Participation design of the final product or production by exploiting multi-site and -user virtual environments

INRS 2017

Kaj Helin, Jaakko Karjalainen

VTT Technical Research Centre of Finland Ltd

Content of the presentation

- Overview of VTT
- VTT's Virtual/Mixed/Augmented Reality laboratory

- Background
- Objective
- Developed proof-of-concept
- Design Methods
- Use cases
- Results
- Conclusion

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We develop new smart technologies, profitable solutions and innovative services. We cooperate with our customers to produce technology for business and build success and well-being for the benefit of society.

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36%

OF FINNISH INNOVATIONS include VTT expertise. (*

- Turnover 277 M€ (VTT Group 2014), personnel 2,600 (VTT Group 1.1.2015)
- Unique research and testing infrastructure
- Wide national and international cooperation network

*) Source: Roles, effectiveness, and impact of VTT, VTT & Technopolis Group, 2013.

25 years history of **VR** and **10 years** of **AR**
More than **100 cases** with end-users

| First digital human model in CAD-system | | The first VR environment in projects e.g. Tele-safe, ELINA | | Several industrial cases, e.g. Rauta-ruukki | | The first kinetics DHM (SIMTU, TÄRSKY) | | The design simulator for cabins (HumanICT) | | Augmented assembly (AugAsse) | | System engineering in PLM (SE-PLM) | | VR/MR/AR continuum (TellMe, UIW) |
| | The first kinematics DHM e.g. Workplace design | | 1st vehicular machine simulator (VIRSU, TERMA) | | VR in manual task design (VIRVA, EU-VIRTUE) | | Easy-to-use DHMs (Osku, Kone-Masina) | | Maintenance work design and training in VR (VIRVO) | | Manual work System lifecycle & VR&AR (ManuVAR) | | VR & MR to increase human comfort (VRHyperSpace) | | ESA – AR for AIT, AIV and Orbit Operations |

| 1980 | 1991 | 1994 | 1996 | 1998 | 2000 | 2003 | 2004 | 2006 | 2007 | 2009 | 2010 | 2012 | 2014 | 2015 |

What we are doing?

Developing customers Human-Machine Systems and Augmented Human by utilising Virtual/Mixed/Augmented Environments

HTI

VR/MR/AR

PLM
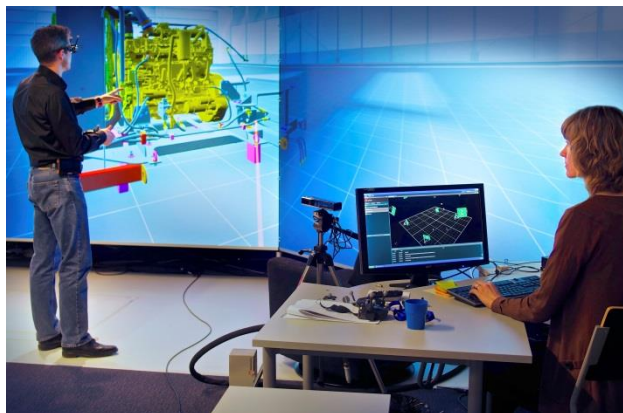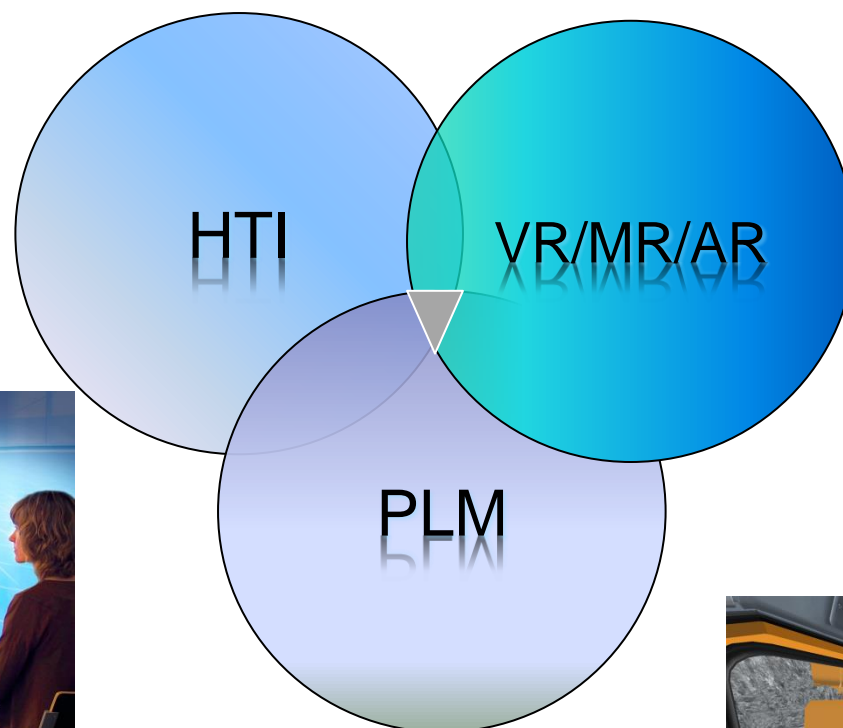
Virtual/Mixed/Augmented Reality laboratory

Powerwall: **3 x Barco RLM-W12** active stereo projectors
(+floor if needed)

VR / Visualization: **U**

Tracking / Motion Ca
(**Vicon Pegasus =>**

AR / Head Mounted I
Epson Moverio BT-

Controls: **several ga**
of machine e.g. cran

Motion Platform: **MeV**

5.1 surround sound

Visualization with sev

Current Research Projects

- ESA - Augmented Reality for AIT, AIV and Orbit Operations (*Coordinator*)
- EU - Use-It-Wisely - Innovative continuous upgrades of high investment product-services (IP-*Coordinator)*
- EU-WEKIT - Wearable Experience for Knowledge Intensive Training
- Fimecc - MANU – LeanMes - Digitalize your factory floor
- VR-cameras – Augmented cameras for vehicles control
- Rolls Royce - From future concept of information visualization on tug boat
- Kemppi – Future user interface for welding

References

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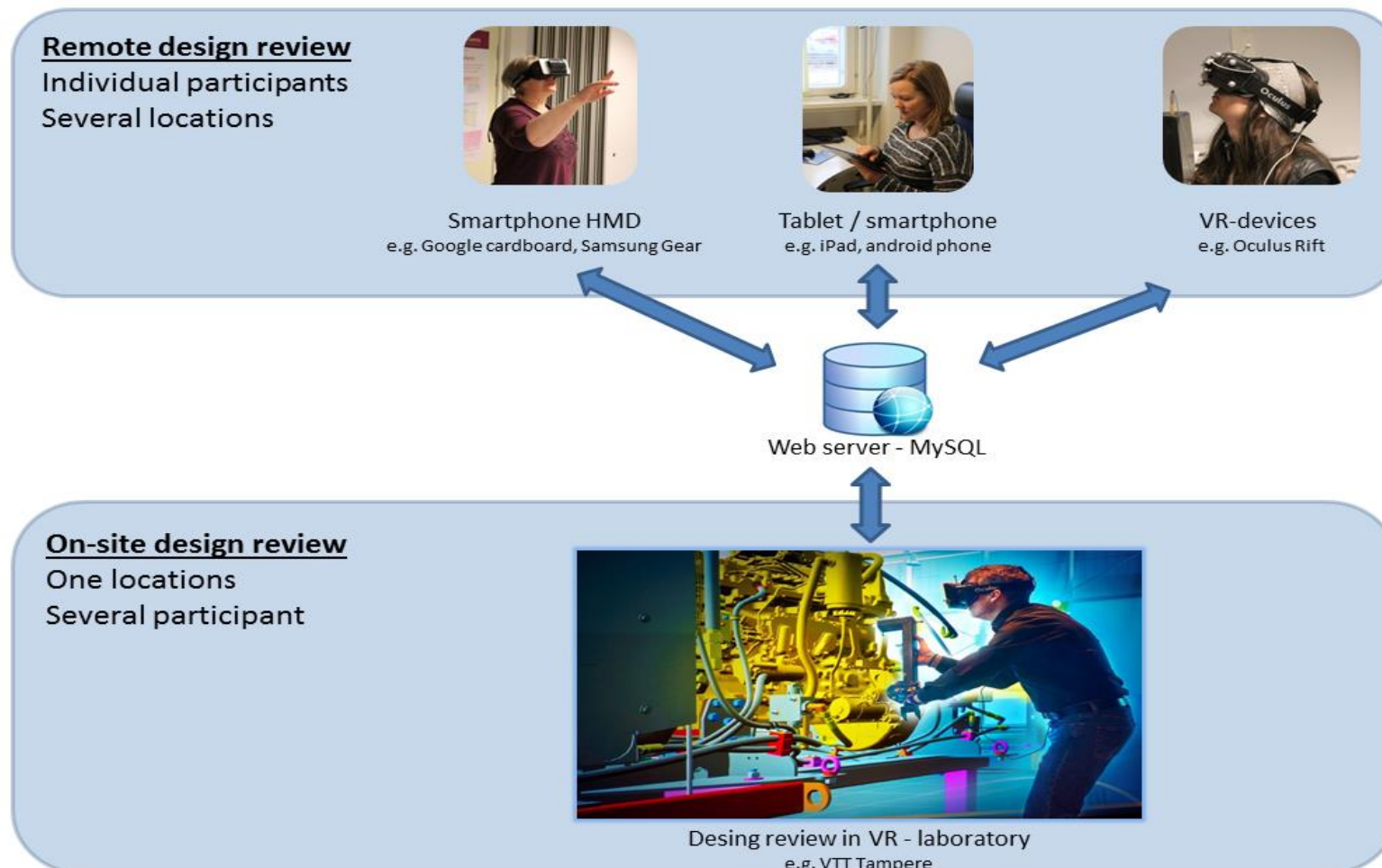- Design Methods
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Background

- Designers' don't often have the real experience how the final product is really used to achieve work task's goals

- High investment product producers are using VR for product review, but most of the stake holders, specially customers are around the world.

- Also personal smartphones, tablet and even VR system are getting common in customer market

Objective

- Develop proof-of-concept of Multi-site and –user VE

- Improve stakeholders' experience of final product

- Test/evaluate design methods with Multi-site and –user VE

- Collect feedback from end-user companies

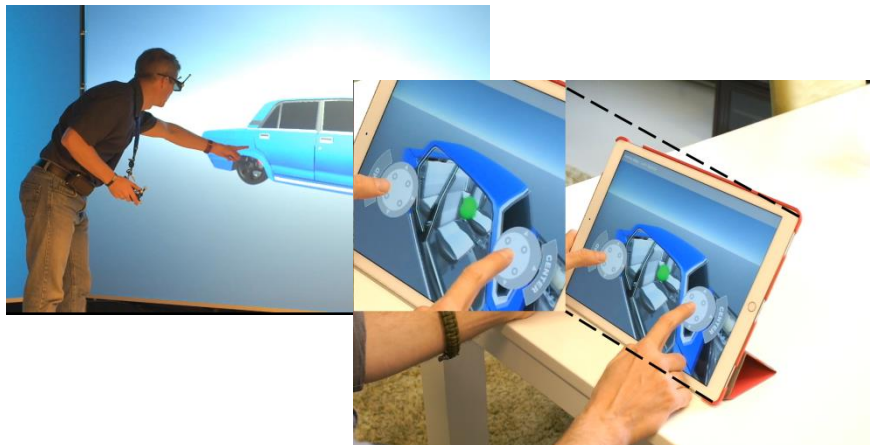# Proof-of-concept of Multi-site and –user VE

Remote design review
Individual participants
Several locations

Smartphone HMD
e.g. Google cardboard, Samsung Gear

Tablet / smartphone
e.g. iPad, android phone

VR-devices
e.g. Oculus Rift

Web server - MySQL

On-site design review
One locations
Several participant

Desing review in VR - laboratory
e.g. VTT Tampere

Expolited Design methods

- **Human Centered Design (HCD) approach**

- **Participatory Design**
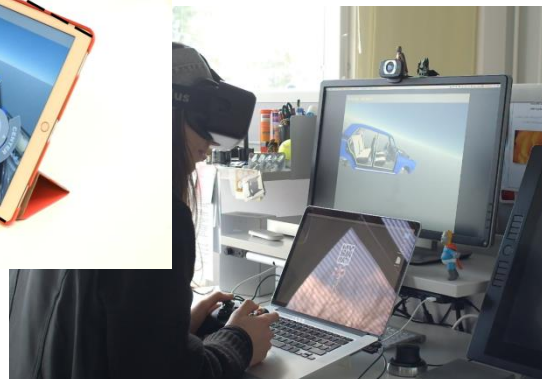
- **Focus group**

Use case

Car maintenance – Public

- Used set-up
    - Power wall with active stereo and tracking
    - HMD with tracking
    - Tablet and smart phone

Forest tractor assembly sequence design – Confidential

- Used set-up
    - Power wall with active stereo and tracking
    - HMD with tracking
    - Tablet

VIDEO

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Results

- System was demonstrated to six companies in field of machine- and shipbuilding, space and military
- More than 50 persons were participating to design review or demonstration
- Multi-site and –user VE is good environment for keeping the focus group meetings by exploiting participatory design
  - but having discussions is sometimes hard via Skype
- Import to have end-user (assembly worker, driver, …) to perform the task better and proper way

Conclutions

- VE technology maturity is already in good level for the design purposes and it is already daily base use in companies. The Multi-site and –user VE still need to improve to have better communication between stakeholder' even its already improves communication in significantly

- For better immersion and interaction in Multi-site and –user VE the sound feedback from system should be more realistic for the better experience

- It is also important to remember that the use of HCD and Multi-site and –user VE in design process is iterative process and it means that sometimes many focus group meetings are required.

- Although some improvement are needed, case studies results support the use of Multi-site and –user VE for improving stakeholders' ability to experience the real use better already in early design phase especially
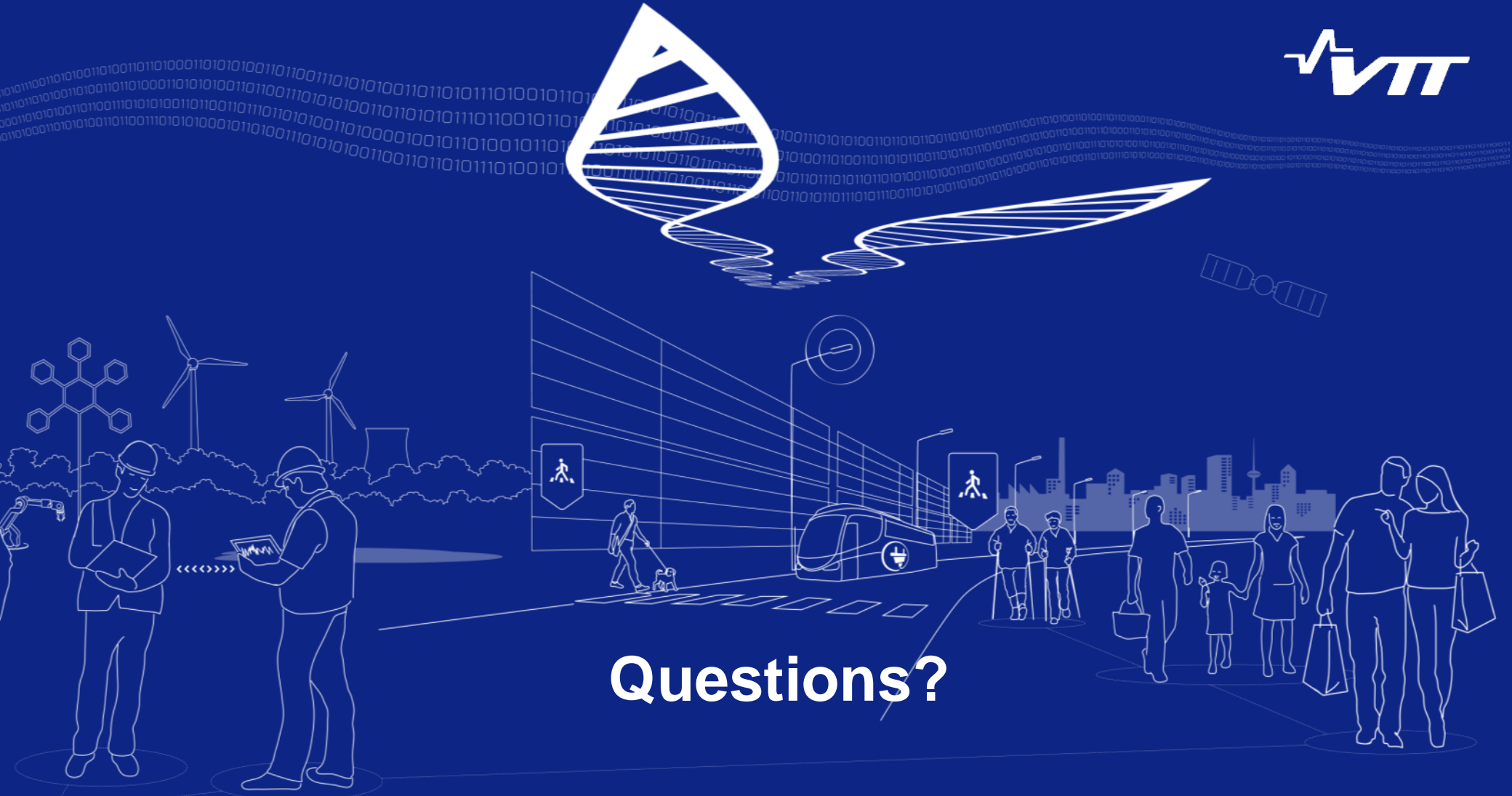
Questions?

Kaj Helin
Kaj.helin@vtt.fi
Principal Scientist, Certified Project Manager IPMA
Human factors, Virtual and Augmented reality
VTT Technical Research Centre of Finland Ltd