



**Why it's time
to invest in
digital oil**



**Building a better
working world**

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Introduction – Why digital now



New technological developments have consistently pushed oil and gas operators into new frontiers – deeper waters, more remote reservoirs and unconventional plays – that were once out of reach. While advances have spanned the value chain, horizontal drilling and hydraulic fracturing unlocking shale resources played a major role in creating the oversupply responsible for the market shift and resulting in low crude prices.

The shift to abundance from the peak oil concerns of the not-too-distant past and the slow demand growth has reset oil and gas prices to lower levels and created a mandate for oil and gas companies to focus aggressively on both capital and operational efficiency to reduce costs.

Transformational shifts will be required to adjust to this new normal; the standard approach to downturns is not sufficient. Dramatic changes in business models, workflows, talent and technology across the hydrocarbon value chain are necessary to improve response to market signals and maximize efficiency.

Digital solutions that support this new approach are how the oil and gas industry will transform to succeed both today and in the future. With true digital transformation, opportunities are created to connect disparate operations across organizations, creating a tipping point and delivering real value for the investment.

Digitalizing across an organization can break down silos and build bridges from the islands of excellence to allow digital innovation to permeate the whole organization.

Challenges still abound – how can companies justify the investment, given the constant influx of new digital applications and during a time when companies need to be extremely selective in their spending?

The short answer is to start by deploying digital in areas where the technology can affect the cost curve in the short term and deliver immediate results.

Digital imperative – the convergence of supply and demand

The oil and gas industry may not have embraced enterprise-wide digitalization yet, but it's far from a technology-adverse industry. Until recently, most of the technology has been focused belowground – finding oil and gas and getting it out of the ground as quickly as possible. When it comes to applying technologies to business operations, the industry often falls short.

Many oil and gas companies exist as islands of technical excellence. Technology advances and engineering brilliance exist in silos, rather than being fully disseminated and embraced by the enterprise as a whole. And one doesn't have to look too hard in most companies to find business operations that still employ outdated means of data entry – manually keying numbers into a spreadsheet – simply because that is the way it has always been done. Innovation is typically focused at the well site.

This traditional mindset is costly and inefficient, particularly in today's sustained low oil price environment. Many companies have already scaled back their workforce, slashed budgets and pushed their suppliers for price reductions. Adapting to this new normal state in market fundamentals, companies are taking a hard look at their operating models and asking themselves how they can change to survive.

Digital – a disrupter or enabler?

While it is undeniable technology has fundamentally changed the operating landscape for many of the industries that have embraced it, oil and gas companies don't have much historical data to go on when making their own investment decisions. Many of the digital offerings – from the iPhone to social media to the Internet of Things – have been around

for less than 10 years or are still in their infancy. And very few oil and gas companies have integrated digital beyond setting up isolated technology islands within their organization, primarily focused on the science of exploration, extraction and production.

Ideas for relatively new technologies can be found from other industrial industries such as manufacturing, automotive and airline industries that have already paid major dividends. To survive and thrive, oil and gas companies need to tap into the promise of digital and leverage knowledge from other industries.

In a span of less than a decade, digital technologies have advanced to the point where they have the potential to transform virtually every aspect of how a company does business. The proliferation of smart phones and tablets makes it much easier to connect people and transfer information. New smart devices are tracking larger volumes of data – everything from emails to a person's heartbeat – and storing them in the cloud. The combination of the widespread adoption of digital technologies and the growing number of companies providing them has brought costs down substantially in a relatively short period of time. Even in back-office operations, like finance, digital solutions have had great impacts.

The fundamental driver is simple: leveraging the power of digital technology to transform business operations can deliver real, sustained value to the bottom line.

The time is now

Another reason now is the time for digital in oil and gas is the robust nature of the latest technology. The consumer internet couldn't handle the volume of data oil and gas needs for digital solutions to be meaningful. With the advent of the industrial internet, the infrastructure now exists to handle the vast volume of data coming off the machines and to gather, store, analyze and act on the data (where does it go, what does it mean and what can be done) – resulting in better decisions, faster and increasing efficiency throughout the organization.

The industrial internet, advanced analytics, cloud storage and increasingly reliable mobile communications enable the potential for digital to transform the oil and gas industry.

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A New Reality for Oil & Gas Complex Market Dynamics Create Urgent Need for Digital Transformation [by Cisco]



History of digital impacts on E&P

The exploration and production (E&P) industry was one of the earliest adopters of computer technology, thanks to a business imperative to use computers for processing asset information in mature fields. By the early 1960s, companies were using computers to improve reservoir modeling, gravity measurements and prediction methods. By 1973, we began to see large workstations being used to process field data information technology (IT) credited with helping achieve a 1% increase in field production.

By the early 1990s, 3D seismic models on PCs had advanced to the point that average finding costs for reserves dropped by 40% from 10 years prior. By the end of the 1990s, operators estimated an average 2.5 times increase in production and proven reserves thanks to 3D tools.

As PCs continued to advance, operators began using them for applications outside of seismic processing and visualization. The first computer-aided optimization of drilling hydraulics in 1986, for example, helped the industry realize a 50% increase in drilling success rates by the late 1990s.

The advancement of PCs and now smaller handheld devices are proving to be valuable in field operations, but mobile is now the preferred method for accessing E&P data to take advantage of advances in cloud computing and networks.

1960s
companies using computers to improve reservoir modeling

1973
workstations being used to process field data

1986
first computer-aided optimization of drilling hydraulics

1990s
3D seismic models on PCs

Where to start on the digital path forward

If there is one place where digital technology offers the greatest impact and highest returns in oil and gas in the short term, it is compressing and standardizing disaggregated operational supply chain processes. To do so will create a step change in efficiency, similar to what has been seen in other manufacturing industries.

In oil and gas, secure digital technology can bring together producers and consumers of common sources of information to create greater operational efficiency. These networks can be internal or external to the enterprise. For example, a transportation and logistics department can serve as the producer of transportation services to multiple internal businesses (e.g., production, trading, refining, chemicals, capital projects, marketing) or consumers. Likewise, an oilfield services company can supply services to an ecosystem of stakeholders, including operators, joint venture partners, contractors and other vested interested parties. The broader these networks extend, the greater the scale and potential for operational efficiency gains.

How these networks create value within the oil and gas context is by enabling better and faster operational decisions, leading to greater asset utilization, reduced operating costs and increasing efficiency. Today's digital technology makes this feasible by enabling what EY has coined as "process compression."

Process compression brings together three foundational digital capabilities, all of which exist in the marketplace today: smart assets, paperless processes and data analytics – all in a secure environment. When applied across the oil and gas supply chain, digital technology can simplify and synchronize processes and accelerate integrated decision-making. This is not a new idea. Process compression has been deployed successfully in other manufacturing-based industries – namely automobile and aerospace manufacturing.

Based on underlying process complexity, reliance on multiple stakeholders and impact of process standardization and automation on operational cost, EY recommends five areas for process compression:

- 1 Topside production optimization** – topside production can be optimized at lower cost with improved interconnection of equipment and assets between data sources and physical locations to drive better, fact-based decisions.
- 2 Predictive maintenance and repair** – when decisions on production assets are reactive rather than proactive (i.e., based on actual, historical failure data), this leads to maintenance overspend, duplicative inventory and suboptimal resource allocation. Today, tracking devices on inventory and asset management applications can connect tool delivery and management to preventive maintenance schedules.
- 3 Back office business processes** – massive amounts of paper-based manual transactions can result in 7%-15% overpayment or coding errors. Digital solutions can combine mobile, cloud and interfaces to finance systems to achieve live automation of invoicing in the field. Real-time views of back office activities and expenditures can increase accuracy and timeliness in billing releasing work capital.
- 4 Integrated planning and execution** – directors, asset managers and rig locations often do not have the same live understanding of production status and plans. And when changes are not integrated and communicated consistently, there is no shared consciousness. The legacy operating model is based on a siloed engineering legacy, which is now dealing with the complexity of an interconnected world. Digital toolsets such as process collaboration and analytics can enable cross-functional understanding and collaborative decision-making based on total situational knowledge.
- 5 Logistics and warehousing** – checking that equipment and (fleet) resources serving critical assets are tracked across all parties involved in the network and connected to business processes is critical to production maximization. Without this capability, deliveries are missed due to route delays, assets are not loaded efficiently, and there is only paper-driven recognition of services.

Implementing process compression by digitizing these processes will be done in a secured fashion and will inherently adhere to the following cybersecurity concepts:

- 1 Software security** – security as a theme in project development, secured third-party integration, software security tests and updates mechanism
- 2 Secured systems design** – secured channels for systems interoperability and openness, authorization, authentication and identity management
- 3 Networks segregation** – IT/OT networks separation while maintaining process continuity and availability, secured third-party remote support connections and secured network administration
- 4 Operational systems security** – assets discovery and monitoring, vulnerability management, secured SCADA systems configuration and patch management

These processes are just the beginning. Not only will they drive down operational costs, but also position early adopters for the future. The industry is facing a generation of workers who are digital natives. Organizations that harness digital technologies and the drive and energy that they unleash have a chance of achieving true differentiation – not just in terms of increased efficiency but in the ability to attract and retain the next generation of brainpower.

Of course, as digitalization increases so does cybersecurity concerns. EY has identified that organizations' responses to cybercrime fall into three distinct stages of cybersecurity maturity – Activate, Adapt and Anticipate (the three As) – and the aim should be to implement ever more advanced cybersecurity measures at each stage. EY can help organizations improve their ability to respond to changes in the threat landscape. We provide services to assist organizations in developing in-house threat intelligence programs as well as several key threat intelligence services in subscription based models and full spectrum managed cyber threat intelligence services.



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How we can help

EY can help develop and execute an agile business strategy to support oil and gas companies in adapting to a constantly changing digital environment, thereby seizing opportunities and managing risks at every stage of your value chain. We are focused on leveraging the power of digital technology to drive efficiency across an organization, from strategy to execution.

- ▶ We help clients develop and deliver new strategies, business models and operating plans that are ideally suited for a digital environment and include a clear road map and benefits case.
- ▶ Our digital enablement programs tie together our clients' purpose, experiences, capabilities and people to deliver an iterative and ongoing approach to digital transformation.
- ▶ We help clients catalogue their existing digital spends and assets, identify risks and develop an operating model for digital that builds confidence and trust, while complying with regulations.

These offerings are not “one-size-fits-all,” but rather are agile and scalable solutions to help clients of all sizes implement digital technologies on their own terms and in line with their long-term business goals.

We have the following five digital offerings to help you grow, optimize and protect your business:

Asset performance management

EY can offer our clients operational technology (OT) that sits on top of machines and equipment while connecting to the cloud and analyzes resulting data to improve productivity and reliability. EY combines these solutions with our transformational process capabilities to drive faster and better operational decisions across a connected and integrated energy value chain. This will lower operating costs, reduce unplanned downtime, increase production and asset utilization and drive internal efficiency.

Digital supply chain and field ticketing

EY digital supply chain team provides fully integrated information system analysis and design, process automation and cutting-edge analytics combined with industry leading performance improvement approaches. By creating transparency in all areas of the supply chain, we can impact better decision-making based on real-time data. EY can deliver fixed and variable cost optimization, process compression and risk reduction for example, by decreasing the number of people in potentially hazardous environment, increasing financial predictability and reducing information transfer errors.

Robotics Process Automation (RPA) and Corporate Functions

EY's Robotic Process Automation fundamentally changes how work gets done by enabling organizations to automate existing manual and repetitive processes with intelligent software applications. Significant cost savings and productivity gains can be achieved for dramatic changes to a corporation's operation. The virtual robotic workforce is transforming how we perform business processes, move data, alleviate regulatory pressures, and improve data security and quality.

Digital Tax

Recent technological investments in digital automation and analytics are viewed as potentially driving cost savings and increasing revenue leading to the evaluation of tax considerations to ensure all the benefits from digital investments are tax optimized. Through assessing an organization's digital penetration, evaluating the current and future R&D spend in the digital space and understanding whether or not digital investments have been monetized as revenue streams, EY's digital tax team can help our clients ensure they are effectively maximizing digital taxation.



Integrated planning and portfolio management

The ability to evaluate performance at an asset level and cascade it across the enterprise portfolio will allow for real-time insights that lead to action-driven reporting related to capital allocation decisions. EY's integrated planning and portfolio management practice offers predictive analytical solutions that enables companies to align and integrate decisions and implications across the planning and execution phases of exploration, development and production, leveraging digital and mobile technologies which complement traditional ERP and reporting platforms.

EY also works with the top technology companies across the spectrum to bring our clients the finest digital enablers, including, GE, IBM, Los Alamos, Microsoft, SAP and others.

GE Digital

The Alliance with GE Digital provides EY with the opportunity to play a critical upfront role in Industrial IoT. It aligns with the global EY digital strategy and priorities to address Digital Transformation focused on asset performance management.

IBM

The alliance with IBM focuses on business analytics and big data solutions by providing an ability for EY to expand the breadth of services to our clients.

Los Alamos

The EY – LANL Alliance leverages the scientific, data sciences, simulation, modeling and cybersecurity talent and knowledge at LANL to help EY build a better and more secure working world.

With this strategic relationship, we are able to bring advanced cybersecurity technology, methodology and tools that integrate with our existing offerings, to our clients to help them manage their cybersecurity threats. For more information, visit ey.com/LosAlamos.

Microsoft

The Alliance is a joint business relationship established to deliver a suite of new and innovative services to companies around the world combining EY's experience in driving strategic transformation, innovation and growth for customers with Microsoft's global cloud, security, productivity and mobility technology.

The collaborative relationship between EY and Microsoft focuses on helping companies balance purpose-driven performance and greater visibility with sound risk management. For more information, visit ey.com/Microsoft.

SAP

The EY SAP practice is focused on delivering a leading-class approach to business transformation leveraging leading-class SAP technology, EY's focus on strategy, transformation and implementation as well as strong credibility in risk fits well with SAP's solution focus. For more information, visit ey.com/SAP.

About EY

EY is a global leader in assurance, tax, transaction and advisory services. The insights and quality services we deliver help build trust and confidence in the capital markets and in economies the world over. We develop outstanding leaders who team to deliver on our promises to all of our stakeholders. In so doing, we play a critical role in building a better working world for our people, for our clients and for our communities.

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The oil and gas sector is constantly changing. Increasingly uncertain energy policies, geopolitical complexities, cost management and climate change all present significant challenges. EY's Global Oil & Gas Sector supports a global network of more than 10,000 oil and gas professionals with extensive experience in providing assurance, tax, transaction and advisory services across the upstream, midstream, downstream and oil field subsectors. The Sector team works to anticipate market trends, execute the mobility of our global resources and articulate points of view on relevant sector issues. With our deep sector focus, we can help your organization drive down costs and compete more effectively.

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