Breaking the Mold: A Nonlinear Approach to Construction Financial Projections

By Dr. Perry Daneshgari, Dr. Heather Moore & Jennifer Daneshgari

The role of a financial professional in construction is different than in any other industry. Managing the financial inputs, throughputs, and outputs in construction are complicated by the unpredictable nature of the source data.

Construction financial professionals (CFPs) can often be the last ones to find out about upcoming projects, their costs, and cash flow requirements as well as the impact on the company's overall financial performance. This lack of insight into the pipeline and backlog forces CFPs to rely on linear projections and predictions, which presents a challenge to projects and budgeting. However, these challenges can be overcome by CFPs getting involved in project operations early and often to gain visibility to the pipeline and backlog information as well as to provide valuable input to project financial planning.

This article explores pipeline (e.g., business development, potential jobs) and backlog (i.e., awarded work that has not yet started) by providing a point of view and recommendations for CFPs to help them transfer linear projections into more accurate nonlinear, historical performance-based projections and budgeting.

PREPLANNING

The term preplanning is unique to the construction industry due to the lack of advanced planning. CFPs along with their project managers (PMs), who operate with more data, primarily rely on financial reports, which are after-the-fact in the best case. As far as the ability to course correct based on the actual work performed, timely decisions are impossible through the rearview mirror of financial reports.

In the field, preplanning refers to any planning that happens before the job starts. In other words, planning the work and resources early is often a challenge due to the lack of, or changing, information.

This challenge continues from the field to the business, where many construction company owners are tradespeople themselves, having once been in field planning. When building on their success with minimal information, it becomes a challenge to depend on data for decision-making and business planning — relying on CFPs and good accounting systems becomes critical.

However, information about the pipeline and backlog doesn't always live in accounting; at best, it is kept in a spreadsheet, but there are often a lot of informal agreements with customers that aren't incorporated into that spreadsheet. So accounting will only know about the upcoming work if a PM or estimator gives them input, which does not always happen.

To connect the front-end of the work and capital flow in a construction business, CFPs must be able to see the input, throughput, and output of the work inside of the company as well as out in the field.

One way of managing the flow of information in many industries is through digitalization, commonization, and interconnection (DCI™) of the data sources and their inputs. The process starts with pipeline, backlog, and project tracking (including procurement) and is finalized with accounting and financial reporting, including data quality analysis of gaps among any of the sources.

PIPELINE & BACKLOG

Through our work in the construction industry, we have come across various understandings of the pipeline and backlog.

There are three general mindsets when it comes to measuring, tracking, and managing this first step in the flow of information:

1. Ignorance is bliss.

- We don't have a pipeline; we bid one job at a time.
- I'm more worried about running current work than tracking backlog.
- It's too tough to keep up with it, and my business is doing fine.

2. Sailing in smooth waters.

- We have a consistent client/work base, and I'm not worried about getting future work.
- I'm not looking to grow or expand outside of our current base; if we just keep doing what we're doing, we'll be okay.
- I have simple tracking on my computer of the jobs I know are coming up.

3. Expansionary and risk-taking.

- We're trying to grow (geographically, market/niches, volume, etc.), and I need to align our strategy with a view of what work is available.
- We've grown, and I can't keep all the bids, customers, and work we've committed to in my head or in our current systems anymore.

All three mindsets can benefit from the digitalization of the pipeline and backlog for interconnectivity.

Digitalization, Commonization & Interconnectivity

The digitalization, commonization, and interconnectivity (DCI™) of data requires data quality control, which has the following components:

1. Data collecting
2. Data recording
3. Data reporting/reduction
4. Data presenting

To assure the quality of these four components, the transition taxonomy of data to information, knowledge, and wisdom must be established.[1]

What supervision uses to manage the work can be replicated in the form of DCI™ applications. DCI replaces the eyes, ears, and spreadsheets of each project and PM with a consistent set of applications that build a corporate memory for the optimized processes and information to be used during each project's planning, procurement, installation, and closure phases.[2]

DCI Construction™ connects distributors, manufacturers, and contractors.[3]

Endnotes

1. *Daneshgari, Dr. Perry & Moore, Dr. Heather. "How Will Working From Home Catalyze Industrialization?" CFMA Building Profits. January/February 2021. cfmabponline.net/cfmabp/20210102/MobilePagedArticle.action?articleId=1655665.*
2. *Daneshgari, Dr. Perry; Moore, Dr. Heather; & Sullivan, James. "What Workforce Shortage? The Problem Is in the Planning." CFMA Building Profits. March/April 2022. cfmabponline.net/cfmabp/03042022/MobilePagedArticle.action?articleId=1776860.*
3. *Daneshgari, Dr. Perry & Moore, Dr. Heather. "2022 Industrialization Update: Evidence & Projections." CFMA Building Profits. November/December 2022. cfmabponline.net/cfmabp/11122022/MobilePagedArticle.action?articleId=1839133.*

By providing a point of view for CFPs, this can help transfer their linear projections into a more accurate nonlinear and historical performance-based projection and budgeting; segregated data about performance provides insight into typical performance of certain groupings of projects (e.g., by customer, location, type of work).

LIFE & WORK ARE NOT LINEAR

When data for daily schedules, weekly and monthly job progress, and overall construction put in place is visible and trended, it can show that construction is not "linear." Yet, accounting systems or other tools forecast the backlog as though it is equally divided in time.

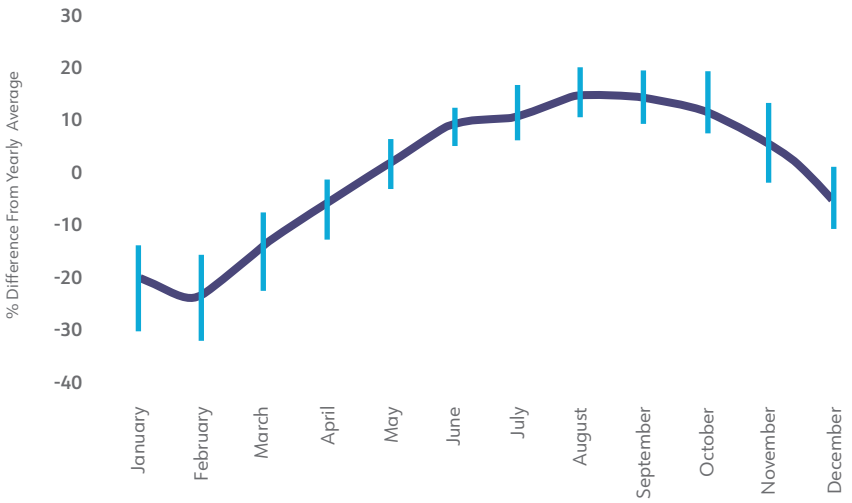
For example, if your estimating department just won a 10-month, $10 million job, the assumption is that $1 million worth of work will be performed per month. For macro planning on that job or a few others, this might be good enough; however, once you start stacking these linear scenarios on top of each other to aggregate company resource planning, the differences become significant.

What once looked like a need for 35 workers in three months could be 70, and what may look like work ramping down in six months could be just the opposite.

As shown in Exhibit 1, industry data shows that construction goes through

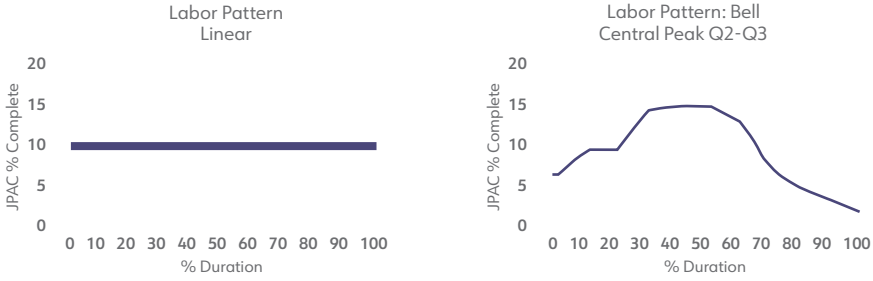
Exhibit 1: Construction Put-in-Place Cycle

The vertical lines represent the range of industry data collected over 50 years.



Source: Construction Spending Report. U.S. Census Bureau.

Exhibit 2: Linear vs. Nonlinear Model of Project Completion



Tips to plan for more predictable operations and financial outcomes:

- Gather minimal data about the pipeline
- Start simple with linear tracking of the backlog to add visibility
- Add input control to improve pipeline & backlog tracking accuracy
- Use work-based progress & burn-rate measurements
- Increase the intelligence of existing pipeline & backlog
- Work toward a nonlinear projective model

very consistent cycles, and the same holds true for your projects. Companies may have a slightly different nonlinear profile depending on the type of work, approach to the four phases of construction (planning, procurement, installation, and closure),[1] etc.

Exhibit 2 shows a comparison of a linear manpower plan for a project with the nonlinear projection. Note that in a linear labor allocation backlog model, the labor is applied straight through the duration of a project; however, the nonlinear allocation of labor projection considers labor loading according to labor usage intensity, where it would use more labor when the project ramps up.

The nonlinear projection is based on industry-wide data collected by MCA, Inc. over 20 years based on true project progress (percent complete of work), independent of their duration and size. Planning and forecasting manpower and other resources on your projects should consider this nonlinear model.

For example, companies should look at the difference of weekly and monthly hours needed for their company when a linear model vs. a nonlinear model is used. It was found that, in some weeks, the difference represented 2,000 hours of work (roughly 50 people).

MCA, Inc.'s approach of DCI™ uses historical and aggregate data from estimating, field, and accounting databases to develop these nonlinear models for the industry, company, and specific project conditions.

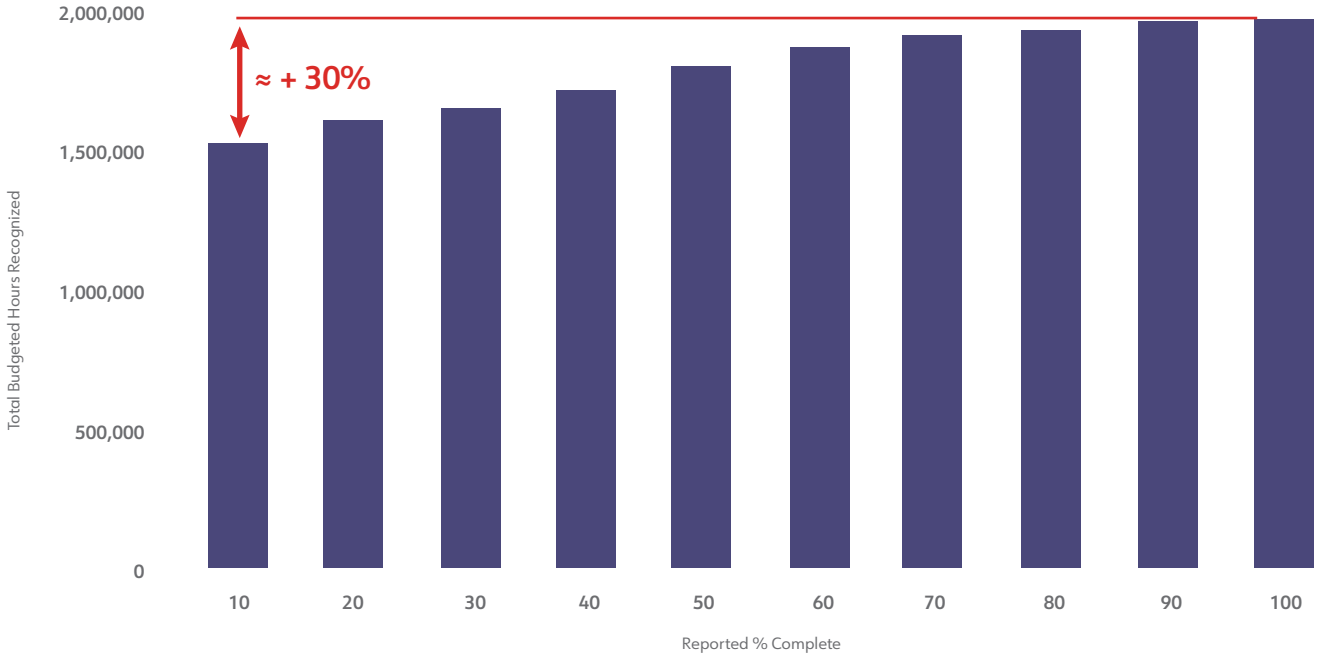
For example, when studying one company's job progression and performance on over $100 million in projects that occurred over a period of five years, the model of comparing and projecting manpower planning for linear vs. nonlinear was the most common option.

WORK EXISTS BEFORE THE MONEY IS SPENT

An accurate pipeline and backlog should represent all the work that a company is or may be doing, which requires input control, during both the estimating and project life cycles.

Exhibit 3: Change Orders Expand Projects by 30%+

This graph represents data from 50 projects over three years, with more than 500 change orders analyzed.



In other words, the pipeline should have a simple and easy way to track all potential work, such as:

- Strategic planning for new or niche markets
- Business development efforts
- Requests for quotes/budgets
- Formal bidding opportunities

If your accounting system is not connected with all of these aspects, then it will not be a reliable source of pipeline and backlog data.

Even before bids are submitted, there are high-level discussions, negotiations, and information available about likelihood of award. That is, the work that *may* come into the company is known well before money is spent.

Once a job is awarded, the same holds true in the form of changes. Verbal requests, revised budgets, change requests, or any type of informal and anticipated change prior to an official and signed-off change order are all part of the pipeline. This information is also often invisible in the accounting system.

PMs keep some form of change tracking,[2] and therefore, the company leadership lacks a full view of its resource needs and related financial planning into the future.

Exhibit 3 shows one sample of studies of several trade contractors, indicating that change orders expand projects (by labor hours needed) by more than 30% from start to finish. This means a company that runs one million hours per year has another 300,000 invisible hours "waiting for approval."

CONDUCTING THE SYMPHONY OF DATA & ITS TRANSFER TO CORPORATE INTELLIGENCE

The CFP's knowledge about operational data, its sources, impact, and translation to useful projections and predictions is not linear. The measures and data come from the field where the work is performed; although tough to gather, they provide a more realistic view about the work as it is happening.

So, what can CFPs do to plan for more predictable operations and financial outcomes with a higher confidence level? Depending on the type of business and which of the three scenarios best resonate with the organization — i.e., ignorance is bliss, sailing in smooth waters, or expansionary and risk-taking, here are a few recommendations:

Gather Minimal Data About the Pipeline

As an example in DCI Construction™, request some basic information in a form/format from estimators, PMs, and even field crew that may be customer-facing and the first point of contact for new work.

Try to keep it simple; even though more detail and data would be ideal, balancing it with the data provided and getting minimal data more frequently is better than receiving in-depth, perfected data infrequently. Make sure to include the job/work description, the start and end dates (in range of months or even quarters, not exact dates), and potential project size (labor hours and/or contract value).

If this data can be provided on all upcoming bids and even change requests, then you will have the data needed for simple pipeline tracking.

Try not to limit the input to certain people, certain project sizes, etc. Depending on your business, change orders and potentially work orders could be 30% or more of your work, and without visibility, you'll plan for a different picture.

Start Simple With Linear Tracking of the Backlog to Add Visibility

Now that you know the pipeline and work-in-progress (WIP) is being tracked in your accounting system, what about the backlog? You can use data from your accounting system for simple linear tracking to add visibility. The burn rate (i.e., the pace at which work transitions from upcoming to completed) can be tracked using time or cost.

Find out if your accounting system has a report or at least the data on the percent complete on existing/committed projects based on these two factors. Once you start seeing trends, this method will enhance pipeline tracking to help plan the resources needed over the coming weeks, months, and years.

Add Input Control to Improve Pipeline & Backlog Tracking Accuracy

Many companies gather the pipeline data and track backlog, yet still find out that their PMs are bidding on work unbeknownst to them. Or, worse yet, they find out that two different prices were submitted to a customer from two different estimators.

Another unpleasant experience is when the CFP finds out that a high-risk contract was signed without a plan or proper risk review. This is the point where policies and processes for input control become desired, typically as the company grows. Although the accounting department can do its best to control output and manage cash flow, input control can help avoid killer jobs and prevent losses. This requires setting and implementing company policies as well as a single point of entry for all pipeline work.

Looking back on the first recommendation, a simple policy can be to require minimal information for every project that is put out for bid. It's also important to ensure internal controls are in place to prevent something from "slipping through the cracks."

A stronger control can be put in place with DCI Construction™ between estimating and accounting. With a unique DCI™ identifier assigned to every project bid, by the time that the estimating life cycle is complete, the CFP can require this unique identifier to be given before a job number is pulled in accounting.

Use Work-Based Progress & Burn-Rate Measurements

Visibility of both pipeline and backlog is helpful, and the next recommendations are enhancements to move from *input control* to *resource management.* One key aspect is to use progress measurements that are more realistic than cost- and time-based measurements.

As previously explained, the progress of jobs using effort-expended measurements that relate to the work give a better picture of the resource needs and uses than time- and cost-based measurements.

All three are valuable, but if you have access to observed percent complete (following ASTM E2691, Standard Practice for Job Productivity Measurement), add it to your existing burn rate calculations and you'll see a different picture of projected manpower, cost, revenue, and profit. The work happens before the cost, so using this metric shifts from a rearview mirror tracking to a planning-based view.

Rearview vs. Actual Work Performed Projections: A Case Study

Managing the money and managing the work are often treated as two separate things, especially by PMs. During a recent review of a large project, one company had the opportunity to see the differences between its financial rearview approach vs. based on actual worked performed measurements.

The company had been using work-predictive Agile Construction® tools such as JPAC®, SIS®, and DCI Construction™ for over six years. The newly hired PM, who was used to relying on financial tracking and projections, had a chance to use the two systems (work-based Agile Construction® tools alongside financial measurements) to measure and compare their ability to project accurately. For more on these tools, take a look at "Are Preventers the Real Heroes? Preventing Risk Pragmatically With Data" from the September/October 2021 issue.

The financial reporting of the project is after-the-fact reporting of the estimated dollars and spent dollars used alongside a PM's best guesstimate of committed and projected dollars. There was no information about the work performed, except the linear projection based on the percent of the cost that was spent — a byproduct of the method used for revenue recognition. Alternatively, the work measuring and predicting tools of Agile Construction® showed different trends (Exhibit 4). JPAC® projections showed ongoing productivity impacts such as work taking about 20% longer than planned, and despite a low-cost crew mix (about 20% less than estimated), the project was projecting labor cost fades consistently at about 50% complete, whereas financial projections from the PMs did not recognize the losses until after 80% complete. Here, profit is lost due to the labor cost fade/overruns. However, it is possible that the profit may not show fade until later if the labor losses are being made up somewhere else (material, subcontractors, etc.).

In comparing the PM's notes with that of the company's president and CFO, it became obvious that financially based projecting will lead the project to unrecoverable major losses due to the lack of true work progress information from the project. In this case, the CFO relied on the field information and nonlinear projection of the pipeline and backlog for profit, cash flow, and budgeting goals. This is why measuring the cost fades and their causes is important to raise and resolve (if possible) issues as early as possible.

Exhibit 4: JPAC® Trending
Based on ASTM E2691

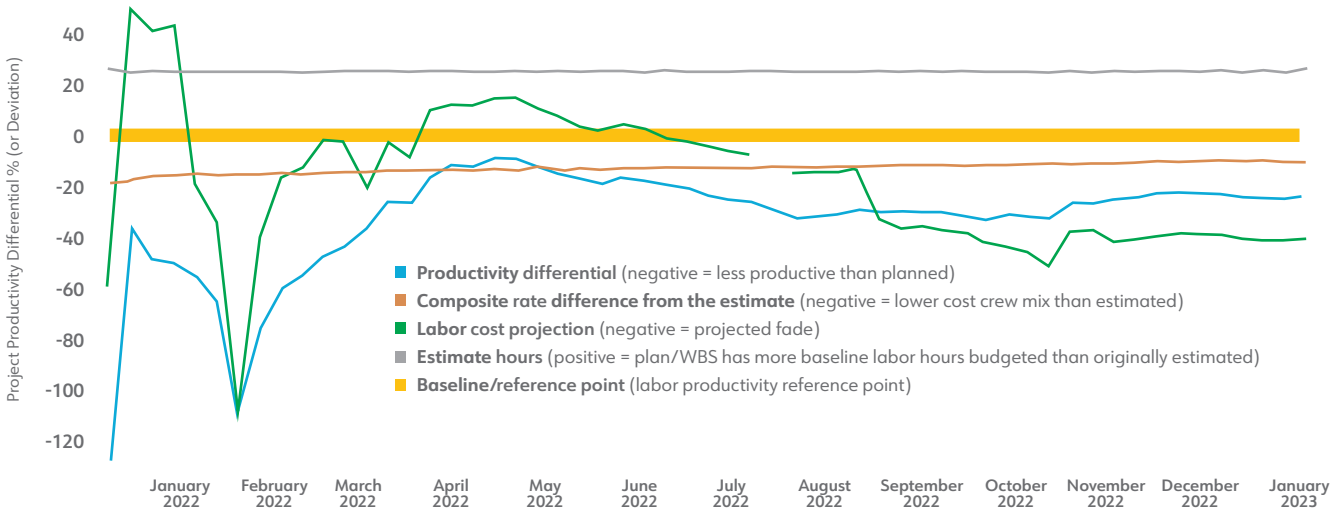


Exhibit 5: DCI Construction™: Managing Workload Across PMs

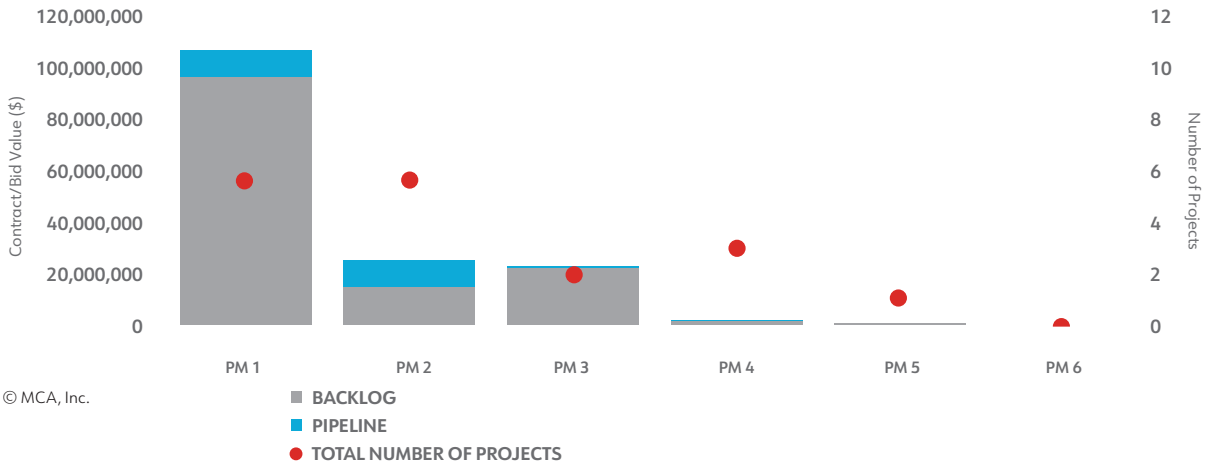
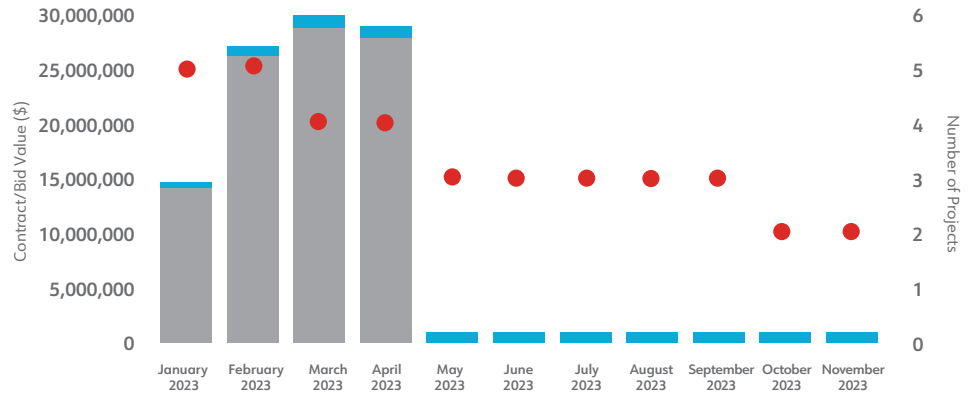
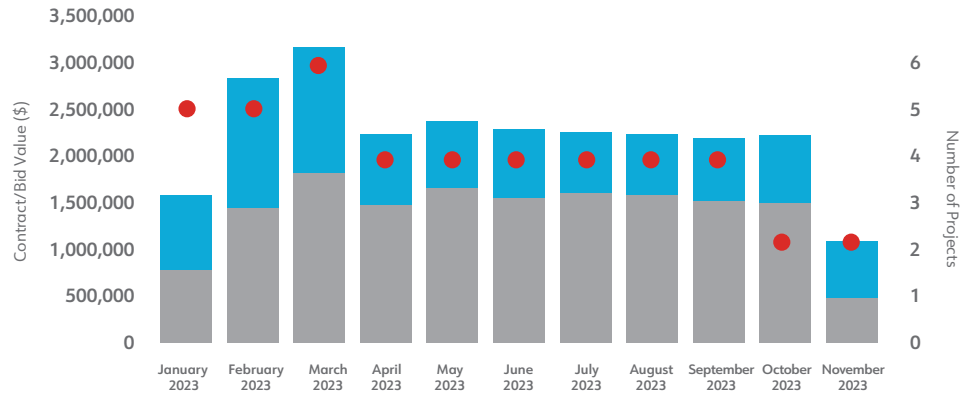


Exhibit 6: DCI Construction™: Visibility to PM Workload Over Time

PM 1



PM 3



Increase the Intelligence of Existing Pipeline & Backlog

Having solid input control and visibility into your pipeline and backlog is an advantage for projecting resource needs based on project volume (labor hours, contract value/revenue, etc.).

Adding a few more pieces of data to the input control process can help with making data-driven decisions upstream in a project, such as:

- *Project team:* Who is ideal to run the work vs. who is available.
- *Location:* If there are multiple locations, get an early look at projected volume for each.
- *Market segments and categories:* How much work exists in core vs. niche markets and what risk will this bring.

Exhibits 5 and 6 show a sample of this type of information. In Exhibit 5, the total pipeline and backlog values are shown by PM. In Exhibit 5, PM 1 has almost $100 million in backlog on six projects, PM 2 has six projects for much less volume, and PM 3 is running two projects of decent size. Taking a closer look in Exhibit 6, we see that PM 1 is going to run out of work in about four months with three projects closing out, whereas PM 3 is full for the next several months.

In addition, work to improve the interconnectivity (using DCI™) between the field's view of change orders and what gets reported to accounting.

Many companies or individual PMs keep their own spreadsheet-based change log. A DCI™ application helps interconnect these data sources so that the submitted, pending, and approved change orders are all made visible in the pipeline and backlog.

Work Toward a Nonlinear Projective Model

This is the toughest step, as it requires historical data and keen analytics to understand your business and work profile. The ultimate view looks like Exhibit 7, where every piece of information is layered for a full view of manpower projections based on all of the inputs.

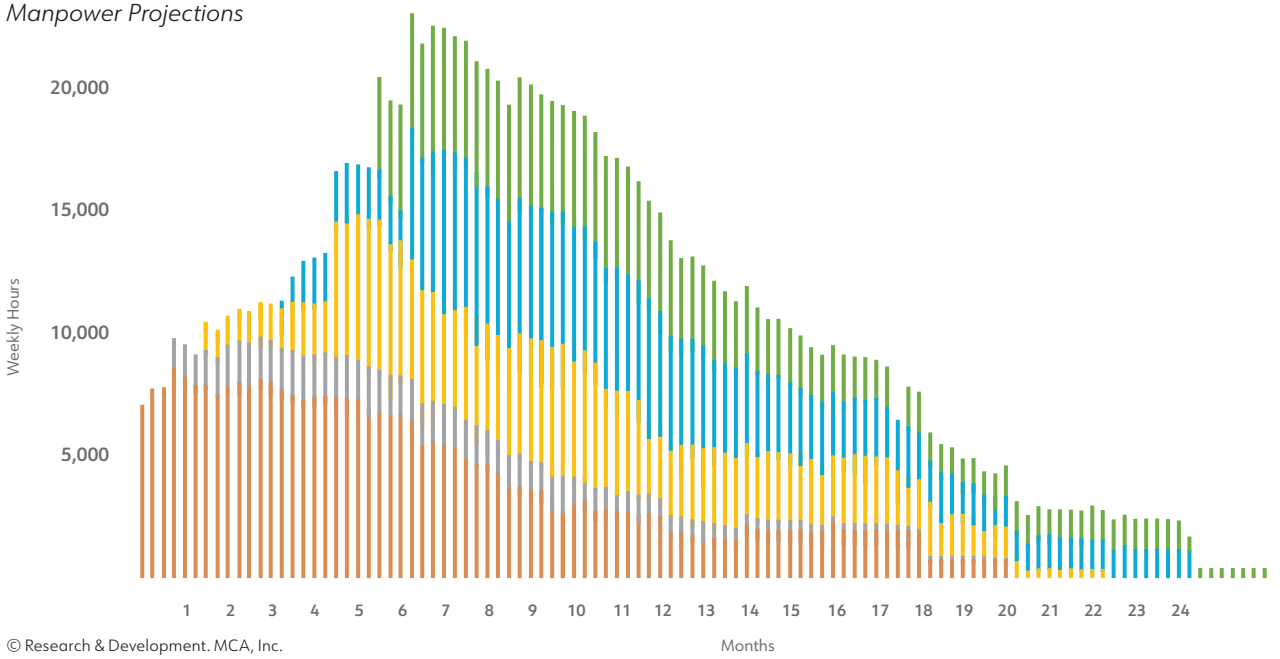
CONCLUSION

The construction industry has unique financial management challenges due to the unpredictable nature of the source data. When there's a lack of visibility into the pipeline and backlog, CFPs who rely on linear projections and predictions negatively impact projects and budgeting.

However, digitizing and connecting data sources, incorporating trend data about daily schedules, and using realistic progress measurements and data-driven decision-making, CFPs can successfully implement more accurate and financially sound nonlinear and historical performance-based projection and budgeting approaches. **BP**

Exhibit 7: Planning Ahead With Visibility to All of the Work

Manpower Projections



DR. PERRY DANESHGARI is President and CEO of MCA, Inc. *(mca.net)* in Grand Blanc, MI. MCA, Inc. focuses on implementing process and product development, waste reduction, and productivity improvement of labor, project management, estimating, and accounting. A previous author for *CFMA Building Profits,* his current focus is on making productivity visible to everyone through digitalization, commonization, and interconnection™ as well as strategic planning and founder transitions. He can be reached at 810-232-9797 and *perry@mca.net.*

DR. HEATHER MOORE is the Vice President of Customer Care and Support at MCA, Inc. *(mca.net)* in Grand Blanc, MI. A frequent author for *CFMA Building Profits,* she holds a PhD in Construction Management with a focus on information available from the jobsite work environment using MCA, Inc.'s processes and tools for Work Environment Management (WEM®). She has contributed to research as well as customer process implementation with MCA, Inc. Dr. Heather can be reached at 810-232-9797 and *hmoore@mca.net.*

JENNIFER DANESHGARI is the Vice President of Financial Services at MCA. Inc. *(mca.net)* in Grand Blanc, MI. A previous co-author for *CFMA Building Profits,* her current focus is translating field data into forward-looking information that can be used for strategic business decisions. She can be reached at 810-232-9797 and *jennifer@mca.net.*

Endnotes

1. *Daneshgari, Dr. Perry. Agile Construction® for the Electrical Contractor (Second Edition). MCA, Inc. 2020.*
2. *Daneshgari, Dr. Perry; Moore, Dr. Heather; & Daneshgari, Jennifer. "PMs & CFMs: Increase Information-Sharing to Improve Profitability." CFMA Building Profits. March/April 2021. cfmabponline.net/cfmabp/20210304/MobilePagedArticle.action?articleId=1669332.*