IPA

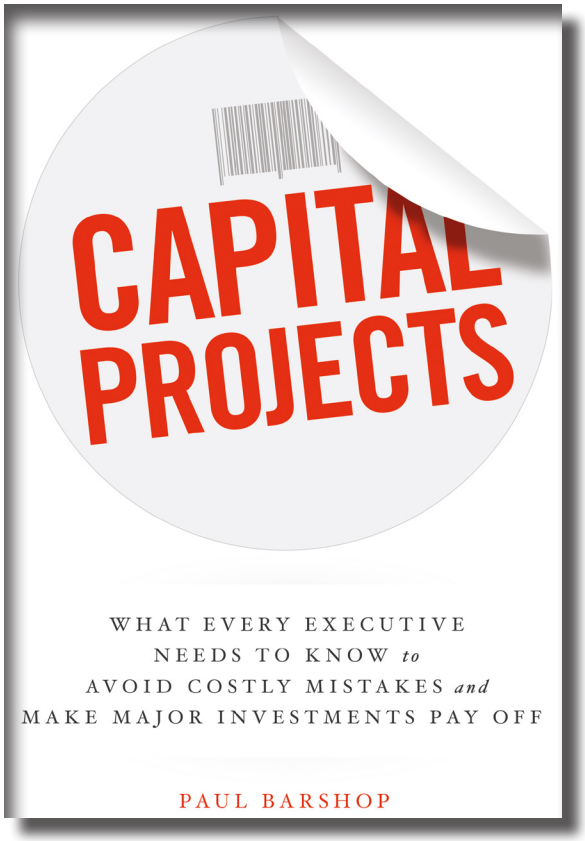
Independent Project Analysis Newsletter

Independent Project Analysis, Inc. is the preeminent organization for quantitative analysis of capital project effectiveness worldwide. At IPA, we identify Best Practices to drive successful project outcomes.

VOLUME 8, ISSUE 3 SEPTEMBER 2016

In this issue:

Visit IPA's website at:
http://www.ipaglobal.com



New IPA Book Published

Capital Projects, by IPA Capital Solutions Director Paul Barshop, is the second in a series of IPA books published by John Wiley & Sons, Inc. The new book tells how business executives can deliver the capital value promised at sanction from capital projects ranging in size from megaprojects to site-based projects.

In a letter to project system managers, IPA President Edward Merrow writes that the book explains in straightforward terms what business executives need to know to make capital projects better and life for project system professionals easier.

Why Consumer Products Projects Should Care About Best Practices

IPA data show that not only do Best Practices apply to typical market-driven Consumer Products projects, they also drive the faster project schedule durations companies desire. As such, Consumer Products companies have good reasons to focus on the practices that deliver better business results through capital effectiveness. IPA's Keith Mayo and Jordan Sealock provide insights into practices they recently identified as driving faster Consumer Products schedules.

A Review of Relocation Projects in China

IPA's Capital Projects Team Lessons Learned Workshop

A Letter From IPA President and CEO Edward Merrow

Dear Project System Managers,

As we all know, project systems exist only for the purpose of serving business requirements of creating, fixing, and maintaining capital assets. So it is really quite ironic that the single most serious and enduring problem in doing projects well is poor communication and lack of mutual understanding between business and project professionals. Often, even the most basic things are sources of misunderstanding. For example:

- As a business executive, what role do I need to play in projects? I worry about sales, not factories!
- What do I get out of all this red tape on the front-end of projects? We need to get a shovel in the ground!
- What's all this stuff about "gates" and "gatekeepers"? Sounds like a zoo!
- How can cost estimates end up so wrong? It's just arithmetic, isn't it?

If any of this sounds like some of your business executives, I think we have finally found a solution. That solution is a short, easy-to-read, non-technical book, *Capital Projects* (John Wiley & Sons, 2016). The book explains in straightforward terms what your business executives need to know to make their capital projects better and your life in the project system much easier. Paul Barshop, the Director of IPA Capital Solutions, has spent a decade getting ready to write this book. He has studied how gatekeeping should work, how technology alternatives should be evaluated by the business, and the business role in project team development and successful scoping of projects.

Paul starts the discussion with the grim reality of too many failing projects. Too much value disappears as a project moves from idea through to completion. But critically important, he makes the point that this value erosion is unnecessary and doesn't occur when business and project teams work together. The book then takes your business sponsors, gatekeepers, and corporate executives through the basic requirements for them and for you to produce systematically better project results.

Read the book yourself and then share it with your biggest supporters—and your biggest detractors—in the businesses you serve. I believe you will be glad you did.

Ed Merrow

Ed Merrow, Founder and President of Independent Project Analysis, Inc. (IPA), is recognized around the world as a subject matter expert in the execution of large and complex megaprojects and capital projects in general. He has spent 35+ years studying megaprojects at IPA and the Rand Corporation, analyzing the drivers of success and failure in capital projects. Ed is the author of the widely influential book *Industrial Megaprojects: Concepts, Strategies, and Practices for Success* (John Wiley & Sons, 2011).

An Excerpt From the Book *Capital Projects**

By Paul Barshop, Director of IPA Capital Solutions

How to Deliver the Value Promised

The proven processes to create more business value from investments and prevent value erosion are well known and largely accepted, at least on the surface. Three-quarters of IPA's clients have a pefectly serviceable capital project development and delivery process. The process covers the entire life cycle of the project from inception to the point when the asset is put in service. Let's say R&D is finishing up the development of a new product and a new manufacturing facility is needed to make the product. The usual process for creating an asset combines a set of defined development stages with decision gates at the end of each stage. The stage-gate process for this opportunity starts when someone is assigned to investigate ways to produce the new product. The process ends when the factory is in service. The stages sequence work in the order needed to identify and deliver value, and the gates allow executives to control the project's progress through the process. The process is managed by a project governance structure that assigns different executives specific roles and responsibilities, creating the checks and balances needed for good project decision making.

There isn't even much debate company to company on what the process should look like. Although there are some differences to accommodate a particular industry, there is very little substantive difference in the fundamental approach companies take toward capital project development.

Moreover, the process works—when it is used correctly. Projects that followed a process, on average, actually added slightly more value than what was forecast when the project was funded, while projects that did not meet any of the process requirements eroded about half the expected NPV (see table below). The average 22 percent value erosion shows that most projects sort of muddle through, meeting some requirements while not meeting others.

Projects That Meet the Stage-Gate Process Requirements Tend to Deliver the Expected Value			
	Met All Requirements	**Met Some Requirements**	**Did Not Meet Any Requirements**
Value Delivery (Actual NPV/Expected NPV)	+5%	-22%	-45%

The assets created by projects that followed the process were much less likely to face a lack of demand, have cost and schedule overruns, or have performance issues. Critically important to understand is that there are no average differences in the market risk and external project risk faced by the projects in the three categories. That is, the projects that met all the requirements were not any less complex or inherently less risky than those that did not. Rather, using the stage-gate process effectively allowed executives to navigate through the complexity, address risks, and deliver better results. Throughout the book, I am going to give specific examples, both good and bad, to illustrate how you can use the process to get better results for your projects.

**Capital Projects: What Every Executive Needs to Know to Avoid Costly Mistakes and Make Major Investments Pay Off (John Wiley and Sons, 2016). Published with the author's permission.*

IPA News & Notes

In July, **IPA President and CEO Edward Merrow** appointed **Andrew Griffith** to the position of **Industry Benchmarking Consortium (IBC) Director**, a new leadership position at IPA. As IBC Director, Griffith is responsible for the orchestration and further development of IBC activities, including the annual IBC conference and the Cost Engineering Committee, an IBC subcommittee. In consultation with Merrow, Griffith will be in charge of developing a 5-year research plan for the consortium. The IBC director's responsibilities extend to the Upstream IBC and its cost subcommittee as well. Griffith will also continue to serve as director of the IPA Institute, which he has led since 2012.

In June, **Aditya Munshi** was named of **Deputy Director of the Cost Analysis Group**, which is part of IPA's Project Research Division (PRD). "Munshi brings to the role a deep understanding of cost analysis, strong analytical skills, and solid relationships" with IPA clients, PRD Director Michael McFadden said in announcing Munshi's new position to IPA staff. Munshi will oversee a team of research analysts who are responsible for developing and maintaining the cost and schedule analysis methods, metrics, and cost models used to measure capital project performance and forecast cost trends. His team also conducts research into Best Practices within the cost engineering industry for capital projects. Munshi joined IPA in 2007 and has led evaluations for megaprojects, major projects, and small site-based projects.

In a recorded interview with Breakbulk Events and Media, **IPA North America Regional Director Phyllis Kulkarni** highlights recent industry project trends and offers insights into what the industry can look forward to in 2017 and beyond. Kulkarni is the keynote speaker at the Breakbulk Americas 2016 meeting in Houston on September 28. Listen to the interview at https://soundcloud.com/breakbulk-sessions.

Tim Mumford Rolando Gächter

IPA Advanced Associate Analyst Tim Mumford and **IPA Asia-Pacific Regional Director Rolando Gächter** are coauthors of an AOG magazine (AOGDigital.com) article about shortsighted project staffing decisions and misguided attention to volumes over value in the oil and gas industry. Read the entire article, "Making Matters Worse," on IPA's website.

IPA

www.IPAGlobal.com

IPA improves the competitiveness of our customers through enabling more effective use of capital in their businesses. It is our mission and unique competence to conduct research into the functioning of capital projects and project systems and to apply the results of that research to help our customers create and use capital assets more efficiently.

THE IPA INSTITUTE
ADVANCING PROJECT KNOWLEDGE
www.IPAInstitute.com

The IPA Institute's mission is aligned with the overall IPA mission to improve the capital productivity of its clients. The programs offered provide a forum for in-depth understanding of key elements of the capital project process and how to apply these learnings to effect positive changes and improvements, resulting in the more effective use of capital.

OIL & GAS PRACTICE REPORT

Lean Scoping, Sustaining Capital Project Studies on Deck for UIBC 2016 Meeting

New Research Centers on Cost Savings & Effective Project Management

Representatives of close to two dozen of the world's leading oil and gas companies committed to the safety and effectiveness of capital projects will gather for the annual meeting of the Upstream Industry Benchmarking Consortium (UIBC) November 14-16, 2016, in Leesburg, Virginia.

The UIBC, an independent forum facilitated by IPA, provides oil and gas companies with insights into how well their asset development investments have fared over the last year in terms of cost and schedule, safety, project definition, and operability outcomes compared to their peers across the E&P industry. In presentations and during discussions that will take place at the consortium's 3-day annual meeting, business executives and project team professionals representing UIBC member companies will learn about industry-wide Best Practices for improving specific elements of capital project execution.

The meeting agenda, developed with the guidance and input of the UIBC Steering Committee, is to show member companies how they can save money on capital projects over the next several years. "All immediate 'go-to' cost-saving measures—reductions to capital expenditure budgets, staffing, and training—have been exhausted in what's become a prolonged lower oil price environment," said Vinay Khemka, IPA Advanced Associate Research Analyst and the UIBC 2016 meeting coordinator. "UIBC companies are now searching for longer-term strategies for delivering profitable assets."

Two new research studies in particular are focused on the issue of reducing project costs.

Lean Scoping for Capital Efficiency. With the E&P Industry concerned with how low oil prices will go and for how long, this study will shine a spotlight on competitive or "lean" project scoping. The research focuses on whether there is a significant opportunity for companies to target cost savings by getting more volume over a longer period of time by making full use of facilities and equipment. This is in stark contrast to the strategy many companies pursued when oil prices were much higher, which was to build large capacity facilities to get more volume faster.

Tradeoffs in Depletion Planning and Well Complexity. Building on a previous study, this study will explore the topic of lean scoping from the development drilling program perspective. Decisions about the number of development wells and the overall depletion strategy are heavily influenced by both the subsurface and facilities functions. So how much influence does the wells function have over basic wells scope decisions? And, does the wells function operate in a service mode, delivering the scope that the subsurface and facilities functions decide on? How are tradeoffs among subsurface, wells, and facilities managed? This study looks to answer these questions and others.

Three other new research studies are set to be unveiled at the UIBC 2016 gathering in Northern Virginia.

Characteristics of Effective Project Leaders. As the gap between experienced and inexperienced resources continues to grow, the success of complex E&P projects is likely to rely even more on effective project management. The first in what is expected to be a series of E&P Industry competency studies developed for UIBC members, this study aims to address several questions, including: What are the most performance-leveraging behaviors, skills, and abilities of effective project managers of complex projects and what are some of their most common personality traits? Plus, do these PM personality traits ►►

► differ based on project characteristics and scope of responsibility?

Defining Sustaining Capital. Following the market downturn, small and mid-sized projects (often described as "sustaining capital projects") have become an increasingly bigger part of E&P company portfolios. However, empirical data indicate that there is little to no consistency in how E&P companies define what constitutes a sustaining capital project. These projects vary in size from $10 million in some companies to $250 million in others.

Among other questions, this study will examine how companies should define what constitutes a sustaining capital project, how the outcomes of large and sustaining capital projects differ, and how staffing needs change based on the definition of what constitutes a sustaining capital project.

Operability Problems: A Root Cause Analysis. UIBC 2015 data show that Industry's operational performance is abysmal with 33 percent of projects facing major operability problems in the first year. The economic importance of achieving good operational performance is undeniable—keeping production up and operability problems down generates cash flow and reduces operational expenditure. This UIBC 2016 study will draw on learnings from past projects about the reasons for their poor/good operational performance so these learnings can be passed to ongoing/future projects.

For more information about UIBC 2016, contact Neeraj Nandurdikar, IPA Oil & Gas Practice Director, at nnandurdikar@ipaglobal.com. ■

Raising the Bar on Early Stage Screening Tools

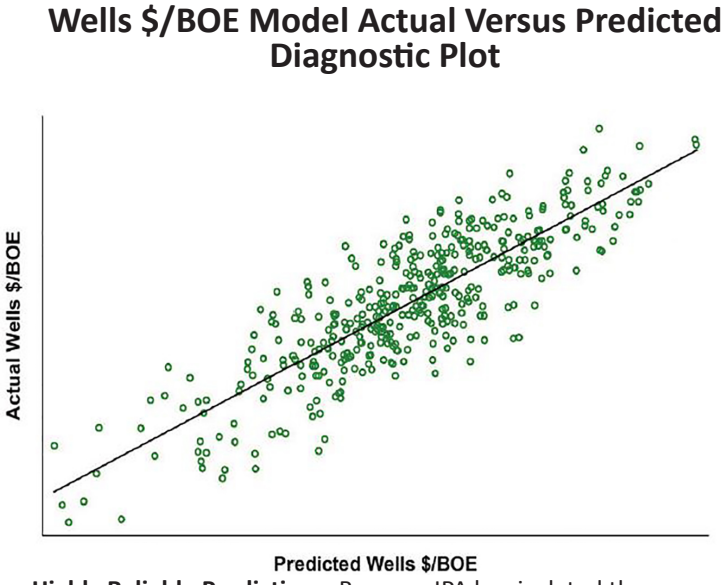
An Overview of the Opportunity Assessment Toolkit

The Opportunity Assessment Toolkit (OAT) is a web-based benchmarking application developed by IPA to help oil and gas companies save capital and improve their project organization's decision making and portfolio quality. OAT is currently used by independents, national oil companies, and super majors alike to support early-stage screening of oil & gas opportunities.

By entering in a few basic project characteristics, the OAT application outputs cost and schedule benchmarks backed by more than 1,000 exploration and production (E&P) projects.

These metrics help companies understand an opportunity's true development cost, which is essential for assessing and comparing opportunities within a portfolio. The metrics also help in spotting optimism bias in the crucial early stages of asset planning and development when internal targets are at the greatest risk of becoming untethered from reality.

The OAT benchmark metrics are based on multi-variable regression models. This means OAT can be used by companies to isolate the effect of reservoir size on development CAPEX cost, holding other factors constant, such as water depth, reservoir complexity, and location. To receive a brochure on how OAT works, contact Tom Mead, IPA Deputy Director of Research, at tmead@ipaglobal.com.



Highly Reliable Predictions: Because IPA has isolated the independent effects of multiple assessment parameters, OAT models offer highly reliable and constant benchmarks tailored to development characteristics.

Research Corner

Capital Project Performance in India

What Are Key Success Factors?

By Manoj Kumar Prabhakar, IPA Associate Project Analyst

India is among the few countries in recent years to have posted continuous economic growth amid recent global uncertainties. The Indian economy is expected to continue posting gains in the coming years, according to the latest India Development Report by The World Bank. Gross Domestic Product (GDP) growth accelerated to 7.6 percent year-to-year in fiscal year (FY) 2016, from an average of 6.5 percent from FY 2013 to 2015.

Lower oil prices and a prosperous 2016 monsoon season are positive indicators of continued Indian economic growth in FY 2017. In addition, a sweeping tax reform measure called the Goods and Services Tax (GST) bill, already ratified by several Indian states, is expected to boost the Indian economy in FY 2017. At the same time, direct foreign investment in the Indian economy in FY 2016 has increased to $40 billion, a 29 percent increase compared to the previous year.

Many major global companies have announced plans to invest in the Indian economy or expand their operations because of the nation's economic growth. A number of infrastructure projects supported by the Indian government have been initiated. Billions of dollars are expected to be spent on these projects, which include petroleum, refineries and petrochemicals, power plants, ports, roads, and railway projects. However, the practices necessary to execute the most cost- and schedule-efficient projects in India are still not well understood. When it comes to India, both Western and Indian companies continue to struggle with framing and executing successful capital projects.

Generally, the cost performance of projects in India tends to be near or at the industry average. Execution schedule slip, on the other hand, is routine, mainly due to construction delays. *Effective construction management is a big challenge in India.* Part of the problem is that poor productivity at sites is an accepted fact, but project managers are often willing to risk schedule slip due to the availability of inexpensive labor. Meanwhile, permitting and procurement issues, undue stakeholder influences, and logistic challenges are the norms in Indian projects. There are also issues related to taxes and duties between states within India, notwithstanding the potential effects of the GST bill on projects.

To succeed in a dynamic market, IPA's clients recognize how companies must constantly re-evaluate their approaches to projects. To advance Industry's knowledge for successful project execution in India within the current marketplace, IPA is initiating a ►►

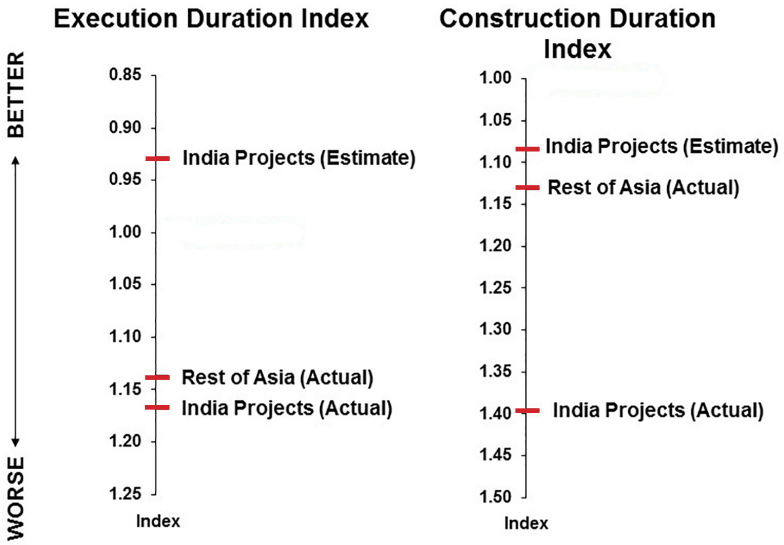
► new multi-client research study. The goals of the India Study are to:

- Evaluate the performance of recent projects in India and statistically compare these outcomes with those typical for industry projects
- Investigate India-specific practices that affect performance, which includes identifying and evaluating the practices that are correlated with the best project outcomes in terms of:
  – Trends in cost estimating and schedule planning
  – Contracting strategies, procurement challenges, quality control, and permitting strategies
  – Level of risk analysis and mitigation
  – Use of project management consultants
  – Construction management and productivity
  – Logistics concerns
- Identify key success factors in countries similar to India and their applicability to projects in India

IPA is looking forward to helping clients gain a more complete understanding of how to improve the effectiveness of capital invested in projects in India.

For more information on the Indian project performance study, please contact Rolando Gächter, IPA Asia-Pacific Regional Manager, at rgachter@ipaglobal.com, or Manoj Prabhakar, IPA Associate Project Analyst, at mprabhakar@ipaglobal.com. ■

Project Performance In India



Actual: Outcome at end of project; Estimate: Plan at project authorization;
Execution Duration: Period between start of detailed engineering to mechanical completion

The author, Manoj Prabhakar, Associate Project Analyst, is IPA's Business Development Lead in India.

Special Recognition — IPA received AACE International's Industrial Appreciation Award in recognition of IPA's service to the total cost management professional community.

The award was presented to IPA Project Research Division Director Michael McFadden by Julie Owen, then AACE International's president, on June 28 during a ceremony at the association's 2016 Annual Meeting in Toronto.

Photo Credit: AACE International

Follow IPA's Company Page On LinkedIn

Why Should Consumer Products Projects Care About Best Practices?

Proven Ways of Improving Project Schedule Performance

By Keith Mayo and Jordan Sealock

Consumer Products projects are different from those from other industries that IPA works with in a number of ways. Their typical business drivers and project objectives are different, as are their typical project system characteristics.

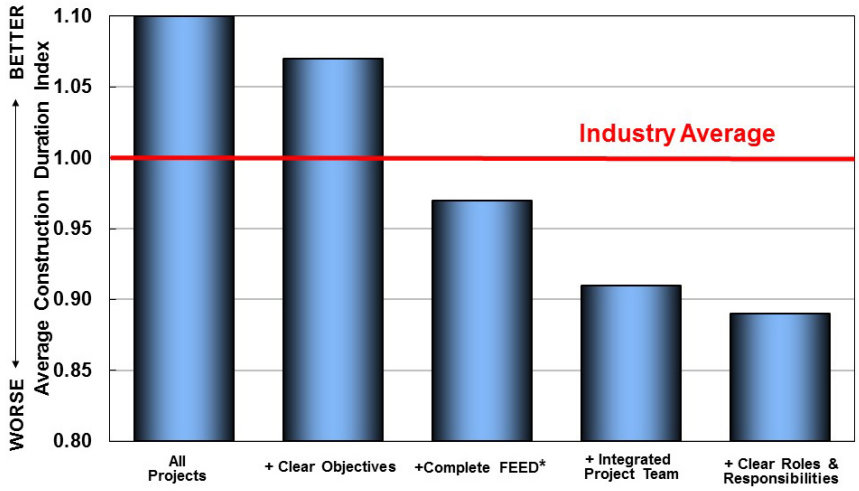
The most distinguishing characteristics of Consumer Products projects are their market-driven mentality and drive for speed. This makes sense: the company that gets to market first is able to capture a larger market share sooner than its competitors. Therefore, focusing on speed in execution is often the priority for these companies.

Given that these projects value time to market more than capital cost, IPA set out to determine if industry practices identified by IPA research as Best Practices actually drove faster schedules on Consumer Products projects. The dataset used was extracted from IPA's database and consists of only Consumer Products projects that are producing something that goes directly to the consumer (e.g., boxes of cereal or soap). These projects tend to exhibit the characteristics described in the chart below. In total, the dataset has over 200 projects with about 90 percent executed in North America; the remaining 10 percent are scattered around the world. The average cost of these projects is about $10 million and all used conventional technology.

The data shown in the figure on page 10 are based only on the Consumer Products projects database described earlier. Given the emphasis on schedule for these projects, IPA looked for correlations with project schedule performance. ►►

Common to Consumer Product Projects		
Business Drivers	**Project Objectives**	**Project System Characteristics**
• The market/customer uncertainties require more flexibility • The product life cycles are shorter • There is an increased need for product differentiation • The time to market is important for business success • The cost of goods sold is important for business success	• The materials and feedstock have specific handling requirements • The project objective trade-offs need to be clearly understood • Flexibility is needed in the work and manufacturing processes • The project must consider the market development and increased production needs	• A responsive (to business directives) project system is necessary • Some project phases are fast tracked: a short engineering phase is common due to the equipment type • The business is integrated into the project cycle

Best Practices for Consumer Products Projects Reduce Schedule Durations



* FEED = Front-end engineering design

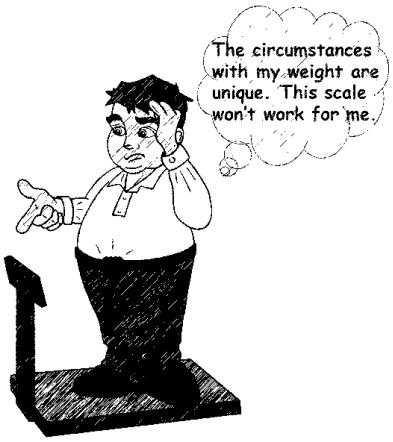
► The average Construction Duration Index (how fast a project is constructed relative to Industry) is shown on the vertical axis. Across the bottom, the progressive influence of industry practices recognized by IPA as being Best Practices for Consumer Products projects in relation to construction schedule duration is shown. The far left bar shows the average for the entire dataset, which is about 10 percent slower than Industry. Construction is about 3 percent faster when projects have clear objectives (as measured by IPA). When projects have clear objectives and have completed all FEED deliverables at authorization, they gain another 10 percent in speed and are faster than global Industry by about 3 percent. Add integrated project teams into the mix and the average construction duration is 8 percent faster than Industry. Lastly, if team member roles and responsibilities are clearly defined, then projects achieve 12 percent faster construction, on average.

However, these improvements are not limited to just construction, as execution (engineering and construction) and the overall cycle time also show similarly progressive improvements in performance as more Best Practices are used. Thus, if the goal is to get to market faster, using industry practices known to IPA as being Best Practices will help. Finally, in addition to schedule performance improvements, the capital costs also improve.

Some project teams feel that it takes too much time to use IPA's Best Practices. After looking into the data, this simply isn't true. There is no correlation between the project definition phase duration and engineering maturity at authorization. In other words, some projects go fast in project definition and achieve advanced engineering at authorization, whereas other projects that go fast do not.

Although some are not true believers in IPA's Best Practices, based on the data shown, not only do Best Practices apply to the typical market-driven Consumer Products projects, but they also drive the faster schedules these companies desire. As such, these Consumer Products companies should focus on the practices that truly deliver better business results through capital effectiveness.

For more discussion on the topic of improving the performance of Consumer Products capital projects, please contact one of the article's authors. ■



Some people do not accept Best Practices

Keith Mayo is a Senior Consultant at IPA and has evaluated hundreds of projects for IPA in the processing and manufacturing sectors around the world. He can be reached at kmayo@ipaglobal.com.

Jordan Sealock is Manager of IPA's Chemicals, Life Sciences and Nutrition Section. She can be reached at jsealock@ipaglobal.com.

Moving From Lessons Learned to Implementing Project Improvements

IPA's Team Lessons Learned Workshop

By Félix J. Parodi

It happens too often. A capital project is completed and it is accepted that there were missteps that should have been avoided. Figuring out how and where the missteps occurred could result in substantial cost savings on future projects, but getting key business executives and project professionals together to recognize how the right sets of project data and insights can be leveraged to drive major work improvements is a challenge in and of itself.

Many companies use performance metrics and lessons learned to improve their project performance, but in many cases the focus on the engineering function precludes companies from identifying the value of contributions of business, operations, and other support functions. IPA has been conducting Team Lessons Learned Workshops (TLLWs) for clients for more than a decade to facilitate lessons learned endeavors. Such workshops have been conducted for the oil and gas; refining; mining, minerals processing, and metals; and chemical industries for projects with values ranging from $15 million to over several billion. The workshop's objective is to examine a project organization's performance on individual projects and glean clear insights for use in developing and implementing lessons learned. TLLWs are most effective when they are conducted in conjunction with or shortly after project closeouts. A closeout evaluation provides highly valuable industry context and findings, including the project's performance metrics and industry data. Together they integrate relevant team experiences and a wealth of insights from over 600 research studies we have completed during the last 25 years. For instance, a project team may contend it achieved excellent cost performance because of a 20 percent underrun on a project it delivered. But IPA's cost analysis of the same project could end up showing that the actual project cost was 15 percent higher than industry average—certainly not a cost competitive project. Such context is essential in convincing company executives to act on lessons learned to preserve capital project value during development and execution.

Figure 1 shows a basic outline of how a typical TLLW works. The TLLW is used to generate lessons by rapidly processing the factors that contributed to the project outcomes. The positive and negative factors are developed by grouping the positive and negative (areas of improvement) ideas generated during brainstorming session. We process positive and negative factors separately, leading to a discussion with senior management about an improvement plan that integrates lessons from positive factors and countermeasures of negative factors. ▶▶

Team Lessons Learned Process

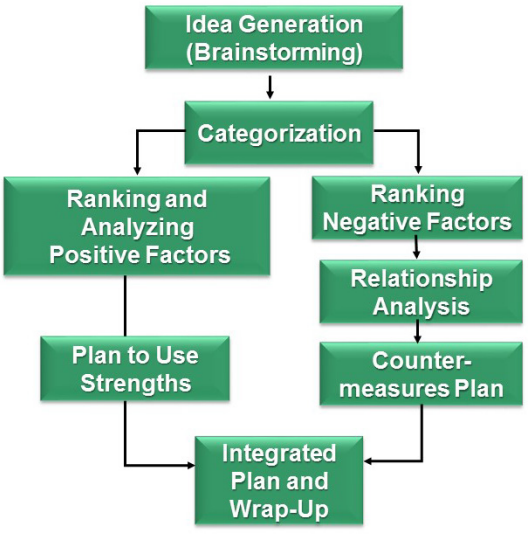


Figure 1

▶ An example of these positive and negative factors is summarized in a force field analysis graph, as shown in **Figure 2**. The positive factors are analyzed and a plan to use these project strengths is developed. The negative factors are analyzed based on their effect on the project and interdependences.

As shown in **Figure 3**, interdependencies among all categorized negative factors are illustrated as red circles. The arrows illustrate the causal relationship among all, as assessed by the project team members during the session. The boxes next to the circles describe the number of arrows departing (OUT) and arriving (IN) for each factor. The factors with more OUT arrows are influential drivers of performance; the factors with more IN arrows (but fewer OUT factors) are less significant.

The interrelationship digraph shown in Figure 3 can provide insights and context to reveal root causes of performance problems and develop implementation plans. The aim is to understand and eliminate the most influential drivers of poor performance. When combined with ratings about the effect of these factors on the project, root causes as well as "low hanging fruits" for improvement are developed as part of the countermeasures plan.

It is very likely that some of the key learnings relate to systemic issues, but it may not be clear how frequent those issues are encountered in other projects, so management's perspective is important. Thus, wrap-up or follow up sessions with senior management are held to focus on what went well and important root causes of project performance such as decision making, project framing and shaping, the stage-gated process, how the project system works on a daily basis, and the plan for implementing the action plan. Senior management leadership is essential to translate the lessons into action plans that can be implemented. In many cases, management realizes that its actions during the business planning phase (i.e., FEL 1) are major drivers of project success.

Collaboration with senior management is essential to drive the changes required to achieve major performance improvements. All too often lessons learned are given low priority or the project management organization owns the process but does not have the authority to make changes to the work process. In most cases, this opportunity is missed because the roles of operations, business, and the project sponsor have not been defined for the project system or the FEL 1 phase.

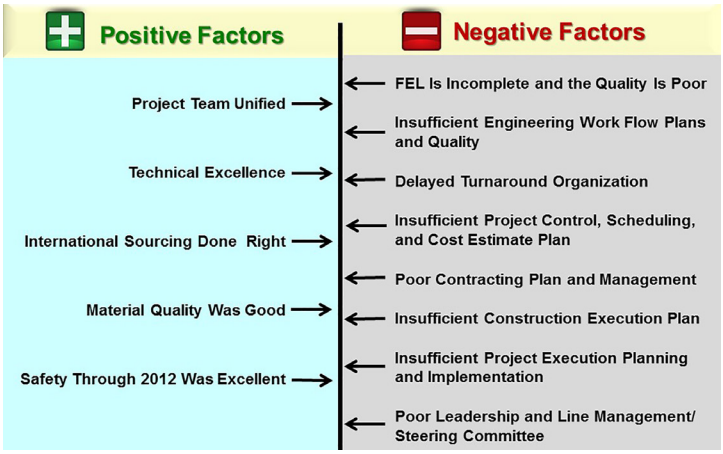


Figure 2

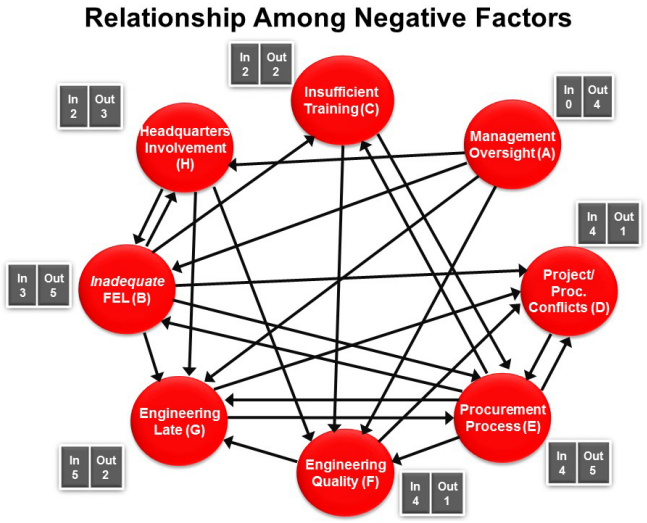


Figure 3

The TLLW is a very fast method to generate lessons learned that can lead to concrete improvement plans. When combined with closeout evaluations, senior management can also use a wealth of quantitative benchmarking data and lessons from thousands of capital projects to improve the company's capital project productivity. ■

Félix J. Parodi, Ph.D., is a Senior Consultant at IPA. He is the lead for IPA's TLLWs. Parodi can be reached at fparodi@ipaglobal.com.

Managing Execution Risks for Relocation Projects in China

Relocation Projects Are Likely to Continue to Grow in China in the Near Future

By Pei Hsing Seow, Christina Yip, and Natalia Zwart

Over 1 year ago, on August 12, 2015, a series of explosions at the Port of Tianjin, China, rocked the bayside city, killing more than 100 people and injuring hundreds more. The calamity unfolded at an industrial site where large quantities of hazardous chemicals, including sodium cyanide and ammonium nitrate, were stored. According to media reports, an initial fire or explosion at the site led to another massive explosion and several smaller explosions, resulting in widespread devastation in a densely populated area.

The heavy casualties stemming from the disaster in Tianjin spurred growth in manufacturing and industrial site relocation projects across China.[1] But even before the disaster, relocation projects had become prevalent as companies sought to move plants and factories away from crowded industrialized areas. Today, companies are also seeking opportunities to tap into expanding areas of domestic consumer spending.

As many as 1,000 plants are estimated to be relocated or upgraded in China.[2] Lost in the movement to transplant assets to new locations, however, is recognition of the risk involved in executing such projects.

IPA data on relocation projects performed globally show that relocation projects demonstrate poor predictability; on average, they slipped their execution schedules by 14 percent and overran their budgets by 7 percent, thereby weakening the return on investment to business. Misplaced confidence in the practicality of moving manufacturing assemblies and equipment bears much of the blame, but so too does omission of industry-recognized practices for project planning. The potential for more substantial investments in capital and lost asset value may, in fact, diminish the expected returns sought by business executives. So, it is worth taking a closer look at what is causing so many companies to consider these projects in China and how execution risks for relocation projects can be mitigated.

Regulations, Incentives, and Opportunities

A few recognized practices are contributing to the rising relocation projects trend. And the trend is not expected to end any time soon, given the central Chinese government's focus ►►

[1]Relocation projects are defined as those that require relocation of the entire manufacturing line, that move major equipment to another location, or that involve the use of equipment from another location

[2] "China to relocate almost 1,000 chemical plants in wake of Tianjin blasts," theguardian.com, August 30, 2015.

► on re-balancing economic development in different regions of the country.

First, over many years, residential neighborhoods have been developed in close proximity to manufacturing facilities in China, not unlike the industrial site at Tianjin. The population growth in these local regions is often accompanied by increases in land value and, subsequently, the need to rezone industrial sites to reduce risks associated with having a large residential population nearby. Some local governments have even begun to reject renewal of land lease requests for manufacturing sites.

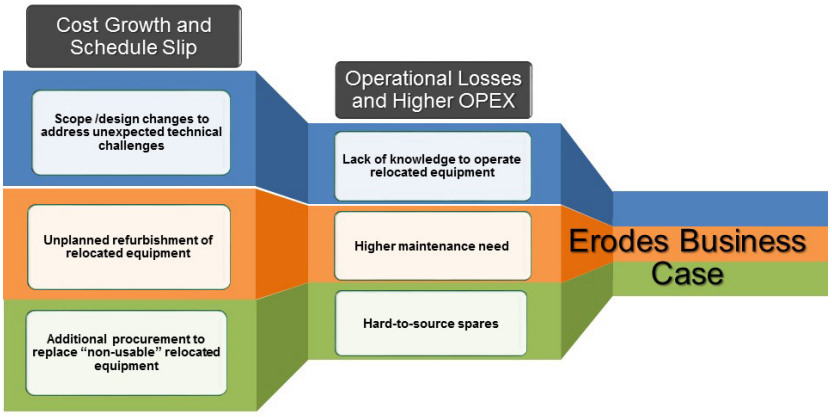
Second, the environmental regulation and process safety regulations driven by the Chinese State Administration of Work Safety are more stringent than in years past. The disaster in Tianjin heightened awareness and the intensity of work safety regulation enforcement, leading to the increased relocation of manufacturing facilities.

Third, incentives external to the company and known to business executives and project teams make the business case for some projects difficult to ignore. Chinese governments at local levels are incentivizing companies to move their industrial activities from developed regions to less urbanized areas in Central and West China. But government-backed incentives are not the only reason companies are willing to transplant manufacturing sites.

Companies are pursuing potential lower manufacturing costs and new business opportunities in these less-developed regions. Lower labor wages and land costs in these regions, plus proximity to new business opportunities, make relocation projects attractive to investors. Further, a shortage of manufacturing labor in coastal regions in China is increasingly likely as migrant workers are more inclined to stay in Central or Western China, where lower living costs compensate for the lower wages.[3]

In addition to economic and demographic reasons, some multinational companies that have invested heavily in China's industrial sector for more than a decade have indicated their interest in consolidating various assets. Although the location of such consolidated efforts may not be entirely clear, the importance of executing relocation projects effectively cannot be underappreciated. ►►

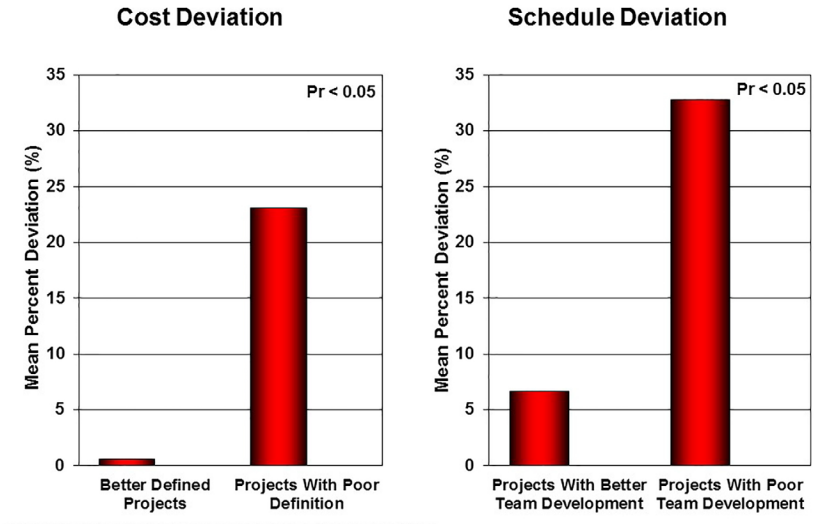
Issues Relocation Projects Often Encounter That Erode Their Business Case



Better Project Definition Drives Success

Applying Best Practices *specific* to relocation projects mitigate risks common to these projects

Good Project Practices Drive Better Performance in Relocation Projects



Data from more than 50 global relocation projects in IPA's projects database

[3] "Beijing reflects China's growing labor shortage," UPI.com, February 25, 2014.

► **Optimism Is Risky for Relocation Projects**

Drawing on data from more than 50 global relocation projects, IPA has observed that relocation projects come with their own risks, ones that are often overlooked during investment evaluation and front-end development. A common risk to relocation projects is the optimism on reusing equipment, which drives the unrealistic assumption: *"We can save money by reusing equipment from Site X; if it works there, it should work in the new plant."*

Business executives and project managers set high expectations for reuse of relocated equipment. They assume the relocated equipment can deliver the same operational performance (i.e., no effect to the production rate and product quality) as soon as the key is turned at the new location. IPA evaluations of relocation projects, however, show that, in many instances, projects that reuse equipment could not deliver the expected operational performance without requiring additional unplanned rework before and after startup. Relocated pieces of equipment, even those running at full capacity prior to moving to the new site, almost always arrive at their new locations in worse shape than anticipated. Project teams must address these post-delivery technical challenges.

Common Technical Issues Identified in Relocation Projects During Execution
As-built conditions of relocated equipment differ from existing drawings
Condition of relocated equipment is worse than expected
Relocated equipment is damaged during dismantling, cleaning, transportation, and storage
Equipment is dismantled without consideration of how the equipment needs to be re-installed
Process integration is more complicated than planned due to different standards, specifications, and automation level
Reused equipment no longer meets the latest environmental and safety regulations
Possibility of reusing bulk materials from existing site is unclear

These unexpected technical challenges are often managed by implementing additional scope or design changes on the projects or performing unplanned refurbishment to reinstate the relocated equipment to its "expected" as-built condition. In some cases, new equipment must be procured to replace the unusable relocated equipment. These solutions require additional capital expenditure and time.

Other than the effect on CAPEX and project schedule, some relocation projects suffered from early operational issues. For instance, organizations may fail to fully appreciate the significant operating and maintenance knowledge lost from the existing site, so operators at the new site are not adequately trained to operate the relocated process/equipment. In addition, some relocated equipment may require more maintenance or hard-to-source parts due to age, thereby affecting operating expenditures. All these factors, including CAPEX and schedule effect, erode the business case, delivering a lower than planned return on the investment.

Better Project Definition Drives Better Outcomes

In examining the reasons behind the common issues relocation projects experienced, it becomes clear that the damage to these projects is largely self-inflicted. Better project definition—which entails clear project objectives, a fully developed scope, integrated teams, and detailed designs—drives better outcomes in relocation projects, particularly when teams applied specific elements of industry Best Practices IPA identified as relevant to relocation projects.

Of course, executing projects in China always comes with specific challenges during project delivery. The challenges listed below must be addressed during project planning to ensure these risks are adequately mitigated.

Intellectual properties (IP) protection considerations: It is essential for business to consider how the operating IP knowledge gained by the operation/maintenance team at the closing site can be protected if these teams decide not to move to the new site. Crucial technical IP information related to the process and equipment technology can also be lost during dismantling, transportation, and installation. ►►

► It is essential for the project team to align on and define the IP protection strategies with business during FEL to ensure adequate protection and additional capital expenditures are reflected in the cost estimate and project schedule.

Cost incentives from the Chinese government can be confusing: Based on feedback from project teams, the fine details on the incentives to relocate can be vague. It is not uncommon to find that the details are only worked out late in execution or early operation in China. This confusion and late clarification can affect the business case, drive changes, and disrupt project execution.

Region-specific issues can impede project execution: With the rising trend of investments in Central and West China, business and project teams need to recognize that these regions differ culturally from the coastal regions, and working with the local governments in these regions can differ from the coastal regions. Avoiding issues takes more than just establishing good relationships. The local authorities may lack the relevant experience if the new site is located in a newly established industrial zone. Further, the government agencies work at different levels depending on the level of authority they have (i.e., whether they are county-level authority, prefecture-level, or provincial level). Longer permit application times should be expected when the local authority has to go through many layers of approval above it. Finally, local labor productivity can also differ from the coastal regions due to differences in attitudes and experience.

Making unrealistic assumptions is a common pitfall of relocation projects. However, executing relocation projects successfully without eroding the business case is possible with the use of industry Best Practices and realistic schedule and cost target setting.

For more discussion on the topic of relocation projects in China or in other regions, please contact one of the article's authors listed below. ■

Best Practices for Relocation Projects

Practice	Key Considerations
Clear Business and Project Objectives	Establish tradeoffs between operational performance and cost savings on relocated equipment
Integrated Project Teams	Involvement of operation and maintenance from existing site
Best Practical FEL at Authorization	Detailed site and design assessment of technical and operability aspects of relocated equipment
Incorporate Dismantling and Re-Installation Plans into Constructability Reviews	Dismantling approach to be captured to facilitate re-installation at new site

IPA has identified a number of other key practices specific to relocation projects that are taken into account in our project evaluations to support project teams in minimizing execution risks

In North America, please contact Natalia Zwart, IPA Manager, Chemicals, Life Sciences, and Nutrition, at nzwart@ipaglobal.com. In the Asia-Pacific region, contact Pei Hsing Seow, IPA Associate Project Analyst, at pseow@ipaglobal.com (Singapore), or Christina Yip, Senior Project Analyst, at cyip@ipaglobal.com (Australia).

Upcoming IPA Events & Presentations

September 18-21	***IPA Presenting at ISPE Annual Meeting and Exposition*** *IPA Life Sciences & Nutrition Global Manager Jordan Sealock and IPA Chief Scientist David Gottschlich will deliver a presentation titled, "Benchmarking to Manage Risk," at the ISPE Annual Meeting and Exposition in Atlanta, Georgia. They will also discuss what needs to be done early in the life cycle for pharmaceutical and biotech projects to achieve project excellence. Visit http://www.ispe.org/2016-annual-meeting for more information.*
September 21-22	***IPA to Attend Latin American Congress of Contract Management Meeting*** *IPA Latin America Regional Director Carlos Flesch and IPA Associate Project Analyst Lisiane Zynger Capaverde will deliver a presentation titled "Contracting Strategies and Incentives Effects on Contracts for Capital Projects" at the Latin America Congress of Contract Management, 7th edition, in São Paulo, Brazil. They will discuss capital project performance in Brazil and Latin America, contracting strategies, and the use of incentives in contracts.*
September 22	***IPA Oil & Gas Deputy Director to Speak at MPA Annual Conference*** *IPA Oil & Gas Practice Deputy Director Nekkhil Mishra will participate in a panel discussion on the topic of getting megaproject initiation right and megaproject Front-End Loading at the Major Projects Association (MPA) Annual Meeting taking place in the village of Cookham, Berkshire, United Kingdom. Visit http://www.majorprojects.org/events for more information.*
September 26	***IPA Oil & Gas Practice Director to Moderate SPE ATCE Panel Discussion*** *IPA Oil and Gas Practice Director Neeraj Nandurdikar will be the moderator for a panel discussion titled "Project Management: Getting It Right," at the SPE Annual Technical Conference and Exhibition (ATCE) in Dubai, UAE. Visit http://www.spe.org/events/ for more information.*
September 28	***IPA North America Regional Director Keynotes at Breakbulk Americas 2016*** *IPA North America Regional Director Phyllis Kulkarni will deliver a keynote presentation on the energy and global capital expenditure outlook for the project industry at Breakbulk Americas 2016 in Houston, Texas. Kulkarni will also discuss the effect of low oil prices on the procurement supply chain and the importance of procurement/logistics in capital project success. Hear a preview of Kulkarni's remarks at https://soundcloud.com/breakbulk-sessions. Visit www.breakbulk.com/events/ for more information about the event.*
October 4-6	***Klerian-Ramírez to Speak at LARTC 5th Annual Meeting*** *René Klerian-Ramírez, Deputy Manager, Hydrocarbon Processing & Transportation, will speak at the LARTC 5th Annual Meeting, an event focused on Latin America's refining and petrochemical industry. For more information about the event, visit http://lartc.events.gtforum.com/*
October 5-6	***IPA COO to Deliver Remarks at PCL Productivity Symposium*** *IPA Chief Operations Officer Elizabeth Sanborn will address attendees at the PCL Productivity Symposium at Lake Charles, Louisiana. In her presentation, "The Owners Role in Driving Field Productivity," Sanborn will draw on IPA's research and experience in benchmarking capital project performance to discuss how aggressive schedule targets and poor execution planning set projects up for productivity issues in the field.*

Upcoming IPA Events & Presentations *(Continued)*

October 6-7	***Prabhakar to Present at SPE Deepwater Workshop***
	Manoj Prabhakar, IPA Project Analyst and Business Development Lead in India, will speak at the SPE Deepwater Workshop titled "The India Opportunity–Innovate, Collaborate, Accelerate." He will deliver remarks on IPA research that serves as the basis for avoiding the pitfalls of past deepwater developments and understanding how to deliver successful projects in deepwater frontier areas such as offshore India. Visit http://www.spe.org/events for more information.
October 11	***Kulkarni to Present Opening Keynote Address at Global Construction Summit***
	IPA North America Regional Director Phyllis Kulkarni will give the opening keynote address on the topic of "Where Are Global Construction Markets Headed?" at the ENR 2016 Global Construction Summit in New York City. Kulkarni will talk about how changing capital spend trends are now forcing owners, designers, contractors, and suppliers to rethink procurement strategies and cost/schedule expectations. For more information, visit http://www.globalconstructionsummit.com.
October 12	***Sanborn Participating in Calgary Energy Roundtable***
	IPA COO Elizabeth Sanborn will participate in a panel discussion at the 13th annual Calgary Energy Roundtable. The panel will consider Industry understanding of the reasons for cost and schedule overruns in the region and discuss the technologies and Best Practices for improving predictability and outcomes for industrial projects. For more information, visit http://energyroundtable.net/calgary/.
September 26-27	***Cost Engineering Committee (CEC) Conference 2016***
	The IPA-facilitated CEC focuses on all aspects of cost (or investment) engineering, including cost estimating, scheduling, and project control practices and metrics, with the goal of expanding the owner cost engineer's capabilities. The primary vehicle for accomplishing these objectives comprises validation metrics, Best Practice research, and practice sharing. The event is structured in a working meeting in which active participation is expected. For more information, contact Aditya Munshi, Deputy Director of the Cost Analysis Group, at amunshi@ipaglobal.com.
November 14-16	***Upstream Industry Benchmarking Consortium (UIBC) 2016***
	Facilitated by IPA, the annual UIBC gathering in Northern Virginia provides an independent forum for each participating company to view key metrics of its project system performance such as cost and schedule, Front-End Loading (FEL), and many others against the performance of other companies and share pointed and detailed information about their practices. For more information, contact IPA Oil & Gas Practice Director Neeraj Nandurdikar nnandurdikar@ipaglobal.com.
November 14-15	***ISPE 2016 Facilities of the Future Conference***
	IPA Chief Scientist David Gottschlich will deliver a presentation "How I Learned to Stop Worrying and Love New Technology: Mitigating Risks and Maximizing Benefits," at ISPE's 2016 Facilities of the Future Conference in Bethesda, Maryland. Visit http://www.ispe.org/events for more information.
March 20-23	***Industry Benchmarking Consortium (IBC) 2017***
	Facilitated by IPA, the IBC is a voluntary association of owner firms in the chemical, petroleum, minerals processing, food and consumer products, pharmaceutical and biotech, and forest products industries that have employed IPA's quantitative benchmarking approach. The members have agreed to support the continuous improvement of capital processes through measuring and comparing performance metrics to improve the effectiveness of their project systems. IBC member companies meet annually in Leesburg, Virginia. For more information, contact IBC Director Andrew Griffith at agriffith@ipaglobal.com.

THE IPA INSTITUTE
ADVANCING PROJECT KNOWLEDGE

2016 Public Course Schedule

The IPA Institute, a division of Independent Project Analysis (IPA), develops and delivers educational seminars to further IPA's mission to improve capital effectiveness. IPA Institute courses are derived from IPA's extensive research and quantitative analysis of capital projects, linking statistically proven Best Practices to business value. To view full course descriptions, pricing, up-to-date registration details, and special discounts, please visit our website at www.IPAInstitute.com.

***Megaprojects - Concepts, Strategies, and Practices for Success** (24 PDUs)*

September 13-15: Vancouver

***Project Management Best Practices** (24 PDUs)*

September 27-29: New Orleans
September 27-29: Johannesburg, South Africa
November 8-10: Lima, Peru

***Delivering Value Growth Through Effective Oil & Gas Asset Developments** (16 PDUs)*

September 27-28: Rio de Janeiro

***Best Practices for Small Projects** (24 PDUs)*

September 20-22: Lyon, France
October 11-13: Orlando, Florida
October 18-20: The Hague, The Netherlands
November 1-3: Kuala Lumpur, Malaysia
November 15-17: Manama, Bahrain

***Contracting for Engineering & Construction Services in a Changing Environment** (16 PDUs)*

September 25-26: Dubai, UAE

***Establishing Effective Capital Cost & Schedule Processes** (16 PDUs)*

October 18-19: Santiago, Chile

In-House Solutions

Whether you are looking for a tailored or off-the-shelf seminar, IPA Institute in-house training solutions provide a company-focused, cost-effective vehicle to educate large groups within an organization or project team. Improve your company's existing internal training program(s) by incorporating the IPA Institute's extensive experience in capital project research, training, and instructional design.

PMI Registered Education Provider

The IPA Institute is a Registered Education Provider (REP) of the Project Management Institute (PMI). All IPA Institute seminars align with current PMBOK standards, enabling PMI credential holders (PMP, PgMP, PMI-SP, PfMP, etc.) to claim Professional Development Units (PDUs) upon completion of each IPA Institute course.

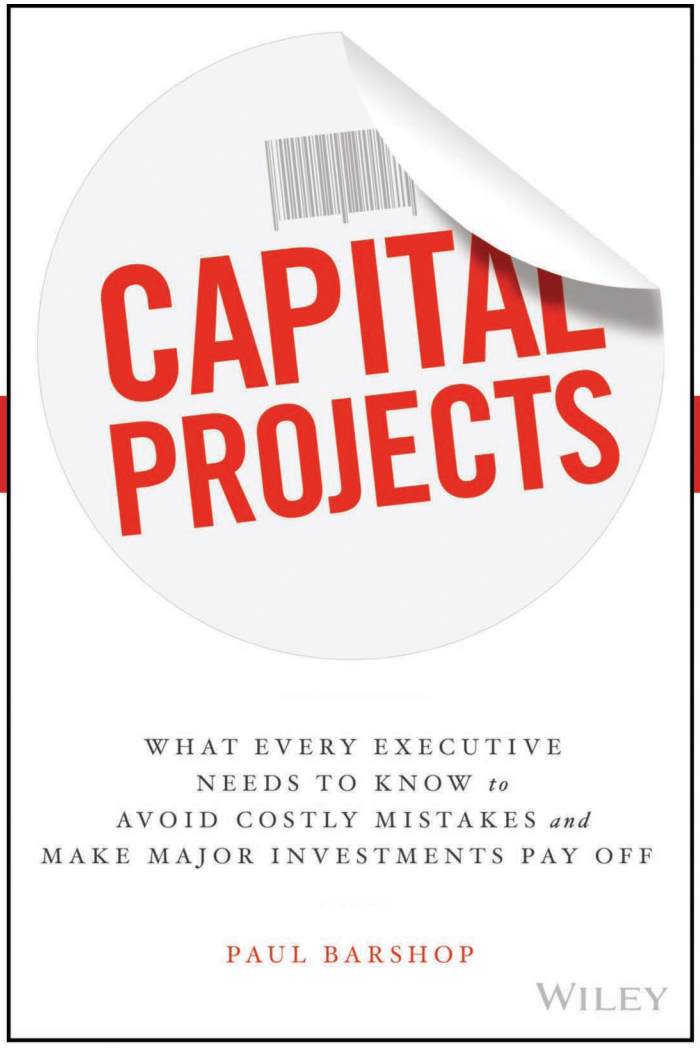
Project Management Institute
Registered Education Provider

Free Webinars on Coping With Limited Resources, Turnaround Projects, and More at: IPAGlobal.com>Services>Training & Education>Webinars

To subscribe to the IPA Newsletter and to view an archive of all past issues, please visit our website at http://www.ipaglobal.com/knowledge-ideas/subscribe.

To be informed of upcoming IPA Institute programs and courses developed for capital project improvement, please visit the Institute's website at www.IPAInstitute.com.

A REAL-WORLD FRAMEWORK FOR DRIVING CAPITAL PROJECT SUCCESS



Executives often start out with high hopes for their capital projects, only to have them fall short of expectations. Only 60 percent of projects actually meet all their objectives after they are completed and the asset is put into service. The success rate is not much better than a coin-flip.

Executives responsible for delivering capital projects do not have to accept these results. Success or failure is not random. Although most of the work to develop and deliver a project is done by others, executives must provide the leadership, guidance, and support necessary to produce a successful business result from the project. Capital Projects explains the essential concepts executives need to know to increase the probability of a successful project and, critically, reduce the chances of disaster projects—ones that lose all the capital investment and get executives fired.

978-1-119-11921-0 * Hardcover
Available September 2016 wherever books and eBooks are sold

The information in Capital Projects is derived from the histories of over 20,000 capital projects ranging from $50,000 to $40 billion contained in the detailed, carefully normalized database at preeminent project consultancy Independent Project Analysis, Inc. This book presents a framework that is applicable to all types of capital investment projects, large and small, in any sector of commerce, including technology, life sciences, petroleum, consumer products, and more.

Although grounded in empirical research and rigorous data analysis, this book is not an academic discussion or a conceptual dissertation; it's a practical, actionable, on-the-ground guide to making capital projects succeed.

- Learn the specific practices that drive project success
- Avoid the missteps that make capital projects fail
- Understand the role of executives in making a project a success

PAUL BARSHOP is a Director of IPA Capital Solutions, a new IPA business initiative to provide hands-on support to clients implementing changes to their capital project development and delivery systems to improve performance.

IPA evaluates capital intensive projects of national and international oil, chemical, pharmaceutical, and major mineral companies, benchmarking their cost, schedules, safety, startup and operational performance. With 5 offices in different regions, IPA interacts with clients all over the world on a daily basis.

Available wherever books and e-books are sold.

WILEY