PVNI Proposal

Production Value Network Interoperability

General Presentation THTH 26 May

PROCESS IT
innovations

Outline

- Key Digital Technologies (Institutionalized Partnership under HE)
- Opportunities with Digitalization
  - Forestry
  - Mining
  - Pulp & Paper
- Data management and Interoperability
- Integrating Interoperability and Major Objectives
- Production Value Networks
  - Legacy Management
  - Introducing Digital Twins
- Consortia overview

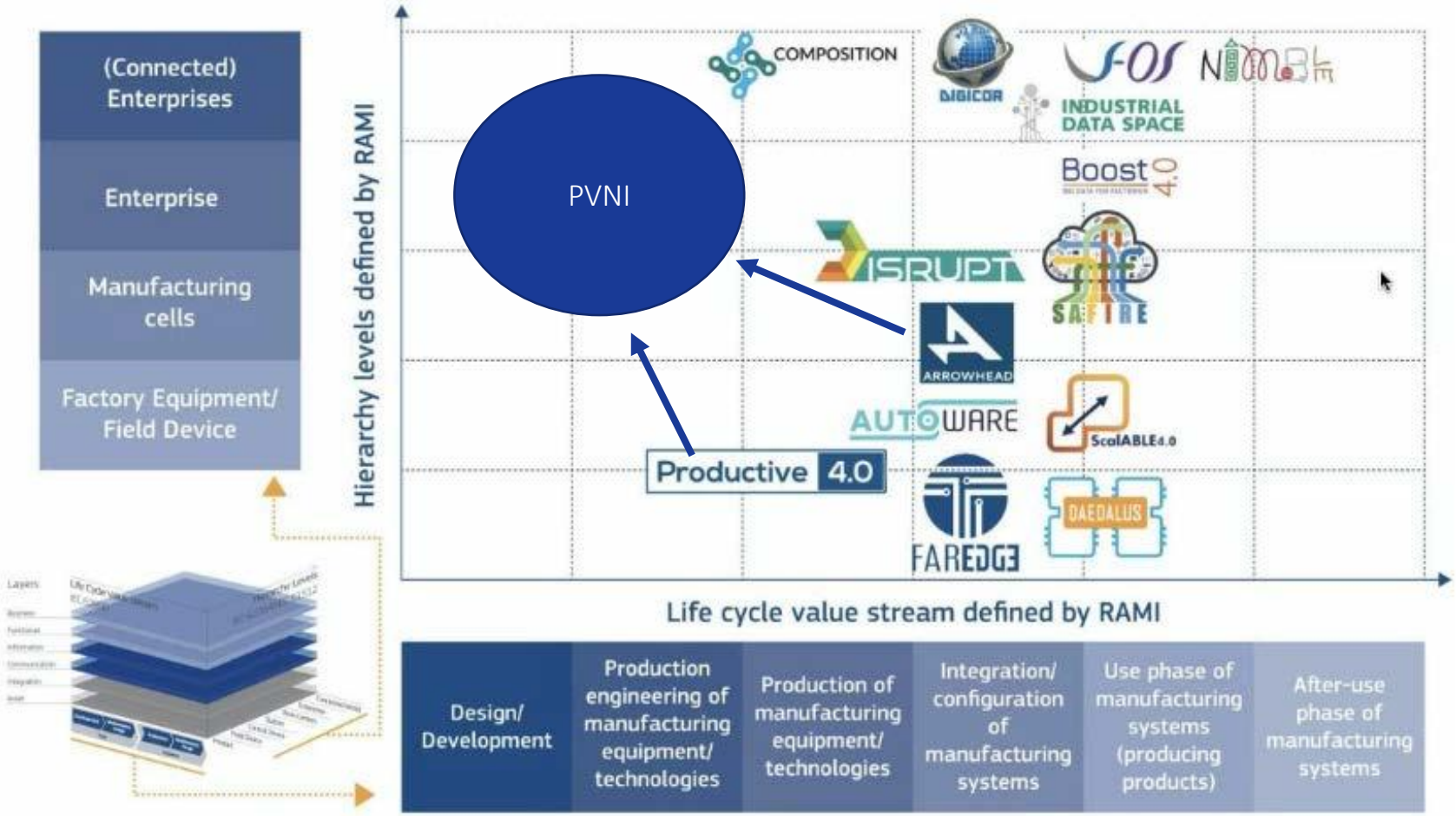
ECS SRIA

- Proposal addressing ECS-SRIA Interoperabilit challenges related to:
  - Digital Industry
  - System of Systems and
  - Connectivity
- Innvation Action
  - 50 – 60 partners
  - 60 – 70 M€
- Sweden & Finland have collaborated ensurin that Interoperability is integral part of KDT

European Commission

Digital Industrial Platforms Mapping on RAMI

Mapping EU platform projects on the RAMI 4.0 reference architecture model



Note: This includes a portfolio of more than €100 million EU investment across different projects

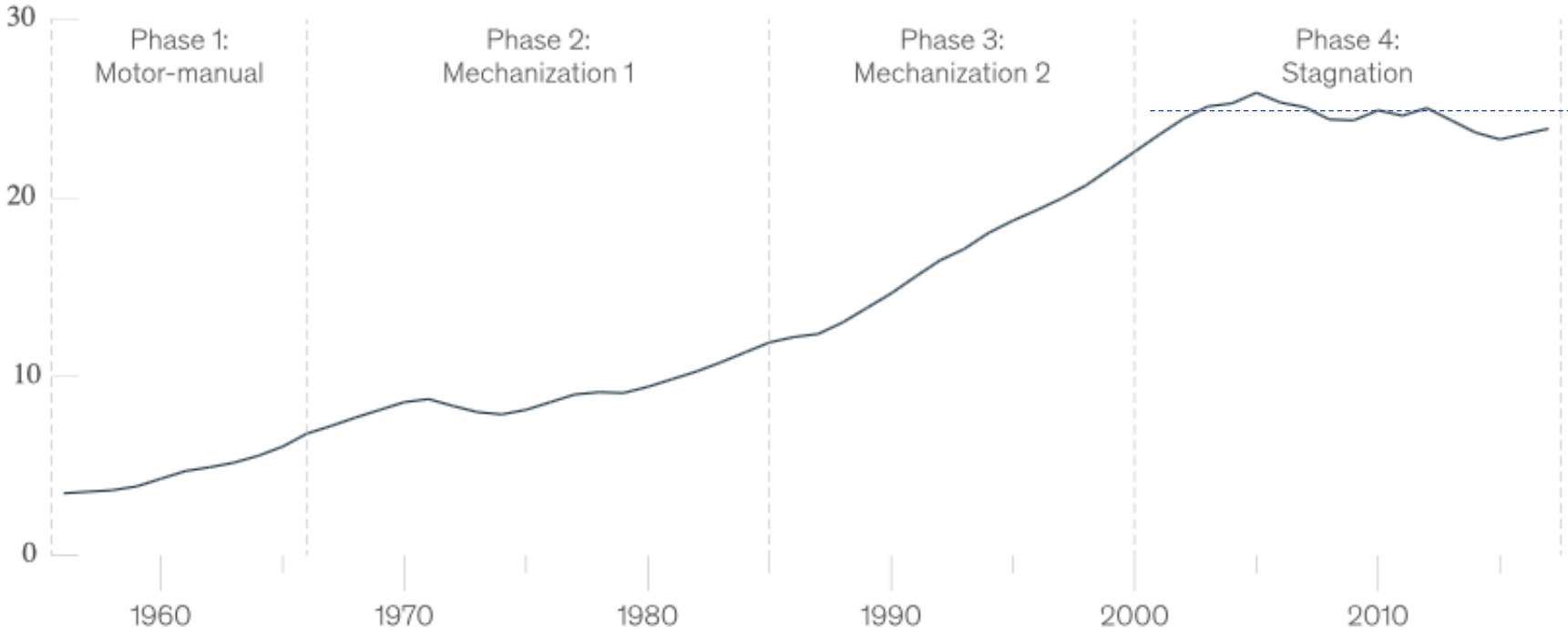
CONNECTED FACTORIES

PROCESS IT innovations

Swedish Forestry

Sweden developed its forest-industry productivity through mechanization.

Standing volume per worker day in the Swedish forestry industry, rolling 3-year average, cubic meters

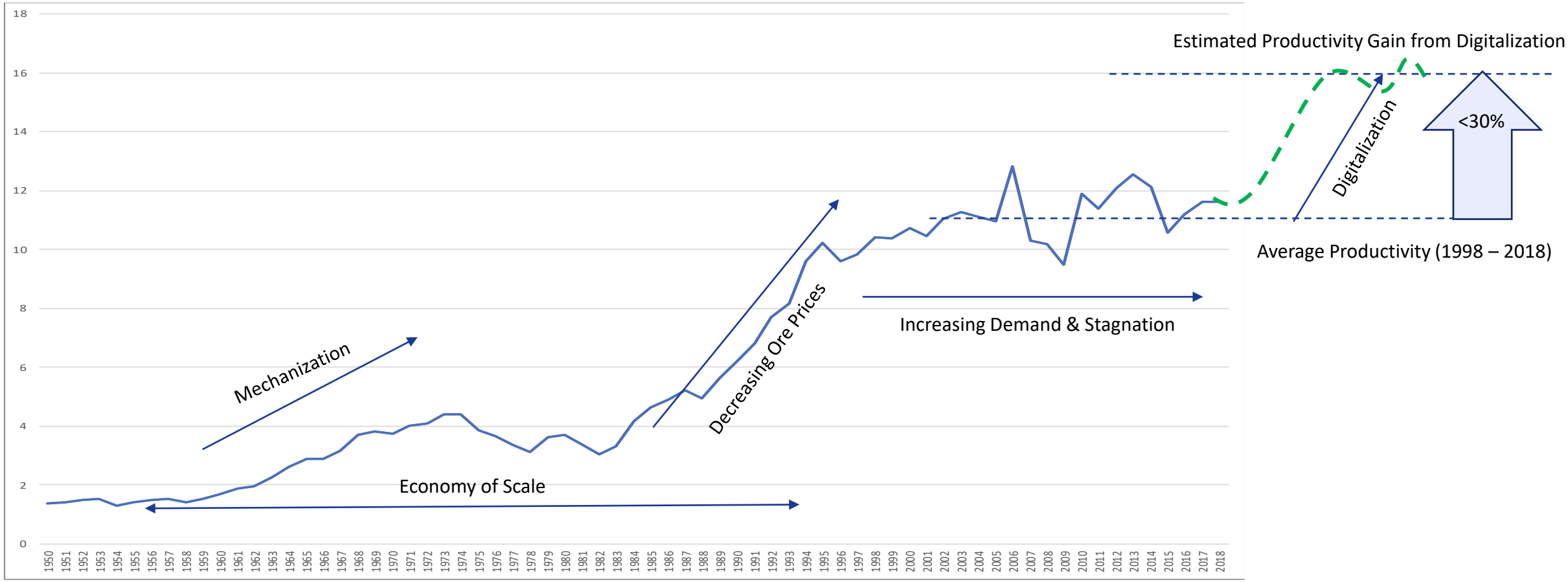


Source: The Forestry Research Institute of Sweden (Skogforsk)

Potential? Large!

Theoretically:
Productivity: ≈60%

Swedish Mining



Pulp &Paper Production

A rough estimation shows the paper and forest-products industry has much to gain from embracing the digital revolution.

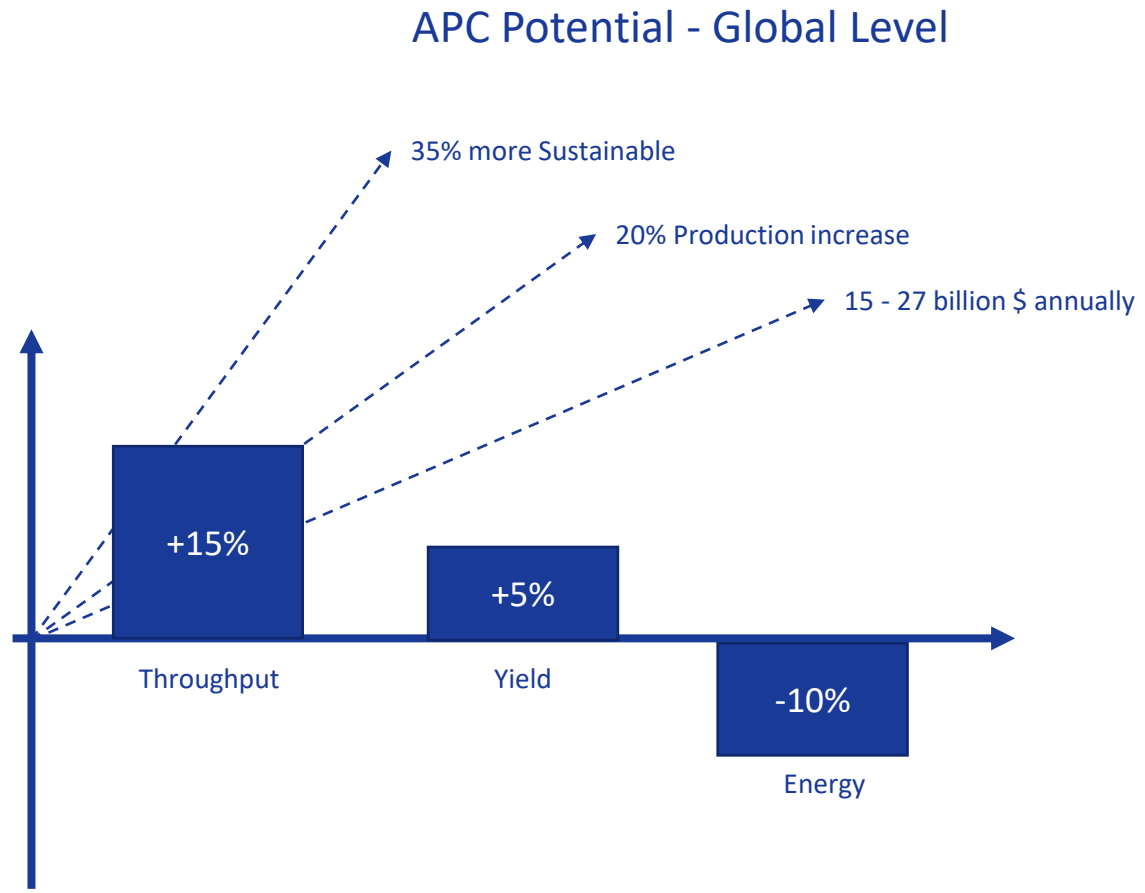
Example use cases in the paper and forest-products industry ● Raw-material supply[1] ● Pulp production ● Paper and board production ● Paper machine ● Converting line		Cost reduction on total cost base, estimate, %		OEE[2] improvement, estimate, pp[3]
		Existing technologies	Existing and future technologies	Existing technologies
Artificial intelligence and analytics	Fiber yield, chemical consumption, and energy	~4.5	~7.0	n/a
	Predictive maintenance	~2.0	~2.5	~2.0
	Throughput debottlenecking and quality	n/a	n/a	~3.0
Automation	Logistics automation	~0.5	~1.0	n/a
	Process automation	n/a	~0.5	n/a
	Remote process control	n/a	~1.5	n/a
	Remote process inspection	~1.0	~1.0	n/a
Mobile	Digital field-force apps	~1.0	~1.0	n/a
	Digital business-support functions	~0.5	~0.5	n/a
	Digital performance management	n/a	n/a	n/a
Total opportunity[4]		~10	~15	~5

[1]Forestry and harvesting.
[2]Overall equipment effectiveness.
[3]Percentage points.
[4]Not including purchasing, marketing and sales.

- Potential Cost Reduction is huge!
  - Artificial Intelligence
  - Automation
  - Mobile Services
- Total potential is estimated to 30%
  - OEE: 5%
  - Other: 25%
- Conclusion:
  - Not Business as usual!
  - Main potential is not OEE
- OEE is still important but saving potential is 5 times larger in “Other areas”

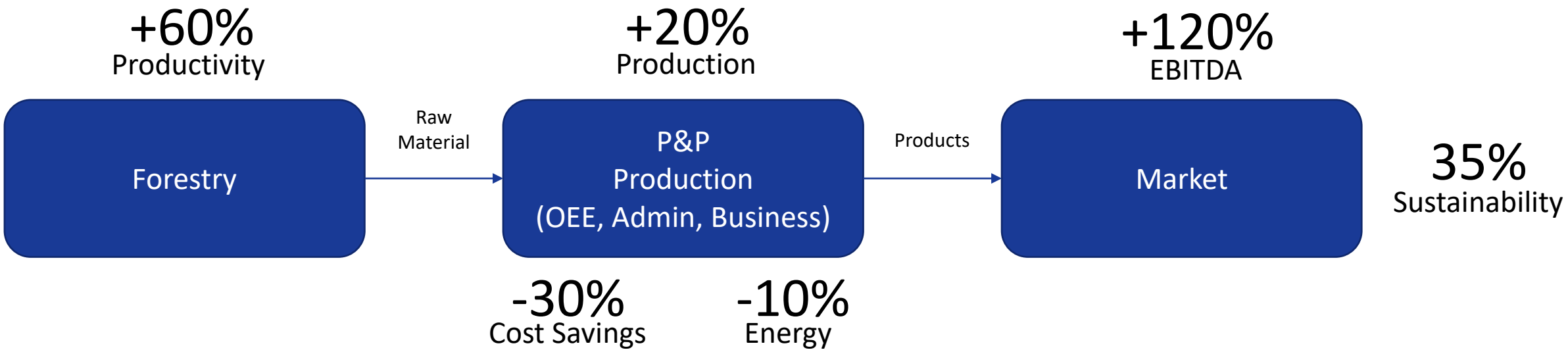
What about Process Control?

- Companies interested in extracting more value from suboptimized APCs should look for any of the following indicators:
  - A high degree of variability in critical process indicators, including throughput and recovery
  - A low utilization rate (less than 80 percent) of existing APCs that control key processes
  - No process to periodically (at least once a year) review APC logic or set points
  - No rigorous management system to track the health of underlying BLCs (Base-Layer Controllers), instrumentation, and sensors
- Collaborating with APC vendors and researchers to identify, calibrate, and tune the crucial underlying BLCs and sensors can be an initial no-regrets move

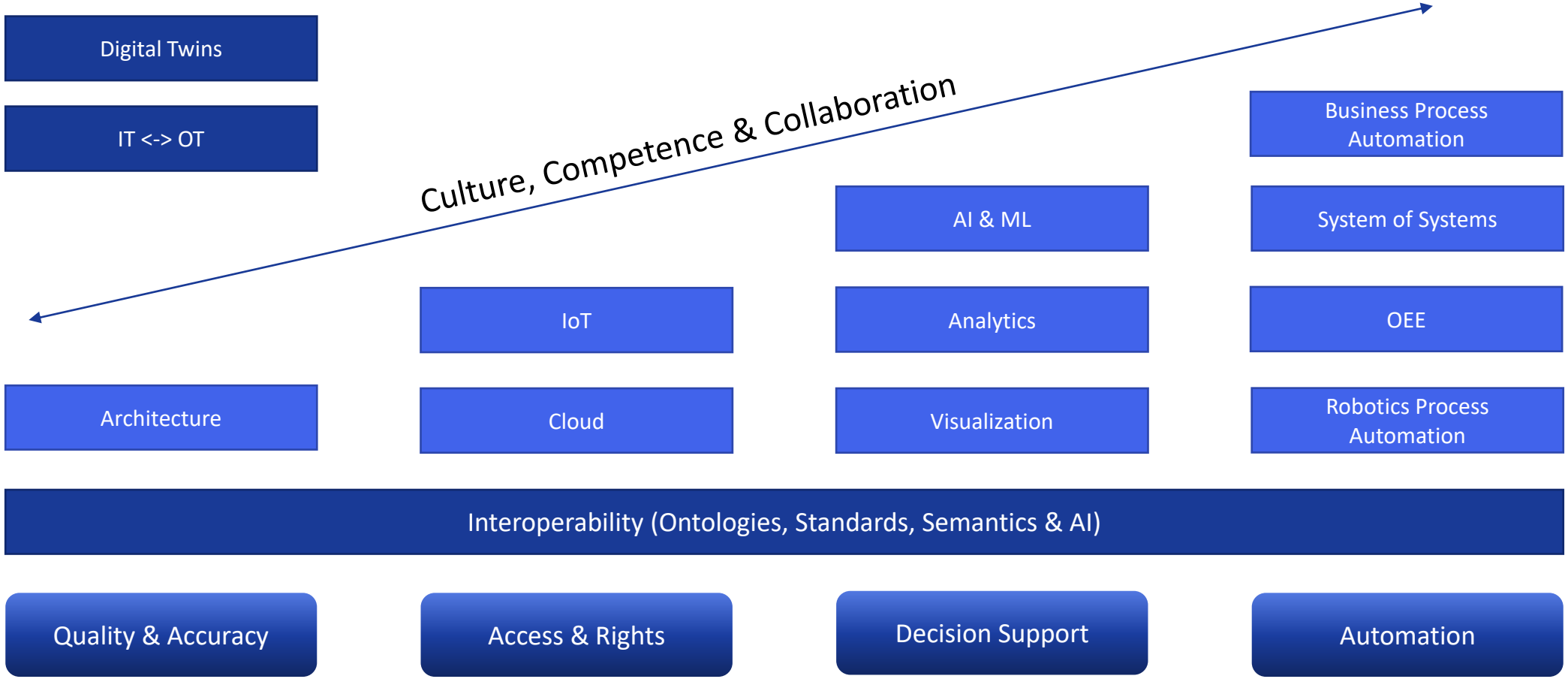


The potential of advanced process controls in energy and materials, McKinsey, 2020

Potential Benefit from Digitalization



Data Management Strategy

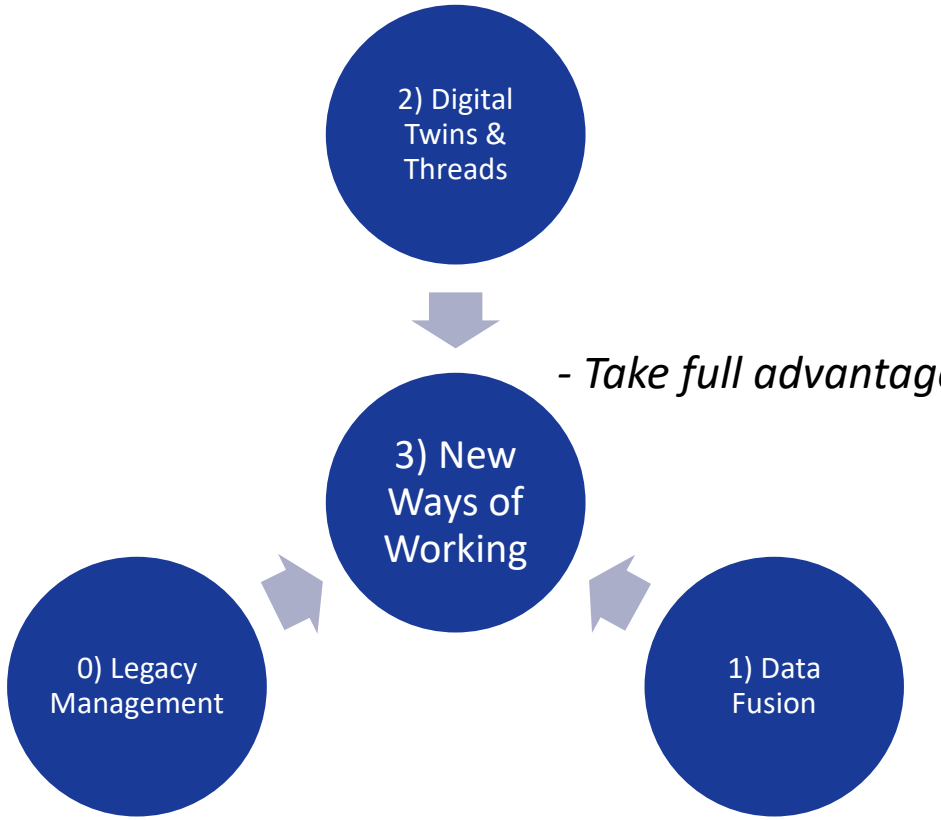


Global Challenge

Enabling autonomous and evolvable interoperability, between value network actors in production, through machine interpretable content

Integrating Interoperability

- Generating Technical Functionality!



- Take full advantage of the benefits from interoperability!

- *Constructing Standardized Digital Asset Models!*

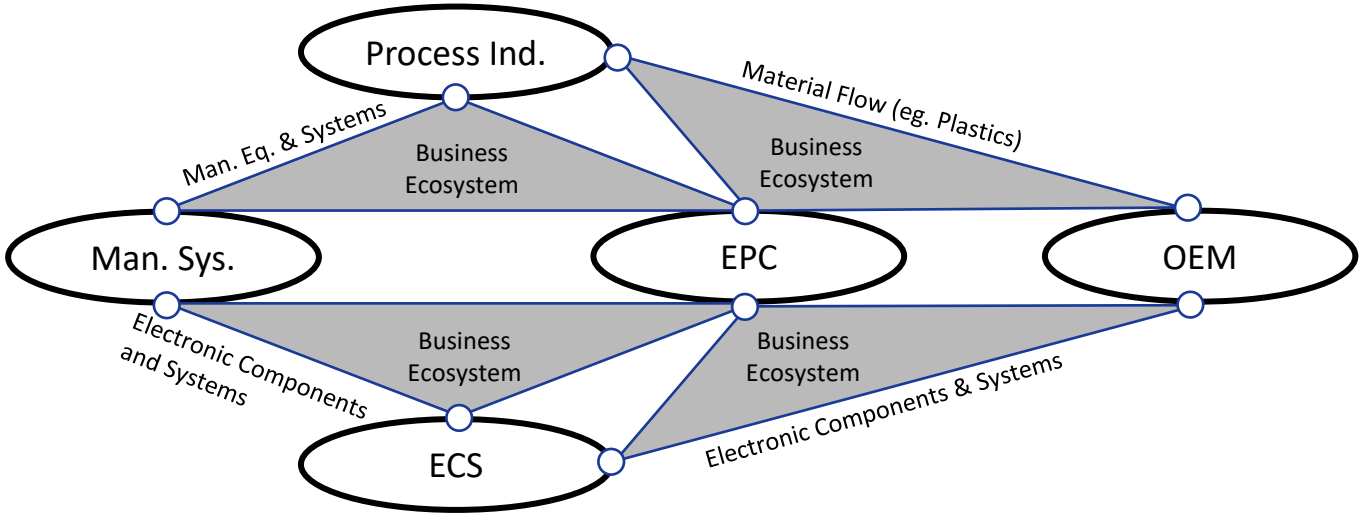
- Making systems interoperable!

Interoperability - Strategic Objectives

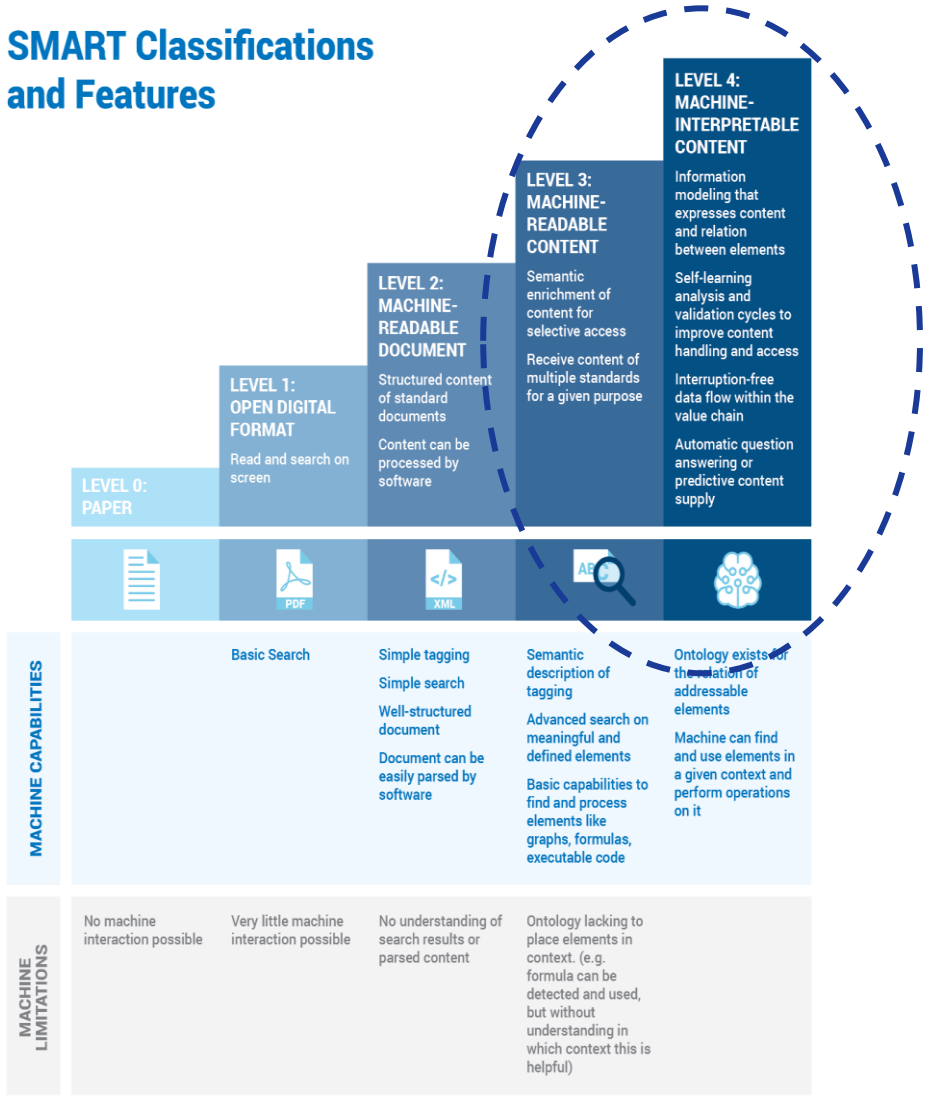
- New ways of working – Level 3 Business & Operation
  - Accelerate uptake and change management for digitalization for primary and secondary business processes for the product and asset life cycle
  - Reducing time spent for searching, interpreting and adapting information
  - Reducing cost by eliminating major bottlenecks for production asset requirements, design and engineering
  - Dynamic Configuration of assets based on Business Objectives and Eco-Efficiency ("Operations" & "Process Behaviors")
  - Interoperable platform/hub enabling centralized and decentralized data management and human interactions in support of new ways of working
- Digital Twins and Threads – Level 2 Transformation
  - Full Data Traceability, Integrity and Security
  - Automatic handling of Information based on standards and open concepts, internally and between external partners
  - Information management strategy for DT enabling and in support of I4.0
  - Requirements for interoperable data acquisition and delivery from third parties
  - Enable asset simulations (operations and behavior) by linking asset-, production- and product data models
- Data Fusion – Level 1 Digitalization
  - Seamless interoperability between data based on different standards and from different sectors.
  - Ability to incorporate and consolidate previous, current, & future (non-existing) versions of standards
  - Automatic data exchange management enabling synchronization with different systems (data sources)
  - Enable Production Value Network collaborations with Machine Manufacturers, Suppliers, Consultants and Customers
- Legacy Management – Level 0 Digitizing
  - Automatic creation of semantic data asset model by unlocking digital and non-digital legacy OT asset information
  - Method and process for introducing I4.0 by creating digital value from existing legacy
  - Automatic verification of data quality & validity
  - Method and tools for Conformance testing with standards

Connected Enterprises

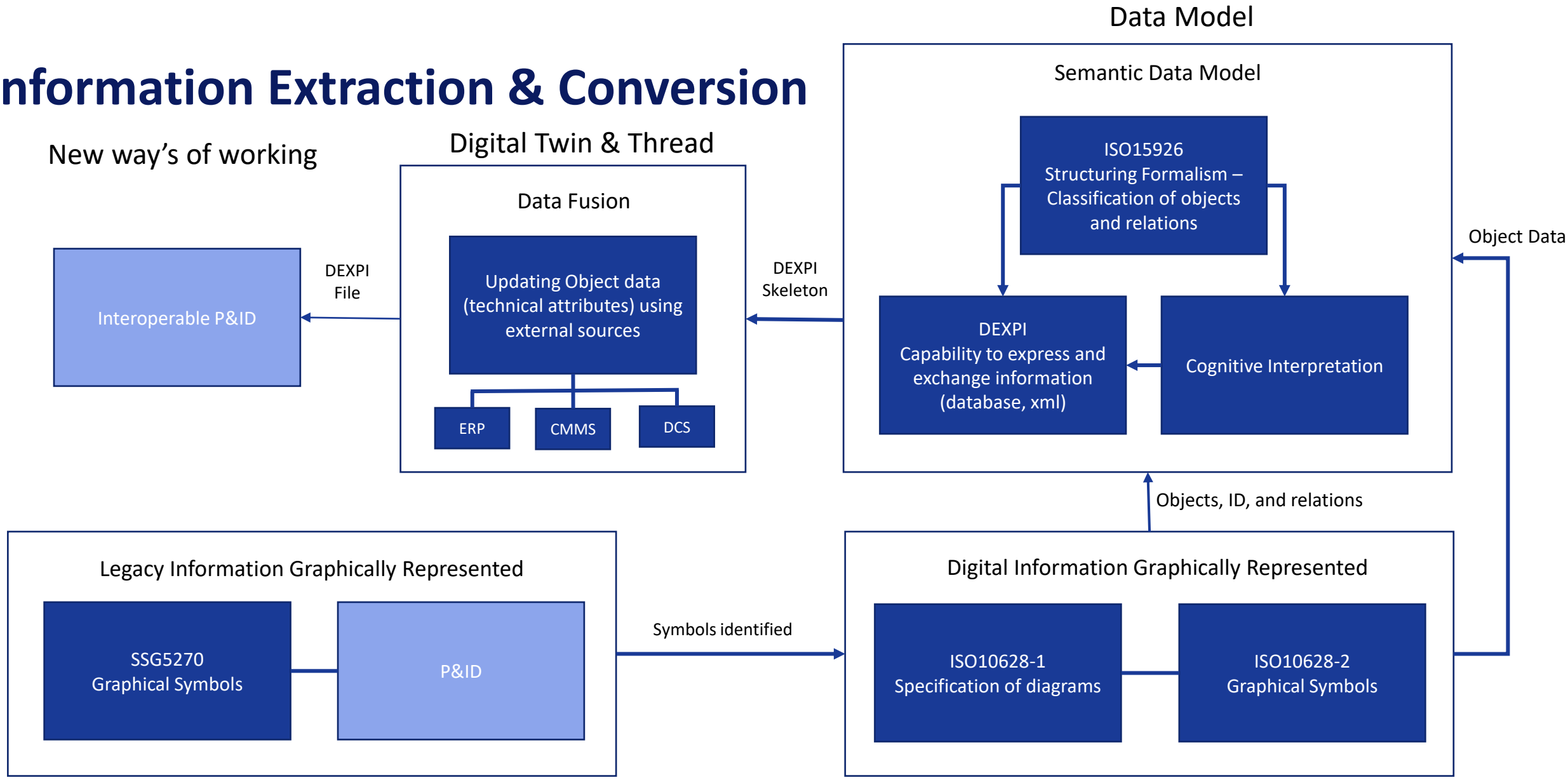
Production Value Networks:



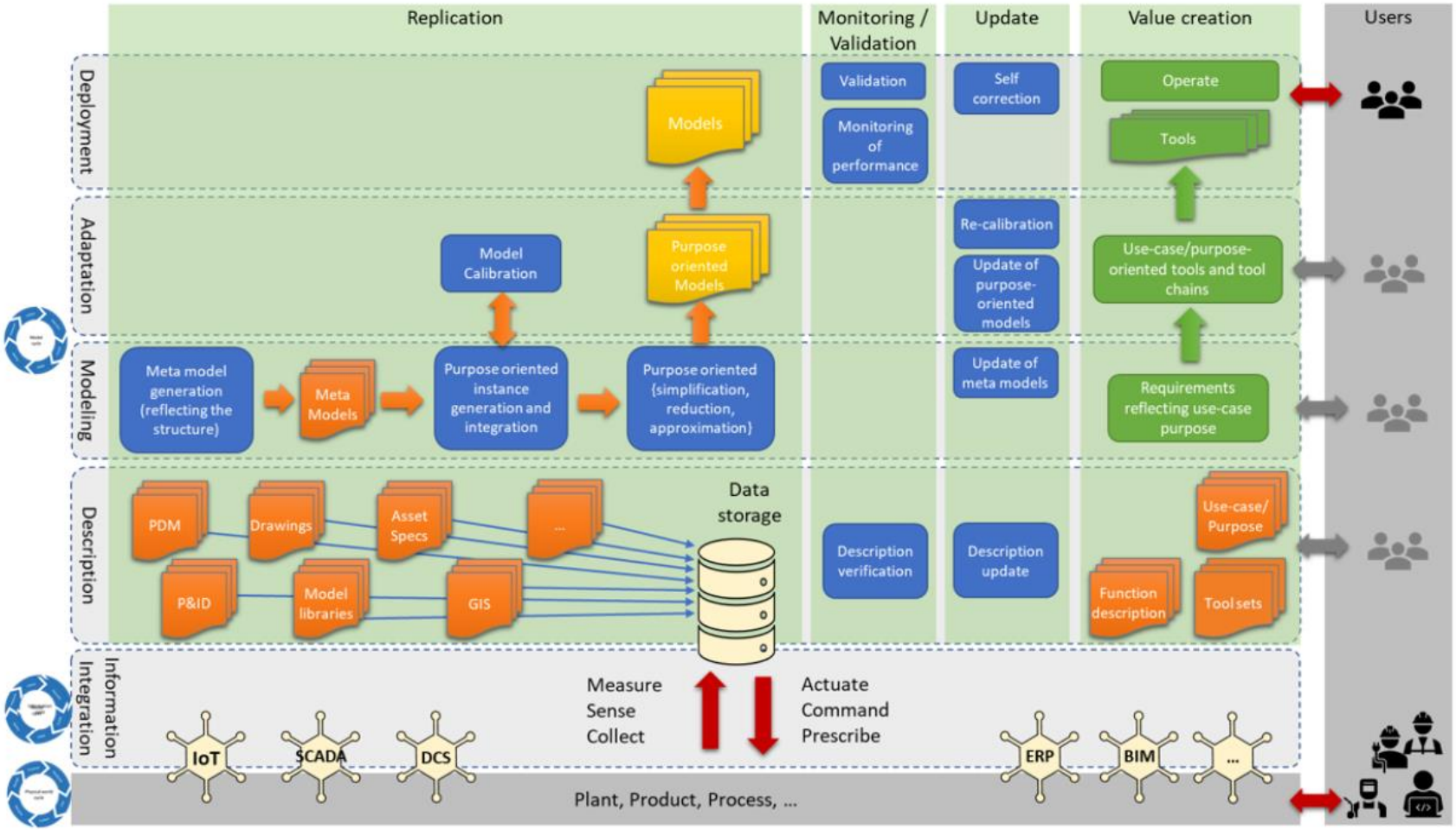
EPC: Engineering, Procurement & Construction
Man.Sys: Industrial Manufacturing Equipment, Solutions and Systems
OEM: Original Equipment Manufacturer
ECS: Suppliers of electronic Components and Systems



Information Extraction & Conversion



Design Thinking

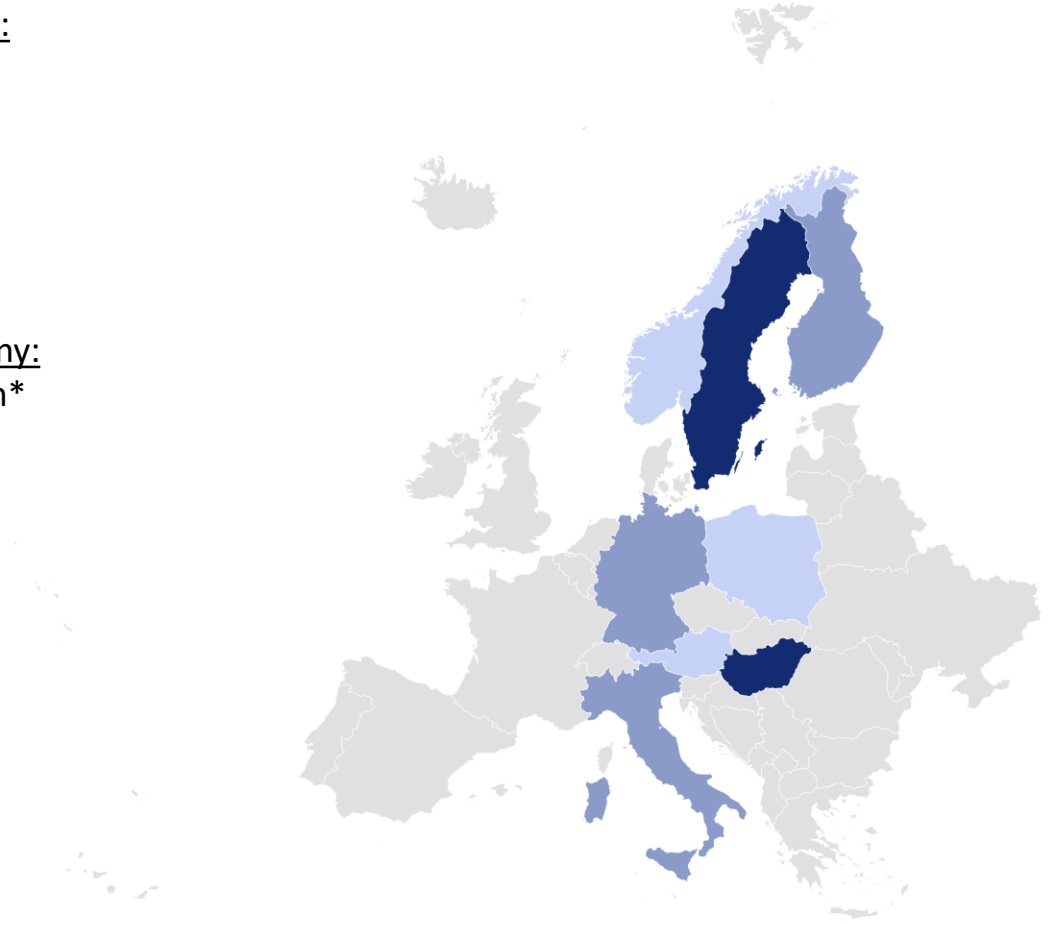


Overview of National Coordinators

Norway:
University of Oslo*

Sweden:
LTU*

Finland:
Tampere University*



France?:
Valeo
Airbus

Germany:
Infinion*
BMW
Bosch

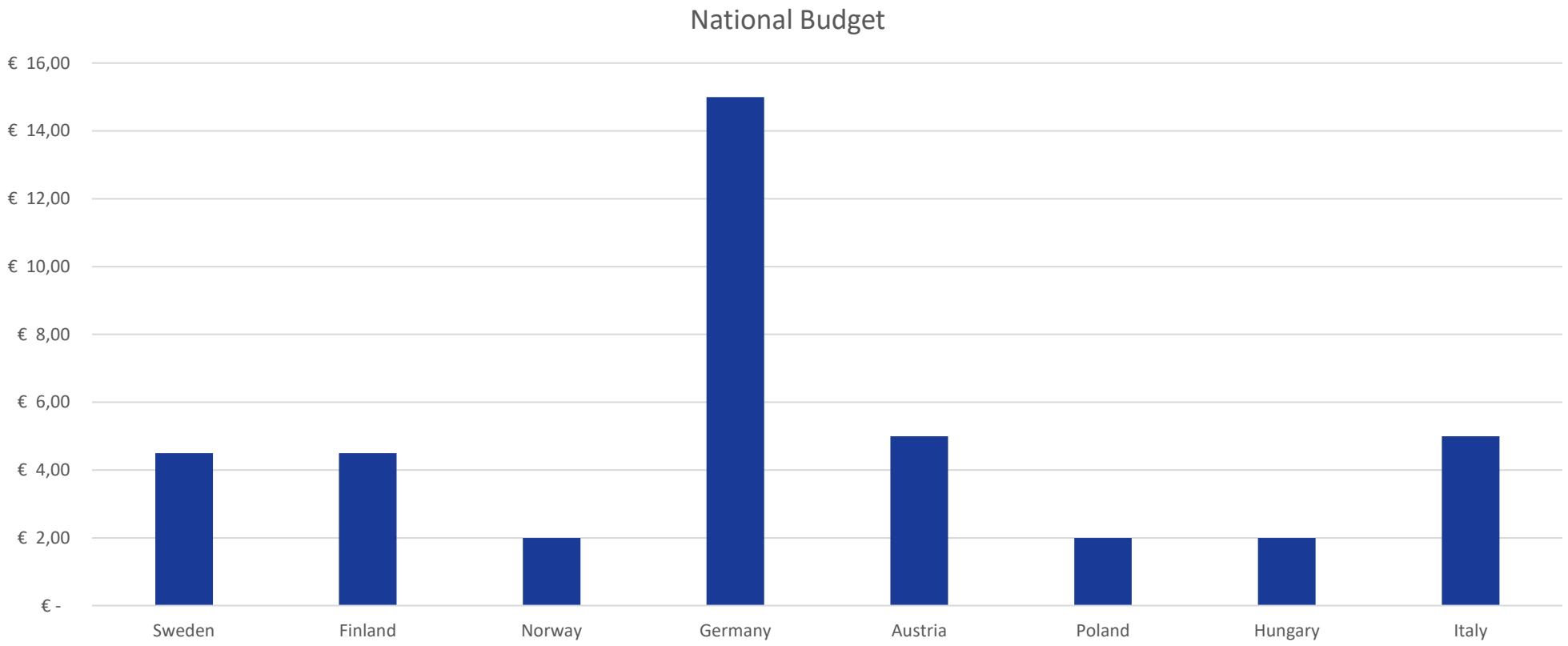
Poland?:
Univ. of Gdansk*

Italy:
Eurotech*
Leonardo
(ST Microelectronics)

Austria:
AVL*

Hungary:
BME*
AITIA

Budget Framework



Tack!

Pär Erik Martinsson, Ph.D
CEO ProcessIT Innovations
Luleå University of Technology
SE-971 87 Luleå
Sweden

E-Mail: Par-Erik.Martinsson@LTU.se
Phone: +46 70 207 71 14