

D 3.4

Digital Transformation Pathway Cases Catalogue and European Demonstration Infrastructure – Second Iteration

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¹ PU: Public, CO: Confidential, only for members of the consortium (including the Commission Services)

² RE: Report, OT: Other; ORDP: Open Research Data Pilot



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Abbreviations and acronyms

TERMS, ABBREVIATIONS AND ACRONYMS	
KPI	Key Performance Indicator
DMP	Digital Manufacturing Platform
CSA	Coordination and Support Actions
WP	Work Package

TABLE OF CONTENT

Executive Summary	5
1 Introduction.....	6
2 Methodology/approach	8
2.1 Essentials	8
2.2 Associated recent deliverables.....	9
3 Catalogue on EFFRA Innovation Portal.....	11
3.1 EFFRA Portal enhancements for better documenting the cases.....	13
4 Collaboration with the DT-ICT-07 projects.....	16
4.1 Cataloguing the pilots.....	16
4.2 Bilateral meetings with some of the projects	19
4.3 Using structured public information generated by other project clusters to further enhance the Catalogue.....	20
4.3.1 Foresee Cluster Whitepaper on Predictive Maintenance Technologies	20
4.3.2 ACE Factories Whitepaper on Human-Centered Factories	22
5 Conclusions.....	27
Annex I: Extraction from the catalogue.....	28

TABLE OF FIGURES

Figure 1: The digital transformation catalogue as one of the main shortcuts on the EFFRA Innovation Portal.	7
Figure 2: Essentials of the methodology – table of contents of Deliverable 3.1	8
Figure 3: The Structure Wiki entry page (with access to index-based search on top).....	9
Figure 4: Launch of the Digital Transformation Cases Catalogue	11
Figure 5: Screenshots from the animated picture that supports the launch of the catalogue.....	11
Figure 6: Filter on Catalogue - Smart Autonomous Factories Pathway (click picture to access)	12
Figure 7: Filter on Catalogue – Hyperconnected Factories Pathway (click picture to access).....	12
Figure 8: The associated resources in the pilot content links the pilot with other resources available at the Structured Wiki.....	13
Figure 9: Links of one deliverable with the different Qu4lity pilots and to other documents in the Structured Wiki.....	15
Figure 10: ZDMP Use cases in the Digital Transformation Pathway Cases Catalogue, mapped on the Autonomous Smart Factories pathway	16
Figure 11: EFFP use cases in the Digital Transformation Pathway Cases Catalogue.....	16
Figure 12: QU4LITY use cases in the Digital Transformation Pathway Cases Catalogue.....	17
Figure 13: SHOP4CF use cases in the Digital Transformation Pathways Cases Catalogue.....	18
Figure 14: KYKLOS 4.0 use cases in the Digital Transformation Pathways Cases Catalogue.....	18
Figure 15: Digiprime use cases in the Digital Transformation Pathways Cases Catalogue	19
Figure 16: The Foresee Cluster Roadmap and Use case document, associated to all the projects of the cluster (on the EFFRA Innovation Portal)	20
Figure 17: The SERENA demonstrators on the EFFRA Innovation Portal	21
Figure 18: The ACE Factories cluster White paper on the EFFRA Innovation Portal.....	23
Figure 19: Searching ‘Operators’ in the structured wiki on the EFFRA Innovation Portal: the taxonomy section ‘Knowledge workers and operators’ appears.....	24
Figure 20: The taxonomy section ‘Knowledge workers and operators’ in the structured wiki includes the buttons that lead to the mapping of projects and demonstrators (clicking ‘mapped results’ leads to the following picture).	25
Figure 21: Clicking ‘mapped results’ on the taxonomy section ‘Knowledge workers and operators’ in the structured wiki leads to the overview of mapped demonstrators.	26

Executive Summary

The main intention of the catalogue 'Digital Transformation Pathway Cases and European demonstration Infrastructure' is to document the use cases and demonstrators generated by Industry 4.0 related research and innovation projects.

The catalogue includes of course use cases from the projects carried out under the call topic DT-ICT-07-2018-2019 (the same call topic to which the ConnectedFactories 2 CSA is associated), but the catalogue covers also use cases and demonstrators from other call topics within and beyond the Factories of the Future Partnership. Also, demonstrators developed by national-regional projects are included.

The collection of information and the mapping into the pathways developed by ConnectedFactories 2 builds on past work done at by EFFRA in relation to the project portfolio management of the Factories of the Future Partnership. Furthermore, it is supported by work done during the ConnectedFactories 1 CSA (Pathways, mapping framework in general with respect to digitalisation) and it builds on recent deliverables generated by ConnectedFactories 2 CSA.

The essential of the methodology of setting up the catalogue 'Digital Transformation Pathway Cases and European demonstration Infrastructure' is described in Deliverable 3.1 'Initial Scouting Collection and fine-tuned mapping methodology'. The supporting roles of other Deliverables and workshops organised by ConnectedFactories 2 with respect to the collection of information regarding uses cases and demonstrators in the second period of the CSA are also described in this deliverable.

This work is related to Industry 4.0 research and innovation projects. However, due to the close relationship among the CSA ConnectedFactories 2 and the Innovation Actions projects of the same call DT-ICT-07 2018/2019, the main focus of this work was to get as much information as possible on those projects. To this end, a series of bilateral meeting with some of these projects have been organised, specially to deepen on how the pilots have addressed aspects related with business models, interoperability and standards, as well as legal and human-related aspects. As a result of these meetings, and thanks to the enhancements on the EFFRA Innovation Portal, the use cases in the Catalogue have been directly linked to the deliverables and other documents that were already available in the portal, making it easier to find all the public information related with a specific case.

An additional source of use cases has been the use of public information, such as project cluster's documents that describe several use cases. Two examples have been used to add almost 40 new use cases. The respective projects have been already contacted, and in the coming weeks specific meetings will be organised to deepen a bit on these cases, to increase the quality of the information available.

The work done by all different involved tasks of ConnectedFactories 2 will support the dissemination of information on innovation projects and encourage SMEs to access success stories and best practices. And specifically, this deliverable summarises in practical and easy way many different aspects of the work done not only as part of the WP 3, but also in the whole ConnectedFactories 2 project.



1 Introduction

The main intention of the catalogue 'Digital Transformation Pathway Cases and European demonstration Infrastructure' is to document the use cases and demonstrators generated by Industry 4.0 related research and innovation projects.

The catalogue includes of course use cases from the projects carried out under the call topic DT-ICT-07-2018-2019 (the same call topic to which the ConnectedFactories 2 CSA is associated), but the catalogue covers also use cases and demonstrators from other call topics within and beyond the Factories of the Future Partnership. Also, demonstrators developed by national-regional projects are included.

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The essential of the methodology of setting up the catalogue 'Digital Transformation Pathway Cases and European demonstration Infrastructure' is described in Deliverable 3.1 'Initial Scouting Collection and fine-tuned mapping methodology'.

The first iteration of the "Digital Transformation Pathway Cases and European Demonstration Infrastructure", D3.2, described the supporting roles of other Deliverables and workshops organised by ConnectedFactories 2 with respect to the collection of information regarding uses cases and demonstrators in the first 18 months of the project. This second iteration reports, in a similar way, the contributions of the different workshops and deliverables carried out in the scope of the ConnectedFactories 2 CSA to support the catalogue in this second period of the project.

The [catalogue is integrated into the EFFRA Innovation Portal](#), assuring a seamless integration with the processes that are in place to collect information from a broad range of projects. This is in particular relevant since almost all projects that are associated to the Factories of the Future Partnership involve the deployment and/or the development of digital technologies.

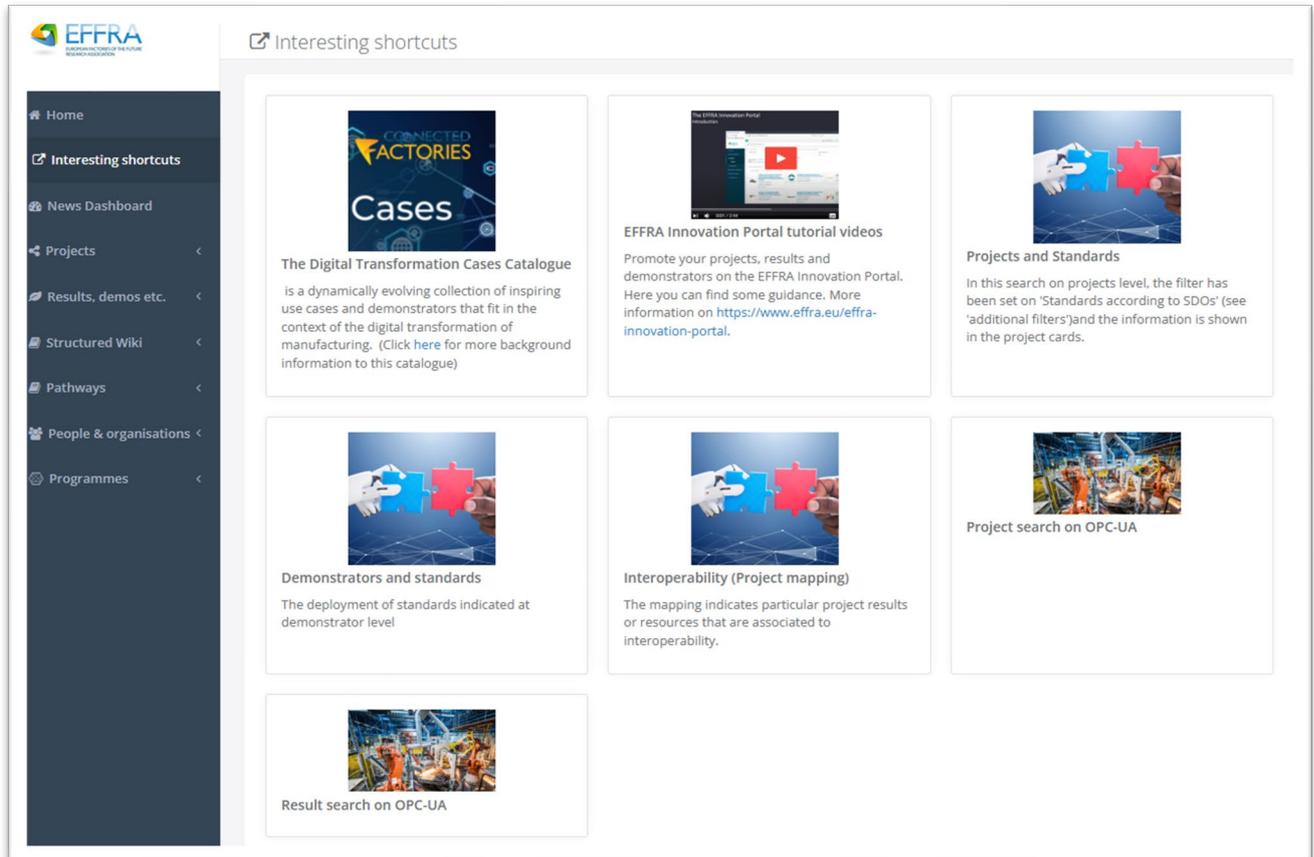


Figure 1: The digital transformation catalogue as one of the [main shortcuts on the EFFRA Innovation Portal](#).

2 Methodology/approach

2.1 Essentials

The essential of the methodology of setting up the catalogue ‘Digital Transformation Pathway Cases and European demonstration Infrastructure’ is described in Deliverable 3.1 ‘Initial Scouting Collection and fine-tuned mapping methodology’. The table of contents is included here below

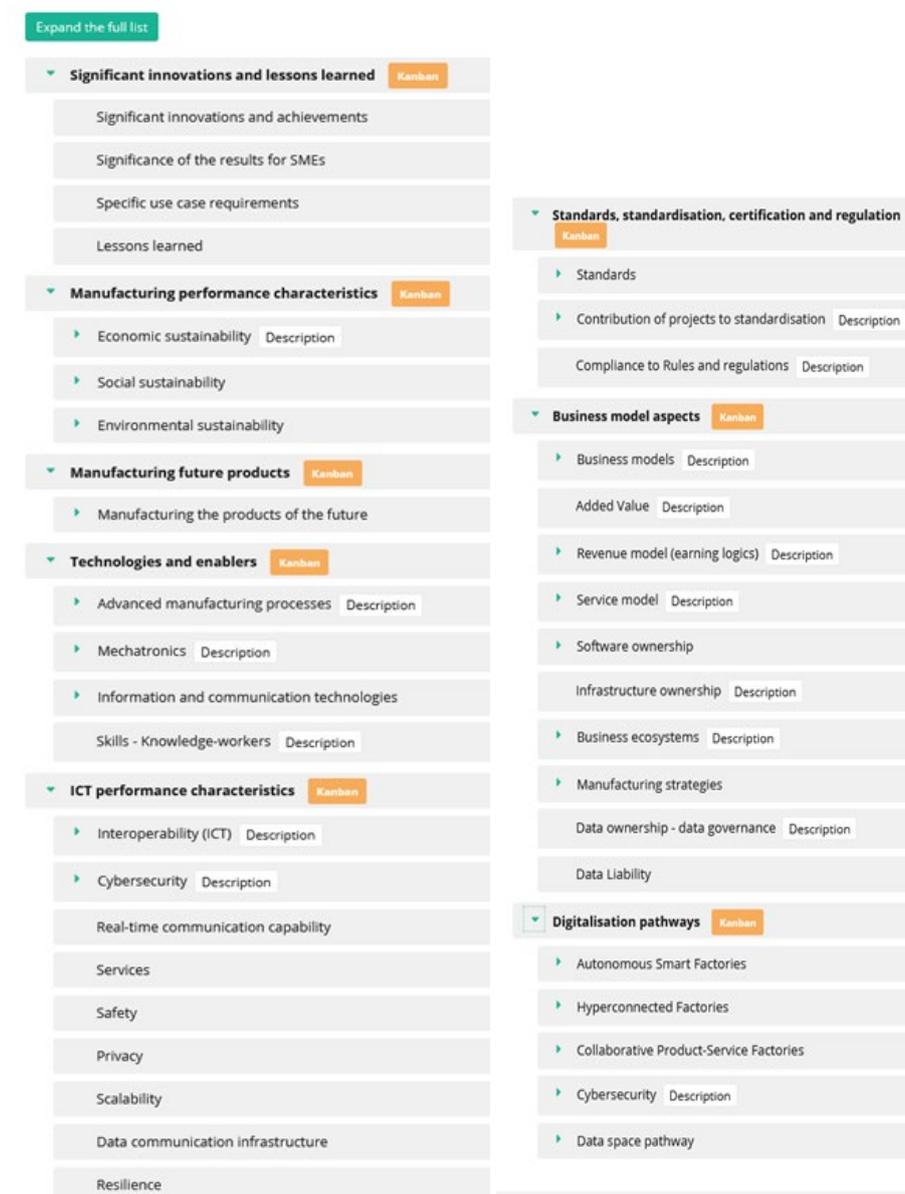
Executive Summary	4
1 Introduction.....	5
2 The mapping methodology	6
2.1 The general approach and the role of the EFFRA Innovation Portal.....	6
2.2 Including cases in the EFFRA Innovation Portal	7
2.3 Searching cases in the EFFRA Innovation Portal	8
2.4 The role of structured lists (including pathways) for mapping projects and their cases	10
2.5 ConnectedFactories mapping and information sharing and analysis	12
2.6 ConnectedFactories related deliverables	15
3 Fine-tuning of the methodology.....	16
3.1 The section on standards and standardisation	16
3.2 The pathway ‘Data spaces in Manufacturing’	18
3.3 The pathway ‘Circular economy in Manufacturing’	19
4 Scouting portfolio of cases	20
4.1 DT-ICT-07-18-19 project demonstrators	20
4.1.1 eFactory Pilots -	20
4.1.2 Qu4lity Pilots.....	20
4.1.3 ZDMP Pilots.....	21
4.2 Other relevant projects and associated cases.....	21
5 Conclusions – next steps	24

Figure 2: Essentials of the methodology – table of contents of Deliverable 3.1

2.2 Associated recent deliverables

As part of the work related to the Catalogue ‘Digital Transformation Pathway Cases and European demonstration Infrastructure’, it is needed to map the use cases according to the pathways and identify cross-cutting factors. In the meantime, the following deliverables have provided more information about the development of the overall framework within which cases and demonstrators can be mapped:

- **D1.3 ‘Structured wiki update on Business models, Legal aspects, interoperability, standardization, Cybersec and Human aspects – Second iteration’**
 - This deliverable describes the evolution of the structured lists that support the structured description of projects, project results and use cases/demonstrators.
 - This deliverable provides an overview of the revision of different items (‘taxons’) in the structured list (‘taxonomy lists’) of the structured wiki within the EFFRA Innovation Portal.



Expand the full list

- ▼ **Significant innovations and lessons learned** Kanban
 - Significant innovations and achievements
 - Significance of the results for SMEs
 - Specific use case requirements
 - Lessons learned
- ▼ **Manufacturing performance characteristics** Kanban
 - ▶ Economic sustainability Description
 - ▶ Social sustainability
 - ▶ Environmental sustainability
- ▼ **Manufacturing future products** Kanban
 - ▶ Manufacturing the products of the future
- ▼ **Technologies and enablers** Kanban
 - ▶ Advanced manufacturing processes Description
 - ▶ Mechatronics Description
 - ▶ Information and communication technologies
 - Skills - Knowledge-workers Description
- ▼ **ICT performance characteristics** Kanban
 - ▶ Interoperability (ICT) Description
 - ▶ Cybersecurity Description
 - Real-time communication capability
 - Services
 - Safety
 - Privacy
 - Scalability
 - Data communication infrastructure
 - Resilience
- ▼ **Standards, standardisation, certification and regulation** Kanban
 - ▶ Standards
 - ▶ Contribution of projects to standardisation Description
 - Compliance to Rules and regulations Description
- ▼ **Business model aspects** Kanban
 - ▶ Business models Description
 - Added Value Description
 - ▶ Revenue model (earning logics) Description
 - ▶ Service model Description
 - ▶ Software ownership
 - Infrastructure ownership Description
 - ▶ Business ecosystems Description
 - ▶ Manufacturing strategies
 - Data ownership - data governance Description
 - Data Liability
- ▼ **Digitalisation pathways** Kanban
 - ▶ Autonomous Smart Factories
 - ▶ Hyperconnected Factories
 - ▶ Collaborative Product-Service Factories
 - ▶ Cybersecurity Description
 - ▶ Data space pathway

Figure 3: [The Structure Wiki entry page](#) (with access to index-based search on top)

- **D1.4 ‘Report summarizing main contributions to other WPs – Second Iteration’**
 - This deliverable provides insight in cross-cutting aspects, such as cybersecurity, standards, interoperability, skills aspects, business model aspects and legal agreements and provides pointers to projects and their relation to these cross-cutting aspects.

- **D2.5 ‘Pathways instantiation from DT-ICT-07 domains – First Iteration’**
 - This deliverable aims to instantiate the Circular Economy pathway within the four domains of the DT-ICT-07 (i.e. (1) Agile Value Networks: lot-size one, (2) Excellence in manufacturing: zero-defect processes and products, (3) The human factor: human competences in synergy with technological progress, (4) Sustainable Value Networks: manufacturing in a circular economy) among which the DMP cluster was born.

- **D2.6 ‘Pathways cross-fertilisation with Digital Technologies – First Iteration’**
 - This deliverable is the second release of CF2 cross-fertilisation with new trends and roadmaps from the domain of Digital Technologies. It is concentrated on the so-called “Data Revolution”, i.e., how Data Economy could affect and influence the business of Manufacturing companies and how the Manufacturing industry is ready to fully adopt the potential benefits of this revolution. It is also especially focused on AI, Cybersecurity and HPC/Cloud/Edge in line with the main technologies at the basis of next 2021-2027 Digital Europe Programme.

3 Catalogue on EFFRA Innovation Portal

The [catalogue is integrated into the EFFRA Innovation Portal](#), assuring a seamless integration with the processes that are in place to collect information from a broad range of projects. This is in particularly relevant since almost all projects that are associated to the Factories of the Future Partnership involve the deployment and/or the development of digital technologies. As described in Deliverable 1.1, the structured wiki within the EFFRA Innovation Portal serves also as a mapping framework for the structured description of project, project results and demonstrators.

This Catalogue was launched on 7 June 2021, supported by an animated picture (see Deliverable 6.4). See the associated article on the [Connected Factories website](#).

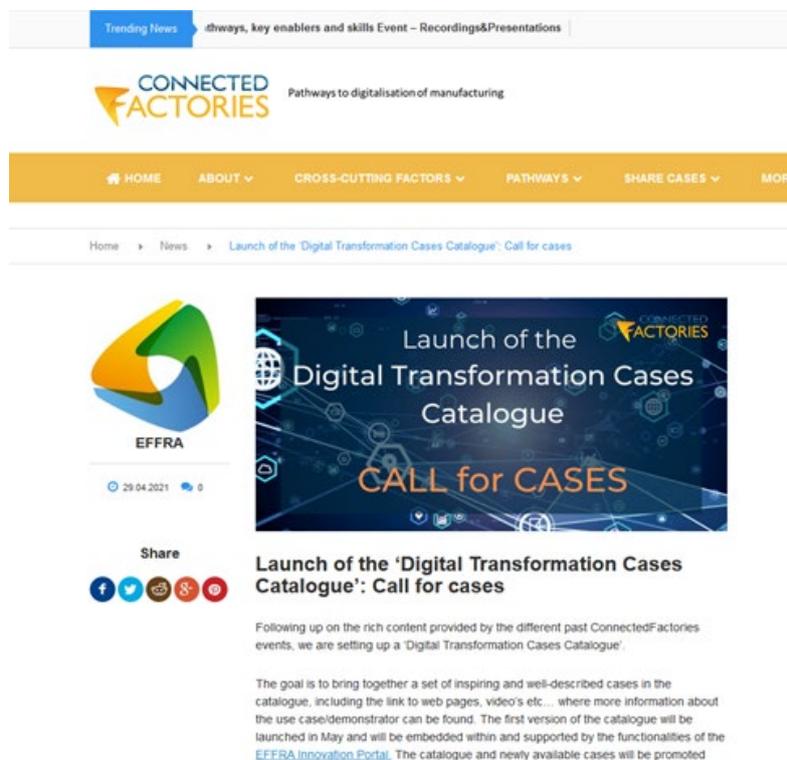


Figure 4: Launch of the Digital Transformation Cases Catalogue

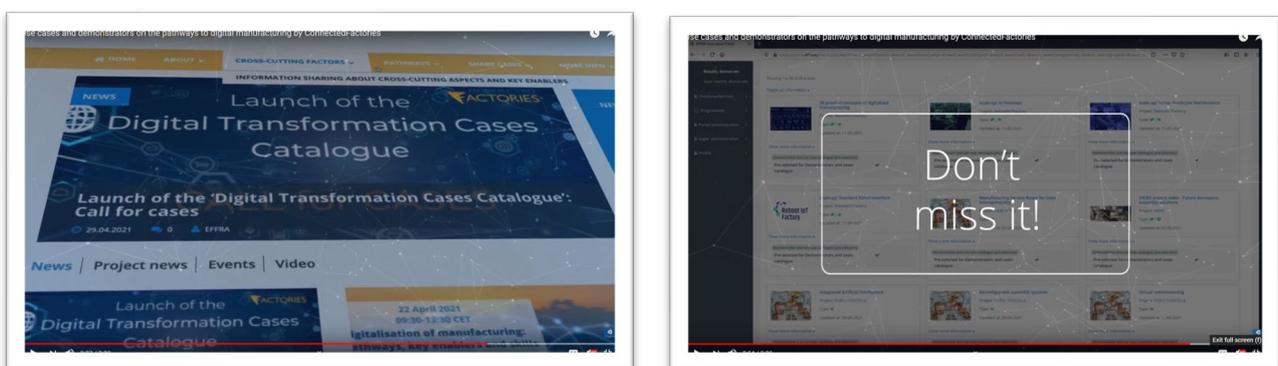


Figure 5: Screenshots from the animated picture that supports the launch of the catalogue

Projects, results and use cases are indexed through any text field, including the structured lists. In addition, structured lists allow filtering of projects and results/demonstrators that have been explicitly assigned in structured lists (covering standards, business model aspects, pathways etc).

The EFFRA Innovation Portal, and therefore the ‘Digital Transformation Pathway Cases and European demonstration Infrastructure’ catalogue, allows specific searches on particular topics. For instance:

Demonstrators associated to the Smart Autonomous Factories Pathway:

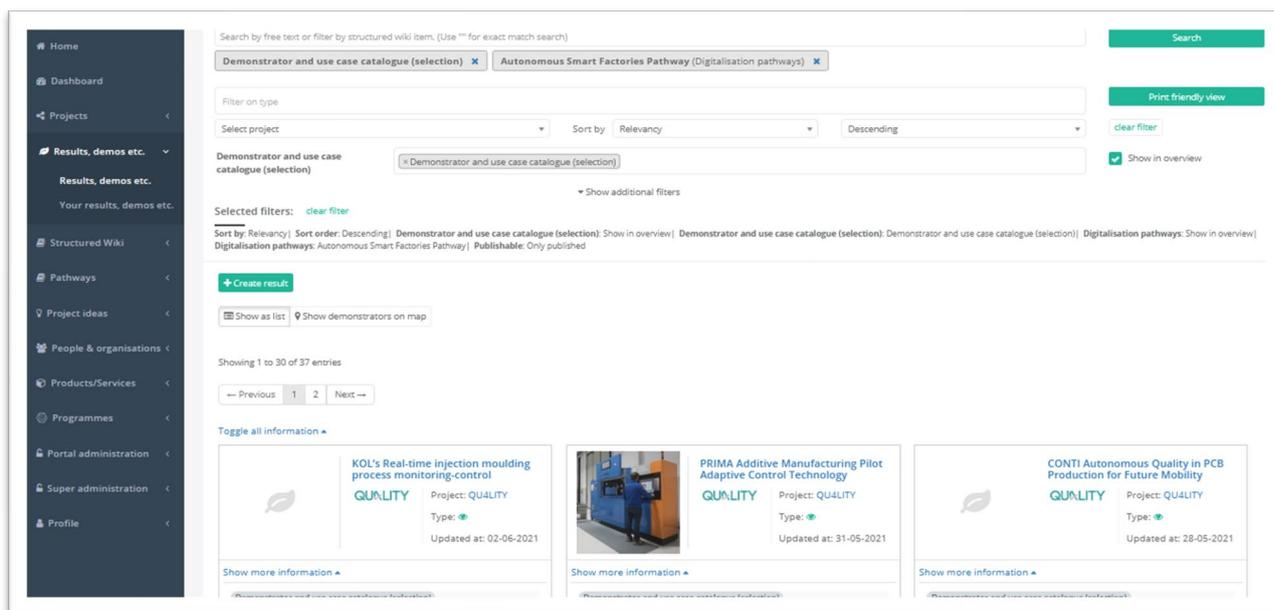


Figure 6: Filter on Catalogue - Smart Autonomous Factories Pathway (click picture to access)

Demonstrators associated to the Hyperconnected Factories Pathway:

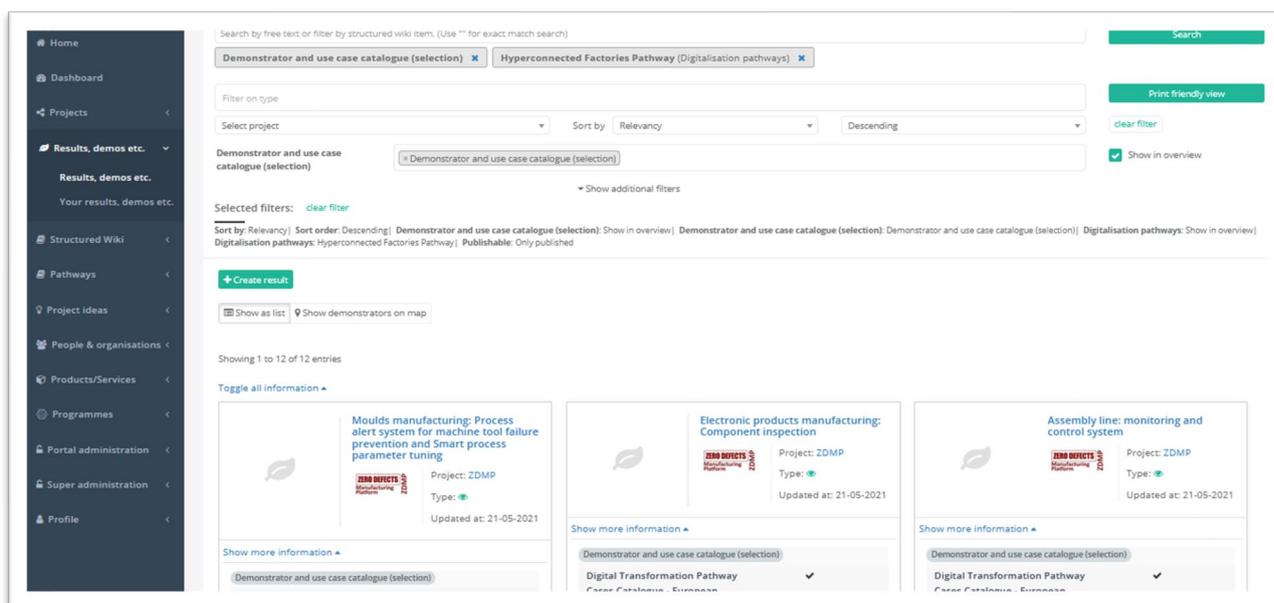


Figure 7: Filter on Catalogue – Hyperconnected Factories Pathway (click picture to access)



3.1 EFFRA Portal enhancements for better documenting the cases

In this second period of the CSA, and as a result of the workshops held with the DT-ICT-07 projects (see Section 4 of this document), the catalogue content has been enhanced in order to link the use cases in the catalogue with the public deliverables of the project, as well as any other resource (videos, presentations, demos...) that is included on the EFFRA Innovation Portal.

The screenshot shows a web page for a demonstrator project titled 'WHR Dryer Factory Holistic Quality Platform'. The page is organized into several sections:

- Summary:** Contains a detailed description of the pilot project, including its goals, the MPFQ-model acronym, and a list of key elements: Material, Process, Function, and Quality. It also describes the production process and data integration.
- More information:** A simple table with 'Country:' and 'IT'.
- More details:** Includes a 'Quick navigation' section with links to 'Resource tags - (1)', 'Significant innovations and lessons learned - (1)', 'Technologies and enablers - (3)', 'Pathways - (9)', and 'Demonstrator and use case catalogue (selection) - (1)'. There is also a 'Resource tags (1) view' section.
- Associated resources:** A section titled 'Associated resources' with a 'Comment:' header and a list of four links:
 - Associated to (11531): D7.2 Detailed Pilot Specification and Report on Pilot Sites Preparation (Final Version)
 - Associated to (4407): Zero Defects Processes Pilots (Version 1)
 - Associated to (4540): Whirlpool Pilot - Qu4lity - Presentation 24 March 2021
 - Associated to (200753): Paper - RMPFQ: A Quality-Oriented Knowledge Modelling Method for Manufacturing Systems Towards Cognitive Digital Twins

Figure 8: The associated resources in the pilot content links the pilot with other resources available at the Structured Wiki

This new functionality (which is being fine-tuned also after the submission of this deliverable), which created greater insights in the relations between public information and resources. It significantly improves the visibility of additional information, since from the general description of the pilot one can quickly and easily access documents that provide more detailed information, either through project deliverables or through videos, presentations or other documents.

Furthermore, the link works both ways, i.e. when viewing the document in the structured wiki we also see the link to the different related use cases, and also to other resources, such as other deliverables, videos, etc.



Result / Report / Qu4lity-Pilots_specs_Final
D7.2 Detailed Pilot Specifications and Pilot Sites Preparation

Summary

This document gives overview of all Pilots regarding specifications and preparations. The pilots have got a central location in the Qu4lity project. It is area where requirements, architecture, knowledge regarding ZDM have to show their real potential. By implementing the needed items to fulfill the needs within the Pilots.

The QU4LITY project demonstrates its data-driven ZDM product and related services in a combination of **five strategic ZDM plug & control lighthouse equipment pilots**

- Pilot #9: GHI Real-time cognitive hot stamping furnace 4.0
- Pilot #11: PRIMA Additive Manufacturing Pilot Adaptive Control Technology
- Pilot #12: Danobat Digital Machine for zero-defects at high precision cutting/grinding
- Pilot #13: FAGOR Zero-Defects Manufacturing Digital Press Machine
- Pilot #14: GF Digital machine and part twins for zero defect manufacturing

as well as **nine production lighthouse facility pilots**.

- Pilot #1: PHILIPS OneBlade shaving unit production line
- Pilot #2: SIEMENS SIMATIC Products Quality Improvements
- Pilot #3: CONTI Autonomous Quality in PCB Production for Future Mobility
- Pilot #4: WHR Dryer Factory Holistic Quality Platform
- Pilot #5: MONDRAGON Zero defect and Autonomous Quality in Machinery Building for Capital Goods sector
- Pilot #6: KOL's Real-time injection moulding process monitoring-control
- Pilot #7: THYS Quality Management of Steering Gear based on Acoustic control
- Pilot #8: AIRBUS Trade space frame
- Pilot #10: RiaStone Autonomous C

Besides global planning, agreed way of work

- General description of each pilot
- Involved partners per pilot
- Current state
- Future state
- Detailed plan
- Expected results
- Preparatory results

More information

Web resources: <https://qu4lity-project.com/>

More details

Quick navigation [toggle all lists](#)

Resource tags (1)

Significant innovations and lessons learned

Resource tags (1) [view](#)

These tags are included to filter the content

RELEVANT ITEMS: [view structured details by](#)

Associated resources

Associated resources

Comment:

- Associated to (4407): Zero Defects Processes Pilots (Version 1)
- Associated to (4406): Zero Defects Machines Pilots (Version 1)
- Associated to (3914): SIEMENS PILOT
- Associated to (3916): WHIRLPOOL PILOT
- Associated to (3921): RIASTONE PILOT
- Associated to (3918): KOLEKTOR PILOT
- Associated to (3919): THYSSENKRUPP
- Associated to (3915): CONTINENTAL PILOT
- Associated to (3920): AIRBUS PILOT
- Associated to (3917): MONDRAGON PILOT
- Associated to (3913): PHILIPS PILOT
- Associated to (3925): GF PILOT
- Associated to (3922): PRIMA PILOT
- Associated to (3924): FAGOR PILOT
- Associated to (3923): DANOBAT PILOT
- Associated to (3973): GHI PILOT

Figure 9: Links of one deliverable with the different [Qu4lity pilots](#) and to other documents in the Structured Wiki

4 Collaboration with the DT-ICT-07 projects

4.1 Cataloguing the pilots

In this final period of the project the collaboration between the CSA and the DT-ICT-07 project has been very intense. The CSA has provided support to all the projects in the process of including the use cases in the Catalogue and also in mapping them into the Digital Transformation Pathways.

As a result of this collaboration, 44 use cases from these projects are included in the Catalogue, most of them also mapped into the Digital Transformation Pathways, and also, as introduced in the previous section of this document, with direct links to the deliverables of the project and other resources (videos, etc.).

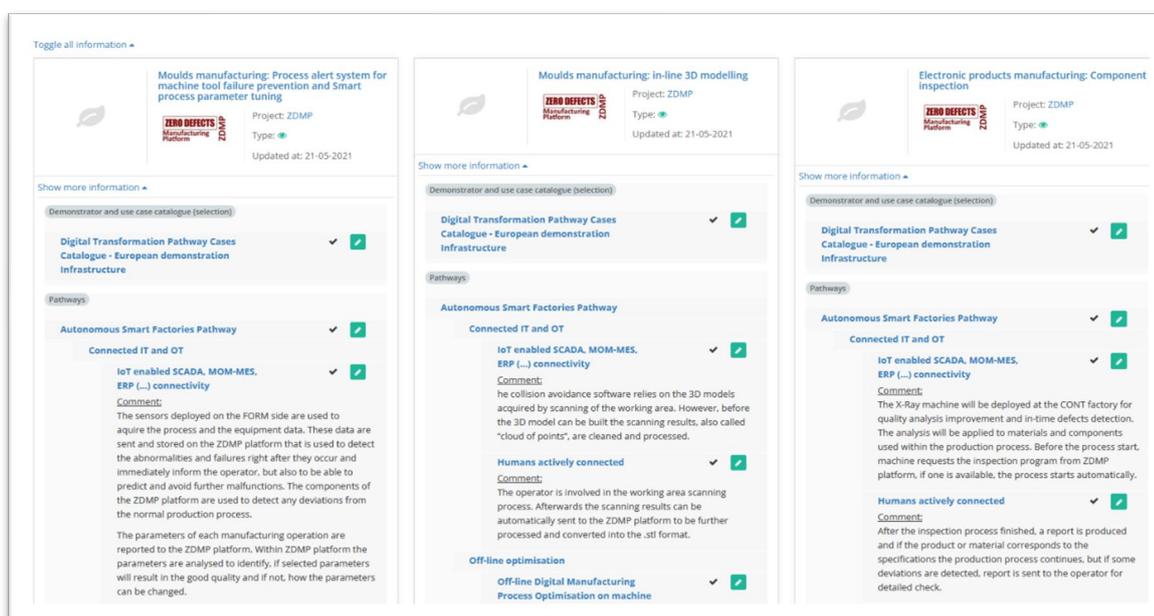


Figure 10: ZDMP Use cases in the Digital Transformation Pathway Cases Catalogue, mapped on the Autonomous Smart Factories pathway

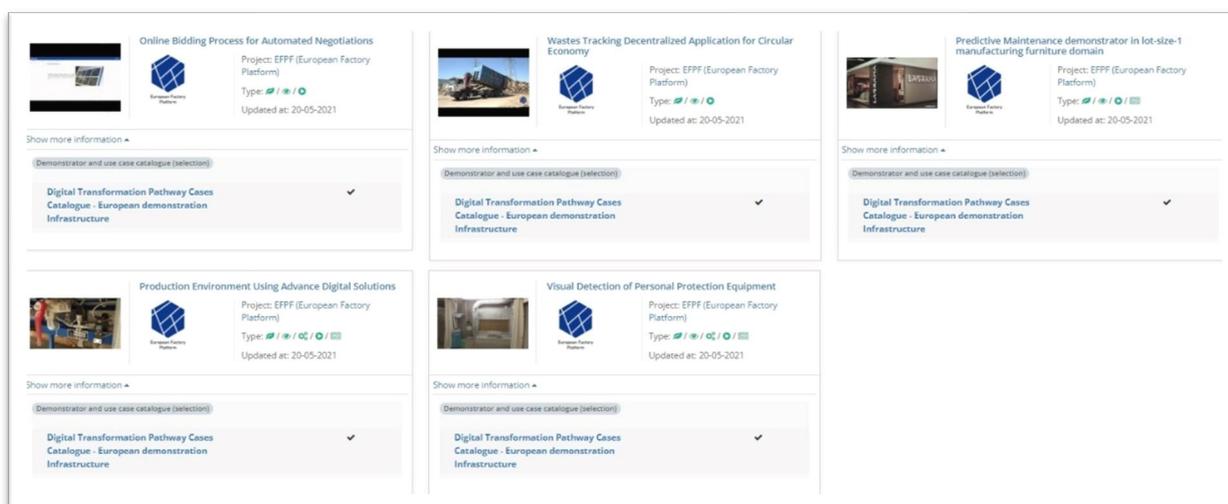


Figure 11: EFPF use cases in the Digital Transformation Pathway Cases Catalogue

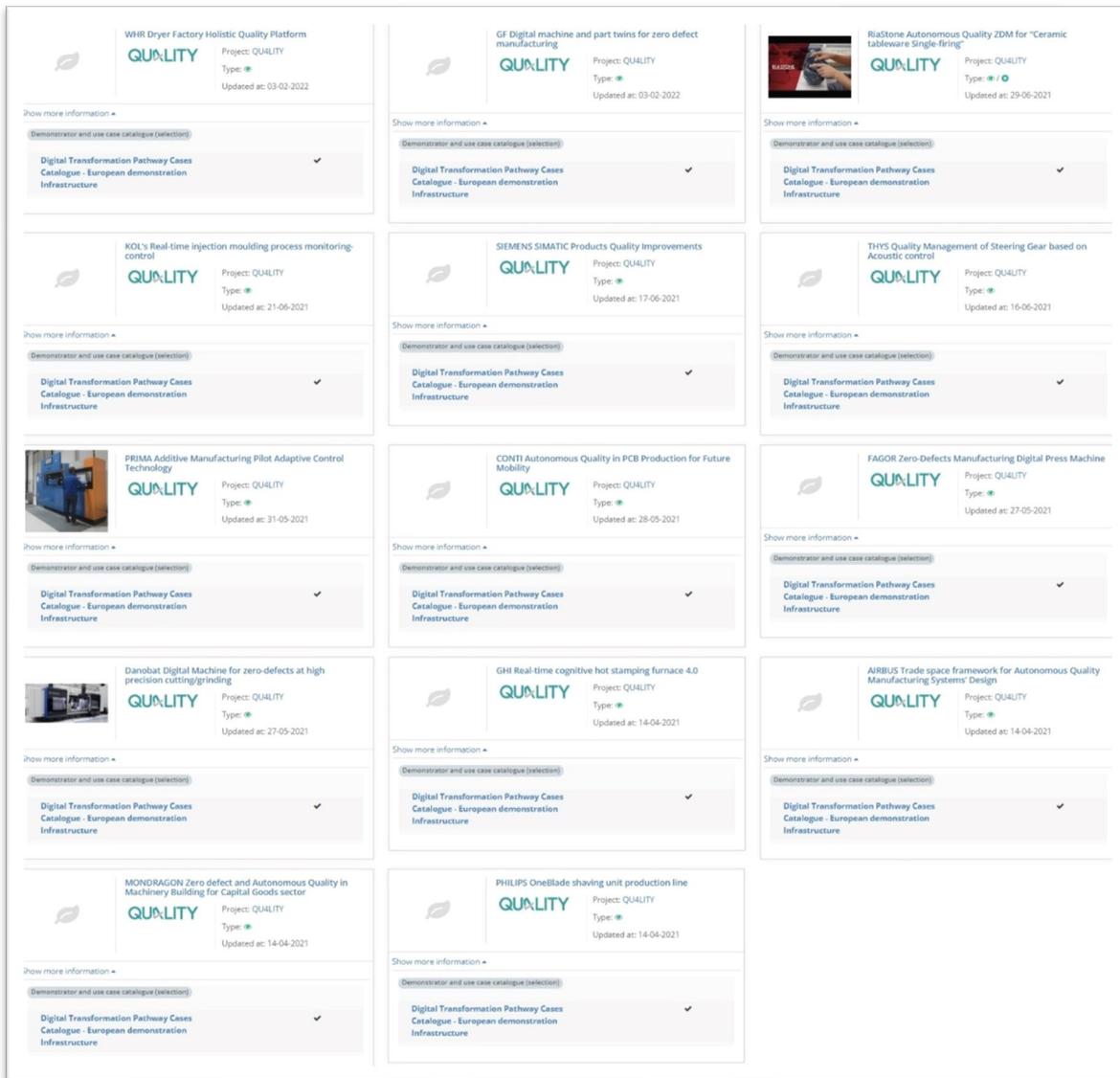


Figure 12: QUALITY use cases in the Digital Transformation Pathway Cases Catalogue

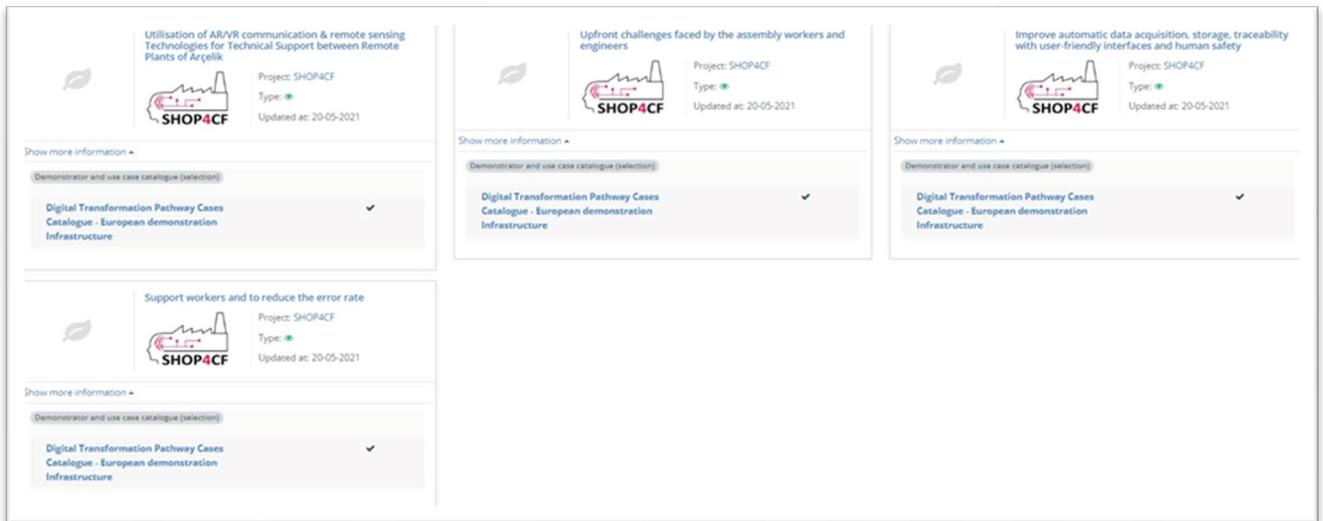


Figure 13: SHOP4CF use cases in the Digital Transformation Pathways Cases Catalogue

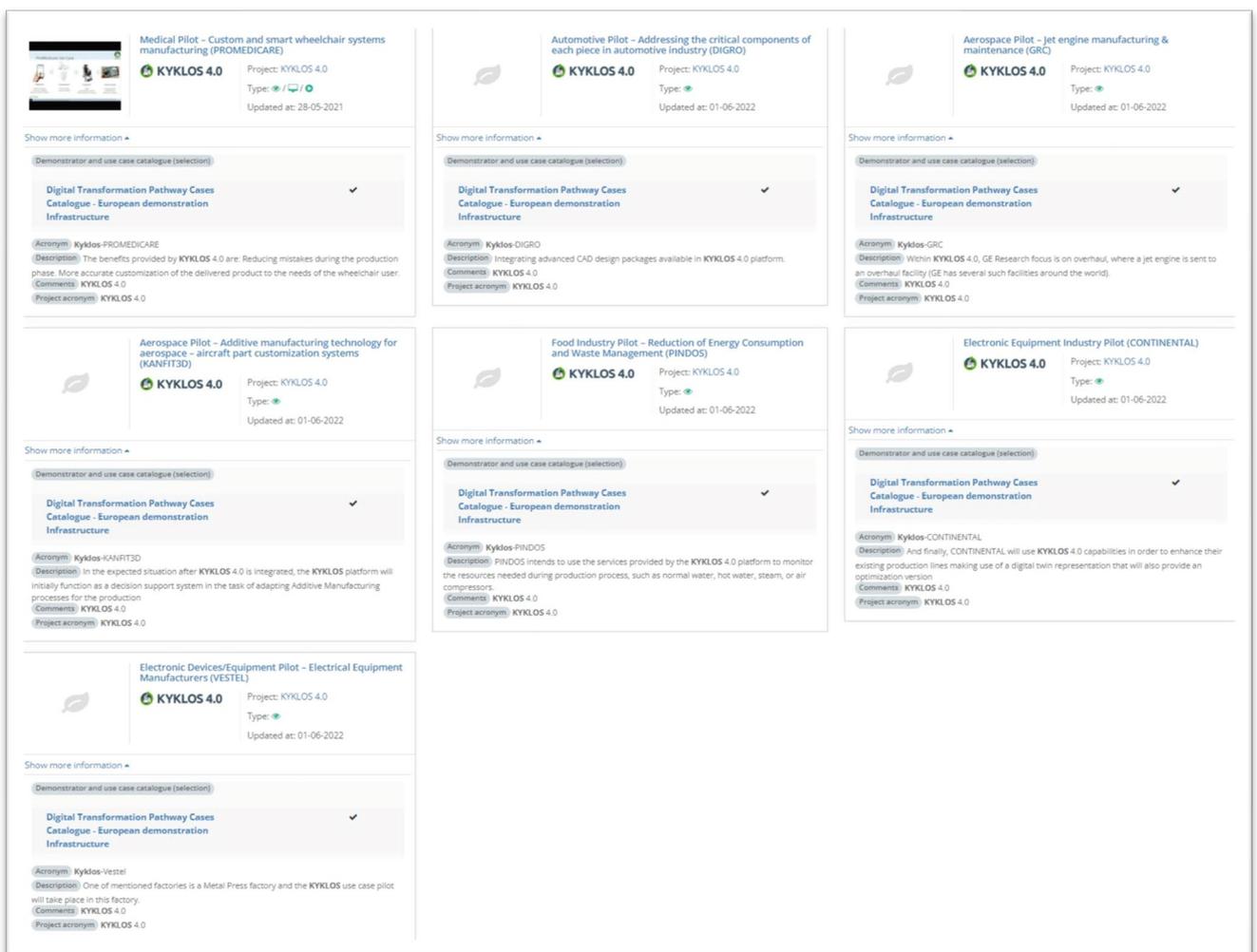


Figure 14: KYKLOS 4.0 use cases in the Digital Transformation Pathways Cases Catalogue

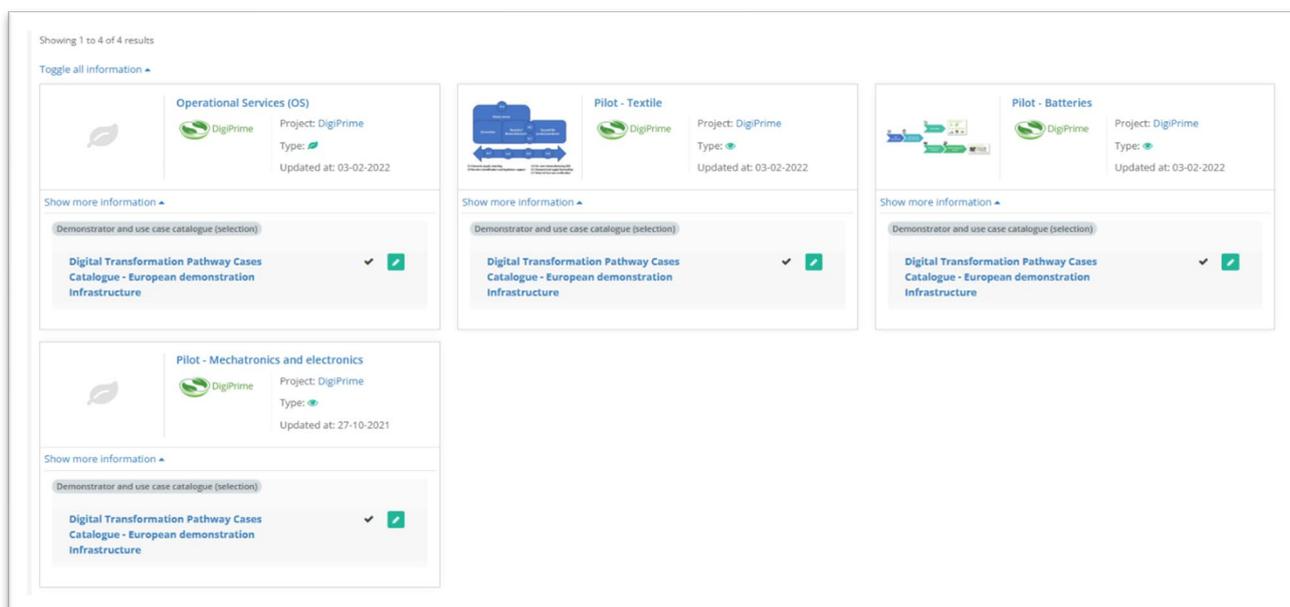


Figure 15: DigiPrime use cases in the Digital Transformation Pathways Cases Catalogue

4.2 Bilateral meetings with some of the projects

With the aim of improving the description of how the pilots of the projects have addressed some specific key cross-cutting aspects such as interoperability and standards, business models and legal aspects, human aspects and cybersecurity aspects in their implementation, a series of bilateral meetings have been organised with most of the DT-ICT-07 projects.

Table 1: Bilateral meeting dates and topics

Project	Date	Main topics
QU4LITY	Feb 3 rd	Business models & legal aspects Standards & Interoperability aspects Human aspects
EFPF	Apr 13 th	Standards aspects
EFPF	Apr 19 th	Business models & legal aspects
EFPF	Apr 25 th	Interoperability aspects
ZDMP	May 3 rd	Business models & legal aspects
ZDMP	May 5 th	Interoperability & Standards aspects
ZDMP	May 3 rd	Human aspects
DigiPrime	July 25 th	Skills & Human aspects
DigiPrime	July 26 th	Business models & legal aspects
DigiPrime	July 27 th	Standards & Interoperability aspects

The outcomes of these meetings have enabled significant process on the work packages that deal with different aspects addressed in each meeting, and also have helped to improve the mapping and the description of the Use Cases.

4.3 Using structured public information generated by other project clusters to further enhance the Catalogue

Besides the contributions from the ConnectedFactories II CSA partners, as well as the DT-ICT-07 projects, the Digital Transformation Pathways Cases Catalogue is constantly being fed by public information about pilots and trials generated by other project cluster. Some examples of documents that have been used to enlarge the number of use cases in the Catalogue are described in this section.

Not only the information is included in the Catalogue, but also the project leaders have been contacted to engage them in the task of improving the description and enriching the information available for each case.

4.3.1 Foresee Cluster Whitepaper on Predictive Maintenance Technologies

ForeSee Cluster aims to develop sustainable predictive maintenance solutions for the factory of the future. The main objective of the cluster is to create a roadmap for predictive maintenance, which may serve as a guideline for companies that want to adapt and adopt predictive maintenance solutions. The ForeSee Cluster consists of six European projects, which are funded under the EU H2020 FoF-09-2017 call – Novel design and predictive maintenance technologies for increased operating life of production systems.

The whitepaper “Predictive maintenance technologies for production systems. A roadmap to development and implementation” provides insight and lessons learned by applying the key enabling technologies that can be utilised to implement the vision for predictive maintenance in factories on several ForeSee cluster projects’ industrial pilot cases.

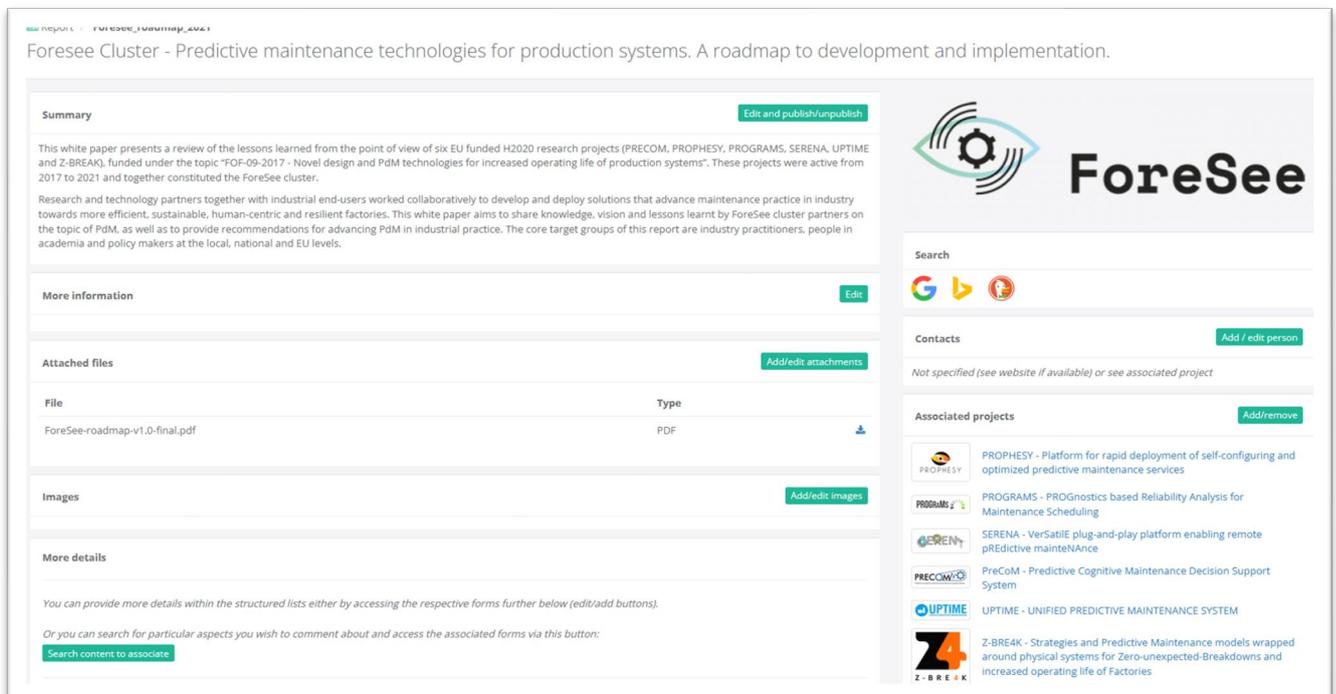


Figure 16: The Foresee Cluster Roadmap and Use case document, associated to all the projects of the cluster (on the EFFRA Innovation Portal)

All the pilots that are described in this Foresee Cluster document are now also available on the EFFRA Innovation Portal and have been associated to the Digital Transformation Catalogue (the hyperlinks below point the EFFRA Innovation Portal):

SERENA system and industrial pilots:

- Robotics use case
- Steel industry use case
- Metrology equipment use case
- White goods use case
- Elevators production use case

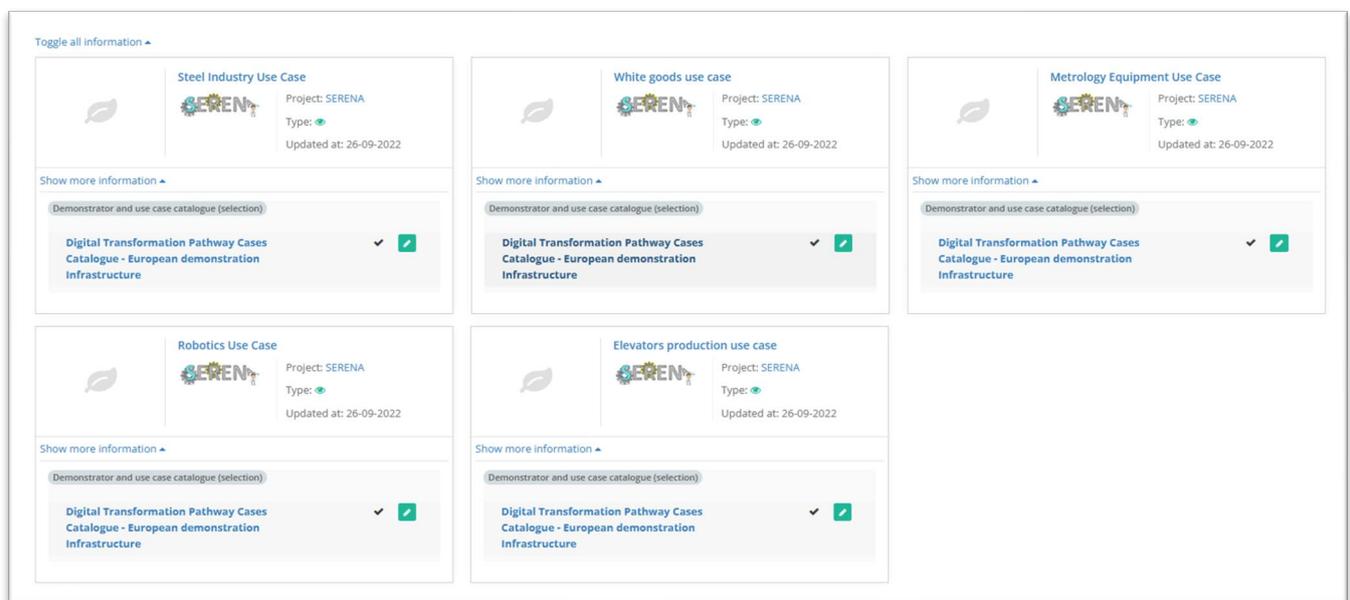


Figure 17: The SERENA demonstrators on the EFFRA Innovation Portal

UPTIME systema and industrial pilots:

- Whirlpool use case: Drum Dryer Production Line
- MAILLIS use case: Cold Rolling Mill
- FTT use case: Transportation Logistics

ZBRE4K system and industrial pilots:

- Philips use case
- Gestamp use case
- Sacmi/CDS use case

PROGRAMS system and industrial pilots:



- Milling machine tool use case: Aurrenak production line
- Robot-assisted welding use case: Calpak pilot line

PRECOM system and industrial pilots:

- Low volume manufacturing: Sakana Production Line
- High volume manufacturing: Spinea Production Line
- Continuous manufacturing: Goma Camps Produccion Line

PROPHECY system and industrial pilots:

- RUL prediction for production tooling
- AR assisted (remote) maintenance

4.3.2 ACE Factories Whitepaper on Human-Centered Factories

Five projects funded under the European Union’s Horizon 2020 research and innovation programme – A4BLUE, Factory2Fit, HUMAN, INCLUSIVE, and MANUWORK – have developed solutions for manufacturing work environments that adapt to each individual worker. The project have grouped themselves under the ‘ACE Factories’ project cluster.

In the past, people were expected to adapt to machine requirements. Now, automation systems are being developed that can recognise the users, remember their capabilities, skills and preferences, and adapt accordingly. Adaptation can also make work organisation more flexible so that individual preferences are taken into account in task distribution. New automation approaches, with workers at the centre, will complement people’s capabilities and ensure higher performance, adaptability and quality.

The purpose of the white paper “Human-centered factories from theory to industrial practice. Lessons learned and recommendations.” is to share the ACE Factories cluster understanding of future human-centred factories and to provide recommendations on how to get this vision into industrial practice.

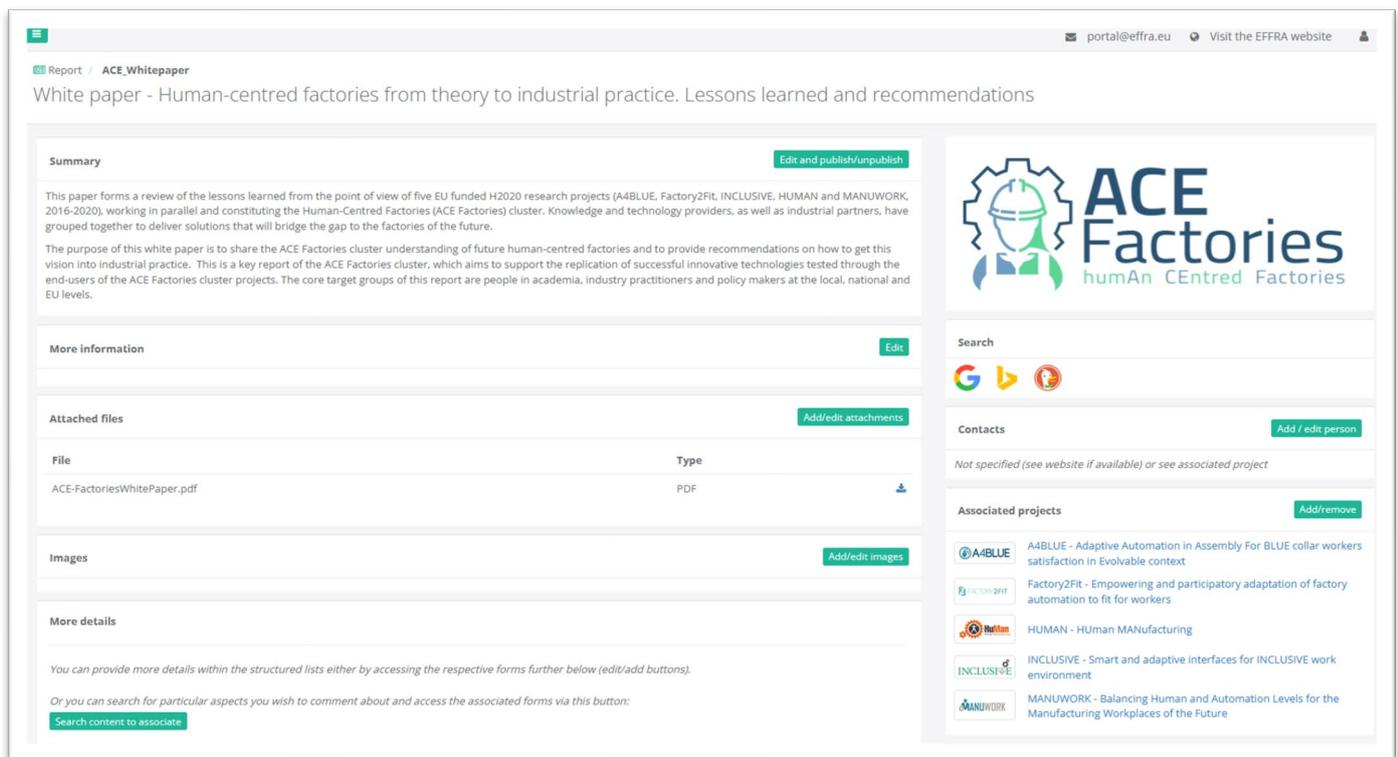


Figure 18: The ACE Factories cluster White paper on the EFFRA Innovation Portal

Besides describing the state-of-the-art methods and enabling technologies that can be utilised in order to implement the vision for future human-centered factories, it provides insights and lessons learned of applying those technologies upon several ACE Factories cluster projects' industrial pilot cases.

The demonstrators of the respective projects can be found via the links below:

- [INCLUSIVE | Smart and adaptive interfaces for INCLUSIVE work environment](#)
- [HUMAN | HUman MANufacturing](#)
- [MANUWORK | Balancing Human and Automation Levels for the Manufacturing Workplaces of the Future](#)
- [Factory2Fit | Empowering and participatory adaptation of factory automation to fit for workers](#)
- [A4BLUE | Adaptive Automation in Assembly For BLUE collar workers satisfaction in Evolvable context](#)

The full list of demonstrators:

- AIRBUS pilot case: Towards a next generation hydraulic system Automation and VR/AR
- UTC pilot case: AR Assembly Guidance (ARAG) Solution – supporting workers in procedural tasks
- Prima Power pilot case: Hands-on pre-training in a virtual environment
- COMAU use case: workplace optimization and operator mental support
- PRIMA use case: AR training and support for bending operations

- Lantegi use case: AR assisted assembly of electrical boards
- CESA use case: Assembly and auxiliary operation of the Main Landing Gear Retractor Actuator
- RWTH lab use case: Assembly and auxiliary operation in automotive final assembly
- Continental use case: Co-design
- Volvo use case: AR visualization of industrial simulation
- UTC pilot case: On-the-job learning
- Prima Power pilot case: Social Media Platform – engaging worker participation and knowledge sharing
- ROYO use case: short term physical and mental support
- IK4-TEKNIKER lab use case: Collaborative assembly of latch valve
- Continental pilot case: Task Distribution Engine – Multi criteria dynamic task prioritization and scheduling
- SCM use case: new HMI for woodworking machines
- SILVERLINE use case: introduction of a robotic cell in the production shop floor
- E80 use case: management of intralogistics flows in complex production lines
- Prima Power pilot case: Worker feedback dashboard – empowering feedback on work well-being and achievements

Mapping on taxonomy section ‘Knowledge-workers and operators’

As reported in deliverable 1.3 about updates done to the structured wiki, a taxonomy section ‘Knowledge-workers and operators’ was further fine-tuned. This taxonomy section is based on the ACE project cluster white paper, which also included a mapping of the demonstrators generated by that project cluster to these ‘Operator types’. This mapping was therefore also included on the portal, associating the specific demonstrators to the respective operator types, as illustrated in the pictures (and links) below.

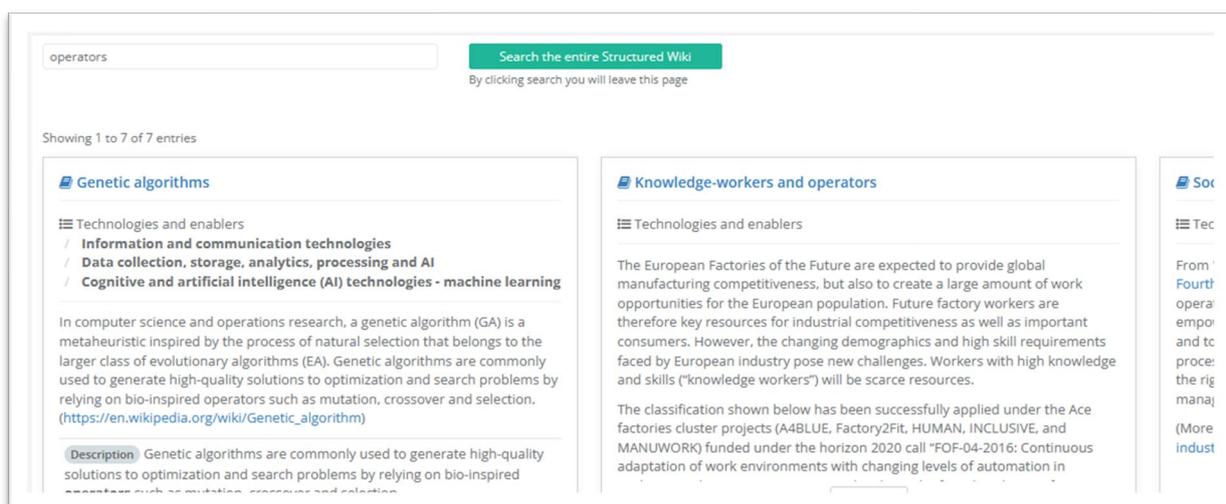


Figure 19: Searching ‘Operators’ in the structured wiki on the EFFRA Innovation Portal: the taxonomy section ‘[Knowledge workers and operators](#)’ appears.

Knowledge-workers and operators

The European Factories of the Future are expected to provide global manufacturing competitiveness, but also to create a large amount of work opportunities for the European population. Future factories as important consumers. However, the changing demographics and high skill requirements faced by European industry pose new challenges. Workers with high knowledge and skills ("knowledge workers") are expected to be the main consumers of automation in evolving production systems". More details can be found in The ACE factories White paper - Human-centred factories from theory to industrial practice. Lessons learned and

- Augmented and Virtual Worker
- Social worker - operator
- Collaborative worker (Human-Robot cooperation)
- Super-strong worker
- Health and happy operator
- Smarter and Analytical operator

[Mapped projects \(48\)](#)
[Mapped results \(35\)](#)
[Mapped demos \(29\)](#)
[Key content](#)

[Associate your results, demos, ...](#)
[Associate your projects](#)

Augmented and Virtual Worker	Mapped projects (6)	Mapped results (19)	Mapped demos (17)
Social worker - operator	Mapped projects (7)	Mapped results (7)	Mapped demos (5)
Human-Robot Collaboration	Mapped projects (20)	Mapped results (5)	Mapped demos (4)
Super-strong worker (wearable apparatus)	Mapped projects (5)	Mapped results (3)	Mapped demos (1)
Healthy and happy operator	Mapped projects (6)	Mapped results (20)	Mapped demos (18)
Smart and Analytical operator	Mapped projects (7)	Mapped results (12)	Mapped demos (10)
One of a kind operator	Mapped projects (4)	Mapped results (12)	Mapped demos (11)

Figure 20: The taxonomy section '[Knowledge workers and operators](#)' in the structured wiki includes the buttons that lead to the mapping of projects and demonstrators (clicking 'mapped results' leads to the following picture).

The screenshot shows a grid of project cards in a digital transformation cases catalogue. Each card includes a project title, logo, project name, type, and update date. Below this is a 'Technologies and enablers' section with a 'Knowledge-workers and operators' sub-section. This sub-section lists specific roles with checkmarks and green checkmark icons, indicating 'mapped results'.

Project Title	Project Name	Type	Updated at	Augmented and Virtual Worker	Healthy and happy operator	One of a kind operator	Social worker - operator
UTC Pilot - AR Assembly Guidance (ARAG) Solution - supporting workers in procedural tasks	Project: Factory2Fit	Type: ●	Updated at: 05-10-2022	✓	✓		
Continental Pilot: Participatory Design Tool	Project: Factory2Fit	Type: ●	Updated at: 05-10-2022	✓	✓		✓
UTC Pilot: On-the-job Learning	Project: Factory2Fit	Type: ●	Updated at: 04-10-2022		✓		✓
Prima Power Pilot - Hands-on pre-training in a virtual environment	Project: Factory2Fit	Type: ●	Updated at: 04-10-2022	✓	✓	✓	
Prima Power Pilot - Social Media Platform - Engaging worker participation and knowledge sharing	Project: Factory2Fit	Type: ●	Updated at: 04-10-2022		✓		✓
SCM Use Case: New HMI for woodworking machines	Project: INCLUSIVE	Type: ●	Updated at: 04-10-2022	✓	✓	✓	

Figure 21: Clicking 'mapped results' on the taxonomy section 'Knowledge workers and operators' in the structured wiki leads to the overview of mapped demonstrators.

5 Conclusions

In this second period of the project the [‘Digital Transformation Pathway Cases Catalogue and European demonstration Infrastructure’](#) has been populated with a significant number of additional use cases from several sources, mainly from European funded projects but also from national/regional projects. Valuable contributions from the DT-ICT-07 projects but also from the different partners of the ConnectedFactories 2 CSA, as well as from DIH have helped to put together a fairly large and complete Catalogue, including and linking previously existing information on the EFFRA Innovation Portal, such as project deliverables, documents and videos.

The work done by all different involved tasks of ConnectedFactories 2 have supported the dissemination of information on innovation projects and encouraged SMEs to access success stories and best practices. And specifically, this deliverable summarises in practical and easy way many different aspects of the work done not only as part of the WP 3, but also in the whole ConnectedFactories 2 project. A clear example of this are the bilateral meeting with some of the DT-ICT-07 projects that have helped to improve the information about the cases of those projects that were previously included in the Catalogue, and also contributed to the work carried out in WP1, WP2 and WP4.

The Digital Transformation Pathway Cases Catalogue main objective is to become a centralised point of information for the European Industry to explore the application of innovative technologies to the industry as well as the best practices in the field of innovation and digitalisation. Building this catalogue within the EFFRA Innovation Portal guarantees its permanence, maintenance and constant enrichment beyond the ConnectedFactories CSA.

Annex I: Extraction from the catalogue

This is an extraction from the EFFRA Innovation Portal (at the time of submission of this deliverable) of the use cases that have been included in the catalogue.

- Project: [A4BLUE](#) - Result: [Landing gear retraction actuator assembly: Manual deburring operation | Assembly process \(CESA\)](#)
- Project: [A4BLUE](#) - Result: [Collaborative assembly in a fenceless environment \(IK4-TEKNIKER\)](#)
- Project: [A4BLUE](#) - Result: [Complex, manual hydraulic system assembly \(AIRBUS\)](#)
- Project: [A4BLUE](#) - Result: [Final assembly of electric vehicles \(RWTH Aachen University\)](#)
- Project: [BEinCPPS](#) - Result: [Lombardy Champion - Zero-Hours Quality](#)
- Project: [BEinCPPS](#) - Result: [Rhône-Alpes Champion: The Smart Mold](#)
- Project: [BEinCPPS](#) - Result: [Baden-Württemberg Industrial Champion](#)
- Project: [BOOST 4.0](#) - Result: [BOOST 4.0 standardization & certification v1](#)
- Project: [CloudiFacturing](#) - Result: [Numerical modelling and simulation of heat treating processes](#)
- Project: [COALA](#) - Result: [COALA Voice - enabled Digital Intelligent Assistant for Manufacturing - Early Prototype Demo](#)
- Project: [COMPOSITION](#) - Result: [Connectors for Inter-factory Interoperability and Logistics II](#)
- Project: [DIGICOR](#) - Result: [Community use cases definitions](#)
- Project: [DigiPrime](#) - Result: [Pilot - Textile](#)
- Project: [DigiPrime](#) - Result: [Operational Services \(OS\)](#)
- Project: [DigiPrime](#) - Result: [Pilot - Batteries](#)
- Project: [DigiPrime](#) - Result: [Pilot - Mechatronics and electronics](#)
- Project: [DYNXPRTS](#) - Result: [Machine Tool Component 7: Wireless Monitored High Speed Spindle](#)
- Project: [EFPF \(European Factory Platform\)](#) - Result: [Visual Detection of Personal Protection Equipment](#)
- Project: [EFPF \(European Factory Platform\)](#) - Result: [Production Environment Using Advance Digital Solutions](#)
- Project: [EFPF \(European Factory Platform\)](#) - Result: [Predictive Maintenance demonstrator in lot-size-1 manufacturing furniture domain](#)
- Project: [EFPF \(European Factory Platform\)](#) - Result: [Wastes Tracking Decentralized Application for Circular Economy](#)
- Project: [EFPF \(European Factory Platform\)](#) - Result: [Online Bidding Process for Automated Negotiations](#)
- Project: [FA3D](#) - Result: [Metrology-integrated Robotics](#)
- Project: [FA3D](#) - Result: [Future Automated Aerospace Assembly Demonstrator](#)
- Project: [FA3D](#) - Result: [Manufacturing Service Buses for Data Interoperability](#)
- Project: [FA3D2](#) - Result: [Future Automated Aerospace Assembly Demonstrator](#)
- Project: [FA3D2](#) - Result: [Virtual commissioning](#)
- Project: [FA3D2](#) - Result: [Reconfigurable assembly systems](#)
- Project: [FA3D2](#) - Result: [Integrated Artificial Intelligence](#)
- Project: [Factory2Fit](#) - Result: [Continental Pilot - Task Distribution Engine - Multi-criteria dynamic task prioritization and scheduling](#)
- Project: [Factory2Fit](#) - Result: [Prima Power Pilot - Worker Feedback Dashboard - Empowering feedback on work well-being and achievements](#)
- Project: [Factory2Fit](#) - Result: [Prima Power Pilot - Social Media Platform - Engaging worker participation and knowledge sharing](#)



- Project: [Factory2Fit](#) - Result: [Prima Power Pilot - Hands-on pre-training in a virtual environment](#)
- Project: [Factory2Fit](#) - Result: [UTC Pilot: On-the-job Learning](#)
- Project: [Factory2Fit](#) - Result: [Continental Pilot: Participatory Design Tool](#)
- Project: [Factory2Fit](#) - Result: [UTC Pilot - AR Assembly Guidance \(ARAG\) Solution - supporting workers in procedural tasks](#)
- Project: [FACTS4WORKERS](#) - Result: [Detailed and Refined Industrial Challenges I, II, III, and IV \(1\)](#)
- Project: [FAR-EDGE](#) - Result: [FAR-EDGE Whirlpool Pilot: Reshoring](#)
- Project: [FAR-EDGE](#) - Result: [FAR-EDGE Volvo Pilot: Mass-Customization](#)
- Project: [FAR-EDGE](#) - Result: [Blueprint Solutions and Strategies for Migrating to Decentralized Factory Automation Architectures - M20 release](#)
- Project: [FAR-EDGE](#) - Result: [Reference Scenarios, Use Cases and KPIs](#)
- Project: [FAR-EDGE](#) - Result: [Report on Testbed Scenarios and Validation - M33 release](#)
- Project: [FLEXCELLE](#) - Result: [Virtual commissioning](#)
- Project: [FLEXCELLE](#) - Result: [Reconfigurable assembly systems](#)
- Project: [FLEXCELLE](#) - Result: [Integrated Artificial Intelligence](#)
- Project: [Fortissimo 2](#) - Result: [Advanced, cloud-based HPC simulation in the foundry business](#)
- Project: [Fortissimo 2](#) - Result: [Near Real-time Analysis of Airframe Certification Test Data](#)
- Project: [Fortissimo 2](#) - Result: [Cloud-based HPC processing for knowledge generation in camshaft manufacture](#)
- Project: [HORSE](#) - Result: [Augmented Reality software for user assistance in a manufacturing work cell](#)
- Project: [HUMAN](#) - Result: [ROYO use case - short term physical and mental support](#)
- Project: [HUMAN](#) - Result: [COMAU Pilot: Workplace optimization and operator mental support](#)
- Project: [HUMAN](#) - Result: [AIRBUS Pilot: Short-term physical and mental support](#)
- Project: [INCLUSIVE](#) - Result: [E80 use case: Management of intralogistics flows in complex production lines](#)
- Project: [INCLUSIVE](#) - Result: [SCM Use Case: New HMI for woodworking machines](#)
- Project: [INCLUSIVE](#) - Result: [SILVERLINE use case: Introduction of a robotic cell in the production shop floor](#)
- Project: [KYKLOS 4.0](#) - Result: [Medical Pilot ☒ Custom and smart wheelchair systems manufacturing \(PROMEDICARE\)](#)
- Project: [KYKLOS 4.0](#) - Result: [Aerospace Pilot ☒ Additive manufacturing technology for aerospace ☒ aircraft part customization systems \(KANFIT3D\)](#)
- Project: [KYKLOS 4.0](#) - Result: [Automotive Pilot ☒ Addressing the critical components of each piece in automotive industry \(DIGRO\)](#)
- Project: [KYKLOS 4.0](#) - Result: [Electronic Equipment Industry Pilot \(CONTINENTAL\)](#)
- Project: [KYKLOS 4.0](#) - Result: [Aerospace Pilot ☒ Jet engine manufacturing & maintenance \(GRC\)](#)
- Project: [KYKLOS 4.0](#) - Result: [Electronic Devices/Equipment Pilot ☒ Electrical Equipment Manufacturers \(VESTEL\)](#)
- Project: [KYKLOS 4.0](#) - Result: [Food Industry Pilot ☒ Reduction of Energy Consumption and Waste Management \(PINDOS\)](#)
- Project: [MANUWORK](#) - Result: [Augmented Reality \(AR\) for supporting operators in press-brake operation](#)
- Project: [MANUWORK](#) - Result: [Volvo use case: AR visualization of industrial simulation](#)
- Project: [MIDIH](#) - Result: [MIDIH Open CPS/IOT Integrated Platform v1](#)
- Project: [PreCoM](#) - Result: [Demonstration of PreCoM system in continuous manufacturing \(Goma-Camps\)](#)



- Project: [PreCoM](#) - Result: [Demonstration of PreCoM system in high-volume manufacturing \(Spinea\)](#)
- Project: [PreCoM](#) - Result: [Demonstration of PreCoM system in low-volume manufacturing \(Sakana\)](#)
- Project: [PROGRAMS](#) - Result: [Robot-assisted welding use case: Calpak pilot line](#)
- Project: [PROGRAMS](#) - Result: [Milling machine tools use case: Aurrenak pilot line](#)
- Project: [PROPHECY](#) - Result: [RUL prediction for production tooling](#)
- Project: [PROPHECY](#) - Result: [Augmented Reality Assisted \(Remote\) Maintenance](#)
- Project: [QU4LITY](#) - Result: [GHI Real-time cognitive hot stamping furnace 4.0](#)
- Project: [QU4LITY](#) - Result: [MONDRAGON Zero defect and Autonomous Quality in Machinery Building for Capital Goods sector](#)
- Project: [QU4LITY](#) - Result: [PHILIPS OneBlade shaving unit production line](#)
- Project: [QU4LITY](#) - Result: [SIEMENS SIMATIC Products Quality Improvements](#)
- Project: [QU4LITY](#) - Result: [CONTI Autonomous Quality in PCB Production for Future Mobility](#)
- Project: [QU4LITY](#) - Result: [WHR Dryer Factory Holistic Quality Platform](#)
- Project: [QU4LITY](#) - Result: [KOLTS Real-time injection moulding process monitoring-control](#)
- Project: [QU4LITY](#) - Result: [THYS Quality Management of Steering Gear based on Acoustic control](#)
- Project: [QU4LITY](#) - Result: [AIRBUS Trade space framework for Autonomous Quality Manufacturing Systems Design](#)
- Project: [QU4LITY](#) - Result: [RiaStone Autonomous Quality ZDM for Ceramic tableware Single-firing](#)
- Project: [QU4LITY](#) - Result: [PRIMA Additive Manufacturing Pilot Adaptive Control Technology](#)
- Project: [QU4LITY](#) - Result: [Danobat Digital Machine for zero-defects at high precision cutting/grinding](#)
- Project: [QU4LITY](#) - Result: [FAGOR Zero-Defects Manufacturing Digital Press Machine](#)
- Project: [QU4LITY](#) - Result: [GF Digital machine and part twins for zero defect manufacturing](#)
- Project: [QU4LITY](#) - Result: [Whirlpool Pilot - Qu4lity - Presentation 24 March 2021](#)
- Project: [QU4LITY](#) - Result: [Video recording - Data Spaces for Additive Manufacturing Machinery in QU4LITY project](#)
- Project: [RebootIoTFactory](#) - Result: [Voice assistance makes factories smarter](#)
- Project: [RebootIoTFactory](#) - Result: [In Robotics Fusion Routine Tasks Blend Into Seamless Co-operation Between Robots and People](#)
- Project: [RebootIoTFactory](#) - Result: [Hunting Data and Putting It to Work - Piloting Data Collection for Industrial IoT](#)
- Project: [RebootIoTFactory](#) - Result: [Future Work with AI Foreman in Digital Factory](#)
- Project: [RebootIoTFactory](#) - Result: [RPA Making People Experts Again](#)
- Project: [RebootIoTFactory](#) - Result: [Towards Future Factories: Automatic Quality Control](#)
- Project: [RebootIoTFactory](#) - Result: [Taking Care of Employees - Well-being and Preferences is the Key to Profitable Industry](#)
- Project: [RebootIoTFactory](#) - Result: [Predictive Maintenance Supports Autonomous Shipping](#)
- Project: [RebootIoTFactory](#) - Result: [Exploring the Challenges of Manufacturing with Learning Machine Vision](#)
- Project: [RebootIoTFactory](#) - Result: [Specific Characteristics Define Business-to-Business Supply Chains in the Manufacturing Industry](#)
- Project: [RebootIoTFactory](#) - Result: [Scale-up: Standard Robot Interface](#)
- Project: [RebootIoTFactory](#) - Result: [Scale-up: Tester Predictive Maintenance](#)
- Project: [RebootIoTFactory](#) - Result: [Scale-up: AI Foreman](#)
- Project: [RebootIoTFactory](#) - Result: [20 proof-of-concepts of digitalised manufacturing](#)



- Project: [SAFIRE](#) - Result: [SAFIRE OAS pilot: Optimisation of production processes and preventive maintenance activities](#)
- Project: [SAFIRE](#) - Result: [SAFIRE Electrolux pilot: Cloud-driven product optimization](#)
- Project: [SERENA](#) - Result: [Robotics Use Case](#)
- Project: [SERENA](#) - Result: [Elevators production use case](#)
- Project: [SERENA](#) - Result: [White goods use case](#)
- Project: [SERENA](#) - Result: [Steel Industry Use Case](#)
- Project: [SERENA](#) - Result: [Metrology Equipment Use Case](#)
- Project: [SHOP4CF](#) - Result: [Support workers and to reduce the error rate](#)
- Project: [SHOP4CF](#) - Result: [Improve automatic data acquisition, storage, traceability with user-friendly interfaces and human safety](#)
- Project: [SHOP4CF](#) - Result: [Upfront challenges faced by the assembly workers and engineers](#)
- Project: [SHOP4CF](#) - Result: [Utilisation of AR/VR communication & remote sensing Technologies for Technical Support between Remote Plants of Arçelik](#)
- Project: [SHOP4CF](#) - Result: [Definition of the deployment scenarios](#)
- Project: [SodaLite](#) - Result: [Eclipse Papyrus Manufacturing: Sizing Stocks Buffers of a Line](#)
- Project: [SYMBIO-TIC](#) - Result: [Demonstrator 2: Human-Robot Collaboration on Aircraft Rib Assembly](#)
- Project: [SYMBIO-TIC](#) - Result: [Demonstrator 1: Human-Robot Collaboration in Food packing](#)
- Project: [UPTIME](#) - Result: [FTT use case: Transportation Logistics](#)
- Project: [UPTIME](#) - Result: [MAILLIS use case: Cold Rolling Mill](#)
- Project: [UPTIME](#) - Result: [Whirlpool use case: Drum Dryer Production Line](#)
- Project: [USE-IT-WISELY](#) - Result: [Upgrade service for mobile rock crushers](#)
- Project: [VIEWS](#) - Result: [Metrology-integrated Robotics](#)
- Project: [VIEWS](#) - Result: [VIEWS project video - Future Aerospace Assembly solutions](#)
- Project: [VIEWS](#) - Result: [Manufacturing Service Buses for Data Interoperability](#)
- Project: [Z-BRE4K](#) - Result: [Gestamp Use Case](#)
- Project: [Z-BRE4K](#) - Result: [Sacmi/CDS Use Case](#)
- Project: [Z-BRE4K](#) - Result: [Philips Use Case](#)
- Project: [ZDMP](#) - Result: [Steel tubes: production monitor](#)
- Project: [ZDMP](#) - Result: [Construction supply chain: quality control at construction site and quality traceability](#)
- Project: [ZDMP](#) - Result: [Stone tiles: equipment wear detection](#)
- Project: [ZDMP](#) - Result: [Assembly line: monitoring and control system](#)
- Project: [ZDMP](#) - Result: [Assembly line: AI-supported optical defects detection](#)
- Project: [ZDMP](#) - Result: [Electronic products manufacturing: Component inspection](#)
- Project: [ZDMP](#) - Result: [Moulds manufacturing: in-line 3D modelling](#)
- Project: [ZDMP](#) - Result: [Moulds manufacturing: Process alert system for machine tool failure prevention and Smart process parameter tuning](#)
- Project: [ZDMP](#) - Result: [Engine block manufacturing: Defects reduction by the optimization of the machining process](#)
- Project: [ZDMP](#) - Result: [Engine block manufacturing: Defects detection and prediction in aluminium injection and machining operations](#)