

Lean Construction with Integrated Project Delivery

Disrupting the Building Industry through People Centered Innovation

WELTY

LEAN CONSTRUCTION WITH INTEGRATED PROJECT DELIVERY DISRUPTING THE BUILDING INDUSTRY THROUGH PEOPLE CENTERED INNOVATION

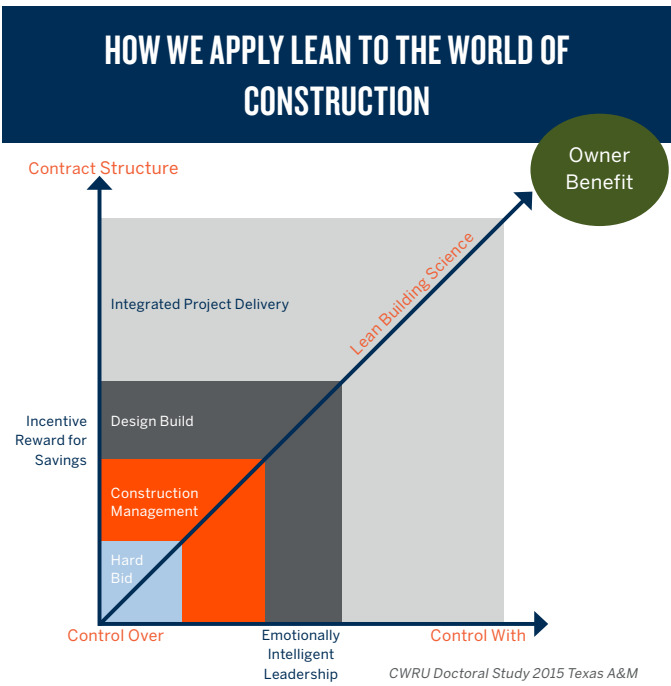
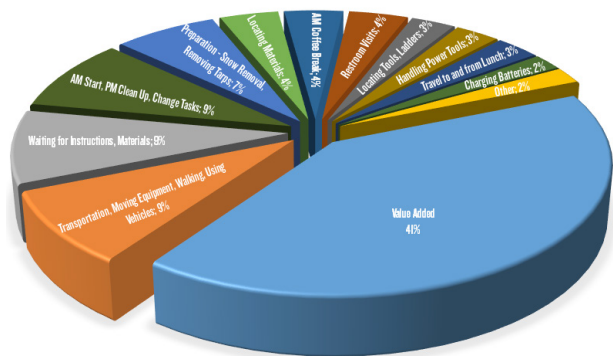
» Based on the research article: People Centered Innovation: Enabling Lean Integrated Project Delivery and Disrupting the Construction Industry for a More Sustainable Future [1]. Available online at: <http://www.hindawi.com/journals/jcen/2016/3704289/>

INTRODUCTION

Construction project delivery incorporating People Centered Innovation represents a fundamental shift in construction industry practices. In order to demonstrate the benefits of People Centered Innovation-based project delivery, this article will explore its significance through the discussion of a completed project case study at [Akron Children's Hospital](#). In the case study, a people centered approach in a [Lean Integrated Project Delivery](#) implementation that not only delivered, but exceeded all expectations in regards to cost, time, safety and expected operating margins is examined. The [results](#) from the project delivery model and processes used in the study showcase the potential of these practices to transform the construction industry.

OVER THE LAST 50 YEARS, THE INDUSTRY, WITH THE EXCEPTION OF CONSTRUCTION, HAS DRIVEN 250% PRODUCTIVITY. CONSTRUCTION HAS DRIVEN NEGATIVE 10%.

ONLY 3.28 HOURS OF CONSTRUCTION WORKER'S DAY WAS VALUE ADDED



BACKGROUND

The construction industry as a whole has fallen behind other industries in productivity gains. Over the last fifty years, while business productivity has increased over 250%, the construction industry has seen productivity decrease by 10%, with more than 50% of projects either over budget or behind schedule. There are several identified factors contributing to the failure of the construction industry to keep pace with other industries. One major problem is that 60% of the activity on a construction project can be classified as [waste](#) [2]. Another contributing factor is the transactional focus of traditional project contracts in the industry. This focus promotes an adversarial relationship between supplier and customer and gives the industry the distinction of being one of the few places where customers and suppliers frequently sue each other. In addition, the creativity, passion and expertise of the entire project team goes unrealized as individuals and management are mired in transactional relationships exchanging fees for services.

The use of a people centered approach, in conjunction with the Lean construction methods and Integrated Project Delivery (IPD) implementation used in the following case study, addresses the factors identified above as contributing to the failure of the construction industry to keep pace with the business productivity gains in other industries. The first of the three concepts is People Centered Innovation (PCI). PCI is a concept based the idea that people, not strategies, methods, schedules and budgets, deliver construction projects. In the context of project delivery, PCI is defined by participating stakeholders at all levels and disciplines having active access and influence into the project definition and delivery process. PCI is characterized by the relational climate

where the participants co-create and form a coherent team based on a shared vision, values and terminology.

One of the fundamental blocks need to build a PCI-based environment is emotional intelligence. Emotional intelligence, “the capacity for recognizing our own feelings and those of others, for motivating ourselves, and for managing emotions well in ourselves and in our relationships” [3], is a prerequisite for creating common shared vision, values and terminology across the many teams of contractors, subcontractors, users, designers and suppliers all participating in project delivery. Emotional intelligence, specifically empathy and self-awareness, is what effective leaders use to create connection between team members [4], engender better relationships, improve ability to deal with conflict, encourage open communication, and drive better project outcomes [5].

The second concept is [Lean construction](#). Lean construction employs processes that are used to accomplish the target condition of Maximizing Customer Value By Eliminating Waste through the use of:

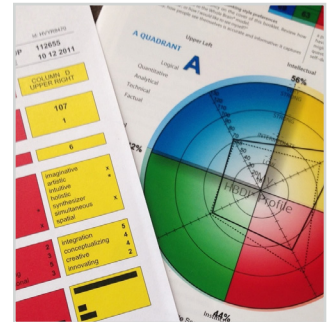
- 1 Structured Collaboration: Collaboration that works with the team’s processes in an organized way, to achieve better results than if team members worked alone.
- 2 Innovation: Innovation that harnesses the compounding factor of continuous improvement, and the best abilities of the entire team.
- 3 Reliable Processes: Processes that use Lean philosophies to ensure reliable release of work, and interpersonal accountability amongst team members.

Finally, it is important to understand what Integrated Project Delivery is in order to help distinguish it from traditional project delivery. IPD is a relational contract between the owner, contractor, and architect to construct a building [2]. The premise is that the three entities become stakeholders in the outcome. With input and agreement from all three stakeholder groups and sub-consultants, a fully coordinated solution and project plan is devised that meets program requirements within the available schedule and budget. One major departure from traditional project delivery methods is that all issues must be resolved by the project stakeholder team and no issues are left unresolved [6]. Projects are integrated through coordination, communication and interaction [7].

The case study discussed in the next section analyzed the design and construction phases of a major addition to a large Midwestern children’s hospital, [Akron Children’s Hospital](#). The construction manager, [Welty Building Company](#), has over 50 years of experience in the local and regional commercial design-build markets with plans for expansion nationally. This case study examines the IPD implementation that resulted in \$60M savings and a six month reduction in the schedule. In addition, the safety rating for this project was 50% better than the national average and the expected improvement in operating margin for the business occupying the new building is 33% greater than the estimate associated with the original plans.

ALIGNING INTERNAL TEAMS THROUGH EMOTIONAL INTELLIGENCE

Each team member is carefully selected by the Project Leadership Team, with the assistance of qualitative personality profiling, including the Herrmann Brain Dominance Instrument (HBDI), to ensure “whole-brain thinking ability,” a condition that ensure the best and most innovative solutions.





- \$60+ Million Reduction in Total Project Budget
- 16% Schedule Improvement
- 99% Cash Flow Predictability
- 33% Increased Operating Margin
- 40% Better than Average Safety DART Rating

DISCUSSION

Traditional project delivery is very transactional. Users pay for design, designers pay for contractor services, contractors pay for subcontractors, and subcontractors pay individuals to perform jobs. In a PCI-led IPD project, leadership and the environment shift the value creation paradigm from goods/services transactions to goods/service interdependencies [8]. This generative process of co-creating an environment with shared vision, values and terminology changes the nature of the service and becomes the fundamental basis of value exchange. Employees are engaged in work they believe to be meaningful and are intrinsically motivated to complete tasks well and even seek innovative alternatives which might better accomplish some objective or task. This reduces the need for leadership to devise various methods of carrot-and-stick incentives and frees employees to share responsibility and ideas. The end result in a PCI environment is an effectively executed project where there is reduced waste, decreased delivery time, and reduced construction costs which can be reinvested in the project in better or more advanced equipment and designs, further reducing lifetime operating costs.

Since PCI-led IPD success is based on the stakeholders having a shared vision, values, terminology and emotionally intelligent leadership, the Akron Children's Hospital (ACH) guiding principles and values were put front and center for the entire building team. [Bill Considine](#), CEO from the hospital, set the vision for the project. "We will design our new building through the eyes of a child." "We want the project team to reflect the values of our organization as they go about building our new hospital wing." ACH's intention was to create a distinctive place in the community that is safe and comforting in the eyes of a child, parent and staff. The culture surrounding the project delivery team was developed with these values as unifying themes.

The team coherence resulting from the shared values and vision creates a relational climate of trust that is codified in the contractual requirements. At Akron Children’s Hospital, the construction manager facilitated PCI by using emotionally intelligent leadership. The construction manager recognized project participants as team members on the project, not as an end to their message, but as a bridge for their message and as a means to create and disseminate a shared vision and shared values. In the case study, team coherence presented itself in many ways and created a sense of pride and identity amongst the participants. Instead of acting as a boss dictating how something should be done, they engaged in a process of co-creation where the general contractor gave up control and jointly created a new and better way to achieve the objective.



PULL PLANNING



FULL-SCALE MOCK-UPS

BAMBINO STICKERS

The “bambino program” is a workforce engagement program that recognizes team members for a job well done through the use of reward stickers. Workers proudly paste these stickers on their hard hats in a manner akin to the Ohio State University football tradition of awarding buckeye stickers for a particularly good play and pasting them on their helmets.



PCI enabled the use of Lean construction practices and the IPD process during the production planning cycle. Activities such as daily huddles, sequence pull planning, color-up boards, load leveraging and back-log tracking enabled communication and open sharing of ideas and progress toward goals. These construction practices further facilitated the continual involvement from the user of the space throughout the delivery process, which is hallmark of IPD. Continual user involvement not only creates a sense of involvement and teamwork, it provides a check during the act of building the space, which reduces waste and rework saving both material and money. An example of PCI was evident in the to-scale, physical mock-ups created by the delivery team – entire floors of the project were constructed in cardboard for easy reconfiguration. Not only were users (tenants) brought in to evaluate the functionality, but the users’ customers were brought in in some cases to provide input on the aesthetics.

As happens in the real world, there were instances where the structure deviated from the specification in the design. In a typical construction contract, the structure would have been torn down or overhauled at significant cost and time delay. In an environment of trust and team coherence, the client users understand that things happen in the real world. People were brought in who would eventually occupy the space to perform their work and give the space a test-run. Having had no prior knowledge of the design deviation, they reported the space worked better than they expected. The delivery team and user accepted the ‘as-built’ structure and saved both time and cost thanks to a trusting environment and flexible contract mechanism. This single example accounted for 22,000 square foot reduction and \$11 million in savings.

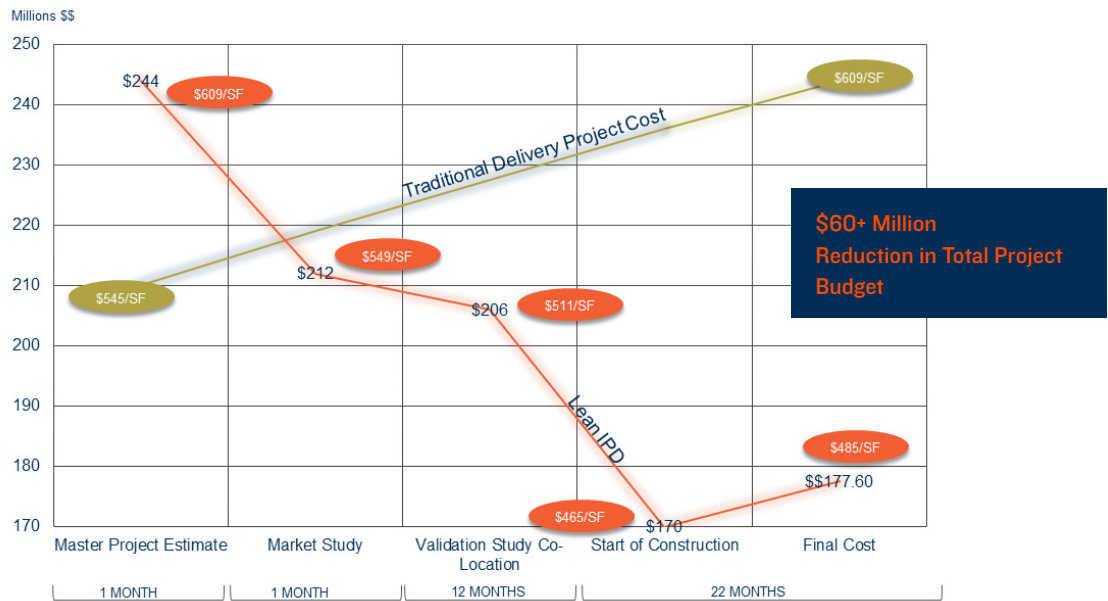
RESULTS

A rigorous system of measurements is a critical element for effective IPD management. IPD projects where leadership and personnel across levels understand and are focused on Up-Cycle Construction Capital maximize the total system result of a construction project. Construction Up-Cycle Capital is defined as the organizational and community benefits produced minus Construction Cost.



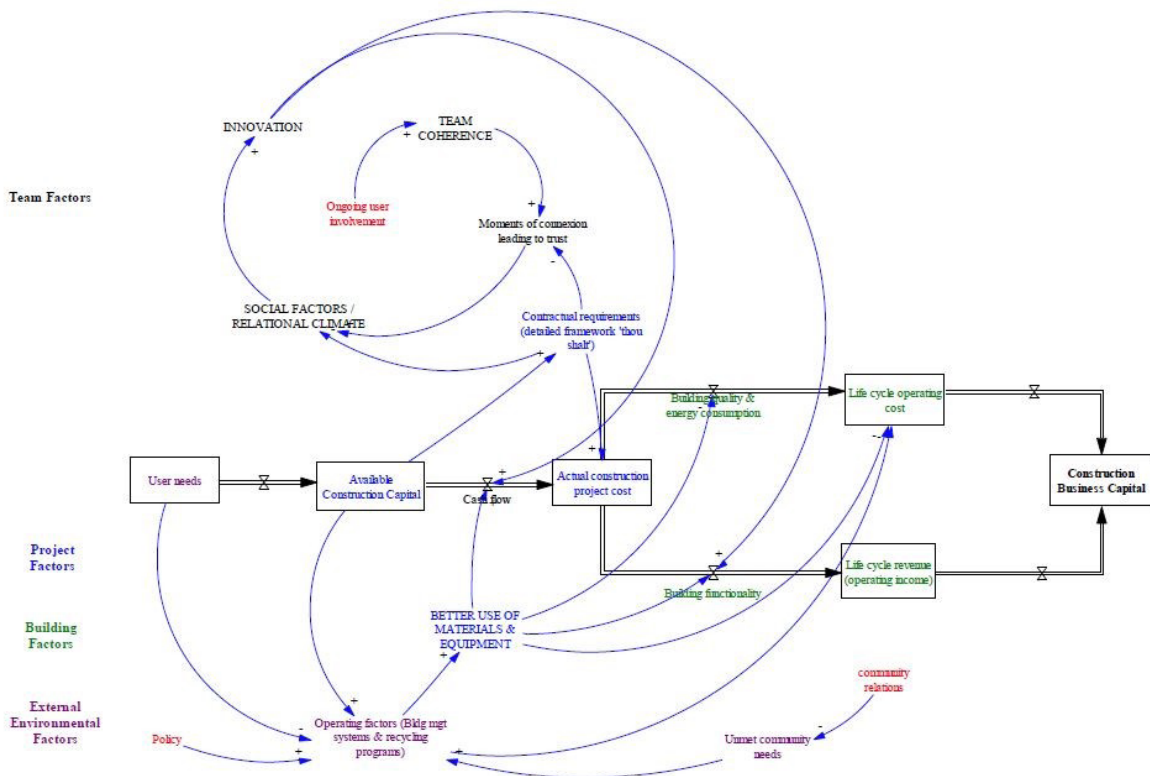
Up cycle benefits are evaluated in three general buckets: Profit, People and Planet. Examples of the 3Ps include reduced construction project costs, reduced life cycle costs such as energy savings, increased positive affect in the community, improved incremental revenues, safer conditions at the site and in the community, increased operating efficiencies and individual's competence. We found an Up-Cycle Construction Capital in excess of \$500 million benefits for the organization and the community, justifying the initial construction bond.

At the outset of planning, the project was projected to cost \$240M using traditional project delivery methods. Through the effective use of IPD, enabled by PCI, the project was brought in at a final cost of \$178.3M – six months ahead of the projected schedule. Additionally, the quality of the product exceeded the original expectations of the stakeholders.



CONCLUSION

Lean Integrated Project Delivery combined with People Centered Innovation takes the complex process of commercial construction to the next level, enabling the co-creation by the core and extended project teams guided by a shared vision of both the short and long term future. This approach is the beginning of a new trajectory of the construction industry that revolves around up-cycle design and life-cycle planning implemented with integrated, Lean construction methods, supported by cutting edge technology and visionary policies. Shared values established through concerns for the environment, health and safety of worker and stakeholders, and social responsibility can become the new norms for the industry as a whole, while open and inclusive processes can allow new ideas to flood the industry with future trends and innovative solutions intended to facilitate a new way of living and working in the built environment.



ACKNOWLEDGMENT

The editors would like to thank Branka V. Olson, Edward Straub and William Paolillo for generously agreeing to share their case study work with us and permitting us to incorporate their work into this piece.

DEFINITIONS

- **Construction Up Cycle Capital** - The organizational and community benefits produced minus Construction Cost.
- **Emotional Intelligence** - The capacity for recognizing our own feelings and those of others, for motivating ourselves, and for managing emotions well in ourselves and in our relationships.
- **Herrmann Brain Dominance Instrument (HBDI)** - A system used to measure and describe thinking preferences in people.
- **Integrated Project Delivery (IPD)** - A relational contract between the owner, contractor, and architect to construct a building.
- **Lean Construction** - Construction practices incorporating processes that are used to accomplish the target condition of maximizing customer value by eliminating waste.
- **People-Centered Innovation (PCI)** - A concept derived from the supposition that people not methods, schedules, or budgets deliver projects. PCI is characterized by the relational climate where the participants co-create and form a coherent team based on a shared vision, values and terminology.
- **Waste** - Anything That Does Not Provide Value. There are 8 wastes recognized in lean construction. They include defects, overproduction, waiting, not utilizing human resources, transportation, inventory, motion and excess processing.

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