ABeam IoT Solution
IoT Data-driven Manufacturing

Manufacturing is becoming more difficult for a number of reasons: demand for better than ever quality, ultra-short turnaround times, a declining labor workforce, retirement of a generation of skilled disciplined craftsmen, and the need to generate added value in a changing manufacturing environment. As Germany’s Industrie 4.0 leads the way towards utilizing IoT, AI, and other technologies to make manufacturing more digital, automated, and less labor intensive, a wave of manufacturing improvements utilizing connected equipment demands an effective response.

ABeam Consulting supports digitalization of the manufacturing workplace to achieve better product quality and productivity by means of proven IoT solutions, business scenarios, state-of-the-art analytics technologies, IoT platforms and a data-driven approach.

Room for improvement

Issues the manufacturing industry is continuously confronted by are, gaining the trust of the market through product quality (design, development and production), and needing to boost competitiveness through productivity.

<table>
<thead>
<tr>
<th>Product Quality</th>
<th>Productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>Equipment Operation</td>
</tr>
<tr>
<td>Understand products’ derogation in the market, and design utilization</td>
<td>Reduce production momentary stop and eliminate long/indefinite halts for continuous line operation</td>
</tr>
<tr>
<td>Monitor variance in equipment behavior to standardize product quality</td>
<td>Identify hidden causes of defects that defy human observation</td>
</tr>
<tr>
<td>Close gaps of unmet customer need, inter-factory coordination, product standards adjustment</td>
<td>Transfer skills for high-quality equipment configuration, quality inspection, etc.</td>
</tr>
<tr>
<td>Enhancement traceability to increase quality and speed</td>
<td>Use plant operation monitoring for efficient maintenance</td>
</tr>
</tbody>
</table>

IoT solutions improving product quality and productivity

Product quality and productivity are improved by utilizing insights gained through analysis of product, equipment and production process data.

- **Data analytics & analysis model** solve business process issues
  - High-level analysis (Machine/deep learning)
  - Problem understanding and resolution based on production knowledge

- **IoT Platform applying data to business processes**
  - Select applicable environment out of various clouds with completed environments
  - Data HUB
  - Business process control
  - Management platform

- **Cyclical business process optimization methodology with automated fundamental analysis**
  - Shorter turnaround through data processing & infrastructure analysis
  - Repeated model tuning

IoT Utilization Scenarios

- **Analytical models for correlation of quality factors from plant, sensor data**
  - Development of product operation model using product-internal sensor data
  - Operational error detection & cause analysis, and product design improvement

- **Operational monitoring & malfunction forecasting using equipment data**
  - Big-picture factory model development from scheduling & real operational data
  - Production management & workplace operational orders for process use

- **Data analytics & analysis model solve business process issues**
  - Problem understanding and resolution based on production knowledge

- **IoT Platform applying data to business processes**
  - Select applicable environment out of various clouds with completed environments
  - Data HUB
  - Business process control
  - Management platform

- **Cyclical business process optimization methodology with automated fundamental analysis**
  - Shorter turnaround through data processing & infrastructure analysis
  - Repeated model tuning
Business issue resolution by data analytics and analysis model

**Problem solving through high-level IoT analytical technology**

From enormous sensor data volume, even rare problems can be detected and predicted:
- Causes of defects for each product in “low-volume various models” production
- Product/plant defect timing, etc.

**ABeam IoT analytics**

High visibility and precise forecasting achieved by combining manufacturing industry knowledge and experience, allowing analysis in light of actual product/plant/process status.

**Issues of high-level analytical technology**

- Incorporate analytical results into factory operations & systems to run continuous improvement cycle
- Interpret data and build hypotheses in light of the on-site perspective of experienced, knowledgeable personnel on scene
- Derive results from exclusive tuning technology combining a wide range of algorithms
- Structure data based on ISO/other international standards, mechanical engineering, technical knowledge, and experience

**Analysis & forecast**

Avoiding development of “black box”

**Implementation & refinement**

Incorporate analytical results into factory operations & systems to run continuous improvement cycle

**Understanding**

Highly readable data analysis

**Deep learning**

Detecting statistically characteristic volumes necessary for problem solving

**Machine learning**

Repetitive learning from data for detection of hidden patterns

**Data mining**

Repetitive learning from data for detection of hidden patterns

**Statistics**

Repetitive learning from data for detection of hidden patterns

**Data Volume**

Repetitive learning from data for detection of hidden patterns

IoT platform to incorporate data utilization into business process

From a variety of major cloud services, an IoT platform is selected for collection, compilation and analysis of product and plant sensor data, as well as all varieties of enterprise data. This platform is then fine-tuned and adapted to the specific business processes.

**Data utilization**

Sensor

Device Controllers

- Analytical models are ready-to-use, and tools for managing and operating the models available
- Library lineups simplify data processing & analysis
- Hybrid environments available for selection from major IoT cloud services

**Data collection**

From data collection to data utilization, equipped to handle diverse range of data types

**Data accumulation & processing**

Model is fine tuned while running BPR and services for constructed systems

**Analysis**

Analytical models and systems for gathering, compilation, and processing are developed for enhanced visibility of data from products, plants, etc.

**Visualization**

Provide BPR and service

**Data links**

Build systems for data collection & analysis

**Data transmission**

Build analytical models & system frameworks

**Ent System**

Optimize actionable data with methodology

**ERP**

Improve business processes and provide services

**MES**

Library lineups simplify data processing & analysis

**QM**

Analytical models are ready-to-use, and tools for managing and operating the models available

**WMS**

Hybrid environments available for selection from major IoT cloud services

**PLM**

From data collection to data utilization, equipped to handle diverse range of data types

Cyclical business process optimization with automated fundamental analysis

We create systems for building analytical models, in which experts with knowledge and experience in, the latest data analysis technology, IT, and manufacturing; apply the cycle of analysis, result evaluation, and improvement to the targeted products, plants, and processes for analysis. We then optimize the model for the client’s business processes and support you to incorporate it into your daily business.

**Hypothetic scenario and result**

Delineate scope of analysis

**Data analysis**

Analyze existing data

**Data utilization system creation**

Build systems for data collection & analysis

**Provide BPR and service**

Optimize actionable data with methodology

**Build analytical models & system frameworks**

A Beam Consulting performs quick processing & analysis on extractable existing data.

**Analytical models and systems for gathering, compilation, and processing are developed for enhanced visibility of data from products, plants, etc.**

Determine business objective and generate action scenarios based on issue hypotheses and anticipated effects.

A Beam Consulting performs quick processing & analysis on extractable existing data.

Analytical models and systems for gathering, compilation, and processing are developed for enhanced visibility of data from products, plants, etc.