

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

8 July 2021



Chris Decubber, EFFRA

 @EFFRA_Live



EFFRA

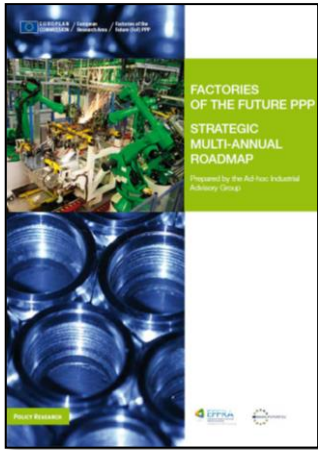
EUROPEAN FACTORIES OF THE FUTURE
RESEARCH ASSOCIATION

Transforming Manufacturing with Help of EU Framework Programmes

FP7



Factories of the Future
Public Private Partnership



2009/2010

FoF 2020

Building on the vision of the FoF 2020 roadmap and public consultation in 2016

Vision of the factories of the future: the challenge perspective



Vision of the factories of the future: the technology perspective

2013/2014

Factories 4.0 and Beyond

Key priorities for FoF 18-19-20

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

2016

Horizon Europe
Made In Europe



EFFRA VISION FOR A MANUFACTURING PARTNERSHIP IN HORIZON EUROPE

2021-2027



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

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Sustainable value networks: Manufacturing in a circular economy

Interoperable digital manufacturing platforms: connecting manufacturing services

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



European Factory
Platform



QUALITY



SHOP4CF



- 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](#)

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



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 across projects and programmes.

18 Open Digital Manufacturing Platforms & Digital Infrastructures

Reliable IoT & 5G connectivity, ubiquitous edge-cloud integration, cybersecurity, data governance & transaction traceability

TTTech

Telefonica
Telefónica I+D

ATB

Technology Transfer System

Synesis
sustainable automation

INTERNATIONAL DATA SPACES ASSOCIATION

Technische Universität Braunschweig

AIT
CENTER OF EXCELLENCE FOR RESEARCH AND EDUCATION

UNPARALLEL

SIEMENS
Ingenuity for life

NXT CONTROL

tu technische universität dortmund

VISUAL COMPONENTS

ATLANTIS ENGINEERING

PACE
a **TXT** company

SQS
SOFTWARE QUALITY SYSTEM

EPFL

7 ZDM Manufacturing Equipment

Real-time quality control, self-adaptation

+GF+

ghi
SMART FURNACES

FAGOR
ARRASATE

PRIMA INDUSTRIE
Prima Additive

DANOBAT

ASTI
MOBILE ROBOTICS
Transforming the future together

UNIMETRIK
METROLOGY AND CALIBRATION

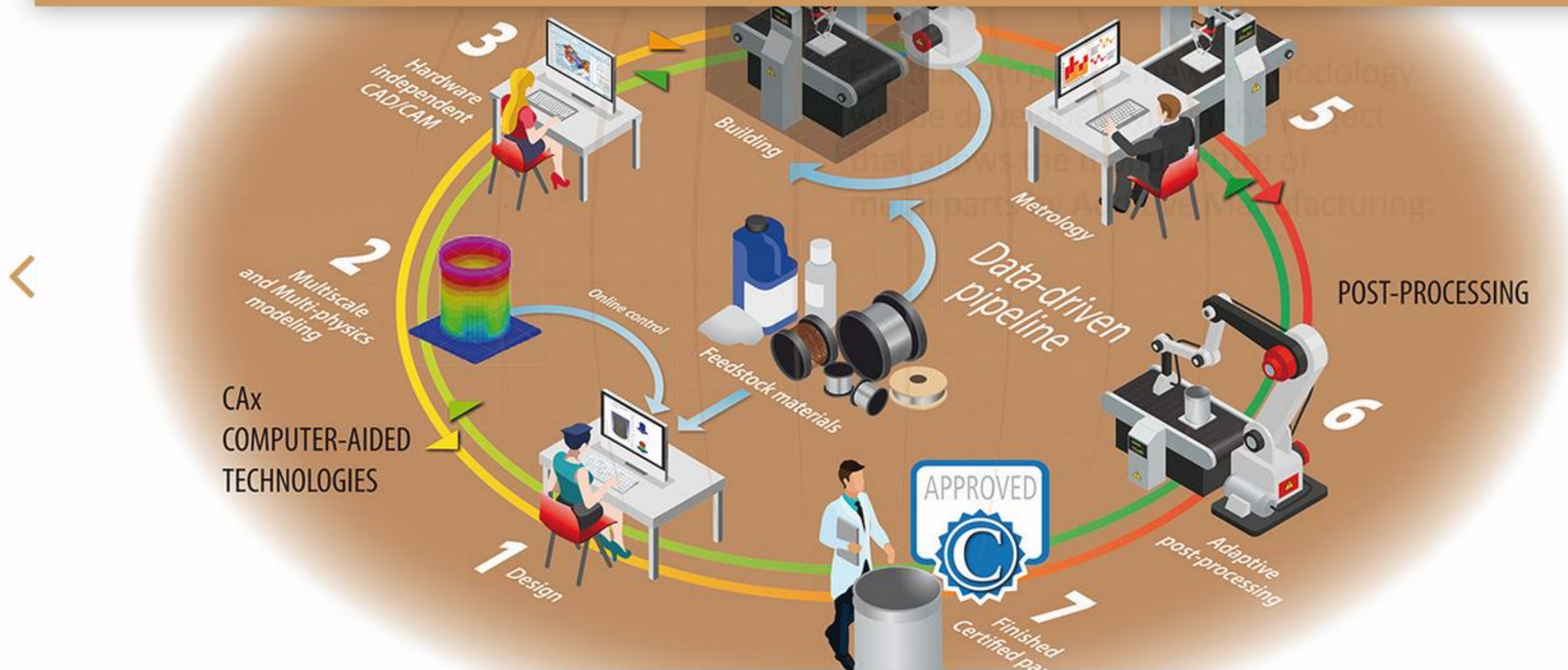
9 Smart Connected Pilot Factories 4.0

Open Big Data Pipelines, Data Sovereignty, Industrial Data Spaces, Platform Composability, Deep Analytics, Digital Twin Simulation

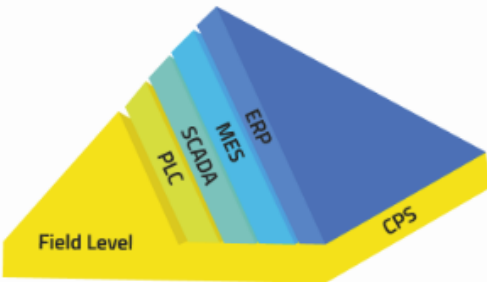
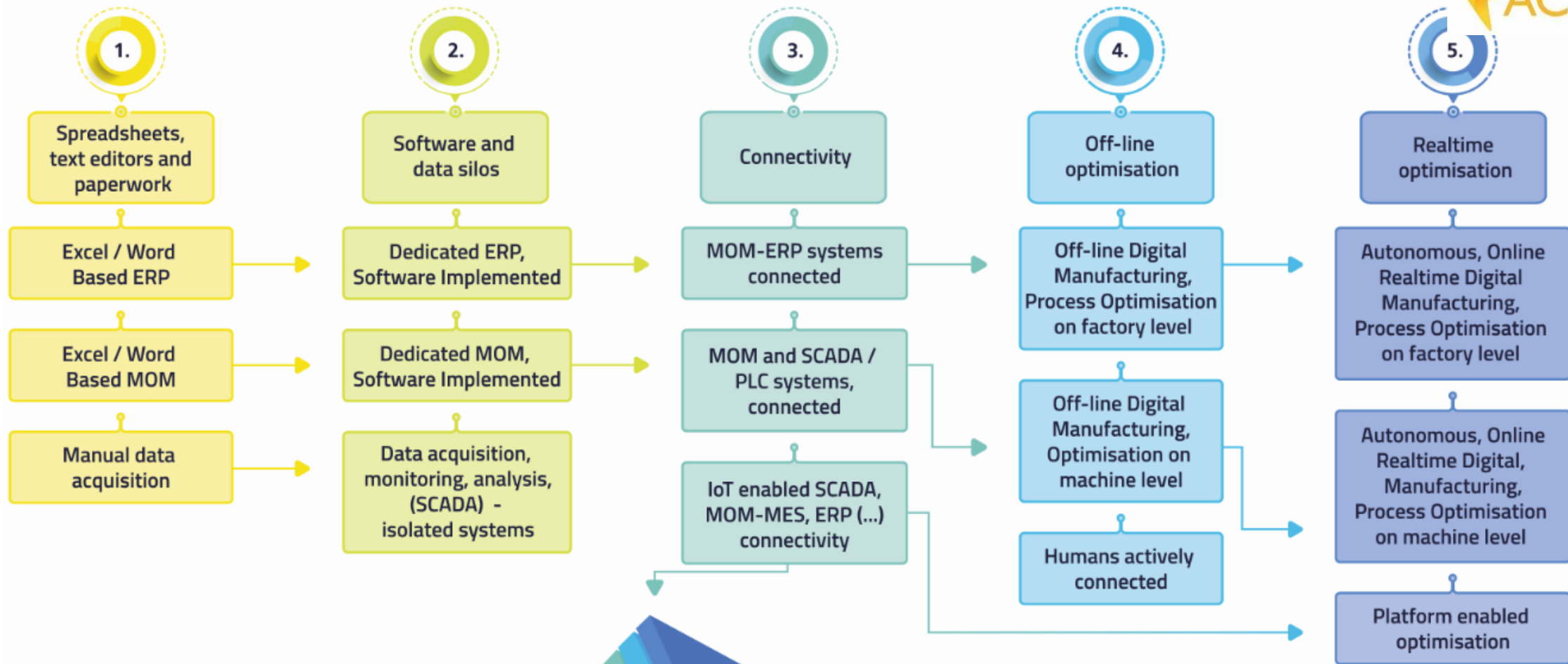
QUALITY



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



PATHWAY - AUTONOMOUS SMART FACTORIES

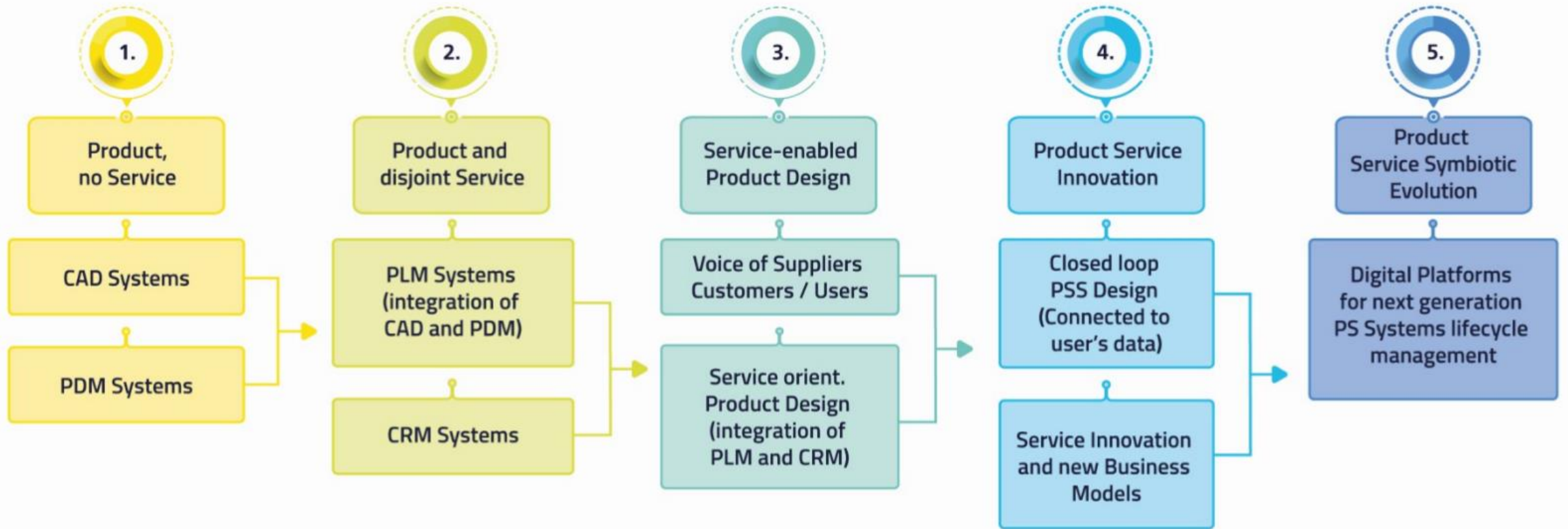


Industrial state of play in manufacturing

Cases that illustrate advanced state of the art

Approaches & cases from research & innovation projects

PATHWAY - COLLABORATIVE PRODUCT-SERVICE FACTORIES





Local Fiware Components

NGSI

Factory Gateway

OPC-UA

Smart Mold

EUROMAP67

Motor Command

Injection Machine

Data storage

Data visualization

Data analysis

CLOUD

Sensor data

T1 (°C) 122,5 T2 (°C) 125 P1 (bar) 860

Motor following

I1 (A) 3,4 I2 (A) 2,7
C1 (mm) 17 C2 (mm) 67

Injection machine data

Top closing mold A6 ●●
Pull out ejection B4 ●●
Pull in ejection B3 ●●

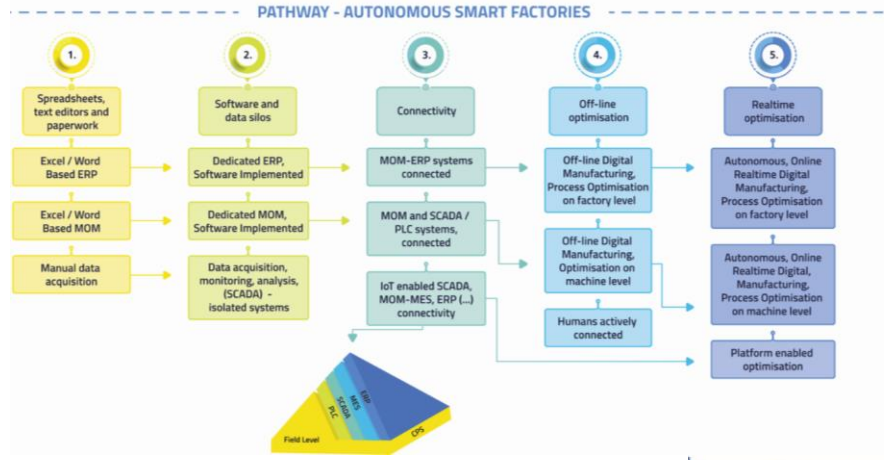
Alerts

Date	Time	Alert
25/04/16	14h56	A1
25/04/16	08h45	A2
26/04/16	15h12	A3

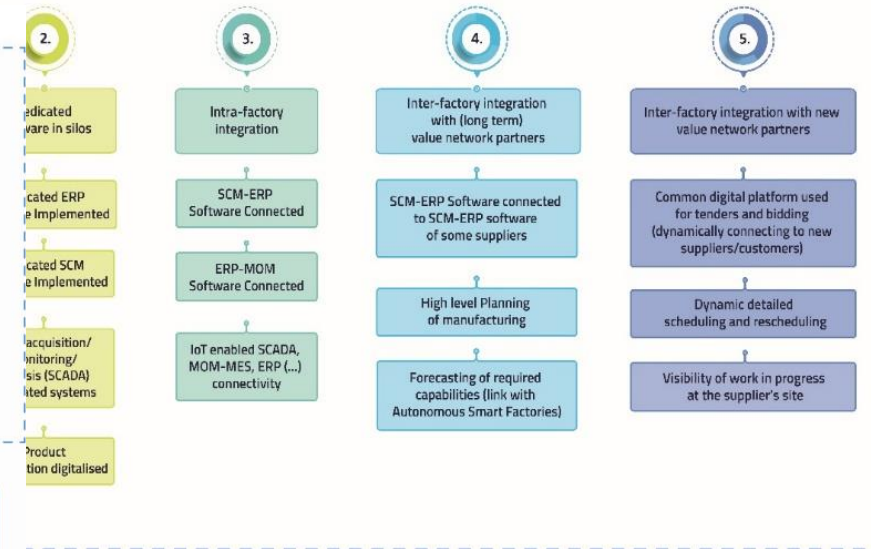
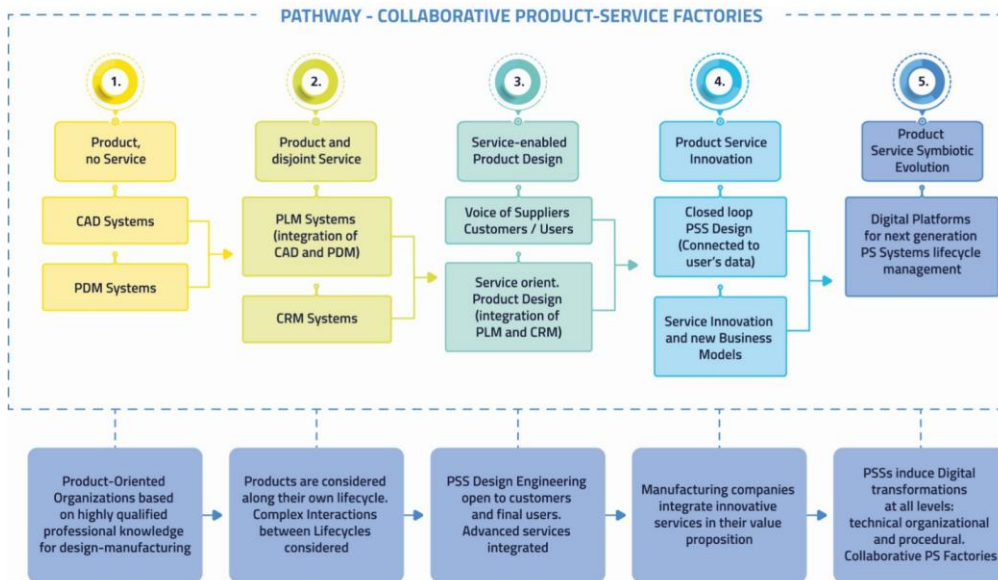
KEY ENABLERS AND CROSS-CUTTING FACTORS

- 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)



Industrial state of play in manufacturing

Cases that illustrate advanced state of the art

Approaches & cases from research & innovation projects

MONDRAGON - ASSET ADMINISTRATION SHELL USE CASE

COMPONENT



MACHINE



FACTORY



ACTIVE COMPONENT I4.0 “DIGITAL TWIN”

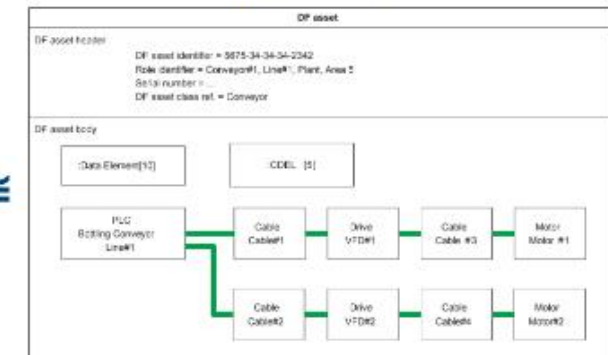
the digital twin will become
synonymous with the Administration
Shell.

PLATTFORM
INDUSTRIE 4.0



IR

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



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**

MiE Specific Objectives

- **Excellent, responsive and smart factories & supply chains**
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- **Human-centered and human-driven manufacturing innovation**

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
-
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
-
1. Collaborative product-service engineering for customer 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
-
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
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 (Zero-waste)
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

1. Ultra-efficient, low energy and carbon-neutral manufacturing
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EFFRA Innovation Portal : search *zero defect*

The screenshot shows the EFFRA Innovation Portal interface. At the top left is the EFFRA logo. The main header area includes a navigation menu on the left with options like Home, Dashboard, Projects, Results, etc. The main content area is titled 'Projects overview' and features a search bar with the query 'zero defect'. Below the search bar are filters for 'Select call topic', 'Select call', and 'Select programme', along with a 'Sort by' dropdown set to 'Relevance'. There are buttons for 'Search', 'Print friendly view', and 'Export CSV'. The search results are displayed in a grid of three cards. Each card shows a project title, logo, dates, call topic, and a 'Show more information' link. The first card is for 'ForZDM | Integrated Zero Defect Manufacturing Solution for High Value Adding Multi-stage Manufacturing systems'. The second is for 'GOOD MAN | aGent Oriented Zero Defect Multi-stage mANufacturing'. The third is for 'STREAM-0D | Simulation in Real Time for Manufacturing with Zero Defects'. The bottom of the page shows the start of three more project cards: 'Z-Fact0r | Zero-defect manufacturing strategies towards on-line production management for European factories', 'ZAero | Zero-defect manufacturing of composite parts in the aerospace industry', and 'QU4LITY | Digital Reality in Zero Defect Manufacturing'.

portal@effra.eu Visit the EFFRA website

Projects overview

Acronym search zero defect

Select call topic Select call Select programme

Sort by Relevance DESC

Show additional filters

Selected filters: clear filter

Sort by: Relevance | Sort order: DESC | Publishable: Only published

Generate Project Contacts CSV

Delimiter: Export CSV

+ Create project

Showing 1 to 30 of 55 entries

← Previous 1 2 Next →

Toggle all information ▲

ForZDM | Integrated Zero Defect Manufacturing Solution for High Value Adding Multi-stage Manufacturing systems

01-10-2016 - 30-09-2020

Calltopic: FoF.2016.03

4 | 0

Show more information ▲

Title Integrated **Zero Defect** Manufacturing Solution for High Value Adding Multi-stage Manufacturing systems

Description **Zero Defect** Manufacturing (ZDM) is a recent paradigm aiming at going beyond traditional six-sigma approaches in highly technology intensive and strategic European manufacturing sectors through new knowledge-based

Comments participating SMEs Additional KPIs project_id_EC admin project_rcn_EC admin topic_EC admin FOF-03-2016 call_EC admin H2020-FOF-2016 deliverableType_EC admin result_rcn_EC admin R&I Objective 1.1: **Zero-defect**

Periodic Reporting for period 1 - ForZDM (Integrated Zero Defect Manufacturing Solution for High Value Adding Multi-stage Manufacturing systems) **Result title** Periodic Reporting for period 1 - ForZDM (Integrated **Zero Defect** Manufacturing Solution for High Value Adding Multi-stage Manufacturing systems) **Result description** Current **Zero Defect** Manufacturing approaches are local solutions, in the sense that they are focused on single production stages.

GOOD MAN | aGent Oriented Zero Defect Multi-stage mANufacturing

01-10-2016 - 30-09-2019

Calltopic: FoF.2016.03

9 | 2

Show more information ▲

Title aGent Oriented **Zero Defect** Multi-stage mANufacturing

Description and quality control for a multi_stage manufacturing production into a distributed system architecture built on agent-based Cyber-Physical Systems (CPS) and smart inspection tools designed to support **Zero-Defect**

Comments Specific Cluster - FOCUS - **Zero Defect** Manufacturing Impact Workshop Specific Cluster - FOCUS Specific Clusters project_id_EC admin project_rcn_EC admin topic_EC admin FOF-03-2016 call_EC admin H2020

Periodic Reporting for period 1 - GOOD MAN (aGent Oriented Zero Defect Multi-stage mANufacturing) **Result title** Periodic Reporting for period 1 - GOOD MAN (aGent Oriented **Zero Defect** Multi-stage mANufacturing)

ZDM Management Methodology **Result description** Description of the methodology towards the **Zero-Defect** target for Multi-Stage.

STREAM-0D | Simulation in Real Time for Manufacturing with Zero Defects

01-10-2016 - 31-03-2020

Calltopic: FoF.2016.03

2 | 0

Show more information ▲

Title Simulation in Real Time for Manufacturing with **Zero Defects**

Description STREAM-0D has the ambition to tackle one of the main challenges of the manufacturing industry: reaching a **zero-defect** production.

Comments Specific Cluster - FOCUS - **Zero Defect** Manufacturing Impact Workshop Specific Cluster - FOCUS Specific Clusters Number of participating SMEs Additional KPIs Number of developed systems and technologies

Periodic Reporting for period 1 - STREAM-0D (Simulation in Real Time for Manufacturing with Zero Defects) **Result title** Periodic Reporting for period 1 - STREAM-0D (Simulation in Real Time for Manufacturing with **Zero Defects**) **Result description** The expected impact of the project is: -Achievement of **zero defects** in multi-stage production lines -Reduction of production costs by 15% -Increased production flexibility.

Z-Fact0r | Zero-defect manufacturing strategies towards on-line production management for European factories

ZAero | Zero-defect manufacturing of composite parts in the aerospace industry

QU4LITY | Digital Reality in Zero Defect Manufacturing

01-01-2019 - 31-03-2022

Bringing the community together

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



Thank you!

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