Digitalization – Driving Competitive Advantage
Liv A. Hovem CEO DNV GL O&G
April 19th 2018 – CGE Node CEO Forum
Since 1864, DNV GL has enabled organizations to advance the safety and sustainability of their businesses.

Over the last 50 years we have also gained a solid position as a trusted third party software vendor, solving technical and operational challenges related to industrial assets.
Digital transformation in the oil and gas industry
The largest increase in R&D spending in four years

Respondents’ expectations for changes to their companies’ R&D and innovation spending, by year:

- 2013: -11% → +19%
- 2014: -21% → +24%
- 2015: -37% → +10%
- 2016: -36% → +15%
- 2017: -37% → +14%
- 2018: -11% → +36%
Top 10 priorities for R&D and innovation in 2018

1. Digitalization (37%)
2. Subsea (29%)
3. Enhanced oil recovery (20%)
4. Smart emission reduction (16%)
5. Energy storage (12%)
6. Cyber security (36%)
7. Pipelines (24%)
8. Advanced materials (19%)
9. FLNG (16%)
10. Power to gas (12%)
A digital tipping point

54% expect to increase investment in digitalization in 2018 vs. 39% in 2017

70% of respondents say they need to embrace digitalization to increase profitability in 2018 vs. 48% in 2017
The competitive situation for the oil and gas industry
A couple of relatively good years ahead dominated by subsea tie-backs

Source: NPD
Squeezed from two sides longer term

Lower cost oil and gas production

Electrification and renewable energy production
Data Analytics – The value of data

- Share rich, reliable datasets across projects and operations
- Apply analytics that enhance safety, efficiency and sustainability
- Unlocking the value of data
- Predict tomorrow’s technical challenges
- Enable faster, smarter decision-making
Case 1 – Using big data analytics to reduce non productive time
Up to 1 year of data

36 billion records

15,000 sensors

3 main systems

2 drill ships
Opportunity – Detecting drilling anomalies before they happen

Drilling anomalies now can be detected before they happen. Key steps:

1. Evaluate data quality and cleansing of data – require domain knowledge
2. Correlation and grouping of variables – with expertise to determine relevance
3. Explore the data/clustering analysis
4. Build an automatic diagnostic system – anomaly detection
# Savings potential – Reducing Non Productive Time (NPT) through diagnostics of the Top Drive system

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>CASE</th>
<th>DATA / MODEL</th>
<th>RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Top Drive General</td>
<td><strong>Data Driven:</strong></td>
<td>Correlation Analysis available for large dataset to be further exploited</td>
</tr>
<tr>
<td></td>
<td>Elevator</td>
<td>GMM</td>
<td>Failure detected 2 months in advance</td>
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<tr>
<td></td>
<td>Motor</td>
<td>k-Means</td>
<td>Failure detected 2 days in advance</td>
</tr>
<tr>
<td></td>
<td>Gearbox</td>
<td><strong>Model Based:</strong></td>
<td>Simple analytical model formulated and Indicator estimated</td>
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<tr>
<td></td>
<td>Main Bearing</td>
<td>Bearing life model (simplified)</td>
<td>Simple analytical model formulated and Indicator estimated</td>
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</tbody>
</table>
A team effort - big data analytics combined with technical domain experts

Data quality must be managed – it is far from trivial

1 billion NOK / year in savings potential on NCS through reducing Non Productive Time of Top Drive systems
Case 2 – Additive manufacturing
Additive Manufacturing (AM)
Value creation to the Maritime and Oil & Gas sectors
Transformation in Product Commercialization

**Current State**
Mass production & centralized manufacturing

**Emerging State**
Mass customisation & distributed manufacturing
Case 3 MyQRA – Digitisation of risk analyses
MyQRA – Online risk presentation and visualisation

Provides better understanding of hazards: for technical and non-technical professionals

Gives detail to aid risk-based decisions, supported by 3D graphics

Allows for sensitivity studies of key operational variables

Aids communication of risk throughout the lifecycle

Makes QRA updates simpler and easier
Case 4 – New (digital) technologies
All-electric subsea technologies – improvements at lower costs

The all-electric technology
- Replacing wellhead, sub-surface safety valve and associated command system with all-electric technology
- Simpler assembly – less complex solution
- Different failure modes

Environmental and safety improvements
- Hydraulic pipes replaced by power cables with less risk of spills
- Removal of high-pressure equipment topside improves safety

Cost reductions*
- Replacing hydraulic pipes with an electricity cable over a distance of 30 km reduces costs by 15%.
- An electrical version of the well’s own equipment is expected to generate additional savings of 10%.
- Enabling further digital innovations may generate total cost savings of 30-40%


Cameron XT (picture source: Oil & Gas Journal)
Potential Benefits from Digitalization
The potential impact from digitally-enabled initiatives is high

Example: Norwegian Continental Shelf; NOK 35 billion

## Greatest opportunities for oil and gas companies: drilling & wells and production & operations

<table>
<thead>
<tr>
<th>Opportunity</th>
<th>Assumptions for impact estimates</th>
<th>Impact for operators, % of total impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Well construction performance solutions</td>
<td>10-30% capex reduction</td>
<td>~28%</td>
</tr>
<tr>
<td>2 Wells engineering analytics</td>
<td>2-4% capex reduction</td>
<td>~4%</td>
</tr>
<tr>
<td>3 Well process digitization</td>
<td>10-20% reduction in FTEs 5-7% capex reduction</td>
<td>~10%</td>
</tr>
<tr>
<td>4 Front loaded analytics</td>
<td>2-4% capex reduction</td>
<td>~4%</td>
</tr>
<tr>
<td>5 Digital procurement</td>
<td>5-15% reduction in procurement spend</td>
<td>~8%</td>
</tr>
<tr>
<td>6 Integrated PD process digitization</td>
<td>10-20% reduction in FTEs 5-7% capex reduction</td>
<td>~12%</td>
</tr>
<tr>
<td>7 Production performance solutions</td>
<td>2-4% production increase</td>
<td>~17%</td>
</tr>
<tr>
<td>8 Predictive Maintenance</td>
<td>10-15% maintenance cost reduction</td>
<td>~14%</td>
</tr>
<tr>
<td>9 Digital operations platform</td>
<td>5-10% reduction in FTEs</td>
<td>~3%</td>
</tr>
</tbody>
</table>

How to speed up?
Qualifying new subsea technologies - Update of RP-A203 for “Technology Qualification”

The new RP-A 203

New digital work process

REASON with DNV·GL

Demonstrating safety of novel subsea technologies

- Develop framework that enables the industry a faster demonstration of safety for novel subsea technologies based on industry-relevant use-cases
  - All-electric, more integrated control systems, subsea compression, new fail-safe philosophies, more integrated control systems etc
- The framework will be a supplement/alternative for current standards and be suitable also for fast-tract subsea projects.
- NFR application: 19 MNOK over 3,5 years (9 MNOK from NFR)
- PTIL : Observer
Digitalize and share

- Requirements and standards in a digital format
- Automated verification and compliance check
- Digital platforms

Willingness to share data
Trust 4.0

- Trust the sensors that generate data
- Trust the way data is stored
- Trust the people and partners who access data
- Trust the algorithms that make sense of the data
Discover the true value of your data

You want to analyze, control and share your data. We are building Veracity to let you do this. Advanced functionality is currently in private preview, but the marketplace is already open for business.

→ Watch the Veracity video

VERACITY
by DNV GL

Register to learn more about the data platform.
Thank you