Common Sense Data Management

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Objectives

• Discuss the purpose of data management

• Talk about why data management can be a complex subject to tackle successfully

• Discuss a few selected areas where a common sense approach is the best way to make continuous progress
Main Discussion Topics

- Purpose of data
- What is data management?
- The opportunity space
- What sorts of problems are we trying to solve?
- Data consistency - Well header example
- Well logs
- Data quality metrics
- Effective prioritisation
Main Discussion Topics

- Purpose of data
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Often heard comments…..

• “Make sure we keep ALL the data....”

• “Transfer only the data that is needed....”

• “I want it to be fully integrated....”

• “We must have quality data...”

• “Make sure we get the priorities right....”

• “To integrate the data, all you need to do is write some code”
Purpose of data

Data → Information → Business decisions → Profits

Creates

How much of the profits is due to data?

Supports

Results in

Losses

Poor data? Mis-information? Bad decision? Losses

Good

Reliable

Sound

Profits

Data

Information

Decisions

Results

Poor

Misleading

Unsound

Losses
Main Discussion Topics

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What is data management?

E&P Data Management Activities Scale

Data Management
- Higher complexity with research elements
- More engagement with business disciplines
- Requires strong business understanding
- Requires broad IT knowledge
- People networking skills
- Project management and integration

Data Services
- Focus on speed and efficiency
- Physically apart from customers
- Requires specialised IT knowledge
- Addressing a global / regional community
- Employing defined standards
- Standardised services

In order to improve on EP Data Management, we need to focus on the upper half of the list.

These are the cumulative range of tasks that are carried out by data managers around the world.
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Opportunity Space: The Upstream Value Chain

Data aspects

- **Review**: Regional studies, data rooms

- **Acquire**: Acreage, production sharing contracts, seismic (2D, 3D, OBC etc), data purchase, exchanges

- **Explore**: Regional reviews and compilations, play & prospect identification, well locations, well data, correlation

- **Appraise**: Additional well planning & data, detailed studies and correlation, geological modeling, volumetrics

- **Develop**: Detailed interpretation and analysis, modeling and simulation, real time automation & control.

- **Produce**: Production management, forecasting and economics.

- **Abandon**: Data consolidation & archival.
<table>
<thead>
<tr>
<th>Geology &amp; Seismic</th>
<th>Interpretation and Compilations</th>
<th>Petroleum Engineering</th>
<th>Drilling, Engineering &amp; Production Operations</th>
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<tbody>
<tr>
<td>Well header Info</td>
<td>Geology – Zones</td>
<td>Spill Points (Reqd. by RE)</td>
<td>Daily Drilling Data</td>
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<td>Well Header Spatial</td>
<td>Geology – Markers</td>
<td>Well Logs – Raw</td>
<td>Well Schematics</td>
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<td>Deviation</td>
<td>Faults (Field Extent &amp; Major)</td>
<td>Well Logs – Processed &amp; Qced</td>
<td>Well Completion Data</td>
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<td>Checkshots</td>
<td>Seismic Horizons – Regional</td>
<td>Well Logs – Interpreted</td>
<td>Well Intervention Data</td>
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<td>Seismic traces (2D &amp; 3D)</td>
<td>Seismic Horizons – Local</td>
<td>Well Logs – Cased Hole</td>
<td>Well Integrity Data</td>
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<td>Mud logs</td>
<td>Velocity Models</td>
<td>Vertical Seismic Profiling</td>
<td>Facilities (P&amp;ID, Limit Diagrams)</td>
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<td>Core description</td>
<td>Structure Maps</td>
<td>Core Analysis (SCAL RCA, Gamma)</td>
<td>Well design</td>
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<td>Core Photos</td>
<td>TZ Curve</td>
<td>Formation Pressure (RFT, MDT)</td>
<td>Drilling Fluid Composition</td>
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<td>Thin Sections / XRD</td>
<td>Gridded Time / Depth Maps</td>
<td>Well Test (DST, FIT)</td>
<td>Well Completion Cost</td>
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<td>Environments of deposition</td>
<td>Sand Distribution Maps</td>
<td>Production Data (Allocated oil/gas/water rates)</td>
<td>Casing Data</td>
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<td>Prospects &amp; Leads</td>
<td>Static Models</td>
<td>Production Pressure Data (Well Tubing/Casing Head Pressure)</td>
<td>Bit Data</td>
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<td>Pore Pressure</td>
<td>Dynamic Models</td>
<td>Production Well Test (FBU,PBU,SDS)</td>
<td>BHA (Borehole Analysis)</td>
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<td>Temperature – Gradient</td>
<td>Synthetic Seismogram</td>
<td>Artificial Lift</td>
<td>Deviation (Drilling)</td>
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<td>Temperature – Borehole</td>
<td>Biostratigraphy – Zones</td>
<td>Fluid Property</td>
<td>Well Hydraulics</td>
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<td>Geomechanics</td>
<td>Biostratigraphy – Markers</td>
<td>Fluid Contacts</td>
<td>Shallow Hazards</td>
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<td>Geospatial:</td>
<td>Geology – Zones</td>
<td>Stimulation Cases</td>
<td>Metocean Data eg Climate</td>
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<td>-Well location Maps</td>
<td>Geology – Markers</td>
<td>Fluid Composition</td>
<td>Facilities As-Built drawings</td>
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<td>-Block Boundaries</td>
<td>Faults (Field Extent &amp; Major)</td>
<td>Material Balance</td>
<td>Facilities Info (type, function)</td>
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<td>-Platforms</td>
<td>Seismic Horizons – Regional</td>
<td>Prosper Models</td>
<td>Facilities Historical Info</td>
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<td>-Pipelines</td>
<td>Seismic Horizons – Local</td>
<td>RMS Models</td>
<td>Pipeline (flowrate, function)</td>
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<td>-Geohazards</td>
<td>Velocity Models</td>
<td>Decline Curve Analysis</td>
<td>Pipeline (properties)</td>
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<td>-Site Surveys</td>
<td>Structure Maps</td>
<td>Volumetrics</td>
<td>Geotechnical data (general soil, seabed properties)</td>
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<td>-Field Outlines</td>
<td>TZ Curve</td>
<td>Reserves and Resources</td>
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<td>-Nett to Gross Thickness Maps</td>
<td>Gridded Time / Depth Maps</td>
<td>EOR Cases</td>
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<td>-FTG</td>
<td>Sand Distribution Maps</td>
<td>Pressure Maintenance Cases</td>
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<td>-CSEM</td>
<td>Static Models</td>
<td>Saturation Height Function</td>
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<td>-Gravity &amp; Magnetic</td>
<td>Dynamic Models</td>
<td>Leak Off Test</td>
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<td>-Microseismic</td>
<td>Synthetic Seismogram</td>
<td>PVT</td>
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## Typical Problems encountered in E&P Data

<table>
<thead>
<tr>
<th>Physical Data</th>
<th>Electronic Data</th>
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<tbody>
<tr>
<td>• Sampling (accuracy) difficulty due to lack of hole integrity (ditch cuttings)</td>
<td>• Missing entries</td>
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<td>• Contamination of ditch cuttings due to excessive cavings</td>
<td>• Missing attributes</td>
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<tr>
<td>• Poor sample recovery (sidewall samples, cores, fluids) – both % recovery per</td>
<td>• Inconsistent storage locations in data models</td>
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<td>sample as well as sample loss</td>
<td>• Incorrect values entered</td>
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<td>• Missing inventory due to poor logistics</td>
<td>• Inconsistent or lack of metadata in entries</td>
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<td></td>
<td>• Duplication</td>
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<td></td>
<td>• Large data sets</td>
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<td></td>
<td>• Distributed or federated data sets and databases</td>
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<td></td>
<td>• Overlapping data models</td>
</tr>
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<td></td>
<td>• Integration challenges</td>
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<td></td>
<td>• Lack of consistent quality</td>
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<td></td>
<td>• Data flow breakdowns</td>
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<table>
<thead>
<tr>
<th>People</th>
<th>Processes &amp; Methodology</th>
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<tbody>
<tr>
<td>• Resource constraints</td>
<td>• Lack of governance structure</td>
</tr>
<tr>
<td>• Lack of competency</td>
<td>• Lack of standardized workflows</td>
</tr>
<tr>
<td>• Lack of people framework</td>
<td>• Lack of standards (data, process, systems etc)</td>
</tr>
<tr>
<td>• Lack of proper accountability structure</td>
<td>• Lack of effective data architecture</td>
</tr>
<tr>
<td>• Indecision</td>
<td>• Lack of transparency</td>
</tr>
<tr>
<td>• Office politics</td>
<td>• No or loose quantification methodology</td>
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</table>
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Consistency in data

Example: Well Header

The need for Data Standards
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Well Logs – The challenges

- Hundreds of different logs in the database
- Original format logs, edited, processed etc
- Different service companies and naming conventions
- Separate runs for each log type
- Technology evolution over the years
- Completeness of inventory

Typical architecture & workflow

Original (raw) format

Raw

Live

Edited with some QC

Data loads (push)

Projects

Integrated Project

User data access (pull)

More projects puts heavier demand on data loading
For pull, users may get confused searching among all available logs
Well Logs – Typical usage distribution

1. **90 %**
   - Everyone, General purpose
   - 8 essential logs used by the majority
   - Basic geological interpretation, correlation, environments of deposition etc
   - GR, Sonic, Density, Neutron, Resistivity (S,M,D), Caliper

2. **8%**
   - PE/PG higher resolution interpretation projects eg dip meter

3. **2%**
   - Petroleum Eng/Prod.Geol special studies. Special Core Analysis (SCAL), High Res. Dipmeter, Borehole Imaging etc
Nominated Petrophysicist carries out the following activities:

1) All logs edited
2) Spliced
3) Joined
4) Quality stamp

Key features:
1) Master store for most used well logs
2) Single delivery point to users
3) Governed by a strict control process
4) Data ownership & accountabilities
5) Cumulative
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- **Data quality metrics**
- Effective prioritisation
Data Quality Metrics

People
- Data quality coordinator
- Data quality team
- Correcting data errors
- Subject matter experts

Roles & responsibilities
- Data quality rules coding
- Management support

Technology
- Infrastructure
- Architecture for DQ metrics
- Data quality metrics tool
- Data standards
- Business rules

Process
- Governance process
- Metrics development process
- Progressive Goals & KPIs
- Data quality improvement processes
- Enterprise Dashboard
- Communication
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Prioritisation for business relevance

Pre-requisites:
1. A master list of current priority wells, with a process for periodical updates
2. An enterprise dashboard for tracking progress of quality-checked work

MPWL is an approach driven by business priorities

~ 200 wells per list (the approx. number based on current project intensity)

Data types vary by:
1. Well content
2. Biz need

Tackling Legacy Data
Probabilistic Approach

Linear data QC towards the theoretical end state
Logical but impractical and lacks business relevance

MPWL is an approach driven by business priorities

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MPW...
Concluding remarks

• Understand your role and contribution to business success

• Identify with company strategies and directions

• Don’t try to boil the ocean

• Ensure early and stepwise deliverables

• Don’t try to manage data for the sake of data

• Effective prioritisation

• Communicate and enlighten – you’re in the hot seat
Thank You