Platform360 Industrial IoT Solutions using Azure Services
# Platform360 Industrial IoT Solutions

## Using Microsoft Azure

### Table of Contents

1. Industrial IoT Challenges
2. KoçDigital Industrial IoT Solutions
3. Industrial Use Cases
4. Appendix
## Digital Transforms Manufacturing Projects

<table>
<thead>
<tr>
<th>Incentive</th>
<th>Operational Needs</th>
<th>Business Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decision Makers</td>
<td>Manufacturing field workforce</td>
<td>CIO, CDO, CTO</td>
</tr>
<tr>
<td>Governance</td>
<td>Variety of vendors for piecemeal traceability</td>
<td>End-to-end manufacturing transparency</td>
</tr>
<tr>
<td>Suppliers</td>
<td>Automation Firms</td>
<td>IoT firms, Digital Transformation firms</td>
</tr>
<tr>
<td>Technology</td>
<td>Monitor basic KPIs with manual input</td>
<td>Connected Digital twin of manufacturing</td>
</tr>
</tbody>
</table>
WHY DO WE NEED INDUSTRIAL IOT?

- Increase Efficiency
- Improve Quality
- Increase Safety
KoçDigital is an IoT System Integrator which provides end-to-end solutions.
Engaging in IIoT based digital manufacturing solutions create substantial impact

Industrial IoT creates business values, increases productivity, and customers gets/stays competitive

- Throughput increase with horizontal product line optimization: 5-10%
- Reduction of unplanned downtime: 50-70%
- Reduction of spare parts usage: 15-20%
- Increase in engagement of maintenance teams: 35-50%
- Increase in equipment uptime: 10-20%
- Eliminate process related production downtimes: 100%
- Decreased Energy Usage: 5-10%
- Eliminate paper based processes: 100%

Source: KoçDigital Customer Insight
# Platform360 Industrial IoT Solutions

**USING MICROSOFT AZURE**

## TABLE OF CONTENTS

1. INDUSTRIAL IOT CHALLENGES
2. KOÇDIGITAL INDUSTRIAL IOT SOLUTIONS
3. INDUSTRIAL USE CASES
4. APPENDIX
KoçDigital’s solution set to digitize existing/new factories

Offerings of KoçDigital in Industrial IoT

- Assembly Management System
- Remote Asset Management
- Predictive Maintenance
- Manufacturing Analytics
- Manufacturing Execution System
- Manufacturing Information System (MIS)
- Quality Monitoring
- RTLS (Manufacturing Traceability)
- Energy Management
- Industry 4.0 Health Check

Source: KoçDigital

Manufacturing Execution Platform
Industrial IoT Platform (IIoT Platform)
Platform360 is the common service layer, enabling numerous Industrial IoT Applications & Analytics

Source: KoçDigital
Platform360 is based on OneM2M, the global standards initiative for Machine-to-Machine and IoT technologies.

The purpose of OneM2M is to specify, promote and maintain a Common IoT Service Layer allowing every component to communicate as one system.

It provides a flexible architecture to accommodate a variety of device platforms.

Provides technical support artifacts ...
- Requirements
- Architecture
- API specifications
- Security
- Interoperability

Over 200 participating partners and members ...

Used across industries ...
- Home automation
- eHealth
- Industrial automation
Platform360 on Azure

Low Powered Devices

IoT Gateway (IPE)

Applications

OneM2M Devices

Azure IoT Hub

Hot Storage

Service Bus

Stream Processor

Big Data Storage

Analytics & Machine Learning

Manufacturing Execution System

Energy Monitoring

Connected Vehicles

Devices

Edge

Data Processing, Analytics

Solutions

“OneM2M module” content will be shown on the next page
OneM2M Modules

- Registration
- Discovery
- Group Management
- Security
- Data Management & Repository
- Subscription & Notification
- Device Management
- Application & Service Management
- Communication Management
- Network Service Exposure
- Location
- Service Charging & Accounting
- Transaction Management
- Semantics
- Transaction Management
- Semantics
**Horizontal IoT Platform**

Platform360 provides horizontal information flow with Azure Services

- **Smart Manufacturing**
- **Smart Energy**
- **Smart Wearable**

**Horizontal Information Flow**

- **Smart Manufacturing**
  - Vertical Information Flow
- **Smart Energy**
  - Vertical Information Flow
- **Smart Wearable**
  - Vertical Information Flow

**Common IoT Service Layer**

- Manufacturing Intelligence
- Assembly Management
- Remote Asset Management
- Automated Meter Reading
- Oth. Vertical Solutions or 3rd party systems
Self Service Dashboard
Visualization of IoT Daas

Self Service:
Widgets allow designing user-defined dashboard views

Stream Data:
Investigate real-time data streams/events in real-time

Query Data:
Investigate existing data using data queries

Map Layer:
Visualize location services and monitor device positions
3-Step Approach for Self-Service IoT Dashboards

Define Dashboard and Widgets

Connect to Assets and Data

Deploy Dashboards
# Platform360 Industrial IoT Solutions

**USING MICROSOFT AZURE**

---

## TABLE OF CONTENTS

1. INDUSTRIAL IOT CHALLENGES
2. KOÇDIGITAL INDUSTRIAL IOT SOLUTIONS
3. INDUSTRIAL USE CASES
4. APPENDIX
Manufacturing Information System (MIS)
Improved manufacturing efficiency
by analyzing bottlenecks, alarms and performance of assets
Monitoring production asset with real-time data analysis.
Asset Performance & Job Per Hour
Manufacturing Asset Layout Management
Rule Based Machine Monitoring
Cycle Analysis
Bottleneck Analysis
Asset Downtime & Alarm Management
Root Cause Analysis
MTBF & MTTR Reporting
Anomaly Detection

Tangible impact in decision making with actionable insights

Productivity KPIs

Bottleneck Analysis

Maintenance Management
Manufacturing Information Systems Objectives

Aggregate & process sensor generated data into a unified platform

Unification of machine data to single semantic layer

Create a digital data platform for advanced manufacturing analytics

Up to % 10
Throughput increase with horizontal product line optimization

Up to % 50
Increase in employee engagement with real-time monitoring and predictive maintenance
Large Automotive Manufacturer Customer Case

Platform deployed across the whole factory
Press shop, welding, paint shop & assembly

- 2200 Stations
- 250+ PLCs
- 450k sensors
- 20+ TB of data annually

Project Impact
At the first year of the project, KPIs reached

- Increased overall output without additional investment on capacity.
- Maintenance employee engagement increased.
- Paper-based data collection has been eliminated on KPI calculation and plant monitoring.
- Automated processes have increased employee productivity.

Source: KoçDigital
Track & Trace
Product Traceability
Correct position of products are traced during manufacturing process

Support for variety of technologies

- RFID Tags
- Photoelectric Sensors
- Barcode Scanner
- OPC UA PLC Connectivity
- SCADA Integration
Track & Trace: Palletizing Process Example

1. Integrates with MES and prints relevant barcode code on the package according to the production plan

2. Checks validity of printed barcodes

3. Packages are traced and packaged into pallets in synchronization with MES system

4. Packages are stacked in pallets, and pallets are barcoded

5. Palet information is synced with ERP system
Assembly Management
Assembly Management System (ASM) Objectives

- Shop-floor integration with Manufacturing equipment and Product traceability
- Human machine interfaces for worker guidance
- Trace and enforce how and from which parts each end-product manufactured
- Increased Manufacturing quality Through monitoring and enforcing quality guidelines
- Decrease worker costs for Adapting to Manufacturing different product variants
- Zero Defect Targeted assembly process
Shop Floor Connectivity
Collect Manufacturing Data from Assembly Equipment and Human Machine Interfaces

Human Machine Interfaces

Industrial Grade HMIs customized according to requirements
- Supports asynchronous operations
- Different installation methods according to shop floor layout
- Edge industrial data collection
- Visual and Audio Alarms

Tablets

Commercial or Industrial Tablets
- Shows status of manufacturing quality operations
- Allows digitized entry of defects to system by quality personnel

Assembly Equipment

Different Screen Sizes
Worker Guidance for Assembly Operations
Employees are driven to quality with visual guidance

- Guides worker through assembly process
- Monitors the procedure and parts of the assembly
- Can be integrated with assembly and quality tools such as electric wrench (Open Protocol support)
- Support with a-sync operation, network latencies doesn’t effect manufacturing process
- Can be integrated to customer Product Lifecycle Management Solution
Remote Asset Management (RAM)
Remote Asset Monitoring

**Observe:** Status, Operation, Environmental Factors

**Manage:** Data and workflows

**Optimize:** Historical data, asset reliability, utilization, usage and efficiency
Asset Monitoring Dashboard Example

Map with Asset Layout

- Asset data can be overlayed on map or sketches
- Assets in with different conditions are color coded. (Critical condition can be denoted as red etc.)
- Important asset attributes are accessible on Mouse hover
- Detailed asset information can be shown on a separate dashboard
- System events/alarms can be shown in table format

✓ Dashboard layouts are completely configurable using widgets
Detailed Asset Dashboard Example

**Detailed Telemetry Data of Selected Asset**

- Temperature gauges, Battery Pack Voltage graphs, Currents Grid and Generator Analyzer Graphs, and all other telemetries configured, can be displayed at detailed asset Dashboard.
- This is a configurable dashboard that can be expanded by adding new widgets for each telemetry that are expected to be seen on the page.
- All alarms and warnings can also be displayed here for the pole selected.
Telecom Operator – Remote Asset Management

Instantaneous Monitoring of CCTV Poles and Assets

Assuring the stations health by monitoring sensor data collected by P360 RAM platform

- Aims to monitor 1400 CCTV poles setup located in multiple cities
- Monitoring each pole on a map design to see instant condition
- Poles assets health by collecting sensor data such as:
  - Cameras condition
  - DC power supply status
  - Air Condition of all cabinet assets
  - Security of the cabinet by checking sensors on cabinet doors
- User friendly, configurable dashboard and rule management mechanism for configuration and reporting

1400 CCTV Poles

500 Sensors per pole
Manufacturing Analytics
KoçDigital advanced analytics and IOT solutions in core mining

Value chain

- **Exploration and construction**
- **Drilling and blasting**
- **Loading and hauling**
- **Crushing and grinding**
- **Concentration and smelting**
- **Marketing**

Cost reduction & margin improvement
- Predictive Maintenance
- Bottleneck Analysis

Productivity increase
- Production Forecast
- Productivity Optimization

Quality increase
- Safety and Security with Intelligent Video Analytics

Safety
- Predictive Maintenance

Other
- (HR, people, etc.)
- HR Analytics

Source: BCG case experience

Ongoing | Implemented
Manufacturing Analytics Customer Case in Mining

Client Situation

• Large mining company with numerous distributed mining fields wants to increase operational efficiency using IoT and analytics

Results

• Operational IoT and IT systems unified in single datalake
• Analytical use cases improved business processes

- %21 decrease in downtime duration
- 1.2M annual operational efficiency in just 3 mines
- %8 less energy usage
- %17 less usage of additive material
Planned/ Predictive Maintenance
Maintenance Workflows

Maintenance Types

- Planned
  - Periodical
  - Usage Based
- Unplanned
  - Periodical and Usage Based

Downtime
Prediction
Platform360 Maintenance Flow

Gather Data
- Real-time data collection with IoT
- Integrate with operational systems for context

Real-time Condition Monitoring
- Asset monitoring & management
- Evaluate alarm data using context

Maintenance Management
- Planned Maintenance management
- Downtime management

Enrich with Predictive Models
- Use asset sensor data and work history to predict asset health and future failures
- Enrich with user defined rules

Optimize
- Continuous model improvement through feedback loops
### Predictive maintenance reduce surprises and cost while increasing equipment uptime

<table>
<thead>
<tr>
<th></th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction of unplanned downtime</td>
<td>50-70%</td>
</tr>
<tr>
<td>Increase in equipment uptime</td>
<td>10-20%</td>
</tr>
<tr>
<td>Reduced overall maintenance costs</td>
<td>10-30%</td>
</tr>
</tbody>
</table>

Source: KoçDigital, BCG, Deloitte, Mckinsey
Predictive Maintenance Solution

VISION
- Minimize unplanned downtimes and improve asset availability
- Doing the most efficient preventive maintenance
- Minimize mean time between failures (MTBF)
- Autonomous control of equipment condition
- Completely paperless maintenance activities

VALUE SOURCE
- Reduced equipment downtime at core machinery
- Improve first-time-fix-rate (FTFR) and reduce mean-time-to-repair
- Reduce cost of maintenance without sacrificing reliability

Source: BCG case experience
What to Expect from Energy Monitoring?

How much energy do we consume?
• What is my manufacturing area/line or even product based energy consumption?
• What is my real cost for manufacturing?
• How can I react to energy spending fluctuations?

Trends of Energy Usage
• Is my energy usage better or worse than before?
• What are my trends in energy consumption that reflect seasonal, weekly, and other operating patterns?

Waste & Problems
• Where are the specific areas of wasted energy?
• Is there anomalies in energy consumption?
• How can I make warning signs visible to maintenance staff?

Analytics
• How much energy will I consume next month?
• How can I correlate this data with other connected factory data?
Industry leaders follow a holistic IoT platform based approach in energy management

1. Collect energy information from variety of systems

   - Energy Meter
   - Energy Analyzer
   - Remote Assets
   - EV Charging Station

2. Real-time data processing to detect events and alarms
   - User defined rules to be enforce known business rules
   - Analytical models can be deployed on the system to detect advanced data correlations

3. Self service dashboards for visualization
   - Create user/role specific dashboards and widgets for customizable usability

4. Common service layer, enabling numerous IoT analytics & applications
   - Cross-functional data ingestion
   - Clear process & APIs for data dissemination
   - Horizontal information flow

5. Advanced analytics to predict and prescribe
   - Analytical products for Industry standard gains
   - Predictive statistics tailored to specific needs
Manufacturing Execution System
# Manufacturing Company Example

## Shop Floor Status
- Mix of legacy machines and new machines from various vendors
- Variety of sensors communicating in different protocols
- Diverse family of products manufactured by same manufacturing assets
- More than one manufacturing plant but no single view of manufacturing

## Governance
- IT generally not involved in acquisition of OT systems.
- OT software acquisitions were driven by operational needs
- Data connectivity is not an issue to be considered in new asset acquisitions
- OT management software vision was focused on asset KPIs such as OEE (Overall Equipment effectiveness)
- Decisions are not driven by data

## Targets of Industrial IoT
- Increased manufacturing throughput
- Decreased unplanned downtimes
- Traceable and improved manufacturing quality
- Data driven decision making by convergence of IT & OT
Personas in Manufacturing

Manufacturing Manager

What is happening in manufacturing in real-time?

How can I minimize unplanned downtimes?

How does my manufacturing line efficiency change per product type?

Where are my manufacturing bottlenecks?

How can I increase quality of products?

How to optimize energy spending?

IT & Digital Transformation Manager

How can I add an IT capabilities in OT systems?

Can I create a backbone for all my industrial systems?

Can I build-up on the system without vendor lock-in?

How can I become a data-driven company?

Can I create a single view for all my manufacturing areas/plants?

How can I create a secure infrastructure?
## Manufacturing Execution on Internet of Things Modules

<table>
<thead>
<tr>
<th>IoT Platform</th>
<th>Data Collection</th>
<th>Tracking</th>
<th>Plant KPIs</th>
<th>Maintenance</th>
<th>Operational Intelligence</th>
<th>Quality Monitoring</th>
</tr>
</thead>
</table>
| • Manufacturing Backbone  
• Operational Data Store  
• Rule Engine  
• Common API Layer | • Shop Floor Connectivity  
• Energy Monitoring  
• PLC  
• SCADA  
• MQTT | • Track Items inside manufacturing process  
• Track workers  
• Track Equipment  
• RFID read/Write  
• Barcode reader  
• Labels printing | • OEE  
• Job Per Hour  
• Bottleneck analysis  
• Cycle Analysis  
• Plant Performance  
• Station Performance per product type | • Asset Downtime, MTTR, MTBF monitoring  
• Anomaly Detection  
• Root Cause Analysis  
• Predictive Maintenance | • Self service dashboard  
• Digital Twin of the Plant | • Quality Inspection  
• Video Analytics based quality inspection |

<table>
<thead>
<tr>
<th>Procedural enforcement</th>
<th>Planning &amp; Scheduling</th>
<th>Manufacturing Process Management</th>
<th>Resource Management</th>
<th>Dispatching</th>
<th>Production Management</th>
<th>Integration</th>
</tr>
</thead>
</table>
| • Manufacturing process steps are performed;  
• In the correct order  
• At the right time  
• By the correct resource  
• In conformance with quality req. | • Production Planning  
• Shift Management  
• Batch production execution  
• Components picking list | • BOM Recipe  
• Process Planning /Work instructions | • Equipment  
• Materials | • Dispatch work acc. To source avail. Schedul. nd capacity | • Process to order management | • ERP Integration  
• PLM Integration  
• Supplier /Customer system integration |
Manufacturing Execution System Customer Case

Platform360 deployed to an Air Conditioner Plant as manufacturing execution system

- **31 Stations**
- **4 Production lines**
- **700 sensors**
- **500+GB* of data annually**

**Project Impact**

Eliminate quality errors in manufacturing

- MES including operational data store, equipment tracking and plant performance.
- Model & critical part matching process for 12 production points
- Station based production, fault, downtime & anomaly detection reports

Source: KoçDigital
# Platform360 Industrial IoT Solutions

USING MICROSOFT AZURE

## TABLE OF CONTENTS

1. INDUSTRIAL IOT CHALLENGES
2. KOÇDIGITAL INDUSTRIAL IOT SOLUTIONS
3. INDUSTRIAL USE CASES
4. APPENDIX
KoçDigital is a Digital Center of Excellence, combining strengths of BCG and Koç Holding & KoçSistem

World class capabilities in analytics

Access to >3,000 digital experts

State-of-the-art enablement

Digital capabilities and infrastructure

Very strong implementation capabilities

Trusted Koç brand

Advanced Analytics

IoT Solutions

Data Platform Design & Development

KoçDigital Academy

Source: KoçDigital
We already have 100+ staff in KoçDigital, supported by 850+ Gamma and 1500+ KoçSistem professionals.