Standardized Data and Artificial Intelligence as Enablers of Data Economy in Building Services Engineering

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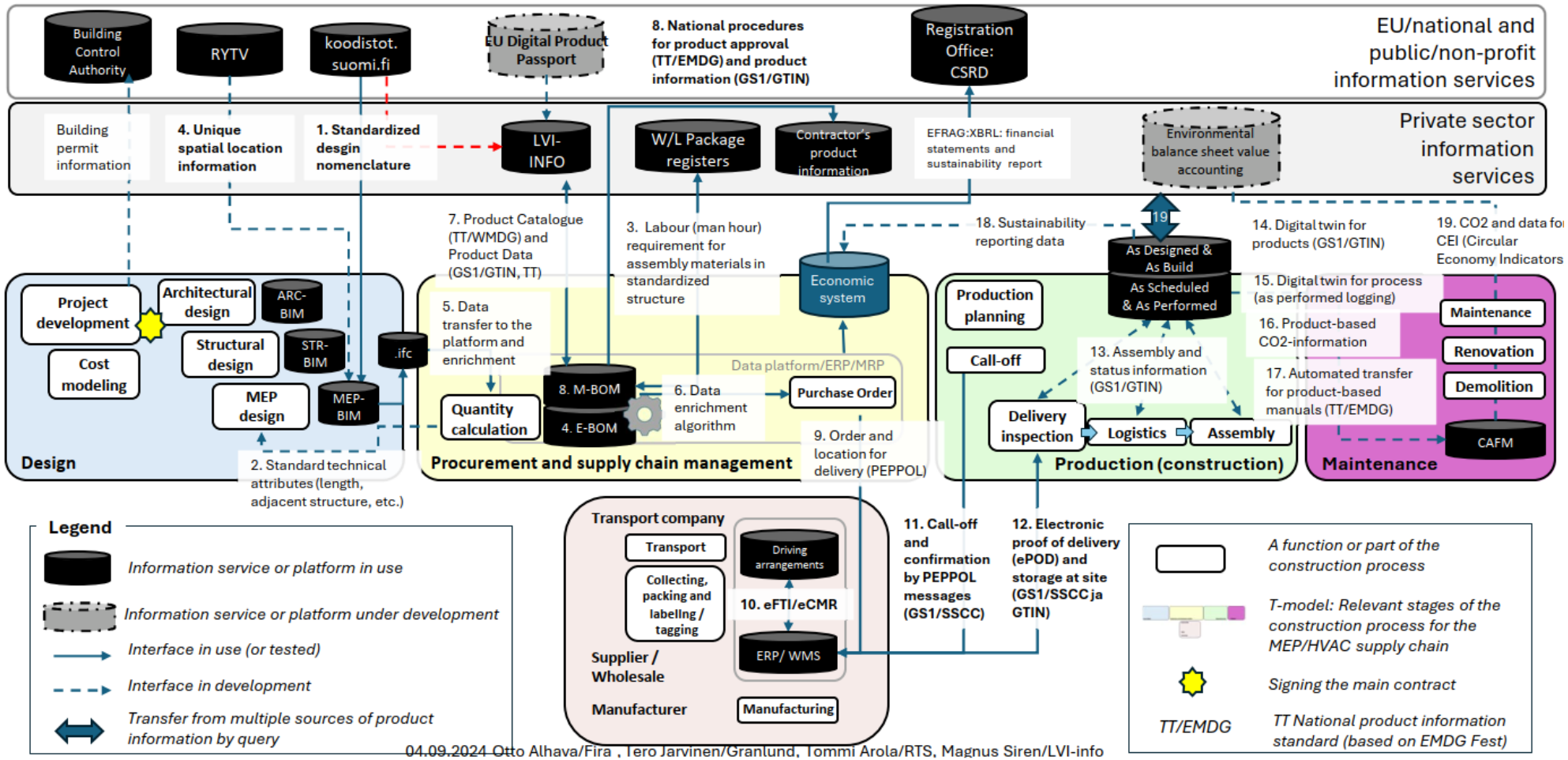
The challenge of construction is the fragmentated data



04.09.2024 Otto Alhava/Fira , Tero Jarvinen/Granlund, Tommi Arola/RTS, Magnus Siren/LVI-info

Breaking the Construction Data Bottleneck: From PDFs to Linked Data

THE HIGH COST OF FRAGMENTATION

20%
OF TIME LOST

Professionals spend a fifth of their workday searching for or correcting information.

€400M
MANUAL CALCULATION GAP

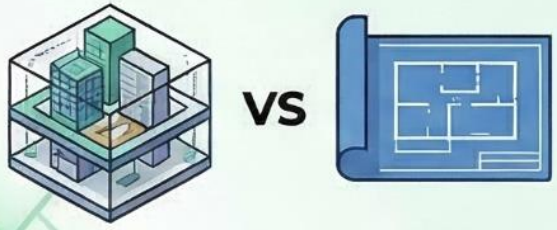
Manual quantity calculations cost the Finnish construction industry 400 million euros annually.

30% INSTALLER PRODUCTIVITY

30%

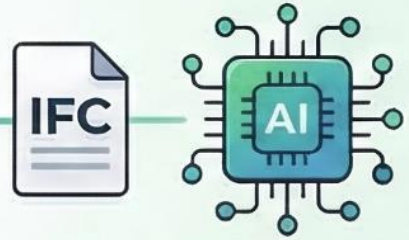
Only a small fraction of an installer's working time is currently productive.

BEYOND IFC: THE SMART DATA FUTURE



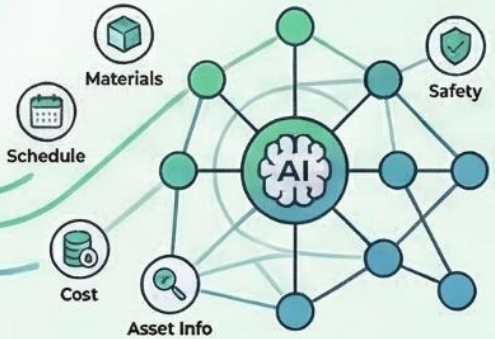
THE LIMITS OF 2D PDF DIGITALIZATION

Critical information is lost when rich BIM models are flattened into static 2D formats.



ENRICHING "LESS IS MORE" IFC

Minimize IFC data content and instead enrich it on smart data platforms for AI use.

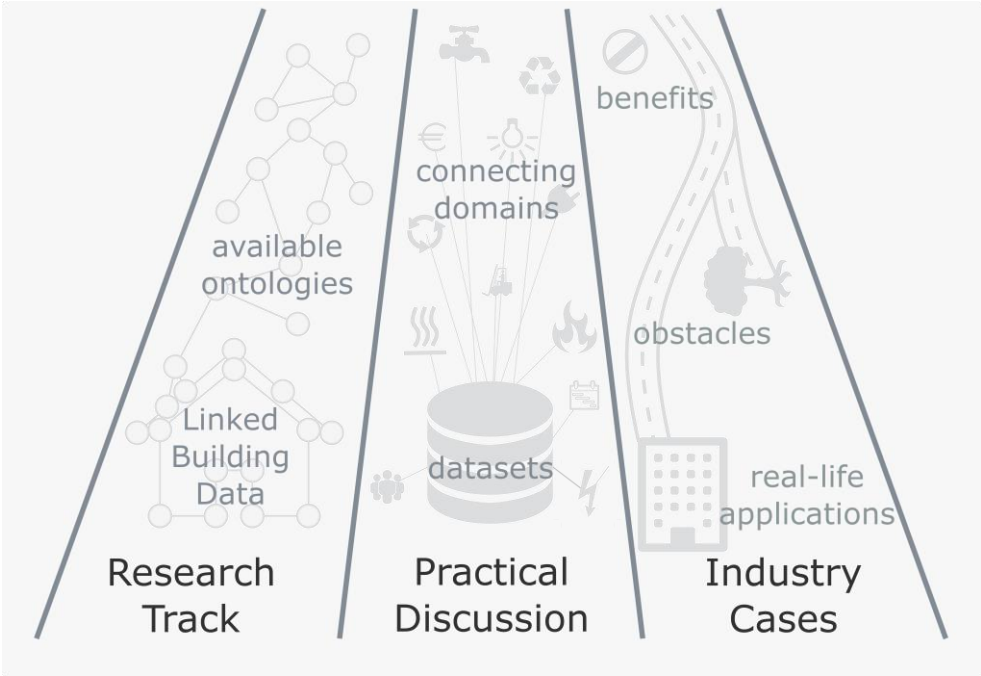


MOVING TO LINKED DATA

Embracing graph databases and domain-specific AI to create machine-readable lifecycle value.

Action points

- **Action Point I: Fixing BIM**
  - Correcting the BIM data content and connecting it to the procurement (E-BOM → M-BOM)
- **Action Point II: Uniform and machine-readable data base**
  - **Standardizing data models alone is not enough** – a prerequisite for a systemic solution is **a smart uniform and machine-readable data base!**
- **Action Point III: Integration of artificial intelligence and data content**
  - Launch cross-sectoral R&D cooperation with the construction industry and AI developers.
  - Developing and testing AI solutions based on open source and common protocols.



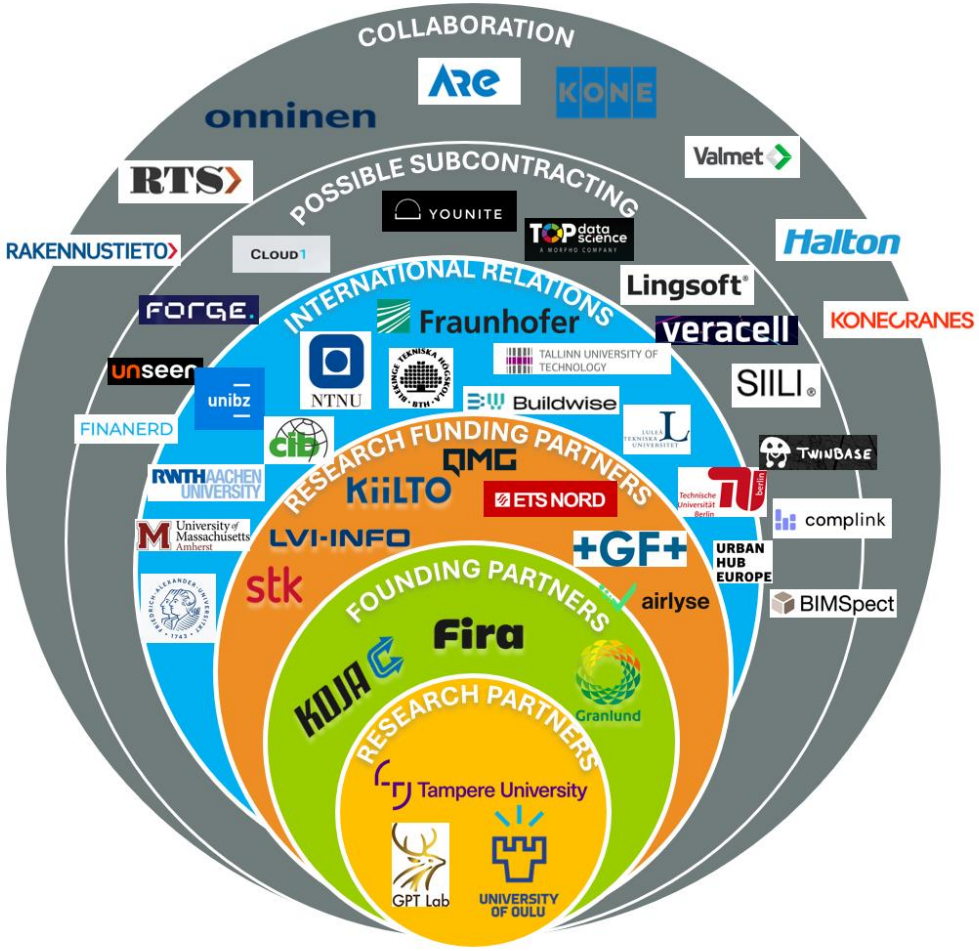
Lähde: https://linkedbuildingdata.net/ldac/

PRODUCT DATA → DATA PRODUCT

Talotekniikka 2030
Report (2025) Vakioitu tieto ja tekoaly talotekniikan datatalouden mahdollistajina

Research project: AI Champion

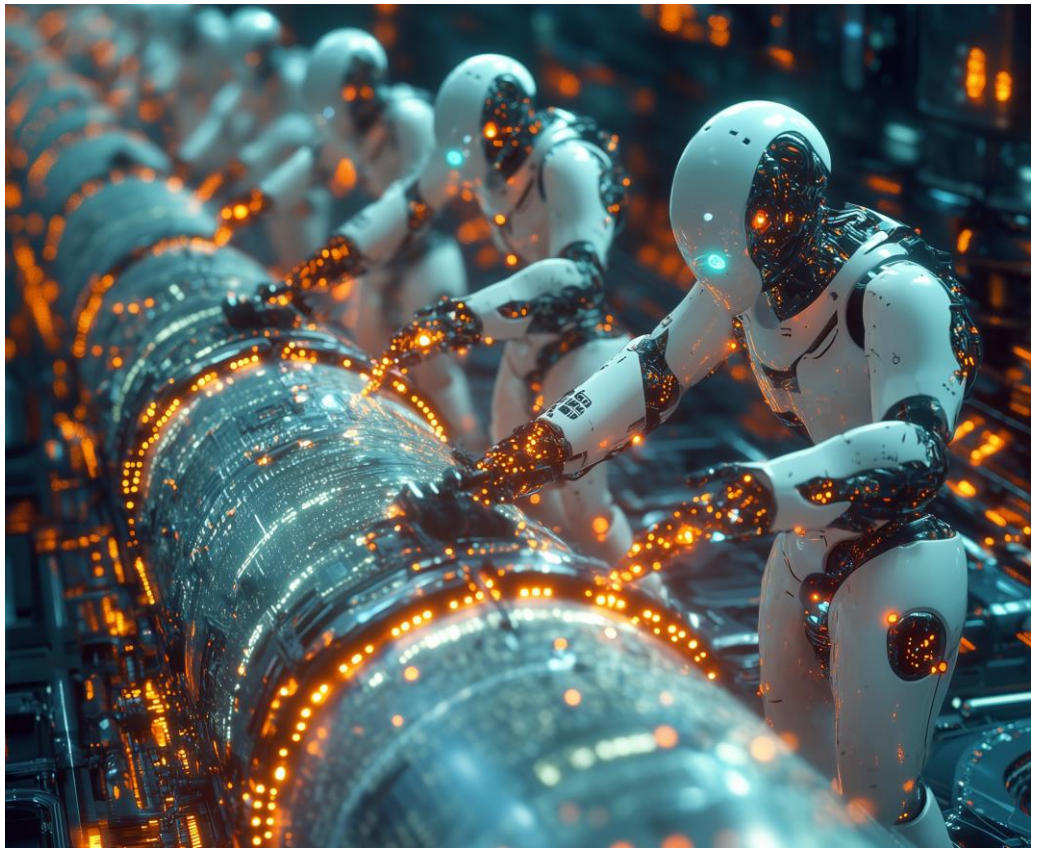
- Business Finland **Co-Innovation** project as part of **the Decarbonised Cities programme**
- Project duration: **3 years**; total budget: approximately **€20 million**
- *Funding decision on 26 November 2026: positive*
- **Challenge:** Information is fragmented across the digital systems and data platforms of different actors and stakeholders in the construction industry supply chain.
- **Solution:** Develop 100 open-source AI agents to enable the flow and enrichment of information in the building services engineering supply chain.
- **Founding companies:** Koja Chiller, Granlund, Fira
- **Research institutions:** Tampere University, University of Oulu
- The project has been selected as a pilot in **the Ministry of Economic Affairs and Employment of Finland (TEM) data economy growth programme**.



AI Champion: Doctoral School of AI in AEC

AI in AEC is not only a technology challenge, but a question of business models, workflows, data governance, and digital infrastructure

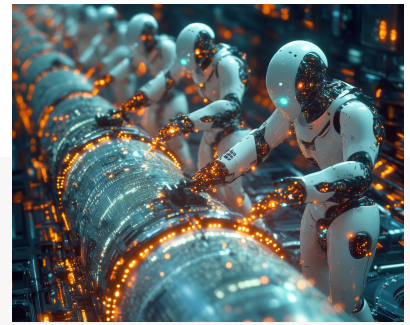
- 13 PhDs + postdoctoral research
- A new **multidisciplinary** doctoral school for AI in construction
- Combining construction research, information systems, and applied AI (GPT-Lab)
- Focused on AI agents, data flows, human–AI collaboration, and industry transformation
- Building long-term research capacity for the future of AEC

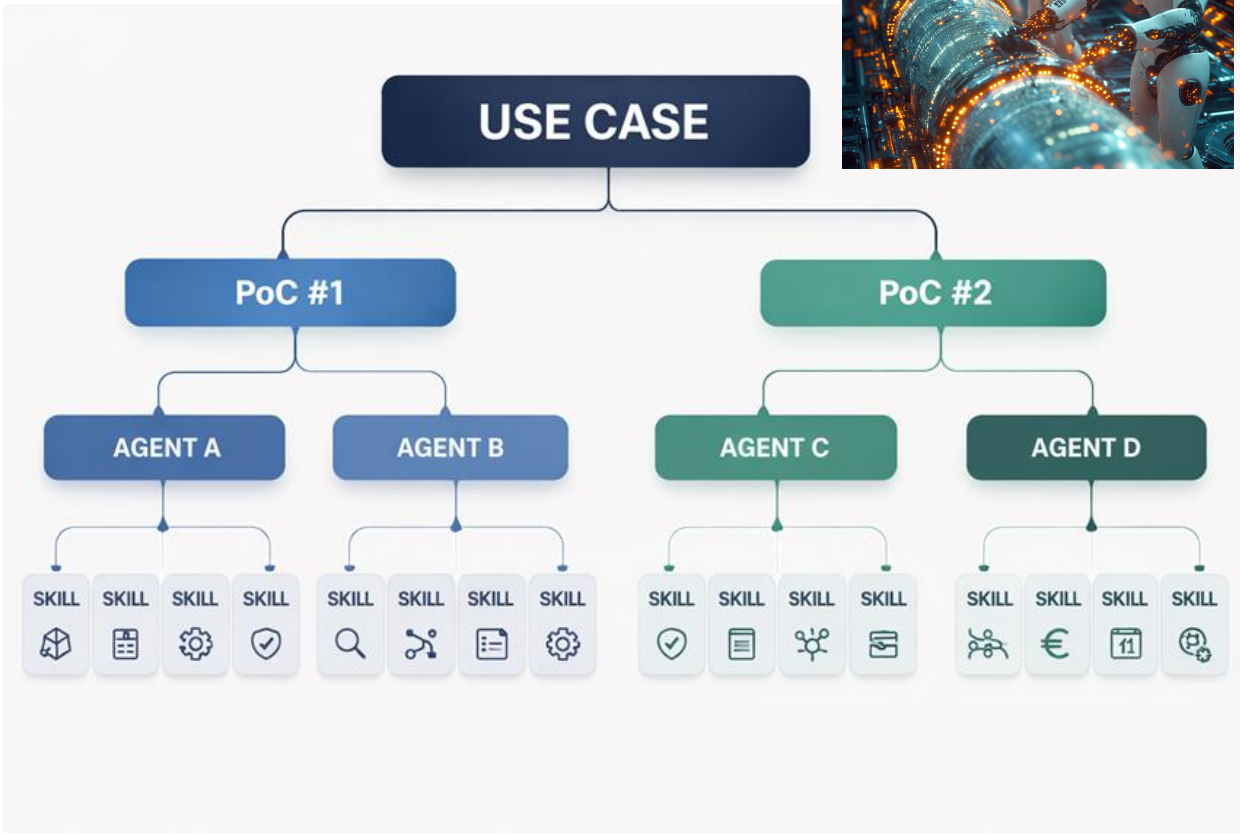


Practical example: AI-enabled quantity take-off

- AI-enabled quantity take-off:
  - High potential impact
  - Considerable hype and a growing number of AI-demos
- IFC → LLM makes it possible to extract quantities directly from BIM (e.g. BIMtoExcel, Claude Skills.md)
- But these “vanilla-LLM” approaches still face problems of accuracy, consistency, and explainability
- IFC → *IFCtoLBD* → LLM may offer a more robust and traceable alternative
- Research is needed to test these AI-workflows systematically

Without reliable and measurable workflows, scalable business models cannot emerge



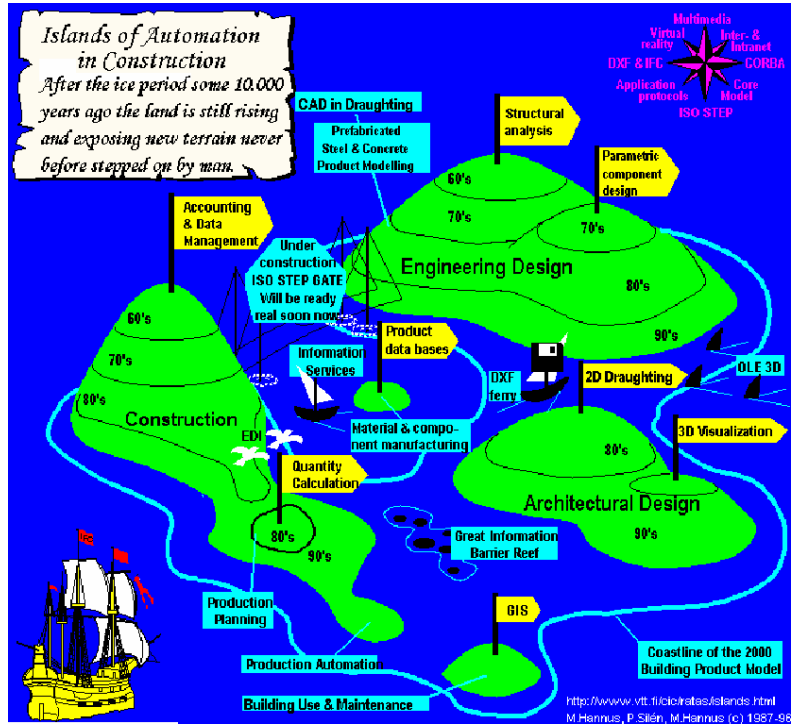


Digital infrastructure in AEC is always imperfect

- The construction industry's digital infrastructure will never be fully complete or error-free:
  - BIM models are not perfect,
  - product data contains gaps,
  - different actors use different systems,
  - work is project-based, and the same data is handled by many stakeholders at different stages.
- Deterministic automation is difficult to achieve, especially in inter-organizational, project-based settings.
- Some degree of incompleteness is unavoidable.

Digital infrastructure is by definition open, evolving, and heterogeneous (Tilson et al., 2010)

Tilson, D., Lyytinen, K., & Sørensen, C. (2010). *Research commentary—Digital infrastructures: The missing IS research agenda*. Information systems research, 21(4), 748–759.

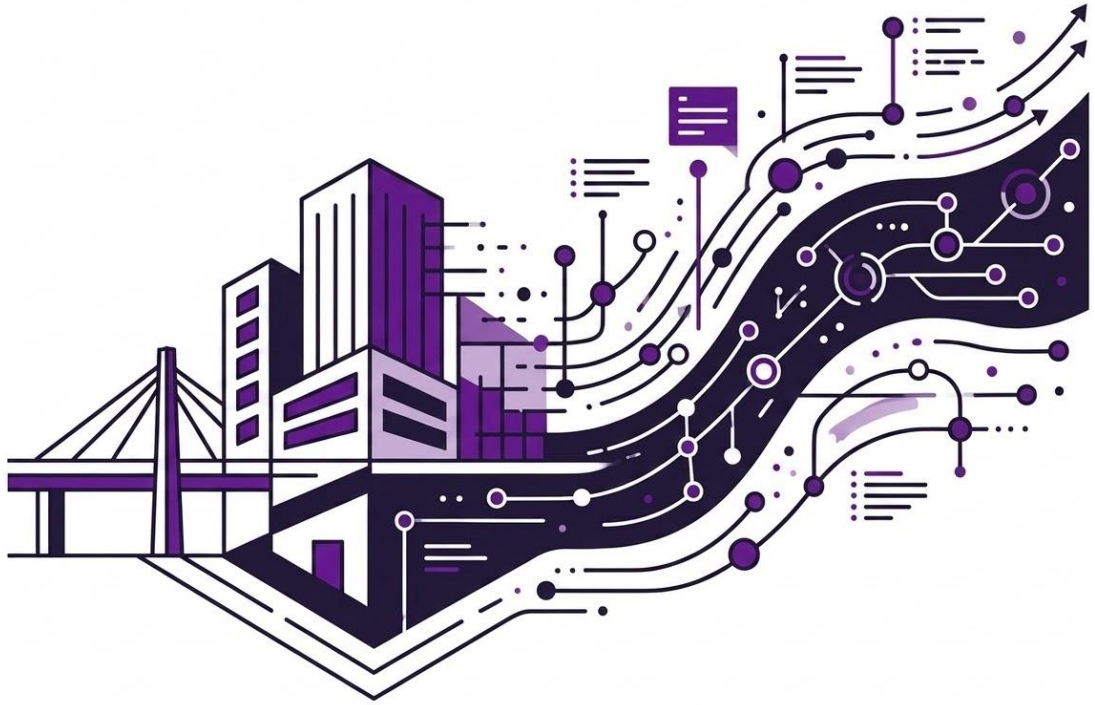


Islands of Automation in Construction (Hannus, 1996)

Can AI agents solve the construction industry's "last mile" problem?

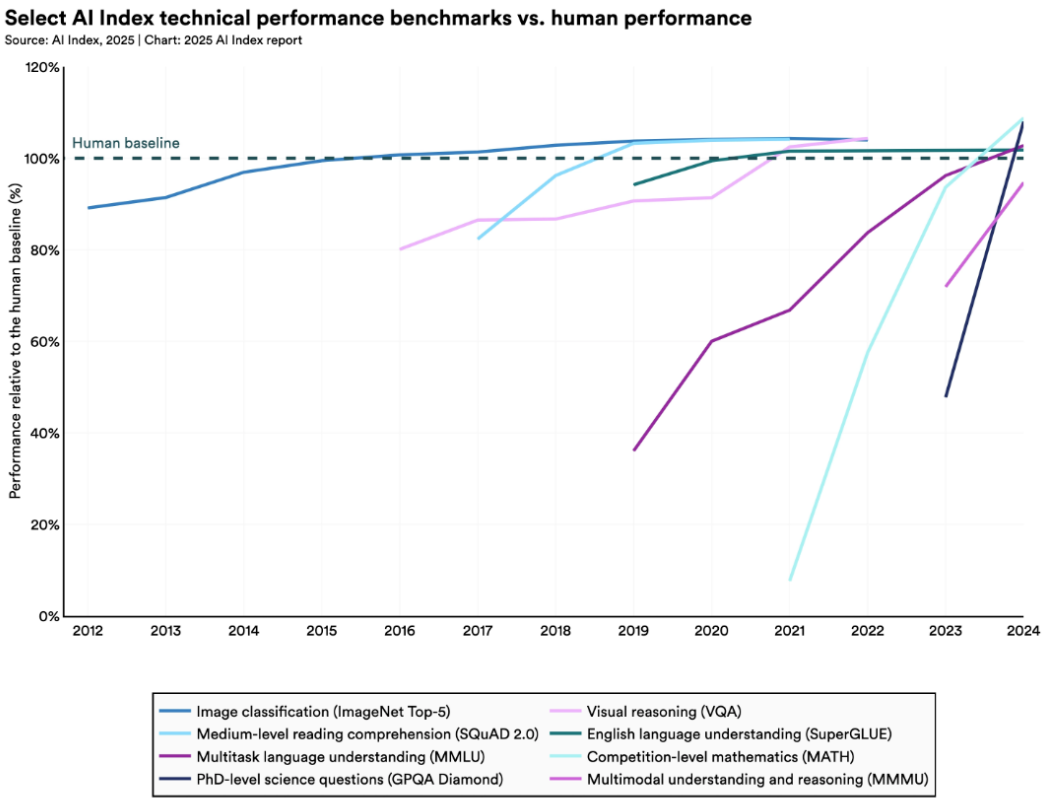
#1 A minimum level of standardization (e.g., IFC & product data) must be defined so that information can be reliably enriched downstream in the supply chain with AI.

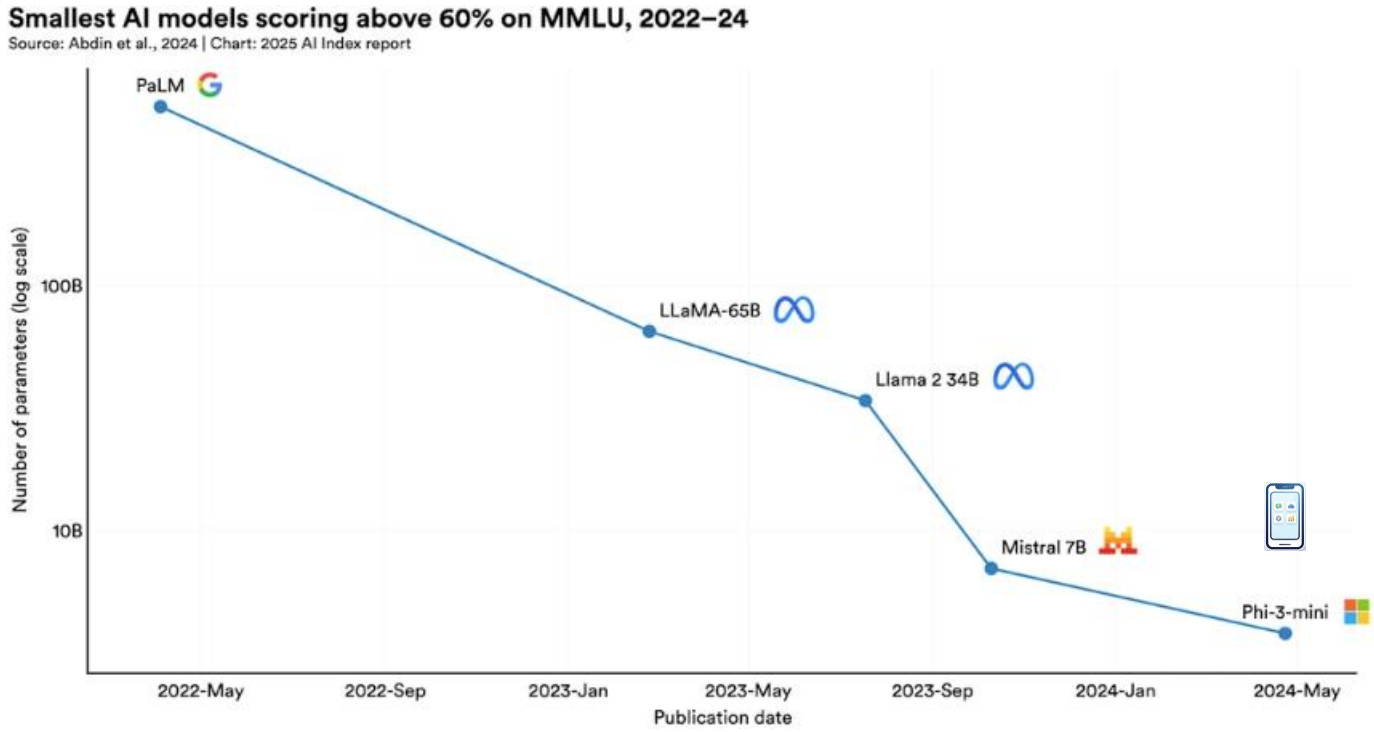
#2 The role of agents is to act as translators and intermediaries of information: they can convert data from one format to another, fill gaps in standardization, interpret incomplete information, and connect data across different systems.



Trend #1: AI Is Getting Better and Cheaper at the Same Time

Intelligence is becoming commoditized and shifting toward edge computing.

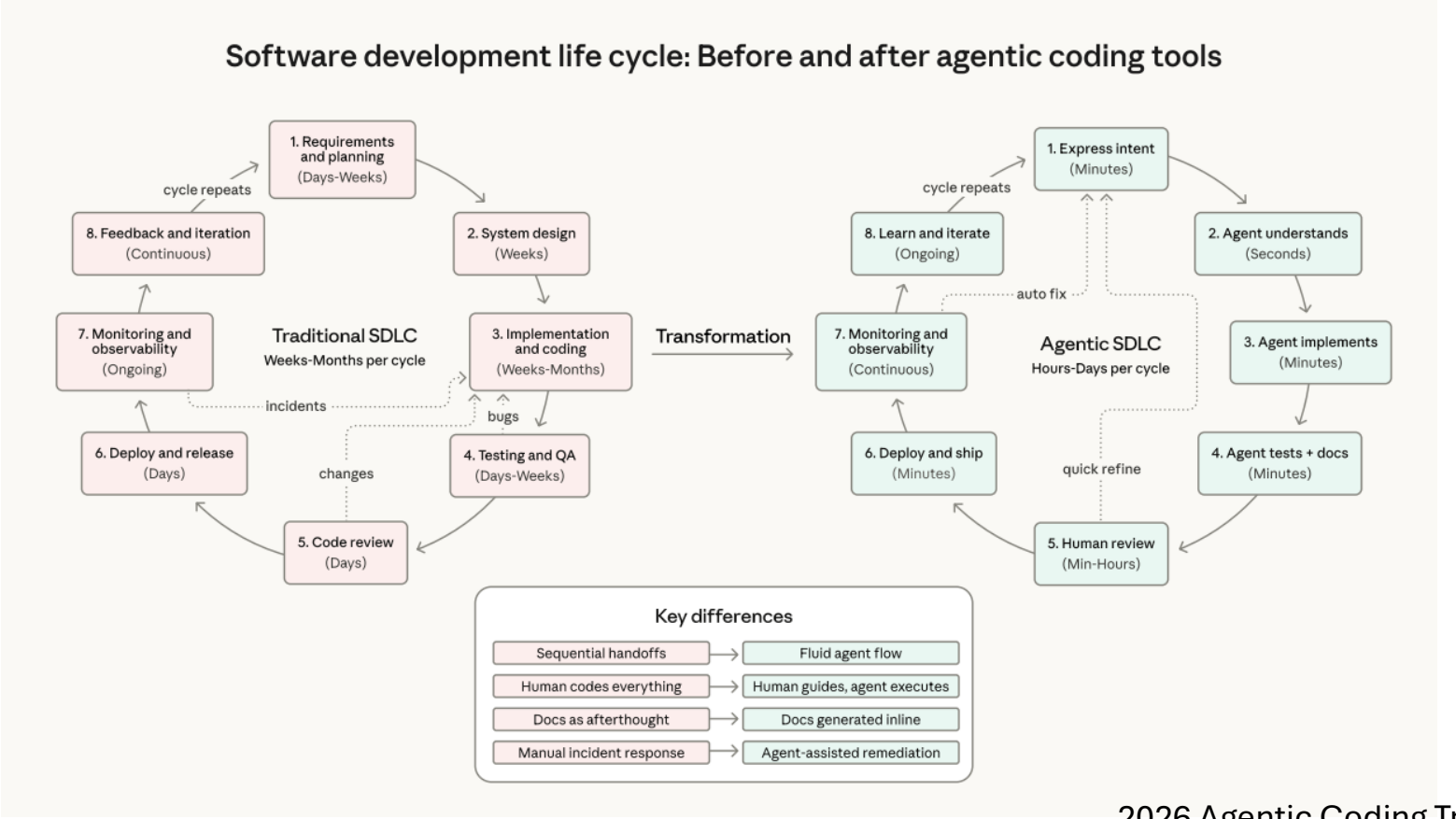




Stanford AI Index 2025

Trend #2: AI Lowers the Cost of Software Development

As code becomes a commodity, renewing digital infrastructure across industries becomes feasible.



2026 Agentic Coding Trends Report (Anthropic)

Trend #3: AI Has Potential Across All Industries, but Adoption Is Slow

The main bottleneck is no longer the technology itself, but inertia—organizational structures, processes, capabilities, and legacy ways of working.

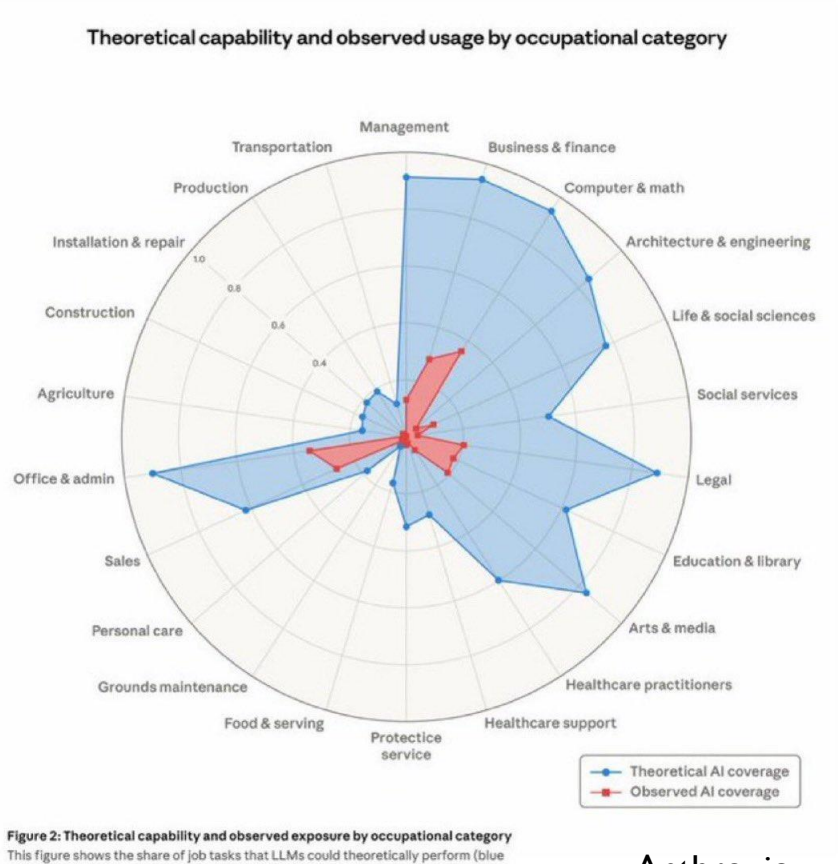
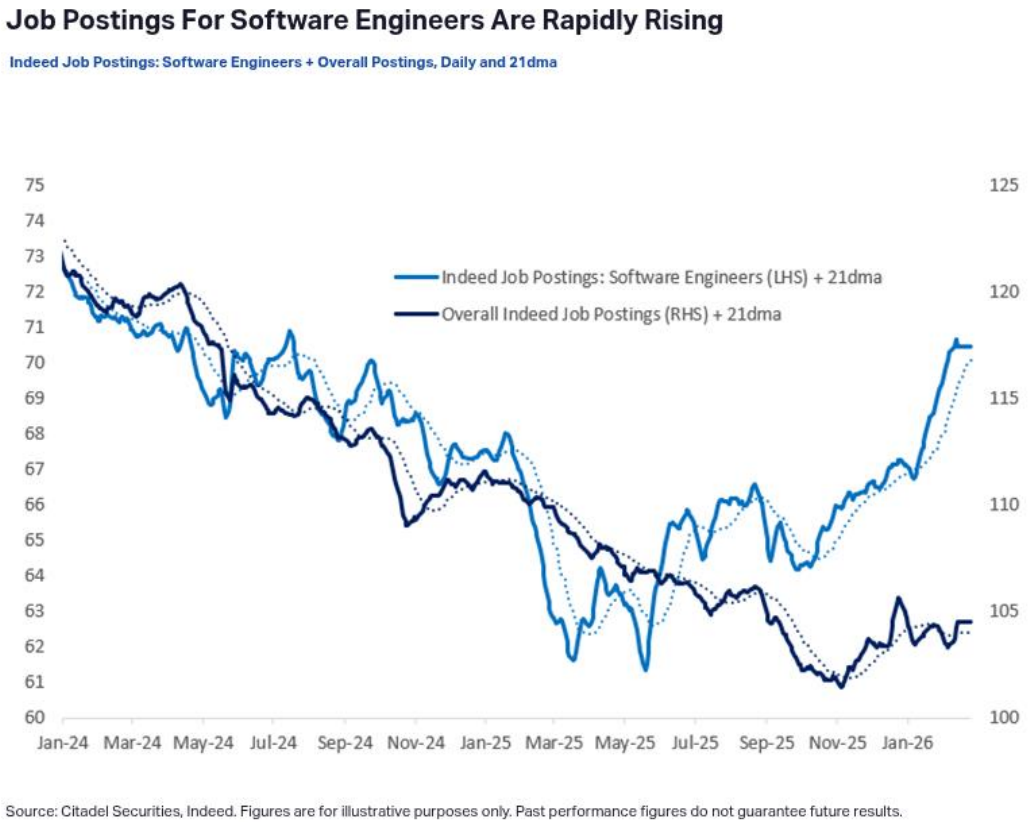


Figure 2: Theoretical capability and observed exposure by occupational category
This figure shows the share of job tasks that LLMs could theoretically perform (blue area) and our own job coverage measure derived from usage data (red area).

Anthropic



Source: Citadel Securities, Indeed. Figures are for illustrative purposes only. Past performance figures do not guarantee future results.

Citadel Securities

Summary

- If we want to industrialize construction, we need to focus on **people, process, data, AI, and business value.**
- The real challenge is not only technology, but the renewal of **workflows, governance, and operating models.**
- We need to **prioritize real use cases** grounded in real problems, real data, and real organizations.
- Understanding how **AI agents become part of digital infrastructure** requires research–industry collaboration.

Thank you!
Questions

- Report (2024): Tekoälyn hyödyntäminen kiinteistö- ja rakennusalalla.
- Raport (2024) Talotekniikan tuotedatan virtautus- ja hyödyntämismahdollisuudet generatiivisen tekoälyn avulla
- Report (2025) Vakioitu tieto ja tekoaly talotekniikan datatalouden mahdollistajina
- AI Champion | Tampereen korkeakouluyhteisö
- AI Champion: Company Page | LinkedIn