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Robots redraw energy supply chain

Market participants are turning to artificial intelligence for cost and efficiency gains

In this article, PE looks at the impact of new technologies on the industry. Part I of II.

From deep-water directional drilling to the liquefaction and long-distance transport of natural gas, the energy sector has long pioneered the use of transformational technologies.

Now the sector is facing another wave of change, this time from the pervasive potential of AI which enables unlimited amounts of data to be ingested, interpreted and acted upon immediately.

As is already happening in financial, retail, healthcare and other sectors, this fourth industrial revolution is set to improve productivity and overhaul established working practices within the energy sector and its support industries.

By 2035, McKinsey estimates that data analytics and robotics alone could produce between $290m and $390bn in annual productivity savings for oil, natural gas, thermal coal, iron ore and copper producers across the globe.

In leveraging data to optimal effect, AI will enable operations to run more efficiently and productively at an ever lower cost. It could be the game changing solution to the challenges facing the energy sector as it transitions to a low or zero carbon future built on 'smart' management of energy, including renewable energy and electric vehicles.

Conversely, AI's widespread adoption will profoundly shake-up established ways of doing things, leading to a complete overhaul of business models and potentially shifting control to specialist tech companies.

Inflection point

The enabler for AI is the rapidly falling cost and availability of computer processing hardware and the development of equipment sensors, cloud services and 'smart' software which can collect, stream, store, process and analyse massive amounts of data.

"A couple of years ago what we're doing now would have been very expensive because computer storage and processing power was cost prohibitive. A reduction in the cost of technology and an increase in the availability of data is a key factor here," says Harry Bloch, CFO of start-up VROC AI which provides predictive maintenance solutions to the oil and gas sector.

The emergence of new areas of computer science—from symbolic learning involving image processing and robotics to more complex algorithm-based pattern recognition and reinforced machine learning using neural networks—is leading to a rapid acceleration in the use of AI across the sector. Developments in quantum computing are set to take cognitive computing to an even more advanced level.

"There is convergence of two things happening at once. The world is awash with data and the opportunity now exists to take that data and analyse it using smart, fast tools. Join that with AI and you've got huge analytical processing power," Bloch says.

For digital strategy specialist Geoffrey Cann, it is the prevalence of data itself which is driving the AI push: "I believe the Internet of Things revolution will generate so much data that the only way to handle and interpret it all is via AI".

"The sheer analytic horsepower available through cloud computing now rivals the best in-house computer data centres and is available on a variety of economic models-cloud can be rented, AI can be available on a per use basis, or even on a benefit sharing basis, whereas in-house data centres are largely fixed cost assets," Cann adds.

Accelerating pace

For an industry predicated on technological transformation, energy companies have been surprisingly slow to recognise the opportunities and impact that AI will have on their business.

In its latest *Global Human Capital Trends 2018 report* , Deloitte notes that AI, robotics and automation alone are still rated relatively low by the energy industry, despite robotics in particular taking a significant foothold over the past 12-18 months.

But Julie Harrison, lead partner in Resources and Industrials Human Capital at Deloitte Australia, says this is changing fast and the industry "is increasingly using AI, digital, data and automation in various ways across the sector from exploration to maintenance".

Daniel Jeavons, general manager for data science at Shell, agrees: "Throughout our value chain there are big opportunities to deploy AI and in particular machine learning. Many other industries have been doing this for years and in many senses we're probably slightly behind the curve as an industry, but we're catching up very quickly".

Talent shortage

The uptake of AI in the oil and gas sector has partly been constrained by a shortage of qualified individuals. According to Element AI, there are fewer than 10,000 people globally who have the skills required to undertake significant research in the area.

Those with AI know-how are being wooed with high salaries and workplace benefits from tech heavyweights Google AI, Microsoft AI and AWS and Silicon Valley-style start-ups. Combined with an evolving skillset, it makes identifying qualified individuals and retaining them a rising challenge.

"Locating the people with the necessary qualifications is a big problem," admits VROC AI's CEO Trevor Bloch. "We're dealing with technology that's being developed almost on a daily basis so it's difficult to find someone who's ready-made and fit for purpose from academia".

"Traditionally, predictive maintenance was done through spreadsheets and manual models using brute force analysis by people with high skill sets in mathematics and statistics. Now we're using dynamic models in real time, models that adjust as they learn new things".

As AI evolves, the skillset required to drive it into the future will also adjust. "The industry is changing from being one that had an element of human capital to one that now has central processing unit (CPU) power. AI combined with machine learning and algorithms means the roles for data scientists are rapidly changing," VROC's Bloch says.

To overcome the immediate recruitment hurdles, many energy companies are opting to outsource AI work. Chevron has signed a seven-year partnership with Microsoft to accelerate the use of analytics and IoT to optimise performance and improve efficiencies in exploration, reservoir management, production

operations, midstream logistics and marketing operations.

BP has partnered with AI start-up Beyond Limits to accelerate the delivery of AI software previously used in deep space exploration missions, banking on it enabling a step change in the way it locates and develops reservoirs, produces and refines crude oil, and markets and supplies refined products.

Total is partnering with Tata Consultancy to create a digital innovation centre in India to explore how AI, real-time data analytics, IoT, automation and agile methodology can make operations more efficient.

Shell undertakes AI and machine learning in-house , but spend is targeted to ensure the group gets the biggest bang for its buck. This includes using AI for predictive maintenance on offshore assets to predict equipment failure and working with Californian utilities to optimise EV charging as part of the company's focus on new and clean energies.

"We're using AI selectively in support of our strategy to provide more and cleaner energy solutions to consumers. We want to show success quickly and build the momentum so we've gone after the things we think are more accessible which can deploy quickly, typically in a three-month timeframe to show bottom line benefits," says Jeavons.

This article will continue in a part II

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