The Digitalisation Challenge in the Oil and Gas Industry

Keith Winning, Pipeline Data Solutions

Managing Complex Data | Delivering Quality Solutions
‘One of the objectives of digitalisation is to break down data silos and make data more fungible.’

Malcolm Forbes-Cable
The Era of Oil & Gas Digitalisation is Upon Us. Energy Voice June 2019
Maximise Value in Oil & Gas

Financial Performance
- ROIC (pre-tax)
- Affordability
- Reliability
- Trust
- Satisfaction

Customer Value
- Increased Safety

Environmental & Societal Value
- Sustainability
- Employment

Operating Margin (EBIT)
- Capital Efficiency
- Accidents Reduced
- Injuries Reduced
- Emissions
- Water Consumption
- Impact on Jobs
Projects
Reference Projects

Middle East
- Khazzan Phase 1 & 2

North Sea
- PODS OneMap Support

Caspian
- SCP Expansion (SCPX)
SCPX (Onshore Transmission Line)

Sources: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY.
UK North Sea (Subsea Regional Assets)
## Project Metrics

<table>
<thead>
<tr>
<th></th>
<th>SCPX</th>
<th>Khazzan</th>
<th>North Sea</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project phase</strong></td>
<td>Design &amp; Construction</td>
<td>Construction</td>
<td>Operation</td>
</tr>
<tr>
<td><strong>Project type</strong></td>
<td>Transmission</td>
<td>Field development</td>
<td>Operational</td>
</tr>
<tr>
<td><strong>Asset type</strong></td>
<td>New</td>
<td>New</td>
<td>New &amp; Legacy</td>
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<tr>
<td><strong>Data models issued</strong></td>
<td>11</td>
<td>74</td>
<td>1</td>
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<tr>
<td><strong>Lineloops / pipelines</strong></td>
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<td>74</td>
<td>1045</td>
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<tr>
<td><strong>Total centreline length (km)</strong></td>
<td>500</td>
<td>400</td>
<td>1970</td>
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<tr>
<td><strong>Total record count</strong></td>
<td>0.5 Million</td>
<td>0.5 Million</td>
<td>1 Million +</td>
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</table>

### Definition

<table>
<thead>
<tr>
<th></th>
<th>SCPX</th>
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</tr>
</thead>
<tbody>
<tr>
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### Creation

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<tr>
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### Validation (third party)

<table>
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### Remediation

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<td>✓</td>
<td>✓</td>
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### Inspection data loading

<table>
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</thead>
<tbody>
<tr>
<td></td>
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<td>✓</td>
<td>✓</td>
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</tbody>
</table>
Definition – Key Processes

Operator Processes

Data Modelling Specification

Approved Lessons Learned

Project Close Out Report

Project Requirements

Data Modelling Philosophy

Data Modelling Contractor Processes
• Schema
• Data dictionary
• Corporate/project classification
• Minimum requirements
• Management of change (requirements)
• Projections and datums

• Project level domain values

• Interfaces

• Delivery formats
- Gap analysis of operator’s specifications and requirements

- Methodology
  - Modelling procedure
  - Data classification
  - Management of missing / incomplete data by classification
  - Model metrics

- Measurable KPIs

- Management of change (Process)
• Out turn metrics

• Review (scope, budget, schedule)

• Technical queries submitted

• Approved changes to schema

• Lessons learned for review
Creation
Inconsistency across models / lines

Managing related models

Bad / missing data

Management of change

Data Model Creation

- Follow modelling philosophy
- Schema changes approved
- Domain compliance
- Field dimension compliance
- Use of automated processes
- Use of checklists
Managing related models

- Master external TagID database
- Linked stationing
- Use of automated processes
- Use of checklists

Bad / missing data

Management of change

Inconsistency across models / lines
Bad / missing data

- Be pragmatic – not all data is equal
- Manage in accordance with philosophy
- Deviations from philosophy need approval
- Document at record level

Data Model Creation

Inconsistency across models / lines

Management of change

Managing related models
Management of change

- Client approval
- Document deviations at record level
- Model specific documentation (metrics)
- Close out report
- Review lessons learned

Inconsistency across models / lines

Managing related models

Bad / missing data
Validation
Third Party Data Model Validation

- Referential
- Integrity
- Geospatial
- Schema
Referential Integrity

• Top down approach
• Focus on core tables
• Automated processes:
  • Identify orphan records
  • Missing data
  • Offline data
• Documented approved schema changes

• Automated processes
  • Domain and dimension compliance
• Automated processes
  • Measures and station values
  • Coordinates
  • Projections
  • Geometry definition (ControlPoints)
  • Site features
Identify Issues – Develop Solution

- Analyse
- Processes
- Procedure
- Document
- Propose Solution
- Approval
Perform

- Focus on Key Issues
- Error Index
- Automated Processes
- Validation
- Model Metrics
- Document
Maintenance
New and divested assets

Changes to supporting systems

Links to external document systems

Schema revisions

Lessons learned
Incorporation of new project data

ILI and inspection data

Repairs

Diversions

Third party crossings
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<td>Depth of Burial</td>
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<tr>
<td>Spare</td>
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<tr>
<td>Raw Depth</td>
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<tr>
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<td>Seabed right Y</td>
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<tr>
<td>Trench right Y</td>
<td>-0.36</td>
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<tr>
<td>Points</td>
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</tbody>
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120 pairs of cross profile coordinates relative to the TOP
Definition

Creation

Validation

Remediation

Care

Summary

• Data Modelling Specification
• Project Requirements
• Data Modelling Philosophy
• Data Modelling Procedure
• Project Close Out Report
• Approved Lessons Learned
Summary

- Follow data modelling philosophy
- Schema changes approved
- Domain compliance
- Field dimension compliance
- Use of automated processes
- Use of checklists
Summary

- Referential Integrity
  - Top down approach
  - Focus on core tables

- Schema Integrity
  - Documented approved changes
  - Domain and dimension compliance

- Geospatial Integrity
  - Measures & station values
  - Coordinates & Projections
  - Geometry definition
Summary

- Identify
  - Analyse
  - Agree solution
  - Document procedure & processes

- Perform
  - Automated processes
  - Validate model
  - Report model metrics
Summary

• Change Management
  • Incorporation of new project data
  • ILI and inspection data
  • Repairs & diversions
  • Third party crossings
  • New and divested assets
  • Changes to supporting systems
  • Links to external document systems
  • Schema revisions
  • Lessons learned
‘Today, the Oil and Gas sector has the opportunity to redefine its boundaries through digitalization.

After a period of falling crude prices, frequent budget and schedule overruns, greater demands of climate change accountability, and difficulties in attracting talent, Oil and Gas companies can provide practical solutions.

In the short term, digitalization can act as an enabler to tackle these challenges and, in the long term, provide value to all of the industry’s stakeholders.’

Bob Dudley
Group Chief Executive, BP
Digital Transformation Initiative - Oil and Gas Industry