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AI4 REALNET

Up-skilling human expertise with AI: A methodological approach

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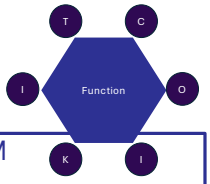


Motivation

- Expertise can be understood as a muscle — if it is not continuously exercised, it weakens (Lee et al., 2025).
- Human learning requires cognitive engagement with AI-generated information (Gajos & Mamykina, 2022).
- Effective learning depends on an active human role, including experimentation and reflection (Kolb, 1984).
- Working with AI may lead to a decline in cognitive skills if humans become overly reliant on automated support (Endsley, 2023).
- AI-induced deskilling is socio-technical. It is affecting decisionmaking, interprofessional collaboration, and institutional knowledge retention (Rafner et al., 2021)

What methodological approach can be used to systematically design AI tools that preserve and support human expertise?

The approach: WIL-FRAM

- Based on Functional Resonance Analysis Method (FRAM) (Hollnagel, 2012)
  - Focuses on functions and their interactions in complex systems.
  - The interactions are connected via six aspects (Input, Output, Preconditions, Resources, Control, Time)
- In the WIL-FRAM Method some aspects are chanced
  - Preconditions: working knowledge
  - Resources: information
- Demonstrating within a socio-technical system:
  - where humans gather information
  - where they develop work-related knowledge
  - how learning takes place

Case study

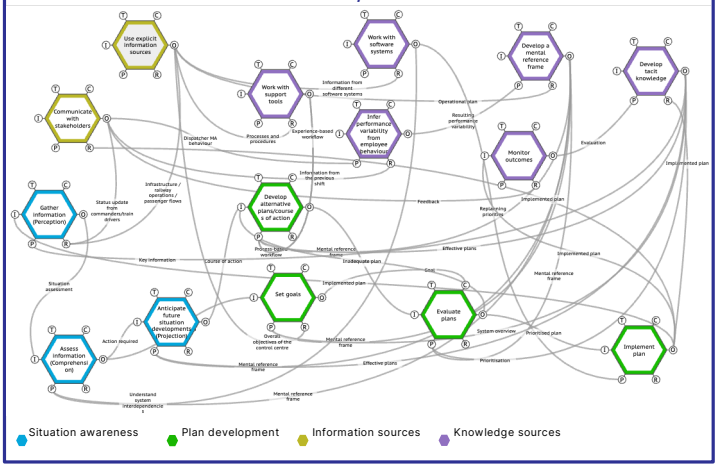
- We tested the applicability of the method in a case study of a dispatching scenario.
- Five semi-structured interviews, each lasting two hours (total of ten hours of interview material).
- Interviews are guided on Structured Exploration of Complex Adaptations (SECA) (Patriarca et al., 2022).
- The analysis followed principles of structuring qualitative content analysis (Mayring & Fenzl, 2019).

"Visualize knowledge flows, their sources, and their role in enabling successful work within a socio-technical system"

Conclusion & future steps

- The method provides valuable insights into how people learn within sociotechnical systems.
- It should be applied and tested in a wider range of scenarios.
- Further applications are needed to build empirical evidence and strengthen the knowledge base and resulting guidelines.
- The different levels within the method are challenging to handle and may lead either to overly generalised results or excessively detailed analyses with a loss of overall system perspective.

Method/Results



Key findings

- Mental frame of reference: Experts maintain a dynamic understanding of the sociotechnical system. → AI should support system-level awareness.
- Problem solving: Experts first seek to understand a situation. → AI should support sense-making rather than provide solutions.
- Expertise differences: Novices rely more on formal procedures, experts on tacit knowledge. → AI support should adapt to expertise level:
  - Novices: Need support in identifying relevant procedures and learning from past cases. → AI should provide contextual guidance and examples.
  - Experts: Benefit from critical reflection rather than advice. → AI should challenge decisions through counterarguments and alternative interpretations.

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