

## White Paper

# Open Systems Are Driving Operational Excellence in Oil and Gas

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### IDC OPINION

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As oil and gas companies continue to transform and reinvent themselves in the face of continuing market pressures, they are turning to new technology strategies as enablers. A key part of those strategies is building systems and business processes that are based on open and agile technology to rapidly develop and deploy enterprise solutions. IDC believes that having such a platform-based system will help oil and gas companies access and manage critical data about the oilfield to enable engineers, geoscientists, and workers in the field to run meaningful analytics and foster better collaboration and improved decision making.

### IN THIS WHITE PAPER

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Companies are being challenged by inefficiencies and lost opportunities because of missing, untimely, or inaccurate information as well as lack of knowledge retention and misalignment between field operations, accounting, and financials. Most applications are self-serving and have become silos over time and companies realize they need an integrated solution to gain a better understanding of their oil and field assets and to provide a shared collaborative IT environment for workers to digitally transform their businesses into resilient organizations.

This white paper explores how oil and gas companies need to focus on the following critical points:

- Adopt transformational technologies to drive operational innovation.
- Build and rebuild business processes to align and improve workflows.
- Break down silos to organize, manage, and provide immediate, accurate data for business analytics with proper governance.
- Develop a tightly integrated open platform for a holistic view of operations.
- Create a data management platform that fosters an exploration and production (E&P) knowledge environment and information sharing and access to immediate, accurate operational information for advanced analytics.

This white paper also describes how the drive toward operational excellence in oil and gas companies cannot be built on monolithic and traditional systems. Oil and gas companies must take an open platform approach to developing systems to support innovative business processes.

## SITUATION OVERVIEW

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The oil and gas industry continues to undergo a business transformation in response to dynamic market challenges. With oil prices being low, companies have had to reevaluate every aspect of their business operations, including streamlining the supply chain and digitally transforming the business to reduce costs and drive efficiencies and productivity. To address the challenges, companies are implementing new strategies for applying innovative technology to develop a business transformation road map.

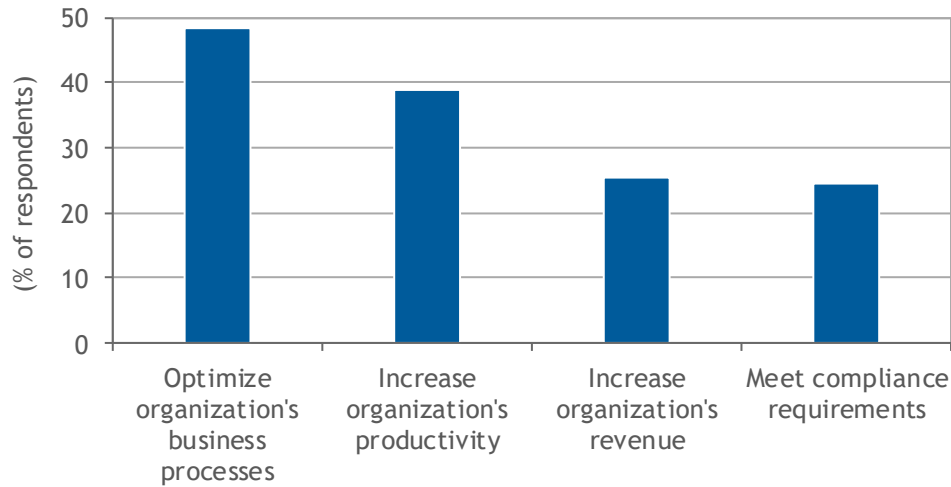
While the entire value chain of oil and gas companies is impacted, upstream E&P is especially in need of business transformation for several reasons:

- E&P is where the long-term value and differentiation of oil and gas companies is seen by the market and shareholders.
- Engineers, management, and field-workers need real-time information about well activities' costs, production volumes, and financials to deploy projects on time and on budget.
- The massive amount of data generated by E&P operations is a potential gold mine, provided companies are willing to invest time and money to develop a platform and cloud networking solution for managing Big Data and analytics in the oilfield.
- Upstream E&P companies are expected to dramatically increase budgets for onshore U.S. drilling and production of oil, especially in shale plays.
- A solution that fosters an E&P knowledge environment and information sharing and access to immediate, accurate operational information, to ensure data clarity, consistency, and confidence for the workers and stakeholders involved, is needed.
- Oilfield applications and systems must be connected to realize a holistic view of operations and to gain a better understanding of oilfield activities and dynamics to improve collaboration and decision making between engineers, IT, and the business team.

The drivers that are considered by oil and gas business leaders to be pushing companies to transform and innovate are shown in Figure 1.

**FIGURE 1**

**Top Business Drivers for Technology Investment: Upstream Oil and Gas**



Source: IDC's *Customer Insights and Analysis Vertical IT and Communications Survey, 2017*

Drivers like improving productivity, increasing revenue, and optimizing business processes focus on continuous improvement and operational excellence. Oil and gas companies are unique businesses because customers are not a primary focus and the key activities revolve around operations and resources productivity. Just to be clear, productivity is not just labor. It's about making the best use of labor, assets, and a reservoir.

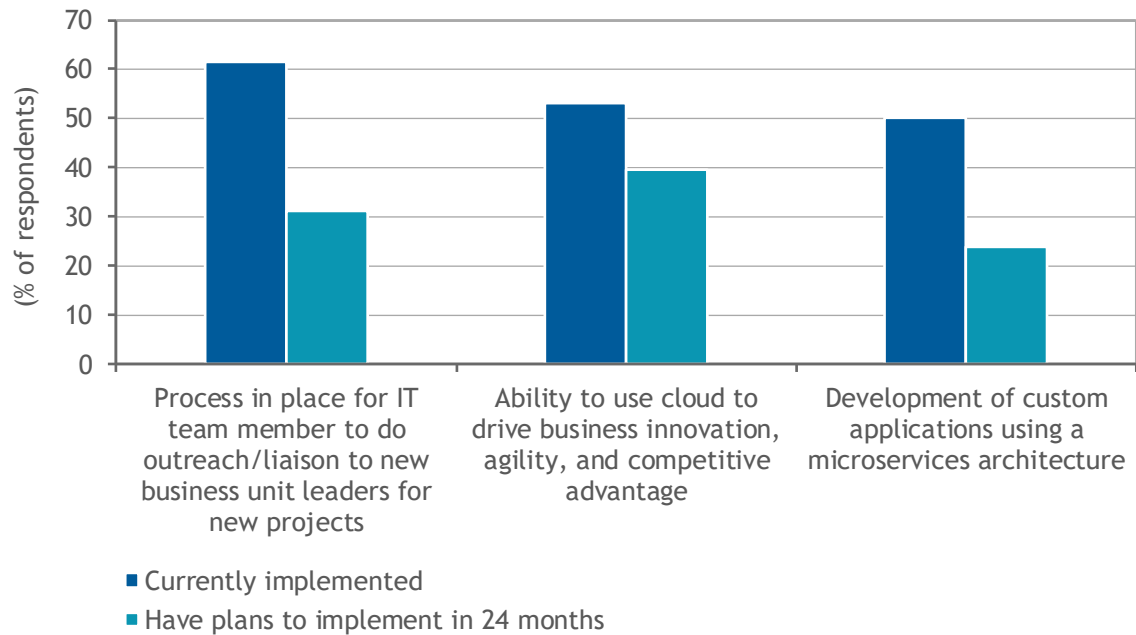
Also note that oil and gas companies are information-intense organizations and rely on sophisticated machines and people to be able to see the subsurface environment in which they are working. Providing immediate and accurate information about the well life-cycle process is a critical function because companies look for and find oil, perform exploratory drilling, develop PDP wells (proven, developed, and producing wells) and, finally, transport hydrocarbons to their destination.

**Laying the Foundation for an Agile and Open Environment**

The organizational and technological capabilities that oil and gas companies are prioritizing are illustrated in Figure 2. These capabilities are intended to drive business innovation and, at the core, involve driving openness and collaboration between technology and business. As shown in Figure 2, newer technologies, such as cloud and microservices, are either currently being implemented or being considered for implementation in the next two years.

**FIGURE 2**

**Business and Technology Capabilities in Oil and Gas**



Source: IDC's *CloudView Survey*, June 2017

Previous IDC Insights research indicates there are several things to consider when looking at transformational technologies:

- Cloud computing is a foundational component for almost all the technologies listed.
- Managing data is the core competency for transforming the business.
- The Internet of Things is a combination of data, analytics, cloud, mobility, and IT.
- Open standards and Agile development are key IT and business considerations.

Transformational initiatives are dependent on how well data is openly managed and distributed throughout the organization. Leading oil and gas companies know that monolithic applications and infrastructure can't adequately address enterprisewide data management. For these organizations, there is a heavy emphasis on developing and implementing open platforms with integrated connections to enable moving data across and outside of silos.

Upstream oil and gas companies are challenged to transform their technical environments into tightly integrated platforms for managing all types of data, including structured and unstructured data. Data is generated by numerous applications as well as equipment and devices, with more devices – cameras, wearables, and drones – making their way into the oilfield every day.

With the rapid advancement of computing systems, the internet, and collaborative development platforms, open source technology is being considered as an alternative to purchasing proprietary software solutions. Open source systems require domain knowledge and skilled technical resources to develop complex solutions and platforms. But, because of the issues in maintaining proprietary

systems, open source is now considered a mainstream alternative in oil and gas companies looking to transform and develop operational excellence.

## **Business Vision: Determine Objectives, KPIs, and Expected Outcomes**

It is most important for companies to establish a clear vision about what business objectives are to be measured and achieved. Companies should prioritize their top IT initiatives around these objectives and set proper expectations about what and how technologies will be utilized, the costs to develop the technologies, and the expected outcomes before implementing the technologies.

There are various technologies and approaches for developing an integrated platform for upstream oil and gas, and careful attention must be paid to understand the business problem to be solved and what key metrics (key performance indicators [KPIs]) will be used to track performance. Once the metrics and KPIs are determined, the next step is to identify where the data resides, and when the requisite tasks and costs have been estimated, decisions can be made by comparing the amount of work, costs, and expected outcomes of each potential initiative for final selection.

Some of the drivers for determining high-impact key business objectives for consideration are:

- Compliance to government and corporate regulations
- Cost management
- Health, safety, and the environment
- Talent management and workforce demographics
- Continuous improvement
- Asset and technology effectiveness

Depending on the company's core competencies and needs, some organizations will want to focus their efforts on digitally transforming their drilling environment, but most organizations are focused on production that connects directly to revenue. Any improvements to processes and productivity will also increase revenue; so many operators are developing platforms that connect relevant operations software and hardware systems that can manage requisite data for analytics about well behavior and performance.

While one objective for upstream might be to monitor and manage the health of equipment, devices, and sensors in the oilfield to maintain 100% uptime by predicting when a machine is about to fail, another key objective might be to identify the top and least performing wells by oil and gas volumes, with the capability to see the underlying data causing the problem if a well suddenly drops in oil production volumes.

Determining objectives for achieving operational excellence in upstream oil and gas makes sense because best practices can be determined and KPIs can be established to visually monitor, analyze, and manage key workflow information elements and performance achievements. KPIs will drive various types of analytics, including dashboards and scorecards to monitor, analyze, and better understand your valuable oilfield assets.

The goal that upstream oil and gas operators want to achieve is to connect systems and applications that streamline operational capabilities and provide immediate, accurate, and integrated information for informed decision making and continuous monitoring and analytics of oilfield assets' key performance indicators. Each company will have to determine the best approaches and technologies to use that best fit its needs for accessing, ingesting, and analyzing data to achieve its objectives.

## Deriving Insight from a Swamp of Apps and Data: An Example of Transformation

The COO of one large independent operator in the United Kingdom required two staff members to spend two to three weeks gathering production information from the hydrocarbon accounting/allocations team, the land team, and financials to cross reference, organize, analyze, and present the previous quarter's oilfield performance. The data had different names for each well, was not formatted for any applications other than the one for use, and the team couldn't even come to consensus about various processes. Each quarter was the same drill and the data was already obsolete before the quarterly meeting even began.

The objective for this COO was very clear. Connect the land, hydrocarbon accounting, and allocations together and include basic financials to understand the impact of performance on the bottom line. A platform was developed and the applications mentioned were all integrated into one version of the truth and leveraged a data management layer to drive meaningful analytics about oil and gas production volumes and sales.

In E&P organizations, geoscientists and engineering groups tend to build their own application infrastructure because they live in a very unique and niche environment that separates their technology needs from traditional IT. The data that is required comes from operational technologies, drones, cameras, educational institutions, and so forth. Oil and gas companies benefit significantly when the silos of data are connected, ingested, and formatted properly. At that point, analytics can be applied across the silos of the organization.

Once a platform is developed for managing upstream data, all kinds of scenarios can be implemented and analytics can be used to compare and predict future outcomes and behavior patterns. This is a continuous process, and best practices are determined and re-determined as the system "learns" over time.

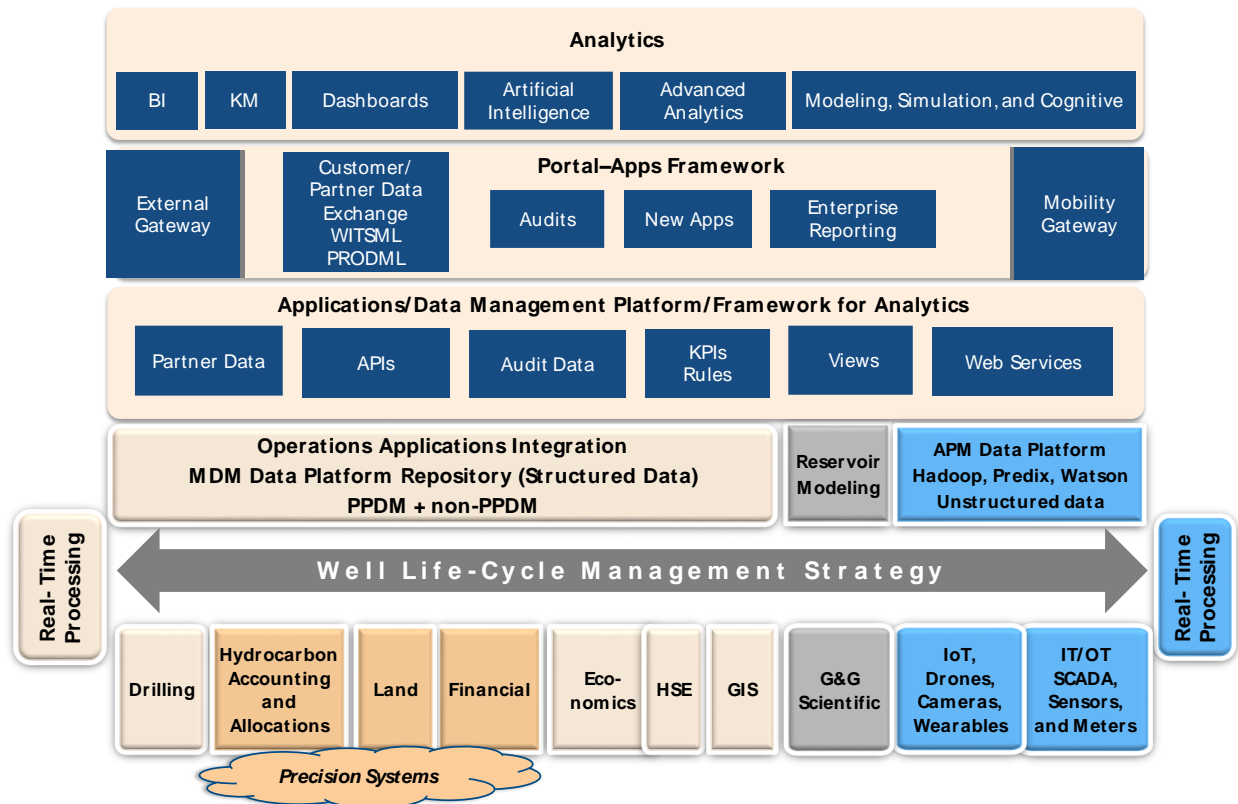
With real-time monitoring and dashboard reporting capabilities, upstream analytics can instantly let field employees know which wells are experiencing problems and therefore assist them in prioritizing which ones need to be inspected first. Advanced analytics as well as cognitive/AI can be applied with a trusted source of integrated data, and a software platform is best practice for management.

KPI-driven dashboards allow monitoring of oilfield assets' business processes and information flow for changes in performance and the ability to quickly drill down to problem areas. A company's staff will be able to monitor and surpass performance goals and objects by having information at their fingertips.

As shown in Figure 3, valuable information is available through the consolidation of data from multiple oil and gas systems like production management, reserves optimization, hydrocarbon accounting, and well logs into a single view of your operations – based on common data definitions. Companies can leverage their investments in ERP, SCM, and CRM systems by integrating them with other essential databases and applications. Figure 3 provides a high-level view of the various applications and data sources and how a typical oil and gas company would build out its open architecture.

FIGURE 3

## A Typical Upstream Oil and Gas Analytics Architecture



Note: For more information, see *Business Strategy: Oilfield Optimization – Upstream IT Data Management Platform* (IDC #EI256898, June 2015).

Source: IDC Energy Insights, 2015

Using an open development platform and open systems, an oil and gas company's technologists can build out an Agile development platform. This platform will allow the company to rapidly develop applications specific to each functional area while maintaining the connectivity and data integration that avoids rebuilding data silos.

## The Open Platform and Best Practices in Operational Excellence

As modern platforms roll out in upstream oil and gas, it is important to discuss what the key aspects for an open system are. Some of the key features of an open platform are:

- Has Agile development capability for rapid app development
- Adheres to open standards for development and data management
- Supports common development languages and methodologies
- Supports an ecosystem of developers and suppliers to share development efforts
- Supports cognitive functions, machine learning, and AI capabilities for process automation

The ecosystem aspect should not be underestimated. This open system approach to development can share ideas and even code with other oil and gas companies, suppliers, academic institutions, and other third parties. This ecosystem of developers and suppliers is enabled by open platforms. Having an ecosystem of developers and suppliers can also be a competitive advantage in the talent management arena.

As far as cognitive capabilities, AI, and machine learning features go, these technologies can be embedded into a platform to provide complex problem-solving capabilities, help automate manual processes, and provide continuous learning activities dynamics to optimize performance and achieve operations excellence. For example, consider the automation of land contract management. Land management is a labor-intensive, complex, and error-prone business function. It also requires skilled legal and accounting staff. Automating a traditionally paper-bound process with AI and cognitive systems can remove errors, increase speed, and improve compliance. This will enable oil and gas companies to transition from paper- and human-centric business workflows to highly automated AI-centric business processes.

## FUTURE OUTLOOK

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The future oilfield will become a digital world of sensors, transducers, equipment, pipes, compressors, and people – all working harmoniously within a tightly integrated and automated environment. Therefore, it is extremely critical to digitally transform the IT environment to have the necessary platform in place to rapidly add new innovative capabilities as technology continues to evolve in the upstream oil and gas environment.

There are many different open source tools available, and many companies are already developing platforms for managing upstream data and analytics because they see big returns in having deep insight about oilfield operations performance, system dynamics, and the ability to predict well behavior patterns.

To be considered an upstream platform for analytics, the system must:

- Maintain a development environment that is flexible and built for rapid development.
- Rely on open data standards to develop connections and governance.
- Use an open development platform for internal and third-party app development.

IDC Insights has worked with several large oil and gas companies that understand data governance. These companies currently are working toward a data and app development model that is based on open standards. The openness is around general IT standards as well as around oil and gas standards for data transfer and connectivity.

Open systems are critical in enabling flexibility for an agile governance and operational model. Companies should consider open source platforms as an answer to large, capital-intensive, and maintenance-focused proprietary systems. In the future, these monolithic applications will be unable to respond to changing business and market conditions. Currently, central IT organizations have to play a significant role in any changes to the monolithic application structures. In the near future, using an open platform, E&P organizations will be able to make changes and rapidly develop apps that can adapt to the dynamic conditions of the oil and gas market.



## CHALLENGES/OPPORTUNITIES

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### Opportunities for Oil and Gas Companies

The opportunities for oil and gas companies to transform their E&P operations are almost too numerous to count. But let's look at some higher-priority opportunities:

- Moving data and business process across silos to drive operational excellence beyond a local organization
- An Agile and open development platform that benefits from common knowledge and development methods not isolated to specific parts of the organization
- Visibility into operational performance from any level of the organization
- Significant reduction in duplication of effort and systems through a unified and open development platform

The opportunities are most visible when you start looking at how silos of the organization are built around silos of data. If you can break down those silos through an open and Agile development platform, you are on your way to a transformed E&P operation.

### Challenges for Oil and Gas Companies

The future oil and gas organization also will require transformation and innovation within the ranks of its employees and service suppliers. Given the demographics within the oil and gas industry, it's fair to assume that many IT and operational employees will retire in the next decade or so. On top of that, the skill sets needed to manage in and develop an open platform-based environment is a top challenge.

In addition, there are other challenges oil and gas companies face. Among the most prevalent are:

- The focus of the organization's vision should be on understanding and prioritizing top objectives, KPIs, and expected outcomes.
- Organizations are still very siloed and moving data across those silos is not easy.
- There are very hardened processes currently in place that are difficult to change.

Some of these challenges will need to be addressed as adoption of an open platform strategy takes effect. Other challenges will be addressed as the market continues to evolve.

## CONCLUSION

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Oil and gas companies need to focus on developing an open systems platform to leverage the vast amount of data in the oilfield. Oil and gas companies want the agility to describe, predict, and prescribe solutions to complex problems without large capital projects.

Solutions are needed to run the business with a holistic view of operations. One of the key technology aspects is that the solution should lay the foundation for analytics of all types that focuses on well operation and operational excellence. That also means that the platform should adhere to open standards and have the ability to rapidly develop applications for specific needs.

Some of the critical items that companies need to address are:

- It is important to first understand what business objectives and KPIs and outcomes are to be achieved.
- Open platform deployments should be the priority for investment to expose data across silos.
- App development must become more agile and connected to an open ecosystem of developers that have access to multiple streams of data across the enterprise.
- Standardization must be a key parameter for platforms, and open systems drive that by default.

Oil and gas companies must consider open source to develop an upstream platform. This platform forms the core infrastructure for managing data that enables collaboration, predictability, and intelligent operational insight. Finally, change is coming fast and companies must not assume the oil industry will ever "settle down." Companies must transform themselves into agile and operationally excellent E&P organizations.

## About IDC

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