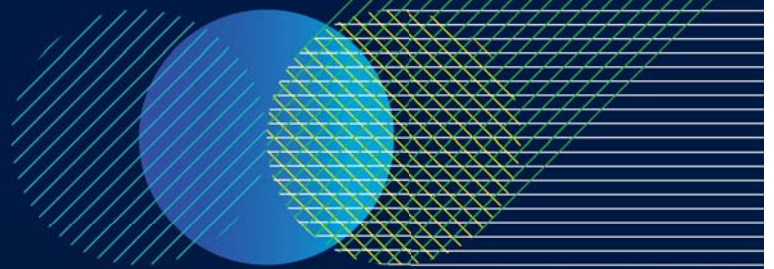BANE NOR

Integration of Human Factors in one of Norway's largest IT projects

ERTMS Programme

Traffic Management System (TMS)

HFC forum Spring 2019

Kristin Lohne Hollingdale and Lene Engh Halvorsen
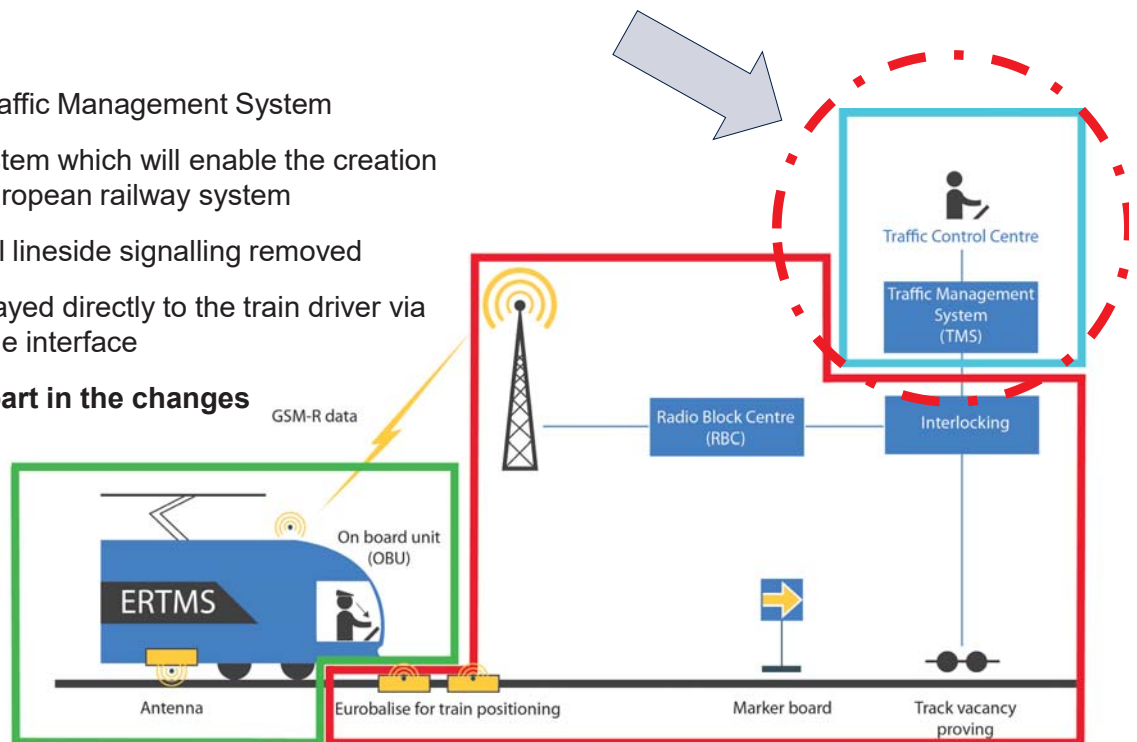

Agenda

- A very short introduction to ERTMS

- Scope of the Traffic Management System (TMS) project

- Areas of focus for HF

- Integration of HF into agile software development

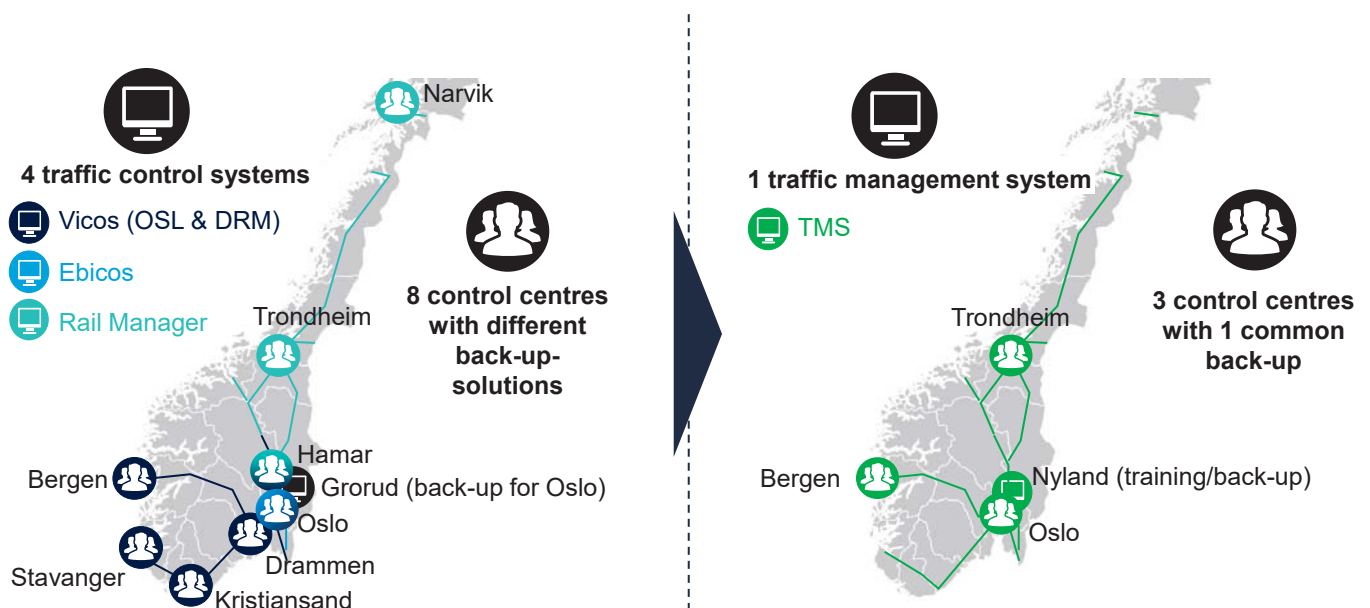- Screens and desk ergonomics

- Training

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ERTMS

- European Rail Traffic Management System
- Standardised system which will enable the creation of a seamless European railway system
- Traditional optical lineside signalling removed
- Information displayed directly to the train driver via the driver machine interface
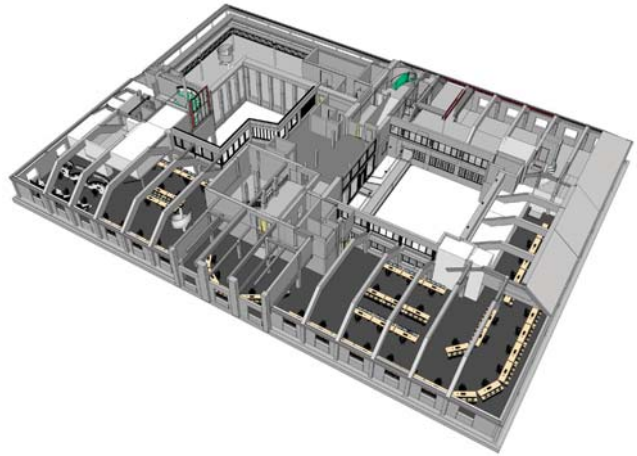- **HF plays a big part in the changes**

GSM-R data

On board unit (OBU)

ERTMS

Antenna

Eurobalise for train positioning

Marker board

Track vacancy proving

Traffic Control Centre

Traffic Management System (TMS)

Radio Block Centre (RBC)

Interlocking

Establishing a common traffic management system in Norway

4 traffic control systems

Vicos (OSL & DRM)

Ebicos

Rail Manager

Narvik

Trondheim

8 control centres with different back-up-solutions

Hamar

Grorud (back-up for Oslo)

Oslo

Bergen

Stavanger

Drammen

Kristiansand

1 traffic management system

TMS

Trondheim

3 control centres with 1 common back-up

Nyland (training/back-up)

Bergen

Oslo

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Traffic Control Centres (TCCs)

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Changes in traffic operation with TMS

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Customer Services and Traffic Operations

8-3 TCCs

Operational model

Operational rules and procedures

Operational training

Counterpart to IFE and Thales

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Screen number and size

TMS functionality

HMI

Desks

Functional training

Fulfilment of contract requirements

IFE

TCC Design

Fulfilment of contract requirements

THALES

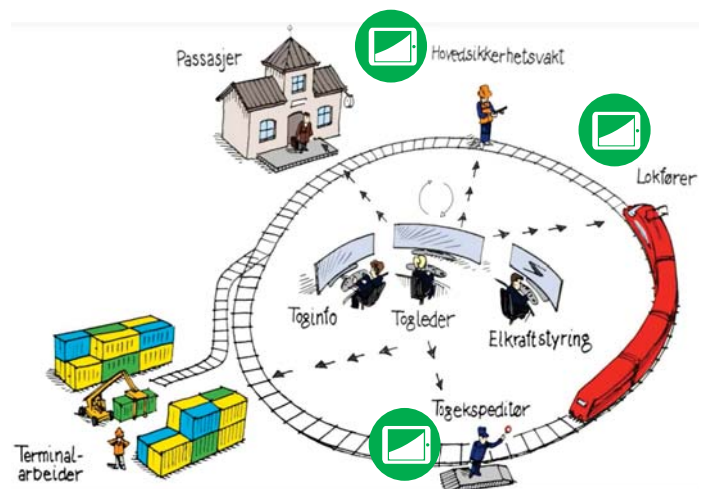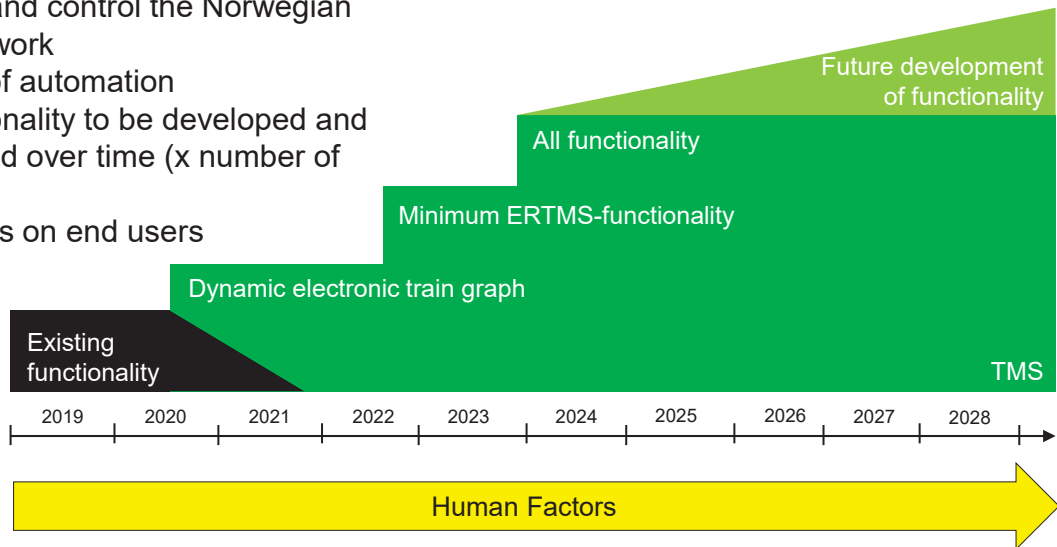BANE NOR
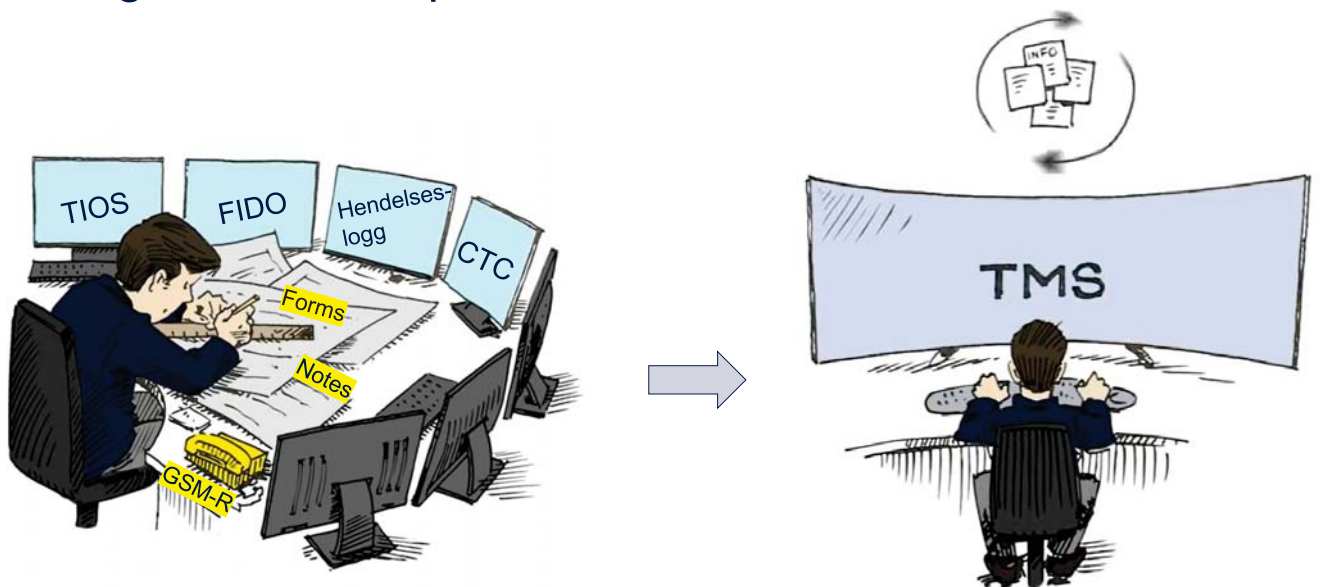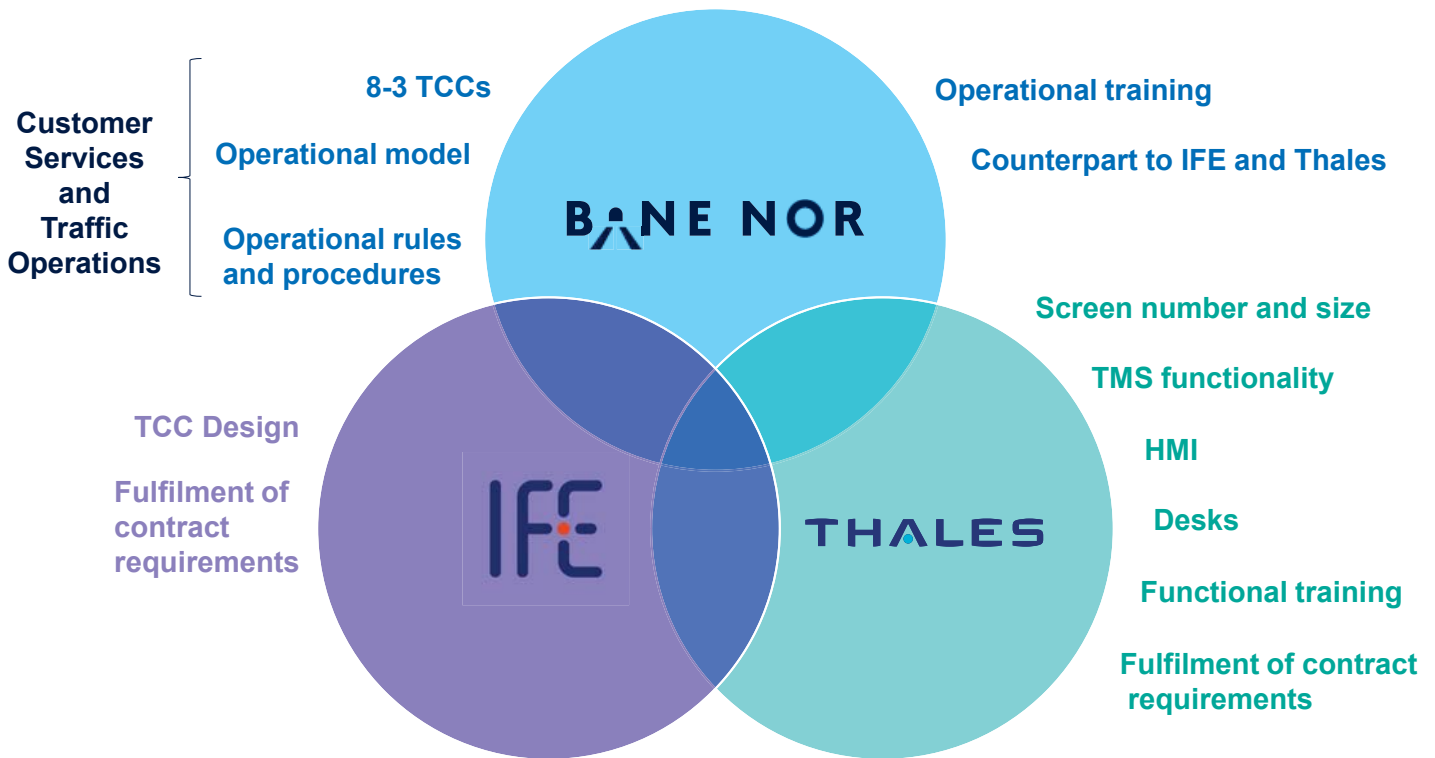
Some areas of focus for HF in the TMS and TCC projects

- New functionality and increased automation
- New ways of working incl. new roles, rules, procedures and tools
- Workload assessments
- Alarms
- HMI and desk design
- Number and size of screens
- Usability
- Ergonomics
- Layout TCC and back-up
- Training
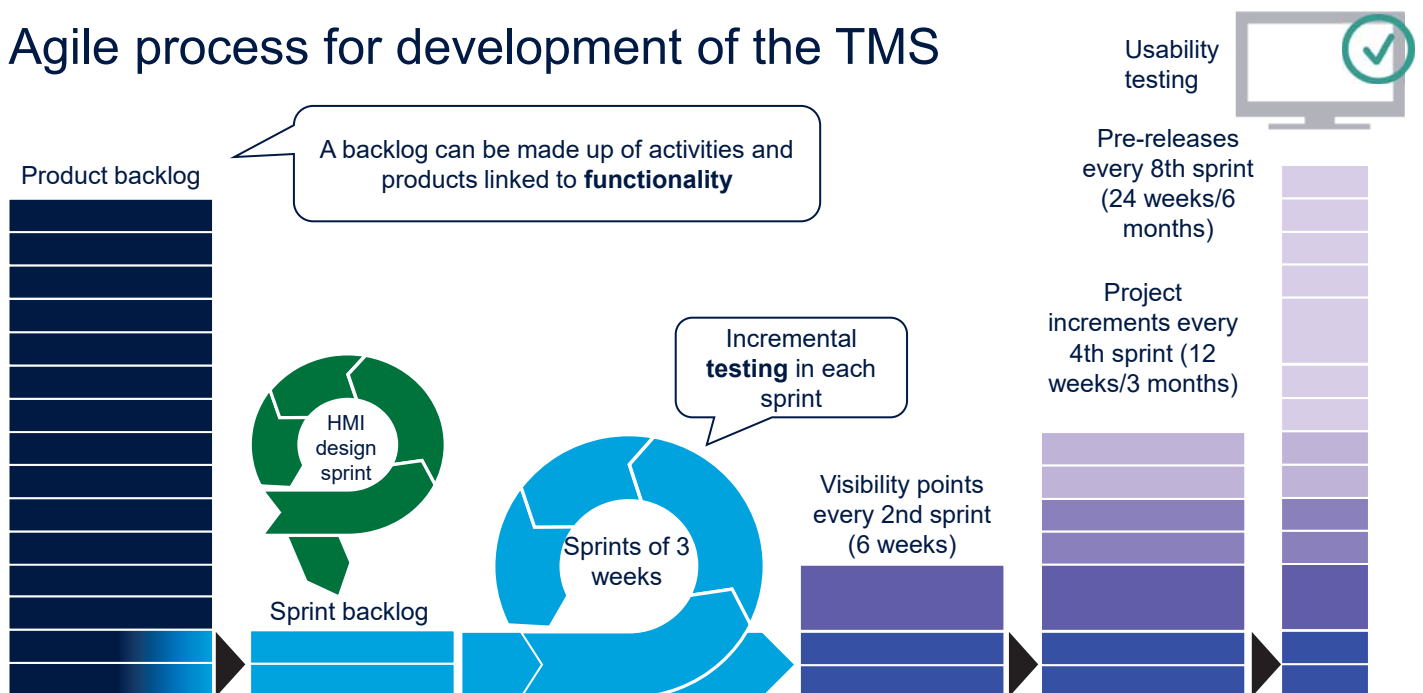- HF in safety (Human reliability analysis)

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TMS functionality will gradually be developed

- TMS is a software application which aims to monitor and control the Norwegian railway network
- High level of automation
- New functionality to be developed and implemented over time (x number of releases)
- Strong focus on end users

Future development of functionality

All functionality

Minimum ERTMS-functionality

Dynamic electronic train graph

Existing functionality

TMS

| 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |

Human Factors

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Agile process for development of the TMS

Usability testing

Product backlog

A backlog can be made up of activities and products linked to **functionality**

Pre-releases every 8th sprint (24 weeks/6 months)

HMI design sprint

Incremental **testing** in each sprint

Project increments every 4th sprint (12 weeks/3 months)

Sprint backlog

Sprints of 3 weeks

Visibility points every 2nd sprint (6 weeks)

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HMI design sprints with end users

- Purpose and scope
  - Create, discard and "test" ideas, alternatives and low-fidelity prototypes (sketches)
  - One HMI sprint lasts 3-5 days
  - Two teams to achieve independence between design and testing

- User test in HMI design sprint (vs usability testing)

Day 2 – Sketch

- Morning Sessions (08:30 – 11:30)
  - Lightning Demos;
  - Sketch session one, and;
  - Sketch Session two.
- Afternoon Sessions: (12:30 – 16:00 ish)
  - Sketch session three.
  - Review of sketches produced;
  - Decision on best scenes, and;
  - Storyboarding session.
  - Day 2 Group Feedback session.

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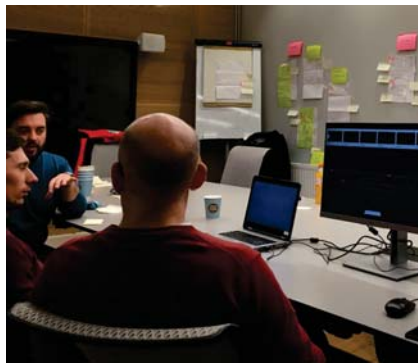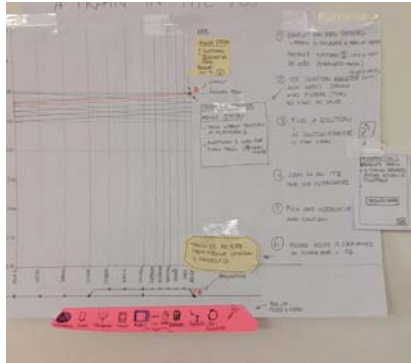
HF integration in agile software development

BANE NOR
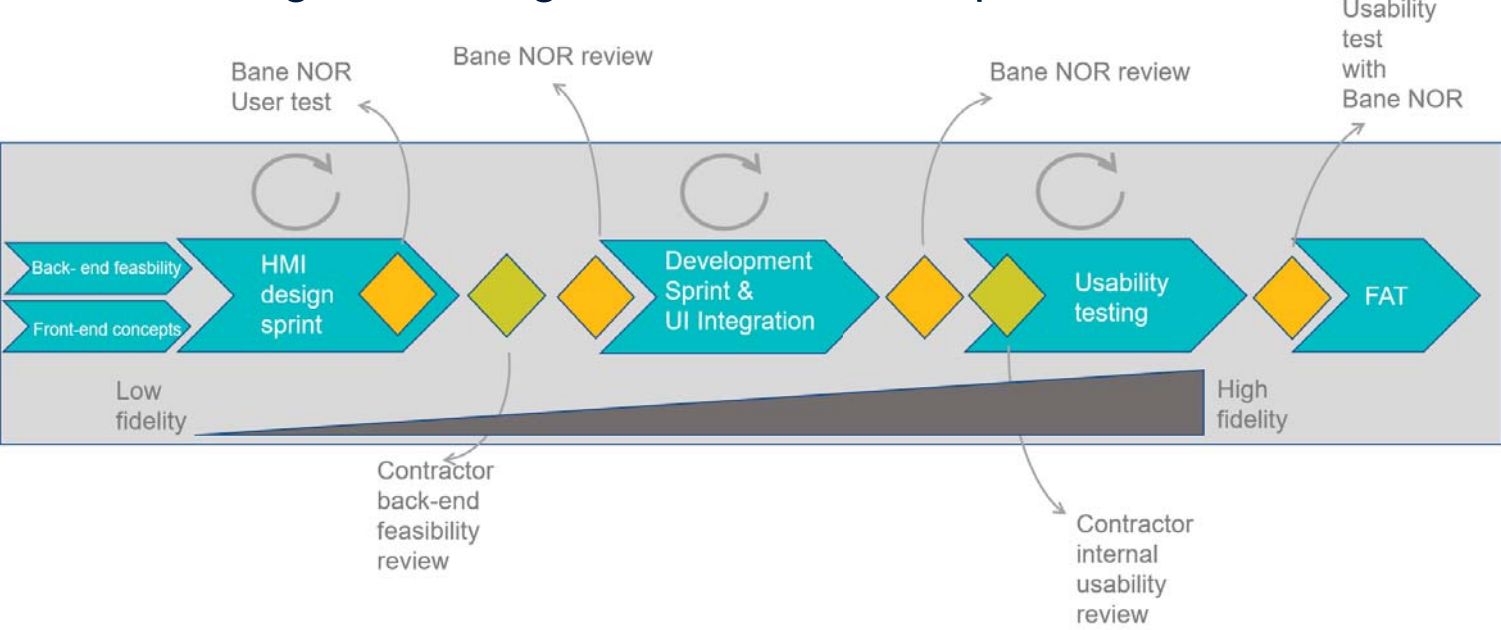
TMS HF lab

- Investigate and evaluate various options in relation to desks and size/number of screens
  - Overview screens (no large screen)
  - Required information to be ensured (situation awareness)
- Ergonomic considerations
- Functional possibilities with TMS
  - conflict detection and information
- Level of integration with support systems will evolve
- Stakeholder management
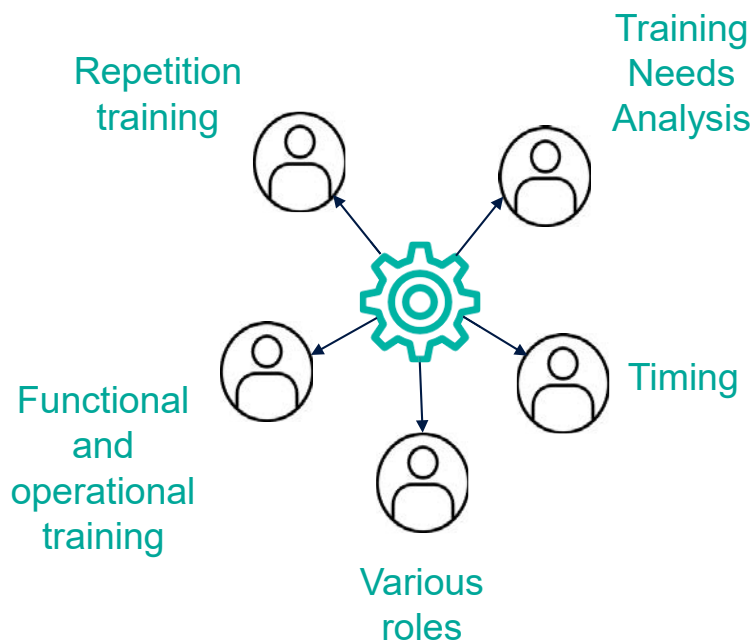 - "Open door policy"

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TMS test lab (in the making)

- Functional testing
- Usability testing
- "Playing" with functionality
- Stakeholder management
  - "Open door policy"

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Training

Repetition
training

Training
Needs
Analysis

Timing

Functional
and
operational
training

Various
roles

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Thank you for
your attention!

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kristin.lohne.hollingdale@banenor.no

What is TMS?

https://www.youtube.com/watch?v=GWU_QNu8Iv8&t=111s

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