Why is Product Modularity underdeveloped in Construction?

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Introduction

- Product Modularity (modularization) is not new in construction

- Unclear understanding of Product Modularity in this context
  - Non-consideration of peculiarities (one-off product, spatial voids, etc)

- Examine product modularity in two projects
  - What are modules? What are interfaces?
    - High-rise apartment building (cast in place reinforced concrete)
    - Low-income housing (pre-fabricated timber framed panels)
What is a module?

• Spatial-oriented perspective
  • Primary functions (work, read, sleep, etc.) performed by people in the spatial voids

• Component-oriented perspective
  • Secondary functions (shield from the weather, noise, etc.) performed by physical components

(Rocha et al. 2015)
What is a module?

- Spatial-oriented perspective

(Gravina da Rocha et al., 2019)
(da Rocha and Kemmer, 2018)
What is an interface?
Problems in interfaces

- Ambiguous interface
- Modules that change across combinations
- Unclear boundaries between modules
Problems in interfaces

• Complexity of interfaces
• Surfaces vs interfaces

(da Rocha and Kemmer, 2018)
Conclusions

• Spatial-oriented perspective is more adequate
  • Spaces align with the *raison d'être* of buildings
  • Spaces align with client requirements and value
  • Global optimization (looking at the building and its comprising spaces)
    • Component-oriented perspective (e.g. MEP system) can lead to local optimization

• Produces benefits even in traditional construction (da Rocha and Kemmer 2013)
  • Completing Platform prior to modules postponed the DP in 42 weeks
  • 30% of time (42/138 weeks) shielded from variability due to variety

• Product Modularity is not applicable only to off-site construction
Conclusions

• Why is Product Modularity underdeveloped in Construction?
  • One-off nature of construction projects: multiple meaning of modules
  • Spatial voids/”cuboids” modules: ambiguous interfaces
  • Two conceptual considerations missing for a proper understanding

• Future studies
  • Acknowledge the multiple meanings of module in construction
    • What is a module in this study? Images, drawings, diagrams, etc.
  • Engage with design teams adopting a spatial-oriented perspective
    • Challenges of resolving the ambiguous interfaces/having truly invariant modules
Thank you!

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