



Key trends shaping the future of large-scale project management software

**Embracing technological advancements
for greater efficiency, collaboration,
and sustainability in project controls**



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Introduction



In large-scale project management, technology is the driving force behind change. While traditional methods have proven effective, new technological advancements are opening up opportunities for more efficient, predictable, and sustainable operations. In front of you lies a trend report born from nearly 40 years of project controls expertise, coming from our small, dedicated team of 35 professionals, primarily based in the Netherlands and Germany. Though less than 30% of our revenue comes from international markets, the vast majority is rooted in our home country. However, we are actively pursuing international growth, expanding our footprint and expertise across borders while staying true to our core values and focus on project excellence.

The world of project controls is evolving rapidly, with software no longer just about scheduling but increasingly focused on integrated project management. A strong connection between time, cost, scope, resources, and risk is essential. As project scopes grow, so do the complexities. Cost control becomes critical, and managing changes and documents, especially in a claim-driven environment, is paramount. Whether through interfacing multiple software solutions or adopting a suite like Oracle's Smart Construction Platform, integration is the future. We are also seeing exciting innovations in the construction and engineering sectors, with data-driven work, BIM, AI, and virtual reality becoming integral to how projects are managed.

This report captures the trends we've encountered firsthand. We don't aim to set the trends; rather, this is a reflection of our experiences in the field of project controls. Everything you read here has been seen or experienced by us in real-world projects. While we have used sources to support the statistics, this report is grounded in our personal perspective. Think of it as our professional diary.

I hope you enjoy reading it. If you have any questions or would like to discuss these topics further, feel free to reach out to our team. We'd love to connect.

Kind regards,
Paul Vogels
CEO, Primanend



The key trends we see in the market



The power of matrix organisations

Matrix and even project organisations are becoming increasingly popular in industries like construction, engineering, and oil & gas due to their ability to foster cross-functional collaboration. In a matrix setup, project teams are formed by bringing together experts from various departments, fostering innovation and effective problem-solving. This structure allows for greater flexibility and responsiveness, as team members can be reassigned based on project needs.

However, managing multiple reporting lines and coordinating across departments requires robust systems that ensure smooth workflows, data transparency, and real-time communication.

For instance, in a large-scale construction project, planners, engineers, procurement specialists, and financial controllers might all work together under a matrix structure. Integrated software solutions play a crucial role in enabling these diverse teams to share information efficiently and make data-driven decisions.

Cross-functional teams: Leveraging diverse expertise

While the benefits of matrix organisations are clear, implementing and managing this structure comes with its own set of challenges. Conflicting priorities between functional managers and project leads, potential communication gaps, and the complexity of managing multiple reporting lines can create friction. Companies must invest in training, clear governance structures, and the right technological tools to mitigate these issues.

Best practices include establishing clear roles and responsibilities, setting up communication protocols, and ensuring that all team members are adequately trained to use integrated software platforms. Additionally, leadership must prioritise a culture of collaboration and transparency, supported by tools that facilitate information sharing and joint problem-solving.

As projects become more complex and require multidisciplinary expertise, matrix organisations will continue to be a preferred structure, particularly in industries where adaptability and cross-functional collaboration are critical.



Collaboration through integral software solutions

For matrix organisations to thrive, integrated software solutions are essential. These platforms unify communication, data management, and decision-making. They are breaking down silos and providing a centralised source of truth for all project-related information.

In project controls, the strong interconnection between key knowledge areas - time, cost, scope, resources, and risk - has become increasingly crucial. As projects grow in complexity, so does the scope, making cost control, change management, and document control even more vital, particularly in industries where a claim culture is prevalent.

For instance, when the project scope expands, the cost naturally increases, and the need for strict cost control becomes paramount. To manage this effectively, all knowledge areas must be tightly integrated within a unified system. Changes in scope and documentation must be carefully tracked and managed to avoid disputes, delays, or financial loss. This is where integrated software platforms play a transformative role. Whether through interfacing multiple solutions or using a comprehensive suite like the **Oracle Smart Construction Platform**, integrating these knowledge areas is essential for managing the complexities of modern projects.

Importance of integrating your construction ecosystem

The New World Order & Digitization Benefit Improvement Potential



The digitization of assets and ecosystem requires at its foundation a digital platform vision to unlock the full potential of the New World Order efficiencies

The potential benefits* in cost, time and quality to capital project delivery are:

- ✓ **Cost Reduction** Up to **33%**
- ✓ **Reduced Time** (Schedule reduction) Up to **32%**
- ✓ **Quality and repeatability** More than **25%**

* Source: Why the Time is Right to Re-Invent Capital Project Delivery - McKinsey Nov 2020



EIGHT DATA AND DIGITAL PRINCIPLES FOR PROJECT SUCCESS

- The **purpose** principle: Focus on outcomes
- The **culture** principle: Put people at the heart of digitalisation
- The **collaboration** principle: Collaborate around shared data
- The **process** principle: Define clear common processes
- The **value** principle: Manage information as an asset
- The **data** principle: Look after your data (and your data will look after you)
- The **security** principle: Secure by design
- The **change** principle: See digitalisation as a journey

A principle shared...
These Data and Digital Principles apply not only to projects, but also to the ecosystem of organisations that come together to deliver projects. The maximum benefit of these principles will be realised when they are implemented across traditional organisational boundaries.

A major challenge in matrix organisations is the risk of silos, where information is fragmented across different departments or teams. Integrated software platforms help address this by providing a centralised source of truth for all project-related data. Solutions such as ERP systems offer comprehensive tools for managing resources, schedules, budgets, and communication, ensuring everyone is aligned and working towards common objectives.

The **Oracle Smart Construction Platform** integrates industry applications with a unified data environment and partner ecosystem. This helps owners and project teams to work together and continuously improve outcomes. In essence, it aligns activities and resources, connects teams, and empowers individuals to make informed, proactive decisions that balance the intricate relationship between time, cost, scope, resources, and risk.





Data transparency and accessibility

In a matrix environment, where decision-making is often decentralised, it is vital to ensure that accurate and up-to-date information is accessible to all relevant stakeholders. Integrated software solutions provide dashboards and reporting tools that allow team members to monitor project performance, track key metrics, and identify issues before they escalate. This is particularly important for maintaining balance across all knowledge areas. For example, a delay in one area (like time) can have direct consequences on cost and resources, and vice versa.

These platforms promote data transparency and foster trust among team members by offering one single source of truth to work with. From project managers to site workers, everyone can access the information they need in real-time. This level of transparency also enhances accountability, as every action and decision is documented and traceable.



Effective communication and collaboration: The key to success

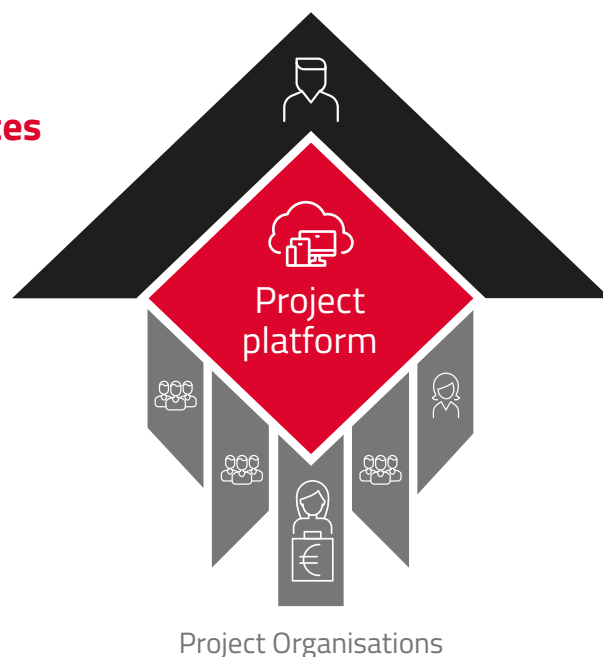
Effective communication is the backbone of matrix organisations. With teams often spread across different locations and disciplines, integrated software solutions facilitate seamless collaboration by providing shared platforms for project updates, document management, and communication. Whether through cloud-based portals, instant messaging tools, or shared task boards, these systems ensure that everyone stays on the same page, helping to manage changes in scope and maintain alignment across all knowledge areas.

For example, platforms like **Oracle Primavera Cloud** or **Aconex** enable multiple contractors and subcontractors working on a project, regardless of their physical location. This unified approach reduces the risk of miscommunication and ensures that all project stakeholders can contribute effectively to the overall success. By integrating time, cost, scope, resources, documents, and risk within these platforms, teams are better equipped to handle the complexities and unpredictability of projects.

The role of integrated software solutions in supporting matrix organisations will only grow with innovations in AI, machine learning, and Data Analytics. These technologies further enhance the ability to manage and predict changes across all knowledge areas.

True Project Platform ► success

- ◆ Project team own and control their data
- ◆ Owner has complete project record for smooth transition to asset operations
- ◆ The project - quality driven by efficient collaboration





From data to decisions: Improving project controls with BI and Data Analytics

Data has become a cornerstone for informed decision-making. Advanced Data Analytics, Business Intelligence (BI), and customisable reporting are no longer just nice-to-haves, but are now essential components for success. As projects grow in complexity, these tools are helping project managers and stakeholders to get insights that support better forecasting, risk management, and strategic planning.

The shift towards data-driven project controls

In construction, engineering, and other industries, we're seeing a shift from static, manual reporting to more dynamic, real-time data analysis. Modern project controls is using some pretty advanced analytics tools that give us a great overview of performance metrics, resource allocation, and financials. This way teams can respond more quickly to changing project needs.

The amount of data being generated is growing rapidly, reaching new records each year. Remarkably, it's estimated that 90% of the world's data was created in just the past two years.*





The role of BI in project reporting

Business Intelligence platforms are becoming an integral part of project controls, offering advanced, customisable reporting that meets the needs of different stakeholders. From high-level summaries for executives to detailed analyses for on-site managers, BI tools provide tailored insights that can be automatically updated and distributed across teams. These automated processes help reduce the manual workload and ensure consistent, accurate reporting throughout the project lifecycle.

Moreover, BI tools facilitate more effective resource management by optimising the allocation of labor, equipment, and materials. Predictive models can forecast the demand for resources based on project phases and milestones, thereby minimising downtime and reducing wastage. This data-driven approach to resource management contributes to overall project efficiency and cost control.

The future of project controls is increasingly data-driven, with trends like enhanced data quality, prescriptive analytics, and broader accessibility to analytics tools set to redefine how projects are managed. As data becomes more accurate and actionable, teams will be better equipped to make informed decisions, optimise resources, and improve outcomes.





Artificial Intelligence and Machine Learning

Artificial Intelligence (AI) and Machine Learning (ML) have positively impacted project management in recent years by improving predictability, optimising schedules, and automating routine tasks. These technologies are quickly becoming integral to the next generation of project controls. Needless to say, AI or ML can only be applied if the foundation and quality of the data are adequate.

Predictive analytics: Forecasting and risk management

AI and Machine Learning are particularly effective at analysing historical project data to predict outcomes and identify potential risks. These systems can analyse vast amounts of data, far beyond what a human planner could manage, to forecast delays, budget overruns, or resource shortages. For example, AI algorithms can sift through data from past projects to anticipate which activities are likely to cause bottlenecks. As a result, project managers can take proactive measures to mitigate these risks before they escalate.

Optimising project schedules and resources

Another major application of AI and Machine Learning lies in schedule optimisation. Traditional scheduling methods often rely heavily on manual inputs and static plans, which can quickly become outdated as projects progress. With AI-driven tools, schedules can be dynamically adjusted in real-time based on changing conditions or new information. These tools can also suggest the most efficient allocation of resources, ensuring that labour, materials, and equipment are used where they are most needed.

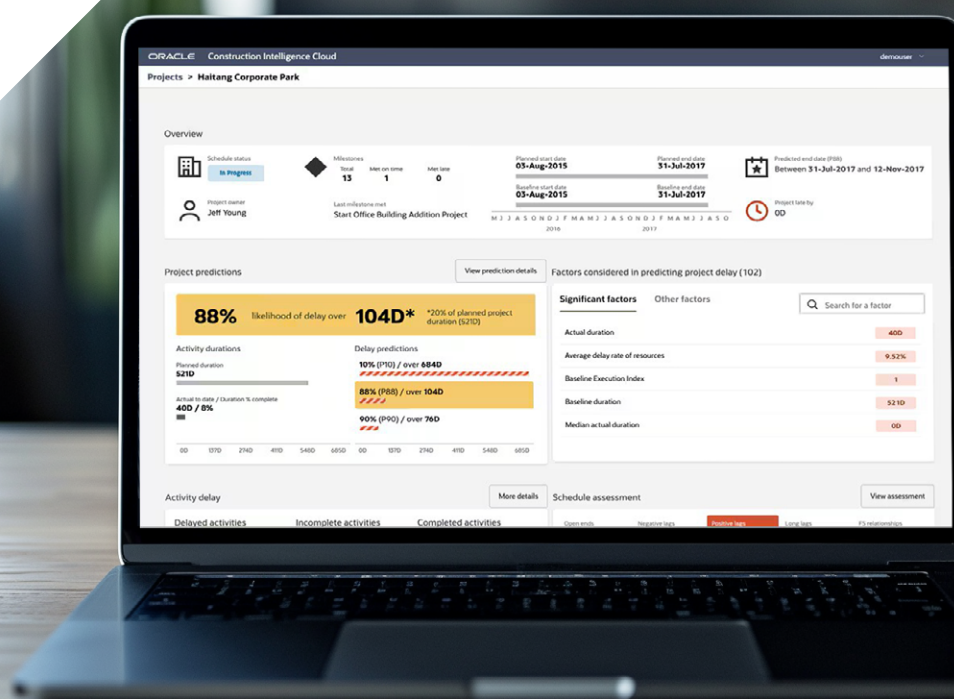




Automation and routine task management

AI is also being used to automate routine tasks, such as data entry, document management, and compliance checks. This not only saves time but also reduces the likelihood of human error. For instance, AI-driven software can automatically generate reports, update schedules, or flag inconsistencies in project documentation. These automations allow project teams to focus on higher-value activities like strategic planning and problem-solving.

For example, the **Oracle Construction Intelligence Cloud Service (CIC)** is an AI-driven analytics platform designed for the engineering and construction industry. It leverages project data to support proactive and informed decision-making. Its first solution, the Oracle Construction Intelligence Cloud Advisor, uses AI and Machine Learning to provide predictive insights, helping organisations identify future risks, evaluate their impact, and take actions to improve project outcomes.





The benefits of AI in project management

Based on PMI's research "[AI innovators: Cracking the code on project performance](#)", companies that incorporate AI into project management experience the following benefits:

61%

Improved on-time delivery

Companies utilising AI-driven tools report that 61% of their projects are delivered on time, compared to only 47% for those not using AI.

Enhanced benefits realisation

69% of projects at companies using AI tools achieve 95% or more of their intended business benefits, while only 53% of projects do so in organisations that don't leverage AI.

95%

64%

Increased ROI

Organisations that employ AI tools see 64% of their projects meet or exceed original ROI estimates, compared to 52% for those not leveraging AI.

A collaborative approach between humans and AI

While AI and Machine Learning bring significant advancements, their role remains supportive rather than fully autonomous. Human elements like contextual understanding, creativity, and strategic decision-making remain irreplaceable. AI is a tool that improves decision-making rather than replaces it.

In the future, we expect even more sophisticated applications, such as sentiment analysis of communication within project teams, providing insights into morale and collaboration effectiveness. The key is to remain a human-centered approach in all your operations.



Cloud-based solutions, mobile accessibility, and cybersecurity

The shift towards cloud-based solutions in project controls is revolutionising the way teams collaborate and manage data in real time. Combined with mobile accessibility and robust cybersecurity measures, these advancements drive efficiency and ensure the integrity of sensitive project information.

Cloud-based solutions: Real-time collaboration and scalability

Cloud-based project controls platforms offer significant advantages in terms of scalability, data accessibility, and collaboration. Unlike traditional on-premise solutions, cloud platforms allow teams from different locations to access project data simultaneously, ensuring that everyone has up-to-date information. This is particularly valuable in industries like construction and engineering, where delays in information sharing can lead to costly missteps.

Scalability is definitely one of the key benefits. Cloud-based solutions can easily accommodate projects of different sizes and complexities, making them adaptable to the evolving needs of large-scale initiatives. For example, as a project expands, additional resources and storage can be seamlessly integrated without significant additional infrastructure costs.

PwC's 2023 Cloud Business Survey reveals that 28% of E&C companies have fully embraced cloud adoption across their operations, while 11% have yet to implement it. The companies that are fully committed to cloud adoption are leveraging it in multiple ways, such as developing cloud-native applications, modernising existing systems to harness cloud technology, and migrating data and workloads. Nearly half (47%) of respondents report they have already realised measurable benefits, including cost savings and enhanced organisational resilience.



Mobile accessibility: Field updates and real-time data

Mobile accessibility complements cloud solutions by enabling teams in the field to interact with project management tools directly from construction sites or other remote locations. Whether it's updating progress, reporting issues, or accessing blueprints, mobile solutions ensure that all team members can contribute to the project in real-time.

For instance, wearables like mobile phones, smart helmets or augmented reality glasses provide real-time data overlays, improving on-site decision-making. Workers can quickly address safety concerns, check compliance, or receive updates without returning to a central office.

RealWear, for example, has developed AI-powered Smart Glasses for frontline workers. The glasses are designed to increase workers' productivity, safety and efficiency across various industries. This hands-free solution empowers frontline workers to do their jobs better, while remaining certified safe for use in hazardous environments.





Cybersecurity: Safeguarding project data in the cloud

The construction industry is becoming more supported by technology, with tools like BIM systems, integrated software and automated machinery playing key roles. While these innovations have made construction processes more efficient, they have also heightened exposure to cybersecurity threats.

“ The construction industry witnessed a 40% increase in cyber threats and attacks from 2022 to 2023.” ▶

Source: "Cobalt"

The latest trends in cybersecurity include multi-factor authentication (MFA), advanced encryption standards, and regular compliance audits. AI and Machine Learning are also being used to detect unusual activity, enabling systems to flag potential security breaches in real-time. For example, unauthorised access attempts can be automatically blocked, and administrators can be alerted instantly.

Cloud migration can significantly transform companies by reducing costs, speeding up time to market, and fostering innovation. It offers the agility needed to adapt to changing demands. As cloud solutions, mobile access, and cybersecurity evolve, we anticipate deeper integration across platforms, creating a seamless ecosystem for project data.





Integration with BIM and Digital Twins

One of the most significant shifts is the integration of Building Information Modeling (BIM) systems and digital twins. These technologies are enabling better visualisation, data management, and real-time project monitoring, which are critical in complex environments such as construction, engineering, and infrastructure projects.

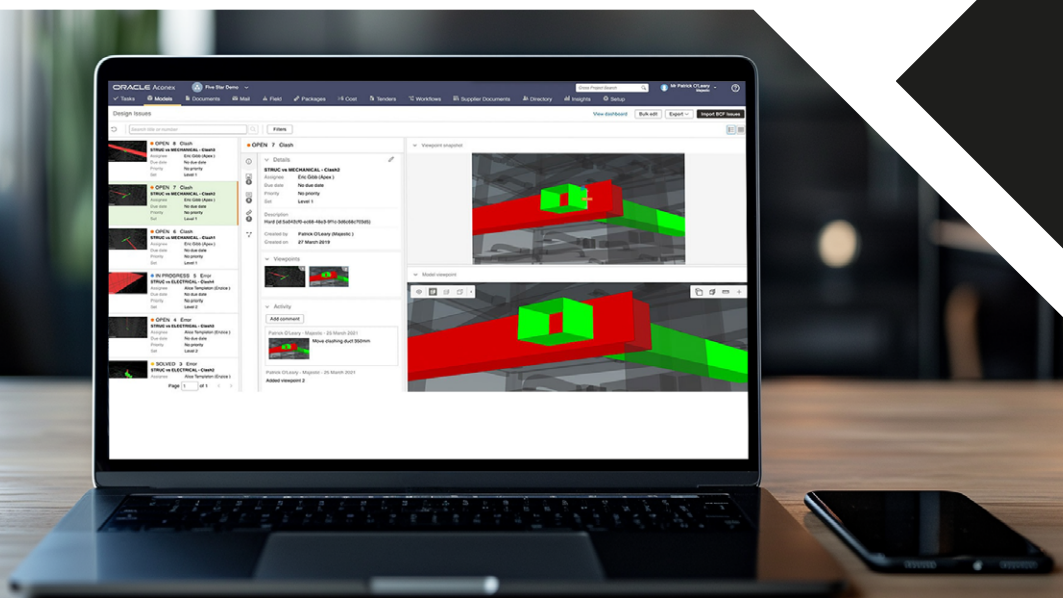
BIM: Improving visualisation and coordination

BIM allows for the creation of detailed 3D models that represent every aspect of a project. From architects to contractors, all stakeholders can work from a single source of truth. This centralisation of information facilitates better communication and coordination.

In essence, it enables the creation of detailed 3D models that represent every aspect of a project, serving as a central source of truth for all stakeholders. Architects, engineers, and contractors can collaborate more effectively, working from the same information. The integration of BIM with document management and project planning tools further streamlines workflows, ensuring that designs, schedules, and updates are easily accessible in one place.

A notable advantage of BIM is clash detection, which identifies potential conflicts in design or execution early, preventing costly errors. By visualising the entire project lifecycle from concept to completion, teams can resolve issues before they escalate which leads to smoother project delivery.

BIM has also advanced in sustainability and energy performance analysis. Project teams can now simulate energy consumption and environmental impact during the design phase, promoting greener and more cost-effective solutions.





Digital twins: Bridging the gap between physical and digital

Digital twins take BIM a step further. While BIM focuses on the design and planning stages, digital twins are virtual replicas of physical assets that live throughout the lifecycle of a project. These models are updated in real-time, providing accurate reflections of the built environment. They allow for simulations, predictive maintenance, and optimisation.

For example, in the construction of a bridge, a digital twin can simulate various stress tests on the bridge's design to predict how it will respond to different load conditions or environmental factors. During construction, the digital twin can be used to monitor real-time data from sensors on the bridge, such as temperature and structural stress, allowing engineers to detect and address potential issues before they become serious problems.

After completion, the digital twin continues to serve as a valuable tool by tracking the bridge's performance and wear over time, enabling proactive maintenance and ensuring the structure remains safe and functional throughout its lifespan.





Convergence of technologies: Toward a unified project ecosystem

The integration of BIM and digital twins is part of a broader trend toward the convergence of multiple technologies, including AI, IoT, and cloud computing. As these technologies continue to evolve, the concept of a unified digital project ecosystem is emerging. We are seeing a growing trend where platforms either expand their functionalities or merge multiple software packages into a single, integrated solution.

Oracle Smart Construction Platform is a prime example of combining applications into one integrated system where functionalities work together. This consolidation improves automation, collaboration, and data flow across the entire project lifecycle.

By integrating AI-driven analytics into digital twins, predictive models can be created that anticipate equipment failures or optimise maintenance schedules. Additionally, cloud-based BIM platforms now offer improved collaboration tools, making it easier for teams working in different locations to collaborate in real-time.



Health and safety innovations on construction sites

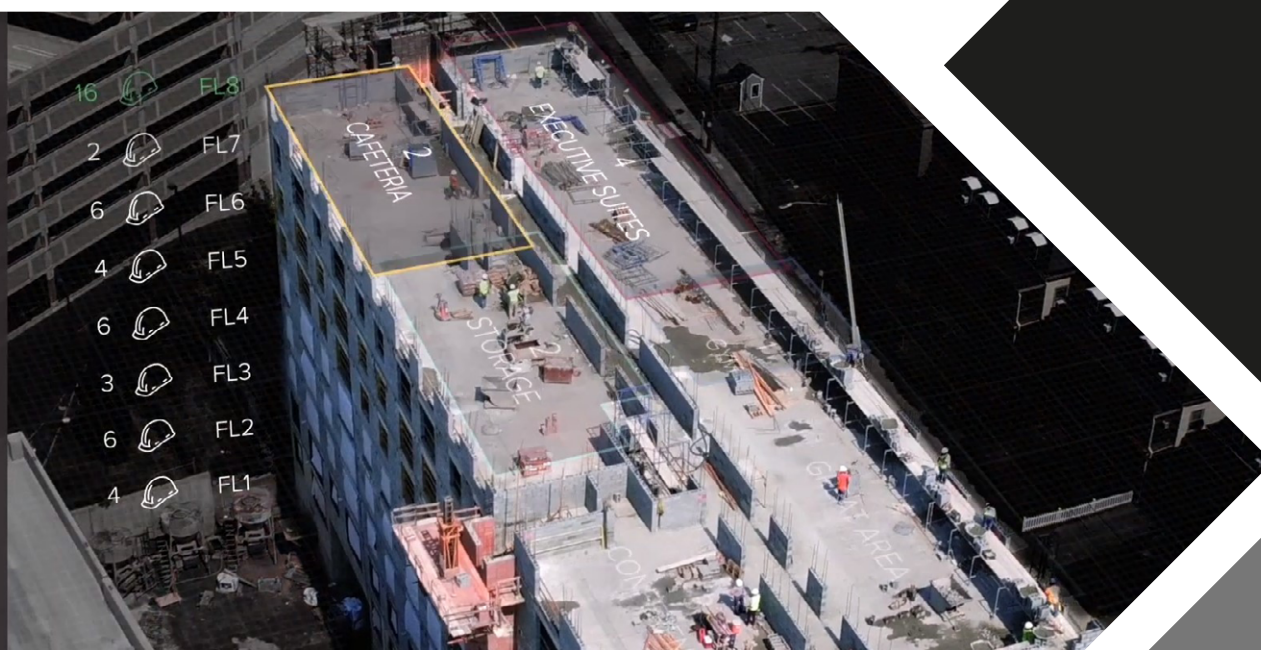
The focus on health and safety in the construction and engineering sectors has intensified in recent years, driven by both technological advancements and evolving regulatory requirements. With the increasing adoption of wearables, drones, and IoT sensors, safety practices on construction sites are becoming more data-driven and proactive, significantly reducing risks and improving worker welfare.

Technological innovations improving on-site safety

Wearable devices: Monitoring worker health in real-time

Wearables such as smart helmets, wristbands, and vests are changing safety management by providing continuous monitoring of workers' health and safety conditions. For instance, devices equipped with sensors can track vital signs like heart rate, temperature, and fatigue levels, alerting both workers and supervisors to potential health risks before they escalate.

Additionally, wearables can be equipped with GPS tracking to ensure that workers remain within safe zones on a construction site. Alerts can be triggered if someone enters a hazardous area, allowing immediate corrective action.





Drones and robotics: Improving site inspections and identifying hazards

Drones have become very common in construction because they can conduct rapid site inspections and provide aerial views of large projects. Using high-resolution cameras and sensors, drones can identify potential safety hazards such as unstable structures, loose scaffolding, or unsafe work practices from a point that would be difficult or dangerous for humans to access.

Beyond drones, autonomous vehicles are now being used to scan construction sites for potential risks. These vehicles can continuously monitor the work area to maintain safety measures throughout the site. Oracle also develops communications and technology software solutions for police, fire, and first responder agencies. In the future, this could lead to the creation of **next-generation police vehicles**.

Robotics are also making inroads in tasks that are either repetitive or pose significant safety risks. For example, robots can be used for tasks like heavy lifting or precision cutting, reducing the need for human workers to perform potentially dangerous operations.





IoT sensors: Real-time data for preventing accidents

IoT sensors play a crucial role in collecting and analysing data from construction sites to monitor environmental conditions, equipment performance, and worker movements. For instance, sensors embedded in machinery can detect irregularities such as overheating or excessive vibration, prompting maintenance before a breakdown occurs. In addition, environmental sensors can monitor air quality, temperature, and noise levels to ensure that the site remains within safe operating limits.

At a more detailed level, IoT sensors can be integrated into personal protective equipment (PPE) to track factors like exposure to hazardous chemicals or gases. If unsafe levels are detected, automatic alerts can be sent to both the worker and the site management team, enabling immediate action.



Data-driven safety measures: Predictive analytics and proactive management

Another important development in construction safety is the use of Big Data Analytics to predict and prevent accidents before they occur. By analysing vast amounts of historical safety data, companies can identify patterns and trends that indicate potential risks. For instance, data might reveal that certain tasks are consistently associated with higher injury rates under specific conditions, such as poor lighting or extreme weather.

These insights enable companies to implement proactive safety measures, such as scheduling certain tasks only during optimal conditions or providing additional training in high-risk areas. Real-time data analysis also allows for dynamic adjustments; if a particular piece of equipment starts showing signs of wear, predictive maintenance can be scheduled before a failure occurs, minimising downtime and preventing accidents.





Configuration based on good-practices and flexibility

As industries like construction and engineering deal with increasingly complex projects, software providers are responding by offering modular solutions that cater to these needs. Historically, extensive customisation was required for software to align with specific processes, but this approach is gradually being replaced.

Today's software platforms come pre-configured with industry-standard best practices, enabling quicker deployments while still allowing for significant customisation. Companies can start with robust out-of-the-box solutions and fine-tune them to match their unique project environments.

The rise of low-code and no-code configurations plays a crucial role here. These platforms enable users to modify workflows, dashboards, and reports without needing deep technical expertise. This is particularly valuable in dynamic project settings, where requirements can shift frequently, and teams need the agility to adapt swiftly. Ultimately, the emphasis on best practices combined with flexible configuration leads to more scalable, sustainable and swiftly implementations.

Start with a strong foundation

Are you curious about how to make a strong business case that shows the true value of project controls software for your team? It all starts with building a smart, well-thought-out strategy. Our Implementation Guide is designed to walk you through each step, from the technical side to organisational best practices, giving you the tools and insights to shape a strategy that truly works for your organisation.





Final thoughts on embracing integration for a data-driven future

In conclusion, the integration of systems and technologies is paving the way for more efficient, insightful, and proactive project management across industries like construction, engineering, and oil & gas. As organisations increasingly adopt matrix structures, the ability to foster collaboration and cross-functional expertise becomes essential. Integrated software solutions are the key to achieving this, breaking down silos, improving communication, and providing a centralised source of truth for decision-making.

Cloud computing will play a vital role in this transformation, enabling real-time data access, scalability, and collaboration across distributed teams. As the demand for more sophisticated insights grows, BI and Data Analytics will become indispensable tools. These technologies will help organisations anticipate risks, allocate resources more effectively, and drive innovation.

By adopting advanced technologies like AI, machine learning, and IoT, companies can significantly improve project outcomes, reduce risks, and automate routine tasks. These tools, combined with a proactive approach to cybersecurity and data transparency, will ensure that organisations are better equipped to manage complex projects and are capable of leveraging data for more informed, strategic decisions. The future of project management is increasingly data-driven, integrated, and collaborative, laying the foundation for more agile and resilient organisations.

Data strategies in focus

Key findings from the IDC InfoBrief "The State of Data Strategies in Construction" include:



77% of surveyed AEC organizations globally have had a data strategy for more than three years

81% of respondents see unifying their data in one project and portfolio management system as a key initiative in their data strategy



58% say they are able to use at most 50% of their data today

89% have or plan to acquire predictive analytics tools in the next 24 months



Source: IDC InfoBrief, sponsored by Oracle, October 2021 | Doc. #US48269621



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