E-tools seminar 2023: OSH E-tools in the construction sector and other outdoor work
Bilbao, 4 – 5 October 2023
Day 1 - Summary
Introduction: e-tools

- Information entered by user or via sensor
- Algorithm
- Output tailored for user

A means to an end not an end in itself

Such tools are being used now. They offer great potential benefits but also pose some challenges

Getting more sophisticated!
M. Chatzimichailidou

- Failure to manage building can lead not only to worker deaths but also deaths “downstream” - “Life-course” of building approach needed
- Building information modelling (BIM): a decision-making tool. BIM is an aid and complement to human processes not a replacement and has to be adapted to each project
- BIM gives advantages in training and warning systems (with VR), safety inspection, and crane management
  • Can be used for sharing between contractor and subcontractors
- Privacy, modelling accuracy, information overload and culture shift are all issues
- Scalability to smaller sites/enterprises may be an issue in the short to mid-term
- Use as part of obligation to include OSH in design of building – not yet integrated
Wearable technologies are here. They can offer real benefits to prevention, but may raise their own challenges.

Wearable technology can monitor physiological parameters (e.g. heart rate) and environmental parameters (e.g. temperature).

Challenge to make the “intelligent” clothing system practical in the work environment (e.g. wear, reliability).

Much depends on the algorithm – bio-cooperative model combining bio and env. data.

Wearable technology offers much for the future as materials and technologies develop, but challenges remain over issues such as certification, data privacy and intellectual property, reliability.

Each baseline shirt is 50 EUR then + 20 EUR for electronic components – price is not the barrier to entry to entry.
B. Molloy

- E-tools have to be what the user needs and trust, with a low barrier to entry (it's free)
- Based on hierarchy of control
- Implementation of e-tools is a long-term process with long-term investment, with testing, testing, testing and user-support
- Active promotion of the tool is required to have up-take with support from all stakeholders
- Tool is embedded in national strategic approach
- Requirement for continual development, maintenance, and update to ensure sustainability
- Construction has many different subsectors, and subcontracting makes many challenges
- Supported by online training courses
- User needs to see where they are in the journey
- Don’t over-assume literacy and numeracy skills
- Need for accessibility for people with disabilities
- Challenges with addressing vulnerable workers, platform economy, mental health. And multilingualism
- Flexibility is difficult to design in, but greatly helps ownership of risk assessment
- Getting tools into the education system is important both as learning tool and for awareness in future use
Challenges in measurements while standardized they are expensive. Are there new measurement options? Real-time sensor driven measurement but not standardized outputs. So, need to examine “low-cost sensors” LCS – (particulate measurement)

Particulates can be more specifically measured (e.g. silica, diesel fume) by composition but not low-cost!

Field testing with construction enterprises – hard to measure when multiple particulates

Measurements alone is no solution

Traffic light app gives real-time exposure profile

Particulate monitoring alone is needed to be combined with interpretation (e.g. what tasks being done) – combine with video exposure monitoring – but privacy sensitive

Can you measure context with sensors – easy to identify when exposure takes place but also need to know where and why. Where is easy (GPS). Why is harder – source-receptor model. Used vibration monitoring + proximity sensors in machinery + sensors to identify location of work equipment

Also, use of light, temperature, and UV for welding fume monitoring

Challenge to have all sensors working at same time!

Privacy is a major barrier – but attitudes are perhaps changing. Trust is so important. Data security has to be legally guaranteed

TNO 5 step approach: Measure exposure, Identify impact on health, Identify when where and why, advise control measures, evaluate process

Workers and employers have to agree with purpose of sensors and buy in
Discussion points

- Construction is both over-regulated (some regulations contradictory) and under-regulated (in comparison to some industries like energy)
- **Algorithm management**: How do we know it is correct? What if it is machine/self-learning? Physiological differences of users for sensors – need for AI adjustment
- **Skill sets of workers** – need for training (e.g. maintenance and use of kit) – raising barrier for entry
- Wearable tech may be considered clothing, or PPE but certification can be an issue (but using commercial products and combining them can be way to facilitate this). Overall cost can be barrier to entry to market
- **Challenge to maintain data security** (for user-identifiable data) while trying to access “big data”
- **Fit for wear** – gender? Barrier to move to market? Especially if gender-sensitive sensors not available on market.
- Reliability and sustainability of wearables and sensors
- “Neutral” OH professionals may be way of getting buy-in, but whatever you do, you have to sell the benefits
- Potential for working up to the exposure limit or other potential for misuse or misapplication? **Sensors difficult to use quantitively currently**. Find where exposure occurs and analyze current exposures (e.g. via trends). That is achievable now
- We are all monitored at work in some way – there is/will be a paradigm shift in how monitoring will occur (c.f. TRUST) Purpose is important (monitoring is by either consent or by law) – ie. that we are doing it to reduce risk of harm to workers
- **Need for regulation fit to societal values** – technology is moving quickly and policy/regulation lagging
- **Before Technological determinism** – e.g. collecting data because we can not because we should or even because it is useful