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Realizing Smart Manufacturing for Electronics

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Digitalization in Electronics

Electronics Industry : New possibilities, new pressures

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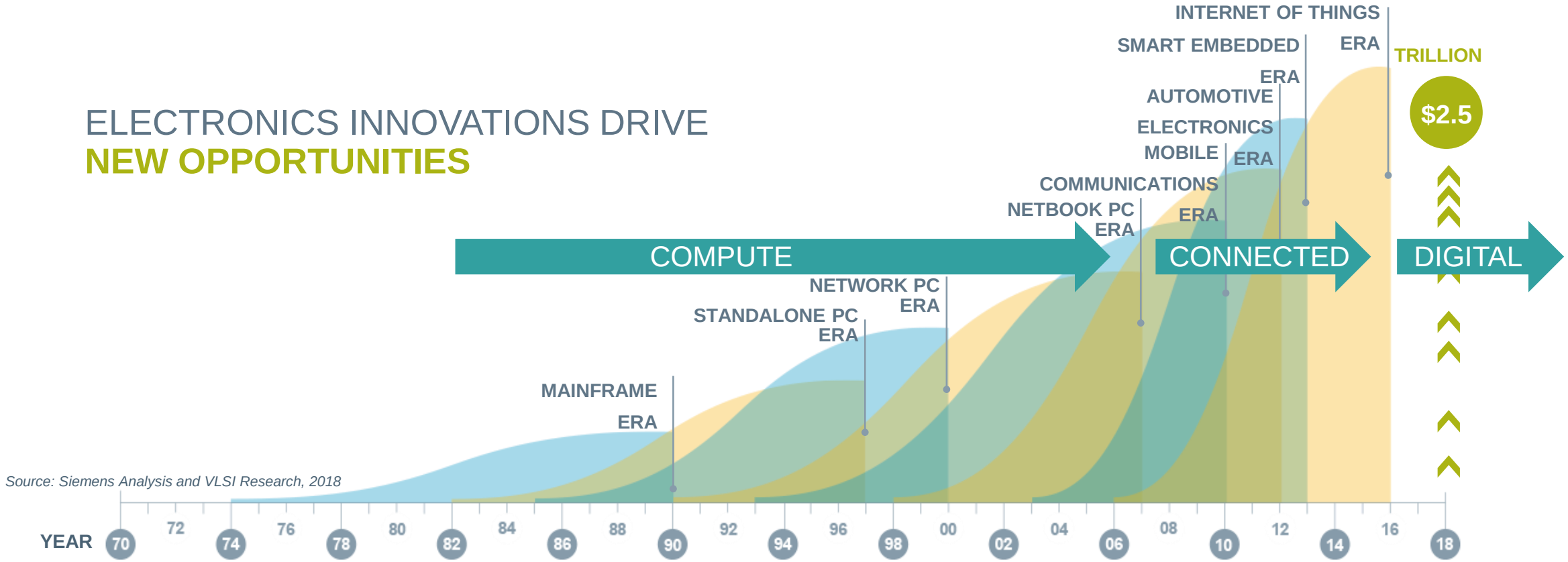
ELECTRONICS INNOVATIONS DRIVE
NEW OPPORTUNITIES



“Digital is the main reason just over half of the companies on the Fortune 500 have disappeared since the year 2000.”
Pierre Nanterme CEO Accenture

The electronics revolution is accelerating
ELECTRONICS INNOVATIONS DRIVE NEW MARKETS

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AUTONOMOUS

- ADAS
- Safety systems
- Electrification
- UAVs

By 2030, 50% of automotive costs will be electronics-based

– Statista

SMART AND CONNECTED

- Smart Cities/Homes
- Industrial IoT
- Connected health
- Smart Products

The global IoT market will grow from $157B in 2016 to $457B by 2020, attaining a compound annual growth rate (CAGR) of 28.5%.

– GrowthEnabler Analysis

AUGMENTED & VIRTUAL REALITY

- Manufacturing
- Military/Defense
- Sales & Marketing
- Recreational

Total spending on AR/VR products will hit $215 billion 2021, achieving a compound annual growth rate (CAGR) of 113.2% along the way.

– IDC

5G Connectivity – More than just speed

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Source: Qualcomm

Trends in Electronics Industry

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Implications of being unprepared

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Those unprepared share common characteristics:

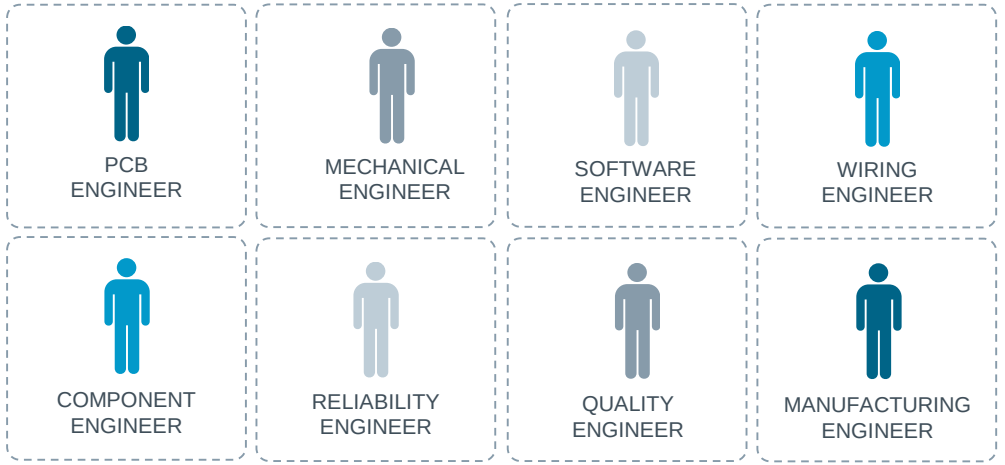
Poor integration of electronics with mechanical across product development and manufacturing	Inefficient design processes, data incompatibilities, data mismanagement leads to extensive error-prone manual intervention	Heavy dependence on backend verification and physical prototyping that compromises product reliability and increases cost

Inefficient cross-domain collaboration

Data incompatibilities

Manual manufacturing handoff

Reliance on physical prototyping



BRINGING MORE CAPABLE PRODUCTS TO MARKET
FASTER REQUIRES **MULTI-DISCIPLINE STRATEGIC INITIATIVES**

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Smart Manufacturing for Electronics

Modern manufacturing introduces new challenges

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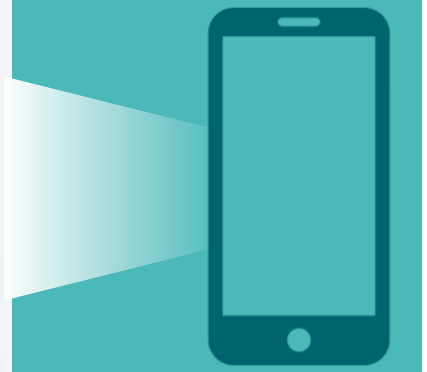
DELIVERING LOT SIZE ONE

OPTIMIZING MATERIAL USAGE

COST OF SELECTED PARTS	
Display	$45
Memory	15
Communications	37.50
Cameras	11
Processor	20
Mechanical	30
Other	37.60
TOTAL PARTS	$196.10
Labor	4
TOTAL	$200.10
U.S. RETAIL PRICE	$649



MAKING DATA USEFUL

Typical customer scenario (based on customer input):

Mechanical and Electronics Assembly planning and execution in disconnected environments

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QUALITY ENGINEER

- Test plan not in sync with assembly plan and product changes
- Difficult to assess quality of the entire product
- No single traceability record

SUPPLY CHAIN MANAGER

- Low material turnover
- High scrap rate
- Low predictability

PROCESS PLANNER

- Product data is complex, outdated, hard to access
- No standardization across sites

SHOP-FLOOR OPERATOR

- Different machine interfaces
- Work instructions are not up-to-date

IT

- Outdated legacy information systems
- Multiple interfaces to maintain

Breaking down the silos: delivering an integrated solution for Electronics Manufacturing

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ERP

PLM

Manufacturing analytics

Design Verification

Manufacturing Planning

Production Execution

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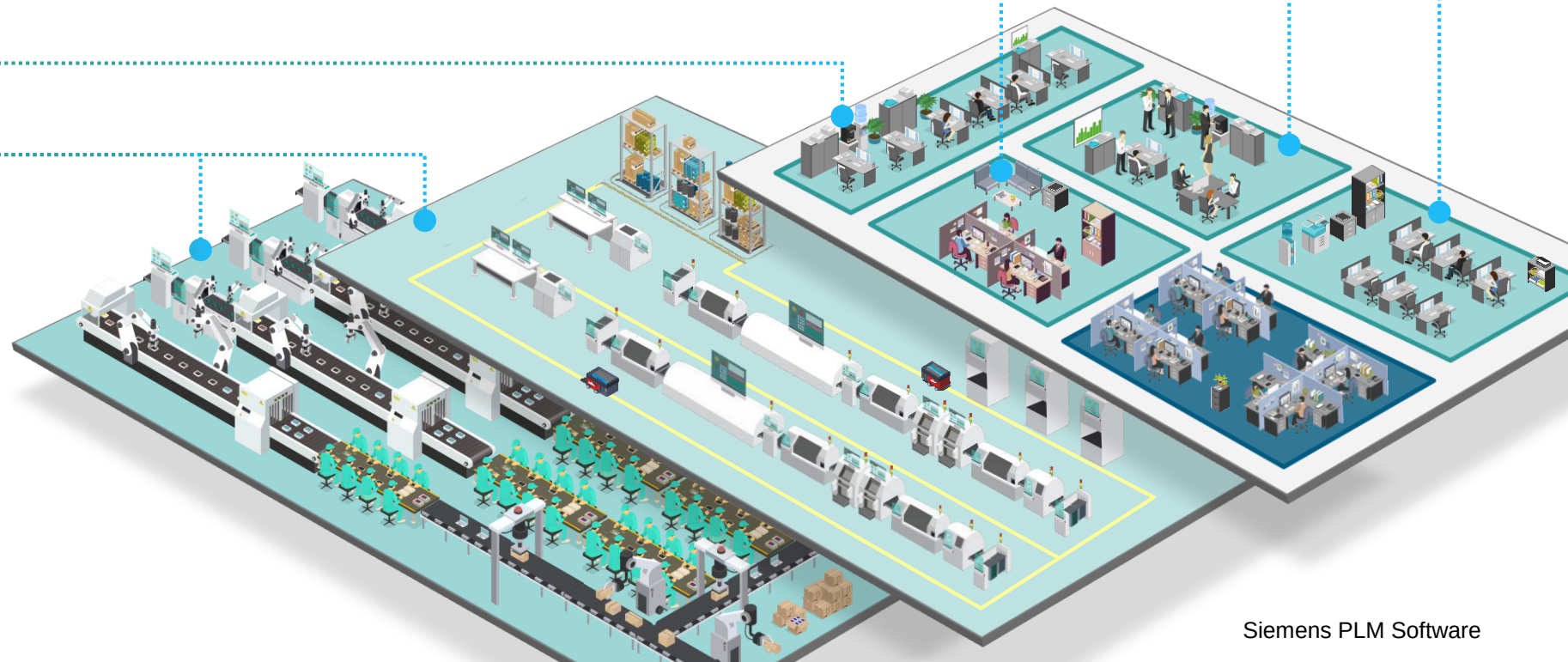

Continuous improvement with the Digital Twin

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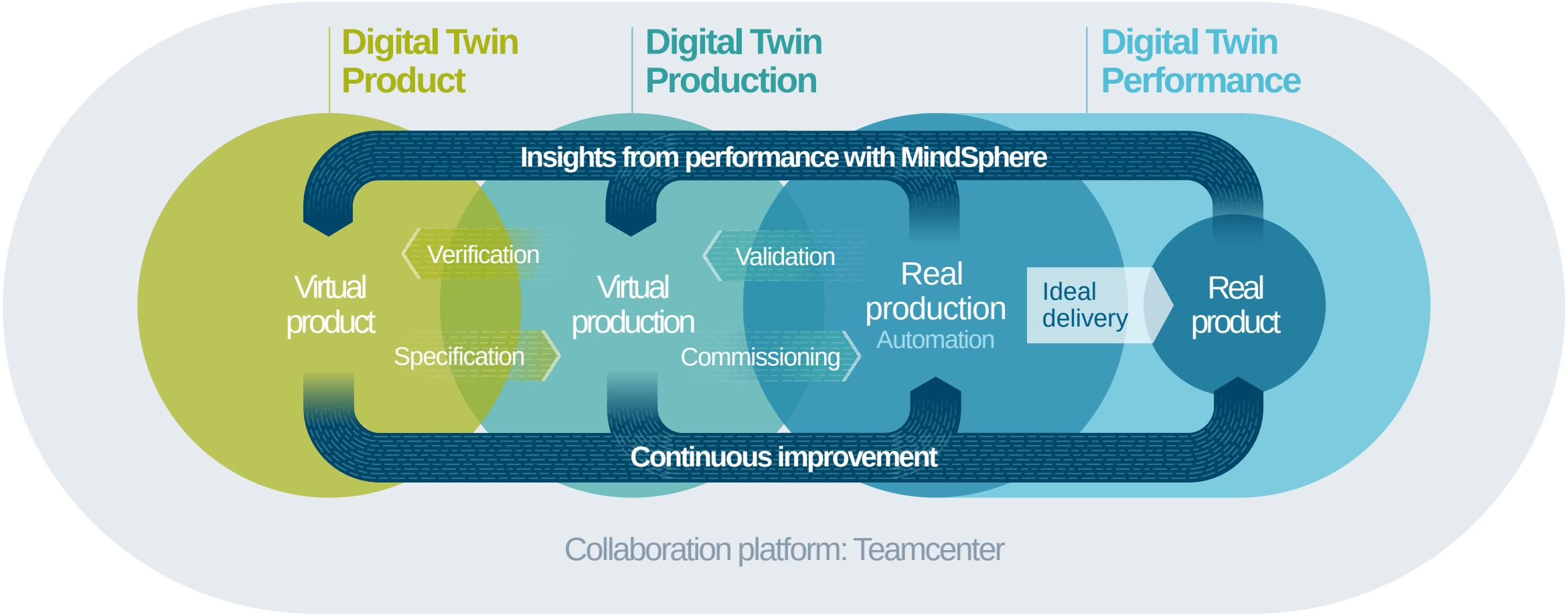

Maintaining a Digital Thread with Open, Intelligent data exchange formats

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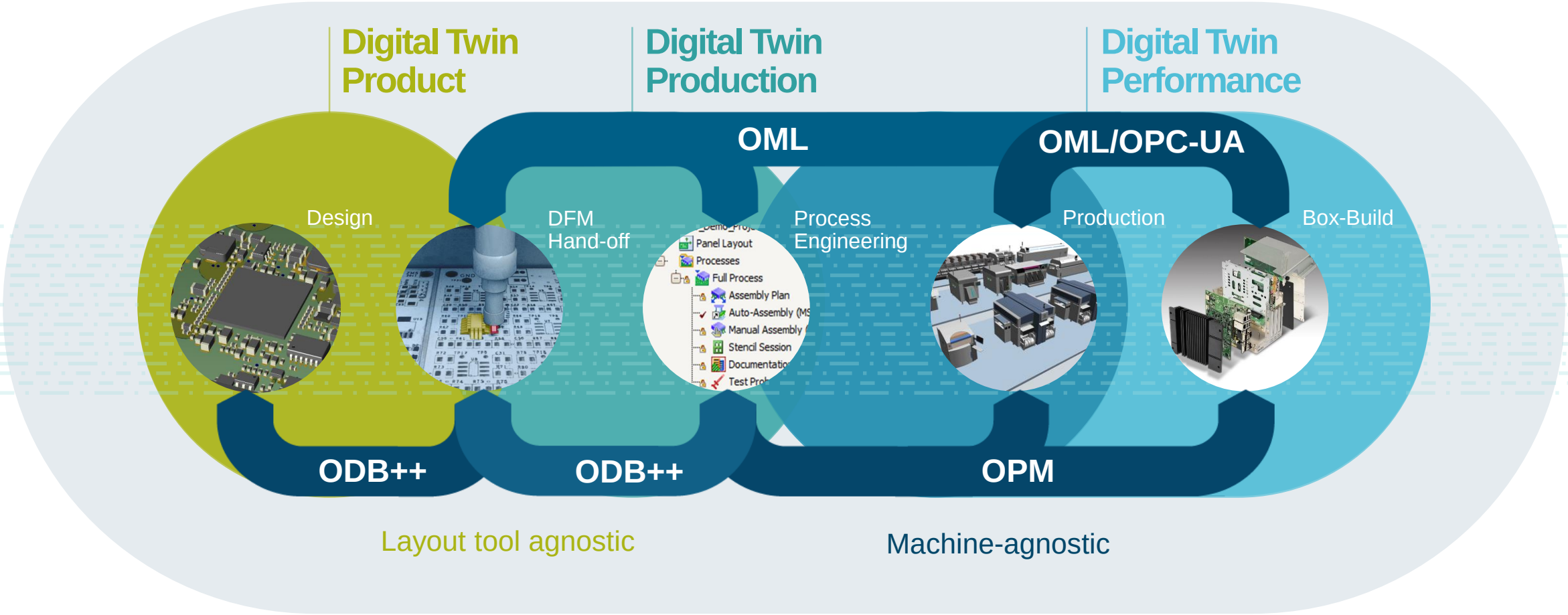

Breaking down the silos:
Delivering an integrated solution for Electronics Manufacturing

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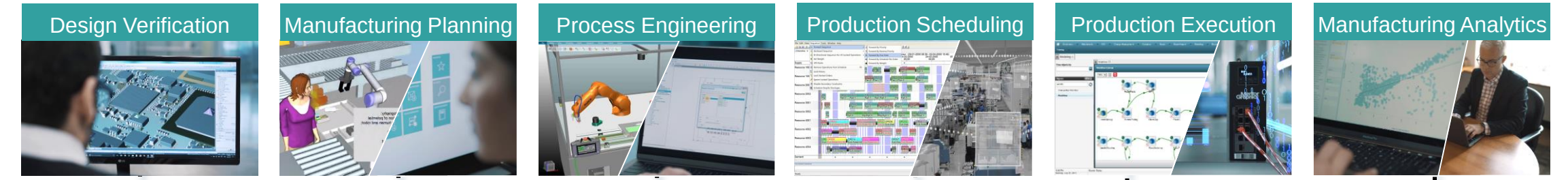
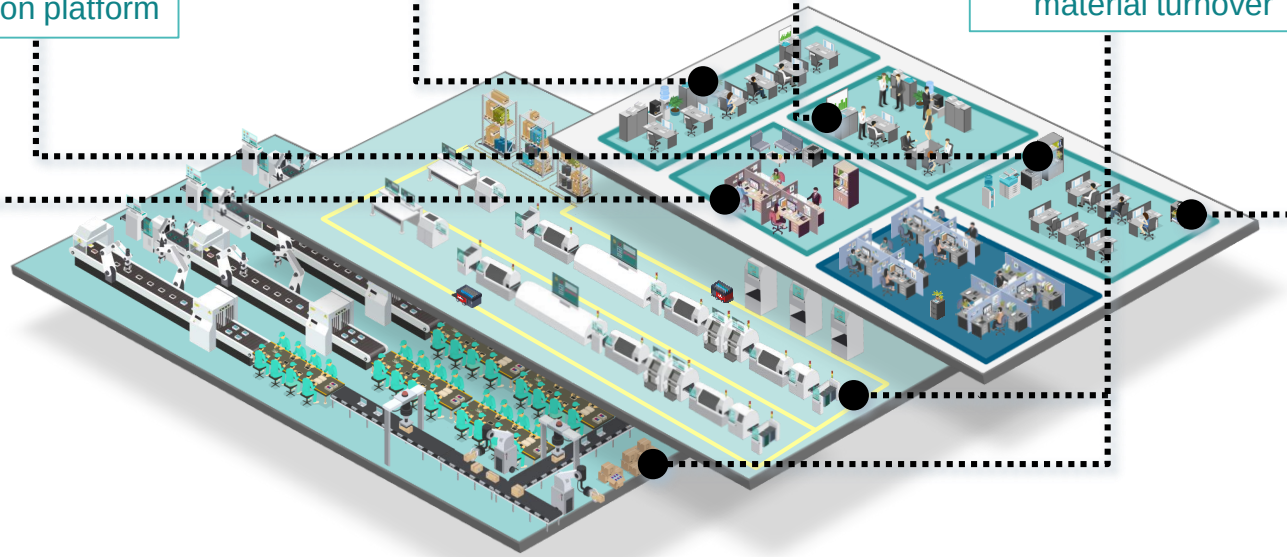


Teamcenter (+Teamcenter Manufacturing)

Camstar Electronics Suite

- ✓ Right-first-time production
- ✓ Consolidated, collaborative digitalization platform
- ✓ Fast, scalable, global NPI
- ✓ Optimized production plans
- ✓ Improved performance, utilization, material turnover
- ✓ Continuous improvement; Intelligent decision making



The vision by 2025
A radical change for manufacturers

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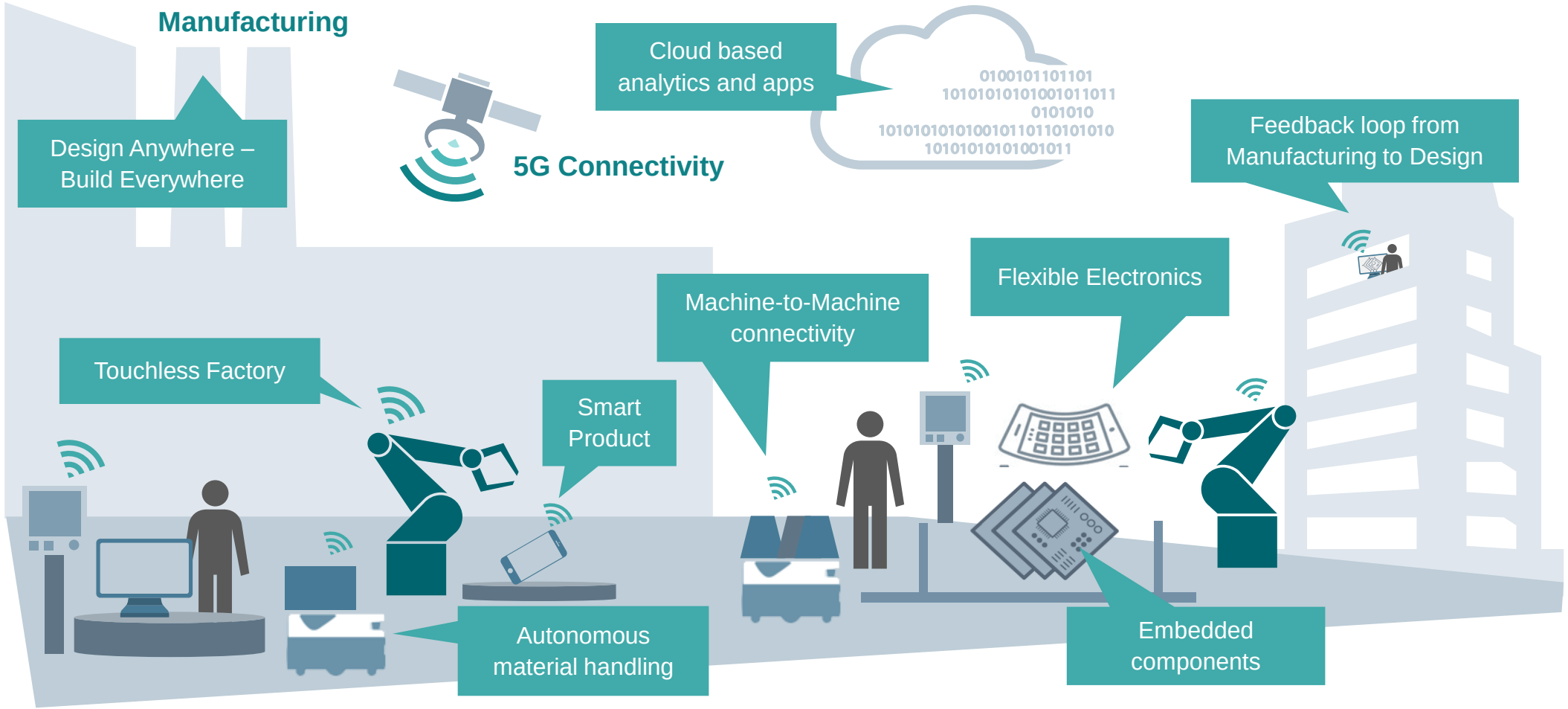

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Introducing Camstar Electronics Suite

The MOM evolution towards Smart Manufacturing

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Improved manufacturing execution

Manufacturing digitalization

Digital Enterprise & Industry 4.0

1
’90s

Stand-alone MES

- Focus on vertical integration
- Rich set of Industry-specific OOTB functionalities
- Real-time data acquisition

2
’00s

Monolithic MOM

- From execution to a broader coverage of manufacturing disciplines
- Scalable solutions, extensibility and code-less configuration
- Data synchronization and contextualization

3
Today

MOM for Smart Manufacturing

- Focus on collaboration through horizontal integration
- Cloud-ready technologies
- Orchestration based on principles of Artificial Intelligence
- Augmented data contextualization through IoT

Camstar Electronics Suite - Overview

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CLOUD

Mindsphere

LEVEL 4
ENTERPRISE

Teamcenter PLM

ERP

Camstar Scheduling

Valor Material Management

Valor Manufacturing Analytics

LEVEL 3
MES

Valor Process Preparation

Camstar Electronics Services

Camstar Enterprise Platform

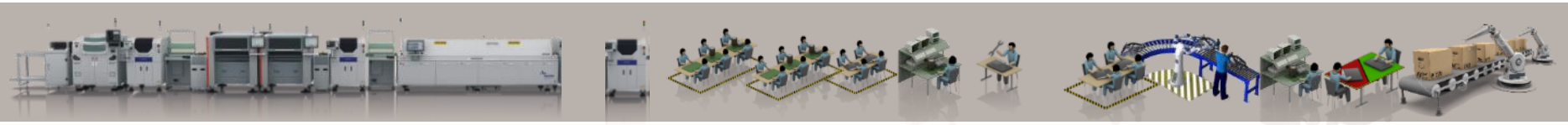
OML
Data Exchange

LEVEL 2

Valor MindConnect

LEVEL 1

LEVEL 0



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CAMSTAR ELECTRONICS SUITE

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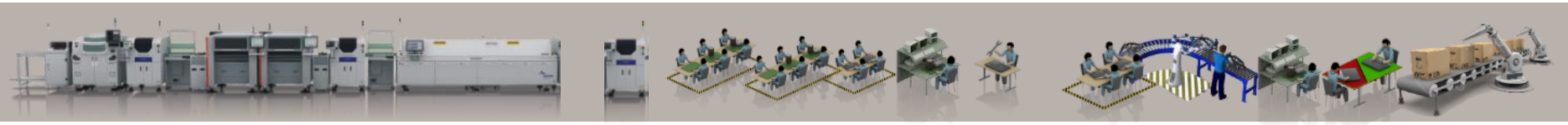

Seamless NPI integration with PLM

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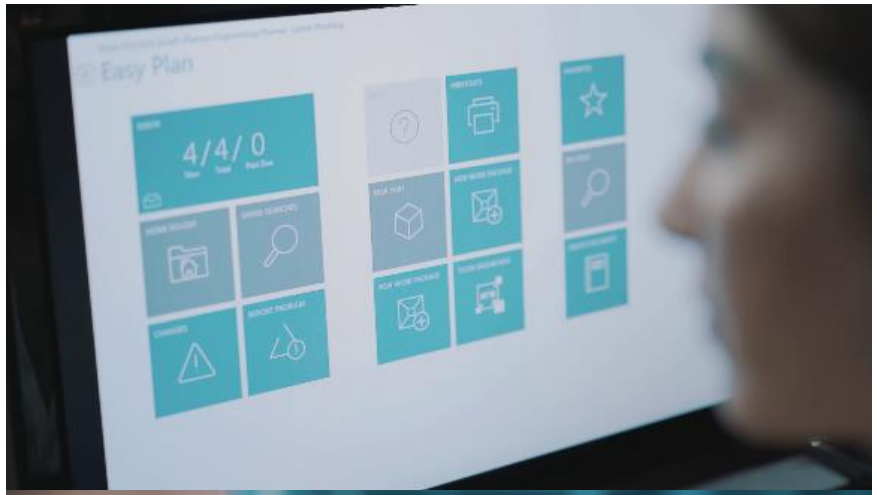

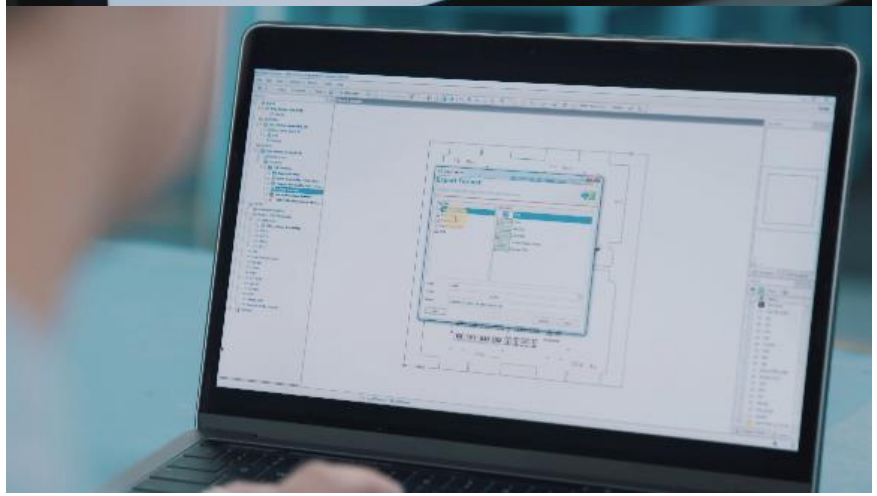

- Seamless flow of product and production data from PLM to manufacturing execution
- One solution for all manufacturing engineering tasks, including Data preparation, Manufacturability and Testability analysis, SMT programming, Test Programming, Stencil design, and work instructions for Manual assembly and inspection
- Visual BOP definition and enrichment through a full set of out-of-the-box (OOTB) manufacturing capabilities
- Automatic machine library generation and DFA leveraging Valor Parts Library (VPL)

Faster product innovation

Effective change management

Reduced errors

Advanced and detailed planning and scheduling

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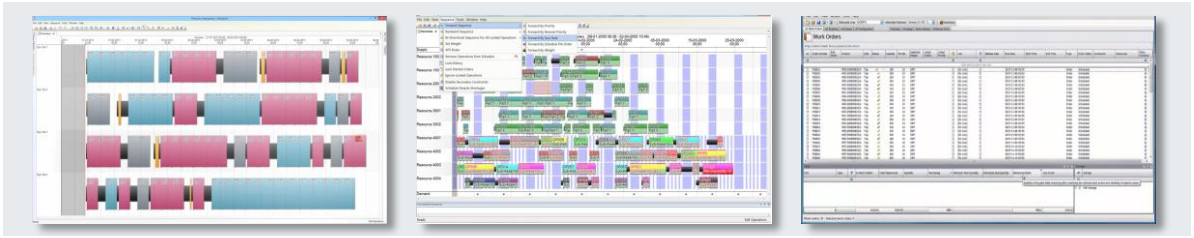
- Import production orders from ERP and integrated PCB, mechanical and box-build plans and schedules
- Optimize SMT grouping for minimized change-over and setup time
- Compare production alternatives and optimize schedules
- Run what-if analysis and analyze the impact of unexpected events and decision taken



Real-time planning and scheduling

Manufacturing efficiency

Global visibility

Plug&play shop floor connectivity

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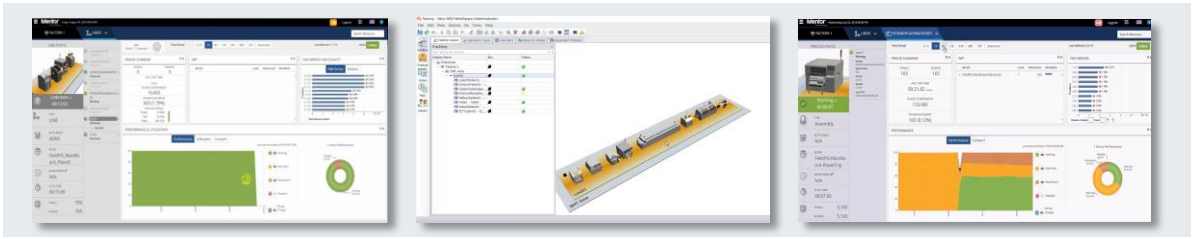
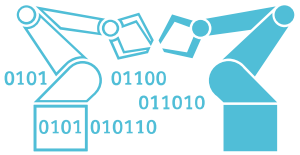
- Robust, real-time data acquisition and control of SMT Production and Test machines
- Live dashboards displaying machine performance, utilization and quality
- Built-in material / process verification and interlock
- Normalized data available through Open Manufacturing Language (OML)





User-friendly plant model configuration

Real-time monitoring dashboard

One production client for SMT and box-build execution

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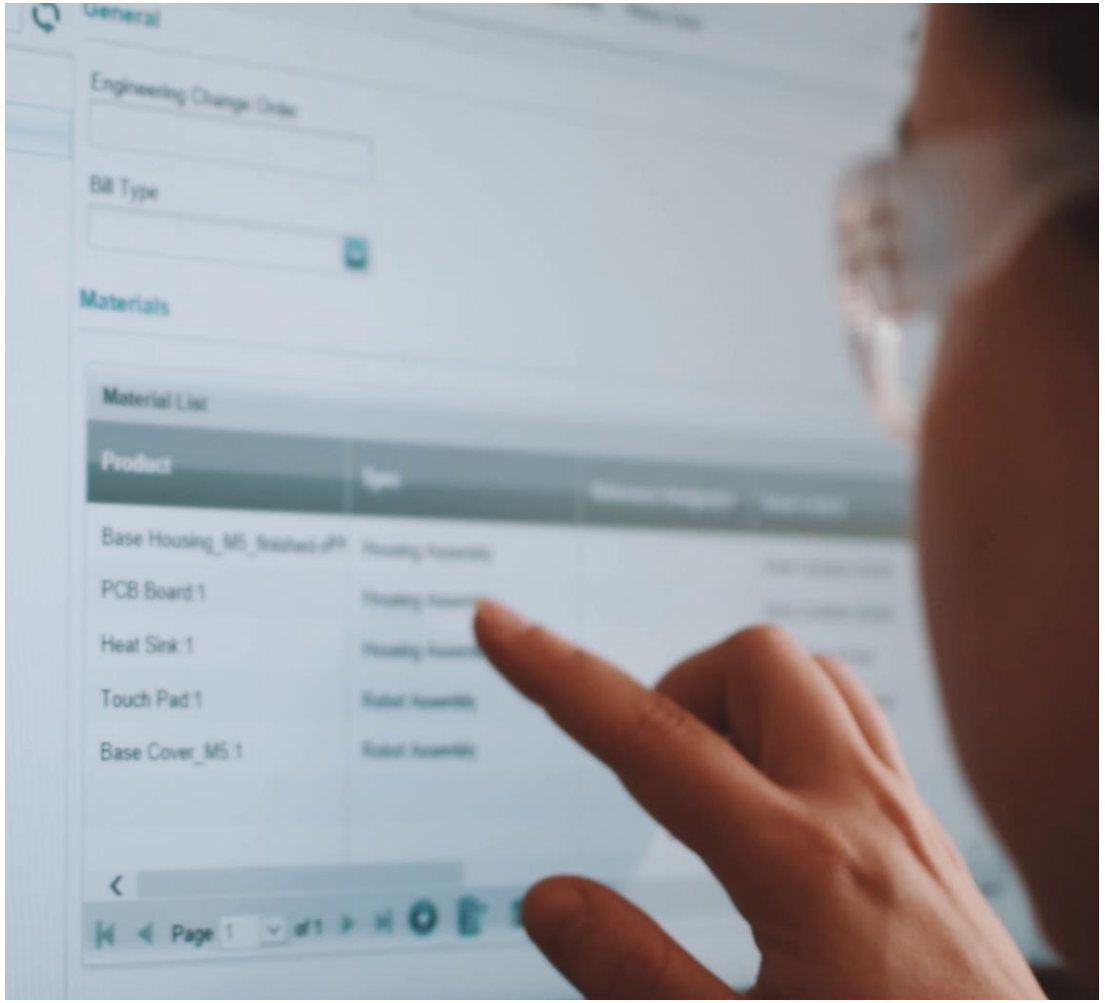

- Streamlined and guided manufacturing processes and traceability
- Bill of Material, PCB and Box visualization and interactions
- Smart scanning, auto recognition and minimized actions for operators
- User-friendly Electronics Work Instructions (EWI), detailed shop-floor documentation, in-process quality tests

Manage shop-floor complexity

Improved shop-floor efficiency

Reduce training and maintenance costs

One production client for SMT and box-build test

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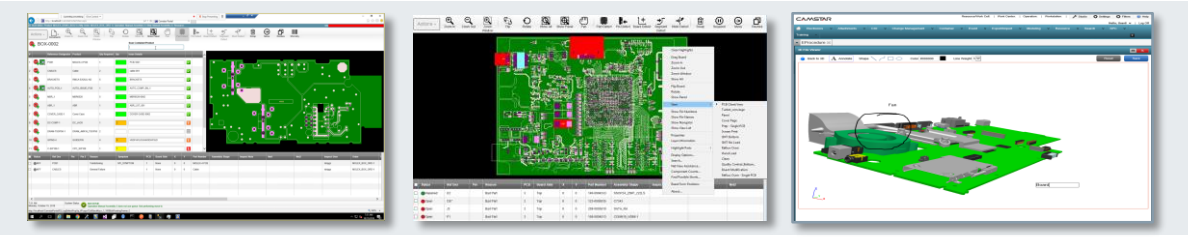
- Guided inspections and graphical defect logging
- Display of defects from automated manufacturing operations
- Guided repair actions and support
- PLM integration for Closed-loop feedbacks from production to product development and engineering



Efficient defects repair

Improved quality

Closed-loop feedbacks

Advanced Material Management

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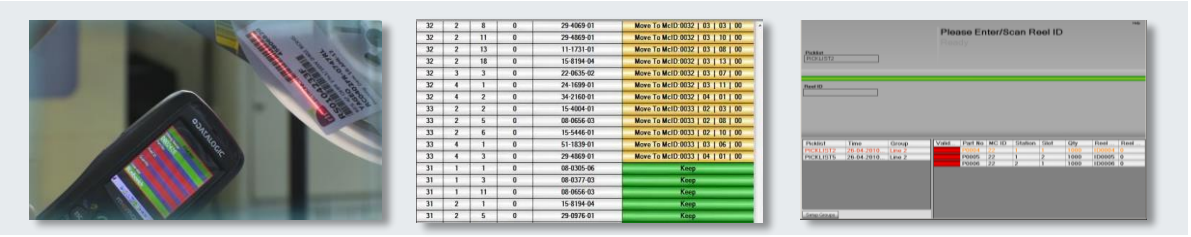
- Manage material handling across the factory, including registration, storing, picking, verification and traceability
- Just-in-time KANBAN material management – Driven by IoT devices
- Autonomous material logistics management
- Bridge ERP-view of work orders and shop floor view of WIP in real-time



Reduced inventory and waste

Improve performance

Empower ERP investment

Configurable big-data reporting and manufacturing analytics

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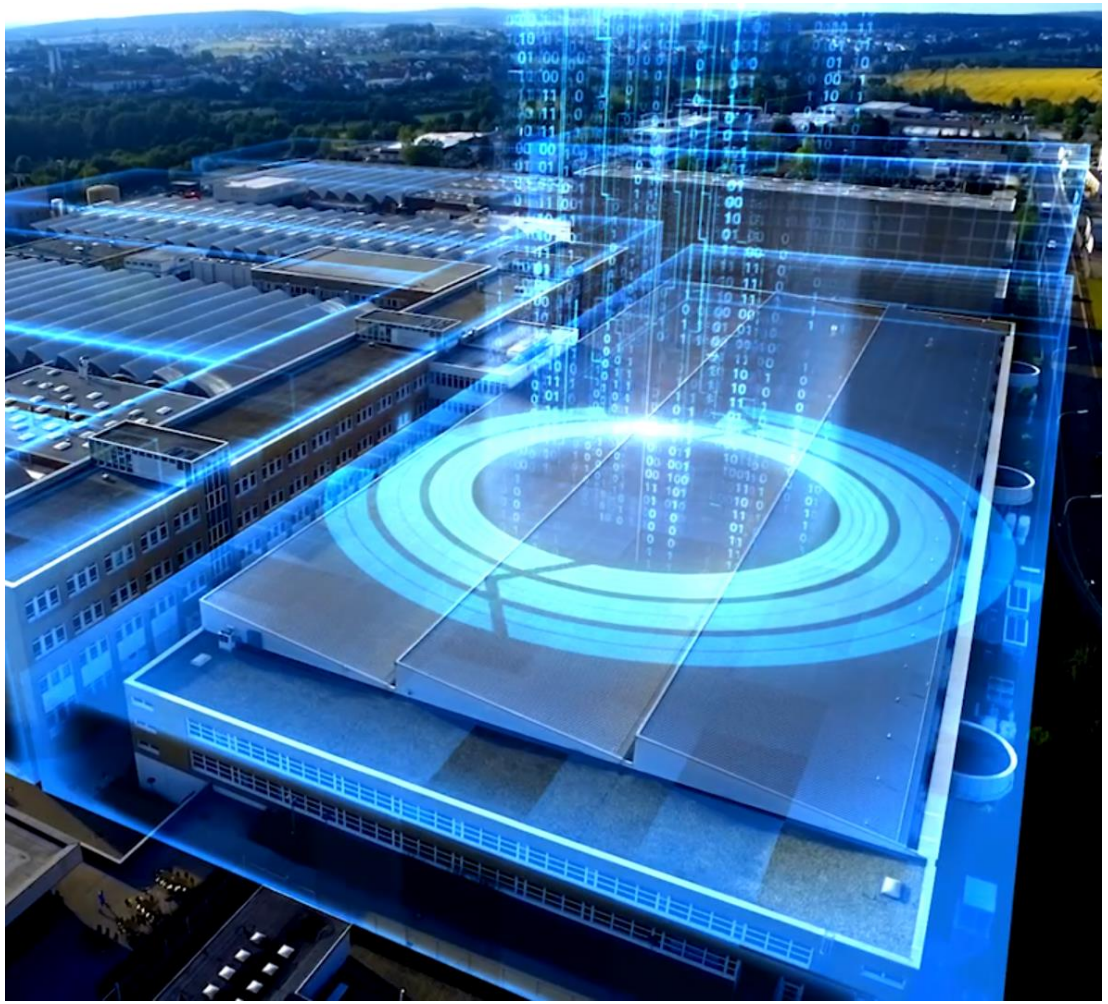
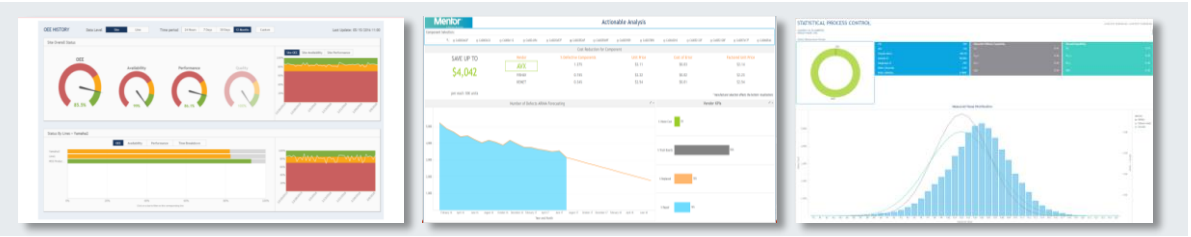


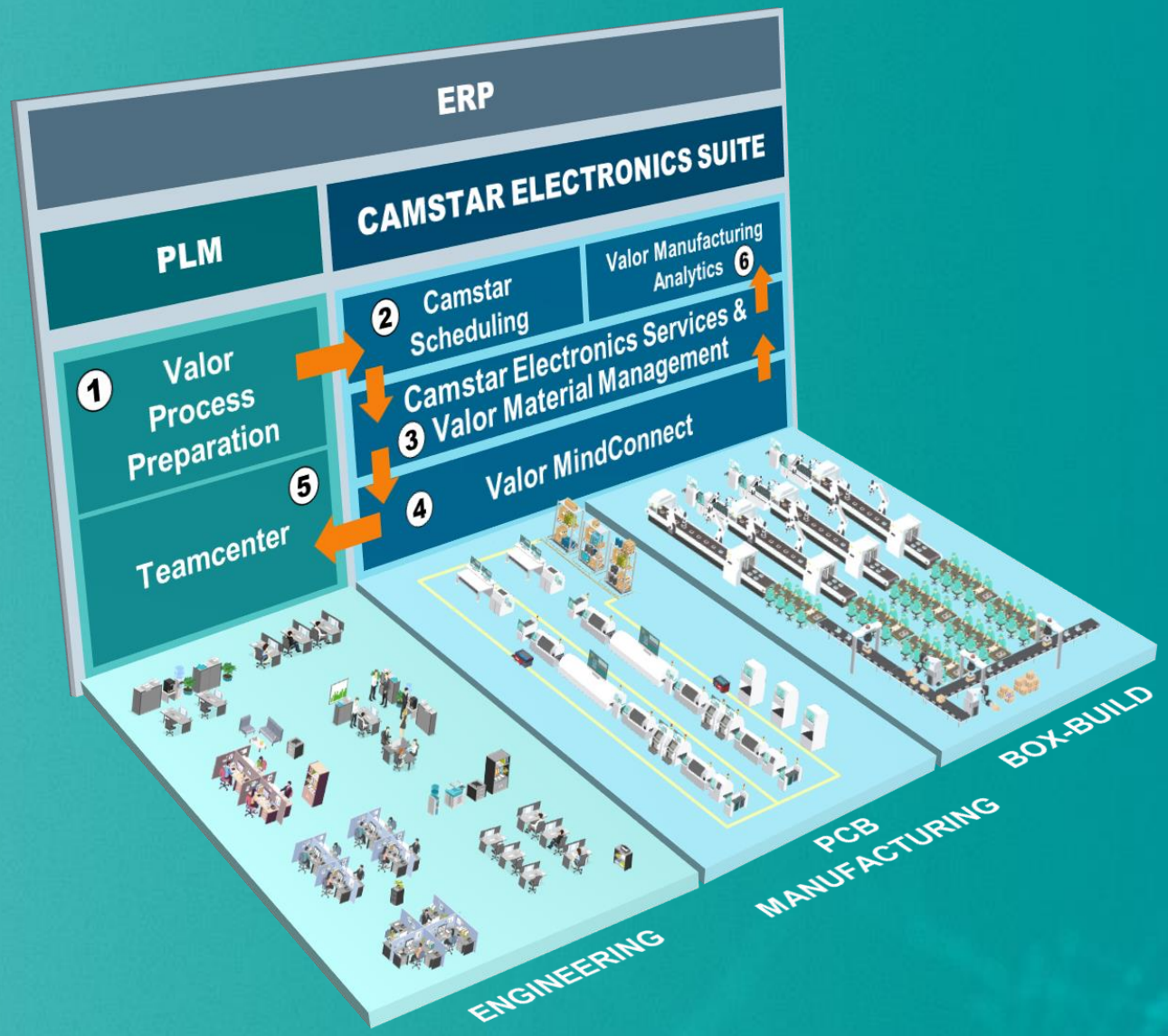
- Out-of-the-box reports focused on Electronics Manufacturing quality, traceability, utilization, materials, environmental data and more
- OEE, SPC, FPY, trends and alarms, Root-cause analysis
- Scalable on-premise big-data solution
- Support for multi-site enterprises



Multi-plant and global visibility

Custom reports and dashboards

Cloud visibility



CAMSTAR Electronics Suite

1. Streamlined NPI processes and change management
2. Optimized production plans and schedules
3. Flexible configuration, out-of-the-box production enforcement, end-to-end traceability and real-time material management
4. Direct shop-floor connectivity, real-time data acquisition and performance analysis
5. Closed-Loop Manufacturing for efficient and continuous improvements
6. Big Data Analytics and intuitive enterprise manufacturing intelligence

for both…

PCB

BOX-BUILD

Case study: Siemens Fürth

Siemens Fürth case study
Before

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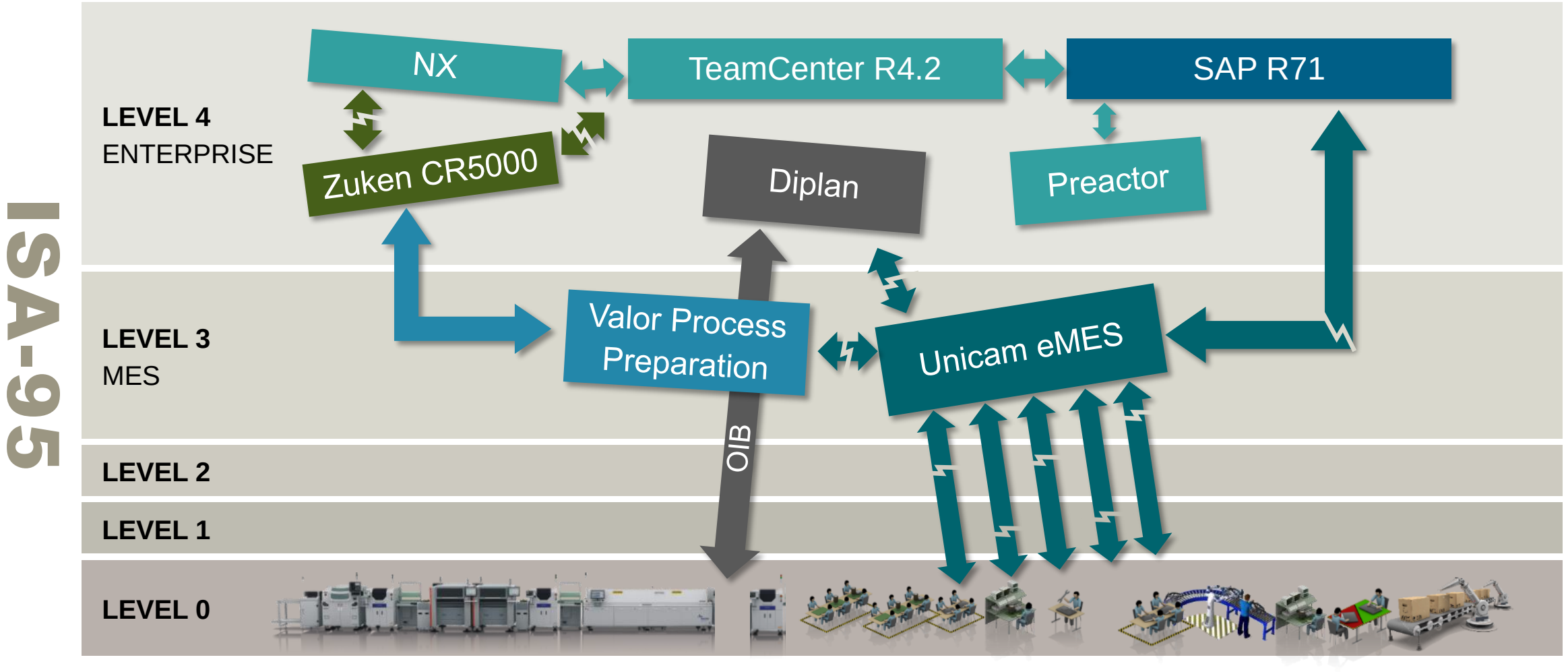

Siemens Fürth case study
After – Camstar Electronics Suite

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LEVEL 4
ENTERPRISE

NX
Xpedition

TeamCenter R4.2

SAP AxP

Camstar Scheduling

Valor Material Management

Valor Manufacturing Analytics

Valor Process Preparation

Camstar Electronics Services

Camstar Enterprise Platform

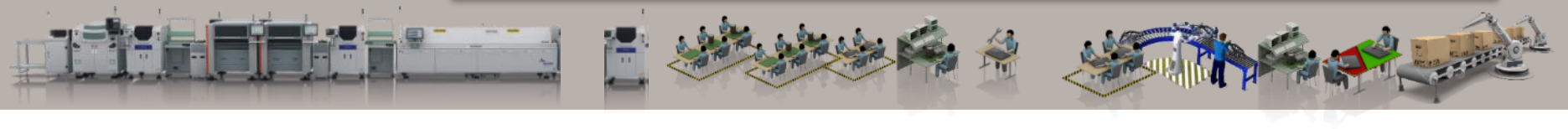
IoT Data Acquisition

LEVEL 3
MES

LEVEL 2

LEVEL 1

LEVEL 0



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“The migration to the Camstar Electronics Suite introduced a layer of value that we could not have achieved with a disconnected set of tools through custom integration”

“The inclusion of Valor IoT data acquisition in the suite has drastically simplified the deployment of the solution across our assembly lines”

“Today we have a true one-stop-shop solution for managing Electronics Manufacturing that covers all process areas, as well as material flow and integration with PLM and ERP”

Hermann Kraus
Manufacturing Manager
Siemens Fürth

Smart Manufacturing

An enterprise strategy – not only a matter of technology

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Driven by inspired executives, realized by experts

Re-think financial and strategic targets

Think big – Start focused – Scale fast

Enabled by innovative partners

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Thank you