Parallel Roundtable 3: Energy Sector Digitalization; Benefits and Challenges

Background Paper
Disclaimer

The observations presented herein are meant as background for the dialogue at the 16th International Energy Forum. They have been prepared in collaboration with The Boston Consulting Group and should not be interpreted as the opinion of the International Energy Forum or The Boston Consulting Group on any given subject.
Introduction

Market Context

• Industries are going through a digital revolution that has started to reshape each and every one of it
• Though digital is at a nascent stage in O&G industry, players are developing sophisticated initiatives in digital space
• Digital is significant in India and will go beyond 3Ms - males, millennials and metro

Session Objectives

• To understand relevance and scope of digital technology across industries
• To assess relevance of digital in India and what be future drivers of its growth in the country
• To observe themes driving digital investments across O&G industry and how some of the majors are deploying and benefitting from it

Key Question: How is digitalisation making oil, gas and power sectors more efficient and resilient? What is the role of inventory data, will stocks become more transparent in the digital age?
Digital is a “tremendous rate of change” with an ubiquitous front end

By 2030, the cloud will have more raw computing power than all human brains together

2X growth in connected devices per household—25 (2017) to 50 (2020)

1 internet minute means

- 0.9Mn logins
- 156Mn emails
- $0.7Mn spent

4 billion of the world’s internet users, will spend a staggering 1 billion years online in 2018

Source: BCG Analysis, 2018 Global Digital Suite of Reports (We are social)
Digitization has started to re-shape the complete industrial world

**Industrial Internet**
- Tracking (location & temperature) of refrigerated shipping container

**Mobile & social**
- Advanced mobile service assistance

**Augmented reality**
- AR-based assistance in warehousing

**Cyber security**
- Industrial cyber security for process industries

**Additive manufacturing**
- 3D-printed fuel nozzles in the combustion system

**Big Data & Analytics**
- Gene sequencing for agricultural production

**Cloud**
- SaaS based process engineering tools

**Simulation**
- 3D real-time factory simulation for design and monitoring

**Horizontal & vertical integration**
- Plant engineering integrated with process control system

**Autonomous robots**
- Human collaborative robots working side-by-side with workers

**Digitization has started to re-shape the complete industrial world**
Digital in India is already significant and will continue to grow

India today has the 2\textsuperscript{nd} largest base of internet users in the world

Internet users to further increase, driven by the rise in smartphone use

<table>
<thead>
<tr>
<th># internet users (Mn)</th>
<th>% Internet penetration</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>53%</td>
</tr>
<tr>
<td>India</td>
<td>35%</td>
</tr>
<tr>
<td>USA</td>
<td>89%</td>
</tr>
<tr>
<td>Brazil</td>
<td>66%</td>
</tr>
<tr>
<td>Japan</td>
<td>91%</td>
</tr>
</tbody>
</table>

Source: BCG Analysis, Ethnos Digital India snapshot 2017
Digital to go beyond 3M’s—males, millennials, metro

<table>
<thead>
<tr>
<th>Segment</th>
<th>2016 (Mn)</th>
<th>2020 (Mn)</th>
<th>Δ</th>
</tr>
</thead>
<tbody>
<tr>
<td>People who we think use internet in India...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Millennials (&lt;34 Yrs)</td>
<td>244</td>
<td>436</td>
<td>1.8</td>
</tr>
<tr>
<td>Male</td>
<td>231</td>
<td>390</td>
<td>1.7</td>
</tr>
<tr>
<td>Metro/T1</td>
<td>96</td>
<td>150</td>
<td>1.6</td>
</tr>
<tr>
<td>... but many others beyond the stereotype are online</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not So Young (35+ Yrs)</td>
<td>86</td>
<td>214</td>
<td>2.5</td>
</tr>
<tr>
<td>Female</td>
<td>99</td>
<td>260</td>
<td>2.6</td>
</tr>
<tr>
<td>Non-metro</td>
<td>234</td>
<td>500</td>
<td>2.2</td>
</tr>
</tbody>
</table>
Digital is still nascent in Oil and Gas but could cause significant disruption

Impact of digitalization is growing in all industries

### Transformations

<table>
<thead>
<tr>
<th>Sector</th>
<th>Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media</td>
<td>axelspringer, burda</td>
</tr>
<tr>
<td>Logistics and mobility</td>
<td>MAERSK, DB BAHN</td>
</tr>
<tr>
<td>Retail</td>
<td>TESCO, OTTO</td>
</tr>
<tr>
<td>Consumer</td>
<td>P&amp;G, LEGO</td>
</tr>
<tr>
<td>Banking</td>
<td>mBank, ING</td>
</tr>
<tr>
<td>Telecommunication</td>
<td>T-Mobile, at&amp;t</td>
</tr>
<tr>
<td>Agriculture</td>
<td>John Deere, CLAAS</td>
</tr>
<tr>
<td>Healthcare</td>
<td>Bayer, Pfizer, Allianz, AIG, OSCAR, MediKeep</td>
</tr>
<tr>
<td>Energy</td>
<td>Total, Shell</td>
</tr>
<tr>
<td>Mining</td>
<td>GLENCORE, RioTinto, Anglo American</td>
</tr>
<tr>
<td>Construction/Building materials</td>
<td>Hilti, Black &amp; Decker, Schindler</td>
</tr>
</tbody>
</table>

### Attackers

<table>
<thead>
<tr>
<th>Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Netflix, Spotify</td>
</tr>
<tr>
<td>UBER</td>
</tr>
<tr>
<td>Delivery Hero, JUST EAT</td>
</tr>
<tr>
<td>Amazon, OSOS</td>
</tr>
<tr>
<td>PayPal, CircleUp</td>
</tr>
<tr>
<td>STARRY, blau</td>
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</tbody>
</table>

Impact of digitalization is growing in all industries.

Digital dominates value chain.

Digital attacks value chain.

Additive digital value.

Digital progress.

Source: BCG analysis
“Digital” in O&G: 11 themes are driving innovation in leading global companies

- **Cybersecurity**: Protecting system integrity is a “must-have”
- **Robotics & automation**: Intelligent robots take on complex assignments
- **Sensors**: Low cost, low power, connected sensors capturing spatial and environment information
- **Unmanned aerial vehicles**: Autonomous, low-cost vehicles able to perform complex tasks and remove human presence
- **3D scanning**: Analyses of real-world object or environment to collect data on its shape/appearance
- **Collaborative technology platforms**: Employee engagement and collaboration enabled by digital platforms and communities
- **Big data & analytics**: Instant analysis of large data sets to identify new patterns
- **Cloud computing/storage**: Highly scalable, variable-cost storage & processing on demand
- **Virtual reality**: Interact more naturally with digital devices and services
- **Real-time communication and tracking**: Every asset, equipment, employee always connected
- **Mobile connectivity & augmented reality**: Virtual tele-presence to remove the need for on-site humans and omnipresent mobile devices

Source: BCG analysis
Oil & Gas players are already developing sophisticated initiatives in the digital space

Digital oilfields controlled from a unique Real-Time Drilling Optimization Center
UAV for pipeline inspections

Analytics driven predictive maintenance
Digital initiatives in retail (customer segmentation and loyalty)

Submersible robot for Ocean exploration
Immersive 3D training simulation

Real time production optimization through big data and machine learning
Digital oilfields controlled from a unique Real-Time Drilling Optimization Center

Description

Provides 360 degrees, 24/7 monitoring of live data, including most complex wells

Interact as virtual extension of rig and business unit-based teams

Supporting performance improvement in multi-well operations and process safety in wells

Technology

- Big Data
- Collaborative technology platforms

Benefits

- Faster communications and collaboration
- Quicker, better decisions and improved drilling performance
- Safer and more efficient operations
Analytics driven predictive maintenance with real-time data integration across all platforms

<table>
<thead>
<tr>
<th>Description</th>
<th>Technology</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>650 wells connected to Industrial Internet across Alaska, Angola and North Sea</td>
<td>Big Data</td>
<td>•&gt;$200 M annual cost savings</td>
</tr>
<tr>
<td>Integrates operational data from producing oil and gas facilities, to deliver notifications and analytical reports to upfront identify operational performance issues</td>
<td>Real-time communication &amp; tracking</td>
<td>• Estimated efficiency improvement of 2-4%</td>
</tr>
<tr>
<td>Leverages GE’s Asset Performance Management (APM), Predix and Plant Operations Advisor (POA) platforms</td>
<td></td>
<td>• Reduced supply chain costs</td>
</tr>
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</table>
Submersible robot for Ocean mapping for exploration

Description
MIT and ExxonMobil are working together to create a self-learning, submersible robot for ocean exploration
• Operates autonomously in all marine conditions
• Collects and analyzes ocean exploration data
• Learns from experience and needs minimal intervention

Technology

Benefits
• Safer and cheaper ocean mapping and surveillance
• Can detect and analyze naturally seeping hydrocarbons
Real time production optimization through big data and machine learning

**Description**

FieldPulse software can seamlessly integrate massive amounts of data from multiple sources (Well production data, testing, metadata like operator logs)

KPIs (e.g., rate decline and model deviations) constantly monitored

Embedded machine learning models track real-time patterns to improve performance through experience

**Technology**

- Big Data
- Real-time communication & tracking

**Benefits**

- Optimised field production: 1 Mbbl production gain from 30 wells in 2 years
- Lower manpower cost due to Automated monitoring
- Safer operations
However, companies are hindered in their “digitalization” by internal roadblocks

Digital talent crunch
72% of CEOs struggle to source the right digital talent

Dated processes
74% high digital decision-makers do not fully agree that their operational process is ready to execute their digital strategy

Cultural obstacles
“The biggest challenge is cultural change”

Inadequate investment in digital infrastructure
Only select cos are investing in state of the art digital infrastructure

Key Questions

1. What are some of the most practical areas where digital can help an O&G company in the short term (1 to 3 years)?

2. How can one insure smooth infusion of technology into traditional O&G business/companies without disrupting it?

3. What are the key challenges of going digital?
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