Creating energy from data

Why do Equinor want to see Object Oriented Information Exchange in a Standard Format
Agenda

- Some background for increased focus on digitalisation in Equinor
- Digitalisation within Equinor
- Focus on Standardisation
- Use of object oriented information exchange
Low oil price

The low oil price in 2016 showed that the investment and operational cost have become too high.

We had to look for more efficient ways of executing CAPEX project.

And decrease OPEX.

\[ \text{Note: West Texas Intermediate (WTI) Crude Oil, prices in USD per barrel (bbl). Daily prices.} \]

CAPEX = Capital Investment Project expenditures

OPEX = Operational expenditures
Cost of Technical information

One arising area of concern was the cost of technical information in O&G business.

Figur 2-2: Totalkostnad ved produksjon av enkeltkomponenter til nybygg for operatør og andre aktører dekomponert til hhv. dokumentasjonskostnader og øvrige produksjonskostnader. Kostnaden for leveranse til andre aktører er normalisert til 100.

Direkte dokumentasjonskostnader ved produksjon av enkeltkomponenter til nybygg

<table>
<thead>
<tr>
<th>Aktør</th>
<th>Direkte kostnader</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operatør</td>
<td>391</td>
</tr>
<tr>
<td>Andre aktører</td>
<td>100</td>
</tr>
</tbody>
</table>

Øvrige produksjonskostnader ved produksjon av enkeltkomponenter til nybygg

<table>
<thead>
<tr>
<th>Aktør</th>
<th>Øvrige kostnader</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operatør</td>
<td>33</td>
</tr>
<tr>
<td>Andre aktører</td>
<td>100</td>
</tr>
</tbody>
</table>
Estimated savings in the Oil and Gas Industry by digitalisation

Value at stake: New Era of Automation
(All figures cumulative, 2016-2025.)
- $220 billion Potential value addition for the industry
- $10 billion Potential value for society
- 6% Estimated reduction in accidents and injuries
- 43,000 barrels Estimated reduction in pipeline spills
- 66,000 barrels Estimated reduction in spills in upstream operations
- 38,000 jobs Estimated number of jobs displaced
- 20 million tonnes Estimated reduction in CO₂e emissions

Value at stake: Advanced Analytics and Modelling
(All figures cumulative, 2016-2025.)
- $425 billion Potential value addition for the industry
- $100 billion Potential value for society
- 3% Estimated reduction in accidents and injuries
- 65,000 barrels Estimated reduction in pipeline spills
- 54,000 barrels Estimated reduction in spills in upstream operations
- 800 million gallons Estimated reduction in water consumption
- 350 million tonnes Estimated reduction in CO₂e emissions

Value at stake: Connected Worker
(All figures cumulative, 2016-2025.)
- $100 billion Potential value addition for industry
- 13% Estimated reduction in accidents and injuries
- 76,000 jobs Estimated number of jobs displaced
Mastery of data and technology has led to the most rapid shift in economic models ever experience by humanity.
Digitalisation drives the next wave of improvements

Safety and sustainability strengthened through leveraging digital technologies

Digitalisation & innovation

Potential

Value creation producing fields
Above 2 bn USD

Automated drilling – cost
Around -15%

Field of the future – capex
Around -30%

Integrated remote operations US Onshore
Around 500 million USD

Added value

Digitalisation within Equinor
A new era

The world’s most valuable resource is no longer oil, but data

The Economist in 2017
At Equinor, digital opportunity is driven by three technological enablers:

- Process digitalisation
- Data science and analytics
- Robotics and remote control
A roadmap to accelerate our development

1. Digital safety, security & sustainability
2. Subsurface analytics
3. Next generation well delivery
4. Field of the future
5. Data driven operations
6. Process digitalisation & commercial insight
A roadmap to accelerate our development

1. Digital safety, security & sustainability
   - Cognitive safety for operational planning

2. Subsurface analytics
   - Subsurface data lake and experience platform

3. Next generation well delivery
   - Digital well planning and automated drilling control

4. Field of the future
   - Digital twin

5. Data driven operations
   - Integrated operation centres US and NCS

6. Process digitalisation & commercial insight
   - Robotic process automation
A roadmap to accelerate our development

1. Digital safety, security & sustainability
   - Cognitive safety for operational planning

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   - Subsurface data lake and experience platform

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   - Digital well planning and automated drilling control

4. Field of the future
   - Digital twin

5. Data driven operations
   - Integrated operation centres US and NCS

6. Process digitalisation & commercial insight
   - Robotic process automation

Digitalisation within Equinor
Projects are already being delivered

Operational planning tool

Digital twin v1.0

Automatic drilling control

Subsurface data lake and reservoir experience platform

Integrated operations centres

Digital field worker
Developing Equinor’s data platform

Data users
- Equinor employees
- Peers
- Suppliers
- Authorities

Applications
- PowerBI
- Spotfire
- Mobile & Web Apps

OMNIA – Equinor data platform
DATA, ANALYTICS AND SOLUTIONS FOR THE FUTURE

Data infra-structure
- Microsoft Azure
  - Cloud storage
- Other tech suppliers

Data sources and capture from existing systems
- Safety data
- Drilling data
- External data
- Subsurface data
- Supplier data
- Financial data
- Procurement & logistics data

Time spent looking for data
- Building models
- Gathering data

Focus on Standardisation
Current Standards Landscape for Smart Manufacturing Systems

Yan Lu
KC Morris
Simon Frechette

This publication is available free of charge from:
http://dx.doi.org/10.6028/NIST.IR.8107
2.2 SMART MANUFACTURING ECOSYSTEM

The Smart Manufacturing Ecosystem encompasses a broad scope of systems in the manufacturing business including production, management, design, and engineering functions. Figure 1 illustrates three dimensions of concern that are manifest in SMS. Each dimension—product (green), production system (blue), and business (orange)—is shown within its own lifecycle. The product lifecycle is concerned with the information flows and controls beginning at the early product design stage and continuing through to the end-of-life of the product. The production system lifecycle focuses on the design, deployment, operation and decommissioning of an entire production facility including its systems. The business cycle addresses the functions of supplier and customer interactions. Each of these dimensions comes into play in the vertical integration of machines, plants, and enterprise systems in what we call the Manufacturing Pyramid (Figure 5). The integration of manufacturing software applications along each dimension helps to enable advanced controls at the shop floor and optimal decision-making at the plant and enterprise. The combination of these perspectives and the systems that support them make up the ecosystem for manufacturing software systems. Details of the lifecycle of the three dimensions, as well as the Manufacturing Pyramid, will be described in Section 3.

NISTIR 8107
A digital twin is a virtual representation of the asset used from early design through building and operation. The digital representation provides both the elements and the dynamics of how a physical device or an asset operates. A digital twin can be seen as a bridge between the physical and digital world.
Technical information main flow in CAPEX project

Today this manage by company specification. The future is to find or define business standards.
Technical information main flow in OPEX project Extensions, Repairs and modification propjects

Company Digital twin

Suppliers

Contractor 4

Suppliers

More than 500 pr.year pr site

Use of object oriented information exchange
The Production process for Johan Sverdrup

1743 diagrams

Identifying over 96,000 physical objects
From Document centric to Object centric

Capture objects and manage information object by object

Use of object oriented information exchange
Digital twin in the future:

All objects in a «Asset world map». The world map is described by several different informations models. Each seen as an seperate aspect where the object sits.

Each object has its own lifecycle

No drawings only different views of collections of objects.
Why do Equinor want to see Object Oriented Information Exchange in a Standard Format

Idar Pe Ingebrigtsen Principal Engineer PRD FE AUT