



Predictive Analytics in Construction:

Maximizing the value of historical project data

linesight.com

Predictive analytics in the value of historical project data

By 2026, the big data analytics industry is expected to reach US\$273.4 billion.

Businesses that are incapable of leveraging the quintillion bytes of data that are generated daily will be left in the dust. As clients begin to **expect greater and more accurate estimates for projects**, the construction industry needs to **harness historical project data** to **provide greater insights for the future**.



That's why advanced analytics, such as predictive analytics, are so important. Used in conjunction with machine learning, AI and other technologies, predictive analytics can help to improve estimates and provide value to customers. As the industry adapts to this new method, construction firms need to lead the way in ensuring that everyone involved in the process — from subcontractors and contractors

to clients — are aware of the value that data and analytics can provide to current and future projects. By creating a greater understanding of the value, construction and construction consultancy firms can help to improve costs, drive project efficiency, improve quality outcomes and timelines and analyze data to assist in decision-making and future investment decisions.

What is predictive analytics?

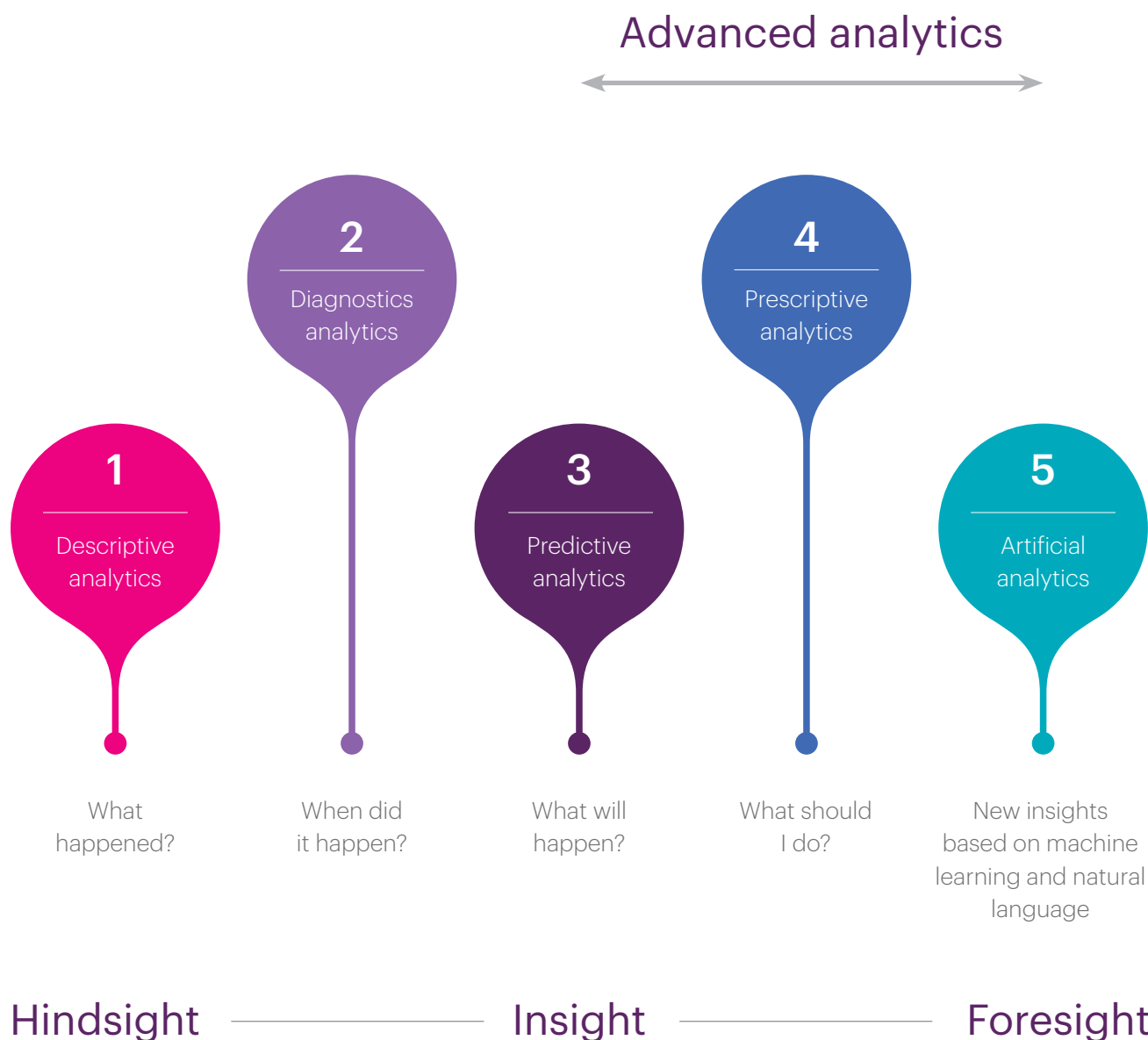
“ Predictive analytics is a branch of advanced analytics that makes predictions about future outcomes using historical data combined with statistical modeling, data mining techniques and machine learning. ”



Though it may not always involve all of the above techniques, predictive analytics centers around analyzing what will happen before it does. It focuses on collecting and understanding data to forecast what will happen in the future, based on what has happened in the past. We move from a place of

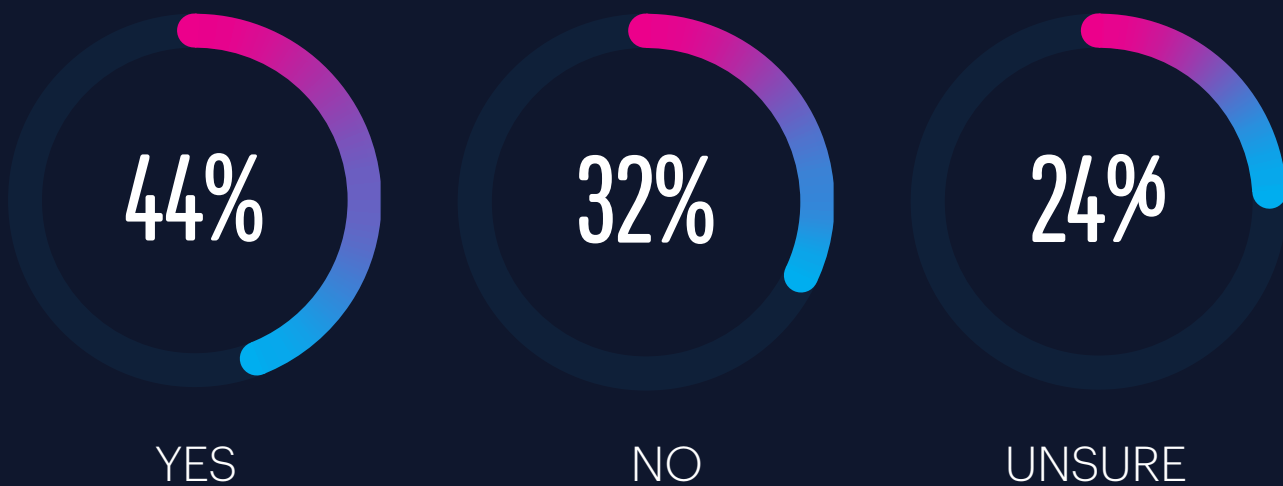
hindsight towards foresight – what happened (descriptive analytics), and why (diagnostic analytics), to what might happen (predictive analytics), and what can be done about it (advanced analytics and leveraging AI). There is overlap across the board, and they are closely interwoven.

An overview of analytics



Getting started: data and the power of predictive analytics

Do you feel the construction industry is ready to harness the power of predictive analytics*?




“Although the industry is always open to change, getting ready for these opportunities is another challenge.”

*Poll results taken from RICS Conference 2021 - 'A new era for construction and infrastructure'

Most construction firms, whether they are consultants, project managers, engineers or anything in between, are already unknowingly using predictive analytics. Take, for example, parametric estimates, which occur at the concept stage. A project estimation technique that uses a unit rate to project costs, parametric measurements are generally considered to be an accurate estimation method because they use similar projects or industry benchmarking to formulate the estimate. For example, companies can anticipate the cost of a project with confidence by analyzing the ranges of previous projects they've completed. This common method of estimation is predictive analytics: you're predicting future outcomes based on

historical data. It's important to understand that these techniques are already something that the industry is focused on. The next steps are to refine, adding data and technology to enhance the scope of the services that we already perform.

Another critical aspect to predictive analytics is that it's a process. Putting information into the program once will not produce a final, ultimate answer. It's a continual process of adding new information, new data and new sources to enhance the predictions that it makes. Throughout the process, data engineering must be conducted consistently – data must be collected, inspected and appropriately cleaned.



“ It’s a continual process of adding new information, new data and new sources to enhance the predictions that it makes. ”

The data challenge

In order to **use predictive analytics to accurately forecast needs**, firms must start with data — and lots of it. The issue is that, without context, data is meaningless and it cannot be turned into useful information. Known as data engineering, the process of getting accurate data that can be used for predictive analytics modeling involves:

Collection

Since datasets tend to be relatively robust so that they can yield more complete results, gathering data from previous projects is essential for the construction industry. If insufficient data is collected, there will not be an adequate amount of data to draw models from. With the immense amount of historical data available in the industry, construction firms need to begin to digitize data to ensure that they can benefit from all information and sources.

Inspection

Inspecting the data should occur at various stages of the process: upon collecting data, upon cleaning data and upon reviewing the results. Data inspection involves reviewing all collected data for verification and cleaning to ensure that it is accurate.

Cleaning

Data cleaning prepares all information and standardizes it to ensure that models will be accurate. During the process, data may be removed or modified to revise incorrect, fraudulent, incomplete, improperly formatted, or duplicative information. The key here is to

ensure that the data is clean, but not inaccurate. Removing or modifying too many data points can produce skewed results.

Data collection is an ongoing process, with constant streams of data needed to refine results and create more accurate predictions, which means that the role of a Data Engineer is never done. Inputting information into the program once will not produce one final, ultimate answer. It's a continual process of adding new information, new data and new sources to enhance the predictions that the system makes. Anyone using predictive analytics, or hoping to incorporate it, must understand the need for a constant stream of clean data to enhance the process. Without clean data, predictions will be flawed and inaccurate, producing skewed results that do not add value.

“ By ensuring sound data cleansing processes, the industry can begin to gain value from predictive analytics. ”

Value for the construction industry

Do you believe clients would be willing to pay more for a service that utilized the power of predictive analytics*?



“ The labor and time savings from advanced analytics can translate into value and advantages for the customer. ”

*Poll results taken from RICS Conference 2021 - 'A new era for construction and infrastructure'

“ Data is an invaluable commodity, and the value of predictive analytics in the construction industry shouldn’t be underestimated. ”

Although the process is significantly less labor intensive — a quality that is crucial for the industry as it continues to be challenged by labor shortages — clients benefit from the increased information and expertise that is available before the project begins.

Speed of analysis

With predictive analytics, historical data is already available in a clean, consistent format for all future needs. This greatly reduces the time needed to make strategic decisions, as the data is already accessible for analysis. Instead of starting from the beginning for each project, there is historical information available that can be analyzed and presented based on the current business or project needs.

Data accuracy

The benefit to predictive analytics is that the more data that is inputted into the system, the more accurate the resulting information will be. These multivariable analyses are a better predictor of future trends than standard parametric metrics, used in conjunction with calculations. By implementing systems that can accurately predict future trends, combined with human experience and expertise, clients can be provided with more accurate indicators of the project success, costs and other important data.

Labor savings

Labor savings processes are extremely important in the construction industry as we contend with labor shortages within the market. By removing the human interaction with data collection, cleaning and analyzing, companies can save on

labor input in the initial stage of the construction process. This includes reducing manual efforts in estimations, project management and cost management. Instead of spending time analyzing and reviewing data, predictive analytics allows automation to complete more mundane tasks, allowing employees and experts to spend their time on higher value advisory responsibilities.

Continuous improvements

With years of historical data available, the construction industry has the ability to create robust data sets to inform future projects. With machine learning, models can be continuously enhanced and improved through increased volumes of data and better capabilities. This allows for ongoing improvement, because the models become more intelligent over time with data that is consistently collected and made more accessible for review and analysis.

Wide applications

With a robust data bank, the models can be used for a variety of projects across the industry. At Linesight, we use it for controls, and to improve accuracy and integrity, but we’re also constantly researching new applications for existing information. Once the data and systems are in place, the power of predictive analytics can be applied across multiple business units and industry sectors.

Predictive analytics challenges

Challenge #1: Sector challenges

There are two general types of enterprises at this moment in time. Born-analog enterprises are those that were founded before 1995, before digitization took over. Their digital and technology competencies are not as advanced, and they are in the process of trying to upgrade their systems and processes for digital transformation. On the other hand, born-digital enterprises have modeling capabilities that rely on new technologies from the Information Age. Even if they aren't strictly digital or technology companies, they have a strong technology foundation. Most construction companies fall into the former category. There are many areas where the two types of enterprises differentiate, including the systems that they use.

The problem is that, among the born-analog companies, there is often a reluctance to transform. Since digital transformation is typically associated with high costs, specifically related to the introduction of new systems and processes, management can be reluctant to make the necessary changes. Analog companies tend not to have the same trial and error approach as digital companies, which makes their innovation and transformation process slow. For established construction companies, these processes can get in the way of digital transformation, although the industry as a whole would greatly benefit from it. As part of one of the oldest industries, construction firms have decades of data available that could help with future project predictions. In order to benefit from this data, which comes from an analog environment, companies need to review and input historical data sets manually. This would require significant time investments.



Challenge #2: Upskilling and digitization

Although construction companies are already likely using predictive analytics in predictive estimates, most don't realize they're using it. When they hear the term "predictive analytics," they assume it will be complicated and costly to implement, causing hesitation. That is why one of the barriers that needs to be addressed is training and understanding of what predictive analytics actually involves. Organizations also must understand the value of these insights in providing more accurate estimates, better quality outcomes, better decision-making parameters, and potential cost and time savings.

In order to implement predictive analytics effectively, construction companies need to invest in experienced such as data analysts. Data analysts are responsible for finding trends in data sets and developing algorithms to help make raw data more useful. They also need to focus on training all subject matter experts to understand the information and pinpoint outliers. Although data analysts are able to input and clean data to create robust datasets, there can still be issues or unexpected results. All team members must be confident in their ability to review and explain data sets and results.

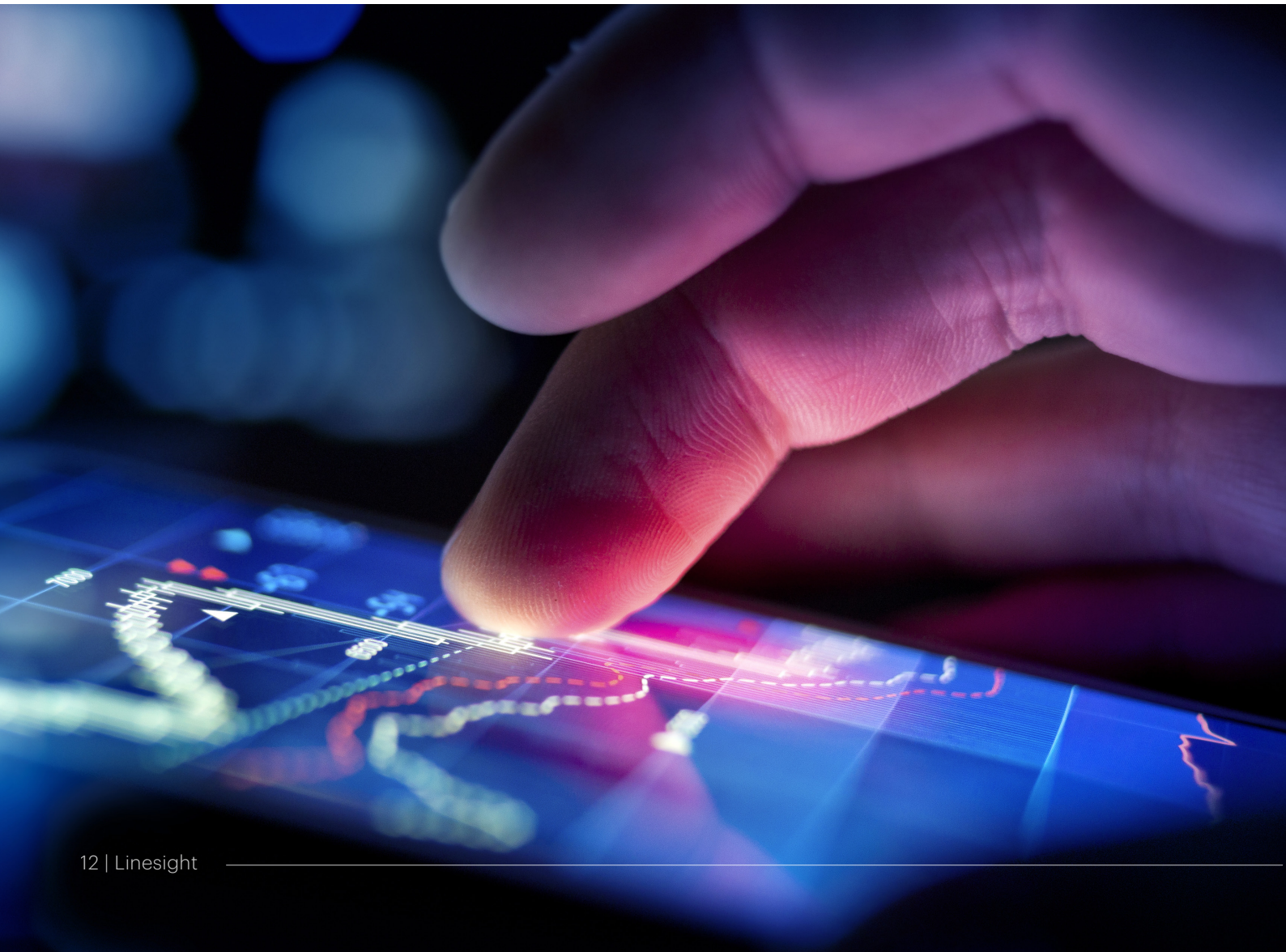
“ Data analysts are responsible for finding trends in data sets and developing algorithms to help make raw data more useful. ”

Challenge #3: Opacity challenge

Accurate analytics and AI are dependent on the quality of data used, so data must be clean, unbiased and comprehensive to avoid skewed results. Since the construction industry has been around for decades, there are many years of data to pull from to gain accurate results. This increases the chance that results could be skewed, due to poor data sources or unexpected changes in the industry. Firms relying on advanced analytics need to be able to adequately understand output to quickly see and correct biased data. They also need to balance removing bias in the data with over-correcting the data sets, which can create inaccurate results. Sufficient data is required

to avoid outliers having too great an impact on the output.

While having high-quality data is important to feed into AI and analytics models, data transparency is also a key consideration in building trust in the output. Visibility and access to data are critical in gaining confidence that insights gleaned from analysis are in fact accurate and representative of the available information. This transparency extends across the entire analytics life cycle, from mapping to acquisition and data publishing. When all stakeholders have a clear view of the practices involved in each stage, they are more likely to trust the end results.





Challenge #4: Open source data

A concept that has gained popularity in many industries is open source data. Unfortunately, this poses a risk in terms of confidentiality and consistency. In terms of confidentiality, open source is susceptible to data breaches and cybersecurity attacks. If companies are not completely confident about where they are obtaining their open source data from, they can unintentionally create system vulnerabilities that allow attackers to perform unauthorized actions.

In terms of consistency, the issue with open source data is that it may not have the same standards or data governance as the overall

company has, or as the organization expects the data to have. This includes consistency of definitions of data, and items and sources for inclusion. This can result in poor data being used for your predictive analytics algorithms, which then produces inaccurate data sets. Since machine learning models improve based on the inputted data, it's important to ensure all data is consistent so that the most accurate results are available. Construction data sets are relatively small compared to other industries, which means that they will be more sensitive to inaccurate data. A single piece of inconsistent or inaccurate data could impact the entire system, which could create biased results.

Investing in predictive analytics

Even with the many benefits of predictive analytics, it may be challenging to understand where to start in the implementation process.

Ultimately, the steps can be broken down into three core elements, starting with investment.

Investment

In the case of advanced analytics, substantial investments are required in terms of capital, but also in terms of time, systems and employees. Starting with investment in employees, time must be allotted to train and upskill staff in innovation and new analytics techniques. Investing in existing employees is a smart business decision and can create a culture of growth. When employees understand that their company is willing to invest in their education and upskilling, it improves the company culture to one of innovation and improvements, which can go a long way as the industry digitally transforms.

Companies will also need to invest in systems and software to run the analytics programs. There are many existing software programs that offer analytics. It's important to analyze the types of data that are available and understand what insights the company needs to draw from them. From there, it's easier to decide what platform the company should invest in based on the business needs. Without these investments as the base, companies cannot move on to the next stage of the process.

“ Investing in existing employees is a smart business decision and can create a culture of growth. ”

Data engineering

Initially, engineering will be required to ensure clean and consistent data. While time-consuming, this is an important initial step to ensure that the outputs will be accurate for future projections. Using the data currently available, data engineers are responsible for creating the infrastructure and governance that will create consistency as the data bank grows. Even without investing in predictive analytics, having clean and consistent data in a database is a benefit, which is why investing in data engineering is critical.

As your analytics become more advanced, the data engineer role will evolve into an analyst position. This will involve reviewing data from past and current projects to anticipate costs and timelines on future projects. Data engineering can help to understand and answer important questions for the business and for clients.

“ Data engineering can help to understand and answer important questions for the business and for clients. ”

Experiment

Born-digital companies lack a fear of failure, which enables employees to suggest new ideas. For predictive analytics, this is an important step in becoming confident in understanding and handling the data. Testing and experimenting with new ideas and analytics, without having to rely on the output, is also an important part of the process. This will help the company become more familiar with the analytics tools and reading the data, checking to ensure how accurate they are without worrying about the client's needs.

As employees become more confident and comfortable with the data itself, the company can begin to offer these data capabilities as a value-add to clients.

“ Testing and experimenting with new ideas and analytics, without having to rely on the output, is also an important part of the process. ”



The future is data

Across all industries, data is becoming an important commodity for justifying and making accurate decisions. Across the board in construction, the industry is moving towards predictive analytics to make AI and new technologies a reality. In order for businesses to remain competitive in this space, they need to **understand the value of data and digital optimization** and need to start investing in the systems and individuals that will help bring value from data sources.

The construction industry also needs to ensure that it is working with contractors and subcontractors who are willing to invest the time and energy into data collection and managing expectations upfront when deciding who to use for projects, to allow alignment on data and create consistency. All partners in the project will need to understand what is required of them. Working with a construction consultant can also help to ensure that data collection is efficient and consistent, as they can manage all aspects of the project life cycle from conception to completion.

Ultimately, predictive analytics can elevate all aspects of the construction industry — from initial project estimates to project execution, all the way through project handover. By providing clients with data-backed information, alongside in-house expert analysis, construction firms can build trust with key industry stakeholders. It can help to optimize project timelines by predicting issues that may arise ahead of time and allowing the project team to implement mitigation measures as appropriate. In a highly competitive industry, it is this added value that will help construction firms and contractors to stay ahead.

