Abstract

Macroeconomic trends, geopolitics, oil prices and the depletion of known hydrocarbon reserves are both motivating and compelling petrochemical companies to venture farther offshore in search of new supplies. And because most new hydrocarbon reservoirs are discovered in ultra-deep (upwards of 5000ft / 950m) remote waters, companies are faced with unprecedented physical, environmental, technical and project management challenges:

− Physical environments are more hostile.
− Exploration and production are more complex.
− Environmental, technical, human and material risks are greater.
− Capital expenditure and expected return on investment are higher.
− Projects are more global and involve multiple stakeholders.
− Contracts are more complicated.
− Expertise is widely dispersed across a global ecosystem of specialized contractors, suppliers and partners.
− Pressure to implement stricter governance standards and enhanced risk-response capability is increasing.
− Investors seek to reduce time to first oil.

This paper examines:

− The impact of macroeconomic trends, oil prices and geopolitics on offshore capital investment strategies.
− The challenges program managers encounter when steering the planning, execution, governance, risk mitigation and delivery of projects involving thousands of globally dispersed multidiscipline participants.
− How a collaborative project management model underpinned by state-of-the-art technology can provide secure online access to a single source of information, enabling a globally dispersed project ecosystem create, collaborate and share information seamlessly while protecting Intellectual Property (IP)—from Front End Engineering and Design (FEED) to platform construction, assembly configuration, and commissioning.
− How dynamically updated performance dashboards provide a unique and reliable basis for risk mitigation, issue handling, prompt decision-making and enhanced risk-response capability.
− How all stakeholders reap measurable benefits and valuable time otherwise spent collating unreliable information from disparate systems can be used on high-value management activities that have a direct impact on the economic outcome of a project.

It concludes that the time has come for companies to make a paradigm shift away from inefficient, adversarial, proprietary, stove-piped information systems toward the use of integrated collaborative applications that foster partnership and trust while protecting Intellectual Property (IP) and enabling equitable sharing of risks and rewards.
Introduction

Macroeconomic trends, geopolitics, oil prices and the depletion of known hydrocarbon reserves are both motivating and compelling petrochemical companies to venture farther offshore in search of new supplies. And because most new hydrocarbon reservoirs are discovered in ultra-deep (upwards of 5000ft / 950m) remote waters, companies are faced with unprecedented physical, environmental, technical and project management challenges. Pressure to deliver hydrocarbons fast and efficiently to generate expected revenues for investors is intense while recent offshore incidents are forcing oil companies to review the organizational and operational improvements necessary to continue conducting business in the future. This is a continuous process. The history of the oil industry is dotted with offshore incidents—be they oil spills resulting from tanker leaks or collisions; drilling well blowouts or malicious oil spills and explosions in times of war. Such incidents cost companies billions of dollars in lost revenues each year in addition to clean-up and damage repair costs, but as long as oil remains the lifeblood of the economy, investment in offshore exploration and production must go on; the potential payoffs—shareholder profits, tax revenues, royalties, jobs and governments’ quest for energy independence—are too high to be discounted.

The drilling moratorium in the United States in the wake of the Gulf of Mexico incident in April 2010 has already cost the industry billions of dollars in lost revenues and thousands of jobs. Drilling rigs—costing up to half a million dollars per day—stand idle as complex contractual negotiations between owners/operators and drilling contractors seek a resolution. Committed capital investment is at risk. As the Bureau of Energy Management, Regulation and Environment (BOEMRE) delays the issuance of new offshore drilling permits, oil companies are forced to rethink their investment strategies. Some are stepping up bidding on alternative offshore projects in foreign seas; others are viewing this incident as a ‘creative destruction’ catalyst for diversification, refocusing their investments on non-conventional hydrocarbons.

The Paris-based International Energy Agency (IEA) predicts that a one or two-year delay in new deepwater drilling projects in the U.S. could reduce projected American oil output by 5% by 2015. Given current global inventory levels, an immediate oil shortage is not to be feared, but the impact of the moratorium—which was mirrored by both the Norwegian and Russian regulators—will clearly push the price of oil upwards in the long term.

- How can oil companies deal with these new challenges and at the same time continue to meet the growing demand for hydrocarbons worldwide?
- Where is there scope for cost–savings, improved performance and the competitive innovation that will enable operations to continue in a sustainable way for the long term?

Exercising excellence in the management and execution of offshore projects is one guaranteed way to reduce time to first oil and accelerate revenue generation while at the same time ensuring workers’ safety and protecting the environment.

Capital Project Management (CPM) applications are already well embedded in the aerospace, defense, automotive and other industries where similar complexity and distributed multidiscipline manufacturing and configuration are the standard. Such applications enable stakeholders of globally distributed projects to collaborate on-line and work from a single source of project information while protecting Intellectual Property (IP). CPM applications enable business processes and procedures based on best business practices to be automated and institutionalized across the extended project ecosystem. Productivity improves for globally dispersed users because of easy access to trustworthy information, flexible processes, dynamically updated data and secured workflows.

Program managers can exert tighter cost controls while providing higher quality project communication with partners and contractors. They can rely on dynamically updated performance dashboards for real-time program status. Drill-down capabilities provide visibility across a complete program portfolio of projects including schedules, resources, costs and deliverables enabling program managers to focus on high-value management activities such as regulatory and standards’ compliancy, risk mitigation, issue resolution and overall delivery performance—domains that have a direct impact on the economic outcome of a project.
Offshore Oil in the Global Mix

According to the International Energy Agency (IEA), 30% of the 85 million barrels of oil per day (bpd) consumed around the world originates in offshore oil wells—a percentage forecast to rise to 34% by 2015. The main offshore oil wells currently in production are located in the North Sea, Arabian Gulf, West Africa, Latin America and the Gulf of Mexico. Up to one fifth (20%) of the world’s still undiscovered, recoverable oil reserves—around 90 billion barrels—are estimated to lie within the Arctic Circle, an area where the development of proven reserves will be mainly offshore.

The Gulf of Mexico, with approximately 3500 active drilling platforms and more than 8000 wells currently in production, accounts for roughly 29% of America’s total domestic oil output—a percentage forecast to grow to 35% by 2020 according to the IEA. And despite the harsh environment and technological challenges, the quest for energy independence, coupled with improved offshore drilling technology and increasing oil prices, render attractive and profitable ultra deep-water frontier oil fields previously considered economically non-viable. According to IHS (Fig.1) from 2000-2009 the quantity of oil and gas coming into the market from offshore production almost doubled.

Offshore Megaprojects

Management and Execution Challenges

The development of offshore facilities in the petroleum industry is technically challenging and complex to manage. Megaprojects (upwards of $1 Billion CapEx) in ultra-deep waters stretch the limits of engineering, fabrication and construction. Companies must design, configure and construct drilling facilities and living quarters robust enough to endure the harshest conditions. Offshore structures can be of a variety of forms—fixed, floating, semi-submersible etc. The type is dependent on factors such as water depth, reservoir characteristics, subsea topography and cost. Technology is constantly evolving. Some of the world’s largest production platforms are larger than a football field and soar higher than a 25-storey skyscraper above the water. When operating, they are home to upwards of 200 on-site workers.

The Perdido (fig.2), an offshore production facility co-owned by Shell, BP and Chevron is currently the deepest, largest and remotest offshore oil and gas production platform in the world. Located 200 miles off the US coast in the Gulf of Mexico; its topside is as big as two football fields. It is moored with polyester rope in 8000 feet (1.5 miles/2.4km) of water. At full capacity it can produce up to 100 000 barrels of oil per day—enough to fuel 500 cars for 15 years. According to Shell sources, the Perdido project cost a total $4.4 billion, a capital investment typical of offshore deepwater megaprojects.

The complexity of the fabrication, assembly and construction of offshore drilling and accommodation facilities requires the participation of a vast team of multidisciplinary experts, including designers, engineers—geo-technical; process; structural; mechanical and marine—and program managers who coordinate a myriad of sub-contractors working in geographically distributed locations. Because of their size, most permanent offshore facilities are constructed in shipyards near land (fig. 3) in pieces or components. As the components are completed, they are shipped on giant barges (fig.4) to the offshore drilling location for assembly, final construction and configuration. At the offshore location, hundreds of sub-components and parts coming from different suppliers have to fit together, work according to design, be safe, and all parties have to agree on how to assemble them. The assembly phase resembles the piecing together of a gigantic puzzle—some pieces of which weigh several thousand tons—in the high seas. According to Shell reports, the construction of the Perdido offshore production platform required the efforts and expertise of a multinational team of multidisciplinary specialists and contractors from five continents.
The spar was designed in the USA, but built in Finland by workers from Finland, Latvia and Estonia; the mooring equipment came from Britain and Poland; a Dutch shipping company towed the spar (fig 4) a distance of 8,202 miles (13,200 km) from the Pori shipyard in Finland to Ingleside, Texas. Other equipment came from Mexico. Thousands of men and women from 48 countries worked together to design, build and assemble the world’s deepest offshore oil production platform. At the peak of the construction phase, 12,000 people were working on the project in the Gulf of Mexico. The security and safety of the workers is of paramount importance during such risky projects.

**Safety and Operational Challenges**

After years of continuous performance improvement, data collected from regulators around the world in 2010 suggest that the safety record of the offshore drilling industry declined globally from 2007 to 2009.

The Wall Street Journal recently reviewed statistics from four countries with large offshore oil industries and modern regulatory systems—the USA, Great Britain, Norway and Australia. (Brazil declined to make its data available). Standards are not always comparable and each country uses different approaches to measuring losses of well control or spills. Apart from the USA Gulf of Mexico, they all reveal a similar trend—a reduction in safety standards and risk mitigation (fig. 5).

Investigations into recent incidents have pointed to the industry's difficulties in finding and retaining experienced workers, its struggle to balance safety priorities with profit demands and occasional lapses due to inconsistent regulations. The investigators found that these challenges have become more pronounced as oil companies push the limits of the available technology and their experience of deep-water drilling in harsher environments. Furthermore, information systems for information sharing and collaboration have not kept up the pace with the demands of the business in the offshore industry, lagging behind other industries that are confronted with similar complexity, such as the aerospace and defense or automobile industry.

**The Impact of Oil Price on Offshore Capital Investment**

The price of the barrel of oil is one of the most important variables in determining oil companies’ capital investment strategies, and oil prices have gone through many major swings since it was discovery in the latter half of the nineteenth century. Initially driven by the economic fundamentals of supply and demand—the rarity and low productivity of the early oil wells meant that any new supply or demand could wildly spike the price (fig.4 1860-1880). As the industry matured, geopolitics and macroeconomic trends started playing a greater role in determining the price. From 1880 to 1970, the price (in current dollar values) remained relatively stable as the major western oil conglomerates (often referred to as the Seven Sisters) that were exploiting the oil concessions in the Middle East, managed production to serve their own financial interests while helping fuel the rapidly expanding economy—increasingly dependent on oil—until the Organization of Petroleum Exporting Countries (OPEC) was created in Baghdad in 1960.
The First Oil Crisis

OPEC’s declared mission from its foundation was the protection of the financial interests of oil-exporting countries and maximising revenues for their governments.

In the early sixties, it first objected to what its member countries described as “the theft of their natural resources” by the seven sisters (major international oil conglomerates). At that time, the latter paid only royalties and taxes to the OPEC member countries for the rights to exploit their countries’ oil reserves. Because the taxes and royalty payments were based on the price of the barrel of oil extracted, a low market price per barrel was in the financial interest of the oil conglomerates.

Observing how the economy in the western world was thriving and how oil had become fundamental to its growth, OPEC members, eager for a fair share of the profits determined to leverage their massive oil reserves to generate more acceptable revenues and greater wealth for their countries.

In its early days, OPEC had very little power to influence oil prices because it did not control its oil reserves. That changed in 1969 when Colonel Muammar Gaddafi took power in Libya. He first demanded an immediate 25% increase in the royalties foreign oil companies paid to his country and shortly afterwards nationalized the country’s oil reserves. Gaddafi’s success in Libya paved the way for the major spate of oil reserve nationalizations in the other OPEC countries that followed. New players now entered the industry—the National Oil Companies (NOCs).

The OPEC now held the key to the world’s largest oil reserves (and economy), and could turn the taps on or off at will. A new era had dawned.

Oil had become a new weapon in international politics and the OPEC lost no time in using it. In 1973, the Arab member countries of OPEC, unhappy with Western support of Israel during the Yom Kippur Arab-Israeli war, launched a worldwide oil embargo. They turned the taps off, cut back production and created a global oil shortage that sent oil prices soaring by 400% (fig. 6) from $3 to $12 per barrel in a period of six months. Double digit inflation and a worldwide economic recession ensued. In the space of a few days in October 1973, a commodity that had been taken for granted for upwards of fifty years had become a luxury. The world had awoken to its first oil crisis (fig. 7).

The Balance of Oil-Power

Although OPEC nations still account for two-thirds of the world’s known oil reserves and up to one-third of the world’s oil production, their ability to control the price of oil has diminished. The discovery and development of large reserves in Alaska, the North Sea, Canada and the Gulf of Mexico and the opening up of Russia has shifted the balance of oil power. But as oil supplies become increasingly demand-driven—fuelled by the growing needs of the emerging economies—the industry is faced with new pricing challenges. In addition to the impact of supply and demand fundamentals, geopolitics and macroeconomic trends, the assetization of oil or the speculative buying of paper-oil futures significantly influences the price of oil. This exacerbates price volatility and renders investors increasingly risk-averse.

From 1998 to 2008 (fig. 8), the inflation-adjusted price of a barrel of crude rose at an average rate of 20% per year. During the same timeframe, the price fluctuated from an average annual price of $10 per barrel in 1999 to a peak of $147 per barrel in July 2008. Towards the end of 2008, the barrel plummeted to $32 per barrel due to the impending financial crisis, weakening economy and concomitant shrinking global demand for oil. Since January 2009, the price has been on an upward trajectory as the slackening demand in the west has been compensated by a thriving demand in the emerging Asian economies. Ranging from $90-$100 per barrel at the end of 2010, analysts anticipate that oil prices will continue this upward trajectory throughout 2011 as the global economy picks up, upstream exploration and production costs rise and the drilling moratorium in the USA delays the issuance of new drilling permits.
The upward crude oil price trend is greeted positively by the industry as testified by the capital expenditures for upstream projects announced for 2011 by some of the major oil companies:

- Miguel Jorge, Brazil’s Minister for Trade and Development announces that Petrobras may invest $400 billion through 2020.7
- CNOOC, China’s largest offshore oil and gas producer plans to invest between 800 billion and 1 trillion yuan ($121-151 billion) over the next five years to boost production and expand overseas.8
- Chevron announces a $26.0 billion capital and exploratory budget for 2011.9
- Norway’s Statistics Agency reports that Norway’s oil and natural gas investments may reach a record 150.8 billion kroner ($25 billion) next year as companies raise spending on platforms to keep aging fields alive.10

Corroborating this rekindled interest in developing new oil fields, the Baker Hughes rig count for December 2010 shows an overall 29% growth in the number of active rigs worldwide relative to the same time a year earlier, with North America’s rig count growing by 42%. The offshore rig count on the other hand increased by only 3% worldwide, dropping by 33% in North America in the aftermath of the Deepwater Horizon explosion and the moratorium on the issuance of new offshore drilling permits. The drop in the number of North American offshore rigs was partly compensated by higher growth in international waters where the number of offshore rigs increased by 8%.

### Offshore Capital Projects

**Management Complexity**

Offshore projects, referred to as “megaprojects” (in excess of $1B CapEx) or “programs” by the Project Management Institute (PMI) are defined by the latter as: “a group of related projects managed in a coordinated manner to obtain benefits and controls not available when managing them individually”.

PMI outlines the program manager’s role in coordinating an entire program, managing the project portfolio including the links between sub-projects, as well as overseeing and prioritizing resources, managing costs and mitigating risks.

To successfully manage complex programs, it recommends managers focus on the following domains:

- **Alignment**: ensuring the project supports the higher level stakeholder’s vision, goals and objectives.
- **Governance**: ensuring the project structure, management processes and procedures and metrics are in place.
- **Management**: ensuring that project management infrastructure, accountability of partners, suppliers and other resources are clearly defined and regular reviews are held.
- **Compliance**: verifying that all projects and sub-projects are adhering to regulatory and industry standards.
- **Integration and interoperability**: ensuring sub-projects fit together properly as part of the intended whole.
- **Collaboration**: optimizing collaboration across the project value chain for improved performance.
- **Budgetary Control**: tracking costs and expenditures and ensuring they are under control.
- **IT Infrastructure**: allocating appropriate IT infrastructure and resources to ensure the success of the project.
- **Planning**: developing the plan project and federating project information concerning all aspects of the project.
- **Constant Improvement**: continuously assessing performance and researching and developing new capabilities.

Program managers in every industry understand the importance of excellence in the execution and management of major programs. Nevertheless, the oil and gas industry is plagued with reports of late project delivery and budget overruns. As demand for oil continues to grow globally, oil companies are under increasing pressure to find, produce and deliver the essential hydrocarbons fast and profitably. Program managers must assume responsibility for reducing the time to first oil. Investors and owners/operators look to them to take ownership for pioneering the paradigm shift in program management that will enable a new and nimble approach to delivering such capital-intensive and risky projects on time and within budget.
**The Traditional Capital Project Execution Model**

The business model (fig. 9) for managing projects in the oil and gas industry has traditionally been for a leading Engineering Procurement and Construction (EPC) company to take contractual ownership for delivering drilling facilities ready for commissioning, start-up and handover to owners/operators (O/O). EPC turnkey contracts negotiated for a fixed price, predetermined scope and agreed delivery schedule are typical of the industry. The leading EPC takes responsibility for all aspects of the project including—planning, design, engineering, procurement, scheduling, construction, risk mitigation, issue handling, testing and commissioning,.. The work associated with these disciplines is performed by a myriad of partners, sub-contractors and suppliers—dispersed over many continents and forming a complex project ecosystem. If problems arise, the O/O seeks amends from the EPC—in many cases involving financial compensation. Conversely, the EPC has limited ability to request supplementary budget from the O/O. Such budget extension requests are limited to ‘unforeseen or unplanned circumstances’ where the O/O is responsible for delays, project scope changes or other reasons of force majeure. Contracts between O/O and EPCs are subjected to Delay Liquidated Damages (DLD) or late delivery penalties. These are designed to compensate O/Os for damages incurred or the opportunity cost of unearned revenue resulting from the late delivery of a facility. This business model places an unfair amount of the responsibility for risk mitigation and the consequences of cost and schedule overruns on EPCs. Additionally, in this highly competitive market, EPCs tend to squeeze margins when bidding for projects in order to provide competitive bids, while the O/O’s priority to maximize return on invested capital can impact their judgment when selecting bids. What information systems are implemented to ensure transparent information exchange between the stakeholders or how prime contracting EPC. The consequence of this is that projects frequently exceed both budget and schedule at great cost to both parties due to the lack of common understanding and communication throughout the project life cycle. In a study carried out by Booz Allen Hamiltonxx (fig.10), it is noteworthy how O/Os (the owners) and EPCs (suppliers) perceive, evaluate and manage risk differently. In an economy of rising materials and labor costs, where attracting and retaining the best, most skilled and experienced resources are becoming increasingly difficult, EPCs are reluctant to continue assuming what has become an excessive amount of responsibility for project risk mitigation

**The Targeted Capital Project Execution Model**

As projects become more complex, O/Os understand the need for them to become more involved and take a more active role in steering the execution and management of strategic projects (fig 9bis). This paradigm shift requires remodeling the relationships between EPCs and O/Os; rethinking the project execution framework to leverage the newly available O/O skills and resources and adapting management processes so all stakeholders can collaborate constructively to jointly address project concerns while protecting IP. To enable such a collaborative business framework, and move away from the traditional and costly facility handover from EPC to O/O (fig.11), access to trustworthy approved project and asset information that evolves in lockstep with the facility’s life cycle is essential.
Managing the e-define, e-design, e-manufacture and e-procure world of offshore megaprojects requires a technology and software infrastructure that provides for a single data source; is transparent; enforces integration; tracks key performance metrics and is web-services based so that define, design, build, and collaborate are feasible from anywhere in the world and up-to-date project information is readily available to all stakeholders.

State-of-the-art technology that offers secured on-line access to a single repository of project and asset information enables a globally dispersed multidisciplinary project ecosystem to create, collaborate and share information seamlessly—from Front End Engineering and Design (FEED) through all stages of an assets’ life cycle. This information repository, updated in real-time, constitutes the DNA of a platform’s components. Enriched continuously throughout a facility’s project life cycle, the information can continue to evolve after formal operations and maintenance. This provides a unique and reliable basis for risk mitigation and enhanced emergency-response capability. All stakeholders reap the benefits and valuable time otherwise spent collating unreliable information from disparate systems can be used on high-value management activities that have a direct impact on the economic outcome of a project.

Managing Risks and Issues

Remi Eriksen, Executive Vice President of DNV the Norwegian classification society told a recent energy summit in Shanghai that “The average cost overrun on new offshore construction programs is 35%, and average schedule delays total seven months.” He explained that these overruns are linked to “the numerous complex interfaces—technical, commercial, organizational and geographical which characterize the industry. The most common causes of cost overruns in offshore megaprojects are linked to risks associated with:

- Orders placed before engineering is completed
- New technology implemented without proper qualification
- Insufficient engineering with regard to operational robustness and maintainability
- Problems with component deliveries and documentation
- Fabrication yards building competencies and training resources during the project
- Interfaces not identified or understood.

Eriksen acknowledges that risks are necessary for companies to grow and create value for stakeholders. “The aim is not to eliminate risks, but to understand, price and better manage risks” he said.

Capital Project Management applications that enable a facility to be managed throughout its entire life cycle—from creation to decommissioning—provide for effective risk mitigation and timely issue handling. To implement such a system, the first step consists in accessing data from the multiple disparate systems used by the different project disciplines and partners. Meaningful and actionable risk identification (fig.12) and issue management (fig.13) become a reality when based on reliable dynamically updated data—or as Eriksen concludes “Once EPCs consolidate and integrate project information, they will likely find that they are sitting on a proverbial gold mine of actionable data”
**IT Interoperability**

Eriksen’s viewpoint on risk mitigation echoes what the US National Institute of Standards and Technology report (NIST GCR 04-867) states concerning the costs of inadequate interoperability in capital projects in the USA.

Its findings demonstrate that inadequate interoperability costs the industry a minimum of $15.8 billion annually for the following reasons:

- Lack of collaboration software that integrates with other systems
- Fragmented lifecycle management processes that are not integrated across the project lifecycle
- Incompatible software packages
- Computer-Aided-Design (CAD) interoperability issues
- Lack of data standards
- Fragmented business processes and legacy systems
- Automated and paper-based systems
- Limited use of technology for managing business processes and information

In offshore megaprojects, much essential project information is often unavailable, incomplete, ambiguous, out-of-date or inaccessible. The interfaces between participants are complex and transcend organizational boundaries, languages and cultures. Project teams are subjected to pressure arising from complexity. Psychologists have recognized that managing complexity under pressure leads to a paradox of consequences, or negative feedback loops—as project complexity and pressure to deliver on schedule and within budget increase simultaneously, there is a heightened propensity for things to be missed, go wrong or simply not to be undertaken at all. Facilitating project collaboration; rendering management systems interoperable and enabling greater transparency between project stakeholders is fundamental to eliminating both the complexity and the resulting pressure. Enabling O/Os and EPCs to work with the same data, originating from the same single source with access to the same project dashboards is the key to overcoming some of these challenges.

**Project Management Dashboards**

Capital Project or Program Management solutions enabling all participants to work from a single source of information are already well embedded in the aerospace & defense, automotive and shipbuilding where similar complexity and globally distributed multiparty, multidiscipline manufacturing and configuration are the standard. Leveraging the benefits of software applications enabling 3D design, virtual simulation and on-line collaboration, many project activities such as—design revision; equipment clash verification; data consistency controls or virtual training for offshore workers—can be carried out before any work begins on-site.

Pre-defined templates enable management processes and procedures based on best business practices to be automated and institutionalized across the extended project ecosystem.

Productivity improves for globally distributed users because of easy access to trustworthy information, flexible processes, dynamically updated data and secured workflows.

Users can access information on-line concerning tasks, documents, deliverables, and consult original data sources, including 3D viewing of drawings.

Best-in-class templates with predefined business processes, approvals, and milestones enable concurrent design, development and delivery decision-making.

Project teams can create, share and manage information globally, ensuring consistent progress and informed collaborative decisions throughout a facility’s life cycle.

Program managers can exert tighter cost controls while providing higher quality project communication with partners and contractors. Meanwhile, they can rely on dynamically updated performance dashboards for real-time program status. Drill-down capabilities provide visibility across a complete project portfolio including schedules, resources, costs and deliverables. This enables program managers to focus on high-value exception management activities such as regulatory and standards’ compliance, risk mitigation, issue resolution and overall delivery performance—domains that have a direct impact on the economic outcome of a project.

Corroborating the vision of centralized program management as the key to reducing cost and budget overruns in megaprojects, a Booz Allen Hamilton study on the oil and gas capital projects’ industry found that as program management becomes more centralized, project performance improves significantly (Fig.15).
To enhance EPCs and O/Os ability to centralize and share information, Booz Allen Hamilton recommend a single knowledge management repository to reduce the risk of budget overruns and schedule delays. “Tighter collaboration between O/Os and EPCs has the greatest potential for improving planning, resource efficiencies and providing the basis for improved risk mitigation, enhanced risk-response capability and equitable sharing of risks and incentives throughout the life of a facility”, the study concluded.

**Conclusion**

Offshore megaprojects requiring a capital investment of upwards of $1 billion dollars need to make economic sense. While available oil reserves, geopolitics and the price of the barrel of crude are important factors in driving oil company investment strategies, successful project execution founded on clearly defined business processes, best business practices and state-of-the-art collaborative software applications provide the basis for sound and safe project execution and on-time, on-budget delivery.

The execution of complex offshore hydrocarbon projects can be compared to a chain—only as strong as its weakest link.

The time has come for all players in the offshore drilling industry to make the paradigm shift away from inefficient, adversarial, proprietary, stove-piped information systems towards integrated collaborative applications that foster partnership and trust while protecting Intellectual Property (IP) and enabling equitable sharing of risks and rewards.

The paradigm shift in megaproject management will be as significant and difficult for the offshore petrochemicals industry as it was for the aerospace, defense, automotive or other industries of similar complexity that have already crossed the chasm and embraced this technological breakthrough.

A collaborative Capital Project Management solution for offshore program management should:

- Provide all participants with visibility across all aspects of the execution of a project, based on a single data source.
- Capture work efforts and interactions and consolidate project knowledge, making it easily available for reuse.
- Facilitate EPC and O/O collaboration by ensuring the integrity and availability of up-to-date information including regulatory compliance, asset tracking for maintenance and operations and auditing for government, health, safety and environmental reporting.
- Ensure secured workflow and on-line management approval processes.
- Reduce project cycle times for O/Os, optimizing capital expenditure and accelerating time to first revenues.
- Jump-start new projects by enabling the redeployment of knowledge assets created and captured throughout the life cycle of previous projects. (This is especially relevant in an industry where the workforce is ageing, competition for skilled and knowledge resources is intense, and turnover of project personnel is high).
- Offer scalable and open technology capable of supporting an extended enterprise collaborative infrastructure.
- Enable technical, engineering and construction data management; knowledge transfer for operations and maintenance; a common user interface for work-in-process; 3D CAD data management; customizable team workspaces; document revision and versioning controls as well as release processes for change management.
- Protection of intellectual property
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