Lean Management is a Game-Changer for Facility Design and Construction
Implementing Lean Fundamentals Presents Adaptive Challenges and Cognitive Impairments, but Big Payoffs
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Lean principles, originally popularized by Japanese automakers like Toyota, are also transforming the traditionally cumbersome method for planning, building, and operating large capital construction projects. Traditional efforts to streamline facility projects in order to realize cost savings often fail because the industry-established planning processes and contracting structures are rife with inefficiencies and waste. A Lean approach to facility design and construction can result in considerable cost-savings by eliminating unnecessary steps and aligning owner expectations with final outcome.

While Lean tools—such as performance-benchmarking, core teams, and risk-sharing propositions—represent obvious benefits to building owners, the real power of the Lean construction model comes from an overall dynamic shift in how strategic goals are met for large-scale facility projects in increasingly capital-constrained environments.

According to John Nelson, a construction industry specialist and adjunct professor for the College of Engineering at the University of Wisconsin-Madison, eliminating the extensive legacy waste problems long associated with traditional project delivery methods, requires instigating wide-scale adaptive change across the entire planning, construction, and delivery process.

“We have all these systems in place that need to change rapidly. This creates a set of adaptive challenges whose scale and complexity are so large that the gap between where we are and where we need to be cannot be closed simply by modifying existing behaviors,” says Nelson.

To create the “game changing” circumstances for Lean to work, it is essential that the fundamental elements are established early. New vocabularies require clear, mutually understood definitions and it’s important to aim high at the outset by establishing the most optimistic goals possible.

“The make or break time for Lean is at the beginning, not at the end. If you design a capital project traditionally, and then go into the field and try to make it Lean, the cognitive impairments of your team can prompt them to revert to normal behavior and nothing will change because they haven’t really made up their minds about it yet,” says Nelson.

Overcoming Cognitive Impairments
A common obstacle in the implementation of Lean process is overcoming what Nelson refers to as “cognitive impairments”—or the preexisting bias of deeply entrenched industry mindsets.
“The facilities business has all these attributes associated with it that make change difficult. Our individual professions confront this and often get stuck on a cognitive impairment, especially the design and construction community,” says Nelson.

Powerful Lean tools that can help overcome cognitive impairments and adaptive challenges include:

- Establishing measurable goals at the outset
- Adhering to reliable promises and personal accountability
- Pull planning — the process of working backwards from the desired outcome to the current condition

“Lean is about eliminating waste. It’s not just about applying a bunch of tools. It’s an organic function of the enterprise. You have to strike the right balance between creativity and economy because facilities—whether it be their operation and maintenance, or their planning—are inherently unique,” says Nelson.

When organizational efforts at Lean fall short, it is often due to a failure to connect the original intentions with the ultimate results.

“Often, there is insufficient follow-through because these new collaborative project teams can blur the lines of individual accountability, but Lean is something that must be measured, not just felt,” says Nelson.

Nelson emphasizes the importance of adhering to the principles of “reliable promising” in making Lean work.

“If your team is achieving more than 90 percent in the weekly performance measurements of promises kept, you know you’re doing pretty well. Less than 70 percent is an indicator that something, or someone, needs to change. Often you’ll assemble a team of people who make a verbal commitment to Lean at the beginning, but don’t really understand what it means organically, and they’ll revert right back to business as usual. The earlier you can identify those people and get them off the job, the better,” says Nelson.

New Risk Propositions

One of the primary differences between Lean and traditional project delivery is a fundamental change in the distribution of risk. Traditional models of risk allocation perpetuate inherent conflicts-of-interest that result in wasteful outcomes including: frequent change orders, increased project costs, unseen construction shortcuts, and possible lawsuits. Under the Lean “integrated delivery” model, the risk is more equally shared among all parties—owner, designer, and contractor.
The traditional method for designing large facilities happens in a sequential, “pass the responsibility,” reactive process, while the Lean model depends on a concurrent proactive team approach. Lean construction principles focus on the end product and ongoing process development simultaneously, striving to eliminate unnecessary steps along the way.

“There is an initial creative planning period that is followed by a period of transition and execution. The key is striking a balance between the need to be creative at the beginning of the process and the need for efficient economy in the execution,” says Nelson.

Achieving this balance often depends on the actions of a select few individuals, which is why it is critical to have an egalitarian core team that oversees the project.

“It’s more a function of the individual than it is the institution, because leaders can come from a design organization, from an owner organization, or from a third party. The entities that I’ve seen do this right have a very unique set of committed individuals making it happen,” says Nelson.

Another adaptive challenge to Lean is achieving project balance between the loyalties of all the parties involved. The traditional linear construction method compels each party to act in their own interests because there is no shared risk to bind together the owner, architect, and contractor. Success depends on assembling a core team made of members who won’t defer to organizational loyalties over project loyalties when things get difficult.

“Of course, there are still the traditional risks for the owner, contractor, and designer, but the challenge with collaborative teaming is that everyone needs to be working towards the common goal in order for a Lean process to work. It really is about collaboration,” says Nelson.

**Changing the Game**

Implementing Lean is about eliminating wastes and refining processes. When successfully executed, Lean can cut project costs and time expenditures by more than a third of what traditional methods demonstrate. The challenge is achieving the fundamental level of cultural and systemic change required for a truly integrated and cooperative approach.

“One big caution is to not fall victim to the romance of the tools. Lean is greater than the sum of its parts. A common trap is adding all these tools to the existing process and calling it Lean,” says Nelson.

This sort of “Lean Washing” can do more harm than good by adding unnecessary steps, rather than eliminating them.

“Lean is a transformative way of thinking and then acting. There is no easy button. If you try to do this incrementally, you will probably fail. So it is critical to start at the beginning and
approach it holistically,” says Nelson.

By Johnathon Allen

This report is based on a presentation by Nelson at the Tradeline's Lean Processes for Facilities Management & Capital Projects conference.

Biography

John Nelson, PE, is a design and construction industry consultant and adjunct professor in the College of Engineering at the University of Wisconsin-Madison. His consultancy focuses on critical analysis, marketplace strategy, sustainable development, and lean building practices.

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Figure 1 - Eliminating Legacy Waste

Eliminate Legacy Waste = Eliminate Unnecessary Steps

Traditional Process

| Program | Schematic Design | Development | Construction Documents | Bidding | Construction | Commission & Move |

Lean Process

CREATE  TRANSITION  EXECUTE  DELIVER

1/3 - 1/2 < than traditional

Hint: Eliminate Whole "Phases" or "Tasks"
Hint: Think "concurrent", not "consecutive"
Hint: Think "proactive", not "reactive"

Lean planning and construction can shorten delivery time from 30 percent to 50 percent over traditional linear project delivery. Lean depends on an integrated proactive planning strategy to anticipate problems and eliminate wasteful steps by utilizing pull-planning, reliable promising, and other “game-changing” tools. (Image courtesy of University of Wisconsin-Madison).
Adopting a Lean approach requires fundamentally changing the way large capital projects are planned and executed. Nelson’s “Game Changer Checklist” gives organizations an overview of the components necessary to revise the project delivery process. At the fundamental level it’s critical to clearly define vocabulary and expectations for all members of the core team. Tools and Metrics, such as pull planning and reliable promising, provide concrete mechanisms for an integrated approach. Properly, executed Lean processes redefine the risk proposition for all parties, eliminates waste, and redefines the leadership model, which sets the tone for Lean operations. (Image courtesy of University of Wisconsin-Madison).

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