Lean Construction Congress

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LEAN CONSTRUCTION INSTITUTE - FI

Can smart site fix the productivity problem of construction?

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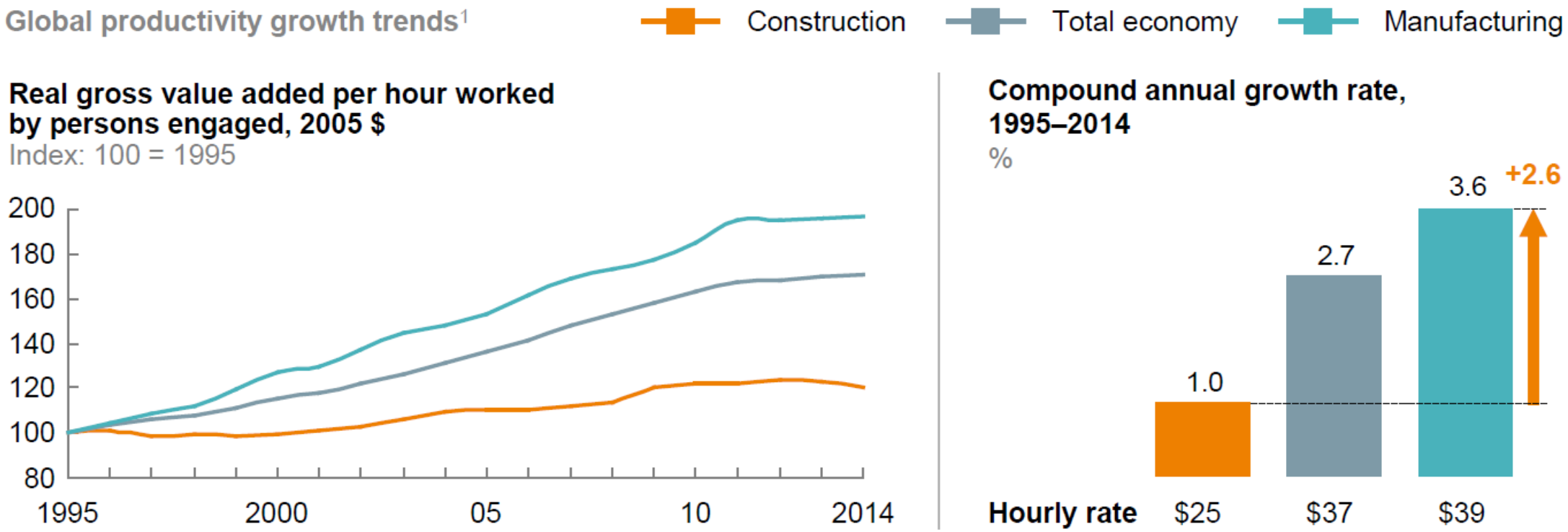
Productivity problem of construction



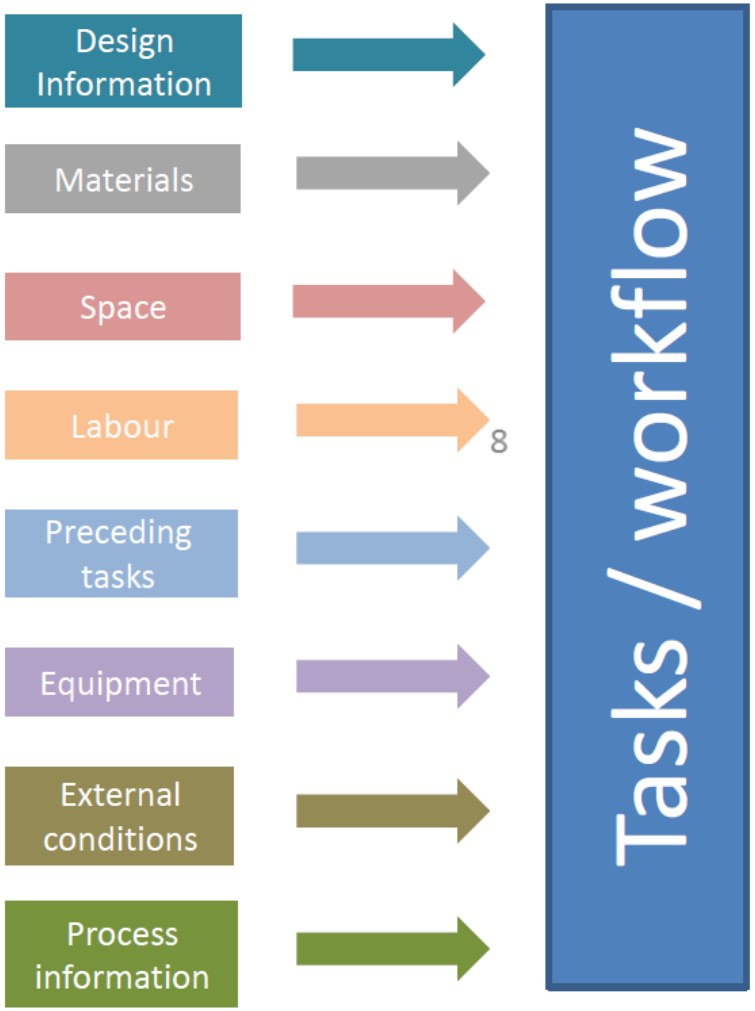
1 Based on a sample of 41 countries that generate 96% of global GDP.

McKinsey 2017: Reinventing Construction: A route to higher productivity

Digitalization has helped the office but not work on site

- **Emphasis has been on improving the design, procurement, project management etc.**
- **Productivity has been neglected**
- **Real-time data from site has been unavailable**
    - Step 1: get real-time data
    - Step 2: Form situational awareness
    - Step 3: Solve productivity problem

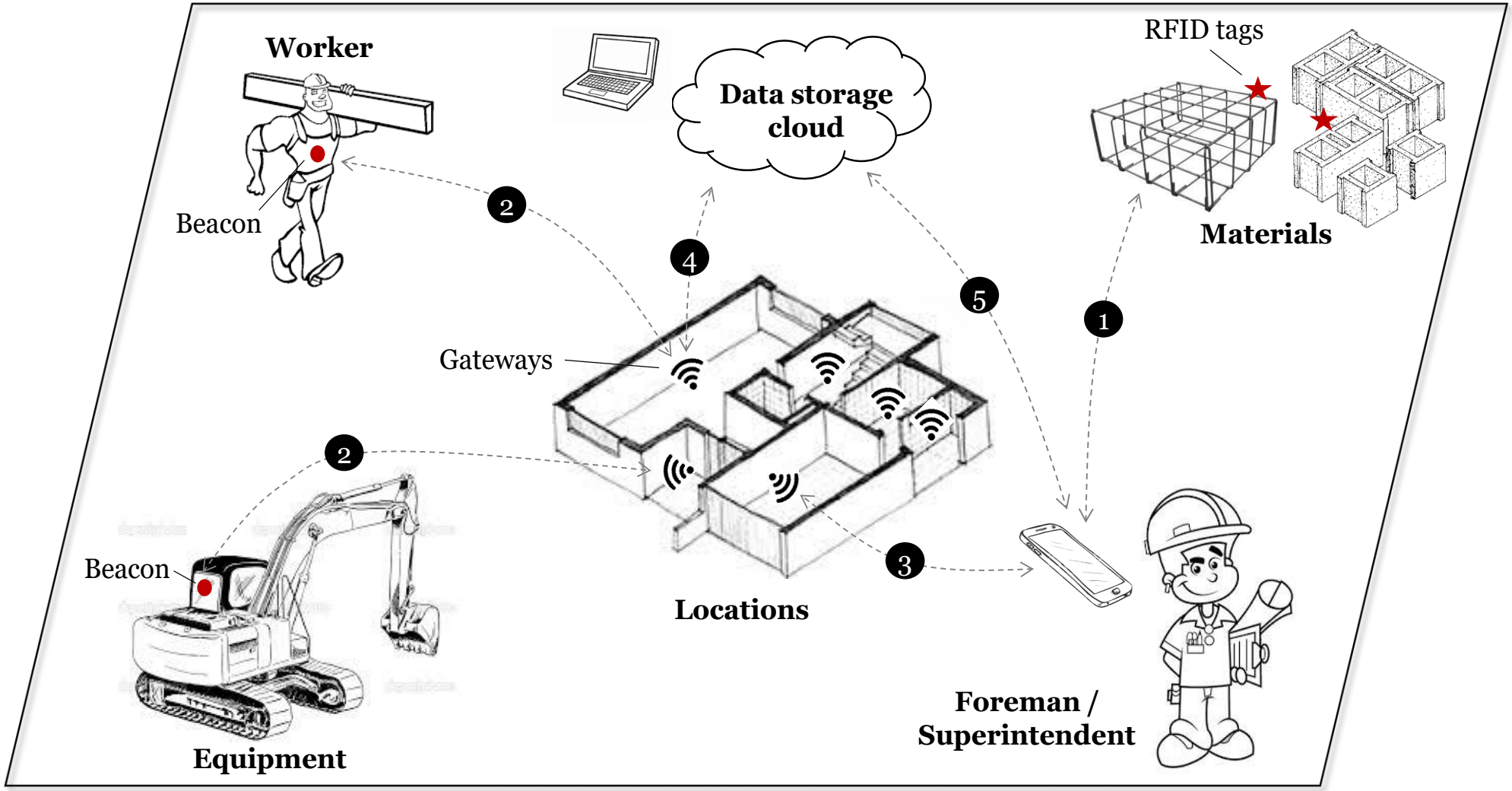
What do workers need to be productive?



- **The 8 flows must be unconstrained for productivity**
- **If constraints are not removed, waste occurs**

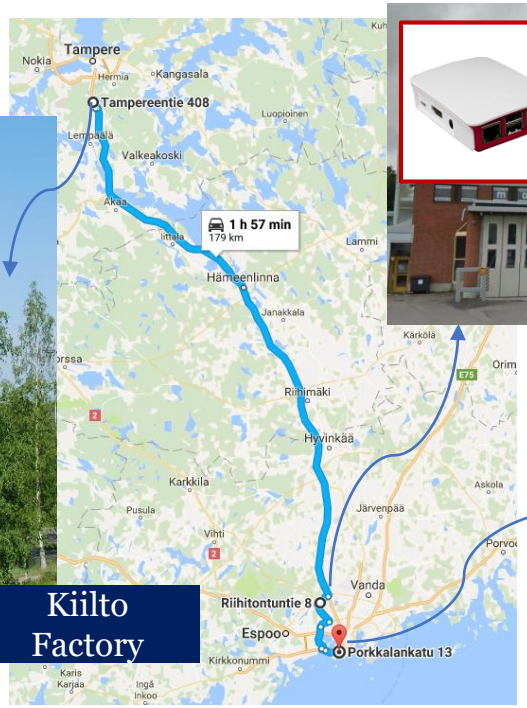
Proposed solution:
Real-time situation picture enabled by AI

Real-time position of resources



Example installation (Fira plumbing renovation)

Kiilto Factory

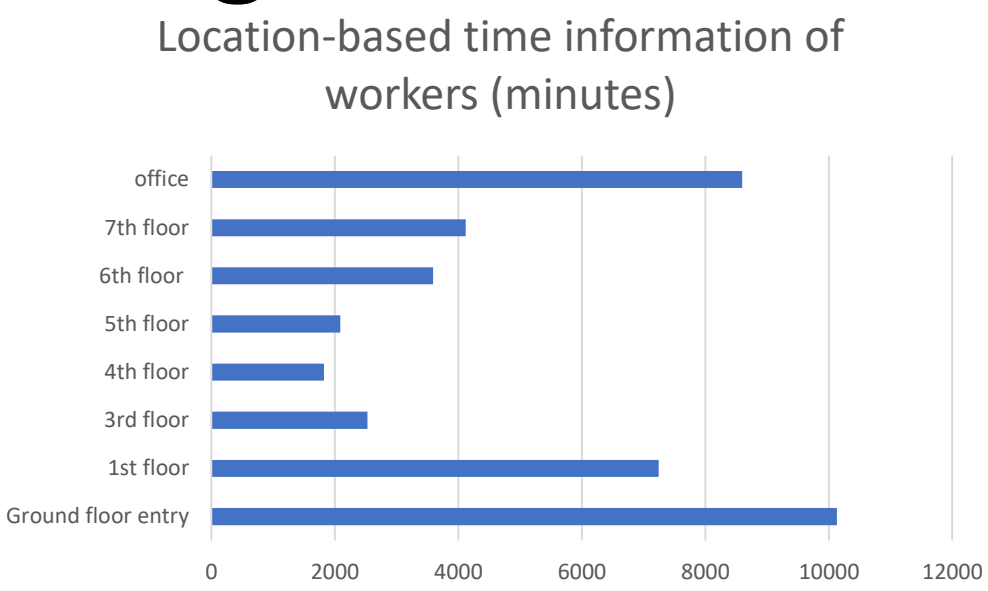


Kiilto Warehouse

Fira Renovation Building

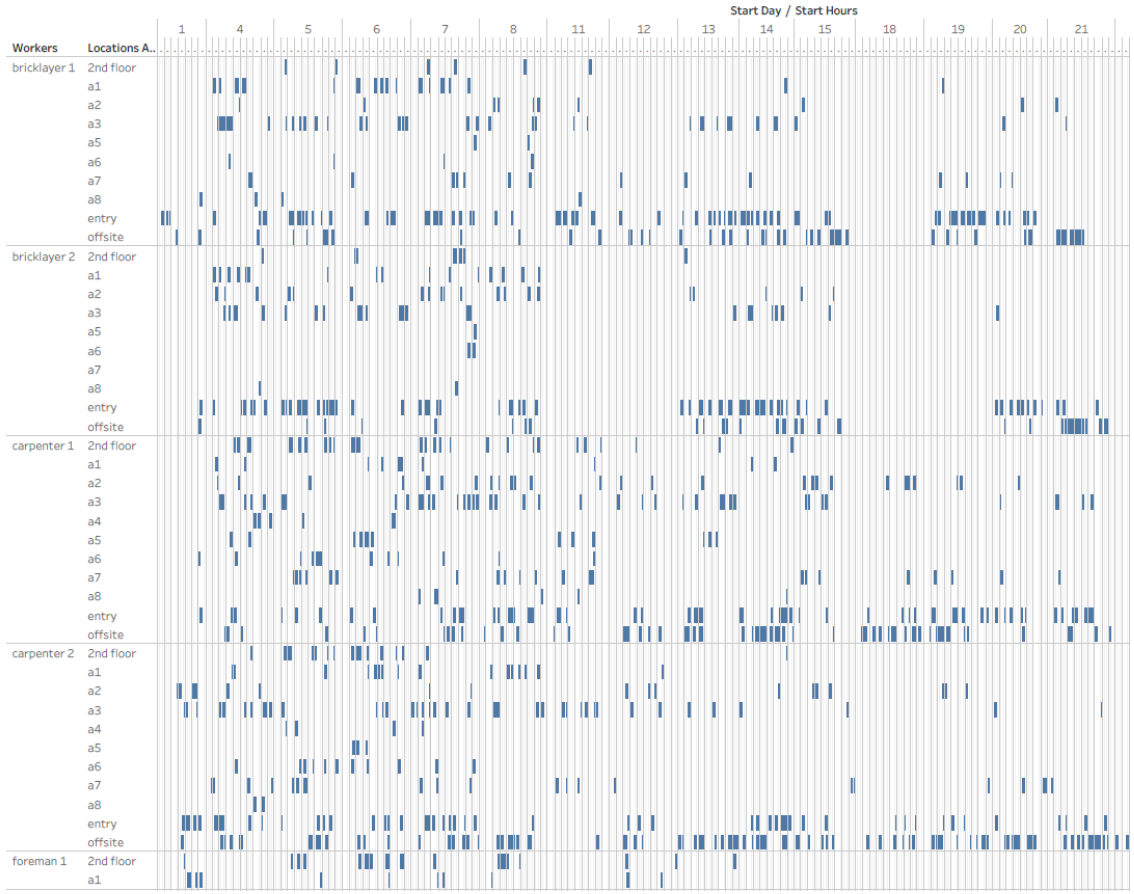
Example data from positioning

Examples		Material number			
Month	Day	25	26	28	53
6	1	1	1	1	0
6	2	0	0	0	0
6	3	0	0	2	0
6	4	2	2	0	0
6	5	0	1	0	0
6	6	2	0	1	0
6	7	0	0	1	0
6	8	1	1	0	0
6	9	0	0	0	0
6	10	1	1	0	0
6	11	1	0	0	0
6	12	0	0	0	0
6	13	0	2	0	0
6	14	0	0	0	0
6	15	0	0	0	2
6	16	0	0	0	0
6	17	0	0	0	0
6	18	0	0	0	0
6	19	0	0	0	0
6	20	0	0	0	2
6	21	0	0	0	0
6	22	0	0	0	0
6	23	0	0	0	0
6	24	0	0	0	0
6	25	0	0	0	0
6	26	0	0	0	0
6	27	0	0	0	0
6	28	0	0	0	0
6	29	0	0	0	0
6	30	0	0	1	0
	total	8	8	6	4
	sum	7	7	5	3

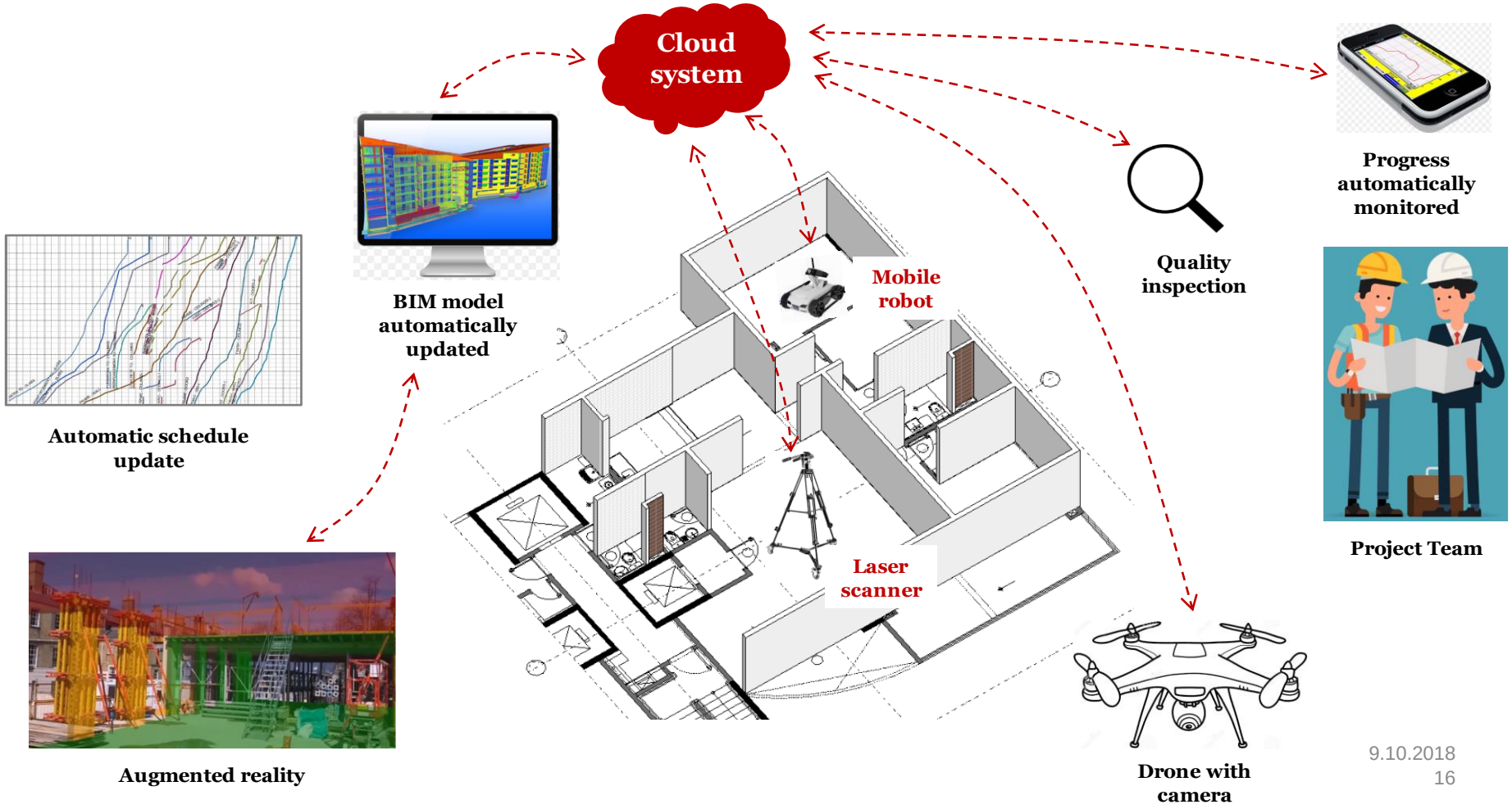


Results related to indoor positioning

- **Real-time, scalable evaluation of value-adding time (~25-35%)**
- **10-20% of worker time in the scheduled locations – but no major delays!**
- **Materials move 8 times before use**



Automated progress through images



Example: bathroom progress

0. Initial state

1. Demolition

2. Plastering

3. Diamond Drilling

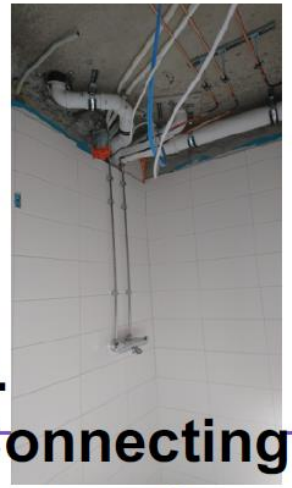
4. Insulating pipes

5. Conduits

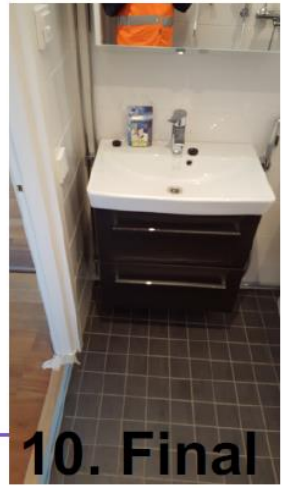
6. Water Insulation

7. Tiling

8. Chrome piping



9. Connecting water pipes



10. Final cleaning

Other examples

- **3D pointclouds from crane cameras or drones**
  - Comparison with 3D models to detect progress
- **Quality checks**
  - For example checking levelness, bumps etc
- **Safety**
  - Fall hazards
  - Personal protective equipment

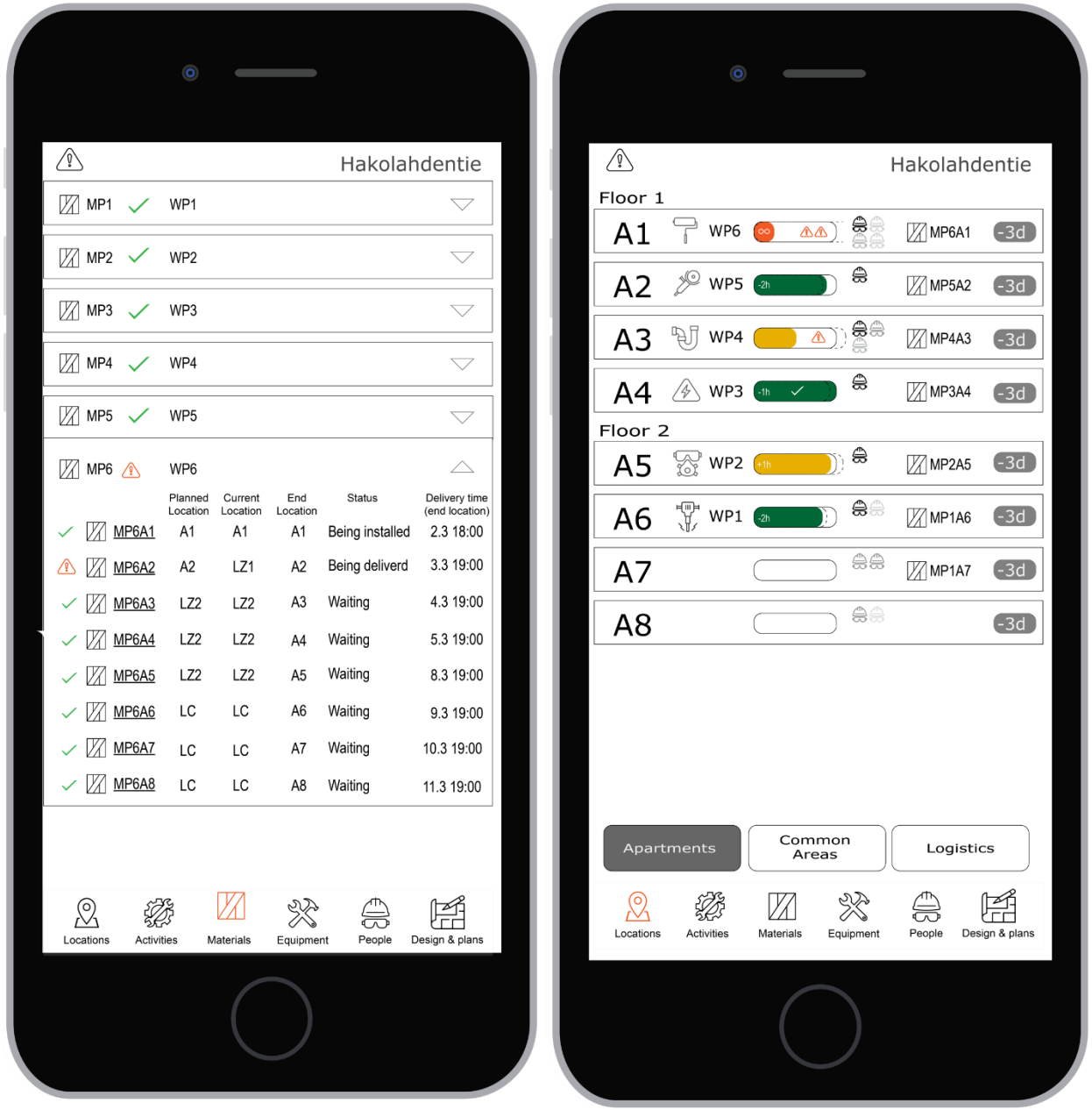
Data collection

- **Other ways to automatically get situation data:**
  - Meeting minutes (text analysis)
  - Communication tools (site WhatsApp, Construction TripAdvisor, Slack, project management platforms etc.)
  - Environmental sensors (concrete drying, humidity, temperature etc)
  - Planning systems
  - Integrating to supplier systems

From data collection to situational awareness?

- Automated data collection results in huge amounts of data
- Data storage needs to be standardized

- Role-specific dashboards are required



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Thank you – questions?

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