

THE FUTURE OF CONSTRUCTION...

IS NOW

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Construction in Philadelphia is experiencing dramatic change in the means and methods of how we do business. Electronic technology and interdisciplinary practices provide predictability through these fast paced and ever-changing times. The not-so-distant future holds even more excitement as our industry absorbs and utilizes the newest technology at an exponentially fast rate. No longer do we solely rely on “this is how we did it on the last job” and “we’ve been doing it this way for decades” to execute decisions and perform work. Technology and intellectual breakthroughs have finally allowed the labor force and management the ability to truly utilize innovative designs, products, and tools, through collaborative thought.

The turn of the millennia introduced newer and faster tools and materials. Estimators were introduced to innovative software programs that created comprehensive and interactive bids. Manual estimating through spreadsheet programs, takeoff tapes, and possibly even paper napkins were immediately dropped into the dustbin of history. Likewise, tradesmen saw increased productions and less physical strain through the introduction of lightweight lithium ion battery-powered tools. Productions were also gained through lighter materials such as Ultra-lite gypsum board, which is 30% lighter than standard drywall. Higher productions were realized solely based upon less worker fatigue; it proved the direct relationship of more physical energy results in more work-in-place. Ultimately these increases in productions allowed for more competitive pricing at bid time.

Back to school...

This new decade though has quickly ushered in something much different; formal learning. For decades, means and methods of construction have remained essentially the same. Education of the tradesman and management was primarily experience based

and learned in the field. Formal teaching and learning was absent from this process and has only recently been championed as a necessity and prerequisite. Collegiate level graduates for management positions have been the status quo for over a decade now. Universities have recognized the desire for further learning and responded to this growing need by the introduction of construction and project management degrees specifically targeting our industry. Tradesmen have also undergone a learning transformation through continued formal training. Safety instruction through mandatory OSHA 30 classes and drug testing reduce the potential harm that is inherent in working at the jobsite. Onsite manufacturer tutorials and informational sessions also promote knowledge of the latest products and tools. The dramatic increase in formal learning has unlocked intellectual talent from other industries. This new influx of talent will thrust our industry into the future of exponential growth and utilization of advanced technologies.

Our industry has slowly adopted and borrowed technology and tools from sister industries such as aerospace and computer programming. These “sister” industries were once “distant cousins”, but we’ve recently experienced a bumper crop of highly educated, critical thinking, and brazenly independent white and blue collar talent. Cross pollination of other industries has brought new experiences and new processes. Where a master’s degree in computer engineering or information management was slated for specific industries other than construction, this industry now desires these skills and knowledge. Cultivation of talent and continued education will be required to train free thinking and intellectually skilled individuals. Prerequisite academic degrees and certifications such as LEED, OSHA 30, and project/construction management programs become vital in maintaining a high level of quality human capital.

**New tools are the status quo; new thoughts are the future...
Prefabrication.**

We are seeing old theories and trendy practices being refurbished and repurposed. Prefabrication was a fad in the 1970's with strictly standardized cookie-cutter construction only befitting rigid and repetitive designs. When accompanied with customization though, prefabrication experiences its rebirth now. The Philadelphia subcontractor market utilizes this recycled construction theory. Carpenters are now privy to computer assisted tools for cutting and shaping gypsum board with CNC routers. Traditionally, soffits and light covers are manually stick-built onsite. A growing portion of drywall and framing is produced off-site in highly controlled assembly shops. This process occurs weeks before framing and sheathing is required in the job schedule and fully utilizes just-in-time deliveries. The drywall shapes are installed quicker and with more precision than traditional methods resulting in shortened job schedules and more satisfied clients.



Mechanical trades have been quicker to adopt prefabrication techniques in thanks to downward pressure from designers and product manufacturers. Building information modeling (BIM) provides mechanical designers the necessary information from architects' and input from other trades to finalize fabrication drawings months before boots are on the ground. The majority of ductwork can be sized and built off-site concurrently with the onsite schedule, while maintaining flexibility if changes arise. An unintended consequence, though beneficial, is the higher control of waste. Increased scrutiny during material ordering with the use of nesting software shows us in seconds the efficiencies of material sizing. Resourceful and simple software programs perform these operations easily where if done manually would be a waste of opportunity cost for the procurement officer.



BIM has been partially implemented in the Philadelphia market. A fuller adoption is inevitable with time, especially when the pressure for adoption comes from the grassroots subcontractors whose prefabrication systems depend on a BIM system. Structural, MEP, and environmental engineers are the typical round-table guests on a BIM

project. We will see more trades involved in the collaborative process as BIM becomes more than just a clash-detection system and fully develops into the master modeling tool, as was intended.

**Bigger, better, stronger... and more collaborative.
Lean Construction**

Owners and General Contractors constantly strive to be more effective, more efficient, and more profitable. Typically, talented management and costly overhead is required to achieve these goals, which are sometimes impossible to execute, hence the disappointing results. Lean Construction is a new theory that attempts to achieve these goals while maintaining low levels of management and more collaboration from design and trade partners. Typically the architect provides his design and draws traditional ways of construction means and methods. As means and methods continue to become more atypical the architect has the sole responsibility of knowing the newest and best methods. This presents an inherent problem in the design process of any project regardless of size and scope. Lean construction aims at improving the collaborative approach to project design, layout, material use, continual value engineering, active and live budgeting with hard pricing, elimination of scope-gap, reduction in change orders, and ultimately and most importantly, ownership of design by the owner, architect, general contractor, trade partners, and suppliers. Essentially, Lean Construction promotes vertical integration of project responsibility. This process may seem similar to "design-build" though is much different. Design-build is mainly a team approach at the higher level, including owner, architect, and general contractor. Lean Construction attempts to fully involve all parties with intent of full responsibility of design, budget, and execution. Lean Construction will become the status-quo as the complexity and quantity of systems becomes too great for a single knowledge center to control and maintain. Conventional arms-length relationships will flounder as technology exponentially grows and collaborative partnerships will flourish. Lean Construction's new methodology bridges the vertical integration gap that currently exists and brings all stake holders together.

What the far future holds...

The future certainly holds amazing technological gifts for our industry such as augmented reality, robotic and drone assistance, and real-time design coordination between architects and contractors. A quick Google search of "augmented reality" will send your mind reeling on the applications in our industry.

Exciting as it may be to dream of huge technological advances for construction, the reality shows that the next decade holds teamwork and vertically integrated collaboration as pinnacle. The further development and adoption of BIM, prefabrication, and design/budget/build assistance will prove essential. The immediate impact of these new processes will be more aggressive pricing, faster schedules, more accountability, safer worksites, and shifts in responsibilities and liabilities. Further maturation of our present will move us farther ahead to be better and wiser. ■



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