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COMBINING TAKT PRODUCTION WITH INDUSTRIALIZED LOGISTICS IN CONSTRUCTION

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Operations and Service Management major

PhD student in Aalto University, Department of Civil Engineering

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Background

Takt production

Variability

Material Logistics

Vulnerability

External variation

Unpredictable, irregular factors → Variability in production

- Problems in material flow
- Impacts on project performance, quality, cost, duration

Background

Factory Physics

If flow efficiency increased without reducing variation, resource needs to be increased exponentially (Hopp and Spearman 2011)
→ Difficult in practice

Logistics is a key aspect for takt planning in residential construction (Vatne and Drevland 2016)

Purpose: How takt production benefits from proper logistics solution

Vatne, M. E, and Drevland, F. (2016).“Practical Benefits of Using Takt Time Planning: A Case Study.” Proc. 24th Ann. Conf. of the Int’l. Group for Lean Construction, Boston, MA, USA, sect.6 pp. 173–182.
Hopp, W.J. and Spearman, M.L., 2011. *Factory physics*. Waveland Press.

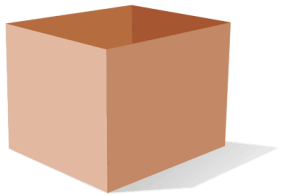
Background

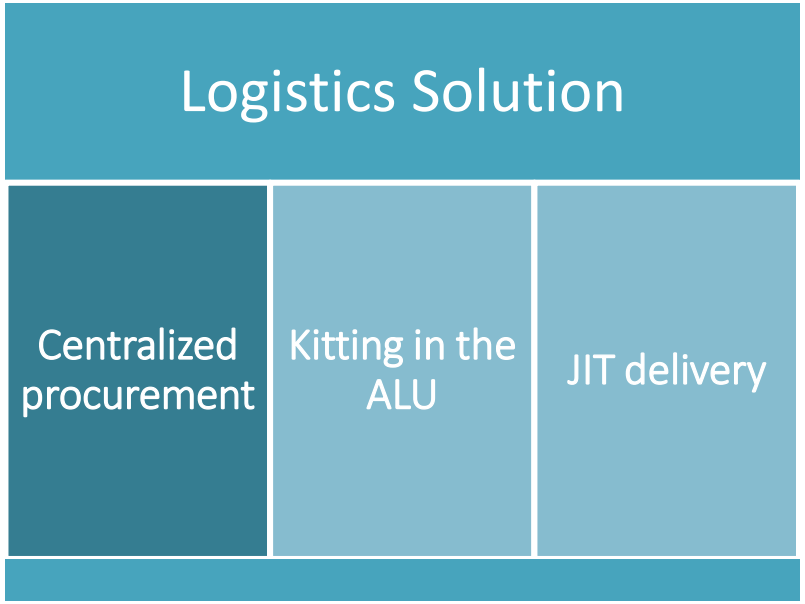
Kitting: Products or components needed in a specific assembly task are organized, packed and delivered as one package to the assembly location

Kitting can be combined with just-in-time (JIT) delivery and consolidation centers

ALU → Assembly and Logistics Unit

The solution could be a good fit for **renovation** projects





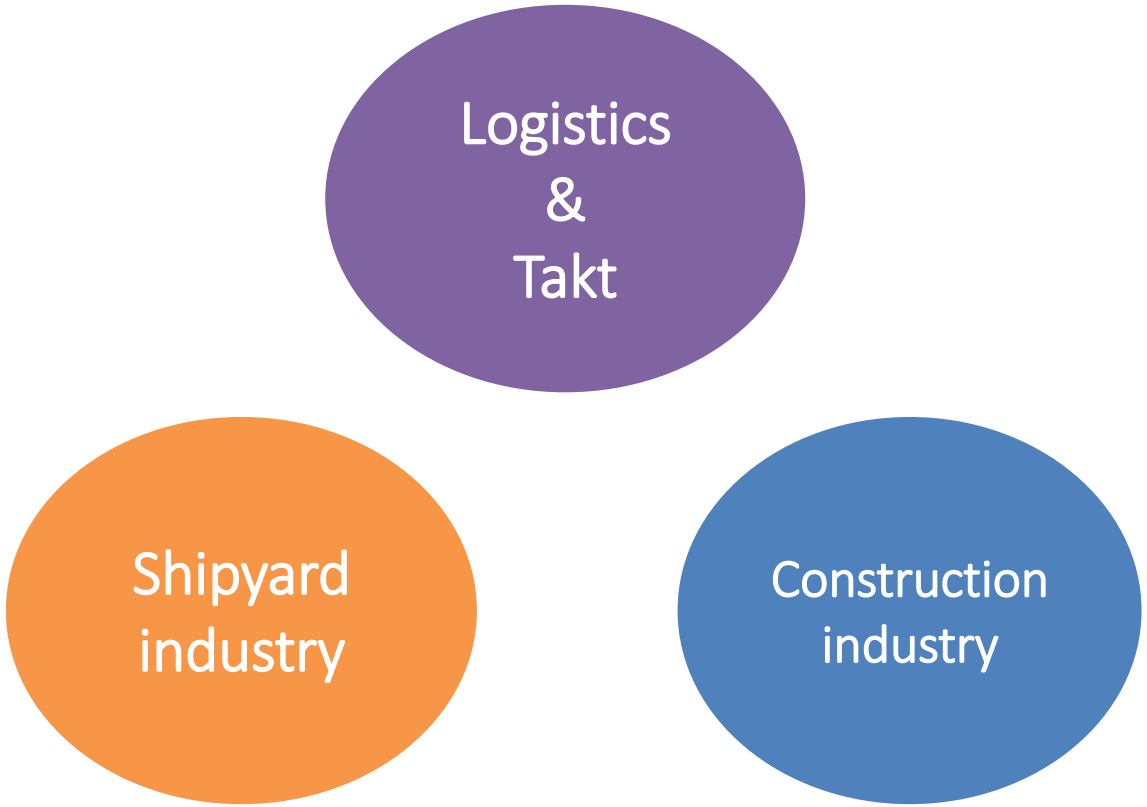
Proper logistics management enhances takt production

Method

How construction industry could obtain more benefits from takt and logistics, based on similar and more mature shipyard industry's practices?

Logistics company working in shipyard industry, extending operations to construction industry

- Interviews with the logistics service company chairman
- Document analysis from the main contractor



Findings

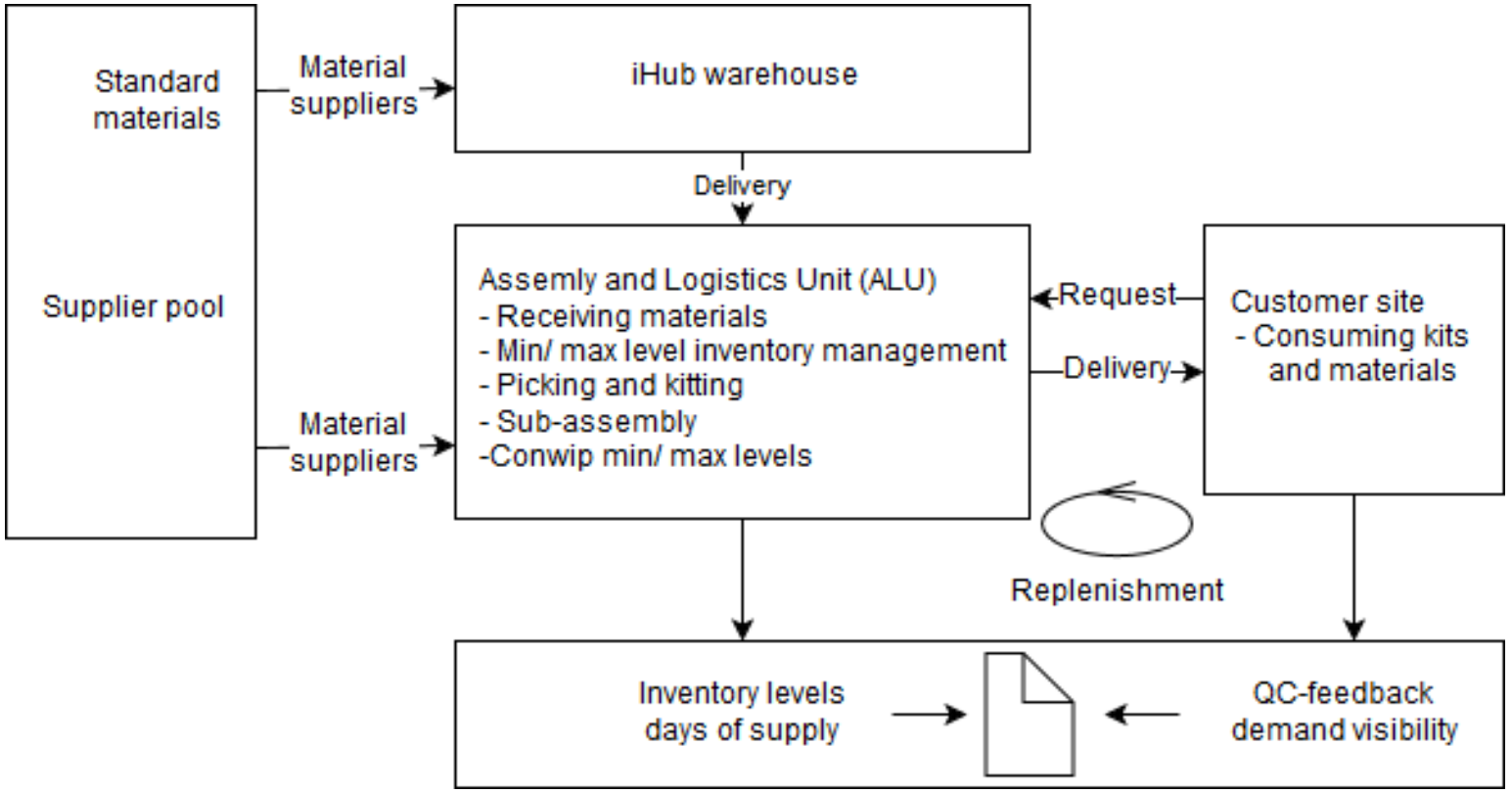
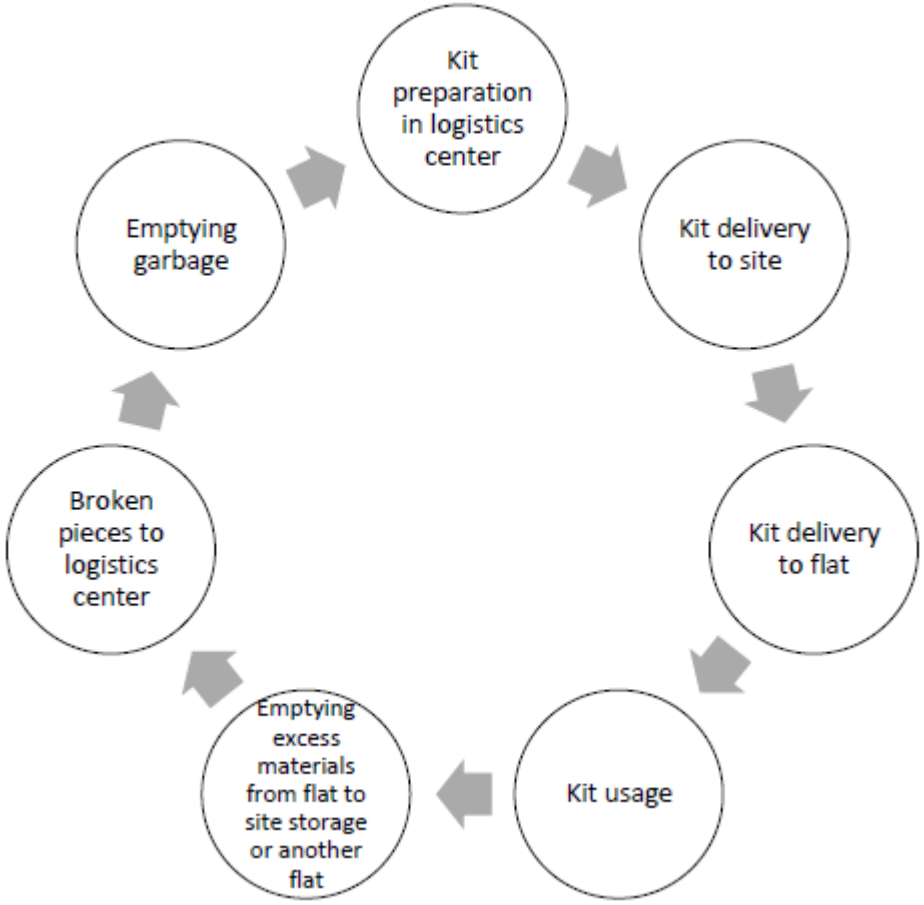


Figure 1. Operations of the logistics provider in the ALU for construction projects

Findings


Kit preparation in logistics center
Kit delivery to site
Kit delivery to flat
Kit usage
Emptying excess materials from flat to site storage or another flat
Broken pieces to logistics center
Emptying garbage

Findings

Shipyard industry	Construction industry
ALU is next to production site	ALU is located around 20 km from the production sites
Takt time is 40 minutes	Takt time is 1 day
More pre-assembly done in logistics center (20-40%)	Pre-assembly amount is limited
Shorter material picking and kitting time (3 hours)	Material picking and kitting takes longer (1 day)
All materials are going through the ALU	Some subcontractors still deliver materials directly to the site

Table 1: Differences between the shipyard and construction industries where takt production is used with logistics solution

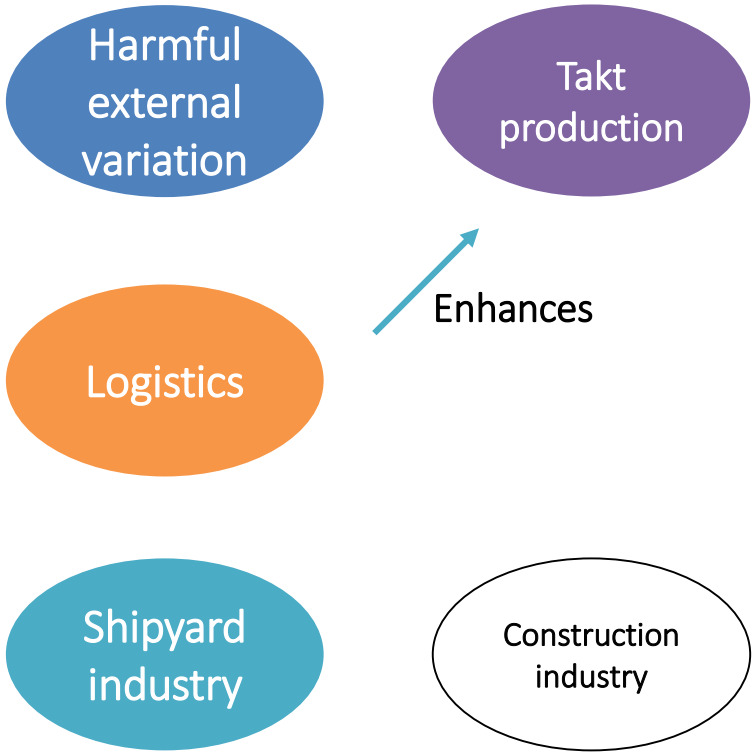
Discussion

Logistics solution with takt →
Multiple improvements in projects:

Why to use the logistics solution with takt?

1. To enforce production sequence by single flow strategy
2. Easy to control the production process
3. Centralized procurement → Material cost savings
4. Shorter lead times due to controlling variation

Conclusion



→ Material picking & kitting in logistic center

→ Procurement in centralized way

→ Delivery is JIT

Pre-assembly

→ Material availability

→ *High quality logistics and procurement management*

Future research

→ *Effects of logistics in takt with case studies, focusing on more construction operations*