

The Unfinished Revolution: What is Missing From the E&P Industry's Move to "Big Data"

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One cannot help but be impressed by the inroads that digital oilfield technologies have made into the exploration and production (E&P) industry in the past decade. Today's production systems can be monitored by "smart" sensors that allow engineers to observe almost any aspect of performance in real time. Our understanding of how reservoirs are behaving has improved considerably since the dawn of this revolution, and the industry has been able to move away from point answers to more holistic "big picture" integrated solutions. Indeed, the industry has already reaped the rewards of many of these kinds of investments. Many billions of dollars of value have been delivered by this heightened awareness of what is going on within our assets and the world around them (Van Den Berg et al. 2010).

Underpinning this heightened awareness is data—*lots* of it. As Beckwith (2011) notes, today's seismic data centers can easily contain as much as 20 petabytes of information, equivalent to 926 times the size of the US Library of Congress. If this amount of information was copied into books and put on a single continuous bookshelf, it would go around the Earth's equator six times. And while seismic data sets are notoriously large and cumbersome, practically every part of the E&P ecosystem is generating orders of magnitude more data than it used to. What is more, there is every reason to believe that this trend toward more digital information is just getting warmed up. Martin Hilbert of the University of Southern California estimates that the total amount of digital data in the world—including items such as books, images, e-mails, music, and video—doubles every 3 years or so (Mayer-Schönberger and Cukier 2013). In light of this sweeping global trend, it is hard to imagine a future in which the E&P industry is not collecting significantly more data than it does at the moment. With such big piles of digital information accumulating around us, it is easy to understand why many in the E&P sector believe that it is solidly on track to reap the benefits of the "Big Data" revolution.

But the E&P sector seems to be approaching these rapidly growing piles of data with the same attitudes and analytical techniques that have been with us for years. As Febowitz (2013) suggests, a lot of potentially valuable digital information harvested from upstream oil and gas assets is barely given a cursory glance, and much of it is simply thrown away. Moreover, in those instances in which data is stored, it is often kept by the service companies responsible for generating it rather than the operator in charge of managing the long-term welfare of the asset.

This is not how the Big Data revolution is unfolding in many other industries. Several other sectors—most notably, the health care, financial, retail, and media industries—have come to realize that new and valuable insights are frequently gleaned from using new techniques to analyze massive data sets in ways that were never possible with smaller ones. These insights tend not to be discovered by testing hypotheses between variables whose relationships are well understood; rather, they are found by applying advanced analytical techniques to massive numbers of variables that, at first blush, might seem to be unrelated. FICO, an American analytics company, has discovered a surprisingly tight relationship between aspects of a person's car ownership records and their propensity to take prescribed medication.

Aviva, a large UK-based insurance firm, has developed predictive models that use credit reports and consumer marketing data to identify health risks among prospective applicants. And by carefully examining what its customers are purchasing from different departments, Target, the US retailer, “knows when a woman is pregnant without the mother-to-be explicitly telling it so” (Mayer-Schönberger & Cukier, 2013, p. 57).

Companies that are leading the charge in the Big Data revolution are not merely creating value by monitoring relationships that they already knew about, but by finding patterns and making predictions based on complex relationships that were previously unknown. And whereas scientists have traditionally sought to understand the causality and mechanisms underlying these kinds of relationships, cutting-edge users of Big Data frequently care about the “what” far more than the “why.” In other words, “When we let the data speak, we can make connections that we had never thought existed” (Mayer-Schönberger and Cukier 2013). This fundamentally different approach to data analysis carries with it a valuable lesson about the kinds of information that should be collected: in the age of Big Data, potential value is lurking within all digital information, no matter how inconsequential and disconnected it might seem at the time it is collected.

Therein lies a fundamental difference of opinion between the E&P sector and other industries that are considered leaders in Big Data. While there is no denying that the upstream oil and gas industry is swimming in digital information—and, indeed, several Big Data technologies have been used for much longer in this industry than in many others—the way that we manage data does not actually bear much resemblance to how it gets used in companies like Facebook and Amazon. The E&P sector

tends to regard data as information that describes the state of an asset; leaders in Big Data, by stark contrast, realize that data is a valuable asset in and of itself.

It goes without saying that the business models behind social networks and online retailing are profoundly different from that of the E&P sector, and that data delivers value within the upstream oil and gas industry in a way that is unlike many other sectors. At the same time, it is no less true that the competitive landscape of the E&P industry is growing ever more reliant on information technologies and computing power. The Internet began as a curious plaything at the beginning of that revolution but, over the past 20 years, it has clearly become an indispensable part of how we do business. And so it goes with Big Data: many of today’s E&P companies clearly do not consider most of their digital information to be mission-critical to their profitability. But they probably will start to think of data that way in the years ahead.

In the future, the issue of data management—including how data will be collected, formatted, stored, and owned—will be an important part of service contract negotiations and agreements between collaborating firms. Companies in the industry will jealously guard the data that they hold and, as suggested by Anand (2013), they will strategically attempt to augment in-house data assets with digital information procured from outside sources, thereby giving them the kinds of massive data sets in which the value of Big Data is often lurking. And petroleum engineers in the years ahead will speak disparagingly about us because we failed to appreciate the long-term value of the data that we are casting aside so carelessly today.

The E&P sector’s digital revolution is unfinished. The industry has succeeded handsomely in learning how to generate a staggering amount of data, but we are still collectively wrestling with

the question of what to do with it. The case for moving toward digital oilfield technologies was largely based on the ability of those tools to help us make better decisions—and when you peel back all the hype, that is ultimately what Big Data is about, too (Regalado 2014). In this way, Big Data is not the dawn of a new age for the E&P sector, but rather the next phase of a digital transformation that started a long time ago. The industry’s digital revolution will be complete when we come to terms with how to monetize the data that we are now capable of collecting and use it to create all the value that it can. **JPT**

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