



EUROPEAN
UNION
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FOR RAILWAYS

Integration of Human and Organisational Factors in Railway Automation

2-3 December 2020

REMOTE CONFERENCE

Case Study «Human and Organisational Factors
within Swiss rail sector programme smartrail 4.0»

Franco Ehrat, Swiss Federal Railways SBB

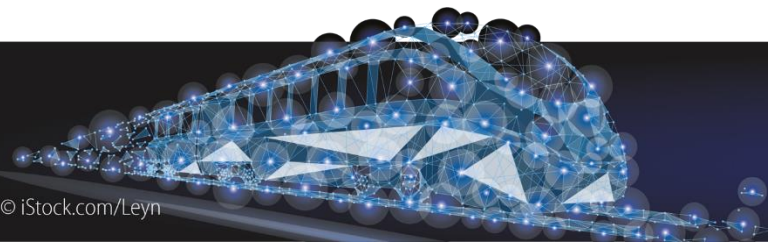
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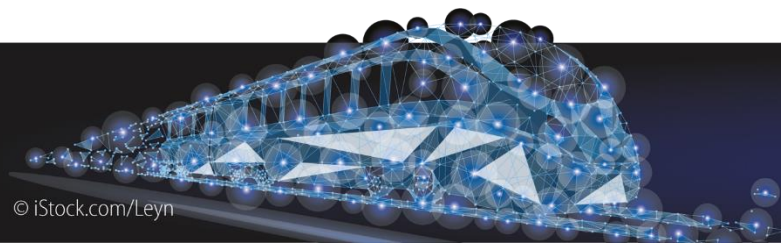
Integration of Human and Organisational Factors in Railway Automation





Franco Ehrat (36), Swiss Federal Railways SBB

- Studied «Electrical Engineering and Information- & Communication Technologies»
- Worked as a Software Engineer (seven years)
- Studied «Human Computer Interaction Design»
- Works as a Senior User Experience (UX) Architect (since seven years)
- Lead UX Architect and HOF responsible for smartrail 4.0 (the last three years)





Human and Organisational Factors within Swiss rail sector programme smartrail 4.0

3 December 2020 / Franco Ehrat

Agenda

1. Smartrail 4.0: A modernisation programme for the Swiss rail sector
2. Why «HOF»: challenges and objectives
3. How «HOF»: solution approach at smartrail 4.0
4. What «HOF»: methods for design and evaluation
5. Take-outs



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Objectives of smartrail 4.0

timetable



Disruption



Timetabling



Disruption



Timetabling



Costs

route



Construction site warning



Interlocking



Construction site warning



Signal boxes



Train sequence



Train sequence



Punctuality

train



Connectivity



Shunting



Automatic Train Operation



Connectivity



Automatic Train Operation



Shunting



Capacity

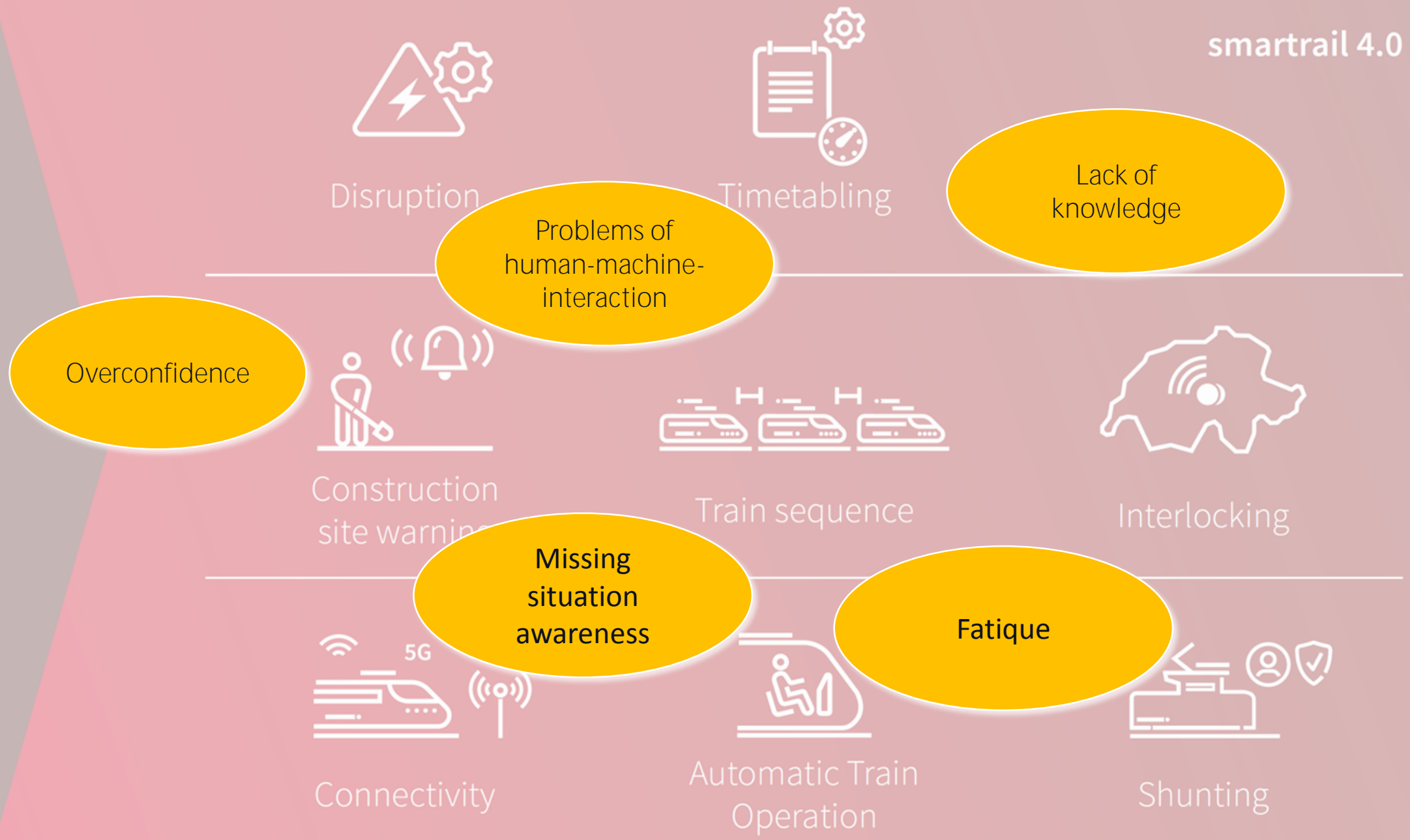


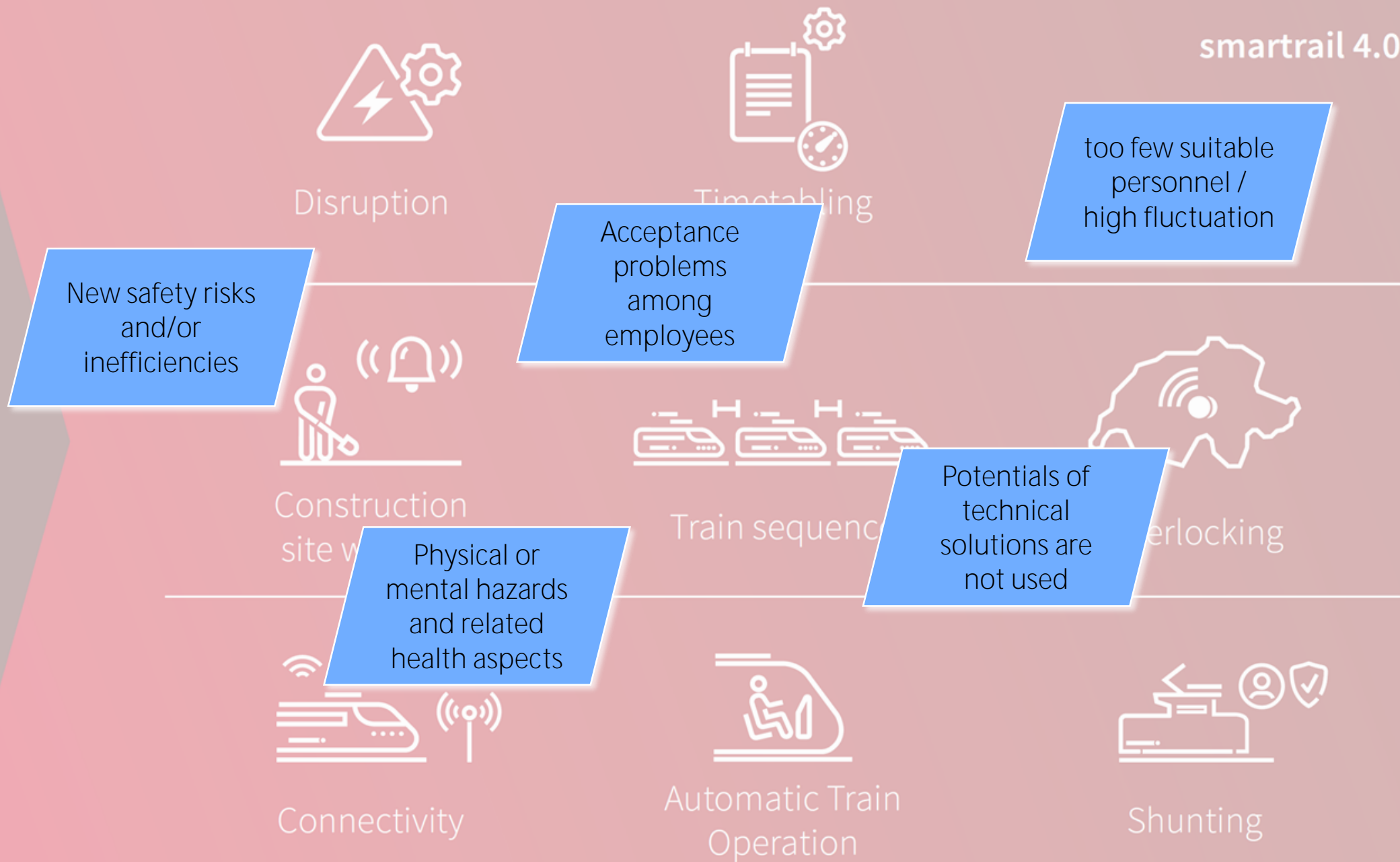
Safety





WHY are HOF important for smartrail 4.0?





Objectives for «HOF» at smartrail 4.0

Increase safety, enhance performance (effectiveness, efficiency), increase user satisfaction and preserve long-term health

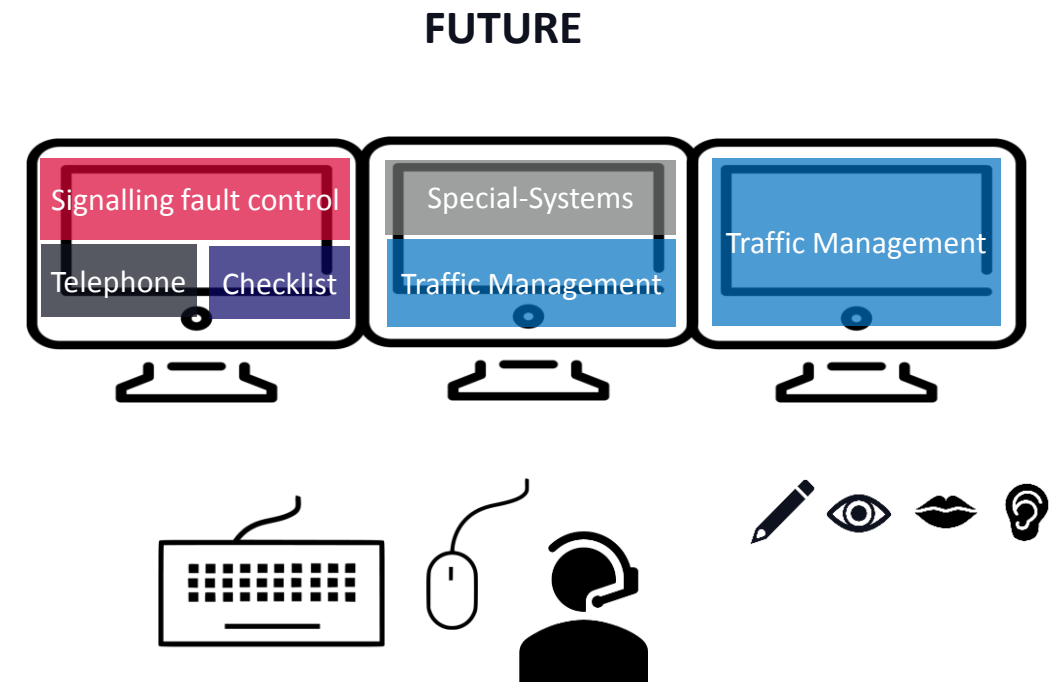
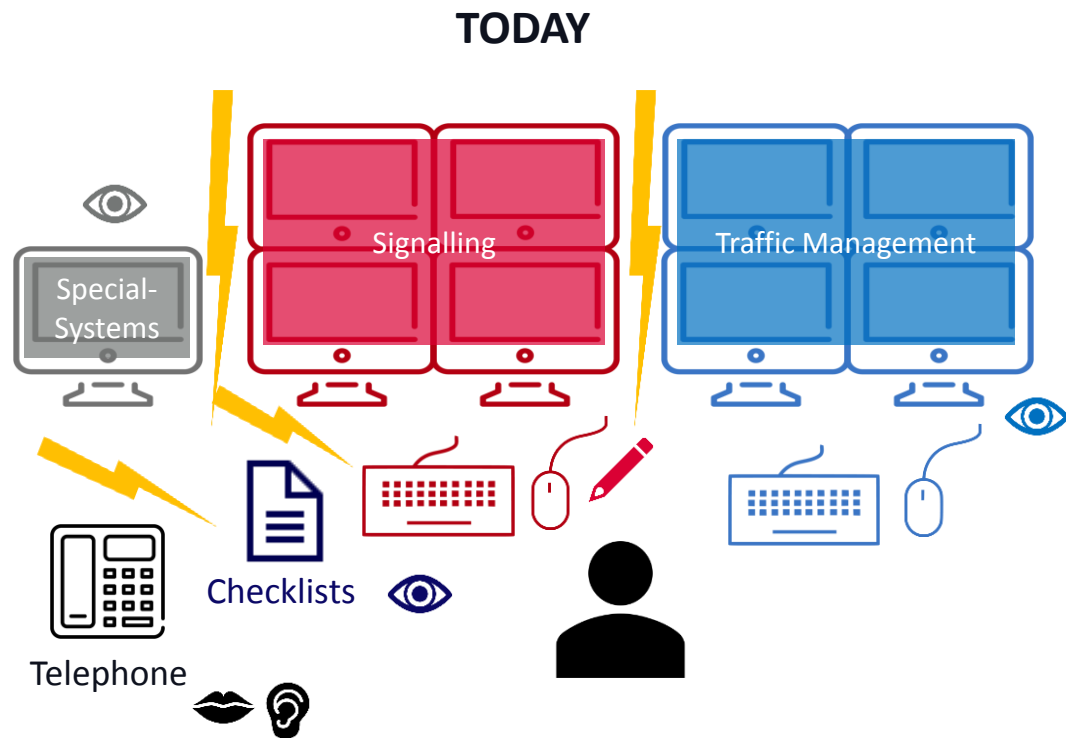
- Holistic design of socio-technical systems with Human-Maschine-Teaming
- Simplification of work processes and workplaces: eliminate duplication and media breaks, using the opportunity for more consistency with integrated ergonomic workplaces
- Tool support for safety processes
- Attractive jobs with meaningful tasks

We design safe, effective, efficient and attractive working environments for the railway operation of the future.



Objective «integrated ergonomic workplaces»

Example for railway operation





HOW are HOF adressed at smartrail 4.0?

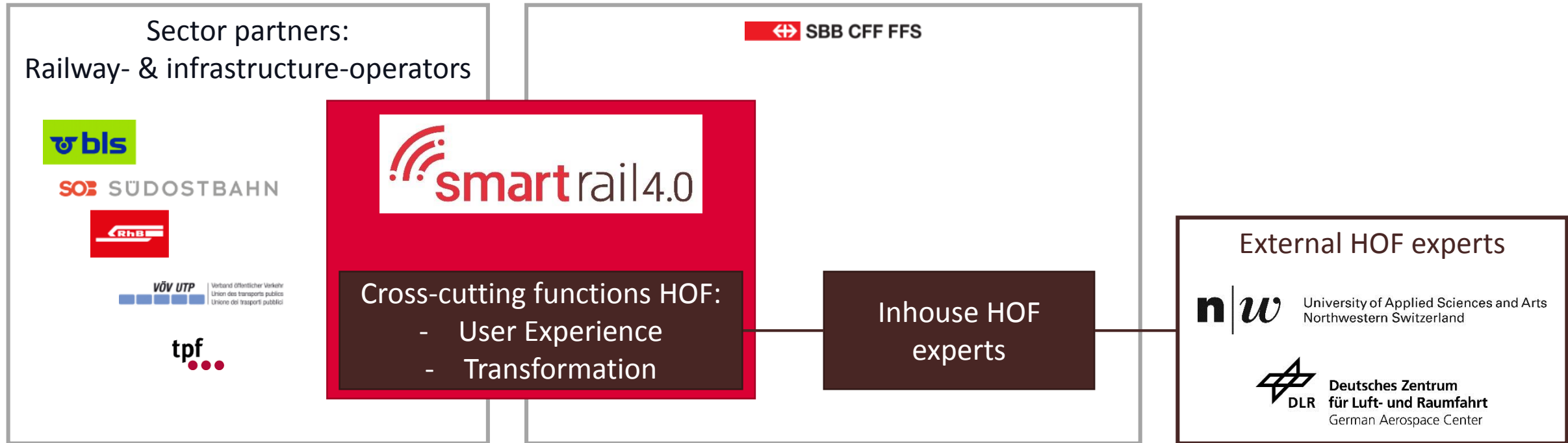


Demand of the regulator

Federal Office of Transport (FOT)

«The FOT expects that the interaction between people, technology and organisation is treated as a whole. To fulfil the requirements, a superordinate (verification) concept must be drawn up.»

Setup HOF@smartrail 4.0



Fields of action

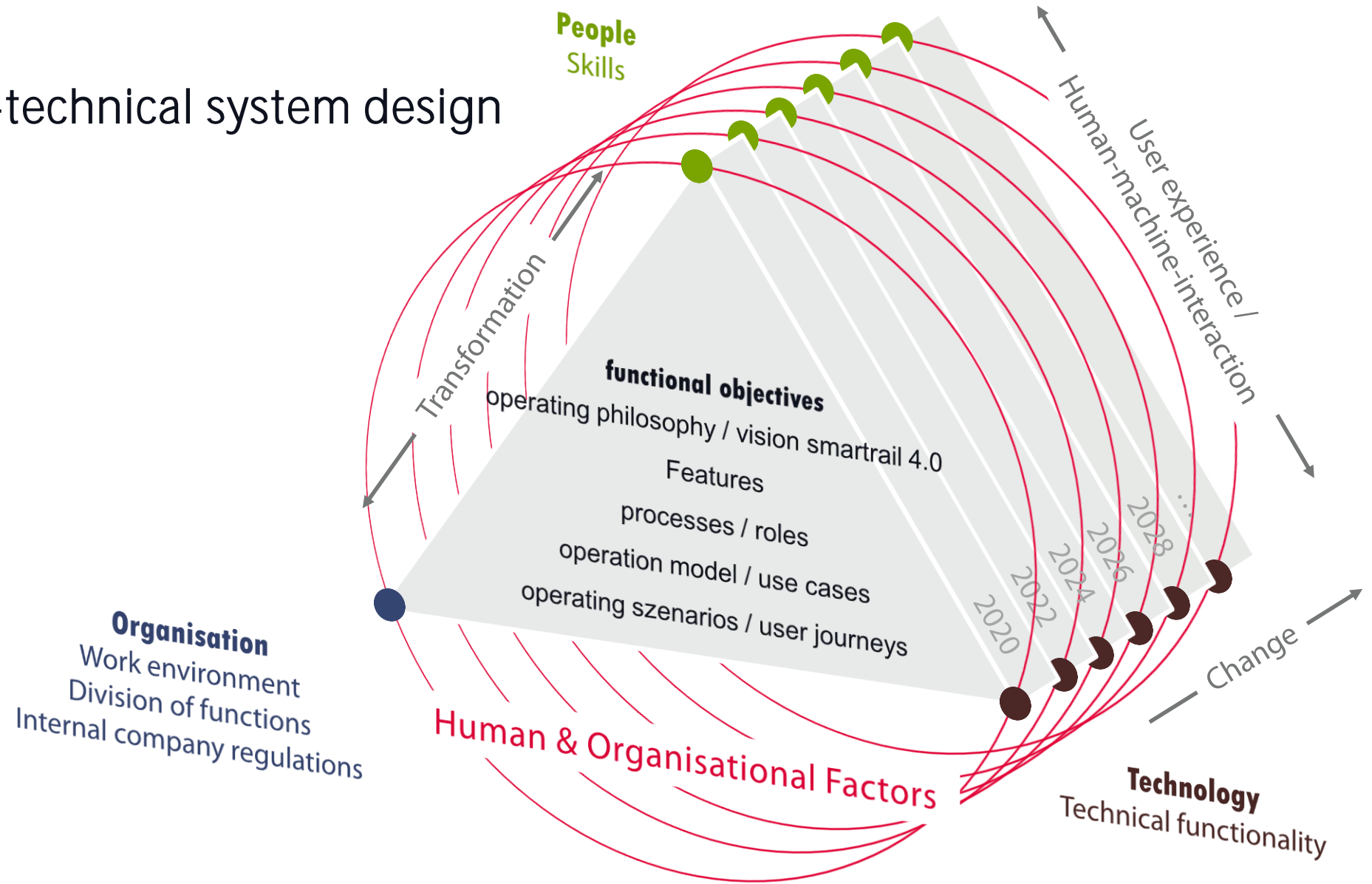
- Human Centered Design Approach (EN ISO 9241-210)
- People:
 - Strategic planning of occupations and resources
 - Further development of basic education for future challenges
- Technology:
 - Reduce system variety / create integrated ergonomic workplaces
 - afasf
- Organisation:
 - Participation of employees
 - Involve business units, e.g. for change management
 - Continuous exchange with social partners
 - Enable programme organisation about HOF (short trainings for project staff)

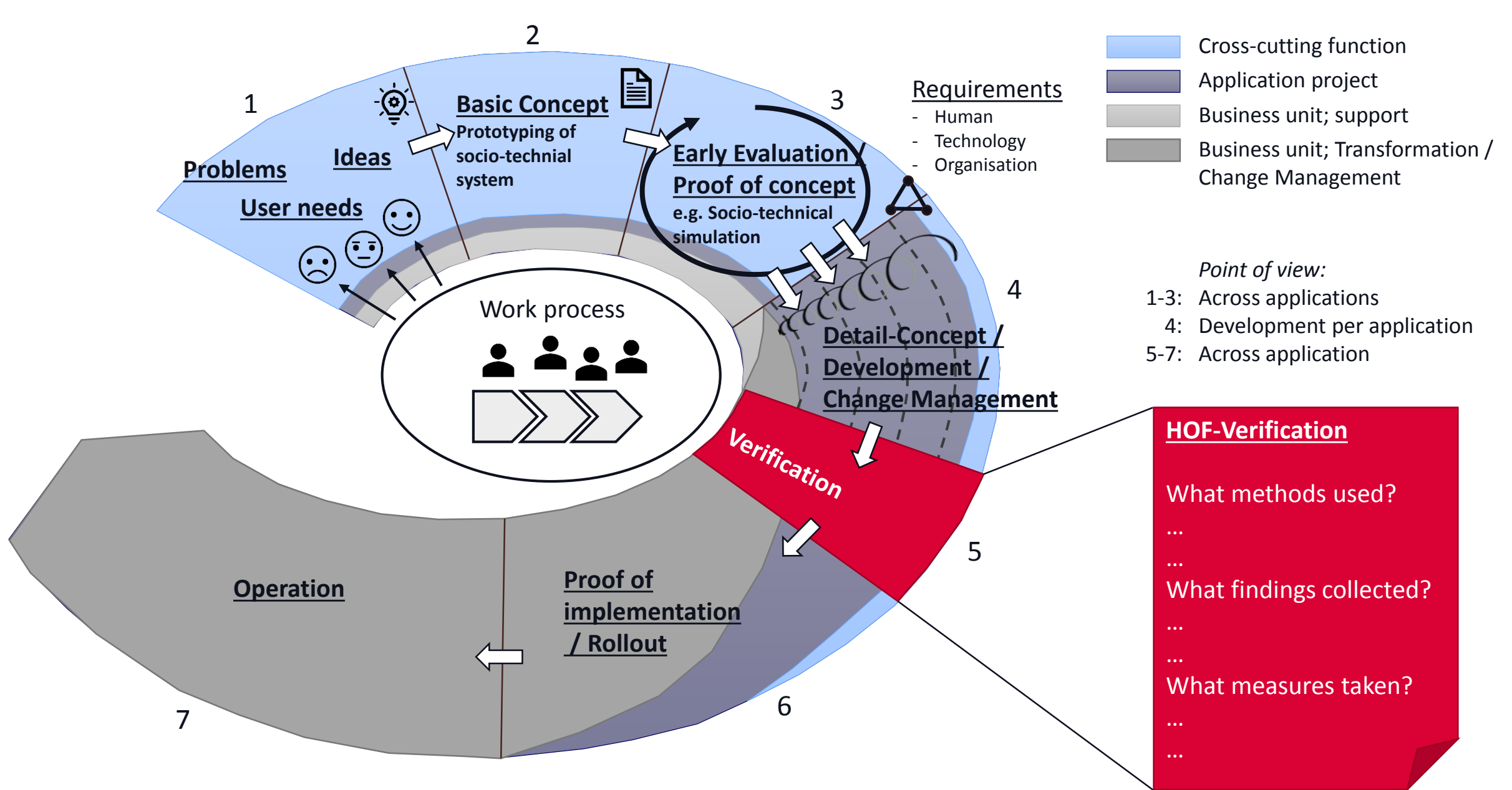


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Holistic socio-technical system design







WHAT HOF methods we used?



Methods for design phase

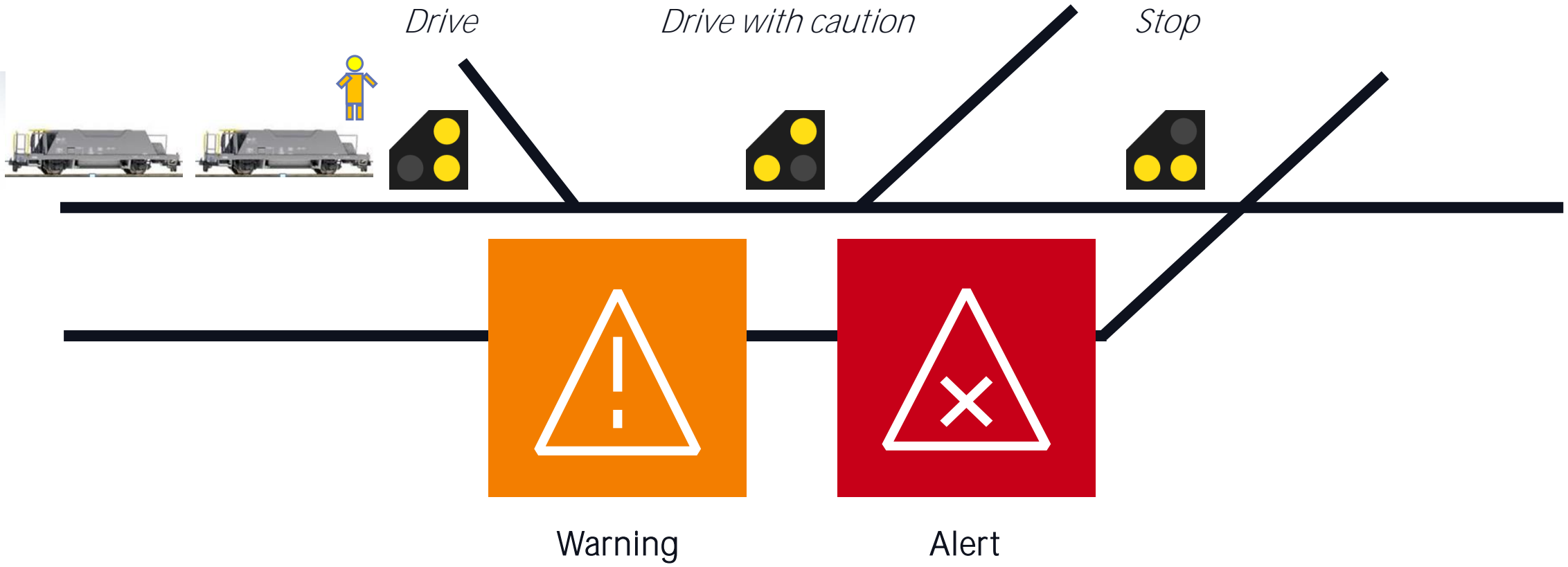
- Design targets with holistic view on socio-technical systems
 - Personas & user journey maps for the holistic view (cross-application)
- HOF Checklist
 - Sensitisation to HOF risks
- ARBIG-MMS: a tool for the optimal design of future human-machine-systems
 - Define concrete HOF requirements for applications



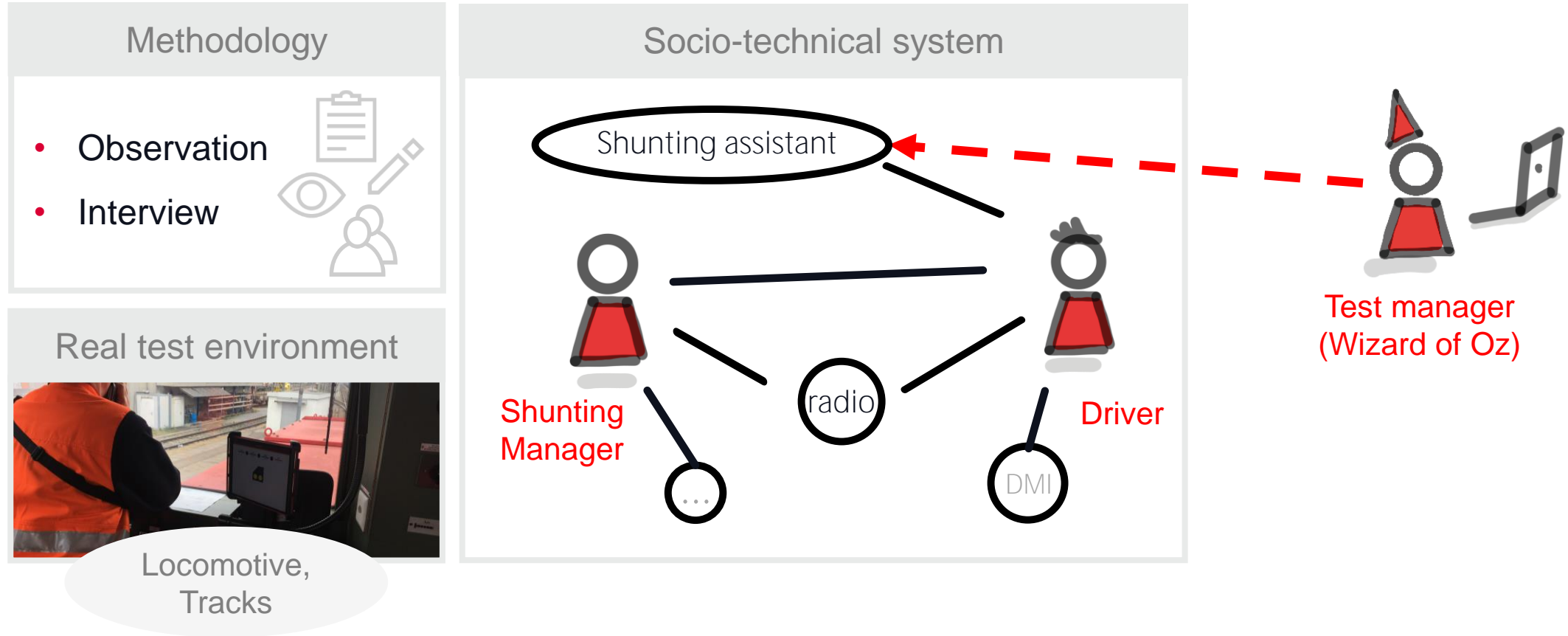
Evaluation with socio-technical simulations

Example «shunting assistant»

Idea of the shunting assistant



Setup of the socio-technical simulation





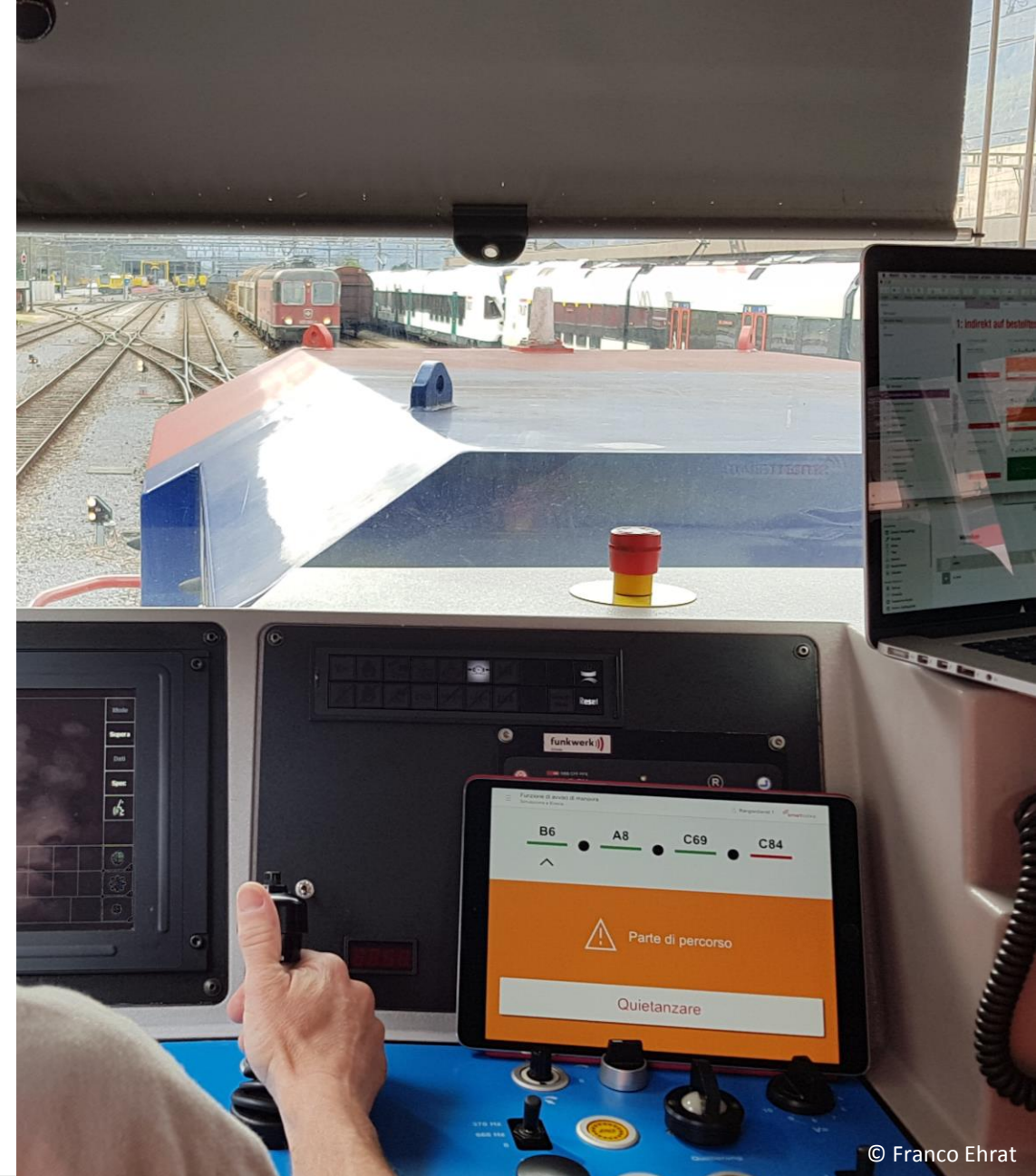
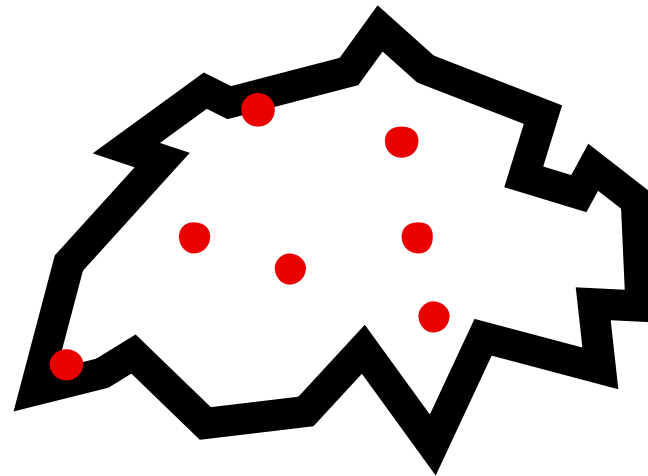


Methodical framework

- Real users
- Real test environment: real application context
- Realistic disturbances, demanding scenarios
- Planned technology is simulated by test manager (wizard of oz)

Facts and figures

- 12 test runs of 2h each
- 8 stations
- About 30 participants, 10 observing shunting experts
- In 3 languages (german, french, italian)



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Take-outs

What was good?

1

Increased HOF mindset in programme organisation

2

More weight for HOF issues caused by the demand of the regulator

3

The socio-technical simulations were very well received

- Fail and learn early
- Make affected users to participants
- Show respect to field force and their knowledge
- Early initiation of the change process



Potential for improvement

1

Number of HOF experts inside the programme organisation should be increased.

2

HOF experts outside the programme organisation should be used more often to scale the impact

3

Better convincing with clear arguments

Conflict of objectives: although the mindset for HOF could be increased, only the argument of safety gets enough weight in comparison with arguments about user satisfaction and long-term health.



Q & A

In the next 20 minutes Mr. Ehrat will reply live to your questions.

- You may wish to write your question in the Teams Live chat, or
- Receive a detailed reply after this conference: use the link provided on the event webpage.

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