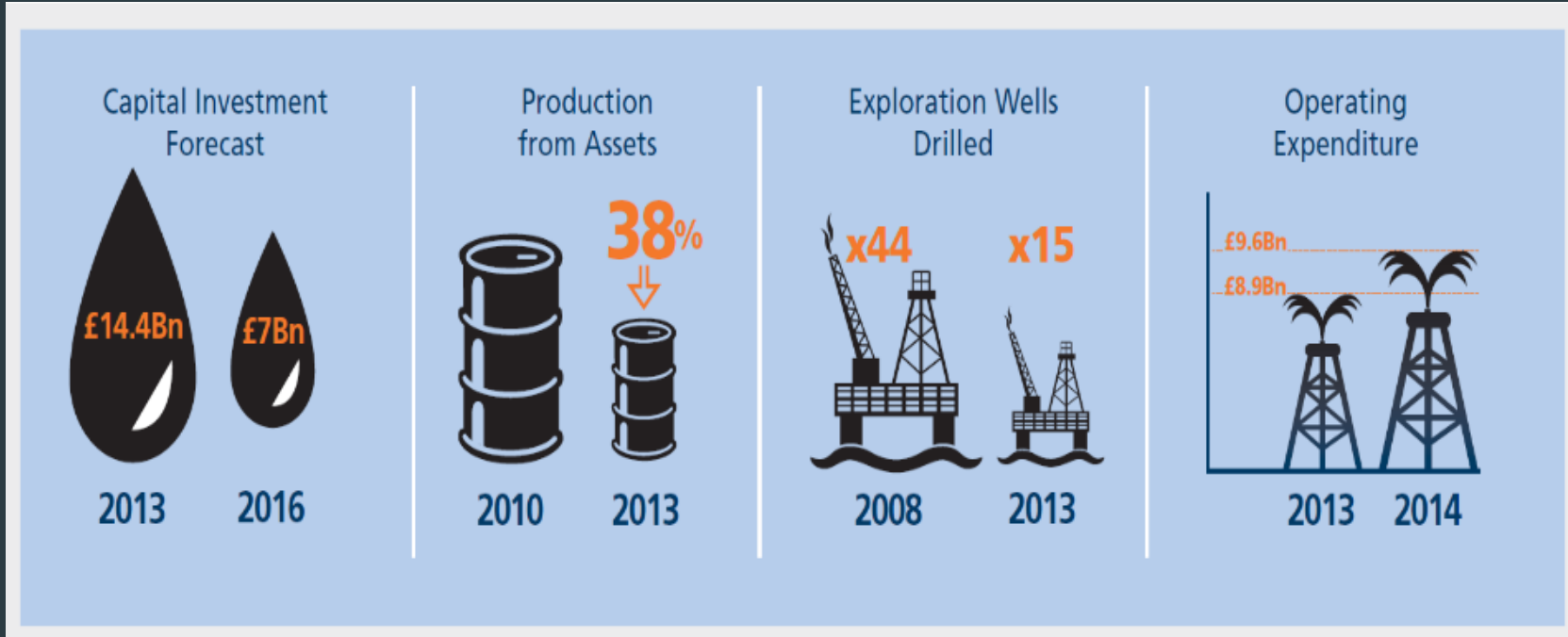# Using Analytics to Improve Production

Digital Energy Journal – Aberdeen Treetops
29th September 2015

Jonathan Guthrie
GreyCloud Limited – Analytics for Energy
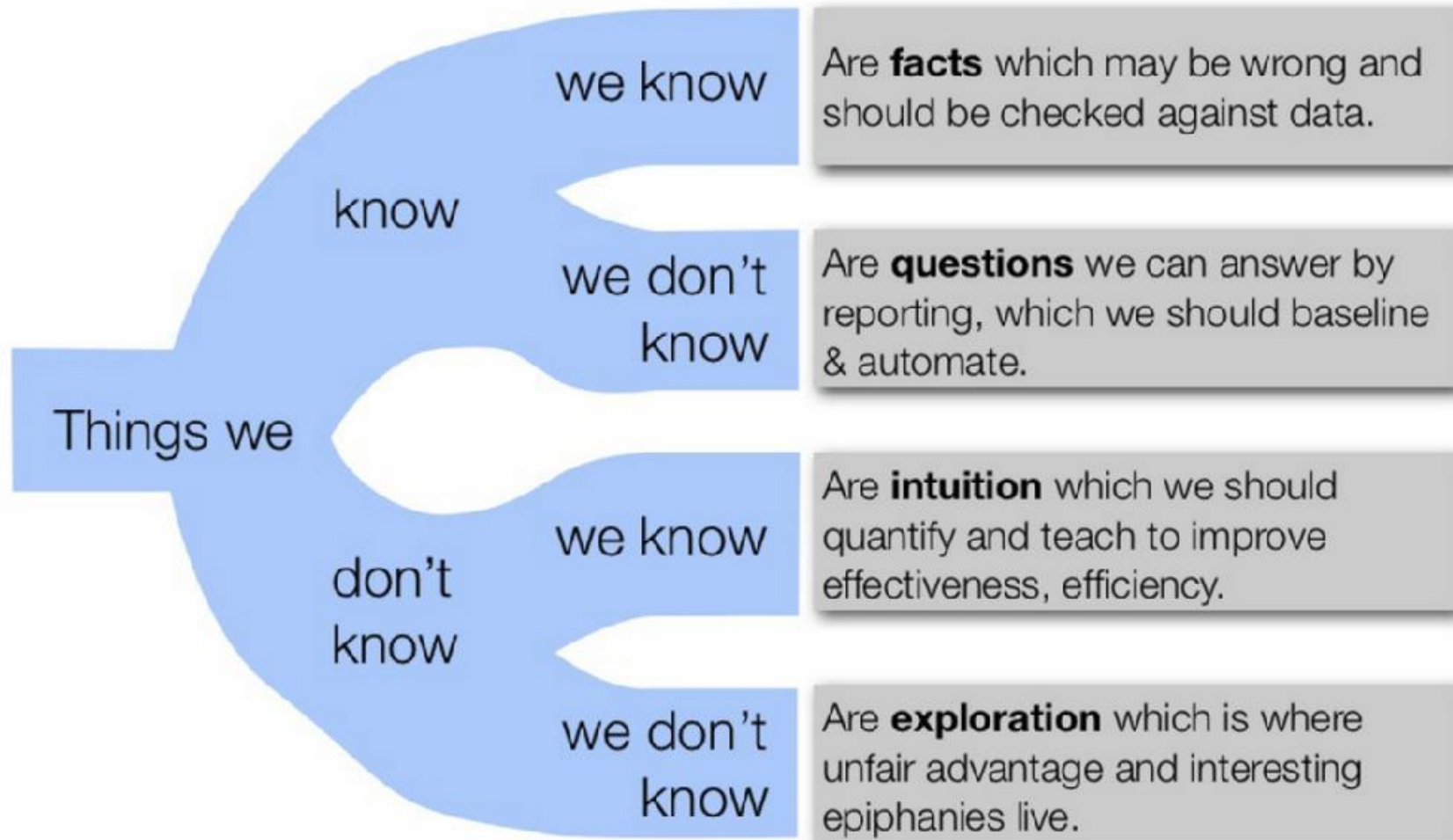
Analytics in Energy – Chasing Barrels

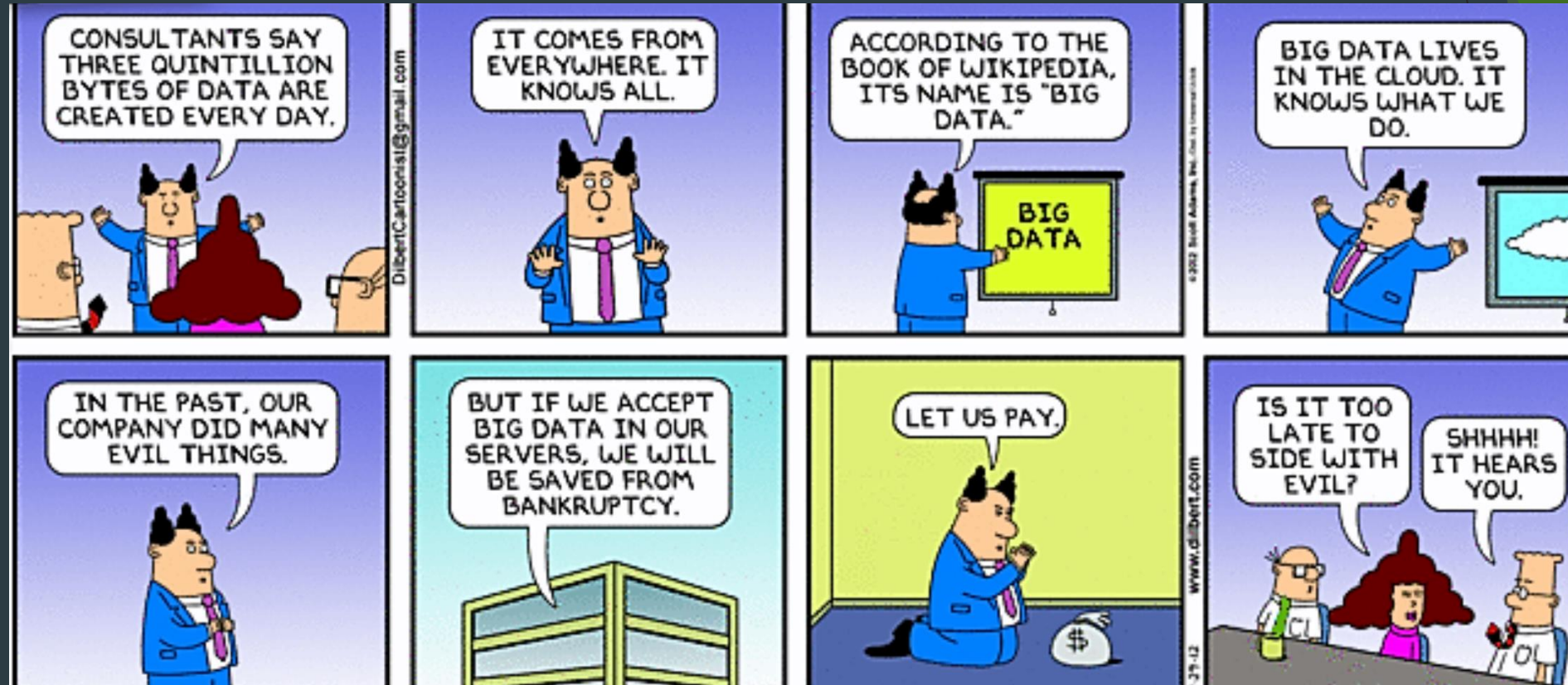Capital Investment Forecast — £14.4Bn (2013), £7Bn (2016)

Production from Assets — 38% ↓ (2010 to 2013)

Exploration Wells Drilled — x44 (2008), x15 (2013)

Operating Expenditure — £9.6Bn, £8.9Bn (2013, 2014)

$$ per BOE

or

BOE per $$

Using Analytics

Donald Rumsfeld on analytics

Things we know → we know → Are **facts** which may be wrong and should be checked against data.

Things we know → we don't know → Are **questions** we can answer by reporting, which we should baseline & automate.

Things we don't know → we know → Are **intuition** which we should quantify and teach to improve effectiveness, efficiency.

Things we don't know → we don't know → Are **exploration** which is where unfair advantage and interesting epiphanies live.
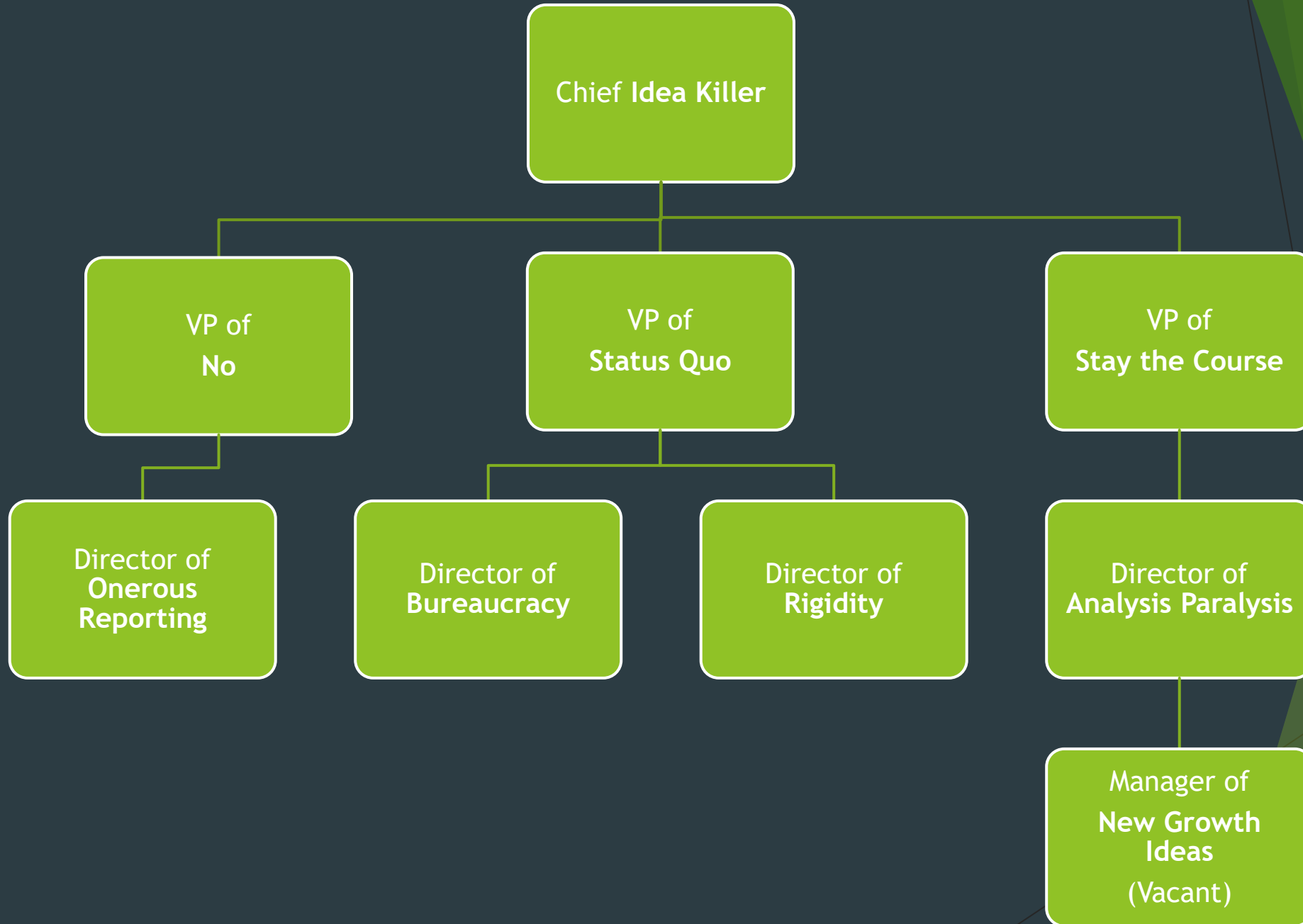
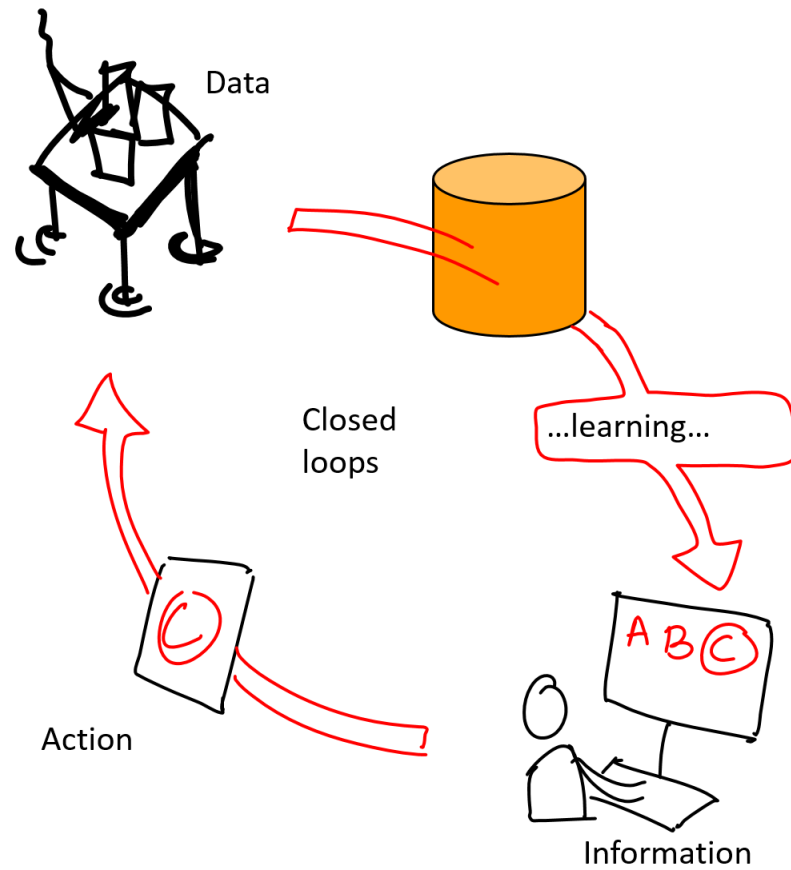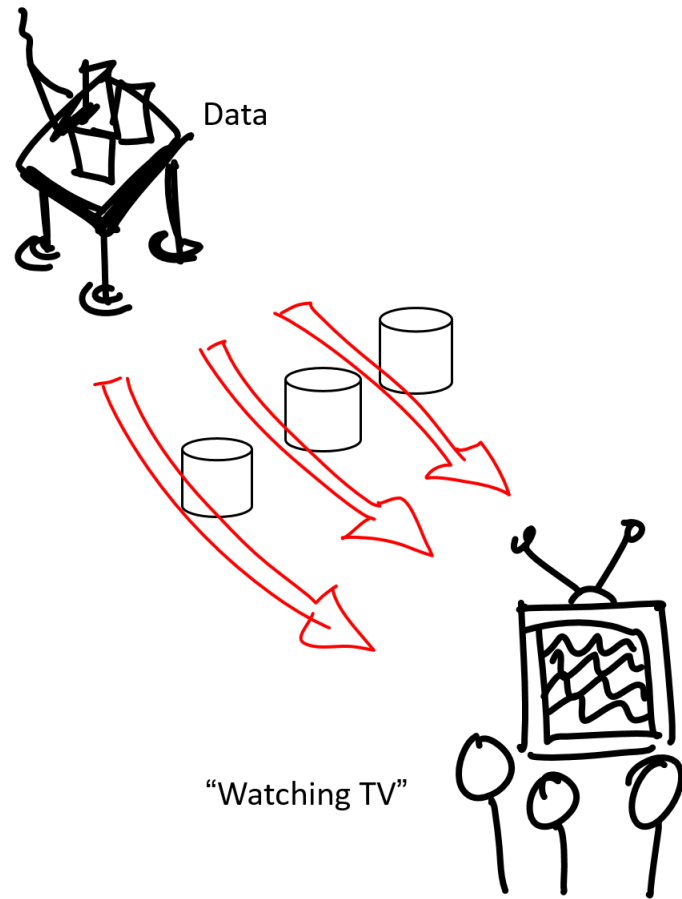(Or rather, Avinash Kaushik channeling Rumsfeld)

Analytics and 'BIG DATA'

Stay away from negative people. They have a problem for every solution.

Field Monitoring – Which one is you?

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

- D

- A

- T

- A

Analytics for Energy Production Process - DATA

- D ▸ Despair

- A

- T

- A

Analytics for Energy Production Process - DATA

- D ▶
- A ▶ Apathy
- T
- A

Analytics for Energy Production Process - DATA

▶ D ▶

▶ A ▶

▶ T ▶ Terror

▶ A

Analytics for Energy Production Process - DATA

- ▶ D ▶

- ▶ A ▶

- ▶ 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

"Capture everything"

IT delivers platform to store, refine & analyze *all* data sources

Self-Service DISCOVERY
- Multi-Structured
- Iterative

"I don't know what I need!"

Business explores data for questions worth answering

DATA AT REST

- Action is driven *solely* from historical context

- Action is driven by real-time events and anticipated outcomes

DATA IN MOTION

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	Optimization	Growth
Understand "why?" to fix problems or apply best practices	Improve efficiency to increase profitability	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

Use Case: Optimization

Optimization

Improve efficiency

Examples:
- Improve processes
- Ensure compliance
- Optimize routes
- Drill better wells
- Use better equipment
- Improve quality of products
- Improve customer service
- Develop stronger offers
- Ensure we meet targets
- Improve spend

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

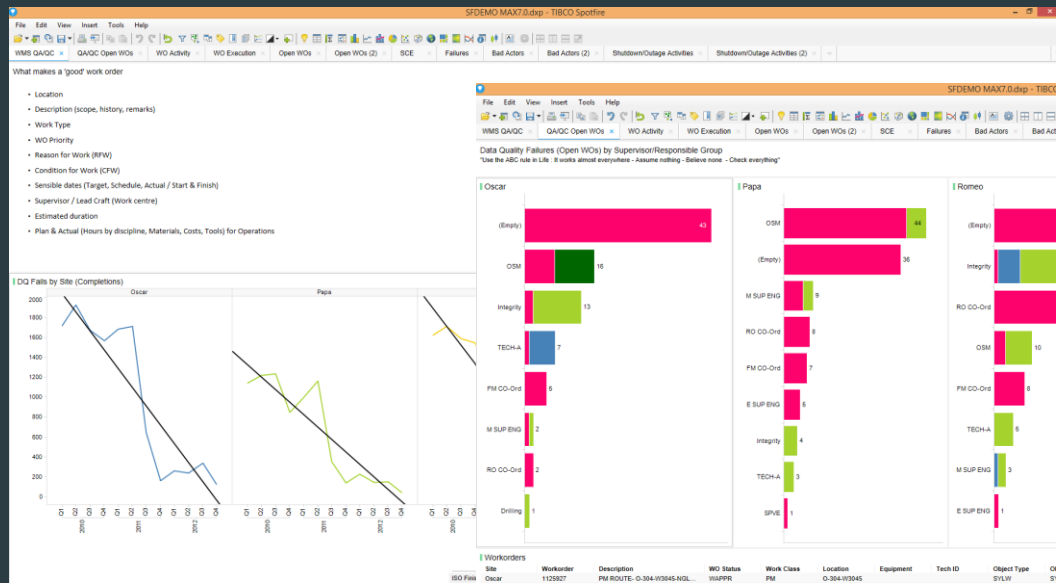## Growth

Uncover hidden opportunities

Examples:
- Identify new markets
- Determine best locations
- Identify new targets
- Forecast trajectory
- Determine strongest investments

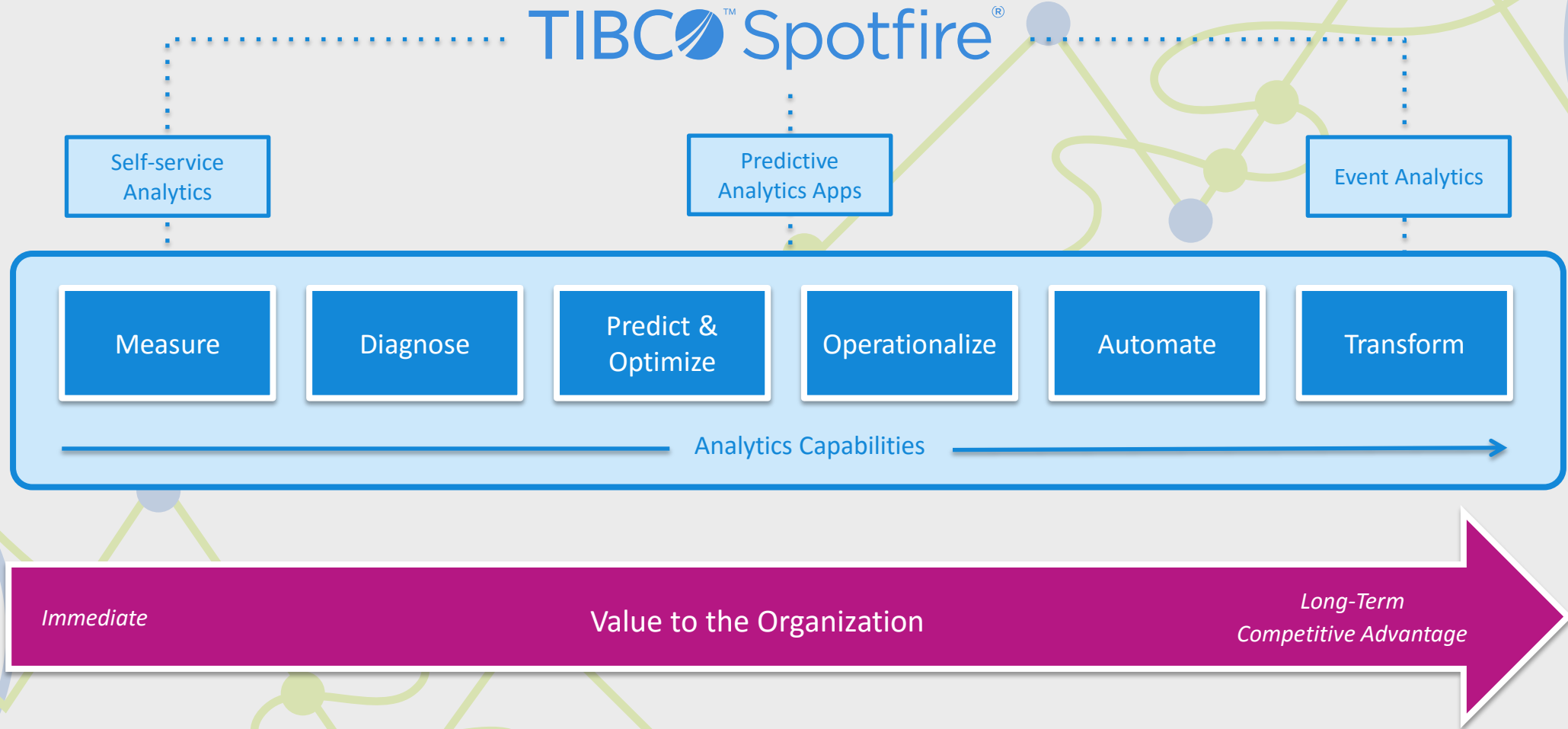Explore opportunities & weigh alternatives to determine how to grow the business

- 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

Analytics for Production Template Workflows

▶ TIBCO Spotfire examples

Analytics Value Model

TIBCO™ Spotfire®

| Self-service Analytics | | Predictive Analytics Apps | | | Event Analytics |

| Measure | Diagnose | Predict & Optimize | Operationalize | Automate | Transform |

Analytics Capabilities →

Immediate — Value to the Organization — Long-Term Competitive Advantage

An analytics platform that can provide value to the organization across the full spectrum of use cases

Enterprise Self-Service BI – Which Would You Rather Support and Maintain…

TIBCO Spotfire =

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
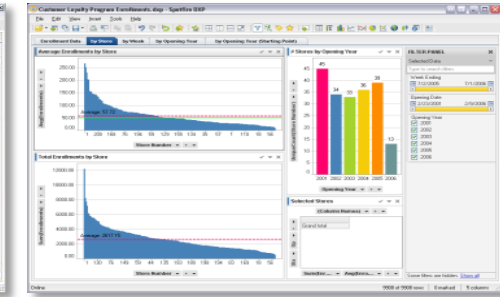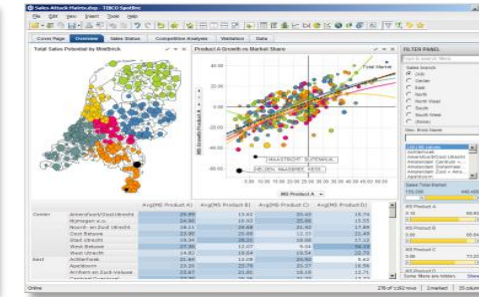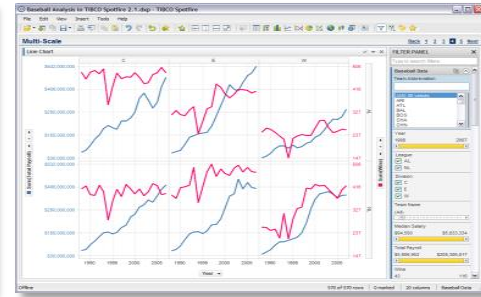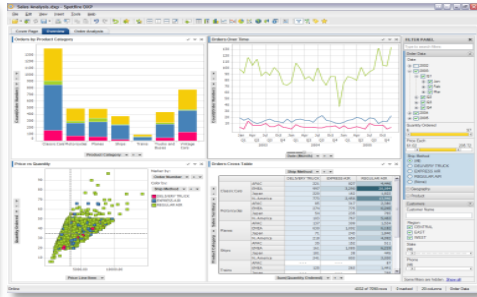
tableau   Urban Mapping

GeoAnalytics and Mapping

tableau   informatica   CIRRO

Data Integration

tableau   alteryx   REVOLUTION ANALYTICS

Predictive Analytics

tableau   METRIC INSIGHTS   splunk>

Real time and Mobility
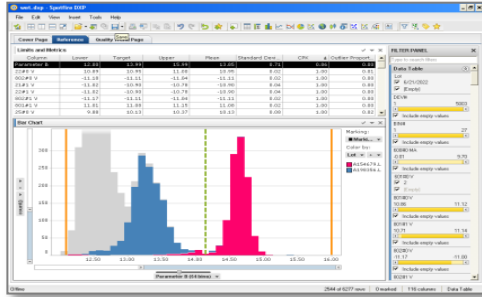
Exploration & Production

- 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

Avails+ Collaborative Forecasting Methodology (Kuwait Oil Company, North Kuwait)

Executive

Platform Services (TIBCO Spotfire®)

Forecasting Assumptions, Inputs, & Variables

Asymmetric Filtering

Data Integration Layer

OFM   FINDER   OPENWORKS   OTS

File Share   Web Services

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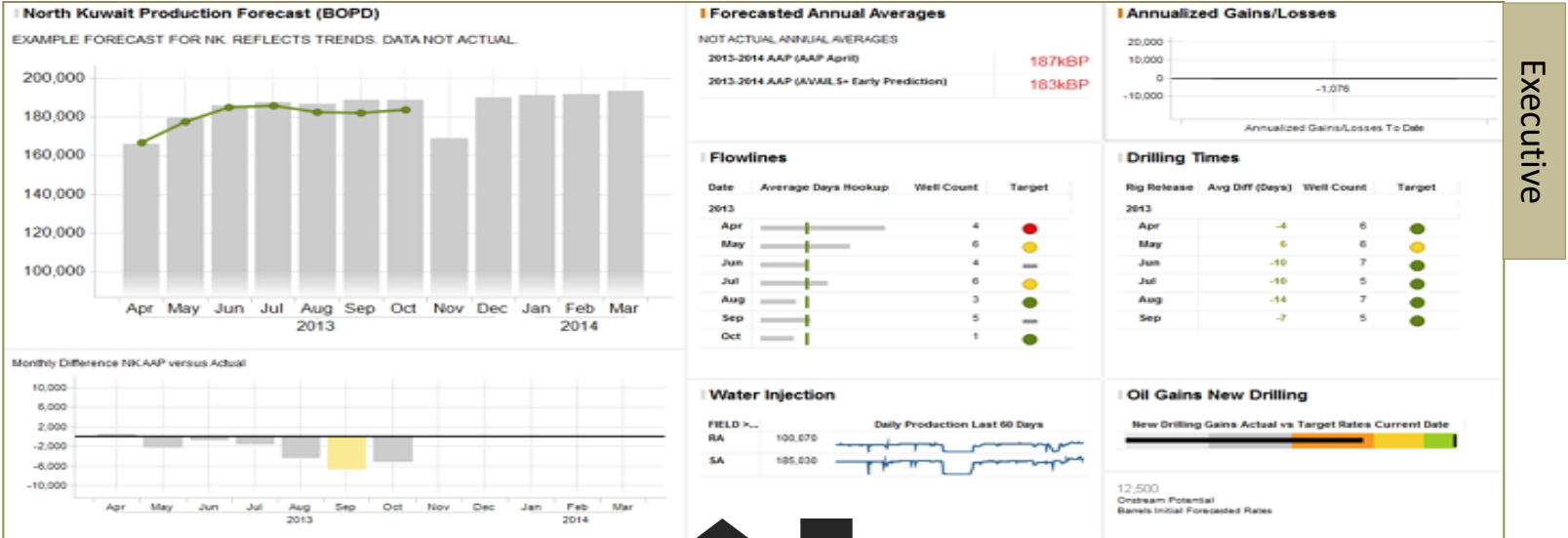
Development and Implementation of the AVAILS+ Collaborative Forecasting Tool for Production Assurance in the Kuwait Oil Company, North Kuwait

(Al-Saad, Murray, Vanderhaeghen, Kansao, Yannimaras , 2013 / **SPE 167375**)

Society of Petroleum Engineers
2013 KOGS
Kuwait Oil & Gas Show and Conference

QRI

Integrated Field Monitoring – Eagle Ford

Data acquisition → **Data integration** → **Data analysis**
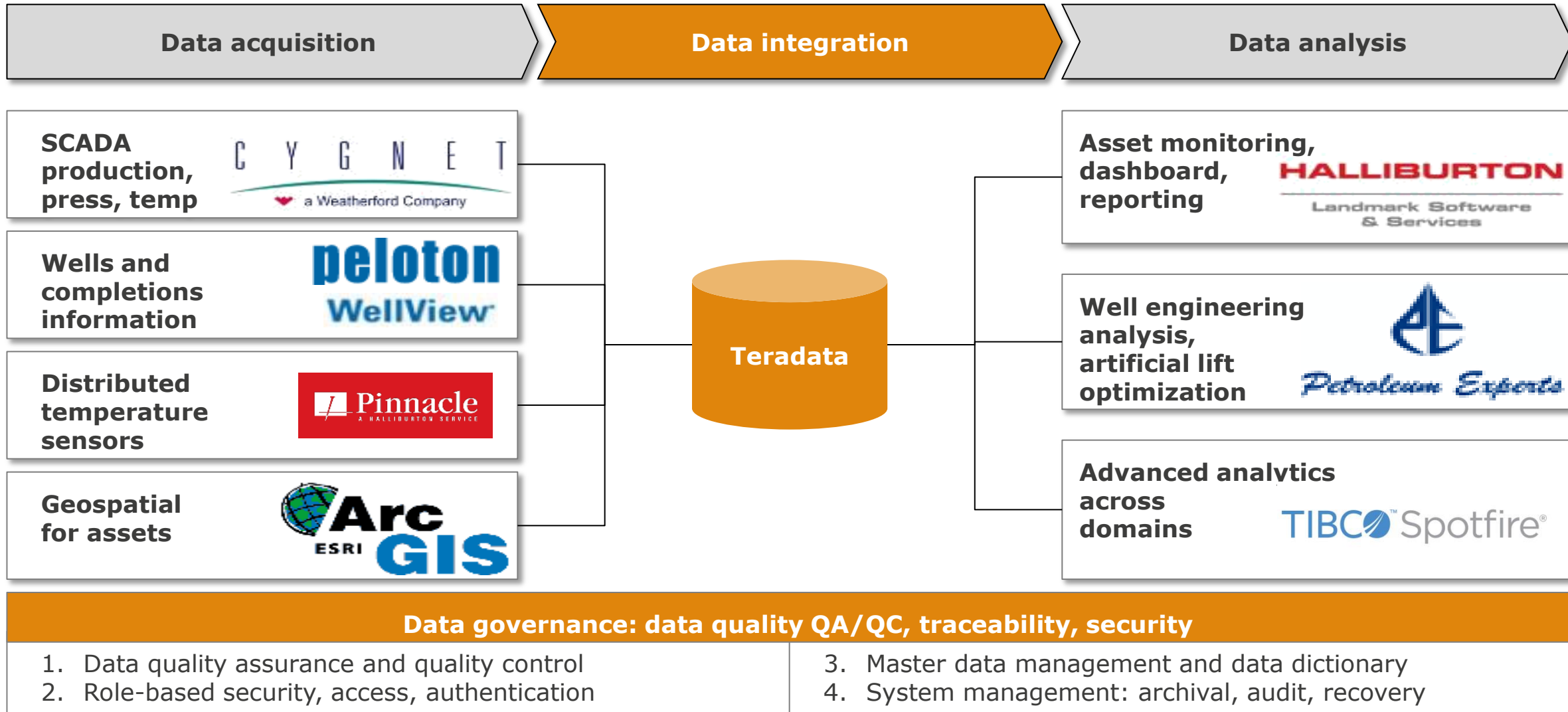
SCADA production, press, temp — CYGNET a Weatherford Company

Wells and completions information — peloton WellView

Distributed temperature sensors — Pinnacle A HALLIBURTON SERVICE

Geospatial for assets — ArcGIS ESRI

Teradata

Asset monitoring, dashboard, reporting — HALLIBURTON Landmark Software & Services

Well engineering analysis, artificial lift optimization — Petroleum Experts

Advanced analytics across domains — TIBCO Spotfire

Data governance: data quality QA/QC, traceability, security

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)
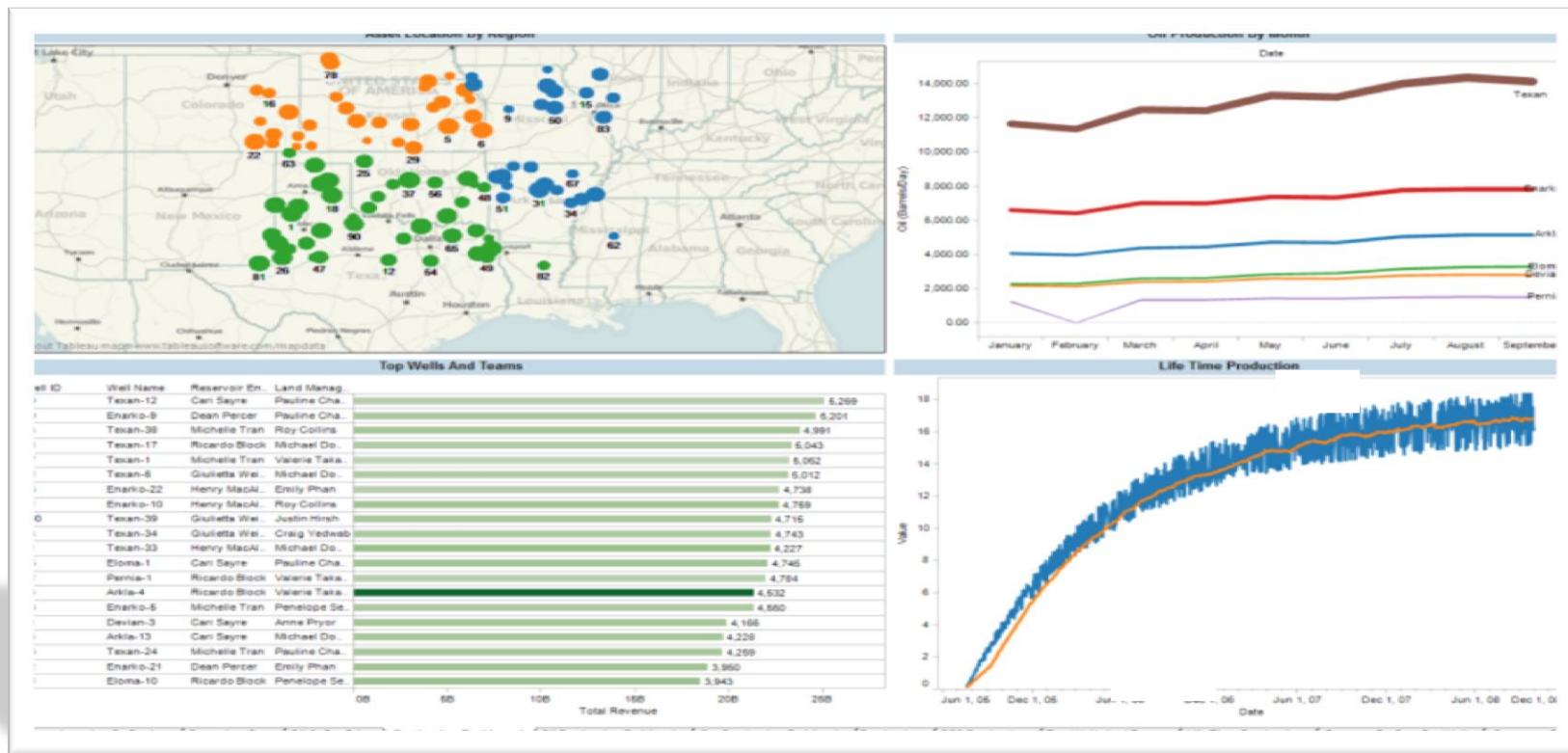
Electric Submersible Pump (ESP) Monitoring

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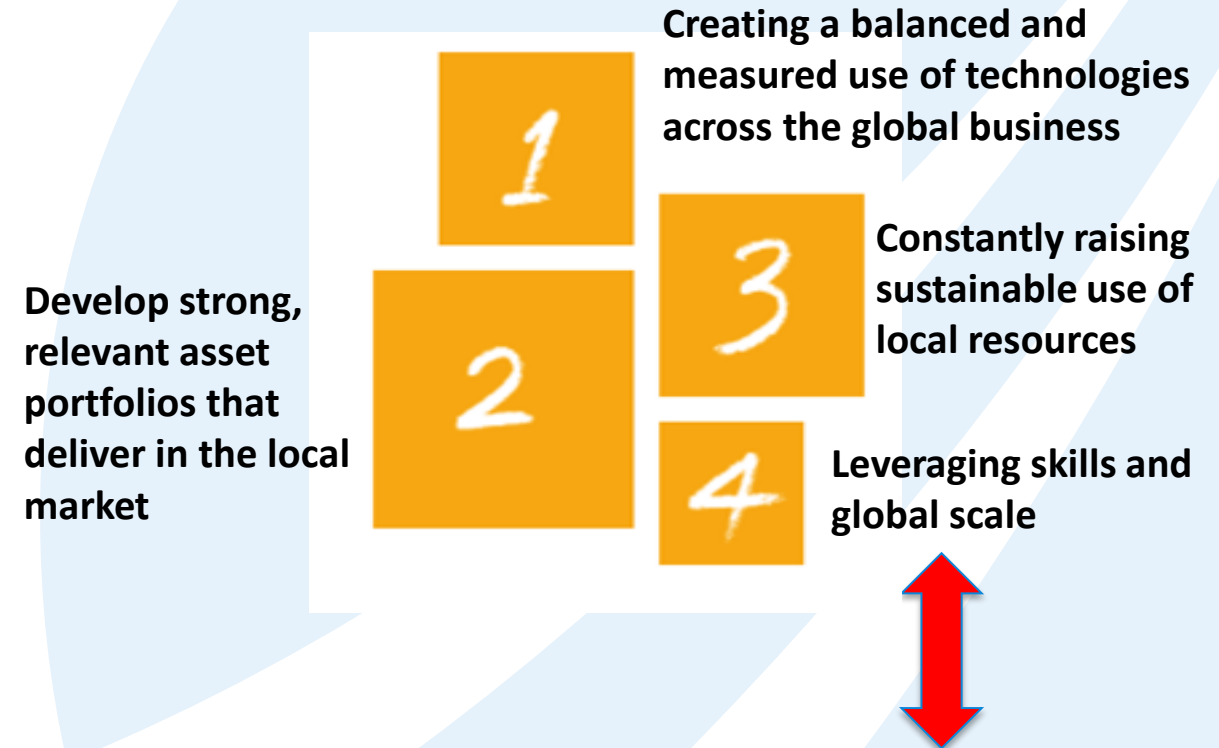- **Right portfolio**
  - Reduce global projects spend by identifying and halting bad projects pre-drill/pre-final investment decisions early
  - Reduce time to first oil by 1-2 years by benchmarking (compare internal/ external) through global collaborative comparison/discussion
- **Right partnerships**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

Creating a balanced and measured use of technologies across the global business

Constantly raising sustainable use of local resources

Develop strong, relevant asset portfolios that deliver in the local market

Leveraging skills and global scale

Using Analytics to Improve Production

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Thank you

Jonathan Guthrie – GreyCloud Limited

Analytics for Energy

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