

UPSTREAM DIGITAL TRANSFORMATIONS

WILL YOUR DIGITAL PORTFOLIO OF INITIATIVES
BE ENOUGH?

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Upstream oil-and-gas players of all sizes find themselves at a critical juncture in the transformation that is taking place in the industry: Increasingly, Upstream companies require greater capital efficiency in order to compete, an objective that digitalization can support by driving operational improvements.

But while every Upstream company has some digital initiative, no single industrywide approach to digitalization has emerged. Instead, a mix of many different approaches and initiatives exists, some of them mature and of low value, others unproven yet holding the promise of delivering great value. In such an environment, it is important that companies first review their portfolio of initiatives for completeness and for the right mix of initiatives.

When assessing their digital portfolio, it is essential that Upstream players have an understanding of the full set of digital initiatives offered, the balanced portfolio of digital initiatives relevant to them, and opportunities to expand these initiatives beyond the core business areas. Oliver Wyman has a structured library of key digital initiatives the industry is implementing, showing the full canvas and how they are linked to value drivers. Rather than focus on a single initiative, we take a portfolio view of the various digital initiatives and on their value potential and maturity.

We have created a framework designed to provide companies with a menu of options and help them prioritize based on potential value and maturity of each digital initiative. Regardless, the initiatives that each Upstream player chooses will ultimately depend on its unique needs. With this framework, the management team can decide where to deploy resources and capital: understanding the options available and recognizing the value trade-offs before allocating people, money, and time.

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THE INDUSTRY IS CURRENTLY FOCUSED ON DELIVERING RETURNS

Over the past few years, Oil and Gas Upstream companies have focused on operating within their cash flows and on delivering returns before growth. Capital efficiency is likely to remain a driving force in the industry, given market conditions.

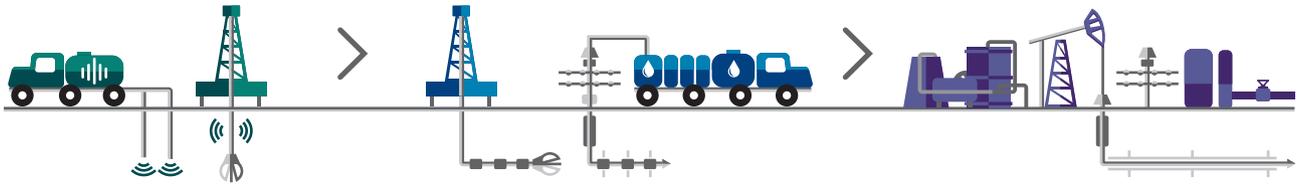
Concurrently, digital technologies have made deep inroads into the sector so that it is not an exaggeration to say that digital is in the bloodstream of every major Upstream player in advancing its capital efficiency and operational goals. Increasingly, Upstream companies are asking themselves: Do we have a complete portfolio of digital initiatives suited to our goals? And are we getting the most value out of our digital program?

In our work with clients, we have encountered a broad array of digital programs, most of them aligned with well-established value levers. With that said, while a focus on value creation is important, developing an efficient digital portfolio that balances value, technology maturity, and areas of greatest opportunity for the business is equally—if not more—critical. We summarize our findings and provide our thoughts to help you develop and implement a robust portfolio of initiatives and enhance your chances of succeeding with your digital transformation.

DIGITAL PROGRAMS: SUPPORTING KEY VALUE LEVERS

Speaking with industry players, reviewing public information available to investors, and tracking venture capital as well as private equity investments in digital, indicates that, while no initiative is the same across companies, all of them draw upon a similar menu of sensing, data, analytics, and use cases. Therefore, we have grouped similar digital initiatives under broader umbrellas aligned with industry value levers. For example, predictive maintenance (value lever listed under Production and Development) has seven separate digital initiatives, including predictive maintenance for rotating equipment, reciprocating equipment, and top drives, among others. A similar approach has been applied to the other digital initiatives found in our review.

VALUE LEVERS AND TYPES OF DIGITAL INITIATIVES SUPPORTING EACH LEVER



EXPLORATION

Digital Initiatives

Automated Interpretation	 9
Data & Workflow Integration	2

Digital Initiatives¹ **11**

DEVELOPMENT

Digital Initiatives

Drilling Automation	 8
Intelligent Completions	 5
Predictive Maintenance	 3
Standardization and Modular Design	2
Surveillance and Inspection	1

Digital Initiatives¹ **19**

PRODUCTION

Digital Initiatives

Asset Simulation, Monitoring, & Control (Digital Twin)	12
Unman Operations and Robots	6
Predictive Maintenance	 4
Field Production Optimization	 4
Artificial Lift Optimization	 3
Connected Oil Workers	3

Digital Initiatives¹ **32**



SUPPORT FUNCTIONS

Supply Chain Optimization	4	Safety – Worker Management	2	HR – Immersive Simulated Training	1	Integrated Portfolio Management	1
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Digital Initiatives¹ **8**

 Machine Learning plays a big role

 Digital Initiatives in Oliver Wyman Library

¹Companies may have digital initiatives which span multiple trends and activities

Industrywide, executives are building the business case for digital transformation by ensuring that the work has a positive return on investment. While no single digital portfolio of initiatives dominates, we found that, at their core, these initiatives aligned with common value levers. While many of these value levers have been around for decades, emerging digital technology is helping companies to take tried-and-true value levers to the next level by uncovering useful insights buried in the data. Within each value lever across the well lifecycle, there are both proven and emerging digital initiatives. Select cases worth noting include:



EXPLORATION

Exploration has historically been a leader in data and digitization. Exploration & Production software platform vendors and producers have been driving data and workflow integration for years. What's changing, however, is how accurate and quick the interpretation and characterization of a reservoir can be. We have grouped initiatives of this type under the Automated Interpretation value lever. The industry is implementing several new algorithms based on advanced statistical methods and optimization algorithms, which are helping to cope with uncertainty and speed up the processing of vast volumes of data, with the capability of each algorithm is becoming a key differentiator. In tandem with greater integration of different sources of seismic and reservoir data, these advances can significantly improve decision making for exploratory drilling, reservoir modeling, and development.



DEVELOPMENT

Development has been actively digitizing drilling, driven by one primary objective: to reduce the number of drilling days, and therefore cost, while maintaining or improving safety. Service providers as well as producers have deployed initiatives that have an impact spanning from the tip of the drill bit to the top to the rig. Many initiatives automate portions of the drilling process, such as automating the drilling floors, increasing productivity and reducing worker exposure to risky activities. Other initiatives use machine learning (ML) to calculate drill-bit location and turn-rate predictions, driving safer and faster rates of penetration (ROP) while drilling. ML has also played a role in improving maintenance programs. The industry has found successful high-value use cases for predictive maintenance for a variety of items, including top drives, mud motors, and rotating pumps. In our experience, launching predictive maintenance programs across operations can be transformational, yielding a 30 to 40 percent reduction in maintenance costs.

Beyond drilling, companies are enhancing their digital workflows for well development. Often times, companies use well software to advance standardization and modularization initiatives. The use of digital well models helps to implement rules-based design, and uniform engineering standards, as well as group wells into common well segments. Segmenting wells can yield significant supply-chain cost improvements, as equipment and services sourcing, along with logistics, can be optimized and aggregated to scale while meeting the needs of a well segment.



PRODUCTION

Production comprises the greatest number of digital initiatives. The industry has been making use of sensors in wells and production equipment. While field control centers and efforts to enhance production optimization are widespread, the number of pilots to create asset digital twins and to deploy robots for safer operations is growing. One interesting thread has been the spread of ML algorithms into areas such as artificial lift. With rod lift pumps having historically been left untouched until the end of the well life, ML is being deployed to control pumping and improve production. ML is also used to reduce downtime by anticipating failures on critical parts in the rod lift pumps. Small improvements can turn into major production increases or savings, as nearly 70 to 75 percent of oil wells in the continental United States have a rod lift pump installed. Artificial lift technologies are also starting to use ML early in the well life to optimize performance. Electric submersible pumps and gas lift technologies are improving performance and reducing total cost of ownership through a combination of automation and ML algorithms.



SUPPORT FUNCTIONS

While support functions are becoming increasingly digitized, Upstream companies are still learning supply-chain best practices from more mature industries, such as manufacturing. We find that demand forecasting for parts and equipment as well as inventory management have yet to adopt the latest digital and analytical techniques to operate more cost-effectively and at better service levels. Similarly, upstream companies still employ tools for logistics and transportation that are less advanced than the transportation management software (TMS) and fleet-management software common in other industries.

In addition to the supply chain, digital technologies are focusing on worker safety, which increasingly is becoming more outcome-driven, thanks to innovation. For example, many vendors are using personal gas detectors as beacons to monitor the location, hazards exposure, and health of remote workers, thereby reducing reported incidents between 10 percent and 15 percent. Furthermore, there is a positive outlook for improving worker productivity, with many vendors of mobility devices looking to standardize routine work through digital apps, connect workers on the field with remote experts, and drive higher worker productivity.

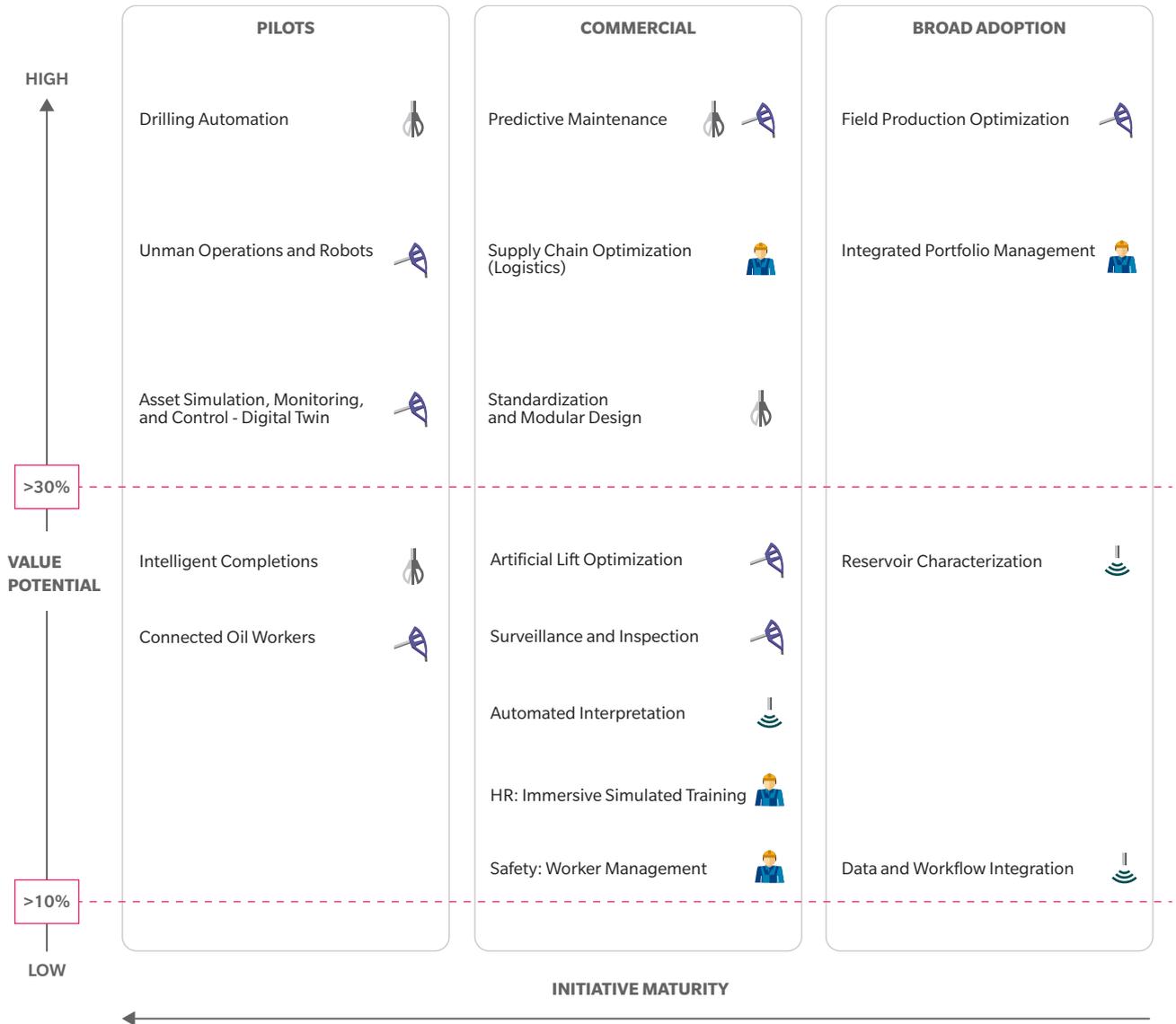
THE DIGITAL PORTFOLIO: BALANCING VALUE AND TECHNOLOGICAL MATURITY

In conversations with clients, we have learned that while many of them take a comprehensive portfolio view of their digital program, not all of them are aware of how balanced their digital portfolio is in terms of value creation and technology maturity, resulting in uncertainty as to whether they are getting the most value out of their digital initiatives.

By evaluating our extensive digital initiative library, alongside value and technology maturity, we created a portfolio view of the value levers being pursued by industry players. Although the value potential may vary, depending on your current operational efficiency, we believe that this can be a useful guide to test whether initiatives are well-aligned and what opportunities are available create the most value. The chart below represents some lessons learned in managing a digital portfolio.

PORTFOLIO PRIORITIZATION FOR VALUE LEVERS

Not an exhaustive list of Digital Initiative grouping



The application of edge technologies reduces the initiative maturity within the group

EXPLORATION 

DEVELOPMENT 

PRODUCTION 

SUPPORT FUNCTIONS 

Understand strong performing business areas

Understanding the business areas currently performing strong in comparison to competitors can be beneficial when deciding where to deploy digital initiatives. Often, while capabilities and functions that perform stronger are well-positioned to quickly adopt digital improvements and capture value, areas that lag are better suited for implementing more basic capabilities and digital tools. In many instances, logistics, demand forecasting, and inventory management are generally less sophisticated activities in upstream companies, and deploying core capability building followed by best-in-class processes and digital tools can deliver large benefits. Recently, we took part in an offshore supply-chain transformation where capability building and digitization helped realize value in the hundreds of millions of dollars, which was nearly, or nearly 30 percent of the initial cost base.

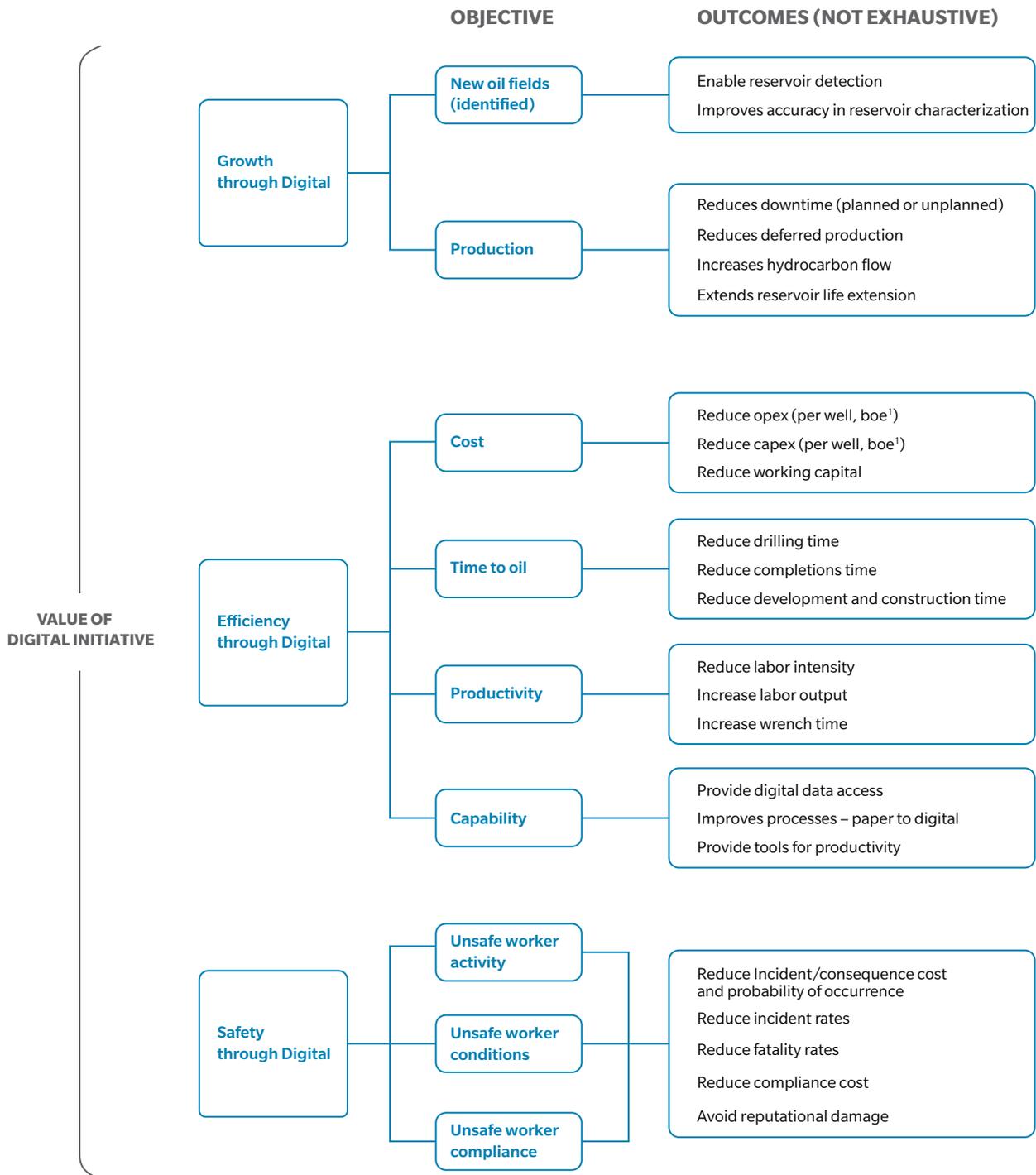
Consider risk-adjusted returns and the benefits of failure

The composition of a digital portfolio may vary, but most Upstream companies are looking to maximize value through their digital initiatives. While big bets on how to invest your resources may help the organization focus, it is important to strike a balance between proven digital initiatives and emergent technologies with high potential. When wagering on technologies that are less mature, or unproven, it's important to allocate investment funds appropriately and understand that, while riskier gambles inevitably have a higher rate of failure, they also present an opportunity to learn for the future. As such, the knowledge that originates from fast proof-of-concept cycles and feedback that comes with failure will help you become more nimble and efficient in trying other emerging digital initiatives, while understanding what works and what doesn't, and adapting accordingly.

Focus on linking initiatives to value drivers and how to monetize them

With tracking and measuring value frequently discussed among Upstream companies, focusing on tangible value drivers - including growth, efficiency, and safety - has helped to create a consistent framework that helps to measure value. Across these three buckets, there are drivers along production increase, cost per barrel, time to oil, and others, each of which can be linked to digital initiatives to establish a clear logic on monetization and strengthen a business case. Often times, there is a connection to a value driver, such as improving labor productivity, but the tactical link to monetization is missing because the cost savings—such as reducing man-hours spent modeling a reservoir—resulting from the digital initiative is not directly evident. With that said, it may be more appropriate to regard some digital initiatives as business enablers, rather than value creating projects.

BUSINESS DRIVERS FOR IMPACT



1 Barrels of oil equivalent

Rapidly scale up pilots of your high-performing digital initiatives

In many instances, the move from successful pilot to fully operational initiative ends in failure. Although the root cause may vary, the common denominator is often the lack of a dedicated digital program management office to handle change management. Best-in-class programs bring multidisciplinary teams with both digital and industry knowledge as well as deep understanding of the business operations and the people. Of equal importance, scaling up a digital portfolio generally requires a review of the operating model, making adjustments where necessary to make the change sustainable.

Maintain a dynamic portfolio and pipeline of digital initiatives

With large digital transformations, there is typically a 30 percent value leakage. For example, a goal of delivering \$1 billion in benefits through digital transformation generally requires a pipeline worth \$1.4 billion. One way to maintain a dynamic stream of initiatives is to build an ecosystem of partners, both internally and externally. The strength of digital capabilities varies across the oil and gas sector, but innovation externally is also thriving with venture capital firms investing billions with many Upstream players having already formed venture teams to harvest outside innovation and ideas. It is essentially that portfolio purges and reviews be conducted regularly, in order to allocate resources to the most promising risk-adjusted initiatives.

THE DIGITAL THREAD SHAPING MORE TRANSFORMATION AHEAD

Digital transformations are progressing among Upstream oil and gas players, with some companies are leading while others are being more cautious in their approach. Evaluating their portfolio of digital initiatives, testing it for completeness and fit with the organization, and assessing its risk-adjusted value is something that all Upstream companies should be doing, regardless of their place in the digital journey. Although the core business of Upstream players is to produce barrels of oil at a profit, those companies embracing digital are likely to achieve higher returns.

Undoubtedly, there is more to come. Some of the threads taking shape that are likely to further transform Upstream companies include:

1 Machine learning and artificial intelligence as a differentiating capability

Research indicates that machine learning is a common thread across most successful digital initiatives, not by accident, but rather by design. Upstream companies that introduce machine learning are more likely to see improved operational performance going forward. In order to do so, they will need to invest in talented data scientists, provide the right infrastructure and governance, and implement organizational changes to unlock the power of this new capability. Vendors are already integrating data across the oil well life cycle and creating analytical work flows enabled by machine learning tools designed for the oil industry.

2 More connected supply chains

As Upstream companies look beyond their core business for digitization opportunities, they will find large pools of value in their supply chains. Across the board, using digital tools to achieve a connected supply chain—which is commonly found in other industries—provides great potential for cutting costs, improving service and reliability, managing inventories, and creating delivery-channel efficiencies. As has been the case in digital thus far, the oil majors are likely to lead and benefit because of their scale.

3 More connected workers on the front line

Although still in the early stages of development, connecting workers at the front line will bring productivity and safety to the next level. Upstream companies embracing digital technologies to improve “tools in hand” times, situational awareness, and risk identification and reporting are likely to see positive results. The challenge will be in identifying industry partners to innovate and connect the oil workers.

Oliver Wyman is a global leader in management consulting that combines deep industry knowledge with specialized expertise in strategy, operations, risk management, and organization transformation.

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