



Lean Construction

Eliminating the Waste

BY LAUREN PINCH

Industry Trims Its Waistline With Emerging Project Management Method

In a fast-paced world, it's no wonder that "lean" is the latest buzzword to describe everything from cuisine to business strategies. The slimmer, the more streamlined, the better.

So why shouldn't construction go lean?

As most construction executives know, the industry can be susceptible to wasteful spending, delays and project inefficiency.

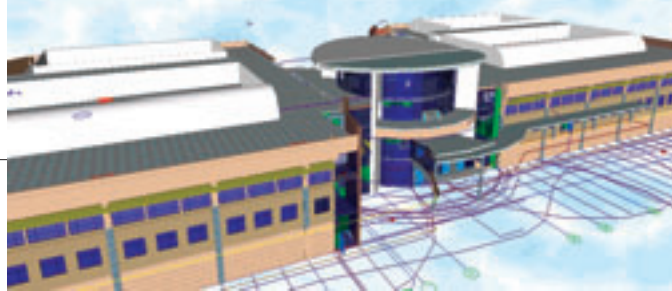
Many project management approaches have emerged to improve performance—value-engineering, partnering and design-build to name a few.

Lean combines concepts from these approaches with principles drawn from production management to create a new way to manage projects.

Lean construction, as defined by the non-profit Lean Construction Institute (LCI), is a production management-based project delivery system emphasizing the reliable and speedy delivery of value. The goal is to build the project while maximizing value, minimizing waste and pursuing perfection—for the benefit of all project stakeholders.

Primarily, lean construction aims to reduce the waste caused by unpredictable workflow. Waste is defined in seven categories: defects, delays due to waiting for upstream activities to finish before another job can begin, overprocessing, overproduction, maintaining excess inventory, unnecessary transport of materials and unnecessary movement of people.

DPR is using 4D modeling technology to build the Camino Medical Group building as a lean project.



DPR CONSTRUCTION, INC.

By first focusing on workflow, lean construction unplugs clogs in the project stream. Planning, engineering, design, construction, production and delivery of materials are all better coordinated to deliver maximum value for the project owner.

This approach, while it sounds simple, requires a fundamental shift in how planners, designers and contractors conceive and manage projects, Greg Howell, co-founder and managing director of LCI, says.

Founded in 1997 by Howell and Glenn Ballard, its research director, LCI developed the Lean Project Delivery System (LPDS) and the Last Planner System of Production Control, applying principles pioneered in manufacturing to construction.

LPDS finds its origins in Lean Production Management, a manufacturing approach made popular by Toyota Motor Company in the 1980s. A Toyota engineer by the name of "Ohno" first coined the term. He insisted that workers stop the production line rather than release a defective part downstream. Ultimately, this approach streamlined workflow, minimized inventory, and improved end-product quality.

The same idea applies to construction: Don't release defective or incomplete work into the process.

But LCI research has shown this happens more often than contractors would like to admit.

"There was a need for a new method because of the widespread dissatisfaction with project management," Howell says. "Most people attribute the problems to bad luck or working with the wrong people, and fail to understand the roots of the problems are in the ways projects are managed."

Howell and Ballard cast a critical eye on systems that allow for defects and waste and ignore the interrelationship between

individual project tasks.

Traditionally, construction projects are first broken into activities, with the activities placed in a logical order, and estimates for time and resources then prepared for each activity, Howell explains. To reduce overall project costs, contractors try to reduce the cost of each piece in the schedule. Safety, quality, time and cost are measured in terms of negative variance from standards.

But this traditional thinking often ignores the big picture. Instead, lean focuses on how one activity affects the next. Craftworkers and other specialists share workloads to maintain a steady workflow and take responsibility for product quality. With the lean method, the project is more about the whole than its pieces.

"The aim is to improve the performance of the entire delivery system, rather than reduce the cost of any one activity," Howell says. "Where current project management manages projects as more or less independent activities, lean works first to assure the reliable flow of work between the tasks that make up the scheduled activities."

Lean construction principles include:

- Establishing integrated teams of owners, architects, facility users, builders, specialty contractors, subcontractors and suppliers;
- Combining project design with process design, simultaneously designing the facility and its production process;
- Stopping production rather than releasing a faulty assignment or product into the construction process;
- Decentralizing decision-making, empowering project participants and making the process transparent so any team member can see the state of the project; and
- Requiring a simple, direct handoff between tasks in the work stream, with a clear way to request action and receive a response, to eliminate clogs between project phases.

COLLABORATION AND ACCOUNTABILITY

In lean construction, collaboration beginning early in

design is extremely important. Everyone is a stakeholder in the project. It incorporates the ideals of relationship-based contracting, meaning everyone on the team must keep their promises.

Don Wojtkowski, network director for design and construction for SSM Healthcare, St. Louis, Mo., says tracking whether promises are kept serves as an education tool for project improvement.

"The projects are actually networks of commitment," he says. "If one person fails to make the commitment he promised, it's a domino effect on every stakeholder in the project."

Lean construction requires bringing subcontractors, foremen and superintendents to the planning table because their roles affect the overall project schedule.

Wojtkowski is one of the team members pioneering lean construction methods for two large hospital projects for the SSM Healthcare system.

The first project, a renovation of Cardinal Glennon Hospital for Children in St. Louis, was already in schematic design (using traditional project management methods) when the team decided to change it to a lean project. Now approximately a year away from completion, the project already has seen a number of successes as a result of lean.

The utility relocation—often a major challenge for projects taking place in operating hospitals—went smoother than ever before, as a result of inviting the foreman and job superintendent in the early planning stages.

SSM Healthcare also is incorporating lean in a new 158-bed replacement hospital project, currently in the plan-

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ning stages. SSM contracted with the Alberici Group, Inc., St. Louis, as construction manager for both lean projects.

ADOPTION BY THE INDUSTRY

“If you talk to the design and construction community, most of the ideas that sur-

round the lean construction philosophy are things they’ve already been saying for years,” Wojtkowski says. “What the lean methodology does is give us the platform we need to bring it all together. We’re trying to do those things we’ve known for years would benefit the project.”

Howell says lean construction has dramatically reduced jobsite accident rates, with rates being reduced by up to a half of the norm. Cost reduction can reach up to 25 percent compared to the traditional project management approach, he says.

“People will often dismiss these claims. They will say the owner was smart or the project team got lucky,” Howell says. “Or they will claim, ‘we’re already doing that.’”

These attitudes begin to change when people understand the difference between current practice and lean.

As LCI holds seminars and word gets out about the approach, more and more owners, designers and construction firms are showing interest and testing the waters.

Firms giving lean a try include The Boldt Company, Appleton, Wisc.; DPR Construction, Inc., Redwood City, Calif.; Herrero Contractors, Inc. San Francisco; Integrated Project Delivery, Orlando, Fla.; Linbeck Construction Corporation, Fort Worth, Texas; Messer Construction Company, Cincinnati, Ohio; and Southland Industries, Irvine, Calif.

“In general, people are intrigued by the idea and trying it out in different ways,” Howell says.

Hospital project owners are some of the first to get on board. Sutter Health, a major hospital system in Northern California, recently decided that its next \$6 billion in projects will be delivered on a lean basis.

One of its contractors, DPR, has incorporated lean practices to enhance efficiency and provide added value to customers.

“Lean leaves no stone unturned to deliver more value,” says Dean Reed, a project planner for DPR, who is currently engaged in lean construction planning of a new \$160-million, 250,000-square-foot medical office building in Mountain View, Calif., for Camino Medical Group, an affiliate of the Palo Alto Medical Foundation and Sutter Health.

“We’re looking at each step of the building process and ways to promote

continuous workflow to create reliable workflow throughout the project, closing the gaps as we hand off work from one party to another,” Reed says.

One of the tools DPR is using is 4D modeling technology, which shows how the pieces will be assembled over time by linking 3D objects to the construction schedule. The project team will be able to see interferences and coordinate installations well before crews are onsite to build the project.

In addition, the team is examining methods for reducing material waste. The project includes demolition of a 297,000-square-foot building and site paving that will generate nearly 25,000 cubic yards of crushed concrete. The crushed material will be used during the construction of the medical office building and an adjacent 420,000-square-foot parking structure.

DPR says the process will save an anticipated \$450,000 in transportation, material and landfill fee costs, as well as generate savings through selling the balance of the unused, crushed material.

“We think the industry will change as owners begin to adopt [lean], and that’s an exciting prospect,” Howell says.

He admits that lean is sometimes a hard-sell, and it will take time for a major change to occur. Those who don’t see the need to incorporate lean methods may be saying, “my competition isn’t doing it yet, so I don’t need to,” he says.

Teams that are implementing lean methods are still learning from their experiences.

“We’ve recognized that we need to just jump into it and learn as we go, and not be afraid of making mistakes,” Wojtkowski says.

Why go lean? It’s simple, he says. “If we can get the construction community to embrace these methodologies, it will make every person involved in the construction project perform their jobs better. And I think that’s exciting,” he says. “It will make us better, more efficient and probably more profitable.”

For more information, visit www.leanconstruction.org.

Pinch is a staff writer for *Construction Executive*.