Lean Construction for Improving Productivity in the Hong Kong Construction Industry Workshop

Lean Construction Status Quo, Benefits and Future Development

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Outline

• Understanding and perspectives of lean
• Benefits and drivers for lean construction
• Lean related tools, methods & approaches
• Future development of lean in Hong Kong
And what do you think about lean?

http://www.leanvalidation.eu/
Participants in Interviews

Type of the organisation of the interviewees
- Specialist Contractor: 17%
- Architect: 3%
- Manufacturer & supplier: 6%
- Institution: 27%
- Developer /client: 17%
- Contractor: 17%
- Government: 17%
- Consulting engineer: 10%

Years of experience in the industry of interviewees
- 0-10 years: 9%
- 10-19 years: 17%
- 20-29 years: 26%
- More than 30 years: 48%
Nearly two thirds are not familiar with the term of “lean”, but actually follow the lean principles in their practices.
## Understanding of Lean Construction

| From Lean Production | “Lean construction was originated from Lean production in factory.”  
|----------------------|-------------------------------------------------------------------
|                      | “For the best of my knowledge, lean is a concept for manufacturing, which is developed by auto-motor industry, it is a very good model in helping company.”  
|                      | “Lean originated from manufacturing industry many years ago. It moved to the similar context in the building industry.”  
| Reduce Waste         | “For my opinion, lean is actually a tool to reduce waste, improve efficiency and can also improve the overall turnaround time of a project.”  
|                      | “My understanding of lean construction is to eliminating waste.”  
|                      | “Mainly it’s to decrees the time waste, material waste and labor waste.”  
|                      | “Lean construction is to reduce the unnecessary waste, improve efficiency and improve the quality and safety.”  
| Minimize resources   | “In my mind, lean construction is simple for construction, simple for design.”  
|                      | “Lean construction should to minimize the material, time and cost, to achieve the maximum value.”  
|                      | “You can produce that with the minimum cost, as well as the minimum manpower, and time required.”  

The University of Hong Kong
Perspectives of Lean Construction in HK

“Actually, lean construction, in a way, in HK, if you looked at the practices, has already been played, even we don’t call it lean construction.”

“I’d like to say that lean construction is not a very common term using in HK, I seldom hear people say lean construction”

“We don’t use the name of lean construction, but we have a lot of things going on in the same direction.”

“Lean construction is new concept in HK, with little research on it”

“I think lean construction is a very loosely defined term, to be honest.”

“I think it was a term created like sometimes ago, and hearing people to talk more about it is like 6, 7 years ago in Hong Kong.”

“So for the lean, I think some of the HK government departments, they have already considered the way to improve the efficiency in order to reduce the high labor cost and labor shortage issue.”

HK does not use the term “Lean construction”, but moves in the same direction to improve construction performance.
Definitions of lean construction

Lean production is perceived as the emerging mainstream approach to main principles, ideas, and techniques as JIT and Total Quality Control.


A conceptualization of lean production in the context of construction.


Lean construction is the continuous process of eliminating waste, meeting or exceeding all customer requirements, focusing on the entire value stream and pursuing perfection in the execution of a constructed project.

Lean - raise up to **strategic systems** level?

- Lean is a **total organisational and operational approach** to business that is customer focused and people centric.

- Often thought to be no more than tools, lean is widely misunderstood, but lean is as much about the way you think and the way you feel about your thoughts.

- You will not get to be a sustainable lean company unless you have a **system** that includes **all** managers, all operatives and a skilled support team of lean leaders working as an **integral** part of your business.
Benefits and Drivers of Lean Construction

- 30-storey hotel built in 15 days
- 5 times more earthquake-resistant
- 5 times more energy efficient
- 20 times purer air
Benefits of Lean Construction

- Reduced Cost: 67%
- Reduced Construction Waste / Reduced Environmental Impact: 63%
- Improved Safety: 46%
- Higher Quality Construction: 46%
- Saved Labour: 33%
- Better Customer Satisfaction: 33%
- Reduced Project Schedule: 33%
- Improved Efficiency: 29%
- Greater Productivity: 25%
- Increased Competitiveness: 17%
- Saved Spaces: 17%
Drivers for Lean Construction

- The government (from HA or other demonstrators): 50%
- The developer/client: 38%
- CIC: 25%
- Local Institutions (general): 21%
- The government (from policy and regulation): 13%
- The contractor: 13%
- All stakeholders should be involved: 13%
- HKGBC: 8%
- The consultant: 8%
- Architects: 4%
Lean Related Tools, Methods & Approaches
Perspectives of Emerging Themes with Lean Construction

- **BIM**
  - “I think today the developer, as well as some government department has not been supporting this broadly.”
  - “To me BIM is a tool you can use for anything, whether it create lean depending on the user”
  - “BIM is a very useful tool for us to achieve lean construction”
  - “The impact is not high so far in Hong Kong.”

- **Low or zero carbon building**
  - “HK is catching now”
  - “Some of projects are complied with the green building standard, BEAM+, LEED”
  - “we already have long time focusing in energy consumption saving.”

- **Prefabrication/modular construction**
  - “Prefabrication and modular construction definitely can help to achieve lean construction.”
  - “I think in Hong Kong we use a lot of prefabrication particularly in public housing, but there is also potential to increase the percentage.”
  - “I think we should bring precast activity back to HK.”

- **Look ahead planning (e.g. Last planner system)**
  - “We may use some similar planning tools.”
  - “I do not hear about the term.”
Good Practices in Use of Improving Efficiency

- Quality control circle (QCC)
- ‘5S’ model
- Partnering
- Just-in-Time
- Sharing platforms
- Prefabrication/precast
- Modular construction
- BIM
- Critical Path Method
- Software
- Safety management

Based on 30 semi-structured interviews done in the HK construction industry
## Lean Related Tools and Techniques from Literature

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>3D modelling</td>
<td>The process of developing a mathematical representation of any three-dimensional surface of an object (either inanimate or living) via specialized software.</td>
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<tr>
<td>5S</td>
<td>A disciplined approach to maintaining order in the workplace, using visual controls, to eliminate waste. The 5S words are Sort, Set in Order, Shine/Sweep, Standardize and Self-Discipline/Sustain.</td>
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<tr>
<td>A3</td>
<td>A one-page report prepared on a single 11 x 17 sheet of paper that adheres to the discipline of PDCA thinking as applied to collaborative problem solving, strategy development or reporting.</td>
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<tr>
<td>BIM</td>
<td>The process of generating and managing building data during the life cycle of a building.</td>
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<td>Cost-benefit analysis (CBA)</td>
<td>The weighing-scale approach to decision-making</td>
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<td>Last Planner System (LPS)</td>
<td>A production planning system designed by to produce predictable work flow and rapid learning in programming, design, construction and commissioning of projects.</td>
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<tr>
<td>Lean Project Delivery System (LPDS)</td>
<td>An organized implementation of Lean Principles and Tools combined to allow a team to operate in unison.</td>
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<tr>
<td>Just-in-time (JIT)</td>
<td>A system for producing or delivering the right amount of parts or product at the time it is needed for production.</td>
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<td>Plan Do Check Act (PDCA)</td>
<td>A structured four-step approach to process improvement.</td>
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<td>Root Cause Analysis/5 why</td>
<td>A systematic method of analyzing possible causes to determine the root cause of a problem</td>
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<td>Value stream mapping (VSM)</td>
<td>A diagram of every step involved in the material and information flows needed to bring a product from request to delivery.</td>
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<td>Visual Management</td>
<td>Placing tools, parts, production activities, plans, schedules, measures and performance indicators in plain view</td>
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<tr>
<td>Others</td>
<td>Kanban, Hoshin Kanri, Failure mode effect analysis (FMEA), Constraint analysis, etc.</td>
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Emerging Topics in research on lean construction
Future Development of Lean Construction in Hong Kong
Future Development Scenarios of Lean in HK

- **Today’s solution**: This is the trend. HK is facing a lot of challenges (e.g. labor, environment, low productivity) and lean construction should be the solution.

- **Dynamics scenario**: There is a need to promote lean construction, but the future development depends on how to implement. Also it depends on the project.

- **Deferring scenario**: It will happen slowly, and next generation might use it, but not in the nearly future.
Potential Challenges to Implementing Lean Construction Standards

- People's mindset (unwilling to change or accept new ideas) 60%
- No time for introducing new ideas 35%
- Unpromised benefits 30%
- Lack of knowledge/training of lean construction 20%
- Support of the company (Boss unwilling to invest) 20%
- Limitation from regulatory framework 10%
Successful Cases are Highly Required to Promote Lean Construction

Pilot cases involving key stakeholders

“we need to do some pilot cases which include the government people, construction people, and also the relevant stakeholders. We can get all these people together, and conduct some pilot cases.”

Successful lean construction adaptors showing benefits

“If there is successful project/case with adoption of lean construction in Hong Kong as reference for the future development, the developer/client would likely to adopt the lean construction management approach in their future projects to enhance the quality and cost of the development.”

Successful examples can help to change people’s mindset

“We need to create the story and then publicise it.”

“I think there is a need to promote the idea of lean construction especially to use some successful examples.”
Collaboration is Critical to Improving Productivity and Achieving Lean

**Project:**
Early Engagement is Important

“To maximize the value, I feel sure that all the designers, contractors must collaborate in front, we can tell them if we design in this way the wastage would be more, if you do it this way, we can reduce the cost by this or that.”

“In many western companies, in the very early stage of the project, they have method teams to look into how to put work into cycles.”

“If we can visualize what we are building in the design stage, then we can avoid mistakes, and then we can minimize the waste and maximize value.”

**Industry:**
Collaboration across the industry

“There is little sharing of resources among construction firms, which need to be promoted in order to achieve lean.”

“It needs cooperation, it needs collaboration, it needs leadership, it needs people to work together, and it needs people to look long term.”

**Society:**
Collaboration across multi-stakeholders

“I think as a concept, this has to be promote, maybe joint with the government, the construction sector, university, etc., and it could be as a concept or topic that people would like to use.”

“Lean construction focuses on integration. We have to address the customer’s value.”

“If we look at the Japanese, the industry work very closely to the University, they put a lot of money in the research of earthquake, and the benefit of research goes into the industry. But in HK not enough for such collaboration.”
International Promotion of Lean Construction

- Founded in 1993 - a network of professionals and researchers in Architecture, Engineering, and Construction (AEC)
- Goal - to better meet customer demands and dramatically improve the AEC process as well as product. Through ... new principles & methods for product development and production management like lean production in manufacturing.
- http://iglc.net/

- Founded in 1997
- To develop knowledge on project based production management in design, engineering, and construction of capital facilities
- LC approach maximizes value delivered to the customer while minimizing waste.
- http://www.leanconstruction.org/

How about Hong Kong?

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<thead>
<tr>
<th>Other National Institutions</th>
<th>Year of Established</th>
<th>Scope</th>
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<tbody>
<tr>
<td>Lean Management Institute (LMI)</td>
<td>2004</td>
<td>Germany</td>
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<tr>
<td>Lean Construction Institute UK (LCI-UK)</td>
<td>2006</td>
<td>U.K.</td>
</tr>
<tr>
<td>Lean Construction Institute Finland (LCI-Finland)</td>
<td>2008</td>
<td>Finland</td>
</tr>
<tr>
<td>Lean Construction Institute of Australia (LCIA)</td>
<td>2012</td>
<td>Australia</td>
</tr>
<tr>
<td>Lean Construction Institute Denmark (LCIDK)</td>
<td>2012</td>
<td>Denmark</td>
</tr>
<tr>
<td>Lean Construction Norway (LC-No)</td>
<td>2012</td>
<td>Norway</td>
</tr>
<tr>
<td>Lean Construction Institute Israel (LCI-Israel)</td>
<td>2015</td>
<td>Israel</td>
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Thank you!

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