Using Analytics to Improve Production

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Analytics in Energy – Chasing Barrels

Capital Investment Forecast

- 2013: £14.4Bn
- 2016: £7Bn

Production from Assets

- 2010: 38%
- 2013: \( \times \text{44} \)

Exploration Wells Drilled

- 2008: \( \times \text{15} \)
- 2013: \( \times \text{15} \)

Operating Expenditure

- 2013: £9.6Bn
- 2014: £8.9Bn

\$$ per BOE

or

BOE per \$$
Donald Rumsfeld on analytics

- **Things we know**
  - We know facts which may be wrong and should be checked against data.

- **Things we don’t know**
  - We don’t know questions we can answer by reporting, which we should baseline & automate.

- **Things we don’t know**
  - We don’t know intuition which we should quantify and teach to improve effectiveness, efficiency.

- **Exploration**
  - Exploration which is where unfair advantage and interesting epiphanies live.

(Or rather, Avinash Kaushik channeling Rumsfeld)
Analytics and ‘BIG DATA’

Consultants say three quintillion bytes of data are created every day.

It comes from everywhere. It knows all.

According to the book of Wikipedia, its name is ‘big data.’

Big data lives in the cloud. It knows what we do.

In the past, our company did many evil things.

But if we accept big data in our servers, we will be saved from bankruptcy.

Let us pay.

Is it too late to side with evil?

Shhhh! It hears you.
Chief Idea Killer

VP of No
- Director of Onerous Reporting

VP of Status Quo
- Director of Bureaucracy

VP of Stay the Course
- Director of Analysis Paralysis
- Manager of New Growth Ideas (Vacant)
Stay away from negative people. They have a problem for every solution.
Field Monitoring - Which one is you?

"Watching TV"
Analytics and ‘………. Fast Data’

- **Fibre Optic Monitoring … Sensors, Sensors, Sensors**
  - Distributed Temperature Sensing (DTS)
  - Distributed Acoustic Sensing (DAS)
  - Distributed Temperature and Strain Sensing (DTSS)
  - Microseismic
  - …….  
  - DAS system generates 5 TB per day (ultrasensitive 1 TB per hour)

- **Data Blending and Visualisation**
  - Quantitative rather than qualitative
  - Flow metrics, profiles and fingerprinting
  - Optimisation
  - Predictive and Event Driven Analytics
Analytics for Energy Production Process - DATA

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A
Analytics for Energy Production Process - DATA

- D - Despair
- A
- T
- A
Analytics for Energy Production Process - DATA

- D
- Apathy
- T
- A
Analytics for Energy Production Process - DATA

- D
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- Terror
- A
Analytics for Energy Production Process - DATA

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- T
- A - Aggression
E&P IT Requires a New Approach

“I know what I need”
- Business determines what questions to ask
- CLASSIC BI
  - Structured
  - Repeatable

“Capture only what is needed”
- IT structures data to answer those questions
- Business explores data for questions worth answering

“I don’t know what I need!”
- IT delivers platform to store, refine & analyze all data sources
- Self-Service DISCOVERY
  - Multi-Structured
  - Iterative

“Capture everything”
- Business determines what questions to ask
Action is driven *solely* from historical context.

Action is driven by real-time events and anticipated outcomes.
Analytics for Production
What are the trends?

Operating Costs?
Replacement Costs?
Production Forecast?
Spares inventory?
Unplanned downtime?
Bottom line impact?
Analytics Use Cases

Data-Driven Decisions Producing Positive Business Outcomes

**Root Cause Analysis**
Understand “why?” to fix problems or apply best practices

**Optimization**
Improve efficiency to increase profitability

**Growth**
Uncover hidden opportunities to grow the business
Use Case: Root Cause Analysis

Root Cause Analysis

Understand “why?”

Examples:
- Why products fail
- Why customers churn
- Why customers buy
- Why processes fail
- Why a process works better
- Why staff leave
- Why accidents happen
- How fraud happens
- How compliance gets breached

Quickly diagnose why something happened in order to fix a problem or apply best practice

- Combine data from a multitude of sources within a single analysis
  - See side-by-side all aspect that may contribute to an outcome
- Highly interactive, visual analytics to fluidly ask & answer questions of the data
- Ability to drill down deeply into the minute details, when necessary
Identify opportunities for efficiency and improvement in order to cut costs & increase profitability

- Combine data from a multitude of sources within a single analysis
  - Enables the strongest optimization determination
- Use flexible analytic capabilities to find the most cost-effective or highest achievable choice
- Use visual & statistical methods to make comparisons & identify outliers
Use Case: Growth

Explore opportunities & weigh alternatives to determine how to grow the business

- Use statistical analysis to find significant information
- Forecast performance to determine whether an alternative course is required to achieve desired results
- Conduct “what-if” analysis comparing potential outcomes to determine actions that will have the most positive impact

Growth

Uncover hidden opportunities

Examples:
- Identify new markets
- Determine best locations
- Identify new targets
- Forecast trajectory
- Determine strongest investments
Analytics for Production Template Workflows

- TIBCO Spotfire examples
An analytics platform that can provide value to the organization across the full spectrum of use cases.
Real enterprise self-service BI provides an IT organization the key capabilities that are needed right out of the box whereas competitors have to partner with multiple 3rd party vendors to provide the same functionality.

GeoAnalytics and Mapping

Data Integration

Predictive Analytics

Real time and Mobility
Analytic Use Cases in Energy

**Exploration & Production**
- Prospect Evaluation
- Production Optimization
- Geochemical Fingerprinting
- Completion Optimization
- EUR Prediction and Analysis
- Drilling NPT reduction
- Reserves Analysis
- Well Optimization
- Permit Evaluation
- Unconventional SAGD Optimization

**Operational Efficiency**
- Asset Integrity and Availability Modeling
- Lease Operating Cost Analysis
- Root Cause Analysis of Unplanned Outages
- Failure Prediction / Reliability Analysis of Critical Equipment
- Maintenance Program Optimization
- Supply Chain Optimization

**Oilfield Services**
- NPT Root Cause Analysis
- Corporate Dashboard
- Drilling and Completion Optimization
- Revenue and Profitability Analysis Across Products, Services, Customers and Regions
- HSE Incident Tracking
- Maintenance Schedule Optimization
- Project Management

**Commercial Operations**
- Retail Analytics and Outlet Management (Performance, Territory Analysis)
- Sales Volume Forecasting
- Netback Analysis
- Competitive Intelligence
- Energy Trading and Risk Management
- Trade Surveillance
- Currency Hedging and Tax Liability

**Corporate Functions**
- HSE Incident Analysis
- Strategic Planning
- Portfolio Optimization and Capital Planning
- Talent Management
- Corporate Dashboard
- Procurement Analytics
- System & License Usage & Uptime Analysis
- Cyber Threat Analysis

Companies: ExxonMobil, Chevron, TOTAL, ENI, bp, Shell, Statoil, HALLIBURTON, MAERSK OIL, ConocoPhillips, Apache, GE, Nexen, Schlumberger, HESS, Hess, Devon, Anadarko, bhp billiton, Schlumberger, Chester, exco
Avails+ Collaborative Forecasting Methodology (Kuwait Oil Company, North Kuwait)

Development and Implementation of the AVAILS+ Collaborative Forecasting Tool for Production Assurance in the Kuwait Oil Company, North Kuwait

(Al-Saad, Murray, Vanderhaeghen, Kansao, Yannimaras, 2013 / SPE 167375)
1. Data quality assurance and quality control
2. Role-based security, access, authentication
3. Master data management and data dictionary
4. System management: archival, audit, recovery
• Provide sophisticated filtering, pattern recognition and advanced analytics to **mine large quantities of operational sensor data**
• Leverage existing operational infrastructure and applications
• Examples:
  – Determine well settings to optimize production
  – **Recommend actions when unexpected events** take place, e.g. shut-ins, storage capacity limits
  – **Predict possible imminent failure** and propose remedial action plan (used in other situations)
Electric Submersible Pump (ESP) Monitoring

- **ESP Monitoring & Value**
  - Pump health & performance surveillance
  - Condition-based maintenance
  - Downhole equipment reliability
  - Warranty cost recovery

- **Analysis**
  - Effects of operating conditions on ESP performance
  - Which suppliers contribute to overall reliability
  - Which systems should Engineering focus on
  - Continuous operations improvement from field feedback

- **Results**
  - Component faults and failure reports
  - Components removals & related dependencies
  - Production reports
  - Prioritization of re-engineering and retrofit programs
  - Supplier collaboration and involvement in system reliability programs
• Right technologies
  – Maturing projects: enhance value, deliver new production, increase oil recovery
  – New fast track projects: deliver volume growth, significant contribution to production value, expand reserves

• Right portfolio
  – Reduce global projects spend by identifying and halting bad projects pre-drill/pre-final investment decisions early
  – Reduce time to first oil by 1-2 years by benchmarking (compare internal/external) through global collaborative comparison/discussion

• Right partnerships
  – Identify global and local, vendors and distributors that enhance delivery from our projects/strategies/assets
  – Source local resources/raw materials supplies where possible

• Right operating processes
  – Ensure compliance with global data governance/security with consistent, timely and repeatable analytic processes
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Thank you
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