



White Paper

Successful Handover of Capital Projects in the Oil and Gas Industry

Sponsored by: Dassault Systèmes

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IDC ENERGY INSIGHTS OPINION

The oil and gas industry continued to increase capital spending over the past two to three years, especially, but not exclusively, in the exploration and production segment of the industry. For the future, IEA forecasts over \$20 trillion in global oil & gas capital spending to 2035. According to Barclays Global, E&P spending is set to reach a record \$723 billion in 2014, up 6.1% on the \$682 billion spent in 2013. This creates an even greater need for improved processes and technologies to manage capital projects, which often overrun in budgets and schedules. Multiple studies have indicated that on average less than 20% of projects end on time, and less than 35% on budget. With so many stakeholders involved in these extremely complex projects, the handover to operations becomes a very critical process, requiring executive attention and the right IT solutions to be properly managed. Experts estimate that around 4% of total annual capital budget is related to inefficiencies incurred in relation to data handover. Even a small improvement on that percentage would represent a significant economic benefit, without even considering the additional benefits in terms of safety of operations, an absolute priority for all oil and gas companies.

The Imperative for a Successful Handover of Capital Projects

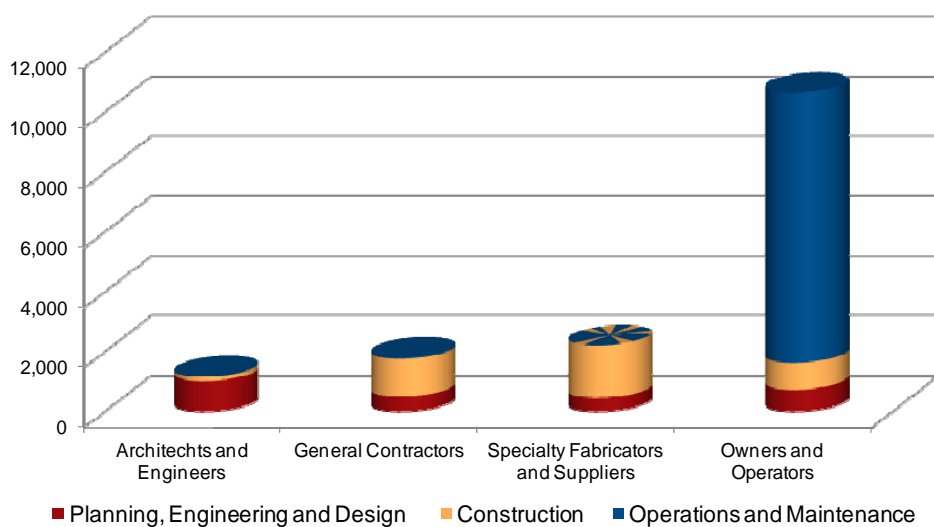
The industry continues to struggle with the management of large capital projects, with budget and schedule overruns being all too common. The multitude of stakeholders involved in these complex projects makes the handover a very critical process that can be highly stressful for contractors, suppliers, asset owners, and operators. An imperfectly organized, inefficient, and ineffective transfer of asset-related information, including drawings, technical documents, and data content, undoubtedly translates into additional costs, inefficient operations, and safety risks.

Ordinarily, oil and gas companies, or any other company for that matter, do not quantify the economic benefits of a properly managed handover. They typically consider the related costs and efforts as part of the overall capital project budget. It is difficult to find quantitative measurements, even cross-industry ones, but some years ago the US National Institute of Standards and Technology (NIST) published a study (ref. *Cost Analysis of Inadequate Interoperability in the U.S. Capital Facilities Industry*, NIST GCR 04-867, August 2004) to identify and quantify the efficiency losses in the US capital facilities industry attributable to inadequate interoperability, which it defines as "the ability to manage and communicate electronic product and project data between collaborating firms and within individual companies' design, construction, maintenance, and business process systems." The study quantified about \$15.8 billion in annual losses, meaning between 1% and 2% of total capital facilities industry revenues for every year of a facility's life.

Even if NIST's study is not oil and gas specific (though it includes the industry) and is likely capturing only a portion of inefficiencies, it provides very useful indications and measurements to be considered by oil and gas companies. In fact, it proves that the greater part of inefficiencies – 85% – is incurred by assets owners and operators that operate and maintain plants and facilities for their lifetime, which typically spans from 30 to 40 years, and sometimes longer. Hence, it is clear that the handover is not only a critical moment related to the commissioning of the asset, but it directly impacts the costs and the safety of future operations. Any improvement, even minimal, in the handover process and related IT solutions has the potential to release concrete and recurring economic value to company shareholders.

FIGURE 1

Costs by Stakeholder and Asset Lifecycle Phase



Source: Cost Analysis of Inadequate Interoperability in the US Capital Facilities Industry, NIST GCR 04-867, redrawn by IDC Energy Insights, 2014

The typical shortcomings of current handover approaches in the oil and gas industry include:

- Lack of standards for data definition, which inhibits transfer and sharing across the different stages of the asset lifecycle. This means asset operators need to standardize what they receive from upstream processes before automatically or semi-manually re-entering the data into different information systems, which leads to the duplication of activities and efforts.
- Design, engineering, and operations systems are all too often not integrated. More broadly there is a lack of seamless integration among the different IT solutions used by the multiple stakeholders involved, not to mention the different solutions or even different releases of the same solution adopted by stakeholders.
- Collaboration software platforms not fully integrated with other company systems.
- Fragmented processes and responsibilities along the plant lifecycle phases. This relates both to new builds and to modifications of existing assets.

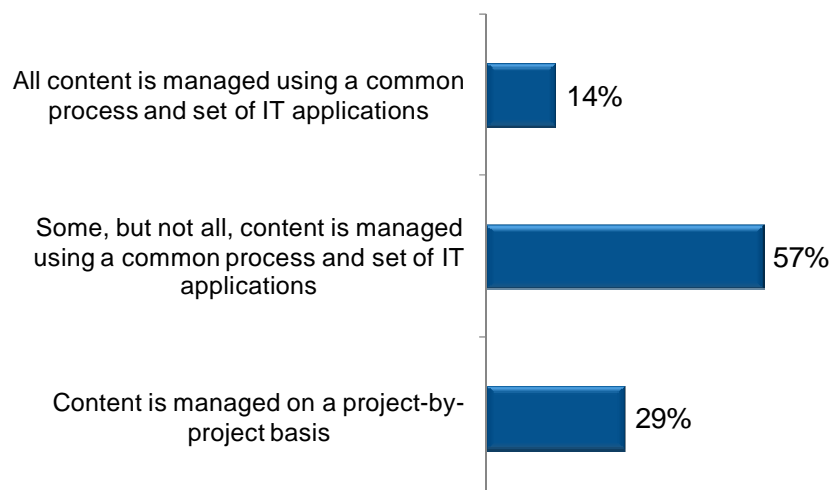
Significant areas for improvement in large capital project management in the oil and gas industry were identified by a study IDC Energy Insights conducted around the maturity of IT systems adopted to manage said projects. Specifically, the study focused on analyzing business practices, system architecture, IT infrastructure, and applications in support of project portfolio management, enterprise content management, business analytics, and construction management. Figure 2 shows an example of the findings from the study, proving the lack of a holistic approach: only 14% of surveyed companies manage content related to capital projects with company-wide common processes and sets of IT applications.

IDC Energy Insights estimates that about 45% of oil and gas engineering department staff time is devoted to locating and validating information available in disparate systems. A similar percentage, around 35%, is devoted by maintenance crews to matching the reality on the field with what is differently reported in the systems. Based on conversations with oil companies, we can estimate that consistent asset information could reduce operation costs by up to 8%-10%. It could also increase production plants' up-time and reduce time in maintenance.

FIGURE 2

Capital Projects in the Oil and Gas Industry: Information Management

Q. How does your company manage content associated with large capital projects?



Source: Large Capital Project IT Benchmark Survey, IDC Energy Insights, 2013

LOOKING FOR BEST PRACTICES

Even if the imperative of correctly managing handover is generally acknowledged and the oil and gas industry is trying to address it properly, significant improvements are still achievable. Best practices focus on:

- Creating a single view of assets along the entire plant lifecycle, with complete and integrated document management enabling collaboration across multiple stakeholders and internal departments.

- Having a full plant hierarchical view and making it possible to start at the plant level and navigate up and down to units, mechanical equipment, electrical equipment, instruments, and so on, and find all the relevant and contextualized asset information.
- Building a solid platform capable of managing massive amounts of asset information, including technical and engineering data, documents, and drawings (2D and 3D) generated during the construction, commissioning, handover, and operations phases.
- Having that platform used across multiple departments and business functions: engineering, technical services, asset integrity, quality control, project management, maintenance, and operations, and having partners and contractors using web-based access or a cloud environment to exchange information and documents, enabling external collaboration.
- Managing the continuous handover inherent in the plant's lifecycle.

The following is an interesting example of good practices from Sweden.

PREEM

PREEM is Sweden's largest oil company, accounting for about 80% of Swedish refinery capacity and about 30% of Nordic refinery capacity. PREEM wholly-owns two refineries – Preemraff Göteborg and Preemraff Lysekil – which are considered among the most modern, environmentally-friendly, and energy-efficient refineries in Europe. PREEM has also established a chain of about 600 gas stations. The PREEM Group employs around 3,000 people. Of these, around 1,200 are the company's own employees, 800 of whom work onsite at the refineries in Göteborg and Lysekil.

Refining operations need to be very cost effective and flexible, while coping with strict environmental regulations. This requires refining companies to improve their processes to optimize plant output for the 30- to 40-year lifespan of the assets. As a well-established company, PREEM wants to effectively follow the continuous evolution of a plant during its lifecycle, keeping track of all equipment-related data and documentation.

Permanent Handover Along the Plant Lifecycle

The handover process concerns not only the commissioning of new large oil plants and facilities, but is also an ongoing activity during the operation of existing plants. Modifications, enhancements, expansions, and new builds normally occur during plant lifecycles. Though there may be less data and complexity in these types of handover, the key capabilities are the same: the ability to consistently manage the asset and its related information across continuous alterations and additions.

By establishing a long-term library for equipment designs, PREEM is able to manage the large quantity of data generated throughout the operational life of the plant. The solution, which leverages Dassault Systèmes' product ENOVIA, allows plant engineers to quickly find all relevant drawings, designs, and technical information needed to manage revisions of equipment, and ensure that maintenance teams have access to the right information at the right time. It also handles drawing check-in and check-out. In other words, the solution enables the continuous internal handover between engineering, production and maintenance teams within PREEM itself.

About 150 people, mostly belonging to the engineering department, use the solution to keep track of any asset modifications and new builds in the refinery. Information is integrated into the maintenance systems, ensuring that the correct parts are used for repairs, and thereby ensuring

that the refinery is correctly maintained over time. Additionally, work order data is equally integrated back into the solution. PREEM has mapped its internal workflows to check and approve new drawings, enabling standardized approval process management. All relevant documents and technical data are made available to PREEM's internal departments electronically via an Intranet.

During the implementation, PREEM made significant efforts to classify all its assets and build a full plant object hierarchical view. As a result, PREEM can now handle refinery configuration throughout the plant lifecycle and have contextualized, powerful information.

PREEM has achieved a holistic lifecycle control of asset-related data, significantly improving quality, reliability, and traceability. This reduces the costs of handling information, but most importantly avoids human error and optimizes all processes in accordance with standard operating procedures. Moreover, documented processes can be measured and analyzed to enable continuous improvement.

CONCLUSIONS

IDC Energy Insights believes that part of the inefficiencies and safety risks related to plants' operation and maintenance is strictly related to an incorrectly managed and non-holistic handover process. Efficiencies should be pursued looking at both the overall capital project management strategies and at basic activities, such as preventing errors related to data transfer, correctly capturing information on assets as-built (and not simply as-designed), and in avoiding manual retrieval of information. It is critical to establish the right handover processes and to implement the appropriate and robust IT solutions and capabilities supporting handover as part of overall asset information lifecycle management.

Actions to Consider

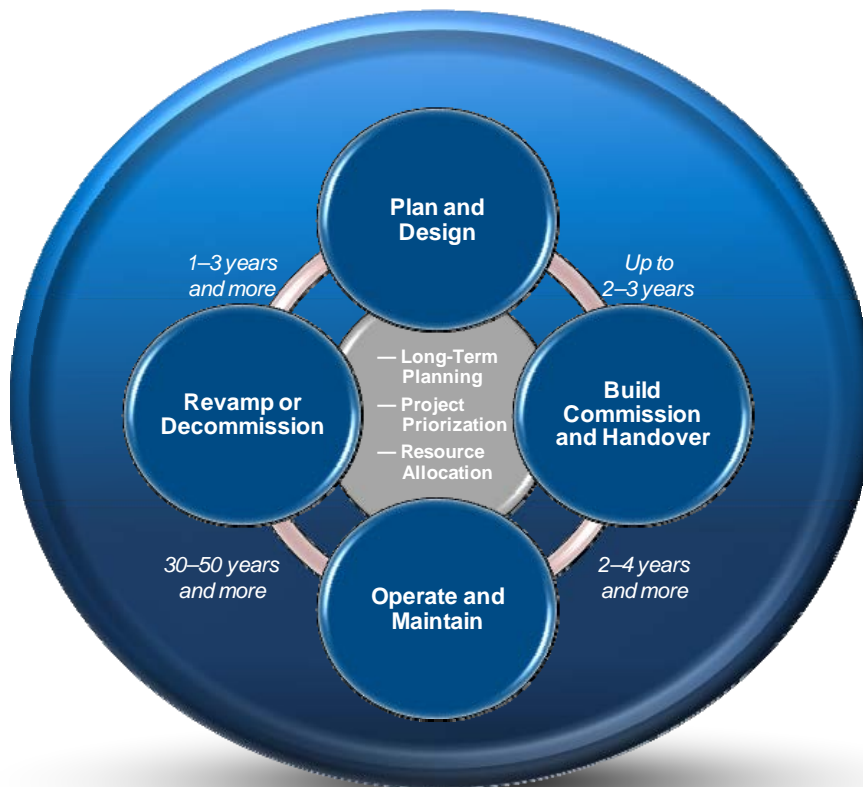
Existing practices prove that there are significant areas for improvement in information handover processes. The avoidance of economic losses, or in a positive perspective, achievable benefits could amount to 1% or even 2% of annual industry revenue. IDC Energy Insights believes oil and gas companies should consider the following top three actions:

- ***Keep one eye on the present and the other on the future:*** Define an asset information lifecycle management strategy and support it with adequate IT capabilities. Asset-related information will be used during the entire life of each plant and facility (Figure 3). A specification document produced during the design phase for construction purposes might also be relevant for a different purpose during operations and maintenance. Therefore, oil and gas companies should clearly define upfront, before starting a capital project, the structure of information that is needed along the asset's lifecycle by engineering, operations, maintenance, and all the other business units that are acting on the plants. Different departments all have different business goals, and different ways of using information, but should be capable of sharing information seamlessly.
- ***Develop a clear handover plan and execute it:*** Formalize a plan that includes information requirements, handover processes and timing, responsibilities for information creation and management, quality assurance, and so on. Then implement the plan, assigning the right people, checking compliance, looking for continuous improvements, and implementing IT capabilities and software applications, not only for the immediate need of the information handover, but also for handling the data, drawings, and documents along the asset's lifecycle.

- **Adopt progressive handover.** Do not consider the handover, even for new builds, as the final step of the construction moment. Handover is a very time consuming activity, and delay would postpone the start up of the asset and the availability of the information in the operations and maintenance applications. Introduce in the handover planning the possibility for asset operators to anticipate information transfer, validation, upload, and enrichment during the design and construction phases. Additionally, cloud should be considered as an option to speed up and simplify handover.

FIGURE 3

Asset and Information Lifecycle Management



Source: IDC Energy Insights, 2014

More broadly, IDC Energy Insights believes a comprehensive and fully integrated planning, execution, and handover of large capital project management in the oil and gas industry requires the following:

- **Put More Emphasis on Early Stage Planning.** There is strong evidence that the ability to improve the performance of large capital projects is greatest during the early planning stages of a project, and that the cost of change to address problems escalates as the project progresses. Companies should put more emphasis on project evaluation and planning using a robust set of analytical tools to model different scenarios and options.

- ***Use More Sophisticated Risk Management.*** The elimination of all risks in any project is impossible, and much less likely in large capital projects. Oil and gas companies and their project partners must therefore define and understand acceptable risk and avoid or mitigate remaining risks. Failing to manage risk can result in regulatory noncompliance, contract disputes and health, safety, and environmental incidents. Companies should implement processes and analytics that identify risks earlier in a project lifecycle, provide visibility of risks for executive management as well as project teams, enable continuous risk analysis and reporting throughout the project lifecycle, and syndicate certain risks across the project portfolio.
- ***Adopt an Enterprise Project Portfolio Management Framework.*** A centralized approach for project portfolio management has been proven to deliver better project performance. Companies should use an enterprise project portfolio management framework that includes standardized project methodologies and governance models, as well as knowledge management, resource management, and supply chain management.
- ***Improve Collaboration Among Stakeholders.*** Large capital projects in the oil and gas industry involve an increasing number of parties. For example, the size of deep water investment requires multiple joint venture partners. In recent years, the industry has been seeing more joint projects involving national oil companies. In addition to joint venture partners, there are multiple contractors that are critical to project completion: EPC firms, contractors and suppliers in complex relationships. Improving collaboration among stakeholders, often across multiple projects in an enterprise portfolio, poses a huge challenge, but also significant potential to improve project performance. Improved collaboration is particularly critical during the commissioning and handover phase of projects because it can have a significant impact on the operations and maintenance of the assets. Companies should provide all relevant stakeholders with consistent, secure, and up-to-date access to project content including drawings, documents, and data, as well as a master data management scheme based on standardized semantics and coding.

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