Saudi Arabia
Centre for the
Fourth Industrial
Revolution

Ministry of Industry
& Mineral Resources

National Industrial
Development and
Logistics Program

4IR Use Case Guide

December 2023





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Foreword



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Director General, Advanced Manufacturing & Innovation, Ministry of Industry and Mineral Resources



Suliman Almazroua
CEO, National Industrial Development & Logistics Program (NIDLP)

As we enter the era of the Fourth Industrial Revolution, companies of all sizes are looking for ways to improve their operations, expand their markets and transform their business models. Small and medium enterprises (SMEs) are no exception, and many are turning to digitalization as a solution to their challenges.

Digitalization holds immense potential to strengthen SMEs, the backbone of economies worldwide. Both public and private stakeholders have crucial roles to play. Targeted policies, investment, and support can help SMEs leverage opportunities from digital technology.

Saudi Vision 2030 looks to enable industry and entrepreneurship through various programs and policy interventions including the National Industrial Development and Logistics Program (NIDLP), Saudi Arabia is pioneering its transformation into an industrial and logistics leader, maximizing value across key sectors. Central to this vision is empowering SMEs with cutting-edge digital tools that drive accuracy, efficiency, and quality.

The Ministry of Industry and Mineral Resources launched The Future Factories Program with the goal of supporting over 4,000 factories to increase adoption of the best global practices of the 4IR technologies, reduce production costs, and increase the competitiveness and operational efficiency of the existing and new factories. This recognizes that the 4IR demands new capabilities from both enterprises and the workforce. However, resource and expertise constraints can hinder SME participation.

As a part of the World Economic Forum's global network of 4IR centres, C4IR KSA fosters collaboration and knowledge exchange, facilitating the introduction of innovative 4IR solutions and helping to catalyse the digital transformation of SMEs, contributing to the realization of Saudi Vision 2030's objectives.

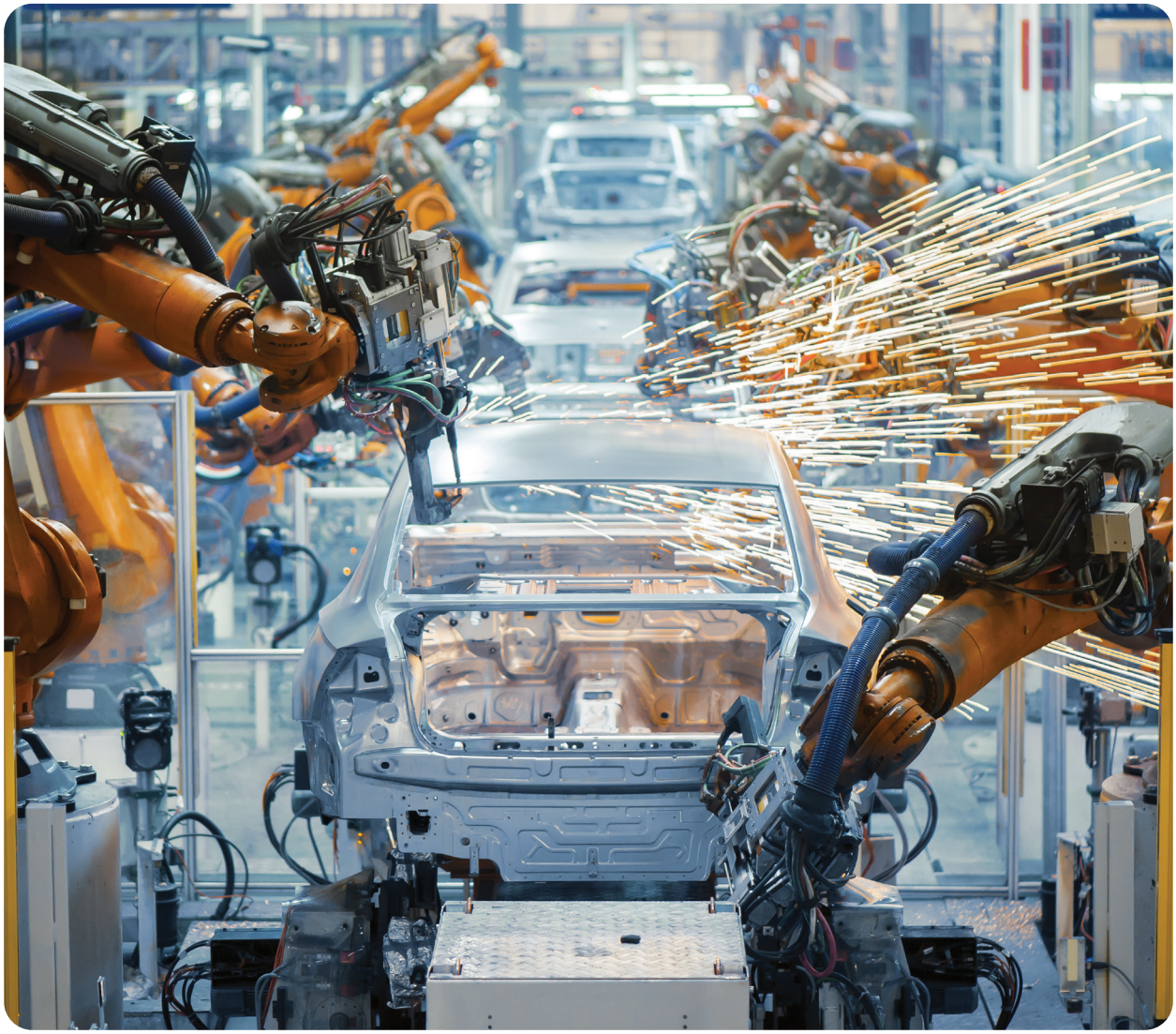
This use case guide highlights the transformative power of 4IR technologies for SMEs. It illustrates how these technologies are enhancing productivity, competitiveness and innovation for real companies. By documenting tangible impacts, these success stories offer meaningful lessons for others seeking to advance through technology adoption. Sharing best practices will empower more businesses to thrive in the digital era.

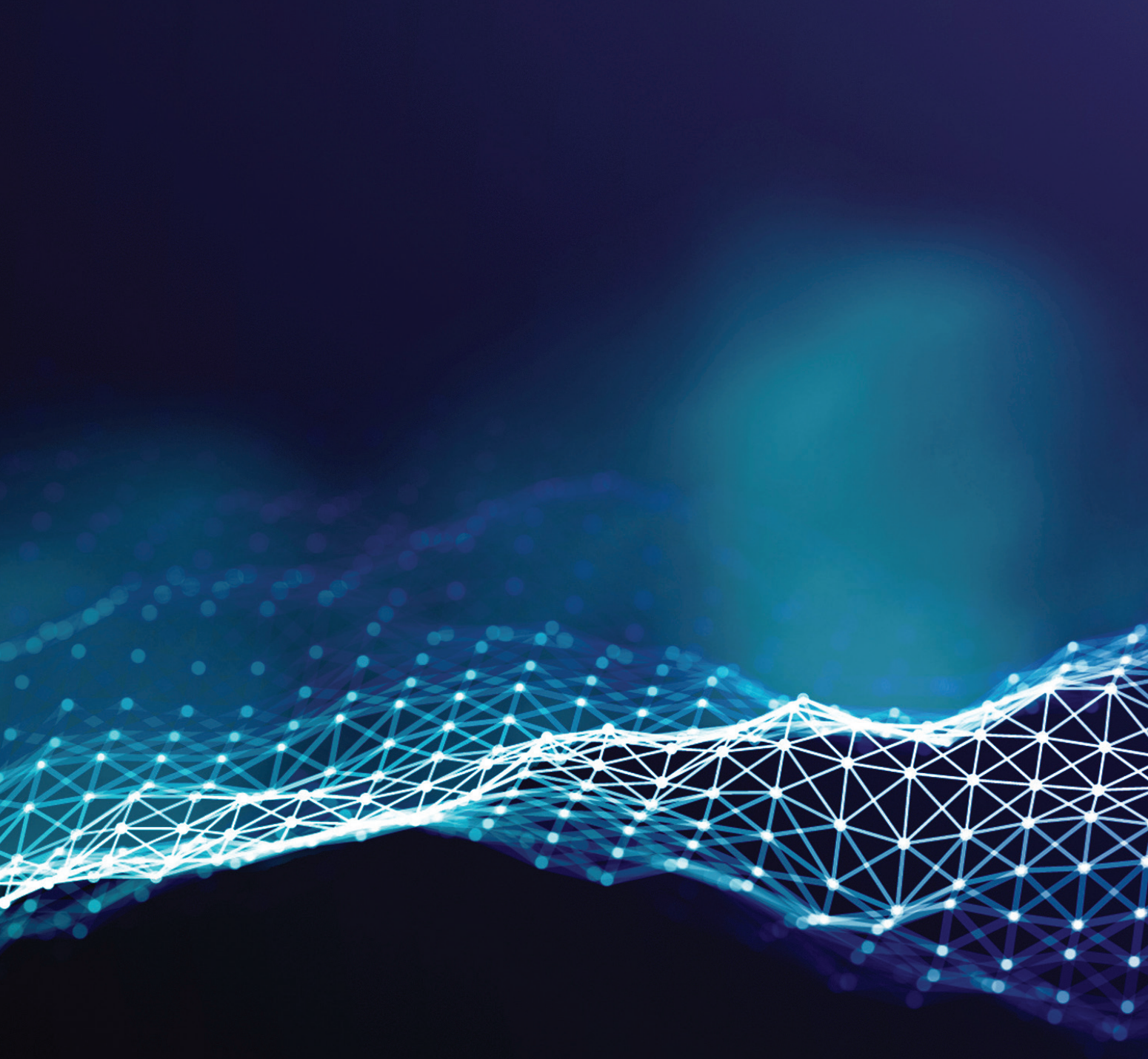
Executive Summary

The 4IR technologies has transformed industries across the world, providing unprecedented opportunities to improve efficiency, reduce costs, and increase productivity. In Saudi Arabia, Vision 2030 aims to create
a more diverse and resilient economy, with multiple initiatives related to advanced manufacturing and digitalization spanning the industrial spectrum.

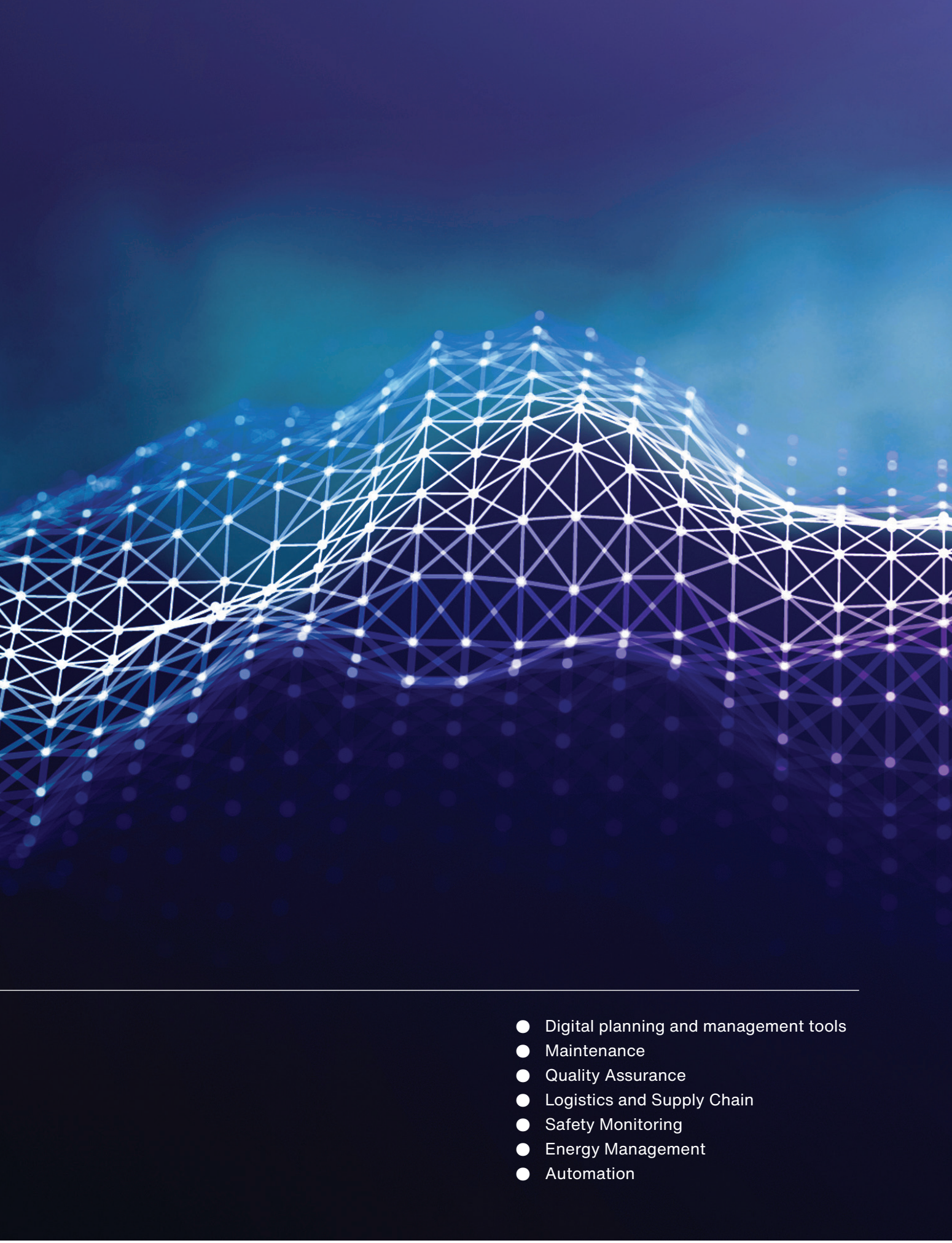
This guide presents a comprehensive range of use cases for 4IR technologies that have been successfully implemented in various industries across Saudi Arabia. These use cases are categorized into different areas of application, including:

1. Digital Planning and Management Tools
2. Maintenance
3. Quality Assurance
4. Logistics and Supply chain
5. Safety Monitoring
6. Energy management
7. Automation

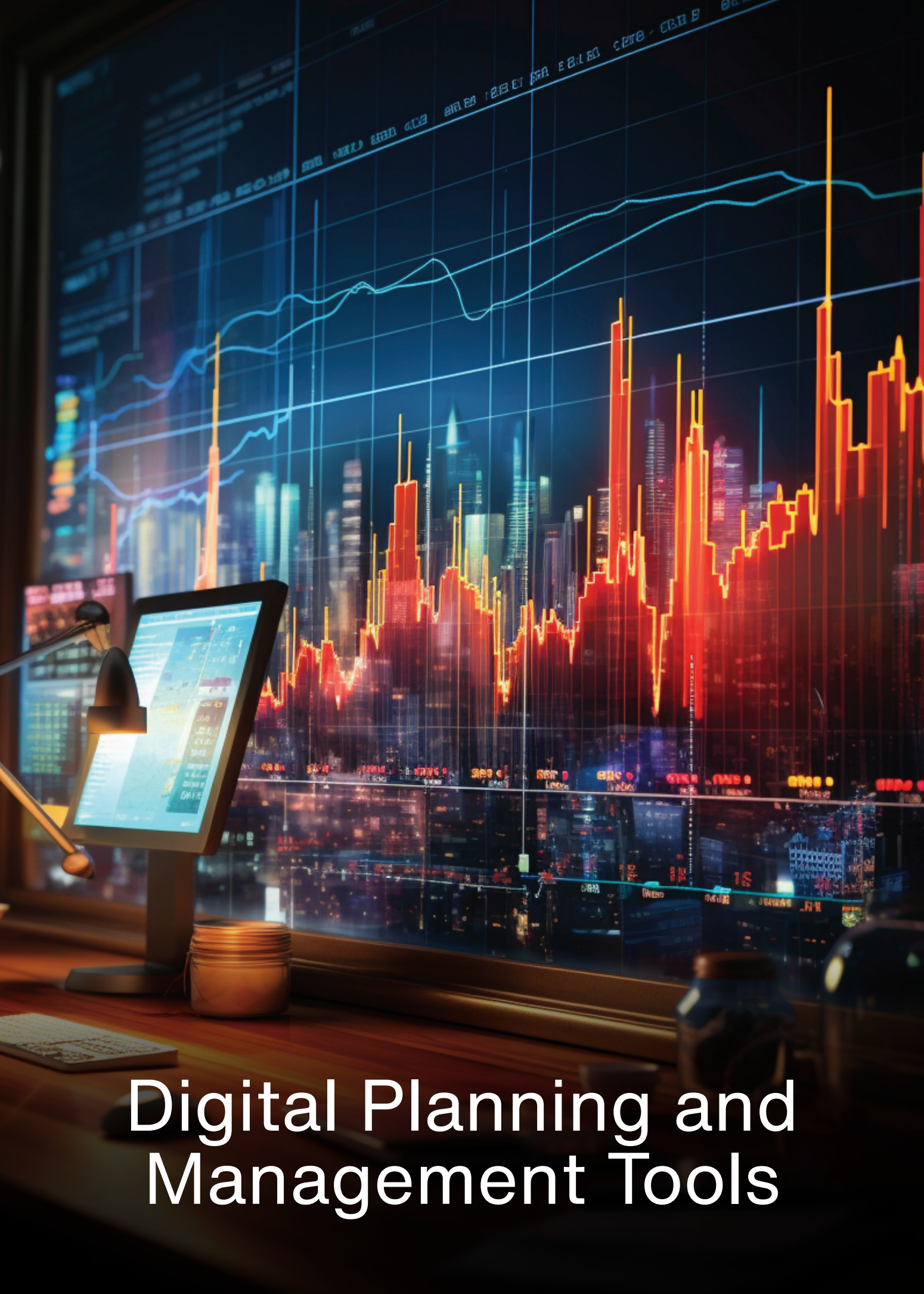




Use Cases



- Digital planning and management tools
- Maintenance
- Quality Assurance
- Logistics and Supply Chain
- Safety Monitoring
- Energy Management
- Automation



Digital Planning and Management Tools

Use Case 01:
IoT Kit for OEE* Tracking

Description

The IoT kit is an all-encompassing tool that fuses a variety of sensors with a cloud-based dashboard, providing real-time manufacturing visibility. It offers consolidated reports, and can be set up easily within an hour.

Key benefits

1. Facilitates simple root-cause problem solving.
2. Potential to enhance OEE by 10-20%.
3. Reduces deployment time by 80% compared to similar solutions.

ROI and KPIs



ROI / KPI*****

OEE ROI: <3 months



Safety

Reduce human error



Quality

Reduce quality error



Main User

Manager, supervisor, technicians, operator.



Cost

Reduce cost by eliminating physical file



Functions

Production, maintenance and quality.



Delivery

Reduce cycle time, increased production and yield



Category

Digital planning and management tools.



Morale

Empower the people through work augmentation

Stakeholders

Production, maintenance, quality.

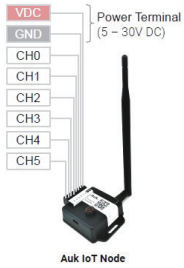
* OEE: Overall Equipment Efficiency. **ROI: Return of investment. ***KPI: Key Performance Indicators. ****FTE: Full Time Equivalent.

Impressions

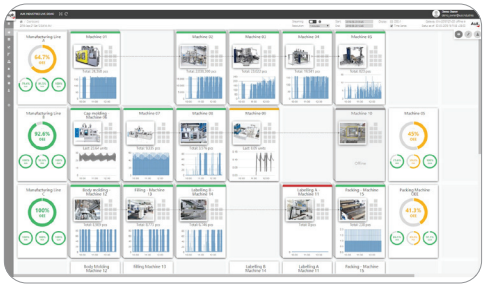
Industrial Sensors



IoT Node to connect to sensors



Dashboard to visualize data



Operational Model

Customer profiles	Processes/Automation
Customer touch-points	Performance metrics
Customer value	Data/Algorithms
Governance/Decision Rights	Systems/Integration
Funding mechanisms	Infrastructure
Organization/Roles	Investments portfolio
Sourcing/Ecosystems	Culture/Behaviour
Capabilities/Skills	

Operational Model Legend — Organization — Execution — Behaviour

IoT Value Loop

Create
Data from IoT sensors

Analyse
Data insights such as OEE (availability, performance and quality)

Communicate
Sensors to Edge device (industrial PC)

Act
Define actions to improve OEE

Aggregate
Machine data

Use Case 02:
Digital Performance Engine

Description

A digital dashboard offering an integrated management system, facilitating performance discussions around custom KPIs, and fostering root cause analysis and workforce growth.

Key benefits

1. Increase capacity of supervisor and employees.
2. Better decision-making process.
3. Earlier indication of challenges.

ROI and KPIs



ROI / KPI
OEE, sustainability
ROI: <6 months



Safety
Near miss and incidents



Quality
Scrap



Main User
Operator, supervisor, engineer, manager.



Cost
*COGS



Functions
● Cascaded KPIs tree ● Action tracker
● Workforce development matrix



Delivery
Takt time



Category
Digital planning and management tools.



Morale
Level of morale

Stakeholders

Production, maintenance, quality

*COGS: cost of goods sold **Takt time: the required product assembly duration that is needed to match the demand.

Impressions

Dashboard



Operational Model

- Customer profiles
- Customer touch-points
- Customer value
- Governance/Decision Rights
- Funding mechanisms
- Organization/Roles
- Sourcing/Ecosystems
- Capabilities/Skills

- Processes/Automation
- Performance metrics
- Data/Algorithms
- Systems/Integration
- Infrastructure
- Investments portfolio
- Culture/Behaviour

Operational Model Legend: Organization · Execution · Behaviour

IoT Value Loop

Create
Digital way of working, e.g. tablets, MES*

Analyse
KPIs from different areas and define actions to improve them

Communicate
Data insights from production shop floor, warehouse, procurement - holistic

Act
Performance dialogue

Aggregate
Data from machines, software systems, manual input from Supervisors and Engineers

*MES: Manufacturing Execution Systems

Use Case 03:
Labour Productivity Tracking

Description

Digital SOP* indicating assembly sequences, with sensors providing data to the platform for personalized tracking and performance planning.

Key benefits

1. Identification of process bottleneck with automatic cycle time graphs.
2. Automatic creation of relevant production KPIs such as OEE.
3. Quality assurance through standard process monitoring.

ROI and KPIs



ROI / KPI
Labor productivity
ROI < 6 months



Safety
Lower accidents



Quality
Standardized quality



Main User
Operators, supervisors



Cost
FTEs



Functions
Production and/or maintenance



Delivery
Less variance in takt time



Category
Digital planning and management tools.



Morale
New joiners empowerment

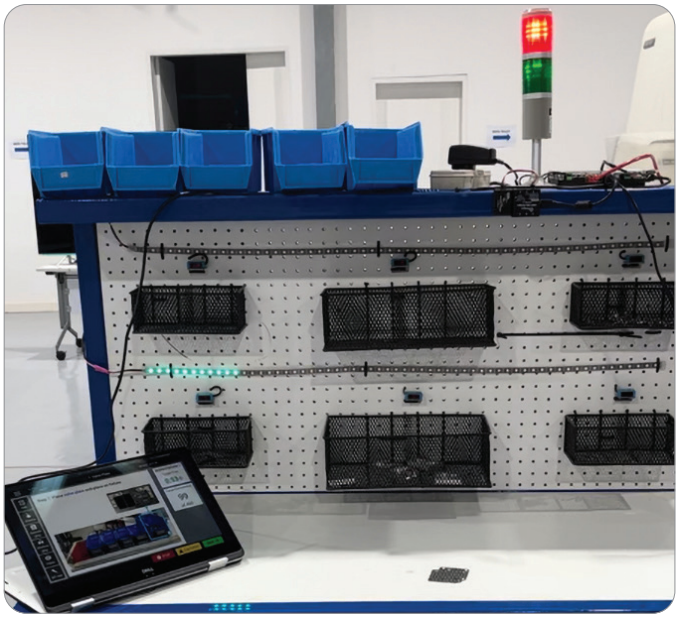
Stakeholders

Production, Maintenance, IT

*SOP: Standard Operating Procedure

Impressions

Station with sensors and pick-to-light, supporting and capturing data from the operator



Operational Model

- Customer profiles
- Customer touch-points
- Customer value
- Governance/Decision Rights
- Funding mechanisms
- Organization/Roles
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- Capabilities/Skills
- Processes/Automation
- Performance metrics
- Data/Algorithms
- Systems/Integration
- Infrastructure
- Investments portfolio
- Culture/Behaviour

Operational Model Legend — Organization — Execution — Behaviour

IoT Value Loop

Create
Historical data insights

Analyse
Analyze data and compile performance reporting

Communicate
Extraction of data sensors

Act
Supervisors to coach operators; planner refines standard planning tasks

Aggregate
Creation of databases from monitoring machine

Use Case 04:
Manufacturing Optimization

Description

Use of IIoT to improve manufacturing operations, analyze material and product flow, identify bottlenecks, and implement process improvements.

Key benefits

1. Improve efficiency
2. Increase overall equipment effectiveness(OEE)
3. Improve product quality
4. Reduce downtime

ROI and KPIs



ROI / KPI
Overall equipment effectiveness(OEE), overall operation effectiveness (OOE), throughput, cycle time, availability



Safety
Real-time alerts by identifying potential hazards



Quality
Reduce downtime by monitoring production processes



Main User
Production manager, technicians, operator



Cost
Reduce cost by increasing productivity



Functions
Production



Delivery
Reduce lead time by improving optimizing processes



Category
Digital planning and management tools.



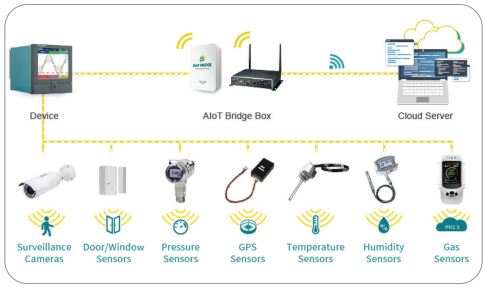
Morale
Increase productivity

Stakeholders

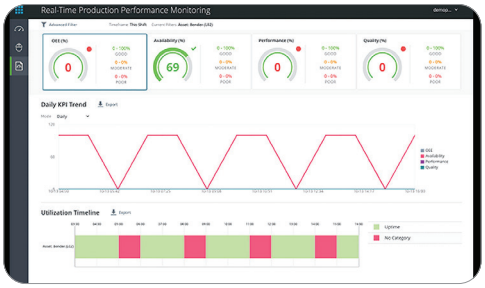
Production management team

Impressions

IIoT connectivity



Dashboard to visualize data



Operational Model

- Customer profiles
- Customer touch-points
- Customer value
- Governance/Decision Rights
- Funding mechanisms
- Organization/Roles
- Sourcing/Ecosystems
- Capabilities/Skills

- Processes/Automation
- Performance metrics
- Data/Algorithms
- Systems/Integration
- Infrastructure
- Investments portfolio
- Culture/Behaviour

Operational Model Legend: Organization · Execution · Behaviour

IoT Value Loop

Create
Collecting data from IIoT enabled devices

Analyse
Analyzing the collected data and calculate manufacturing KPIs

Communicate
Transfering the data into the cloud platform

Act
Taking action based on the insights

Aggregate
Gathering data to be analyzed

Use Case 05:
Manufacturing Execution System (MES)

Description

Replacement of an existing production management application with a modern, reliable and cost effective one.

Key benefits

1. Automated digital data capture (reduction in manual entry and paper-based work, efficiency increase)
2. Visibility of the process with automatic generation of reports for the management.

ROI and KPIs



ROI / KPI
Overall efficiency of +%33.
Production on average 1/3 faster



Safety
Significant reduction of error risk



Quality
Data reliability paperless



Main User
Production manager



Cost
1 technician full time for 3 months



Functions
Production



Delivery
3 full months of work to prepare, deploy and deliver the solution



Category
Digital planning and management tools.

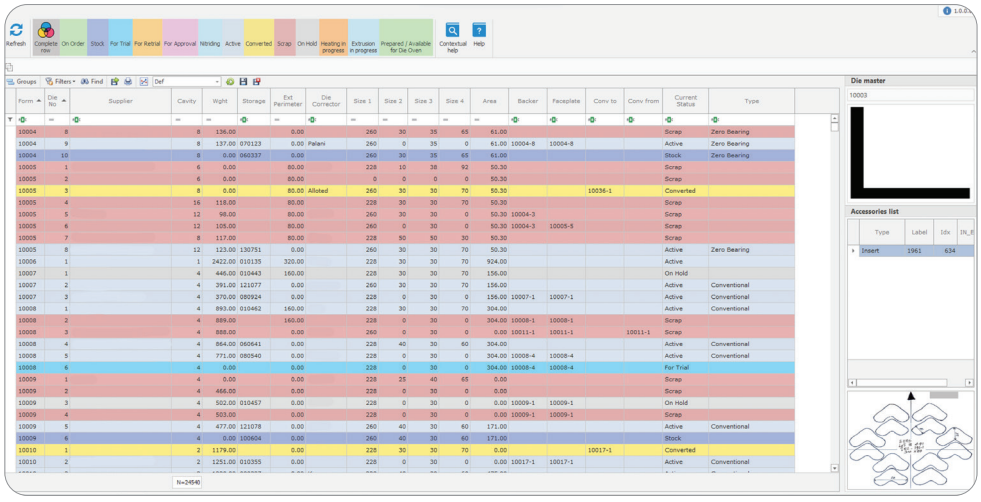


Morale
Increase efficiency and visibility

Stakeholders

Executive management

Impressions



Operational Model

- Customer profiles
- Customer touch-points
- Customer value
- Governance/Decision Rights
- Funding mechanisms
- Organization/Roles
- Sourcing/Ecosystems
- Capabilities/Skills

- Processes/Automation
- Performance metrics
- Data/Algorithms
- Systems/Integration
- Infrastructure
- Investments portfolio
- Culture/Behaviour

Operational Model Legend — Organization — Execution — Behaviour

IoT Value Loop

Create
Process automation

Analyse
Real time visibility of process, possibility to send automatic reports to management

Communicate
The new MES Solution is scalable and compatible with the ERP

Act
Paperless, anymore and data is only entered once by operators

Aggregate
The solution could be deployed on all stages (tooling, dies, billet die, spinning, anodizing)

Use Case 06:
Machine Working Status Tracking

Description

Monitoring solution aims to enhance the understanding of machines and overall production performance via communication between different machines.

Key benefits

1. Real time Visibility of the production.
2. Better communication between operators.

ROI and KPIs



ROI / KPI
First step of digitalization.
ROI : 1 month profitable by increasing a bottleneck overall equipment effectiveness (OEE) from 47% to 72%



Safety
Adoption of color code to remove language barriers with foreign workers speaking neither English nor Arabic



Quality
Data reliability
Production efficiency



Main User
Production manager



Cost
3 days for OEE engineer
(3-4 hours per machine)



Functions
Connectivity



Delivery
1 week



Category
Digital planning and management tools.

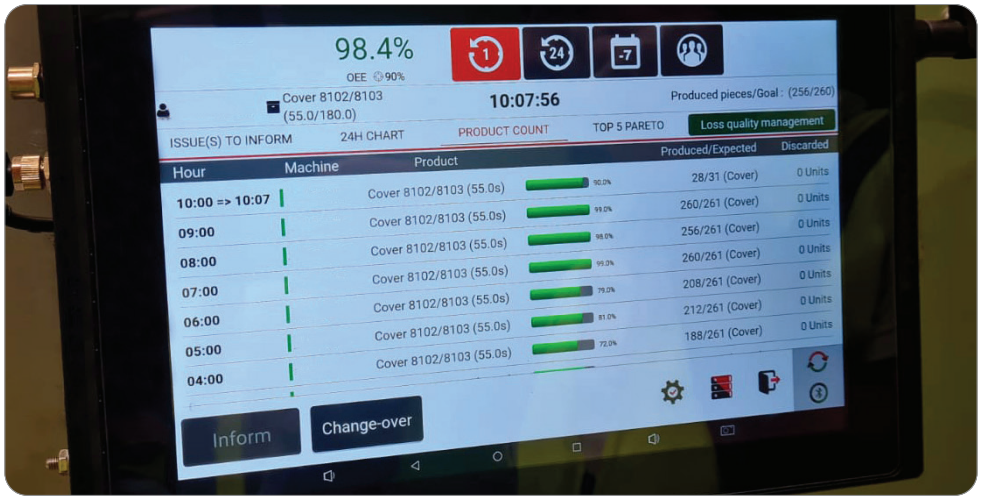


Morale
Visibility of the production

Stakeholders

Executive management

Impressions



Operational Model

- Customer profiles
- Customer touch-points
- Customer value
- Governance/Decision Rights
- Funding mechanisms
- Organization/Roles
- Sourcing/Ecosystems
- Capabilities/Skills

- Processes/Automation
- Performance metrics
- Data/Algorithms
- Systems/Integration
- Infrastructure
- Investments portfolio
- Culture/Behaviour

Operational Model Legend — Organization — Execution — Behaviour

IoT Value Loop

Create
Real-time monitoring

Analyse
Data generated provided more detailed information in comparison with the data from the PLC

Communicate
The solution is compatible with any types of machines: new or old, network connected or not.

Act
Implement the solution on maintenance, planning and scheduling

Aggregate
Setting up key features (reports, real-time alarm) enhancing teamwork while tackling language barriers

Use Case 07:

IoT Platform for Worker Productivity Enhancement at Manufacturing Units

Description

AI video analytics for worker standstill detection, ensuring worker safety, identifying potential health issues, and optimizing productivity.

Key benefits

1. - 95% reduction in fatal slips & trips.
2. - 80% reduction in near miss incidences.

ROI and KPIs



ROI / KPI

Decrease in reported safety incidents, quick implementation



Safety

Psychological safety of workers ensured with constant monitoring for instant action in case of any emergency



Quality

Improvement in work productivity through preventing workers wasting time during job



Main User

Safety Managers, EHS* Professionals, Production Manager



Cost

Injury/Compensation cost saved, Project delay cost saved, Manual Monitoring cost saved



Functions

Visual Analytics for Worker Monitoring



Delivery

Real Time Insights, Trend Reports, Granular Insights through Intuitive dashboard



Category

Digital planning and management tools.



Morale

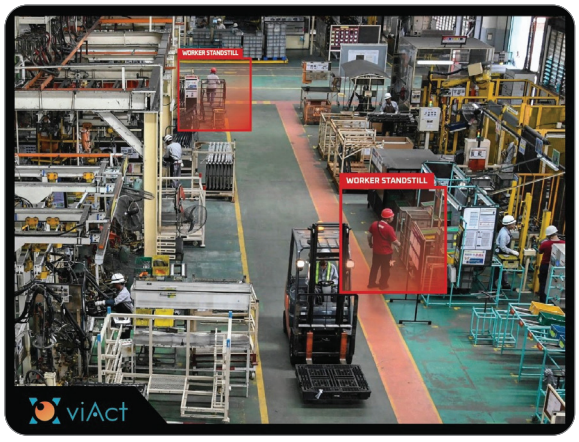
Responsible, Transparent & Ethical AI

Stakeholders

Production management team

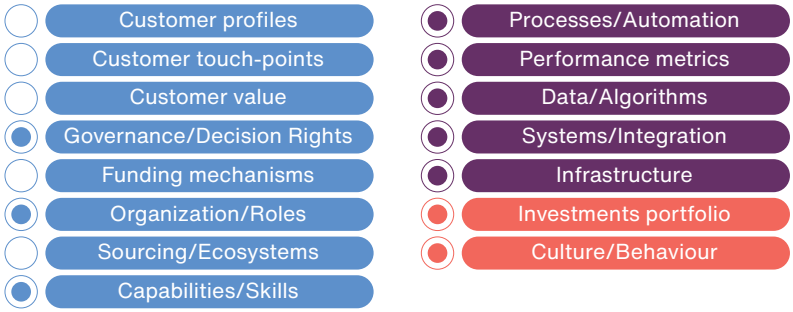
*EHS: Environment, Health and Safety

Impressions



- Worker Standstill Detection.
- Video Analytics & IoT.
- Alerts through local alarms, SMS & Email alerts in case of worker's standing still for more than a specified period of time.
- Dashboard to view trends & reports.

Operational Model



IoT Value Loop



Create

Real-time data from various working scenarios at different regions of plant to detect standstill workers



Analyse

Analyze aggregated data, real-time insight, evidence-based record and prediction on repeatable future events



Communicate

Real-time evidence-based Video Data is transmitted to cloud through 4G or 5G network



Act

The analyzed data will provide a historic trend and actionable insight for the safety manager and top management to improve specific safety measurements



Aggregate

Aggregate all the historic data based on camera location and zoning with a time frame

Use Case 08:
Production Planning and (Re) Scheduling

Description

Utilize scenario analysis to optimize scheduling, and optimize across customers and SKU* in order to maximize total profit based on factors like cost, capacity and service level.
Automates the creation of work orders and procurement orders leveraging data from ERP and other systems.

Key benefits

1. 10-20% increase in production capacity
2. Improvement of accuracy and profitability in supply and production planning scenarios
3. Increase of manufacturing line utilization

ROI and KPIs



ROI / KPI
Production volume
ROI – 1-2y



Safety
Reduce number of changeovers



Quality
Improve productivity and efficiency



Main User
Production manager



Cost
Unit cost reduction



Functions
Supply chain



Delivery
Higher OTIF**



Category
Digital planning and management tools.



Morale
Satisfaction index

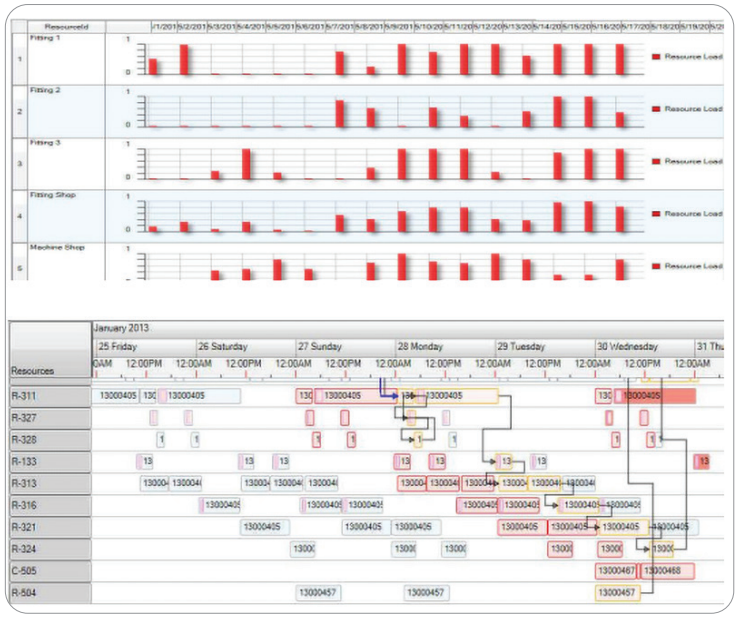
Stakeholders

Planning, Production, Procurement, IT

*SKU: Stock Keeping Units **OTIF: On time in full.

Impressions

Dynamic schedule considering product and process constraints



Operational Model

- Customer profiles
- Customer touch-points
- Customer value
- Governance/Decision Rights
- Funding mechanisms
- Organization/Roles
- Sourcing/Ecosystems
- Capabilities/Skills
- Processes/Automation
- Performance metrics
- Data/Algorithms
- Systems/Integration
- Infrastructure
- Investments portfolio
- Culture/Behaviour

Operational Model Legend — Organization — Execution — Behaviour

IoT Value Loop

Create
Optimized production plan

Analyse
Data from ERP and MES from the factory

Communicate
Software systems

Act
Inputs for production planner and production team

Aggregate
Data from ERP and MES from the factory

Use Case 09:
Digital Standard Operating Procedures (SOPs)

Description

Interactive work instructions provide operators with detailed content, enhancing guidance and feedback through media and IoT device integration, and personalizing tracking for targeted coaching.

Key benefits

1. Improved quality via operator guidance and fast tracking.
2. Standardized training of new operators.
3. Automated display of current work steps.

ROI and KPIs



ROI / KPI
Labor productivity
ROI < 6 months



Safety
Lower rate of accidents



Quality
Standardized quality



Main User
Manager, supervisor, technicians, operator.



Cost
Digitalization of SOPs



Functions
Production, maintenance and quality



Delivery
Less variance in takt time



Category
Digital planning and management tools.



Morale
Empowerment of new members

Stakeholders

Internal: Production, maintenance, quality

Impressions

Hardware (IoT gateway, pick-to-light)



Dashboard



Operational Model

- Customer profiles
- Customer touch-points
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- Systems/Integration
- Infrastructure
- Investments portfolio
- Culture/Behaviour

Operational Model Legend: Organization · Execution · Behaviour

IoT Value Loop

Create
Historical data insights

Analyse
Extracted data

Communicate
Extraction of data from machines

Act
Feedback to operator

Aggregate
Creation of databases from monitoring machine

Use Case 10:

Track Cycle Times through Barcode Scanning and Digital Performance Engine

Description

Cycle time apps use location sensor and barcode data to analyze the assembly process, highlight deviations and trends, and display cycle comparisons and trends.

Key benefits

1. Transparency allows for simple root-cause problem solving and 10-20% OEE increase.
2. The plug'n'play solution reduces time to deploy by 80% in comparison to similar solutions.

ROI and KPIs



ROI / KPI
OEE ROI: <6 months



Safety
Maintain and improve performance



Quality
Scrap



Main User
Manager, supervisor, technicians, operator.



Cost
Productivity



Functions
Productivity



Delivery
Availability



Category
Digital planning and management tools.



Morale
Revenue growth

Stakeholders

Production, maintenance

Impressions

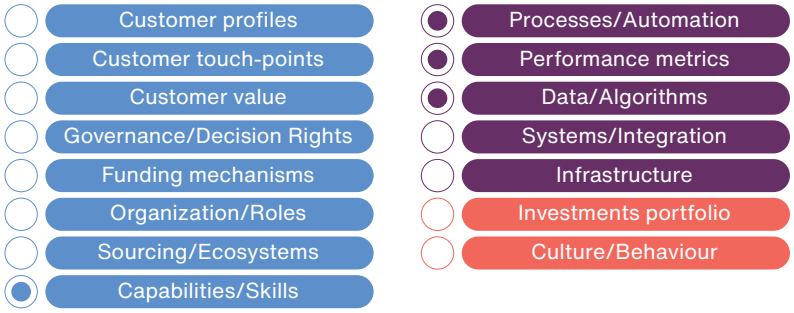
Industrial barcode scanning - Labor productivity



Dashboard to visualize data



Operational Model



IoT Value Loop

Create
Data from industrial barcode scanning

Analyse
Data insights on performance

Communicate
Dashboard

Act
Define actions to improve productivity

Aggregate
Machine data



Maintenance

Use Case 11:
Predictive Maintenance

Description

An advanced algorithm identifies potential critical failures from patterns in historical data, enabling the maintenance team to schedule interventions before a breakdown occurs.

Key benefits

1. Reduced breakdown frequency through machine monitoring.
2. Lower costs through avoiding unnecessary maintenance.
3. Optimized production scheduling.

ROI and KPIs



ROI / KPI
Availability and maintenance costs
ROI: depends on OEE value can vary from 6months to 2-3y



Safety
Critical failures



Quality
Scrap



Main User
Manager, supervisor, technicians, operator.



Cost
Spare parts and technicians



Functions
Fabrication and machining



Delivery
Takt time reliability



Category
Maintenance



Morale
Moving from reactive to proactive

Stakeholders

Production, maintenance, IT departments

Impressions

Alert system

Status	OrderId	Priority	Description	Date
	MO-1225647	Medium	Planned calibration	February 12 2023
	MO-1225652	High	Unplanned -Check Ball screw	January 13 2023
	MO-1525652	High	Unplanned -Low Lube Condition Dete	February 1 2023

Dashboard to visualize data



Operational Model

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- Systems/Integration
- Infrastructure
- Investments portfolio
- Culture/Behaviour

Operational Model Legend — Organization · Execution · Behaviour

IoT Value Loop

Create
Historical data insights

Communicate
Extraction of data from machines

Aggregate
Creation of databases from monitoring machines

Analyse
Analyse data, apply algorithms in order to predict failures

Act
Provide information to maintenance department in order to schedule a maintenance order

Use Case 12:

AR* Technical Guidance for Maintenance

Description

A telecommunication application enables remote experts to provide tailored instructions, with technicians and experts able to draw digital annotations that stick to 3D objects.

Key benefits

1. Reduced operational costs for expert support.
2. Increased information retention and accuracy.
3. Empowered technicians through remote expert guidance.

ROI and KPIs



ROI / KPI
Downtime
ROI: 1-2y



Safety
Improve corrective actions



Quality
Increase in operational resiliency



Main User
Technician, operator, remote expert



Cost
Maintenance cost



Functions
Production and maintenance



Delivery
Equipment availability



Category
Maintenance



Morale
Reduce maintenance time

Stakeholders

Maintenance, production and facility

*AR: Augmented Reality

Impressions

Hololens 2 supports technicians while doing a maintenance intervention



Operational Model

- Customer profiles
- Customer touch-points
- Customer value
- Governance/Decision Rights
- Funding mechanisms
- Organization/Roles
- Sourcing/Ecosystems
- Capabilities/Skills
- Processes/Automation
- Performance metrics
- Data/Algorithms
- Systems/Integration
- Infrastructure
- Investments portfolio
- Culture/Behaviour

Operational Model Legend — Organization — Execution — Behaviour

IoT Value Loop

Create
Digital way of working

Analyse
Remotely

Communicate
Between experts and technicians located in different locations

Act
Improve performance of experts and technicians

Aggregate
Data from maintenance interventions

Use Case 13:

AI Based Preventive Maintenance

Description

The Predict Uptime Model provides insights into a physical asset's state (represented by a Twin) to improve overall uptime of equipment.

Key benefits

1. Advanced warning of future downtime events for better planning.
2. Insights into maintenance or corrective actions to prevent outages.

ROI and KPIs



ROI / KPI
Downtime reduction by ~ 10%
ROI : 2 Months



Safety
Improve predictive and corrective actions



Quality
Machine down time and failure



Main User
Manager, supervisor, technicians, operator.



Cost
Mean Time Between Failure (MTBF)



Functions
Production and maintenance



Delivery
Equipment availability



Category
Maintenance

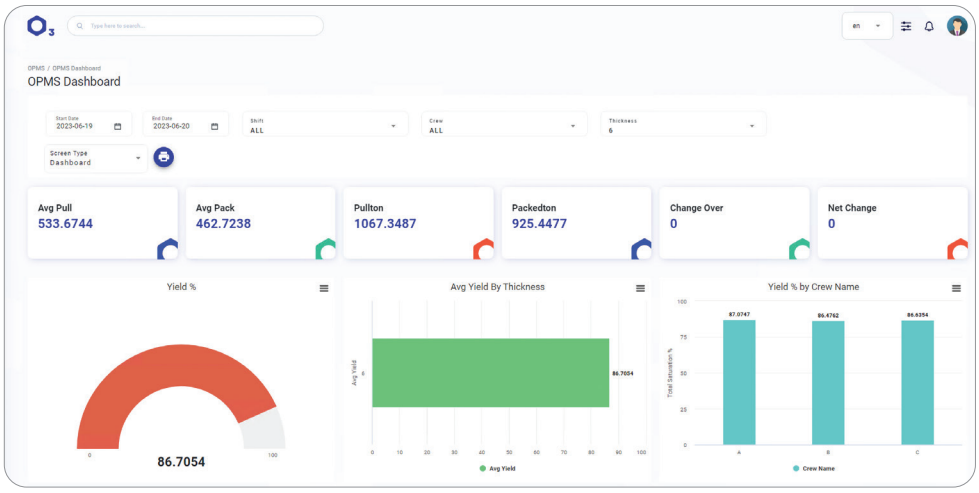


Morale
Move from predictive to corrective

Stakeholders

Maintenance, Production

Impressions



Operational Model

- Customer profiles
- Customer touch-points
- Customer value
- Governance/Decision Rights
- Funding mechanisms
- Organization/Roles
- Sourcing/Ecosystems
- Capabilities/Skills
- Processes/Automation
- Performance metrics
- Data/Algorithms
- Systems/Integration
- Infrastructure
- Investments portfolio
- Culture/Behaviour

Operational Model Legend — Organization · Execution · Behaviour

IoT Value Loop

Create
AI/ML Model for linear regression

Analyse
Machine availability

Communicate
Raw data to AI/ML model

Act
Improve machine availability, Mean Time Between Failure (MTBF)

Aggregate
Unlock Critical Insight about down time and time to fail and Mean Time Between Failure (MTBF)



Quality Assurance

Use Case 14:
Product Design Customization

Description

Digital twin technology enables the creation of virtual prototypes of customized products, allowing for design testing and refinement before manufacturing. It also simulates and optimizes production processes.

Key benefits

1. Enhanced competitive advantage.
2. Increased customer satisfaction.
3. Reduced time-to-market.
4. Improved product quality.

ROI and KPIs



ROI / KPI
Time-to-market, product quality, customer satisfaction



Safety
Helps to improve the worker's safety



Quality
Improve quality by improving the process



Main User
Manager, supervisor, technicians, operator



Cost
Reduce cost of customized product



Functions
Production



Delivery
Reduce lead time, and cycle time



Category
Quality assurance



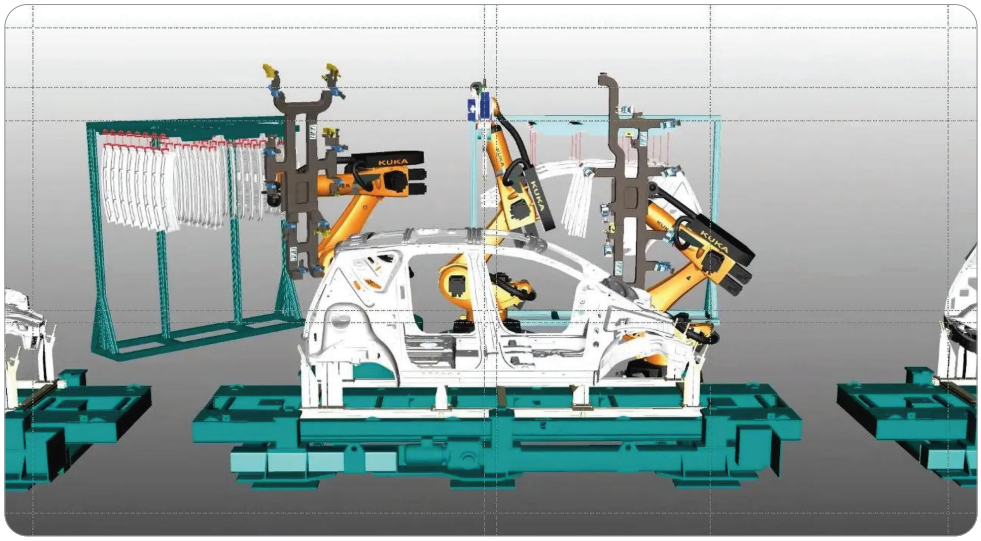
Morale
Help in decision making

Stakeholders

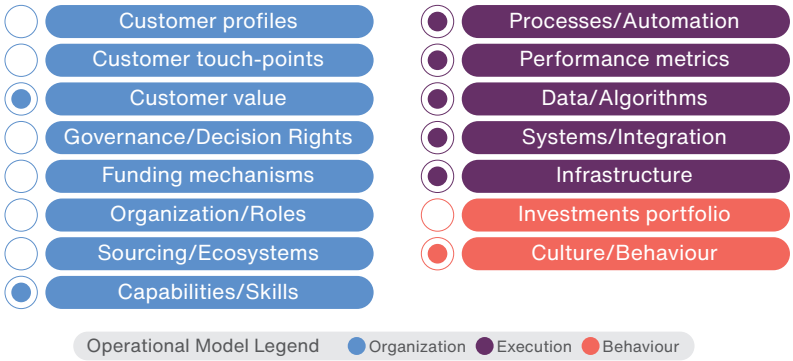
Production team

Impressions

3D replica



Operational Model



IoT Value Loop

Create
Create digital replica of factory and connect IoT devices

Analyse
Analyze the collected data and enable simulation

Communicate
Share the collected data with a digital cloud platform

Act
Simulate customized product and refine the design

Aggregate
Gather data from different sources

Use Case 15:

Quality Testing using Digital Vision

Description

Quality inspection is streamlined through real-time identification of quality issues, using a camera with pattern recognition and machine learning models.

Key benefits

1. Reduced time spent on quality control by operators.
2. Lower scrap production due to quality issues.
3. High accuracy in scrap detection.

ROI and KPIs



ROI / KPI
Quality inspectors productivity
ROI: 1 year



Safety
Minimize human intervention



Quality
Early detection / rework time



Main User
Operational Model



Cost
Quality team FTEs



Functions
Production



Delivery
Enhance product quality



Category
Quality assurance



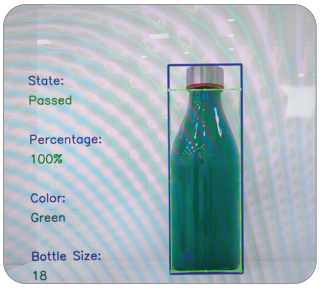
Morale
Decrease defective products

Stakeholders

Production, Quality

Impressions

Application detects colour and bottle fill percentage





Operational Model

- [ ] Customer profiles
- [ ] Customer touch-points
- [ ] Customer value
- [ ] Governance/Decision Rights
- [ ] Funding mechanisms
- [ ] Organization/Roles
- [ ] Sourcing/Ecosystems
- [x] Capabilities/Skills

- [x] Processes/Automation
- [ ] Performance metrics
- [x] Data/Algorithms
- [ ] Systems/Integration
- [ ] Infrastructure
- [ ] Investments portfolio
- [ ] Culture/Behaviour

Operational Model Legend: Organization · Execution · Behaviour

IoT Value Loop

Create
Data insights (images)

Analyse
Analyse data, trends and root-cause of product deviations

Communicate
With machines and automatic processes to alert product deviations

Act
Provide information to quality and production department

Aggregate
Historical data

Use Case 16:
Quality Control

Description

AI and IIoT technologies automate the inspection process, ensuring products meet required specifications and standards. They also provide real-time insights into production processes for early defect detection and root cause analysis.

Key benefits

1. Improved product quality.
2. Cost savings.
3. Enhanced work efficiency.
4. Increased visibility.

ROI and KPIs



ROI / KPI
Quality product rate, Production efficiency, Customer satisfaction



Safety
Minimize human intervention



Quality
Improve Quality by automate quality inspection process



Main User
Production manager, quality assurance manager, engineer



Cost
Reduce the cost of defected products



Functions
Production and quality



Delivery
Reduce lead time



Category
Quality assurance



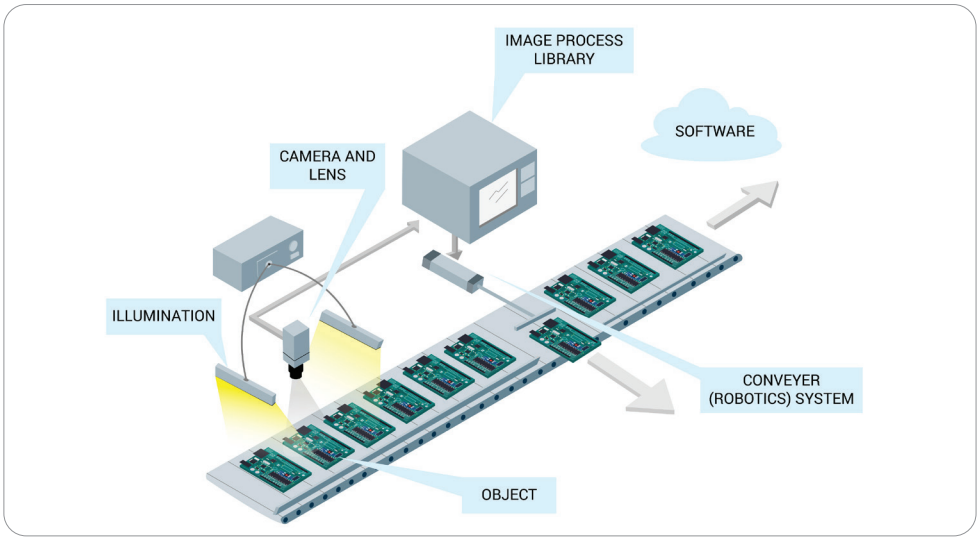
Morale
Decrease defective products

Stakeholders

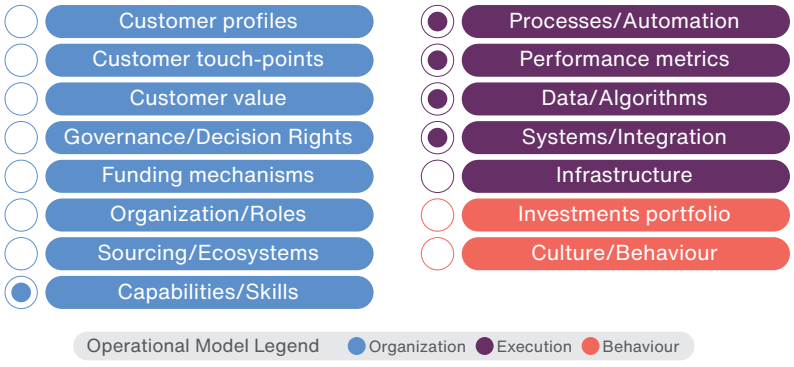
Production and quality team

Impressions

Visual detection and rejection



Operational Model



IoT Value Loop



Create
Connect quality inspection IoT enabled devices to generate data



Analyse
Analyze the collected data to calculate quality KPIs



Communicate
Share data with digital cloud platform



Act
Eliminate the defected items and follow recommendations to improve quality



Aggregate
Aggregate the collected data from different resources



Logistics and Supply Chain

Use Case 17:

Shipment Tracking and Delay Drediction & Last Mile with Dynamic Route Optimization

Description

AIS* satellite tracking for shipments along entire routes until port arrival, predictive intelligence for service disruptions, and automated route allocation and optimization.

Key benefits

1. 10-20% reduction in logistics' cost
2. Elimination delays and manual route planning
3. Optimization routes for on-times deliveries

ROI and KPIs



ROI / KPI
Logistics cost
ROI: 6-12 months



Safety
Fleet safety



Quality
On time deliveries



Main User
Logistics managers



Cost
Shipping costs



Functions
Supply chain



Delivery
Deviations management



Category
Logistics and supply chain



Morale
Visibility

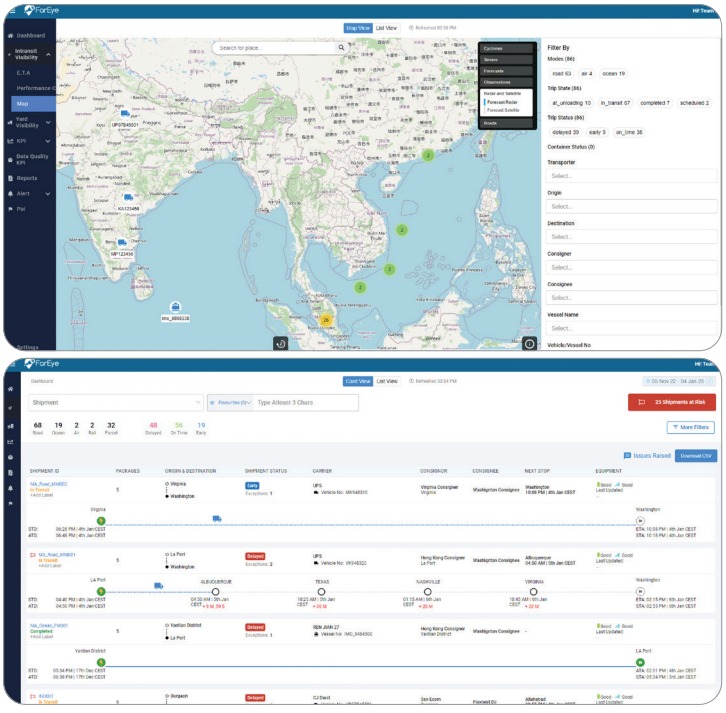
Stakeholders

Planning, Production

*AIS: Automatic Identification System

Impressions

User dashboard with visualization of orders



Operational Model

- Customer profiles
- Customer touch-points
- Customer value
- Governance/Decision Rights
- Funding mechanisms
- Organization/Roles
- Sourcing/Ecosystems
- Capabilities/Skills

- Processes/Automation
- Performance metrics
- Data/Algorithms
- Systems/Integration
- Infrastructure
- Investments portfolio
- Culture/Behaviour

Operational Model Legend — Organization — Execution — Behaviour

IoT Value Loop

Create
Optimized route planning

Analyse
Analyse data, apply algorithms in order to optimize route planning

Communicate
Software systems

Act
Inputs for supply chain team on potential delays, best delivery route and so on

Aggregate
Data from ERP and MES from the factory



Safety Monitoring

Use Case 18:
Safety Equipment Verification

Description

AI-powered monitoring system detects missing PPE* and communicates issues to the workforce, reducing injuries by 15% and improving overall safety.

Key benefits

1. Automatically detects people with missing PPE and reduce training effort.
2. 15% reduction in injuries thus a significant increase in safety on the shop floor.

ROI and KPIs



ROI / KPI
Injuries
ROI: safety safeguard



Safety
Injuries gravity reduction



Quality
Employee safety



Main User
Operator, safety engineer



Cost
Compensation cost saved



Functions
Health and safety



Delivery
Workforce improvement



Category
Safety Monitoring



Morale
Comfort of safety

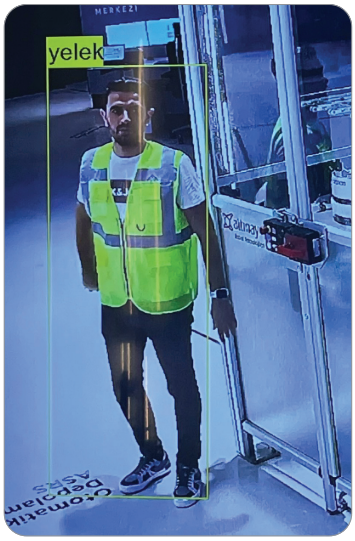
Stakeholders

Production, Maintenance, HSE, warehouse

*PPE: Personal protective equipment

Impressions

System detects when operator is using PPE



Operational Model

- Customer profiles
- Customer touch-points
- Customer value
- Governance/Decision Rights
- Funding mechanisms
- Organization/Roles
- Sourcing/Ecosystems
- Capabilities/Skills

- Processes/Automation
- Performance metrics
- Data/Algorithms
- Systems/Integration
- Infrastructure
- Investments portfolio
- Culture/Behaviour

Operational Model Legend: Organization · Execution · Behaviour

IoT Value Loop

Create
Data insights (images)

Analyse
Analyse images

Communicate
Cloud-trained machine learning model

Act
Give warnings to operators for using proper PPE

Aggregate
Images

Use Case 19:
Employee Safety

Description

Prioritize occupational health and safety in industrial settings by leveraging IoT technology. Monitoring air quality, preventing fire hazards, and enabling quicker emergency response enhance workplace safety, increase productivity, and ensure compliance with regulations.

Key benefits

1. Prevention of fire hazards and monitoring of hazardous substances like hydro sulfuric acid.
2. Quicker emergency response and analysis of incidents for future prevention.

ROI and KPIs



ROI / KPI
Accident Reduction
OHSAS 18001 compliance



Safety
Improve workers', occupational health safety, enforcing compliance and improving productivity.



Quality
Employee safety



Main User
Manager, supervisor, technicians, operator. (All field employees)



Cost
Compensation cost saved



Functions
Field worker



Delivery
Loss prevention



Category
Safety Monitoring



Morale
Comfort of safety

Stakeholders

Occupational Health and Safety

Impressions



Operational Model

- Customer profiles
- Customer touch-points
- Customer value
- Governance/Decision Rights
- Funding mechanisms
- Organization/Roles
- Sourcing/Ecosystems
- Capabilities/Skills
- Processes/Automation
- Performance metrics
- Data/Algorithms
- Systems/Integration
- Infrastructure
- Investments portfolio
- Culture/Behaviour

Operational Model Legend — Organization · Execution · Behaviour

IoT Value Loop

Create
Data from sensors

Analyse
Safety limits, insight's compliance, risk, hazard

Communicate
Sensors to smart connected hub

Act
Define action to improve occupational health and safety

Aggregate
Sensor data

Use Case 20:
AIoT Platform for Proactive Alerts in Emergency Situations

Description

Powerful video analytics system detects near misses and proactively mitigates accidents. With above 95% accuracy, it sends instant alerts for potential falls, slips, and PPE non-compliance while working at height, preventing emergencies.

Key benefits

1. 95% reduction in fatal slips and trips.
2. 80% reduction in near miss incidents that could lead to accidents.

ROI and KPIs



ROI / KPI
Accident, safety safeguard



Safety
Psychological Safety of Workers Ensured



Quality
Working environment of worker's improved, safety & quality of work enhanced



Main User
Safety Managers, EHS professionals



Cost
Injury/compensation cost saved, Project delay cost saved, Manual Monitoring cost saved



Functions
Visual Analytics for Worker Monitoring



Delivery
Real-time Insights, Trend Reports, Granular Insights through Intuitive dashboard



Category
Safety Monitoring



Morale
Responsible, Transparent & Ethical AI

Stakeholders

Occupational Health and Safety

Impressions



1. Detection of improper means of climbing.
2. Video Analytics & IoT.
3. Alerts through local alarms.
4. SMS & Email alerts in case of near misses, slips, trips, PPE non-compliances while working at heights.
5. Dashboard to view trends & reports.

Operational Model

Customer profiles	Processes/Automation
Customer touch-points	Performance metrics
Customer value	Data/Algorithms
Governance/Decision Rights	Systems/Integration
Funding mechanisms	Infrastructure
Organization/Roles	Investments portfolio
Sourcing/Ecosystems	Culture/Behaviour
Capabilities/Skills	

Operational Model Legend — Organization · Execution · Behaviour

IoT Value Loop

Create
Real-time data while working at height at different regions of plant

Analyse
Analyze aggregated data, real-time insights, evidence-based record and prediction on repeatable future events

Communicate
Real-time evidence-based Video Data is transmitted to cloud through 4G or 5G network

Act
The analyzed data will provide a historical trend and actionable insights for the safety manager and top management to improve specific safety measurements

Aggregate
Aggregate all the historical data based on camera location and zoning with time frame



Energy Management

Use Case 21:
Energy Management System

Description

Integration with different hardware devices enables real-time monitoring of energy consumption and production, allowing to the user different measures that reduces cost and increase energy usage, such as energy planning, financial projections and suggestion of maintenance actions.

Key benefits

1. With solar panels, energy generation is increased up to 20%
2. Save 25% energy by implementing strategies based on use case insights
3. Decrease 20% maintenance costs by being preventive rather reactive

ROI and KPIs



ROI / KPI
kWh
ROI: 1y



Safety
Prevent hazards



Quality
Energy Efficiency



Main User
Technician, engineer



Cost
Energy consumption



Functions
Facility management



Delivery
Environmental, cost reduction



Category
Energy Management



Morale
Increase efficiency

Stakeholders

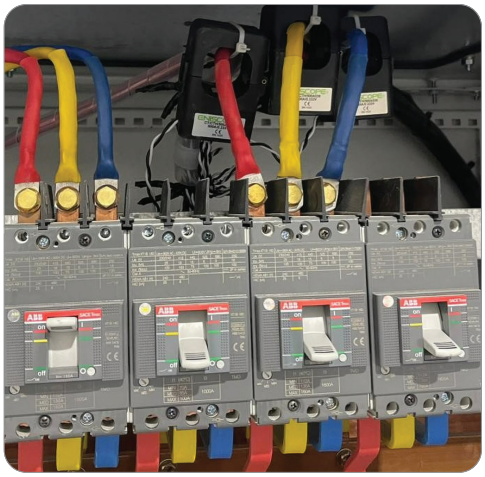
Maintenance, production and facility

Impressions

User interface visualizing energy consumption



Inductive sensors measuring electricity in main circuit breakers



Operational Model

- Customer profiles
- Customer touch-points
- Customer value
- Governance/Decision Rights
- Funding mechanisms
- Organization/Roles
- Sourcing/Ecosystems
- Capabilities/Skills

- Processes/Automation
- Performance metrics
- Data/Algorithms
- Systems/Integration
- Infrastructure
- Investments portfolio
- Culture/Behaviour

Operational Model Legend — Organization · Execution · Behaviour

IoT Value Loop

Create
Data insights

Analyse
Analyse data and relate it to production output

Communicate
Web based dashboard

Act
Provide insights to facility manager and maintenance team

Aggregate
Data from measuring electricity

Use Case 22:
Energy Consumption Monitoring

Description

Monitoring energy usage in real-time and identify opportunities for energy saving to reduce costs and improve sustainability which involve implementing energy efficient processes and equipment by enabling IoT connectivity to collect data and using AI for analyzing the data and giving recommendation to reduce energy consumption and identify areas of improvements.

Key benefits

1. Cost saving
2. Reduce carbon emissions
3. Reduce energy consumption
4. Improves equipment performance

ROI and KPIs



ROI / KPI
Energy Efficiency Ratio (EER), Energy usage, Energy intensity, Carbon footprint



Quality
Improves product quality by reducing downtime and optimize equipment performance



Cost
Cost savings by identify efficiency improvements and making behaviour change



Delivery
Environmental, cost reduction



Morale
Increase efficiency



Safety
Improves safety by addressing issue proactively



Main User
Energy and facilities mangers



Functions
Energy



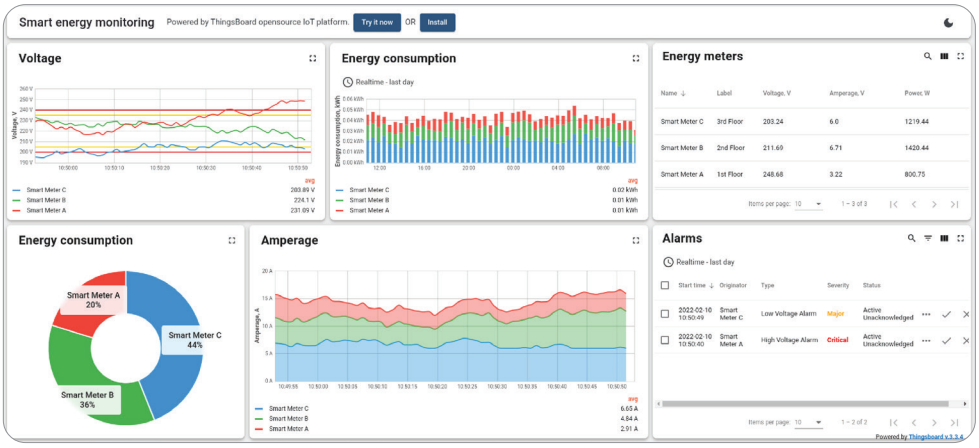
Category
Digital energy management tools

Stakeholders

Energy and facilities mangers

Impressions

Energy usage dashboard



Operational Model

- Customer profiles
- Customer touch-points
- Customer value
- Governance/Decision Rights
- Funding mechanisms
- Organization/Roles
- Sourcing/Ecosystems
- Capabilities/Skills
- Processes/Automation
- Performance metrics
- Data/Algorithms
- Systems/Integration
- Infrastructure
- Investments portfolio
- Culture/Behaviour

Operational Model Legend — Organization · Execution · Behaviour

IoT Value Loop

Create
Generate data using IoT enabled devices

Analyse
Analyze the collected data and calculate the consumption of machines

Communicate
Transfer the data into the cloud platform

Act
Respond to alerts and implement recommendations

Aggregate
Aggregate data from different resources

Use Case 23:
VR* for CNC** Operator Training

Description

Trainings for operators on machine utilization can be theoretical or practical. Theoretical training is not as implacable and practical training may be dangerous in case of a remote and hazardous environment, as well as if the machine is running 24/7.
VR training is a powerful solution that permits the operator to experience an almost real/life experience, while not being exposed to dangerous circumstances nor limiting production capacity

Key benefits

1. Training does not stops or slows down production
2. VR for training is more impactful than theoretical training delivered in a classroom
3. Reduction time and cost of workforce skill training

ROI and KPIs



ROI / KPI
Training costs
ROI: 1-2y



Safety
Safe environment for trainings



Quality
Making learning experiential and immersive



Main User
Technician, operator



Cost
Reduce cost by 20%



Functions
Manufacturing trainer



Delivery
Fast upskilling



Category
Connected and digitized worker



Morale
Increase trainee confidence

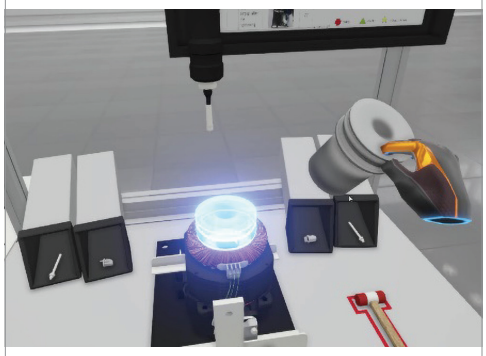
Stakeholders

Production, maintenance

*VR: Virtual Reality **CNC: Computer Numerical Control

Impressions

Safe, but impactful learning experience with VR glasses





Operational Model

- Customer profiles
- Customer touch-points
- Customer value
- Governance/Decision Rights
- Funding mechanisms
- Organization/Roles
- Sourcing/Ecosystems
- Capabilities/Skills
- Processes/Automation
- Performance metrics
- Data/Algorithms
- Systems/Integration
- Infrastructure
- Investments portfolio
- Culture/Behaviour

Operational Model Legend — Organization · Execution · Behaviour

IoT Value Loop

Create
Digital way of working

Aggregate
Digital training delivery

Communicate
Training new operators

Act
Digital training delivery



Automation

Use Case 24:
Legacy Systems

Description

The complexity of integration and connectivity is a main barrier to scaling IIoT in manufacturing. This issue is further amplified by the presence of legacy systems utilizing outdated technologies. The layered architecture of an IIoT environment inevitably includes different types of software and hardware. One of the challanges here is that each component of an IIoT system may rely on different network protocols and handle specific data formats.

Key benefits

1. Protocol standardization within Obeikan Group Companies by achieving universally accepted specifications and protocols for true interoperability between devices and applications.
2. Build a library and standard operating procedures of the top 12 most commonly used IoT protocols and standards.
3. API* development
4. Data management

ROI and KPIs



ROI / KPI
We can connect any legacy system



Safety
Extensive data security coverage



Quality
Real time visibility, from raw data to insights



Main User
IIoT Engineer



Cost
Cost saving by increasing efficiency



Functions
Automation and IoT engineers



Delivery
Connect any legacy system



Category
IoT Engineering



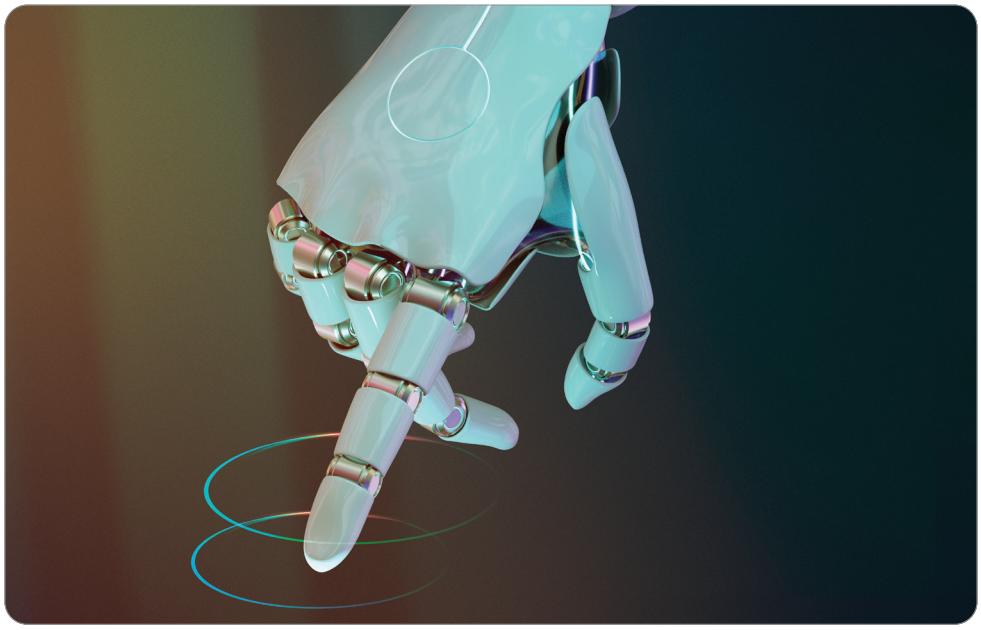
Morale
Develop a better understanding of shop floor performance

Stakeholders

Production, Maintenance

*API: Application Programming Interface

Impressions



Operational Model

- Customer profiles
- Customer touch-points
- Customer value
- Governance/Decision Rights
- Funding mechanisms
- Organization/Roles
- Sourcing/Ecosystems
- Capabilities/Skills
- Processes/Automation
- Performance metrics
- Data/Algorithms
- Systems/Integration
- Infrastructure
- Investments portfolio
- Culture/Behaviour

Operational Model Legend — Organization — Execution — Behaviour

IoT Value Loop

Create
Standard Operation procedures for machine connectivity

Analyse
KPIs and Metrics

Communicate
Sensors to Edge device (industrial PC)

Act
Convert Raw data into knowledge and meaningful insights

Aggregate
Machine Data _Process Parameters

Use Case 25:
IoT kit for Online Vibration Monitoring Solution

Description

To continuously monitor the health of the Mixer motor, Extrudr pump, Sugar Mill M/C and dumoulin pump using IIoT vibration sensor's & provide the vibration & surface temperature readings.
Sushi Sensor strengthens collaboration between operation systems and equipment maintenance systems, thus achieving predictive maintenance that optimizes all phases from the detection of equipment conditions by sensors to decisions on appropriate actions by operators.

Key benefits

Sushi Sensor continuously monitors target equipment. Data are quantified, accumulated, and used for simple diagnoses. Signs of abnormality in equipment are never overlooked.

ROI and KPIs



ROI / KPI
ROI: < 4 months



Safety
Improve reliability and safety



Quality
More visibility and monitoring



Main User
Technicians & Operators.



Cost
software and hardware



Functions
Automation



Delivery
Availability



Category
Maintenance Management



Morale
Increase efficiency

Stakeholders

Production, Maintenance

Impressions

Industrial Sensors



IoT Node to connect to sensors



Operational Model

- ○ Customer profiles
- ○ Customer touch-points
- ○ Customer value
- ○ Governance/Decision Rights
- ○ Funding mechanisms
- ○ Organization/Roles
- ○ Sourcing/Ecosystems
- ○ Capabilities/Skills

- ● Processes/Automation
- ○ Performance metrics
- ○ Data/Algorithms
- ● Systems/Integration
- ○ Infrastructure
- ○ Investments portfolio
- ○ Culture/Behaviour

Operational Model Legend ● Organization ● Execution ● Behaviour

IoT Value Loop

Create
Pump/ Motors data from IoT sensors

Analyse
AI analysis to predict the failure

Communicate
IoT Sensors to on-premise software

Act
Preventive actions to enhance the conditioning monitoring system

Aggregate
Asset data

Use Case 26:
Set up nesting software

Description

The software is capable of performing automatic layouts based on the parts inputted and the sheet metal available in stock.
Software can generate reports on the operations executed, in addition to the ability to track offcuts and reuse them at later a stage.

Key benefits

1. Reduce average scrap and eliminate scrap in built-up areas.
2. Centralize nesting process and save time wasted on nesting by shearing operator

ROI and KPIs



ROI / KPI
OEE ROI: <3 months



Safety
Waste and handling reduction



Quality
Scrap



Main User
Manager, supervisor, technicians, operator.



Cost
FTEs costs, overtime



Functions
Production, engineering and quality



Delivery
Availability



Category
Digital planning and management tools

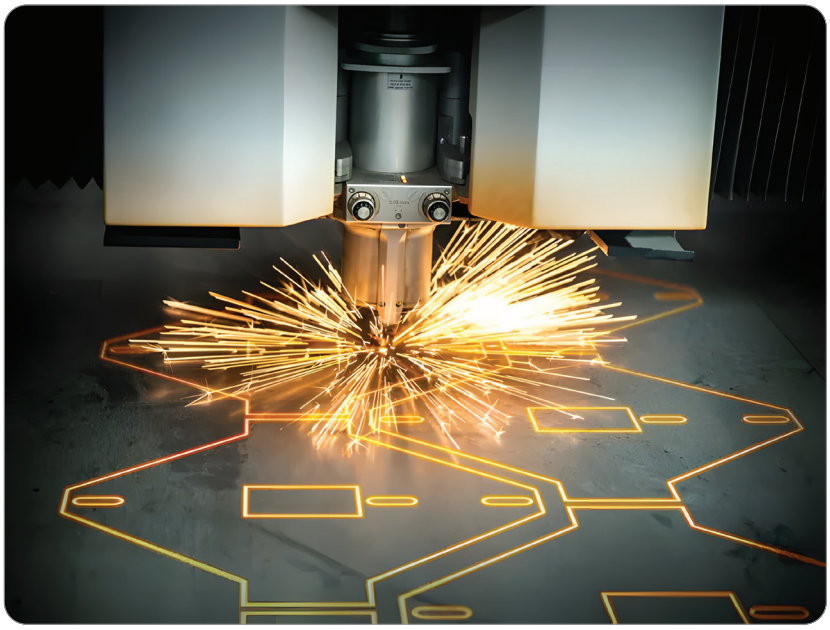


Morale
Increase efficiency

Stakeholders

Production, Engineering

Impressions



Operational Model

- Customer profiles
- Customer touch-points
- Customer value
- Governance/Decision Rights
- Funding mechanisms
- Organization/Roles
- Sourcing/Ecosystems
- Capabilities/Skills

- Processes/Automation
- Performance metrics
- Data/Algorithms
- Systems/Integration
- Infrastructure
- Investments portfolio
- Culture/Behaviour

Operational Model Legend — Organization — Execution — Behaviour

IoT Value Loop

Create
Data from Engineering, Design Team

Analyse
Data insights from engineering

Communicate
Designing software

Act
Define actions to reduce scrap

Aggregate
Machine data

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Evaluation Form

The evaluation aims to measure the value of the use cases guide to the reader, allowing us to assess its effectiveness and identify areas for improvement. Your feedback is valuable in shaping our upcoming publications. Thank you for taking the time to share your thoughts with us.

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