

A Digital Journey: The Transformation of the Oil and Gas Industry

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1. Introduction

1.1. Why did we write this book (and why should you read it)?

At its core, this is a book about data and data management in the oil and gas industry. There are not too many books that focus on this specific domain. Two that come to mind are: "*The Management of Oil Industry Exploration and Production Data*" by Steve Hawtin and "*Drilling Data Vortex: Where the Bits Meet the Bits*" by Dr. Carlos Damski. Given the importance of data and the lack of visibility at higher levels of management in most companies, this topic needs more attention.

Over the last year, Steve Cooper undertook a lengthy review of the industry and technology trends that are influencing oil and gas data management practices within the context of the Digital Transformation that is underway. This research resulted in a position paper, 'Digital Journey', laying out the findings and providing the groundwork for the data management vision for his company, **EnergyIQ**. Jim Crompton reviewed the document and observed that 'it is way too long for a White Paper and too short for a book'. The authors therefore decided to collaborate in expanding the scope of the document to create a book that integrates relevant information from the numerous papers and books that the authors have written over many years within the overall structure established by the Digital Journey position paper.

It is our considered opinion that, while the pace of change with respect to digital technology is increasing at a rapid pace, the essential principles of effective data management are as relevant today as they ever have been, and probably more so. In this book, we attempt to combine lessons learned from the past with insight gained from an analysis of current and emerging technology to help companies who are struggling to define their own journey towards a Digital Transformation.

If you want a good reason for reading our book, it might be that we try to provide an approach to developing a digital strategy from the bottom up, without taking the tempting short cuts, to deliver the data that the business needs to effectively compete in the future. We identify the best practices from an organization, process, and technology perspective that companies should be adopting to prepare for the digital journey. Do not worry, we have waded through all the noise and have the scars to prove it so that you don't have to!

If you want to read a valuable book about data and data management, the digital lifeblood of your organization, by two people who have spent more years than we care to count working with oil and gas data; read on. Do not forget to let us know what you think about our message and how it can be improved.

application of new technology to gain competitive advantage as we emerge from the downturn.

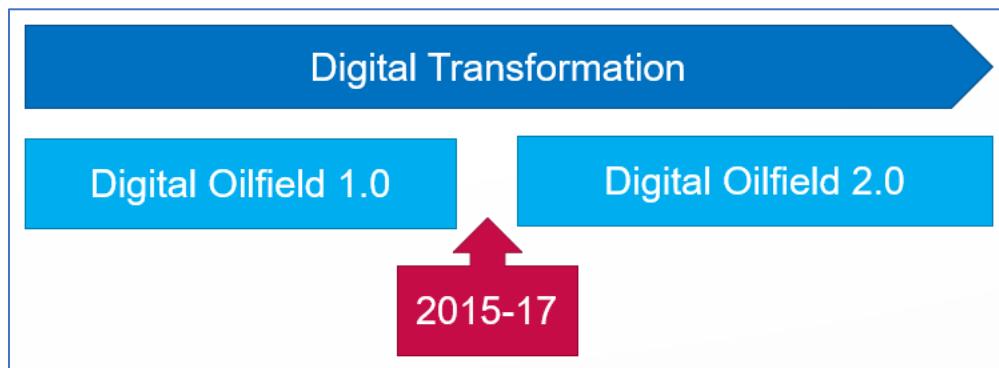


Figure 1.1: Digital Oilfield Transition

Through our review of industry and digital technology trends, we highlight the key changes that are happening today and the impact that this is having on oil and gas operators. It can be a very confusing landscape. The pace of technology change is increasing all the time and barely a week goes by without the emergence of some new product or technology that is going to revolutionize the way that data is captured, visualized, analyzed, or applied to work processes. Consulting firms are inventing new terms all the time designed to position themselves as thought leaders and the only ones that ‘get it’; apparently a data lake is not enough, and the data ocean is now in vogue. In this book, we attempt to make sense of the changes that are underway as part of the Digital Oilfield 2.0. A fundamental premise of this work is that it is not just about the technology; many of the underlying data management principles and organizational issues learned through the school of hard knocks remain the same. From our perspective, some of the important questions to be answered are what role does data management play in this landscape, can we keep up (or catch up) with the pace of change, or are we destined to keep struggling along while the challenges of the past are perpetuated?

Many people see data management just as ‘the technology where data is stored’. Unsurprisingly, we see data management as a more complex and nuanced subject. Effective data governance, managing data through its lifecycle (especially well data), and building a trusted data foundation give a company the chance to not only build valuable solutions through analytics, automation and optimization, but to continue to build scalable, and sustainable solutions over the years. Data is dynamic. Data is an enterprise asset. Data is the fuel that drives the digital journey. Data is no longer the Rodney “I get no respect” Dangerfield of oil and gas companies. And data is becoming more valuable every day. Yet, we still observe that data management often gets neglected at senior levels of the organization and it is left to “bench level” data technician heroes that find ways to muddle through. We see too many

Stage 4: Big Data and Advanced Analytics:

Even though things slowed down in the Oil and Gas Industry after 2014, the digital technology world kept moving forward. The three V's (Volume, Variety and Velocity) hurdle was crossed by Internet retail and social media, with the development of the open source Apache Hadoop technology stack. This sparked interest in these developments and the potential for the E&P industry. Many companies have set up pilots and test environments to learn more. With higher oil prices since 2017, the pace of these experiments has accelerated.

The focus is shifting from Exploration (E), finding more barrels, to Production (P), understanding where to exploit assets to generate positive cash flow and operate lean. The demand for analytics to understand spend and identify workflow inefficiencies has grown just as fast as the price of oil has fallen. As prices recovered, companies want to continue a strong focus on costs, all the while increasing activity (drilling and production). The industry has a technology and data enabled, manufacturing mindset that is trying to operate with fewer engineers and operators, using data driven approaches and field automation. Centers for analytics experts have been started, as well as new tools for 'self-service' business intelligence. Data Science is the new 'cool' discipline; but the demand greatly exceeds supply so almost everyone has had to develop some analysis skills.

It is worth pointing out here, that geoscience remains very important in terms of understanding reservoir properties. Companies that ignore this to focus primarily on engineering run the risk of impacting the efficiency of operations.

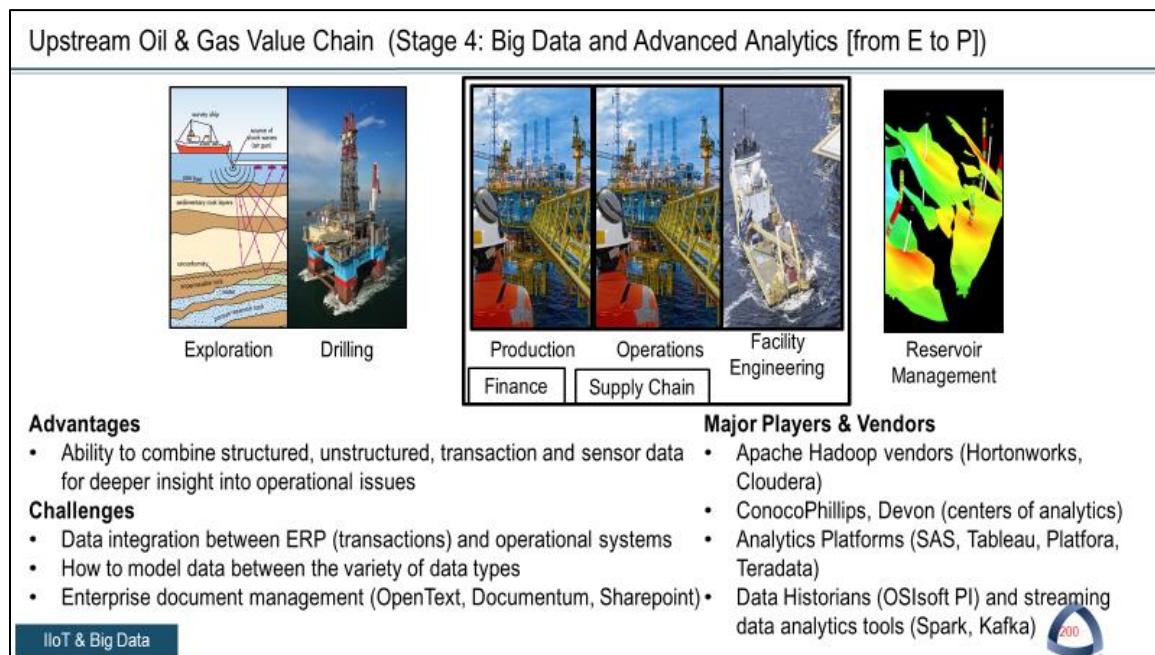


Figure 2.4: Big Data and Advanced Analytics

workflows. It should be part of an individual's or group's responsibility to perform this research on a regular basis.

3.5. What Lessons are being Applied?

The data challenges the industry is facing are not new. While painful, they have been historically more tolerable owing to:

- A reduced focus on efficiency when oil prices were high. These have driven companies to focus on drilling more and more with less of a focus on the efficiency of those operations – Oil and Gas is an information-rich business, it needs to learn from other industries that are also information-rich how to exploit that information.
- The focus has been on driving innovation within specific groups and has not taken a more holistic view of the enterprise. Innovation, is technically challenging and, particularly in large organizations, requires the cooperation of departments that have traditionally operated as fiefdoms with little incentive to collaborate.
- A tendency towards big bang solutions that are long on promises, take forever, and then come up short on actual delivery. Numerous attempts have been made to address exploration data management in the past, but the initiatives end up being huge, expensive, and unwieldy and they are often too driven by IT rather than the business. Companies then tend to run out of patience when results are not forthcoming, or they reorganize.

As the Digital Transformation takes hold, the industry needs to make it a priority to go through the exercise of capturing lessons learned and applying them to other projects. This will help to prevent them from replicating mistakes and ensure that the organization functions more effectively. These actions have manifested themselves into discreet operational and organizational changes within the Digital Transformation community. Some examples of the changes that we have observed that have made a difference to operating companies are listed below.

Establish Strong Business Alignment

The key takeaway from what we have learned regarding operating in a global environment is that we need to better understand and partner with our deployment targets in the future. The following are being done to improve this partnership:

- To give the business units a voice into decisions being made by central organizations, projects should appoint program coordinators within each business unit. These coordinators need to be well respected and trusted by the business unit and fully understand the local complexities and business drivers. Additionally, Regional Advisors located within the central development teams can be a valuable asset. These