

INITIATIVE FOR EXCELLENCE IN DIGITAL INDUSTRY

CSA-Industry4.E

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Deliverable 2.1 – Interim report

Report presenting the operational platform

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Deliverable Lead: WP2 Lead IMR

WP2: Engaging the Research Communities in Collaboration

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Summary

The work of WP2 in the CSA-Industry4.E project is to support the Industry4.E Lighthouse Initiative Advisory Service (LIASE) in developing a strategy for engaging the different research communities in collaboration. Deliverable 2.1 is a report presenting the operational platform created as part of WP2 (Task 2.1 Establishing a communication platform for all stakeholders).

A communications platform has been created as a first step towards facilitating sharing of knowledge, networking and interaction between projects, participant among projects and the wider research and innovation community. The platform consists of a database and web application, which will include details about all relevant projects. The platform scope has expanded to include all ECSEL-JU projects including the Industry4.E Lighthouse projects and the URL is **www.ECSEL-portal.eu**.

Examples of the type of information included in the database are: project title, objectives, participating organisations and contact persons, website, funding body, knowledge outputs, products, prototypes, demonstration sites etc. Projects and results can be characterised by structured lists of attributes. The main goal of the structured lists is to support the collection of information in a structured way, herewith also supporting the analyses of collected information.

Since most of the structured lists that are used by EFFRA are relevant to the Industry4.E Lighthouse and to ECSEL-JU projects in general, the highest level of synergy in terms of the analysis of projects across programmes is to use the same lists. In the current demonstration version of the communications platform (referred to as **ECSEL-portal** in this document), these lists also appear in what is called the 'structured wiki'. The ideal starting point is sharing the lists (this would require an interaction with EFFRA in order to have a common view on this and create a win-win situation) and then see if and how the list can evolve or if at some points 'separate lists' should be established.

Sharing lists would allow the characterisation of the ECSEL-JU projects and other projects that are characterised via the EFFRA Innovation Portal using the same attributes and hence it would help in obtaining a common view and more efficient analysis of the challenges and technologies that have been or that are being addressed by these projects. The shared structured lists can be modified in order to take into account new development or requirements, and other structured lists that are specific to Industry4.E or other ECSEL projects can be added to the **ECSEL-portal**.

The suggested ECSEL-portal will not require that data that is already in CORDIS, should be separately uploaded on the ECSEL-portal: Via the open data files that are available from CORDIS, the data and pointers (links) to public deliverables that are available on CORDIS can be imported in the ECSEL portal. For the Industry4.E Projects, the data will then be completed by the project coordinators. The CSA-Industry4.E team will be able to suggest additional topics and fields to fill in the **ECSEL-portal** to the Industry4.E Lighthouse projects' coordinators, where they see fit.

This deliverable D2.1 is a report at month 12 in the CSA-Industry4.E project presenting the operational platform that is being created for the Industry4.E Lighthouse: presenting the platform functionalities, giving summary information about its contents, information on the progress of the platform and the feedback to date.

Further details are available from: WP2 Lead, IMR

1 Introduction

1.1 Introduction to Industry4.E Lighthouse

The digitalisation of industry – Industry 4.0 – is rapidly transforming all stages of the production value chain of goods globally. Advances in robotics, data collection, cybersecurity and other technologies are creating increasingly efficient, flexible and tailored manufacturing processes. If exploited, these technologies could create huge growth in European industries.

ECSEL Joint Undertaking (ECSEL-JU) is an EU-driven public-private partnership, funding innovation in electronic components and systems (www.ecsel.eu). Through the ECSEL-JU, European industry, SMEs and Research and Technology Organisations are supported and co-financed by ECSEL participating states and the European Union. ECSEL-JU has created “Lighthouse initiatives” as they identified the need to better coordinate and link Research, Development and Innovation (RDI) activities taking place in order to help European industry achieve digital transition and strengthen Europe’s competitiveness and leadership. Three Lighthouses have been launched to date; **Industry4.E**, Mobility.E and Health.E.

The **Industry4.E Lighthouse** has a special focus on all means of microelectronics and Information and Communications Technology (ICT) for Digital Industry. Operating across project, funding, and national boundaries, Industry4.E is expected to bring together relevant Research, Development and Innovation (RDI) projects funded across various programmes, helping projects to connect with each other and the end-user/stakeholder community.

To support the implementation of activities in relation to the Industry4.E Lighthouse, ECSEL-JU via Horizon 2020 have funded a Coordination and Support Action (CSA) for 24 months which started in October 2018. CSA-Industry4.E intends to:

- Support the **Lighthouse Initiative Advisory Service (LIASE)** in establishing the Lighthouse
- Actively assist in enabling successful execution of the Digital Industry roadmap
- Engage research communities - coordinate the relevant stakeholders, project consortia and policymakers
- Facilitate, support and assist Industry4.E projects in effectively exploiting project results
- Promote the Industry4.E Lighthouse visibility
- Develop and implement a public engagement and outreach strategy to raise the visibility of Industry4.E to the broader public and related initiatives

The work of WP2 in the CSA-Industry4.E project is to support the Industry4.E Lighthouse LIASE in developing a strategy for engaging the different research communities in collaboration. A communications platform, **www.ECSEL-portal.eu**, has been created as a first step towards facilitating sharing of knowledge, networking and interaction between projects. The platform consists of a database and a web application, which will include details about all relevant projects. Deliverable 2.1 is a report presenting the operational platform created as part of WP2 (Task 2.1 Establishing a communication platform for all stakeholders).

1.2 Objective for developing an operational projects' communications platform

This operational platform, **ECSEL-portal**, was first conceived for the Industry4.E Lighthouse to facilitate communications between different research communities on the technical details of their projects. It is intended:

- to help the Industry4.E Lighthouse projects to communicate the technical details and results of their projects in a consistent and efficient manner;
- to enable the internal needs of the Industry4.E Lighthouse team for road mapping and gap analysis purposes, to have visibility and ease of comparison across the Industry4.E Lighthouse projects, as well as other related projects;
- to enable the external platform users to compare technical topics and the approaches being researched and published results against other projects.

In the initial design phase, in consultation with ECSEL-JU, the scope of the platform has been broadened to include all ECSEL-JU projects.

This new operational platform, **ECSEL-portal**, could be used by all of the lighthouses to support the collection and information about the ECSEL-JU projects and their results, as well as the dissemination of this information via an ECSEL-portal. This deliverable is a report on the ECSEL-portal from the point of view of the Industry4.E Lighthouse.

1.3 Rationale

The function of the operational platform is to provide a tool that facilitates communications, sharing of knowledge, networking and interaction across the Industry4.E Lighthouse project participants, as well as the wider research and innovation community, on the technical details of the projects. The platform will allow visibility on trending topics and how, or whether, they are being addressed in different projects. The tool will aid the Industry4.E team to perform gap analysis and develop a deeper insight into the covered technologies and objectives across a particular topic or application area, which will contribute to the future road mapping for Industry4.E.

Examples of the type of information included in the database are: project title, objectives, participating organisations and contact persons, website, funding body, knowledge outputs, products, prototypes, demonstration sites etc.

Projects and results can be characterised by structured lists of attributes. The main goal of the structured lists is to support the collection of information in a structured way, herewith also supporting the analyses of collected information.

Since most of the structured lists that are used by EFFRA are relevant to the Industry4.E Lighthouse and to ECSEL-JU projects in general, the highest level of synergy in terms of the analysis of projects across programmes is to use the same lists. In the current demonstration version of the **ECSEL-portal**, these lists also appear in what is called the 'structured wiki'.

As stated in the summary, the ideal starting point is sharing the lists (this would require an interaction with EFFRA in order to have a common view on this and create a win-win situation) and then see if and how the list can evolve or if at some points 'separate lists' should be established

Sharing lists would allow the characterisation of the ECSEL-JU projects and other projects that are characterised via the EFFRA Innovation Portal using the same attributes and hence it would help in obtaining a common view and more efficient analysis of the challenges and technologies that have been or that are being addressed by these projects. Allowing users to perform gap analysis and to develop deeper insights into the technologies and objectives covered across the ECSEL-JU programme and beyond, and situate it within the wider research and innovation landscape. The EFFRA platform (portal.effra.eu) has been built up over a number of years and hosts information on a wide range of projects (national, regional and European), which is useful for comparison. The shared structured lists can be modified in order to take into account new development or requirements, and other structured lists that are specific to Industry4.E or other ECSEL-JU projects can be added to the ECSEL-portal.

In order to avoid duplication of effort and for delivering an impactful platform with the limited resources available, the platform is designed so that it can be populated to a large degree automatically by importing information from other existing databases (i.e. CORDIS). This initial data import will then be supplemented by project coordinators adding to the data once it is in the platform. The data enrichment can also be aided by prompts from the CSA team to the coordinators to fill certain fields or topics which the CSA team know to be relevant to any of their Lighthouse projects.

It has also been decided to include all ECSEL-JU projects in the **platform**. By including all the ECSEL-JU projects this will allow platform users to search against a larger range of projects. Since many of the technical topics being researched are cross-cutting this will be useful for information sharing, community building and comparison of challenges, and technologies and innovative approaches being addressed across the board.

The platform can be found at www.ECSEL-portal.eu. Once it is fully operational, the platform will be linked from the Industry4.E Lighthouse website industry4e.eu.

The work of task 2.1 will link with the work in task 2.2 and in WP3, where the CSA-Industry4.E team will be engaging with the Industry4.E Lighthouse projects. As part of this engagement, the CSA-Industry4.E team will be presenting the platform, asking the representatives of the Industry4.E lighthouse projects to provide feedback for the data uploaded and to provide additional information for upload, which will make it easier for projects to cooperate and create synergies, increasing the value of the developed tool.

2 The selected platform justification

The Operation platform that has been evaluated and chosen for use is the DeCubber Platform. This platform has already been used for classifying EFFRA projects (<https://portal.effra.eu/home>) and the justifications to use this same platform to support the Industry4.E new communication portal are many-fold:

1. The DeCubber Platform is the only platform of its type developed to a level that enables data upload to the platform in a format that was established for H2020 projects.

2. Project coordinators can register in the system and be given access right as project owners to edit and add to the data for their projects, providing the opportunity for regularly updated project details and results (this functionality is not available to project owners in CORDIS or H2020 Dashboard as the information in these platforms is based on formal deliverables and reports, and cannot be edited in the same way).
3. CSA-Industry4.E WP2 team has had detailed discussions with the DeCubber Platform provider to determine the optimal approach to establish a suitable communications platform for the Lighthouse projects.
4. This approach was supported by the ECSEL-JU office and the LIASE using proven platforms to link projects under ECSEL-JU brand. The platform hosting address has been agreed with the ECSEL-JU office as www.ECSEL-portal.eu.

2.1 DeCubber Platform v's Horizon Dashboard v's CORDIS

This section outlines the differences between the proposed ECSEL-portal and other existing platforms, CORDIS and the Horizon Dashboard.

The **Horizon Dashboard**¹ mostly generates statistics and associated graphs, using fairly high-level categories of project data. The suggested ECSEL-portal is not an answer to a request to generate or duplicate the functionalities of what the Horizon Dashboard is already offering.

CORDIS² is a portal that basically draws from the information that is generated by the projects (contract info, participant, project general descriptions and public reports and deliverables).

The proposed **ECSEL-portal**³ (based on the **DeCubber Platform**) offers the participants of the projects the opportunity to share more specific information about their project. What they share and how they share can be structured according to specific attributes that can be dynamically managed. For example, projects can be asked to share information about specific technologies or action lines, that are identified by the ECSEL-JU management and steering bodies, including the lighthouses and the LIASEs. The visibility of the shared information can be limited to specific user groups (while the CORDIS Database is limited to deliverable and reports being publicly shared). Attributes can be easily added in order to group the projects in project clusters (such as the lighthouses). The attributes can also serve as a structured guidance on its own right (structured wiki).

The description of results and demonstrators can also be uploaded and updated dynamically by the project representatives that have editing permissions on the projects (editing permission that they can manage themselves, meaning that project participants that have editing permissions can grant editing permissions to other registered users on the portal).

The suggested ECSEL-portal is also not requiring that data that is already in CORDIS, should be separately uploaded on the ECSEL-portal: Via the open data files that are available from CORDIS, the

¹ Horizon Dashboard <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/horizon-dashboard>

² CORDIS www.cordis.europa.eu

³ ECSEL-portal www.ecsel-portal.eu

data and pointers (links) to public deliverables that are available on CORDIS can be imported in the ECSEL-portal (the current portal set-up already includes this info based on data available in May 2019).

The ECSEL-portal can include other projects or results of projects that are generated by other programmes or initiatives, such as national regional (publicly funded) projects, and hence the portal can generate more intelligence and visibility about what has happened or what is in the research and innovation pipeline.

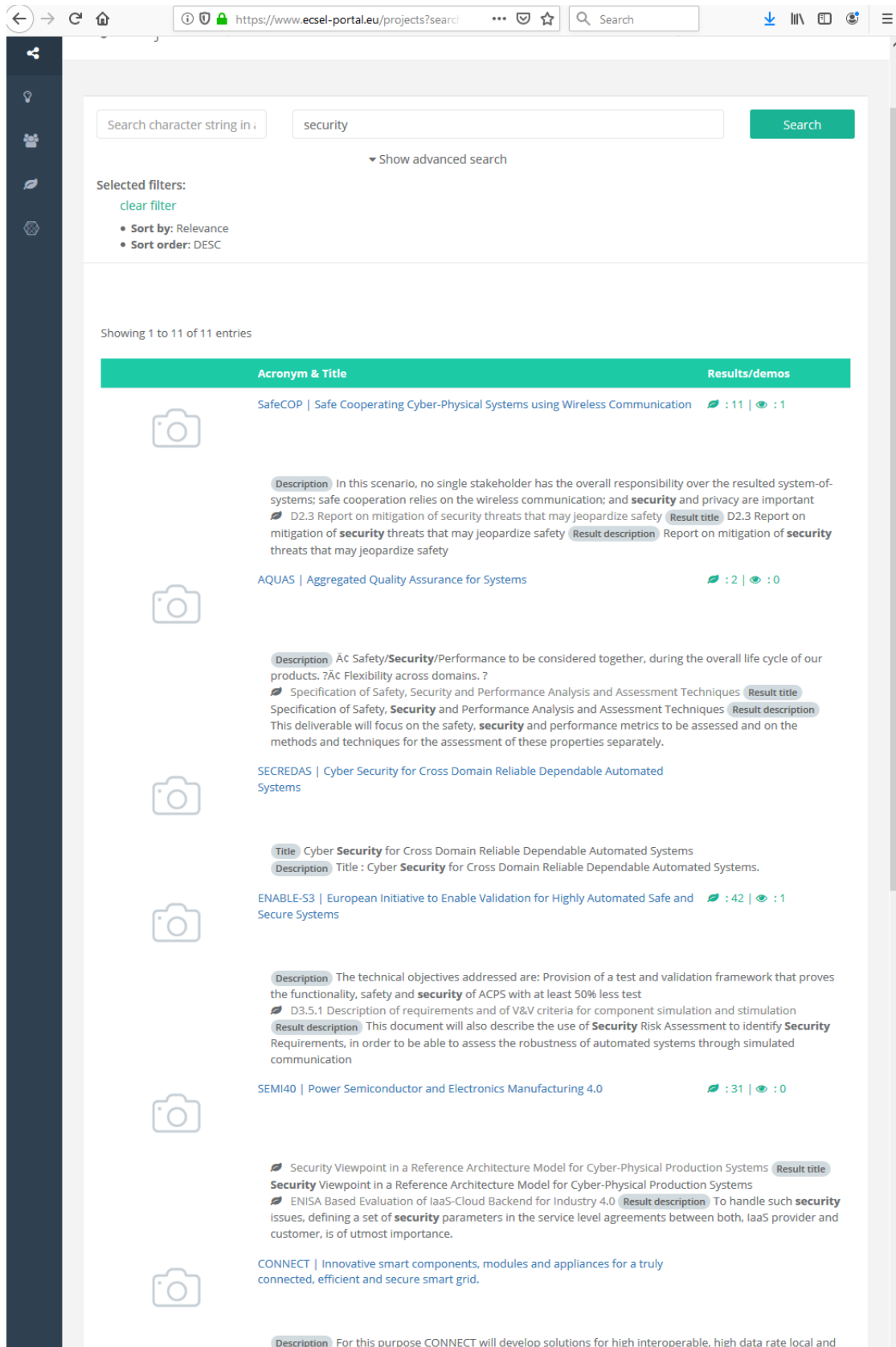
2.2 The search functionality and the role of structured lists.

The main goal of the structured lists and its attributes are to support the collection of information in a structured way, herewith also supporting the analyses of collected information and the highlighting of specific information directly on project and results pages.

However, the portal is equipped with a quite powerful search engine, which supports the free text search and where the relevance of items (basically projects and results/demonstrators) can be fine-tuned (for instance relevance being higher if the search terms appear in the projects' title, the short description, in the description of results associated to the project, in the structured lists associated to the project etc.). So, when users will search the portal, they will primarily use the free text search. The quality of the search and the returned information will be raised by collecting information through the structured list, but quality is also very much dependent on the short descriptions of the projects and the associated results and demonstrators.

Regarding results and demonstrators: using the publicly available data files from CORDIS, imports where already done into the ECSEL-portal using the CORDIS files that where available in May 2019. At regular intervals, such imports can be carried out, resulting in project representatives not needing to upload a repeat of the information on the **ECSEL-portal**. However, by then highlighting some specifics using the structured lists, the quality of the descriptions and their 'searchability' would be increased. It would be up to the projects to decide which results/demonstrators would be published or 'unpublished' on the **ECSEL-portal**.

See screenshot in Figure 1, which shows a 'free-text' search on the current demo platform for projects about 'security'. Considering that Security attributes where not even filled out, the search already returns rich information. In addition, from the search results returned it is possible for the user to easily get a quick overview of, and navigate, the results.



The screenshot shows the ECSEL-portal search interface. The search bar contains the text 'security'. Below the search bar, there are filters: 'Selected filters: clear filter', 'Sort by: Relevance', and 'Sort order: DESC'. The results are displayed in a table with columns 'Acronym & Title' and 'Results/demos'. The table lists several projects, including SafeCOP, AQUAS, SECREDAS, ENABLE-S3, SEMI40, and CONNECT. Each project entry includes a description and a result title.

Acronym & Title	Results/demos
SafeCOP Safe Cooperating Cyber-Physical Systems using Wireless Communication	11 1
AQUAS Aggregated Quality Assurance for Systems	2 0
SECREDAS Cyber Security for Cross Domain Reliable Dependable Automated Systems	
ENABLE-S3 European Initiative to Enable Validation for Highly Automated Safe and Secure Systems	42 1
SEMI40 Power Semiconductor and Electronics Manufacturing 4.0	31 0
CONNECT Innovative smart components, modules and appliances for a truly connected, efficient and secure smart grid.	

Figure 1. ECSEL-portal ‘free-text’ search for security

An example from the EFFRA Innovation portal, also supported by the same platform technology on a 'free-text' search for 'human robot', also returns a wealth of information⁴, and allows for easy overview and quick navigation of the results.

The platform that supports the portal is being further developed on a continuous basis and suggestions for additional functionalities by the users influence the prioritisation of new or improved functionalities of the platform. For instance: extraction of information in pdf from the portal in specific formats can be supported indirectly now, but will be more readily available for all users in the near future.

3 Platform functionalities

This report aims to present the platform functionalities. We do this by first introducing the specification of the system, then the structured lists that would be ideal to use, followed by the details of the classification of themes and topics that would be used in the ECSEL-portal in structured lists, and then follow this with some practical examples.

A demo has been setup by the platform provider to give an idea of how this could look like, some of the following screen grabs are from the demo system while others are from the EFFRA portal to give a better idea of what kind of data can be shared between the projects once all the project owners have filled in their project details with the structured wiki.

The Portal will be ECSEL-JU branded.

3.1 Structured Lists

If agreed with EFFRA, all the ECSEL-JU projects on the ECSEL-platform would use the structured wiki list that classifies the themes and topics of the projects using the same structure that has been defined in the EFFRA portal. One extra classification would be added to the ECSEL-portal for Industry4.E Lighthouse – in this way the Industry4.E lighthouse projects can all be tagged as being part of Industry4.E. As the ECSEL-portal evolves more categories can be added to the wiki. These new categories maybe either be:

- Categories that are only relevant to the ECSEL-portal and so used in the ECSEL-portal only or
- Categories that are relevant to EFFRA projects and could be discussed and agreed on between EFFRA and ECSEL-JU so that they could be added to both portals.

The top tier of the proposed structured lists are shown in Figure 2, as:

1. Added value and impact
2. Technologies and enablers

⁴ 'free-text' search of the EFFRA platform for 'human robot' returns the following:

<https://portal.effra.eu/projects?search%5BtextQuery%5D=robot+human&search%5Bsort%5D=Relevance&search%5BsortDirection%5D=DESC>

3. Digitalisation pathways
4. Significant innovations, use case requirements and lessons learned
5. Standards, standardisation and regulation
6. ICT performance characteristics
7. Business model aspects
8. Resource tags

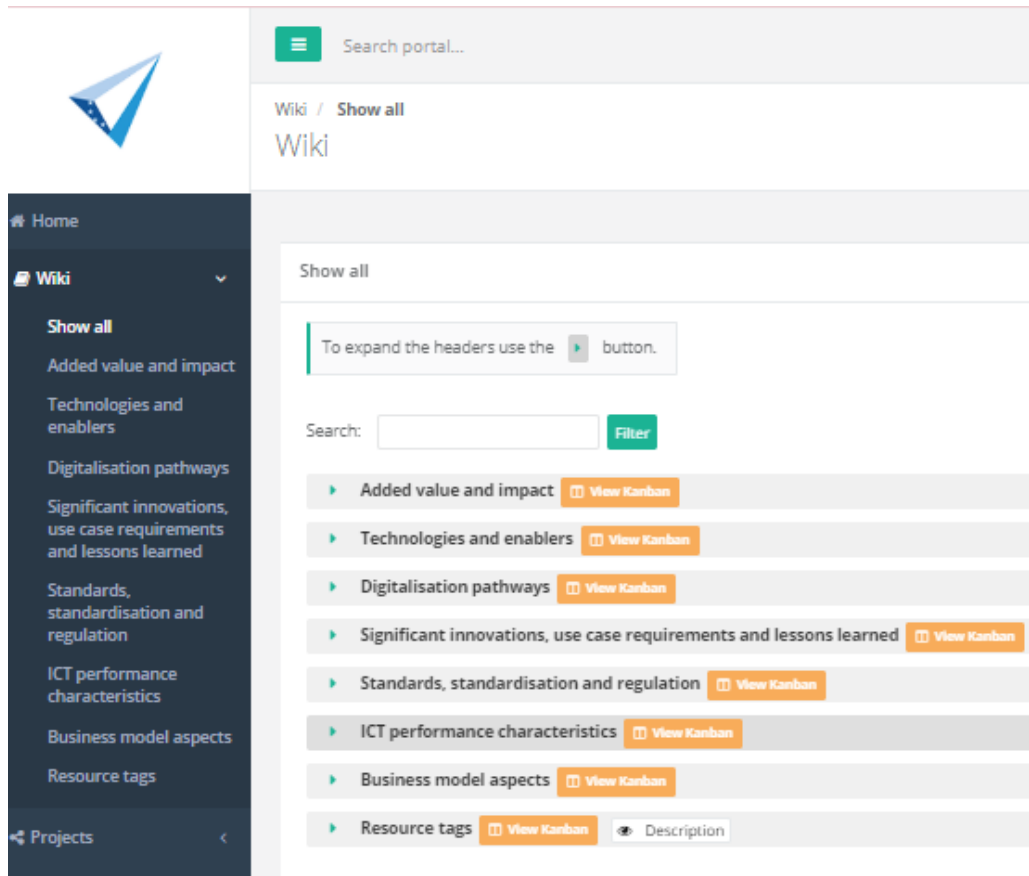


Figure 2. Top tier of proposed structured lists for ECSEL-portal

Structured list – Technologies and enablers

Each of these topics or taxons are further broken down into different levels. For example, the second category ‘Technologies and enablers’ is further broken down as follows:

- **Technologies and enablers**
 - **Advanced manufacturing processes**
 - Additive manufacturing
 - Innovative physical, chemical and physicochemical processes
 - Photonics-based materials processing technologies
 - Shaping technology for difficult to shape materials
 - Replication, Equipment for flexible scalable prod/Assembly
 - Methods for handling of parts, metrology and inspection

- Integration of non-conventional technologies and conventional technologies
- High productivity and 'self assembly' technologies development of conventional (joining, forming, machining) and new micro/nano-manufacturing processes
- Flexible Sheet-to-Sheet (S2S) and Roll-to-Roll (R2R)
- Recycling processes
- **Mechatronics for advanced manufacturing systems**
 - Control technologies
 - Condition and performance monitoring
 - Intelligent machinery components, actuators and end-effectors
 - Energy technologies
 - Advanced materials in manufacturing systems
 - Smart and functional materials
- **Information and communication technologies**
 - Digital manufacturing platforms
 - IoT- ICT solutions for factory floor and physical world inclusion
 - Human Machine Interfaces
 - Augmented reality
 - Virtual reality
 - Advanced and ubiquitous human machine interaction
 - Data visualisation
 - Data analytics, including artificial intelligence (AI)
 - Data storage
 - **ICT solutions for next generation data storage and information mining**
 - **Rlational databases**
 - **Non-relational database (NoSQL)**
 - Data processing
 - **Cloud computing, edge computing**
 - Cloud computing
 - Edge computing
 - Data acquisition
 - Data modelling
 - Cognitive and artificial intelligence (AI) technologies – machine learning
 - **Fuzzy logic**
 - **Neural networks**
 - **Genetic algorithms**
 - **Heuristics**
 - System modelling, simulation and forecasting
 - Programming Frameworks – Software Development Kits (SDKs)
 - FIWARE
 - **Smart Industry Context Information Management and Persistence**
 - The Orion Context Broker Generic Enabler
 - The STH comet Generic Enabler
 - The Cygnus Generic Enabler
 - **Smart Industry NGSI Agents framework to Real World**
 - The IDAS Generic Enabler

- The Fast RTPS Incubated Generic Enabler
 - The OpenMTC Incubated Generic Enabler
- **Smart Industry Information Processing**
 - The Wirecloud Generic Enabler
 - The Knowage Generic Enabler
 - The Cosmos Generic Enabler
 - The FogFlow Incubated Generic Enabler
 - The Aeon Incubated Generic Enabler
 - The Domibus Incubated Generic Enabler
 - PROTON
 - PERSEO
 - CEPHEUS
 - XML3D
 - Augmented Reality (FIWARE)
 - Quantum Leap
- **Smart Industry Context Data/API Management, Publication and Monetization**
 - The CKAN extensions Generic Enabler
 - The Keyrock Identity Management Generic Enabler
 - The Wilma proxy Generic Enabler
 - The AuthZForce PDP/PAP Generic Enabler
 - The Biz Framework Generic Enabler
- Programming Languages
- Operating Systems
- Architecture
 - Collaborative and decentralised application architectures and development tools
- **Manufacturing strategies**
 - From Product/Service Systems (product centric approach) to Services through Products (solution oriented approach)
 - From delocalisation to Globalisation 2.0
 - Innovation
 - From User-centric design to user well-being design
 - Virtualisation and digitalisation of the interrelation between manufacturing and new business models
- **Skills – Knowledge-workers**

Each of the other top tiers of the structure list breakdown in a similar way.

By clicking on the “Technologies and enablers” branch of the structured list the user would see the topics on tier two of this list (ref 03). Each of these branches at tier two are further divided (and some subdivided) into related topics. By clicking on sub-branch ‘Information and communications technologies’ the user can see further sub-branches under this taxon (ref Figure 4).

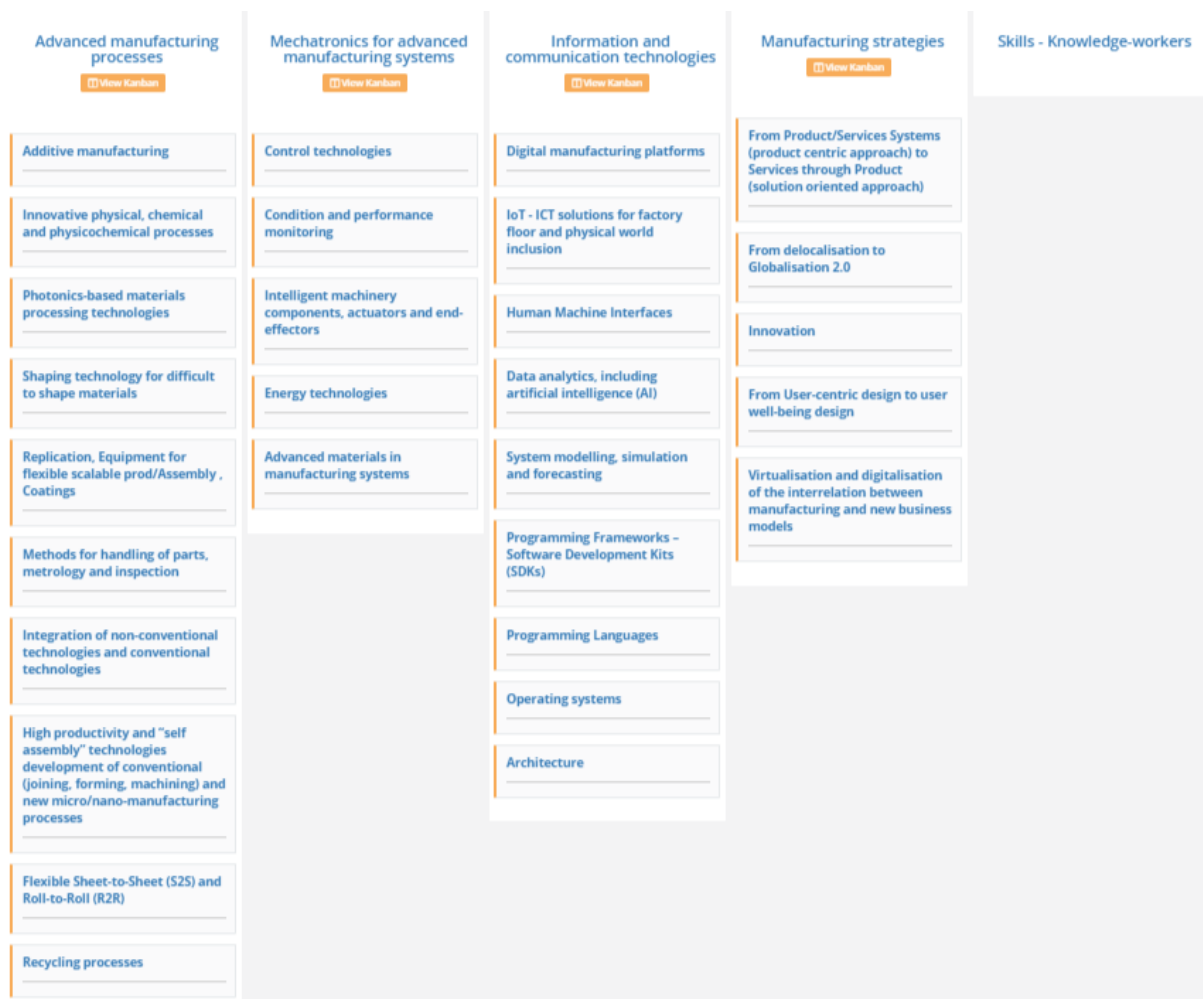


Figure 3. Tier two under Technologies and Enablers

Example of a search using the structure lists.

If a user was to do a search under a particular taxon, any related projects, results and demonstrators will be displayed. For example, if the user clicks on 'Digital manufacturing platforms' under 'Information and communication technologies' in the portal then the results display the related projects and the degree to which they are relevant to the taxon clicked ("Digital manufacturing platforms", in this example). This example, in Figure 5, was run in the EFFRA portal to show the capability of the search on a structured wiki portal. The search returns 35 directly mapped projects and 3 directly mapped results & demonstrators, as seen in Figure 5. Each of the results returned shows the project logo, title and acronym and the degree to which the project covers the upper branch "Information and communication technologies" and also the degree to which the project covers the taxon "digital manufacturing platforms". The level at which the project covers these taxons has been set by the project owners.

By further clicking into one of the projects, for example COMPOSITION (see 6 & 7), the user can see more details on the project.

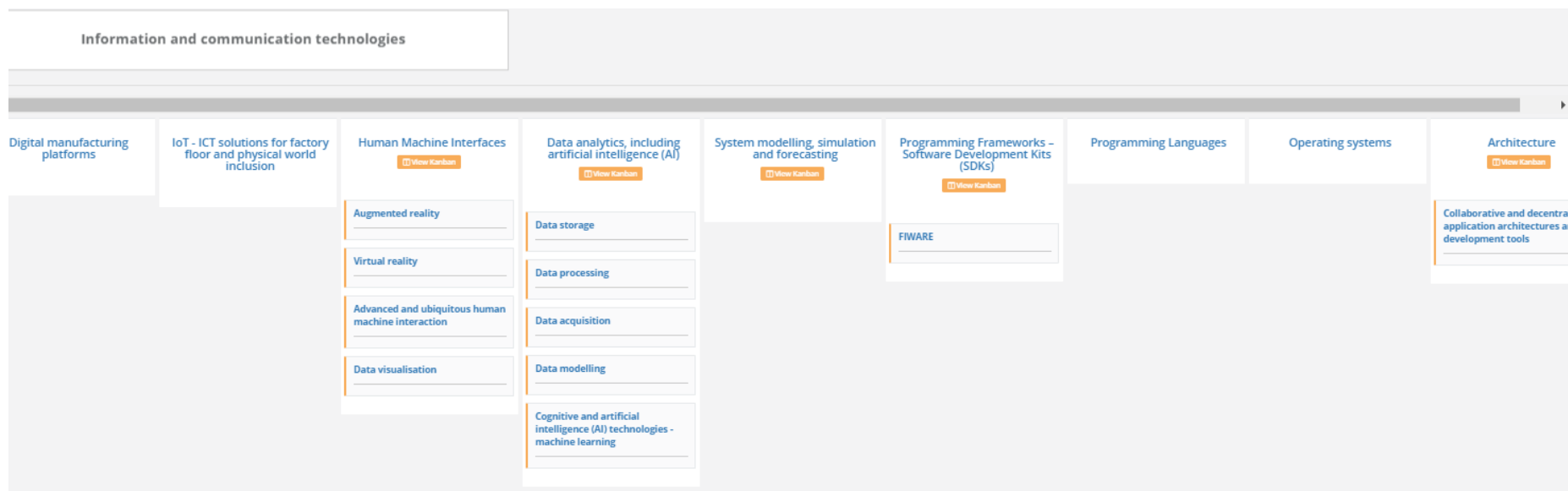


Figure 4. Kanban view of the lists for 'Information and communication technologies' under the 'Technologies and enablers' branch of proposed structured wiki

Directly mapped projects

Showing 10 last updated out of 35 [Show all](#)

Acronym	Title
 COMPOSITION	Ecosystem for Collaborative Manufacturing Processes _ Intra- and Interfactory Integration and Automation
<p>Information and communication technologies</p> <p>Digital manufacturing platforms</p> <p><u>Comment:</u> The COMPOSITION Integrated Information Management System will be a collaborative ecosystem where all members of a manufacturing supply chain can connect in a secure environment. The Security Framework will implement the security core mechanisms aiming to ensure the security, confidentiality, integrity and availability of the managed information for all authorised COMPOSITION stakeholders.</p>	
 FACTS4WORKERS	Worker-Centric Workplaces in Smart Factories
<p>Information and communication technologies</p> <p>Digital manufacturing platforms</p>	
 T-REX	Lifecycle Extension Through Product Redesign And Repair, Renovation, Reuse, Recycle Strategies For Usage&Reuse-Oriented Business Models
<p>Information and communication technologies</p> <p>Digital manufacturing platforms</p> <p><u>Comment:</u> Fleet-Wide Asset Health Management (FW-AHM) platform to collect, analyse and share fleet information among both manufacturers and customers.</p>	
 CONNECTED FACTORIES	Industrial scenarios for connected factories
<p>Information and communication technologies</p> <p>Digital manufacturing platforms</p>	
 PERFORM	Production harmonizEd Reconfiguration of Flexible Robots and Machinery
<p>Information and communication technologies</p> <p>Digital manufacturing platforms</p>	
 Från spill till guld	From Waste to Gold , in Swedish: Från spill till guld
<p>Information and communication technologies</p> <p>Digital manufacturing platforms</p>	
 FiaD	Factory-in-a-day
<p>Information and communication technologies</p> <p>Digital manufacturing platforms</p>	

Directly mapped results & demonstrators

Showing 3 last updated out of 3 [Show all](#)

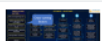
Acronym	Title
VTT_UseCase_DigitalFiberEcosystem	Digital Fiber Ecosystem
<p>Information and communication technologies</p> <p>Digital manufacturing platforms</p>	
Nebbiolo USE-CASE-Precision-Machine	Machine Fog Node (MFN) Case Study
<p>Information and communication technologies</p> <p>Digital manufacturing platforms</p>	
 Cross-cutting_factors	Key enablers and cross-cutting factors
<p>Information and communication technologies</p> <p>Digital manufacturing platforms</p>	

Figure 5. Search of 'Digital manufacturing platforms' under the EFFRA portal

Project / COMPOSITION

Ecosystem for Collaborative Manufacturing Processes _ Intra- and Interfactory Integration and Automation

Summary

Data and services have become the key factor in optimising manufacturing processes. The need to react to dynamically changing market demands is dramatically rising. One of the most imperative problems so far is to connect supply chain data and services between enterprises and to connect value chain data within a factory so that it can meaningfully support decision-making.

COMPOSITION will create a digital automation framework, the COMPOSITION Integrated Information Management System (IIMS) that enhances the manufacturing processes by exploiting existing data, knowledge and tools to increase productivity and dynamically adapt to changing market requirements. This technology acts as the technical operating system for business connections between factories and their suppliers. Furthermore, it opens a new space for third party entities to actively interact along the supply chain, e.g., by providing services to optimise cycle time, cost, flexibility or resource usage. In addition to the supply chain improvements, the processes inside the company can be addressed and optimised.


Data across the (multi-sided) company internal value chain is integrated by the IIMS with optimisation and modelling tools for resource management including innovative, multi-level, real-time cross-domain analytics and a Decision Support System.


The technology will extend existing FI-WARE, FITMAN and LinkSmart catalogues, in addition to a Building Management System for environmental data gathering. Inter-operability, ease of retrofit and scalability are critical parameters that are taken carefully into account in devising such IIMS.

More information

Images

Location





Results

- Industrial use cases for an Integrated Inform...
- Initial requirements specification
- The COMPOSITION architecture specification I
- The COMPOSITION architecture specification II
- Lessons Learned and updated requirements repo...
- Lessons Learned and updated requirements repo...
- Process Modelling Representation and Monitori...
- Digital Factory Model I
- Digital Factory Model II
- Computational Modelling, Simulation and Predi...
- Computational Modelling, Simulation and Predi...

Figure 6. Snip 1(2) of the project COMPOSITION highlighted in the search of ‘Digital manufacturing platforms’ on the EFFRA portal

Technologies and enablers - (15) ▲ close
[View Kanban](#)

Advanced manufacturing processes

Recycling processes

Comment: Part of the scrap generated by the manufacturing industry is recyclable. The recycling companies need to stay connected with the industries and to plan for the further reselling and/or disposal of the material. COMPOSITION will connect the dots in the inter-factory pilot.

Mechatronics for advanced manufacturing systems

Condition and performance monitoring

Comment: Continuous monitoring of the condition and performance of specific critical parts (equipment, infrastructure and environment) of the manufacturing system will provide feedback to the real-time brokering and message translations services allowing seamless integration of heterogeneous manufacturing components.

Information and communication technologies

Digital manufacturing platforms

Comment: The COMPOSITION Integrated Information Management System will be a collaborative ecosystem where all members of a manufacturing supply chain can connect in a secure environment. The Security Framework will implement the security core mechanisms aiming to ensure the security, confidentiality, integrity and availability of the managed information for all authorised COMPOSITION stakeholders.

IoT - ICT solutions for factory floor and physical world inclusion

Comment: The Digital Factory Model (DFM) will provide an integrated representation of the intra-factory domain at machine-level, end-user-level, and process-level. The DFM model will be used to exploit data coming from machinery, sensors and production lines and will offer interoperability in communication by providing all these heterogeneous data in a common format. The DFM is re-used in the Decision Support System, in Simulation and in the Deep Learning Toolkit. The integration of information will enable better use of the data available in the physical layer of the factories to be made.

Human Machine Interfaces

Comment:

Requirements of modern production processes stress the need for greater agility and flexibility, for faster production cycles, increased productivity, less waste and more sustainable production. Human-machine interaction is put in the center, supporting the decision making process.

Investigation of advanced HMIs for direct interaction with real-world objects. Consideration of mobile user interfaces that allow accessing crucial immediate information everywhere in the factory. Consideration will also be given to data gathering from ultra low power IoT devices such as wireless sensors where data can then be aggregated and visualised at an appropriate HMI interface. Where possible provision for self-powering these IoT devices using energy harvesting will be taken into account in order to avoid battery replacement. Flexible and dynamic data-driven solutions that can be adapted to different environments and needs.

Advanced and ubiquitous human machine interaction

Comment: Decision makers are not at their desk the whole day. In order to reduce the probability that they miss important information, the project investigates user interface solutions for the shop floor and everywhere else in the factory, in order to provide data monitoring, control and notification systems, that help humans in interaction with machines and with the decision making process.

Data analytics, including artificial intelligence (AI)

Comment: Big data analytics in cloud environments to support manufacturing scenarios.

Figure 7. Snip 2(2) of some of the project details available for the COMPOSITION project that was highlighted in the search of 'Digital manufacturing platforms' on the EFFRA portal

Example of a project with all the relevant taxons of the structured wiki filled.

Once a project owner has filled all the relevant taxons of the structured wiki, their project description in the ECSEL-portal would include an overview of this. The “More information” section at the bottom of their project page will include all the related taxons (that have been selected) for the project and the degree to which the project covers each of these taxons (shown as a bar chart on the right hand side of the taxon name). Figure 88 shows the information on the EFFRA portal for the ConnectedFactories project as an example of a project using the platform to its full potential, by adding the details for the project.

At a glance the user can get a feel for the topics and technologies covered by the project. For each of the taxons, it is possible for the project owner to also include comments on how the taxon is covered in their project.



Figure 8. An example of a project using the platform on the EFFRA portal with the details filled by the project owner. The ConnectedFactories project shows the taxons covered and the degree to which they are covered for the project

3.2 The search functionality and the role of the structured list

The main goal of the structured lists is to support the collection of information in a structured way, herewith also supporting the analyses of collected information.

In addition, the portal is equipped with a fairly powerful search engine, which supports a free text search and where the relevance of items (basically projects and results/demonstrators) can be fine-tuned. For example, the relevance of a project is placed as higher if the search terms appear in the projects' title, the short description, in the description of results associated to the project, in the structured lists associated to the project etc.

So, when users will search the portal, they will primarily use the free text search. The quality of the search and the returned information will be raised by collecting information through the structured list, but quality is also very much dependent on the short descriptions of the projects and the associated results and demonstrators.

4 Steps needed for adding projects into ECSEL-portal

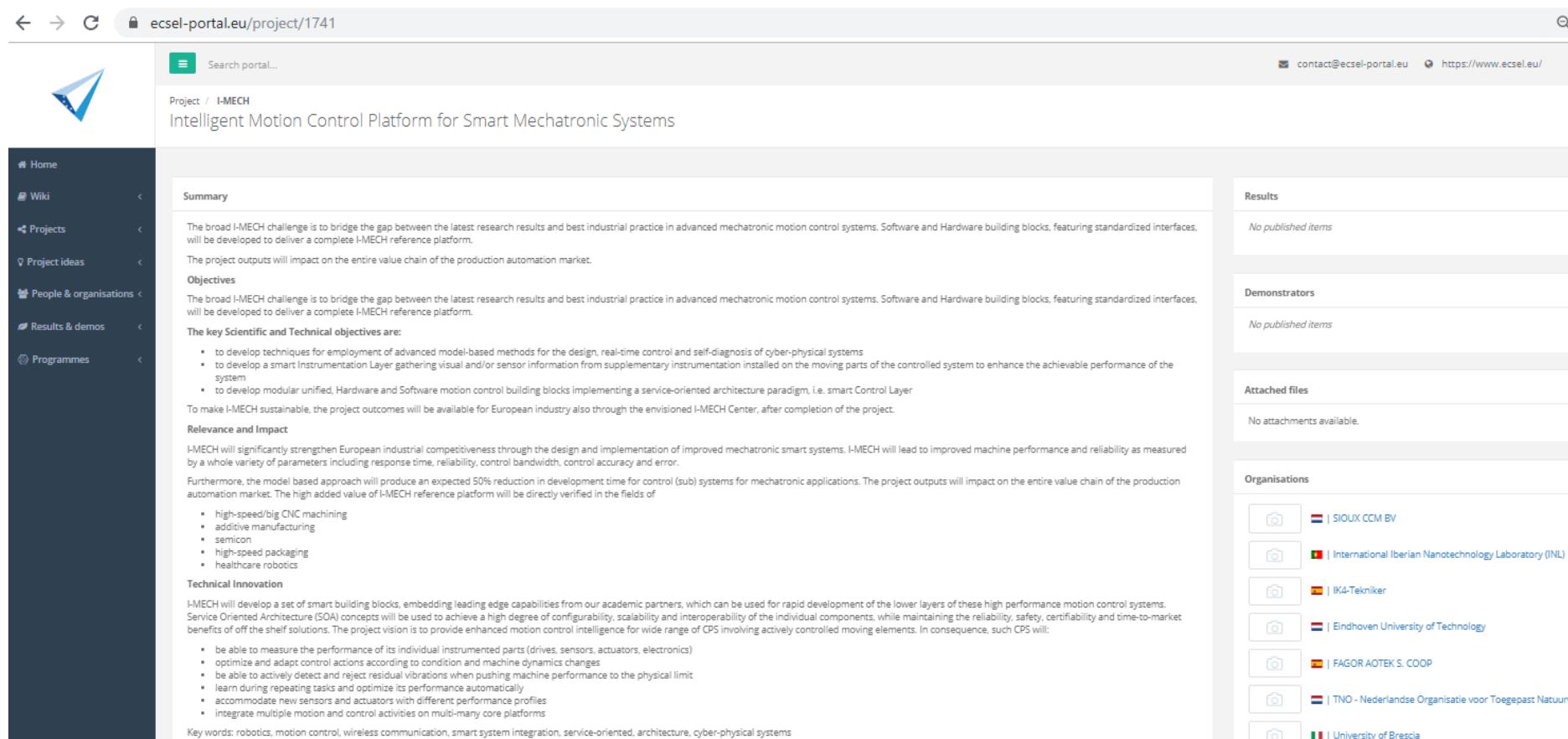
There 6 steps needed to add a project into the ECSEL-portal and maintain it, these are:

1. **Data import process:** Generic data from CORDIS is imported – this is only as good as the data available on CORDIS on the day it is imported.
2. **Project owners register on ECSEL-portal:** Project owners/coordinators (or designated members of their consortium) are asked to register on ECSEL-portal so that they can be given editing rights
3. **Supplement data import and add to the structured wiki:** Project owners/coordinators are asked to check and supplement the imported data from CORDIS. Mainly the coordinators are asked to fill the structured wiki and to add the project summary and comments where possible (this helps increase the power of the 'free text' search for presenting most relevant projects first in search results).
4. **Data vetting:** Someone vets the data against their own dig on the projects and confirms there is nothing missing &/or consults the coordinator to amend missing data or verify extra data they were unaware of.
5. **New updated project data import from CORDIS:** On a regular basis a script is run to check if there is more data available on CORDIS to import. This will be imported to the ECSEL-portal without overwriting any existing data on the ECSEL-portal which has been added by project owners. When new project data is detected and uploaded to the ECSEL-portal the project owners will be notified so that it prompts them to add any extra data.
6. **Updated project data from project owners:** On a regular basis, and after a CORDIS update, the project owners should check that their structured wiki is filled for new items and updated for existing items to reflect the degree to which their project matches or covers a particular topic/taxon.

5 Projects mapped under the Industry4.E Lighthouse

In this section we show an example for how one of the Industry4.E Lighthouse projects (I-MECH) would look on the ECSEL-portal (Figure 9-11).

5.1 Example1 Industry4.E Lighthouse Project in platform: I-MECH



The screenshot shows the ECSEL-portal.eu website with the URL ecsel-portal.eu/project/1741. The page displays the project details for "I-MECH: Intelligent Motion Control Platform for Smart Mechatronic Systems".

Summary

The broad I-MECH challenge is to bridge the gap between the latest research results and best industrial practice in advanced mechatronic motion control systems. Software and Hardware building blocks, featuring standardized interfaces, will be developed to deliver a complete I-MECH reference platform.

The project outputs will impact on the entire value chain of the production automation market.

Objectives

The broad I-MECH challenge is to bridge the gap between the latest research results and best industrial practice in advanced mechatronic motion control systems. Software and Hardware building blocks, featuring standardized interfaces, will be developed to deliver a complete I-MECH reference platform.

The key Scientific and Technical objectives are:

- to develop techniques for employment of advanced model-based methods for the design, real-time control and self-diagnosis of cyber-physical systems
- to develop a smart Instrumentation Layer gathering visual and/or sensor information from supplementary instrumentation installed on the moving parts of the controlled system to enhance the achievable performance of the system
- to develop modular unified, Hardware and Software motion control building blocks implementing a service-oriented architecture paradigm, i.e. smart Control Layer

To make I-MECH sustainable, the project outcomes will be available for European industry also through the envisioned I-MECH Center, after completion of the project.

Relevance and Impact

I-MECH will significantly strengthen European industrial competitiveness through the design and implementation of improved mechatronic smart systems. I-MECH will lead to improved machine performance and reliability as measured by a whole variety of parameters including response time, reliability, control bandwidth, control accuracy and error.

Furthermore, the model based approach will produce an expected 50% reduction in development time for control (sub) systems for mechatronic applications. The project outputs will impact on the entire value chain of the production automation market. The high added value of I-MECH reference platform will be directly verified in the fields of

- high-speed/big CNC machining
- additive manufacturing
- semicon
- high-speed packaging
- healthcare robotics

Technical Innovation

I-MECH will develop a set of smart building blocks, embedding leading edge capabilities from our academic partners, which can be used for rapid development of the lower layers of these high performance motion control systems. Service Oriented Architecture (SOA) concepts will be used to achieve a high degree of configurability, scalability and interoperability of the individual components, while maintaining the reliability, safety, certifiability and time-to-market benefits of off the shelf solutions. The project vision is to provide enhanced motion control intelligence for wide range of CPS involving actively controlled moving elements. In consequence, such CPS will:

- be able to measure the performance of its individual instrumented parts (drives, sensors, actuators, electronics)
- optimize and adapt control actions according to condition and machine dynamics changes
- be able to actively detect and reject residual vibrations when pushing machine performance to the physical limit
- learn during repeating tasks and optimize its performance automatically
- accommodate new sensors and actuators with different performance profiles
- integrate multiple motion and control activities on multi-many core platforms

Key words: robotics, motion control, wireless communication, smart system integration, service-oriented, architecture, cyber-physical systems

Results

No published items

Demonstrators

No published items

Attached files

No attachments available.

Organisations















-   | **SIoux CCM BV**
-   | **International Iberian Nanotechnology Laboratory (INL)**
-   | **IK4-Tekniker**
-   | **Eindhoven University of Technology**
-   | **FAGOR AOTEK S. COOP**
-   | **TNO - Nederlandse Organisatie voor Toegepast Natuurwetenschap**
-   | **University of Brescia**

Figure 9. Example of how Industry4.E Lighthouse project I-MECH would look in the ECSEL-portal screenshot 1(3)

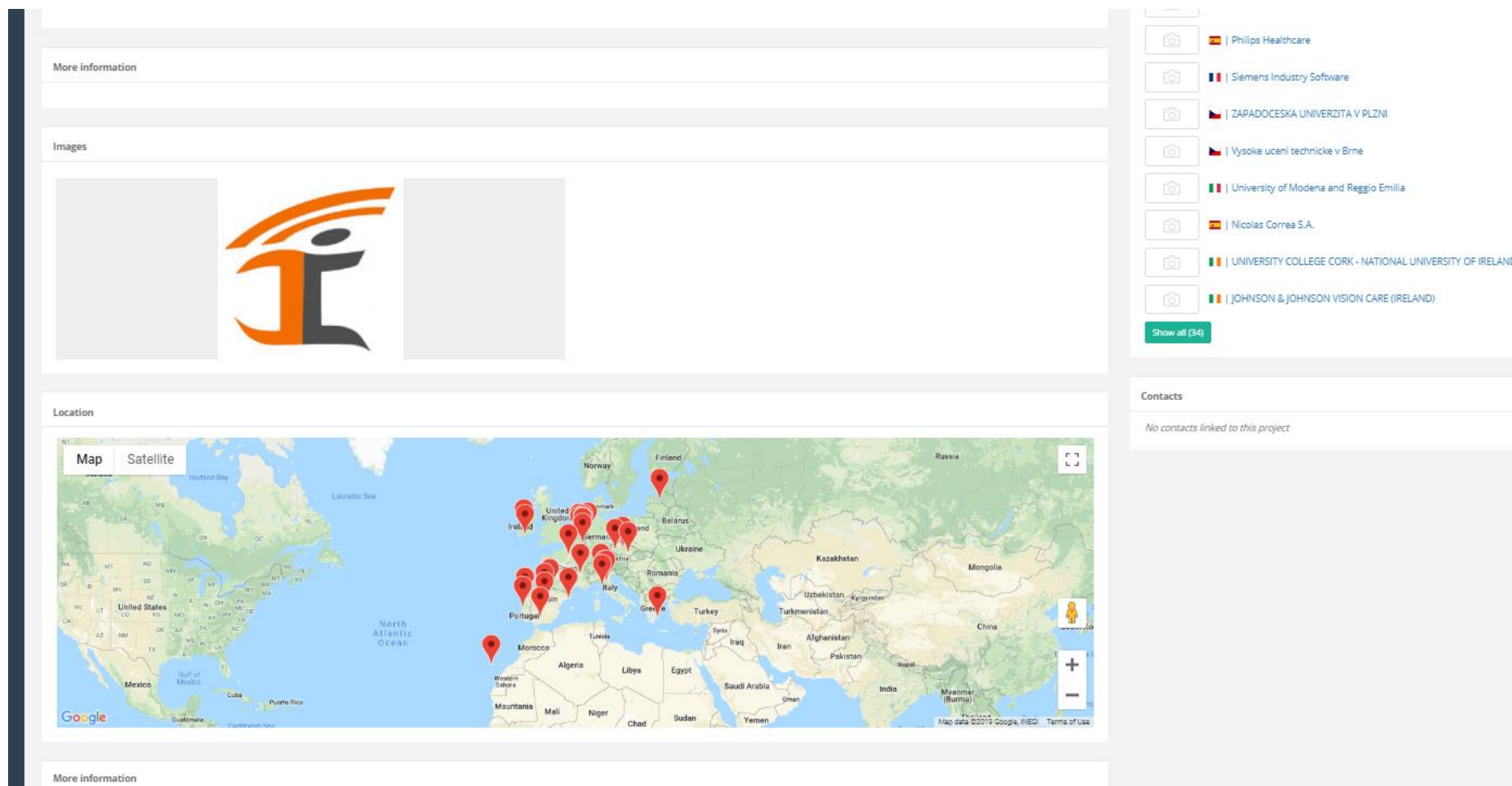


Figure 10. Example of how Industry4.E Lighthouse project I-MECH would look in the ECSEL-portal screenshot 2(3)

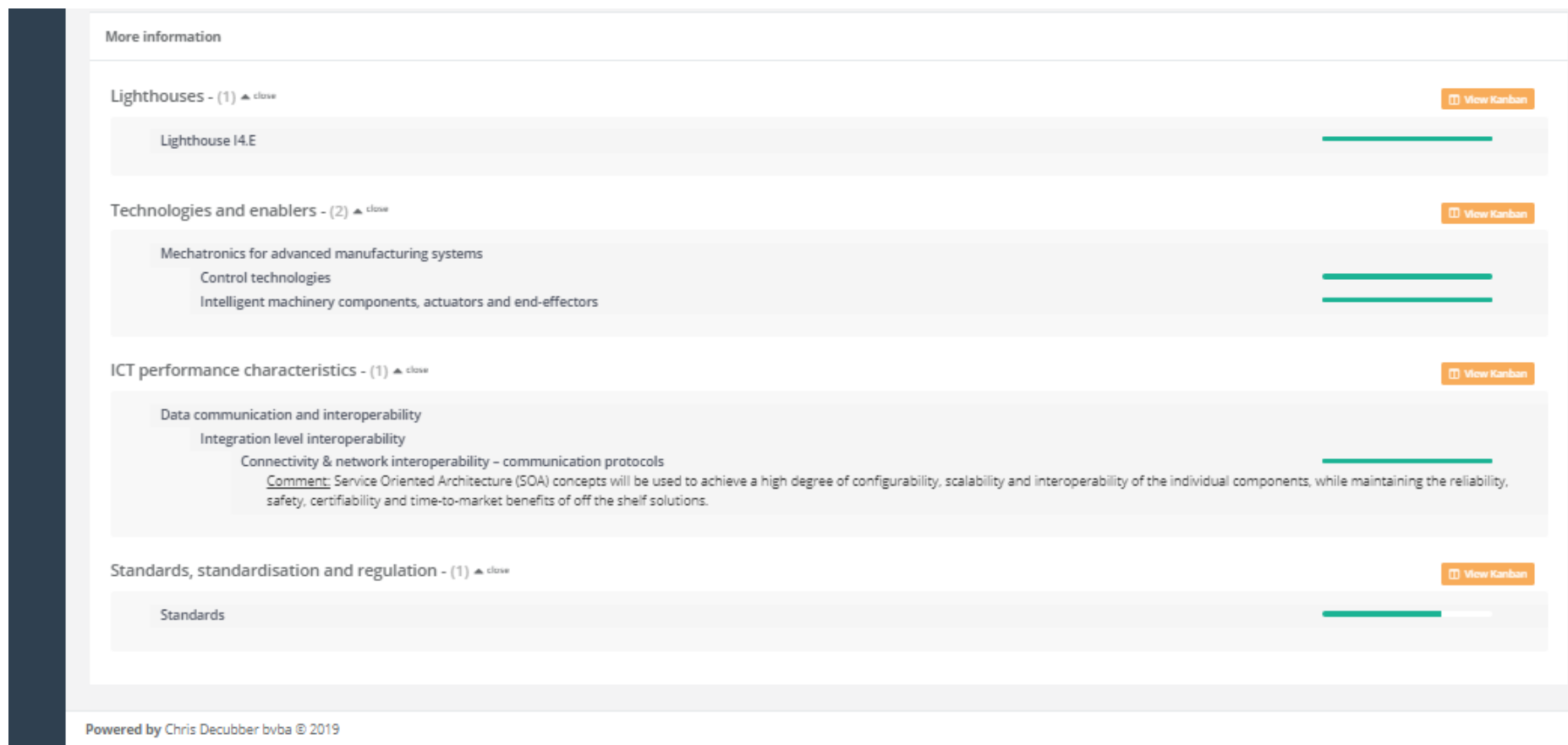


Figure 11. Example of how Industry4.E Lighthouse project I-MECH would look in the ECSEL-portal screenshot 3(3)

6 Promoting the platform to the Industry4.E Lighthouse Community

6.1 Productive4.0 Annual Meeting March 2019

The CSA-Industry4.E team participated in the Productive4.0 meeting in March 2019. This included an information session on the Industry4.E Lighthouse, during which the CSA-Industry4.E Coordinator presented the Industry4.E Lighthouse, alongside the ECSEL-JU Programme Officer Berta Ferrer Llosá. As part of this session the proposed communications platform was introduced and the platform provider (Chris DeCubber) gave a presentation on the advantages of the platform being used by EFFRA and the digitalisation pathways mapping by the ConnectedFactories project.



6.2 Discussions with ECSEL-JU office regarding the platform setup

The Platform Launch and Sustainability will be discussed by the ECSEL-JU Office, and whether it will be used by all the Lighthouses (Mobility.E and Health.E, as well as Industry4.E) and their associated projects in the coming weeks.

7 Platform Conclusions

The aim of this deliverable D2.1 was to present a report at month 12 in the CSA-Industry4.E project on the operational platform created for the Industry4.E Lighthouse: presenting the platform functionalities, giving summary information about its contents, information on the progress of the platform and the feedback to date. This report highlights the key work done to date in developing the platform and facilitating interactions from the Industry4.E Lighthouse projects to include their project details in the platform. Further work is required in the run up to the launch of the portal. The work on further promoting the platform and getting all useful details from the Industry4.E Lighthouse projects onto the platform will continue for the duration of the CSA-Industry4.E project.

8 Document Information

ECSEL-JU CSA Project	Coordination & Support action for Lighthouse Initiative Industry4.E CSA-Industry4.E No 830845
Project website	www.Industry4E.eu
Deliverable	D2.1 - Report presenting the operational platform Interim version by email
Work Package	WP2 - Engaging the Research Communities in Collaboration
Deliverable due date:	M12 – 30/09/2019
Submission date:	04/10/2019
Dissemination level:	Interim version not public
Nature of deliverable:	R: Report
Authors (Partner)	Olga Ormond (AquaTT)

Contributors: Dr. Ann O’Connell (IMR), Chris DeCubber (Chris DeCubber bvba – Platform provider), CSA-Industry4.E consortium and LIASE (including Leire Etxeberria Elorza (MGEP), Meike Reimann (S2i), Maurice O’Connell (IMR), David Murphy (AquaTT), Olli Ventä (VTT), and Matias Viermaa (VTT)).

D4.2 A suite of promotional material developed for the project - Version log	
Version - Date	Comments & Recommendations
V0.06 – 26.09.2019	D2.1 draft - AquaTT sent to Platform provider for comment.
V0.14 – 29.10.2019	D2.1 draft – updated following comments from provider and updates following justification requests from ECSEL-JU (in comparison to CORDIS and H2020 Dashboard) sent to CSA-Industry4.E partners for comment
V0.19 – 29.10.2019	D2.1 draft – updated following comments from partners
V1.0 – 29.10.2019	D2.1 V1.0 ready for email to project office