DIGITAL TRANSFORMATION AND THE OIL AND GAS INDUSTRY
## WHAT'S NEXT?

CONTENT

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Digital transformation in the oil and gas industry is already a fact of life. In the present climate, the quest is not only for volume, but rather for value. Oil companies need to make money in a new price regime. The oil and gas business model can no longer sustain an inflated and inefficient value chain in the search for, and delivery of, hydrocarbons to the world markets.

A KEY ADVANTAGE OF IoT...

is that it provides objective insight into business processes, allowing you to pinpoint the exact parts of the process that should be addressed.
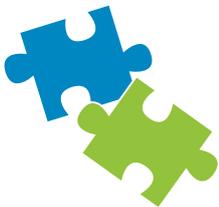
Digital transformation is not just a technology trend; it is at the **center of business strategies** across all industry segments and markets.

STRATEGY

TECHNOLOGY

Digital transformation is a predominant trend impacting today's global business. Broadly speaking, digital transformation speaks to the changes produced by the application of digital technology to society at large—just walk down a street or go into a coffee shop and look at the eyes focused on the ubiquitous smartphone. But for business, digital transformation goes beyond the tactical application of technology—something that has been happening in enterprises for years—to the strategic incorporation of digital technology as the very basis for competition. It is transforming business models by speeding innovation and making ongoing practical gains in operational efficiencies, product design, development and delivery, and customer relationships. It's changing the way companies think about coming to market.
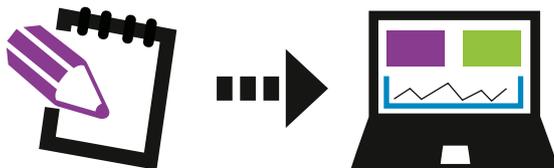
Many of the ideas driven by digital transformation and Big Data have found new and innovative ways of transforming consumer and media markets. Further, environmental and societal changes are increasingly shaped by the power of the new ways of sourcing and analyzing information. For the sake of this discussion, let us make a distinction between the consumer and behavioral disciplines and the oil and gas industry. Instead of Big Data, let's call it *Smart Data*—industrial application of data based on a deep understanding of technology and processes. Utilizing data to improve performance is not a new concept, but what is new is the pace of change in capturing the effects of automation and process know-how. This is now a global race to become "the digital winner," as it is widely understood that future winners will need to be on top of this digital development. What really has spurred this change is a strong underlying technological change that has happened over the last 10 years:

- Cost of data processing improved by a factor of 60

- Cost of bandwidth improved by a factor of 40

- Cost of data improved by a factor of 1,000

- Cost of sensors improved by at least 50 percent

Combine this with a generation that has grown up with the digital world —that is always connected and tuned into the digital economy—and the result is strong digital innovation in all industries.

IoT BENEFITS FOR EQUIPMENT VENDORS

In the oil and gas industry, you see the most prominent change in business models among equipment vendors.

Equipment manufacturers embedding machine-learning technologies into equipment for condition-based maintenance to help customers extract maximum value and efficiency from their infrastructure are not a new phenomenon. But building entirely new business models onto these technologies is relatively new. These suppliers want to provide support services such as data monitoring that will help customers optimize equipment utilization and maintenance strategies, as well as provide data that can be used in the design phase of new products. With enhanced user data, the precision of design parameters can be improved significantly, thereby optimizing the product cost and value relationship. This marks a turning point in the business strategy of suppliers, as oil and gas companies have historically been hesitant to rely on equipment suppliers to run maintenance programs due to fear of vendor lock-in, which pushes up costs. While the fear of lock-in is still relevant, we also see the business benefits that not only improve the equipment vendor's margin significantly, but also the benefit for the end user.

Asset owners increasingly see the benefit in gathering data from their installations to improve operations and look for ways to own both the data they generate and the technology that enables them to manage condition-based maintenance programs. Expect to see this understanding become practice as more oil and gas companies take steps to capture and learn from smart data to make their operations smarter and reduce costs. The ones that manage to capture scale effects in this regard are particularly well positioned, so therefore expect the largest fleet owners to be the most aggressive in leading this development. You may also see pooling of data becoming more widespread, even if this sharing of data may be controversial. In areas of health, safety, environment and quality (HSEQ), this may be less controversial —and may lead the way. Real-time monitoring, accurate reporting for compliance purposes, integration of Wi-Fi, and location-based technologies are examples of this trend.

SENSORS AND 3D PRINTING

Several technologies are speeding this development, specifically sensors and 3D printing. The increasing sophistication and lower costs of sensors are making their broad scale application feasible as a means of building the Internet of Things (IoT) and realizing the benefits it offers to oil and gas companies, such as machine learning. 3D printing is emerging as an innovative alternative for companies in the oil and gas sector as they scrutinize their supply chains and engineering practices.

An increasing number of oil and gas companies are already deploying 3D printing technology, using it in two different ways:[1]

- **To create models that can be used for training**. Innovation in training methods has been driven by the need to move away from on-site apprenticeships due to a mixture of safety issues and new technology requirements in the field. This combination has changed what is practical to teach on site, making 3D printing particularly valuable in teaching onsite equipment repair and maintenance, especially for offshore and subsea equipment.

- **To replace traditional tools and parts, helping access and maintain equipment in remote areas**. Parts and equipment that could be 3D printed include almost anything that can be drawn in 2D (e.g., drill bit molds, fix cutter drill bit bodies, and other down-hole tools).

These examples of digital developments are enabling businesses to cut costs and improve performance and asset integrity. They're beginning to be rolled out in maintenance and operations due to necessity, driven by the drop in the price of oil.

TRENDS IN DATA SHARING:
- Real-time monitoring
- Accurate reporting for compliance purposes
- Integration of Wi-Fi
- Location-based technologies
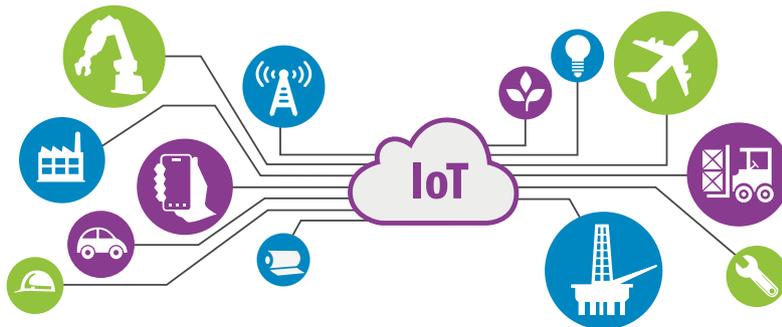
BENEFITS OF DIGITAL DEVELOPMENTS:
- Cut costs
- Improve performance
- Improve asset integrity

[1] Reed, Jeff, "Real World Application of 3D Printing in O&G: A Subsea Training Game Changer," http://oilpro.com/post/3176/real-world-application-of-3d-printing-in-og-a-subsea-training-game-changer

Other use cases of digital transformation specific to the oil and gas sector include:

- **Performance forecasting**
  - Production forecasts across thousands of wells
- **Enhanced oil recovery**
  - Analytics across unconventional assets
  - Analytics have been shown to help exploration companies extract 3-5% more oil
- **Predictive maintenance**
- **Automation of work**
- **Transferring work onshore from offshore facilities**
- **Integration of Wi-Fi and location-based technologies** to allow for remote monitoring of potential incidents, tracking and tracing not only people in potentially dangerous situations, but also contractors and equipment utilization
- **Enhanced asset security**
  - The increase of hydrocarbon shrinkage through theft and leakage is a problem that can be identified and tracked through logistics analytics

To be sure, the technologies driving the digital transformation are challenging companies—ratcheting up the pressure on them to change—but they are also providing exciting opportunities. Those consistently looking to what's next as oil and gas evolves will benefit greatly as the digital transformation continues.

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DATA

VALUE

DRIVING THE TRANSFORMATION

The technologies of social media, mobile computing, cloud computing, analytics, and the Internet of Things (IoT) are the principal drivers of digital transformation. As a group, these technologies comprise a platform defined by the interdependencies between them, and Gartner notes that these interdependent trends are "transforming the way people and businesses relate to technology."[2]

To succeed with IoT and digital transformation more broadly, [it] is important to address it as an evolutionary process and have a clear roadmap

[2] Gartner, "The Nexus of Forces: Social, Mobile, Cloud and Information," December 3, 2014; http://www.gartner.com/technology/research/nexus-of-forces/.
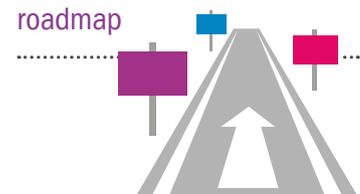
Particularly key to the oil and gas sector has been the development of IoT. According to IDC, "The Internet of Things is one of a handful of technology areas [that] are set to drive growth and innovation in the coming decade . It both enables and is fueled by digital transformation—it allows companies to digitalize, optimize, and automate processes [that] were not previously connected to IT systems."[3]

As the number of connected endpoints grows exponentially, massive amounts of data will be produced:

- The installed base of IoT endpoints will grow to more than 30 billion by the end of the decade from just less than 13 billion units in 2015.

- As a consequence, machine-generated data will comprise an increasing share of stored data: by 2020, 10 percent of the 44 zettabyte digital universe will originate from IoT devices.

- In five years, there will be seven times more IoT data than there is today.

All this will drive the need for more enterprise systems to deploy, manage, and make use of IoT, as well as the necessity to establish standards for interoperability and connectivity. From an infrastructure perspective, traffic will shift from the center of the network outward to inward from the edge, as increasingly more data flows from the connected devices of IoT into the data center. This will affect computing and communications architectures.

EDGE DATA PROCESSING AND TECHNOLOGY CONVERGENCE

Two related developments are the convergence of technologies and edge data processing. As operational technologies (OT) increasingly include software and sensors, OT and IT converge in systems comprising smart machines, storage systems, and facilities capable of autonomously exchanging information, triggering actions, and controlling each other independently. While IoT data can be processed at the data center or at the edge of the network, the amount of content that will be generated at the edge will demand that process queries be delivered to the data rather than bringing the data to the enterprise data center. Indeed, edge processing will drive innovation in analytics, systems, and operational management.

This is particularly key in oil and gas, where companies can now take advantage of real-time data analytics and new IoT applications that require low, predictable latency. Consider a typical offshore oil platform that generates between 1TB and 2TB of data daily. Most of this data is time-sensitive, relating to platform production and safety issues. Using a satellite connection (i.e., the most common communications link for offshore oil platforms), it would typically take 12 days to move one day's worth of oil platform data to a central repository.

[3] IDC, "Digital Transformation: An Internet of Things Perspective," March 2016

PRINCIPAL DRIVERS OF DIGITAL TRANSFORMATION:
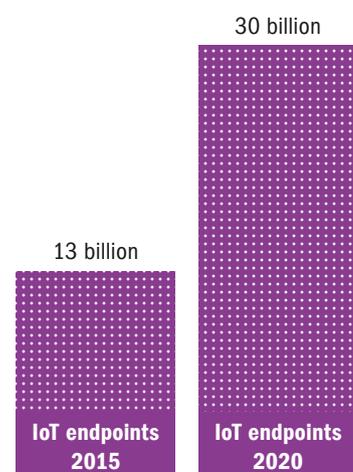
- Social media
- Mobile computing
- Cloud computing
- Analytics
- Internet of Things (IoT)

IDC: The Internet of Things is one of a handful of technology areas [that] are set to drive growth and innovation in the coming decade.

In **5 years**, there will be **7 times** more IoT data than there is today

30 billion

13 billion

IoT endpoints 2015 **IoT endpoints 2020**

But with edge processing, companies can assess this data locally to determine whether it needs to be moved to the cloud or datacenter—or analyzed where it is, at the edge of the network.[4]

DRIVING THE ADOPTION

For oil and gas companies and their suppliers, the move to leverage IoT and realize digital transformation is driven by the real value the transformation promises in three key areas:

Customers
Companies will win business and differentiate themselves through the greater customer satisfaction and better customer experiences facilitated by digital transformation.

Operations
Digital transformation will open up new operational efficiencies, productivity gains, and cost benefits for those companies that successfully make the transformation.

Offerings
By enabling businesses greater agility to broaden or change their business models, digital transformation supports the introduction of innovative products and services to meet changing market dynamics.

IMPACTS ON OIL AND GAS

There are significant benefits in the oil and gas sector for those companies that leverage digital transformation to optimize the use of critical equipment. Two overarching benefits are better maintenance and higher equipment availability .

First, consider maintenance. Oil and gas equipment has different wear and tear depending on where it is located. For instance, a riser gets different tension on the string depending on where it is situated physically, from the rig down to the floor level. It's important to track the wear on this piece, which can be done by data gathered in monitoring the physical conditions of equipment. Whether in use or being stored, all this information can be put together with an RFID tag to monitor what has been happening to the equipment. Based on that information, a company can optimize its maintenance plan.

Some of the main barriers to adopting IoT solutions are about prioritization and financials. Companies need to move beyond the immediate budget aspect and ensure that IoT is approached strategically.

BENEFITS IN OIL & GAS:
- Better maintenance
- Higher equipment availability

As more sensors and equipment are connected, companies need to assess the data availability and usability.

4 Anand, Mala, "Digital Transformation in the Oil and gas Industry: Drill, Data, Drill," Cisco Blog, The Platform, June 25, 2015, http://blogs.cisco.com/news/digital-transformation-in-the-oil-gas-industry-drill-data-drill

Second, consider availability—or put another way, the cost of downtime. This is where most IoT applications have been targeted in oil and gas: leveraging sensors to remotely monitor equipment to help make decisions about whether or not to shut it down. That's a very expensive decision to make. Typically, oil and gas companies monitor a fleet of similar equipment from a central unit or control location. When an anomaly is detected, personnel from the company and the equipment manufacturer assess diagnostics before a shutdown is ordered. Increasingly, these data monitoring centers are run by equipment providers as part of the support services they contract to oil and gas customers. General Electric, for example, is doing this for gas turbines, surveying a potential of 5,000 GE installations at once.

IoT TRANSFORMING WORK PROCESSES

The digital transformation is also rapidly transforming work processes in oil and gas. Remote sensors and drones are reducing the need for people to physically monitor equipment. For instance, autonomous robotic drilling now enables the complete removal of people from the drill floor[5], robotic moving platforms are being developed for shale wells, and remotely controlled trucks are being developed to transport oil or gas. According to Accenture, "Digital technologies are not only rapidly changing the practice of work [in oil and gas], but they are also reshaping the very nature of the workforce and its work experiences in everything from hiring experiences to jobs to careers."[6]

SUPPORTING DIGITAL TRANSFORMATION IN OIL AND GAS

A company pursuing digital transformation must have tools that allow executives and managers to review and orchestrate processes that align with their business strategy to ensure process execution delivers that strategy. This means bringing data to the desktop, visually, to provide decision makers a complete understanding of which functions deliver real customer value, which are less effective, and which waste both time and resources in terms of meeting organizational goals.

Ultimately, this enables businesses to accelerate the realization of their business strategy—in this case, by moving to become a digitally transformed business—by making better decisions, faster. This can happen by assessing real-time business performance in the context of how it affects key business processes and goals, giving managers real-time operational intelligence and actionable controls to solve issues before they become problems. The solution is about strategy acceleration and execution.

BENEFITS FOR DECISION MAKERS:

- Progress visible in real time
- Understand functions that deliver real value
- Action on controls
- Make faster and better decisions
- Meet organization goals
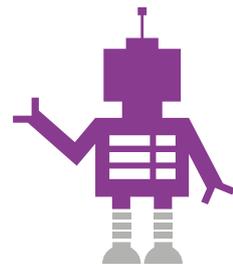
The true value of Internet of Things is only released when companies and organizations leverage the data to transform the business.

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[5] Robotic Drilling Systems AS, www.rds.no/home.

[6] Sloman, Colin; Holsman, Rich; and Cantrell, Susan, "Digitizing Energy: The Future of Work in the Oil and Gas Industry,' Accenture, May 23, 2015

STREAMLINE, AUTOMATE, OPTIMIZE

At IFS, we focus on the efficient execution of work processes. For our customers, optimizing execution is first and foremost, so the primary goal of our software is to have that execution streamlined, automated, and optimized.

We've also invested heavily in predictive analytics, getting ahead of the curve so that when equipment has been instrumented, sensors put data into the cloud, then machine learning algorithms assess that data, and, in conjunction with historical information, come up with a predictive model that companies can rely on for execution. That model is optimized. To effectively leverage that, we have intelligence to assess the situation in real time and trigger action based on the assessment.

This leads to a broad scale IoT approach. To realize the value from an IoT solution, an organization's enterprise software must capture data effectively, present it in real time, and make it actionable. To get the most out of this, we need to take an integrated look at new technologies. The strength of digital transformation is not in the individual technology, but in how different technologies reinforce each other. A contemporary example is the growing use of drones in industry.

Take the case of aerial power line inspections in forested areas. While aerial power lines are generally easier to run and more cost effective to build, they are vulnerable to severe weather. If a tree falls on a power line, it disrupts service and typically requires a helicopter to be sent out for inspection. Clearly, drones are more cost-effective than helicopters in doing such a scenario.

IFS took this a step further, combining computer image analysis with the IFS IoT Business Connector™ to enable the drone to work entirely autonomously. The drone flies over the power line, and the video imagery that the drone provides is immediately processed to detect any obstructions in real time. The observations are transmitted through the IFS IoT Business Connector to IFS Applications™, upon which a work order can automatically be scheduled and dispatched in the most optimal way.

In many industries today, drones are providing an array of opportunities and allow businesses to realign resources, gather data, reduce costs, ensure safety, optimize processes, and increase efficiency. Combining that with other new opportunities, such as the internet of things (IoT), opens up for even greater benefits.

In oil and gas, where companies are clearly accelerating efforts for digital transformation, IFS Applications can function as a unifying hub for gathering and processing data from disparate sources across the enterprise, eliminating the need for proprietary solutions from equipment providers. For companies that typically—and purposefully—leverage multiple suppliers, this is an advantage as it streamlines access to essential data. Consequently, it delivers value across the total enterprise (e.g., warehouse optimization, production control, supply chain synchronization, maintenance planning, and back office efficiencies).

By leveraging the Microsoft Azure™ IoT cloud platform, IFS is partnering with Microsoft to collect large IoT data volumes and feed them into IFS Applications™.

WHAT'S NEXT?

A recent report on the state of digital transformation had some interesting results: 88 percent of companies surveyed said they were undergoing digital transformation efforts, but only a quarter had an understanding of what it is.[7] The challenge creating this gap, according to *Forbes*, was not investment in technology, but rather the realignment of business models to reflect the transformation being sought.[8] This underscores the point made by IDC: digital transformation is not just a technology trend, but rather a core business approach at the center of enterprise strategies across all industry segments and markets.[9]

ASSESS	EVALUATE	SECURE	SELECT

The advent of digital transformation has both immediate and long-term implications for oil and gas companies. You need to identify and assess the value of your data and build necessary IT platforms to take advantage of new technologies, particularly IoT—now. You also need to evaluate and reevaluate vendors in the context of what is happening now. Those who will help you realize the digital transformation you seek will have a deep and committed understanding of what digital transformation means—and can achieve—across the enterprise, so they can help you execute effectively when digital opportunities present themselves, as they will.

For some organizations, facing these challenges may be threatening or intimidating; but for others they lead to pragmatic solutions to today's challenges that set them apart as industry leaders. In these cases, organizations have reached out for what's next. They all believe their best days are ahead of them, and what's next is what really matters. They don't just take opportunities—they make them by actively participating in the transformation process.

In that sense, they are characteristic of IFS customers.

FORBES SURVEY SAYS:

88% of companies said they were undergoing digital transformation efforts.

YOUR STRATEGY:

Step 1—Check how your data can be used
Step 2—Evaluate processes and IT solutions
Step 3—Don't forget security
Step 4—Pick the right software vendor

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[7] Solis, Brian, "The 2014 State of Digital Transformation," Altimeter Group, 2014.
[8] Bloomberg, Jason, "Digital Transformation by Any Other Name?" Forbes, July 31, 2014.
[9] Ibid, IDC.

ABOUT IFS

IFS develops and delivers enterprise software for customers around the world who manufacture and distribute goods, maintain assets, and manage service-focused operations. The industry expertise of our people and solutions, together with commitment to our customers, has made us a recognized leader and the most recommended supplier in our sector. Our team of 3,500 employees supports more than ten thousand customers worldwide from a network of local offices and through our growing ecosystem of partners.

For more information about IFS, visit **IFSworld.com**

ABOUT CORNING DATA

Corning Data has provided professional technical services for nearly 40 years. By Partnering with world-class technology providers such as DSI, IBM, IFS, and Oracle, we offer our customers the world class solutions. And by employing only senior-level talent, our customers receive support and services from true experts.

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