Case Studies of Digital Transformations in Process and Aerospace Industries

Strategies, organizational setup and practical projects

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Background in physics and aerospace engineering, transformation experience in chemicals, beer and aerospace
Approach Jugaad Analytics
Enabling partners to exploit their existing data

**Big data journey: learn from your own data**

- Full utilization of operational data ranging from logistics, manufacturing, procurement etc. without adding any sensors
- Added intelligence through laws of physics to close gaps in data
- First results within 1-2 weeks identifying correlations in the process within scope
- Report (roadmaps) to show potential improvements in:
  - Production efficiencies, Energy reduction, Process automation etc.

**Data sources:**
- Planning
- Finance & Sales
- Logistics
- Warehouse
- Manufacturing
- Maintenance
- Procurement
Biggest opportunity is turning data into information and the challenge is finding the right team.
Step 0.
- Site visits
- Identify As-Is & Site initiatives
- Meet relevant stakeholders

Step 1.
- Inspire and inform leadership on i4.0
- Inspire and inform sites on i4.0 plus workshops "net ophalen"

Step 2.
- Create vision & strategy based on workshops and external sources

Step 3.
- A. Setup internal community of digital volunteers incl. newsletter
- B. External community
  - Copy with pride from competitors
  - Define joined efforts to create optimal SC and Customer Intimacy

Step 4.
- Run projects based on: Think big, start small
  - "Beads & mirrors" or non-scalable projects, will help in change and acceptance
  - "Enablers"
  - "Scalable projects"
- Goal should be to create a bottom up strategy and sites are evenly involved with scalable projects

Step 5.
- Program management
  - Experiments
  - Go/No-Go
  - Roll out

Roadmap to build a coherent Industry 4.0 strategy
Personal view on Digital Transformation and Industry 4.0

Evolution from Lean, to 6sigma, to i4.0

New Business (Top line)
Efficiencies & Effectiveness (Bottom line)
Processes
Transformation IT to DT
People

Sequence
Benefits
Enablers
Current aspects of i4.0 site maturity scan

- Are people willing to accept new technologies ("yellow profile")?
- Are people data driven and fact driven?
- How does the IT infrastructure look like?
- Is way of working standard ("lean mature")?
- How far are the production processes optimized ("6sigma mature")?
- Do current products lines have opportunities for new business models?
Building to a vision statement
Examples from AkzoNobel and Rolls Royce
How do we tackle a broad scope of Industry 4.0

<table>
<thead>
<tr>
<th>Scope</th>
<th>Feasibility assessment</th>
<th>Determine scope (relevant process, asset, etc.) and select a site for the Experiment. Make detailed timeline and effort estimate for Lighthouse</th>
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</thead>
<tbody>
<tr>
<td>Show</td>
<td>Experiment</td>
<td>Demonstrate initial benefits through the collection of real-world data, understanding the current performance and generating predictions</td>
</tr>
<tr>
<td>Go / No-go</td>
<td></td>
<td>Assess outcome of Experiment</td>
</tr>
<tr>
<td>Scale</td>
<td>Roll-out</td>
<td>Scale the initiative to accelerate benefits creation. E.g. expand across sites / asset types</td>
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Digital Innovation function
The innovation outpost is a dedicated unit separate from any functional unit or division, but cross-functional.

Fenced-off digital factory
This is the most common starting point. It concentrates digital talent and capabilities inside the business, but the factory works as a partner with business and functional units from the start.

Business-unit (BU) accelerator
This is a scaled-down version of the digital factory, embedded in a particular BU. Using this approach, the BU gets a crash course in digitization, building its own relevant skills in areas such as robotics or process redesign.

Full-scale evolution
This is the most ambitious path, involving simultaneous transformations across the organization’s operating units and functions. This path is the default for “digital natives” whose technology, digital services, and product delivery are already inextricable. The model is highly attuned to customer needs and emphasizes rapid development, testing, and iterations of products or services.
The digital organization and its considerations

- Alignment of workforce planning in terms of outflow and required capability

- Identify current i4.0 capability and need for education/training

- Training actions to consider for all sorts of employees in the context of Industry 4.0

- Recruitment of relevant i4.0 capabilities
Data analytics, where to start?!

**Linear Regression: Debottlenecking**

- Chemical process does not meet the DCA specification levels at maximum capacity
- High variance in performance, gives poor predictability of model output
- Controlling and standardizing the process will provide a predictable process to optimize production

**Machine Learning: Energy flexibility**

- High energy price fluctuations can be found in the imbalance market, mainly caused due to green energy production
- By operating autonomous and flexible the production can be optimized through electricity cost. This will require updated automation algorithm/system of master controller

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Data Availability & Connectivity
Visualisation (e.g. distribution)
Statistics (e.g. linear regression)
Advanced Analytics (e.g. ML)
Predictive Maintenance

Can we predict failures’ cause in rotating equipment?

Our approach:
• Big-data algorithms to process existing real-time operating data
• Embed engineering intelligence in these algorithms to predict time and cause of failure
• Continuous update between clients and Jugaad to validate algorithm outcomes

Results:
• Number of assets: >10 pumps and >3 compressors
• Prediction accuracy for cause of failure: 80%
• Prediction accuracy for time of failure: 93%

Three companies from very different industries share the benefits of these algorithms to learn for their predictive maintenance; “A pump is a pump”
SwipeGuide, a tool for knowledge sharing, best practices and paperless work floors through digitized work processes

https://swipeguide.com/
To close the gap of internal capabilities, use open innovation to accelerate digital innovations.
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