

# Oil and Gas Megaprojects

## Using Technology and Collaboration To Drive a Step Change in Value

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### Introduction

The demand for energy is predicted to increase by up to 50 percent over the next 30 years, and oil and gas will continue to be a major part of the mix. As a result, capital investment in the oil and gas industry is at unprecedented levels, reaching an estimated \$600 billion in upstream exploration and production in 2012. Megaprojects have long lead times, and execution can be delayed, resulting in cost overruns of up to 20 percent.<sup>1</sup>

Many steps have been taken already to improve the performance of project delivery, but there is a need for new solutions that can reduce cycle time, ensure quality of design, and deliver to budget. The industry is plagued by a persistent record of budget overruns, delayed schedules, and missed targets for peak production and reserves. In addition, operational problems often emerge after commissioning.

The Cisco® Internet Business Solutions Group (IBSG) believes the next frontier in driving improvement in capital projects is in applying *people, technology, and collaboration* to drive business process improvement.

In its studies of energy industry leaders, Cisco IBSG has identified key opportunities for network-enabled collaboration technology to reduce project cycle times. In the engineering design stage of one project, there was an estimated improvement in cycle time from 16 to 10 months.<sup>2</sup>

This paper will discuss some of the core areas of focus, including conceptual design, detailed design, and construction; ensuring real-time collaboration across contractual and intercompany boundaries; and achieving a working environment that speeds decision making and is quick to resolve issues throughout a project's lifecycle.

### A Search for Improved Performance

The current drive for growth in the oil and gas industry is leading to unprecedented levels of investment. Annual upstream exploration and production (E&P) capital spending (CapEx) has more than tripled since 2001, reaching an estimated \$600 billion in 2012.<sup>3</sup>

Of this increase, international expenditure is up 11 percent year over year; North America is up 8 percent year over year. Globally, the top 20 E&P spenders account for 57 percent of this total spending, and all were expected to increase CapEx during 2012 (by an average of 13

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<sup>1</sup> Cisco IBSG, 2013.

<sup>2</sup> Ibid.

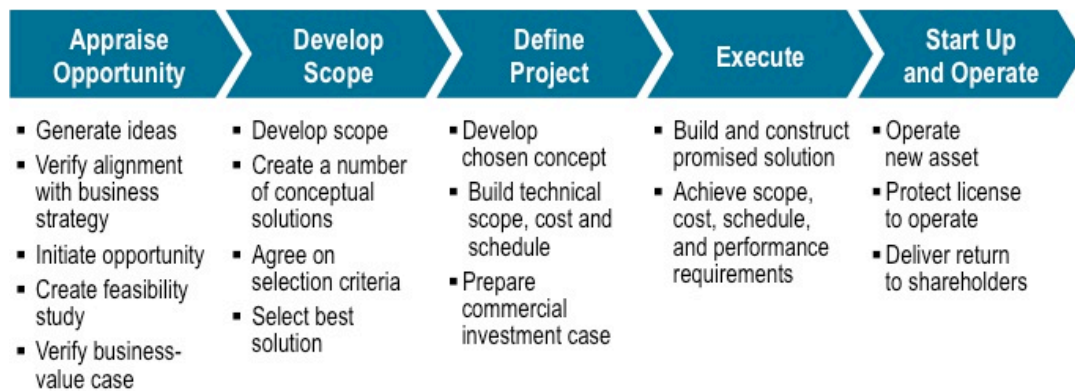
<sup>3</sup> Barclays Global 2012, E&P Spending Outlook.

percent). The number of megaprojects (greater than \$1 billion) has nearly quadrupled over the last decade.<sup>4</sup>

Compounding the issues facing the industry, accessing hydrocarbons requires ever-increasing project complexity, both technically and commercially. On the technical front, the industry is learning to operate in environmentally sensitive areas, such as the Arctic, while maintaining complex subsurface configurations. The rising levels of risk and investment require new commercial approaches. As a result, oil and gas companies have gained greater expertise in developing partnerships with resource holders, setting up joint ventures, and engaging with a wider range of interest groups.

Project management processes have been fine-tuned from years of experience and are well codified. The industry has developed well-documented, stage-gated capital management processes to ensure a rigorous approach to any investment, while creating a portfolio of commercial and procurement strategies to manage risk and ensure quality project delivery.

Figure 1. Typical Stage-Gated Capital Management Process.



Source: Cisco IBSG, 2013

Within a framework of the capital management process, organizations have adopted new approaches to the design and construction of capital projects to drive greater value, improve quality, and ensure that they deliver on commitments.

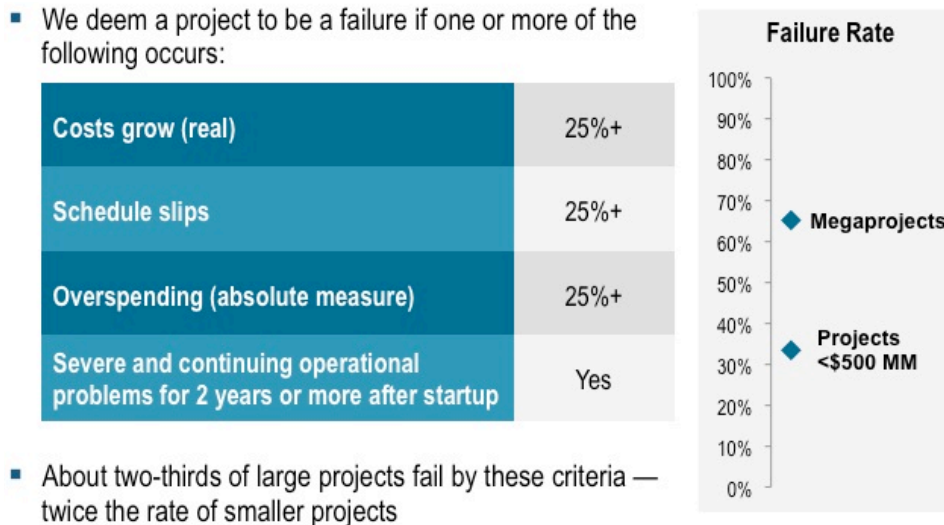
These are some of the strategies that have been adopted for offshore oil and gas projects:

- **Modular design philosophy:** the jacket, subsurface, and topsides are frequently designed and developed by different global contractors
- **Global project teams:** geographically dispersed project teams now work with different engineering design contractors and construction teams—making global coordination and orchestration essential
- **Global performance management:** complex ecosystems of numerous parties have emerged, resulting in an even higher number of interfaces and interactions (not just intracompany, but intercompany as well)

<sup>4</sup> Schlumberger Energy Perspectives Report, summer 2012.

Yet the industry's capacity to deliver on its investment promises is not keeping pace with its growth in activity. There is a persistent record of budget overruns, delayed schedules, and missed targets for peak production and reserves. In addition, operational problems often emerge after commissioning.

Figure 2. Success and Failure in Megaprojects.



Source: Independent Project Analysis (IPA)

Numerous studies have diagnosed the reasons for this poor performance. One source, Independent Project Analysis (IPA),<sup>5</sup> has evaluated industrial projects both large and small across a number of industries such as petroleum, minerals, chemicals, and power (see Figure 2). In all of these industries, the trend is the same: larger, more complex projects that are failing much too often.

Recent projects and analyses conducted by Cisco IBSG indicate that in oil and gas, two factors currently impact the success of capital projects:

1. **Economics of project performance.** There is continued evidence of budget overruns and schedules being delayed. One organization cited project spending that was 20 percent above the sanctioned estimate over the last five years. Of this gap, 5 percentage points were attributed to supply-chain inflation, and 15 percent to internal project execution or management, addressable by internal improvements.<sup>6</sup>
2. **Market for human resources and its changing dynamics.** A recent study of the oil and gas industry by Schlumberger,<sup>7</sup> the international energy-services company, covered global majors, large independents, contractors, and national oil companies (NOCs). It found that the single largest risk to project delivery was inadequately

<sup>5</sup> "The Seven Deadly Mistakes in Industrial Megaprojects," Independent Project Analysis, Ed Merrow, January 6, 2012.

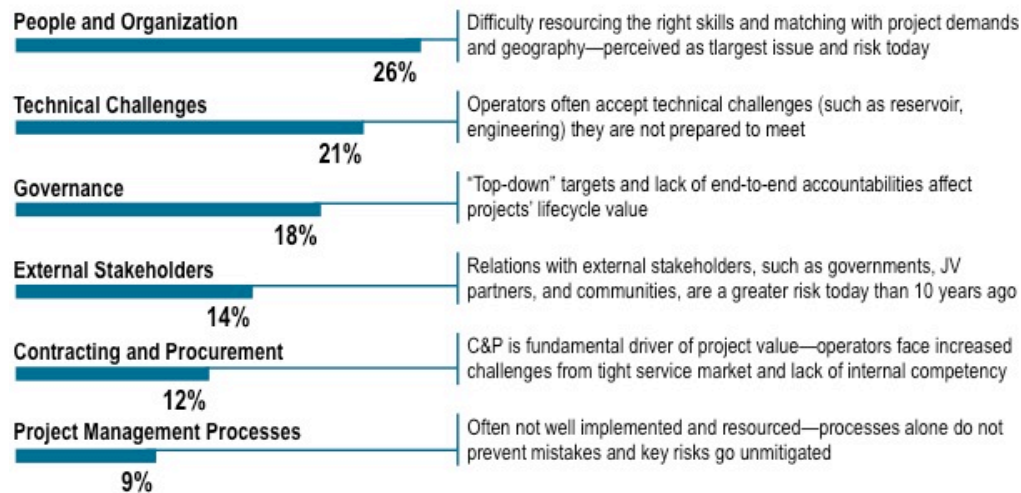
<sup>6</sup> Oil industry analysis, 2010.

<sup>7</sup> Schlumberger Energy Perspectives Report, summer 2012.

resourced project teams (see Figure 3). The study found that operators are constrained by the availability of experienced staff for critical roles, and by the challenge of attracting new employees to the demands of working in project teams. A rapidly aging workforce sees little appeal in remote, faraway engineering projects. And many oil and gas companies are finding it harder to attract younger, skilled staff in both project and operational spaces.

Figure 3. Most Common Root Causes of Capital Project Issues.

#### Relative issue weight (%) given during interviews



Source: SBC Capital Projects Research, 2012

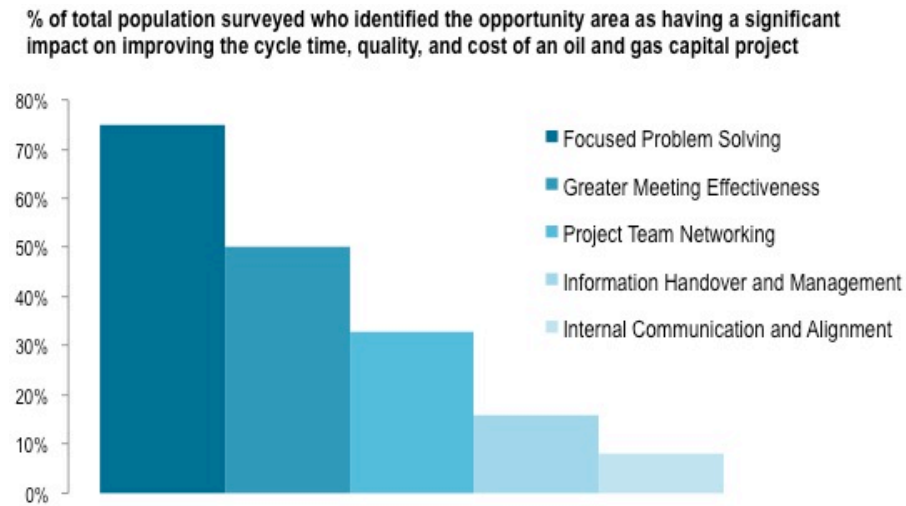
Given these challenges, which steps should oil and gas companies be taking in the capital-projects space to improve performance of their projects and overcome the additional constraints that are emerging? In the past, the project-management process has been a key focus, with a particular emphasis on bolstering leadership and management skills. But where will the next wave of business benefits come from? And how will it drive down cycle times, improve productivity of skilled staff, and ensure better-quality project delivery?

### Where To Find the Next Level of Benefits

Cisco IBSG believes the next wave of improvements in capital projects will come from applying technology. This will enable project teams to work in more efficient and effective ways, and in a more attractive and collaborative work environment. It will also deliver important economic benefits. We see some progress in this area, but there is great potential for further improvements.

Recently, Cisco IBSG worked with a number of oil and gas companies to explore how to upgrade the performance of project-management teams by creating improvements in project outcomes. Another core goal was to enhance working environments. This paper aims to outline the five areas that could deliver significant improvements (see Figure 4). We also present potential actions to drive new and enhanced behaviors by project teams.

Figure 4. Opportunities for Improving Delivery of Capital Projects.



Source: Cisco IBSG, 2012

## 1. Focused Problem Solving

Project teams in oil and gas are supported by large, often geographically dispersed sets of subteams and task groups. This large ecosystem of partners requires an even greater number of individual contributors and connections across organizational and company boundaries. Given this environment and the nature of work dynamics, ensuring effective and timely problem solving becomes a challenge. As one project director asked, “How do you get a team to kill the problem in two hours and not two weeks?”

Typically, the process involves defining the problem, gathering relevant data, and arranging the appropriate time and place for individuals to meet and determine the solution. Often, after a delay in finding a convenient time and location, the meeting is held. Then, a series of actions may be defined, leading to further data gathering, soliciting the views of others who could not attend, and confirming a time to reconvene. Multiply this process by the number of meetings held in, say, the design phase of a project and the schedule consumes more and more time. In the last three to four years, however, breakthroughs in technology have been enabling project teams to work in new and more productive ways. These new technologies challenge established ways of working, along with entrenched attitudes concerning “how long it takes to get stuff done around here.”

Collaborative work environments that combine video technology, SMART Boards, and multiple displays for data and drawings can create a virtual meeting room with the functionality of a “real” environment. Third parties are connected to the room on as-needed basis via any endpoint devices, including tablets and smartphones.

Cisco IBSG’s work in the domain of engineering design has demonstrated that it is possible to reduce the cycle time of the overall design process from 16 to 10 months using these IT tools and techniques. The challenge is less technical than behavioral. To encourage true problem solving in a virtual setting, teams need technology that is instinctive to use, “one touch” in operation, and able to support high-energy, interactive discussion and annotation.

In some cases, a dedicated problem-solving collaboration “room” can offer teams an opportunity to work with great efficiency across far-flung geographies and time zones. Such environments will drive next-level benefits in schedule improvement without compromising the quality of output.

The challenge for project directors is to understand the human networks and interactions that are potentially critical to activities within the project. Then they must create the infrastructure of real and virtual meeting facilities that will enable optimal work. There will always be a role for face-to-face problem solving and decision making. But the opportunity to drive interactions and discussions earlier—before a final decision or stage gate—will demand virtual collaboration.

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“We need to go beyond the standard one-on-one video meeting. We must aim to make the conversations between project teams more proactive and avoid all taking an action and working on it sequentially outside the meeting. Why can’t we just tackle it there and then and get resolution!”

— Oil and Gas Project Director

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## 2. Greater Meeting Effectiveness

Working on an oil and gas project team typically involves much travel to remote locations. To achieve the required objectives, enormous amounts of data and information need to be shared, and a multitude of contributors must be orchestrated to achieve the required objectives. This involves numerous meetings and interactions. But how effective are all these meetings, and what can reduce the cycle times for getting the actual work done?

Email and instant messaging are convenient and immediately available, but if they overshadow face-to-face communications, misunderstandings can plague a project. Video conferencing—whether in a formal setting or to the mobile device—enables much more effective communication. This is especially true of groups that are in a continual state of flux and dispersion. A technical environment teeming with engineering drawings, terms, and data, for example, can be fraught with misinterpretations and misunderstandings. By bringing body language and nonverbal communications to the fore, video helps all parties understand how colleagues are reacting to the information being shared.

Leadership training that focuses on project management will always be a key investment. But video technology—enabling meetings on a one-to-one level—can build relationships and personal connections among team members. This creates a foundation for more effective leadership. In an oil and gas project, overreliance on email can create a sense of isolation and disconnection among employees. To influence and lead a team to reach an objective, workplace relationships and team cohesiveness must be strong. Face-to-face interactions, albeit through video-based technology, can be an essential element in sowing personal connections, relationships, and trust throughout the team.

The challenge for the project director is to identify where the problem exists, configure an appropriate solution, and drive implementation of new behaviors. To encourage a new style



of working, they should first pinpoint processes that will benefit from improved collaboration and more efficient meetings. A wide number of information technologies and connectivity are available to promote a high percentage of face-to-face communications. Today, innovative architectures and endpoints provide a platform to reshape the traditional behaviors of project teams, while driving greater productivity and connections among team members.

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“We used to do project review meetings face-to-face, traditionally. Now, we seem to over-rely on email, updates, and reporting. How can we achieve the same level of engagement as face-to-face, but do that remotely? Getting individuals to work effectively using virtual tools is our next challenge.”

— Oil and Gas Project Manager

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### 3. Project Team Networking

The cycle time for a project, from inception through commissioning, can typically take four to five years. As each project stage is completed, a wide and diverse group of organizations and individuals comes together to focus on achieving the next milestone. In this highly dynamic and fluid environment, multiple parties touch the project—some for only a few days, others for much longer periods of time. Traditionally, the value of these networks and relationships is focused on the near term. But how can this value be captured and exploited in the longer term? Even after the final asset is operational, further tuning and improvement are often required. If that same collective expertise were available, it could be used to drive an extra level of performance from the equipment.

Fortunately, there is an opportunity to change the established ways of working by providing greater leverage from these relationships. During the design phase, for example, engineers may want to get a peer review or contribution from others so they can test their ideas and share their challenges. Naturally, individuals will form their own work groups through formal or informal networks in the project organization. Technology, however, can enhance and broaden these networks. It can connect people with others beyond their immediate circle of relationships, creating a much wider pool of help.

Social-media tools have been implemented at a number of organizations. But there is now an opportunity to create a social network for a specific asset, as it is being designed and built during the project phase. This helps improve the quality of decisions while reducing the cycle time. In addition, this social network can be used after the asset is operational.

The current model for project networking is often limited to groups of people who have worked together previously. With social-media tools, insights can be shared throughout the project and used to create better overall outcomes. Contact details, areas of expertise, and contribution to a project can be uploaded and shared, as with LinkedIn and other social-media tools. A project social-media application, however, enables dynamic updating of expertise based on current work challenges. An individual team member can auto-track, accept, and even apply ranking mechanisms to see who has the most current experience on a particular issue. A tool can be created to be specific to one project, linking all relevant



players, including the owner, the lead contractor, and the subcontractors. Informal workspaces can be created to complete the corporate information management systems, which are in place to manage documents, data, and information.

During a project, team members often gravitate to an informal, easily accessible workspace where issues can be discussed, shared, and developed. This approach has clear benefits during the project phase, and offers potential leverage in the handover and eventual commissioning and operation of the asset. Frequently, however, after a project is successfully completed, production targets are missed in the early stages of asset life due to unexpected operational issues. In the early part of asset life, it is often necessary for the operational team to do rapid problem solving. This usually requires access to the project team's expertise, but by this stage, many of them have moved on to other projects. Here, the network tool can provide an additional source of knowledge for the asset's operational team, including whom they can contact and consult for help in addressing their challenges. Designating a social-media tool for the project will provide enhanced opportunities to supplement corporate memory and intelligence. Once the project is completed, the tool can become a legacy asset to the operational team. Social-media tools can also preserve institutional knowledge as experienced staff members leave the industry.

Combining the right expertise with the appropriate information will drive improved decision making. A social network of experts provides significant benefit, especially when it is combined with tools created by the asset for managing information.

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“Over the lifetime of a project, many staff will come and go. During the engineering process, for example, I will want to get a peer review or contribution from others so I can test my ideas. At the moment, the engineers will rely on their personal network. But there must be a way to enhance this which goes beyond the chance meeting in an airport lounge or back of a cab.”

— Oil and Gas Engineering Manager

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## 4. Information Handover and Management

During the capital-project process, critical asset data and project information are created and must be transferred across multiple stage gates. Numerous parties are involved, and each may have its own systems and methods for managing data and information. Too often, the handover across stages—and from the project to asset owner—is not as smooth as it should be. Asset data is frequently lost or misplaced, creating problems in early life of the asset operation. Process and instrumentation diagrams can be missing, data specifications not available, and relevant specialists impossible to locate when an issue arises. Clearly, owners need a new approach that will minimize the probability and impact of these issues.

With the development of cloud-based capabilities, there is an opportunity to create a unified environment for capturing all asset data and information over the duration of a project. Any party will be able to input data into this virtually hosted system, creating a hub around which all interactions are executed. Too often, dedicated systems are created to sort and manage

data for each separate operation and contractor. The unified environment provides one area, owned and provisioned by the asset owner, where all parties can make their contributions and seek project information. This cloud-based approach ensures that the asset owns all the relevant knowledge while giving all players access to the same core applications and data. This requires new approaches to security and connectivity. But recent developments in wired, wireless, and mobile technologies make it a much more feasible option.

## **5. Internal Communication and Alignment**

Analysis of successful projects has highlighted the role of project directors and their leadership teams in maintaining alignment, engagement, and momentum across all other teams. In oil and gas, as in other megaprojects, it is difficult to maintain a sense of teamwork among vast numbers of stakeholders from inside and outside an organization. Additional challenges include time-zone differences; the long duration of projects, which can last years; and participants moving in and out of the team as each milestone is achieved.

How can project directors maintain enthusiasm, motivation, and connection across a vast number of staff and contracting companies? And how can they create an environment or project culture that is unique and engaging?

Traditional strategies have included town-hall meetings, emails, newsletters, and other passive forms of communication. Today, with the ability to access video messages anytime, anywhere, a project team can reinvent how it connects. Using cost-effective tools, video clips and town-hall meetings can be broadcast on high-quality video to laptops and mobile devices. To raise safety awareness, video messages and safety insights can be shared in a more digestible and higher-impact format. Updates on key milestones and achievements can be broadcast, recorded, and consumed on demand.

A project director and an on-site fabricator, for instance, can maintain a personal connection via wireless infrastructure, intrinsically safe end devices, and digital signage. Connecting web broadcasts with an interactive chat facility can encourage dialogue, discussion, and alignment across geographically dispersed teams.

Overall, IT infrastructure can engage the human element of project leadership in a cost-effective way. Project directors and their teams will gain a wider set of communications tools with which to communicate, influence, and lead.

## Call to Action

At all major oil and gas companies, the goals are similar: maximize return on investment in the short and long term, and deliver projects on time and on budget, while meeting all technical and operational standards. Cisco IBSG believes that network-enabled collaboration tools will help achieve these goals while driving additional positive changes.

As we have seen, the capital-project ecosystem will gain significant business benefits once it is enabled to work more efficiently. And there is a clear opportunity for collaboration tools to make those improvements a reality. By connecting energy-industry partners across continents, oceans, and time zones, and by bringing expertise to bear on problems in real time, the industry can drive significant economic value.

The first step for the energy industry is to recognize that some long-established patterns for executing major capital projects can and should be disrupted. One way to do this is to identify areas where time is lost or inefficiencies exist, and then apply technology to transform the manner in which people interact and collaborate.

The energy industry is ripe for a new, highly collaborative working culture that will span its entire global ecosystem. As Cisco IBSG believes, this new culture should challenge the norms of today and create new rules for tomorrow. The result will be shorter cycle times, significant cost savings, and much greater efficiency over the entire lifecycle of projects.

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