Workshop Closing The Energy Performance Gap

INSITER OBJECTIVES AND RESEARCH VISION

Ton Damen | Project Coordinator
DEMO Consultants | NL

SUSTAINABLE PLACES 2015

INSITER INTUITIVE SELF-INSPECTION TECHNIQUES

ABOUT INSITER

- **INSITER**
  - Intuitive Self-Inspection Techniques
  - using Augmented Reality
  - for construction, refurbishment and maintenance
  - of energy-efficient buildings
  - made of prefabricated components

- **INSITER**
  - Site : applications at real building sites
  - Insight : knowledge, techniques, and skills
  - Insider : directly involved construction workers

RATIONALE OF INSITER

- **On-site** Real building sites

RATIONALE OF INSITER

- **Insight** Knowledge and skills to decide actions on the building site

RATIONALE OF INSITER

- **Insider** Directly involved construction workers

PROJECT UPTAKE

Main principle: “from practice to research, and back to practice”

CONSORTIUM

INSITER INTUITIVE SELF-INSPECTION TECHNIQUES

PARTNERS REPRESENT THE TOTAL VALUE-CHAIN

- **Design, engineering, energy**
  - *IPOSTUDIO, 3L, AICE, DWA*
- **Construction, refurbishment, maintenance**
  - *DRAGADOS, HOCHTIEF, DEMO*
- **Measurement hardware equipment and software tools**
  - *SIEMENS, UNIVPM, CARTIF, FRAUNHOFER IPA*
- **BIM software development and implementation**
  - *RDF, HOCHTIEF, DEMO*
- **Standardization, training and dissemination**
  - *ISSO, SBRCURNET, UNIVPM, CARTIF*

AIMS AND CONTEXT

INSITER INTUITIVE SELF-INSPECTION TECHNIQUES

AIMS OF INSITER

- To eliminate the gaps in quality and energy performance between design and realisation
- To develop a set of intuitive, robust and cost-effective instruments for self-instruction and self-inspection by workers and other stakeholders
- To develop a methodology that consists of protocols and guidelines for self-instruction and self-inspection

CONTEXT OF INSITER

- **What?** New as well as refurbished buildings
- **When?** During construction/refurbishment,
  during delivery/commissioning,
  during occupancy/maintenance
- **Where?** At the construction site as well as in the building
- **Who?** Construction workers, construction managers,
  site supervisors, building engineers, building occupants
- **How?** Applied research, lab testing, field demonstration, training

EXPECTED RESULTS

INSITER INTUITIVE SELF-INSPECTION TECHNIQUES

EXPECTED RESULTS

1. Methods	Guidelines and use cases of self-inspection and self-instruction
2. Hardware optimization	Protocols for improvements of portability, user-friendliness, cost-effectiveness
3. Software	3D interfaces with BIM and Augmented Reality, self-monitoring dashboard
4. Trainings	Professional courses with interactive demonstrations

METHODS FOR SELF-INSPECTION AND SELF-INSTRUCTION

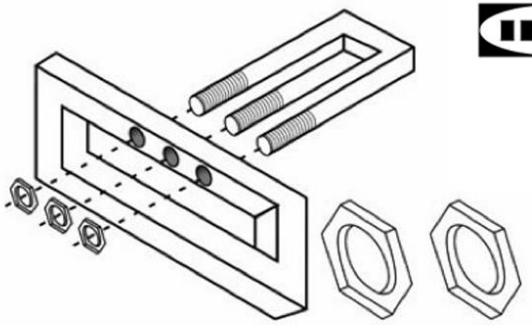
Targeted results (1)

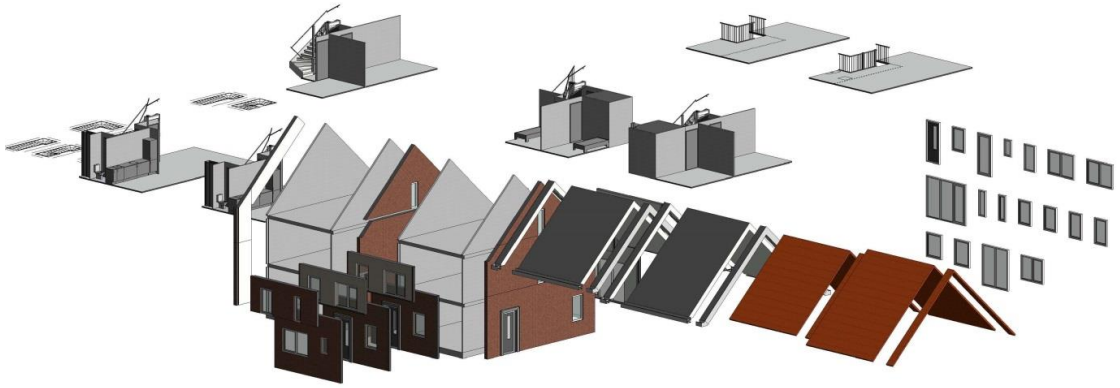
- **Guidelines of BIM-based self-inspection**
  - For workers and other construction actors: to monitor, evaluate and improve own work
  - For end-customers and other stakeholders: to check the delivered building against client requirements

METHODS FOR SELF-INSPECTION AND SELF-INSTRUCTION

Targeted real results (2)

- **Guidelines of BIM-based self-instruction**
  - For workers and other construction actors: as interactive guidance for the working process
  - For end-customers and other stakeholders: to configure and operate the building and utility systems





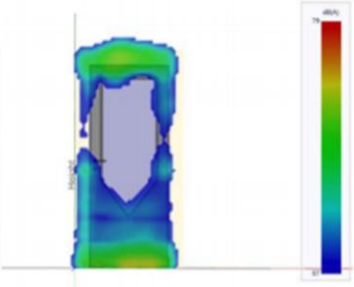
PROTOCOLS FOR HARDWARE OPTIMIZATION

Targeted real results

- **A toolset of most relevant instruments, including user guidelines**
  - Selection of measurement/diagnostic instruments
  - User manuals for self-inspection by specialists and non-specialists
  - Holistic analysis of cost-effectiveness: a relative high cost of instruments should be measured against added-value and cost-saving by prevention or reduction of ‘failure cost’ (cost for ad hoc rework) and ‘performance loss



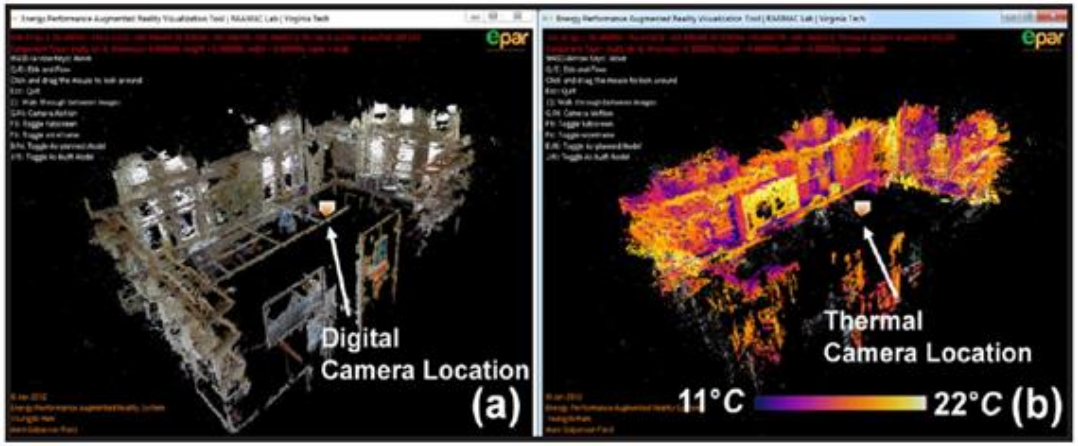




PROTOCOLS FOR HARDWARE OPTIMIZATION

Targeted real results

- **Protocols to improve the use and output quality of the selected hardware instruments**
  - Integration of thermal/acoustic output with 3D scanner images to produce 3D spatial-thermal-acoustic models of buildings and environment
  - Improved quality and interoperability of the obtained data



SOFTWARE AND INTERFACES FOR BIM, AR, DASHBOARD

Targeted real results

- **Mobile Apps for BIM-based Augmented Reality (AR)**
  - Self-inspection by real-time clash detection between design models and realized work (as-built models)
  - Operation through mobile devices connected with outdoor and indoor positioning
  - Combining building models and workflow (process, scheduling, cost planning)

SOFTWARE AND INTERFACES FOR BIM, AR, DASHBOARD

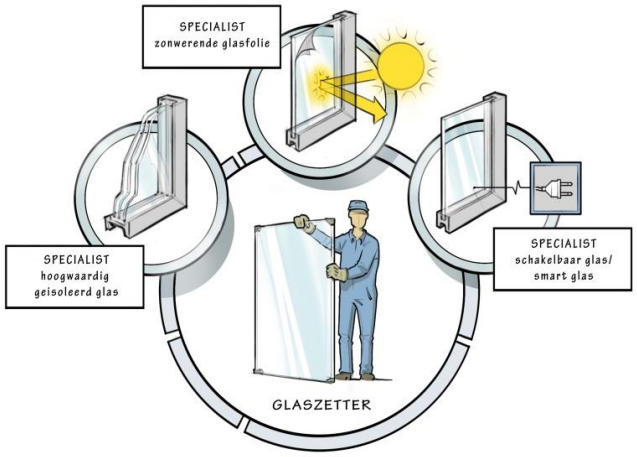
Targeted real results

- **Interfaces between measurement data, condition assessment, energy monitoring, BIM and decision-support dashboard**
  - Evaluation against Key Performance Indicators (KPI)
  - Export – import of data from INSITER software to As-Built BIM

PROFESSIONAL TRAINING WITH INTERACTIVE DEMONSTRATIONS

Targeted real results

- **Training modules and course materials, including use cases**
  - Pilot training courses in NL, IT, DE, ES in synergy with Build-Up Skills
  - Double-loop learning: action learning through errors
  - Progressive learning: starting by using simple tools until operating mobile BIM AR



By the end of the project, we will be able to…

INSITER INTUITIVE SELF-INSPECTION TECHNIQUES

BY THE END OF THE PROJECT, WE WILL BE ABLE TO…

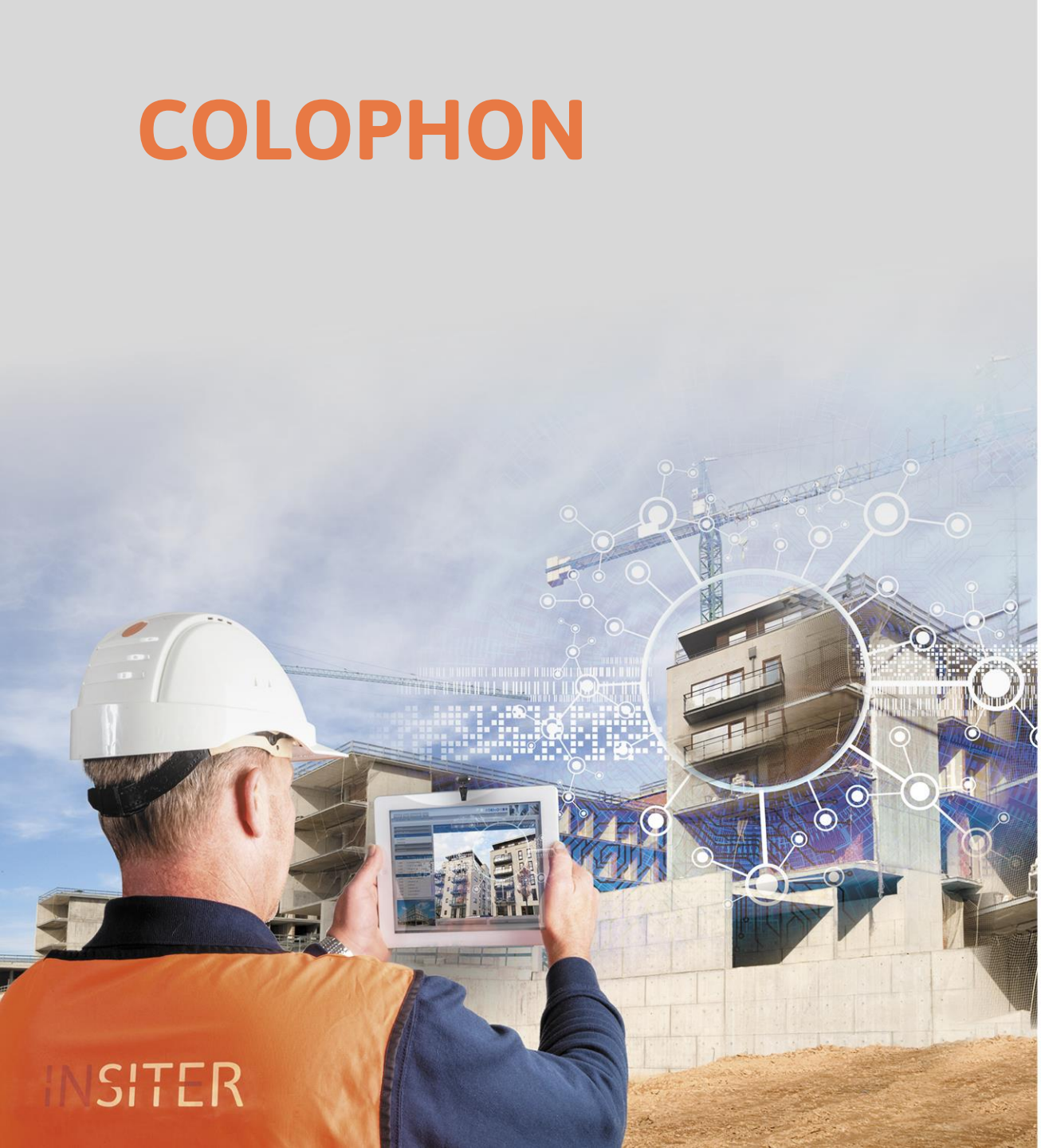
- Verify the estimated energy performance based on the design ***prior to*** construction / refurbishment / maintenance / commissioning
- Anticipate, prevent and resolve performance and quality gaps ***during*** construction / refurbishment / maintenance / commissioning
- Provide construction workers, supervisors, clients and end-users with ***practical method and training*** to perform self-instruction & self-inspection
- Utilize and exploit a set of intuitive, robust and cost-effective measurement ***instruments with BIM & AR*** to perform self-instruction & self-inspection

MORE ABOUT INSITER

- **www.insiter-project.eu**

- **Paper: Intuitive Self-Inspection Techniques based on BIM for Energy-efficient Buildings; EU Horizon 2020 Research Project INSITER**

COLOPHON



10 March 2017

INSITER PRESENTATION

AUTHOR: Ton DameN

VERSION: 2.0

THIS RESEARCH PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S H2020 FRAMEWORK PROGRAMME FOR RESEARCH AND INNOVATION UNDER GRANT AGREEMENT NO 636063.

THE INFORMATION IN THIS PUBLICATION DOES NOT NECESSARILY REPRESENT THE VIEW OF THE EUROPEAN COMMISSION.

INSITER INTUITIVE SELF-INSPECTION TECHNIQUES