

Lean Construction FAQs

Answers provided by Lean Construction Institute (Greg Howell, ghowell@leanconstruction.org; and Tariq Abdelhamid, tabdelha@leanconstruction.org)

1. When did Lean Construction begin?

When current practice died. It died a slow death as the ideas and insights that form LC today came together. LC began with an insight that revealed the inability of the current planning system to produce predictable workflow. This was in the middle 1980s. A more formal start could be identified as the first meeting of the International Group for Lean Construction in 1993. We have no idea when LC will be completely defined let alone understood.

2. Is Lean Construction just applying Lean Production in construction?

No. The word "just" makes it sound as if Lean production itself were something small. Lean Construction started as an attempt to reform the way work in projects is managed. Once the obvious was understood, that work moves between specialist in construction by the administrative act of making an assignment, it was possible to adapt principles and practices direct from Toyota.

3. What is Lean Construction?

Lean Construction a different way to see, understand and act in the world. For example, waste in current practice is normally understood as labor utilization. Learning to see contingency as waste is the big step we need if we are to make a step change in construction, one commensurate with managing inventory just in time.

Lean Construction is a philosophy - a comprehensive system of ideas that lead to the flawless delivery of the built environment. This philosophy is practiced using the Lean Project Delivery System, which continues to evolve as more is learned from practice and research.

Lean Construction is the soil that allows us to “socially construct” the built environment. Lean Construction is something that people do - a philosophy or an orientation of sorts.

4. What are the major difference between a project run based on Lean Construction and one that is not?

Lean works because the work on the project is designed and managed by those who do it. LC designs and activates the network of commitments necessary to deliver the project. The “tragedy of the commons” is prevented; The individually rational decision is destructive to the overall project. The local optimization driven by labor utilization versus system optimization that is driven by throughput. Work on Lean Construction projects is deliberately and systematically organized to maximize the project and not the pieces, and

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commercial terms are adjusted to align interests, and promote improvement and minimize risk to the involved parties.

Another difference is that the construction process, the building operation and maintenance, and the recycling/salvage needs are inputs to the design and not outputs of it; inputs needed to start the work are provided and issues (waste) that prevent finishing started work are eliminated; problem solving and learning is the job of those involved in the project and not just part of the job; Where possible, materials are brought to the site in the same way concrete is; The aim is for a zero punchlist and not to zero-out the punchlist.

5. BIM aims to build a collaborative relation between designers and constructors, so how is that different from LC?

BIM is technology. It doesn't aim, it does make possible different conversations. LC structures those conversations and connecting design, logistics and installation. LC designs and activates the network of commitments necessary to deliver the project. It is necessary to enable Lean Construction ideals but not sufficient.

6. Is Lean Construction like LEED where you have to commit to a certain level of compliance and the project is checked against that?

No. Lean is a way to manage and improve work. LEED and GREEN are value propositions - an end. Lean Construction is the means to better arrive at that end.

7. What percentage of the US construction industry is adopting it?

There is now way of knowing. Lots of hospitals, lots of suppliers etc. There is still time to be an early adopter.

8. Is Lean Construction accepted more in other countries than in the US?

We have no way of making a well grounded assessment. There is significant implementation in Germany, UK, Denmark (the longest running with strong Union support, Sweden, Brasil, Chile and Peru. I would not say the US is ahead.

9. What is the primary difference between Lean Production and Lean Construction?

- Lean production is the inspiration for lean construction, but cannot be grafted onto construction.

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- Production & construction are different; construction is more like ship-building or airplane-building, where the workers move and the product is stationary instead of the product moving between stationary workers like in production.
- In production, typically the same part is produced in mass volume. This is not the same as construction, unless major generalizations are made (i.e. a wall is a wall, even if made of different material and on different projects). So, lean construction focuses heavily on the similarity in the process of constructing more so than on the product of construction.
- Sven Bertelsen holds that we need to move from construction on to project production in general because he sees the project as the basic form of production where mass production is just the simplified version Toyota and Shingo showed us new thoughts but we have to establish our own thinking.
- Lean Production primarily focuses on the reduction of the time from order, of any transaction be it assembly, billing, supply, etc, to delivery. This reduction of time is achieved by the elimination of waste (the unproductive use of resources) that is captured in “DOWNTIME”. Respect for people and continuous improvement guides the reduction of waste. Lean Construction has been inspired by this but also by other paradigms. Production in construction is conceptualized as a transformation of inputs to outputs through a flow process of materials and information that is directed at maximizing value to the client. Lean Production is not about maximizing value to the client, otherwise, we would have had the Cadillac for the price of the Chevy, the Lexus for the price of the Camry, etc. Lean Construction also draws on the new theories regarding project management as well as social science, and complexity theory. A construction project is really a project-based production system.

10. Can the concept of Heijunka be used in construction? Why?

- Heijunka = production leveling. Production leveling for a manufacturing plant relies on being able to “create” stable demand, so that the Takt time for the plant is constant. Toyota does this through its marketing and sales division. The TPS is so vulnerable otherwise. Of course, it is not always perfect but they strive for this stability, especially with tactics such as mixed-model production.
- In construction, we are project-based and we know what needs to be done for a project – the quantities are known, with a time and budget constraint. What we need is stability and reliability in the workflow so that we are not going in fits and stops. We achieve this using the Lookahead and weekly work planning process

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with a constraint screening process, and not just an FYI coordination meeting. The act of keeping a workable backlog is designed to keep work flowing and progressing.

- The use of the line of balance (linear scheduling, flow lines) is a nice tool to visualize the production rates of different activity and avoid the interruption of work as well as the problem of overproduction. However, in Lean Construction we don't want to see one crew finish too fast or too slow.
- Crew balancing is not an example of heijunka. Crew balancing may lead us to locally optimize at the expense of the system throughput.

11. Contrast “lean work structuring” with “work breakdown structure”.

- A WBS should not be used as the sole planning tool for a project. It is a great brainstorming tool to understand the project. It is probably the best scheme to develop a MASTER schedule. The problem is that we use it for more than what it is capable of. We can't determine project cost and project duration by simply working the WBS. The WBS is looking at activities in an independent fashion in support of transformation thinking. The WBS assumes that optimizing the part will optimize the whole – reduce the part cost and duration and you will reduce the cost and the duration of the whole. Get the lowest price and the shortest time for drywall separate from electrical and plumbing and you find on site that the work of these three trades is so intertwined that the cost and duration you received for drywall was a pipe dream.
- A WBS is a tool to use in Lean Work Structuring.
- LWS is thinking production, operation, maintenance, and recyclability during design. It also focuses on work package (not trade or contract packages), i.e. the wall, or the ceiling.

12. What are the differences between project control and production control?

- Project control monitors progress using lagging indicators such as schedule and cost variance. It is sometimes too late to do anything about the project going off-track or it takes too much to get it back on track. So, project control is reactive. Think of the stock market. The DJI - Dow Jones Industrial Average – only tells you what has happened to the market after the fact. It's like taking the temperature of a patient – it tells you whether the person has a fever but not why.

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- We need to practice production control such that we make things happen to prevent the project from having a fever. Production control is pro-active in the sense that you are doing all that you can to make work happen by removing the constraints that you know about.

13. Is Value Stream Mapping (VSM) a tool for construction?

VSM has a place in construction. In fact, it is probably being implemented but we just don't know about it. And this applies to many other tools and techniques that are being used to enable the lean construction ideals, but we don't know about them. The Last Planner System is one example.

As far as VSM is concerned, it provides a big picture view of the flow problems in whatever system you are studying. It's a flow improvement tool and not a process improvement tool (flow kaizen vs. process kaizen). A great bottleneck finder.

VSM has been applied to reduce the time for processing specialty contractor payment applications (from 40 days to 5 or so – see IGLC11 in a paper by Mastroianni). An architecture office also is using it for streamlining the submittal and show drawings review and approval process because of delays and complaints by contractors. An example for application on a construction site is that of a construction company that specializes in suspended ceiling and drywall installation. They used VSM to identify time that drywall sheets and tiles spend before being put in place. They used the results to justify the cost of using a temp warehouse (supermarket) close to the site and deploying a pull delivery system (the best they could do). The result, using the SAME installation process, was less time per SQFT because material handling was almost down to single touch – from the truck to the installation location. Interestingly, they then used work sampling techniques (as described in Oglesby, Parker and Howell 1989) to improve the drywalling process itself.

In Brazil, VSM is being used mostly by academics. As any other tool developed for manufacturing it needs some adaptation in order to become useful for construction. Some of my colleagues at the University of Campinas (UNICAMP) have developed some innovative applications of VSM for administrative and design processes and also as part of production system design of construction projects. They have published a few papers in previous IGLC conferences.

14. Is Integrated Project Delivery the same as Lean Construction?

No. In fact, the ideals of Lean Construction are enabled by using the Integrated Project Delivery approach. IPD is necessary but not sufficient. In other words, just having an IPD will not guarantee that we meet the Lean Construction ideals.

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IPD is a Relational Contracting approach that aligns project objectives with the interests of key participants, through a team-based approach. The primary Team Members would include the Architect, key technical consultants as well as a general contractor and key subcontractors. It creates an organization able to apply the principles and practices of the Lean Project Delivery System.] (Matthews and Howell 2005). IPD is defined at <http://www.leanconstruction.org/glossary.htm>. For more information see http://www.leanconstruction.org/lcj/V2_N1/LCJ_05_003.pdf

[IPD is a registered business mark by Lean Construction Institute with the US PTO]

15. What is Integrated Lean Project Delivery?

Integrated Lean Project Delivery (ILPD) is a process trademarked by The Boldt Group. It was created and is practiced by The Boldt Group's subsidiary, The Boldt Company. The process aims to eliminate waste across the construction value chain, through evaluation of initial planning and design, and examination of construction processes to predict where and when waste will occur, which is then eliminated through the use of lean tools in the IPD process. An ILPD contract is a multi-party agreement that specifies the use of lean practices as conceived in the Lean Project Delivery System. This distinction is needed because Integrated Project Delivery (IPD) is now only referring to the multi-party agreement regardless of what practices are used, the so-called IPD-lite or IPD-ish.