

Product Variety in Construction: A Critical Review and Way Forward

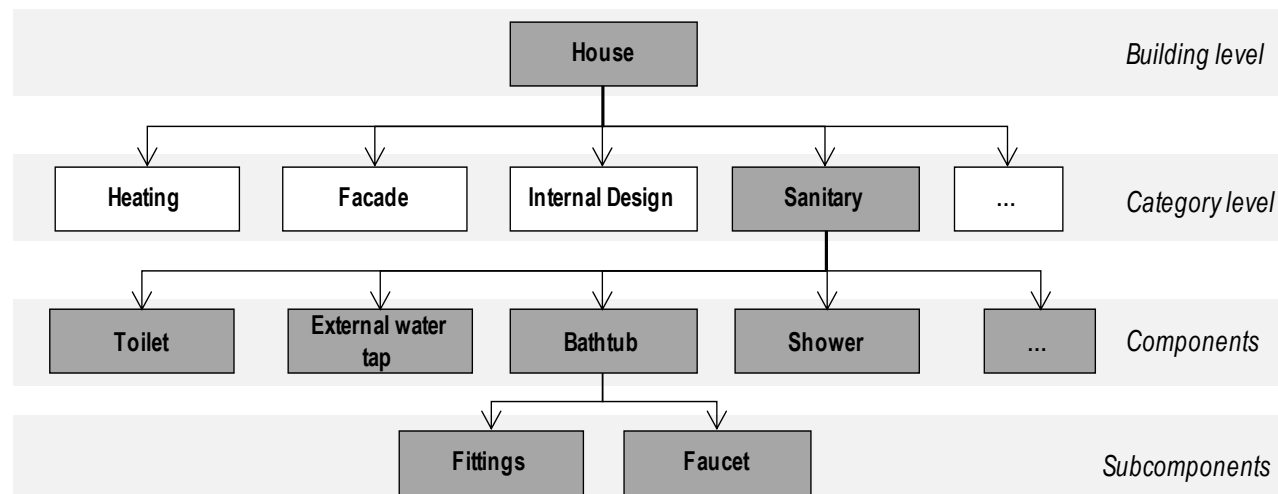
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Introduction

- Customisation (or product variety) creates an additional level of variability
 - Variability of the product itself
 - Variability in client's input
- How to measure product variety in construction and its effect on flow?
- Revise existing conceptualizations and identify new ones

Product variety: hierarchical product breakdown

Functional decomposition of a building into system and physical parts



(based on Schoenwitz et al. 2012, 2017)

Limitations

- Does not allow spatial changes to be appropriately framed
- Does not reflect the way buildings are erected

Product variety: supply chain types

Based on the Decoupling Point (DP) moment in which clients input enter the supply chain

Generic production stage	Supply chain type	Customization strategy
DP in design	Buy to order	Pure customization
DP in fabrication	Make to order	Tailored customization
DP in assembly	Assemble to order	Customized standardization
DP in distribution	Make to stock	Segmented standardization
--	Ship to stock	Pure standardization

(Naylor et al. 1999)

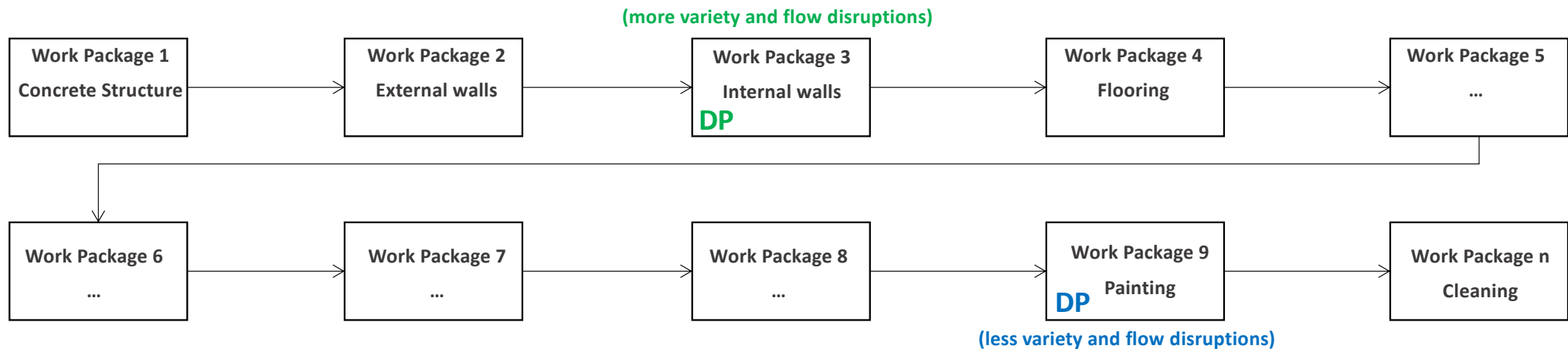
(Lampel and Mintzberg 1996)

Limitations

- Generic understanding of product variety – not at a project level
- “Construction as an engineered-to-order industry”

The way forward

Decoupling Point (DP) and Work structure/Work packages

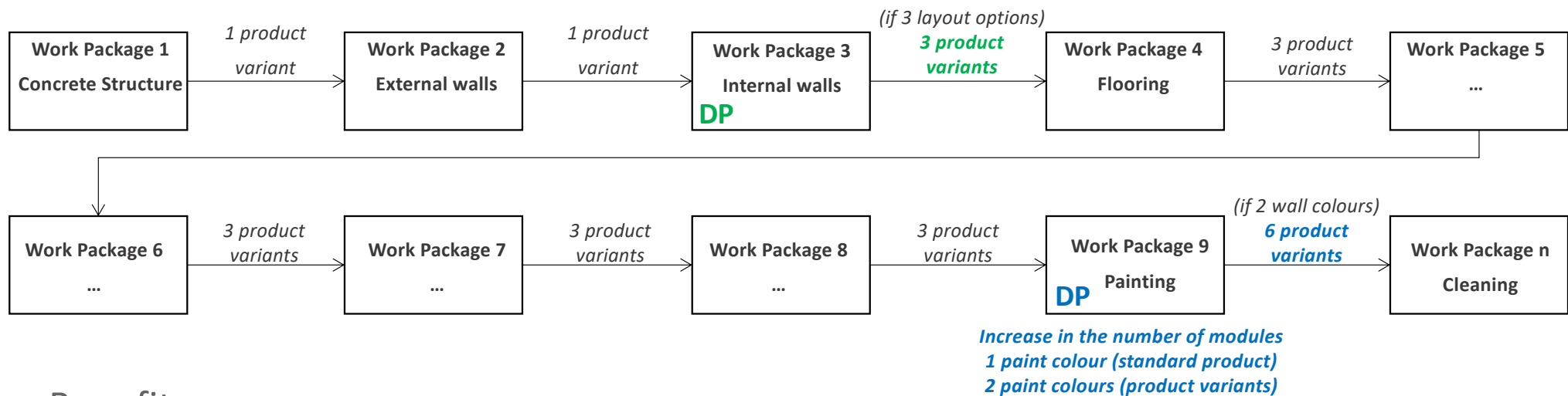


Benefits

- Flexible to accommodate one-off products and varied construction sequences
 - Similar potential for Design Structure Matrix

The way forward

Product Variants and Modules



Benefits

- Product variants linked to production – effect in flow is better understood
- Extended definition of module (any building component, material, etc.) allowing complexities in production due to product variety to be accounted

Conclusions

- Lack of conceptual frameworks to measure product variety at projects level
- Key to assist practitioners in deciding on customisation strategies
 - Example: Which strategy is more detrimental to flow?
 - A) Four internal layout options and two flooring options
 - B) Three kitchen layout options and three wall colours
- Conceptual frameworks need to account for the specificities of construction
 - One-off products entailing spatial/layout changes
 - Varied construction methods (more or less prefab) and sequences

THANK YOU!

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