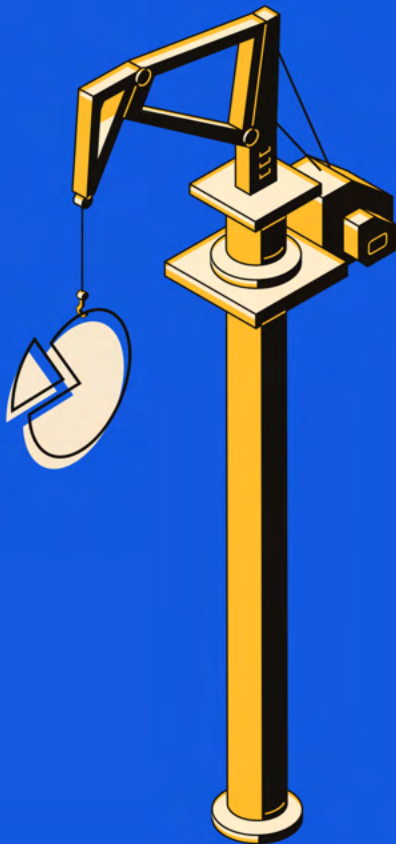# HOW CONSTRUCTION LEADERS
# BENEFIT FROM ADVANCED ANALYTICS

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## $5.1 BILLION

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The digital transformation of construction has been one of, if not the, biggest changes across the industry. Organizations have invested in technology solutions to strengthen all aspects of their business, from the lifecycle of a project to back-office functions. From 2015 to 2019, investors allocated $5.1 billion to construction tech startups across 571 deals.[1] With such a heavy investment in this digital transformation — and as organizations have started to enter into a post-Covid-19 world — this is a clear signal that digital collaboration is the path forward.

Part of the motivation here is to overcome the inefficiencies associated with "legacy" reporting systems. All too often, contractors are working with systems that don't talk to each other. As a result, they may have to manually reenter hundreds of lines of data from their project management software into their accounting platform, wasting time and risking errors. At a certain point, they can no longer tolerate the stagnant process of double entry, and they start looking for solutions. Similarly, too many contractors waste untold hours manually extracting data from different spreadsheets to put together reports that could be automated and customized in a cloud-based platform.

But increasingly, contractors are interested, not just in addressing such problems, but also in taking fuller advantage of one of their most valuable resources: their data.

Within all digital applications being utilized, information is being collected in the form of data and documentation. And the trend shows no sign of slowing down: The industry continues to shift toward collecting even more data from the likes of AR/VR equipment, BIM models, wearables and other emerging technologies. By continuously collecting data from these various applications and connecting them into a data warehouse or data repository, construction leaders can leverage the tremendous benefits of advanced analytics.

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*Investing resources into data strategies, particularly when applied to decision-making, have clear performance implications. Data-driven companies are 58% more likely to exceed their revenue goals when compared to their non-data driven peers.[2]*

## WHAT IS ADVANCED ANALYTICS?

According to Gartner[3], advanced analytics is the autonomous or semi-autonomous examination of data or content using sophisticated techniques and tools, typically beyond those of traditional business intelligence (BI), to discover deeper insights, make predictions, or generate recommendations. Advanced analytic techniques include those such as data/text mining, machine learning, pattern matching, forecasting, visualization, semantic analysis, sentiment analysis, network and cluster analysis, multivariate statistics, graph analysis, simulation, complex event processing, and neural networks.

Advanced analytics has turned into a central focus for leaders in other industries as they execute ambitious plans, make bold choices, and pursue all angles to gain an edge. To be sure,  adopting advanced analytics and/or data-warehousing can create some challenges for project-driven organizations.

For example, adopting a new technology solution and framework for **KPIs** during the lifecycle of a project can cause incompatibility and irregularity in the data-collection process. Nonetheless, that hasn't stopped top contractors from building real-time, cloud-based analytical systems to unsilo disparate data sources and deliver actionable insights to decision-makers.

One construction tech executive, in an interview with Forbes.com[4], tersely described the stakes in today's highly competitive construction industry: "Data is the new dollar. Material waste accounts for approximately 25% of a project's cost, and rework adds an estimated 10%. This is inexcusable given the fact that today's digital tools are readily available to stop this haemorrhaging of money, materials and time. This inefficiency costs big money to customers."

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[2] https://www.ciodive.com/news/tech-proficient-companies-leadership-thoughtworks/600389/

[3] https://www.gartner.com/en/information-technology/glossary/advanced-analytics

[4] https://www.forbes.com/sites/bernardmarr/2016/04/19/how-big-data-and-analytics-are-transforming-the-construction-industry/

Incorporating an advanced analytics strategy into the decision-making process doesn't replace the current way of doing things; it supports it with a fact-based approach that stands to:

# 1. Reduce Bias in Decision-Making
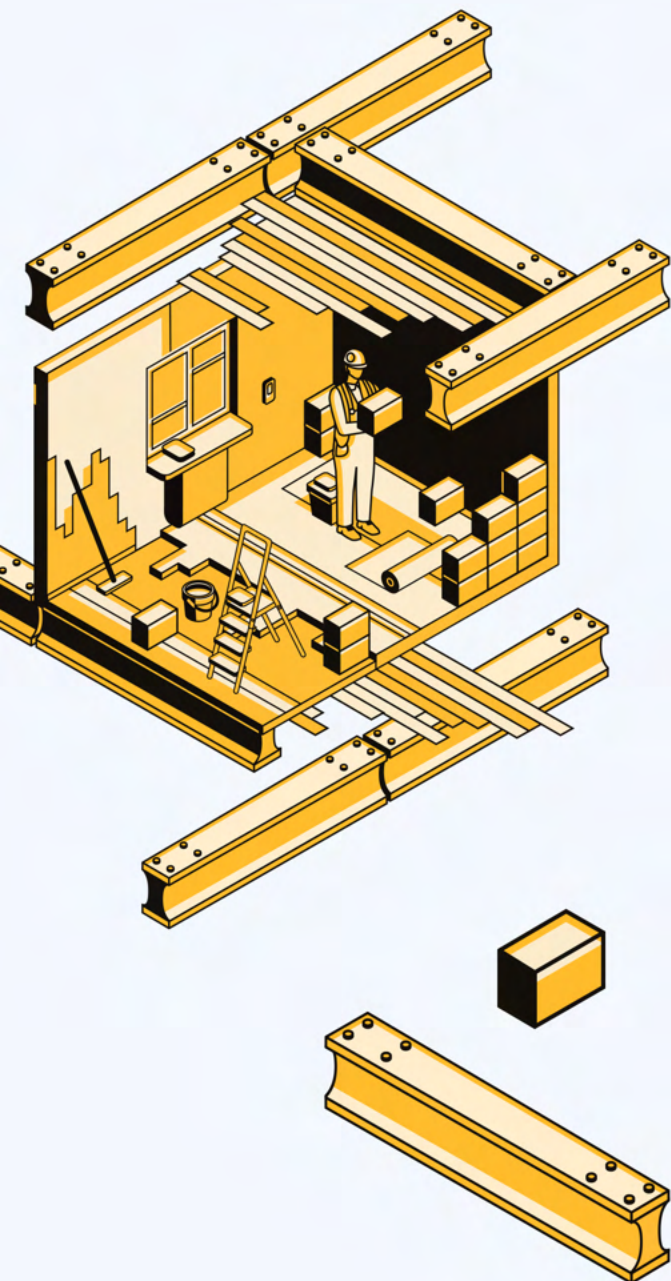
A cognitive bias is a systematic error in thinking that occurs when people are processing and interpreting information in the world around them; psychologists have repeatedly demonstrated that cognitive biases routinely undermine our decisions and judgments. In construction, one of the most common biases involves relying too much on "gut feelings," based on previous experience and expertise, to calibrate the likelihood of a future project's success. This is not to devalue personal experience and judgment, which certainly have an appropriate role in decision-making. However, analytics can help construction leaders ferret out flawed assumptions and better understand the actual variables in play in any decision. The basic idea: rely on concrete facts on data points such as contract and labor arrangements, costs/resources (such as materials and equipment), location, weather, project type and size, and more. This effort tends to uncover factors that influenced the performance and profitability of prior projects. Making decisions, not based on opinions, but on proven historical data empowers construction firms to better assess the likeliest outcomes of projects under consideration. **Advanced analytics** can also mitigate early-stage risks and lead to process improvements that ramp up profitability. For example, one construction contractor gave smart bands to all workers and then tracked them as they travelled back and forth on the jobsite from stored materials to their install locations. By applying analytics to this data, the contractor was able to find the most efficient and cost-effective storage locations for those on-site materials. Another used data to optimize its supply chain.

# 2.

## Uncover New Growth/Savings Opportunities

Advanced analytics complements the traditional strategic-planning process. It enables contractors to identify trends that would otherwise be hard to spot—for example, by projecting which opportunity may be the most attractive, or finding ideas for new services that would support hitting new revenue targets. Leveraging advanced analytics enables companies to more confidently move forward with strategic decisions, such as which regions, project sizes or specific subs or GCs are the best fit for their organizations.

**Connecting and automating data into an analytics engine** will deliver real-time insights into any information a construction leader seeks. One contractor, for example, used analytics to dramatically improve its approach to equipment management. Prior to "going digital," the national construction firm relied on carbon copies to track its inventory—a labor-intensive process that required costly, time-consuming monthly audits and that was marred by crew members routinely failing to fill out equipment transfers. This breakdown in the process led to chaos in the yards as crews came and went grabbing equipment, which in turn made it impossible to accurately track quantities. After rolling out a data-driven approach, the contractor was able to register individual pieces of equipment in the system, with ID numbers, weights, pics, specs, current and scheduled locations and more. Yard managers could now approve new transfers at the touch of a button. Simultaneously, this approach created a rich trove of equipment data that could be analyzed from every angle.

Today, leaders at the firm have a better sense of when to buy equipment as opposed to renting it. They have cut back on disruptions caused by "last-minute" equipment pickups; bolstered accuracy by reducing the need for manual data entries; and succeeded in more accurately estimating equipment costs and quantities. They even save thousands of dollars each year by tracking and managing damaged equipment more efficiently.

Across the industry, contractors are getting better at making productive use of analytics. Their efforts include running "what-if" scenarios related to jobs, cash flow, safety risks and sales and pre-construction dynamics. GCs use advanced analytics to identify the best subcontractors, while specialty contractors leverage these tools to quantify their progress in areas such as productivity, quality and safety, thereby winning more bids. On the financial side, construction decision makers leverage **cloud-based analytics platforms** to better understand the state of their contracts; their profitability, liquidity, leverage and efficiency ratios; and to see how their companies stack up against benchmarks by the likes of the Construction Financial Management Association.

But organizations are not just finding patterns in their internal data: Increasingly, construction leaders are integrating publicly available data on weather, sales taxes, labor rates and more into their analytics dashboards. Their goals include monitoring project performance, identifying risks, and positioning themselves to quickly pivot before jobs get troublesome and market conditions become unfavorable. In a world with increasing uncertainty, construction leaders are using advanced analytics to more dynamically set, manage and execute their strategic plans.

# 3.

## Anticipate and Adapt to Change

Data modeling and predictive analytics can be used to help leaders and managers anticipate and respond to fluctuations in schedules; materials and labor costs; productivity, and more. In the course of this modeling, behaviors that likely would not have been predicted using traditional, spreadsheet-based approaches to analysis often "emerge."[5] One contractor, for instance, is using advanced analytics to integrate data from its two offices into comparative reports. The goal is to understand, not just which office is making the most money, but precisely why. In this case, access to a data warehouse has given the company the ability to model different "what-if" scenarios: How much more profitable Office X would be if labor costs were reduced by 2 percent, or what the situation would look like for both offices if lumber costs increased at the present rate, or projected revenues for the next 2-4 years if the company wins particular bids on its radar screen.

Other contractors aim for a 360-degree view of resources—knowing what they have, where, and what they will need—by doing deep dives into important variables such as employment trends.[6] To be sure, not all events are easily predicted.

When the Covid-19 pandemic hit, for example, few, if any, construction contractors had game-planned what would happen in the event of a global pandemic. Nonetheless, contractors were able to **use data analytics to rapidly respond**.[7] For instance, they leveraged cloud-based analytics platforms to game-plan scenarios related to the federal Paycheck Protection Program, in some cases running up to eight different scenarios. They focused on identifying the causes of slow receivables and calculated the burdens associated with financing negative cash flows. Construction leaders used analytics dashboards to reexamine their backlogs based on historical data and asked questions related to the likely effects of delays or cancellations; the efficiency of existing projects; the state of their budgets; the revenue they could anticipate collecting, and how to establish a competitive balance between fixed personnel costs and their projected level of revenue.

[5] https://www.constructiondive.com/news/data-analytics-facilitates-more-accurate-project-costs-schedules/578620/

[6] http://nationalsurety.com/predicting-the-future-construction-industry-job-skills-to-recruit-for/

[7] https://pronovos.com/webinar-using-analytics-to-navigate-economic-uncertainty/

# Next Steps

Construction leaders who employ an analytical approach and bring data-driven insights into the decision-making process are far more likely to see their companies emerge as leaders. Whether it's knowing what to bid, tracking variable costs, or monitoring project performance, the ever-improving capabilities of analytical platforms increasingly create new ways for construction leaders to evaluate new opportunities, overcome inefficiencies and see their organizations in new ways.

But before they use advanced analytics to make quicker decisions with greater confidence, they should ask some questions that could shape their approach.

These include:

+ **Precisely what data points do you want to see?**

+ **What systems and workflows do you want to integrate for reporting and analysis?**

+ **What is the state of your data cleanliness[8] and how will you improve it if that is required?**

+ **Which internal and external stakeholders will see your reports and how should those reports or dashboards be customized to accommodate different roleplayers' needs and even personal preferences?**

+ **Will the tech firm you work with design your dashboards and reports based on your existing processes and workflows, or expect you to wrap your organization around a static, inflexible application?**

+ **How will you distribute information and bring it into the decision-making process?**

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In assessing their current tech stack and reporting methods, construction leaders should pay particular attention to whether siloed data is hindering their understanding and/or whether they are bidding with incomplete or inaccurate information. It also helps to determine precisely what's mission critical and essential, so that you can prioritize reports and processes, and to set clear objectives to benchmark and beat. The IT team could also consider tracking trends construction data—everything from predictive analytics, to machine-learning and AI—to make sure the company can capitalize on these new opportunities as they emerge.

Finally, it's important to acknowledge that challenges may arise in adopting advanced analytics. These include creating a data-centric company culture in which all stakeholders prize compliance with respect to the accuracy and timely collection of information. Toward that end, it's extremely important to adopt a platform approach that "keeps it simple" and actually makes the jobs of personnel in the office and the field easier, not the converse.

Contractors should ask tough questions about what to measure and bring a healthy skepticism to their interviews with technology vendors. As noted by Bruce Orr, founder and Chief Data Scientist of ProNovos, metrics that are useful to one company can be meaningless to another. While certain financial yardsticks are universal, the relevance of other **key performance indicators (KPIs)**[9] depends on many factors, such as how large the company is, what it builds, who its customers are and how long its projects take to complete. A contractor with 15 or 20 customers, for instance, could discover some surprise standouts by ranking them according to project profitability over time—and then targeting bids accordingly. For others, though, such a high-level ranking may have less utility. Construction data visualizations can help contractors understand multiple dimensions of their internal processes, such as AR and AP, at a glance. But every metric must be rigorously questioned. "If it's a 100-hour job and the crew has already logged 50 hours, that may seem to suggest that the project is halfway done," Orr wrote in a column for Construction Business Owner. "But introduce production quantities and you may learn that only 25 cubic meters of concrete, out of a required 100, have actually been poured... Nearly any KPI can sound like it would add to your understanding, but by looking at the specifics at your own company, you can better determine which metrics will serve you best."

[9] https://pronovos.com/kpis/
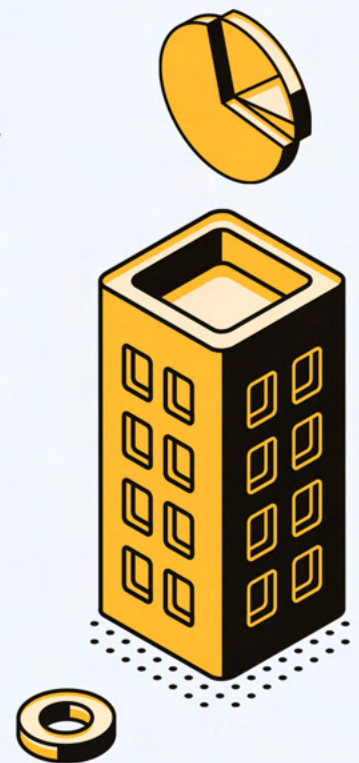
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