gives us powerful tools and solutions, they are not always used for “**fitting the task to the man**”.

Human needs do not always come first

Contemporary ergonomics is about **designing work for humans in all their complexity**:

- physical,
- cognitive, and
- social.

It's about shaping the future of work where:

technology serves people, not the other way around.

As ergonomists, **our mission is to bridge science, empathy, and innovation** making sure that **every advance in work design enhances both performance and human well-being.**

Thank you