Digitalization Trends in the Oil & Gas Drilling Industry

...if the oil industry knew what the oil industry knows...
Contents

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- Oil and Gas Digitalization Roadmap Example
- Changing the Way we Work
- Going Digital
- The Change in Workforce
DPE Research Area in Data Science

Monitoring and Analysis

Operational Surveillance

Data Gathering

Real Time Data Analysis

Process Improvement and Decision Making

- REAL-TIME
- PRO-ACTIV
- EFFICIENT
- ANALYTIC

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Digitalization refers to “the adoption or increase in use of digital or computer technology by an organization, industry, country, etc.”  
Oxford English Dictionary

Integration of digital technologies into everyday life by the digitization of everything that can be digitized.  
www.businessdictionary.com/definition/digitalization.html

Digitalization is the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business.  
Gartner
Possible Digitalization Roadmap

Virtual Organization, Remote Control, Automation & Autonomy

Efficiency Development

Data Integration

1st gen.  2nd gen.  3rd gen.  4th gen.  5th gen.

Virtual Organization
Access data anywhere & anytime

Local Rooms
Onshore Expert Centers
Database
Operations Centre
Corporate Digital Information & Competence

Automation

Work Process Digitalization

Land Rig
Platform Rig
Subsea Rig

Intelligent see thru casing with sensors

Standardized Hardware

Autonomous Unmanned Systems

Possible Digitalization Roadmap

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# Changing the Way of Working: Trends

<table>
<thead>
<tr>
<th>Before</th>
<th>With Integrated Operations</th>
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</thead>
<tbody>
<tr>
<td>Serial</td>
<td>Parallel</td>
</tr>
<tr>
<td>Single discipline</td>
<td>Multidiscipline teams</td>
</tr>
<tr>
<td>Dependent on physical location</td>
<td>Independent of location</td>
</tr>
<tr>
<td>Decisions based on experience</td>
<td>Decisions based on Real-time Data</td>
</tr>
<tr>
<td>Reactive</td>
<td>Proactive</td>
</tr>
<tr>
<td>Manual work processes</td>
<td>Automated and digital work processes</td>
</tr>
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**General development**

Better, faster collaboration and information transfer across geographical, discipline and organizational boundaries, and between different persons.

Increasing digitisation of the work process leading to more automation and eventual autonomy.
Digital Continuous Improvement Process

PLAN – Prepare for implementation
- Input to Well Engineering
- Well Planning and Scheduling
  - Communicate KPI Targets
  - Incorporate Learnings and Best Practises
- Job Preparation Training, Simulation

ACT – Evaluate results
- Identify positive and negative deviations from plan
- Derive new KPI targets from
- Audit Feedback to capture Lessons Learned and Best Practises

DO – Execute the plan
- Performance as part of daily workflows
- Coaching

CHECK – Measure
- Automated Reporting Assistant
- Capture deviations from plan
- Collect, quality control and process data
- Measure KPIs to identify Invisible Lost Time
- Capture Feedback from operations personnel on Lost Time
Going Digital

Automated Decision Making

Automated Work Process

Where we typically are

Where we should be from there

IT Input

Domain Input

Integration

Value Creation

Integration

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Evolution of Drilling Rig Technology (Land Rigs) and Skill Set

- Oil rigs beginning 1900
- Standard rig, 1960 to 2000
- Automated drilling rig, Bauer, 2013

- Global Rig Fleet
  - 4000 Land Rigs
  - 800 Offshore Rigs
- About 150,000 people as rig crews
- About 20,000 Monitoring Experts required
Data Workers

Images: courtesy of TDE
Demographics and Technology Implementation

SPE Membership

- Is there a correlation between age and new technology implementation?
- Is digitalization a way from an experience driven to a fact driven industry?
- Who drives technology development?
Transition of Business Model Land Rig

How does this picture and the revenue distribution change with high-tech based integrated services?

Process control changed

Source: Applied Drilling Engineering, Bourgoine, Chenevert, Millheim, Young, 1981
Summary

We are not seeing crisis today but a transition into a new way of working and how we do business

We are changing from a risk driven to a cost driven industry (brown and unconventional fields)

We are changing from an experience driven to a fact driven industry based on digitalization and automation

Technological leadership moved from operators to service companies (late 80ies and 90ies)

The business model very likely will change on that basis