



BY DR. PERRY DANESHGARI & DR. HEATHER MOORE

# INDUSTRIALIZATION: *Is Construction Next?*



Like other industries that have gone through an industrial transition, it will be up to construction financial professionals to take the leadership role as the industry changes.

This article will serve as a starting point for CFOs and other financial managers so they can see the coming trends and possible next phases of the industry – which could be parallel to what other industries have experienced – and can help companies prepare by learning from the history of industrialization. It will discuss what could change, why, and how companies can adapt for a competitive advantage.

## COMPETING IN THE NEW CONSTRUCTION ENVIRONMENT

In times of change, CFOs have the best seat in the house with access to and responsibility for leading and lagging indicators. Currently, the construction industry's economy is in the middle of a boom and there is optimism about how long it will last. Simultaneously, construction growth continues to be stifled with expensive production costs. For example, the cost of labor per every dollar sold in construction is 38 cents, whereas other industrialized industries are below 15 cents per dollar sold.<sup>1</sup>

As the traditional way of operations in construction is expected to transition to more industrial and professional operations for providing shelter and infrastructure, it will require a different set of rules and regulations, which will demand a different role for CFOs.

In the era of new industrialization, the construction industry will no longer be content with the know-how of the skilled tradesmen, but they will also be looking for the know-why of resource management. The missing element of this transition is the content, which only exists with the tradesmen. Transferring the tacit knowledge from skilled tradesmen to an explicit knowledge environment requires careful application of the principles of scientific management that were developed in the early 20<sup>th</sup> century.

The key element of industrialization is the way in which human resources are, and will be, used. The entire project delivery process – from design to

## Are You Ready?

Agree Disagree

- |                       |                       |   |
|-----------------------|-----------------------|---|
| <input type="radio"/> | <input type="radio"/> | I believe that the construction industry is not what it used to be.   |
| <input type="radio"/> | <input type="radio"/> | I believe that competition is tougher now than ever before.   |
| <input type="radio"/> | <input type="radio"/> | I believe that my company needs a different business model that includes active participation of the CFO in how projects are run.   |
| <input type="radio"/> | <input type="radio"/> | I believe that I need new tools and need to engage in continuous learning to survive in today's market.   |
| <input type="radio"/> | <input type="radio"/> | I believe that prefabrication, BIM, and vendor managed inventory are a must to compete, and that it will require an overhaul of our current system to comply with the new revenue recognition principles. |
| <input type="radio"/> | <input type="radio"/> | I believe that I need more than "a good accounting program."  |
| <input type="radio"/> | <input type="radio"/> | I believe that an accurate work-in-progress (WIP) is just a lag indicator, and I need more lead indicators to know where projects will end up financially.  |
| <input type="radio"/> | <input type="radio"/> | I believe that I should have more say in how projects are managed and controlled.   |
| <input type="radio"/> | <input type="radio"/> | I believe that I should have a greater role in predicting and preventing project obstacles and outcomes.  |
| <input type="radio"/> | <input type="radio"/> | I believe that, ultimately, labor and management can work effectively together.   |

If you agreed more than you disagreed, you may have already educated yourself about the upcoming shift in the industry. If you disagreed with some or most, ask yourself why? Maybe it's time to take a deeper dive into understanding what is involved in shifting your mindset away from traditional views.

construction to operating and maintenance – will be impacted. Similar to industrialization in other industries, the entire process will improve with better time, cost, quality, and safety. The “construction phase” of a built environment is the shortest, yet it can be the most costly due to the decisions and missing feedback from the skilled trades.

Industrialization occurs through the following socioeconomic steps:<sup>2</sup>

- 1) Managing Labor
- 2) Managing Work
- 3) Lean Operations
- 4) Modeling and Simulation
- 5) Feedback from the Source

Much can be learned about these steps from what other industries have gone through, as presented in *Industrialization – What Is It?* that begins on page 50, if the principles are correctly understood and translated to construction. And, the CFO can play a critical role in leading this transformation by acting as a source of financial information and connection to the money that is going to and from the operations, while the operations and delivery of construction itself transitions.

### INDUSTRIALIZATION & CONSTRUCTION CONTRACTING

“While the productivity in the manufacturing industry has improved by 400% over the last century, the construction industry’s productivity has, in even the best case, stayed flat”<sup>3</sup> (Exhibit 1 on page 47). To achieve comparable results to those seen in manufacturing, the construction industry must also make the leap to industrialization.

#### How Will It Happen?

The transfer to industrialized work management can begin by defining the work via a work breakdown structure (WBS), followed by identifying who does what, where, and when. Exhibit 2 on page 47 depicts a schematic of the Work Cube, which demonstrates how the WBS facilitates transferring the work from tacit to explicit knowledge by detailing what needs to be done as well as who, where, how, and when it *can* be done. Each task is then subdivided as other factors are added to further extend the understanding of the requirements for each task.

The work includes material handling, studying the drawings, laying out the work, testing and troubleshooting, etc.



## Is Construction Next?

Once this step has been established and is part of the standard work management, the CFO will be able to help cost and price each standard work and adopt the cost and revenue recognition accordingly to the elements of the Work Cube. Such efforts will be the beginning of a “Cost Book” that incorporates the now-explicit knowledge of the skilled trades.

Improvement in this area can only happen after the work has been defined and the reliance on skilled trades to perform the work has been reduced. Once this occurs, the construction industry will be ready to move onto the third step of industrialization with the application of Lean principles.

Lean principles learned from automotive and manufacturing will be applied by optimizing what is in the Work Cube. Once the work is made explicit, it is decoupled from the physical work environment and time. Tools for managing information about that work will need to be used, since the work now exists explicitly and will be performed at a much faster pace. Contractors will need to develop processes that can facilitate the value transfer through the effective usage of resources.

Once all of these steps are in motion, the step that will distinguish the Best in Class contractors from others is their ability to gather feedback ubiquitously from the source of energy transfer.

Processes, tools, and techniques are used to constantly learn and improve using feedback from the source. The unbiased feedback must reflect the work and what is happening to transfer energy. The Work Environment Management® (WEM) system has been developed to facilitate this feedback. This process will enable the CFO to be the bridge between the actual operations as lead indicators and the financial outcome as lag indicators.

### FINANCIAL MANAGEMENT DURING INDUSTRIALIZATION OF CONSTRUCTION

In manufacturing, the Industrial Revolution spurred the need for more advanced cost accounting systems. The development of corporations created much larger classes of external capital providers – shareowners and bondholders – who were not part of the company’s management but had a vital interest in

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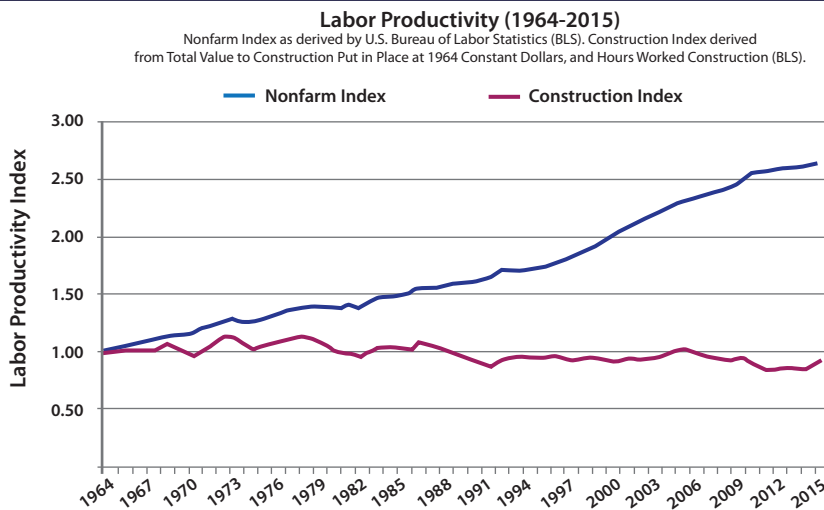


## Is Construction Next?

its results. The construction industry's industrialization will lead to more consolidation of construction providers at all levels, from GCs to subcontractors to distributors. The consolidation of the construction and distribution industry is already at an all-time high, and new skills and expertise will be required

to handle all of these changes. The construction industry will also have to rely on more accountants due to higher productivity and production tracking. (As a comparison, the farming industry today employs more people than before its industrialization – only a fraction of the farmers but more accountants and CFOs than ever before.)

### EXHIBIT 1: Productivity of Construction vs. Other Industries

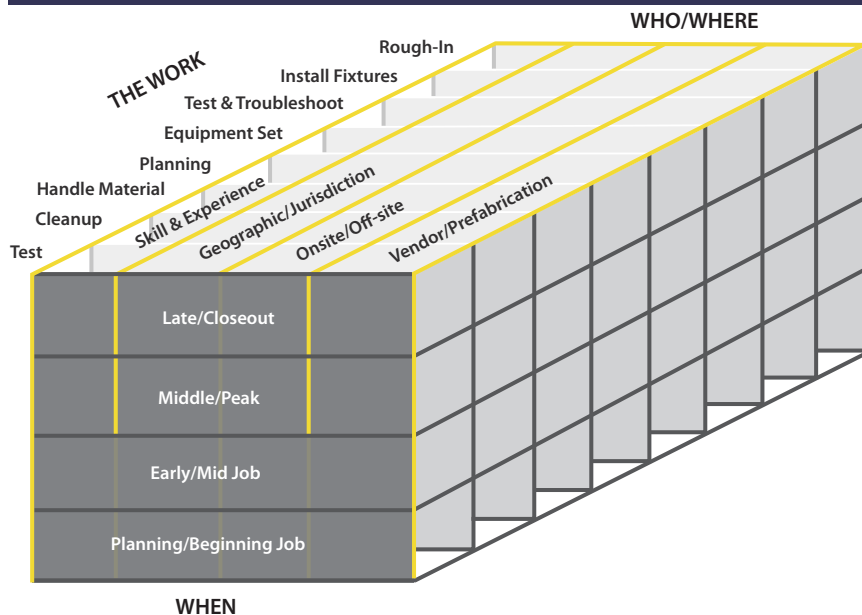


© MCA Inc.  
 Source: Data analyzed by MCA, Inc. from U.S. Department of Commerce Bureau of Labor Statistics.

During the industrialization of the manufacturing industry, the rising public status of accountants helped to transform accounting into a profession. In 1887, 31 accountants joined together to create the American Association of Public Accountants. The first standardized test for accountants was given a decade later, and the first CPAs were licensed in 1896. This all was due to industrialization and its need to manage an expanded amount of information about performance.

Even if all the accounting for industrialization exists as of today from what is known in other industries, the construction industry's needs for industrialized construction accounting will be much different due to its nature as a multi-trade industry with fragmented supply chains and business interests.

### EXHIBIT 2: Dimensions of Work



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Standards and tools for WEM<sup>®</sup> will be needed to manage an industrialized environment. These are beginning to take shape with the translation of enterprise resource planning (ERP)-like systems into construction. Standard classifications of work will be needed, and these will differ from classifications of costs or building functions. A standard measurement of value transfer will be needed, which differs from the measurement of dollars and hours.

These types of standards and agreements are needed to facilitate work processes that are no longer local. See Exhibit 3 on page 48 for an overview of the financial management implications in each step of industrialization.

It is more than likely that an accelerated format of the accounting changes

will follow the industrialization of the construction industry. Implementation of FASB's new revenue recognition standard is just one of the standards directly related to prefabrication, as it requires contractors to recognize the transfer of value of construction performance. This means that the more that work is done off-site, the more it will need to be broken down and measured without traditional cost-based methods. Additional accounting standards and measures will likely need to be developed for the new way of working, and the financial profession has historically led the way.

### THE EVOLUTION OF PREFABRICATION & HOW THE CFO PARTICIPATES

Prefabrication is not new in construction, and it has happened in various forms and shapes. A few trades, such as carpentry and sheet metal, have been prefabricating their installed assemblies in a factory-like setting for a few decades, primarily due to the physical size of their building components. Roof trusses and ductwork are easier to build off-site than one piece at a time on the jobsite.

However, not all of the trades have gotten to this point, especially the ones that have the smallest profile material since it can easily be "field-fit."

Future articles in this series will explain how the industry will move toward industrialization as it relates to prefabrication. As the work in construction becomes more segregated, or digitalized, the need for big-data management will increase.

The new work environment will reduce the cost, improve the safety and lead to lower composite rates, enable higher productivity, predictability, and reliability, and reduce liabilities on the jobsite for the owners of the projects as well as GCs. How to measure and achieve these results will be laid out in subsequent articles in this series and discussed as a key role and responsibility of the CFO in the evolution of prefabrication.

### CONCLUSION

The evolution of prefabrication is only one signal of industrialization taking hold in construction, driven by the industry's excessive and unnecessary costs. The upcoming articles in

## EXHIBIT 3: Financial Management Implications in Industrialization of Construction®

#### Management of Labor

- Encourage operations to measure jobs independent of accounting measures
- Help develop cataloging to "account" for what labor does

#### Management of Work

- Use/enforce WBS and establishment of third database
- Setup common cost codes and labor codes
- Start building a Cost Book for work packages
- Initial prefab financial planning: capitalization and investments, tax laws, measurement methods

#### Lean Operations

- All databases are aligned to "One Best Way"
- Recognize and transmit between different business and financial model such as vendors, GCs, trade contractors (spirit of IPD)
- Labor is no longer a separate "cost;" you are delivering, building, and selling work (spirit of ASC 606)

#### Modeling & Simulation

- Provide Cost Book data for decision modeling of best way to build

#### Feedback from the Source

- Assure financial measures and decisions are balanced with field and production data



## Is Construction Next?

this series will address and provide operational insight into the transition from prefabrication to full modular production through online ordering, electronic design and modeling (including work simulation), production mega centers encompassing all trades and subassemblies, transportation, onsite installation, and remote maintenance monitoring and control. ■

**DON'T MISS "Industrialization – What Is It?" THAT BEGINS ON PAGE 50**

### Endnotes

1. Data analyzed by MCA, Inc. from U.S. Bureau of Economic Analysis, U.S. Bureau of Labor Statistics, and U.S. Census.
2. Daneshgari, Dr. Perry & Moore, Dr. Heather. "Industrialization of Construction®: A Compilation to Lead the Way." Series of four books. MCA, Inc. for ELECTRI International. 2015.
3. Original analysis comes from Teicholz, Paul. "Labor Productivity Declines in the Construction Industry: Causes and Remedies." *AECbytes*. April 14, 2004. Maintained update from data published by the U.S. Department of Commerce Bureau of Labor Statistics.

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