EXECUTING
TRANSFORMATION
AND INVESTING IN GROWTH
1-A: DIGITALIZATION IN THE CHEMICAL INDUSTRY

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Founder and CEO
Chemical Industry Roundtables
DIGITALIZATION IN THE CHEMICAL INDUSTRY

Anders Brun, Partner, McKinsey & Co

Frithjof Netzer, Chief Digital Officer, BASF

Thorsten Wenzel, VP and Global Head of Chemicals, SAP
Digitization in the chemical industry masterclass

13th Annual GPCA Forum
Nov 26th, 2018
Introductions

Anders Brun
Partner
Global Leader of McKinsey’s Digital client service in Oil & Gas

Digital McKinsey

We have made significant investments to build a distinctive set of capabilities and assets – these now represent 35% of our Firm and are growing at >40% per year

**McKinsey Analytics**
1,000+ advanced analytics experts focused on translating insights into action and building 360° customer views. Acquired Quantum Black and other leading analytics firms.

**Digital McKinsey**
Global team of digital experts who bring the combination of business + technology to capture the value of digital

**McKinsey Digital Labs**
850+ designers, developers, and technology experts that translate ideas into cross-channel experiences

**McKinsey Solutions**
Data, analytics and technology solutions to drive growth – includes recent acquisitions ClickFox and 4Tree

**McKinsey Design**
Acquired leading design firms: Veryday, Lunar and Carbon12, with 80+ years of cumulative experience of creating products and services for iconic brands including Apple

**McKinsey Implementation**
Seasoned industry talent acting as long-term coaches as clients scale action
Three discussion points...

❖ Our perspectives on digital

❖ What is the digital maturity of petrochemical institutions in the region?

❖ What can we learn from pioneers?
## Digital will unlock significant impact in O&G

### Economic impact of the digital, 4IC growth index %

<table>
<thead>
<tr>
<th>Sector</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthcare and Pharma</td>
<td>100%</td>
</tr>
<tr>
<td>Mining</td>
<td></td>
</tr>
<tr>
<td>Retail</td>
<td></td>
</tr>
<tr>
<td>Oil &amp; Gas</td>
<td>85%</td>
</tr>
<tr>
<td>Advanced Industries</td>
<td></td>
</tr>
<tr>
<td>Telecom and Media</td>
<td></td>
</tr>
<tr>
<td>Consumer Goods</td>
<td></td>
</tr>
<tr>
<td>Banking and Insurance</td>
<td></td>
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<tr>
<td>Transportation and Logistics</td>
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</table>

1. Digital impact, calculated based on the relative impact of digital on a sector compared to the sector with the highest digital impact.

**Example of organizations moving forward...**

Core concepts: The 4 enablers for digital innovation

<table>
<thead>
<tr>
<th>Redefining the delivery system</th>
<th>Enabled by...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced analytics</td>
<td>Digital org and IT infrastructure</td>
</tr>
<tr>
<td>Robotics and automation</td>
<td>▪ <strong>New analytical methods</strong> (descriptive, predictive and prescriptive) to maximize the value of large and complex data</td>
</tr>
<tr>
<td>Process digitalization</td>
<td>▪ <strong>Eliminate the need for human intervention</strong> in non-decision making functions through artificial intelligence, machine vision, etc.</td>
</tr>
<tr>
<td>Connectivity and sensing</td>
<td>▪ <strong>Digitization of business processes</strong> enabled by centralization and proliferation of data</td>
</tr>
<tr>
<td></td>
<td>▪ <strong>Connecting various assets</strong>, enabled by a data platform to better understand and manage</td>
</tr>
<tr>
<td></td>
<td>▪ Creation of <strong>Centers of Excellence</strong> and investments in <strong>cloud enablement</strong> of data and infrastructure</td>
</tr>
</tbody>
</table>

1. The four shown digitally enabled practices are selected as they cover the full breadth of observed digital opportunities in oil & gas.

SOURCE: Team analysis
Complex production, sales and procurement system

Big Data – diverse data set; ~1 million variables; 800k constraints

Data scientist + Process engineer

Building learning models (some opensource)

Governance setup to drive adoption

7% profit improvement
- Frontline maintenance application created to assign maintenance tasks and support faster execution
- Drives quality and productivity and improvements on the field. E.g.,
  - Reporting of hazards
  - Integration to SAP to provide on-the-field work instructions
8% Return on Sales improvement

Dynamic pricing applied to specialty products

- Global specialty chemical BU where price setting was unstructured process and largely reactive to market forces
- Predictive AA model developed and deployed in a cloud platform
- 100+ sales and pre-sales reps trained to use new solution
- 8% RoS run-rate impact after 4 months
What is the digital maturity of petrochemical institutions in the region?
Digital Quotient

Objective and comprehensive measure of digital maturity that correlates with performance

...in-depth diagnostic survey

- Measures digital maturity in a way that correlates with financial performance
- Links digital management practices to key outcomes
- Provides actionable insights to surgically focus improvements
- Offers internal and external benchmark
- Developed by experts across industries in partnership with Google

...across GPCA

- 13 GPCA member companies participated
- 177 respondents
- 50 questions answered by each respondent

McKinsey ran...
DQ™ comprehensively measures a company’s digital maturity across 4 key areas and 18 management practices.

- **Strategy**
  - Bold, long-term orientation
  - Linked to business strategy
  - Centered around customer needs

- **Culture**
  - Risk appetite
  - Speed / Agility
  - Test and learn
  - Internal collaboration
  - External orientation

- **Organization**
  - Roles and responsibilities
  - Talent and leadership
  - Governance / KPIs
  - Digital investment

- **Capabilities**
  - Sales force enablement
  - Content & digital marketing
  - Customer experience
  - Supply Chain
  - Data-driven decision-making
  - Automation
  - IT architecture
  - Dealer management & enablement
GPCA companies aspire to be digital leaders in their sector and drive significant growth and cost efficiencies from digital in the next 3-5 years.

In digital, 3-5 years from now, you want your company to be...

Operative
Reliable
Excellent
Grown
Safe
Data-driven
Competitive
Petro-Chemical
Sustainable
Automated
Technological
Digitized
Connective
Online-based
Innovative
Analytical
Efficient
Leader
Recognized
Integrated
Secondary
Robotics
Cloud-based
Secured
Optimized
Global
Performed
Best-in-class
Improved

Q: When you think about where you want your company to be 3-5 years from now in digital, what 3 words will describe it?

22% of companies spend more than 30% of their time thinking about digital issues.
DQ scores reveal opportunity areas to strengthen GPCA’s digital maturity across 4 key areas when compared to digital leaders.

43

1 Digital Leaders are defined as companies with a DQTM score equal to or above 50.
We have identified 5 priority management practices to improve

<table>
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<tr>
<th>Strategy</th>
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<th>Organization</th>
<th>Capabilities</th>
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<tr>
<td>Bold, long-term orientation</td>
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<td>Governance / KPIs</td>
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Member institutions need to better align its digital strategy with its overall business strategy and strategic planning process

Digital strategy is not rooted in the broader business

None of the companies believe that digital initiatives flow from or add up to a coherent digital strategy that links to the broader business (and/or corporate) strategy.

Q: To what extent do your digital strategy and activities form a coherent part of your broader business (and/or corporate) strategy?

... and not fully integrated in the strategic planning process

Q: How is digital a part of the strategic planning process?

<table>
<thead>
<tr>
<th>Percent of total companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – Not part of the strategic planning process</td>
</tr>
<tr>
<td>2 – Limited role in the strategic planning process</td>
</tr>
<tr>
<td>3 – Limited role in the strategic planning process</td>
</tr>
<tr>
<td>4 – Integral role in the strategic planning process</td>
</tr>
<tr>
<td>5 – Integral role in the strategic planning process</td>
</tr>
</tbody>
</table>
Top 5 pitfalls underpinning the lack of adoption at scale

1. “Lots of hype; let’s wait and see…”
2. “This is a IT / technology/ platform play…”
3. “I can outsource the capability…”
4. “I am too busy, let my team deal with this…”
5. “Pilots, more pilots…”

70% of transformations trying to make companies more innovative fail....

Source: Forbes, McKinsey O&G Experts
What can we learn from pioneers?
Successful journeys entail a triple transformation

**Business and product transformation**
- Value mapping
- Product testing and development
- Customer interaction

**Organizational transformation**
- Digital governance
- New roles & capabilities
- Agile culture – Ways of working

**Technology Transformation**
- Future-proof flexible architecture
- Digital

SOURCE: Digital McKinsey
Triple transformation is achieved by challenging the status quo across 3 dimensions

<table>
<thead>
<tr>
<th>Category</th>
<th>Type</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business and product transformation</td>
<td>Value mapping</td>
<td>Shiny objects / Being cool</td>
<td>True pockets of value / EBIT &gt; XX M</td>
</tr>
<tr>
<td>Product testing and development</td>
<td>Traditional</td>
<td>Limited touch points</td>
<td>Iterative</td>
</tr>
<tr>
<td>Customer interaction</td>
<td>Digital governance</td>
<td>30% processes digitized</td>
<td>85% processes digitized</td>
</tr>
<tr>
<td>Organizational transformation</td>
<td>New roles and skills</td>
<td>Limited</td>
<td>Mobile</td>
</tr>
<tr>
<td></td>
<td>Agile culture – ways of working</td>
<td>Functional siloes</td>
<td>Digital Mkting</td>
</tr>
<tr>
<td>Technology Transformation</td>
<td>Future proof flexible architecture</td>
<td>One speed (slow)</td>
<td>Data Analytics</td>
</tr>
<tr>
<td></td>
<td>Digital</td>
<td>Top down</td>
<td>DevOps</td>
</tr>
</tbody>
</table>

SOURCE: Digital McKinsey
In petrochemicals our advanced Value Maximizer tool helped to achieve 7% profit improvement

**Client situation**

- Leading petrochemical company
- 25 plants in operation involving 150+ chemicals and $1bn in revenues
- Current plant scheduling process is mostly manual, involving ad hoc decisions with no quantifiable metrics to compare against optimal planning

**Summary of approach / methodology**

- Developed McKinsey proprietary analytical Value Maximizer software solution that creates profit optimal plant schedule, showing how much each plant should produce of each chemical per month; given the chemical supplies, production capacities, operational requirements with costs and demand

- Designed integrated operations, sales, and procurement planning processes based on a data-driven planning approach, enabled by the tool suggesting optimal plans and facilitating rapid scenario analysis. Plans can now be quickly adapted to new conditions.

**Organization & Process Design**

Unique combination of proprietary McKinsey advanced analytics, software solution, plus organization & process design was key for success

**Impact**

<table>
<thead>
<tr>
<th>Operating profits</th>
<th>Indexed to 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual plan</td>
<td>100</td>
</tr>
<tr>
<td>Value maximizer’s plan</td>
<td>107</td>
</tr>
</tbody>
</table>

7% profit improvement with the same level of complexity solved in a matter of minutes
Manufacturing analytics was used to optimize profit per hour of ammonia unit indicating 150-300MEUR value at stake for entire client network

Best ammonia plant of global corporation with stable operations and running APC looking for additional potential.

- **Sensing & capturing** – PI data used for 3 year period sampled at 5 min interval and combined with weather data

- **Analysis & modelling** – Model used to correct for weather impact as this explained 75% of variability. Remaining 20% addressed through 5 controllable parameters.

- **Insights & intervention** – New parameters coded into APC, technical insights used to create high payback business cases, faster deviation management as performance corrected for weather impact reducing noise

- 2% variable profit increase for the best unit of the client
- Overall EBITDA improvement for site network estimated at 150-300 MEUR

SOURCE: McKinsey Yield, Energy & Throughput service line
Case example 2: Bringing dynamic pricing to a global specialty chemical company

Situation

- Global specialty chemical BU with EUR ~1Bn in sales
- Worked extensively over past two years to help increase profitability from EUR 90M to 160M
- Work focused on more classic topics like transactional pricing quick wins, GTM redesign, setting up a pricing war room
- Price setting without structured process, reactive to market forces, based on best effort

Approach and result

- Completed 4-week diagnostic focused on impact from improved price setting and identified additional EUR 60M impact
- Segmented products based on differentiation
- Identified need for 3 distinct pricing approaches, dynamic commodity pricing, dynamic data driven pricing and value-based pricing
- Developed a pricing engine for each pricing approach in 8 weeks
- Delivered a single, integrated, cloud-based platform that combined all relevant pricing tools for each engine and approach
- Created and trained a pricing office
- Trained 100+ sales and pre-sales reps in value pricing in 20+ top cases and 4 Forums
- Build capabilities of entire commercial organization over the course of 4 months

Impact and lessons learned

- EUR 20M of impact already in the bank by end of the project (4 months after starting to apply first measures)
- EUR 84M (>8% RoS) run rate impact achieved already 4 months after starting to apply first measures
- Best guess is not good enough, money is being left on the table if you are not able to price every customer product combination optimally
- The value and impact is in the individually built pricing engine, every client situation is different and there is no one-size-fits-all quotation tool
- While a flexible set of light cloud-based tools supports value capture, mindset change across the entire organization is key to capture impact
- All elements need to work hand in hand (Tools, Organization, Mindset) to achieve sustainable impact
Best ammonia plant of global corporation with stable operations and running APC looking for additional potential

- AA modeling to identify parameters impacting profit per hour
- Data scientist + Process engineer
- Insights integrated into APC

2% variable profit increase
Executing Transformation and Investing in Growth