Digitalizing work – modelling work processes and mapping HF and OSH hot spots

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SARAH

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Digitalisation reshapes occupational safety and work demands

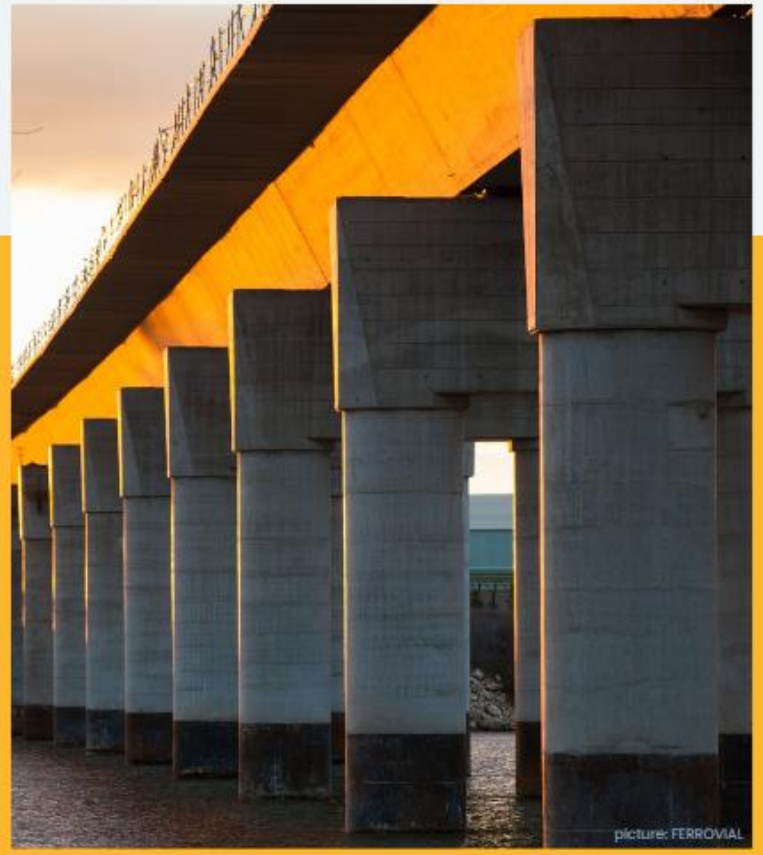
Changes occur across physical, cognitive and organisational dimensions

- Physical work is transformed
  - Direct exposure may decrease, while new kinds of installation, field and maintenance activities emerge
- Cognitive work intensifies
  - Interpretation, situation awareness and technology-supported decision-making become more prominent
- Organisational work changes
  - On-site and remote roles depend on shared information, procedures and coordinated responsibilities

➢ Design target: safer work and reliable performance

SARAH

Transforming how Europe **inspects**, **maintains** and **repairs** its critical civil infrastructure.



EUROPEAN CONSORTIUM

10 project partners from 6 European countries; France, Spain, Italy, Finland, Austria and The Netherlands are working together for 36 months.

HUMAN-CENTERED DIGITAL SOLUTION

SARAH adopts a human-centered approach to develop a safe-by-design integrated digital solution.

CIVIL INFRASTRUCTURE

Solutions empowering civil infrastructure supervisors and intervention workers in the maintenance and repair of civil infrastructure.

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Study approach: modelling current and future work

- Collaborative modelling was used to identify HF and OSH hot spots

Current work processes → HF and OSH hot spots → Future work tasks → Technology design aspects

- Iterative validation with end users and technology developers
- The study approach builds on collaborative modelling methods (Teperi & Leppänen, 2011; Teperi et al. 2019)



Picture: Copilot premium 9/2026

Human factors used as an approach for analysis –> HF Tool™ as 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.



HF Tool™, Teperi 2012

From collaborative process mapping to task architecture

Collaborative process map

- Chronological phases and tasks
- Participant descriptions of work-as-done
- HF and OSH issues linked to the work context
- Joint correction of interpretations

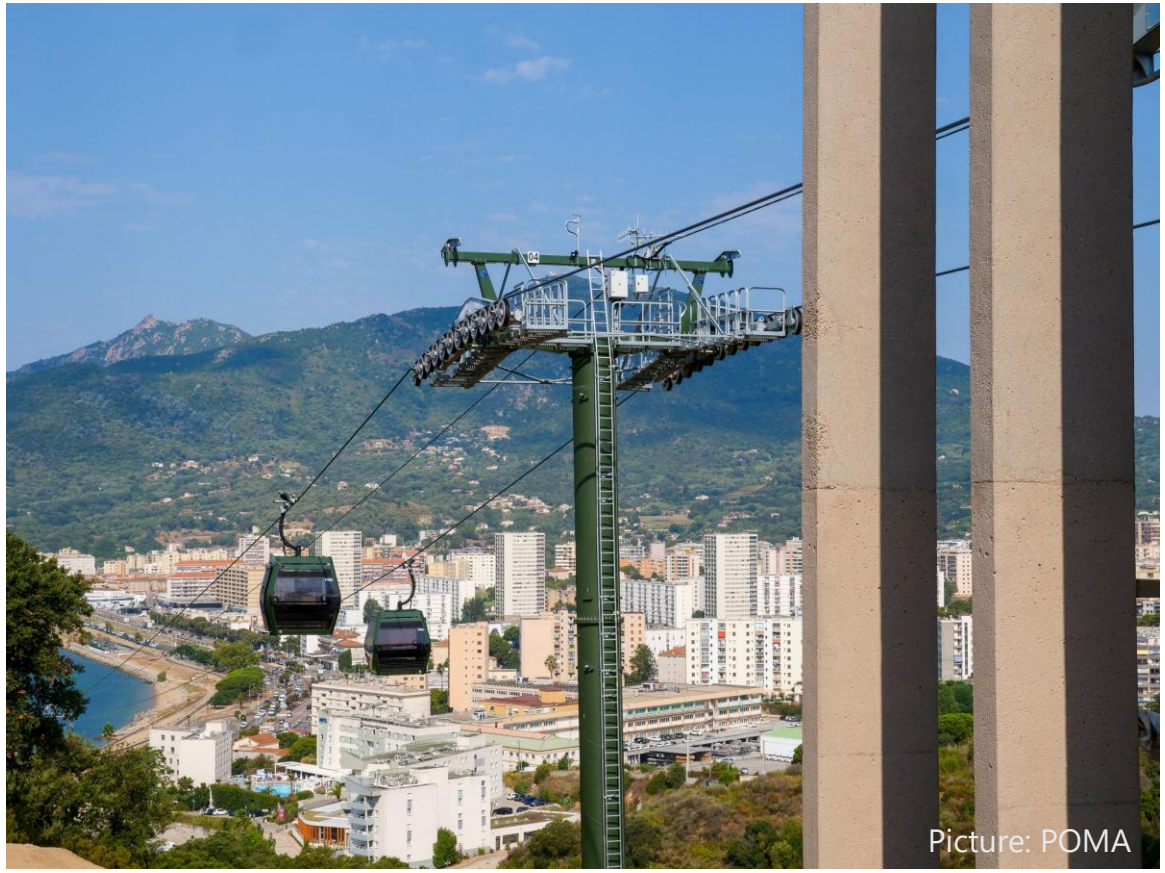


Actor and task models and swim-lane diagram

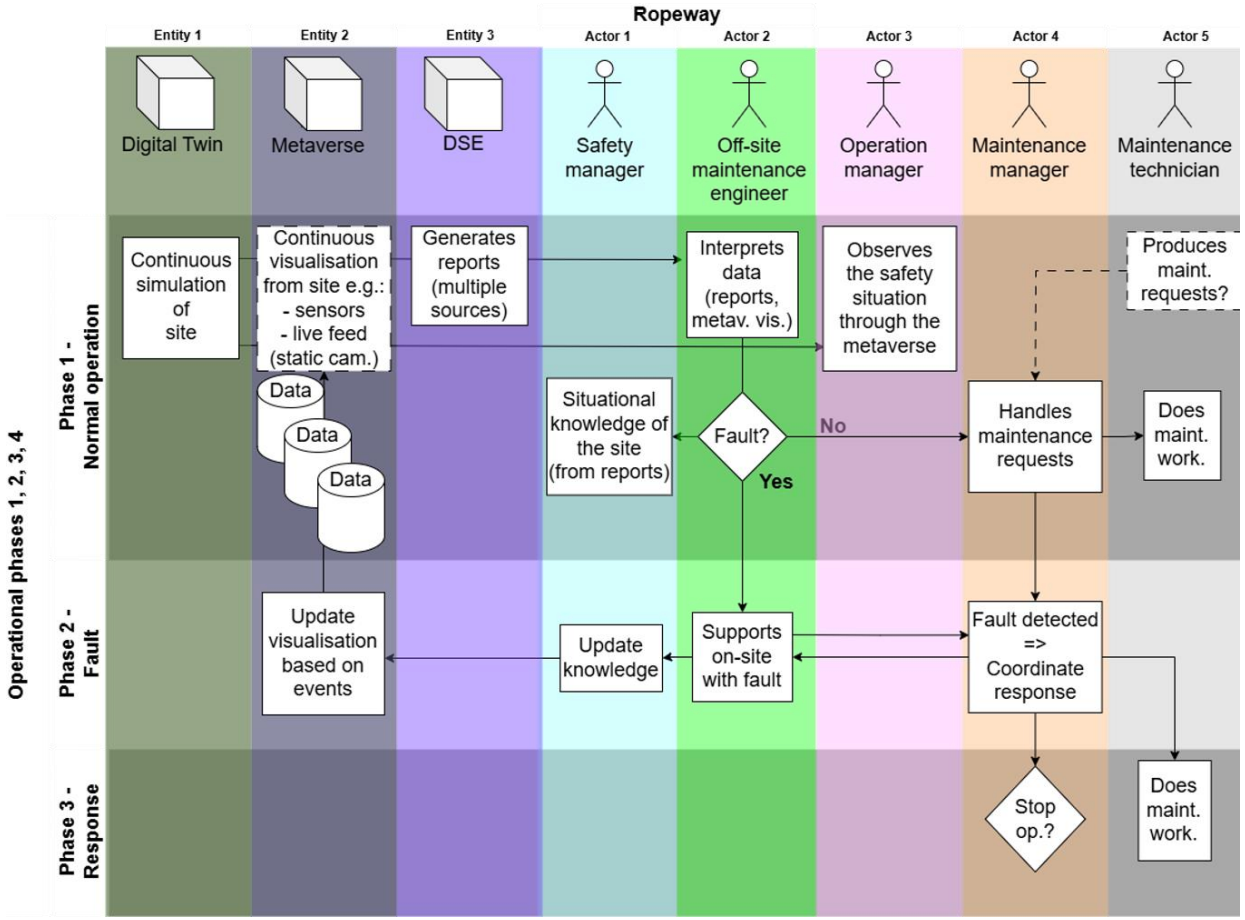
- Roles, responsibilities and task allocation
- Human–technology interactions
- Sub-processes and handovers
- Iterative refinement of future work

Case study: maintenance of ropeway infrastructure

- Current work - regulations, maintenance instructions, and visual inspections of structure and its current activities
- New technologies - sensors, digital twins, and remote digital environments
- Anticipated change - a transition from periodic observation toward continuous monitoring and predictive maintenance



Anticipated effects of digital monitoring on work



Safety benefits and new human factors requirements coexist

- Potential OSH benefits
  - Reduced exposure to work at height, difficult conditions and terrain, and repeated travel
- Human factors requirements
  - Competence, procedures, teamwork, communication, and information ergonomics
- Reliability of decision-making
  - Both over-reliance and insufficient reliance on technological information may affect safe decisions

Methodological contribution of collaborative modelling

- Anticipation
  - Identification of task changes and safety concerns before implementation
- Specification
  - Translation of HF and OSH observations into requirements for design and implementation
- Shared representation
  - A common description of work for end users, employers, and developers
- Iterative revision
  - Progressive refinement as technologies and work practices develop

➢ The models provide an empirical basis for human-centred technology design


Image created with Sora (OpenAI, 2025)

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