Digital Champions in the Mining & Processing Industry
Our Digital Operations framework covers all key operations & support functions and technologies in a mine.

- Connected Supply Chain
- Smart Operations
- Connected Supply Chain
- Digital Maintenance
- Integrated Planning
- Digital Support Functions
- Health, Safety, Security & Environment
- Digital Mining
- Metal Processing
- Exploration

Enablers:
- IT/Technology Architecture
- Digital Capabilities & Culture
- Partnership & Alliances
- Governance/Processes and Data Management
- Information Risk Management
Digital Champions create value through integrated ecosystems with double-digit revenue boosts and efficiency gains

Benefits investing in digital technologies and Digital Champion Solutions – Process Industry

- **Digitization of product and service offerings**
- **Leadership in customer-centric solutions**
- **Management of a partner solution network**
- **Near real-time E2E integration & planning platforms**
- **Full vertical integration / MES of manufacturing operations**
- **Tech innovations, e.g. AI Solutions, Collaborative Robots**
- **Digital Strategy & implementation roadmap**
- **Digital experts and dedicated training programs**

**Digital Revenue Increase 2018 - 2023**
- **Digital Novices**: 8%
- **Digital Champions**: 13%

**Efficiency Gains / Cost Reduction 2018 -2023**
- **Digital Novices**: 11%
- **Digital Champions**: 23%
A large downstream manufacturer collects and analyzes operational data that allow for predictive maintenance, remote monitoring & digital repairs.

Predictive maintenance at downstream process manufacturer

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**CLIENT EXAMPLE**

Data collection
Remote control tower
Smart Algorithms
Mobile information
On site
Remote
Fully digitized process

Sensor- and remote diagnostics
Planning
Maintenance & repair

Data collection
Remote control tower
Smart Algorithms
Mobile information
On site
Remote
Fully digitized process
Drone and robot technologies are applied to support maintenance processes in the mining and oil & gas infrastructure

Best Practice Examples – Digital Maintenance & Repair

- Maintenance of assets, e.g. **structural assessment of technical conditions** of various infrastructure elements, structural alignment validation, detection of overheating elements and corrosion
- Leak detection with **no ability to see the leakage** on often long- stretching or difficult-to-reach pipelines
- Engagement of workforce in potentially dangerous areas posing a significant **health and safety risks**
- Drone-borne infrared sensor enable **automation and acceleration** of maintenance issue identification
- **The initial assessment and correction** of the situation can be done immediately based on real-time video stream and robot tools

*Source: Desk research, Client examples, Strategy& analysis*
Augmented reality solutions have been implemented by a client in the process industry to optimize operations and maintenance.

1. Maintenance
   - Mobile Maintenance solutions

2. Turnaround
   - Special maintenance

3. Operations
   - Mobile solutions for plant operations

4. Engineering
   - Mobile access to engineering data

Objectives of Augmented Reality

- **Connect physical** assets to **digital world**
  - Enable identification of equipment
  - Receive performance and quality data in real time

- **Enable equipment alarm settings and remote diagnostics**

- **Enable equipment visibility and location tracking in complex plants**

- **Provide critical service data** for equipment

- **Push work instructions** to reduce time and knowhow requirements for service

- **Establish optimized user interface, task confirmation and service documentation**
Digital technologies have been implemented to enable mobile communication and AR solutions.

**AR Platform Framework**

- **Wireless Plant Infrastructure**
- **Mobile Devices & Mobile Device Management**
- **Augmented Reality Solution**

**Apps Store + Apps**

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<tr>
<th>Sub Platform</th>
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<td>for PIMS based AR solutions (vendor tbd)</td>
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<td>for DCS based AR solutions (vendor DCS specific)</td>
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<td><strong>SAP/PM</strong></td>
<td><strong>PIMS (prod. inf. mgmt. system)</strong></td>
<td><strong>DCS (distributed control system)</strong></td>
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Global Process leader trains its field operators in a 3D virtual environment to ensure higher safety procedures and reduce operations cost

Overview
• 3D digital asset information data capture by scanning (drones, autonomous underwater vehicle (AUV) and scanners) and providing centralized management of all available field data
• Web-based 3D view of site stored in the Single Point Of Truth database allow for Single Panoramic Images; Walkthrough / Flythrough; Asset Tagging etc. Siemens software is used to train its staff for offshore installations using a virtual 3D environment
• The simulator offers a virtual 3D environment of a plant and provides the opportunity to simulate real-life situations, allowing workers to see and experience what tasks they need to perform, and rehearse procedures and workflows associated with any number of scenarios.

Benefits
• Increased transparency for brownfield works
• Risk mitigation and increased safety
• Operational Cost and Downtime Reduction
• Reduction of maintenance time & cost
Advanced MES planning tools integrate and optimize all operations management functions.
MES Digital cockpits allow for real time controlling and optimization of operations processes

Collaborative planning solution
An integrated end-to-end planning is based on a joint platform for all planning-related activities between key functions.

Supply
- Integrated material requirements planning (VMI/consignment stock, visibility on inventory)
- Vertical integrated real-time planning in production incl. MES introduction
- E2E logistics visibility (Last mile notification, E2E tracking)

Integrated planning & execution platform
- E2E supply & demand planning
  - Integrated planning and execution along the value chain
- E2E supply & demand planning

Customer
- Integration into B2B and B2C ecosystem (PoS data & public data, online market places, own apps, customer ERP integration)
- Proactive demand sensing
  - Utilization of digital customer and configuration data, sales data, service needs and external data
- Dynamic real-time inventory management for a multistage SC and warehouse network

Enabler
- E2E data availability, utilization and analysis & efficient IT and data architecture as supply chain support

Industry case

Globally leading player using cloud ERP solution to create a supply chain ecosystem

- Using a cloud collaboration platform to link all stakeholders from suppliers through internal operations to customers
- Near real-time feedback on changes in customer demand or product availability assessed and communicated along the supply chain
- Integration with different legacy planning solutions and logistics platforms
Live inventory location and stock level tracking & optimization management has been installed to optimize inventory levels.

Seamless workflow of warehouse processes

- Schedule maintenance
- Create work order
- Generate picklist
- Receive picklist by resource
- Fulfil order

**Systems / IT (Level 3)**
Integration of Maintenance with the warehouse management system for seamless workflow and real-time data analytics.

**Monitoring & Surveillance (Level 2)**
Access control system and CCTV for monitoring warehouse and inventory.

**Material Inspection & Tracking (Level 2)**
Use of RFID/barcode based scanners for inbound and outbound material movement, with automated track and trace capabilities.

**Put-away, Palleting, storage and packing (Level 2)**
- Forklifts with scanners which directly receive pick lists
- Rail-guided Very Narrow Aisle (VNA) storage trucks
- Man-to-goods systems (wide aisle Pallet storage, racking system with bins and cantilevers)
- Goods-to-man system (vertical carousal system)
Implementation of a Smart Site Management using an Integrated Supply Chain Tower

Control Tower activities

- Just-in-time / Just-in-sequence delivery
- Detailed operations scheduling (FTEs and equipment)
- Fleet management & optimization
- Maintenance management
- Dynamic project management & scheduling
- Big data analytics for performance data
- Integration of suppliers (incl. services)
- Optimal on-site routing
- Autonomous operations (control room)
- Smart site technologies for in- and outbound logistics
- Automated and fully transparent tracking
A best practice IT architecture covers all elements to enable the implementation of digital applications.

**Recommended IT Architecture**

### Users
- **Access channels**
  - Web browser
  - M-browser
  - Mobile apps
  - E-mail
  - SMS
  - AR / VR

### Client management and staff
- **Presentation (view)**
  - Website
  - Multi-lingual support

### Client service providers
- **Data retrieval and aggregation services**
  - Collaboration solution
  - Workflow management
  - Strategy and performance tracking workflows
  - HR and training solutions
  - Account and finance solutions
  - Legal compliance and case mgmt. solutions

### Business services / components layer
- **Client Business Enabling Solutions**
  - MOM (Manufacturing Operation Management)
  - Inventory Management
  - APM
  - Procurement suite
  - Condition Monitoring
  - Predictive Maintenance
  - Permit to work
  - HSE drones
  - IT service activation
  - Knowledge management
  - Contract mgmt. solution
  - Capital – Investment management solution
  - Risk assessment and management solution

### Centralized data management
- **Data Abstraction Layer**
  - MDM database
  - Transaction database
  - Process historian
  - Analytics database
  - Audit database
  - Reporting database

### Physical IT infrastructure
- **Server infrastructure**
- **Network infrastructure**
- **Peripheral devices**
- **Security devices**

### IT applications
- **Business applications**
- **IT security apps**
- **Enabling / shared system apps**
- **IT delivery and support mgmt. apps**

**Source:** Strategy& analysis
Empowered employees and the right strategy are at the center of digital transformation

Corporate Digital Vision and Culture

**Digital Strategy**

“Our leadership has a clear digital vision and strategy for the digital future and acts as role model.”

“We foster a culture of innovation with multi-disciplinary teams.”

**Digital Organization**

“We are focused on providing a digital customer experience throughout the customer journey.”

“Our company has flat hierarchies that facilitate agile working and quick decision-making.”

**Digital Education**

“We have invested heavily in training to make our staff fit for digital transformation.”

“Our employees have the required qualifications for the digital future.”

Source: Global Digital Operations Study, Strategy& analysis