

THE INTEGRATION IMPERATIVE: WHY SUSTAINABLE GROWTH DEMANDS SMARTER PROJECT CONTROLS



GROWTH, COMPLEXITY AND THE CASE FOR INTEGRATION

The construction industry plays a pivotal role in the global economy, and current reports show no signs of it slowing down. Growth in general construction output is predicted to average 3.6% per year to 2030, higher than either the manufacturing or services sectors.¹ This fact, coupled with forecasts that investments in new infrastructure will peak over the next decade, presents a welcome yet challenging opportunity for new construction projects in multiple key markets.²

Because while this growth in construction is driving positive changes across our industry, such projects are also incredibly capital intensive. So, if we are to succeed as an industry, all capital projects must be managed at the highest efficiency rate possible throughout their full life cycles.

In their quest to meet this new demand for maximum project certainty, smart construction project owners and contractors are already benefiting from connected construction technology. With thoughtful planning, highly scalable integrated systems can be smoothly adopted in a modular fashion and grow as business dictates, meeting today's urgent needs while paving the way to a fully integrated future state.

Taking a step back to examine the current project landscape and its challenges makes a persuasive case that integrated project controls is the preferred path to support complex projects — and crucial for your continued business success.

THE CHANGING DEMANDS OF THE CONSTRUCTION INDUSTRY

The Need for Greater Operational Resilience

With the copious amounts of data generated across the value chain of a construction project, the current focus is to gather this data into a single platform to derive actionable insights. In a recent survey conducted across organizations involved in capital-related projects, most respondents acknowledged digital transformation to be the biggest enabler of growth in the coming years. Further, nearly 100% of these respondents expressed a desire to do more with the data they capture.³

The Push for Outcome-Driven Processes

The combined impact of the major external and internal trends transforming the construction industry is resulting in a long-awaited paradigm shift to outcome-driven processes. This has implications for every phase of a project (from the concept or pre-planning phase to design and construction to startup and operations) and alters the very definitions of success that will be used in the industry moving forward.

¹ *Future of Construction*, Oxford Economics, September 2021.

² *Supercharging Net Zero, the Race to a Faster, Fairer Energy Transition*, Arcadis, 2022.

³ *Global Capital Projects Outlook, 2023: Seeing the Bigger Picture Together: Connected Data for Smarter Decisions*, InEight, 2023.

The Role of Construction Project Owners

Financiers for construction projects and project owners or their representatives are increasingly getting involved in all life cycle phases, especially in critical construction projects. Owners may adopt an arms-length, supervisory role or may get intimately involved in design and construction as an active collaborator depending on the project delivery model.

Whatever the approach, the owners' increasing need for greater visibility and tighter control requires more comprehensive and connected digital solutions. These enable collaboration and agile decision-making as your business grows, managing and mitigating project risk as you go.

With the advent of improved data capture tools and digital project controls, owners can now anticipate issues before they occur. Additionally, they can establish more realistic plans, and accurately account for and mitigate risks, resulting in higher certainty around project outcomes.



Shifting Workforce Demographics

The construction industry averaged more than 390,000 job openings per month in 2022, the highest level on record, and the industry unemployment rate of 4.6% in 2022 was the second lowest on record, higher than only the 4.5% unemployment rate observed in 2019.⁴

At the same time, the global construction industry is currently contending with a negative labor demographic, with approximately 21% of the workforce 55-years and older. Only 9% of the current workforce is in the 24-year-old-and-below range.⁵

The resulting labor shortage is being viewed as an industry-wide challenge to be addressed through a range of strategies, including the leveraging of automation and digital technologies. The construction industry must help bridge the gap of this transition.

- A survey conducted by the Associated General Contractors of America showed that 80% of U.S. construction companies encounter difficulties locating qualified employees.⁶
- The NCCER has indicated that over 40% of the current U.S. construction workforce is expected to retire by 2031.⁷

With statistics like these, it will have to be our smartest solutions to improve project staff utilization and reduce time taken to complete common tasks such as schedule and budget creation, document search and updating, plus data analysis) that will help us gain positive traction.

⁴ *Construction Spending and Employment Forecast, ABC, February 2022.*

⁵ *Business Model Innovations in the Building Construction Industry, Frost & Sullivan, 2020.*

⁶ *USG+U.S. Chamber of Commerce Commercial Construction Index, 2017, Q4, U.S. Chamber of Commerce, December 2017.*

⁷ *The End of an Era, the Dawn of Digital, NCCER, Fall/Winter 2017.*

WHY INTEGRATED PROJECT CONTROLS FOR CONSTRUCTION?

Integrated project controls, also known simply as project controls, streamlines workflows by integrating all necessary management processes onto a single platform. It also helps owners gain access to information across project phases and facilitate better monitoring and execution.

Project Controls Systems Across All Project Phases

Pre-Planning. Project controls connects across disciplines and brings together estimate/bid/tender information with the schedule, while also drawing insights from past performance for risk analysis. It also assists in enhancing engineering management whereby owners can see design changes in real time and understand their impact on the project schedule and cost to decide whether to retain the design or look for alternatives.

Design and Construction. The cost of key construction materials rose sharply between 2019 and 2020. This highlights the critical nature of close monitoring and management of cost and schedule during the design and construction phase. Project controls provides the right execution tools that gather project progress from the field to create performance reporting for owners to access.

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Startup and Operations. Project controls can pool all documentation, inspections and models. This will ensure that owners have a complete historical record of the project that is well-documented and can be visualized through a digital twin. A digital twin provides the owner valuable insights that can be leveraged throughout the lifetime of the asset. All construction project and commissioning data is available for the operations team.

A modular project controls system can also help address the challenge with disconnected point

solutions. While such solutions may be highly efficient in niche functions, regular introduction of new point solutions can lead to a cacophony of technologies and create data silos from different vendors, resulting in compatibility and integration issues. And no wonder. Point solutions were not created and therefore cannot be expected to communicate with each other. In addition, projects can run into data sharing challenges due to lack of data standardization across solutions and due to the absence of a consistent framework.

In this context, adopting an integrated platform can make connected data available in real time, allowing owners to better understand past context and current state, and give contractors the chance to create more accurate forecasts. Having these fully enriched, time-sensitive perspectives enables more impactful decision-making that can greatly mitigate risk and improve outcomes across the board.

SOLVING FOR CONSTRUCTION PRE-PLANNING

The pre-planning phase of a construction project encompasses the tasks that are done to support project approval prior to moving onto significant engineering and design work. Some of the major activities undertaken during this stage are the identification of project scope, feasibility and constructability analyses, and development of a high-level (or conceptual) budget and schedule.

In addition, any critical information captured during this phase will serve as a solid foundation for subsequent detailed design and construction work

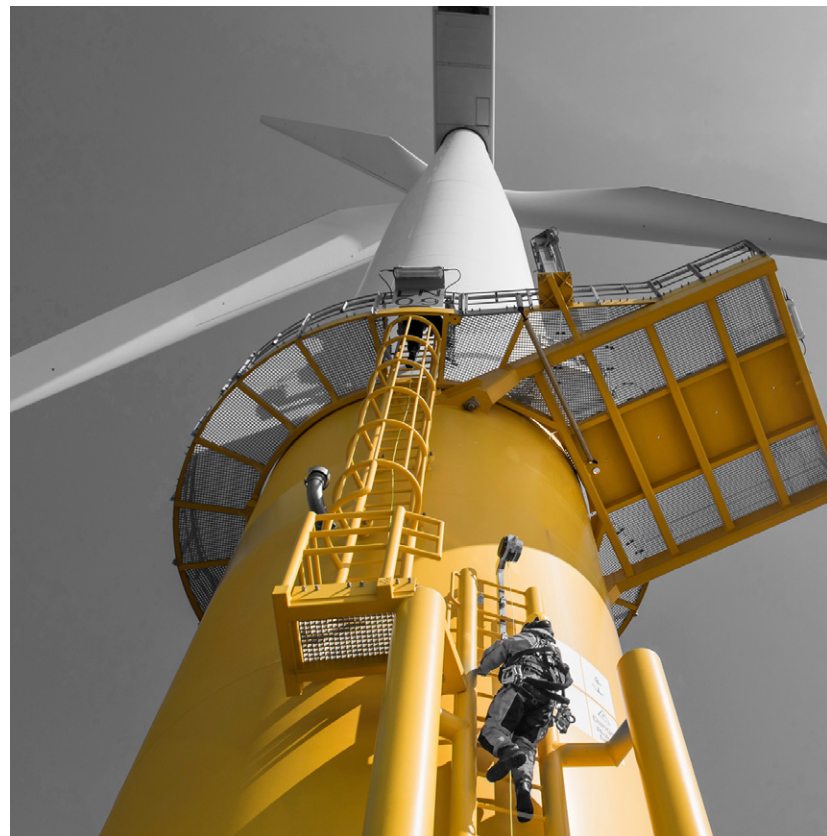
Core Challenges

Risks Unidentified Early On. Without early risk detection, budgets and schedules become unrealistic — and unexposed risks get baked into design details, multiplying and exacerbating the inevitable negative impact.

Poorly Defined Scope. This can result in everything from less-than-ideal communication between project stakeholders to serious problems during handover, i.e., the ongoing maintenance of a wastewater plant not being fully considered.

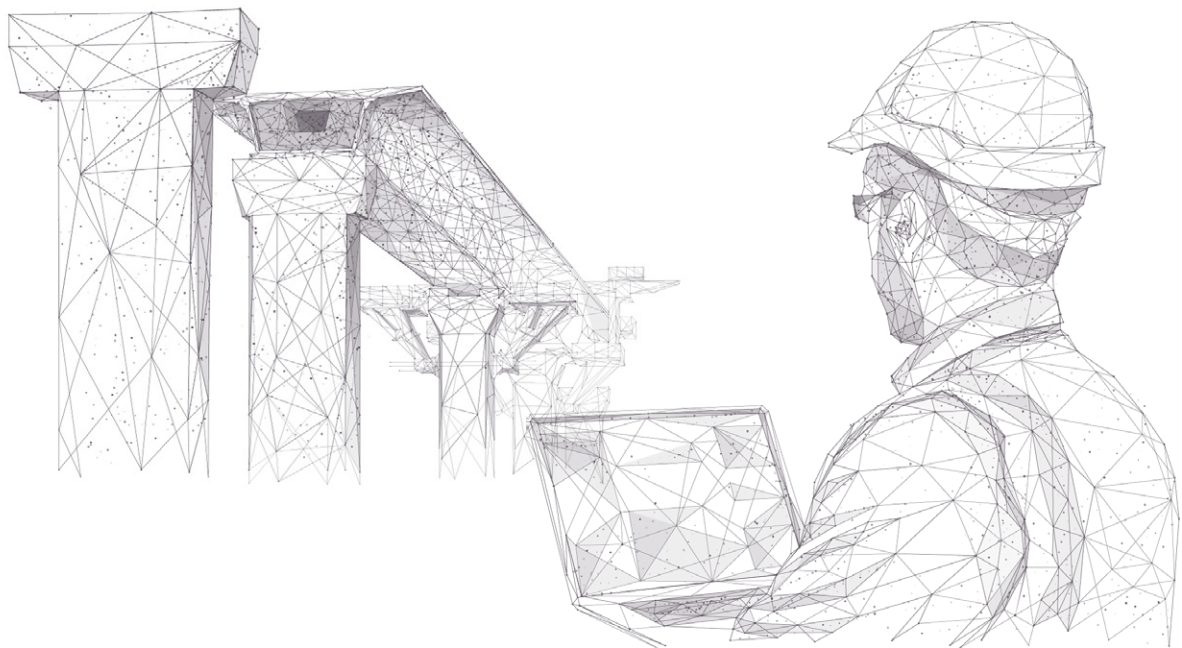
Inappropriate Revision Control. Revision control, such as ensuring the latest project drawings are being referred to, is an essential aspect of document control. In addition, throughout the pre-planning phase of the project, the number of collaborating parties expands seemingly exponentially. Without properly managing this access among team members relevant to the documents in question, task delays, disputes and costly rework can ensue.

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Leveraging Project Controls Systems During Construction Pre-Planning

- **Proactive Risk Mitigation.** Project controls systems allow for benchmarking, enabling users to identify known risks from current and past projects to help answer ‘what-if’ scenarios for estimating both real-time and future project impacts on schedule and cost. Such impacts can be determined even when the work scope changes. This can provide owners the confidence to proactively develop risk mitigation strategies that may arise either early in the project or during project execution.
- **Sharpening Scope Through Machine Learning.** The advent of Machine Learning (ML) and Artificial Intelligence (AI) has made scope definition through project controls much more effective. AI/ML can reduce the overhead and complexity associated with scope analyses by allowing an inference engine to make project suggestions based on historical data captured from previous projects. Further, AI can leverage historical data and generate ‘most-likely’ scenarios along with ‘best-’ or ‘worst-case’ scenarios.
- **Revision Control Within a Data Repository.** All project-related data in project controls is centralized and available for all stakeholders, enabling informed decision-making and better control of revisions and permissions. Considering from 2019 to 2020 alone, the global average value of construction disputes increased to US\$54.26 million,⁸ the impact of reliable control requires strong expertise from multiple domains.



⁸ 2021 Global Construction Disputes Report, Arcadis, 2021.


SOLVING FOR DESIGN AND CONSTRUCTION

The design and construction phase involves detailed planning, procurement and project execution. Detailed designs are completed by architects and engineers to ensure the construction approach and process will meet owner objectives, while remaining feasible and compliant. Depending on the contracting model employed, contract documents containing final drawings and specifications are used to place bids for selecting contractors and subcontractors to work on the project. Owners are kept informed of the progress on the project on a regular basis. In ideal scenarios, they should have access to progress dashboards and reports, providing visibility and transparency across earned vs. planned vs. actual project values, such as costs and durations.

Core Challenges

Inadequate Risk Assessment. Traditional project scheduling is performed through the critical path method, where task lists are defined, time durations are assigned and activities are sequenced. Likewise, budgets are developed using a cost breakdown structure intended to reflect the scope of work and resources required to accomplish the work. The biggest challenge in both cases is properly identifying risks and allowing for those risks and unknowns in the budget and schedule.

Lack of robust project management processes cannot ensure project continuity and invariably leads to unpredictable outcomes.



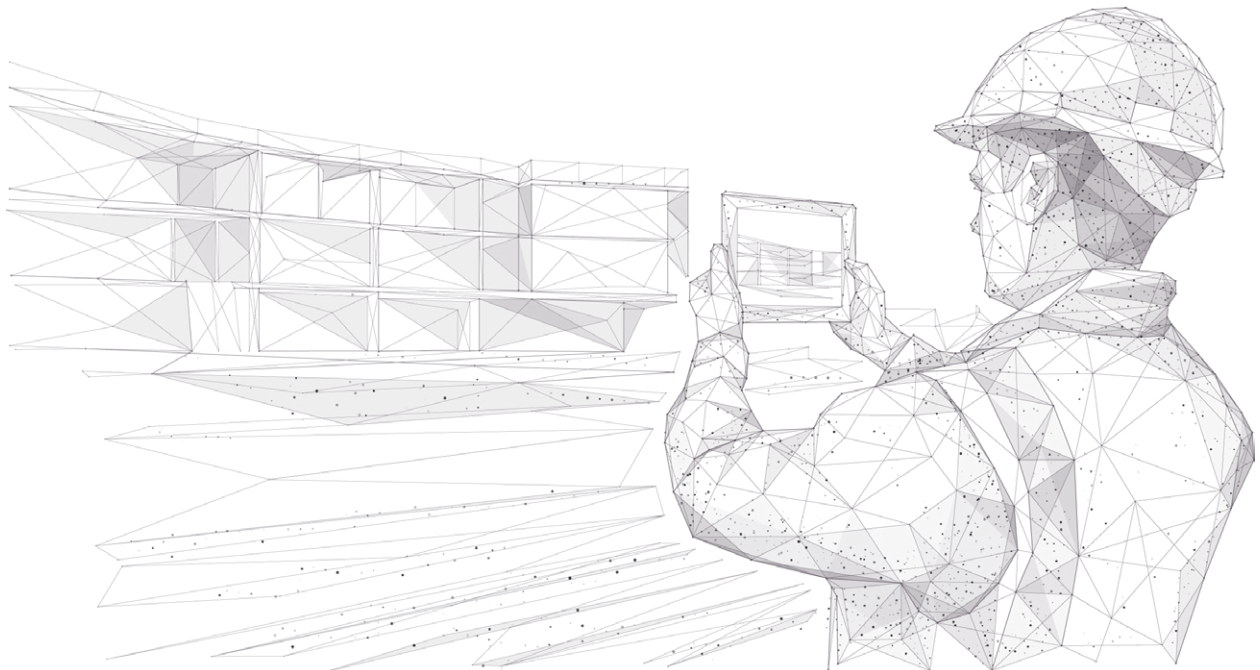
Since construction projects often involve highly specialized, engineered equipment, along with complex logistics to get people and materials to the work site, not having a risk-adjusted plan for procurement is detrimental to ensuring that shortages or delays don't have a ripple effect on the project's budget and schedule.

Optimism Bias. Common human bias and overly optimistic risk and expectation scenarios invariably lead to less-than-ideal project decisions and in turn, outcomes. Additionally, task duration cannot be reliably derived at or guided. Percent complete calculations are often off at best, or heavily skewed at worst.

Inconsistent Project Management. The timeframe involved in the design and construction phase of an infrastructure project, for example, typically varies between three and 10 years, causing an organization to undergo considerable restructuring internally. Lack of robust project management processes cannot ensure project continuity and invariably leads to unpredictable outcomes.

Leveraging Project Controls Systems During Design and Construction

- **More Realistic Designs, Budgets and Schedules.** Project controls systems can aid project stakeholders in enhancing scope, cost and schedule predictions. They can also reduce risk by leveraging historical data available from previous projects, helping to more competently account for risks and unknowns. Such accommodations ensure that project scope and designs are not overly aggressive relative to the budget and schedule assumptions that are underpinning the business case for the project.
- **Reduced Optimism Bias.** Integrated project controls reduces and often eliminates human bias and overly optimistic scenarios and instead accommodates variables based on real facts. The duration of tasks can be derived or guided by the system by referencing productivity rates and quantities taken from similar historical projects. In addition, rules of credit can be applied during progress tracking that remove subjectivity from percent complete calculations.
- **Real-Time Project Tracking and Management.** Integrating cost, schedule and scope under a single project controls platform can help track project performance in real time. Real-time metrics can be closely monitored and any deviations beyond the acceptable range can be tagged as true risks requiring attention.



SOLVING FOR CONSTRUCTION STARTUP AND OPERATIONS

Startup and operations marks the completion of physical construction and the beginning of an exciting yet often delicate new phase. The activation of a water treatment plant, for example, that will now begin processing wastewater for the communities it serves will only be deemed truly complete when fully handed over to the owner as operational in the manner predicted. Ideally, startup and operations should be smooth and certain for a project to be counted as a success.

Core Challenges

Inadequate Capture of Site-Related Incidents. Health and safety at the jobsite are of paramount importance, and a failure to adhere to standards can lead to significant delays and expense resulting from workplace accidents and investigations. Considering that one in five deaths among U.S. workers were in the construction industry,⁹ the importance of improving the capture and registering of safety-related issues to ensure compliance and provide insights to improve health and safety protocols for future projects has never been more important.

Lack of Collaboration Between Specialist Teams. Startup and commissioning activity for an asset can often be overlooked early in a project's life cycle, with the focus instead being on the scope, cost and schedule. But without the budget and schedule accounting for the requirements to validate the quality of the project scope, and ensuring the appropriate steps are taken to start up the asset, successful delivery of the project is not assured.

Uneven Documentation at Handover. All project-related documents handed over must be validated as the correct or latest versions. If as-built documents, such as drawings, inspection results and warranty documentation, are not handed off and easily accessible going forward, operational and maintenance challenges are likely to be encountered throughout the life of the asset. These challenges can become substantial if paper-based or poorly managed digital document management is followed, leading to errors and gaps. In many instances, these discrepancies can also add to overall project costs and the resulting process delays can aggravate the financial burden on owners.



⁹ 2020 Census of Fatal Occupational Injuries, December 2021.

Leveraging Project Controls Systems During Construction Startup and Operations

- **Centralized Document Sharing for Incident Capture.** With centralized sharing, there is better document control and management and therefore, better incident capture through an integrated project controls system. This is because such systems bring all related project documentation into a centralized location, providing one source for sharing, and ensuring that all appropriate stakeholders are accessing the same documents. Further, automating and tracking document collection, including incidents, increases accountability and reduces risk for owners.
- **Improved Process Visibility Enhances Collaboration.** The startup team needs full visibility to construction schedules and task completion status to properly execute all handover and commissioning activities as planned. The project controls system ensures visibility and collaboration for all parties involved. This then facilitates the creation, assignment and completion of checklists by the construction team for review along the way, all the way through startup, ensuring the asset is truly ready for operation.
- **A Digital Twin Smooths Handover and Operations.** An integrated project controls system can enable successful operations for the constructed asset by offering as-built documentation in the form of a digital twin. Easily accessible in the context of a 3D model, inspection forms, certifications, quality documents, warranty documents and more can all be verified and accessed quickly by simply clicking on any component in the model. This ensures streamlined decision-making for ongoing maintenance activities, as well as for future expansion or upgrade projects, through easy access to the information needed for those plans. That not only includes quality inspections and certifications but could also include care and maintenance of installed equipment prior to handover to the owner.



WHAT WILL YOUR FUTURE BE?

The construction industry's contribution to the global economy is set to increase, with massive infrastructure investments planned by both public and private stakeholders. Key trends such as changing workforce profiles and stemming the tide of operational disruptions are leading the industry to radically transform itself.

Savvy construction project developers and asset owners, whose stakes are the highest, are increasingly looking to adopt methods and solutions that will enable them to independently monitor and assess project progress, without relying on other stakeholders.

At this point, we know that an integrated project controls system that can grow with business needs in a modular fashion can help meet strategic objectives and manage risks more effectively — risks that are predicted to keep growing as our industry grows. We also know that the power of connected data made available through integrated platforms, which bring the various workflows and processes of a project together, can allow owners to gain superior visibility across the entire life cycle of their asset, ensuring more successful project outcomes now and well into the future.

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This is why smart construction professionals are already exploring how technology, specifically in the form of modular integrated construction project controls systems, can support and grow with their business needs. They understand that the case for flexible project controls as the preferred path supports not only the success of our industry but its survival.

Today, more and more of the construction world is being divided into the “haves and have nots.” Those who have begun to harness the power of a connected, modular system will profoundly benefit. Those who have not will soon find themselves behind the curve, perhaps unable to catch up as the transitional window begins to close. Right now, the choice remains yours.

And remember, while starting toward a modular, integrated system doesn't require throwing out your entire playbook, it does require that you start. InEight has been there from the beginning and is here now to help you begin your journey to a more secure and successful future.



ABOUT INEIGHT

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