European Digital Industry Alliance

D1.2 Individual cluster analysis and positioning in the global value chain

DISCp - Digital Industry Strategic Cluster partnership

Action number: 783390

GAIA

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Project deliverable

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Abstract	The D1.2 Individual cluster analysis and positioning in the global value chain is the **initial situation/identification of each participating cluster/country** in terms of **technology offer** (in ICT clusters) and **demand** (in industrial clusters), and analysing the **strengths and weaknesses** of the respective clusters ecosystems, and **links with Regional Innovation Smart Specialisation Strategies**.		

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Content

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Executive summary

This document analyses the positioning of each cluster of the project in the Digital Industry global value chain, mainly speaking products and technologies and the relevant actors and stakeholders responsible for their development, with a specific focus on SMEs. Many examples of SMEs of these clusters providing solutions for a digital industry are available in this document.

The 3 ICT clusters, SCS, GAIA and TICE.pt, have defined a common nomenclature of available technologies for digitalising the industry. In total, 16 groups of technologies have been identified, including among other the IIOT (Industrial Internet of Things), Big Data and Artificial Intelligence, cybersecurity…. The cross analysis of their respective positioning in the value chain shows some complementarities as well as some gaps on certain technologies (like for instance autonomous robots), that will be further addressed by linking with additional clusters in Europe to better cover and complete the value chain.

The 3 industrial clusters, MESAP, BalticNet-PlasmaTec and MITC, have identified common areas where industrial players need digitalisation, and have summarized them into three categories: smart production and smart products, industrial safety (including data security), and human resources (interaction between humans and machines). These needs can be addressed by the use of the technologies observed in the ICT clusters.

Finally, all clusters have included a description of their regional strategies with a specific focus on the initiatives towards the digitalisation of the industry. All the regions and countries represented by the clusters of the projects have very clear and strong strategies aligned with the objective of modernising their local industries, using clusters as catalysts for innovation in SMEs.

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1 Introduction

This deliverable is a public document delivered in the context of **WP1 State of the art and basis for collaboration** for DISCp project. After a first analysis of the Digital Industry global value chain analysed in D1.1 High level analysis of the digital industry global value, the objectives of this deliverable are to:

- identify **the initial situation of each participating cluster/country** in terms of **technology offer** (in ICT clusters) and **demand** (in industrial clusters);
- analysing the **strengths and weaknesses** of the respective clusters ecosystems, and **links with Regional Innovation Smart Specialisation Strategies**.

The document is divided into the following sections:

- **Analysis of the ICT sector**, with the definition of the nomenclature of the main selected technologies covered by the expertise of the ICT companies related to Industry 4.0. Then the analysis of each ICT clusters participating in the project (SCS, GAIA/BASQUE GAMES, TICE.pt) with respect to these technologies and with the identification of some best practices and companies with experience in these technologies.
- **Analysis of the industrial sector,** with an attempt of a structuration of the main areas of demand for the industrial sector related to Industry 4.0. Then the analysis of each Industrial clusters participating in the project (MESAP, BNPT, MITC).

In both cases, we have identified the synthesis of industrial cluster positioning for ICT and industrial sector that can be considered the first step for the identification of the main collaboration areas for ICT and industrial sector.

Finally, we have included a conclusion section with the main findings regarding strengths, needs and demands for ICT and industrial sector.

It's also important to reinforce that this project intends to help industrial companies becoming “Digital” or “Digitalize” their businesses. In fact, for several years, companies were “Digitizing” their processes and the later involves standardizing business processes and is associated mainly with cost cutting and operational excellence. In essence, Digitization imposes discipline on business processes that, over the years, were executed by individuals in a variety of creative (but not always optimal) ways.

Nowadays, companies are confronting something new and different. Becoming “Digital” refers to host powerful, accessible and potentially game-changing technologies like social, mobile, cloud, analytics, Internet of Things, and Artificial Intelligence. It also refers to the transformation that companies must undergo to take advantage of the opportunities these technologies create. Digital transformation involves rethinking the company’s value proposition, not just its operations, since it implies to innovate, to deliver enhanced products or services and to rethink customer engagement. Many business leaders are thinking of digitalization as advanced digitization, such as enhancing the customer experience with mobile technologies or implementing internet of things capabilities to improve operations.

But “becoming digital” is a totally different exercise from digitizing. Companies today must become digital to compete in a world in which both end consumers and business customers expect products

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and services to meet their needs on demand across channels. In most industries, digital is already a business imperative. Digitization is an important enabler of digital, but all the digitization won't, on its own, make a business a digital company. Digitalization is, therefore, to use Digital Information and Technologies to optimize Business Outcomes and, ultimately, create new revenues.

In this document, we will refer to Digital Industry, or sometimes Industry 4.0 to describe this modernisation of the industry.

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2 Analysis of the ICT offer

The offer englobes the relevant ICT technologies needed to digitalise the industry. In this section, we will first define a nomenclature of these technologies, then analyse the positioning of each ICT cluster of the project with respect to these technologies.

2.1 Nomenclature of technologies observed in the clusters

The nomenclature defined below is the result of an analysis of the technologies used to digitalise the industry, observed in the three ICT clusters of the project and from the digital industry global value chain (D1.1). The objective of this is not to cover all the technologies neither to provide a detailed description of each technology neither, but rather to establish a categorisation to further analysis the positioning, complementarities and gaps of the ICT clusters within this digital industry value chain.

2.1.1 Autonomous robots

Long used to tackle complex tasks, robots provide an ever wider range of services and are becoming more autonomous, flexible, and cooperative. They will interact with one another and work safely with humans (the term “cobotics” is used to describe robots helping operators perform their tasks). Eventually, they will be able to learn from humans.

2.1.2 Simulation

3D simulation of product development, material development and production processes will become widespread. It will leverage real-time data to mirror the physical world in a virtual model that will include machines, products, and humans. Operators will be able, for example, to test and optimize the machine settings for the next product even before production starts, thereby reducing machine setup times and improving quality**.** (*Virtual simulations* such as : *dynamic, fluid, tensibility..)*

2.1.3 Horizontal and vertical system integration

Today, information systems are not fully integrated. Companies are rarely connected with their suppliers and customers. Engineering design departments are seldom linked directly to production within its own organization. But with Industry 4.0, the entire organization will be interconnected, and companies will be connected with one another.

2.1.4 Industrial Internet of Things (IIoT)

Few machines are currently fitted with sensors and interconnected. With the Industrial Internet of Things, an ever greater number of products will incorporate intelligence and be connected using standard protocols. This will decentralize analytics and decision-making, enabling real-time responses. IIoT includes connected sensors, communication networks (like LoRa, Sigfow, NB-IoT…) and IoT platforms

2.1.5 Cybersecurity

The days of closed, unconnected operational management systems are over. Connectivity and communication protocols are becoming the norm. Protecting information systems and manufacturing lines from cybercrime threats is becoming a critical issue. Sophisticated identity and

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machine access management systems will be used to provide secure, reliable communications. A large part of the cyversecurity issues in the industrial domain concerns the IoT security (securing devices, communications and data, to protect industries from attacks, theft, reverse engineering…)

2.1.6 Cloud

The operating processes of Industry 4.0 require more data sharing across sites and companies. The performance of cloud technologies will improve, achieving response times of mere milliseconds. This will foster the development of an ever greater number of Manufacturing Execution Systems (MESs) based on cloud-stored machine data.

2.1.7 Additive manufacturing

Companies have just begun to adopt 3D printing for prototyping and unit production. With Industry 4.0, these technologies will be chosen for their very high performance in producing small batches of customized products. Decentralized systems will reduce transportation and inventory management costs. The offer focusses on ICT technologies for designing, controlling and monitoring additive manufacturing.

2.1.8 Augmented reality

Augmented-reality tools are still in their infancy, but they are paving the way for new services. For example, they will provide operators with the real-time information they need for faster decision-making and for improving work processes.

2.1.9 Big data and analytics

There are still massive sets of untapped data in the industrial world. Their analysis will optimize production quality, save energy, and improve services. Here as well, the goal is to allow real-time decision-making, using Artifical Intelligence algorithms.

2.1.10 ICT strategy and planning

ICT models, schemes, structures and platforms that guarantee effectiveness and efficiency in the use and application of resources, thereby allowing the continuation of compliance with defined ITC plans and strategies.

2.1.11 Transformation and innovation models

Models that constitute the frames of reference against which a legal organization's situation is compared and evaluated, establishing the architectures that will guide the development of the judicial information systems, and promoting the creation and transmission of knowledge, which is the main asset in the Information Society, and must be managed to maximize its performance.

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2.1.12 Document management

Modeling of document standards that will make it easier for employees to work with documentation, socializing information as a collective resource and maintaining the memory of the organization beyond individuals.

2.1.13 User support center

This englobes the only point of contact for the resolution of incidents and channelling of needs.

2.1.14 Support for Knowledge Management

Through the extraction and management of content, to function as an "observatory" in order to propel and dynamize the use of the information systems and, definitely, to motivate all the actions that promote the creation and dissemination of knowledge.

2.1.15 Support for Information Systems

Solutions ensuring the correct functioning of the management of capacity, security and availability.

2.1.16 Support for training processes

In person and online, applying the methodologies necessary to optimise time and cost according to the needs of the organisation, and directed towards employees and collaborators.

2.2 Individual ICT cluster analysis

The three ICT clusters of the project are:

- SCS cluster in France, Provence-Alpes-Côte d'Azur
- GAIA in Spain, Basque Country
- TICE.pt in Portugal

2.2.1 SCS cluster

2.2.1.1 Cluster presentation

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SCS (Secured Communicating Solutions) cluster, is based in the Provence-Alpes-Côte d'Azur region, in France, and gathers more than 300 members, including companies (and 70% of SMEs), research centres and educational institutions in the fields of microelectronics, telecommunications and software. The cluster represents 60 000 jobs in these fields, 26 multinational companies, 1200 researchers in the public sector and 18 educational institutions training 1500 engineers per year. Its aim is to promote the development of competitive R&D projects between all these players with the support of local communities, in order to design and develop new solutions targeting high-growth markets such as smart cities, smart homes and smart buildings, smart grids, **Industry 4.0**, or e-health. It also aims to contribute to the creation of an appropriate ecosystem for the overall regional ICT landscape, especially through the development of SMEs. Its ambition is to be recognized as a key player in innovation in the three "Smart Specialisation Areas" that constitute the core of its strategy:

- Contactless technologies (NFC, RFID);
- Networks (5G), M2M & mobile services;
- Digital security & identities.

2.2.1.2 Cluster actions and strategy towards industry 4.0

The **French** national programme **"Nouvelle France Industrielle"** launched in 2015, includes 9 challenges (smart cities, smart objects, digital trust…) and one transversal plan: Smart Industry (**"Industrie du Futur"**). Its objective is to encourage all industrial companies to modernise their production tools and the transformation of their business model through digitalisation. It includes five challenges: 1) the development of the technology offer (including the IoT); 2) the individual assessment of the capacity of industrial companies to modernize their production tools; 3) the training of current and future employees, to prepare them to a more digitalised industry; 4) the reinforcement of the European and international cooperation, and in particular with the German initiative on the "Industry 4.0"; 5) The promotion of the Industry of the Future to make the French know-how more visible in France. In parallel, the **"Alliance pour l'Industrie du Futur"** has been launched, gathering industrial, technology and academic stakeholders to organise and coordinate initiatives and projects for the modernisation and the transformation of the French industry. www.economie.gouv.fr/lancement-seconde-phase-nouvelle-france-industrielle

The **Provence-Alpes Côte d'Azur (PACA) Region** initiative on the Industry of the Future (Opération d'Intérêt Régional Industrie du Futur) is a declination of the French national policy "Industrie du Futur" at a regional level. It is included in its Regional Innovation Strategy. SCS cluster takes part in this initiative, by representing the technology offer in the PACA region. This offer consists of more than 50 startups, SMEs and larger companies offering technologies for the smart industry (IoT including sensors and actuators, networks and communication, mobile internet, social networks and

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cloud computing, Big Data, Cyber security). SCS cluster is editing a catalogue aiming at promoting these technologies towards traditional industries (aerospace, ship building, agrofood, chemicals…) on their way to smarter manufacturing. In parallel, traditional industries from the PACA region are currently being consulted on their needs regarding the modernisation of the production tools.

2.2.1.3 Cluster strengths in the value chain

SCS cluster has identified strengths in particular in the following areas:

- **Industrial Internet of Things:** companies developing wireless sensors network solutions for managing, monitoring, and tracking assets and external conditions within industrial environments. These solutions are based on RFID, IoT networks (like LoRA) and other proprietary protocols. Examples of companies:
  - EDITAG: IoT based products dedicated to process and asset monitoring. www.editag.eu
  - STID: solutions securing and facilitating the supervision of industrial flows and processes. www.stid.eu
  - INEO-SENSE: wireless sensor network for asset tracking. www.ineo-sense.com
  - NEWSTEO: wireless smart sensors for measurements used for traceability, supervision and real time alerts. www.newsteo.com
  - GREEN CITYZEN: IoT solutions to monitor the environment. www.greencityzen.fr
  - STACKR: asset management in industrial context for optimising margins: www.stackr.-group.com
- **Cybersecurity**: companies developing hardware and software solutions for securing industrial IT infrastructures within industrial environments. Examples of companies:
  - TRUSTED OBJECTS: security expert transforming IoT end-to-end security development with a new personalization tool kit designed for Secure Element. www.trusted-objects.com
  - INSIDE SECURE: software, silicon IP, tools, services and know-how for customers' secure transactions, ID, content, applications and communications. www.insidesecure.com
  - SOLIDSHIELD: code obfuscation, anti-tamper and software licensing solutions. www.solidshield.com
  - TRUSTAZUR: Trusted Execution Environment (TEE), Secure Element (SE), Hardware and Software protection, Root-of-Trust (RoT) and Asset Management to protect Provisioning, Storage and Use of Assets enabling secure access to applications as well as remote and cloud services. www.trustazur.com
  - PROVE & RUN: software solutions that improves the level of security of Connected Endpoint/Gateways so-as-to protect them against remote cyber-attacks. www.provenrun.com
- **Big data and analytics:** companies providing software for managing large amount of data and algorithms to analyse and this data, to support decision processes (like in predictive maintenance), or other industrial use cases. Example of companies:
  - ACTIVEON: solutions for IT automation, acceleration and scalability, Big Data, Internet of Things, Distributed and parallel applications. www.activeeon.com
  - DATA2I: platform using machine learning models for analysing and visualizing massive data coming from sensors in order to automatically detect anomalies. data2i.fr/
  - CITYZEN DATA: platform for collecting, storing and creating value from sensor data. www.cityzendata.com

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  - O2QANT: expert in time series (classic data) and predictions, image recognition, error detection or fraud in Big data, recommendation system, segmentation/clustering, optimization, Deep reinforcement learning. www.o2quant.com
- **Cloud:** mainly data centers providing solution for hosting and managing data coming from IoT devices. Example of company:
  - TAS GROUP: solutions (software, networks, outsourcing) for card management, payment networks access and order management. www.tasfrance.com
- **Document management:** companies provide solutions in the field of electronic signature, or dematerialisation of documents. Example of company:
  - KEEEX: embedded data protection technology for trusting the source, integrity & date of every file. keeex.me/
- **Support for Information Systems:**
  - ASALOG: IT solutions (visualisation, monitoring, predictive analysis…) for the industry. www.asalog.com
  - STACKR: IT solutions (security, safety, monitoring of logistical flows…) for the industry. www.stackr-group.com
  - USITAB: mobile tablet to monitor industrial processes and take the right decision. www.usitab.com/
- **Support for training processes:**
  - TEACH ON MARS: mobile learning platform. www.teachonmars.com

2.2.2 GAIA/BASQUE GAMES

2.2.2.1 Cluster presentation

GAIA, the **ICTA Basque Country (Industry of Knowledge and Applied Technology**) sector constitutes a competitive advantage to accelerate the transformation of companies, territory and society with the aim of positioning Euskadi in the New Economy. The ICTA sector companies create, develop and offer advanced solutions for all sectors: industry, services, Public Administration and Society. GAIA is formed by 280 companies.

The **Strategic Plan 2017 - 2020** aligns the offer of the companies of the sector towards the specialization in the development of **Projects** referring, in Clave of **Collaborative Innovation**, in three **Spaces of Opportunity: Smart Industry. Industry 4.0 & Energy, Smart territory and Smart Society.**

2.2.2.2 Cluster actions and strategy towards industry 4.0

Basque Country has developed a RIS3 plan called RIS3 Euskadi.

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The Basque smart specialisation strategy has identified **Energy** and **Advanced Manufacturing** as strategic areas. The three essential enabling technologies of RIS3 Euskadi strategy are: biosciences, nanosciences and advanced manufacturing. The windows of opportunities identified by the RIS3 Euskadi Plan, offer companies new opportunities to collaborate in the construction of Integrated Solutions for the development and the transformation of processes, products and services for companies and Administrations. Driven by product and service receivers and final users, GAIA fosters alliances among ICTA sector companies, companies from other sectors, RVCT entities and the Public Administration in order to develop new generation solutions. These performances foster the development of companies from varied sectors, and boost their outreach to local and international markets. The contribution of ICTA sector companies, is not only knowledge and technology for management or the environment, but they also provide applied experiences of similar solutions in organizations from the same sectors as well as from other sectors.

2.2.2.3 Cluster strengths in the value chain

Competences and capabilities. Reference cases and companies:

- **Simulation**
  - Monitoring of productive activities through virtual reality techniques.
    Reference case: Virtual reality at the service of the industry. Company: BIHARTECH. www.bihartech.com/
- **Horizontal and vertical system integration**
  - Integration of machines. Reference case: Thinking Factory. Company: CTI SOFT S.L.. GRUPO SPYRO. www.spyroerp.com/
  - Integration and monitoring of lines. Reference case: MES Olanet. Company: IBERMÁTICA.S.A. ibermatica.com/
  - Robust connectivity ring of heterogeneous equipment plant. Reference case: Industry 4.0 Platform for Industry with Typology of Discrete Multi Components Manufacturing -line and Multi –Product. Company: SYSTEM ON CHIP ENGINEERING, S.L. soc-e.com/
- **Industrial Internet of Things**
  - Monitoring of plant and infrastructure. Reference case: Rowingte Plant Supervision System. Company: IZERTIS, S.L.U. www.izertis.com/
- **Cybersecurity**
  - Augmented reality and simulation for a safer Industry 4.0. Reference case: Advanced interaction systems for asset Management. Company: VIRTUALWARE 2007, S.A. virtualwaregroup.com/es
- **Cloud**
  - Infrastructure in the cloud at the service of the industry.
    Reference case: Support services for the development of industry 4.0. Company: EUSKALTEL. www.euskaltel.com
- **Additive manufacturing**
  - The opportunities of additive manufacturing in tools for improvement of processes, molds or prototypes. Reference case: Manufacture of plastic injection molds prototype through additive manufacturing. Company: OPTIMUS3D. optimus3d.es/
- **Augmented reality**

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  - Visualization and management of resources in plant. Reference case: Lantek Factory. Company: LANTEK SHEET METAL SOLUTIONS, S.L. www.lanteksms.com/es
- **Big data and analytics**
  - Analysis of the manufacturing activity. Reference case: Manufacturing Analytics. Company: TECNALIA- www.tecnalia.com/en/
  - Advanced monitoring and Big Data for Industry 4.0. Machine connectivity and information analysis. Reference case: Industrial Cloud. Company: CIRIL DATA SYSTEMS. www.savvydatasystems.com/
  - Intelligent product inspection. Reference case: Big Data and Machine Learning applied to the Predictive Quality Control. Company: LKS. S.COOP. www.lks.es/Default.aspx
  - Capture big volumes of information, for analytics exploitation analytics, guaranteeing the security for all the information in all moment. Reference case: Big Data monitoring platform that solves all the needs of an OEM (original equipment manufacturer). Company: SAVVY DATA SYSTMES. www.savvydatasystems.com/
- **ICT strategy and planning**
  - Transformation of the business model. Reference case: Sareteknika. Company: LKS. S.COOP. www.lks.es/Default.aspx
- **Transformation and innovation models**
  - Synchronization of the supply of components. Reference case: Syncro Automotive.Company: IGARLE, S.L. www.igarle.es/
  - Optimization of raw material cutting. Reference case: Izaro Coils Cutting Planner. Company: INFORMÁTICA 68, S.A. www.grupoi68.com/
  - Solution for intelligent quality inspection of product. Reference case: M3. Company: TRIMEK, S.A. INNOVALIA METROLOGY. www.trimek.com/sobre-trimek/innovalia/
  - Smart maintenance Reference case: Maintenance assistance platform remotely using AR for complex product servitization. Company: DEUSTO SISTEMAS, S.A. www.deustosistemas.net/es/
  - Assistance with product configuration with the customer. Reference case: Repcon Configurator. Company: SEMANTIC SYSTEMS, S.L. www.semantic-systems.com/
  - Intelligent systems for the positioning of solutions in the global market. Reference case: Automation of practical marketing for the industrial machinery sector. Company: WEBALIANZA T.I, S.L. beta.webalianza.com/
- **Document management**
  - Exchange of information with clients or suppliers / subcontractors. Reference case: Vector Web Sites. Company: IDS INGENIERÍA DE SISTEMAS S.A www.ids.es/
  - Exchange of documents between clients and suppliers. Reference case: Syncro Euskadi. Company: GAIA NET EXCHANGE. www.gaianetexchange.com/en/
- **User Support Centre**
  - Post services - sale for monitoring and attention to user. Reference case: VISUALIZE Infotainment platform and Telemaintenance for elevators. Company: OBOID, S.L www.oboid.com/
- **Support for Knowledge Management**

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- Intelligent data and process management to ensure traceability in the supply of critical products. Reference case: Voight: Monitoring the chain process of cold. Company: LIS SOLUTIONS. www.lis-solutions.es/
- Management of intelligent knowledge in production. Reference case: Digital factory Sistems. Manufacturing Intelligence topic. Company: SISTEPLANT, S.L www.sisteplant.com

- **Support for Information Systems**
  - Automation process. Reference case: Industrial Software MES ENNTTE. Company: IDS INGENIERÍA INFORMÁTICA INDUSTRIAL, S.A. www.ids-industrial.com/
- **Support for training processes**
  - Creative Learning Solutions. Reference case: Training for industry. Company: TAK LEARNING S.L. www.tak.es/

2.2.3 TICE.PT

2.2.3.1 Cluster presentation

TICE.pt - Associação para o Pólo de Competitividade das Tecnologias de Informação, Comunicação e Eletrónica was formally recognized by the Portuguese Government in August 2009 as the entity responsible to implement collective efficiency strategies in the ICT sector.

TICE.PT's overall action is based on the setup and development of a concertation platform involving and mobilizing ICT's main players in innovation processes, RTD, knowledge and technology transfer, advanced training, development, production and marketing of products and services and internationalization.

TICE.PT currently involves 89 bodies, 67% of which are Companies (mainly SMEs), 17% are part of the National Scientific and Technological System and 16% are Associations, basically distributed throughout northern and central Portugal, as well as in the area of Lisbon and the Tagus River Valley. Our companies in 2016 account for a turnover of € 2,0 billion (1,0 % of GDP), € 930 M€ in exports, invested over 300 M€/year in research, development and innovation and provide more than 9797 direct jobs.

2.2.3.2 Cluster actions and strategy towards industry 4.0

The **Portuguese National Smart Specialization Strategy**, developed in November 2014, defines 5 thematic intervention axels focused on Transversal Technologies and Applications; Industry and Production Technologies; Mobility, Space and Logistics; Natural Resources and Environment and Health, Well-Being and Territory. Despite this thematic organization, industrial modernization and digital transformation are included in all this axels with different expressions.

In the end of January 2017, the Portuguese Government announced i 4.0 (Indústria 4.0) program, managed jointly by the Portuguese Ministry of Economy and COTEC Portugal. This program includes a Strategic Committee where the most relevant public and private (especially large companies) are

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present. During this last year, its action plan is being implemented and includes actions promoted by private companies and funding and investing mechanisms to support industrial modernization and digital transformation in both large companies and SMEs. In a similar way to other European countries' initiatives, this program main objectives are:

- **Accelerate Industry 4.0 concepts and technology adoption by Portuguese businesses,** providing the business community with knowledge and information, promoting a set of tools for business transformation and empowering and readjusting the national workforce
- **Promote Portuguese companies as international Industry 4.0 players** through the capitalization of the scientific and technological ecosystem, creating a favourable context for the development of i4.0 start-ups and promoting national technological solutions abroad
- **Make Portugal an attractive location to invest in industry 4.0**, communicating the country as a Hub of experiences and know-how sharing to attract resources and creating favourable conditions (legal and fiscal) for investment related to i4.0.

Despite the national coverage of TICE.PT, it's based in the Centro Region of Portugal. This region, in a similar fashion to the National Smart Specialization Strategy, structured its Regional Smart Specialization Strategy around 4 transversal innovation platforms where digital transformation and industrial modernization are present:

- Industrial Sustainable Solutions
- Natural Endogenous Resources Valorisation
- Technologies to promote Quality of Life
- Territorial Innovation.

At first sight, the first and third innovation platforms are the ones with a stronger emphasis on Digital Industry. Nevertheless, for instance, Natural Resources Valorisation includes the agro-food sector where relevant activities linked with traceability, intelligent packaging and smart manufacturing (through the adoption of IoT) are being implemented. Mobility and Logistics, especially in the context of Smart Cities and Communities are included in last platform and this area is particularly relevant for Industry Supply Chain and Efficiency.

TICE.PT integrates works closely with the Regional Authority in Centro, but also with other Regions, in the discussion and promotion of their Smart Specialization Strategies and cooperates with COTEC Portugal i4.0 program.

2.2.3.3 Cluster strengths in the value chain

Please describe on which technologies the cluster is strong amongst the following. May be pick the 3-4 most important and give short examples of companies per category

- **Autonomous robots**
  - Transport of objects and goods transport using new sensor and navigation techniques. Able to follow an operator easy and safe object transportation powerful help on restocking. WiiGo Logistics/Follow Inspiration (followinspiration.pt/technology)
    Collaborative Robotics for Assembly and Kitting in Smart Manufacturing – INESC TEC – (www.inesctec.pt/en/projects/colrobot-PG07035#about)

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- STAMINA – Development of a fleet of advanced and collaborative mobile robotic manipulators, capable of dealing with unstructured environments and complex tasks – INESC TEC – (stamina-robot.eu/)
- Robots collaborating with humans in a shared workspace in the shop-floor, creating a co-working partnership – INESC TEC (www.colrobot.eu/)

- **Simulation**
  - Simulation models of the productive system and Robust decision-making process in dynamic and multivariable environments (designed for IKEA industry) – INESC TEC (www.inesctec.pt/en/projects/smartmanufacturing-PG05168#about)
  - Innovative simulation-optimization (SOS) approach to predict and improve storage operations (for SONAE SR) – INESC TEC (www.inesctec.pt)
  - Diagnosis and optimization of the distribution of products from warehouses to stores (for SONAE MC) – INESC TEC (www.inesctec.pt)
- **Horizontal and vertical system integration**
  - IGPM – Integrated Management System for Industrialization Processes – Bosch Car Multimedia Portugal/Universidade do Minho/CGG (www.ccg.pt/projetos/p25-igpm/?lang=en)
  - Open scalable production system framework that can be used efficiently to visualize, virtualize, construct, control, maintain and optimize production lines – INESC TEC (www.inesctec.pt/en/projects/scalable4-0-PG07052)
  - Design and Development of a management application of the stitching automatic conveyors for shoes production (for Kyaia Group) – INESC TEC (www.inesctec.pt/en/projects/smartsl-PG05208)
  - Industrial Process Optimization, Computer Vision, Automated Machines and Autonomous Robots Integration. IoT hardware and software development. WiseWare (wisewaresolutions.com)
  - Equipment and Legacy Systems integration – Critical Manufacturing (www.criticalmanufacturing.com)
    prodsmart integration services – prodsmart (prodsmart.com)
    Concept : Atena Industrial Automation (www.atena-ai.pt)
- **Industrial Internet of Things**
  - UH4SP, software service-oriented architecture and technology solutions, under the paradigm of IoT and Industry 4.0. Cachapuz/CCG/eurotux/Universidade do Minho (www.ccg.pt/projetos/uh4sp-unified-hub-for-smart-plants/?lang=en)
  - Artificial Vision and Machine Learning – Neadvance – Intelligent Vision Systems (www.neadvance.com)
  - Agile software development, big data, IoT, web, mobile and cloud-based solutions for smart industries (www.bitcliq.com)
  - Embedded Systems Development (www.digiwest.com)
  - IoT platform and integration services (www.tecmic.com)
  - Industrial weighing equipment – Cachapuz (www.cachapuz.com)
- **Cybersecurity**
  - Software Security Validation CodeV 2.0 – Dognaedis (www.dognaedis.com/products/codev.html)

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  - Software Assurance, Business Continuity Support, Security Audit and Consultancy, Network Design and Management – Dognaedis (www.dognaedis.com)
  - Cyber Threat Intelligence Centre, Cyber Security Services, Lookwise (Enterprise Manager, Device Manager and Compliance Manager) – s21sec (www.s21sec.com)
  - Cybersecurity consulting services, intrusion detection and mobile security – INOV (www.inov.pt)
- **Cloud**
  - Cloud Solutions – vmuse (www.vmuse.com)
- **Additive manufacturing**
  - 3D Printers, 3D Printing Services and 3D Modelling Software – BeeVEryCreative (www.beeverycreative.com)
  - 3D Printers (representatives), 3D Scanners (representatives), 3D Modelling Software (representatives), 3D Printing Services, Innovation and Product Development Consulting – CODI (www.codi.pt)
- **Augmented reality**
  - CMMS (Computerized Maintenance Management System) – Centro de Computação Gráfica/Universidade do Minho/Bosch (www.ccg.pt/projetos/cmms-computerized-maintenance-management-system/?lang=en)
  - FAMEST SHOE (Development of Anatomical Measurement and Visualization of Footwear) – Centro de Computação Gráfica (www.ccg.pt/projetos/famest-footwear-software/?lang=en)
  - Computer vision and 3D modelling – Centro de Computação Gráfica (www.ccg.pt/projetos/maxcut4fish/?lang=en)
- **Big data and analytics**
  - Organizational Data Warehouse – Centro de Computação Gráfica/Universidade do Minho/Bosch (www.ccg.pt/projetos/p30-business-intelligence-platform-for-data-integration/?lang=en)
  - Ultra Scalable Big-Data Platform – INESC TEC (www.inesctec.pt/en/projects/leanbigdata-PL05005#about)
  - Data Analysis and Manufacturing Business Intelligence – Critical Manufacturing (www.criticalmanafacturing.com)
- **ICT strategy and planning**
  - Assessment and Analysis, Operational Improvement and Technology Consulting – Prodsmart – (www.prodsmart.com)
- **Transformation and innovation models**
  - Innovation and Product Design Consulting – inCentea (www.incentea.com)
  - Business Model and Advanced Industrial Management Consulting Services – INESC TEC (www.inesctec.pt)
  - Organizational Engineering Products and Services – INOV (inov.pt)
  - Innovation Consulting – Inova+ (www.inovamais.pt)
- **Document management**
  - Genio – Highly-automated Software Development and Lifecycle Platform; Vertical Solutions – Quidgest (quidgest.pt)
- **User Support Centre**
  - Interactive experiences – EDIGMA (www.edigma.com)

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- **Support for Knowledge Management**
  - Collaborative Design Platform – Centro de Computação Gráfica (www.ccg.pt/projetos/pt21-design-colaborativo/?lang=en)
  - Critical Manufacturing MES (Manufacturing Execution Systems) – Critical Manufacturing (www.criticalmanufacturing.com/en/critical-manufacturing-mes/overview)
  - prodsmart MES (prodsmart.com/en/features)
- **Support for Information Systems**
  - Manufacturing Decision Making with Advanced Manufacturing Technologies – INESC TEC (www.inesctec.pt/en/projects/dm4manufacturing-PG07050#intro)
- **Support for training processes**
  - Training, Consulting and Certification Services – ISQ (www.isq.pt)

2.3 Synthesis of the ICT cluster positioning

	SCS	GAIA	TICE.pt
Autonomous robots			
Simulation	+	+	+
Horizontal and vertical system integration	+	+++	++
Industrial Internet of Things (IIoT)	+++	++	++
Cybersecurity	+++	++	+
Cloud	++	+	+
Additive manufacturing		+	+
Augmented reality		+	++
Big data and analytics	+++	+++	+++

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ICT strategy and planning	+	+	++
Transformation and innovation models		+++	+++
Document management	++	++	+
User Support Centre		+	+
Support for Knowledge Management	++	++	+++
Support for Information Systems	++	+	+++
Support for training processes	+	+	++

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3 Analysis of the demand – industrial clusters

This analysis is the results of a collaborative thinking between the 3 industrial clusters of the project: MESAP, BalticNet-PlasmaTec and MITC. It attempts to categorise and further describe into three main areas (smart production, safety & security and human factors) the needs for a digital industry.

3.1 Description of the needs expressed from industrial players

The integration of industry 4.0 concepts requires the complete change of production culture. Therefore, company starting with the implementation need a strategy for their digitalisation. This strategy should be including the planning of step by step modification and should integrate the digitalisation of production, the production safety and security and the development of human resources.

3.1.1 Digitalized (Smart) Production and Products

3.1.1.1 Digital Manufacturing

"Digital manufacturing is the use of an integrated, computer-based system comprised of simulation, 3D visualization, analytics and collaboration tools to create product and manufacturing process definitions simultaneously. Digital manufacturing evolved from manufacturing initiatives such as design for manufacturability (DFM), computer-integrated manufacturing (CIM), flexible manufacturing and lean manufacturing that highlight the need for collaborative product and process design.

Many of the long-term benefits from product lifecycle management (PLM) cannot be achieved without a comprehensive digital manufacturing strategy. Digital manufacturing is a key point of integration between PLM and shop floor applications and equipment, enabling the exchange of product-related information between design and manufacturing groups. This alignment allows manufacturing companies to achieve time-to-market and volume goals, as well as realize cost savings by reducing expensive downstream changes. " [www.plm.automation.siemens.com/global/en/our-story/glossary/digital-manufacturing/13157]

Digital manufacturing includes:

- The digitalisation of production processes from raw material to the final product;
- Systems Automation, viz. the production / processing without human interaction *(Groover, Mikell (2014). Fundamentals of Modern Manufacturing: Materials, Processes, and System);*
- Production on demand: the production of an individual order e.g. individualised products, adapted quantity of products, order of materials and parts;
- Additive Manufacturing is a very fast-growing technology of digital manufacturing: it is the process of building parts layer-by-layer directly from (3D-CAD) data to form solid objects. The geometry and material properties will be generated simultaneously without the need of special

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tools. Due to the layer-by-layer construction, a stepped structure is characteristic for additive produced parts.

Preconditions for digital manufacturing are:

- Computer based construction, design and modelling (software/ICT part) to generate digital data for the production planning and to simulate the production process;
- Standardised communication protocols to ensure communication between different machines and robots and to monitor systems from the industrial point of view including the IIoT and thus integrating all objects to a universal digital network;
- Visualisation of the production process up to visualisation of the fabric including the visual based process / production control;
- Artificial Intelligence – knowledge-based production adaptation: as experts will be a rarity in the future, the machines must be smart enough to automatically react to different production situations and adapt the processes accordingly;
- Metrology / sensors / measurements to monitor the production process – a metrology implemented in the complete production line is required to obtain enough information about the production process related to the:
    - product (semi-product) such as information of position, status of the (semi-) product, used materials, required materials, geometry, completion date;
    - process like manufacturing equipment monitoring, components and material handling, management of capacity of machines (including predictive maintenance, assets management, monitoring of environmental conditions: temperature, humidity, pression, vibrations…);
- all this should be done in real time and on cloud infrastructures.

3.1.1.2 Smart products

This stands for the development of products with added value like integrated sensing structures (sensors) into coating e.g. pressure measuring or changes of length and measuring the thickness of coatings to get information about wear. This will often be realised by using key enabling technologies (KET) like nano-technologies e.g. the use of nano-fibers in composite materials or plasma technologies to generate self-cleaning surfaces. But also integrating the new possibilities of additive manufacturing like 3D-Printing to generate and modify more complex parts will generate smart products. But this also means to view the product as a system e.g. the reduction of friction, the so-called optimisation of the "tribological system", requires an optimised interaction of materials, coatings and liquids (e.g. cooling liquids, lubricants etc). Other aspects are the integration of printed electronics, RFID structures and energy storage into products.

The overall approach is to have an optimized Product Lifecycle Management (PLM) that includes all steps from the:

- Marketing (generation of orders);

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- Planning of product;
- Development (construction) of the product;
- Preparation of production including resource planning (materials, components, energy, water, gases, etc.);
- Production especially digital manufacturing with aspects of resource efficiency production incl. energy consumption optimization, re-use of raw materials, etc.
- Distribution;
- Smart MRO (Maintenance, Repair and Operations) concepts incl. remote service, field service, remote maintenance and control use cases, predictive and remote maintenance;
- Recycling and re-use concepts.

None of these steps should be considered isolated processes but rather as interconnected phases of a product lifecycle. This requires an overall view of the product as a whole.

[Prof. Dr. Günther Schuh, RWTH Aachen (www.enzyklopaedie-der-wirtschaftsinformatik.de/lexikon/informationssysteme/Sektorspezifische-Anwendungssysteme/Product-Life-Cycle-Management/index.html)]

3.1.2 Industrial safety / production security

3.1.2.1 Data security

In digitalized production, data and information are the most relevant assets. Therefore, data security is a necessary precondition for digitalised production. There are two main categories for data security:

- Internal: it is necessary to protect data to guarantee its constant availability (reliability). Furthermore, the digitalized production requires new systems and methods for data handling, especially to analyse and find relevant data. Some questions that need to be answered are: What data can we make use of and in what way? How does it add value to the production processes? How does data generate new information?
- External: it is necessary to protect data for miss-use. This means that innovative knowledge and AI-data belong to the owner and should be protected against unauthorised copying, deleting and modification.

The challenges of data security are the requirement of data in a cloud environment (data availability in a cloud to access all productions worldwide) and data connection within the Internet of Things.

3.1.2.2 Securing the production capability

This includes the purchase and logistics of raw materials, components, semi-products and products. More specifically, smart factory applications e.g. to automatize ordering of materials and smart warehousing (reduced warehousing cost). That includes smart logistics with integrated transportation monitoring (the location as well as transport and storage parameters like temperatures, humidity etc.)

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3.1.2.3 Protection of the (production) environment

This means that the environment of the production processes must be monitored and protected. Especially the human safety within the process should be warranted, thus monitoring all relevant parameters (Ozone, gas and temperature monitoring in industrial environments) is a necessity. This also includes concepts for ensuring heating, ventilation, and air conditioning in emergency cases.

The second aspect is the protection of the environment and the build-up of sustainable production concepts. This includes the installation / development of (air and water) cleaning systems, the reuse of resources like heating, production waste etc.

3.1.3 Human Resources

The third requirement for Industry 4.0 is the interaction between humans and machines and thus resulting in new demands for humans. The digitalisation of industry means fast changes of production, which requires new concepts regarding staffing.

Often the integration of Industry 4.0 concepts is connected with changes to agile work concepts and an integration of change management onto the production routine. This requires skilled workers and regular training. This also means that lifelong learning / further qualification concepts have to be established for workers to acquire hard and soft skills to operate industry 4.0 tools.

Another aspect is the knowledge transfer from experts onto the production process e.g. improvement of artificial intelligence, build-up of expertise data base etc.

To implement this information exchange between machines and humans, new technologies and smart Human-Machine-Interfaces (HMI) will be required such as touch interface, new GUI (graphical user interface, visualisation of processes and production) and concepts for intuitive operation.

3.2 Individual cluster analysis

3.2.1 MESAP

3.2.1.1 Cluster presentation

MESAP Innovation Cluster in the North-West of Italy, operates in the Smart Systems Integration and Industry 4.0 domains with 253 Members, including 210 SMEs, 33 Large Companies, 2 Universities and 8 Research Centres. The main target sectors are: manufacturing plants and machines, robotics, automotive, aerospace, energy, railways, biomedicine, household machines, agrifood, printers, textile, chemical, waterborne.

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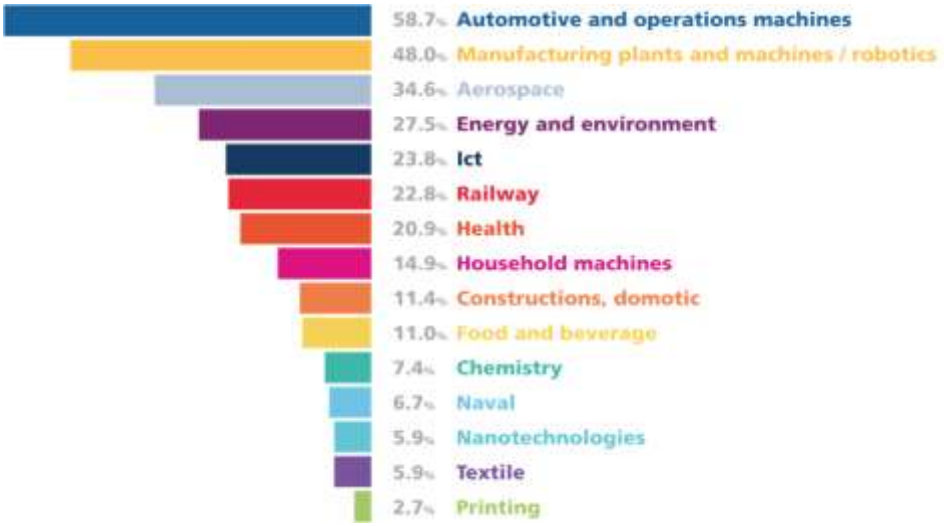

MESAP main goals and activities are knowledge development and transfer from research centres to companies, cross transfer and spread of sectorial competences into new application fields, international cooperation for R&D European/international projects, new end markets identification at European and world level. Its final goal is to strengthen regional industrial capabilities and local supply chains, enhancing their competitiveness all over the world.

Services offered by MESAP:

- National and international cooperation for R&D, sharing of best practices and expertise with clusters and innovation clusters;
- Development and transfer of knowledge and technologies to business and markets;
- Strengthening and expansion of scientific, technological and industrial studies;
- Strengthening regional industrial capabilities and local supply chains, enhancing their competitiveness all over the world;
- Identification and opening of new markets in Europe and worldwide.

3.2.1.2 Cluster actions and strategy towards industry 4.0

In 2016 the **Italian Ministry of Economic Development** (Italian Acronym MISE) has launched a **National Industry 4.0 Plan** for Italian companies (today Industria 4.0.) to help them win the challenge set by the digital revolution and help an even more competitive Made in Italy. (For an overview about the plan and its roadmap:

http://www.sviluppoeconomico.gov.it/images/stories/documenti/impresa_4%200_risultati_2017_azioni%202018_en.pdf)

The plan provides:

- a public investment of about 20 billion euros
- a super and hyper amortisation of 140% and 250%
- a 50% tax credit on R&D investments
- incentives on investments in start-ups and innovative small businesses

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MESAP also joins **Fabbrica Intelligente** (Smart Factories), the Italian Technology Cluster admitted by **Ministry of Education, Universities and Research** (Italian Acronym MIUR) that since 2012 has been consolidating and incrementing the national competitive advantages and, in the meantime, orienting the transformation of the Italian Manufacturing sector towards new product systems, processes/technologies and manufacturing systems, coherently with the strategic agendas of the European Union for research and innovation.

Cluster's expected results and impacts on industrial and research communities, and consequently on society, are ambitious and strictly related to the development of the necessary enabling technologies to face the innovation challenges in the Italian manufacturing industry. The most relevant industrial and social repercussions foreseen include the dimensions of competitiveness, employment and environment, in line with the targets of the European strategy.

In 2015 MESAP advised the local public authority in launching the Regional Technology Platform - Intelligent Factory call for the implementation of collaborative research projects led by large enterprises with the involvement of a large number of SMEs. The **Piedmont Region** has initiated a participatory process to the productive world and the Piedmont innovation stakeholder community to build the S3, the Regional Smart Specialisation Strategy through the new site OpenS3 Region. **S3 Strategy** aims to support and accelerate a process of transforming industry through research and innovation policies into selected areas of innovation promoting cross fertilization among different industries and addressing new challenges and needs by investing and consolidating the skills in the health and wellbeing of citizens.

In the spring of 2016, the Politecnico di Torino (leader), together with MESAP, University of Turin Istituto Superiore Mario Boella, Polo ICT responded to the European Call for Proposals I4MS (H2020 - DG Connect) creating a **Digital Innovation Hub for Manufacturing.** The DIH Piemonte focuses on laser systems (including additive manufacturing), Cyber Physical Systems, IoT and High-based modeling and simulation services Cloud computing performance, for S3 (regional intelligent specialization) themes including mechatronics, automotive and aerospace.

3.2.1.3 Cluster strengths in the value chain

MESAP has its roots in Piedmont, a territory with a strong history and industrial footprint in Mechanics and Electronics, integrated with control science and ICT. Since mechatronics is a technology that crosses different sectors, our companies cover a large part of the value chain.

As can be seen from the figure below, MESAP Companies show top level of specialization in integration of mechanics, electronics and control science and advanced mechanics.

In particular there are two big subdomains: Smart Products and Smart Manufacturing. In the first MESAP companies works on:

- **Methods and systems for product development** (high added value servitization processes, development of high performance products and components, etc.) Companies: AMET srl, Argotec srl, Thales Alenia Space spa
- **Components and automatic systems** (sensors and monitoring systems, autonomous and robotics products, etc.) Companies: Brain Technologies srl, Blue Engineering srl

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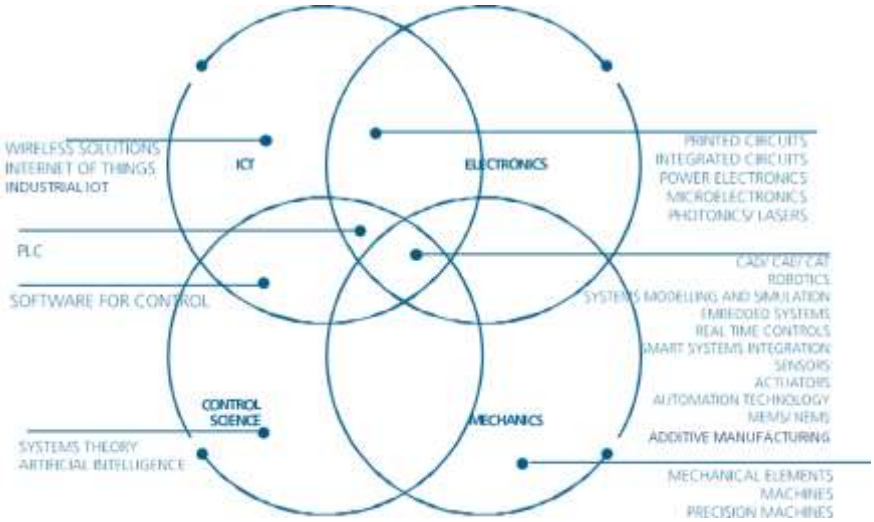
- **Human-Machine Interface** (wearable devices, exoskeletons for rehabilitation, etc.) Companies: OT Bioelettronica snc, Novasis Innovazione srl
- **Micro and nanotechnologies** (application of MEMS to monitoring). Companies: Movimatica srl



- **Photonics Applications** (optoelectronic and optical systems, detection systems of shapes, colors, environments, smart monitoring systems, etc.). Companies: DMA srl, AdHoc3D Solutions srl

In Smart Manufacturing we have:

- **Systems for the development of production processes** (digital manufacturing). Companies: Illogic srl
- **Automation and control systems** (collaborative robot applications, predictive maintenance) Companies: Astel srl, COMAU spa
- **Human-Machine Interface** (remote and intelligent interfaces, exoskeletons to support workers) Companies: AMADA Engineering Europe spa
- **Applications of micro and nanotechnologies** (deposition of materials and surface treatments for functionalization and low environmental impact, devices and processes for the production of nanomaterials, etc.). Companies: Varnish srl,
- **Photonics applications** (laser-based processing systems: cutting, drilling, welding, etc., Vision and control systems based on optoelectronic technologies, etc.). Companies: Microla Optoelectronics srl, CEMAS Elettra srl,
- **Processes of transformation, processing and assembly of materials and structures** (additive manufacturing, etc.). Companies: STV Italia srl

This highlights that our companies are located in all phases of the supply chain.

3.2.2 BNPT

3.2.2.1 Cluster presentation

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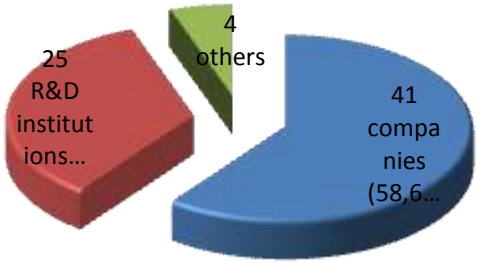
Registered as a non-profit association, BalticNet-PlasmaTec (BNPT) is an international cluster – located in Greifswald, Germany – which stands for a technology and market-oriented cooperation of science, research and economics in the field of plasma technology. As one of the most important plasma technology clusters in Europe, BNPT's aim is to raise the perception of the plasma technology in society. BNPT is a contact partner for interested parties who intend to expand their own technical and economic potential in using the plasma technology. BalticNet-PlasmaTec has currently 73 members in 17 different countries, more of half of them (44 members) from the industry. SME are the strongest group within the industry members with nearly 73% (32 members).

Because of their sizable temperature and density ranges, plasma is used widely for a broad variety of application industries for example aerospace, automotive, electrical, food packaging, medical, metalworking, glass, optics, plastics, textiles and tools etc. New applications are being developed daily and the field continues to grow at an enormous rate. Plasma provides many practical uses: new manufacturing techniques, consumer products, the prospect of abundant energy, more efficient lighting, surface cleaning, waste removal, plasma-assisted pre-treatment and coating of film materials, and many more application topics. In 2011 and 2014 BNPT received the Bronze Label of the European Cluster Excellence Initiative and in 2015 the Silver Label.



3.2.2.2 Cluster actions and strategy towards industry Cluster actions and strategy towards industry 4.0

National background: One of the 6 priority tasks according to the High-Tech Strategy Innovations for Germany of the Federal Ministry of Education and Research published in August 2014 is the digital economy and society.

It was determined that the "successful development and integration of digital technologies within industrial application sectors plays a decisive role in Germany's competitiveness, since ICT are important drivers of innovative value creation chains and products in many economic sectors."

Within this priority task one central area of action is the Industry 4.0. "Industry now stands at the threshold of a fourth industrial revolution. Via the evolution of the Internet, the real world and the virtual world are increasingly converging, to form an "Internet of Things". The key characteristics of the industrial production of the future will include production of extensively individualised products, within highly flexible production environments; early-stage integration of customers and business partners within design and value-creation processes; and linking of production and high-quality services, to yield "hybrid products". "

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[www.hightech-strategie.de/de/The-new-High-Tech-Strategy-390.php]

To support this area of action several tools have been implemented:

A lot of information is listed at www.plattform-i40.de/I40/Navigation/EN/Home/home.html supported by the Federal Ministry of Education and Research. Additionally, several supporting programs were implemented such as:

- ERP-Digitalisation and Innovation loan
- Funding schemes e.g. funding for SME "Industrie 4.0-Testumgebungen – Mobilisierung von KMU für Industrie 4.0" [i4kmu.de/foerdermassnahme/] supports the R&D&I in this area
- The program "Zentrales Innovationsprogramm Mittelstand" also offers possibilities to co-finance digitalization projects [www.zim-bmwi.de/zim-overview]
- SME's can also get financial support for R&D&I from the "KMU-innovativ" [www.bmbf.de/de/kmu-innovativ-561.html]

As a supporting organisation of PLASMA GERMANY, the competence network for plasma technologies, BNPT is also involved in the strategy development for digitalisation in the plasma community.

3.2.2.3 Cluster strengths in the value chain

The industrial members of BNPT are clients of the IT service providers / IT clusters specializing in digitalization. The main industrial application area of plasma technology is surface modifications. This starts with surface fine cleaning (removal of organic contaminations by oxidation or removal of oxidation layers) to surface activation (generation of active areas at the surface), etching of surfaces (specific structured removal of atom layers), implantation of ions onto surfaces (hardening of surfaces), the functionalization of surfaces (chemical binding of active groups) and generation of coatings (e.g. layers with low friction coating, biocompatible layers).

This surface modification can be found in many industrial areas as shown in the figure.

There are two main focus of interest in digitalization: one is to focus of integration of plasma technology devices in industry 4.0 concepts with all aspects elaborated in section 3.1 and the other is

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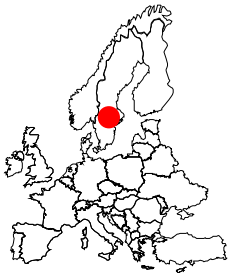
to develop new plasma-based solutions for digitalized products such as the integration of active structures into products (e.g. sensors, functional coatings etc.).

Typical job coaters are Plasmanitiertechnik Dr. Böhm, Roplass, Surface – Plasma Engineering Solutions, Tantec, Tigres, Impreglon EST. Some companies mainly developing and producing coating machines are CemeCon, EST, GRINP, Hauzer, Meyer Burger. The companies Schaeffler (bearing, parts for automotive), Dürr (automotive) and Cortronic (stents) focus on development and production of coated parts. Other companies such as Neoplas control and Zirox are involved in the development of sensors for process control. There are also companies covering other application areas such as plasma cutting and environmental applications (air and water cleaning, waste to energy).

3.2.3 MITC

3.2.3.1 Cluster presentation

MITC MÄLARDALEN INDUSTRIAL TECHNOLOGY CENTER



Mälardalen Industrial Technology Center, established in 2012, is a regional cluster based in Eskilstuna, about 100 km west of Stockholm. The mission is to contribute to increased regional competitiveness through increased cooperation between industry and academia, which will strengthen the industrial competitiveness, contribute to the economic growth in the region, and strengthen the academic sector. MITC is located in the region Eastern Mid Sweden (a region with 1,3 million inhabitants surrounding the capital Stockholm) the coordinator of Produktionslyftet, a national program for industrial competitiveness. MITC has nine full partner members, mainly large companies as GKN, Volvo, Alfa Laval etc. Along with that there are more than 30 SMEs engaged in ongoing projects. MITC is one of four parts in the regions Smart Industry strategy. MITC is currently running several digitization projects for SMEs and is developing a lab named MITC 4.0.

3.2.3.1 Cluster actions and strategy towards industry 4.0

A laboratory, named MITC 4.0 is currently being developed in a public-private partnership. The focus of the laboratory is full scale industrialisation. Automated production and assembly lines virtually and in practice. A specific line is planned for training manufacturing SMEs in Smart production. The benefits of using 5g is under evaluation. Digitization is on every agenda and we are in regional or national projects ranging from encouraging SMEs, via implementation in manufacturing education in university programs to digitalisation in casting. Specific funding is often available for internationalisation and digitization.

region.sormland.se/soermlandsstrategin-2020/maal-3-naeringslivsutveckling/affaersutvecklingscheckar/

The region Eastern mid Sweden is divided into five countries. Each county with its specific, related Smart Specialisation Strategy. The strategies are then linked in to a joint strategy for the region. Smart industry is a regional area for smart specialisation. Within the county the area is "Advanced manufacturing for demanding environments". The regional competences are based in industrial information technology, embedded systems, automation and production.

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region.sormland.se/soermlandsstrategin-2020/maal-3-naeringslivsutveckling/innovation/smart-specialisering/

3.2.3.3 Cluster strengths in the value chain

MITC is strong in the strategic area, via Blue institute and a strong partnership with the national research institute Swerea we have a unique competence in supporting SME companies in how to develop and implement digitization strategies and technologies. Along with Robotdalen and their strong link to ABB, MITC has extensive knowledge in automation. MITC has also extensive knowledge in the human factor, especially on how to organize and successfully implement new technologies in a production system. A laboratory MITC 4.0 is being developed, financed by Alfa-Laval, GKN, Hexagon, Volvo and others, putting simulation within a factory as well as in a value chain as important issues.

3.3 Synthesis of industrial cluster positioning

	MESAP	BNPT	MITC
Industrial safety		+	
Data & security		++	
Human factor	+	+	+++
Automation, robotisation, integration	+++	++	+++
Simulation	++		++
HMI (Human Machine Interface)	++		+
Additive Manufacturing	+	+	+
Industrial Internet of Things	++	++	++
Augmented and Virtual Reality	++		+
Prototyping	+	+	+++

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4 Conclusions

The analysis of the offer within the ICT clusters and of the demand on the industrial clusters side shows some areas for collaboration between stakeholders from these two sectors. Indeed, in terms of digital production and products, the preconditions observed such as computer-based modelling, standardised communication protocols, visualisation of production process, knowledge-based production adaptation, metrology and measurements can be addressed by the solutions provided by ICT clusters in the field of IIoT (sensors to monitor conditions, standard communication technologies), Big Data and Artificial Intelligence (in particular to handle and analyse in real time large amounts of data provided by the machines), and cloud infrastructures. The same applies for the requirements in terms smart products, industrial safety, and human resources: ICT clusters have the right technologies to address these needs: horizontal and vertical integration, cybersecurity technologies, augmented reality…

On the other side, it appears that the ICT clusters do not widely cover robotics neither additive manufacturing technologies. Yet, it appears also clearly that the industrial clusters themselves have within their respective networks members providing competences in these areas, that can address their needs (for instance MESAP in robotics, MITC in human factors…). However, complementarities with other European clusters in these domains will be needed to better cover the Digital Industry value chain, since these topics represent actual interest in the industrial clusters.

In terms of positioning on the value chain, the industrial clusters show different interests for topics like industrial safety, data security, simulation and HMI (Human Machine Interface). However, these complementarities between the 3 industrial clusters will allow collaboration opportunities with the stakeholders of the ICT clusters. In particular, topics like the IIoT and automation are relevant in all clusters.

In terms of Regional Innovation Strategies for Smart Specialisation, the analysis reveals that the regions and countries represented by the clusters of the project have all set the industrial modernisation as one of their most important objectives, which comfort the actions of the clusters in this project. Naturally, inter-regional collaboration within Europe and the internationalisation of SMEs in this domain are also key objectives for policy makers.

As a final conclusion for this report, we can observe that it has been a challenge to define a common nomenclature in terms of technologies and needs on the industrial side as the vision and language used by each cluster is unique, and the topics are numerous and quite large (from production to user, from machines to men, from ICT technologies to operation technologies…). However, this work was necessary and sets the basis to organise future collaboration activities, gathering the actors of these different clusters around concrete innovation activities in the industrial domain.

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