

Resources and dependencies in the departure of suburban trains

*Analysis of the resources and dependencies in the train
departure of suburban trains of Swiss Federal Railways,
based on the Functional Resonance Analysis Method*

Simon Steiner, FHNW

Background Swiss Federal Railways

- 4250 times around the world
- Investigation of incidents (e.g. Signal crossings) and accidents
- Human Errors are identified (e.g. Train Engineer has to improve sth.)
- Highest Risk for accidents after departure of suburban trains around Zürich
- >8 times around the world before crossing red signal



Purpose & Questions

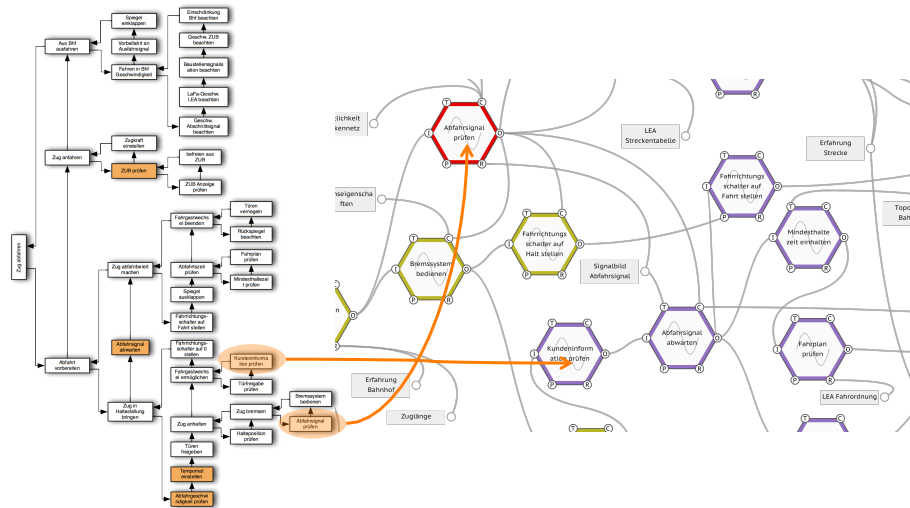
- Purpose: Testing FRAM in practice & testing Safety-II perspective for departure process
- Which are the functional units, what are the dependencies and which functions vary?
- What do variation cause, what are the conditions for success and which resources could support train engineers?

Methodology

Just work-as-done! (without WAI mental model)

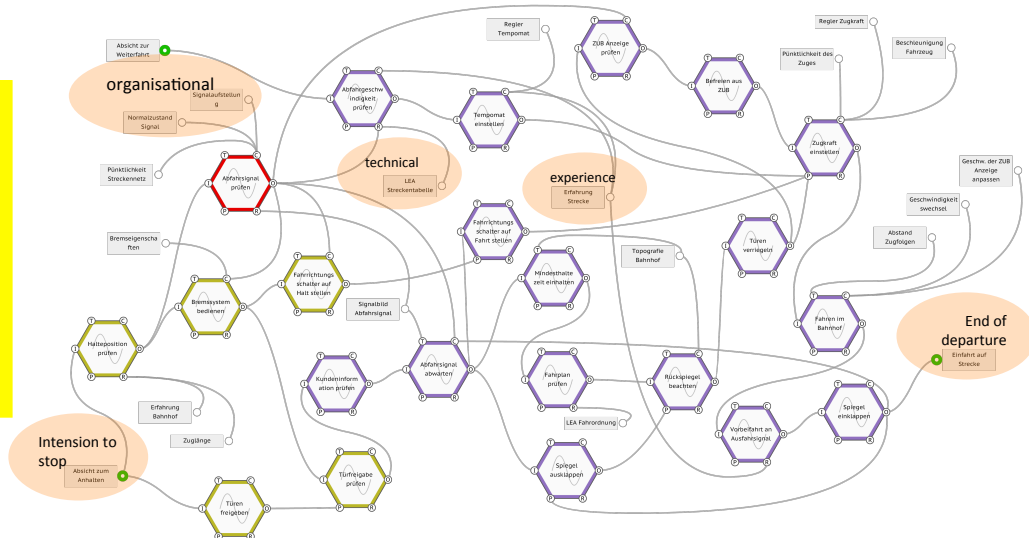
1. 8 entire shifts of train engineers + semi-structured interview → HTA + Description
2. Building FRAM-Model (activities from HTA to functions) for experts and novices
3. 8 entire shifts to extend FRAM-Model (variability + validating model)
4. Conducting Risk-Assessments with instantiations

Results: HTA -> FRAM



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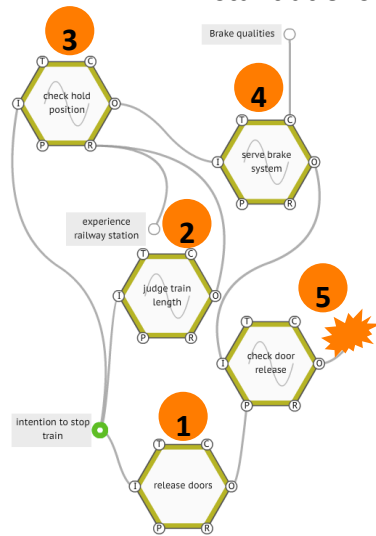
FRAM-Model for experts



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Instantiations (prospective analysis)



1. Release Doors correctly
2. Wrong train-length (mindset)
3. -> wrong hold position
4. -> wrong brake operation
5. -> doors are open outside platform

- not allowed to use rear view mirror before departure-signal is green
- → no possibility to detect mistake

Questions

- Any questions?
- Is a Hierarchical Task Analysis a good base for identifying FRAM-Functions?
- What would you make different?
- How you would do Investigation with FRAM?