Tampereen yliopisto

# Kokemuksia tutkimusprojekteista teollisuuden kanssa


**Tampere Unit for Computer-Human Interaction (TAUCHI)**
**Tampere Accessibility Unit (TACCU)**
**Faculty of Information Technology and Communication Sciences (ITC)**

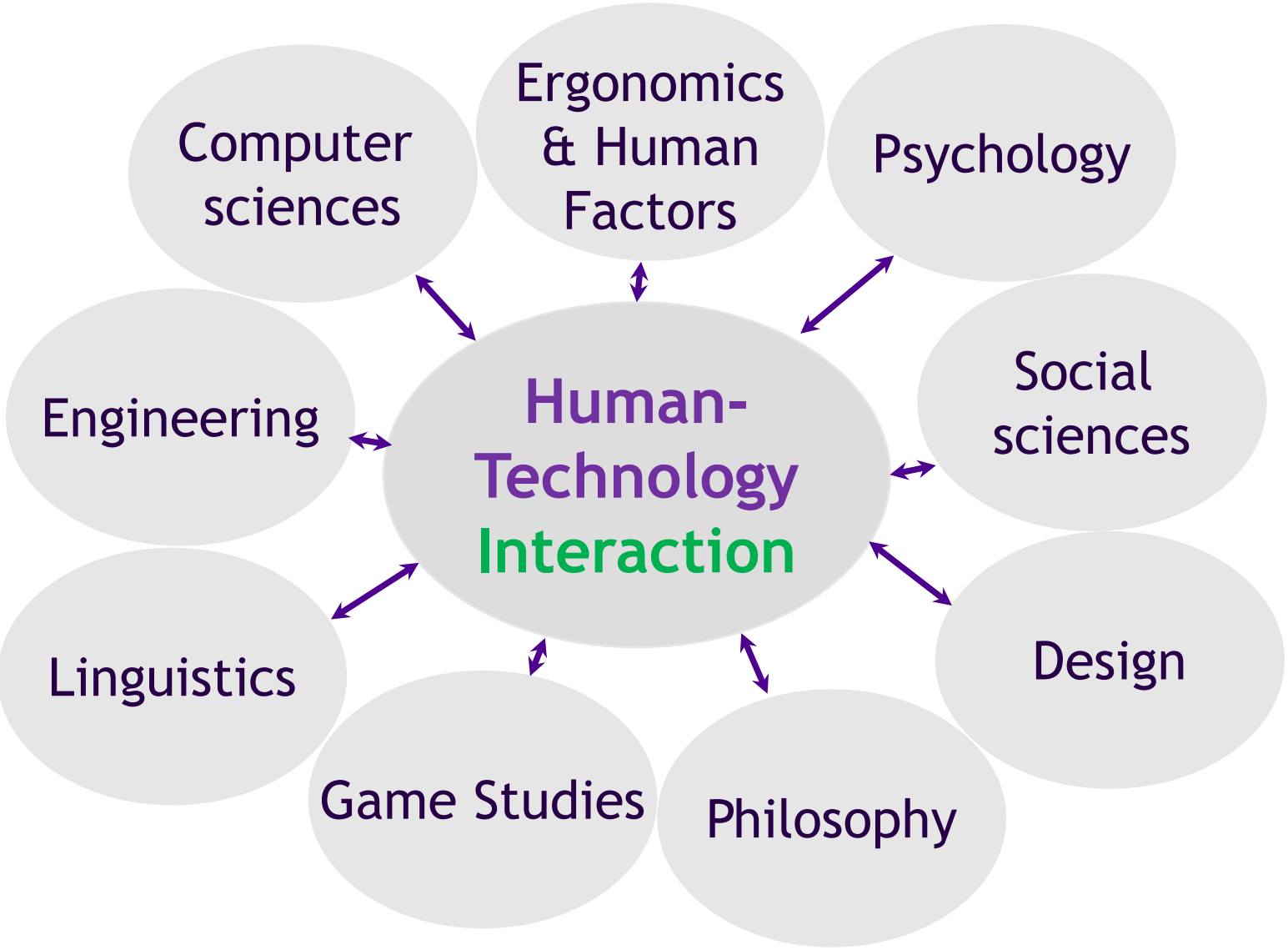
**Markku Turunen**
<markku.turunen@tuni.fi>


8.6.2021

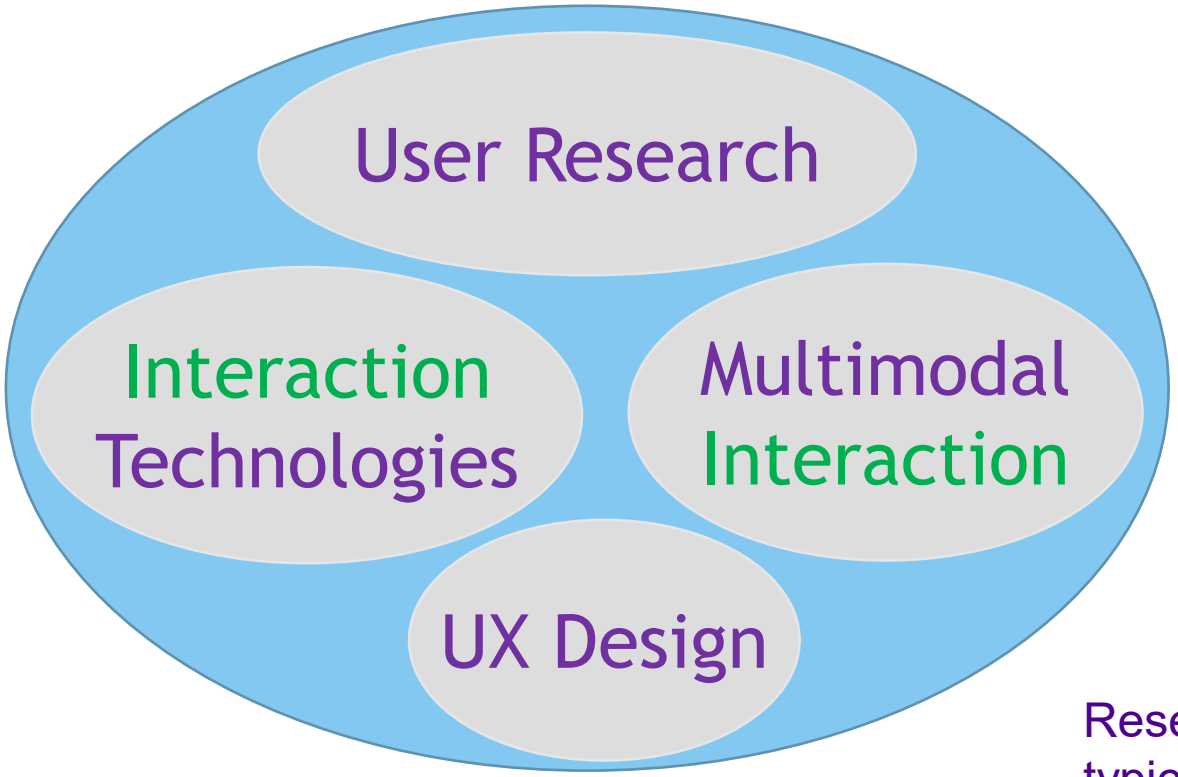
# Pervasive Interaction Research Group (PIRG)

- PIRG: a group of ~ 15 researchers, a part of:
  - TAUCHI – Tampere Unit for Computer-Human Interaction (approx. 50 researchers)
  - TACCU – Tampere Accessibility Unit (a new research and education initiative established in 2020).
- Focus on novel interaction technologies: in particular, how they can be applied for real-world usage in different domains.
- Specific research areas: interactive software solutions, user experience, multidimensional analysis of human-technology interaction, spoken, auditory and gestural interaction, multimodal interaction (combination of different interaction such as speech etc.).
- More than 200 publications on the mentioned subjects.
- Experience on more than 70 externally funded research projects over the last 20+ years.
- **Research is carried out in close collaboration with different stakeholders, including industry and public organizations (e.g., schools, museums etc.).**

# An interdisciplinary research field

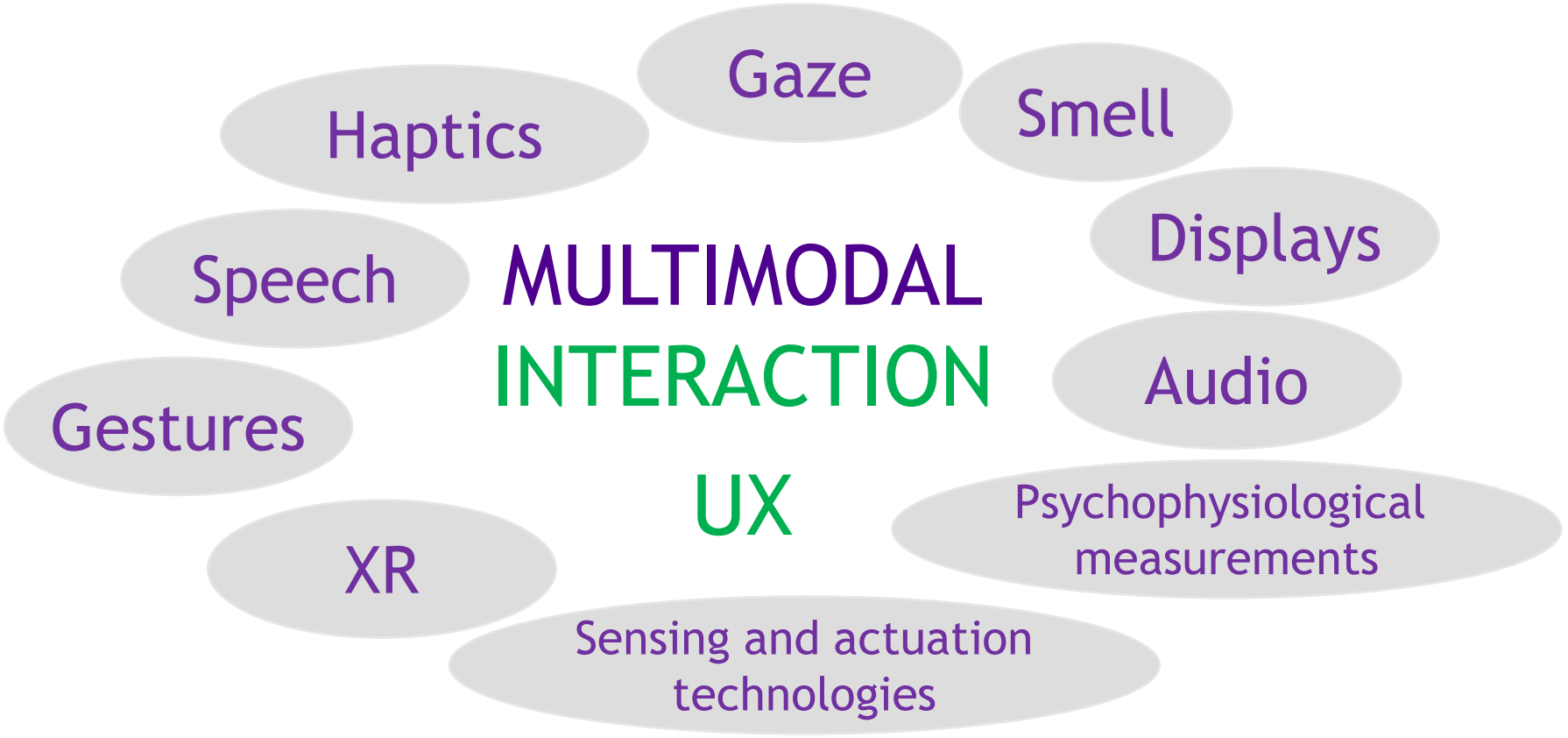


# The core expertise of TAUCHI & IHTE




Research conducted at TAUCHI typically involves a combination of experimental basic research and constructive applied research.

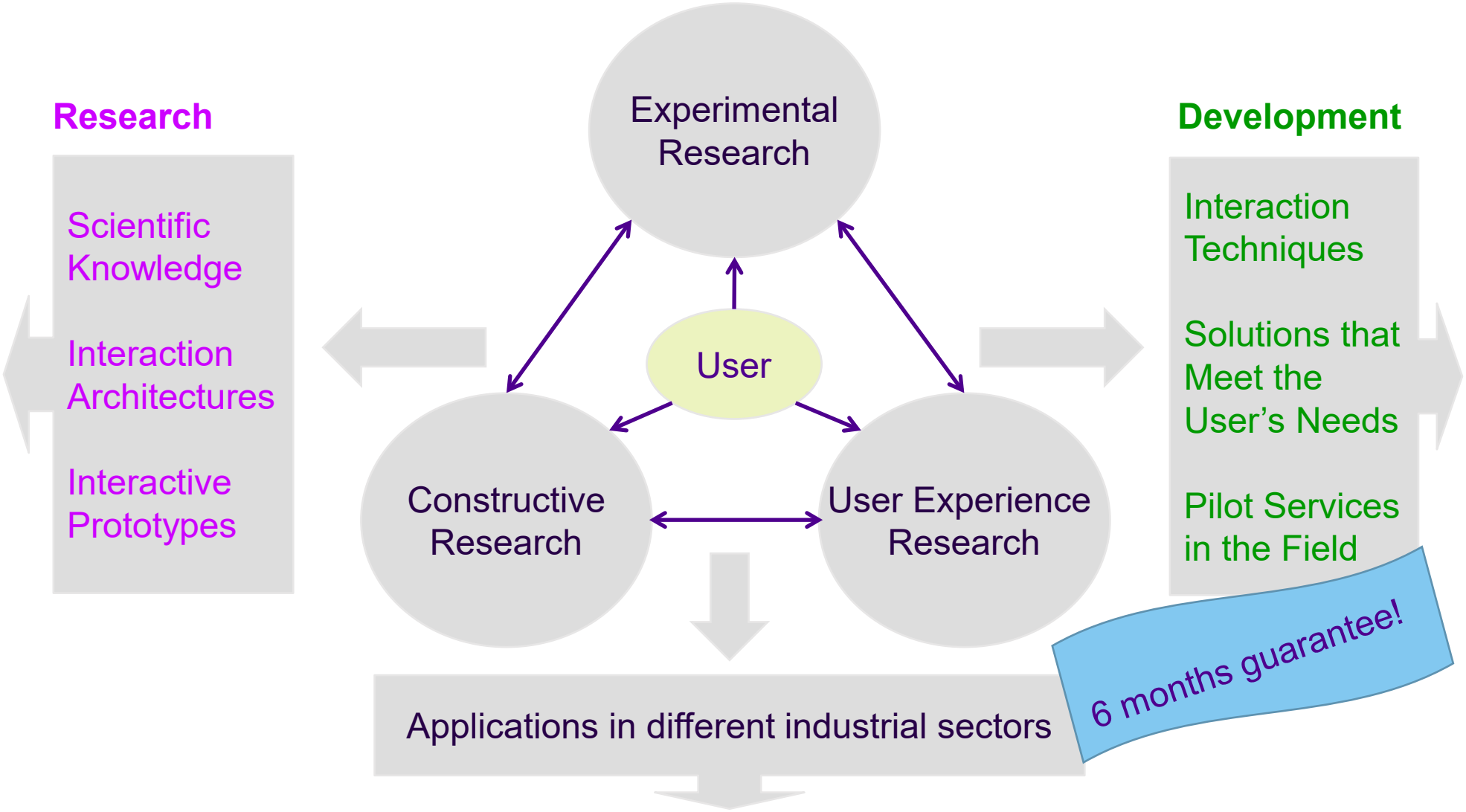
# The core expertise of TAUCHI




**Combined expertise on:**

- Human Physiology
- Human Cognition
- Human Behavior
- Emotion
- Design
- Technology development
- Multimodal software
- Controlled lab studies of interaction methods
- Applications based on user needs
- Field studies
- UX research

# Research and Development Process



# Project Example I

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# Mobile Interaction with Elevators – Improving People Flow in Complex Buildings

UNIVERSITY OF TAMPERE

KONE

# Getting Around in Complex Environments

- During 2011-12 we developed a mobile application that allows advance elevator calls and provides guidance in complex buildings

- User experience studies:
  - Mobile elevator control can shorten the feeling of waiting
  - Participants considered app a natural and innovative direction for mobile elevator control

# Research Process

1. User centered development of the first prototype by TAUCHI and KONE R&D teams
2. Initial evaluation
   - Six-story office building in Espoo: usability studies and one week pilot usage
3. Development of second prototype based on the results of the first user study
4. Long-term evaluation with improved prototype
   - Higher office building than in the initial evaluation: log-data, user feedback and interviews
5. Application development responsibility was moved to a KONE product development team
6. Research continued in EIT (H2020) projects

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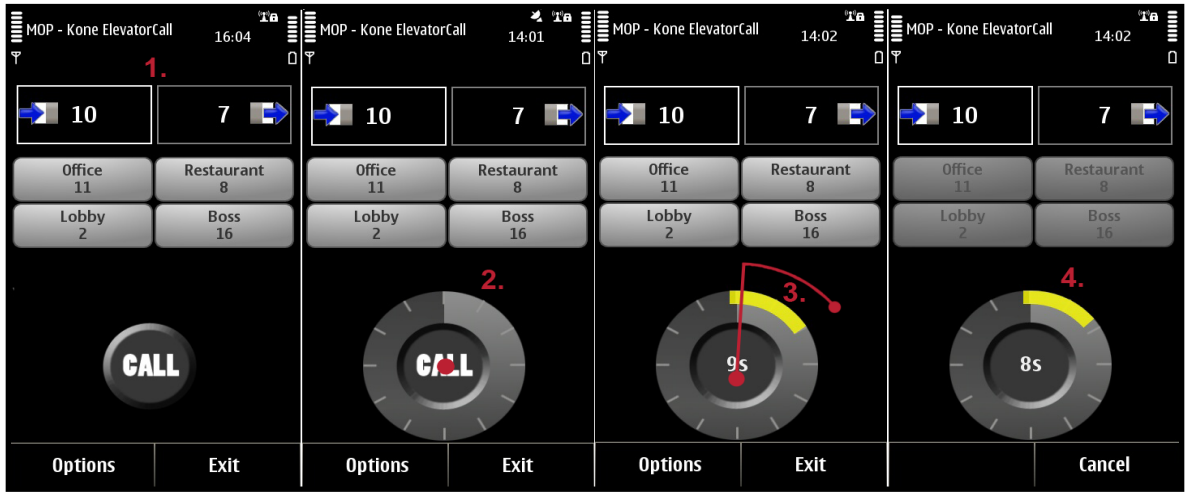
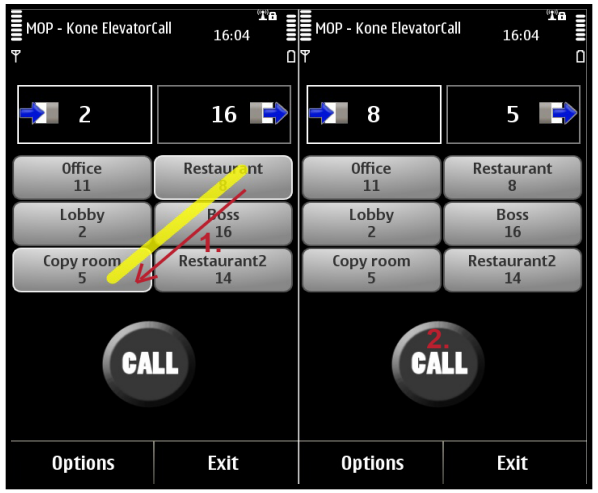
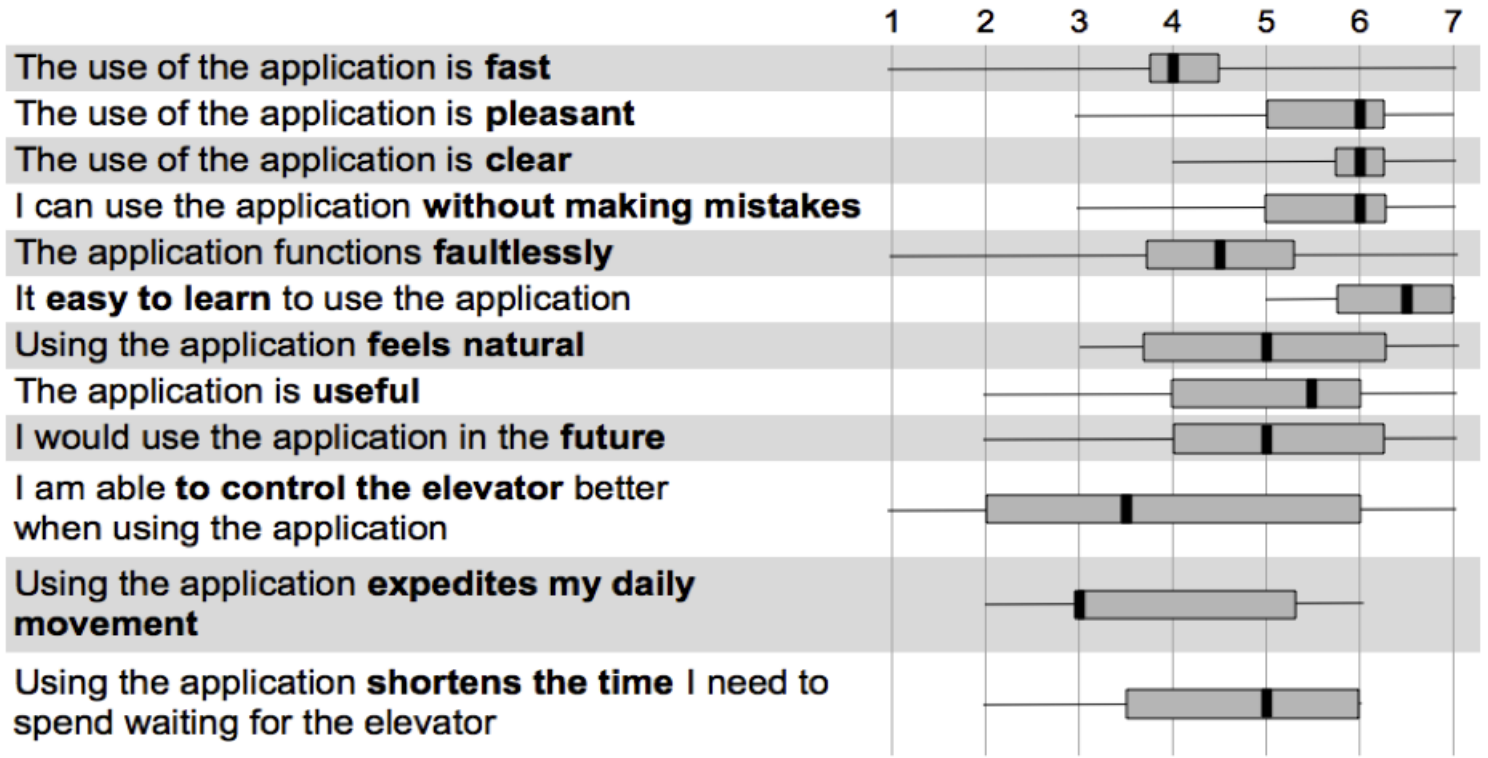
# Mobile Elevator Call Prototype




# User Studies: Example Results



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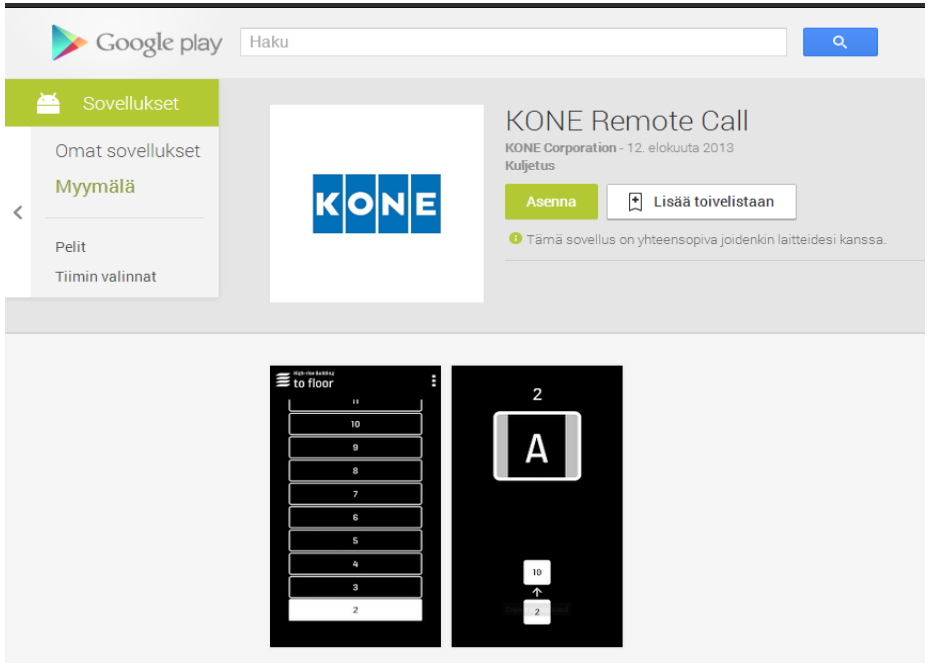
# Academic and Industrial Perspectives

## Article

Turunen, M., Kuoppala, H., Kangas, S., Hella, J., Miettinen, T., Heimonen, T., Keskinen, T:, Hakulinen, J., Raisamo, R. Mobile **Interaction with Elevators – Improving People Flow in Complex Buildings.** *In Proceedings of International Conference on Making Sense of Converging Media (AcademicMindTrek '13). New York: ACM: 43-50, 2013.* **Best Paper nominee.**

## Software




## Press release

KONE People Flow Intelligence solutions to improve the user experience as buildings get smarter

01/10/2013

**KONE Corporation, press release, October 1, 2013**


KONE, one of the global leaders in the elevator and escalator industry, today announced new innovations to make navigation through buildings ever smoother and smarter. The new KONE People Flow Intelligence suite of smart solutions is designed to guide building visitors and tenants effectively and smoothly from front entrance to desired destination, while at the same time improving building security.

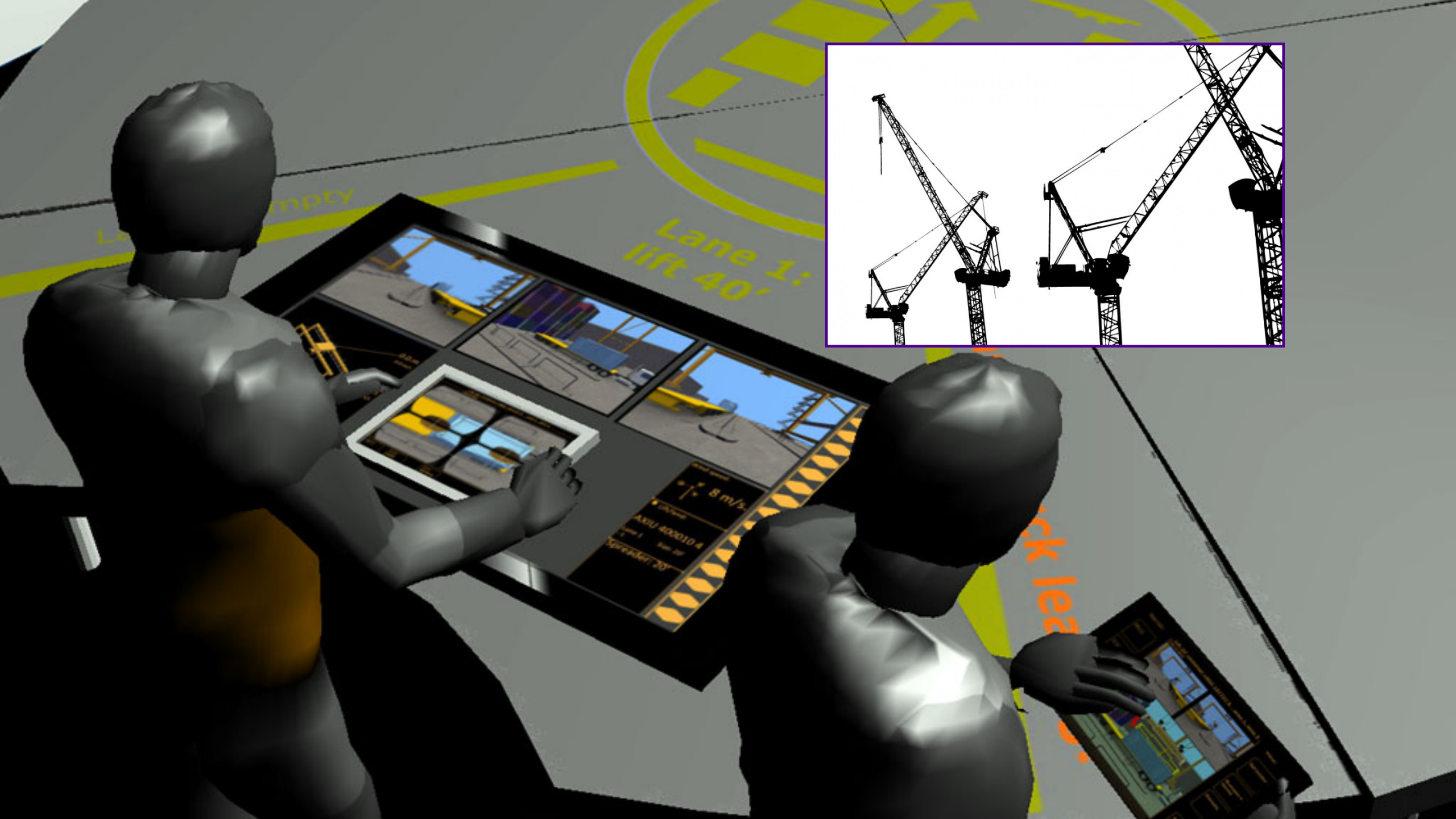
"We know that property owners and developers are under increasing pressure to ensure their tenants can move around buildings as quickly and comfortably as possible, and simultaneously provide improved security and access control. At the same time, building users expect to be able to move through various public spaces smoothly and intuitively. KONE People Flow Intelligence solutions address these demands," says Heikki Leppänen, KONE Executive Vice President, New Equipment Business.

The KONE People Flow Intelligence portfolio includes four product areas: access control, destination guidance, information communication, and equipment monitoring. The solutions are modular, flexible, and third-party compatible, meaning building owners can either take the whole integrated package or pick and choose the solutions they want and need to complement the existing systems in their buildings.

KONE's new access solutions can connect elevators seamlessly with all entry points in a building, including turnstiles and automatic doors, to provide maximum security while ensuring a smooth journey. Destination solutions take into account the number of people waiting to use the elevators and their destination floors when they assign and guide individual users to their assigned elevators. This improves elevator traffic handling capacity and performance, leading to less crowded elevators, shorter travel times and fewer stops. Traditional elevator call buttons can be replaced by touchscreens in KONE's new destination solutions. A unique destination feature is the new KONE RemoteCall(TM) mobile application, which allows users to call an elevator from anywhere in the building using their smartphone.

# Further Project Examples


CAMERA
GESTURE MATCH
INDICATION
STOP
A metal workshop, Ylöjärvi, Finland


Lane 1:
lift 40'
8 m/s

# Project Timeline

## Completed (3)

7 Projects Remaining

**MAERSK left to Stockholm**
Overall time : 1:00:30
Efficiency : 98 %

**Containers dispatched**
Unlocked : Best Maneuver
Rating : ★★★☆

Key Contributors
Laura, Timo

## Now

Home
10:40
15 Oct 2014

25 C
10 m/s

UTC
7:20
15 Oct 2014

**Unloading in progress**
Steps Completed : 3 of 5
Estimated Time Left : 0:30:22

Resources
Jaakko, Juho

Overall Progress
75 %

## Upcoming

**11:00 AM** — **Histria Agata Arrival**
Cargo Size : Panamax
Cranes Installed : Yes
Resouces required
Equipment : Jib Crane
Personnel : 2
20 C, 12 m/s

**12:00 PM** — **Team meeting**
Project : MS Amoerella
Team lead
Jaakko
18 C, 28 m/s

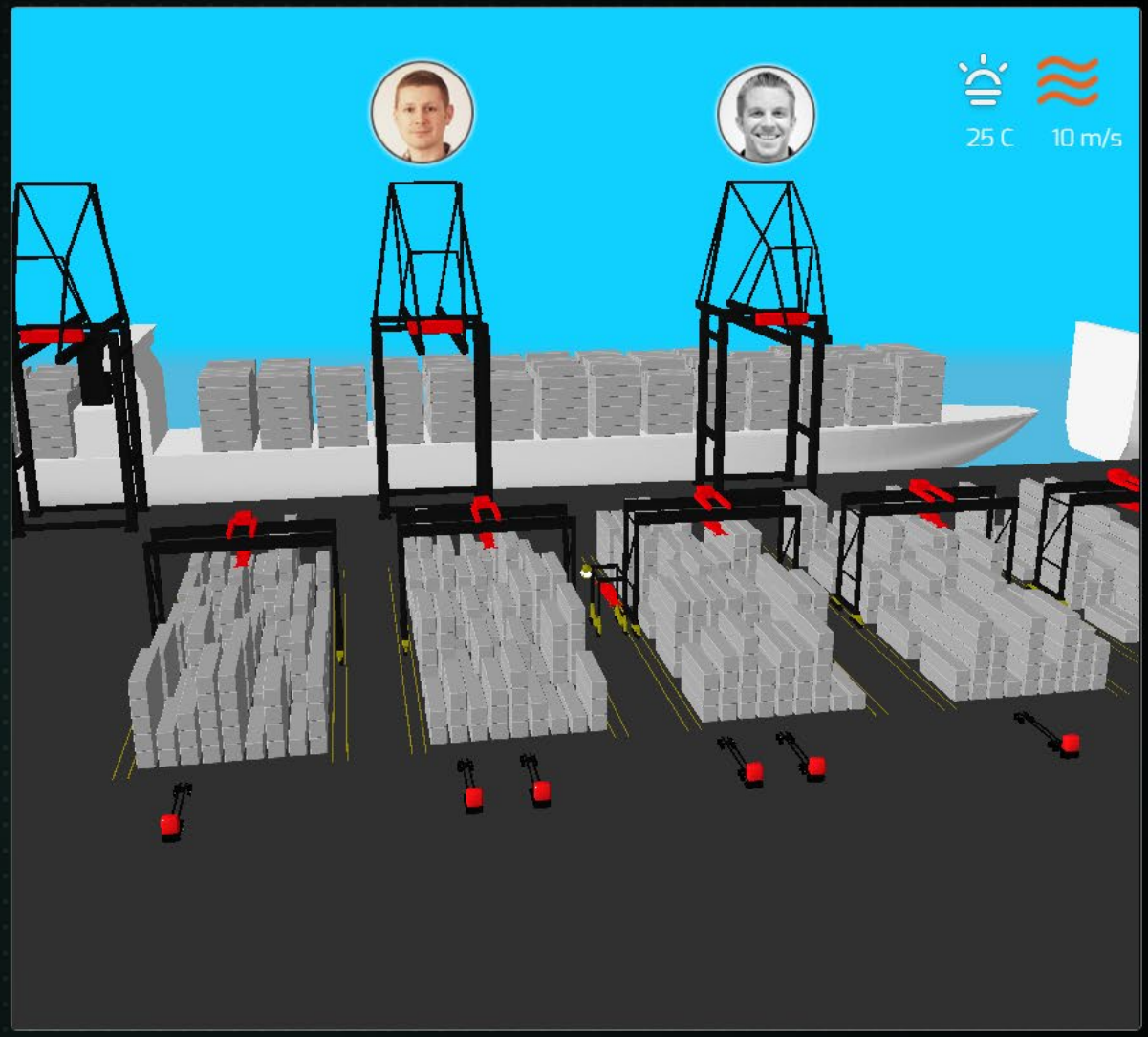
**01:00 PM** — **Shift Change**
Team Name : Munich_6
Resources
Olli, Minna
15 C, 40 m/s

**Turbulent weather**
92 % Chance effecting work

# Live Monitoring

## Port View (3 Ships)

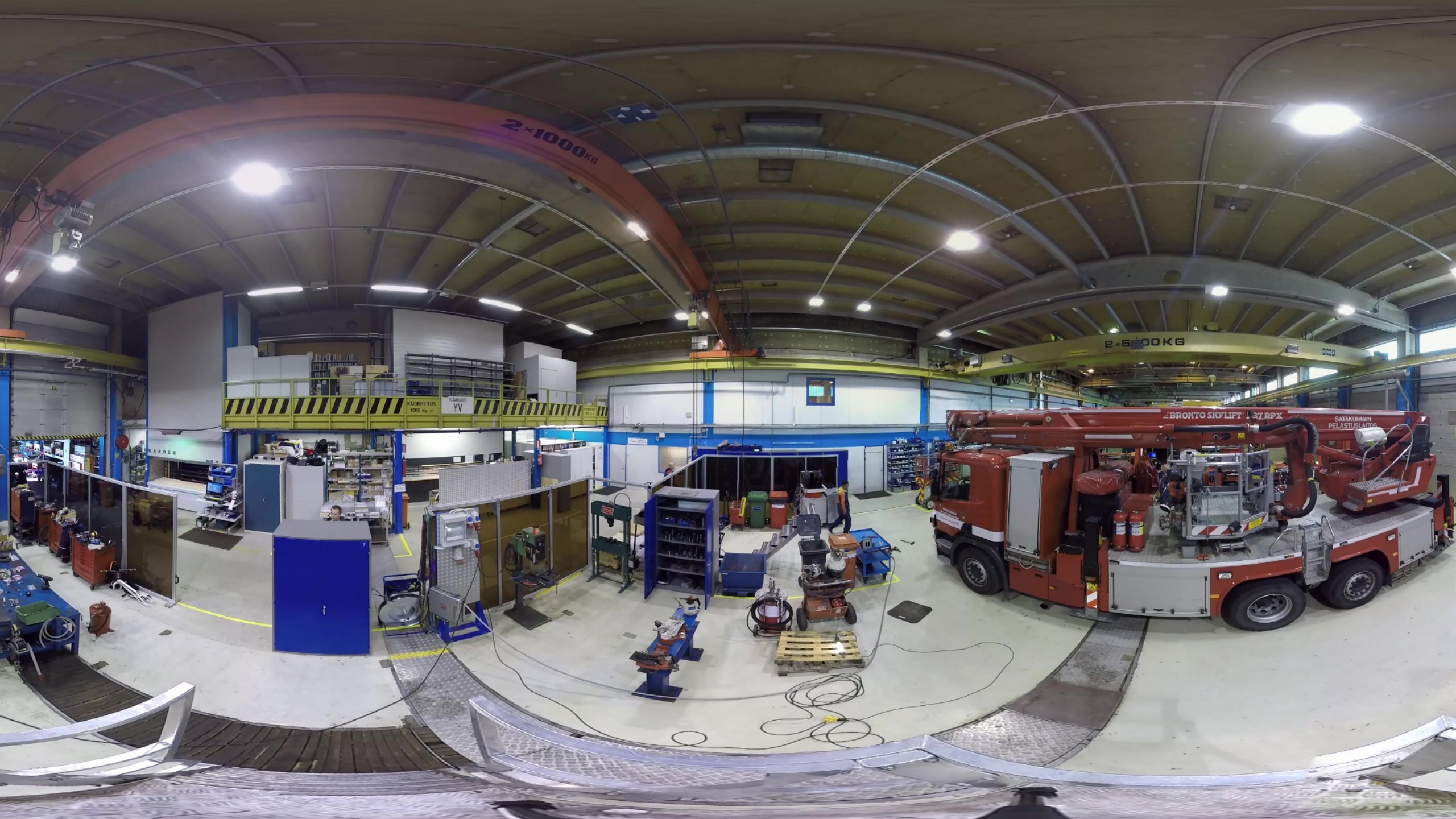
4 Projects being tracked



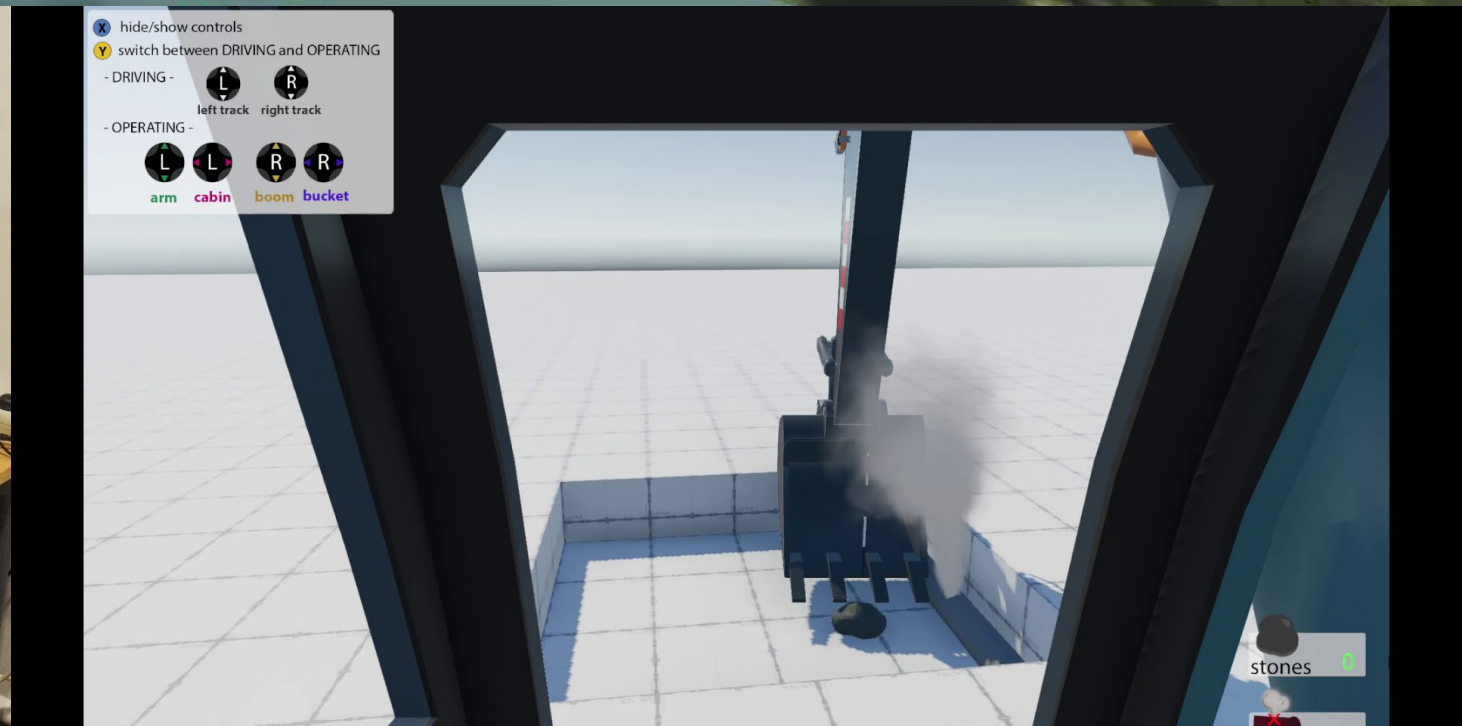

**Project 1: Unloading started**
Steps Completed : 3 of 5
Estimated Time Left : 0:30:22

Resources
Jussi, Juho

Overall Progress
75 %


2×1000KG
KUORMITUS
1000 kg
YV
BRONTO SKYLIFT
SATAKUNNAN
PELASTUSLAITOS


64 km/h
40


X hide/show controls
Y switch between DRIVING and OPERATING
- DRIVING -
L left track
R right track
- OPERATING -
L arm
L cabin
R boom
R bucket
stones 0


# Digital Twin

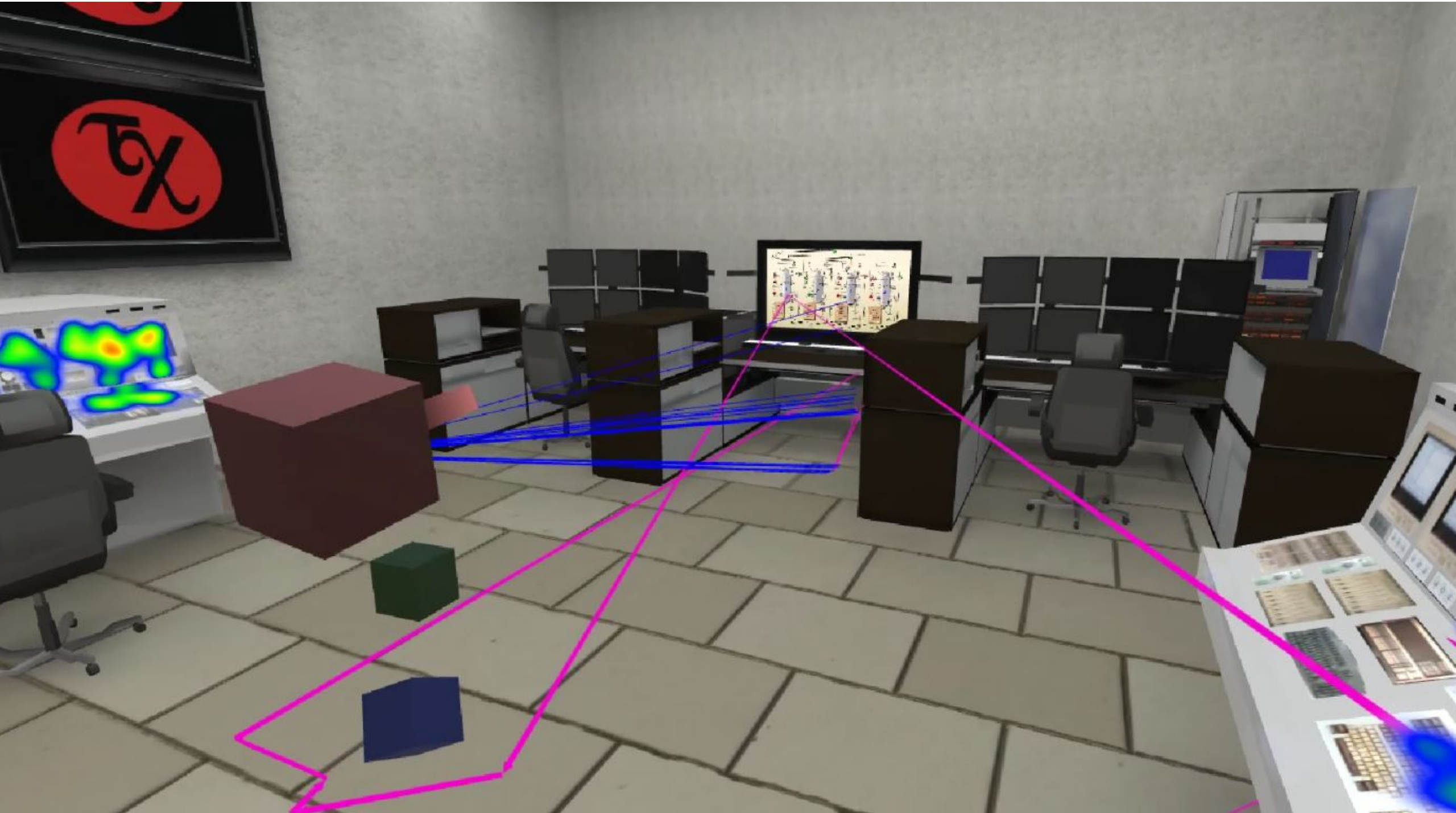
A generic Digital Twin implementation for industrial purposes.

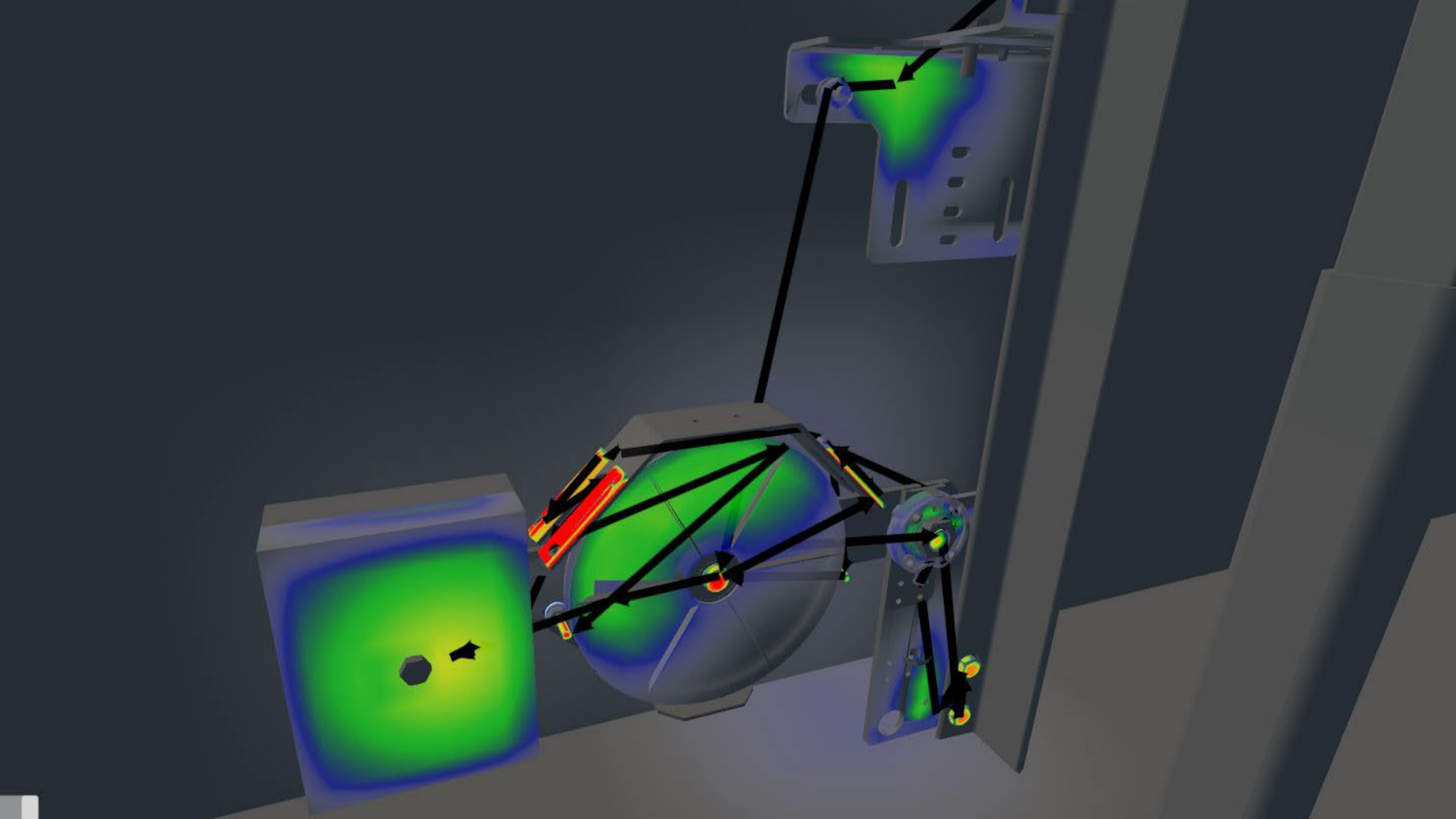
Supports navigation and browsing of design models, IoT data, 3D scans etc.

A custom version for build environments.

Optimized custom visualizations (e.g., energy loops).

Partner: Ruukki





# Project Example II

# Toward Efficient Academia-Industry Collaboration: A Case Study of Joint VR System Development


- *Alisa Burova*
- *Tuuli Keskinen*
- *Jaakko Hakulinen*
- *John Mäkelä*
- *Kimmo Ronkainen*
- *Roope Raisamo*
- *Markku Turunen*
- *Hanna Heinonen*
- *Paulina Becerril Palma*
- *Viveka Opas*
- *Sanni Siltanen*

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Tampere University

KONE

# Motivation & RQ

Our motivation for this article is to **promote academia-industry collaboration**, share our practices of long-term collaboration history and demonstrate the benefits of such collaboration

- *RQ1: What are suitable methods and processes to enhance remote academia-industry collaboration?*
- *RQ2: What are the benefits of a joint academia-industry development process in the case of a VR system?*

https://blog.vantagecircle.com/foster-collaboration-in-the-workplace/

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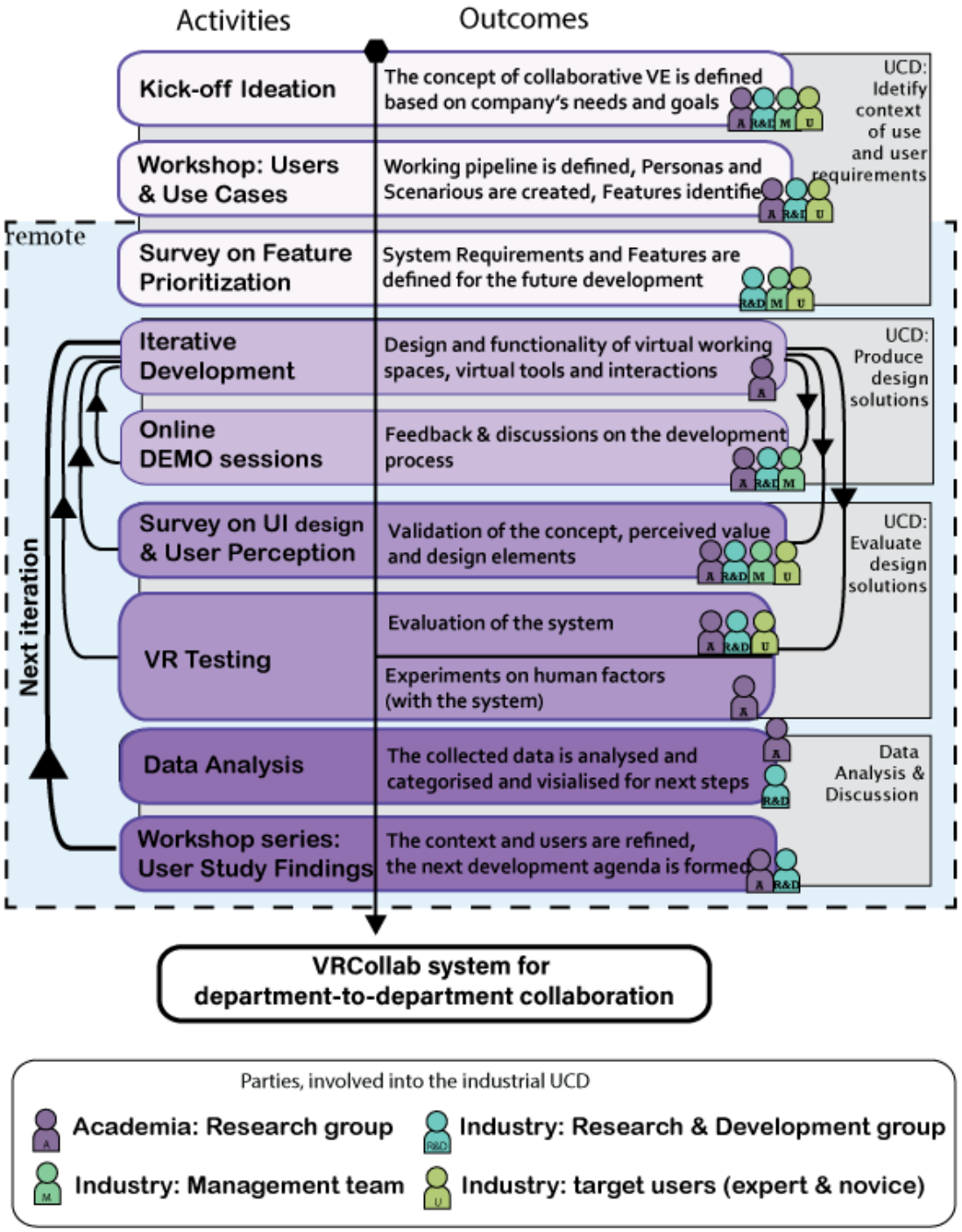
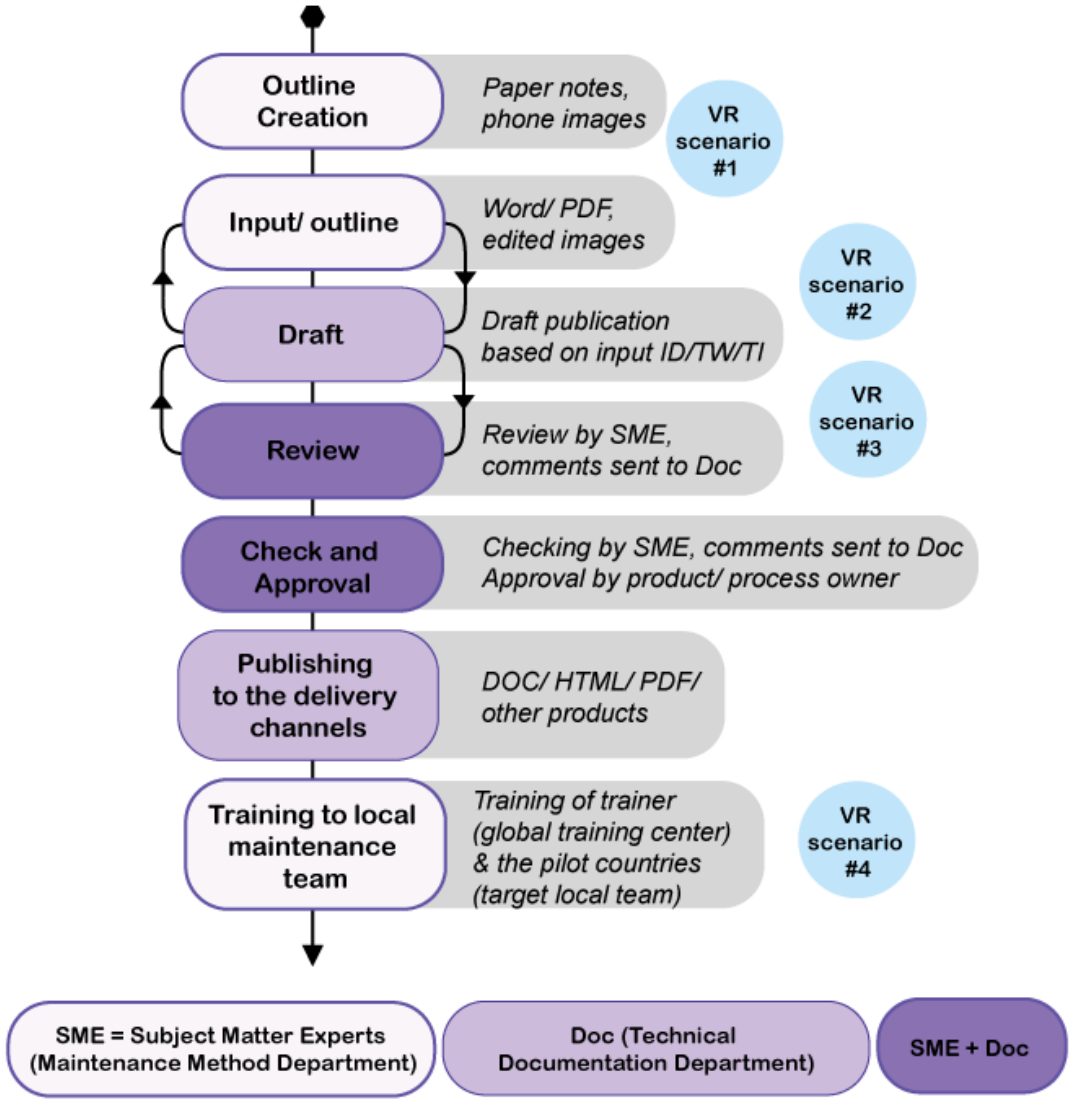
# A process-oriented framework for *remote* academia-industry collaboration

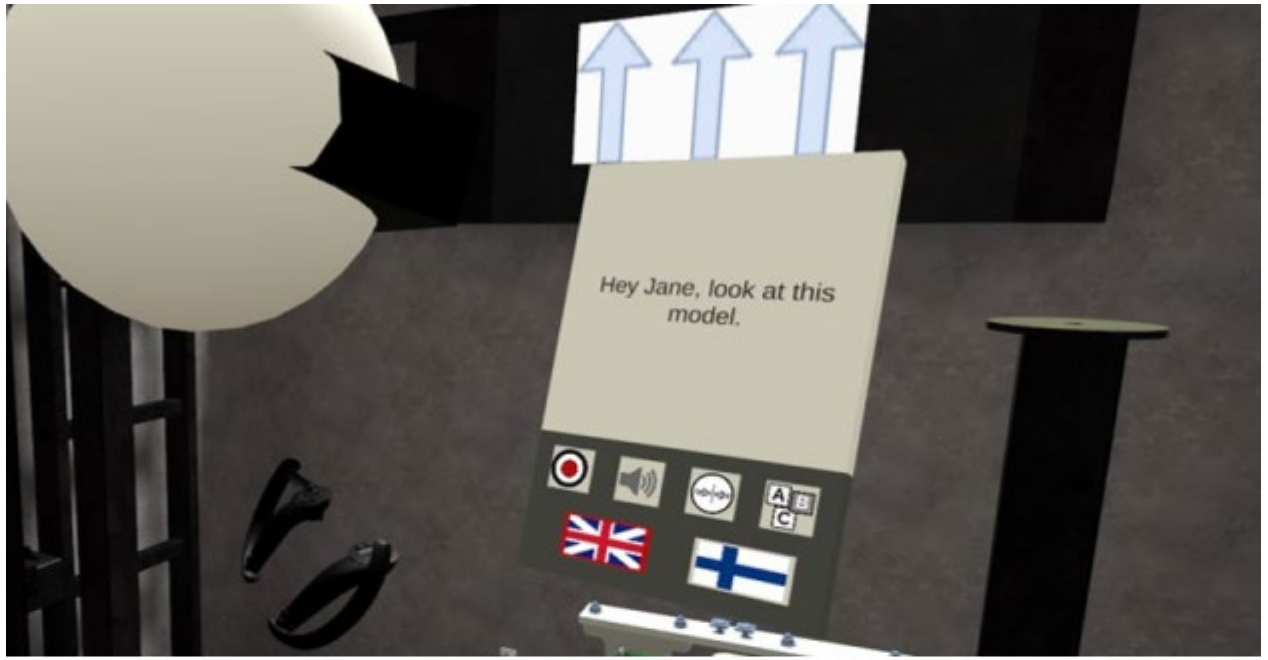


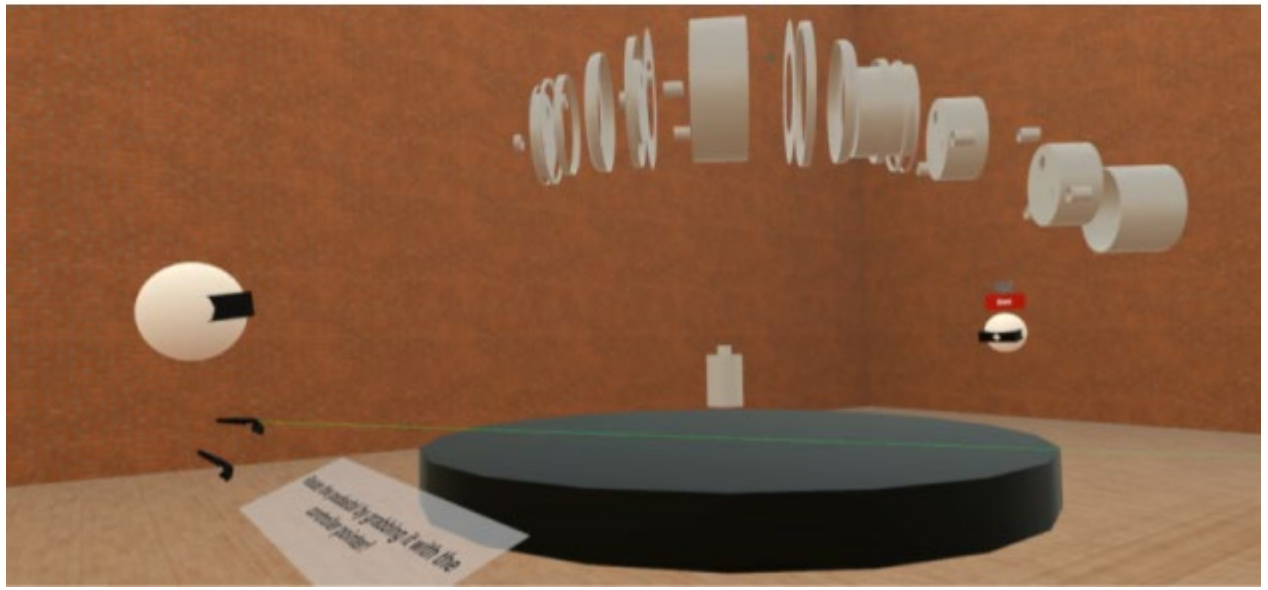
# Maintenance documentation journey & VR Scenarios



# COVE-VR: VR system to enable virtual collaboration of departments

- 2 virtual environments
- 7 virtual tools



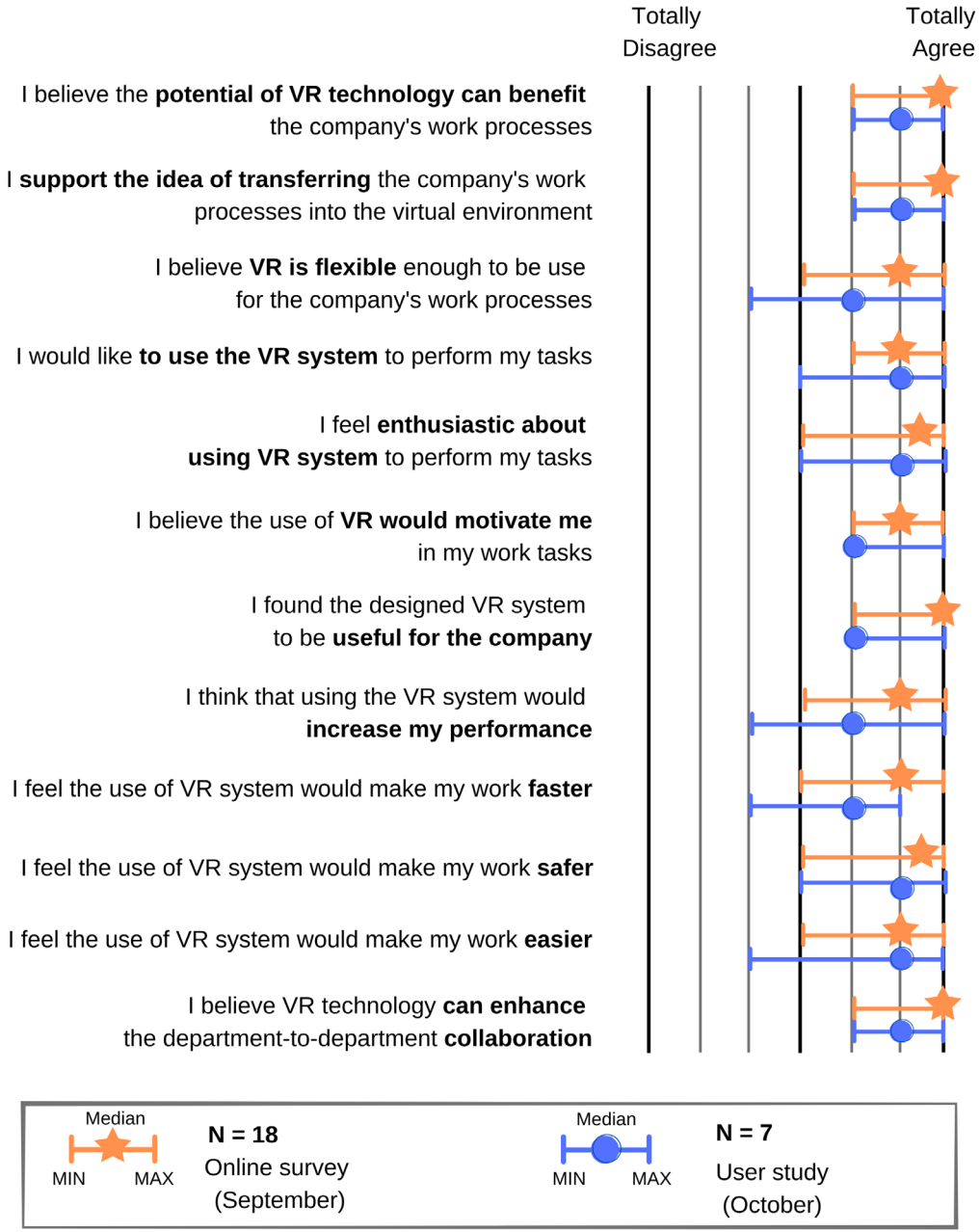
# User study iterations

Survey with **18** participants -

- created to rapidly gather feedback on the system functionality and collect subjective opinions on the *perceived value of the system*, *virtual spaces* and *virtual tools* from target users and KONE managers
- aged from 26 to 62 (with average = 36,5)
- six were from *Finland*, four from *China*, four from India and the rest were from *Australia, Netherlands, Germany* and *Malaysia*.
- User study with **7** experts
- aged from 27 to 57 (M = 40); 4 method developers & 3 documentation designers, 6 from Finland and one from USA
- The study investigated subjective perceptions of the system and its usefulness in accordance with the industrial tasks

# Perception of the system

- The concept of *COVE VR* system was found to be **safe** and **convenient** approach to ease up the remote communication and collaboration of departments
- The system evaluation demonstrates that the system design addressed the employees' needs and is sufficient to support the work tasks of both maintenance methods developers and documentation experts.



# Benefits of collaboration

From academia's **perspective:**

- increases the relevance of research and opens new research directions

- grants the opportunity to gain a clear understanding of the gaps and challenges in the industrial context

- access to actual target users for data collection and user studies → retrieval of realistic and relevant data for the analysis

**From industry's perspective:**

-knowledge expertise and additional resources available for experimental studies

-better understanding of companies' own user needs and requirements

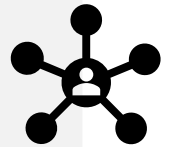
-possibilities of doing research and experiments in companies

-allows the industry to publish and share their knowledge with others

Burova, A., Heinonen, H., Becerril Palma P., Keskinen, T., Hakulinen, J., Opas, V., Mäkelä, J., Ronkainen, K., Siltanen, S., Raisamo, R., Turunen, M. Toward Efficient Academia-Industry Collaboration: A Case Study of Joint VR System Development - Mindtrek '21, June 1–3, 2021, Tampere/Virtual, Finland.

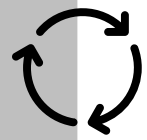
# Practical Suggestions for Academia-Industry Collaboration

***Define roles, procedures, and industrial focus groups.***



***Establish trust and shared understanding.***

***Remote participation and iterative feedback.***



# Summary & Lessons Learned

- Co-development needed: advisory boards etc. are also needed, but best results are always achieved when there is some serious work carried out by both researchers and company employees.
- Traditional user-centered design is not enough. We had to understand not only the end users, but also processes etc. together with all stakeholders.
- When we are looking for future solutions, we need to shoot in the dark => best results as well, even higher risks.
- Short term “ideation” projects are promising, but most often the wheel is invented once again.
- Academic research projects: generic solutions which can be *applied* to different needs of industrial stakeholders.
- Fixed project plans vs. collaborative exploration of different possibilities.
- Transfer of results between domains: e.g., build-environments vs.
- Here the focus has been on industrial projects: projects with e.g. cultural organizations have some other things to consider.
- Joint publications!