Executive summary

Change is the new normal for Capital Projects

Capital Projects have earned a notorious reputation for being over budget and overschedule. Far-reaching reforms are underway, however, as Owner-Operators and EPCs turn to a powerful combination of cloud-based technology and new working processes to achieve transformational, data-driven improvements in Capital Project delivery.
Introduction

Even before the industry had to contend with the unprecedented challenges of the Covid-19 pandemic, momentum was building to transform Capital Project delivery to become more efficient, transparent, cost-effective, and agile.

A data-centric engineering approach in the cloud holds the key to creating resilient Capital Projects that can flex and adjust easily throughout a project’s lifecycle and when wider changes impact the market. It also forms the core of the Digital Twin and paves the way for new digital business models between EPCs and Owner-Operators.

This whitepaper explores how companies can reduce risk and create sustainable practices for the future by transitioning Capital Project data to the cloud. This allows EPCs and Owner-Operators to:

- Modernize their processes and business models
- Cut costs
- Increase efficiency and transparency
- Transfer Digital Twins to Operations and Maintenance

Does your cloud have a silver lining?

There’s no doubt that these are the toughest times that the Capital Projects industry has faced. In 2020, IIR predicted a mid- to long-term slump on Capital Projects in most process industries such as Oil and Gas, Refining, Chemicals, Power, and Mining.

With recovery expected to be slower than that of the previous financial crisis, Owner-Operators and EPCs must pivot to protect both their short-term interests and long-term future. As with all times of challenge, there are significant opportunities for those who are willing to embrace new ways.

Learnings from the 2008 financial crisis show that engineering and industrial organizations that move fast and hard can gain on the competition by increasing efficiency, reducing cost, and better meeting new market requirements.

A study from McKinsey found that 98 percent of mega-projects incur cost overruns or delays. The average cost increase is cited at 80 percent of the original value, and the average slippage is 20 months from the original schedule. As a result, both EPCs and Owner-Operators are experiencing intensifying pressures to rethink Capital Projects and how they interact by adopting transformative digital technologies with cloud being the vanguard to improve efficiency, modernize workflows, enable new business models, and reduce cost.

Big EPCs and companies in the Process Industry are already moving quickly to adopt new cloud-based technologies for the asset life cycle, cutting costs and time, improving efficiency and transparency, and transferring data from Capital Projects to develop Digital Twins in Operations.

Impact of financial crisis on resilient vs nonresilient companies, leverage ratio

<table>
<thead>
<tr>
<th>Year</th>
<th>Nonresilient</th>
<th>Resilient</th>
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<tbody>
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<td>2007-09</td>
<td>-2</td>
<td>0</td>
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<tr>
<td>2009-11</td>
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1Calculated as an average of different subsector medians for resilient and nonresilient companies. Excludes financial companies and real-estate investment trusts. Total debt divided by total capital. Total debt (book value) calculated as short-term borrowings plus current portion of long-term debt plus current portion of capital lease plus long-term debt plus long-term capital lease plus current finance-division debt plus noncurrent finance-division debt. Total capital calculated as total common equity plus total preferred equity plus minority interest plus total debt.
Unquestionably Capital Projects are in need of modernization and digital transformation, but the steps to get there can sometimes be opaque and there is not always a one-size-fits-all approach. As with all new digital approaches, it is important to rethink the implementation to maximize the benefit. Organizations that do well with their transformation typically follow these steps.

1. Eliminate manual processes with data-driven project execution

To maintain a competitive edge, it is time for owner-operators and EPC companies to leave their manual tracking processes in the past and adopt one unified, data-centric system that can autonomously flag updated information and store it in one place for consistency.

Engineers spend 30-50% of their time looking for and validating information. A data-driven approach allows everyone to see the same real-time information, and flag changes instantaneously and make confident decisions, reducing the risk for error and delays.

2. Decide the scope of your implementation

The scope of a data-centric approach is flexible and can be chosen and scaled based on organizational preference and the type of Capital Project. Greenfield projects make it easy to execute and deliver entire Capital Projects, from conceptual design to handover, digitally. In brownfield projects, the situation is more complex, and the scale and pace of the implementation vary from organization to organization. Many organizations identify a low-hanging fruit, such as engineering information management for instrumentation or 3D data capture with laser scanning to gradually build their Digital Twin.

3. Implement your system in the cloud

Moving your Capital Project data to the cloud is the key to transforming project delivery and reliable Digital Twin development and maintenance. A single, secure platform finally gives companies the ability to keep all their data in one, easily accessible place, break down silos, enable remote working and scale solutions quickly and efficiently. It eliminates the risks and value leakage associated with information handovers and improves transparency. This single source of data also forms the core of the Digital Twin and is essential for data continuity and accuracy in subsequent Capital Projects, operations and maintenance.

4. Use process simulation to validate design and train operators to start up faster

Both the EPC and the Owner-Operator benefit from quick, efficient start-up after a Capital Project. The information in process simulation models is the key to a smooth start-up. Extending that process simulation into an operator training simulator unlocks the ability to perform virtual commissioning and start-up, even before the equipment is procured. Repeated virtual start-up reveals preventable issues, which builds confidence in real world start-up schedules and accelerates ramp-up from first feed to full capacity. Immersive training, which is seven times more effective than classroom training, builds a well-trained workforce for continued operations.
A monumental shift is underway throughout the Capital Projects market for both EPC and Owner-Operators. Just like digital transformation in our everyday lives such as Google Maps™, online shopping and smart phones have changed our behavior tremendously, data-centric and cloud technology is accelerating change in the process industry. Those that are quick and successful in their implementations will emerge as leaders by capturing the following opportunities:

**New digital business models**: Several new business models are emerging with EPCs developing new digital services and deliverables and Owner-Operators transferring data to Digital Twins and new Capital Projects. Continuous collaboration between the EPC and Owner-Operator reduces Handover flashpoints while project standardization cuts time and cost, ultimately reducing the time to safe start-up.

**Accelerate project start-up and increase flexibility and agility**: While a data-centric system for Capital Project Execution on-premises may take some time to implement and make available to an organization, the same system in the cloud is available immediately with flexible licensing. This makes it easier and faster for teams to start work and to tailor use based on the stage of the project so that you only pay for what you need.

**Transparent, efficient, and collaborative Capital Projects for all stakeholders**: Working on a single platform in the cloud allows EPCs and Owner-Operator teams, project managers, vendors and suppliers to accurately track project status and progress in an efficient and collaborative manner. It creates a platform for fact-based decision making and review for all relevant parties to the project to collaborate efficiently on.

**Remote working and training**

**Increased engineering efficiency**

**Efficient workforce development**

**Reduced IT costs and footprint**

**You can do so much with data in the cloud**
Remote working and training: Deploying simulation, engineering design, project execution and training tools in the cloud paves the way for easy remote working for multiple Capital Project teams and increases the flexibility for the organization to work with remote and global contractors, team members and teams. Operators can train, maintain and transfer knowledge from the comfort of their own homes or offices.

Increased engineering efficiency: Aligning all teams around a single source of trusted, standardized data in the cloud improves access and collaboration between engineering teams, external contractors, and vendors. The risk of error and delay plummets. Time wasted searching for and verifying data is eliminated, leaving more time to focus on engineering.

Efficient workforce development: Connecting workers in the cloud not only breaks down silos, improves collaborations and allows teams to work remotely, but it facilitates process standardization globally, delivering better workflow between discipline engineers and engineering, operations and maintenance teams, external contractors, and vendors. Corporate knowledge can be transferred and used more easily across the organization and the agile and flexible systems attract younger talent by transforming the obsolete.

Reduced IT costs and footprint: Cloud implementation moves the responsibility of implementation from the customer to the software vendor and reduces pressure on IT departments for implementation, support, maintenance and availability. Cybersecurity becomes a shared responsibility with the customer addressing training, user access and the like, and the vendor for continually delivering a secure-by-design system.

Cloud benefits at each organization level

- Better transparency and collaboration with peers
- No need for manual transfer of information and updates
- Confidence in the quality and accuracy of their work
- Frustration-free access to data and tools
- Easy remote working

- Agile and strategic decision making based on data with consistent definitions across projects
- Cybersecurity from the most experienced providers
- Standardized processes based on best practices

- Smooth communication within and between teams
- Transparent view of status and issues affecting the team
- Seamless integration of specialists and contractors

- Continuous handover and better collaboration between EPCs, Owner-Operators and Contractors
- No data and value leaks
- Rapid scale-up and scale-down on project phase needs
- Ability to partner rapidly
- Transparent, shared project data
During these times of unprecedented change, we’re helping both Owner-Operators and EPCs to stay ahead of the disruption with innovative thinking and advanced industrial software in the cloud. Our EPC 4.0 strategy gives you greater flexibility and allows you to complete your projects on time and on budget with complete transparency. You can also transfer the data as the core of the Digital Twin used in Operations and Maintenance.

Our solutions for Capital Projects and Digital Twin development span the full Asset Lifecycle and are focused on Process Simulation and Engineering Design, Project Execution, and Learning. To accelerate project design and execution, our technology is available on AVEVA™ Connect, our common cloud platform, that enables engineers, suppliers and clients to collaborate on a unified platform that spans your project lifecycle.

AVEVA’s EPC 4.0 strategy model in the cloud
Realize transformational change with AVEVA™ Unified Engineering

AVEVA Unified Engineering seamlessly links process simulation with engineering design for better coordination and faster design cycles keeping process, 1D, 2D and 3D data on a single, data-centric platform with automated workflows and update notifications for all engineering disciplines. With teams working seamlessly from a live feed of engineering data stored in the cloud you can achieve a higher maturity level of deliverables at each stage of the project.

Organizations who rapidly and accurately communicate changes in the FEED and detailed design phase will be the most effective during procurement and construction. Process Licensors, EPCs and Owner-Operators can expect to save time by up to 50% at the FEED stage, 30% increase in engineering efficiency and a minimum of 5% saved on TIC in the engineering and design phase alone.

New digital business
Faster development of reliable digital twins unlocks new market opportunities

Streamline collaboration
Enable engineers to complete deliverables faster, and with higher maturity

Reduce cost, risk and delays
Minimize engineering errors and improve quality and reliability of engineering deliverables to accelerate project delivery and maximize margins

Explore Unified Engineering
Watch the Unified Engineering demo

Accelerate project delivery and maximize margins
In the execution phase of a project, every decision counts. AVEVA's Unified Project Execution approach leverages engineering data combined with collaborative execution solutions to drive alignment, transparency, and control throughout.

Through streamlined execution, our customers cut equipment catalog specification time by 30%, optimize material management, and reduce overall field labor costs by an average of 10%. By aligning execution with commercial oversight according to the contract (even as the plan changes throughout the project) project teams can virtually eliminate the threat of unproductive time and costs due to claims and disputes, while also improving trust amongst stakeholders and streamlined execution. And finally, 3D data capture allows EPCs and Owner-Operators to quickly and accurately enable visual status updates as the project develops, and create an as-built digital twin 3D model at the end of the project to improve handover quality.

Through this collaborative, decision-centric approach project teams can expect to shave months off their project schedule, and a minimum of eight percent on their overall project costs.
Reduce start-up risk with Unified Learning

Unified Learning leverages engineering data in the cloud to ensure teams have the necessary knowledge and competency prior to start-up; allowing operators to reach nameplate capacity much faster. An Operator Training Simulator removes the start-up gamble by letting experts validate every aspect of the start-up system – from operating procedures to tuning control loops to workforce competence – all in a cloud-based virtual platform. Immersive simulation not only improves knowledge retention by seven times that of classroom training, but saves up to 50% in training costs and has been shown to boost productivity by 50% too.

Learn
- Acquire knowledge through targeted training materials that fit into the worker’s schedule

Practice
- Learn by doing in a safe and controlled environment that mimics real life

Assess
- Ensure workers are competent with built-in assessments

Reinforce
- Sustain competence with short, frequent reinforcement sessions and job aids

Explore Unified Learning
Watch the Unified Learning demo
Join us on your transformation journey

To continue to evolve and stay ahead of the competition in these challenging market conditions you need a cloud-based, data-centric approach to engineering, project execution, training and Digital Twins. This will enable your organization to modernize your work processes, increase transparency, pivot and make the right decisions quickly and develop new business models in line with market needs.

AVEVA is a global provider of industrial software. We have 50 years of proven experience delivering plant and process modeling technologies. We are trusted by 19 of the top 20 petroleum companies; 22 of the top 40 chemical companies; and all 15 of the largest EPCs as our customers.

Our data-centric, cloud-based technology will help you realize your digital strategy and stay ahead of the game across the asset lifecycle from Capital Project to operations and maintenance.

For more information about AVEVA’s Engineering portfolio, please visit: aveva.com

About the author
Rebecca Elgebrandt is the Director for portfolio marketing for AVEVA’s Engineering business. With a combined Chemical Engineering and Marketing background Rebecca has over 10 years’ experience in engineering software for the process industries. She is passionate about supporting organizations in their digital transformation journeys to realize the hidden value of their engineering information and maximize the profitability of their capital projects and operations.