

LEAN Construction Delivery – WHITE PAPER

URL: WWW.4BT.US

Contact:
INFO@4BT.US

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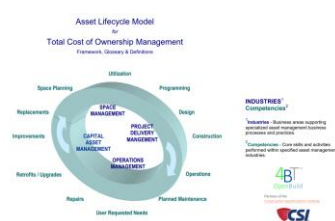
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Introduction

LEAN Construction Delivery¹ can significantly improve quality, productivity, and overall levels of satisfaction for all participants and stakeholders.

The adoption of robust LEAN management practices and workflows, change management, and technologies, has been shown to enable the consistent delivery of quality renovation, repair, maintenance, sustainability, and new construction projects on-time, on-budget, and to the satisfaction of all participants and stakeholders.



LEAN CONSTRUCTION DELIVERY DELIVERS SIGNIFICANTLY IMPROVED OUTCOMES, BUT REQUIRES A CHANGE IN CULTURE, ENHANCED COMPETENCY, ROBUST PROCESS, A COMMON DATA ENVIRONMENT, AND ENABLING TECHNOLOGIES.

These levels of success clearly are not being achieved by most real property owners, facilities manager, construction contractors, architects, or engineers. In fact, many articles and research papers claim that *construction productivity* has stagnated, if not been in decline for decades.

This paper outlines, fundamental changes that must occur across the Architecture, Engineering, Construction, Operations, and Owner (AECOO) sector to pave a clear path for participants to achieve significantly improved outcomes.

LEAN Construction Delivery and Efficient Asset Life-cycle Management are Non-Linear

All forms of construction, and associated project phases, have been viewed as linear and discrete. This mindset creates multiple barriers to maximizing efficiency.

¹ LEAN Construction Delivery – A system to minimize waste of materials, time, and effort to generate the maximum possible amount of value. 2002, Koskela, L., Howell, G., Ballard, G., and Tommelein, I. *The Foundations of Lean Construction*. ADAPTATION

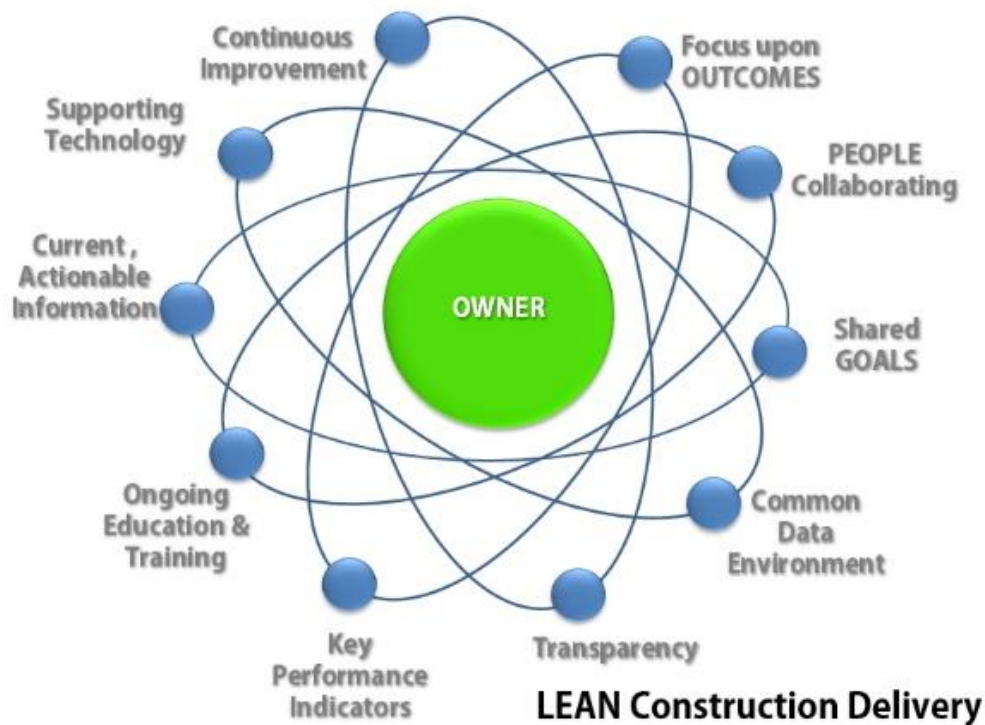
Adoption of a continuous process perspective versus linear, affords multiple benefits. The following graphic portrays an integrated, ongoing convergence of LEAN construction delivery and all previously disparate and discrete competencies, processes, and technologies.



Implementation of this method requires **LEADERSHIP** and **ACCOUNTABILITY** on the part of real property owners and oversight groups. Owner competency includes an operational understanding and adoption of collaborative LEAN collaborative business processes, without excessive management and control.

Owners must be capable of developing statements of need, general requirements, and conceptual design. These, of course, can be created by the owner in concert with appropriate owner's representatives.

In short, as the below diagram demonstrate, LEAN Construction is owner driven.



While the above can appear somewhat complex, the concept of LEAN construction is quite simple and has been described as five (5) basic principles.²

1. Specify what customers Value - Value is what the customer wants and only what the customer wants. This requires a precise understanding of the specific needs of the customer. In approximately 60% of "work" is currently non- value added.
 2. Understand the Value Stream – This is the combination of the processes, activities, tools, and activities that consistently produce what the customer values.
 3. Improve the Flow –Work should flow from one value added activity to the next with a minimum of interruption or supporting activity to the next.
 4. Pull – The system support and react to customer demand. The customers "pulls" the work through the system.
 5. Perfection – Striving towards perfection is a continuous process. The goal is to deliver the value to the customer exactly what is anticipated.
- The goals of the LEAN process are to...
- "1. Solve the customer's problem completely by ensuring that all the goods and services work, and work together.
 2. Don't waste the customer's time.

² 1996, Womack and Jones 1996

3. Provide exactly what the customer wants, when and where it's wanted.
4. Continually aggregate solutions to reduce the customer's time and hassle."

Cost, Time, and Quality Management Are Achievable

Achievement of on-time, on-budget, and quality construction delivery is achievable on a consistent basis if the following foundational elements of LEAN Collaborative Construction Delivery are put in place.

- ✓ Competent Owners providing LEADERSHIP
- ✓ BEST VALUE procurement
- ✓ Early and Ongoing COLLABORATION among all participants and stakeholders
- ✓ Integrated internal and external Planning, Procurement, and Project Delivery Teams.
- ✓ Mutual TRUST and RESPECT
- ✓ Shared RISK/REWARD
- ✓ PERFORMANCE-BASED reward system
- ✓ Planning based upon interdependencies
- ✓ COMMON DATA ENVIRONMENT, CDE – standardized terms, definitions in plain English and locally researched current and granular unit price construction task data organized using standard data architectures (for example expanded Uniformat, expanded CSI Masterformat, Omniclass)
- ✓ Supporting Technology – Modular technology that supports, rather than restricts, robust business processes.
- ✓ Long term, mutually BENEFICIAL RELATIONSHIPS and associated multi-party contacts and Operations Manuals/Execution Guides
- ✓ Global oversight that respects and leverages of local team members knowledge and capabilities

The most widely known and used examples of LEAN Collaborative Construction Delivery Methods are Integrated Project Delivery, IPD, for major new construction), and LEAN Job Order Contracting, JOC (example 4BT OpenJOC™ Solution) for renovation, repair, maintenance, sustainability, and minor new construction.

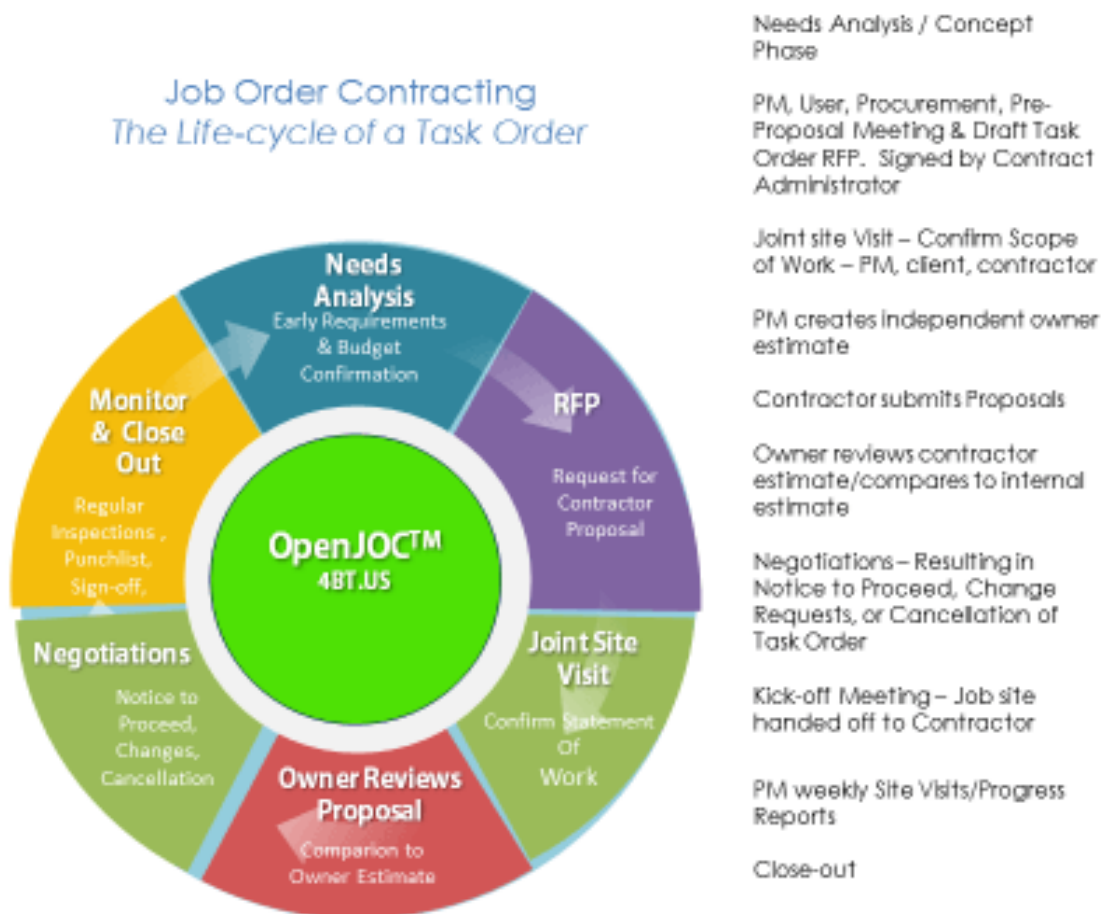
The management of cost, time, and quality no longer need to be mutually exclusive.

Operational Aspects of LEAN Construction

Moving from the foundation elements of LEAN construction to implementation into day-to-day activities is all about defining, consistently implementing, monitoring, and continuously improving practical and beneficial processes and their related outcomes, specific to your organization. Waste is managed through increasing early and ongoing communication among ALL participants with full technical and cost transparency. Suggestions and improvements are welcomed. The goal is to minimize activities that do not create value.

- ✓ Change management (Process and Cultural)
- ✓ Written Execution Manual or Operations Manual as a component of all contracts
- ✓ Joint meetings, including site visits, among all participants
- ✓ Key performance indicators, KPI's and ongoing monitoring
- ✓ Continuous training
- ✓ Co-located multi-disciplinary teams
- ✓ Empower worker to make decisions and make suggestions

A specific example of a LEAN construction operation workflow is provided in the below graphic graphics.



The task order process, per above, assures transparency and minimizes waste of materials, time, and efforts through the use of a Unit Price Book, UPB. A [JOC UPB](#) is a listing of discrete, granular line-item production tasks. Each task has a description and a detailed breakdown of the relevant labor, material, and equipment requirements and costs as well as a defined productivity. *This tool plays a major role in communicating the scope of work and well as managing the full project life cycle.* As might be expected

cloud-based [JOC technology](#) assists in promoting collaboration and rapid access to actionable information.

The role of contractor or other services providers relative to LEAN construction is simply to deliver exactly what the customer expects. This encompasses multiple activities before project start, including but not limited to:

- ✓ Determining the purpose(s) of the project
- ✓ Understanding the client's business and financial requirements
- ✓ Understanding user needs
- ✓ Identifying ALL stakeholders and their needs/requirements.
- ✓ Determining local conditions
- ✓ Determining applicable codes, standards, & laws³

Moving Ahead

Whether you achieve over 90% of your construction related project on-time, on-budget, and at the desired quality, or at best 40%-50%⁴ is entirely your choice. As an owner, architect, engineer, contractor, subcontractor, facilities manager, or building user, you decide on what projects are appropriate, how you manage them, and whom you work for... it's ALL up to you!

Owners must lead and accelerate the shift from design-bid-build, lowest bidder, and even design-build, to LEAN collaborative delivery methods. They must demand integrity and trust in the construction process. *Studies have demonstrated that owners are responsible for low productivity throughout the construction sector. It's time for a change.*

LEAN construction can enable achievement defined goals with respect to cost, time, satisfaction, quality, sustainability, and safety without undue compromise.

• Reduced Waste • Conserve Capital • Reduce Cost • Improve Quality • Provide Flexible Delivery Systems in Concert with Owner, Contractor, AE, and User Requirement • Meet Schedules • Assure A Reliable Workforce • Promotes Services Partner and Employee Participation • Improve Satisfaction among All Participants • Demand Cultural Change.

The above information is via Four BT, LLC – Independent, Objective, and Best Value provider of LEAN construction delivery solutions, including Job Order Contracting, Integrated Project Delivery, Unit Price Books, Technology, Support, Training, and Professional Services - 4BT.US

³ Adapted from Lean Construction Institute 2001

⁴ 2005 CMAA Study, 2016 McKinsey Report

Four BT, LLC

Technology, cost data, and services supporting the efficient renovation, repair, & sustainability of the built environment - buildings, transportation, utilities.



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