EFFRA @ *European Zero-Defect Manufacturing (ZDM) Landscape: State of Play*

8 July 2021

Chris Decubber, EFFRA

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@EFFRA_Live

Transforming Manufacturing with Help of EU Framework Programmes

FP7

FoF 2020

Factories 4.0 and Beyond

Horizon Europe
Made In Europe

Factories of the Future
Public Private Partnership

Building on the vision of the FoF 2020 roadmap and public consultation in 2016 → **Key priorities for FoF 18-19-20**

Vision of the factories of the future: the challenge perspective

Vision of the factories of the future: the technology perspective

Agile value networks: Lot-size one - distributed manufacturing

Excellence in manufacturing: Advanced manufacturing processes and services for zero-defect processes and products

The human factor: Human competences in synergy with technological assets

Sustainable value networks: Manufacturing in a circular economy

Interoperable digital manufacturing platforms: connecting manufacturing services

2009/2010

2013/2014

2016

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Past and present (2)
Revision of FoF 2020 roadmap - Factories 4.0 & Beyond (2016)

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Factories of the Future
Public Private Partnership

HORIZON 2020

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DT-ICT-07-2018-2019 - Digital Manufacturing Platforms for Connected Smart Factories

https://www.connectedfactories.eu/origin-project-and-outreach

- ZDMP - Zero Defect Manufacturing Platform
- QU4LITY - Digital Reality in Zero Defect Manufacturing
- eFactory - European Factory Platform

See DT-ICT-07-2018

- SHOP4CF - Smart Human Oriented Platform for Connected Factories
- DigiPrime - Digital Platform for Circular Economy in Cross-sectorial Sustainable Value Networks
- KYKLOS 4.0 - An Advanced Circular and Agile Manufacturing Ecosystem based on rapid reconfigurable manufacturing process and individualized consumer preferences

See DT-ICT-07-2019

Digitalisation of manufacturing: pathways, key enablers and skills Event – Recordings&Presentations

The ConnectedFactories project also reaches out to other projects, initiatives and stakeholders within and outside the FoF PPP in order to stimulate synergies and cross-fertilisation accross projects and programmes.

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DT-ICT-07-2018-2019 - Digital Manufacturing Platforms for Connected Smart Factories

QUALITY

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DT-FOF-04-2018 - Pilot lines for metal Additive Manufacturing (IA 50%)

integradde

MEMBERS AREA

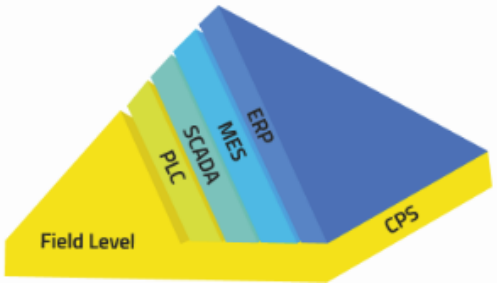
Intelligent data-driven pipeline for the manufacturing of certified metal parts through Direct Energy Deposition processes

THE INTEGRADDE PROJECT | CONSORTIUM | TECHNOLOGY & DEMONSTRATORS | OPEN PILOT LINES | MEDIA

PATHWAY - AUTONOMOUS SMART FACTORIES

CONNECTED FACTORIES

1.	2.	3.	4.	5.
Spreadsheets, text editors and paperwork	Software and data silos	Connectivity	Off-line optimisation	Realtime optimisation
Excel / Word Based ERP	Dedicated ERP, Software Implemented	MOM-ERP systems connected	Off-line Digital Manufacturing, Process Optimisation on factory level	Autonomous, Online Realtime Digital Manufacturing, Process Optimisation on factory level
Excel / Word Based MOM	Dedicated MOM, Software Implemented	MOM and SCADA / PLC systems, connected	Off-line Digital Manufacturing, Optimisation on machine level	Autonomous, Online Realtime Digital, Manufacturing, Process Optimisation on machine level
Manual data acquisition	Data acquisition, monitoring, analysis, (SCADA) - isolated systems	IoT enabled SCADA, MOM-MES, ERP (...) connectivity	Humans actively connected	Platform enabled optimisation



Industrial state of play in manufacturing

Cases that illustrate advanced state of the art

Approaches & cases from research & innovation projects

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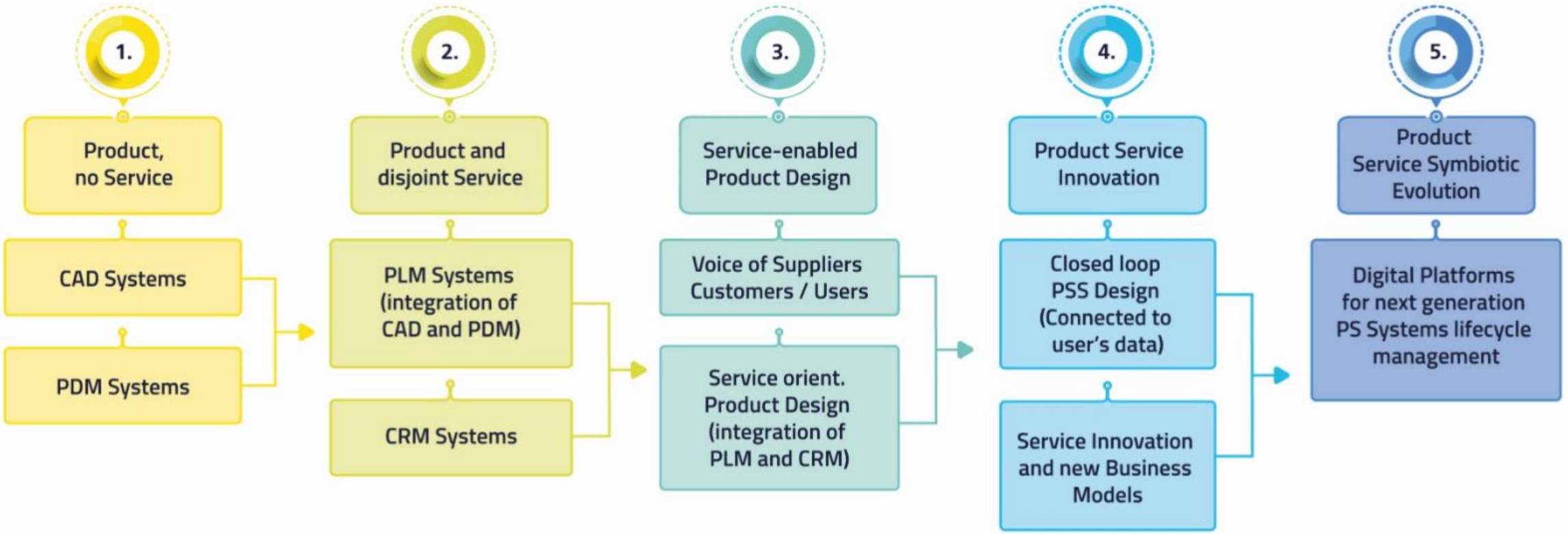
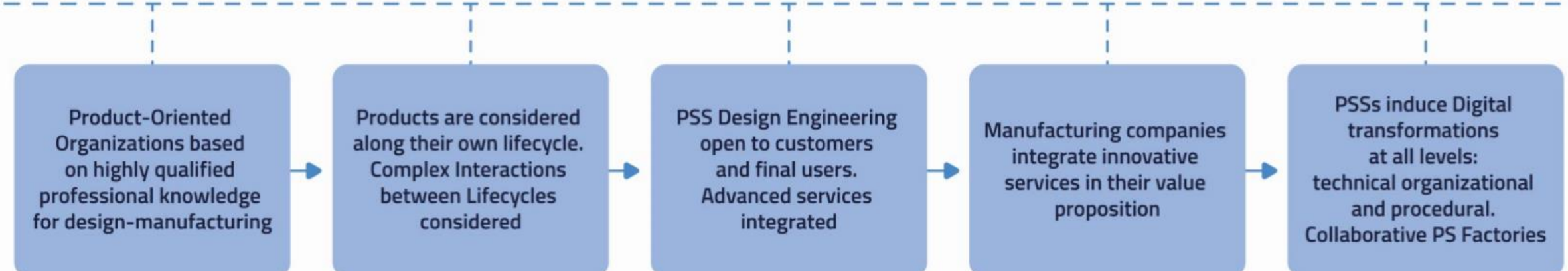
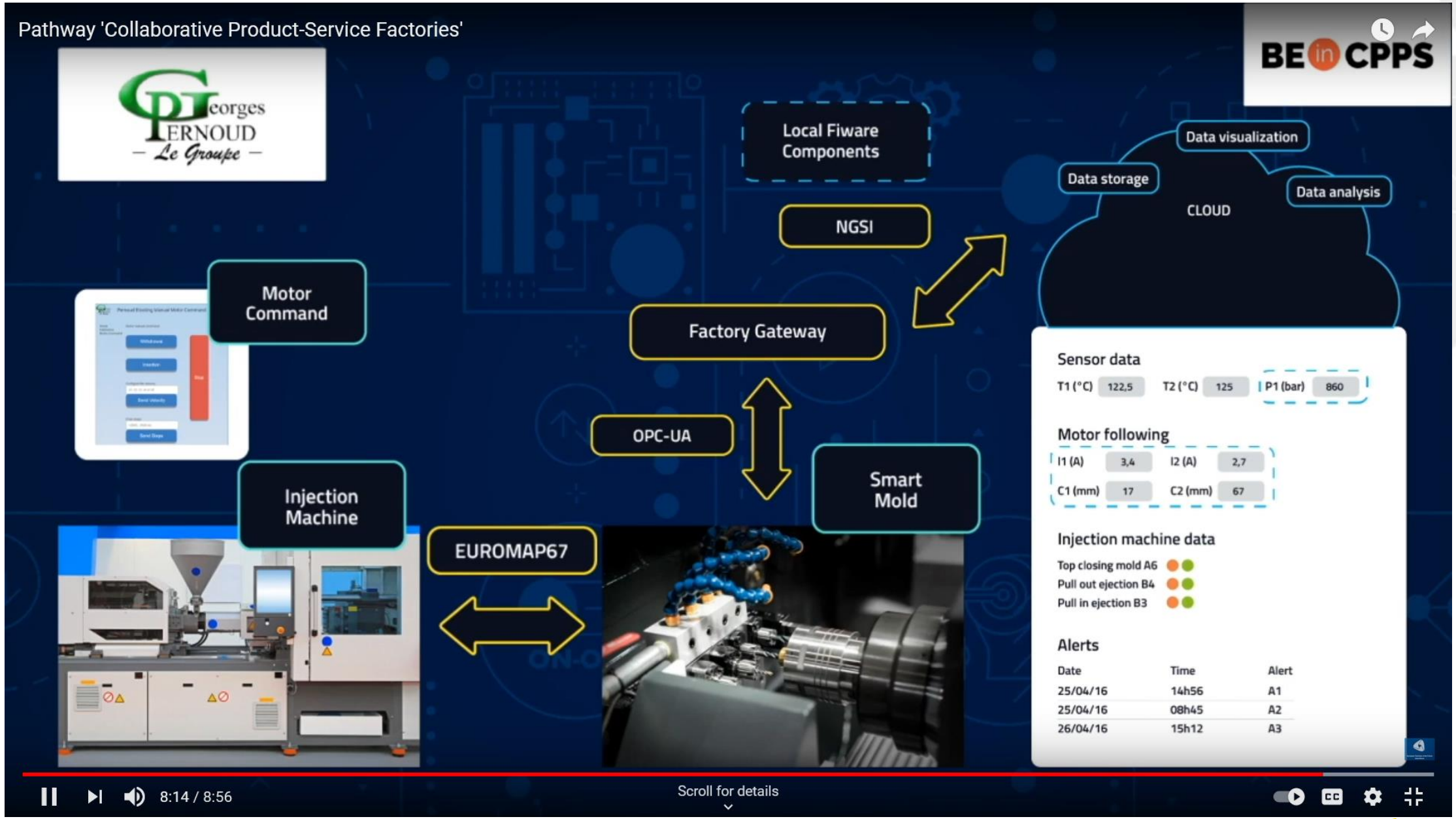
PATHWAY - COLLABORATIVE PRODUCT-SERVICE FACTORIES

CONNECTED FACTORIES







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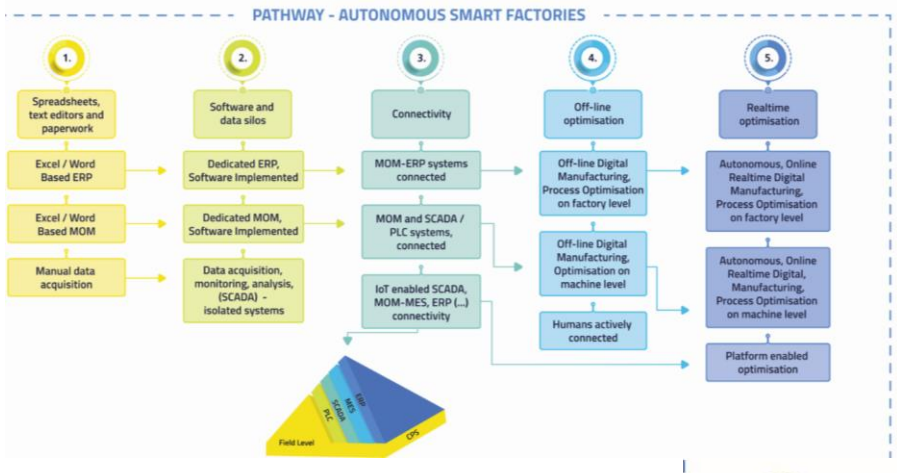
KEY ENABLERS AND CROSS-CUTTING FACTORS

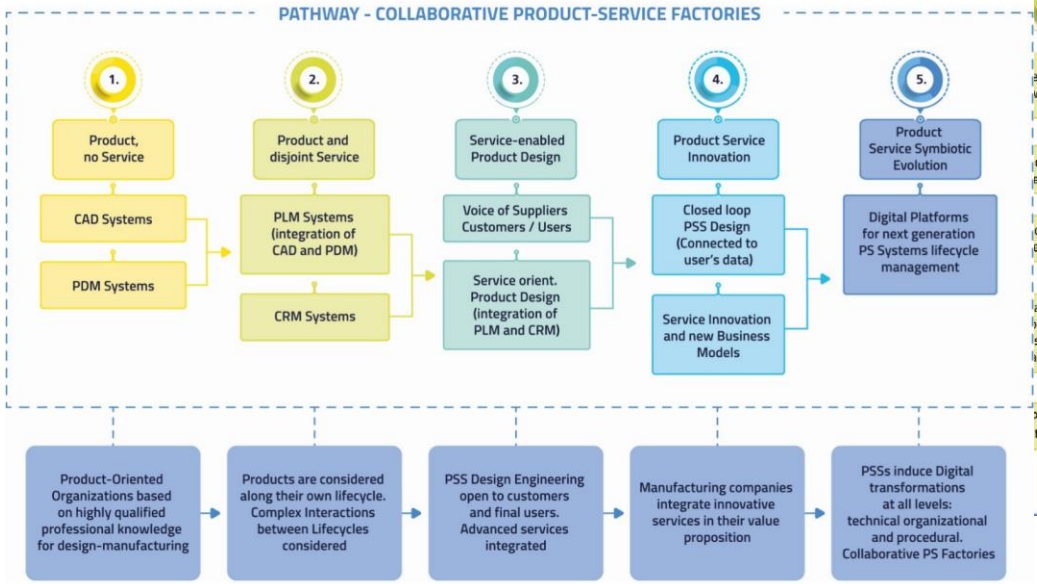
- Skills and engineering tools
- Skills for operation of the technologies
- Added value / optimisation focus
- Business models / financial investment
- Interoperability / standards
- Security
- Technology – building blocks
- ...

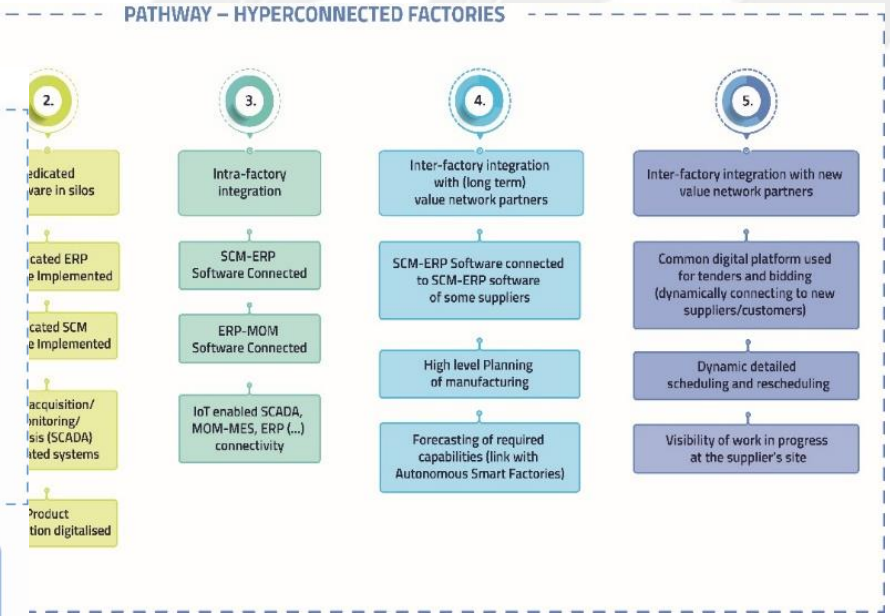
PATHWAYS

- Autonomous Smart Factories
- Hyperconnected Factories
- Collaborative Product-Service Factories

- Cybersecurity
- Circular Economy
- Data spaces
- (AI for manufacturing)







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MONDRAGON | HUMANITY AT WORK | Finance Industry Retail Knowledge

MONDRAGON - ASSET ADMINISTRATION SHELL USE CASE

CONNECTED FACTORIES

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COMPONENT

MACHINE

FACTORY

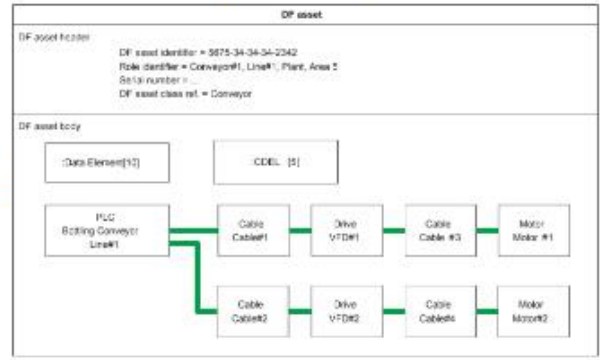
ACTIVE COMPONENT I4.0 "DIGITAL TWIN"

the digital twin will become synonymous with the Administration Shell.

PLATTFORM INDUSTRIE4.0

≅

IEC CD 62832 Digital Factory



https://www.connectedfactories.eu/news/digital-transformation-cases-catalogue-now-launched

The Digital Transformation Cases Catalogue is now launched!

Digitalisation of manufacturing: pathways, key enablers and skills Event – Recordings&Presentations

The future Partnership

MADE IN EUROPE

MiE General objectives

Manufacturing competitiveness

Leadership & manufacturing excellence, generating new products and new markets

European Green Deal

Circular and climate-neutral manufacturing

An Economy that Works for People and SMEs

Attractive value added manufacturing jobs

A Europe Fit for the Digital Age

Digital transformation of manufacturing industry, trusted and robust

MiE Specific Objectives

- **Excellent, responsive and smart factories & supply chains**
- **Circular products & Climate-neutral manufacturing**
- **New integrated business, product-service and production approaches; new use models**
- **Human-centered and human-driven manufacturing innovation**

MiE Key Technologies and Enablers

- **Advanced and smart material processing technologies and process chains, including recycling and remanufacturing**
- **Smart mechatronics, robotics and logistic technologies**
- **Data analytics and (cognitive) artificial intelligence, Simulation and modelling, digital twins**
- **Digital platforms and data sharing solutions, robust and secure industrial communication technologies**
- **New business models, manufacturing organisation approaches and human-centred science and innovation approaches**
- **Skilled workforce**
- **Standards**

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- **Excellent, responsive and smart factories & supply chains**
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Research & Innovation Objectives

1. Data highways and data spaces in support of smart factories in dynamic value networks
2. Scalable, reconfigurable and flexible first-time right manufacturing
3. Zero-defect and zero-downtime high precision manufacturing, including predictive quality and non-destructive inspection methods
4. Artificial intelligence for productive, excellent, robust and agile manufacturing chains - Predictive manufacturing capabilities & logistics of the future
5. Advanced manufacturing processes for smart and complex products
6. Manufacturing for miniaturisation and functional integration

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1. Ultra-efficient, low energy and carbon-neutral manufacturing
2. De-manufacturing, re-manufacturing and recycling technologies for circular economy
3. Manufacturing with new and substitute materials
4. Virtual end-to-end life-cycle engineering and manufacturing from product to production lines, factories, and networks
5. Digital platforms and data management for circular product and production-systems life-cycles

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1. Collaborative product-service engineering for costumer driven manufacturing value networks
2. Manufacturing processes and approaches near to customers or consumers
3. Transparency, trust and data & IP integrity, open systems and cyber security along the product and manufacturing life-cycle

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1. Digital platforms and engineering tools supporting creativity and productivity of manufacturing development
2. Improving human device interaction using augmented and virtual reality and digital twins.
3. Human & technology complementarity and excellence in manufacturing
4. Manufacturing Innovation and change management
5. Technology validation and migration paths towards industrial deployment of advanced manufacturing technologies by SMEs

2021-TT-01-01: AI enhanced robotics systems for smart manufacturing (IA) **(R&I 1.4 , 4.3)**

2021-TT-01-02: Zero-defect manufacturing towards zero-waste (IA) **(R&I 1.3 , SpObj 2)**

2021-TT-01-03: Laser-based technologies for green manufacturing (RIA) **(R&I 1.3 , 2.2)**

2021-TT-01-05: Manufacturing technologies for bio-based materials (RIA) **(R&I 2.1)**

2021-TT-01-07: Artificial Intelligence for sustainable, agile manufacturing (IA) **(R&I 1.1, 1.4 , 2.2, 2.4, 4.3)**

2021-TT-01-08: Data-driven Distributed Industrial Environments (IA) **(R&I 1.1 , 3.1, 3.3)**

2022-TT-01-01: Rapid reconfigurable production process chains ((IA) **(R&I 1.2, 3.1)**

2022-TT-01-02: Products with complex functional surfaces (RIA) **(R&I 1.5)**

2022-TT-01-03: Excellence in distributed control and modular manufacturing (RIA**) (R&I 1.2, 3.1, 3.3)**

2022-TT-01-04: Intelligent work piece handling in a full production line (RIA) **(R&I 1.2, 4.3)**

2022-TT-01-06: ICT Innovation for Manufacturing Sustainability in SMEs (I4MS2) (IA) **(R&I 4.2, 4.4, 4.5 , 3.3, 1.4)**

2022-TT-01-07: Digital tools to support the engineering of a Circular Economy (RIA) **(R&I 1.1 , 1.4, 1.4)**

Research & Innovation Objectives

1. Data highways and data spaces in support of smart factories in dynamic value networks
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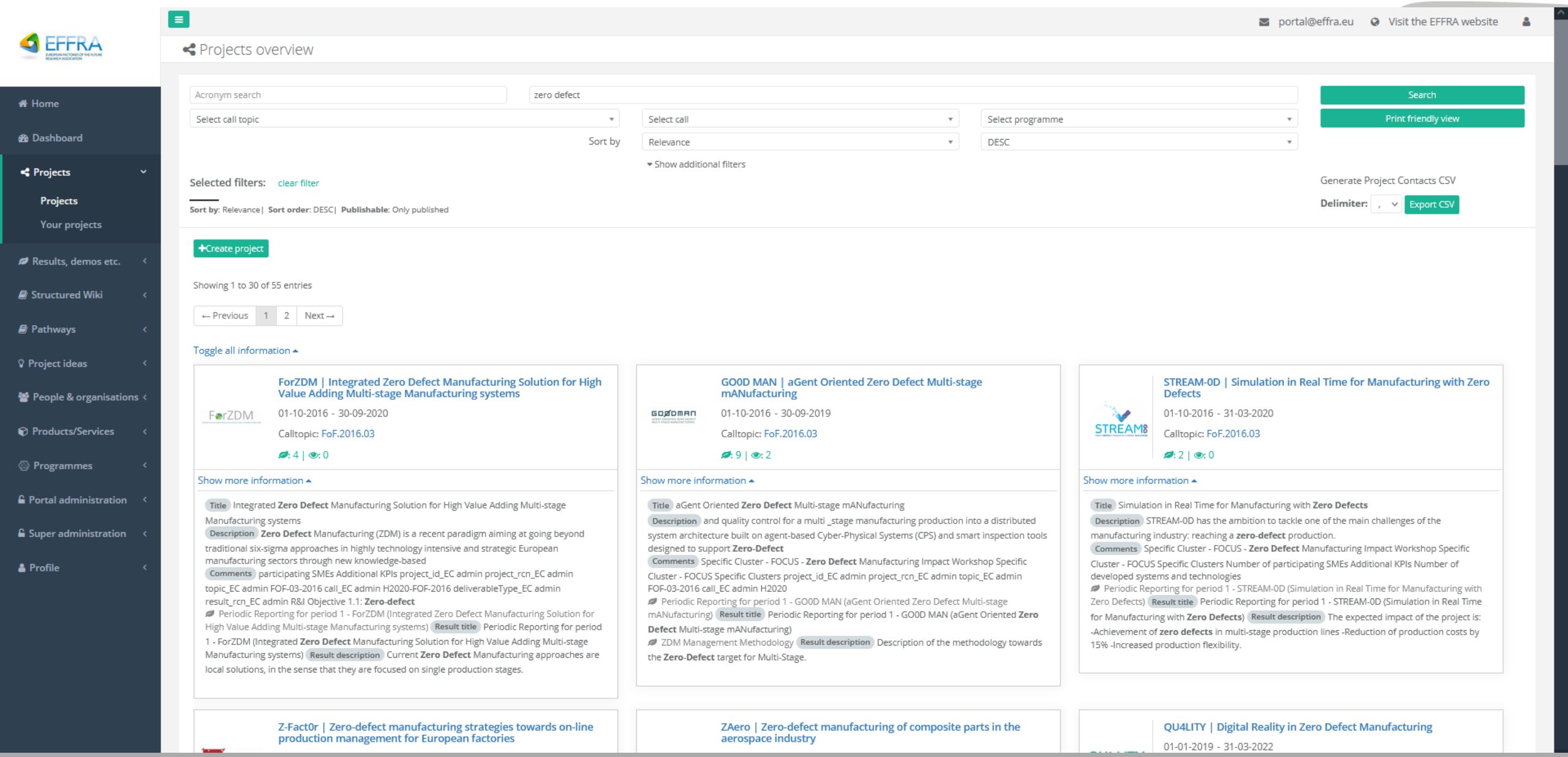
EFFRA Innovation Portal : search *zero defect*



Bringing the community together

- Public consultation towards the preparation of the Work Programme 2023-2024
- Public Webinar / Made in Europe Community Day(s) TBD

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MADE IN EUROPE

Thank you!

chris.decubber@effra.eu
info@effra.eu

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EFFRA.EU
portal.effra.eu

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