

ISSUE 05 | BY CONCORD PROJECT TECHNOLOGIES INC.

VELOCITY

INNOVATION AND LEADERSHIP FOR CAPITAL PROJECTS

EXCLUSIVE

AN INSIDE LOOK AT PG&E'S CAPITAL INVESTMENT AND EXECUTION PLANNING PROCESS

BY TODD MINTZER

INNOVATION

Ideas, technologies and debate at the cutting
edge of capital projects management

TOWARD MEANINGFUL MANAGEMENT INNOVATION

by Olfa Hamdi

CYBERSECURITY FOR CAPITAL PROJECTS

by Adam Sbata

THIS ISSUE

A CEO'S GUIDE TO EPC DIGITAL TRANSFORMATION

Technology is the
foundation for success
in modern markets
including construction,
so why isn't the CEO
leading change?

JOIN THE REAL-TIME ASSURANCE REVOLUTION

Real-time assurance
is here. Is your
capital project
organization ready?

BRIDGE THE GAP: BUILDING A CONNECTED TEAM FOR ADVANCED WORK PACKAGING

How smart capital
project managers
bridge the gap
between engineers and
construction managers.

CONTENTS

1 | EDITORIAL

When it comes to capital projects, what does a culture of innovation look like?

p. 01

2 | WHAT CAPITAL PROJECT ORGANIZATIONS CAN LEARN FROM STARTUP CULTURE

Nimble, passionate and innovative: What startups can bring to legacy organizations.

p. 02

3 | TOWARD MEANINGFUL MANAGEMENT INNOVATION

More than ever we need a set of guiding management principles for capital project execution. Here's why.

p. 04

4 | LEARN PG&E'S ELECTRIC TRANSMISSION CAPITAL INVESTMENT AND EXECUTION PLANNING PROCESS

Over 16 million Americans depend on PG&E's energy grid. How does one of the country's biggest energy companies manage capital projects for its electric transmission system?

p. 06

5 | JOIN THE REAL-TIME ASSURANCE REVOLUTION

Real-time assurance is here. Is your capital project organization ready?

p. 10

6 | BRIDGE THE GAP: BUILDING A CONNECTED TEAM FOR ADVANCED WORK PACKAGING

How smart capital project managers bridge the gap between engineers and construction managers.

p. 12

7 | 5 CRITICAL STEPS TO PROTECT YOUR INDUSTRIAL CONTROL SYSTEM FROM HACKERS

68% of American oil and gas companies got hacked in 2016, but most have little confidence in their security systems. Here's what you can do, right now.

p. 14

8 | THE CASE FOR CREATING A DIGITAL TWIN FOR YOUR CAPITAL PROJECT

You've dramatically improved your business efficiency with a digital twin for your physical properties. So why don't you have a digital twin for your project delivery components?

p. 16



9 | A CEO'S GUIDE TO EPC DIGITAL TRANSFORMATION

Technology is the foundation for success in modern markets including construction, so why isn't the CEO leading change?

p. 18

10 | HOW TO OVERCOME RESISTANCE TO CHANGE

Your people have very good reasons for resisting your attempts at change. Do you know what they are?

p. 20

EDITORIAL

Innovation in Action

BY OLFA HAMDI



When it comes to capital projects, what does a culture of innovation look like?

What impact would this kind of culture have on our organizations, on our bottom line? How can we create an environment in which our teams have the knowledge, skills, tools and data they need to innovate and execute with unrivaled efficiency? What will it take to get us there?

These are the questions that drive us here at Concord Project Technologies. We take a new and radically different approach to supporting our clients in their management system transformations. Here's how.

Bespoke support for capital projects management system transformation

We have developed pioneering software, it's true, but our most important innovation is not our technology — it's our deep commitment to providing a tailor-made value proposition for management system renewal. That's the Concord way.

We offer a robust suite of research, development and management systems implementation support services. Why? Because experience has taught us that R&D is the first step in helping organizations adopt the cutting-edge methods and technologies that will set them apart from their competition. In some cases, we combine our own R&D resources with those of our clients in an effort to better understand the market, the methodology and the implications for our technology. We help you lay the foundation for change.

Principle-driven development of the Advanced Work Packaging mindset

Advanced Work Packaging is gaining momentum, and we work closely with our clients to help them adopt this revolutionary capital project methodology. It's not enough to leverage leading-edge technology and analytics — we go further, helping organizations develop an innovative AWP mindset.

In practice, this means we're deeply invested in refining the principle-based execution of the AWP approach. From established principles like construction-driven project development to new and evolving principles like self-organizing execution, we're thought leaders in capital project management innovation and we bring that cutting-edge expertise to your organization.

Ultimately, we aim to empower organizations by providing them with the knowledge and tools they need to innovate. We know we've done our job well when our clients start leveraging their teams' capabilities, in-house knowledge and data to drive innovation independently from us.

Cultivating technological capacity through organizational maturity

We offer all of these services as well as the opportunity to pilot our T-CON™ framework, a fully customizable, cloud-based, scalable platform that we purpose-built for capital project teams.

When you're ready, we can help you build a technology ecosystem that is unique to your company, with the capacity to conduct highly tailored inquiries into your own data, work environment and organizational capabilities. We give you the power to access these critical insights yourself, to drive meaningful change now and in the future, long after we're gone.

We believe that one size *never* fits all.

The Concord team invests the time and effort required to create a unique value proposition that drives innovation and real progress for each individual client. Every intervention is unique, because every organization is unique. Every step in a Concord collaboration provides you with the resources you need to mature, reach independence and develop a culture of innovation all your own.

This issue of Velocity is dedicated to helping you get started. Enjoy.

Olfa Hamdi
CEO
Concord project Technologies

WHAT CAPITAL PROJECTS CAN LEARN FROM STARTUP CULTURE

**Nimble, passionate and innovative:
What startups can bring to
legacy organizations**

BY OLFA HAMDI



ESTABLISH A FLAT TEAM STRUCTURE

The entire team is empowered to make decisions and get things done

BE RESOURCEFUL

Think about what you need



01

USE RAPID PROTOTYPING

Find ways to experiment and innovate at a small scale



02

03

HAVE A FLEXIBLE SCOPE

Be prepare to crumple it all up and start over



04

There is much to revere in an established capital project organization, where deep experience and vast expertise transform our most extraordinary ideas into reality. It is also true, however, that sprawling multinational giants move slowly, and that the weight of large, powerful organizations can suffocate innovation.

By contrast, the startup is the nimblest corporate creature. Startups can pivot on a dime because they're small, driven by passion and operating on a shoestring, without concern for "how things have always been done."

Can they teach us anything? Yes.

Here are four things we think legacy organizations can take away from startup culture.

1 | Use Rapid Prototyping

Find ways to experiment and innovate at a small scale, so that if you fail, you'll fail fast and cheap. This is called "rapid prototyping," and it's a cornerstone of startup culture.

Before we built T-CON™, we picked one small innovation problem: How can we best manage work packages in the field? In a matter of weeks, we had combined all of the existing solutions into a new, better prototype, and we were testing it with leaders in the petrochemical industry. Several rounds of rapid prototyping like this, and we had a clear understanding of how our comprehensive work packaging management solution would work.

2 | Establish a flat team structure

Most startups operate on a tight budget, so they are always looking to do more with less. Teams are small and intensely collaborative. Often, there's little discernable difference between the founder and the intern; no task is too small — or too big — for someone to do. There's no hidebound bureaucracy, and the work comes first. Everybody is focused on results.

At Concord, we manage everything in sprints. For one or two weeks at a time, everybody on the team is working toward a single goal. Delivering the work comes first. Everybody's role is flexible, and the entire team is empowered to make decisions and get things done. We do whatever it takes, and a flat team structure makes that possible.

3 | Have a flexible scope

Yes, you should still plan, define your scope, and write up your specifications before you start. But when it becomes apparent that you need to revise that scope, be prepared to crumple it all up and start over. That's not just what innovation requires; that's what innovation is.

When we set out to develop T-CON™, we thought we could store our work packages the way every other company does: in a database, on a server. Midway through the development process, we realized that if we wanted to build the kind of rich, dynamic and collaborative work packages we had in mind, we would need to have search capabilities that were as powerful as the work package itself. We realized that we needed to go well beyond standard database technology to more robust, sophisticated big data technologies.

It was a big change. It was expensive. We needed more and different talent. But we are not slaves to scope. Instead, we remain dedicated to a simple principle: We do what is best for the end user, always. Whatever it takes to get there, we do it. And we did.

4 | Be resourceful

Think about what you need, then focus on how you can get it quickly and efficiently. This seems simplistic, but rigid corporate culture often involves jumping through multiple hoops to get even the simplest things done.

Legacy organizations can break out of this cycle by working with startups. Choose a small pilot project, and work with a startup to execute. Nimble, progressive, hungry startups are well-positioned to help legacy organizations find new solutions, try new methodologies and innovate for the future. Beyond this, they often have research, development and piloting budgets they can tap into for new projects, and so large organizations can actually save money by working with them.

This is what our clients are doing with our team. Through a single project and one ambitious team. A lightweight, versatile and productive pilot project that is driving the industry forward.

That's how innovation happens. 🌐

Toward Meaningful Innovation

More than ever we need a set of guiding management principles for capital project execution. Here's why.

BY OLFA HAMDI

Concord Project Technologies may look like your generic software vendor, but it's not.

It's true that we developed T-CON™, launched it just over a year ago, and that industry leaders moved quickly to investigate and pilot our groundbreaking, purpose-built capital project management platform. But deep down, we're not just about software, cloud computing or big data. We're management innovators, plain and simple.

T-CON™ is a tool. Like all human tools, it has both a function and a purpose. A hammer drives nails, but its purpose is to help people build homes. An engine combusts fuel, but its purpose is to help people move. T-CON™ facilitates collaboration and harnesses data, but its purpose is to help managers innovate.

We're constantly thinking about current capital project management systems: what's wrong with them, how to fix them, and what we need our tool to do to get the job done. Then, we refine the tool. We do this because we believe that management innovation is hands-down the most accessible, powerful and

sustainable way to bolster your company's competitive advantage.

Why? Ask yourself: Where can an EPC company secure a competitive advantage? Hire better engineers and project professionals, and you'll get an advantage. Buy less expensive equipment and materials, hire cheaper craft labor, or use an Engineering Value Center overseas, and you'll get a competitive advantage. These are all excellent ways to achieve a competitive advantage, but they're external sources of advantage, and they can shift at a moment's notice.

The only enduring competitive advantage that a company can secure for itself is the competitive advantage that comes with improved management proficiencies. Management innovation is owned, and therefore reliable and sustainable.

That's why it's worth the investment.

Consider the competitive advantage that Toyota secured by developing and implementing The Toyota Way starting in the late 1940s. General

Electric applied a sector-specific management approach to its research and development, and still wins more patents than any other company in the country. The Linux operating system, Wikipedia — they've resolved complex problems with unique information management approaches. It has become increasingly difficult to catch up with them.

Today, of course, many organizations have adopted Lean tactics and learned from the success of GE and others. However the question we should be asking ourselves is not: "How can we apply these learnings to capital projects," but rather: "What management innovation can uniquely transform capital projects?"

Advanced Work Packaging is one step in the right direction, and I've advocated relentlessly for industry-wide adoption, both here in Velocity and elsewhere. But we're not done yet. AWP is still a nascent approach to capital project management, with countless opportunities for improvement. A key component of management innovation is the ability to see problems and link them to management.



The trouble is that, until now, the industry has looked at AWP primarily as a collection of practices. It's time we elevated the discussion to one of principles. We've got a solid list of AWP practices, but the principles that drive the theory have yet to be fleshed out in a meaningful way. This is our challenge, as we strive to innovate in capital project management: A set of rock-solid principles is the only way for AWP itself to become a self-sharpening tool for innovation.

I've got three working principles I think we can start with, and I'm keen to hear what other industry professionals have to add. Here they are:

1 | Construction-Driven Project Development

Fundamentally, capital projects are construction projects. Every stakeholder in the project ecosystem needs to understand that the most important "client" is the construction team: the construction manager, the supervisors and the labor. Construction-driven thinking like this results in construction-driven planning, engineering and procurement, and ultimately drives sustainable, successful management systems for capital projects.

VELOCITY

The Advanced Work Packaging methodology is an example of a construction-driven methodology. All decisions — from proposal to turnover — are viewed through the lens of construction-driven development. This is the only well-established and broadly applied principle that we currently have for AWP-driven projects.

2 | Self-Organizing Project Execution


A successful management system for capital projects should be self-organizing. In our experience, when AWP has been properly applied, the team becomes self-organizing. If the team is not self-organizing around AWP, the implementation is faulty and should be reviewed. Everybody on the project team must be empowered to execute independently or collaboratively in the best interests of the project.

Take, for example, the design and execution of procurement work packages in a well-functioning, self-organizing AWP project team. First, the team undertakes a collaborative effort to define

construction work areas, which then form the basis of the procurement work packages set out by the procurement team. Once that initial work is done, the procurement work packages are maintained and updated by the expediting and procurement team members — independently of the rest of the work package formation.

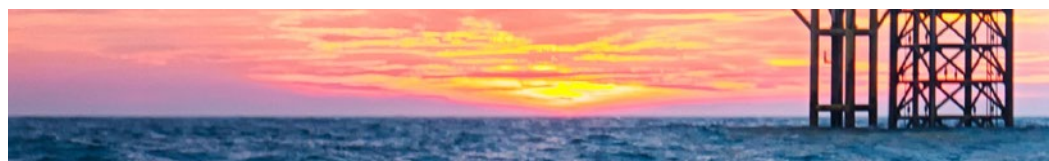
3 | Self-Correcting (Along The Path Of Construction)

In practice, AWP will look slightly different at every company. Organizational culture and convention mean that each person will have a different interpretation of their own role in AWP, as well as their manager's role and their department's role, too. The value of the AWP system is that it is infinitely customizable, and the act of customizing is an act of management innovation. As the project moves through the path of construction, this makes the process functionally self-correcting.

There are more principles to add to this list; these are just the ones that I've identified myself. What principles do you apply in executing AWP at your company? 



“Management innovation is owned, and therefore reliable and sustainable.”



LEARN

PG&E'S ELECTRIC TRANSMISSION CAPITAL INVESTMENT AND EXECUTION PLANNING PROCESS

Over 16 million Americans depend on PG&E's energy grid. How does one of the country's biggest energy companies manage capital projects for its electric transmission system?

BY TODD MINTZER

Todd Mintzer is the Senior Manager of the Electric Transmission Work Portfolio department at Pacific Gas & Electric Company, one of the largest combined natural gas and electric companies in the United States. After nearly a decade in the environmental and American integrated steel industries, Todd transitioned into the energy industry, where he is now part of a team that oversees the management of a ~\$1.5 billion portfolio of hundreds of capital projects.

Over the past few years, Pacific Gas & Electric Company (PG&E) has reimagined and retooled the way we manage our portfolio of capital projects. We have always had a reliable process in place, but like many capital project organizations we struggled at various times with project churn, schedule compression, fragmented change control processes and challenging cash flow forecasts. We wanted to be more efficient and effective in executing our capital project plan.

We conducted an in-depth review of our workflow processes, evaluating what was working best, and what we could do better. The result is an integrated six-part Capital Investment and Execution

Planning Process, or CIE Process for short. Here's a brief overview and introduction to the six parts.

Overview

At PG&E, a big part of what we do is managing the electric grid. Our mission is to safely and reliably deliver affordable and clean energy to our customers and communities every single day, while building the energy network of tomorrow.

Ultimately, the long-term objective of our CIE process is to ensure that, within Electric Transmission, we are effectively executing a strategy aimed at achieving this mission. This

objective is ultimately achieved via the optimization and integration of each of the six process components covering the work in our capital project portfolio. Our efforts in this space allow us to maintain a continuously-balanced five-year capital project work plan.

Part 1: Strategy and Planning

In the Asset Management department, we monitor the condition and effectiveness of our grid assets, including substations, lines, transformers, switches, relays, towers, circuit breakers, and power poles. We are constantly working to understand the condition of the assets, and our related customer load profiles, so that we always have a clear idea of



what we will need to do to the grid over the next five to ten years in order to execute our mission. In this part of the process, we want to make sure the strategy is being developed and vetted, and that we have a clear set of “needs” coming out of it — discrete pieces of asset-centric work required to maintain and, where needed, improve the transmission system.

For us — and for any capital project portfolio — all work must be aligned with a strategy. You need to understand why a company does the work that it does. Without an aligned

and connected strategy, it is difficult to ensure that you are executing a work plan that aligns with your mission.

Part 2: Project Development

The next step is to begin the development of projects that will be used to carry out the strategy. To do this, we take the “needs” and bundle them together into projects. The goal is to gain efficiencies by combining work where it makes sense to do so.

At the same time we develop, for the first time, a high-level project scope, which we call the Project Development Scope. To ensure completeness, we use a set of checklists, we conduct table-top meetings, and we bring in stakeholders from different parts of the business who will be responsible for executing the project to collaborate with Asset Managers. The primary focus in this step is projects that will start in the sixth year, so that as time progresses, we are able to maintain a detailed work plan for each of the five years in our capital project portfolio. The table-top process for each project takes about 30 to 45 minutes, depending on the size.

Coming out of these meetings, we not only have our Project Development Scope, we also have an Advance Authorization —

which is the first time we authorize a portion of the actual project. We also select and configure one of our two dozen template-based cost and resource loaded schedules for the first time. Our templates are based upon historical information. This template approach enables us to generate initial estimates for activities, sequences, dates and dependencies together with costs, labor demand, material demand, and overheads. One of the outputs of a cost and resource loaded schedule is a Project Forecast, that provides a monthly cash flow component extending out to the fifth year.

Part 3: Investment Plan

All of the Cost and Resource Loaded Schedules are then rolled up, and become the basis of our Five-Year Investment Plan — a five-year capital project portfolio. Critically, this process must align the highest priority work in the capital project portfolio with the resources available to execute it.

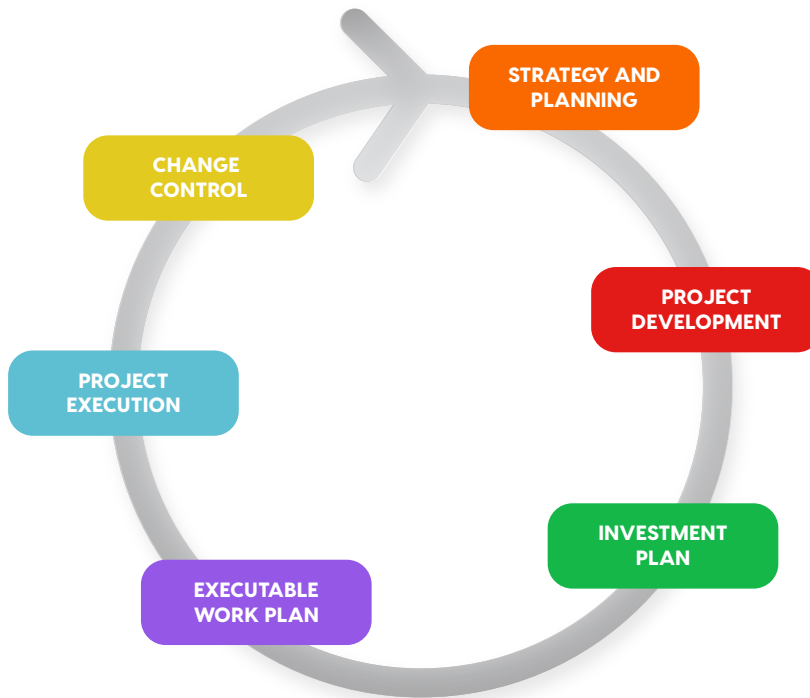
At PG&E, we employ a risk-based framework and scoring system to ensure that our investments are aligned with achieving our strategic drivers. Each piece of discrete work is evaluated and receives a score that reflects how effectively it achieves our strategy.

“If we don’t have a clear picture of what we’re going to be delivering on three, four or five years down the road, we’ll encounter unanticipated impacts in the near-term that tend to generate a lot of churn because we’re being reactive, instead of proactive.”



Capital Investment & Execution Planning Process

An integrated six-part planning process designed to facilitate efficient and effective capital project planning and execution. Courtesy of Todd Mintzer, Senior Manager of the Electric Transmission Work Portfolio, Pacific Gas & Electric Company.



Then, given the financial, labor, material, and other resources that are available, we use the methodology to draw a “cut-line” in our portfolio for each year. Work that is around and below the cut line is carefully evaluated, and if it is determined to be below the cut line, it is deferred into the future or cut altogether.

Given that 80% of our work plan consists of multi-year projects with a number of internal and external dependencies, we maintain a balanced five-year capital project plan because, collectively, we need to understand the impacts of future, multi-year projects on the immediate

work plan. If we do not have a clear picture of what we are going to be delivering on three, four or five years down the road, we will undoubtedly encounter unanticipated impacts in the near-term which can generate a lot of churn because we are being reactive, instead of proactive. Not having a multi-year plan also tends to generate a lot of execution risk, because the unforeseen work is added to the near-term plan, the timing of that work is often compressed.

Step 4: Executable Work Plan

A three-year executable work plan ensures that the work we are seeking to accomplish is aligned with real-world constraints. Each project in our three-year portfolio is compared to a compression standard, which essentially tells us how long work should reasonably take under ideal circumstances, but which also includes a bit of breathing room, or float, between the various steps. When we check projects against the compression standard we can determine whether they are executable or not. Projects that are not executable are put on an action plan list, and they are subject to regular review by both those responsible for execution and their supporting leadership.

As a part of the Executable Work Plan, we also ensure that we have adequate resources in place, and that those resources are balanced – ie. Labor assigned to the projects in the plan are scheduled to work appropriate levels of overtime. If we find that we do not have enough resources in place, we make sure to move work to external resources and get any necessary contracts in place.

Step 5: Project Execution

This step is where we execute the work. We have established the portfolio of projects that makes up the three-year Executable Work Plan, and we are ready to go out and execute those projects. At the 30,000-foot level we ask two key questions — one forward-looking and one in the rear-view mirror: Are we prepared to start construction on time? Are we executing our work plan?

Today, the CIE process is mainly forward-looking. We spend more of our time asking: Are we ready to execute the work that is coming up next? A key component of this is our Construction Readiness analytic. The goal is to be in high-readiness a full 90 days before the start of construction. This means that we have all dependencies cleared on the project in order to start the construction phase, which is the most resource-intensive phase. If we do not have those dependencies cleared, the project goes into a low-readiness state, where it receives additional leadership attention and support.

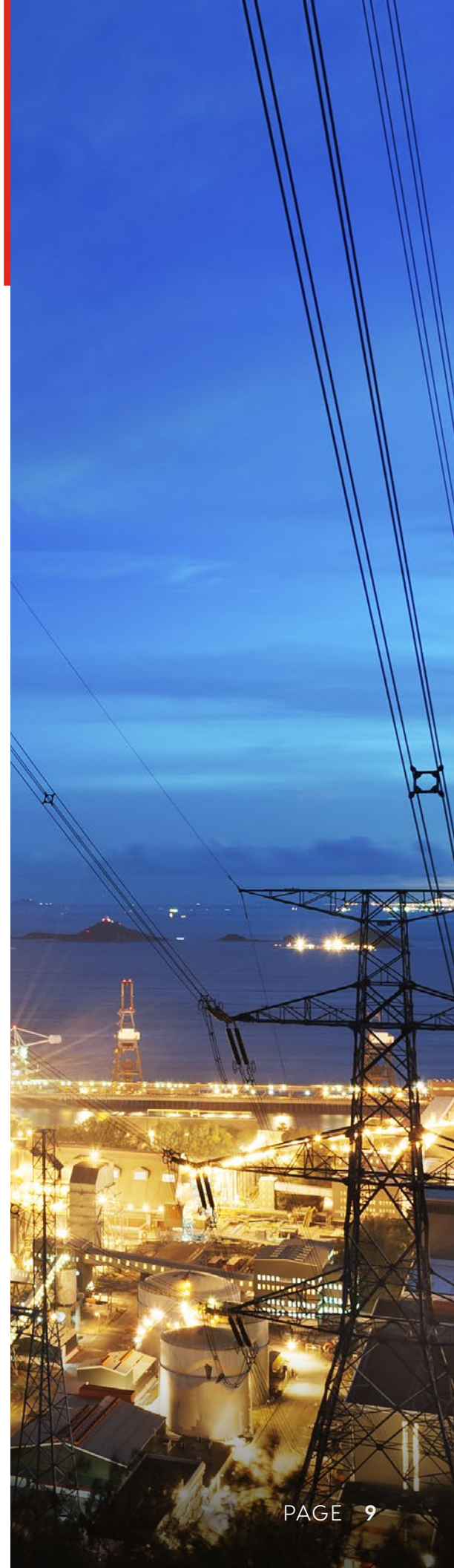
The cost and resource loaded schedule is a key tool here. The project managers use these schedules throughout project execution, so that as dependencies are cleared, they are reflected in the system. In addition, we have a standardized set of common milestones for every project — including things like scope approval, design completion, receipt of permits, and long lead-time materials ordered. Project managers keep the status updated on all these milestones as they manage their work. At the portfolio level, this enables a clear view of project progress at all times.

Step 6: Change Control

Change control is about course-correction. At PG&E, we employ both project-by-project and portfolio-level versions of change control. At the project level, if there are any changes that impact scope, cost, or schedule, we ensure that those changes go through an approval process that requires all members of the collective project team — including the sponsor — to sign off. That process is how the appropriate levels of leadership can ensure that the decisions being made on each project are in the best interests of PG&E.

Then, at the portfolio level, we are able to review the collection of all changes and the related impacts to macro-level items, like the impacts on our collective budget. If we are short on resources, or vice versa, we can direct efficient changes in our capital project portfolio work plan, or we can signal to our partners in other parts of the company that we have extra resources or need additional resources. This step is also where we manage things like portfolio level risks and mitigation.

Now we have come full circle with the CIE process. All changes to the capital project portfolio get fed back into the start of the process, where Strategy and Planning can then make course corrections. Collectively, having an integrated Capital Investment and Execution Planning process enables Transmission Operations to effectively execute a strategy aimed at achieving PG&E's mission. 



JOIN THE REAL-TIME ASSURANCE REVOLUTION

BY THE CONCORD DEVELOPMENT TEAM

**Real-time assurance is here.
Is your capital project organization ready?**

Real-time assurance is the next step for leading capital project organizations. It will drive unparalleled efficiency across the entire project lifecycle, sharpen your competitive edge, mitigate risk and save money. Your teams will be more collaborative, your stakeholders will be more engaged, and high-level visibility for owners and sponsors will be second-to-none.

Here's how it works.

First, a definition. Real-time assurance is the practice of continuously monitoring the progress and risks in a capital project, coupled with the continuous benchmarking of that progress against project milestones and comparable projects as well as the continuous expert review of key project deliverables.

This type of continuous monitoring and expert review has only become possible in recent years with the development of modern technologies that leverage artificial intelligence and machine learning. On a practical level, these new technologies support the creation of purpose-built computer programs that allow teams to capture work as it takes place.

Real-time assurance: an example

Currently, an employee completing a task might send an email to his boss, with a comprehensive report attached. The boss then opens her spreadsheet and marks the task complete, and shares the news (and perhaps the report) with others, again via email. The report must then be filed, and perhaps even printed on paper to be distributed or stored. Later, during the assurance process, all of this information must be collected and forwarded to assurance teams for review.

In an organization practicing real-time assurance, the employee would complete his task by opening the company's capital project management platform and locating the task that has been assigned to him, much like you might open your email program and find an email that has been sent to you. He would open that task, build his report, update the task file with any relevant comments, and mark it complete. Everyone with the appropriate permissions will immediately be able to see that the task is complete, access the report, read the comments, and provide feedback. Critically, the completion of the task and the quality of the work will move the bar on all relevant

timelines and quality progress charts that have been set up in the software, providing real-time assurance.

In purpose-built software the entire process is customizable, from the timelines and milestones to permissions and accessibility, and beyond.

It is much like the Project Definition Rating Index, or PDRI, which most organizations use in the front-end planning process to measure and benchmark scope definition, leading to more precise cost estimate and better risk assessment. The critical difference with real-time assurance is that it functions continuously, and throughout the entire project lifecycle. This level of project visibility is unrivalled and will have powerful implications for risk management, decision-making and competitiveness.

Real-time assurance: key considerations

Real-time assurance also obviates the need for vintage assurance processes, which are far more labor-intensive, exponentially more expensive, and significantly less effective. With real-time assurance, you'll know well in advance if your team is failing to meet critical milestones, and you'll be able





to address problems long before the final run-up to key funding gates.

Ideally, companies looking to implement real-time assurance processes will adopt purpose-built technology that does this by design. If this isn't an immediate option, here are some key technology considerations to help shift your company paradigms and get your organization ready for the real-time assurance revolution.

1. Establish strong lines of communication between your capital project assurance department and your in-house IT department. Get the key players in the same room and ask: "How can we move toward real-time assurance?" Talk about solutions.

2. Take a critical look at your knowledge and technology architectures. The only way to achieve real-time assurance is to collect and consolidate your team's work in real time. Do you have the capacity to do this in-house? Do your current technology solutions support modern knowledge management practices? Can you apply machine learning to the data you collect? At the very least, do you have the capacity for expert-driven searchability functions across your files?

3. Practice with the PDRI. Divide the spreadsheet into sub-components — cheat sheets, if you will — and communicate these to the project teams on a regular basis. Say: "This is what the PDRI is asking for, this is the optimum rating, you should

be here at this point." Have the in-house assurance group conduct early check-ins and provide analog updates similar to those that would be generated by real-time assurance technology. This will help to encourage a paradigm shift: Your team will start to think about assurance as a continuous practice that's helping them — not auditing them.

4. Break the connection between assurance and funding once and for all. The capital projects industry universally defines stage gates in terms of funding mechanisms. Why do we only engage our assurance teams in the months or weeks before the project hits a major funding gate? This is an unsupportable paradigm. It makes far more sense for assurance to take place continually, and for assurance teams to be actively working alongside project teams to support and facilitate success.

5. Start from a prototype to sell the concept. Oscar Monagas, Senior Engineering Management

Specialist at ConocoPhillips, shares his perspective: "Big organizations are hesitant to adapt new work process unless they are enforced by upper management. Thus, it is necessary to start with a campaign to promote the goals and benefits of this real-time assurance process." Your project and assurance teams will be easily sold on the paradigm shift if you roll it out correctly, that is through rapid prototyping and gathering the buy-in of the project teams.

Ultimately, the project team members will be relieved to see the end of last-minute assurance reviews that highlight gaps just weeks before a major gate. The assurance teams will be newly positioned to collect powerful data that can help them build a knowledge base and support the creation of more meaningful benchmarks.

Together, they'll drive unrivalled efficiency across the entire organization. 🌐

Real-time assurance is the practice of continuously monitoring the progress and risks in a capital project, coupled with the continuous benchmarking of that progress against project milestones and comparable projects as well as the continuous expert review of key project deliverables.

Bridge The Gap:

Building a Connected Team for Advanced Work Packaging

How smart capital project managers bridge the gap between engineers and construction managers

BY CONCORD RESEARCH TEAM

Solid workflows and supportive technology are critical components of a successful capital project, but ultimately we rely on people to make things work. Even teams that understand the benefits of a construction-driven approach will struggle to execute it if they're continually bumping up against entrenched interpersonal and interdepartmental paradigms. This is a particularly big risk when teams are using the Advanced Work Packaging methodology for the first time.

Here are four easy ways to help your engineers and construction leads work together productively in these changing times.

1 | Support engineers in their efforts to collaborate with construction

Historically, capital project engineers have had strong control over every aspect of front-end development, and established systems and protocols are built around their accountabilities. In a construction-driven environment, engineering has to relinquish some of that control, and some of those systems and protocols will have to change. Beyond these organizational impediments, giving

up control simply isn't easy for most people to do — particularly when engineers still shoulder much of the practical and legal risk associated with front-end development.

The solution is to establish a clear, explicit mandate that explains how, when and why construction managers will take a bigger role in front-end development. This is easier in an E/P/C setup, as the engineering company will comply if integration of construction needs is a contractual requirement. For consolidated EPC companies, however, it will be more of a challenge, since the paradigm shift has to happen inside the organization itself. The key: Write it down, provide training on why construction-driven engineering is beneficial for the entire project performance, and offer ongoing support for teams that encounter challenges.

2 | Support construction managers in the office

Construction managers typically come up on the field side of capital project execution and are most at home on an active construction site, where

work is physical, visible, and typically done outdoors. A construction-driven project approach requires them to join the project at a much earlier juncture, when the work is done on paper and screens, and progress takes place in meetings, memos and invisible milestones. These are radically different working conditions that demand vastly different skill sets, and construction managers often experience a kind of culture shock. Companies simply cannot expect that someone who has spent decades in the field will transition effortlessly into an office environment.

The solution is to offer practical office support and leverage the construction manager's strengths in an office environment. Consider assigning a mentee who can assist with technology and help navigate office protocols while learning construction management theory from a field veteran. Allow the Construction Manager to drive interactive planning sessions verbally, with support for PowerPoints, write-ups and flowcharts. Above all, be sensitive to the culture change and support the person in transition.

Even teams that understand the benefits of a construction-driven approach will struggle to execute it if they're continually bumping up against entrenched interpersonal and interdepartmental paradigms.

3 | Focus on active facilitation

When it comes to bridging the gap between engineering and construction, active facilitation means getting key people into the room and working to ensure that they're communicating effectively. If they're not, you need to force the interaction. During the initial meetings, the project manager must be clear that construction is in the front seat, right beside engineering.

The very best way to do this is by modelling and encouraging a new style of discourse. Engineers will need to learn when and how to ask for construction input, and construction managers will need to learn when and how to give it. Remember that, until now, these two parts of your team have operated independently from one another; there are no established communication protocols. Help your team navigate these first meetings by setting a high standard for respectful, productive engagement.

4 | Support people continuously, from start to finish

Engineers and construction managers have radically different experiences of a project. Engineers work in a conceptual way, in their heads and on paper. Construction managers work in a tangible way, with their hands and on-site. You can't integrate these disparate experiences on paper, in an organizational chart. Integration only happens in real life, between real people.

Project managers need to pay close attention to every single person in the org chart: How they view their roles, how they interpret what they need to do, and how they execute. Job titles and descriptions are important, but they don't say anything about a person's nature, strengths or skills. If you continually monitor the members of your team — especially the first time they execute a construction-driven AWP project — you'll be able to maintain a good balance between what they should be doing, what they want to be doing, and what they're good at. 🌐



5 CRITICAL STEPS

to Protect your Industrial Control System from Hackers

BY ADAM SBETA,
CHIEF INFORMATION SECURITY OFFICER, T-CON™

68% of American oil and gas companies got hacked in 2016, but most have little confidence in their security systems. Here's what you can do, right now.

A recent survey from the Ponemon Institute revealed that 68% of American oil and gas companies experienced a security breach in 2016. Equally shocking: Just 35% of them say they're prepared to counter a cyber attack involving their industrial control or operational technology systems. The reality in 2019 is that most oil and gas companies have neither the staff nor the expertise to effectively fight cyber crime.

This is alarming, and it should worry us all. Deloitte warns that hackers "are becoming increasingly sophisticated" and "launching coordinated attacks on the industry." In 2014, for example, they launched "an all-out assault" on 50 European oil and gas companies, using phishing campaigns and Trojan horse attacks.

Why should you care? What's at stake when a cyber attack succeeds against your industrial control system?

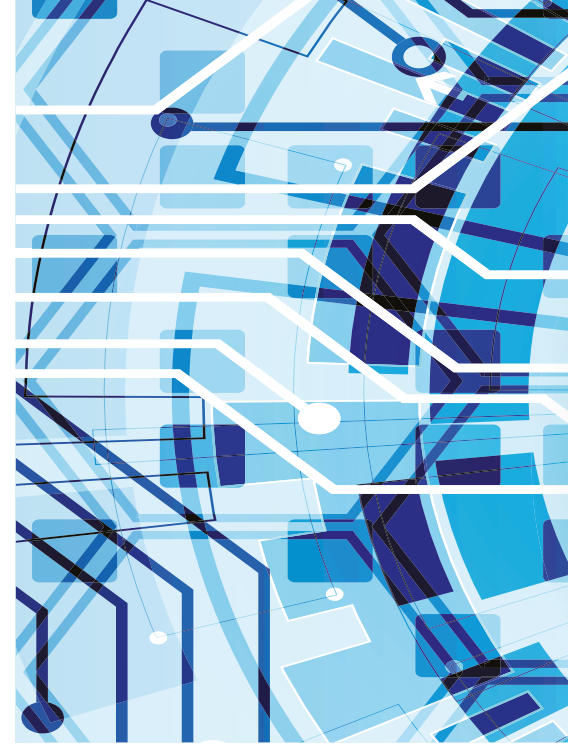
- **Dramatic slowing or full stoppage of all technology-driven production**
- **Severe damage to your company's reputation**
- **Theft and sale of your intellectual property to competitors, rogue nations or other actors via the dark web**
- **Shutting down of critical American infrastructure, like hospitals and power grids**

In our connected world, hackers can quietly infiltrate vulnerable industrial control and operational technology systems and then halt production with the click of a button. A company's IT firewalls only protect against roughly 10% of attacks; the most significant risk facing petrochemical Owners and EPC companies is the unwitting employee who opens an innocuous-looking attachment or uses an insecure USB drive. In short: Our systems are vulnerable, and we need to fix them.

Here are five steps you can take today to mitigate existing risks, and immediately begin setting up protections that will help you withstand a cyber attack.

PRO TIP:

You should also conduct a cyber security assessment whenever you make any significant changes to your technology infrastructure.





1 | Start awareness training, now

Uninformed people make your organization vulnerable to cyber attack, and you need a comprehensive, mandatory awareness training program in place to help mitigate that risk. A one-hour video is not enough. Consider hiring a company to conduct simulated phishing attacks, and provide extra training for employees who fall for the ruse.

The goal is to build a culture in which people are educated about cyber security and not afraid to ask when they have questions about downloading an attachment or clicking a link. Hackers are more sophisticated than you think.

2 | Hack yourself first

Hire a third-party company to conduct a security assessment according to the National Institute of Standards and Technology cybersecurity framework. Don't rely on your IT department to do this; they're focused on critical IT operations, not security. Cyber security experts have unique skill sets, and the field is expanding and

growing more complex every day. We recommend a quarterly cyber security assessment during which the third-party organization evaluates the status of the network and provides a report to all stakeholders, highlighting areas of concern and providing recommendations for improvement.

3 | Use less email

Email is not just inefficient, it is a major security risk. According to Symantec's 2018 Internet Security Threat Report, nearly nine out of 10 malicious emails use attachments like Word and PDF with malware to infect target computers. The solution is to stop using email and start using smart, secure, collaborative platforms. These platforms allow for safe file sharing, and break the email attachment habit that plagues most modern capital project organizations. Collaborative, cloud-based platforms also offer significant project efficiencies.

4 | Don't assume your vendors are secure

You cannot assume that your vendors are secure, regardless of the certifications they have. During the concept phase, get permission from

prospective vendors and conduct penetration testing through a respected third-party cyber security firm.

In 2017, an Austrian hotel was forced to pay a bitcoin ransom to hackers who infiltrated their third-party electronic key card system. For the hotel, the consequences were minor (guests were locked out of their rooms for a short while) and the solution was easy (they simply returned to an old fashioned lock-and-key system). A similar breach in the petrochemical industry could have devastating consequences and be much more difficult to resolve. Make sure your vendors are secure.

5 | Pay special attention to older ICS systems

During your internal security assessments, focus especially on older industrial and operational control and SCADA systems. Older systems have more vulnerabilities than new ones, and you need to routinely update firmware and ensure that you're not using default passwords.

The importance of monitoring every aspect of your control systems cannot be overstated. In 2017, hackers used an internet-connected thermometer in a fish tank to gain access to a casino's list of high-rollers. The innovative hack was possible in part because the casino had failed to change the default passwords.

These five critical steps are relatively easy to take, and taken together they will significantly increase your organization's ability to withstand a cyber attack. Start now. 🌐

THE CASE FOR CREATING A DIGITAL TWIN FOR YOUR CAPITAL PROJECT

YOU'VE DRAMATICALLY IMPROVED YOUR BUSINESS EFFICIENCY WITH A DIGITAL TWIN FOR YOUR PHYSICAL PROPERTIES. SO WHY DON'T YOU HAVE A DIGITAL TWIN FOR YOUR PROJECT DELIVERY COMPONENTS?

BY CONCORD RESEARCH TEAM

Consider the tremendous benefits of the modern digital twin.

The continuous collection and analysis of sensor data from petrochemical installations has produced astonishing new efficiencies that were inconceivable just a few decades ago. As an industry, we now have unrivalled insight into our physical properties: we can monitor and manage operations remotely, quickly identify potential risks, and literally fix things before they break.

It's time to expand that remarkable new efficiency to our capital project teams. In this article, we're going to make the case for applying digital-twin thinking for your non-engineering data.

What would that look like?

Take this common scenario: A construction manager has a question about a design, and files a request for information (RFI). Typically

this is done via email, and the record of the resulting exchange is held in an email string, which is buried in the company servers (if it's kept at all). Any effort to understand or analyze costly and time-consuming RFIs at a higher level — project-wide, company-wide — requires companies to hire a team of researchers to hunt down individual exchange records like these, consolidate them in a spreadsheet, then conduct an analysis, and write a report.

A digital twin of the capital project team would eliminate the majority of that work. Instead of sending an email, the construction manager would use collaborative, cloud-based software to send the RFI to the engineering team. It's critical to note that there's no additional work for the team, they just use a different tool to send the message. The difference is that, unlike email, the collaborative cloud-based software captures the exchange in a digital twin.

This means that a project manager looking for insight into the number, type and outcome of RFIs could access this data with a click of a button. An Owner looking for insight into company-wide trends — say, the top three RFI categories across multiple projects — could easily access that information as well. Once this technology is adopted industry-wide, researchers can mine anonymized data from multiple companies and make findings that radically improve communication between engineering and construction.

That's how you use technology to drive increase project efficiency, and that's why you need a digital twin for your project delivery system.

The analytical capacity of a digital twin is not limited to the analysis of RFIs. Purpose-built software for capital projects can capture, aggregate and analyze data on

any aspect of project management and execution that is important to your organization. In an industry plagued by soaring transactional costs and late, over-budget projects, there are countless opportunities to leverage project data for improved efficiencies. Here are a few:

1 | Real-Time Assurance

We've written at length about the power of real-time assurance. Your project digital twin facilitates real-time assurance by giving you the capacity to continuously monitor progress and risks in your capital project execution. As you progress, you'll automatically benchmark against key milestones and comparable projects, freeing your assurance team to conduct expert reviews of key deliverables and work directly with project managers to identify and address problems.

2 | Lessons Learned

Your project digital twin will feed data into a sophisticated knowledge base that can support and facilitate unrivalled analysis of lessons learned. Instead of an expensive and limited one-off review at the very end of the project, you'll collect specific, relevant, highly contextualized data throughout the project execution, and you'll leverage all that big data to extract powerful lessons for application to future projects.

3 | Live Project Execution Plan (PEP)

A purpose-built, cloud-based collaborative platform for capital projects can capture work product in real time, creating a powerful digital twin that feeds a live Project Execution Plan, or PEP. A modern, digital PEP transforms legacy paper-based

project plans into a live document that serves as an up-to-the-minute, single source of truth on a project, from beginning to end. This is the key to managing complexity and driving increased efficiency on multi-year, multi-continent, multi-billion-dollar capital projects — and it all starts with a digital twin.

These are just three of the most obvious opportunities to improve capital project execution with a project digital twin. The possibilities are endless, and can be customized to reflect the unique nature of your business and your industry vertical. The technology is so powerful that it's not a question of if the industry will adopt it, it's really a question of when.

Who will get the first-mover advantage? 🇺🇸





A CEO'S GUIDE

TO EPC DIGITAL TRANSFORMATION

Technology is the foundation for success in modern markets including construction, so why isn't the CEO leading change?

BY CONCORD RESEARCH TEAM

We're just going to come out and say it: in today's world, digital transformation strategy should be at the top of the CEO's agenda. It's not just a job for the technology director; it's not the work of your IT lead. Technology is changing so quickly — and the consequences for your capital project delivery business are so profound — that the CEO must be both the guide to and the champion for change.

Why? To start, technology has an increasingly big impact on your bottom line — and that impact will only grow in the years to come. It touches every part of the project lifecycle, from proposal to turnover; it is used by every person in your organization, from office to field; it directly influences everything from daily communication to overall organizational capacity, effectiveness and efficiency. (If you need proof of how central technology is to your business, consider what happens

when your email servers go down, or the edge your competition would have with the ability to reuse standard digital work packages for construction.) As the use of big data and sophisticated knowledge architectures increases across the capital project and petrochemical sectors, the influence of technology on the bottom line will increase even more. The CEO should be in command.

Second, there is a great deal of research showing that when capital project organizations implement process improvements without the leadership sponsorship, those improvements are destined to fail. It has also become clear that piecemeal application of technical solutions is a recipe for failure. Meaningful digital transformation requires centralized strategy and direction, and full engagement. Enthusiastic sponsorship from the C-suite sends a clear, unequivocal message to the

entire organization that there is a business case for change — and it's not optional.

Third: Predictability. If there's one word that matters for everyone in the capital projects industry right now, it's predictability -- the on-time, on-budget delivery of critical projects. The CEO of an EPC company must make predictability a key performance indicator. How do we deliver more predictable projects? The answer to this question is complex, of course, but the proper use of technology, manpower, engineering resources and knowledge, strong procurement and efficient management systems all contribute to predictability. Notice that technology influences all of the above.

Fourth, consider the improved value proposition of a technology-driven EPC company. Not only will you build your client's project faster and with improved capital efficiency, you'll provide them with comprehensive

**Technology is changing so quickly –
and the consequences for your capital
project delivery business are so profound –
that the CEO must be both the guide
to and the champion for change.**

project data when the project is complete. This data can drive improvements for future projects, creating lasting value and continuous improvement over time as more data is captured, aggregated and analyzed. Technology can, in fact, be the basis for relationship business development. The better your company gets at this, the stronger your client relationship will be. You'll be far more valuable in the marketplace — and if you start now, it will be harder and harder for your competition to catch up with you.

How to begin? Whether you're an EPC CEO or someone in an executive leadership role for capital projects programs and portfolios, here are three steps you can start taking today.

1 | Test Your IT Leadership

Initiate a gap analysis in your IT department. Ask your key technology leaders to tell you where you stand in comparison to similar-sized organizations, both within the capital projects sector and outside of it.

Ask specifically for benchmarks on the following:

- **big data**
- **artificial intelligence**
- **cloud computing**
- **knowledge architecture**
- **internet of things**
- **reliable data exchange**
- **cyber security**

Resistance is red flag, and so is a cursory report that says everything is fine. Technology is changing fast, and your leadership must be alive to that change and ready to act. Use the report as an opportunity to decide whether you have the right people in place.

2 | Give Your IT Department Some Skin In The Game

The IT department should be fully integrated into the mission-critical work of a capital project organization. Technology leadership should be fully aware of each project's bottom line and should — for lack of a better

word — feel the pain of delivering a project on-time and on-budget.

Achieve this by setting KPIs that are directly related to technology. For example, a goal might be: "By the time we deliver our 100th project, we're going to have 60% of our work processes digitized." Or: "By 2020, our procurement department will be fully digitized, paper-free and procurement work processes requiring a minimal use of emails and attachments." Or: "By the end of the next year, we need to reduce the average number of RFIs by 20% on average across all projects, using technology."

3 | Stay The Course

It's easy to launch initiatives, but it is very hard to stay the course. This seems trite, but it bears repeating — if you're not 100% committed to driving technology forward in your company, your team won't be, either. CEOs don't need to micromanage, but by having a clear vision and setting clear goals, they can drive meaningful change over time. One must stay the course. 🚀



HOW TO OVERCOME RESISTANCE TO CHANGE

YOUR PEOPLE HAVE VERY GOOD REASONS
FOR RESISTING YOUR ATTEMPTS AT CHANGE.
DO YOU KNOW WHAT THEY ARE?

BY CONCORD RESEARCH TEAM

The construction industry is resistant to change. Contrary to popular belief, however, this is not because the industry is too conservative, too male-dominated, or too old. Aside from being offensive, this reasoning is superficial, it is defeatist and it obscures the real reasons why we languish so far behind other industries in our adoption of technology and best practices.

Here's the truth: There are good reasons why your organization is resistant to change. Once you understand those reasons, you can change how your

organization introduces, executes and assesses change. You can lead an organization that embraces change. Here are the four main reasons why your efforts at change are failing, and some proven solutions.

1 | You don't practice effective change management.

Other industries understand that change management is a unique area of expertise, informed by decades of real-world studies with a great many effective, proven best practices. Ask around at any large capital projects

organization, though, and chances are you won't find anyone with a job description that includes change management. Without anyone to guide them through periods of tectonic change, employees have had experiences characterized by uncertainty, fear, confusion, poor morale and plummeting productivity — it's no wonder they resist change.

Solution: Hire a change management professional to help your organization execute change.

“Those who master change persist and persevere. They have stamina. They are flexible. They expect obstacles on the road to success and celebrate each milestone. They keep arguing for what matters. And who knows what might happen?”

– ROSABETH MOSS KANTER



2 | You fail to engage employees affected by change.

All meaningful change will have a direct and immediate impact on the work your team members do each day. This is true whether you're implementing a change in technology (like a new computer program) or a change in procedure (like Advanced Work Packaging). Employees need to understand the impact of change, and they need to be engaged in articulating how their job descriptions and duties will change as a result. Change is more successful when employees buy into change and choose to adopt it of their own accord.

Solution: Don't dictate change. Explain the change rationale, establish an understanding, and let your team be involved in the assignment of responsibilities.

3 | You don't acknowledge that change is hard.

There is no such thing as easy change; if it's not hard, it's not change. Leaders need to understand and publicly acknowledge that change means more work. Change means new systems

and protocols, new skills, new responsibilities, new people, and very often a new definition of success. Risks and threats are real: People can and do lose their jobs in times of transformation.

Harvard business professor Rosabeth Moss Kanter established Kanter's Law to explain what how miserable and gruelling the middle of change can be. "Everything looks like a failure in the middle," she writes in the Harvard Business Review. "Everyone loves inspiring beginnings and happy endings; it is just the middles that involve hard work." What's worse, many capital project organizations don't even make it through the "miserable middle" of change, and another abandoned project reinforces employee cynicism surrounding change initiatives.

Solution: Acknowledge that change is hard, provide support, and reward employees for hard work — especially during the miserable middle. Take them to dinner. Give them a day off. Say thank you.

4 | You train by telling, and you don't train enough.

Change cannot be accomplished without training. If you embark on change without training, you are guaranteed to fail. Your team will not have the skills required to succeed, and worse, they will know you're not serious about transformation. Exceptional training focuses primarily on answering the "why" question: Start by explaining why the organization is embarking on transformation, and your people will truly understand why change is necessary. They'll be more likely to buy in and will better understand execution priorities. Don't just stand up front with a PowerPoint — engage. Most importantly, teach by doing — you cannot teach a boxer to box unless she steps in the ring; why do we think we can train people for capital projects without letting them go several rounds?

Solution: Train your people before, during and after the implementation of change. Then train them again. 🔄

Concord Project Technologies provides T-CON: a technology-powered AWP support platform purpose-built for capital projects.

This revolutionary cloud-based platform puts decades of historical data at your fingertips and breaks down silos by facilitating project-wide collaboration between all stakeholders in the project ecosystem, from start to finish.

Learn and Implement AWP.

Pilot T-CON™ today.

CONCORD PROJECT TECHNOLOGIES INC.
WWW.TCONGLOBAL.COM

2225 EAST BAYSHORE ROAD, SUITE 200
PALO ALTO, CA UNITED STATES 94303

PHONE | 800-982-6609 (800-9TCONO9)
EMAIL | COMMUNICATIONS@TCONGLOBAL.COM

VELOCITY

