



Human-centric approach in 5.0 manufacturing processes

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Agenda

- 01 Human-Centered design
- 02 Human Factors
- 03 HumanDT guideline tools



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Industry 5.0

An EU vision of industry built on **human-centricity**, sustainability, and resilience, ensuring technology empowers people while respecting societal and planetary needs.



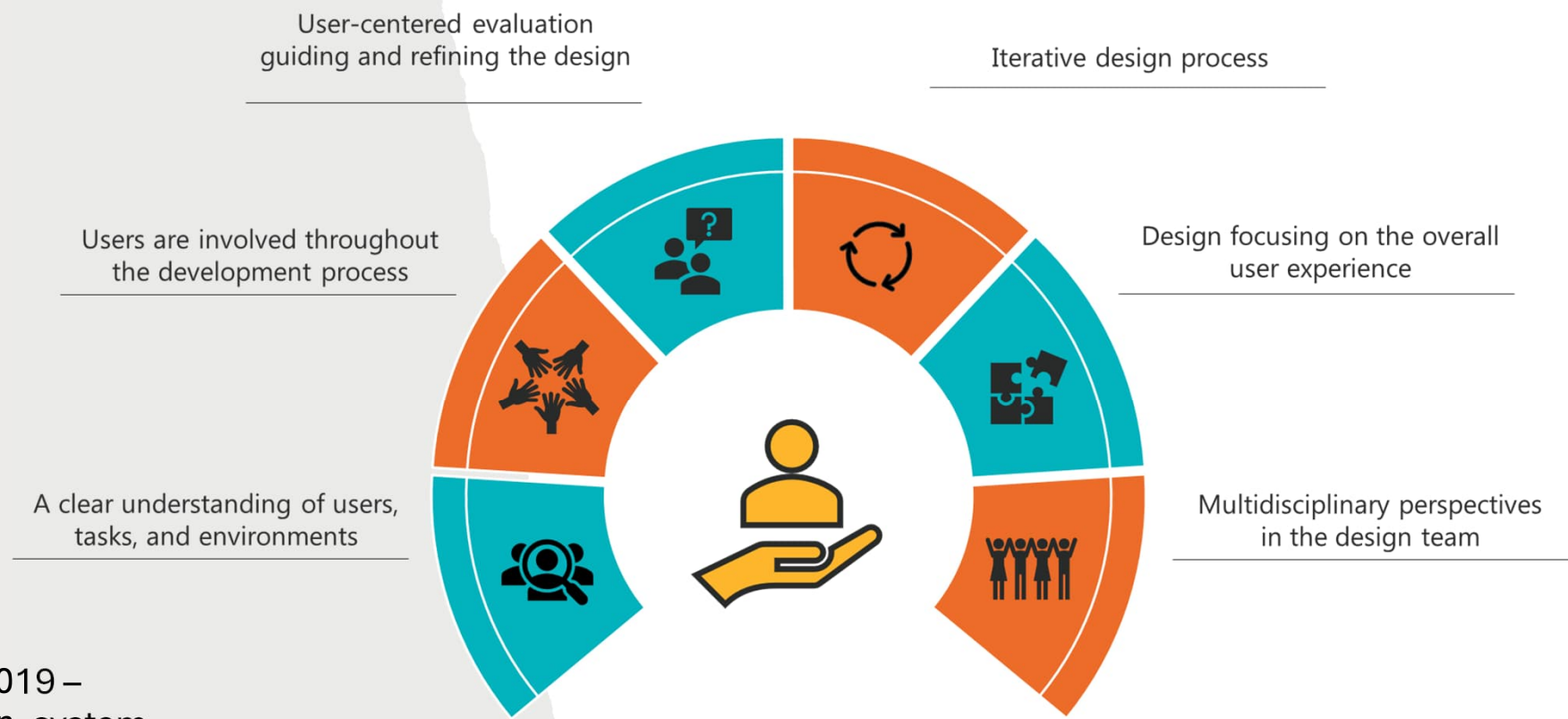


Nokia 9000
Communicator,
'Responder'





Human-centered design



PRINCIPLES OF HUMAN-CENTRED DESIGN
(Based on ISO 9241-210:2019)

ISO 9241-210:2019 –
Ergonomics of human–system
interaction — Part 210:
Human-centred design for
interactive systems

Kannisto, H. 2025



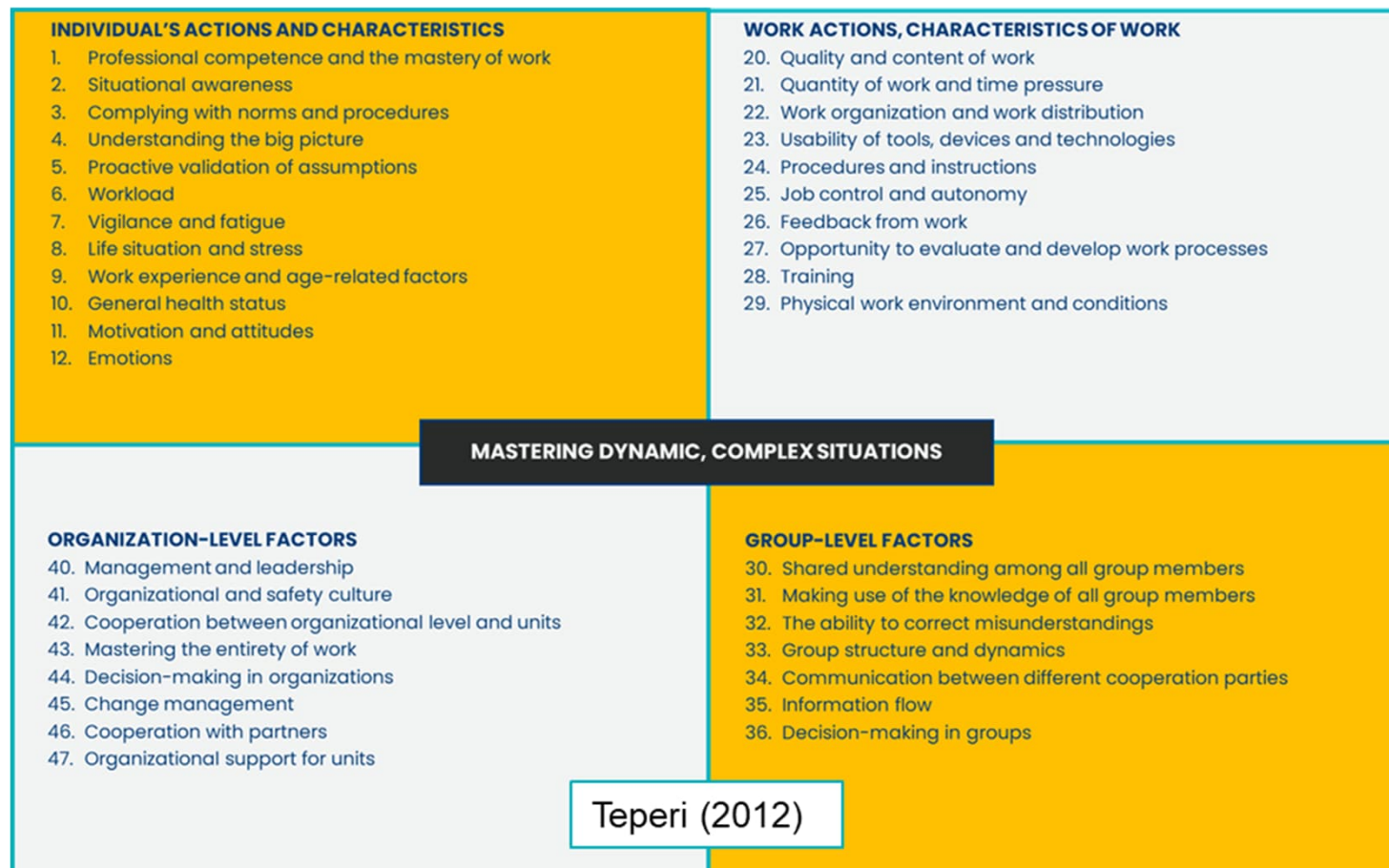
Human Factors Tool (HF Tool)

Prof. Anna-Maria Teperi (2012)

Directs focus on the **aspects of work that support or hinder success**

Describes the factors influencing the **individual, work, group and organization** levels.

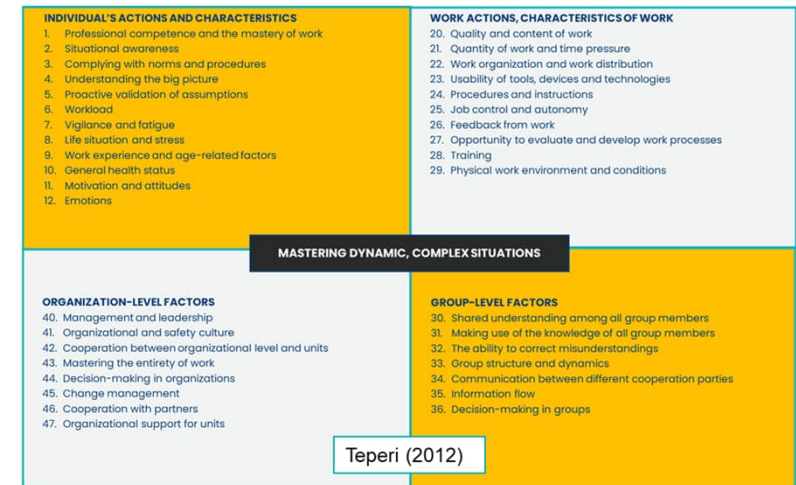
Helps to **perceive the big picture** and detail the nature of human contribution in work activities.



HF Tool

Gathering background information to compile design specifications

1. Organise a **site visit** to the premises where the DT will operate. As a lighter alternative, arrange a **meeting** with those who will operate the Digital Twin once it is implemented.
2. **Ask the participants** to describe the processes the DT is planned to support. Work to gain understanding of how the process unfolds.
4. **Ask the participants to name three items** from each of the four content areas of the HF Tool that are especially important to consider in the design of the DT.
5. **Ask for concrete descriptions** of how the HF should be considered in the final design.
6. **Refine** the information to compile **design specifications**.



Human DT checklist

Extending the risk evaluation to cover Human Factors

Collaborate with end-users to evaluate the “HF risks” related to the DT design.

1. Ask the participants to go through the checklist and evaluate the assertions.
2. Use the risk matrix to evaluate the risks identified (“yes” answers)
3. Focus on the risks that are evaluated “high”: iterate the design to reduce the risk.
4. Repeat the risk assessment and continue iteration until reaching a low final risk level (FRL).

Probability	Likely	Medium	High	High
	Possible	Low	Medium	High
	Unlikely	Low	Low	Medium
RISK MATRIX		Minor	Harmful	Serious
Severity				

HF CHECKLIST							
Nº	ITEM	SPECIFICATION	ASSERTIONS	APP.	IRL	MEASUREMENTS	FRL
1. INDIVIDUAL LEVEL	1	Professional competence and the mastery of work	The knowledge, skills, and expertise required in a given job	The DT challenge users' skills, knowledge or capabilities	Y/N		
	2	Situational awareness	On-going process of perceiving, understanding, and projecting what is happening in the individual's work environment (attention, observation, memory, decision-making, and action).	The DT challenges users' attention and memory. The DT challenges users' sustaining an up-to-date understanding of what is happening in the work environment.			
	3	Complying with norms and procedures	Norms can be official instructions, such as written work guidelines, safety regulations, or industry-specific standards, or they can be unofficial practices developed within the work community.	The DT contradicts with norms and procedures mandated from user. The DT contradicts with established practices in the user's work community.			



Conclusions

- The human-centered approach to digital twin design is based on **collaboration between the designers and the end-users**
- Compiling **design specifications** and executing **risk evaluations** offer an opportunity to collaboration
- **A planned and structured approach** enables gaining valuable user insight in a focused and economical way
- A human centered approach can **enhance usability, reduce user's stress and increase profit**



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Thank you Muchas gracias Eskerrik Asko

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