Finnish Institute of Occupational Health

Boosting safety: Integrating Human Factors in the safety critical industries

2.10.2025 Safety Days ERA

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Anna-Maria Teperi

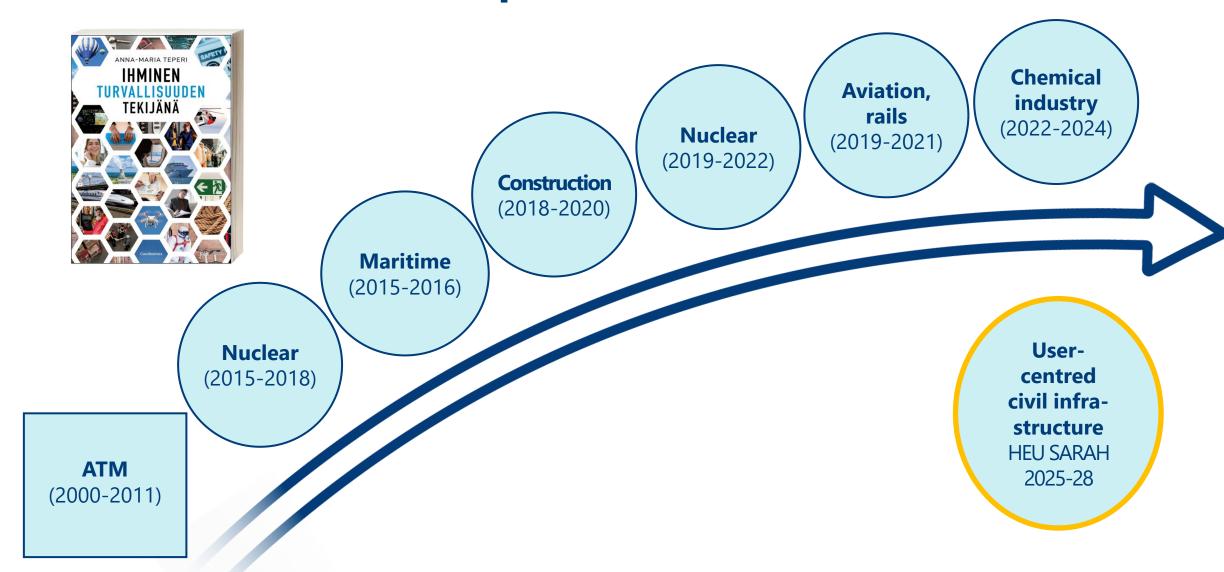
- Psychologist; work and organisational psychology
- **Title of Docent**: University of Tampere, University of Vaasa
- Finnish Institute of Occupational Health (FIOH)
- Co-Chair, The Finnish Expert Panel for sustainable development, the Prime Minister's Office
- EU Commission: Working Party 'Climate change and OSH'

- Earlier:
 - Finavia Human Factors in aviation // Occupational Health Centre
 - Accident Investigation Board HF Specialist // Nuclear Safety
 Committees



MOTTO: HOW TO HELP PEOPLE SUCCEED?

HF research and development since 2000



SUPPORT SYSTEM AND HUMAN RESILIENCE:

Ability to anticipate, cope, recover and learn. **HELP PEOPLE SUCCEED.**

SAFETY I

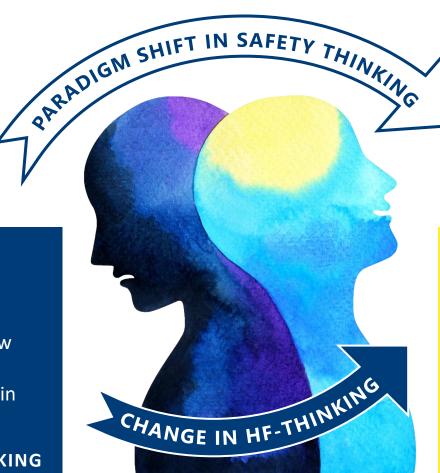
FACTORS WEAKENING SAFETY

- Unsuccessful actions
- Risks
- Errors

INDIVIDUALS AND ERRORS IN FOCUS

- "Bad Apple Theory"
- "Find the weakest link and throw them away"
- Latent systemic failures remain in system

= OLD THINKING



SAFETY II

FACTORS MAINTAINING SAFETY

- Things working well
- Understanding human variation
- Limited resources

ORGANISATION, SYSTEM, RESOURCES AND DEVELOPMENT IN FOCUS

- Several contributing factors behind the cases
- Learning is main goal of investigation
- Human error is starting point for improvement - not the conclusion

= NEW THINKING

HF Tool™– a tool for understanding and analysing human activity

- Helps to perceive the big picture and the systemic nature of human contribution in operations.
- Describes the factors influencing the individual, work, group and organization levels.
- Describes the strengths and weaknesses of activities and how they affect each other.

INDIVIDUAL'S ACTIONS AND CHARACTERISTICS

- 1. Compatence, mastery of work
- 2. Situational awareness (perception, memory, decision-making, response/execution)
- Complying with norms and procedures
- 4. Understanding the bigger picture/overall situation
- 5. Proacting, preconceptions and assuring
- 6. Workload (overload/unload) and means for managing it
- Vigilance, fatigue symptoms
- 8. Life situation, anxiety (long term) stress
- 9. Age; qualitu and quantity of working experience
- 10. Health, working ability
- 11. Motivation, attitudes
- 12. Emotional state and reactions

WORK ACTIONS, CHARACTERISTICS OF WORK

- 20. Quality and contents of work; work demands
- 21. Quantity of work; time pressure, having to rush
- 22. Work organization, work distribution, job descriptions; clarity
- 23. Usability and functionality of devices, software,
- 24. Procedures and instructions; functionality, clarity
- 25. Opportunitites to influence one's work and working
- 26. Feedback from work, professional appreciation
- 27. Opportunity/ability to evaluate and develop one's work processes
- 28. Training; content, effectiveness, availability
- 29. Physical working environment, working conditions, work hygiene factors (ventilation, lighting, temperature, layout)

ORGANIZATION-LEVEL FACTORS

- 40. Management and leadership, management system
- 41. Organization/safety culture
- 42. Co-operation between different organizatoinal levels and units (area, units, company)
- 43. Mastering the entirety of work, mutual understanding of each other's work
- 44. Decisions made (resources, personnel, equipment)
- 45. Change management (personnel, systems)
- 46. Co-operation with partners; differences in procedures, mutual collaboration)
- 47. The company's support for unit (HR, finance)

GROUP-LEVEL FACTORS

- 30. Shared understanding of the situation among all group members
- 31. Making use of the knowledge of all group
- 32. Correcting misunderstandings. interpretations and -hearings (speaking up)
- 33. Group structure, cohesion and other group dynamics (social relations, athmosphere, mutual support)
- 34. Communication between different groups
- 35. Information flow (communication practices, e.g. shift change)
- 36. Decision-making in group

Currently trademarked to FIOH (HF Tool™). Based on the development work at Finavia 2000-2011 (Teperi, 2012)

Mastering

dynamic, complex

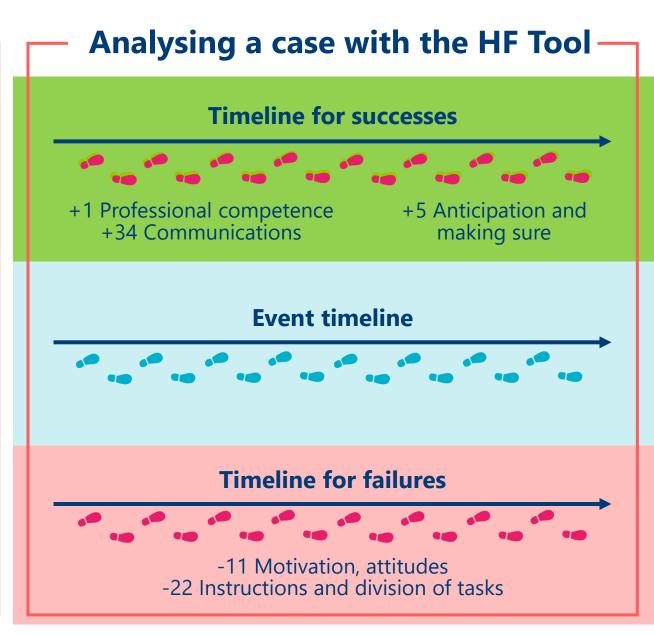
situations

Why such a tool?

- intended for **operative personnel's own use** (not only 'HF/safety-professionals')
- easy-to-use (compared to 'heavy investigation methods')
- embedded in everyday life (part of SMS)
- holistic
- positively-minded



HF Tool Individual's Work actions, characteristics of actions and characteristics work Items 1-12 Items 20-29 **Organization-level Group-level** factors factors Items 40-47 Items 30-36

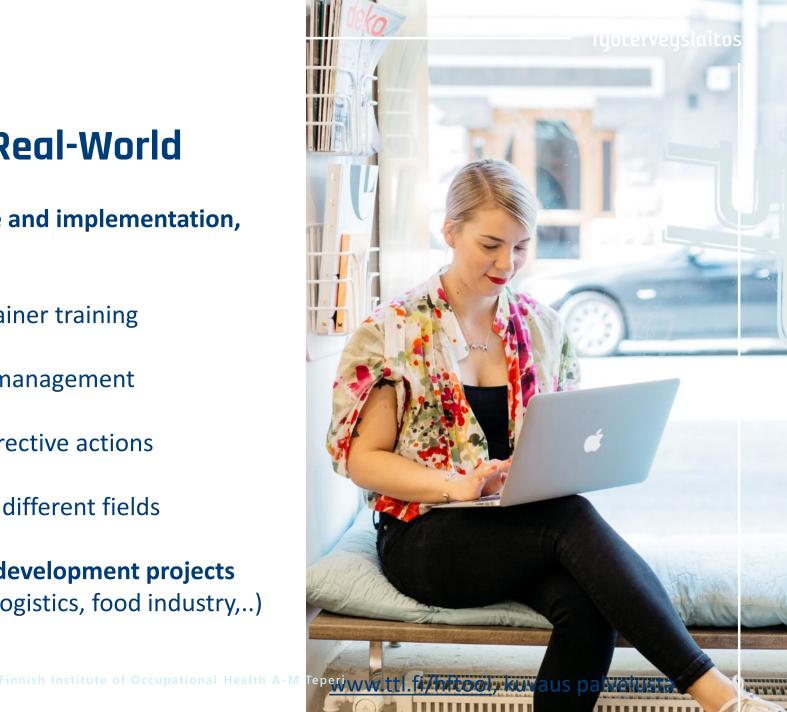


HF Tool – Gripping the Real-World

A concept for bringing about change and implementation, includs several parts:

- Basic, continuing education and trainer training
- Information and presentations to management
- Investigative tools, support for corrective actions
- Constantly evolving, researched in different fields

The basis for long-term, systematic development projects (aviation maintenance, rail, forestry logistics, food industry,..)



Air Traffic Management 2000-2011

1. phase: Post strike actions, analyzing ATM work processes (2000-2003)

2. phase: HF Tool embedded in SMS

- Operational personnel, incl. supervisors
- Incident investigation and reporting
- Monthly reports on incidents throughout the organization (from board to personnel)
- HF Tool included in risk analyses
- HF Tool introduced in 2003, still in use today



(Improving HF in ATM From must to mindset)

Nuclear power industry 2015-2018 / on-going collaboration

- HF Tool used by safety experts and managers of two nuclear power plants
- Investigations currently include HF Tool as an analysis method
- Helped to focus on successes
- Explored in UK at EDF Applying Adaptive
 Safety Methods to Normal, Everyday Work in a Nuclear
 Powerplant by Robin Hamer, Thomas Jun, Patrick
 Waterson, Anna-Maria Teperi :: SSRN



Maritime 2015-2016, continued in 2020-2025

- Collaboration with eight maritime operators, both on land and at sea
- HF Tool provides an opportunity to report deviations positively and develop safety inclusively
- Application in simulator training for maritime and other sectors (rescue services, emergency care)
- Study for high-speed workboats Human factor analysis of cockpit work incidents in high-speed workboats: the mystery hidden between the lines PubMed



Railway 2015-2019

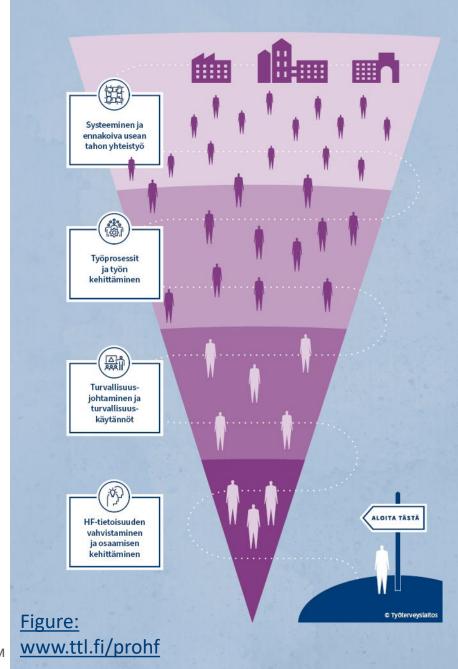
- Implemented **proactively with VR Group** in Finland since 2015 (EU directive 2016)
- **Trigger:** Accident investigation in 2015
- HF-programme in 2015-2018: training sessions, workshops, network meetings, revised safety investigation
- ..continued by research 2018-2019



The development path with HF

Human-centric mindsets and practices evolve over time and across different spaces

- Awareness; Competence
- Safety management and safety practices
- Work practices and planning; system design
- Systemic and proactive multi-stakeholder collaboration
- HF Tool supported organizational learning, enabling the development of safety practices and work



SARAH: uSer-centric civil infrAstructure Reliable assessment And Healing -projekti

- The human-centric concept of the EU Horizon project is based on the HF Tool™
 research and development over 20 years
- Use Cases: Maintenance and repair of a viaduct along the railroad; Stabilization of slopes using ground anchors



Horizon EU Twin digital transition: <u>uSer-centred civil infrAstructure Reliable Assessment and Healing | SARAH | Project | Fact Sheet |</u>
HORIZON | CORDIS | European Commission



Finnish Institute of Occupational Health

Thank you

HAVE A GOOD DAY AT WORK!

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