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VDC, technologies, and monitoring in the construction industry

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VIDENTJENESTE
FOR BYGHERRER OG RÅDGIVERE

Programme

1. The VDC project
   OSH potentials of new technologies
   Corporate support for new technologies for OSH purposes.
   Professional identities as opportunities and constraints

2. Monitoring, new technologies, and ethics
   Monitoring in literature and in companies
   Ethical considerations

1. Questions and discussion

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VDC-projektet

- Scoping review
- Interviews and observation studies
- Workshops with stakeholders

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Publications

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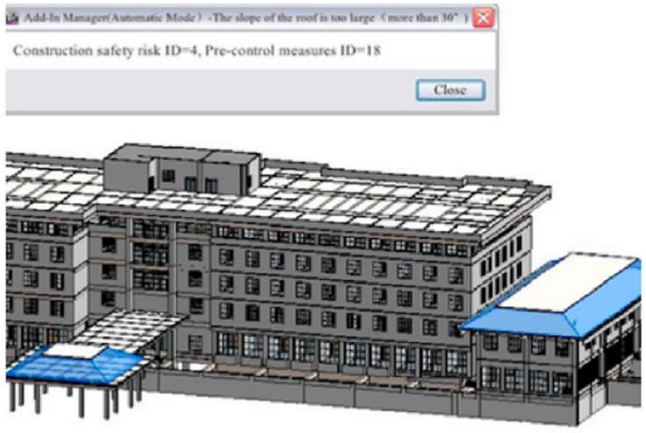
Identificering af risici

På baggrund af sikkerhedsregler kan risici automatisk identificeres i 3/4D model

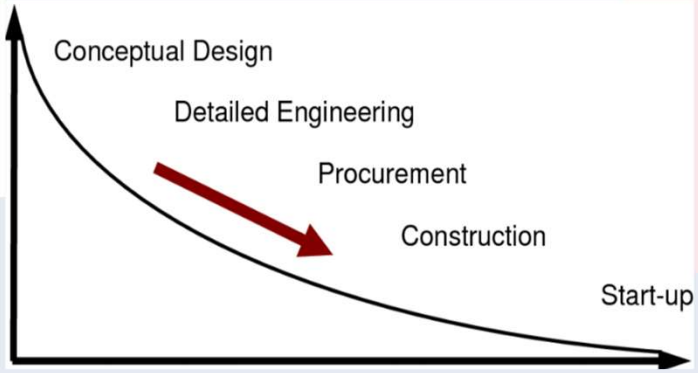


Billede 4. Resultatet af et sikkerhedsplugin. Fordi hældningen på taget er mere end 30 grader er dette identificeret som en risiko og markeret med blå - fra Yuan m.fl. (2019).

Building Information Modelling - plugins

20 studies.

Automated safety controls.



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Safety Training

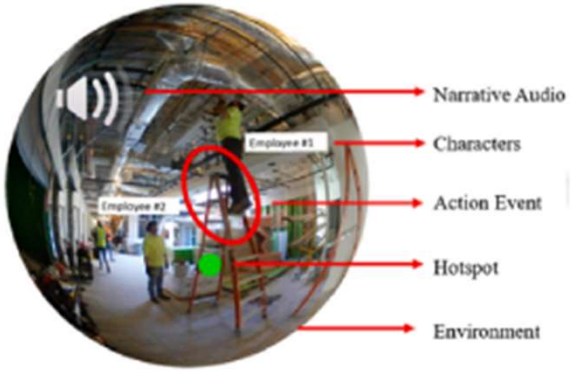
15 studies

Occupational safety training in virtual environments.

Limited training effectiveness

360 graders panorama + Augmented (AR)

360 billeder af den faktiske byggeplads, hvor AR anvendes til præsentation af sikkerhedsinformation.



Billede 15. Sikkerhedsplatform. En bruger med VR briller, går virtuelt rundt på den faktiske byggeplads, hvor augmented sikkerheds information og historiefortælling er inkorporeret - fra Eiris m.fl. (2020).

Virtual Reality (VR)

Arbejdsopgaver kan trænes i virtuelle scenarier, hvor brugeren kan interagere med relevante problemstillinger.

Billede 16. Brugeren har kontrol over en stor maskine, og træner arbejdsprocesser i VR - fra Vahdatikhaki m.fl. (2019).

Key Points from the Review (2022)

1. There is a need for general development of OSH-oriented solutions in new digital technologies.

2. There is a lack of standards in how to address OSH factors and digital safety checks, data collection, concepts, etc.

3. Data collection, management, and analysis for safety purposes are very limited.

4. Stronger collaboration is needed between stakeholders: researchers, safety professionals, developers, companies, managers, IT professionals to support the integration and testing of VDC solutions for safety purposes.

5. Political organizations should take an interest in how digital technologies can support safety in the construction and civil engineering sector.

Key Points from the Review (2022)

6. There is a great need for education in VDC and OSH thinking.

7. There is a lack of studies investigating VDC technologies and their impact on workers and safety professionals.

8. Ethical discussions regarding the implementation of technologies to improve both safety and other VDC functions are necessary.

The Case Studies

- Case studies in three major construction companies:

- A total of 27 interviews.
  - 12 OSH professionals.
  - 10 IT professionals.
  - 5 others.

- Observations in two out of three cases.

Key Points Summarized

- VDC and digital technologies are not central to OSH coordinators' professional identity.
  - Technology vs. human contact.
  - OSH coordinators see great potential in new technologies.

- **Dalux** is widely used for safety purposes—**BIM 360** is more sporadic.

- Technologies are less accessible to site workers.
- Occupational safety is not central to VDC professionals' identities but remains relevant.
  - Who oversees the work environment of VDC professionals?

- Significant barriers exist for developing occupational safety functions, particularly due to financial constraints.

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In the name of safety - safety monitoring and the development of the Duty, Utility, Virtue framework for ethical consideration

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ABSTRACT

New safety monitoring technologies have begun to emerge in both research and practice. This may improve safety and health at the workplace, but may also cause worries about the implications for people exposed to the technologies. This calls for ethical considerations concerning the monitoring technologies. A need, which is not currently fulfilled. The lack of ethical considerations means that potential negative consequences of the technologies are never brought into the light of day, which means that potentially problematic technologies are developed and implemented at workplaces at the cost of worker health and safety. In order to address this issue, we revisit existing literature on monitoring technologies at work and develop the Duty, Utility, Virtue (DUV) framework for considering ethical implications of OSH technologies. We then examine nine safety monitoring studies, in order to illustrate the use of the DUV framework and show the character of ethical considerations currently taking place in this field of research.

The analysis of the nine safety monitoring studies shows that all studies had severe shortcomings in their ethical considerations and that the development and implementation of safety monitoring technologies inadvertently risk affecting both workers overview of work, their influence, their skill discretion, their safety and their physical and mental wellbeing in negative ways. All, in the name of safety.

Virtual Design for Occupational Safety Improvements

- New Types of Monitoring.

Billede 10. Personbårne RFID til identifikation af brugen af PPE - fra Barro- Torres m.fl. (2012).

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Quote

- "With the help of camera-based analysis technology, it is possible to automatically detect abnormalities in workers, materials, and machinery on site and extract relevant documentation images. The entire process does not require extensive human intervention to analyze and monitor the results. Therefore, [...] video monitoring systems are more acceptable in the construction industry."
  (Guo et al. 2019, own translation)

Monitoring and Psychosocial Work Environment

- Tasks become standardized.
- Increased performance management.
- Reduces influence, and employee skills are structured based on data (Dyreborg et al. 2022; Ball, 2021).
- Algorithmic management makes leadership invisible.
  - Decisions become opaque.
- Relationships disappear—risk of dehumanization (Walker et al. 2021).
- Calls for ethical reflections.

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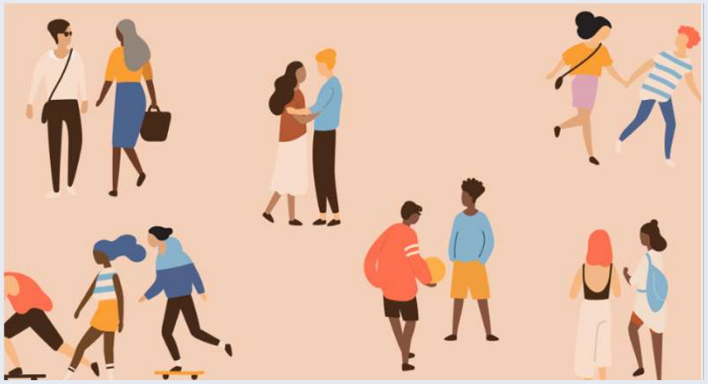
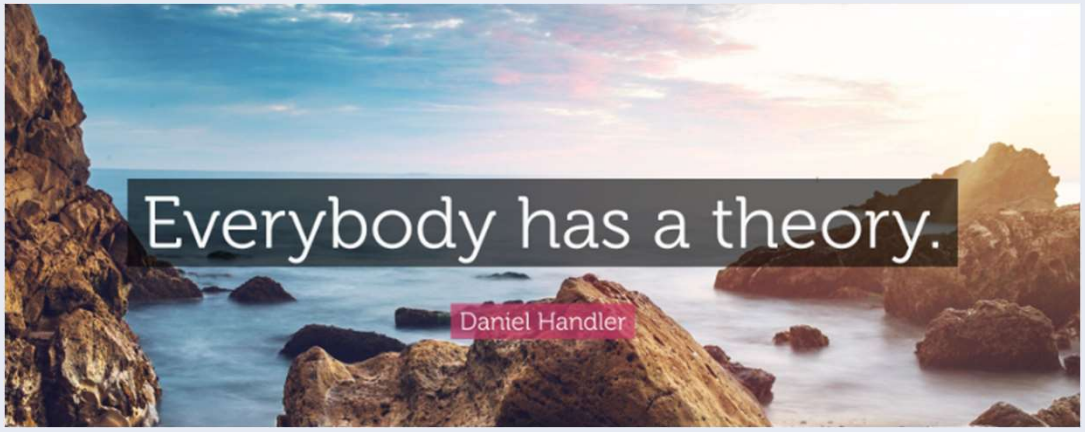
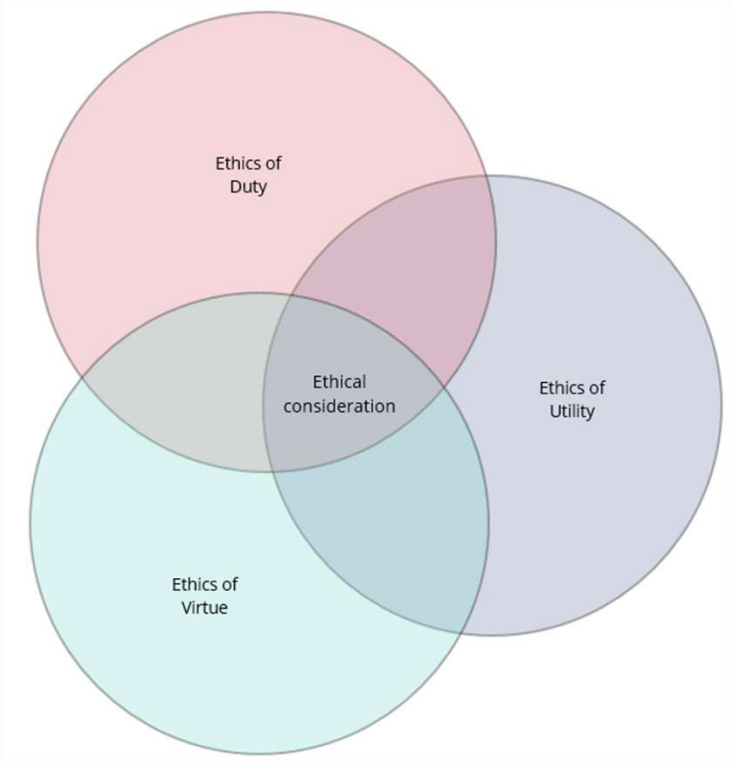
Ethics – or Moral Philosophy





DUV - A Concrete and Common Frame of Reference

- Duty –(Immanuel Kant, Knud E. Løgstrup)
- Utility – (Jeremy Bentham)
- Virtue – (Aristoteles, Michel Foucault)



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The 7 Questions Summarized

1. What purposes or intentions are associated with the technology?
2. How can the technology serve as a principle for general practice?
3. Who or what does the technology care for?
4. What advantages and disadvantages are related to the technology?
5. What new needs, opportunities, and desires will arise from the use of the technologies?
6. How are power relations within the organization affected?
7. How will the technology or its principles affect those who implement or develop it?

Summary of Ethics and Monitoring in the Three Cases

- The overarching goals of technologies are to optimize time, efficiency, earnings, and productivity.
- Some technologies point towards sensible occupational safety directions—improving communication, risk identification, etc.
- However, surveillance technologies introduce challenges and are increasingly used.
  - Unclear purposes – "for fun."
  - Unlimited usage.
  - No employee involvement (are they informed?).
  - It's left to individual OSH coordinators, VDC professionals, site managers, etc., to handle.

Group Discussion 2

15 min

- Technology use, monitoring, and influence – what opportunities and risks do you see?
- Is there a need for dialogue within the organization about these issues?
- Should there be shared guidelines and practices around, e.g., monitoring?
- Could ethical analysis and considerations become a specialty or business area for OSH coordinators, managers, consultants, or professionals?

Thank you for today.

- What's to come?
  - Accimapping in construction and civil engineering.
  - Technology development – automation of safety rules and guidance.

- If this interests you, contact:
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