



PDF Solutions for Semi Manufacturing Integration

Sapience Manufacturing Hub

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PDF Solutions is the world's leading data and analytics platform spanning the semiconductor and electronics ecosystems

Solutions

Optimize design for yield & test

Secure connectivity for equipment, manufacturing, and test data

End to end Analytics, Modeling, Prediction & Control

Die traceability through the supply chain

Market Penetration

>350 customers globally

Top 50 Equipment suppliers use Cimatrix by PDF for connectivity

#1 Commercial solution for mfg yield and control

>300 different equipment models for Mfg, Test and Assembly connected by PDF

>40K process tools controlled by PDF

>125k equipment factory Connections

Company Profile

Founded in 1991

Headquartered in Santa Clara CA, global presence in 11 countries

\$1.2B Market cap, PDFS, Nasdaq

185 patents, 200+ pending

400+ employees, 100+ PhDs

#55 in Forbes list of America's Best Small Employers for 2023

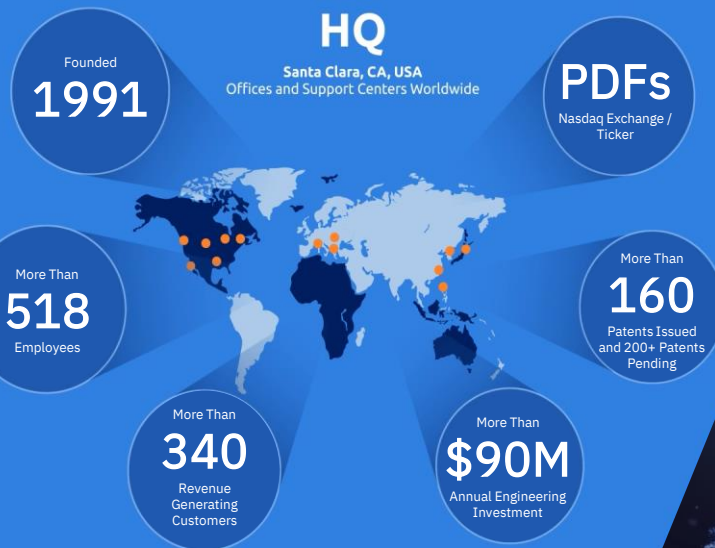
01

02

03

PDF Solutions: Leading the Digital Transformation of Semiconductor Manufacturing

PDF Solutions: End-to-End Data Connectivity, Control and Analytics for Systems and Semiconductor Companies



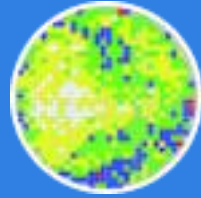
Leading provider of comprehensive analytics solutions for semiconductor manufacturing



IC Design



Fab



Sort



Assembly



Final Test



System



Enterprise

PDF is solving mfg challenges with analytics-driven platform



**Yield & Quality
Improvement**



**Faster Time
to Value**



**Disintegrated
Decision Siloes**



**Geo-Sensitive
Supply Chain**



**Design to Deliver
Efficiencies**

Modern Data and Analytics Platform



**Data Engineering with
extensible data model:**

Designing and building systems for collecting, transforming, and storing data for analysis with diverse data types across varied sources



**Flexible & Scalable
Data Architecture:**

On-demand access to a complete, ready-to-use, cloud-hosted platform or on-prem software that can scale and offer flexible deployment options



**Insights enabled
by AI and ML:**

Techniques, tools, and technologies to gain deeper insights, predictions and data-driven decisions with advanced analytics and generative AI capabilities



**Security, Risk and
Governance:**

Overseeing the data and analytics platform for mitigating business risks with security, risk and protection for customer's data with embedded data controls

Analytics platforms provide a tool set for businesses to absorb, organize, discover, and analyze data to reveal actionable insights that can help improve decision-making and inform business strategy.

SAP and PDF Solutions Partnership

- In order to meet the challenges of improving semiconductor manufacturing yield and reducing operational cost, **PDF** and **SAP** have partnered to provide a connectivity platform to link financial and operational data for solutions that provide complete visibility and strong ROI
- New platform product “**Sapience Manufacturing Hub**” from PDF combines proven capabilities from Exensio & Sapience for a common central interface for accessing Manufacturing Execution Systems (MES) and MFG & TEST data and merging with **SAP ERP** data in an analysis ready system.
- This enables **KEY solutions** targeting industry supply chain issues and manufacturing challenges: 1) Product Costing; 2) WIP Control; 3) Cost of Yield Analytics; 4) Return Material Authorization; and 5) Lot Genealogy



Leader in semiconductor manufacturing solutions



Market leader in enterprise application software for the semiconductor industry.

SAP + PDF Solutions – The Big Picture for Semiconductor Manufacturing

Seamless Business Process Integration to Engineering and Manufacturing Context and Data

Enterprise Business
Processes

Top Floor



Shop Floor



Manufacturing
(Fab, Assembly, Test)

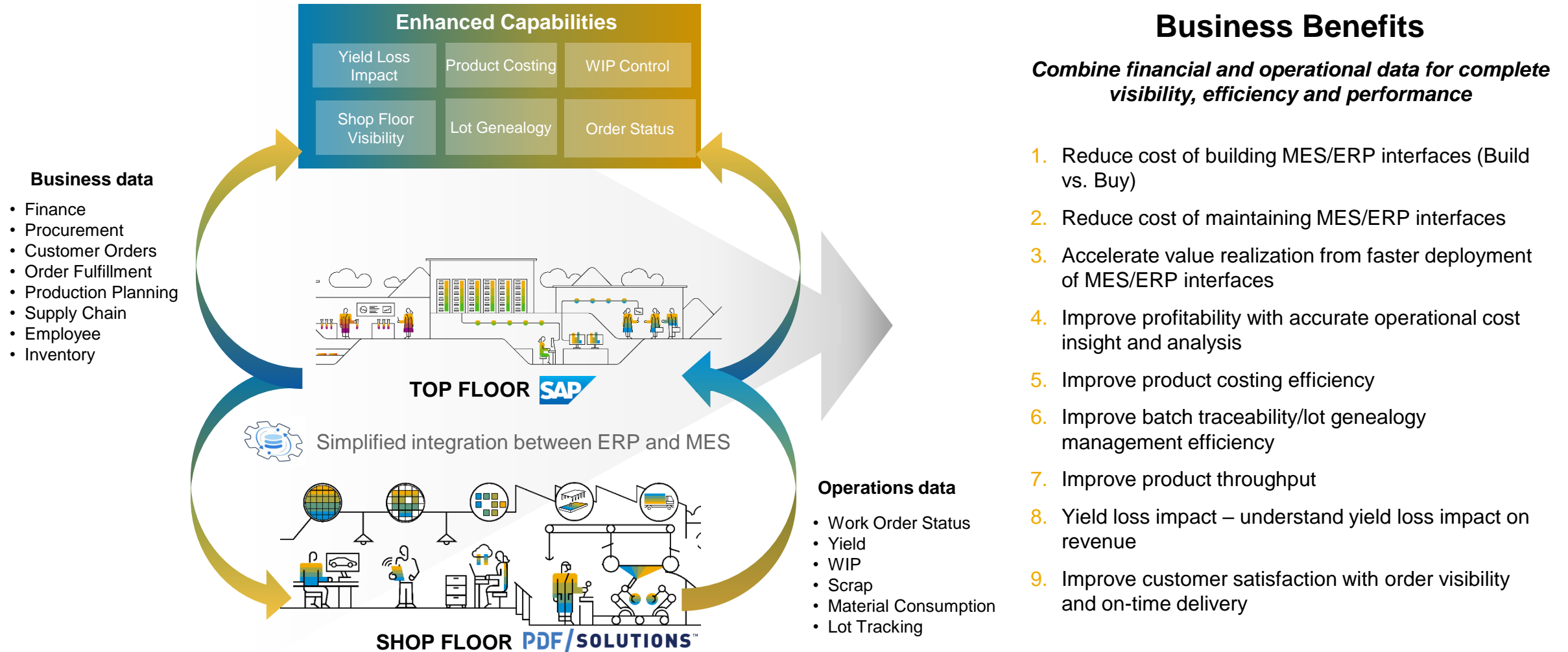
- 1 A common logical model for Product / Assets supporting next generation E2E scenarios
- 2 Extend business process, logic, and data to the manufacturing edge
- 3 Semantic data model for standard pre-packaged content ready for consumption
- 4 Derive business, product, and service insights from manufacturing

Opportunity

- Simplification
 - Business Processes, Information Systems...
- Closed-loop business processes
- Greater visibility across supply chain
- Improved throughput, yield, test efficiency, asset management, factory planning, NPI, TTM...

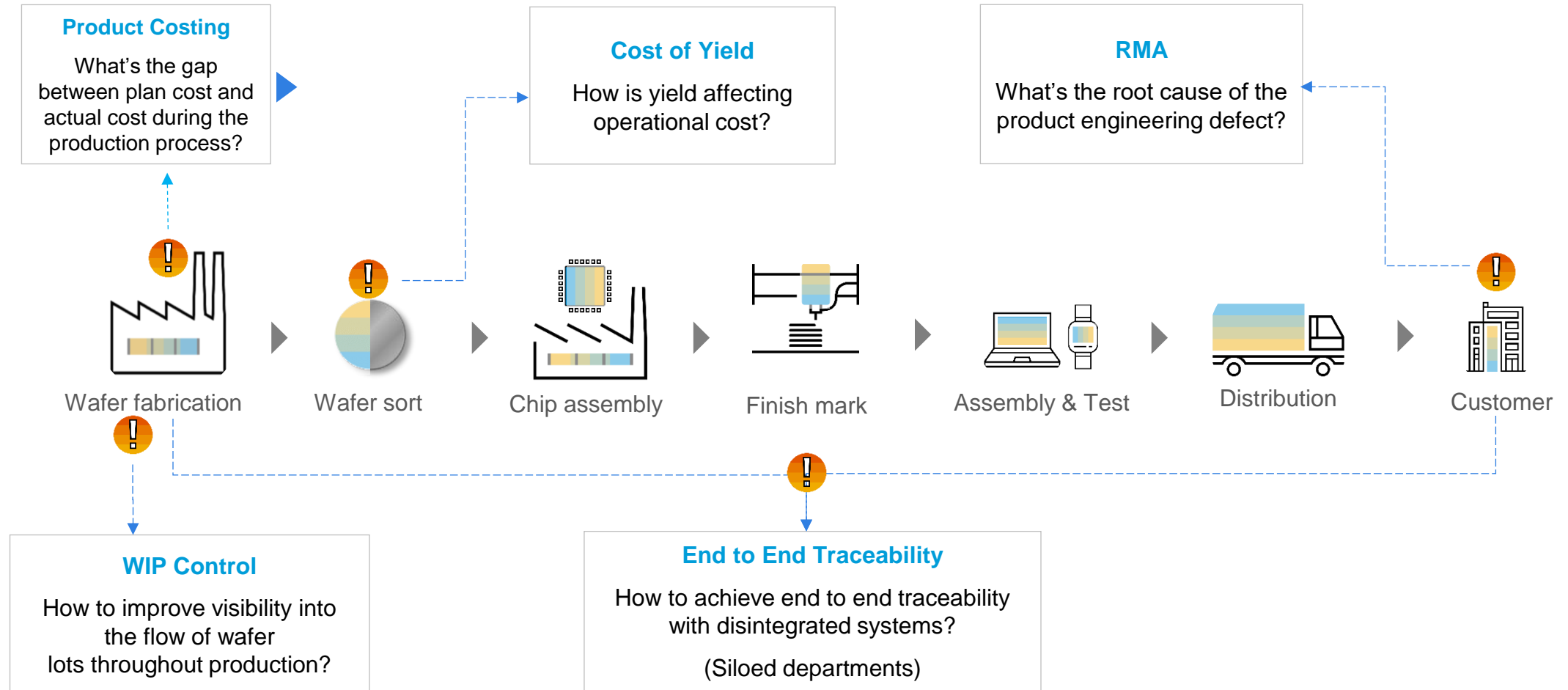
Connecting the Shop Floor to the Top Floor

Overview of the Scope, Capabilities and Business Benefits



Industry Challenges & Solutions

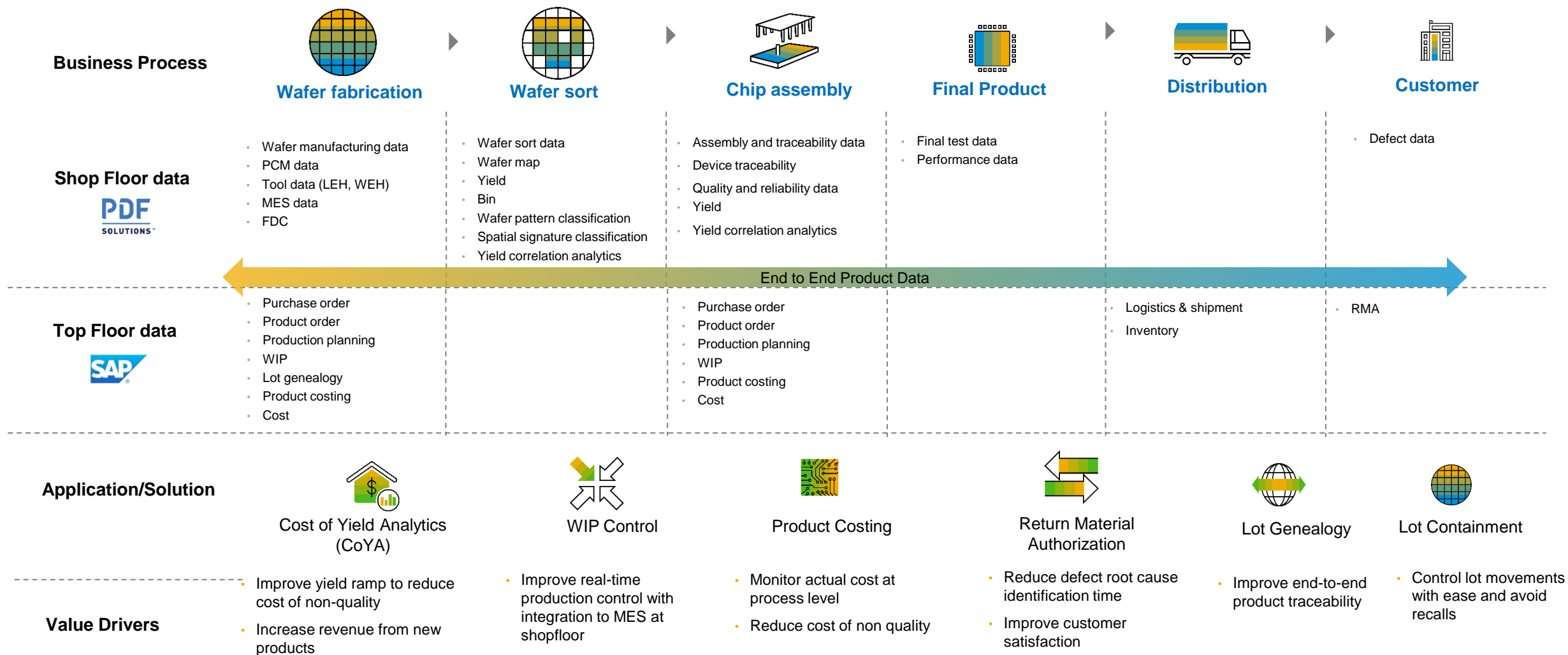
Business and production lack end-to-end visibility between finance and operations data



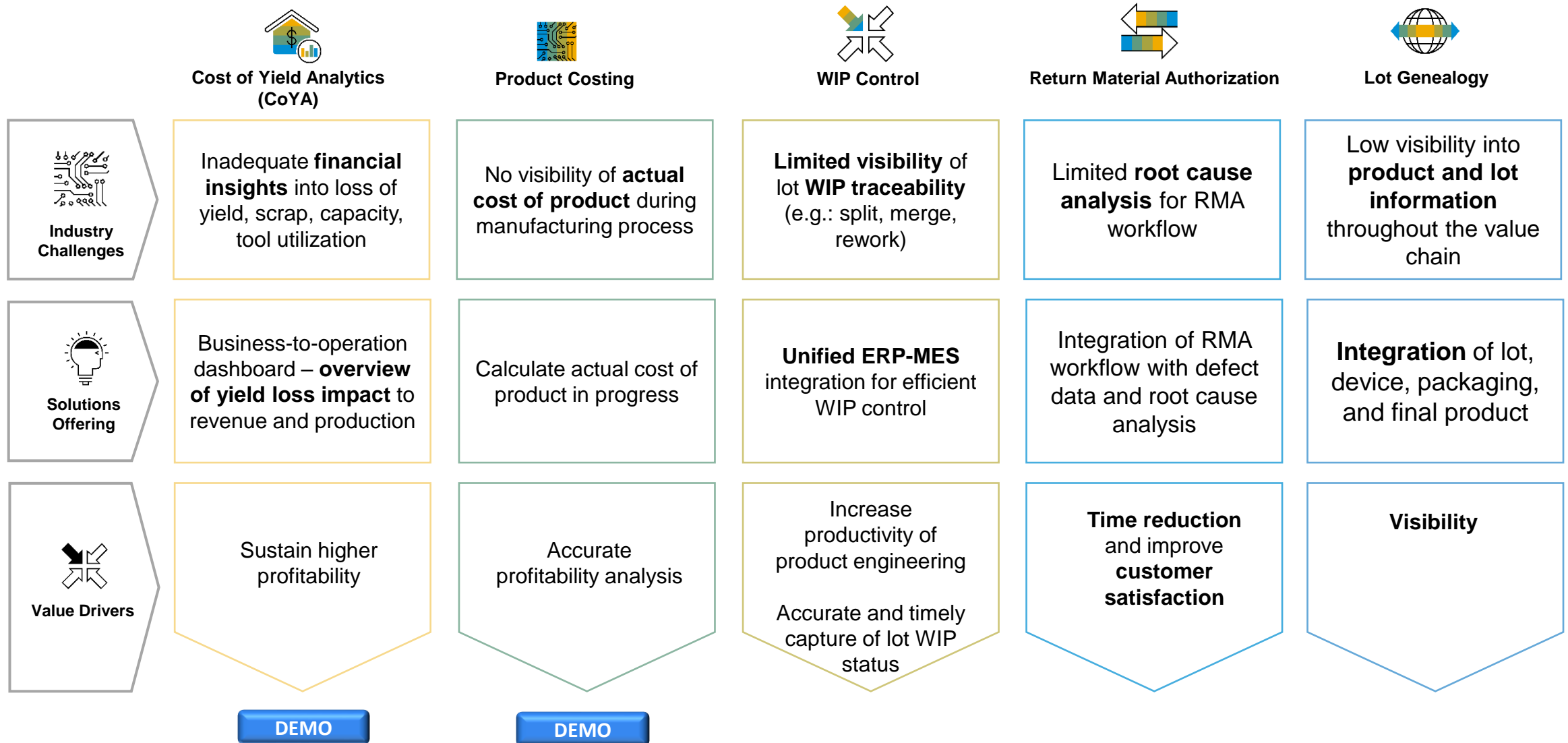
Refer [here](#) for detailed examples.

Solutions

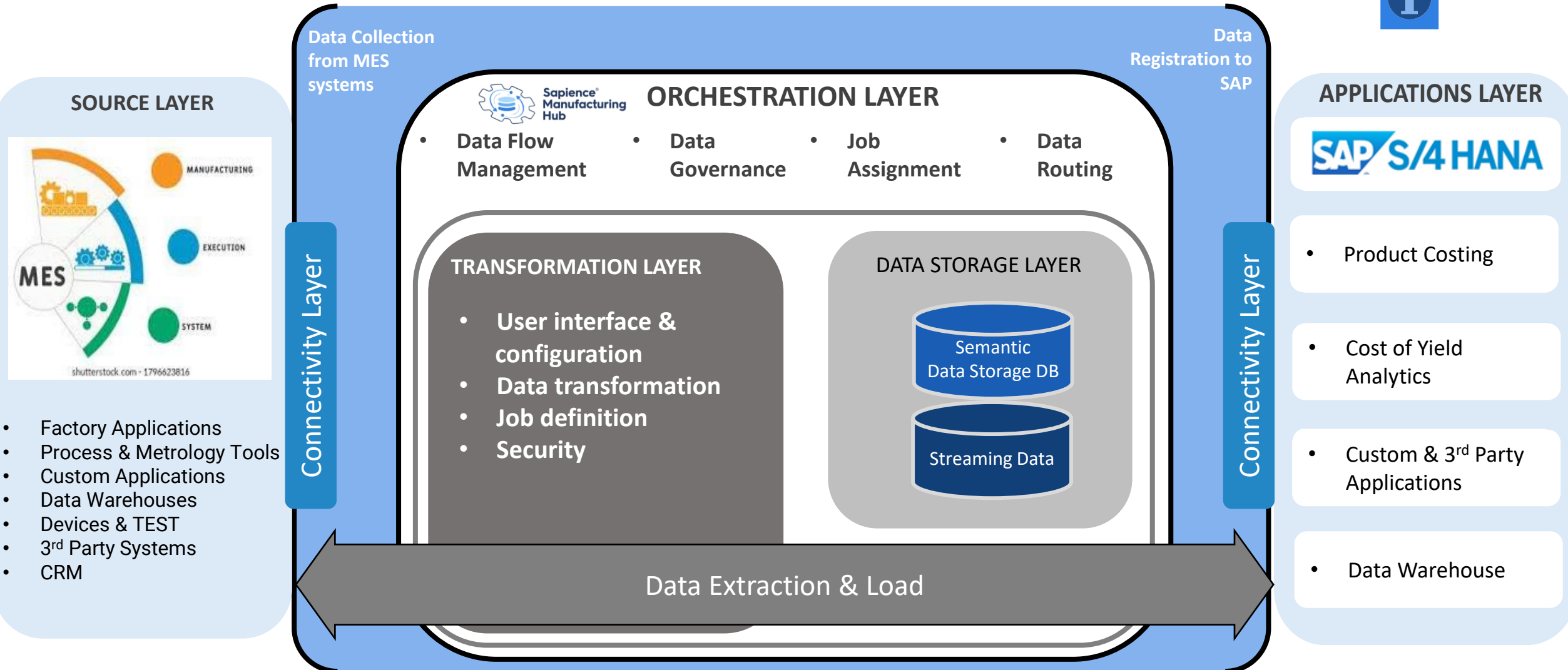
Combine financial and operational data for complete visibility & strong ROI



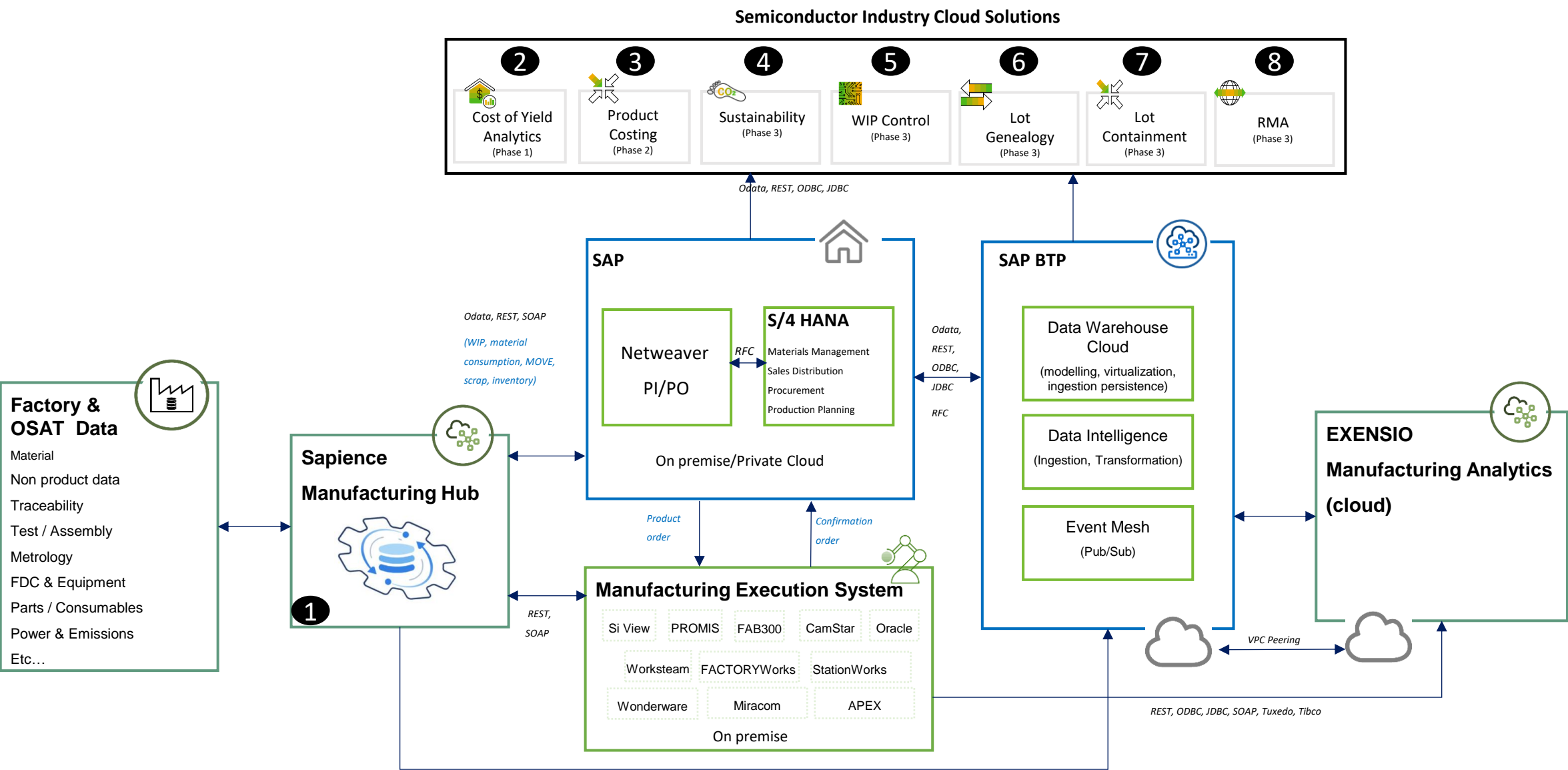
SAP + PDF are providing solutions to meet today's Industry Challenges



Sapience Manufacturing HUB for Collection to Registration *and everything in between*



Joint PDF & SAP Architecture



Semantic DB for Data Quality & Completeness – End-to-End



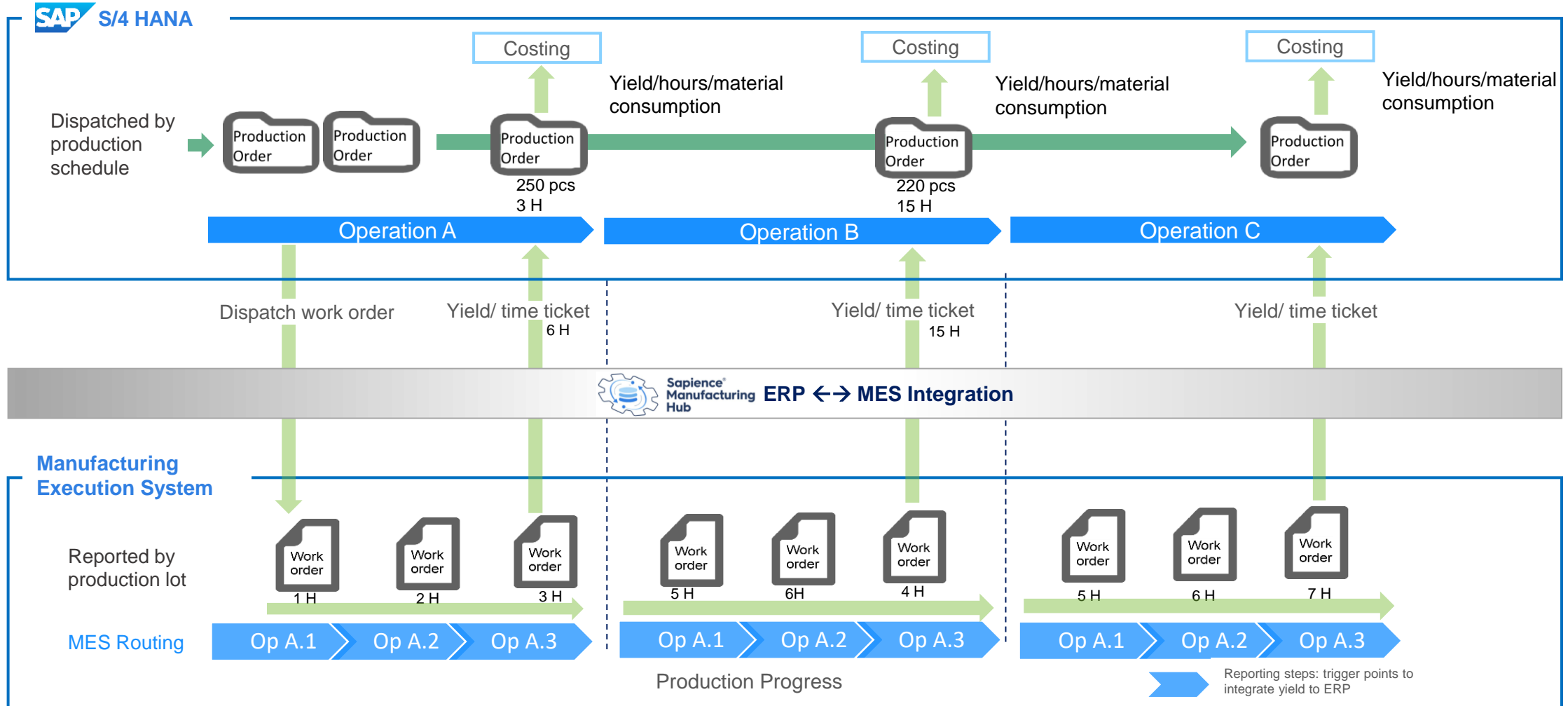
Material Descriptions In Hierarchy	Meta Data	MES/ WIP Equipment History	Fault Detection and Control (FDC)	Defect & Metrology	Equipment and Non-Lot	Product	Assembly / System	ERP / Business / Financial	Data Sources & Connectors
Technology Family Process Product Source Lot Lot Wafer # Die Layout	Equipment Operator Program Recipe Date/Time Process Flow Stages Steps SEMI E142 Traceability	Equipment TrackIn/Out Recipe Operator Chamber QueueTime CycleTime Wfr Counts Rework Split/Merge Reticle	Indicators Summaries Trace Charts Model prediction & Management Real time data collection Sub-fab FDC	Parametric Categorical Lot / Wafer Summaries Defect Summary Kill Ratio Defect Images	Equipment SPC Fab chemical delivery Equipment counter data Equipment Event / PM Consumables	Test chip (CV) PCM / WAT Wafer Sort Bin Map Multi-Bin Final Test Module Data MCM Chiplets WLA	Die traceability Location of reel/tube Solder paste batch, vendor Equipment parameters Operator logs	Production Order Product Costing Consumables Parts Alarms / Events Split / Merge Scrap / Unscrap Financial EBOM	Other 3rd party Apps & databases ... Data Lake connectivity BDAPI ... Sapience Manufacturing HUB

Standard pre-packaged content for consumption by S/4 HANA & Apps

S/4 HANA → SMH → MES Integration Model

ERP and MES routing has different granularity level:

- ERP Routing: For MRP, Production Costing (inventory valuation, variance analysis, aggregation & summarization)
- MES Routing: Validate operation sequence, dispatch to shop floor, production genealogy (inspection and testing)



Quantifying Business Value

#	Benefit Type	SMH - Value Driver	Improvement	Value Realization
1	Financial	Improve product throughput	1% - 2%	Annual Recurring
2	Strategic	Improve on-time delivery through real-time WIP insight and control/feedback to manage production orders	3% - 5%	Non-quantified
3	Financial	Accelerate value realization from faster deployment of MES/ERP interfaces - gain 2 years on a typical 5-year deployment	60% - 80%	Time to Value
4	Financial	Reduce cost of building MES/ERP interfaces (Build vs. Buy)	30% - 50%	One Time
5	Financial	Reduce cost of maintaining MES/ERP interfaces	70% – 80%	Annual Recurring

#	Benefit Type	APPS - Value Driver	Improvement	Value Realization
6	Financial	Improve profitability / Margin with accurate operational cost insight and analysis	1% - 2%	Annual Recurring
7	Financial	Improve product costing efficiency	20% - 40%	Annual Recurring
8	Financial	Improve batch traceability/lot genealogy management efficiency	20% - 40%	Annual Recurring
9	Strategic	Yield loss impact - understand yield loss impact to revenue	0.5% - 1%	Non-quantified

PDF/SOLUTIONS™

