IPA

Independent Project Analysis Newsletter

Independent Project Analysis, Inc. is the preeminent organization for quantitative analysis of capital project effectiveness worldwide. At IPA, we provide practices you can use to ensure your success.

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Inside this issue:

Doing More With Less (Without Failing Miserably)

Lucas Milrod, Research Team Leader, Organizations and Teams

If there is one thing owner companies agree on, it is that they do not have the people they need to effectively execute the work they want to do. In fact, 73 percent of capital project teams are missing critical functions, using inexperienced people in leadership positions, or generally understaffed.[1] Although this is not a new problem, it will not be going away anytime soon, and simple demographics suggest it is likely to get worse in the near-term. Worldwide, 9 percent of the population was 60 years old or older in 1990. In 2013, that number had risen to 12 percent, and in 2050, it is projected to be 21 percent.[2] More and more experienced talent is leaving the workforce through retirement and semi-retirement, and there is not a sufficient pipeline of talent, particularly in science, technology, engineering, and math (STEM) disciplines,[3] to adequately fill the gap.

As a result, owners have to rely more and more on contractors to execute their portfolio of projects or simply try to do more with less. When compared to project teams that are adequately staffed by owners, these approaches achieve degraded project performance to the tune of 25 percent worse cost competitiveness, 22 percent higher cost growth, and 5 percent worse schedule slip. Given the limited resource environment owners are operating within, these approaches cannot always be avoided. However, there are a few proven practices that can help owners avoid such severe negative consequences.

How to Do More With Less

The first step in minimizing the negative effects introduced by resource limitations is to ensure that the most leveraging positions are filled by owners and that project team members' skills and abilities are aligned with the project needs. Business sponsors have the ability and the responsibility to ensure teams meet minimum staffing requirements, even if ideal staffing is not achievable. The only reliable way for this to happen is for sponsors to understand the project and the project's staffing needs. Project teams that have an actively involved business sponsor[4] are two times more likely to have owner representation in the most critical functions than projects without active sponsors.

1 Lucas Milrod and Chris Valleau, *Doing More With Less (Without Failing Miserably)*, IBC 2014, IPA, April 2014.
2 United Nations, Department of Economic and Social Affairs, Population Division (2013). World Population Aging 2013. United Nations. 2013. ST/ESA/SER.A/348.
3 Internal Communications Research. The Bayer Facts of Science Education XVI: U.S. STEM Workforce Strategy—Myth or Reality? Fortune 1000 Talent Recruiters on the Debate. Bayer Corporation. October 2013.
4 Business sponsors are considered actively involved when they spend more than 10 percent of their time on the project.

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The way project teams are organized also has a big effect on their ability to deal with resource limitations. Project teams tend to be organized in a way that reflects the systems they come from. As shown in ***Figure 1***, systems are generally organized in one of several ways, ranging from full functional control to pure project-based systems. Most systems, however, are organized as either a function-centered or a project-centered matrix.

In a function-centered matrix, team members report directly to functional leads and the project manager coordinates the work of the functions. In a project-centered matrix, primary authority lies with the project manager; functional leads provide qualified team members and maintain some oversight, but team members report directly to the project manager.

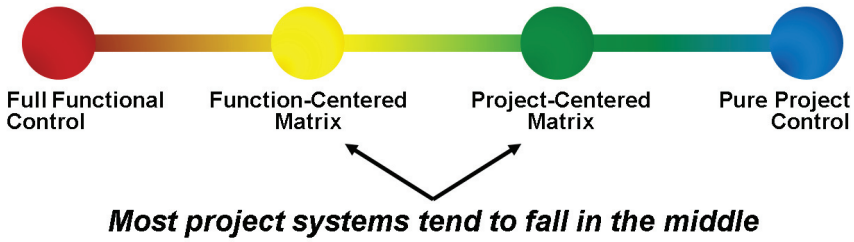

Figure 1. Types of Project System Organization

Project teams that cope with resource limitations most effectively tend to be organized in a project-centered matrix. Conventional wisdom suggests that a function-centered matrix allows you to get by with fewer people because some functional strength results from people being housed within their functions and team members are often shared across projects. This, however, is not the case. In a function-centered system, there are inherently more interfaces, and team integration is more difficult to achieve. A project-centered matrix simplifies the flow of information within and outside the team, which eases the problems caused by inadequate staff. Teams that experience resource limitations but still manage to achieve some degree of success tend to be organized in a manner that reflects a project-centered matrix.

Forming the core team early during FEL 2 can also help offset the negative effects of a project's resource constraints. Teams that experience resource limitations, but are formed early, achieve significantly better project definition than teams that are formed during FEL 3 or later.[5] This makes sense because, although these teams do not have all the people they need, they are able to get a head start on the planning process and ultimately achieve better definition.

Several other ways of effectively coping with resource limitations include:

- Leveraging retirees to fill short-term gaps in the project team, especially in situations where they will have the opportunity to impart their knowledge to the next generation
- Establishing and maintaining long-term, mutually beneficial relationships with contractors where individuals from the contractor have the opportunity to develop an understanding of the owner's standards, processes, and requirements—this can take the form of formal alliances or informal relationships
- Performing targeted development and support of inexperienced owner personnel through mentorship relationships and communication channels with peers

Improving the Staffing Outlook

It is extremely difficult to find enough people who have the expertise required to execute a portfolio of projects. Reasons for this dearth of talent range from the lack of foresight on the part of companies to recruit and develop staff to the "demographic cliff," a common reference to skilled workers who are retiring without a sufficient pipeline of talent ready to take their place in the workforce. The main reason planning is challenging is because it requires a long-term commitment and a focus on the important, sometimes at the expense of the urgent.

5 Lucas Milrod and Chris Valleau, *Doing More With Less (Without Failing Miserably)*, IBC 2014, IPA, April 2014.

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The practices outlined here may help manage this issue more effectively but do not do anything to improve it for the future. To fully address this problem as an Industry is quite complex, but owner companies can take some high-level steps to improve the staffing outlook for their portfolios:

- Define and understand core capital project functions: For each function or functional group involved in capital project execution, identify critical responsibilities and the expertise required to perform them.
- Assess the current state of owner people resources: Use functional definitions to determine the competence of existing resources.
- Assess immediate staffing needs: Conduct workforce planning based on corporate strategy and portfolio planning. With an understanding of functional demands, the type and level of necessary resources can be identified based on the amount of project work and specific characteristics of the work.
- Identify gaps in the current state and staffing needs: Compare the current state of owner people resources and the immediate staffing needs to identify gaps.
- Address immediate needs: Develop a plan to address identified gaps between current and needed internal people resources. If competency gaps are identified in existing resources, create individual development plans to get them where they need to be. If additional resources are needed in specific functions, use functional definitions as the basis for recruitment and selection.
- Assess long-term staffing needs: Strategic workforce planning should be conducted based on long-term corporate strategy and portfolio planning. With an understanding of each function, long-term staffing priorities can be identified and risks mitigated in a targeted manner.
- Plan to address long-term staffing needs: Develop a plan to move internal functional resources from where they are to where they need to be over the next several years. This should include staffing plans and contingencies, clear career paths linked to development plans, compensation structures aligned with strategy and resource needs, and a performance management system that effectively promotes excellence in performance and addresses weaknesses.

To learn more about IPA's capabilities around organizations and teams, contact *Lucas Milrod,* Research Team Leader, Organizations and Teams, at *lmilrod@ipaglobal.com.*

Professional Profile:

Lucas Milrod, Research Team Leader, Organizations and Teams

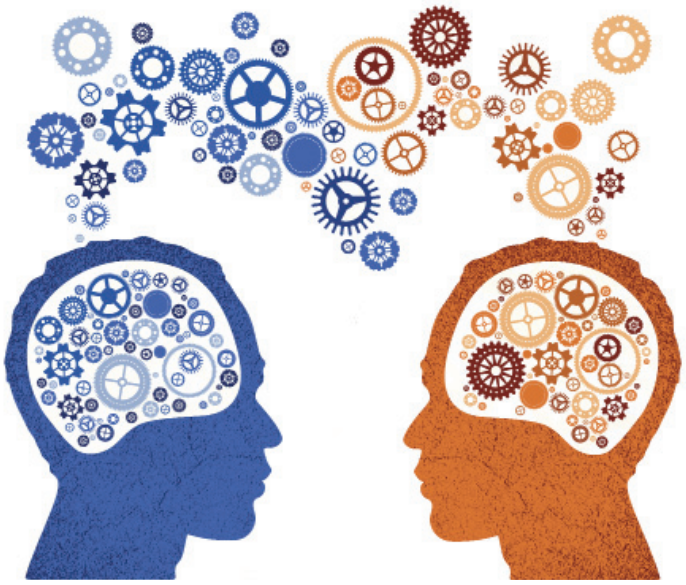
Lucas Milrod joined IPA in 2012 and is currently the Research Team Leader for IPA's Organizations and Teams Research Group. Lucas has directed research on executing projects with limited resources, the project management function, how to staff megaprojects, and other organizational topics.

Before joining IPA, Lucas worked in the Organizational Development group at McKee Foods Corporation. His experience includes organizational design and development, staffing system design and validation, individual and group performance management, engagement research, and training development and evaluation. Lucas has also taught several organization related classes at the college level including Employee Selection, Performance Management, and Team Management. He has achieved PHR certification through the HR Certification Institute. Lucas has an M.S. Degree in Industrial/Organizational Psychology from The University of Tennessee at Chattanooga and a B.S. Degree in Psychology from Lee University.

Mapping the Value of Collaborating With the Academic World

Olfa Hamdi, Project Analyst

The rise of a global knowledge economy has intensified the need for strategic research, going beyond both geographical and discipline boundaries. For more than 20 years, IPA has subscribed to this vision and has established a world-class research body aimed at continuously advancing the understanding and mastering of global capital projects management. Research is a primary driver of our line of work. In this sense, we have a lot in common with the academic world as we both strive for discovery, innovation, and knowledge creation. As a private research institution, we seek collaboration opportunities with universities, corporate graduate programs, and the academic community in general outside the traditional industry-academia interactions. Indeed, we put great emphasis on communication and the creation of channels for knowledge elicitation. Below are examples illustrating the interaction opportunities between IPA and the academic world.



Enhancing Career Paths: A Commitment to Educating and Attracting Young People to Our Industry

A recently completed multi-client study by IPA explored the consequences of the stretched supply chain on projects in the United States. As widely discussed throughout the industry, the study found that almost all industry players are more likely to experience workforce shortages, and that includes not only craft workers but also engineers, qualified managers, and leaders. One of the most discussed workforce related issues remains the ability of our industry to attract and maintain a skilled workforce, thus closing the generational knowledge gap. At IPA, we believe that providing students, independently of their academic background, with an early introductory exposure to our industry can be a gateway to attracting them to joining our community, whether from the research and consulting side or other facets of the industry. Our Internship Program Lead, Jennifer Nicolaisen, states: *"Through IPA's summer internship program, we want interns to get exposure to the complexity of the extractive and process industries that drive the global economy. We want to provoke them to ask the kinds of meaningful questions that will stimulate improvement in our client systems."* In the same context, we team up with universities and companies to provide through our Institute intensive courses to students and new graduates. Indeed, both companies and universities have found the project management Best Practices course to be a great complement to those graduates making their transition to the industry.

Sharing Ideas: The First Step Toward Change Is Awareness

Since its founding in 1987, IPA has tamed the mystery of capital project's management through quantitative research. As we have served hundreds of clients around the world and helped them improve their project performance, we believe in the role that education can play into transforming our industry. We thus not only chartered our IPA Institute specializing in providing education seminars for project professionals but also have participated in seminars and delivered keynote speeches in educational institutions around the world to further IPA's mission of improving capital effectiveness. From The University of Manchester in the UK to the Tafawoq Institute (a successful partnership between Qatar Shell, Qatar Petroleum, and Hamad Bin Khalifa

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University), our CEO, Edward Merrow, has drawn on IPA's decades of research and experience to educate the next generation of industry leaders about the complex behaviors of large projects. Inspired by his leadership and IPA's mission of improving our industry capital productivity, several IPA analysts participate in spreading our mission message and sharing research insights with the academic community. For instance, invited by Professor Lafhaj, head of the Planning, Construction & Environment Department of École Centrale de Lille (a top engineering school/Grande École in France), Olfa Hamdi, a project analyst at IPA, conducted a seminar on capital effectiveness in interaction with the academic institution faculty, graduate and doctoral students as well as industry sponsors in Northern France. The seminar allowed an insightful discussion on the state of the art of the industry capital effectiveness in France in comparison to North America. With its ability to benchmark projects around the world, IPA is recognized to be a reliable source for identification and validation of local context characteristics affecting projects.

Faculty, doctoral students, and business sponsors in Northern France gathered to discuss IPA's framework on the elements of capital effectiveness within the French context, École Centrale de Lille Spring 2014

Research Collaboration: Mutually Expanding the Industry Body of Knowledge on the Dimensions of Capital Projects

In collaboration with the University College of London Department of Construction and Project Management, IPA teamed up with Professor Peter Morris in a research project that addressed the research question of how the project sponsor's actions during the front-end shaping process can affect the project's ultimate success or failure. The research project provided further insights into the interface between the project team and the business side, a topic that is critical to the future of our industry. The joint research team includes members based in the United States, the United Kingdom, and Australia. This team illustrates how IPA serves as a platform for the global integration of knowledge. Although most of IPA's research is multi-client funded research governed by a set of confidentiality rules, we see research collaboration with the academic side as a two-way gate allowing the exchange of knowledge that is not only related to the substance of research but is also expanded to the research methodology.

In a Word...

IPA's interaction with the academic world is diverse, ranging from engaging the next generation of industry leaders through education and dialogue to collaborating with leaders from academia to advance global project management knowledge access. ***In a word, research is our essence.***

For more information on any of the programs listed, please contact ***Olfa Hamdi***, IPA Project Analyst, at ***ohamdi@ipaglobal.com***.

Research Corner: Updates for IPA's Current Research Initiatives

Achieving Better Project Outcomes in West Africa

The group of coastal countries stretching from Guinea to Angola is home to vast mineral wealth and 35 percent (>350 million) of Africa's total population. It is also very possibly the single most difficult region in the world in which to develop and execute successful industrial capital projects. The motivation for this study is to find ways to reduce project risks in this uncertain region. The goal is to find the commonalities in the successful projects from this region and catalog the practices to minimize risks. The study is currently in the framing phase and the analysis is expected to start in October 2014, with completion targeted for July 2015. The study is open to owners and contractors.

Edward Merrow, IPA Founder and President: ***emerrow@ipaglobal.com***

Sustaining Capital for LNG Facilities

Every LNG facility must spend capital to sustain production and comply with regulations, yet the amount of capital to be allocated to a given facility is often hotly contested. With a number of export LNG facilities currently in operation and many more in development, the cost of constructing these facilities is well known. However, the necessary capital investment to sustain the facilities year after year is more challenging to predict. To help companies compare and forecast their sustaining capital expenditure and ensure that their LNG facilities are neither over- nor under-capitalized, IPA is developing a multi-client study. The study will produce benchmarks for annual sustaining capital spend at LNG facilities, normalized for several LNG-specific factors. Several operators have already committed to the study, and it remains open to additional participants.

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Phyllis Kulkarni, Business Manager, Plant-Based Systems: ***pkulkarni@ipaglobal.com***

Evaluating the Performance of In Situ Oils Sands Development Projects

Industry currently faces substantial capital cost challenges for in situ oil sands developments. There is an urgent need to better understand what success looks like for in situ oil sands developments in Alberta and the practices that drive better cost, schedule, safety, and production attainment performance. The purpose of this study is to pool the learnings and data from in situ projects in Alberta from multiple owner companies to aggregate the practices and outcomes from these projects and determine what drives success. In addition, these data will be used to benchmark the performance of individual companies against Industry as a whole and to guide the later projects on cost and schedule planning. We are targeting oil companies that currently have in situ oil sands projects in operation or are planning to in the future. IPA has issued a formal prospectus and is evaluating feedback from potential participants. IPA hopes to kick off the study before the end of 2014. The study is currently open to all interested participants.

Keith Mayo, Study Principal Investigator: ***kmayo@ipaglobal.com***

Understanding Drivers of Rising Owner's Cost in the Oil & Gas Industry

Today's landscape in which oil and gas projects are executed is a difficult one. Projects are complex, much larger, executed in frontier regions, and done against a backdrop of demographic and supply chain constraints. Yet, the number of projects continues to increase, leading to significant sector inflation, including owner's costs. At the request of several clients, IPA launched a study to determine what is driving owner's costs in the oil and gas industry. This study will establish a common basis for comparing owner's costs, identify trends and drivers,

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and test correlations between higher owner's costs—either in its entirety or by category—and project outcomes. This study is currently in the analysis phase and remains open to additional participants.

Jonathan Walker, Study Principal Investigator: ***jewalker@ipaglobal.com***

Project Authorization Processes and Durations

"It seems like it's taking longer and longer to get my projects authorized, and the hurdles keep getting higher..." is a theme IPA has heard from several clients this year. Although a hasty authorization phase can lead to an ill-prepared project facing trouble in the field, a process that is too onerous means the project may risk team member turnover or market changes while waiting on approval. So what is the "right" level of approval for a given project's authorization, and how long "should" it take, considering the project's size, the company's portfolio size, project type, and other key factors? IPA will answer these questions in a multi-client study open to all companies. Several companies have already committed to the study.

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Oil Sands Tailings Management

As regulatory requirements for tailings management continue to tighten, the major players in the Canadian oil sands industry face significant challenges in reducing the amount of tailings they generate during bitumen extraction and in reclaiming the large volumes of tailings that already exist on their sites. Tailings management projects are increasingly capital intensive with no direct return on investment. At the request of several clients, IPA launched a study to determine a benchmarking methodology for these unique projects and to investigate the drivers of cost and schedule in tailings management capital investments. IPA is currently collecting data for the study and will finalize results by the end of the year. This study is open to additional participants.

Jennifer Nicolaisen, Study Principal Investigator: ***jnicolaisen@ipaglobal.com***

Improving Mining, Minerals, and Metals Operating Cost Estimates

IPA's recent experience with Mining, Minerals, and Metals (MMM) sector projects has found that operating expenditure (OPEX) costs are volatile and commonly higher than anticipated at project sanction. This underestimation of OPEX costs heavily erodes net present value (NPV) and ultimately undermines the selection of the right scope to achieve the business case. The scope of this study is to investigate the OPEX estimating practices employed on large capital projects during Feasibility and link these with the operating cost line items that commonly overrun and do not meet expectations at project completion. The results of the study will be reported to participating companies. We are currently seeking commitment to allow the study to proceed.

Tim Mumford, Study Principal Investigator: ***tmumford@ipaglobal.com***

Global Equipment Procurement for Capital Projects

IPA is conducting a study that aims to advance Industry's understanding of the current trends and practices in equipment procurement for capital projects. A key focus is to evaluate the total cost of procurement in various global regions, taking into account equipment prices, the costs associated with transportation and setting up and maintaining regional procurement organizations, and other costs tied to addressing potential quality problems. IPA will also assess how companies' organizational structures, procurement approaches, contracting strategies, and other purchasing practices and strategies affect procurement effectiveness. IPA kicked off the study in April 2014. The study remains open to additional participants.

Josh McClellan, Study Principal Investigator: ***jmcclellan@ipaglobal.com***

Natalia Zwart, Business Manager, Chemicals, Life Sciences and Nutrition: ***nzwart@ipaglobal.com***

UCEC 2014 Gathering Spotlights Contingency Setting Concepts

Members of IPA's Upstream Cost Engineering Committee (UCEC) gathered June 11-12, 2014, in The Woodlands, Texas, to review and discuss metrics, trends, and tools for the development of project conceptual estimates, and practices for improved asset evaluations.

Established in 1998 and today made up of 16 member companies who provide project cost data to IPA, the UCEC's objective *"is to improve project and business results by providing metrics for better cost engineering,"* said IPA Analyst Carlton Karlik, the committee's coordinator. Member company representatives gather once a year to learn about and review new UCEC metrics packages that are prepared by IPA. The upstream metrics packages are used by companies to compare their upstream project cost and schedule outcomes with industry cost and schedule norms, and in general boost business project estimate assurance and evaluation quality.

This year's meeting, hosted by Anadarko Petroleum, had more than 60 attendees. Karlik said metrics for onshore projects in the Middle East and Russia were included in this year's metrics package, as well as a variety of more detailed platform duration metrics worldwide.

A highlight at this year's meeting was an IPA study on required contingency and contingency setting for exploration and production (E&P) offshore projects. The study examined different contingency setting concepts and, for each concept, drilled down into project data to the line item level. Among the study's findings: required contingency depends on the contingency concept selected for a project; cost growth and contingency allocation for line items varies considerably across concepts; and most required contingency is allocated to cover transportation and installation (T&I) and hook-up and commissioning (HUC) costs for offshore pipeline and subsea work. Not surprisingly, cost estimating methods and practices significantly affect required contingency. An industry-led panel discussion followed the presentation of the study by IPA Analysts Jason Walker and Qian Zhou.

Other notable research presented at the UCEC meeting focused on setting attainable project target dates for first oil, and offshore carryover work. The attainable schedule targets study in particular provides a suite of project screening tools that can be used to improve a company's project first oil estimating capability. The offshore carryover work study characterized the types of work that get carried over, highlighted drivers of work carryover, and quantified the effect on project cost and schedule when work is carried over.

IPA's companion committee for downstream projects, the ***Cost Engineering Committee (CEC)***, is gearing up for its annual meeting to take place on September 16-17, 2014, in Tysons Corner, Virginia. Read about last year's CEC gathering at: ***http://goo.gl/vTla4e***, IPA Newsletter, December 2013, Volume 5, Issue 4, Page 12, "CEC Members Gather for 2013 Conference." *—Geoff Emeigh, IPA Staff Writer*

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Industry Norms for Sustaining Capital Allocation to Sites

Data to Put an End to the Rising and Waning, Fighting and Complaining

Phyllis Kulkarni, Business Manager, Plant-Based Systems

One of the biggest conflicts IPA observes at manufacturing companies occurs during the annual capital allocation process, in which sites and corporate or business units battle it out to see who will receive the biggest chunk of available sustaining capital (SC). By sustaining capital, I mean *"stay-in-business"* capital—the money that sites will use to maintain their production and make minor improvements to existing assets. Although this sounds like it could be a straightforward number to determine based on the site's needs, the process can be quite contentious. Moreover, it is often driven by corporate finance requirements (e.g., "spend should be 60 percent of depreciation this year"), more so than by site requirements. As ***Figure 1*** shows, a given manufacturing site typically wants to maximize its share of sustaining capital, to make improvements, eliminate process, safety, and environmental risks, and sustain production. Conversely, because sustaining capital projects are typically non-revenue-generating, the business or corporate arm usually prefers to minimize, or at least strenuously justify, sustaining capital spend.

- **Plant wants maximum capital to keep running**
- **Spend more when commodity prices rise**
- **Risk-based approach to determine site needs**
- **Under-capitalizing is risky**
  - **Projects deferred until they cannot be anymore**
  - **May miss out on revenue-generating projects**

- **Corporate wants to minimize non-revenue-generating spend**
- **Cut back when commodity prices drop**
- **Abide by corporate financial directives**
- **Over-capitalizing wastes money**

How much SC should each company site receive?

Figure 1. Competing Forces Surround Sustaining Capital Allocation

Although benchmarks for maintenance expenditure are often readily available, some industries seem to lack robust benchmarks for sustaining capital. Without comparative data, companies face several major risks:

- Knee-jerk reactions to commodity price changes—when prices drop, companies that respond too dramatically risk cutting back investment to the point where it negatively affects safety, environmental performance, and uptime. When prices rise, they risk over-investing relative to the long-term market outlook.
- Letting corporate politics or personal relationships dominate the discussion—for example, allocating a disproportional share of capital to the site where the facility manager is the "squeaky wheel"—the most aggressive in making the case for more capital.
- Without good data to allocate capital year after year, sites are often on the receiving end of large swings in allocation. As an example, it is not unheard of for a site to receive $50 million in sustaining capital one year, then $100 million the next, and $75 million the year after. Although sometimes such swings are legitimate due to shutdowns or major investments, they can often be

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driven by finance objectives and the whims of the allocation process. As any site knows, it is very difficult to manage capital in the face of such ups and downs—it is quite challenging to initiate or slow down projects to fit the desired cash flow, and to staff up and down rapidly. Likewise, it is frustrating for the business, which may see that the site is unable to complete as many projects as requested.

- Not being able to quantify how the company's allocation practices are enhancing or impeding effective sustaining capital project execution. For example, some systems have quite restrictive "use it or lose it" approaches to annual capital allocation, which can be very disruptive to good execution. A common pitfall is that at the end of the financial year, projects are rushed into the field to accelerate spend, without adequate project planning.

In short, a better, more quantitative way to allocate capital to operating facilities can help ensure that facilities are able to sustain production for the long term, while reducing unnecessary swings in capital spend.

So how can a site or company understand what's "normal" or how their sustaining capital investment level stacks up against competitors? Last year IPA worked with five global mineral operators to answer this question. We collected data from 50 sites around the world, covering the past 10 years of sustaining capital history, to reflect the high and low of the most recent commodity price cycle. The data came from a diverse set of sites, including different commodities, locations, and sizes, as shown in ***Figure 2***.

Characteristic	Study Database	
Number of Operating Sites	~50	
Organizations Represented	5	
Locations	Australia South Africa	Europe The Americas
Commodities	Coal Iron Ore Copper Zinc	Lead Alumina Mineral Sands
Facility Types	Mine Mine + Processing Plant Refinery	Smelter Port
Average Site Annual Sustaining Capital Expenditure *Full Range*	$84 million *($2 million – $462 million)*	

Figure 2. Sustaining Capital Study Included Diverse Mining/Minerals/Metals Sites

Given the diversity of sites in the study, it would be nonsensical to compare absolute capital spend (e.g., to say that Site A spends $50 million and Site B spends $30 million), without taking into account differences in production throughput, complexity, location, age, and other factors. To account for such factors, we studied a range of variables and identified the most robust ratios that can be applied to fairly compare sustaining capital investment across different sites. The key ratios are shown in ***Figure 3***.

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Throughput	SC $/ton
Financial Measures	SC as percentage of: – Gross Book Value – Annual Depreciation – Total Fixed Asset Value
Maintenance Expenditure	SC as percentage of Maintenance Expenditure
Staffing	SC per Project Manager

These measures account for factors often thought to be the most influential, such as facility age and complexity

Figure 3. Sustaining Capital Investment Metrics

These are all important, and quite useful, measures:

- ***Throughput:***
  SC $/ton is a straightforward metric that can be used to easily compare sites of different sizes within the same commodity, using one of the most important measures of site performance—production. This is also the most robust metric we identified, with sites tending to fall quite close to the group average.

- ***Financial Measures:***
  Financial measures are frequently used by the business as the primary guide for capital allocation—for example, we commonly hear that the business will allocate a site the equivalent of (or no more than) its annual depreciation. Although on average this may be the case, our study revealed significant variability (as shown in the example graphic below). Most sites add considerably to their cost basis in some years. Likewise, sustaining capital spend relative to gross book value is another commonly used metric. However, whereas other literature sometimes cites that sustaining capital should be only a few percentage points of gross book value, our study found that for certain types of facilities, it is often 8 percent or higher.

- ***Maintenance Expenditure:***
  Examining sustaining capital expenditure relative to maintenance expenditure helps us understand if lowering spend in one area leads to a correspondingly higher spend in the other area, or vice versa—whether these expenditure categories interact and are traded off against one another. The study showed that these categories actually act together—they follow the same up and down pattern driven by commodity prices, although maintenance expenditure shows much less year-to-year variability than sustaining capital.

- ***Staffing:***
  Sustaining capital per project manager is a critical metric because capital cannot be delivered effectively without the right staffing—if project managers are carrying too high a workload, they are unlikely to deliver the total capital spend effectively. A workload of $5 million to $10 million in total capital per project manager was common in our study.

As part of the study, we developed metrics by commodity (e.g, Sustaining Capital $/ton for copper sites) and by facility type (e.g., Sustaining Capital $/Project Manager for integrated mine and process facility sites). ***Figure 4*** provides an example of how data were presented in the study.

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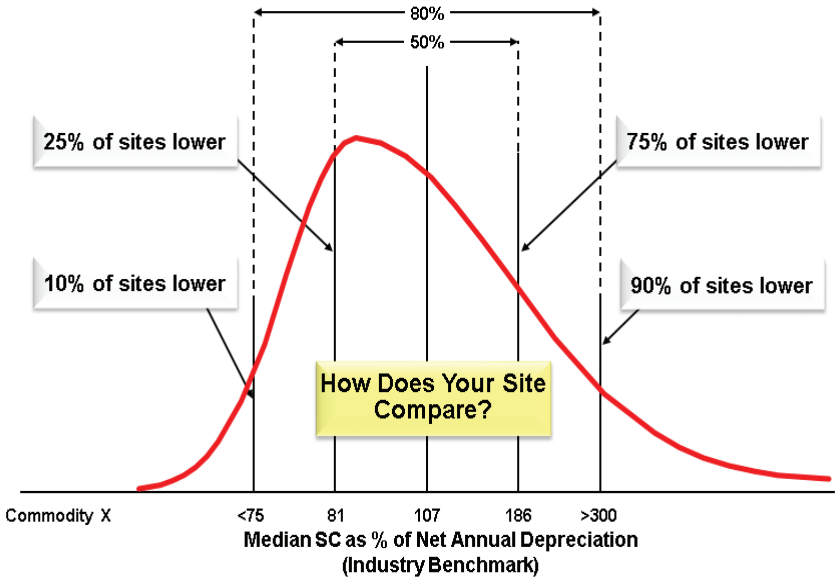

Figure 4. SC Expenditure as % of Depreciation

Our discussions with participating companies show that these data are highly valued for several reasons:

- They allow companies to easily compare their investment levels with those of their major competitors, and at a glance discern whether their facilities are under-capitalized or over-capitalized. This can help justify a correction in spend where needed.
- They give companies a basis for better forecasting their sustaining capital needs in the near future. For example, coal prices reached a peak several years ago but have begun to decline. Should the decline continue, how drastically can coal sites afford to cut back on sustaining capital investment? Our data show that coal sites have enjoyed several years of above-average sustaining capital project investment, which means that (as much as sites may not like this result), the next few years can likely withstand fairly substantial cutbacks.
- Finally, relying on industry benchmarks helps remove the emotion from the allocation process.

The Sustaining Capital for Mining/Minerals/Metals sites study remains open to new participants. Further, IPA is developing similar studies to benchmark sustaining capital levels for other industries, such as LNG, pharmaceuticals, and chemicals. Contact ***Phyllis Kulkarni, IPA Business Manager, Plant-Based Systems,*** at ***pkulkarni@ipaglobal.com*** for more information.

The goal of the *IPA Newsleter* is to provide you with research-based articles on current capital project issues, announce upcoming IPA events and IPA Institute course offerings, and introduce new and future IPA products that can improve your project management systems.

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

To be kept informed regarding upcoming IPA Institute programs and courses being developed for capital project improvement, please join our mailing list at *www.IPAInstitute.com*.

Upcoming IPA Events & Presentations for 2014/2015

September 9 - 11

IPA to Speak at the Atlassian Summit in San Jose, California

Ian Hostetler, Operations Analyst, will present at the Atlassian Summit in San Jose, California. His presentation will identify crticial elements of project planning in desiging and building an Enterprise Wiki that provides a basis for in-depth information management and knowledge transfer. For more information, please visit ***summit.atlassian.com***.

September 16 - 17

CEC 2014 Annual Meeting in Tysons Corner, Virginia

The ***Cost Engineering Committee (CEC)***, an approved subcommittee of the Industry Benchmarking Consortium (IBC), 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 capability of the owner cost engineer. For more information, contact ***Luke Wallace*** at ***lwallace@ipaglobal.com***.

Sept. 23 - Oct. 3

IPA to Speak at the International Pipeline Conference 2014 in Canada

René Klerian-Ramírez, DEP Manager, Hydrocarbon Processing & Transportation, will present at the International Pipeline Conference 2014 in Calgary, Canada. His presentation, titled *Best Execution Practices for Pipeline Projects*, will focus on the importance of good project execution planning to pipeline project results.

October 27 - 29

IPA to Speak at SPE ATCE in The Netherlands

Ray (Zhenhua) Rui, Research Analyst, will present at the Society of Petroleum Engineers (SPE) Annual Technical Conference and Exhibition (ATCE) in Amsterdam, The Netherlands. He will present a paper he co-authored with ***Jason Walker***, Research Analyst, entitled *Upstream Offshore Facility Weight Growth Study*. Dr. Rui will also chair a session on Project Operations and Debottlenecking. For more information, please visit ***www.spe.org/atce/2014***.

November 17 - 19

UIBC 2014 in Leesburg, Virginia

The annual meeting of the ***Upstream Industry Benchmarking Consortium (UIBC)*** provides an independent forum for each participating company to view its performance against the performance of other companies. The consortium meeting highlights Best Practices, reinforcing their importance in driving improvements in asset development and capital effectiveness. For more information, contact ***Neeraj Nandurdikar*** at ***nnandurdikar@ipaglobal.com***.

November 24 - 28

IPA to Speak at the Mastering Complex Projects Conference in Australia

Rob Young, IPA Consultant, will give a keynote speech at the Mastering Complex Projects Conference in Melbourne, Australia. In his presentation, entitled *Leading Complex Projects to Success or Failure*, Mr. Young will discuss why large complex projects have a significantly higher failure rate than "standard" large projects. For more information, please visit ***www.convention2014.org.au/mcp***.

January 19

IPA President to Present at 15th PMI-AGC International Conference

IPA's President and CEO, Ed Merrow, will give a keynote speech at the PMI-Arabian Gulf Chapter 15th International Conference, Seminars, and Exhibitions. The conference will be held at the Gulf Hotel, Manama, Kingdom of Bahrain. The theme for the conference is *Delivering GCC 2030 Vision Through Excellent Project Management*. For more information, please visit ***www.pmiagcconference.com/2015/***.

THE IPA INSTITUTE
ADVANCING PROJECT KNOWLEDGE

2014 Public Course Schedule

To view full course descriptions, pricing, up-to-date registration details, and special discounts, please visit our website at www.IPAInstitute.com

Gatekeeping for Capital Project Governance (16 PDUs)

September 23 - 24: Gold Coast, Australia
October 21 - 22: Calgary, Canada

Project Management Best Practices (22 PDUs)

September 23 - 25: Dubai, UAE
October 7 - 9: Salvador, Brazil
November 18 - 20: Johannesburg, South Africa

Establishing Effective Cost & Schedule Processes (14 PDUs)

September 23 - 24: Calgary, Canada

Megaprojects - Concepts, Strategies, and Practices for Success (22 PDUs)

October 7 - 9: London, UK
October 8 - 10: Perth, Australia
November 11 - 13: Lima, Peru

Best Practices for Small Projects (22 PDUs)

June 24 - 26: Paris, France
August 12 - 14: Johannesburg, South Africa
October 14 - 16: Orlando, Florida
November 11 - 13: Seoul, South Korea

Practices for Shorter, More Cost-Effective Turnarounds (14 PDUs)

November 11 - 12: The Hague, The Netherlands

Developing Solutions Through Data: Answers to Real-World Problems

webinar

IPA is known to many clients as a benchmarking organization; however, there is a growing demand for greater access to our data and research expertise in order to make decisions and solve problems based on facts, not opinions. To support this effort, we have bolstered our capabilities to address specific challenges for organizations.

Please join us for a ***free 30-minute webinar, at 1p.m., EST, October 1, 2014***. During the webinar, we will walk through several examples where IPA was used by clients to explore issues, identify solutions, and implement changes. For more information, please contact ***Jordan Sealock, Deputy Director of Research***, at ***jsealock@ipaglobal.com***.

Independent Project Analysis (IPA) is pleased to announce that it has been selected as one of The Washington Post's Top Workplaces.

The Top Workplaces are determined based solely on employee feedback. The survey was conducted by WorkplaceDynamics, LLP, a leading research firm on organizational health and employee engagement that conducts regional Top Workplaces programs with 40 major publishing partners across the United States.

The Washington Post references several reasons why IPA is recognized as one of the Washington, D.C. area's Top Workplaces. IPA fully covers health care premiums for all employees and their family members. The company actively supports a number of local charities, including the U.S. Marine Corps Toys for Tots Program, Habitat for Humanity, Generosity Feeds, and The Leukemia & Lymphoma Society. Every year, the company donates $500 to the charity of each employee's choice on their behalf. Additionally, employees accrue a minimum of 4 weeks of vacation time annually and enjoy a casual dress code and comfortable office environment.

"While I welcome this recognition from the Post and from our staff, the effort to make IPA a great place to work for our staff around the world is a journey and not a destination," said IPA founder and CEO Edward Merrow. *"The engagement and creativity of our staff is at the center of our success. Our commitment to stable, long-term employment started 27 years ago and has never been stronger."*

The Washington Post published the complete list of Top Workplaces on June 22, 2014

Edward Merrow
Founder and President

Paul Barshop
Chief Operating Officer

Elizabeth Sanborn
Regional Director, North America

Carlos Flesch
Regional Director, Latin America

Mary Ellen Yarossi
Regional Director, Europe

Allison Aschman
Regional Director, Asia Pacific

***Kelli Ratliff*, Managing Editor**

***Geoff Emeigh*, Staff Writer**

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.

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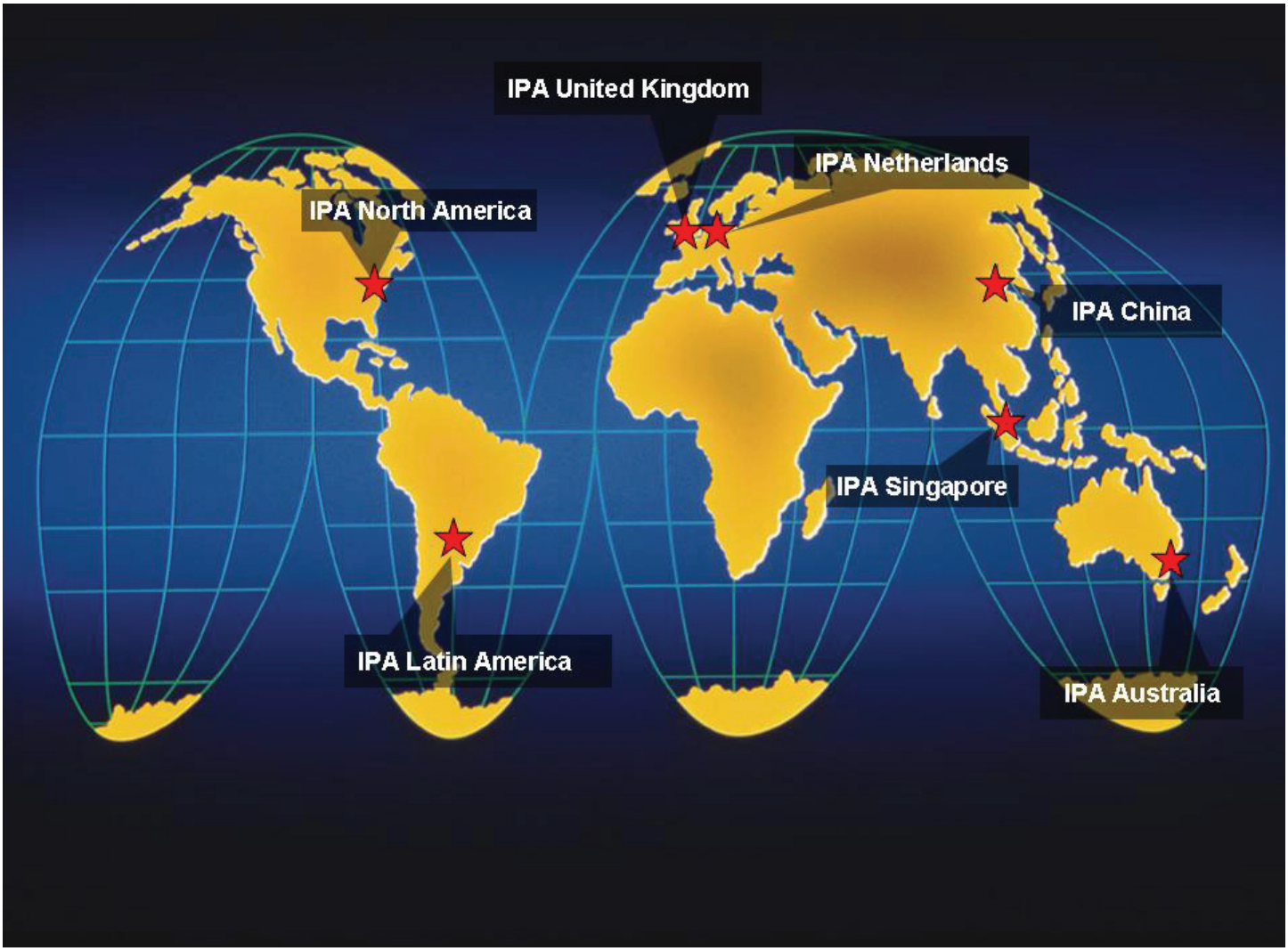
The IPA Institute's mission is aligned with the overall IPA mission to improve the capital productivity of its clients. The programs offered provide a forum for in-depth understanding of key elements of the capital project process and how to apply these learnings to effect positive changes and improvements,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



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