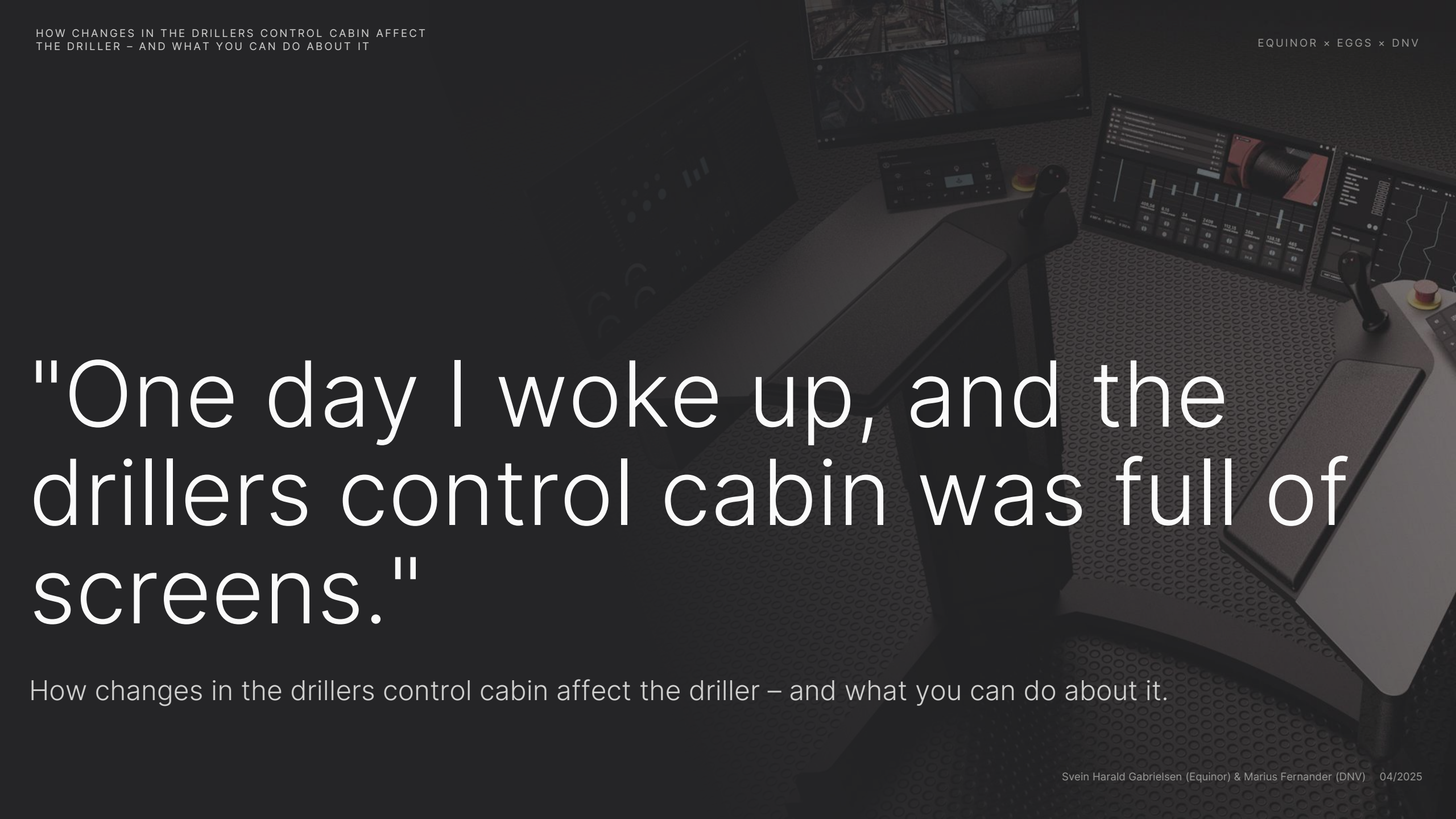


"One day I woke up, and the drillers control cabin was full of screens."

How changes in the drillers control cabin affect the driller – and what you can do about it.

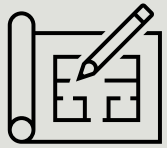
Svein Harald Gabrielsen (Equinor) & Marius Fernander (DNV) 04/2025

Agenda

Background

Human Factors

Method & Findings



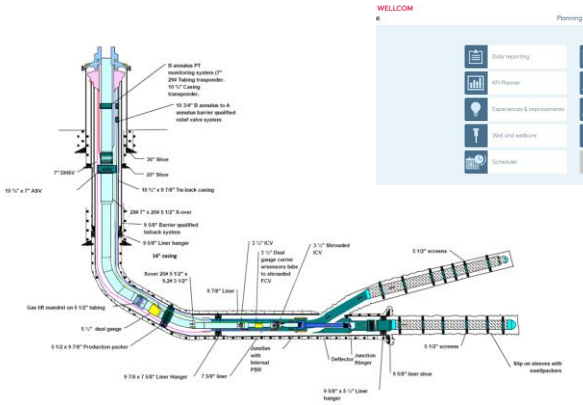
Design concepts

Summary & Way forward

Elisabeth Arndt, Svein Harald Gabrielsen 09/2024

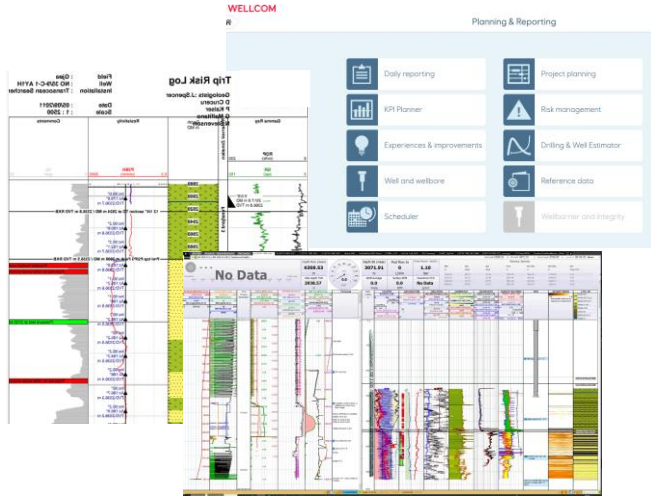
Drilling process from a drilling rig perspective

Planning



Operation

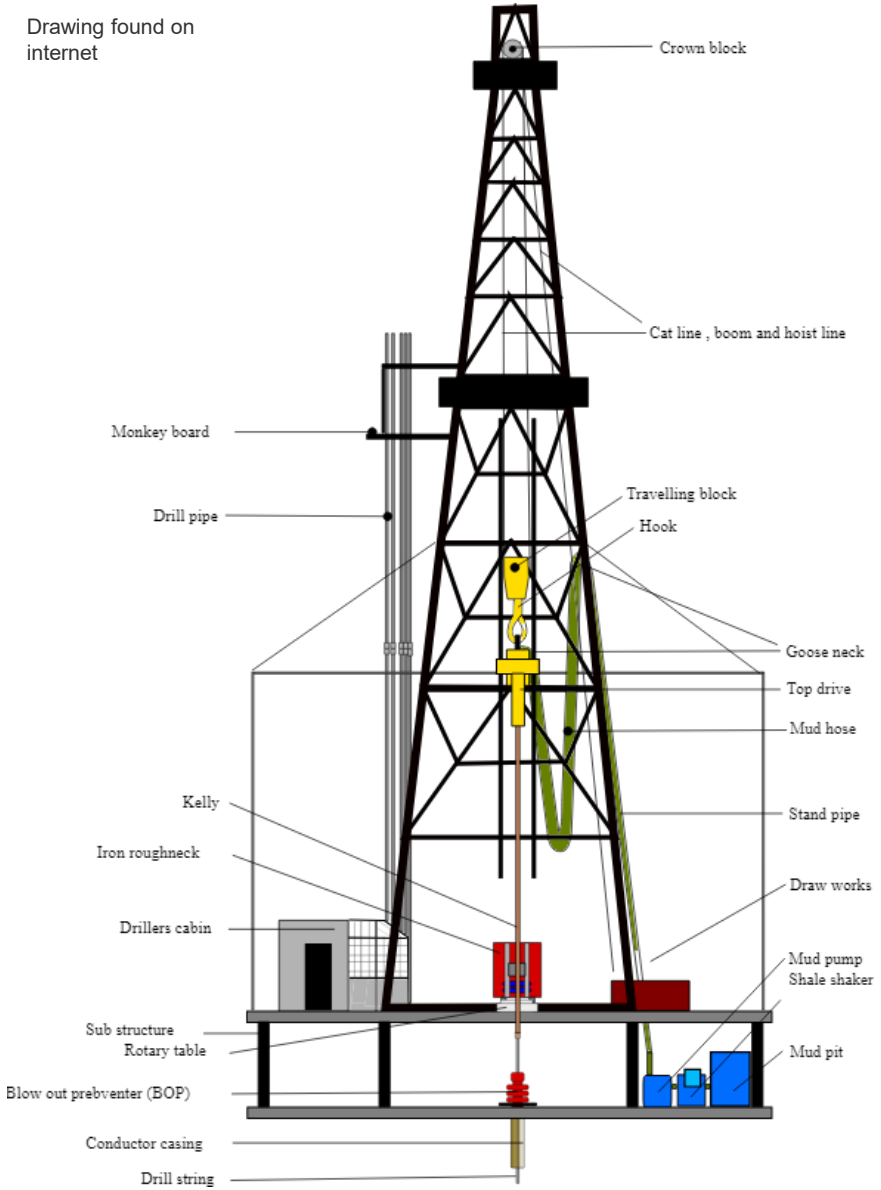
Reporting

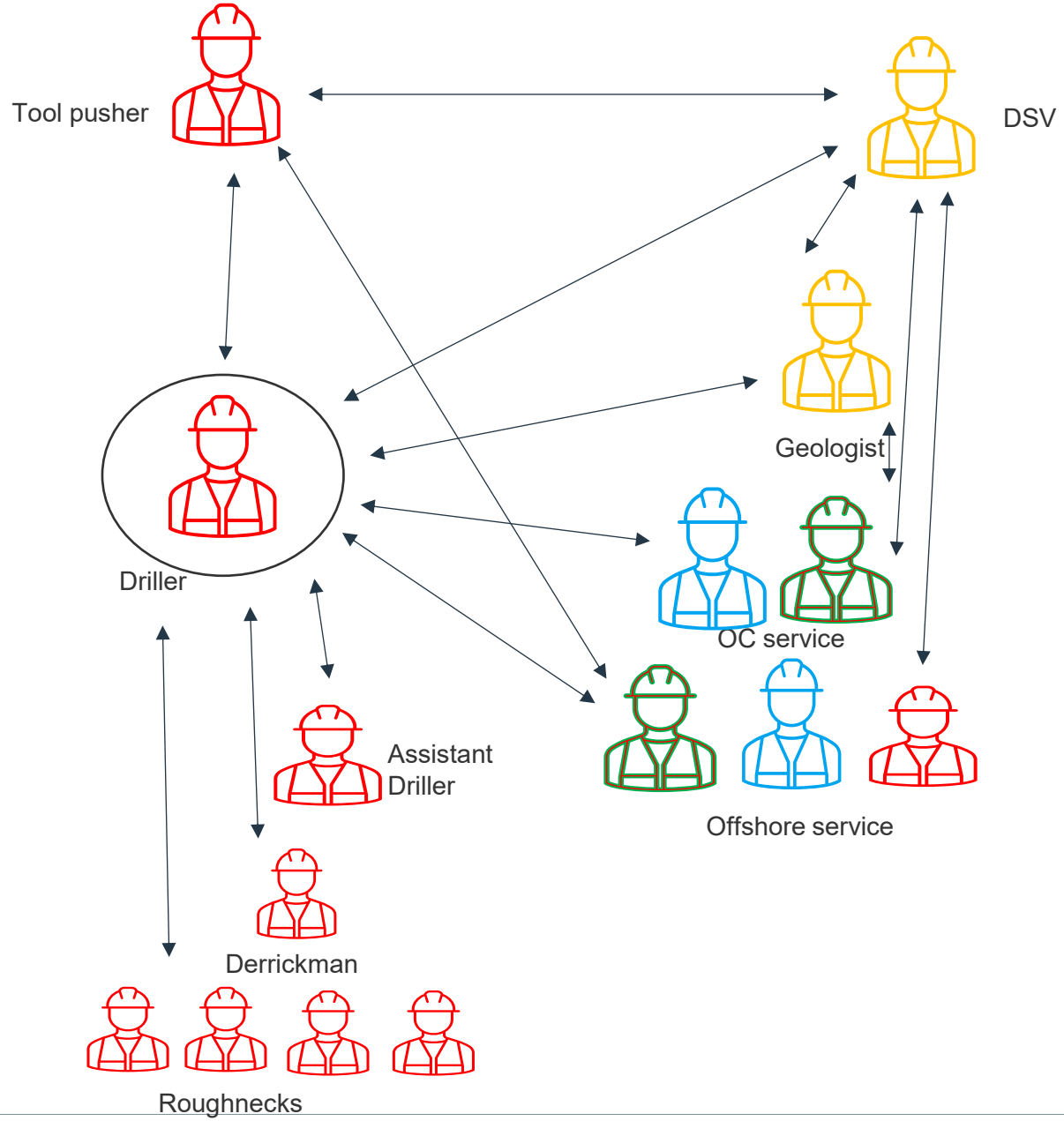


Experience transfer

Pictures from internet

Drawing found on internet





Background & Experience

- Increased number of screens
- Limited focus on Human Factors
- Limited user involvement

Human Factors in the drillers control cabin

Many parallel work tasks and unplanned events.

Definition Human Factors

*Human Factors is the scientific discipline concerned with the understanding of **interactions** among **humans** and other elements of a **system**, and the profession that applies theory, principles, data and methods to design in order to **optimize** human **well-being** and overall system **performance**.*

Core challenges in today's driller's cabins

Elisabeth Arndt, Svein Harald Gabrielsen 09/2024

Method

User interviews (onshore)

3 drillers and 1 assistant driller

Interviews and observations at rigs

- 4 rig visits
- 9 drillers and 5 assistant drillers
- Other roles: roughneck, tool pusher, drilling supervisor, service company

Stakeholder meetings

01 02 03

Screen clutter and information overload

01 02 03

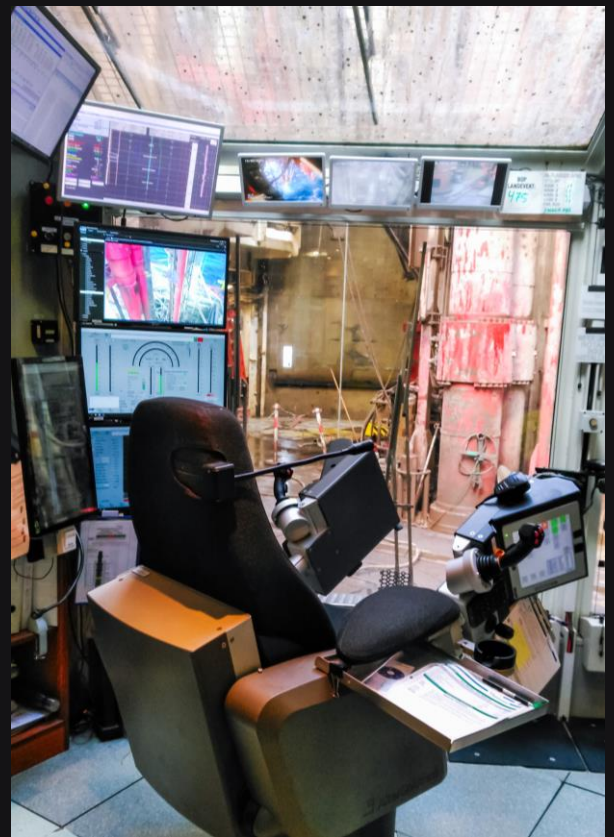
Screen clutter and information overload

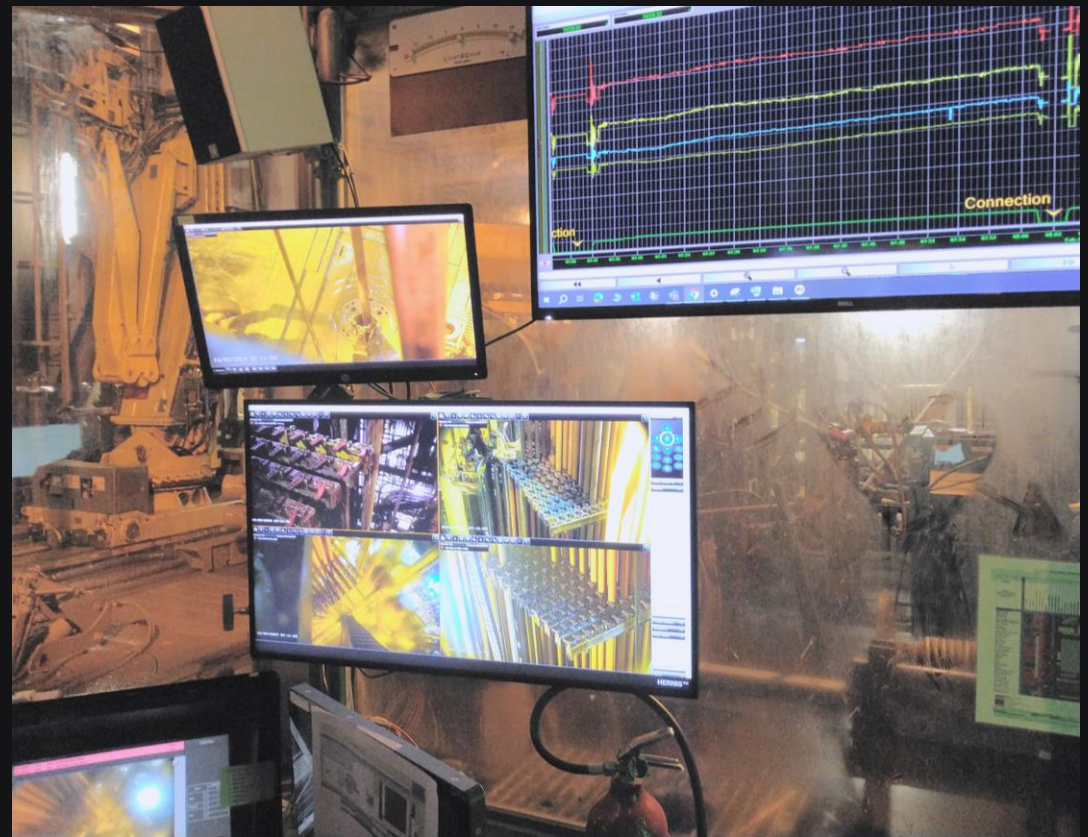
"There's been a big increase in screens and equipment. When I started as a driller, there were only four screens. Some things are better now, but with too much information, it's easy to lose focus on what's really important."

-Driller

01 02 03

Screen clutter and information overload





Left:
Poor readability from screens placed far away

Right:
3 screens placed in front of the emergency exit

01 02 03

Screen clutter and information overload

Challenges

- Lack of system integration, prioritisation and consistency
- Many screens are crowded into a limited space, with some placed out of readable range

Potential consequences

- Usability and readability problems, eye strain
- Increased workload & stress and reduced performance
- Safety risks include missing important info and blocked evacuation ways

01 02 03

Inadequate workplace ergonomics

01 02 03

Inadequate workplace ergonomics

"Sitting in the chair for 12 hours is really tough on the shoulders and neck. The work can be very static. Imagine looking through a dirty glass ceiling, and being really focused on the task. Imagine the neck pain!"

-Driller

01 02 03

Inadequate workplace ergonomics

Insight from the project: Frequency of reported pain areas after a 12-hour shift, by six drillers.

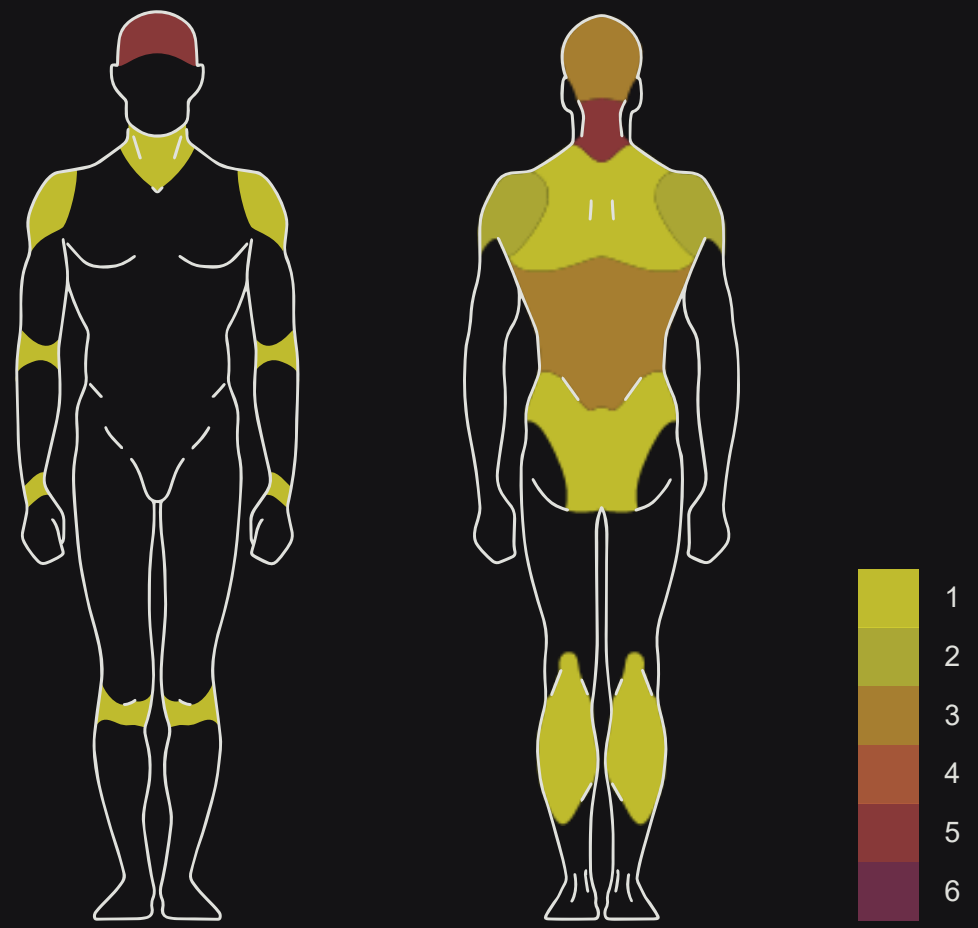


Illustration based on Baeyer, C. L. V., Lin, V., Seidman, L. C., Tsao, J. C., & Zeltzer, L. K. (2011). Pain charts (body maps or manikins) in assessment of the location of pediatric pain. Pain management, 1(1), 61-68.

01 02 03

Inadequate workplace ergonomics

Challenges:

- Long shifts with static or repetitive work postures
- Not ideal chair designs and screen positionings

Potential consequences:

- Health problems like neck, shoulder, and back pain
- Reduced performance

01 02 03

Distractions from core tasks

Elisabeth Arndt, Svein Harald Gabrielsen 09/2024

01 02 03

Distractions from core tasks

"There are quite a lot of interruptions from people, phone calls, and discussions in the cabin. The equipment and cooling systems add to the noise, making it very tiring by the end of the day"

-Driller

01 02 03

Distractions from core tasks

01 02 03

Distractions from core tasks

Challenges

- Noise from systems and co-workers
- Multiple communication channels
- Growing administrative workload

Potential consequences

- Reduced well-being and performance

04

Lack of a holistic, human-oriented approach to cabin designs and upgrades

04

Lack of a holistic, human-oriented approach to cabin designs and upgrades

04

Lack of a holistic, human-oriented approach to cabin designs and upgrades

Why do we end up with these challenges

- Technology is developed in silos.
  New technology = another new screen.
- Driller's cabins are designed and changed without the holistic overview of user needs
- Lack of human factors knowledge and guidelines during cabin modifications
- Multi-vendor environment complicates integration and collaboration.

Design concept

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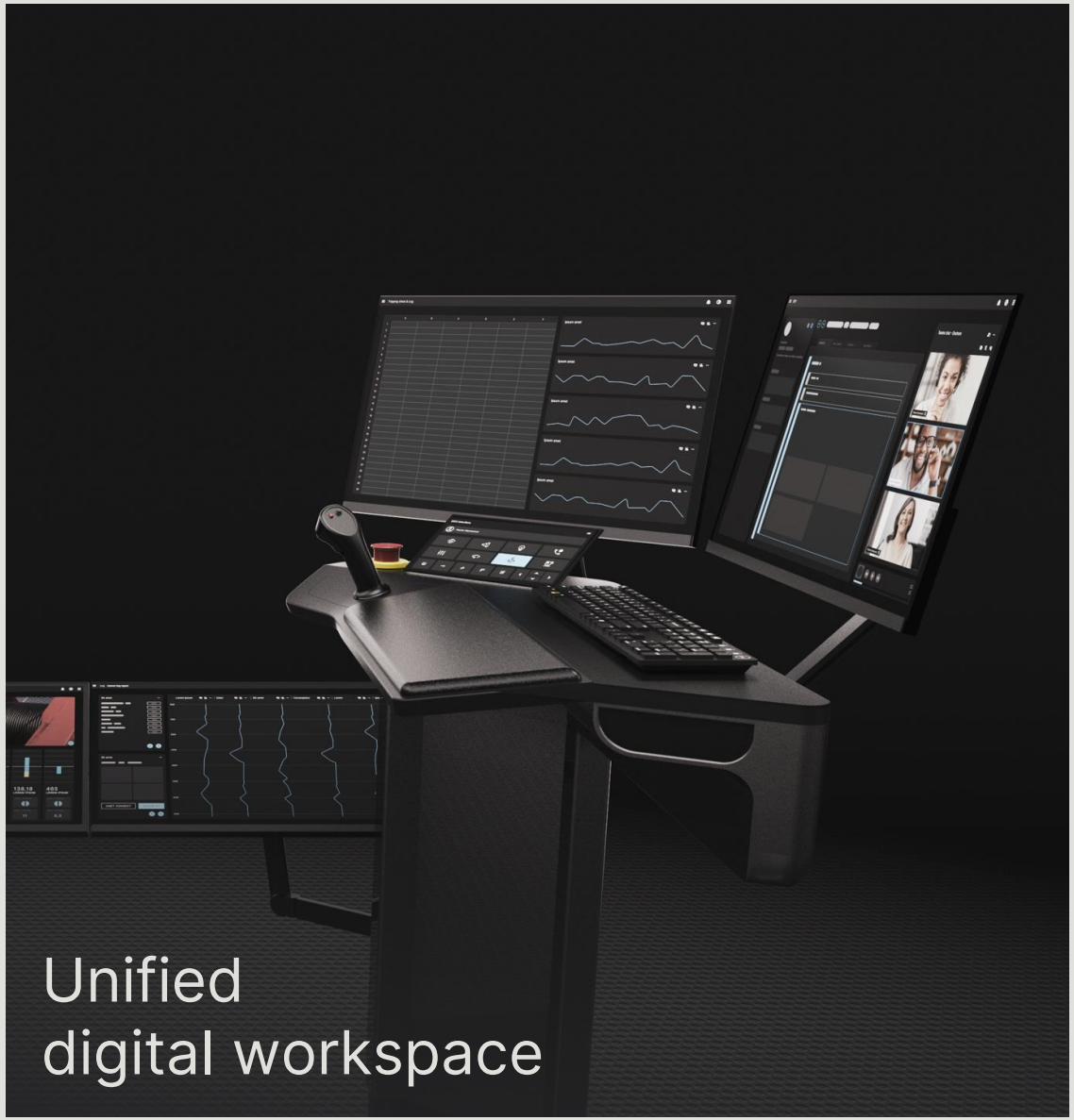

Unified digital workspace

Digital systems share screens and/or data, where feasible

Information displayed is operation-sensitive and presented in a consistent manner

Number of screens can be reduced

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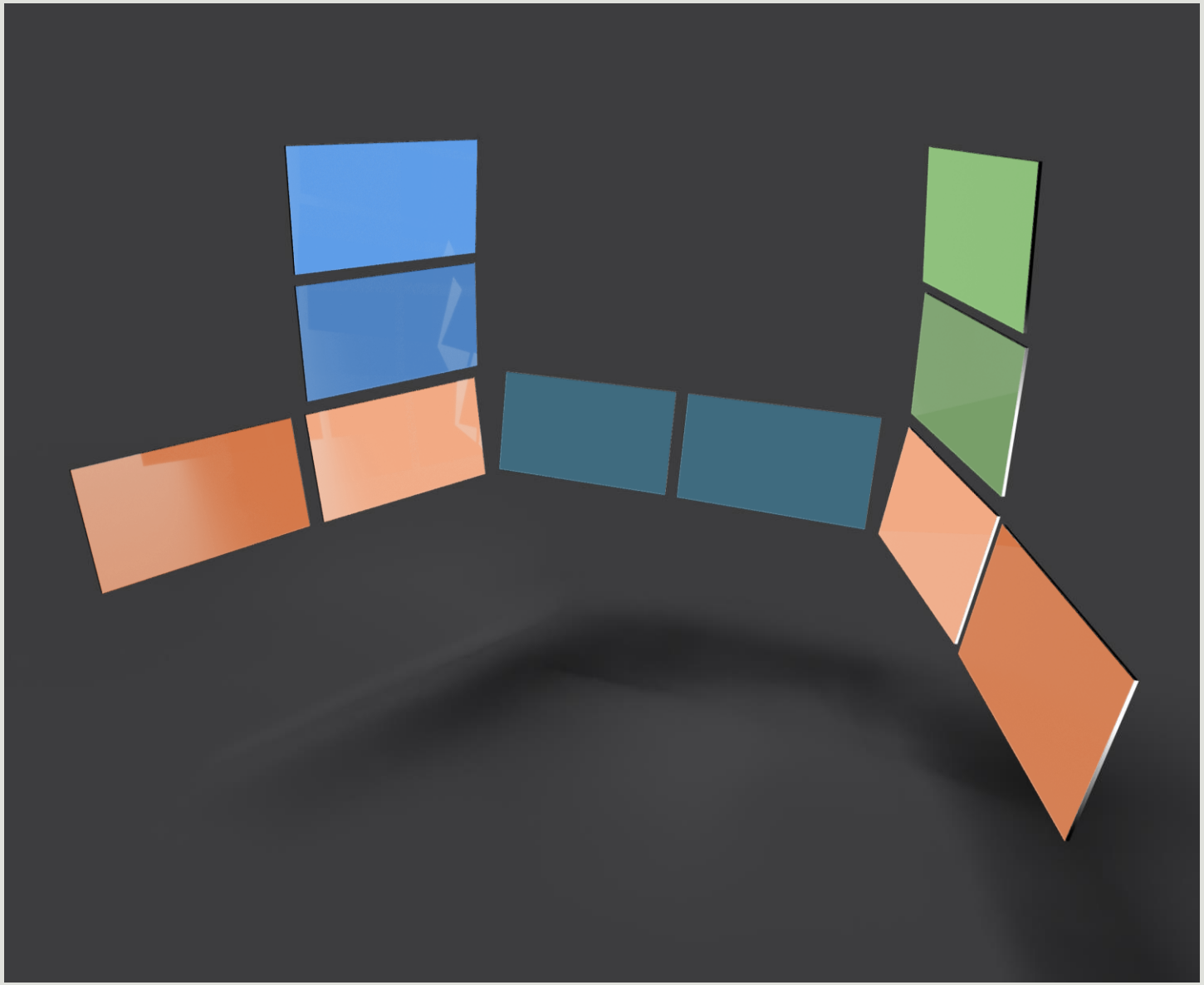
Digital systems share screens where feasible

- the number of screens can be reduced
- a single input device can operate the systems

- vendors can have their systems alongside others



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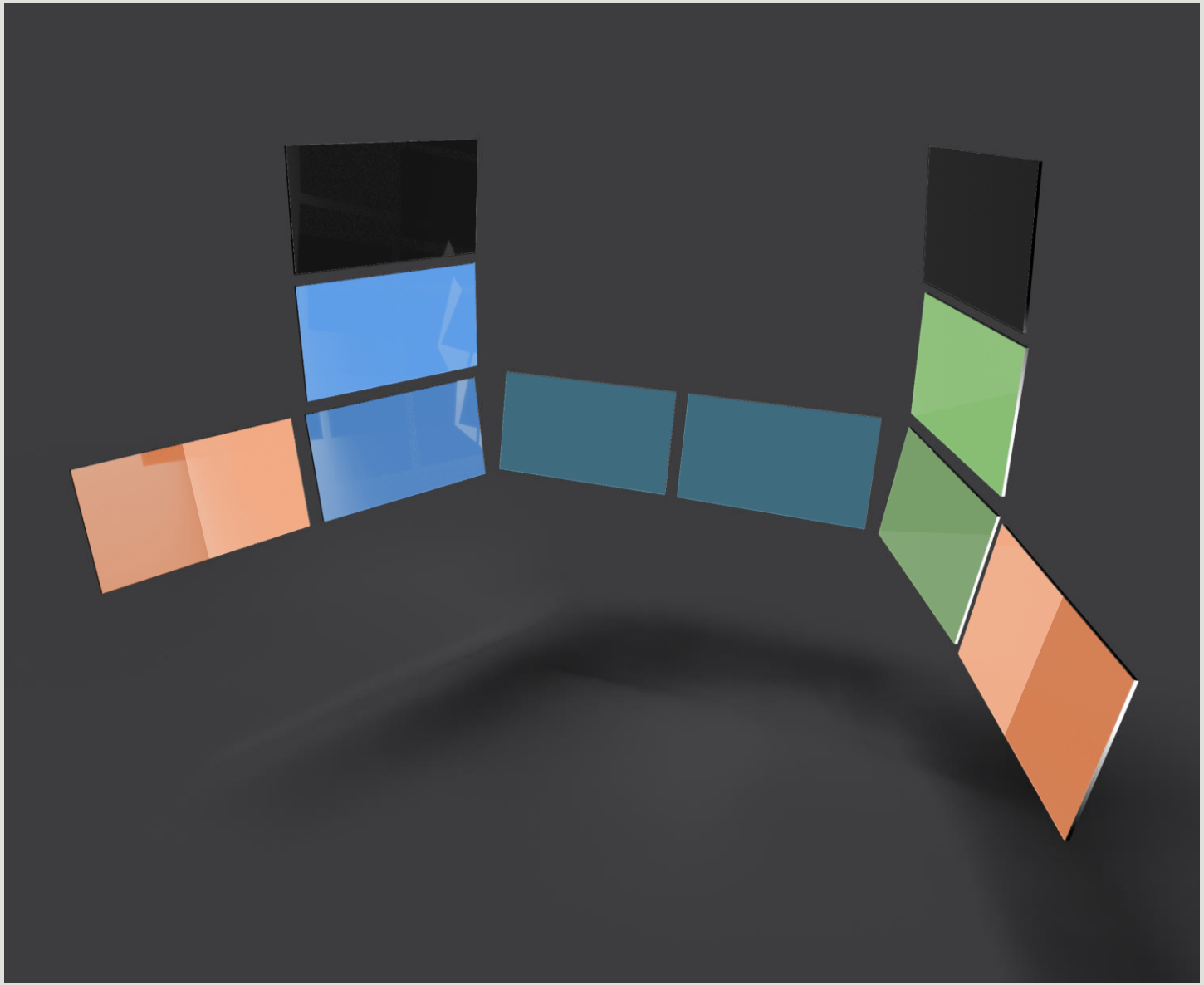

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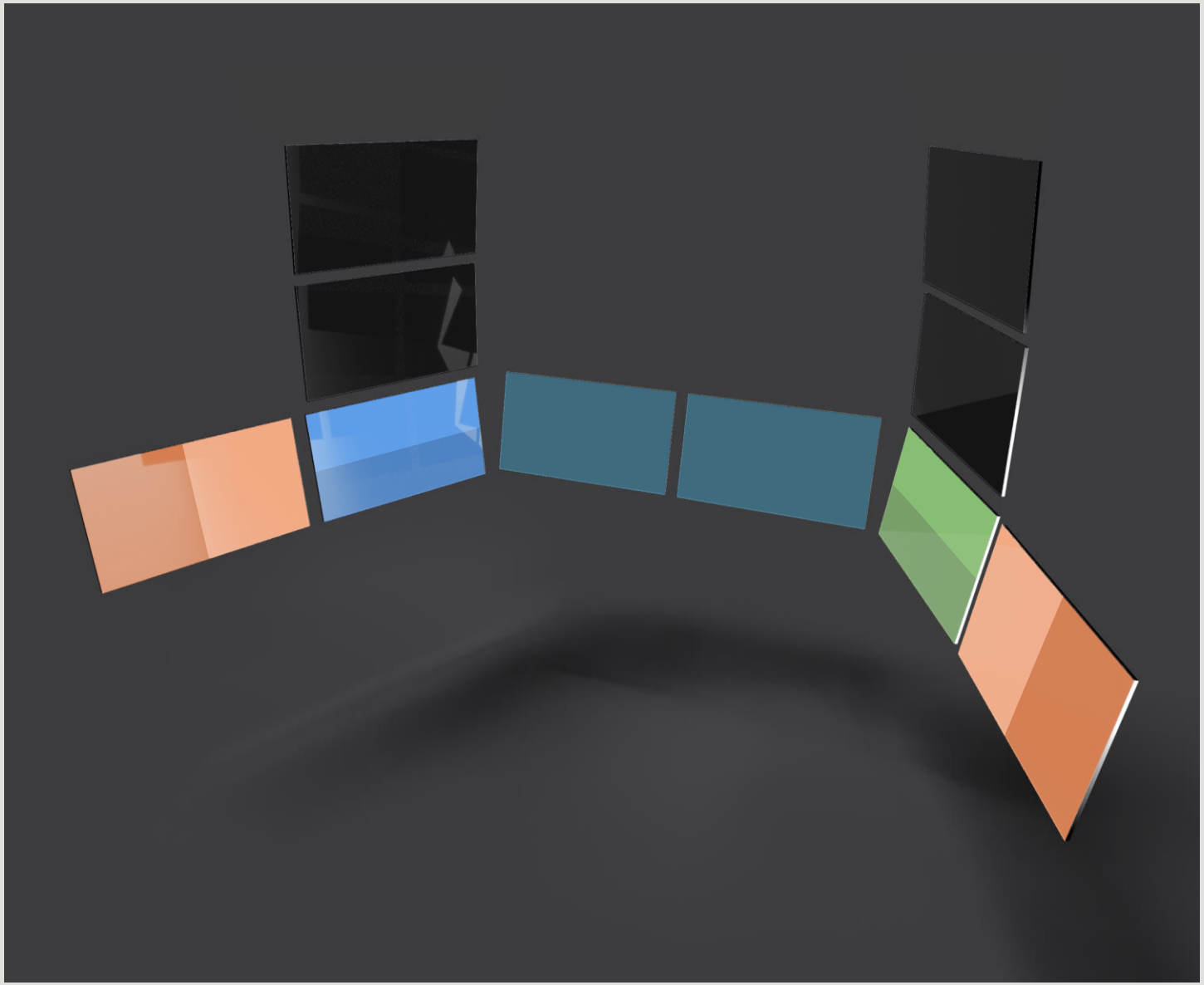

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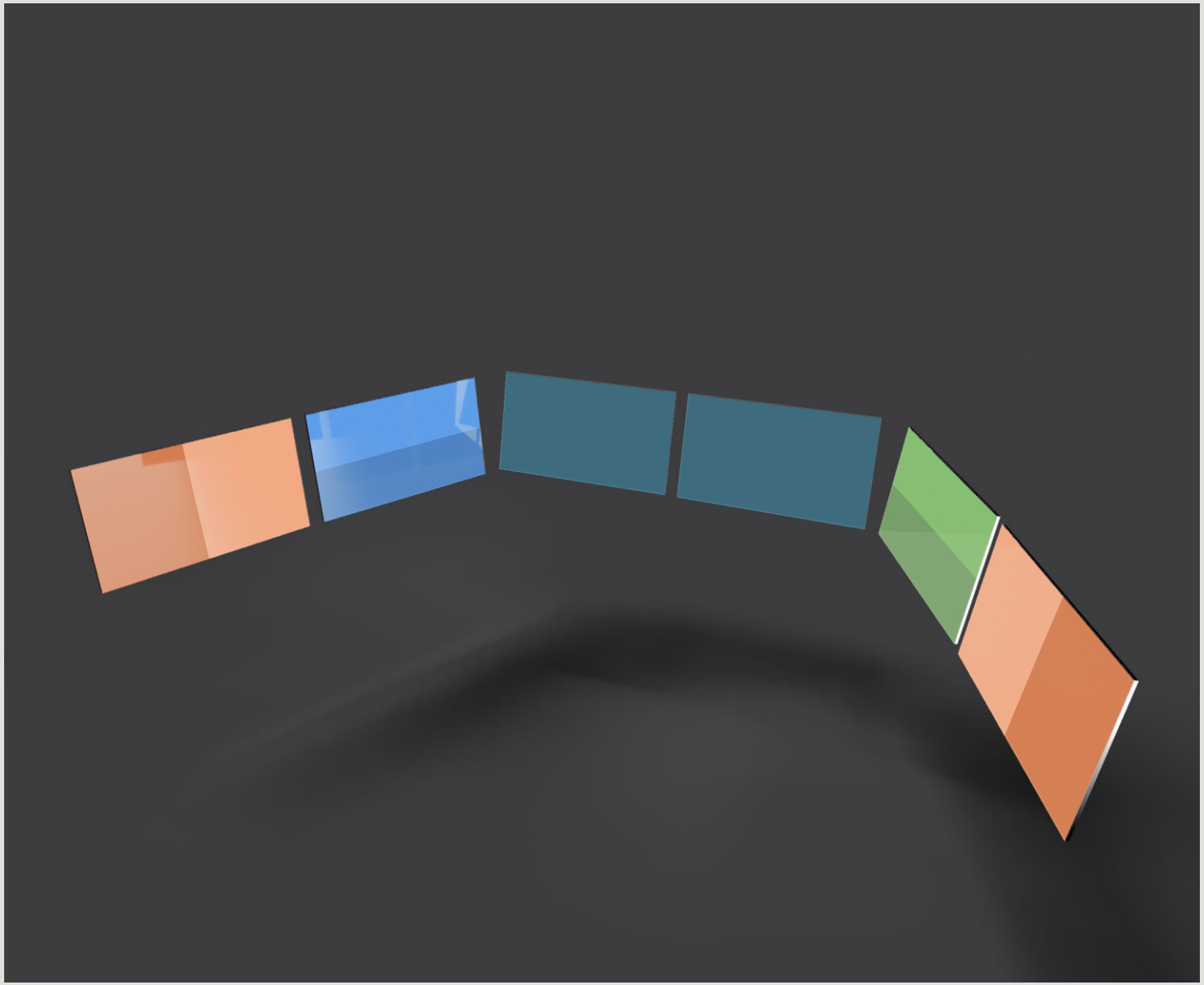

Operation-sensitive display of information

- Screen information and functionality adapt to the task
- Details can be hidden
- Automatically

- Reduction of screens and amount of displayed information

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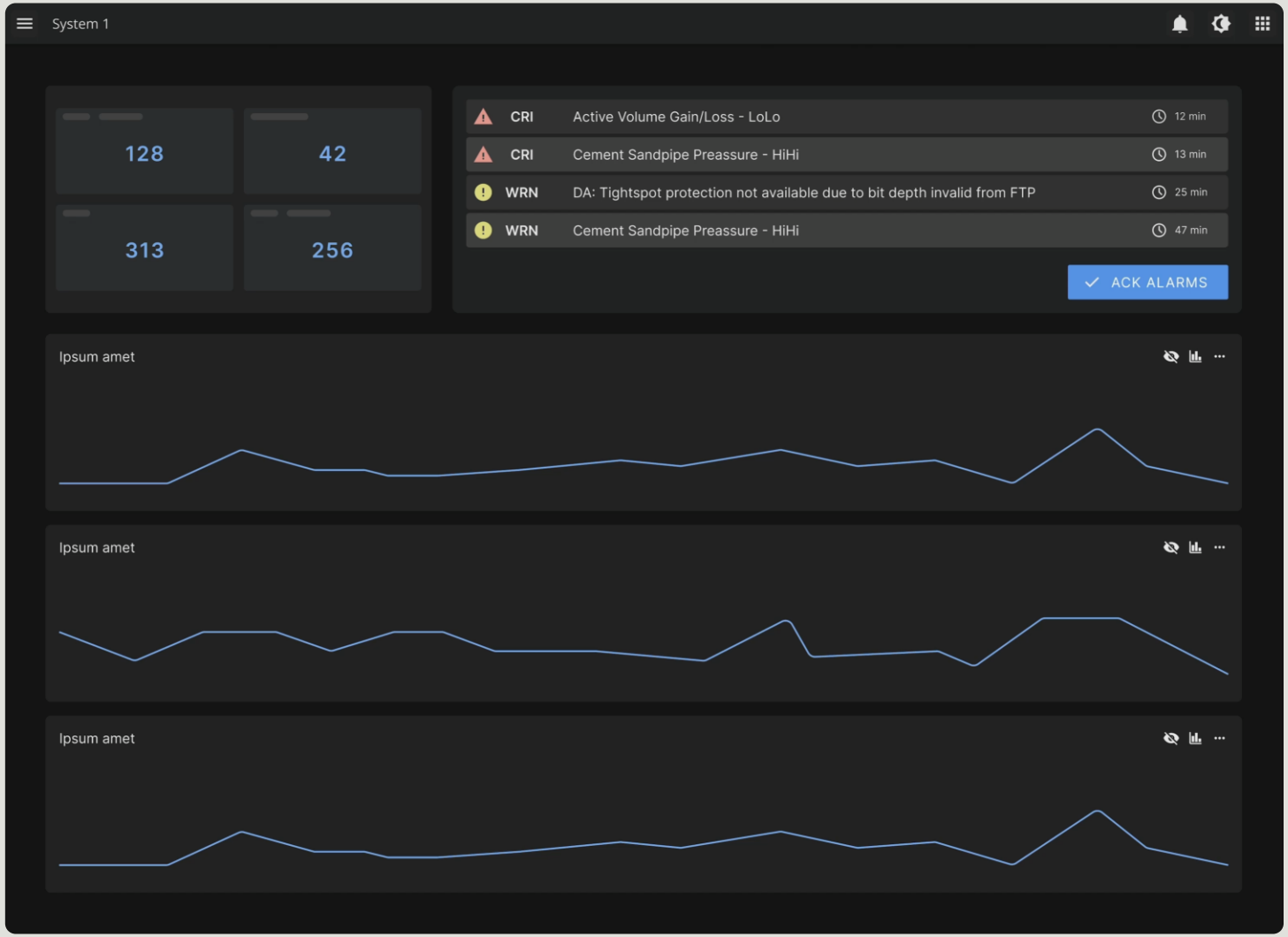

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Design concept

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Flexible work postures

Seating & workstation allowing users to vary work postures during long shifts

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Flexible work postures

Seating & workstation allowing users to vary work postures during long shifts

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Supports team collaboration

A workspace that supports focused individual work as well as team collaboration

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Ergonomic screen positioning

Workstation with screens attached aids ergonomic screen positioning.

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Ergonomic screen positioning

Workstation with screens attached aids ergonomic screen positioning.

Underlying considerations:

- Ensure clear view of drill floor with low front and side screen placement.

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Ergonomic screen positioning

Workstation with screens attached aids ergonomic screen positioning.

Underlying considerations:

- Ensure clear view of drill floor with low front and side screen placement.
- Keep all screens within readable range.

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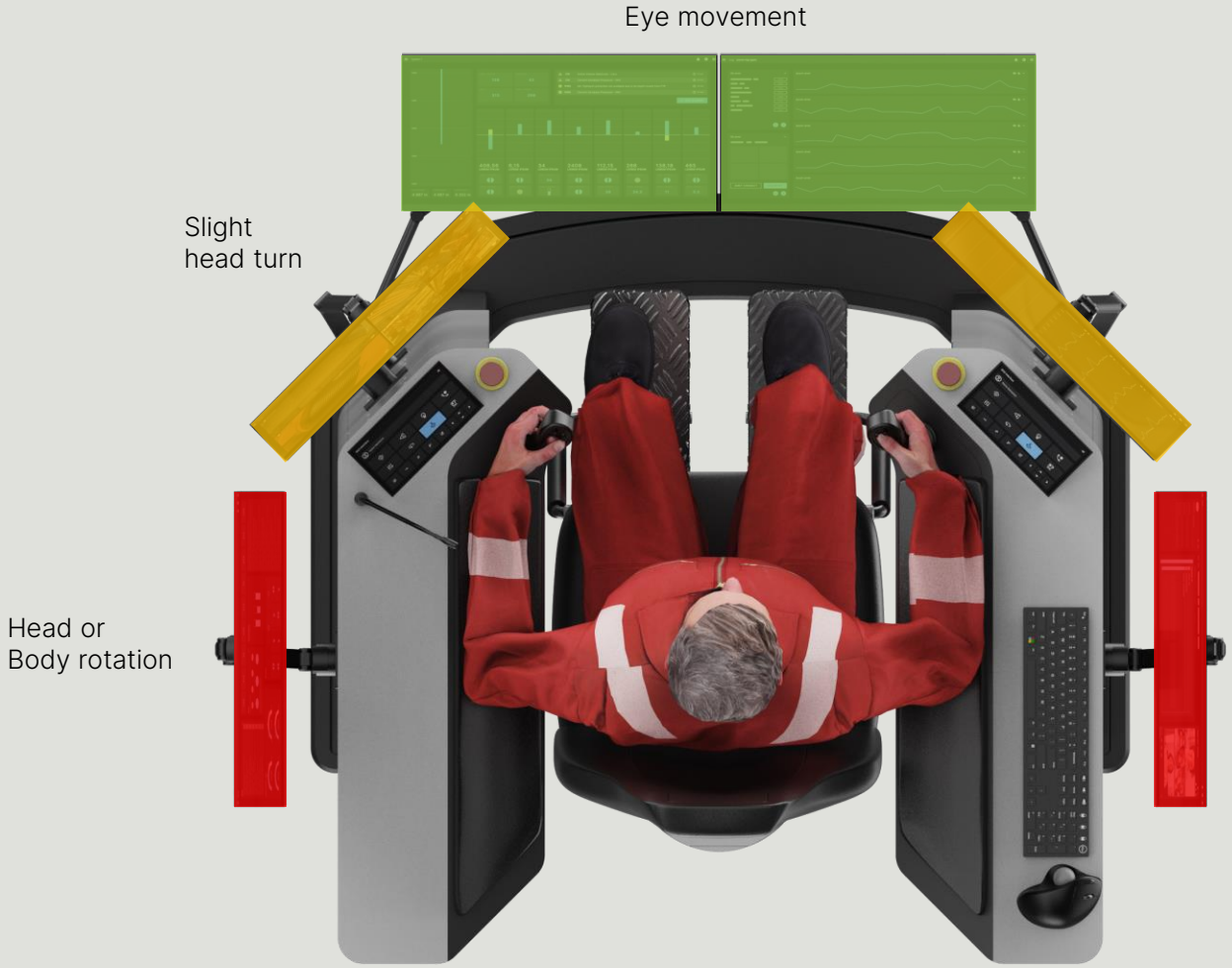
Ergonomic screen positioning

Workstation with screens attached aids ergonomic screen positioning.

Underlying considerations:

- Ensure clear view of drill floor with low front and side screen placement.
- Keep all screens within readable range.
- Position screens symmetrically to prevent one-sided movement.
- Prioritize information by importance and frequency of use, and position it accordingly



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Hardware level: Design for upgradability

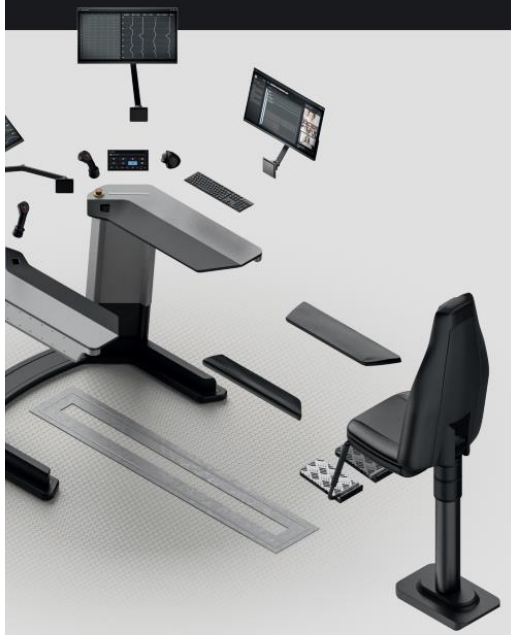
Opt for "non-integrated" solutions for easy and cost-effective replacement of worn-out or outdated equipment like controls, chair, displays and audio devices.

Best Practices

- Based on our findings
- Guidance on human-centered changes
- Easily applicable with examples
- Reference to industry standards

BEST PRACTICES

For human-centred changes in the driller`s cabin



Authors: Elisabeth Arndt, Marius Fernander, Arne Jarl Ringstad

→ Consider the visual field, physical strain of the operator and importance of information when placing a new (information on) screen to reduce potential for long lasting pain and increase performance.
Example: When adding a new screen, assess the importance of the displayed information and the frequency of use. Very important information that is frequently needed should be shown in front of the operator (preferred information zone) while less important information should be shown further away (acceptable information zone). This way, operators don`t have to turn their head frequently to see important information, providing a better working posture. Furthermore, they will see important information quicker, resulting in an increase of their performance.

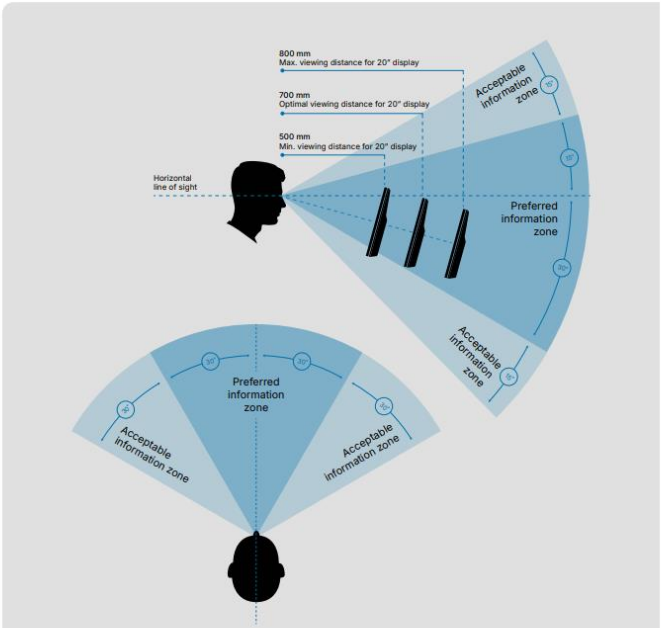


Figure 8. Placing of information according to EN894-2.

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Content

- Introduction to Human Factors
- Description of a Human-Centered Design process
- (Technical) Management of Change (MoC)
- Applied Human Centered design for Driller's Cabin
- Tools/checklists
- Design basis for Driller's Cabin

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