



# Empowering and engaging factory workers with Operator 4.0 solutions

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CIOP-PIB Conference on Novel technological innovations for occupational safety and health

Warsaw, October 15<sup>th</sup>, 2019

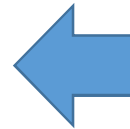


# Outline of the presentation

- Industry 4.0 and Operator 4.0
  - Factory2Fit approach and solutions
    - Video
  - Impacts of Operator 4.0 solutions on work well-being
  - Case example: Worker Feedback Dashboard
- *The research results presented are from H2020 project Factory2Fit (2016-2019)*  
[www.factory2fit.eu](http://www.factory2fit.eu)

# Industry 4.0

Industrial work is increasingly mediated; i.e. the work is not related to the physical objects but to their counterparts in the virtual world



4.0 Integration of physical and virtual

3.0 Automation

2.0 Mass production

# Factory Operator 4.0



## Opportunities

- More interesting and versatile jobs
- Work is physically less demanding
- Individual preferences can be taken better into account
- Remote work is increasingly available

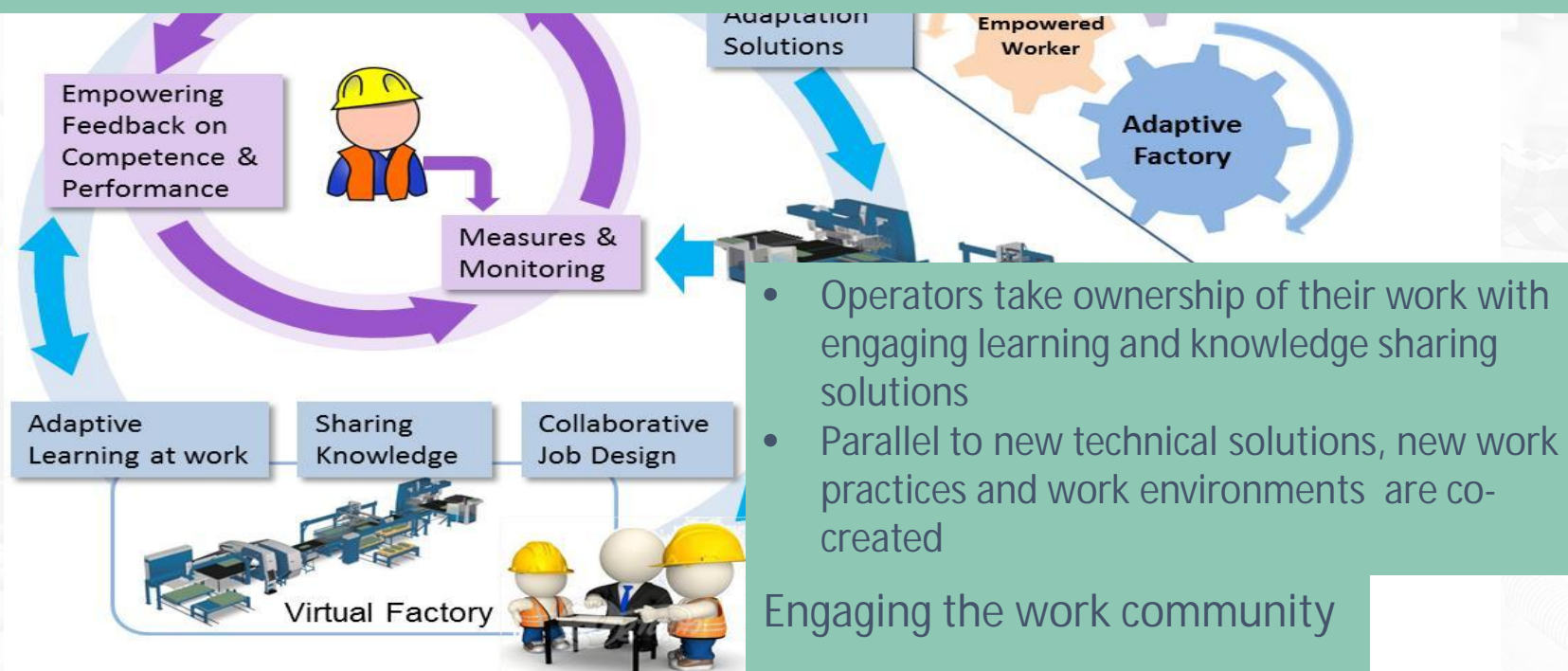
## Challenges

- How current operators can be supported in learning new skills
- How to tempt young talented people to choose factory work as the career
- Mentally demanding work tasks
- How to maintain the understanding of the physical world and work

# Factory2Fit Approach to Operator 4.0 solutions

## Empowering the worker

- Humans and automation take advantage of each others strengths
- Factory systems adapt to the individual skills, capabilities and preferences of the worker
- Workers take responsibility of their own competence development with on-the-job learning
- Workers get encouraging feedback of their well-being and competence development



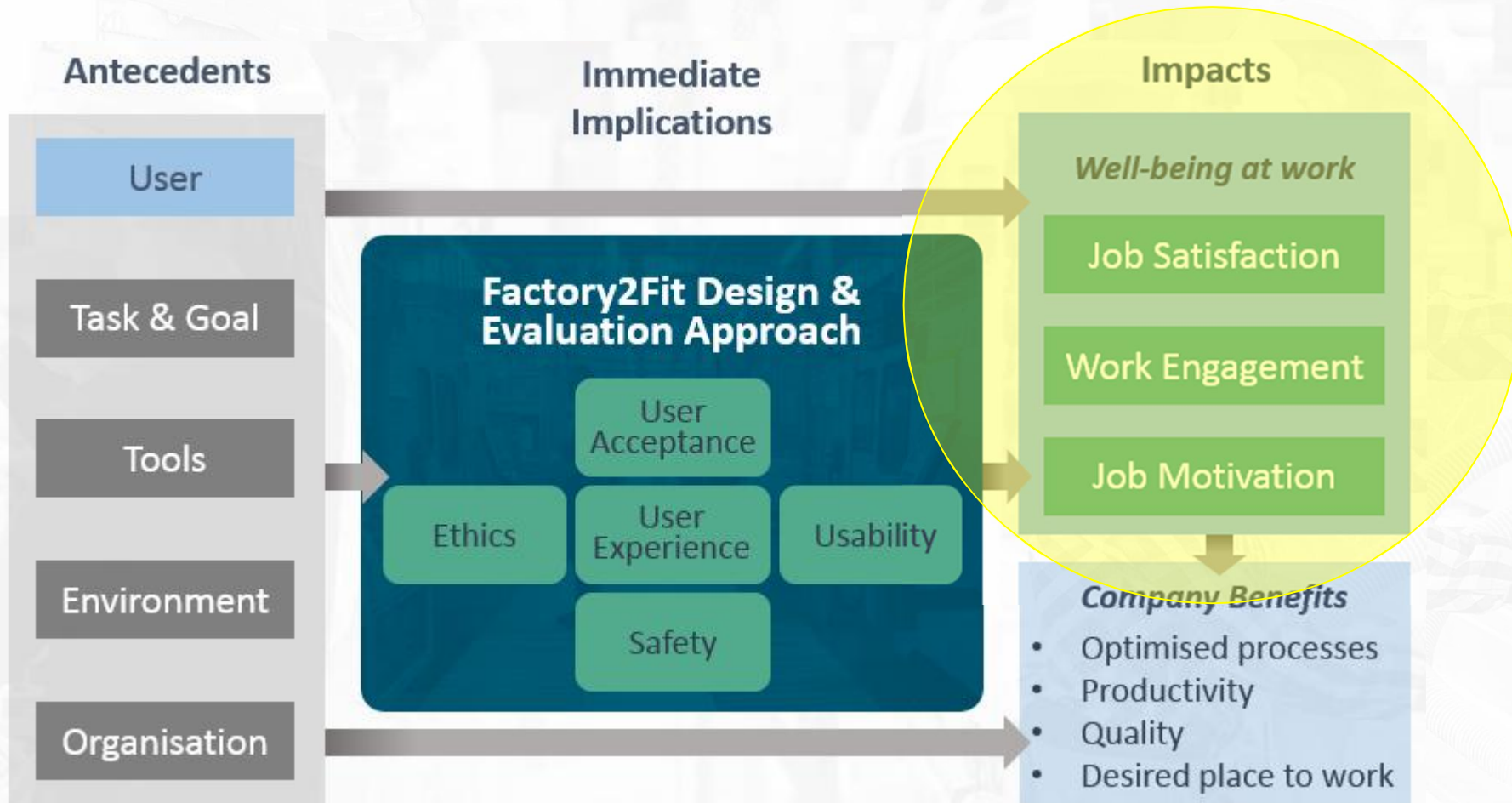
# Factory2Fit solutions - video



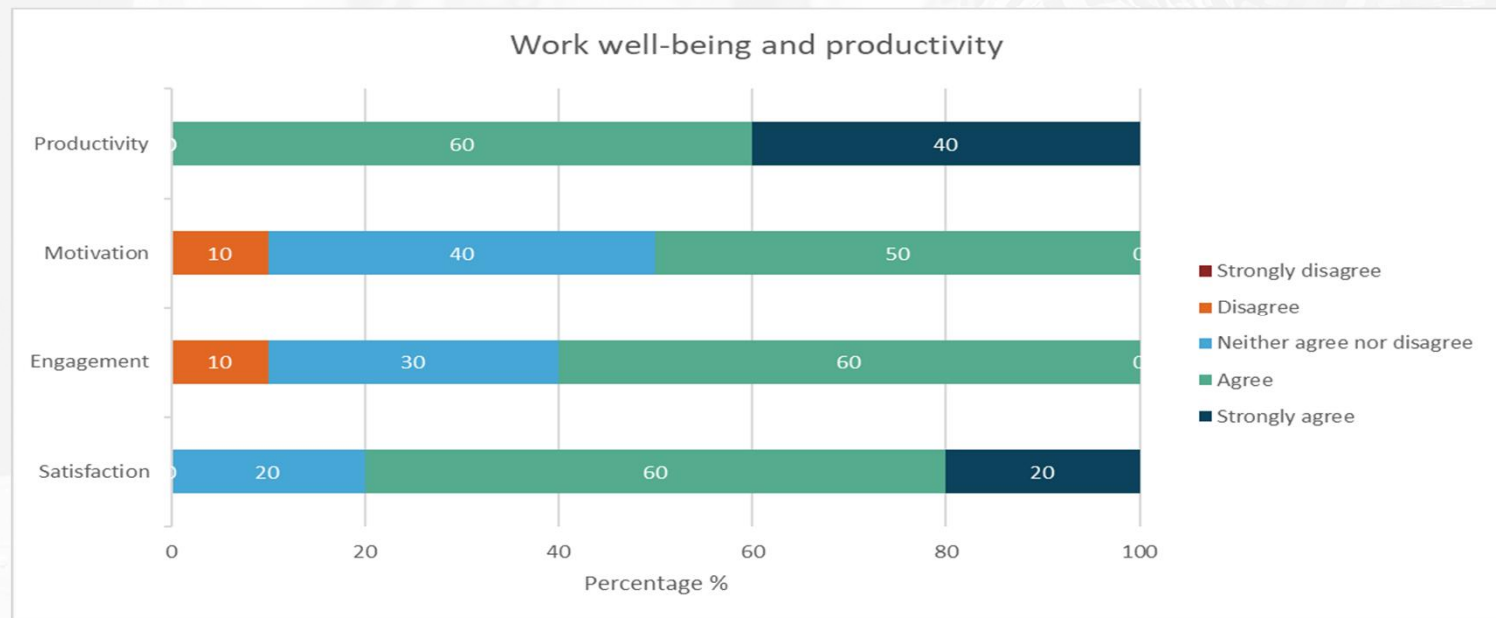
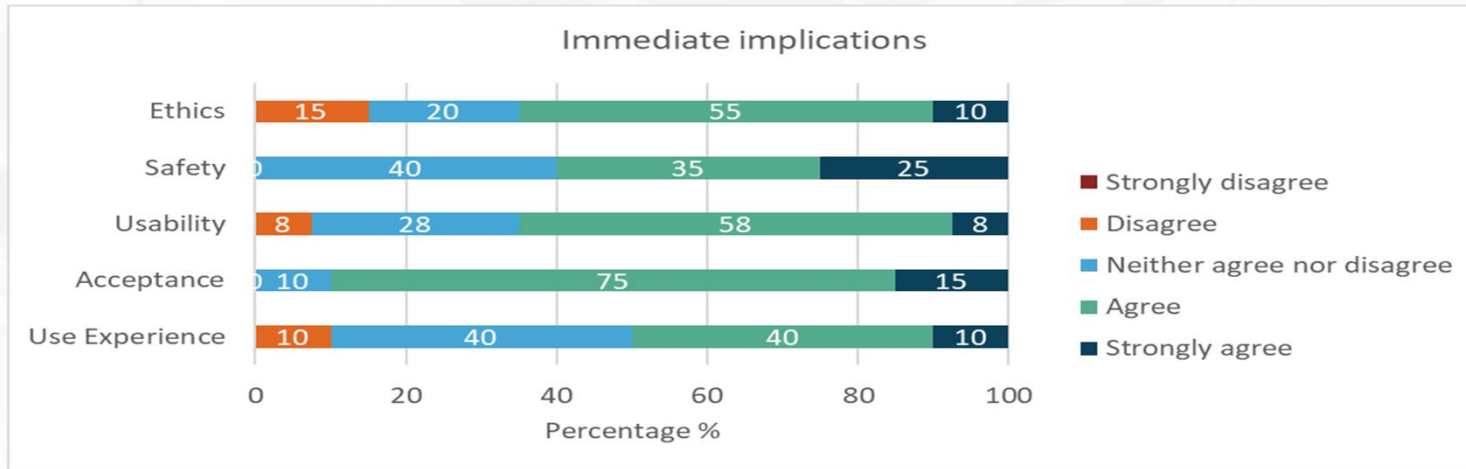
<https://www.youtube.com/watch?v=QQcYi8hTwFc&feature=youtu.be>

# Studying the impacts of Operator 4.0 solutions

## Factory2Fit Design and evaluation framework



# Examples of the results of impact assessment studies



*Results of piloting Contextual knowledge sharing at Prima Power*



# Impacts of Operator 4.0 solutions on work well-being

- In Factory2Fit project we have studied foreseen impacts of the solutions from the very beginning
- Paying attention to foreseen impacts on work well-being and productivity has supported identifying wider issues related to the usage of the applications
- Impact studies have supported the design of both the technical solutions and the new work practices
- The results of the pilot evaluations show that especially the solutions to engage the work community are expected to have positive impact on work well-being

*Kaasinen E., Liinasuo, M., Schmalfuß, F., Koskinen, H., Aromaa, S., Heikkilä, P., Honka, A., Mach, S. and Malm, T. 2019. A Worker-Centric Design and Evaluation Framework for Operator 4.0 Solutions that Support Work Well-Being. In: Barricelli B. et al. (eds) Human Work Interaction Design. Designing Engaging Automation. HWID 2018. IFIP Advances in Information and Communication Technology, vol 544. Springer, Cham*



## Case example: Worker Feedback Dashboard



# Worker Feedback Dashboard

## Concept



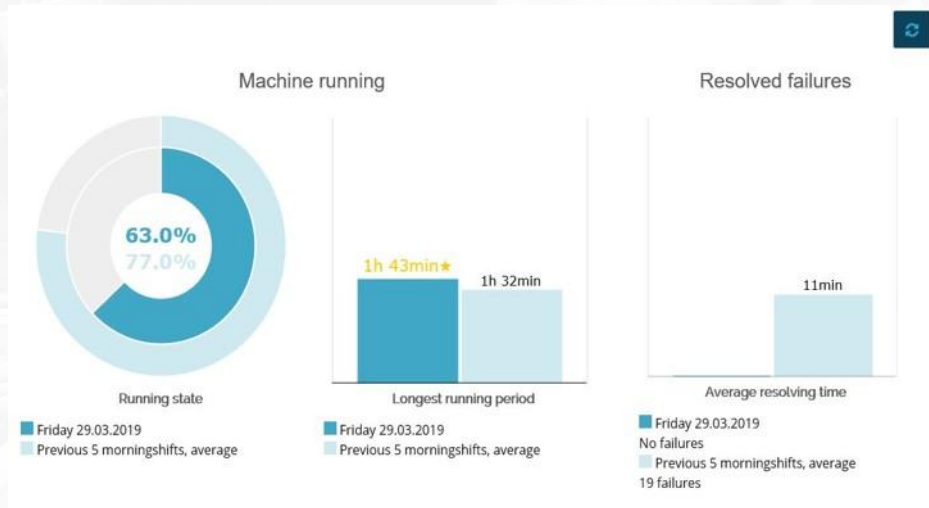
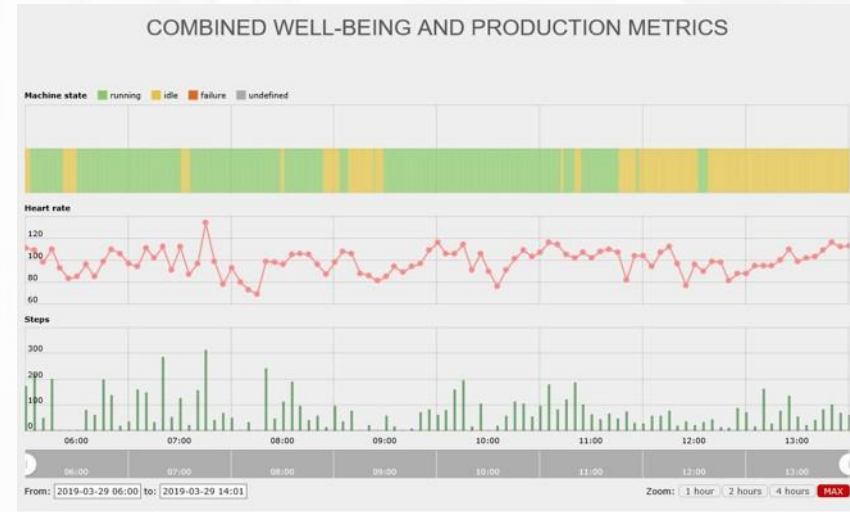
Work performance metrics

Well-being metrics

Juxtapose personal and production metrics to:

- Highlight personal achievements for the day
- Track own progress in competence development
- Expand self awareness about the relations between well-being and work performance

# Main views



# Pilots



3 industrial pilot companies



Altogether 10 factory floor workers

- 7 males, 3 females
- Mean 32 years (range 22-50)



Duration: 2-3 months each at the factory shop floor



Spring 2018  
3 users



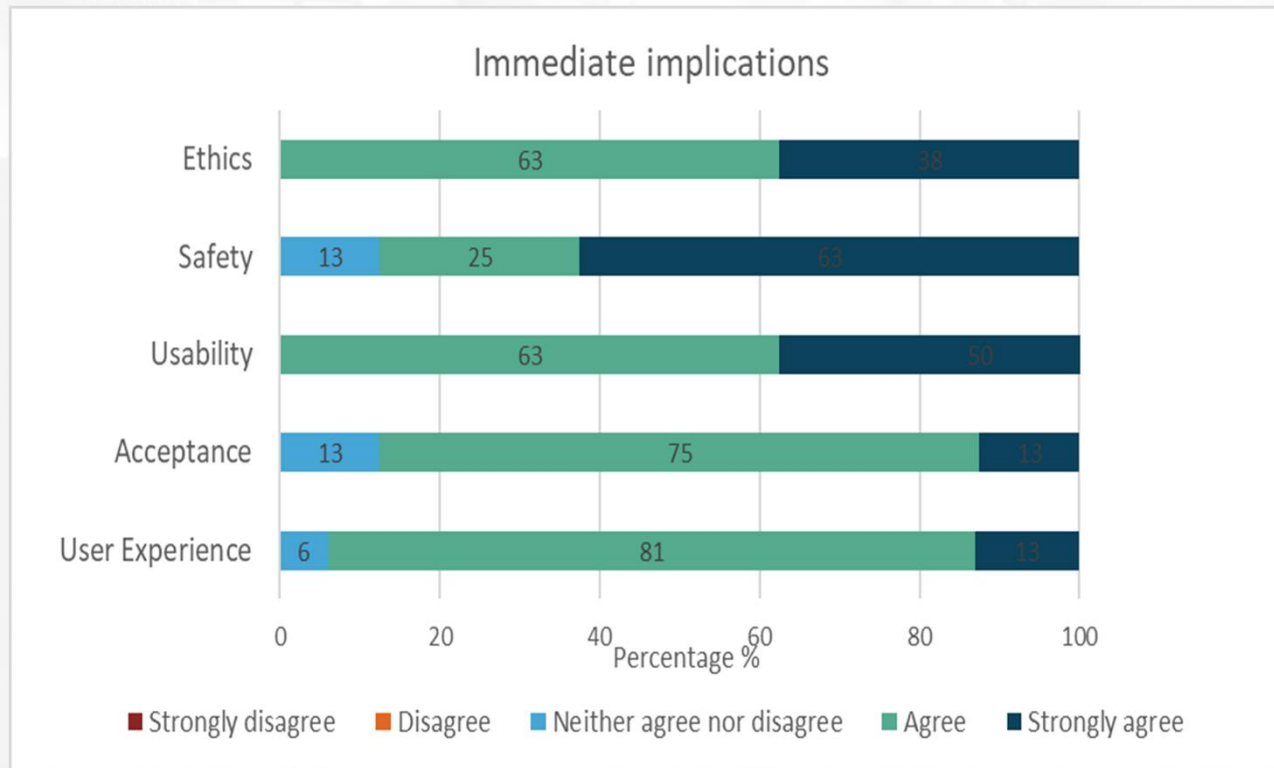
Spring 2019  
2 users



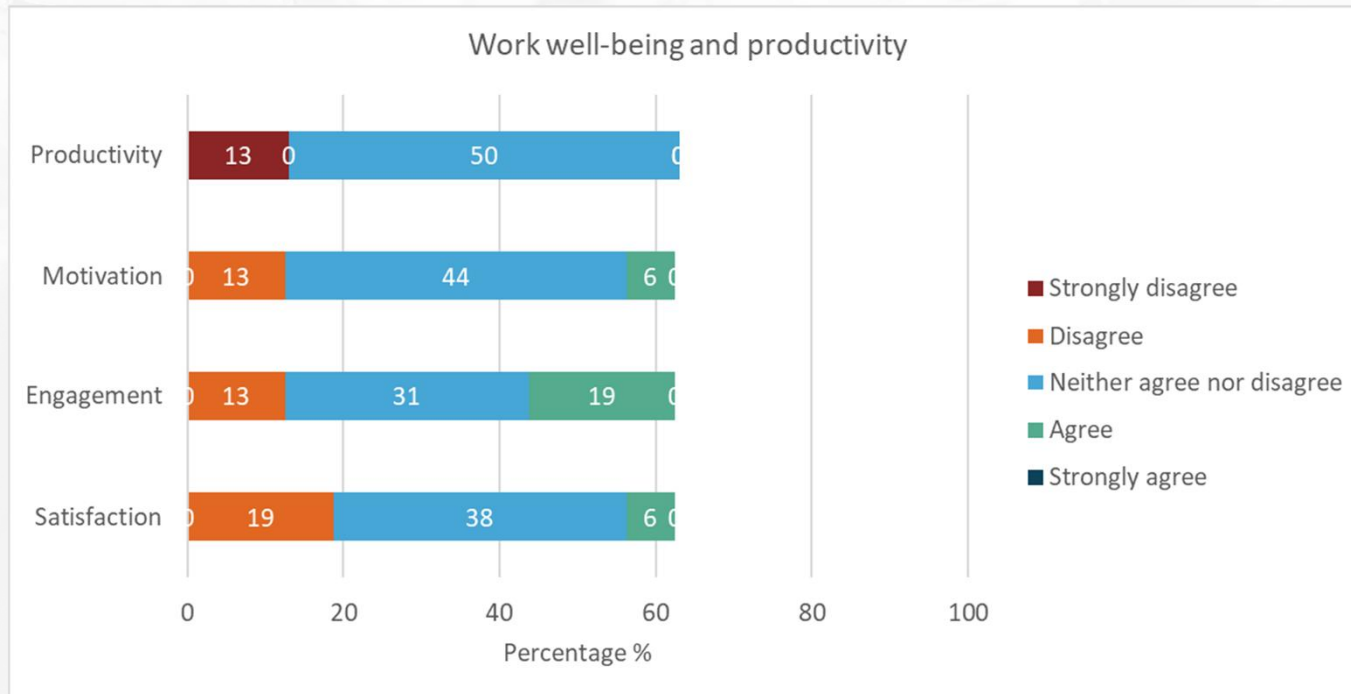
Spring 2019  
5 users



# Immediate implications



# Impacts



N=5

# Perceived benefits

## Changes in daily habits: Better sleep and more exercise

- *"If you sleep badly the day is a mess. When you slept longer the day was better. You could see it also in the utilisation rate of the machine".*

## Efforts for improving work performance by concretising accomplishments

- *"I perhaps try a bit more at work as I like to compete (laughs). I have known the ways to do things faster already before, but haven't put effort on that. As you can't see it anywhere."*

## Support in self-reflection

- *"When I've felt that the work day has been hard, I have checked from the data whether it is seen also there (e.g. in the step count)"*

## Opportunities for developing ways of working

- *"I was surprised about the quantity of steps during the work day. This means that there would be an opportunity for development, that the material needed haven't been easily available, and you have had to search for them."*



# Conclusions of piloting Worker Feedback Dashboard

- The concept was found novel but interesting
- It is challenging to find measurable indicators for work achievements
- Ethical aspects, privacy concerns and potential impacts on all stakeholders shall be addressed when introducing Worker Feedback Dashboard
- Workers should locally participate in planning how to utilize Worker Feedback Dashboard, and what kind of work practices should be agreed related to its use
- Worker Feedback Dashboard seems to have potential lead users, so could be introduced via them, showing encouraging example to others
- Still, using Worker Feedback Dashboard should be voluntary



Thank you for your attention

Any questions?

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