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# *The Great* **UNKNOWN**

Technology continues to improve and impress. But the subsurface remains as inscrutable as ever.

# The digital imperative

Shale's next great challenge is embracing all the possibilities of digital.

**Paul Goydan and Kristen Speicher,**  
The Boston Consulting Group

The history of the modern shale oil business has been a tale of continuous innovation. By pioneering methods for horizontal drilling and hydraulic fracturing, innovators made shale deposits a prime source of North American oil and gas production. And steady efficiency gains have proved once again the power of experience curves, a concept developed in the mid-1960s by Boston Consulting Group founder Bruce Henderson.

Henderson observed across industries that per-unit costs decline as cumulative volume increases, but only if conscious action is taken to capture and apply the knowledge gained. The shale business has taken the right actions by turning lessons learned into better processes and technologies, improved economies of scale, and increased production and recovery.

## Setting the curve

The results are seen in the steady decline of well capex per barrel of oil equivalent (boe) recovered as 120,000-plus horizontal shale wells have been drilled across U.S. basins. With each doubling of the number of wells drilled costs have declined by 23% in the Bakken, 36% in the Eagle Ford and 41% in the Permian (adjusted for

commodity and input prices including the costs of oil services). Newer shale basins are able to achieve faster experience-based cost improvements by applying knowledge gained from older plays (Figure 1).

To preserve margin amid plummeting oil prices in 2015 and 2016, operators conducted heavy layoffs and pressured oilfield service companies for large price concessions. As a result, operators were able to maintain a competitive cost structure and realized reductions in capex per boe beyond what the experience curve would predict.

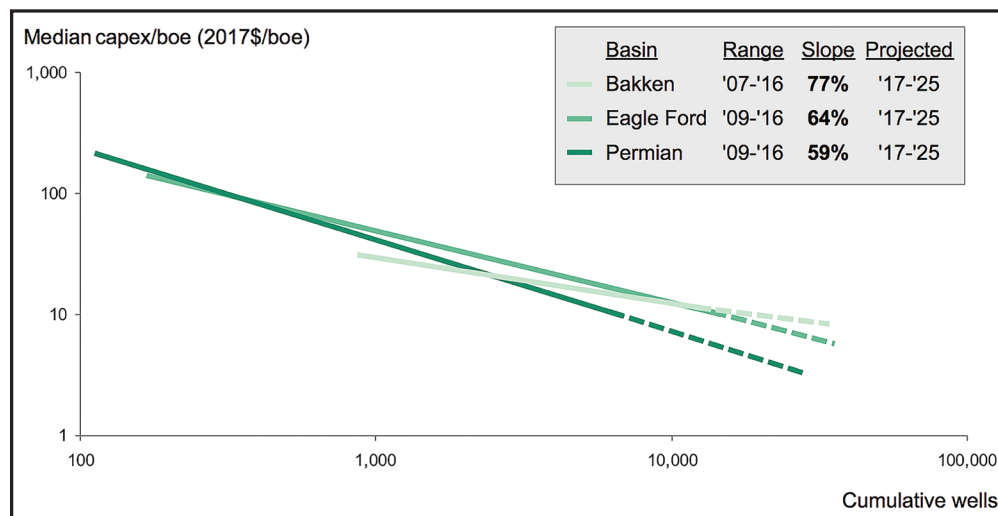
Although West Texas Intermediate (WTI) crude prices have dropped slightly in recent months, the price has rebounded from 2016 lows, with WTI now above breakeven pricing for operators. With this rise the large capex per boe reductions achieved in the past two years are unwinding as oilfield service companies are raising prices due to shortages of high-specification drilling rigs and tight supply of hydraulic fracturing equipment. Meanwhile, labor shortages hamper the ability to ramp up supply, and logistical planning from spud to production is increasingly challenged, threatening returns on investment.

Beyond the natural challenge of staying on the experience curve, operators must cope with the additional disruption in the supply landscape and severe loss of knowledge in the sector as a result of layoffs. Operators

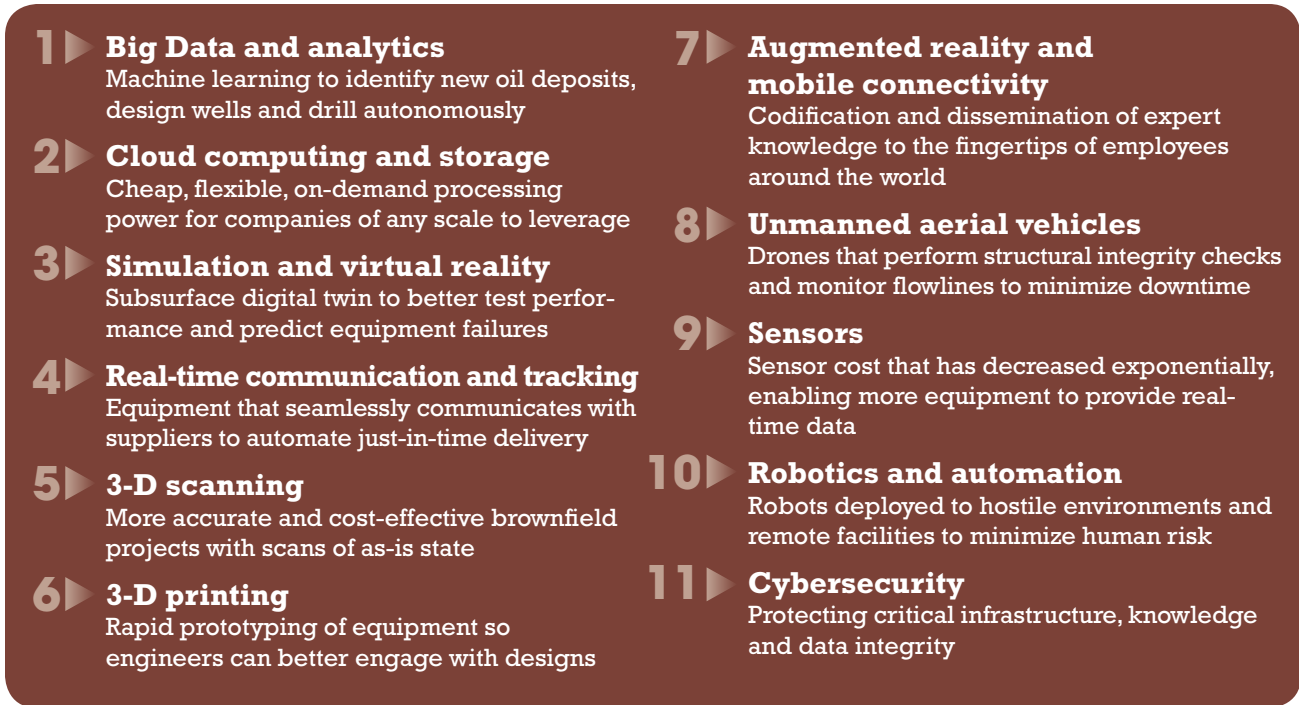
face an incredible challenge ahead to get back on the experience curve and maintain a lean cost structure. The biggest lever to meet this challenge is digitalization.

## Embracing digital

Digital technologies can be applied along the entire upstream value chain to reduce costs, increase production, make faster and better decisions and raise labor productivity. Across industries digital is changing the



**FIGURE 1.** The capex per barrel for major U.S. unconventional oil basins with data from the top 10 operators adjusted to be net of supplier cost compression is shown. (Source: The Boston Consulting Group)



**FIGURE 2.** The 11 digital domains listed are reshaping the energy world. (Source: The Boston Consulting Group)

way customers, suppliers and employees interact, creating new business models, attracting new players and increasing competition.

The digital oil field is a complex ecosystem made up of operators, oilfield service companies and technology entrants, both startups and established industry titans. Each are developing or adopting technologies across 11 digital domains (Figure 2) at different paces depending on the nature of their core business and the proven benefits that technology can introduce to their business.

In the oilfield service space, offerings are primarily seen in real-time communication and tracking, simulation and machine learning, and robotics and automation. Meanwhile, operators have made strides in Big Data and analytics, sensors, 3-D scanning and cybersecurity. Some operators are investing in 3-D printing, mobile connectivity and augmented reality, and unmanned aerial services. Across

the sector companies are rapidly testing new use cases and technologies.

Technology entrants are collaborating or directly competing with operators in Big Data and analytics,

real-time communication and tracking, sensors, and cybersecurity. Technology entrants lead efforts in cloud computing and storage, 3-D printing, and mobile connectivity from the wellhead to the home office.

Operators, oilfield service companies and technology entrants are providing solutions and fighting over data. Players must rapidly decide whom to partner with, where to invest and how to prioritize build vs. buy. Digital mastery will require companies to take risks beyond proven technologies to pilot, test, fail fast and ultimately deploy what wins.

As a whole, the oil and gas industry lags behind others in embracing the digital megatrend but is a prime candidate for the next big wave of digitalization. With short cycle times and

**Digital activism is the most advanced model, with digital engrained throughout the company including in its culture, operations, innovations and value proposition. Most oilfield companies are moving from digital opportunism to centralism with a few examples of more mature digital profiles.**

a culture of innovation, the shale sector can play a leading role.

### **Implementing digital**

Digitalization needs to be tackled on both short- and long-term horizons. In the short term, companies should focus on their core by using proven technologies to digitalize discrete functions, cut costs and increase productivity. This usually involves replacing manual processes and using data and online systems to make the business leaner, more agile and more efficient. These improvements can fund long-term innovation beyond the core business into the future digital energy landscape.

Digital efforts can be classified into three operating model archetypes that correspond to a company's stage of digital development: digital opportunism, digital centralism and digital activism. In digital opportunism digital initiatives and functions are launched across an organization but are mostly independent of one another. In digital centralism there is an overarching corporate strategy for digital transformation, and the digital portfolio is centrally coordinated. Digital activism is the most

advanced model, with digital engrained throughout the company including in its culture, operations, innovations and value proposition. Most oilfield companies are moving from digital opportunism to centralism, with a few examples of more mature digital profiles.

The shale sector faces a digital imperative. Each organization must choose the type of digital operating model it wants to embody based on the maturity and ambition level of the organization. But for digital ambition to become reality, companies must build the capabilities and culture required to take full advantage.

The operating improvements and efficiencies that come with digitalization can spur breakthrough growth for those that brave this new frontier. However, operators and service companies that fail to embrace digitalization risk falling far behind the experience curve, placing their organization at a considerable competitive disadvantage. **ESP**

**Have a story idea for Industry Pulse?** This feature looks at big-picture trends that are likely to affect the upstream oil and gas industry. Submit your story ideas to Group Managing Editor Jo Ann Davy at [jdavy@hartenergy.com](mailto:jdavy@hartenergy.com).