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DEVELOPING A FRAMEWORK FOR SYSTEMIC TRANSFORMATION OF THE CONSTRUCTION INDUSTRY

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RESEARCH BACKGROUND

- Lack of innovation and future-oriented investments in construction
- Contractors having enormous project management problems, which has traditionally been the general contractors' key capability

→ Why in the era of customer-driven and disruptive digitalized businesses, the construction industry has demonstrated an unsatisfactory development?

- **Systemic innovations** (SI) as industry-defining changes that diffuse across companies, resulting in fundamental changes in companies' operations
- SIs requires commitment from several actors in the supply network
- The construction industry's fragmented and risk-averse nature sets barriers for employing SIs

OBJECTIVES AND METHODS

Objectives:

- to disentangle the industry's problems and present justified paths toward sustainable improvement
- In practice, to develop a conceptual framework about the path toward the **systemic transformation** of the construction industry

Design Science Research approach:

1. Describing the status of the construction system
2. Defining the principles for solution
3. Conceiving a solution framework for construction industry transformation
4. Presenting partial solutions of actual cases
5. Concluding by discussing on implications on research and practice

Data: literature, 20 CEOs representing various AEC companies of the Finnish construction ecosystem

DIAGNOSIS – A SINGLE-PROJECT MINDSET LEADING TO LACK OF SCALABILITY AND CONTINUOUS IMPROVEMENT

PRODUCT	PROCESS	PEOPLE & ORG.	INFORMATION	VALUE CREATION
• Incompatible sub-products and materials • Complex interfaces and coordination issues • Large and unaligned engineering tolerances	• Ad hoc processes and practices • Lack of integration of value chains and limited engagement and integration of stakeholders • Lack of flow in design and production processes	• Traditional contracting models leading to distrust • Professional and cultural silos originating from the education system • Users and material suppliers not integrated into the process	• No adequate information management standards • Lack of interoperable systems • Manual data entry and updating • Technical, organizational, and cultural barriers to sharing data	• Lack of customer-driven business models and services • No differentiation • Asset-dependence and outdated financing instruments • No real business connection between the project delivery and building operation phases

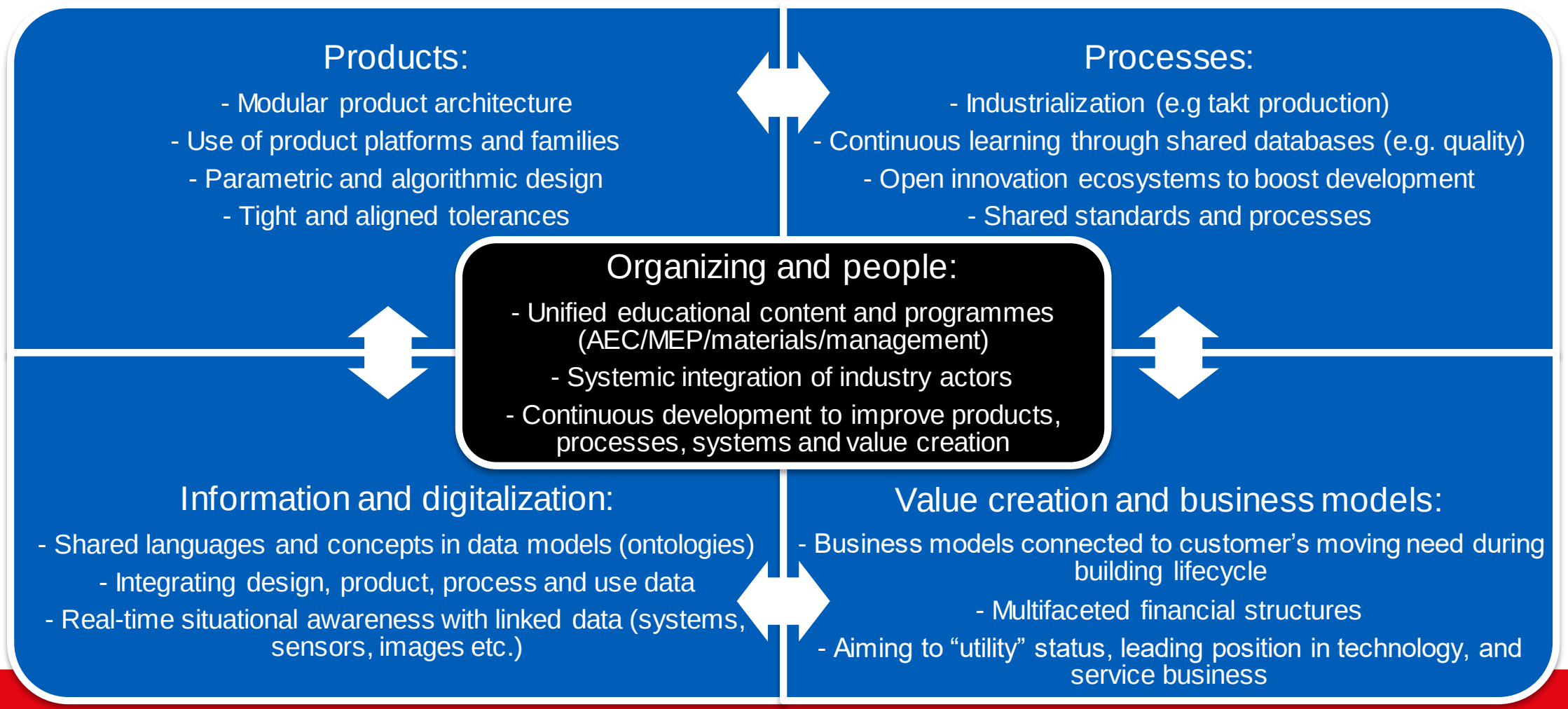
Table 1. Five broken subsystems of construction

PRINCIPLES FOR SOLUTION

1. **Principle:** Not only fixing visible and obvious problems but identifying ***root causes*** for symptoms and acting on them
   Examples:
   - Instead of controlling production on-site, asking why these activities are done on-site
   - Instead of solving quality issues on site, asking why the issue emerged and was not detected in earlier stages
   - Instead of managing multi-specialty teams, asking why we have so many professions with siloed cultures and languages

2. **Principle:** Looking for solutions that exist at the ***boundaries*** of the sub-systems

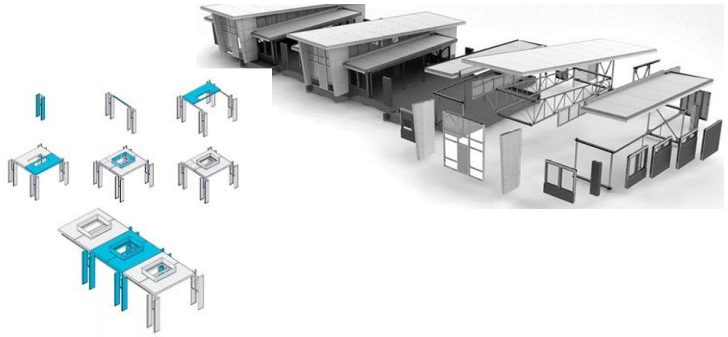
FRAMEWORK FOR SYSTEMIC TRANSFORMATION AS A SOLUTION

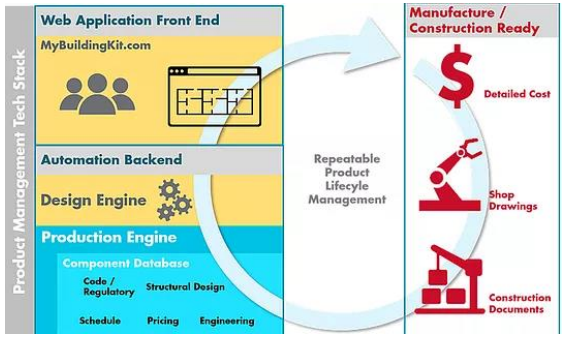


PARTIAL SOLUTIONS

- PROJECT FROG: ECOSYSTEM AROUND DIGITAL DESIGN CONFIGURATOR

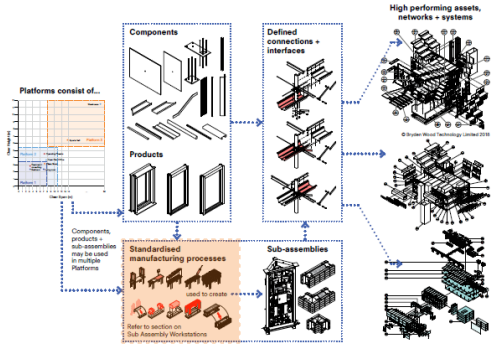
Kit-of-Parts **+** **End-to-end technology platform**





source: https://www.projectfrog.com/

- BRYDEN WOOD: PLATFORM APPROACH TO CONSTRUCTION

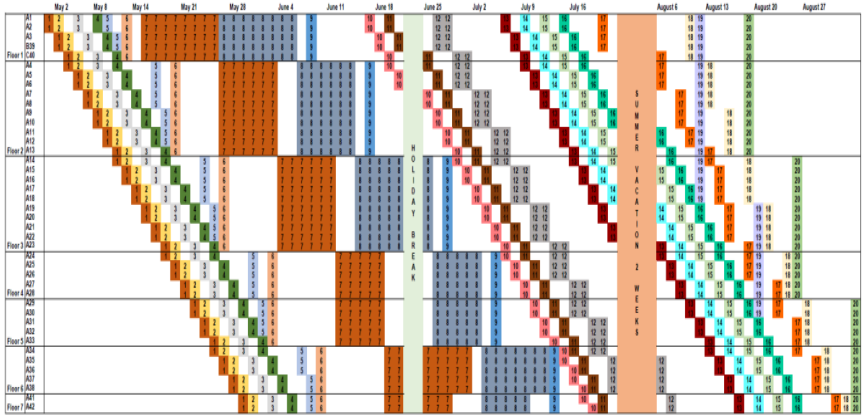


source: https://www.brydenwood.co.uk/

PARTIAL SOLUTIONS

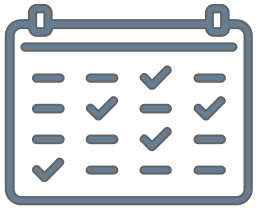
- **DIGITAL TAKT PRODUCTION**

- Takt production process development is linked to:
  - A. **Product development** (pull-based design management, constructability of designs),
  - B. **Value creation** (production pacing is matched with client's needs),
  - C. **Information flow and digitalization** (real-time situational awareness aided with digital tools), and
  - D. **Learning of organizations and people** (a collaboration between actors, continuous improvement, and holistic understanding on how effective project systems operate)



CONCLUSIONS

Innovation may originate in a specific sub-system. Still, to achieve a **sustainable transformation**, modifications are also needed in other sub-systems.



Simultaneous improvements in multiple sub-systems lead to **competitive advantage** that other firms cannot easily imitate.

Takt production could work as a key **driver for many systemic changes** in the construction ecosystem.

THANK YOU!

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