Construction sector transformation

The productivity drivers: lean construction

Engaging with better process: part one
The productivity drivers: lean construction
Lean construction

The EY E&C Sector Transformation model is focused on two productivity multipliers: process and technology. For organizational development to be truly transformational, it will need to include integrated strategies covering both sides.

“We set out on the journey three years ago; working towards safer, better, faster, leaner delivery... quickly learning that architecture and data exchanges needed to be more dynamic and transformation needs to occur across the enterprise, not just in an area of isolation.”

— David Wilson,
Chief Innovation Officer, Bechtel

What is lean construction (Lean)?

Lean construction moves the paradigm from looking at construction as “projects” and an “engineering challenge” to a “production system” across projects.

Lean construction is about improving construction processes to achieve improved quality at a lower cost and in a condensed timeframe. Being focused on compressing time to complete forces coordination between different functions and trades, which creates a healthy tension in the process. This works to expose problems that were always there but not visible. That practice is counter to the typical dynamic of covering over problems, e.g., by building in contingencies.

Culturally, leaders play an important role in coaching people at all levels of the organization to enjoy exposing problems and systematically eliminating their root cause(s), through improved processes, as part of daily work.

“Lean is getting your operations optimized to a new level. Your operations carry your op-ex and your op-ex is what drives your market.”

— Stacy Scopano,
Innovation, Development & Construction, Skanska USA

“... the discussion around BIM and Lean is absolutely valid. Is it going to become the standard? Absolutely, in the next five to ten years. Is there across the sector enough investment going into realizing the benefits? Absolutely not.”

— Sheldon Morris,
VP Commercial & Risk, El Seif Engineering and Contracting, Saudi Arabia

Lean construction (Lean)

A process improvement discipline that maximizes value creation by continually optimizing the flow of activity and improving quality while reducing underlying costs by cutting time, effort and waste.

“Digital construction is essential to capture the benefits of automation, live data in the field, connecting to reduce fragmentation, integrating productivity enhancing technologies, etc.

Lean ensures the underlying operations being automated are optimized to begin with. Transforming both process and technology leads to exponential benefits.”

— Peter Campbell, EY Partner
Lean Practice Leader
Why is lean construction transformational?

Project to production: When moving the paradigm from construction as projects to a production system across projects, benefits carry across projects resulting in a continuously growing competitive advantage in the market.

Construction is a fragmented process with the general contractor, individual trades, external architect and engineering firms and multiple suppliers each operating as separate functions on a project, which regularly affects time, quality and cost. Lean construction integrates this fragmented process and optimizes the production system to enhance the flow of value. It requires stakeholders to work together from the outset, as precise synchronization of efficient and reliably executed tasks is the only way to compress as much value creation as possible into the shortest possible lead time.

Example shifts in thinking:

- From: taking cost out of the project, to: taking costs out at the underlying process level and then carrying new processes over to the next project as the new baseline/standard
- From: quality costs money, to: quality is essential and saves money, as any quality issue interrupts the flow and has knock-on effects, as well as the direct costs associated with material wastage, re-work and downstream warranty issues
- From: we’ll work out how to get it done, just allow some contingency time, a couple of extra staff and some just-in-case materials, to: we have a clear plan for how we want to execute, where we can’t follow that plan, let’s highlight that issue, mitigate its impact for now, but also recognize it as a problem and see if we can eliminate the root cause for next time.
- From: no problems, so it is going well, to: “no problems is a problem” – we should be adding tension to expose the next level of underlying issues (that were always there), e.g., trying to do it faster, or with one less person.
Waste in construction

While the focus of Lean needs to be improving the “flow” between value-adding steps, which promotes a system-wide perspective, identification and elimination of waste is fundamental and particularly relevant to construction.

A simplistic pursuit of waste “elimination” can simply result in one waste being swapped for another. The underlying issue is poor balancing of capacity, which could be related to unevenness (see “Lean recognizes three types of waste”). An understanding of the system of Lean, including how all these wastes are symptoms of an underlying process, is important when trying to diagnose and eliminate the root cause(s).

An essential part in closing the construction sector productivity gap is through process improvement, providing a more evenly scheduled workload and achieving overall synchronization. Flow is key to safely compressing lead times and maximizing value creation relative to resources invested.

Benefits of Lean

**Safety:** good lean processes will considerably enhance safety, a non-negotiable when designing processes. Careful synchronization, smoothly balanced workloads (versus overburden and stress), standardized and consistently executed tasks all contribute to reduced risk of injury. Culturally, the concepts of exposing problems that were always there and systematically eliminating their root cause(s) applies to safety improvements as much as it does to quality, flow or efficiency. One of the major premiums of Lean construction has been shown to be the health, well-being and job satisfaction of staff and contractors, with increased retention and job satisfaction rates relative to non-lean construction sites. Inevitably, secondary benefits will include improved reputation and reduced insurance premiums.

**Profitability:** More efficient execution of task resulting in higher labor productivity and reduced rework and waste lowers material consumption. Better synchronization of trades and materials flow means subcontractors can come in and complete their tasks without blockages, resulting in lower quotes and enhanced reputation/partnering. The ability to complete the building significantly faster will be a competitive advantage and sharing of the financial benefit will lead to better price for the client and more sustainable margins for the construction company.

**Cash flow:** Lower inventories and faster build times can have a significant impact on working capital.

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**Mini case study:**

**high-rise apartments**

The construction company decided to stress its processes by setting targets to progress through the floors more quickly while simultaneously reducing staff numbers. This exposed underlying problems of getting materials organized and delivered to the floors to speed up construction and the need for waste to be removed more quickly. Both required hoist/crane time and would normally need additional staff rather than less. The root cause analysis showed that materials were being delivered in packs, rolls and boxes and materials shared the hoist with people. Waste had to be removed and leftover materials needed to be moved to the next floor. This drove the organization to implement a system of bins with pre-cut and organized materials, prepared by the subcontractor off-site. These were delivered to floors in advance of staff/trades arriving to those floors. The new process eliminated much of the waste or leftover materials, requiring fewer staff and time to remove waste off-site or leftover material up to the next level. It improved speed of construction as staff and trades could start immediately on arrival with time saved on carrying, measuring, cutting and moving.

The important part of this case study are the thought processes more so than the solution, which will continue to develop in order to deliver further reductions in staff, movement of materials, and duration of build, as well as, increases in quality.
Lean recognizes three types of waste

1. Unevenness
   - Unevenness is being busy in one time period but idle during others, resulting in the waste of idle capacity (waiting)

2. Overburden
   - Overburden waste occurs in peak periods; the stress can result in injuries, defects, schedule disruption, etc.

3. The waste of non-value adding activities
   - Transport: unnecessary transport of product, materials or information
   - Inventory: work, or material waiting to be processed, i.e., a queue/delay in the process consumes working capital
   - Motion: a worker or machine doing more movements than absolutely necessary to complete the process
   - Waiting: this is a person, or resource (e.g., crane) idle, waiting for work to arrive (as distinct from the work waiting for the resource, which is inventory waste)
   - Overproduction: when a fast process feeds a slow process and does not adjust capacity to match the slower pace (results in inventory)
   - Over processing: an activity extending beyond the point of adding value for the customer
   - Defects and rework: rectification requiring effort that can be avoided by understanding and eliminating the reason(s) why the defect(s) occurred
   - Skills: where people's skills are not utilized to the full benefit of the organization

Lean transformation – getting started:

1. Get the right advice – look for a deep understanding of Lean, a track record of delivering impressive results and advocacy from past clients.

2. Begin with a rapid scan to identify the best place to focus – some problems matter more than others.

3. Run a pilot; the skill includes selecting the area where improvement will drive maximum impact and knowing how to extract the benefit.

4. Be explicit on the problem you are trying to solve and how you will measure success.
   Demonstrate quantified performance uplift in your pilot area to build momentum for the program. With the right thinking and approach it should be possible to halve timeframes and achieve productivity uplifts of 20-40% over just a few weeks within the pilot area.

5. Build understanding of the underlying principles and engage with your staff doing the work – create ownership of the solution and “know why” as well as “know how.”
   “Many people believe that when implementing a new system only the know-how is required. However, if you want to succeed, you must understand know-why as well.
   With know-how you can operate the system, but you won’t know what to do should you encounter changed conditions. With know-why, you understand why you have to do what you are doing and hence will be able to cope with the changing situations.”
   – Shigeo Shingo

6. Develop leaders – change cannot be outsourced or delegated. Both front line leaders and senior management are key to developing the culture, building momentum and achieving sustainability. Your leaders need to develop your organization’s lean future state, continually align the organization to it, understand lean principles in detail, learn and model different behavioral routines and adopt specific coaching styles to develop their people’s problem-solving skills.
   “Instead of getting trucks out of way, we are trying to force resources around a blockage. By stepping back and orchestrating the independent functions to all execute their parts in a project, you create flow and gain efficiencies and achieve much better outcomes than when the whole battalion is pushing forward, tripping over each other.”
   – Stacy Scopano,
   Innovation, Development & Construction, Skanska USA
EY point of view

Lean construction is the quadrant demanding the greatest paradigm shift for the construction sector while at the same time offering significant commercial reward. Combined with digital and BIM, and driven by transformational leadership, lean construction has the potential to create productivity improvements that companies not engaged in transformation will find hard, if not impossible, to compete with.
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