Your Innovation Partner

The Oil & Gas Technology Centre

Your Innovation Partner

Digital Landscaping Study of the Oil & Gas Sector

May 2019

Discussion

Introduction to the OGTC

- Digital landscaping study of the oil and gas sector – application of data analytics
- Study outcomes and recommendations
- Data analytics – applying analytics
- Future opportunities to innovate with data

Our Goals

Unlock

Unlock the full potential of the UK Continental Shelf

Anchor

Anchor the supply chain in North East Scotland

Inspire

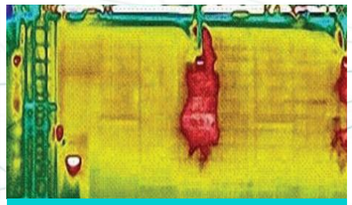
Inspire a culture of innovation and transformation

£180 million funding from the Aberdeen City Region Deal

Technology Vision

Fix today

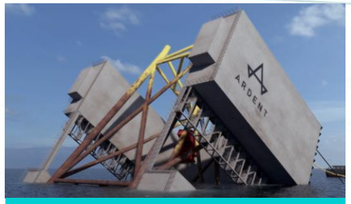
Data access



Asset inspection

Production optimisation

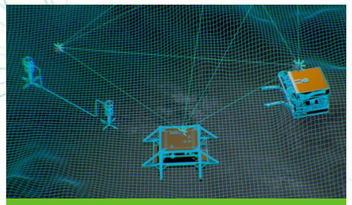
Revitalise exploration



Efficient decommissioning

Alternative well barriers

Maximise recovery



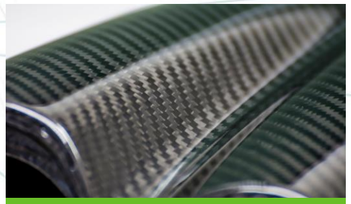
Tieback of the Future

Integrated energy

Automation

Remote operations

Artificial intelligence

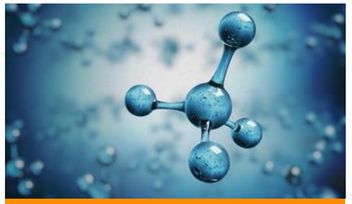


New materials

Transform tomorrow

Low carbon operations

Reusable infrastructure



Hydrogen delivery

Data driven

Unmanned facilities

Zero carbon developments

Transforming the industry for the low carbon future

How We Work

Driving

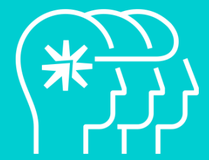
Action through technology roadmaps to achieve MER UK and grow the supply chain

Delivering

Projects that move the dial on key challenges and opportunities across the UKCS and beyond

Connecting

Industry, governments, regulators and academia to drive technology investment and deployment

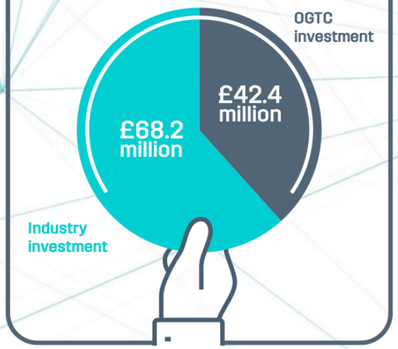


Partnering with industry, government and academia

Our Track Record

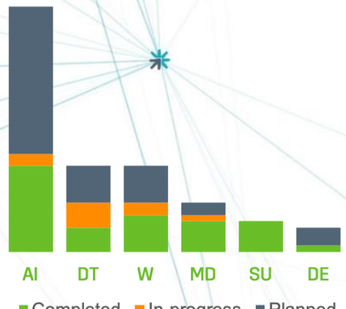
£111m invested

Co-investing in industry-led projects to develop and deploy new technologies.



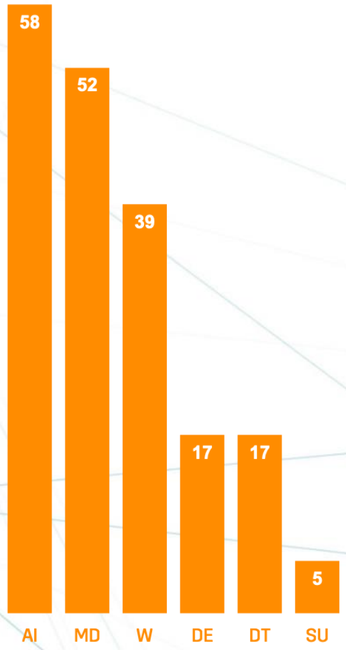
Field Trials

27 10 49



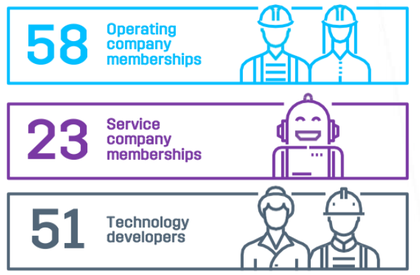
188 Approved Projects

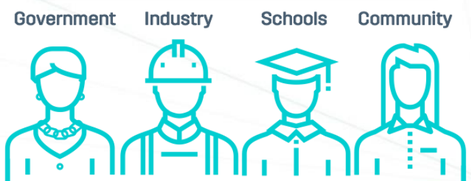
Delivering technology projects to fix today, maximise recovery and transform tomorrow



memberships

113 Bringing together operating, supply chain and technology companies to drive innovative new solutions.



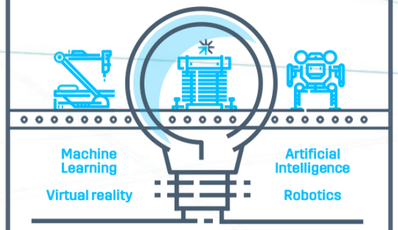


16,100 visitors

Creating a culture of innovation in the region through exciting events and workshops.

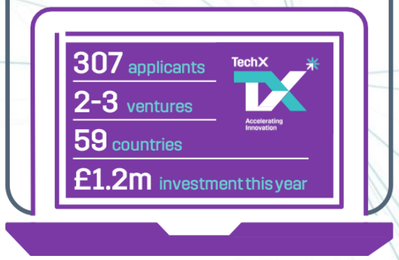
800+ Technologies screened

Harnessing the power of an ever-expanding range of transformational new technologies.



22 TechX Start-ups

Accelerating innovation by helping a new generation of entrepreneurs take their technologies to market – faster.



Delivering strong results

Discussion

Introduction to the OGTC

Digital landscaping study of the oil and gas sector – application of data analytics

Study outcomes and recommendations

Data analytics – applying analytics

Future opportunities to innovate with data

Digital landscaping Study - context

- In 2016 production efficiency across UKCS averaged 73% (increased to 74% in 2017) with production losses at 210 mmboe and plant losses estimated as 60% of that total loss.
- It was recognised that oil and gas industry was slow to adopt digital technologies for improved understanding and increasing production
- It was considered that there was a lack of clarity around the extent of application of digital technology and data science

Focus on topsides equipment and associated systems

Digital Landscaping Study - scope

Investigate current use of digital technology in supporting production

Identify best practice, gaps, blockers and barriers

Identify opportunities and provide recommendations to close the gap

Focus on topsides equipment and associated systems

Digital Landscaping Study - Methodology

- Structured questionnaire to Operators and Vendors
- Follow up interviews
- Workshops
- Report and recommendations
  - Success case studies including from other industries

30 +
Operators and Technology providers

Focus on topsides equipment and associated systems

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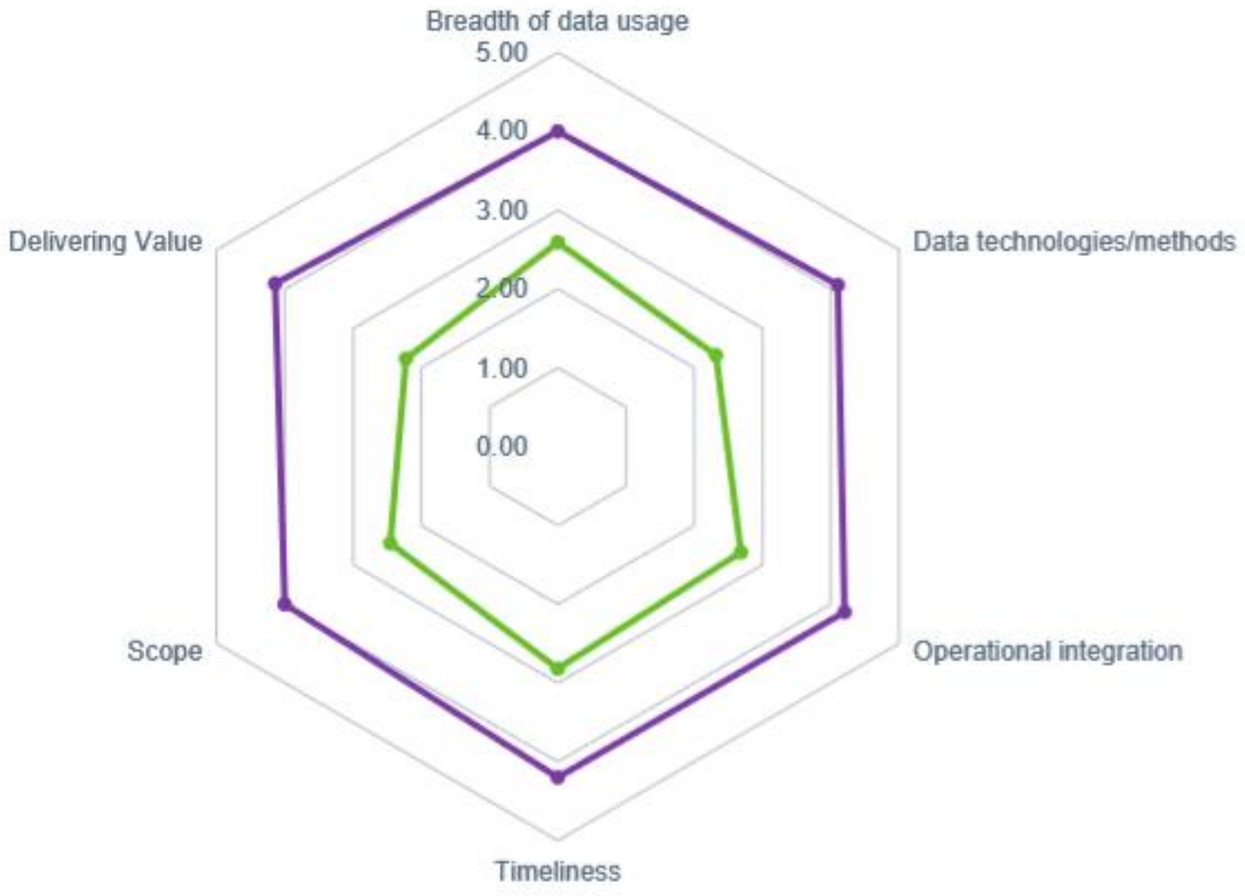
Digital Landscaping Study - Maturity



Breadth of data usage	
5	Integrating unstructured data (inspection reports, imaging, etc.)
4	Integrating additional structured data (production, operations, environmental, etc.)
3	Current historian/sensor data
2	Historic historian/sensor data
1	Little or no regular use of data
Data Technologies & Methods	
5	Optimisation (prescriptive supplemented with AI and machine learning)
4	Prescriptive (applied data science combined with domain expertise)
3	Predictive (packaged analytics/ software - forward projections of previous known events)
2	Rule Based (condition monitoring with alarms)
1	Descriptive (queries, reporting, dashboards)
Timeliness	
5	Ahead of time (optimising approach to operations and maintenance)
4	Ahead of time (predicting the onset of faults and failures before alerts/alarms)
3	Realtime (interventions in response to alerts/alarms)
2	Ad hoc (interventions based on periodic inspections/readings)
1	No forewarning/anticipation of issues
Operational integration	
5	Automation of processes, including closed loop learning
4	Continuous insights, feed into engineers' daily work
3	Alerts passed to human decision makers
2	Selective reports feed human decision making
1	All analytical work offline, discrete from operations
Delivering value	
5	A proven core initiative in production and efficiency of related operations
4	Measurable improvements in production, business case to do more
3	Value hard to attribute due to human steps in decision process
2	Appreciation of potential value, no hard figures
1	No measurement, no appreciation of potential value
Scope	
5	Process system (equipment & process, operations, interdependency of connected systems)
4	Process system (equipment & process)
3	Equipment across system
2	Select Equipment
1	Aggregate view only, no consideration of individual machines

Figure 3.3: Data Maturity criteria and ranking

Industry Average – green line; Exemplar – purple line

Digital Landscaping Study – Survey findings

90% have a Production Loss Management System and can identify loss by system. Common sources of failure are gas compression, power generation and water injection.

60% include data strategies as part of asset stewardship.

72% of respondents state they have implemented digital technologies on main risk areas or are already best in class. This increases to 91% within 2 years.

SENSORS
90% have part to good coverage.

TRANSMISSION / STORAGE
63% have good to excellent capability (0% poor).

DATA ANALYTICS
45% have poor or limited capabilities while 18% believe they are fully integrated within the business.

36% of respondents state they have the ability to routinely avoid failures through prescribed insights and actions.

54% believe they have demonstrable or quantifiable value.

70% would be willing to share data for common learning and 83% would share with supply chain for problem solving if anonymized.

Industry has the infrastructure to capture data

Digital Landscaping Study - Conclusions

Capability is largely available but the industry needs to adopt it

Sector

Substantial opportunity for the industry to exploit data analytics technologies to unlock the full potential of the basin and significantly contribute to MER objectives.
The size of the prize is estimated to be worth in excess of $2 billion each year.

Technology

The sensors & infrastructure generally available. Making data available is a challenge. Leaders have already started to use data analytics technologies with demonstrable success and value creation.

Barriers

There is a perceived high cost of implementation and service provision and unproven benefits. A risk-averse culture with many operators appear to be focussing on further reducing operational costs, with less attention on increasing production. Challenging to change current operational processes

Digital Landscaping Study - Recommendations

Capability is largely available but the industry needs to adopt it

Industry Actions

Leverage an industry forum (such as, for instance, the PETF) to create an open environment to: Facilitate enable learning from each other, share knowledge, success stories and facilitate closer collaboration with supply chain

Technology Plans

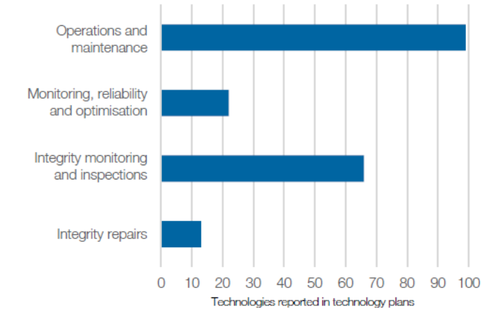
The OGA to engage UKCS operators on plans to adopt (advanced) data analytics as part of their asset management technologies and methods

Maturity Model

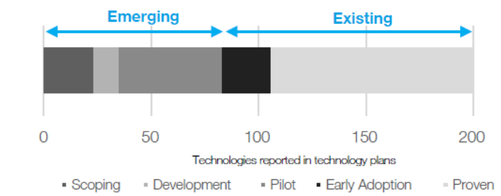
Issue the industry with a shared methodology for assessing the maturity of data analytics technology in use. To be used for a regular assessment across the sector in order to gauge the progress of with digital technology adoption

Industry Insights – Facilities Management

Technology categories



Technology maturity



Industry insights

- Technology investment has allowed assets to operate beyond their design life, delivering additional production and field development opportunities.
- Remotely operated inspection technologies for hazardous or hard to reach areas deliver cost, safety and efficiency benefits.
- There should be a wider uptake of NII technologies for vessel inspection.
- Exploiting digital based technologies has increased across the UKCS. The use of wearable and wireless technologies, integrated with ATEX tablets provides efficient workflows.
- Integrated operation centres, digital twins and virtual machines have improved production efficiency, optimising real time asset management.
- Most technologies are developed by, or in partnership with, vendors. Many solutions are available 'off the shelf' but there are opportunities for operators to pilot and trialing new and emerging technologies.

Areas	Technologies
Wearable and wireless technologies	• Wider 4G coverage • More devices ATEX rated (many vendors) • Body-mounted cameras, mobile data/communication (5+ operators))
Hard-to-reach area inspections	• Drones (10+ operators), splash zone and subsea crawlers (Chrysaor, Shell, Dana, Repsol Sinopec, CNR) • Visual (10+ operators), FLIR (Repsol Sinopec, BP, EnQuest, Shell, Spirit), CT pipeline scanner (Shell, Repsol Sinopec)
Composite repairs	• Fabric repairs (10+ operators) • Structural repairs (Repsol Sinopec, CNOOC, ConocoPhillips, Shell) • Repairs in splash zone and other very harsh areas (Shell)
Corrosion detection and monitoring	• Detection - ultrasound (thickness), pulse-eddy current (flaws), x-rays (internal) (10+ operators) • Monitoring (Shell, Chevron)
Real-time asset monitoring	• CBM rotating equipment (5+ operators) • Subsea electrical fault finding (BP, Marathon, Shell, Total) • Onshore virtual centres (5+ operators)
Asset digitisation	• 3D asset surveying – photogrammetry and laser scanning (10+ operators), including subsea (Shell), point and shoot survey (Shell)

Enough Focus on Data Analytics?

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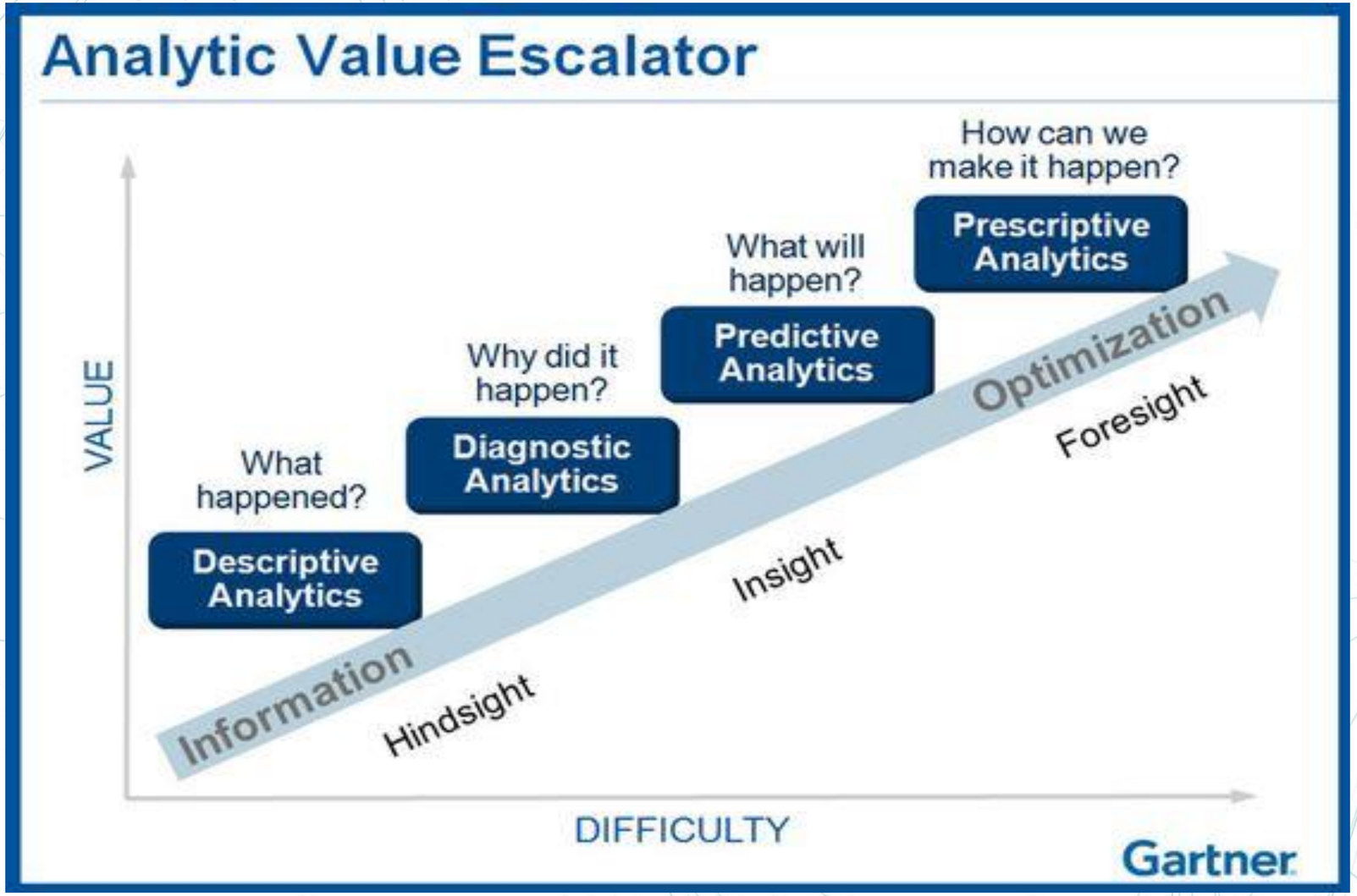
What is Data Analytics?

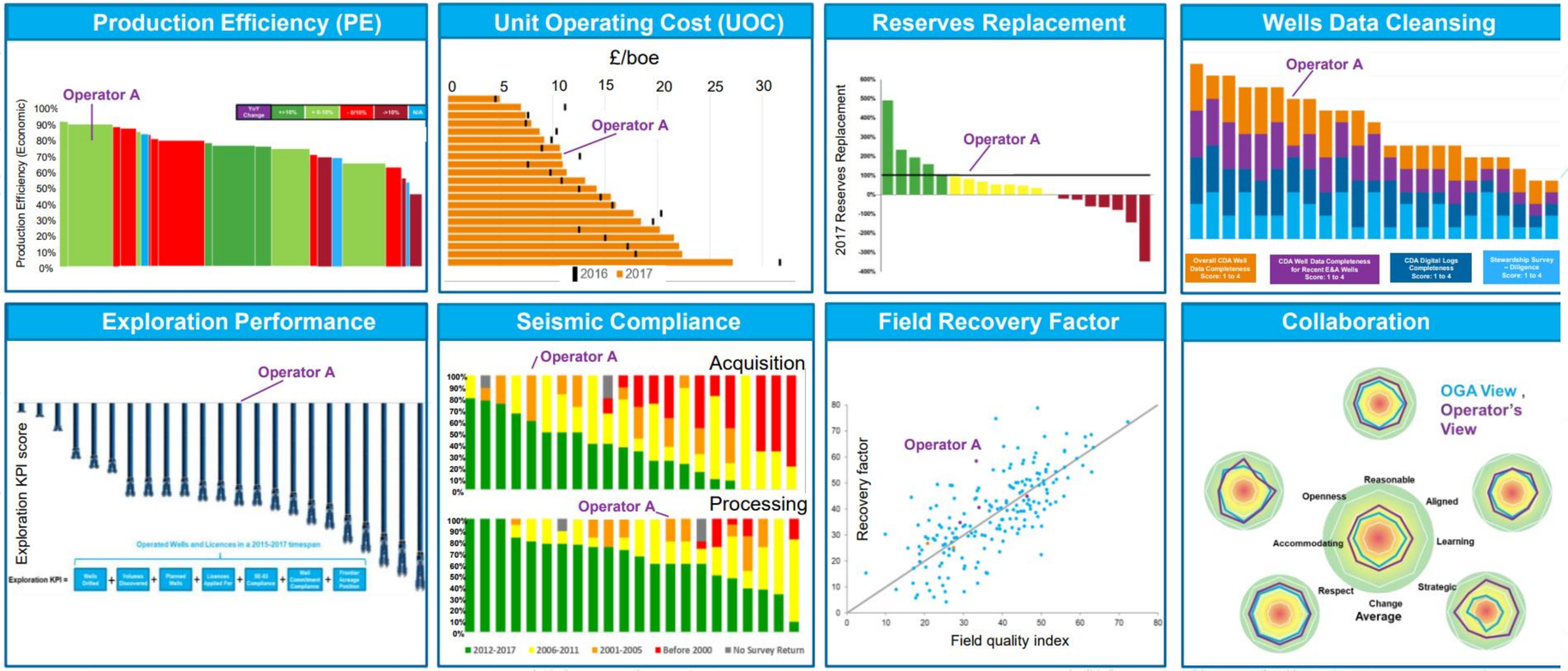


Descriptive Analytics?

- Data extraction
- Data mining
- Data cleansing
- Data aggregation
- Align to use case

Storytelling

Insight and analysis into ‘What has happened?’



Diagnostic Analytics

Insight and analysis into ‘Why did it happen?’

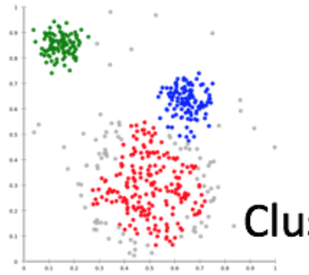
High level analysis

- Public inquiries
- NAO/GAO reports
- Lessons learned

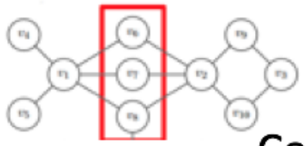
Forensic Analysis

- Critical Success Factors
- Root cause analysis
- 5 whys analysis
- Fault tree analysis
- Ishikawa analysis
- Timeline plots

Statistical analysis



Clustering



Centrality

Path finding

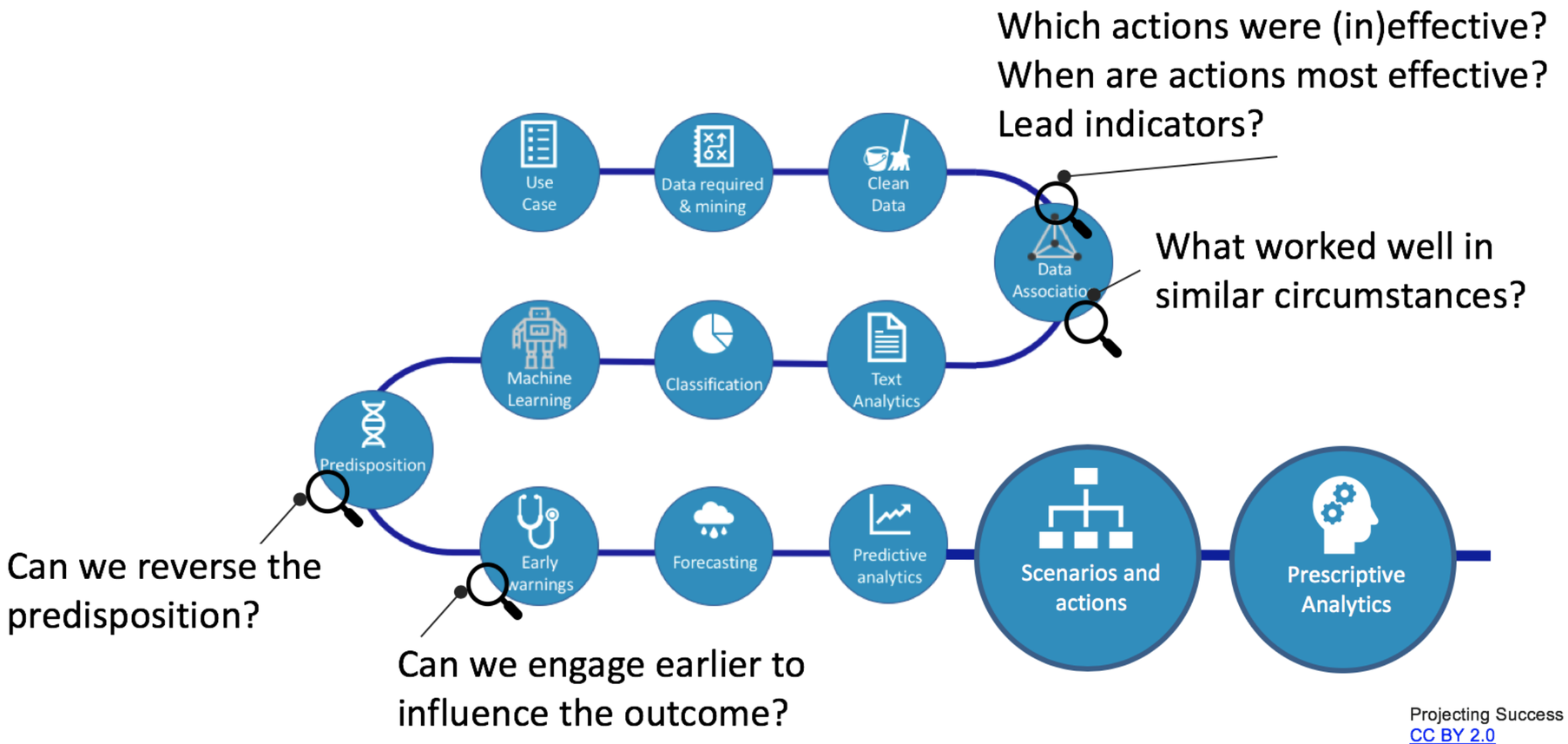
Images courtesy of Neo4J

Predictive Analytics

Insight and analysis into ‘What may happen’

Prescriptive Analytics

Insight and analysis into ‘How do I influence the result’

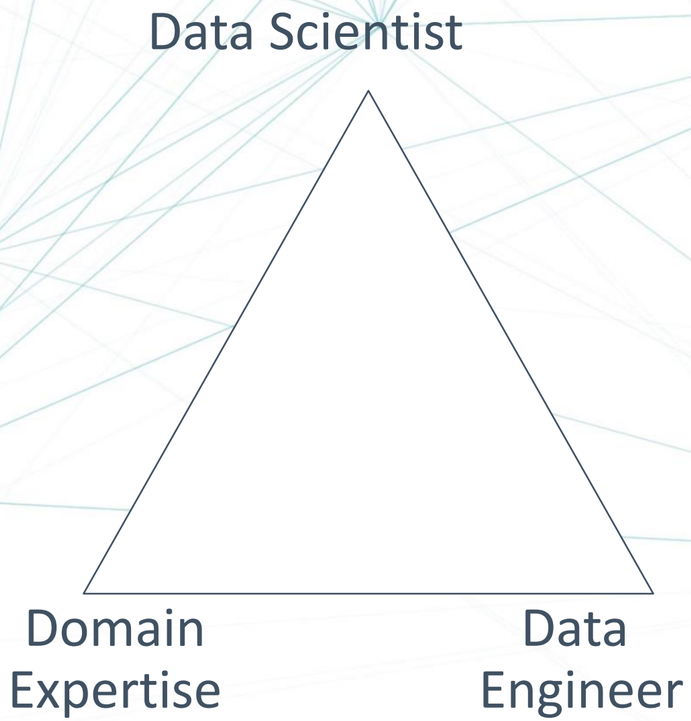


So where do we start?
We change our mindset

- Stop starting with what we **do to** data
  - Clean, quality check, store, control, protect
- Start with what we **do with** data
  - Business priorities
  - Reduce deferments, reduce risk, etc.
  - Start with the answers you need/want

Data Innovation

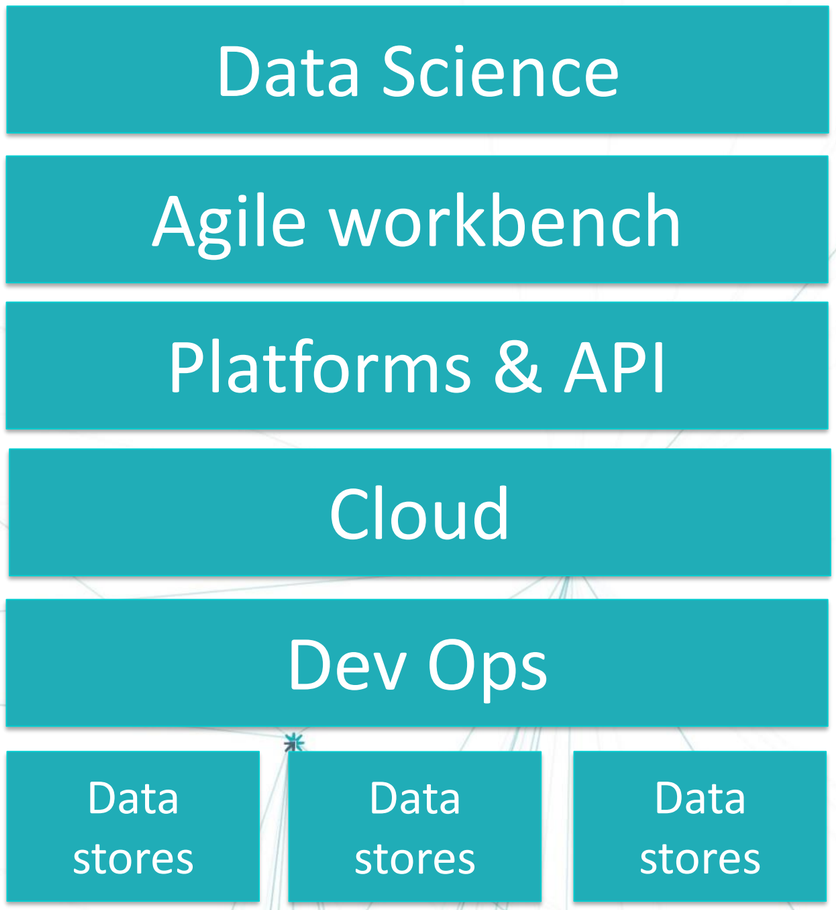
Platform for experimenting with data



Data Science – explore scenarios and answer questions

Platform – Making data available by building a solid base

Foundation – Making data infrastructure available



Experimentation must be quick, cheap and not impact operations

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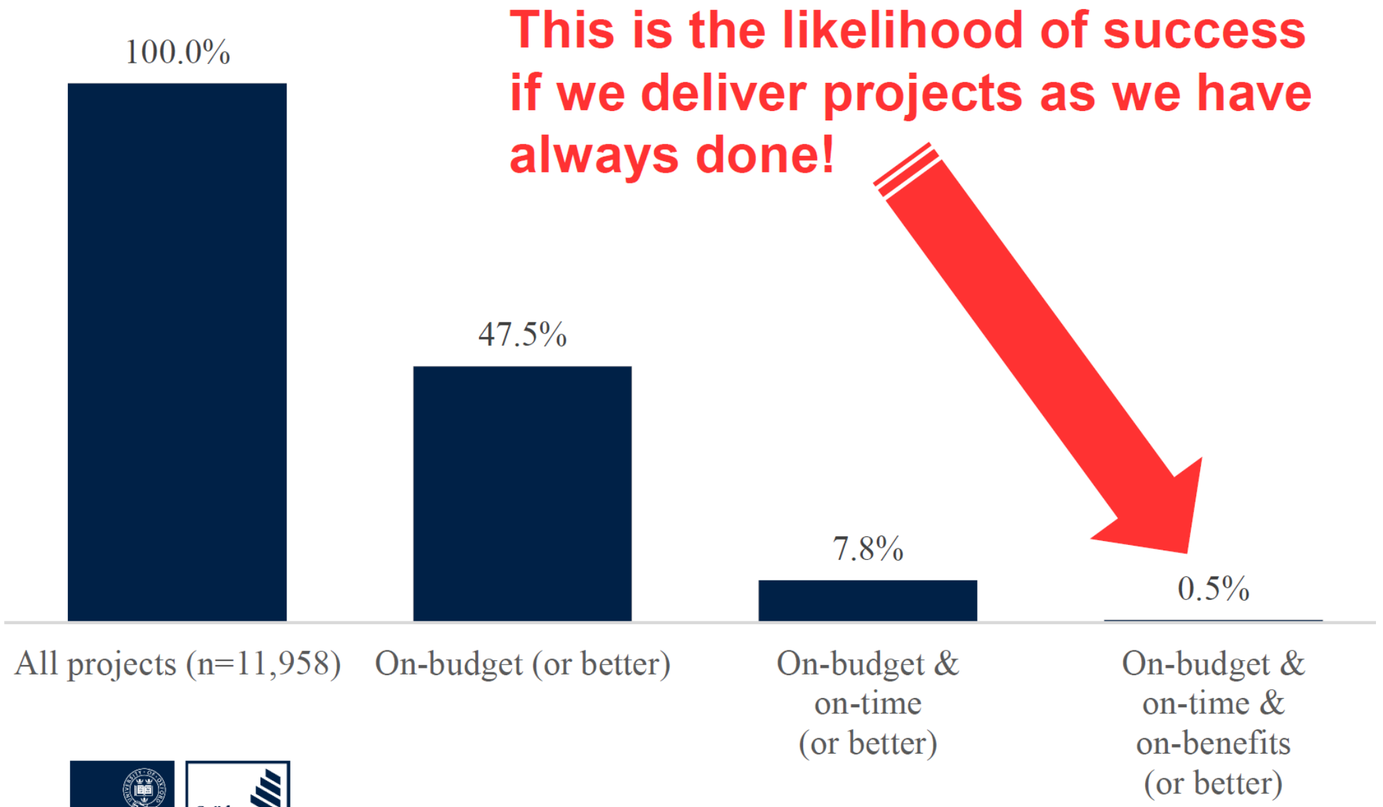
Major Project Delivery
Some Challenges



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OGA Study

58 projects delivered 2011-2016

- 50% failed to deliver to FDP
- 75% delivered late
- Average of 35% over budget

OGTC Project Data analytics

Data Trust - Study

The ability to begin to avoid the avoidable and improve certainty of outcomes

Oil & Gas – Create a data trust

Create a data trust that enables the industry to be comfortable to share project data. Working on the legal and governance framework - based on the ODI work

Populate the data trust

Populate the project analytics data trust to enable organisations working to pool data within a secure environment, to test the technical capability

Use analytics to move the dial

The project data trust has the potential to drive £millions in value across the Industry through improved ability to predict project outcomes and prioritise interventions. The data provides the ‘outside view’ that has the potential to transform how we deliver projects and initiate a chain reaction into other sectors

Work With us

The Oil & Gas Technology Centre

Your Innovation Partner

Together we can transform the future