

**Delivering technology  
Ensuring trust  
Enabling transparency**



# Introduction



# Delivering efficiency with HCL's manufacturing execution systems

The new normal calls for enterprises to accelerate their digital manufacturing and the connected factory journey for increased visibility, collaboration, and insight into operations. This, in turn, enables enterprises to rapidly and flexibly respond in an optimal way to changing customer demands and economic situations.

Manufacturers have expanded geographically but manufacturing sites continue to function at varying operational levels constraining the optimization of global operations and the associated warehouse management. The ability to orchestrate operations and drive continuous improvement demand a shift in deployment strategies to provide global visibility in addition to specific site visibility. Dynamic build processes and the proliferation of automation systems over the years are preventing standardization across sites, inhibiting manufacturing excellence and rapid scaling of operations to meet changing business demands. Furthermore, the prevalence of paper-based operations is hampering real-time and informed decision-making.

Digital manufacturing, connected factories, manufacturing execution systems (MES), and manufacturing operations management (MOM), in combination with industry 4.0 technologies, have become central today. These technologies are invaluable in transforming traditional manufacturing and warehouse management to create a connected factory with an intelligent, interconnected, and optimized production environment. Such an environment can connect products, production plans, assets and supply chains to gain visibility into operations and to control and optimize execution.

HCL's connected factory services cater to the full spectrum of digital manufacturing transformation needs. HCL offers consulting, product engineering, MES/MOM implementation or migration services, continuous platform upgrades or technology refreshes, and operations support.



# Digital manufacturing and industry 4.0 practice



## Competencies and service offerings



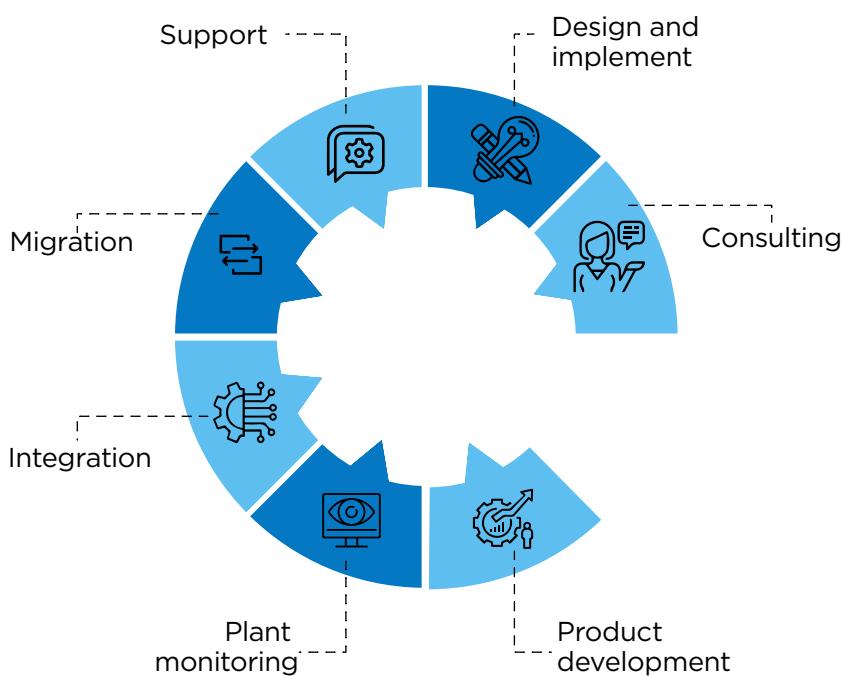
Consultants  
**300+**



Global coverage  
**44 countries**



Engagements  
**45+**



## Global partnerships

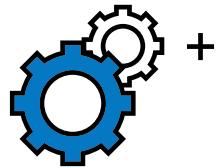


Critical manufacturing



SIEMENS





## IPs and solution accelerators MES and MOM

## Proactive production monitoring

## PanaCIM-work instructions

## Manufacturing analytics dashboard

## Industrial IoT-based device integration

## Supply chain tracking solution

## Test automation framework

## DevOps framework

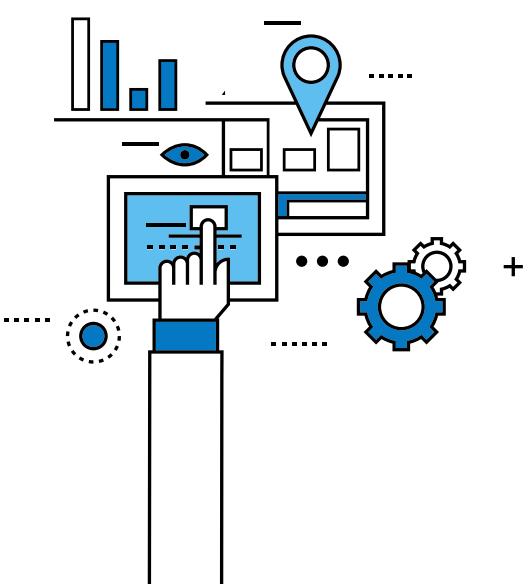
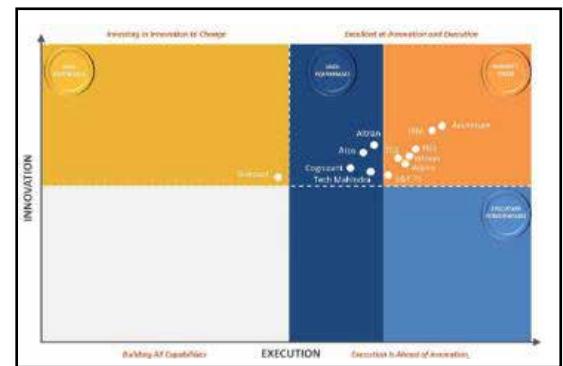
## Equipment discovery and integration approach



## HCL rated in leadership quadrant for industry 4.0 and IoT



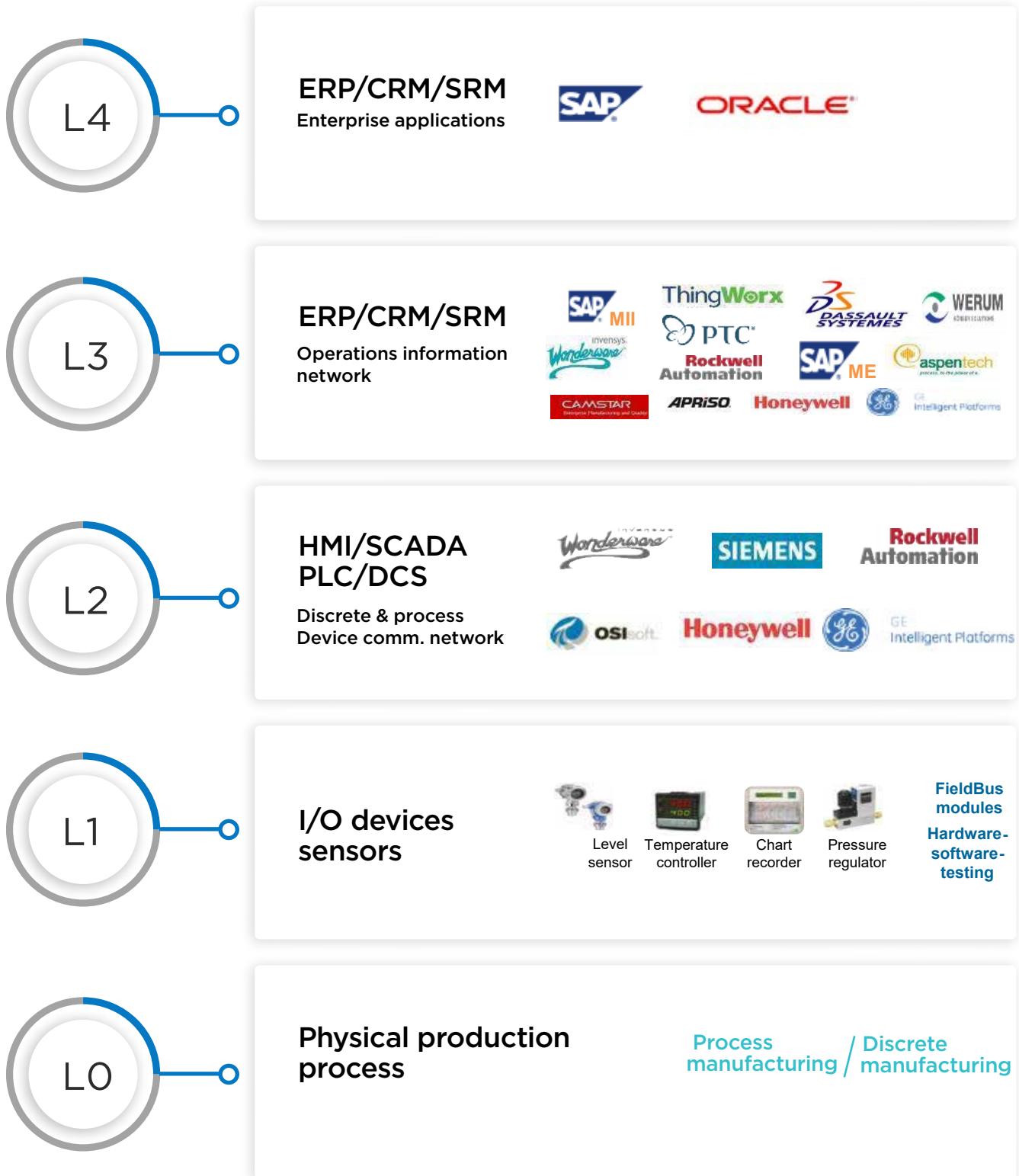
HCL positioned in Winner Circle  
& ranked No. 3 for industry 4.0  
services by HfS Research



# Our Capabilities



# HCL MES/MOM and integration capabilities (ISA 95 Factory)



System Hierarchy as defined in ISA-95 standard



## Manufacturing functional area

### Plant to business integration

- ▶ Visibility to influence production and cost management
- ▶ Enterprise business system information and integration

### Manufacturing execution

- ▶ Batch and inventory management
- ▶ Product tracking and genealogy
- ▶ Operations/detailed scheduling
- ▶ EH&S

### SCADA, HMI

- ▶ Control system architecture migration
- ▶ DCS/PLC engineering
- ▶ SCADA/HMI development

### Technologies and standards

▶ ISA 95/B2MML	▶ SECS, GEM
▶ PDX, PLM-XML	▶ EDA, EPT, 300mm
▶ EDI, Rosetta Net	▶ OPC, OPC-UA
▶ BPEL/SOA	▶ OAGIS, Modbus

### Asset management

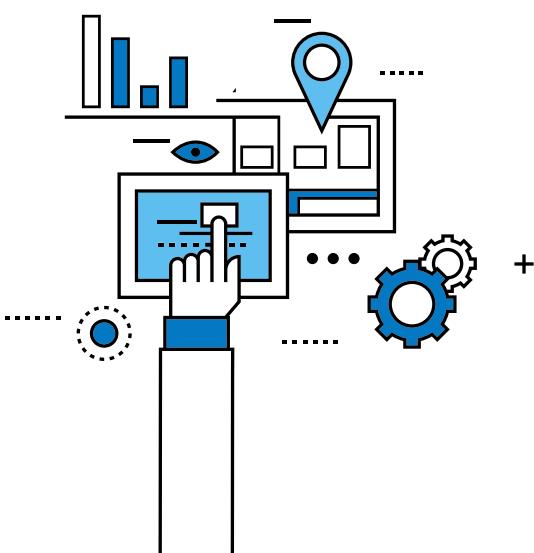
- ▶ Asset information management and analytics
- ▶ Predictive monitoring and remote management

### Manufacturing intelligence

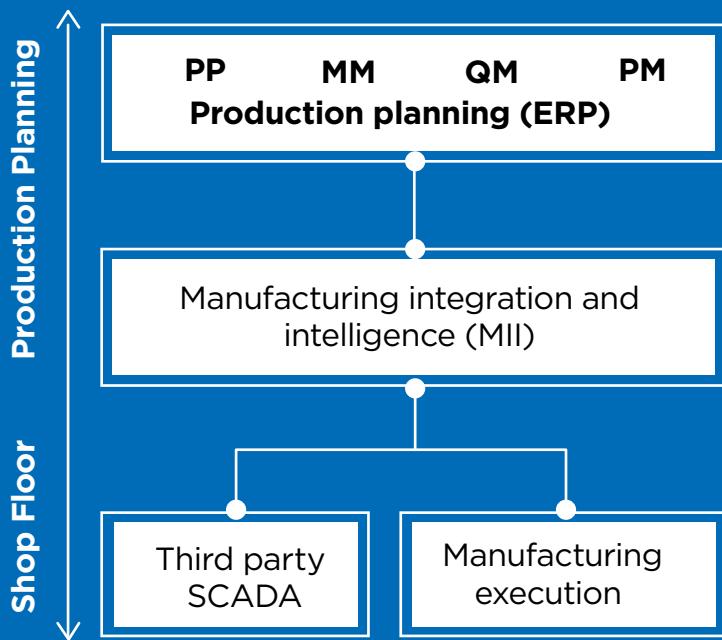
- ▶ Measure and manage overall equipment effectiveness (OEE)
- ▶ Production reporting
- ▶ Alerts, process analysis, traceability and genealogy

### Remote plant monitoring

- ▶ Advanced process control and optimization
- ▶ Support and maintenance



# IT - OT Integration



## Downstream integration

- ▶ MES, DCS, SCADA systems
- ▶ PLC, field devices
- ▶ OPC servers
- ▶ Laboratory systems
- ▶ Plant historians
- ▶ Maintenance systems

## Upstream integration

- ▶ ERP, PLM, PDM systems
- ▶ SCM, CRM, SRM, CMMS, EAM systems
- ▶ SPC and SQC systems, LIMS, Data historians

## Data analytics

- ▶ Data acquisition and reporting
- ▶ Role based dashboards and scorecards
- ▶ KPI monitors and trends analyzers
- ▶ Email and SMS alerts, alarms



### Services



Maintenance and ongoing support services



Enhancement, migration, upgrades and consolidation services



Consulting, blue printing and new solution development

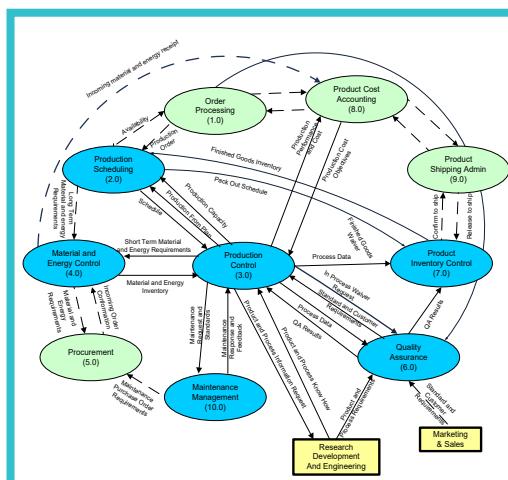
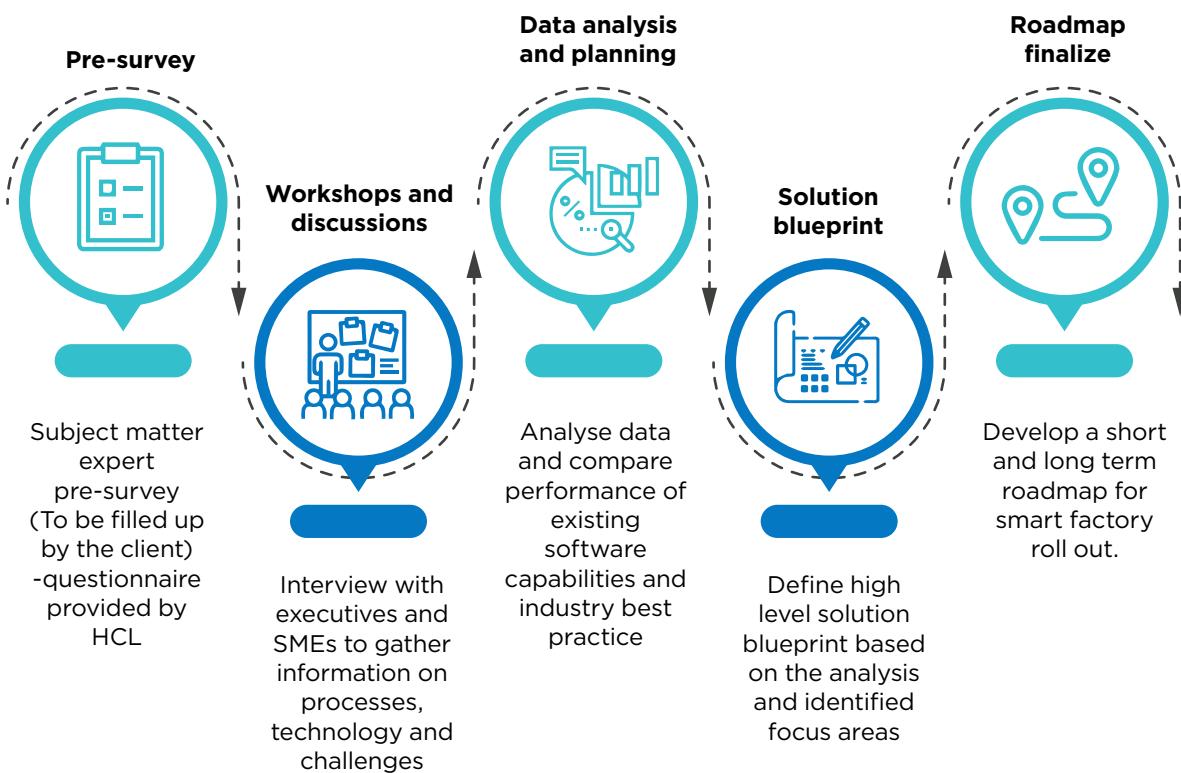
## Integration Suites



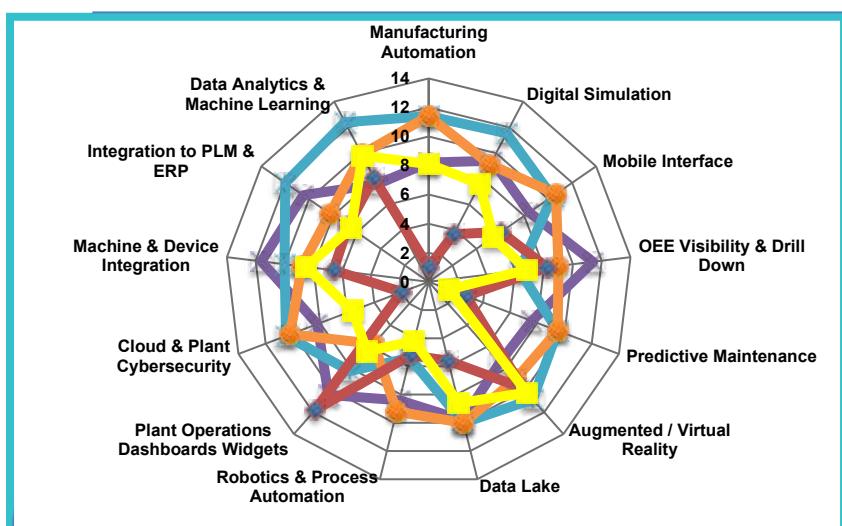
## Integration Suites



# Our smart factory assessment approach



	Plant A	Plant B	Plant C	Plant D
Operations Scheduling	5	6	2	2
Resource Allocation Status	8	8	4	4
Order Dispatching	5	5	3	3
Process Management	6	4	2	2
Quality Management	7	5	5	5
Product Tracking & Genealogy	8	6	5	5
Performance Analysis	8	7	5	5
Document Control	8	6	4	4
Data Collection & Acquisition	8	6	3	2
Maintenance Management	7	7	6	6
Inventory Management	9	5	1	1
Demand Visibility & Integration	7	5	2	2
Visibility to Component Inventory & QC Results	11	9	7	7
Linking Component Plan with FG rescheduling	6	2	3	3
MRP, Kanban, & JIT Inventory Integration	9	5	0	0
PO/ASN Invoking Collaboration	7	4	0	0
Scalable to global supplier base	8	4	0	0
Data Analytics & KPI Dashboards	5	1	1	1
Visibility to Supplier Inventory	5	5	5	5
Supply Planning & Detailed Scheduling	7	2	0	0
Supplier Performance Management	6	3	4	4



# Solutions



# Our solutions

HCL developed MES solution accelerators for industrial use which can be leveraged in client's MES ecosystem as value additions

## Integrated Manufacturing Analytics

- Integrated mfg analytics offers deeper insight into key manufacturing parameters, history and real time status of the connected assets.
- The solution has analytical capabilities for operations and predictive maintenance



## ROST – Connected Supply Chain

- Supply chain monitoring solution provides visibility into status of supplier parts in near real time and predict delivery date in advance
- This solution leverages integration with shop floor systems and mobile applications for data acquisition based on supplier capabilities

## Machine Maintenance Scheduling

- Machine maintenance scheduling product with AR capability help with scheduled & unplanned maintenance management.
- It includes some features custom checklist, linked documents, parts/ assignment, repair requests, response time tracking, multi-level escalation



## e - Pick to Light using AR

- E-Pick To Light with AR capability is an error proofing solution.
- It helps to reduce errors and defects in production process just by scan of a bar/QR code.
- Helps to optimize parts selection in operating stations, warehouses, etc. so the right parts are sequenced to production line at the right

# Case Studies



# Smart factory consulting for global aluminum producer

Smart factory assessment and recommendation for a global aluminum producer



## Challenges

- Different production software in use for two manufacturing plants resulting in no harmonization and complexity in implementing similar change in both plants
- Scattered data flow and different reporting formats
- No real-time visibility in the production



## Solution

### **HCL conducted smart factory assessment and performed the following activities**

- AS-is study of both the production facilities (processes/areas), key differences in manufacturing and documentation of all the manufacturing processes
- Functional mapping of user requirement with MES core functionalities as per MESA guidelines. Deriving the one MES solution architecture as per ISA-95 standard
- Fit-gap analysis of 'as-is' production function with respect to MES core functions
- Provided concept of "integrated cast house MES solution" and performed evaluation and selection for integrated cast house MES solution



## Potential Benefits

- **Adopting the new age industrial standards and concept of industry 4.0**
- **Digital transformation, removal of manual processes and manual reporting**
- **Implementation of unified production model as per ISA-95 guidelines**
- **Implementation approach for core MES modules:**
  - Unification of data and data integrity
  - Traceability and genealogy
  - Digital workflow
  - In-depth scheduling at caster level
  - Recipe management



# Apriso implementation for a leading automotive parts OEM

Global automotive parts supplier planning to implement MES solution for its manufacturing facilities in North America



## Challenges

- Develop a LEAN integrated solution for assembly lines and in-process quality with integration to ERP system
- Reduce IT complexity by standardizing manufacturing execution systems on a single manufacturing platform
- Develop and implement world class manufacturing processes, utilizing "best in class" processes and tools to drive business performance
- Develop a full lifecycle management, and that includes tracking, genealogy, material validation, operator qualification, production confirmation and test results in one unified database



## Solution

- As part of the global IT transformation strategy, HCL supports, maintains, enhances and implements Apriso FlexNet for all subsequent manufacturing facilities across the globe.
- Provide shop floor support for all the assembly line implementing Apriso FlexNet.
- Standardize the MES footprint across all merit sites.
- An integrated assembly line where the entire assembly process is automated with close integration of equipment controls, PLC, OPC, and MES.
- An integrated manufacturing plant interfaced with Oracle ERP to allow material, order, BOM, production confirmation to enable effective visualizing of manufacturing data.



## Benefits

• Integration of machine tool and quality processes to reduce risk priority numbers (RPN)	• Reduction in waste time, effort, rework, paper
• First time quality defined in the process and supported by the toolset	• Resource optimization for operator efficiency
• Ability to identify and contain defects	• Allow enforcement of best practices in a systematic manner

Reach out to us to talk to our industry experts about HCL's digital manufacturing services at : [mfg\\_marketing@hcl.com](mailto:mfg_marketing@hcl.com)



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