OPPORTUNITIES AND CHALLENGES BIG DATA IN OIL AND GAS INDUSTRY

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Abstract.

Big Data space is developing rapidly in all areas, especially in the oil and gas industry. In this paper explores opportunities and challenges big data in oil and gas industry.

Keywords: Big Data, Oil and Gas industry**,** business analytics, business intelligence, predictive analytics, data mining, decision-making.

Introduction

Since the beginning of the twenty-first century, the rapid growth of information has created a serious concern for people going out of Moore's law, socio-economic, security, scientific point of view, has become a complex problem. Storage, management, value creation which has created a serious problem. The problem of data from different sources generated automatically and continuously in real-time processing and analysis of IT (Information Technology) is that inefficient solutions. The current situation "is extremely easy to create data, it becomes extremely difficult to process the" lends credence to the idea. At the same time large-scale hides much of the valuable knowledge. Therefore, it is important to study this technology, relevant. Today, the "Big data" is actually called the abundance of information available.

According to forecasts from the International Data Center's 2013 reports, the digital universe for the Oil and Gas industry includes 2.7 zettabytes of data. With the high rate of data expansion, companies are scrambling to develop ways to develop near-real-time predictive analytics, data mining capabilities and are expanding their data storage infrastructure and resources. With these new goals, come the challenges of managing data growth, integrating disparate business intelligence tools, and analyzing the data to glean useful insights.

Oil and Gas (O&G) companies as well as oil field service providers, now have more upstream data (structured, unstructured as well as real-time) than ever before; to base their operational decisions relating to exploration, drilling or production. For this reason effective, productive, and on demand data insight is critical, for decision making within the organization.

Today a vision towards an integrated Exploration and Production (E&P) data management platform, still remains a challenge as extraction of business critical intelligence/insights from large volumes of data in a complex environment of legacy diverse systems, and fragmented/decentralized solutions is a daunting task.

However, by maximizing the use of these resources to create value for society and the business sector, there is a need for a new generation of analytical technologies. In this regard, the major theme of the scientific researchers, decision makers and politicians or government agencies, as well as by representatives of the business community and has attracted great attention.

Like it or loathe it, Big Data Analytics is most definitely coming to the Oil and Gas industry. If look at the conferences (*SPE Big Data and Analytics conference, the upcoming ECIM conference The Annual European E&P Data and Information Management Conference, EAGE workshop on Oil and Gas Business Analytics and so on.*) held in the world, covering oil and gas professional societies, and you will see that this is a serious actual topic.

Definition of Big Data

The topic of ''big data'' has attracted significant attention throughout the past 10 years and, as a result, academics and trade journals have created several competing definitions of big

data. Clearly, size is the first characteristic that comes to mindconsidering the question "what is big data?" However, other char-acterics of big data have emerged recently. For instance, Laney suggested that Volume, Variety, and Velocity (or the ThreeV's) are the three dimensions of challenges in data management. The Three V's have emerged as a common framework to describe big data. In addition to the three V's, other dimensions of big data have also been mentioned. IBM coined Veracity as the fourth V, Oracle introduced Value. Any data that is characterized by 5 Vs like Volumes, Velocity, Variety, Value and Veracity can be classified as Big Data. They may exist in various forms like structured, semi-structured or unstructured. Depending on the need any oil and gas data could be a big data. The data has always been the backbone of decision making process. Business thrives or dies on quality of decisions made at various level in any industry.

Opportunities

For Oil and Gas firms understanding, leveraging and unleashing the power of data and the information derived will help to:

- Remain competitive throughout planning, exploration, production and field development

- Maximize production with regard to maintenance and forecasting

- Reduce time to first oil/gas, lower operating costs and improve the productivity of assets across the life cycle

- Ensuring the seamless, automated availability of right information to the workforce at right time

So with Big data we can - Reduce costs, Improve decision making and operational performance, Achieve greater efficiencies in Business processes, Gain new insights, by combining and analysing data types in different ways and Develop new business models with increased market presence and revenue. As a result we can say Big Data is equal to Big Return on Investment (ROI).

Big Data Examples of Oil & Gas Industry

The processes for Oil and Gas exploration, development and production generate large amounts of data. The data volume grows daily. Seismic, logs, surveying and real-time measurements data can form the big data examples. The different data formats like DLIS, LIS, SEGx,Videos, Docs, PDFs, XLS, CSV, graphics, OGP Px, XML, RDBMS etc are present. The intelligent wells or intelligent producing fileds like real time drilling data continuously feed our systems along with senor or telemetric data at many places. While we are acquiring this data we also need to organize analyse and decide the actions on such data.

Industry Challenges

The oil and gas industries are facing major challenges – the costs of extraction are rising and the turbulent state of international politics adds to the difficulties of exploration and drilling for new reserves. In the face of big problems, its key players are turning to Big Data in the hope of finding solutions to these pressing issues. Big Data is the name used to describe the theory and practice of applying advanced computer analysis to the ever-growing amount of digital information that we can collect and store from the world around us. Over the last few years businesses in every industry have enthusiastically developed data-led strategies for overcoming problems and solving challenges, and the oil and gas industries are no different.

Surveying of potential sites involves monitoring the low frequency seismic waves that move through the earth below us due to tectonic activity. Probes are put into the earth at the spot being surveyed, which will register if the pattern of the waves is distorted as they pass through oil or gas.

As well as exploration, Big Data is being put to use to streamline the transport, refinement and distribution (retail) of oil and gas. Shell is vertically integrated, and therefore involved in every aspect of the process through to packaging and selling it to the consumer as fuel for their car for heating their home. Refineries have limited capacity, and fuel needs to be produced as close as possible to its point of end use to minimize transportation costs. Complex algorithms take into account the cost of producing the fuel as well as diverse data such as economic indicators and weather patterns to determine demand, allocate resources and set prices at the pumps.

Of course, we've long been conscious of the fact that we could eventually use up all of the non-renewable oil and gas buried under the earth – perhaps sooner than we think. While this is an environmental concern to us all. However new techniques are being developed to use the data that is being collected from probing and drilling these sites to help pinpoint other locations where reserves could be hiding.

All of these elements form the "big picture" – every part of which must be synchronized if a company is going to prosper in the costly, dangerous and highly competitive field of oil and gas production. Thanks to big data analytics, the interconnection between these elements of the business can be examined and monitored in detail. This means models can be built and simulations created by analysts, to explore how minor tweaks to a certain area of operations could have big impacts on the productivity or efficiency of another. The vast amount of data collected from all areas of the company's activity means the result of the simulations will hopefully be as close as possible to the way things will play out in the real world. Ultimately this leads to decision-makers being better equipped to make the decisions that affect the company's fortunes.

Today, the need to collect more data for competitive and informed decision-making is driving the industry to address Big Data within E&P and Drilling. The desire to better understand subsurface has driven oil and gas companies to collect more data and different types of data at higher frequencies. Thanks to real-time data collection, the amount of data being gathered from seismic activity, drilling process, logging activity, production activities, downhole sensors, etc has dramatically increased over the past years. On the other hand; data analysis is the key for the success of the businesses. The industry deals with huge quantities and varieties of data on one hand, and ever-faster expectations for analysis on the other.

A unique opportunity has been emerging technologies of Big Data for the oil and gas industry to address the challenges within E&P and Drilling. A unique opportunity emerging technologies of Big Data for the oil and gas industry to address the challenges within E&P and Drilling.

Some typical challenges for E&P data management are:

• Upstream focused applications are at a functional level. So, substantial time is spent in data collection and running reports for a given asset level i.e. for a single well or aggregate wells in a given location

    • A major number of applications are still non PPDM (Professional Petroleum Data Management Association) based, which makes the reports and KPIs non-accurate at most times

    • It is difficult to drive insights from unstructured data lying in multiple applications

    • It is difficult to run predictive analytics as data is spread out in multiple systems with lesser integrity and reference to master-level data.

Conclusion

We are entering a new era of unprecedented data availability, where digital trends are disrupting traditional business models. These trends have enabled the emergence of Big Data and Advanced analytics, which is rapidly becoming a big industry. The Oil and Gas industry lags the leading industries when it comes to broad based adoption. However, four key applications are emerging for Big Data in Oil and Gas companies; Digital fields, Predictive plant and drilling analysis, Remote operations and Reservoir modelling and seismic imaging. Companies can get ahead in the game by taking the right approach - adopting key success factors, and avoiding typical pitfalls. Our research suggests that, if done right, significant value can be captured from Big Data and Advanced analytics.

'Big Data' solution refers to the use of such voluminous, of ten unstructured data sets to detect patterns and extrapolateinformation otherwise undetectable to the human eye. Oil and Gas companies need Big Data solutions to economically extract value from very large volumes of a wide variety of data generated fromexploration, well drilling and production devices and sensors,

byenabling high velocity capture, discovery and or effectivelypredicting power supply and demand.

Big Data Challenges in the Oil and Gas Industry:

- Exponentially increasing volume of data from different sources (structured, unstructured as well as real-time) during a well lifecycle
- Oil and Gas companiesspend heavily in E&P datamanagement, handlingstreams of oftenincompatible data fromdifferent stages of a welllifecycle
- Geologists and Geophysicist steams using a mix ofdifferent software productsfor data interpretation anddecision-making
- Difficulty in using datato quickly andefficiently respond touser needs
- Large volume ofdomain-specificinformation embeddedin each data cluster

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