Report on Cooperation Opportunities

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1. Publishable Summary

The major objectives of the current report are to review the growth and innovation potential of EXCITE clusters based on regional smart specialisation strategies and analyse the value chain the partners belong to in order to derive the areas of mutual interest and areas for mid-term cross-cluster cooperation.

For this purpose, the report contains the desk research of S3 strategies of the EXCITE regions, regional SWOT analysis highlighting technological, social and economic strengths and weaknesses and identifying the threats and opportunities for growth.

The technological analysis is completed by information on the existing regional Digital Innovation Hubs (DIHs) / European Digital Innovation Hubs (EDIHs) and the technologies and services they offer.

Each cluster has presented his own value chain it belongs to and defined its role in the joint EXCITE value chain, the results were consolidated to best represent the areas of overlaps and missing competencies.

Based on partner inputs some areas of strategic joint activities have been suggested.

This report will form the basis for the EXCITE mid-term strategy developed as the next step under the T4.2.

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5. Introduction

EXCITE aims at strengthening cluster management and facilitate exchange and strategic partnership between cluster staff and cluster members by using the ClusterXchange mobility scheme. The project focuses on skills, processes and services related to digital transformation - both in terms of the cluster organisation itself and its members, to be able to support them in successfully accessing global markets.

Better understanding of the areas of specialisation of each EXCITE cluster is a key to development of a successful mid-term and long-term strategy for collaboration beyond the lifetime of the project.

Thus, the major objectives of the current report are to review the growth and innovation potential of EXCITE clusters based on regional smart specialisation strategies and analyse the value chain the partners belong to and to in order to identify the specific role of each partner, its competences in EXCITE partnership and to define the areas of collaboration.

6. Analysis of growth and innovation potential deriving from smart specialisation strategies and their own strategic plans

6.1 Silicon Saxony

Founded in 2000 as a self-financed association, Silicon Saxony e.V. with 437 members is the largest high-tech network in Saxony and one of the largest microelectronics and IT clusters in Germany and Europe linking manufacturers, suppliers, service providers, universities, research institutes, public institutions as well as industry-relevant start-ups in Saxony and beyond.

Dresden is the location of the largest micro-chips manufacturing in Europe having the key players Infineon, GlobalFoundries, Bosch and X-fab with established large manufacturing facilities in town. Every third chip produced in Europe is made in Dresden.

Besides the core cluster´s competence in microelectronics comprising the supply of materials and equipment, IC design, fabrication of microchips, automation and systems integration, the thematic focus of the cluster is on the technological trends of the present and future - e.g. artificial intelligence, robotics, automation, Internet of Things, sensor technology, energy efficiency, neuromorphes and edge computing.

The strategic goal of the cluster is to expand and strengthen the leading microelectronics location in Europe as well as to further develop towards the software state Saxony in close cooperation with Saxonian state government and key digitalisation players or the region - Dresden Smart Systems Hub and the Leipzig Smart Infrastructure Hub, formed under the Digital Hub Initiative of the Federal Ministry of Economics.

6.1.1 S3 Priorities of Saxony for 2014-2020

Name	Description
Advanced production technologies	**Advanced production technologies**
New materials	New materials
Biotechnology	Biotechnology
Nano technology	**Nano technology**
Microelectronics including organic and polymer electronics	**Microelectronics including organic and polymer electronics and semiconductors**
Photonics	Photonics
ICT and digital communication	**IT infrastructures, e-commerce, e-business, e-government, software development, IT services, mobile embedded elements for communication among daily objects and towards their environment (embedded systems and internet of things), self-learning systems for the creation and storage of knowledge and learning, time and resource efficient computing systems for simulation and visualization, applications for IT security with legal implications (identity management, authentication, linking information) and cyber physical systems**

According to the Innovation strategy of the Free State of Saxony 2020 [1] prepared by State Ministry of Economic Affairs, Labour and Transport of the Free State of Saxony (SMWA) Saxony strives:

- to be a country of successful innovators,
- consolidate and expand its position in global value chains through excellence,
- to strengthen the culture of innovation in business, science, administration and society,
- to become a magnet for bright minds from all over the world,

thus to support innovation-based, intelligent, sustainable, and socially inclusive growth in the region of Saxony.

The innovation strategy is based on two pillars. The first pillar stands for so-called smart specialisation and follows the principle of "strengthening strengths". The second pillar - intelligent diversification - underlines the importance of sectoral and technological openness.

Focus areas for smart specialisation as shown in the below Figure are Environment, Raw materials, Energy, Mobility, Digital and Health.

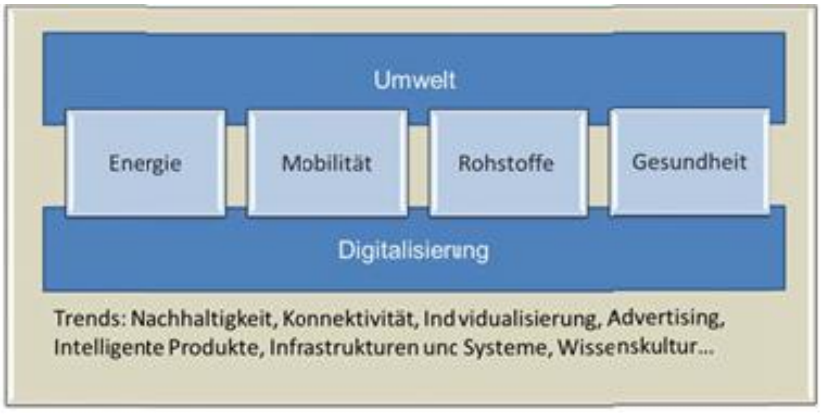

Figure 1. Saxony´s smart specialisation fields. Source: Innovationsstrategie des Freistaates Sachsen

In the field of Environment the most important fields of innovation are circular economy, water management and environmental technologies both for environmental -related industries as well as other applications, such as energy generation (including the recycling of wind power and photovoltaic systems), energy storage (including the recycling of accumulators and batteries); sustainable mobility solutions, agriculture and forestry. A special focus is on the environment and resources protection (soil and water protection, biodiversity, reduction of CO2 emissions).

In the field of raw materials Saxony sees a great innovation potential in exploration, extraction, and processing of raw materials. Efficient use of resources, use of recycling and search for substitutions in the resources-intensive industries, reduction of dependencies on foreign markets are in focus. In Digital domain Saxony will further support development and commercialisation of digital innovations in all areas of Internet of Things (IoT) which are the basis for innovations in automated and connected driving, intelligent energy networks, virtual power plants, e-Health, smart cities and smart farming. In the area of Artificial intelligence Saxony aims at becoming an internationally recognized location for research, development and innovation. It will support the development of new data-driven business areas and digital platforms.

Power grid is a backbone of a successful energy transition. To carry network optimizations and reinforcements Saxony relies on smart grids to control generation, transport, storage and distribution of energy. Saxony will make a greater use of innovation potential in the field of energy efficiency, in particular it will support use of new building materials, efficient building technolo-

[1] The next Innovation strategy of the Free State of Saxony is currently under preparation

gies and planning to reduce energy losses, new energy -efficient products and production processes including waste heat utilisation; energy-efficient industrial cross-sectional technologies, innovative an efficient drive concepts in the transport sector as well as energy saving transport concepts.

In Mobility field Saxony strives to develop new vehicle concepts (electric, hybrid and other vehicles, automated and autonomous vehicles), intelligent transport systems, connected cars (Car2X) innovative driving technologies and fuels.

In the health sector Saxony aims to continue support research and will promote the expansion of the Life Science cluster. Digitalisation of health care securing more efficient and innovative treatment methods, support of development of smart medical devices and suitable digital and telemedical procedures in the entire healthcare system.

6.1.2 DIHs in Saxony

1. Smart Systems Hub - Enabling IoT

https://smart-systems-hub.de/

Currently Smart Systems Hub (SSH), which is a daughter organisation of Silicon Saxony is the Europe's largest innovation hub for the Internet of Things. It brings together various stakeholders: start-ups, SMEs, large companies, technical universities and research institutions to work in cross-functional teams on different IoT challenges.

Offered formats:

Figure 2. Smart System Hub´s digital innovation

Technical Competences that the Hub offers vary from sensors, communication networks, cyber physical systems, Robotics, Artificial Intelligence, 5 G/ 6G private cloud, Analysis of Big Data.

SSH services include:

- Ecosystem building, scouting, brokerage, networking
- Collaborative Research
- Concept validation and prototyping
- Incubator/accelerator support
- Access to Funding and Investor Readiness Services

Other Saxonian DIHs, including the EDIH Saxony are listed in the below Table.

Name	Technical Competences	Services
EDIH Saxony	• Robotics • Internet of things • Artificial intelligence • Cyber security • Big data, data analytics, data handling • Virtual, augmented and extended reality • Software as a service and service architectures • Cloud computing • Logistics • Internet services • New media technologies	• Awareness creation • Ecosystem building, scouting, brokerage, networking • Visioning and Strategy Development for Businesses • Collaborative Research • Concept validation and prototyping • Testing and validation • Commercial infrastructure • Incubator/accelerator support • Access to Funding and Investor Readiness Services • Mentoring
simul + InnovationHub (SIH)	Non-profit initiative founded by the SAXON STATE MINISTRY OF THE ENVIRONMENT AND AGRICULTURE Under the umbrella of the **simul + InnovationHub (SIH)**, research institutions, companies and administrations are jointly implementing outstanding innovation projects in the fields of rural areas, the environment, agriculture, forestry and the food industry.	With the simul + InnovationHub new products, processes and technologies in the five subject areas Experimental field 5G in agriculture and forestry • Smart farming and forestry technology • Environmental technologies and sustainability • Nature and climate protection and • Digital villages and smart rural areas are implemented.
Digital Innovation Hub "Smart Production Systems Saxony" – InnoSax	• Micro/nano electronics • Sensory systems • Cyber physical systems • Robotics • Internet of things • Artificial intelligence • Mobility & Location based technologies • Interaction technologies • Big data, data analytics, data handling • Virtual, augmented and extended reality • Simulation, modelling and digital twins • Cloud computing • Additive manufacturing • Laser based manufacturing • Logistics • Internet services	• Visioning and Strategy Development for Businesses • Collaborative Research • Concept validation and prototyping • Testing and validation • Incubator/accelerator support • Education and skills development
Experimental and Digital Factory (EDF)	• Cyber physical systems • Robotics • Internet of things • Mobility & Location based technologies • Interaction technologies • Big data, data analytics, data handling	• Awareness creation • Ecosystem building, scouting, brokerage, networking • Collaborative Research • Concept validation and prototyping • Testing and validation • Pre-competitive series production • Mentoring

	• Virtual, augmented and extended reality • Simulation, modelling and digital twins • Additive manufacturing • Logistics • Internet services • New media technologies	• Education and skills development

Table 1. DIHs/ EDIH in Saxony

6.1.3 Regional SWOT- Analysis of Silicon Saxony

STRENGTHS	**WEAKNESSES**
• Competence for high-volume chip production by Infineon and Globalfoundries, Bosch, X-Fab • most powerful micro-chip production in Europe (every 3nd chip made in Europe is from Saxony) • Silicon Saxony as core of the ICT cluster • Strong research landscape (9 universities with over 100,000 students - approx. 45,000 relevant for MNE -, 13 relevant Fraunhofer institutes, HZDR, 3 relevant institutes of the Leibniz Association, 3 relevant institutes of the Max Planck Society • Working technology transfer structure (Namlab, GWT, 20 Technology Centres and Incubators, 5 cross-university start up initiatives) • Dedicated education schemes on worker level (dual study, professional schools) • Strong strategic cooperation between Cluster and the regional authorities • Real triple helix managed high-tech region • Microelectronic as enabler identified in the regional smart specialization strategy • Silicon Saxony is recognized as strongest microelectronic cluster in Europe • Competence for energy efficiency in Cool Silicon Cluster – ranked as the strongest national leading-edge cluster (BMBF) Technology: • Vast experience in high volume production (More Moore and More than Moore, 300mm) • Strong industrial base for equipment makers, materials • 3D-integration, smart systems-integration • Home for the largest IoT Lab – Smart Systems • Hub; strong competences in Industry 4.0 • Strong competence mobile networks of the most recent generation - 5G / 6G Lab created by Technical University of Dresden • Application competence for e-automotive (production of VW- ID.3 in Dresden and Zwickau), engineering, energy, medical AI	• Small-scale structures of Saxon economy (many SMEs, no headquarters of large companies in Saxony) • Systems and final-products approach (weakness at the end of the value chain) • Lack of Venture Capital and Business Angels • Lack of structured innovation management within the companies • Decline in start-ups (start-up intensity with 61 per 10,000 working people is below the German average 78) • Insufficient use of knowledge transfer structures • Low proportion (approximately 15%) of women in MINT-subjects (mathematics, IT, natural sciences, engineering)
OPPORTUNITIES	**THREATS**
• Cross cluster cooperation for enhancement of innovation • Coordination of the research activities of the European Clusters regarding the market trends • better cooperation between the key players in	• Existing European regulation of competition and investment • Supply and technology dependency on Asian Foundries • Decrease of EU funding (structural funds)

industry and RTOs in Europe´s Microelectronics Clusters => indispensable for future growth • Alignment of European, national and regional strategies (European Strategy on microelectronics, Innovation Strategy) and respective measures • Strategy alignment with application industries • Focus on consumer products/industries (high potential of multiplication), create new player for consumer products • More foundations of technological start-ups than German average and above-average potential for technology-oriented start-ups from universities and research institutes • Growth of software segment – 500 employees in Dresden, research institutes for embedded software and systems (cyber-physical systems), more systems provider companies (e.g. server, embedded products etc.) **Technology:** • Continue with More Moore and More than Moore with the goal of convergence as well venturing Beyond-CMOS • Interdisciplinary cooperation with biotechnology, organic electronics, optoelectronics, mechanical engineering, agriculture, health care • Microelectronic as enabler/driver for future Mega Trends (Industry 4.0, smart mobility) • Many changes in cyber-physical systems engineering (Smart City, Smart Logistics, Smart Factory, Smart Car, Smart Grid, Smart Systems, Smart Lighting, Cyber Security)	• Lack of national co-financing within ECSEL • Increasing energy costs through current national energy policy ("Energiewende") • Demographical change => decreasing start-up activities and potential lack of skilled staff • Challenge of successor establishment for SMEs

Table 2. Regional SWOT analysis - Silicon Saxony

6.2 DTI

Cluster for Digital Transformation and Innovation is founded in 2008. The mission of the organization is to improve the competitiveness of its members, by:

- Achievement of higher degree of internationalisation and penetration on new markets
- Cross-cluster, cross – industry and cross –border cooperation
- Digital transformation and industrial modernisation
- Improvement of the marketing strategies of the member companies
- Implementation of processes management best practices

Members of DTI Cluster are Technical University of Sofia and 14 small and medium sized companies covering the following expertise: Internet of Things, Cyber security, Big data, Cloud computing, Design, development and maintenance of complex telecommunication networks, Micro- and nanoelectronics; Embedded systems; Power supply devices and converters; Security systems, access control and fire alarm systems.

6.2.1 S3 Priorities of Bulgaria for 2014-2020

Name	Description
New technologies	**Computer and mobile applications and games with educational marketing**

Name	Description
in creative and re-creative industries	**and/or entertainment character**
Mechatronics and clean technologies sectors	**Clean technologies and new solutions for sustainable energy systems with focus on the transport sector; "smart homes" and "smart cities" solutions; advanced automation processes, including 3-D modelling, and assisted management software solutions with application in manufacturing**
Healthy life and biotechnology industries	Improved high productive technologies for traditional food sector; new approaches to diagnostics and medical instruments and equipment; **advanced solutions, nano** and biotechnologies to be applied in medicine, health care services, other than in blue economy; green/ bio-based economy
Informatics and ICT	**New and hybrid applications (including 3D digitalization) for industrial design, assembling, visualization, prototyping and other areas (cultural heritage). Big Data, Grid and Cloud Technologies. Development of wireless sensors and language technologies**

Bulgarian Smart Specialisation Strategy 2021 -2027

Bulgarian Smart Specialisation Strategy 2021 – 2027 main objective is turning Bulgaria into an innovative, smart, green, digital and connected country through a new common policy for interaction between scientific research, innovation and technology, as well as increasing international and cross-sectoral cooperation and intensive use of data for accelerated specialization in products and services with high technological and scientific intensity and significant economic impacts for sustainable competitiveness, technological transformation of the economy, increasing resource efficiency and digitization.

Operational objectives

- Improvement of the scientific research system and innovation performance of enterprises. With the realization of this goal, the ambition is to reach levels of 70% compared to the EU average, which will strengthen Bulgaria's position in the group of moderate innovators by 2027.
- Increasing the technological capacity of enterprises, increasing the environmental friendliness and internationalization of Bulgarian products and services.
- Improving human resource capacity in the field of new technologies and innovations.

On this basis, the Innovation Strategy for Smart Specialization (ISIS) 2021-2027 **defines five thematic areas**:

1. "Informatics and ICT" (Information and Communication Technologies).
2. "Mechatronics and microelectronics" (independent area).
3. "Healthy Living Industry, Bioeconomy and Biotechnology"
4. "New technologies in the creative and leisure industries"
5. "Clean technologies, circular and low-carbon economy"

Digitization/digitalization in the context of Industry 4.0 will be included as a horizontal priority and will be present in all five thematic areas of smart specialization.

Regional innovation advantages and trends are identified at the NUTS III level for all 28 districts in the country.

6.2.2 Regional SWOT-Analysis of DTI

Strengths	**Weaknesses**
• The companies in the cluster have diverse and complementary capabilities. • Ability to offer a wide variety of services. • Broad range of competences • Well connected to the local ecosystem • Recognised as reliable partner on national and international level • High R&D capabilities. • Ability to update quickly digitalisation services. • Relatively lower prices of services • Good experience in the European market • Experience in EU funding • Part of the Management Body of Intelligent Communication Infrastructures Lab (ICI Lab) which is part of Sofia Tech Park scientific complex - the first technological park in Bulgaria, offering unique activities for all Balkans and Western Europe	• Lack of differentiation of the offered services. • Limited financial resources • Companies in the cluster are small and internationalisation, few of them have enough capacity in creating innovative products and to complete internationally • Lack of public funding on national level • Competitive advantages based on cost and price can only be relied on temporarily. • Issues in coordination of the activities and responsibilities of the companies in the cluster.
Opportunities	**Threats**
• The markets for smart city and smart manufacturing services are large and has a growth potential. • High added value and profitability of ICT services. • Investment capacity of manufacturing companies and municipalities as potential consumers. Increasing demand for new and diverse smart services in the market, within the competence of the cluster. • Opportunities for partnership with companies in 3rd countries markets. • Opportunities to participate in already launched projects.	• Many competitors and Intense competition in the market. • Medium market entry barriers. • Stagnation and recession in the industry • Political instability • Existence of corruption. • High R&D capabilities of the competitors. • Lack of highly qualified HR

Table 3. Regional SWOT-Analysis - DTI

6.2.3 DIHs/EDIHs in Bulgaria

DTI Cluster is partner in Innovation Amp – one of the DIHs with seal of excellence www.innovationamp.com , located in Sofia, Southwestern region.

The digital innovation hub, InnovationAmp, aims to support the process of digital transformation of the industry and the society and to introduce the low-carbon circular economy in manufacturing and public companies, public administration and the society. The technical competences include: high-performance computing, artificial intelligence and data science.

EDIHs in Bulgaria:

- **The European Digital Innovation Hub (EDIH) Zagore:** synergy for Green Regional Digital Transformation of South-east Region of Bulgaria opened in the town of Stara Zagora. Its main objective is to build key digital capacity in the South-east Region in support of the region's industrial ecosystems undergoing green and digital transformation by focusing on the key areas of high-speed computing, digital skills upgrade training, cyber security, data infrastructures, data management and processing

- **EDIH in construction** - combine digital technologies in the construction sector; policy making regarding the development of the construction sector in Bulgaria; business networks for clean technologies, innovation and sustainable development; technology transfer and access-to-finance capabilities; vocational trainings and educational programmes; access to Pan-European networks; R&D of innovative technologies and greener building materials.

- **AgroHub.BG SNS** - Develop the innovative potential of the agro- sector in the perspective of "precision agriculture" and support the overall digital transformation and development in South-Eastern Region"

6.3 BHV

Founded in 2010, Business Hive Vilnius (BHV) is one of the oldest startup incubator and technology hubs in the Baltics. Primarily focused on hardware, security, blockchain, AI, fintech and enterprise software startups. BHV offers its residents: introductions to investors and financial networks, mentorship, events, and support from leading industry experts.

BHV manages continuous cluster activities of UCC and Lithuanian ICT Cluster.

UCC - "Užupis Creative Cluster" is a non-profit limited liability public entity established in 2010. Cluster operates in Information and communication technologies (ICT), creative industries, cyber security, research, and other fields. On 2018 06 08 UCC changed its name to Lithuanian ICT Cluster.

Our Cluster's Mission is to create and implement value-added national and international projects, technologies, and solutions in ICT, creative industries, cyber security and startups. Furthermore, we grow cluster activities to compete in global markets, combining and developing the potential of Lithuania.

The Cluster's Vision - to become the most successful cluster in Lithuania, the leader in ICT, creative industries, and cyber security projects management in Europe.

Currently cluster consists of 19 members – 6 educational institutions (colleges and universities) and 13 companies from ICT sector.

6.3.1 S3 Priorities of Lithuania for 2014-2020

Name	Description
Agricultural innovations and food technologies	sustainable agri-biological resources and safer food; functional food; innovative development, improvement and processing of biological raw materials (biorefinery)
Energy and sustainable environment:	**smart systems for energy efficiency, diagnostic, monitoring, metering and management of generators, grids and customers; energy and fuel production using biomass/waste and waste treatment, storage and disposal; technology for the development and use of smart low-energy buildings - digital construction; solar energy equipment and technologies for its use for the production of electricity, heat and cooling**
New production processes, materi-	**photonic and laser technologies; functional materials and coatings; structural and composite materials; flexible technological systems for product**

Name	Description
als and technologies:	**development and fabrication**
Health technologies and biotechnologies:	molecular technologies for medicine and biopharmaceutics; advanced applied technologies for individual and public health; advanced medical engineering for early diagnostics and treatment
Transport, logistics and ICT:	**smart transport systems and information and communication technologies; technologies/models for the management of international transport corridors and integration of modes of transport; advanced electronic contents, content development technologies and information interoperability; information and communications technology infrastructure, cloud computing solutions and services**
Inclusive and creative society:	modern self-development and education technologies and processes; technologies and processes for the development and implementation of breakthrough innovations

6.3.2 Lithuanian Smart Specialisation Strategy (Innovation Strategy)

Lithuania's smart specialisation strategy evolved through joint efforts of a number of institutions, the main actors being the Ministry of Education and Science, the Ministry of Economy and the Research and Higher Education Monitoring and Analysis Centre (MOSTA) authorised thereby. By engaging international independent experts, MOSTA carried out a detailed analysis of the country's research, higher education, business potential and possibilities of cooperation in relevant areas, major national and global challenges, future trends, new knowledge, technology and products with the potential to have the most significant impact on the growth of domestic and global economy. In order to ensure that the smart specialisation strategy was based on common accord, the process involved all stakeholders, including scientists, entrepreneurs and representatives of the public sector, who made their inputs into wide-scale surveys and some 50 expert discussions. This process:

- identified general priority areas in terms of R&D and innovation development and their specific priorities;
- proposed measures required for their implementation and timing of the measures, specific technologies and products to be developed in implementing individual priorities;
- proposed mechanisms for implementation, monitoring and impact assessment of the smart specialisation process.

Research performed and reports produced in the process organised by MOSTA are available **here**.

As a result of MOSTA analyses, expert discussions and surveys, also joint work of research, business and government representatives, the following legislation was prepared as part of the **smart specialisation strategy:**

1. Priority R&D&I development areas approved by the resolution of the Government:

1.1 Energy and sustainable environment;
1.2 Inclusive and creative society;
1.3 Agro-innovation and food technologies;
1.4 New production processes, materials and technologies;
1.5 Health technologies and biotechnologies;
1.6 Transport, logistics and information and communication technologies (ICT).

The priority R&D and innovation area represents the area of economy, where the country has sufficient science and business potential to respond to global or national challenges encountered

in this area and to take advantage of opportunities that could bring about significant positive change.

2. **Programme for the implementation of smart specialisation priority areas and their priorities** approved by the resolution of the Government, which lays down the key implementation principles of the smart specialisation process and distinguishes the following R&D and innovation priorities under each area.

R&D and innovation priority means a technology, product, process, method or their group, which is feasible to be developed and suited to public needs (including market uptake) by making use of the R&D&I, business and other potential existing in the country.

3. Twenty action plans for the implementation of R&D innovation priorities approved by orders of the Minister of Education and Science and Minister of Economy of the Republic of Lithuania, which provide for measures necessary for the implementation of the priorities, their timing, particular technologies and products to be developed in implementing individual priorities:

3.1 action plans for priorities of the priority area "Transport, logistics and information and communication technologies":

- Smart transport systems and information and communication technologies;
- Technologies/models for the management of international transport corridors and integration of modes of transport;
- Advanced electronic contents, content development technologies and information interoperability;
- Information and communication technology infrastructure, cloud computing solutions and services.

3.2 action plans for priorities of the priority area "New production processes, materials and technologies":

- Photonic and laser technologies;
- Functional materials and coatings;
- Structural and composite materials;
- Flexible technological systems for product creation and production.

3.3 action plans for priorities of the priority area "Energy and sustainable environment":

- Smart systems for energy efficiency, diagnostic, monitoring, metering and management of generators, grids and customers;
- Energy and fuel production using biomass/waste and waste treatment, storage and disposal;
- Technology for the development and use of smart low-energy buildings – digital construction;
- Solar energy equipment and technologies for its use for the production of electricity, heat and cooling.

3.4 action plans for priorities of the priority area "Health technologies and biotechnologies":

- Molecular technologies for medicine and biopharmaceutics;
- Advanced applied technologies for individual and public health;
- Advanced medical engineering for early diagnostics and treatment.

3.5 action plans for priorities of the priority area "Agro-innovation and food technologies":

- Sustainable agro-biological resources and safer food;
- Functional food;

- Innovative development, improvement and processing of biological raw materials (biorefinery).

3.6 action plans for priorities of the priority area "Inclusive and creative society":

- Modern self-development technologies and processes;
- Technologies and processes for the development and implementation of breakthrough innovations.

4. **Procedure for Monitoring the Development of the Priority Areas of Research, (Socio-Cultural) Development and Innovation (Smart Specialisation) and the Implementation of their Priorities and for Promoting Collaboration between Businesses and Science and Study Institutions** approved by the order of Minister of Education and Science and Minister of Economy of the Republic of Lithuania defines the functions of MOSTA and MITA in the context of smart specialisation and the principles of monitoring and assessment of this process.

5. The General Action Plan for the Implementation of the Smart Specialisation Programme in the Area of Governance of the Ministry of Education and Science was approved by the order of the Minister of Education and Science with a view to contributing to the implementation of the smart specialisation strategy. This Action Plan projects all measures for the higher education and R&D policy administered by the Ministry of Education and Science, which contribute, whether directly or indirectly, to the implementation of the smart specialisation strategy, and substantiates already known specific projects that are planned to be implemented on the basis of those measures.

6.3.3 Regional SWOT Analysis – BHV

Strengths	**Weaknesses**

• Rapidly developing ICT sector
• Favorable economic conditions
• Top 1 in the CEE for digital quality of life
• 5th globally for digital skills availability
• Favorable conditions for startups – 3 unicorns developed
• 2nd on the International Cybersecurity Index
• Favorable credit ratings – Fitch A, Moody's A2, Standard & Poor's A+
• Well-developed and diverse ecosystem of DIHs
• Open ecosystems:
  ○ ICT – cybersecurity, AI/ML, game dev, big data
  ○ Automotive – mobility, automotive electronics, autonomous vehicles, EV charging
  ○ Lasers – ultra-short pulse lasers, laser processing systems
  ○ Fintech – crowdfunding, payments, AML/KYC, insurtech, wealth tech
  ○ Startups – B2B, edtech, SaaS, Cybersecurity, Fintechs, Govtechs
  ○ Life Sciences – cell & gene therapy, gene editing, medical devices
	• The demand for ICT specialists strongly exceeds market capability to provide them.
	• A small population (around 2.8 mill):
	  ○ Certain companies have limited capacity for internationalization
	  ○ Limited possibilities to satisfy growing demand of trained personnel – both demographically and infrastructurally
	• Education system overall is lagging behind – systematic changes will bring tangible results only in later years

Opportunities	**Threats**
• Big concentration of various ICT industry players in a small geography. • Digitalization programme approved by the Government for growth support.	• Problematic neighbors – war risks. • Demographic decline – emigration and aging society. • High level of competition in ICT sector globally

• Future education investments aimed at ICT • High education rating 58% of 25–34-year-olds have tertiary education (7th in the OECD) • The highest share of women scientists and engineers in the EU - 52 %	• Increased labor costs in Lithuanian DIHs have negative impact on their competitiveness.

Table 4. Regional SWOT Analysis – BHV

6.3.4 DIHs in Lithuania

Name	Description	Technical Competences
Advanced Manufacturing Digital Innovation Hub	Advanced Manufacturing DIH is led by non-profit public organization - Intechcentras. The one-stop-shop center provides business enterprises with up-to-date information, expert assistance and access to technology for testing digital innovations. It also helps to carry out and conduct experiments with products, processes or business models. It seeks significant changes in the field of digitizing industry in Lithuanian companies, thus increasing their competitiveness and added value. • Access to the centers of competences • The heart of the innovation ecosystem • Mediation services • Aid for funding • Education, training and consulting services	• Sensory systems • Photonics and imaging technologies • Robotics • Internet of things • Big data, data analytics, data handling • Simulation, modelling and digital twins • Software as a service and service architectures • Cloud computing • Additive manufacturing • Laser based manufacturing • Logistics
AgriFood Lithuania DIH	With over 20 public, science, education, industry and SME partners, the AgriFood Lithuania acts as coordinator and facilitator of digital-based technology solutions for agriculture and food industries. To this end, the DIH seeks to: • Provide all-round support and specialized services in the research, development and deployment of AgriFood Tech innovations; • Facilitate partnerships in collaborative development, technology transfer and industrial uptake of high-tech innovations; • Link national innovation projects, startups and SMEs with wider international and cross-sector initiatives and competence networks;	• Micro/nano electronics • Sensory systems • Robotics • Internet of things • Artificial intelligence • Mobility & Location based technologies • Big data, data analytics, data handling • Software as a service and service architectures • Logistics • Internet services

Lithuania Agro Space Digital Innovation Hub (Agro Space DIH)	Non-profit regional focus network that brings together Lithuanian research, education, business and governmental institution organizations all aimed at fostering cross-sectoral digital technology innovation. A sum of 11 key stakeholders (governmental institutions, clusters, industry & business associations and science & technology parks) have expressed their interest in mutual cooperation and the establishment of Agro Space DIH. The main activities pithing the hub are in line with the national RIS3 strategies (http://sumani2020.lt/apie-sumania-speciaizacija/prioritetai)	• Agro-innovation and food technologies • Advanced pest control and plant nutrition systems • Precision (precision) crop and livestock farming technologies • Technologies of agricultural raw materials and their processing • Novice production processes, materials and technologies • Physical Impact Measurement and Materials Recognition Technologies • Innovative and balanced design solutions and modeling techniques • Virtual Product Development Technologies • Materials and resource-efficient technologies • Robotic Production Technologies • Intelligent Process Control Systems
Digital Media Innovation Hub	Digital Media Innovation Hub is a digital media and innovation center consisted of several film & media industry clusters, research institutions that work closely with major film, media, digital art, immersive reality and game companies in Lithuania and in neighboring regions.	• Screens and display technologies • Robotics • Mobility & Location based technologies • Interaction technologies • Virtual, augmented and extended reality • Simulation, modelling and digital twins • Gamification • Software as a service and service architectures • Internet services • New media technologies
Future Technologies Digital Innovation Hub (FTDIH)	Future Technologies Digital Innovation Hub (FTDIH) was established as a not-for-profit organization to achieve a common goal and synergy effect, combining the high competencies and expertise of Visorių DIH and AgriFood Lithuania DIH members in various market verticals, mobilizing technical, social and financial capital.	• Micro/nano electronics • Sensory systems • Photonics and imaging technologies • Screens and display technologies • Communication networks • Cyber physical systems • Robotics • Internet of things • Artificial intelligence • Mobility & Location based technologies • Interaction technologies • Advanced, or high-performance computing • Big data, data analytics, data handling • Virtual, augmented and extended reality • Simulation, modelling and digital twins • Gamification • Software as a service and service architectures • Laser based manufacturing • Logistics • Internet services
Laser Digital Innovation Hub (LaserLT DIH)	Laser LT DIH – the technology-based non-for-profit hub established a few years ago as the continuation of FP7 APPOLO project. The HUB integrates the whole concept value chain from	The vision of Laser LT DIH is to become the strongest DIH on lasers, photonics and advanced manufacturing in Northern-East part of Europe through the development of three main pillars: 1. Competence in laser technologies (Depart-

	identifying problems in existing manufacturing processes and new opportunities, offering potential technology solutions and innovations, testing technologies in industrial-grade laboratories, transferring novel research knowledge to manufacturing directly with a search of funding sources and broad-spectrum services for incubation of new technologies. Laser LT DIH is a single one-stop-shop providing access to the latest photonics related knowledge, experience and technologies to improve businesses by digitalizing manufacturing processes, products and services.	ment of Laser Technologies of FTMC); 2. Business support and access to finance (Science and Technology Park); 3. Access to industry (Laser and Engineering Technologies Cluster - LITEK).
Lithuanian robotic DIH (LTroboticsDIH)	The overall mission of Lithuanian robotics DIH is to bring together local robotics stakeholders, establishment of a robotics eco-system in Lithuania and increase the competitiveness of Lithuanian manufacturing sector	• Sensory systems • Robotics • Internet of things • Artificial intelligence
Santaka Digital Innovation HUB	One of the main national initiatives for digitizing industry that Santaka DIH activities are part of is Lithuanian Industry 4.0 platform (2016 – ongoing). The aim of the initiative is to create a sustainable debate platform, to review the Lithuanian strategy for industry development, to propose an improvement to Lithuanian smart specialization strategy and programs for its implementation and to promote Industry 4.0 concept through various dissemination activities. DIH members are contributing to established working groups. Funding: public-private partnership. The activities of "Skaitmeninių inovacijų centras" are non-profit.	• Additive manufacturing • Artificial intelligence • Big data, data analytics, data handling • Internet of things • Logistics • New media technologies • Software as a service and service architectures
Smart Audiovisual World	The Smart Audiovisual World is led by non-profit public organization Audiovisual innovation centre. The mission of Smart Audiovisual World is to promote the competitiveness of cultural and creative industries, through applied research, innovation and knowledge transfer	• Internet of things • Artificial intelligence • Mobility & Location based technologies • Interaction technologies • Cyber security • Big data, data analytics, data handling • Virtual, augmented and extended reality • Simulation, modelling and digital twins • Gamification • Cloud computing • Additive manufacturing • Internet services • New media technologies

Smart Energy Digital Innovation Hub	Smart Energy DIH is non-profit organisation which developing the smart energy innovation ecosystem based in Vilnius (Lithuania).	The Digital Innovation Hub that brings together major research, business and public stakeholders in Lithuania for the common development and implementation of digital transformations in the renewable energy, greenhouse gas reduction, eco-design, recycling, environmental protection, circular business model development and associated sectors that meets European citizens' needs.
Smart Health Digital Innovation Hub	Smart Health DIH is non-profit organization which developing the health care innovation ecosystem based in Vilnius (Lithuania). It aims at innovative solutions to promote health, prevent disease and provide resilient, accessible and effective patient-centered care that meets European citizens' needs.	• Artificial intelligence
Sunrise Valley Digital Innovation Hub (SV DIH)	Non-profit association that aims to become a leading industry digitalization service center in Lithuania. SV DIH activities are aligned with these priority sectors of Lithuanian RIS3 strategy ICT	• Micro/nano electronics • Communication networks • Cyber physical systems • Robotics • Internet of things • Artificial intelligence • Mobility & Location based technologies • Interaction technologies • Cyber security • Advanced, or high-performance computing • Big data, data analytics, data handling • Virtual, augmented and extended reality • Simulation, modelling and digital twins • Gamification • Software as a service and service architectures • Cloud computing • Additive manufacturing • Laser based manufacturing • Logistics
ViDIH Visoriai Digital Innovation Hub	ViDIH unites business-oriented clusters, innovative high-tech companies and research institutions.	• Micro/nano electronics • Sensory systems • Photonics and imaging technologies • Screens and display technologies • Communication networks • Cyber physical systems • Robotics • Internet of things • Artificial intelligence • Mobility & Location based technologies • Interaction technologies • Advanced, or high-performance computing • Big data, data analytics, data handling • Virtual, augmented and extended reality • Simulation, modelling and digital twins • Gamification • Software as a service and service architectures • Laser based manufacturing • Logistics

		• Internet services

Table 5. DIHs in Lithuania

6.4 MCICT

6.4.1 S3 Priorities of Poland for 2014-2020

Name	Description
Natural resources and waste management	Technologies of acquisition, processing and use of natural resources, reducing their consumption and re-use of secondary raw materials as materials or energy sources.
Innovative technologies and industrial processes	**Horizontal approach focusing on advanced materials, sensors and their networks, ICT application, printed, organic and flexible electronics, automation and robotics, photonics, creative technologies and innovative marine technologies.**
Sustainable energy	**Smart and energy efficient construction, high efficiency, low-emission and integrated circuits of manufacturing, storage, transmission and distribution of energy (smart grid), and sustainable transport solutions.**
Bio-economy comprising agri-food, forestry and environment	Innovative biotechnological technologies and products in agri-food, forestry, chemical and environmental engineering.
Healthy Society	New medical and medicinal products and technologies of their manufacturing; diseases diagnosis and advanced therapy methods.

6.4.2 RIS Mazovia 2030 – Innovative Mazovia

The key strengths of Mazovia identified in the SWOT analysis prior to RIS Mazovia 2030 elaboration are:

high level of investment attractiveness and industrial traditions in the areas of urban areas and zones of economic activity in the Mazowieckie region, unique in comparison to other Polish regions, concentration of hi-tech sectors, specialists IT/ICT, Electronics, Photonics, Biotechnology (BIOMED) in the capital region, large and diversified labour market, high concentration of qualified personnel in the capital region, large and constantly growing number of enterprises, including those with foreign capital in the capital region, developed foreign cooperation in the field of R&D in the capital region.

The main weaknesses in the Mazowieckie Voivodeship are:

low expenditures on R&D and technological investments in traditional sectors of the economy (technological debt), low market maturity for absorption of innovations in the Mazowieckie voivodeship, small number of technological companies and jobs in companies basing their activities based on innovations in the Mazowieckie region, ageing research infrastructure, insufficient capacity for self-financing and replacement in the capital region.

The opportunities in the environment that determine the choice of strategy to the greatest extent are in turn:

progressive European integration, internationalization of business and agricultural production, international consortia and their growing role in the economy international consortia and their growing role in the economy, global value chains, the development of new economic areas and business models, the emergence and opening up of the emergence and opening up of new markets and sectors, growing demand for highly advanced technological and ICT products and services, development of technical infrastructure, accelerated technical and technological progress.

On the threat side, the following should be regarded as key:

growing regional competition in the sphere of innovation, economic development of China and other Asian countries (competitiveness in terms of introduction of innovative products), educational system inadequate to the needs of the labour market, the geopolitical situation - conflicts, trade wars, terrorist attacks, cyber threats.

Main objective:

Mazovia as a region of exploited opportunity - becoming one of the of innovation leaders in Central and Eastern Europe by 2030.

Strategic objective I: Supporting the creation and implementation of innovation as part of regional smart specialization, inter alia, through knowledge and technology transfer from the scientific sphere to enterprises.

Strategic goal II: Strong and efficient value chains linking businesses

Strategic goal III: An effective ecosystem for creating and supporting innovation

Strategic goal IV: Increase in the internationalization of the Mazovian innovation ecosystem

Polish National Smart Specialisation Strategy addresses several Sustainable Development Goals (SDGs) related especially to healthy society, circular economy, water, climate change, renewable energy, smart city, sustainable transport systems, industry development towards Industry 4.0.

The National Smart Specialisation Circular Economy supports research, development and innovation for the transformation towards the **circular economy model**. The circular economy model allows to maintain the conditions of efficiency, optimize the value added of raw materials/resources, materials and products and minimise waste. In Poland, the selected activity areas related to the manufacture and processing of materials for example acquisition of raw materials, eco-design, waste and water waste, processing and production.

Poland (at the national level) together with 16 regions has developed the coordinated system of **17 RIS 3 strategies**. Priority selection policy should be continued with greater attention on choosing most innovative projects which can ensure sustainable growth and competitiveness. There is room to find new ways of attracting stakeholders in cooperation with partners from other regions or countries to benefit from the quite low transnational cooperation.

6.4.3 Regional SWOT – Analysis of Mazovia

STRENGTHS	**WEAKNESSES**
Representation of the industry - a large number of entities gathered in the Cluster	Large dispersion of actors
Access to industry best practices from abroad	Limited success in obtaining EU funding
Possession of an accessible research laboratory	Limited financial resources
Membership in many partnerships in Europe	Insufficient communication within the cluster
Experience in implementing projects and providing services to cluster entities	Too few joint consortium tenders
Successes achieved so far	Insufficient internationalization of the cluster
	Insufficient possibilities to finance ideas e.g. start-

Broad range of competencies Strong scientific representation (numerous A and A+ rated research units) Knowledge and experience of the management Large number of diversified clients in the companies' portfolios Ease of communication with authorities High ability to initiate and manage projects Experience in international projects International reputation of the Cluster (participation in international conferences, establishing international cooperation in the creation of international project consortia) Investment in the space industry in Poland at an early stage Ownership of the Space Bridge Investment Fund Establishment of a Joint-Venture with the Ukrainian Space Agency	ups Too little cooperation with incubators and accelerators
OPPORTUNITIES Very strong concentration of companies in the sector High potential of the industry in Warsaw in relation to the rest of Poland Large growth potential for the customer market in Warsaw Expected increase in demand for the industry's products due to the development of the Internet of Things Expected further increase in demand for data processing services Expected increase in demand for highly advanced software Developed creative industries in Warsaw and opportunities for cooperation with them Increased demand for ICT products and services in many industries in Poland and worldwide Technological progress in the sector Opportunities to support research activities of the industry from European Union funds Possibilities of supporting exports of enterprises in the sector Development of network cooperation in the industry Market niche of the space industry Space industry is the most technologically advanced industry Rapidly growing space industry in Poland	**THREATS** Strong competition at the national level - flow of companies to other regions of Poland (especially ICT production) High production costs of ICT products and services compared to the rest of Poland Stagnation and recession in some segments of the industry Relatively low margins for some products and services on global markets Competition from Asian countries (India) Negative impact of a weak global economy Competition from global corporations on foreign markets and in Poland

Table 6. Regional SWOT – Analysis : Mazovia

6.4.4 DIHs/EDIH of Mazovia / Poland

Name	Technical Competences	Services Provided
Mazovia EDIH	• Artificial Intelligence & Decision support • Cybersecurity • High performance computing • Micro- and nanoelectronics,	• Manufacturing and processing

	optoelectronics • Photonics • Robotics • Semiconductors and Nanotechnology	
PIAB HUB	• Cyber physical systems • Robotics • Internet of things • Artificial intelligence • Mobility & Location based technologies • Interaction technologies • Simulation, modelling and digital twins • Additive manufacturing	• Awareness creation • Ecosystem building, scouting, brokerage, networking • Collaborative Research • Concept validation and prototyping • Testing and validation • Commercial infrastructure • Digital Maturity Assessment • Incubator/accelerator support • Education and skills development
Institute of Electron Technology (ITE)	• Micro/nano electronics • Sensory systems • Photonics and imaging technologies • Cyber physical systems • Internet of things • Cyber security	• Awareness creation • Ecosystem building, scouting, brokerage, networking • Collaborative Research • Concept validation and prototyping • Testing and validation • Pre-competitive series production • Commercial infrastructure • Micro/nano electronics • Sensory systems • Photonics and imaging technologies • Cyber physical systems
NASK National Research Institute	• Sensory systems • Communication networks • Robotics • Internet of things • Artificial intelligence • Cyber security • Big data, data analytics, data handling • Simulation, modelling and digital twins • Software as a service and service architectures • Cloud computing • Internet services	• Awareness creation • Digital Maturity Assessment • Mentoring
IT and Expert Hub Supporting Biomedical Research, Technology and Education (BioMedHub)	• Cyber physical systems • Artificial intelligence • Interaction technologies • Advanced, or high-performance computing • Big data, data analytics, data handling • Virtual, augmented and extended reality • Simulation, modelling and digital twins • Software as a service and ser-	• Collaborative Research • Concept validation and prototyping • Testing and validation • Commercial infrastructure • Digital Maturity Assessment • Incubator/accelerator support • Mentoring • Education and skills development

	vice architectures • Cloud computing • Additive manufacturing • Internet services	
Emerging Transactional and Financial Technology Hub (ETFTH)	• Internet of things • Artificial intelligence • Interaction technologies • Cyber security • Software as a service and service architectures • Cloud computing	• Awareness creation • Ecosystem building, scouting, brokerage, networking • Collaborative Research • Concept validation and prototyping • Testing and validation • Incubator/accelerator support • Market intelligence • Education and skills development
WaMa InnovationHub	• Advanced, or high performance computing • Artificial intelligence • Cyber security • Internet of things • Robotics	• Access to Funding and Investor Readiness Services • Digital Maturity Assessment • Ecosystem building, scouting, brokerage, networking • Education and skills development • Testing and validation

Table 7. DIHs of Mazovia / Poland

DIH ITSG - provides access to cutting-edge technology and expertise in areas such as software development, cloud computing, cyber security and data analytics.
https://itsg-global.com/
DIH INNO-PRO - focuses on supporting SMEs to implement Industry 4.0 technologies, including automation, robotics and predictive maintenance.
http://innopro.pl/

6.5 GAIA

GAIA is the Association of Knowledge and Applied Technologies Industries (ICTA) in the Basque Country, a private and professional non-profit organization, established in 1983. It is a regional Cluster that promotes Networking with key stakeholders within the Basque Region, currently made up of 302 companies that offer products and services in the field of electronics, information technology, consulting, engineering and telecommunications. Currently there are four main enabling technologies that are deployed and in the GAIA's strategy: Internet of Things, Artificial Intelligence, Experiential Intelligence and Cybersecurity. There is also an intensive effort to foster the microelectronics sector and the application of quantum technologies.

GAIA's mission is to boost the development and growth in the ICTA sector and to favour the assimilation and efficient usage of the technologies to the industry, territory, and society, with the aim of collaborating in the development of the Information and Knowledge Society. GAIA has two main headquarters located in the two main cities of the Basque Country, San Sebastian and Bilbao.

6.5.1 S3 Priorities of Basque Country for 2014 – 2020 and beyond

Basque Country has set the following smart specialisation priorities for 2014-2020:

Name	Description
Sustainable buildings	**Advance processing and materials for improving construction processes and energy efficiency. Improvement accessibility conditions for senior people**
Renewable energy	**Renewable energy particularly regarding to marine offshore energy testing, energy storage systems, integrated systems and residual heat exploitation.**
Advanced manufacturing to transform Basque industry	**Development of the Basque Open Industry Platform 4.0 concept, with particular attention to distributed intelligent manufacturing, improvement of human capital skills and capabilities by promotion of STEM studies in Secondary Education. Also advancement of offshore manufacturing**
Health Research and Biosciences	Health research focused on rare diseases, 29personalized medicine, equipment and **applied ICT**.
Building a new circular economy	Moving towards a new production model based on a circular-economy view of the production of goods and services; reducing consumption and waste of raw materials, water and energy sources. Transition is based on the principle of closing the life cycle of products, services, waste, materials, water and energy. The model includes more green and new types of products and businesses; appraisal of residuals; cleaner technologies and processes; preservation and regeneration for a sustainable territory; treatment and recuperation of water and soil; and adaptation and mitigation of climate change and ecosystemic services.
Healthy and safe food	New Food Production systems; healthy and sustainable food processing; gastronomy; and the **use of ICT technologies** to increase food safety quality and traceability.
Cultural and Creative Industries	Cultural and creative industries, including videogames, audio-visual performance, editing, visual marketing, music, language, crafts, publishing, architecture, fashion, design, gastronomy, etc.

Smart Specialisation /Strategy paper of Basque Country

The new European innovation strategy called RIS3 (Regional Innovation Strategy for Smart Specialisation) sets out a smart specialisation strategy. RIS3 Euskadi, incorporated in the Science, Technology and Innovation Plan 2020, identifies the strategic priorities for smart specialisation in the Basque Country.

RIS3 Euskadi establishes a deliberate and explicit strategy of diversification of the Basque economy based on three essential enabling technologies (Biosciences, Nanosciences and Advanced Manufacturing) and five priority markets (Transport and Mobility, Digital World, Science Industry, Ageing and Health and Energy).

Within this framework, and with a clear commitment to the diversification of the fabric towards an area with a high technological level and high growth potential, three priorities have been defined that affect various sectors in which the Basque Country has a strong specialisation and high capacities: Advanced Manufacturing, Energy and the Bio/Health binomial.

Strategic sectors identified in RIS3 Euskadi

In addition, four areas of opportunity have been identified: Food, Ecosystems, Urban Habitat and Cultural and Creative Industries. The field of Cultural and Creative Industries (CCIs) is managed by the Department of Culture and Language Policy (DCPL), always in coordination with the Department of Economic Development and Infrastructures and Lehendakaritza of the Basque Government.

For this purpose, and as in the rest of the territories of opportunity and in the 3 priorities, a Steering Group has been created.

Pilotage groups. Composition

Under this general scheme of composition of the RIS 3 Steering Groups, for the one corresponding to the Cultural and Creative Industries opportunity territory, a steering group of only 14 people has been chosen, where the representation of the following types of entities is rotating:

Basque Government (4): Commissioner for the PCTI, 1 representative of the Department of Culture and Language Policy, 1 representative of the Department of Economic Development and Infrastructures and 1 representative of the Department of Education.

Araba, Bizkaia and Gipuzkoa Provincial Councils (2): 1 representative of the Departments of Culture / 1 representative of the Departments of Economic Promotion.

Capital City Councils (2) (Bilbao, Donostia and Vitoria-Gasteiz): 1 representative of the Culture Departments / 1 representative of the Economic Promotion Departments.

Associations and Clusters (4): Eiken, Habic, Gaia-Basquegame, Langune, Arbaso, Architects Association, Basquemoda, Advertising Agencies Association, Eide, Ehmbe, Eskena, Chamber of Books, Ibaia, EPE-APV, MIE, AVPIOP.

1 representative of Innobasque

1 representative of GAIA

6.5.2 Regional SWOT-Analysis of Basque Country

STRENGTHS	**WEAKNESSES**
• Competence for high key technologies specialization • GAIA as core of the ICT cluster (311 companies, 21,750 employees) • 70% of the population of the Basque Country has a University Degree, 11 relevant research centers • Working technology transfer structure (IoT Lab and Basque Game Lab with more than 50 solutions) • Dedicated education schemes on worker level (dual study, professional schools) • Strong strategic cooperation between Cluster and the regional authorities • Real triple helix managed high-tech region • Microelectronic as enabler identified in the regional smart specialization strategy • GAIA is recognized as strongest ICT and electronics cluster in Europe • Competence for energy efficiency, improve the quality of live of people, helping SME to be more digitalize. Technology: • Vast experience in high volume research project in different topics: industry, health, automation, mobility, smart cities, education…	No many of large companies in Basque Country in the Microelectronic areas. Low knowledge linked with the Quantum Technologies. Insufficient use of knowledge transfer structures Low proportion (approximately 36%) of women in (mathematics, IT, natural sciences, engineering) Difficult to put some new products in the market, especially international markets.

• Strong industrial base for equipment makers, materials • Artificial Intelligence, smart systems-integration • Home for the largest IoT Lab – Smart Systems Hub; strong competences in Industry 4.0 • There are some resources such a Venture Capital and Business Angels • There is a specific centre, leader by the Basque Government to improve the innovation management within the SME.	
OPPORTUNITIES • Cross cluster cooperation for enhancement of innovation • Coordination of the research activities of the European Clusters regarding the market trends • Better cooperation between the key players in industry, RTOs and Universities in Europe´s inside the key technologies. • Alignment of Basque Country, national and European level on the tree transitions. • Strategy alignment with application industries • Focus on develop products/services and new processes inside the industries. • Start with a new strategic line, such as culture and creative industry, quantum technologies, data´s economy, etc.	**THREATS** • Some SMEs are still buy for a foreign companies • Supply and technology dependency on Asian • Increasing energy costs through current word situation • Challenge of successor establishment for SMEs

Table 8. Regional SWOT-Analysis of Basque Country

6.5.3 DIHs of Basque Country

The DIH in the Basque Country is the Basque Digital Innovation Hub (BDIH) which is a connected network providing Basque companies with assets and advanced manufacturing services for training, research, testing and validation.

The BDIH is initiative leaded by SPRI, which is the local development agency and is the network that provides SMEs with the technological capabilities they need to rise to the challenges of smart industry, energy and health, and to be able to grow in a more digital and sustainable environment.

The BDIH provides companies with infrastructure and know-how, laboratories, equipment, software, scientific and technological capabilities and an expert team to support each project. The services offered by BDIH are:

- Technological and economical consultancy
    - Technological and economic consultancy
    - Technological needs assessment
    - Collaboration and co-working
    - Technology foresight
    - Evaluation of economic viability
    - Proof of concept
- Design, prototyping and validation
    - Conceptual design
    - Simulation, solution architecture
    - Security analysis

    - Prototyping, programming and experimental validation
    - Technology transfer for industrialization
- Training
    - Deep dives
    - Demonstration/showroom
    - Educational workshops

The BIDH has 8 different nodes based on the different technologies which are relevant for the advanced manufacturing. One of those is leaded by GAIA (Data Driven solutions). These are:

- Smart and connected machines: testing of advanced solutions for digital grinding
- Digital electricity networks: digitisation of networks for energy transition
- Additive manufacturing: validation at all stages of the process
- Flexible robotics: experimentation for solving automation challenges
- Medical devices and digital health: digitisation for diagnostics and development of new applications and devices
- Advanced materials: scaling of new functionalities and associated processes
- Data Driven solutions: demonstrating data-drive solutions for industry
- Cybersecurity: real environments for testing, operation simulation and cybersecurity training

6.6 SCS

POLE SCS is a European leading digital cluster based in Provence Alpes Côte d'Azur, France. Focused on key technologies in the fields of IoT, Big data&AI, microelectronics and digital security, the cluster gathers 311 players, large corporates, startups, SMEs and Research laboratories and Universities. Acting as an Innovation accelerator with 324 R&D collaborative projects and 1 063 millions euros R&D investments, SCS is dedicated to accelerating the growth of its members on high growth markets such as Industry 4.0, e-health, mobility & smart vehicle, smart cities.

6.6.1 Smart Specialisation Strategy and S3 Priorities of Région Sud Provence Alpes Côte d´Azur

For 2014-2020 the S3 Priorities are:

Name	Description
Cultural industry, tourism and digital content	Developing e-tourism solutions and increasing the number of international customers, and creating links between the transmedia and the smart city.
Energy transition and energy efficiency	**Advancing on energy-efficient building renovation through improved thermal insulation, managing and securing smart electricity networks and developing the production of marine renewable energy.**
Risks, security and safety	Promoting global solutions for environmental monitoring (land, sea, air and water) and crisis management, strengthening the technological competitiveness of security solutions and diversifying their application.
Health and food	Improving patient care through early testing, medical diagnostic assistance and the development of medical devices, developing e-health solutions and preventing diseases through the promotion of the Mediterranean diet.
Smart and	**Providing mobility solutions that allow optimizing the management of flows of**

Name	Description
sustainable mobility	**people and goods, developing new, energy-efficient and safe port and airport services and infrastructure and strengthening the industrial competitiveness of aeronautic and sea transport through the development of new transport vehicles and new activities.**

Smart Specialisation /Strategy paper of Région Sud Provence Alpes Côte d'Azur 2022-2028

Regional strategy for regional development, innovation and internationalisation 2022-2028 (*SRDEII*): "Make Provence-Alpes-Côte d'Azur Region the most attractive region of Europe, and a European model of resilient and sustainable economic development."[2]

AXIS 1: Towards a 100% climate-friendly regional growth

1. Producing carbon-free energy
2. Decarbonising industry and transport, based on our innovative sectors
3. Supporting new models of economic development and fostering the circular economy
4. Succeeding in the ecological transition of companies

AXIS 2: Towards a sovereign industrial region that is more resilient to crises

1. Ensuring sovereignty over basic needs
2. Reindustrialise and consolidate our sectors of excellence
3. Securing the supply of the regional economy
4. Developing a dynamic attractivity policy to boost the regional economy
5. Optimize and adapt the land and real estate offer

Axis 3: Making Provence-Alpes-Côte d'Azur one of the most innovative regions in Europe

1. Bringing research and innovation actors closer to business
1. Fostering the creation of innovative businesses
2. Supporting the acceleration of companies and the industrialization of innovations
3. Accelerate the digital transformation of companies

AXIS 4: Accelerating business growth: skills, international, development and transfer

1. Adapting skills to transitions and business needs
2. Facilitating access to employment, mobility and professional transitions
3. Supporting businesses in every phase of their lifecycle
4. Helping SMEs to grow and internationalise

AXIS 5: A simpler, closer and more readable Region at the service of a balanced territorial growth

1. Relying on and supporting the territories
2. Supporting local and neighbourhood economy
3. Supporting tourism economy towards sustainable tourism
4. Simplifying relations with enterprises

Governance

[2] The full SRDEII strategy paper of Région Sud Provence Alpes Côte d'Azur is available here: https://www.maregionsud.fr/fileadmin/user_upload/SRDEII_2022-2028.pdf (last view 15/02/2023)

1. Improve structuring of collective action by developing agreements
2. Sharing and pooling economic information
3. Share concrete implementation tools
4. Implement simplified monitoring governance
5. Evaluate the regional development strategy

6.6.2 Regional SWOT- Analysis of SCS[3]

STRENGTHS • Favorable assessment of the implementation of the SRDEII on most of the Commitments, with major achievements: - Region in a leading position - OIR (regional strategic sector), materialization of the choices of structuring and strengthening of the sectors of excellence - Flagship schemes (*FIER, portail d'entreprise, information sur les métiers, Région Sud Invest*) included in the landscape - Favorable learning & training dynamics - Diversity of financial support tools for companies • Strengthening the Region's links with other economic and territorial development actors (examples: Rising Sud governance, Covid Task Force actions) • Economic assets of the territory - Balanced economy – multi-sector - Entrepreneurial dynamism - Power of public and private Research, cutting-edge Research infrastructures: ITER, internationally renowned 3IA technopoles, Cité des Sciences, Henri Fabre innovation platforms, IMREDD Nice - Innovation Leadership - Geostrategic positioning and infrastructures: Port of Marseille, Nice and Marseille airports - Quality of life & ability to attract talent	**WEAKNESSES** • Unemployment rate above national level (9.1% against 8%) • Job creation deficit by regional companies (an average of 7.9 employees per private employer establishment in 2020 compared to 9.9 in France) • Scarce and expensive real estate for business, an obstacle to implementation • Limited number of direct investments (11th region in terms of industrial FDI) • Diversity of territories (alpine vs. coast, metropolises vs. rurality) factor of complexity for a homogeneous public policy • Insufficient articulation and coherence of schemes and roadmaps • OIR (regional strategic sector) not at the same level of maturity and structuring, and with an upstream (research and innovation - S3 and SESRI) and downstream (training) component which is insufficiently marked • Mobility infrastructure: high-speed line delay, regional interconnections • Action of the Region still little perceived by certain audiences (SMEs, young people)
OPPORTUNITIES • Structuring spaces (territories) defined in the SRADET (Regional scheme for planning, sustainable development, and equality of territories) • Economic transitions (energy, digital and societal) • Disruptive technologies like Messenger RNA • Structuring Plan Climat 2 (climate plan) • Africa = 1st market in 2050 • 5G digital service, a factor of attractiveness and acceleration of the digital transformation of companies	**THREATS** • Competition from other regions • Weakening of city centres and shops • Uncertainty about the post-crisis rebound capacity of the regional fabric • Possible effects of a logic of concentration and specialisation on important parts of the regional economy: building & construction for example • Weight of global supply chains: economic sovereignty

Table 9. Regional SWOT- Analysis: SCS

6.6.3 DIHs of Région Sud Provence Alpes Côte d'Azur

Move2Digital

[3] Source - *SRDEII strategy paper of Région Sud Provence Alpes Côte d'Azur*: https://www.maregionsud.fr/fileadmin/user_upload/SRDEII_2022-2028.pdf (last view 15/02/2023)

Move2Digital will act as a one-stop shop for SMEs in the French SUD Provence Alpes Côte d'Azur region to support digital transformation and will position supporting activities on AI, cyber security and Internet of Things (IoT).

https://www.move2digital.eu/en/

Location: Région Sud Provence Alpes Côte d'Azur

SCS is the coordinator of the Move2Digital EDIH, and the consortium comprises 12 partners (9 clusters and 3 academic partners & research centers).

Technological competences :

- Artificial Intelligence
- Internet of Things
- Cybersecurity

Strategic regional sectors covered :

- Greentech
- Chemical industries
- Energy
- Health
- Space & safety
- Blue economy,
- Agritech, foodtech, aroma & fragrance

Services:

- Diagnostics:
  - Digital maturity assessment
  - Digital transformation plan
  - Diagnostics on specific technologies (AI, Cybersecurity and IoT
- Test before invest:
  - Awareness raising on AI, IoT, Cybersecurity (by industrial field):
  - Analysis of the technical feasibility and market potential of solution deployment project (AI / IoT)
  - Prototyping (PoC) of a digital solution (IoT, AI, Cybersecurity)
  - Vulnerability / security assessment
- Innovation ecosystem & networking:
  - Matchmaking with qualified technical service providers
  - Matchmaking with qualified innovation ecosystem
  - Access to technologies (Support for deployment of technologies (AI/IoT/Cyber) from external service providers (AMOA)
- Support to find investments:
  - Support on funding panorama
  - Support for funding application preparation
  - Support for business plans

7. Clusters´ value chain analysis

7.1 Silicon Saxony

A. Individual value chain analysis

Silicon Saxony belongs to the Semiconductors value chain as per below figure.

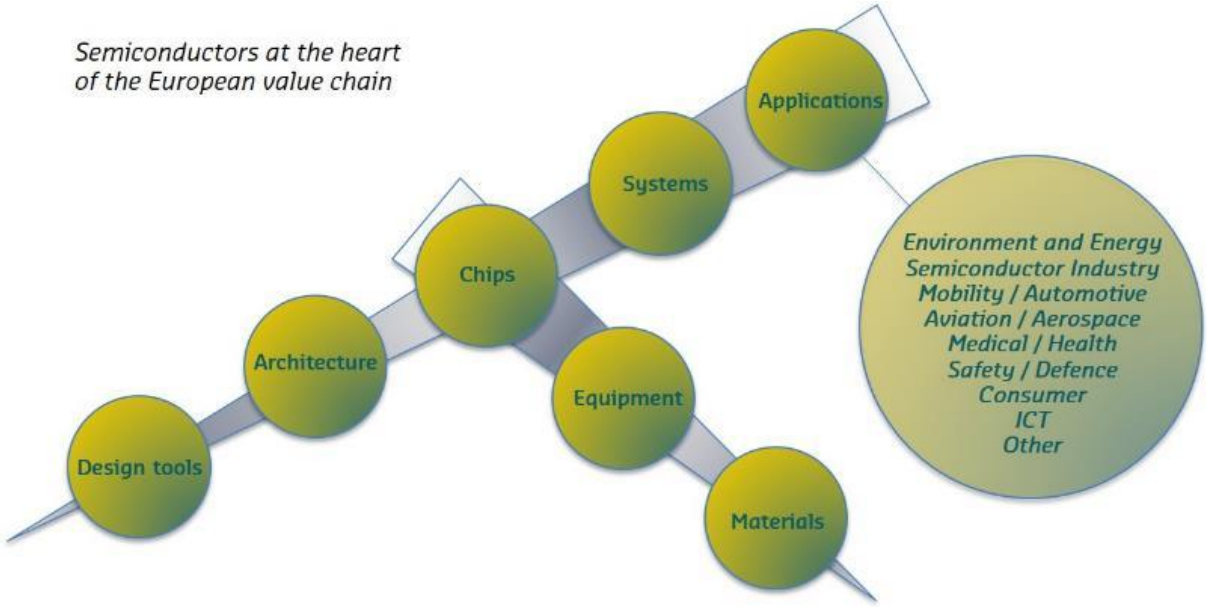

Figure 3. Silicon Saxony´s Semiconductors Value Chain

Silicon Saxony is one of the largest microelectronics clusters in Europe with a total of 437 members: large companies (44), SMEs (336, about 77% of all members), research institutes (18), universities (12), associations (16), public bodies (3) and 11 persons (honorary members). More than 60% of the members are engaged within the field of Semiconductor Industry which shows a clear orientation of the cluster for that industry, about 30 % are active in the Software branch.

Companies´ competences cover most of the areas of the microelectronics value chain from materials and consumables, design of Integrated Circuits (ICs), Equipment and components for manufacturing of microchips to chips fabrication, including systems integration (hardware and software), packaging and testing.

Materials and components: 60
System- und IC-Design: 26
Chips, Displays; MEMS/MOMS, Sensors manufacturers: 20
Equipment: 76
Systems, including:
assembly, packaging and testing: 24
Application software: 65
Embedded software: 12

The cluster companies' technology orientation along the whole semiconductor value chain is dominated by the sub-category of Equipment where about 18% of the Silicon Saxony´s members are having their core business.

B. Role of SiSax in the EXCITE Value chain

The role and position of Silicon Saxony in the Joint EXCITE value chain is shown in the below Table.

Joint EXCITE Value Chain		e-automotive	Smart city	Energy sector	e-health/-medical
Components (nano-/microelectronics, electronics, mechanical, databases, programs)	Hardware	x	x	x	x
	Software	x	x	x	x
Design/Architecture	Hardware	x	x		
	Software	x	x	x	
Equipment	Hardware	x		x	x
	Software	x		x	x
Materials	Hardware	x			
	Software	x			
Packaging/Assembling	Hardware	x			
	Software	x			
Software Development	Hardware		x		
	Software	x	x	x	x
Systems Integration	Hardware	x	x	x	x
	Software	x	x	x	x
Test, Analysis	Hardware	x	x	x	
	Software	x	x		
Application, implementation, User	Hardware	x	x		
	Software	x	x		

Table 10. Position of SiSax in the EXCITE value chain

7.2 DTI

A. Individual value chain analysis

The key value chain in the case of the cluster is the chain of Smart Manufacturing and Smart and Sustainable Cities" services. Another area where the participating companies have substantial expertise is the area of "Environmental Technologies for Cities", followed by the areas of "Smart Urban Mobility".

The DTI Cluster and its members are covering the following expertise:

- Internet of Things
- Cyber security
- Big data
- Cloud computing
- Waste management and Smart Building solutions
- Design, development and maintenance of complex telecommunication networks
- Telecom systems & networks for audio, voice, data transmission;
- Micro- and nanoelectronics;

- Embedded systems;
- Power supply devices and converters;
- Security systems, access control and fire alarm systems;
- Software products and applications.

B. Role of DTI in the EXCITE Value chain

Joint EXCITE Value Chain		e-automotive	Smart city	Energy sector	e-health/-medical
Components (nano-/microelectronics, electronics, mechanical, databases, programs)	Hardware	X	X	X	X
	Software	X	X	X	X
Design/Architecture	Hardware	X	X	X	X
	Software	X	X	X	X
Equipment	Hardware		X		
	Software		X		
Materials	Hardware				
	Software				
Packaging/Assembling	Hardware				
	Software				
Software Development	Hardware	X	X		X
	Software	X	X		X
Systems Integration	Hardware	X	X		X
	Software	X	X		X
Test, Analysis	Hardware	X	X		X
	Software	X	X		X
Application, implementation, User	Hardware				
	Software				

Table 11. Position of DTI in the EXCITE value chain

7.3 BHV

A. Individual value chain analysis

BHV as a cluster is operating in Information and communication technologies (ICT) - creative industries, cyber security, research and other fields.

As an incubator, BHV primarily focused on hardware, security, blockchain, AI, fintech and enterprise software startups.

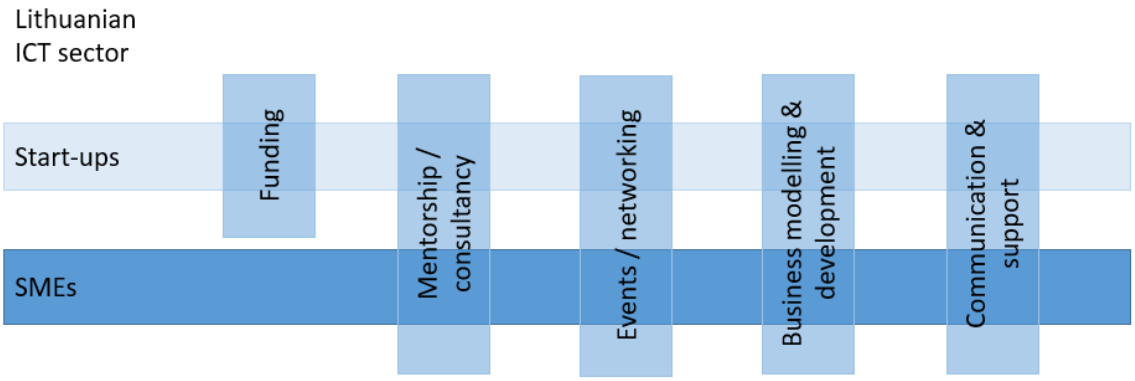

Figure 4. Value chain of BHV

B. Role of BHV in the EXCITE Value chain

Joint EXCITE Value Chain		e-automotive	Smart city	Energy sector	e-health/-medical
Components (nano-/microelectronics, electronics, mechanical, databases, programs)	Hardware	X	x		
	Software	X	x		
Design/Architecture	Hardware		x		
	Software	X	x	x	X
Equipment	Hardware				
	Software	X	x	x	x
Materials	Hardware				
	Software	X	x	x	X
Packaging/Assembling	Hardware		x		
	Software				
Software Development	Hardware	X	x	x	X
	Software	X	x	x	X
Systems Integration	Hardware				
	Software	X	x	x	x
Test, Analysis	Hardware				
	Software	X	x	x	x
Application, implementation, User	Hardware	X	x	x	X
	Software	X	x	x	X

Table 12. Position of BHV in the EXCITE value chain

7.4 MCICT

A. Individual value chain analysis

Within Mazovia Cluster ICT there are vertically and horizontally integrated entities. These entities create a value chain for an industry being a specialization of the cluster. The key value chain in the case of the cluster is the chain of creating, implementing and maintaining innovative software. The diagram of the leading value chain is presented on the chart below.

Figure 5. Value chain of MCICT

B. Role of MCICT in the EXCITE Value chain

Joint EXCITE Value Chain		e-automotive	Smart city	Energy sector	e-health/-medical
Components (nano-/microelectronics, electronics, mechanical, databases, programs)	Hardware	x	x	x	X
	Software	x	x	x	X
Design/Architecture	Hardware	x	x		
	Software	x	x		
Equipment	Hardware	x	x	x	X
	Software	x	x	x	X
Materials	Hardware	x	x	x	
	Software	x		x	
Packaging/Assembling	Hardware	x		x	
	Software	x		x	
Software Development	Hardware		x	x	
	Software		x	x	X
Systems Integration	Hardware	x	x	x	
	Software	x	x	x	X
Test, Analysis	Hardware	x	x	x	X
	Software	x	x	x	X

Application, implementation, User	Hardware	x	x	x	X
	Software	x	x	x	X

Table 13. Position of MCICT in the EXCITE value chain

The cluster brings together entities related to ICT services, space and energy (e.g. software, data processing services, telecommunications, mobile solutions for business support, geocosmic technologies, energy technologies, etc.), business support (consulting, funding, incubation, etc.) and dealing with "creative technologies" (e.g. design, mobile software, games, advertising agencies, media, website design, Internet portals). First, the potential of the cluster in three strategic areas will be presented: ICT, space and energy. In the following part there will be references to the areas in which GSSC consortium partners specialize nanotechnology, energy and water.

Analysis of MCICT potential in the ICT sector:

In 2019 employment in the ICT sector in Poland amounted to 315094 FTEs. Comparing this number to the number of FTEs of the members of the Mazovia Cluster ICT i.e. 10300 we get 3.26% of the total employment in the ICT sector in Poland. A high research potential of the relation is confirmed by the number of employees with a PhD degree employed by the entities of the cooperation network - 2370 people, which constitutes 23% of all employees in the entities of the Mazovia Cluster ICT. The value of sales obtained by members of the Mazovia Cluster ICT in 2018 amounted to PLN 9,566,144,000.00. This value corresponded to 5.8% of the value of sales in the ICT Sector in Poland and 36.32% of the value of sales in the ICT Sector in the Mazowieckie Voivodeship.

Key trends in the ICT sector are cloud technologies, Big Data, IoT, AI and cyber security.

Analysis of MCICT potential in the energy sector:

Mazovia Cluster ICT implements unique undertakings:

- Strategic cooperation with the Ministry of Energy in two areas: Energy Clusters - and building an innovation ecosystem in the Polish energy sector.

Energy clusters are solutions aimed at the development of dispersed energy sector serving the improvement of local energy safety with simultaneous maximization of economic effectiveness. Energy clusters achieve this objective in an environmentally friendly way by creating optimal organizational, legal and financial conditions for the implementation of the latest technologies, taking into account local resources and national energy potential. The project is continuous. Key trends in the energy sector are:

- Renewables
- Internet of Energy (IoE)
- Energy Storage.
- Blockchain
- Energy-as-a-Service (EaaS)
- Distributed Energy Resources
- Quantum Computing
- Vehicles-to-Grid (V2G)
- Power-to-X (PtX)

Analysis of MCICT potential in the space sector:

MCICT carries out a number of activities in the space sector, including:
- established a joint-venture with the Ukrainian Space Agency
- runs the MINI-REIS project - Multifunctional Unmanned Light Jet Aircraft

- runs the Mobile Cosmodrome project - It aims to enable the delivery of small satellites into orbit by means of a launch rocket dropped in the air from a transport aircraft.
- is a member of the Space Sector Task Force for the Mazovian Voivodship, which is organised by the Marshal's Office in Warsaw.
- a founder and coordinator of the Space Bridge Investment Fund, under which it invests in start-up companies realizing R&D projects in Proof of Concept and Proof of Principle stages by providing them initial non-equity financing before the start-up company is incorporated ("pre-equity investment stage") followed by the private capital equity investment (20%) leveraged with a public grant (80%) ("equity investment stage").
Actual trends in the sector: space surveillance and waste management mechanisms, as well as protection of space assets; satellite telecommunication and data, remote sensing.

7.5 GAIA

A. Individual value chain analysis

The role of GAIA Cluster are integrated tech entities. These entities create a value chain for an industry and energy, for a territory and for the citizens, implementing different key technologies based on the specialization of the cluster. The key value chain in the case of the cluster is the chain of creating new products, services and processes to create a new business model and a new economy based on data.

The diagram of the leading value chain is presented on the chart below.

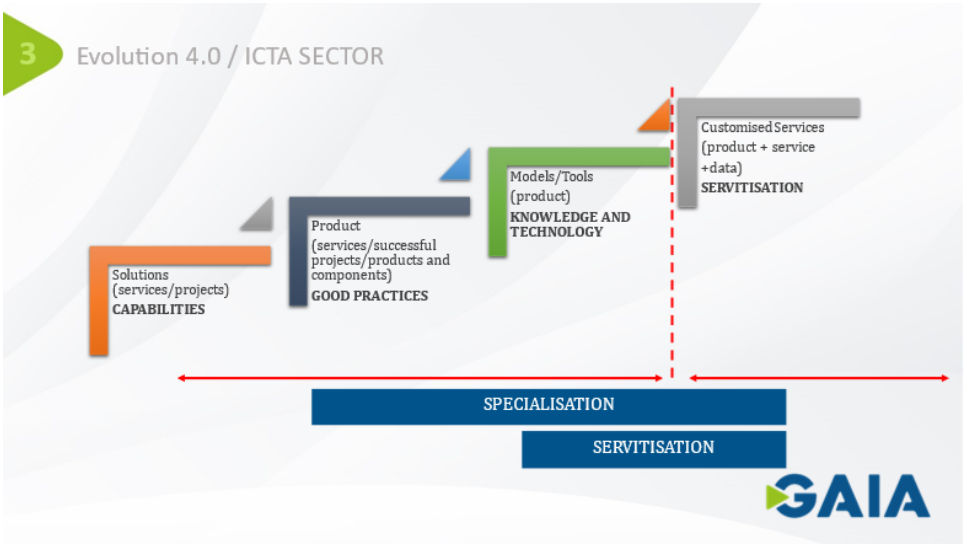

Figure 6. Value chain of GAIA

GAIA´s operating system is presented below:

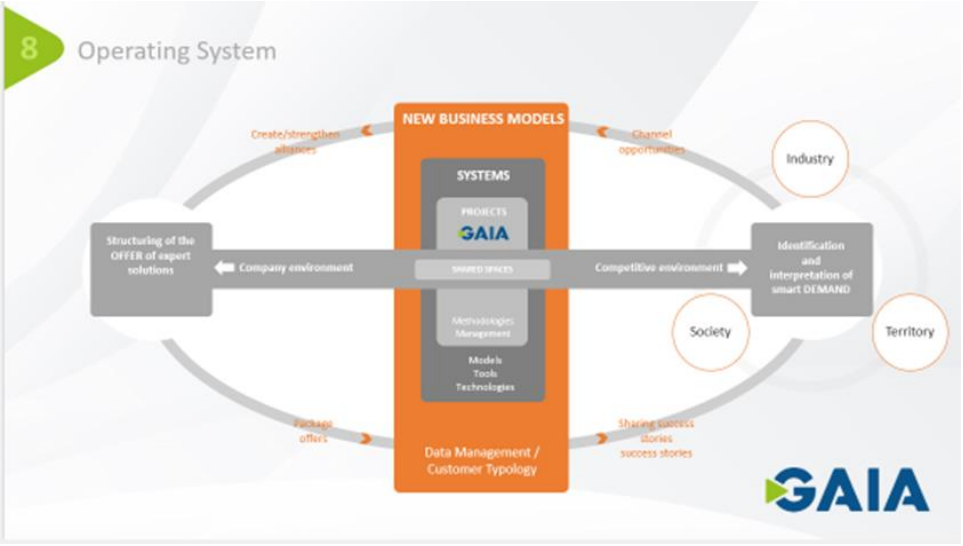

Figure 7. Operating system of GAIA

B. Role of GAIA in the EXCITE Value chain

Joint EXCITE Value Chain		e-automotive	Smart city	Energy sector	e-health/-medical	…
Components (nano-/microelectronics, electronics, mechanical, databases, programs)	Hardware	X	x	X	X	
	Software	X	x	X	X	
Design/Architecture	Hardware		x		X	
	Software	X	x	X	X	
Equipment	Hardware	X		X	X	
	Software	X	x	X	X	
Materials	Hardware	X			X	
	Software	X		X		
Packaging/Assembling	Hardware					
	Software					
Software Development	Hardware	X		x		
	Software		X	x	X	
Systems Integration	Hardware			x	X	
	Software	X	X	x		
Test, Analysis	Hardware	X	X			
	Software	X	X			
Application, implementation, User	Hardware	X	X	x	x	
	Software	X	X	x	x	

Table 14. Position of GAIA in the EXCITE value chain

7.6 SCS

A. Individual value chain analysis[4]

Value chains of SCS ecosystem of its four strategic technologies:

Internet of Things:

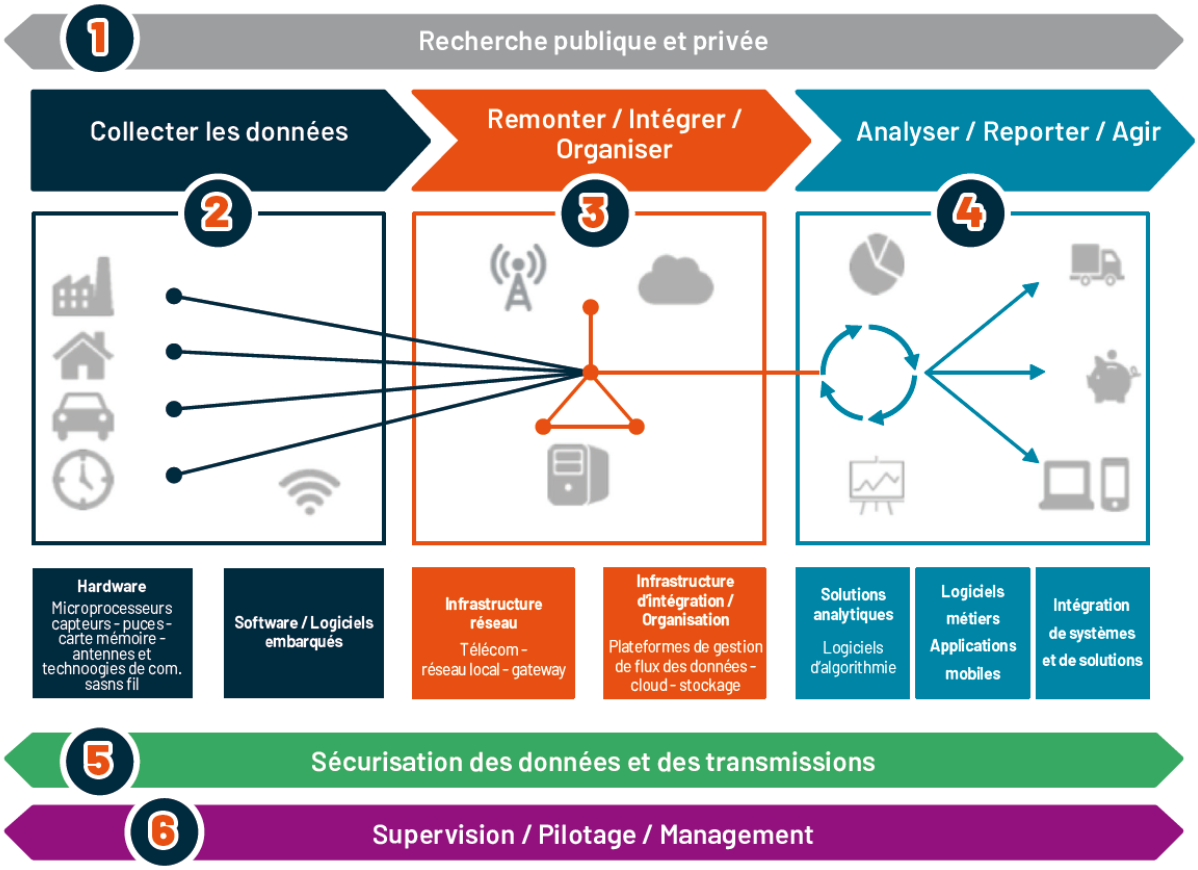

Figure 8.Technological value chain of IoT – sources: Olivier Wyman study ; KPMG analysis ; SCS 2022

Value chain distribution of SCS players:

1- Public and private Research – 13 players
2- Data collection – 23 players
3- Escalating / integrating / organising – 19 players
4- Analysing / Reporting / Acting – 13 players
5- Security of data and transmissions – 11 players
6- Supervision / Steering / Management – 2 players

The Region SUD counts 187 actors or 17% of the total base. It lists 96 IoT companies, including 62 headquartered in the Region SUD and achieving a cumulative turnover of €484 million in 2020. Of these players, 41 could be described as "pure players". The actors are present in all sub parts of the region but two basins are in the lead: Alpes Maritimes and Bouches du Rhône. The 96 companies based in Region SUD territory represent between 20 and 25% of national players (compared to national counts; *sources: Orange and BearingPoint*).

[4] *Sources : SCS publications – Digital Observatory notes available here (in French):* https://www.pole-scs.org/publications/livres-blancs-etudes/

In terms of position on the value chain, the Region SUD territory benefits from a complete ecosystem with "poly-expert" players (most of whom master several areas of expertise).

There is also a distinctive excellence in connectivity and hardware, which are links considered by experts as key and not trivial to support the acceleration of the diffusion of solutions and use-cases.

Artificial Intelligence:

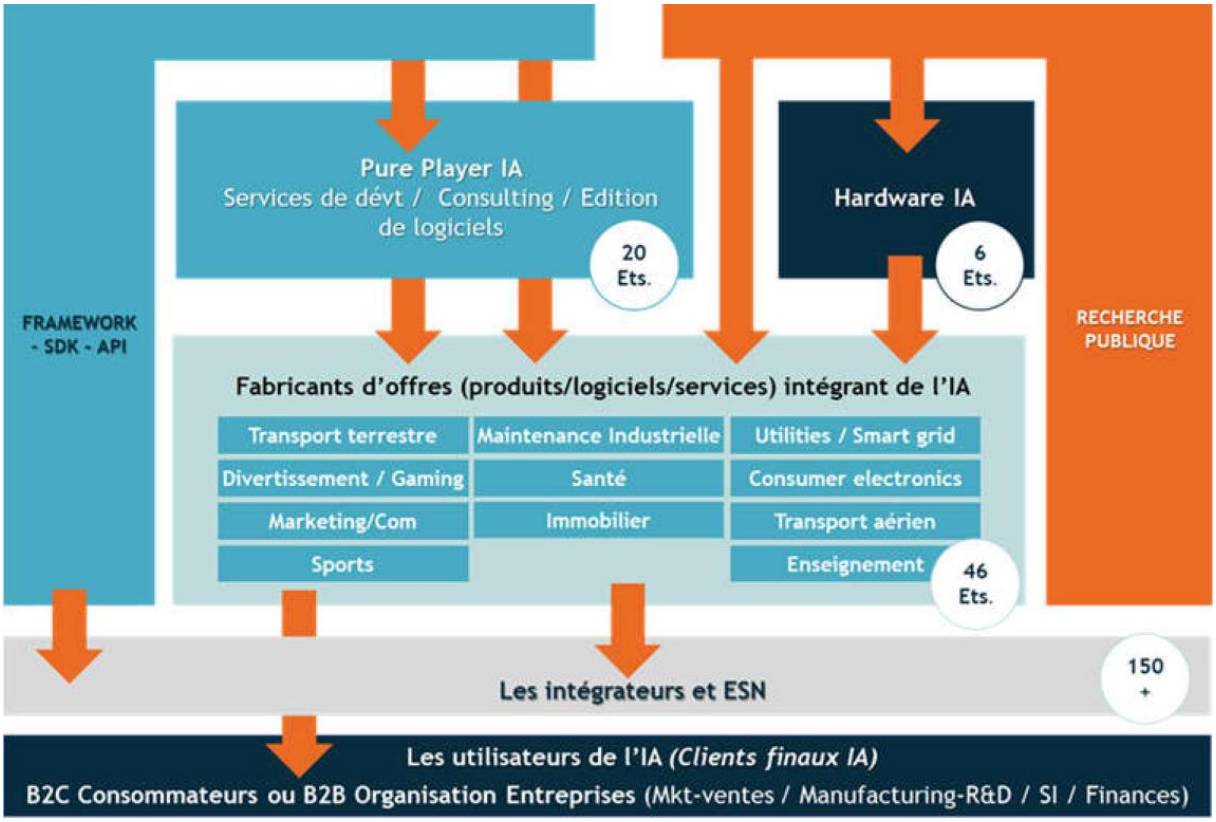

Figure 9. SCS AI Value Chain - Source: SCS (2021)

The Region SUD has 67 companies (and 99 establishments) with distinctive AI expertise. In addition, the Region has a large network of integrators (more than a hundred within the Observatory) who invest heavily in expertise related to data and AI. These actors are key because they not only contribute to the development of skills but also carry out in-depth work in terms of evangelization and dissemination of uses. Of these 67 companies, 45 are startups tracked in the AI radar of the Deal Room base. At the national level, this database lists 992 startups. The relative share of startups in the Region SUD can therefore be estimated at about 5%.

Digital & Cyber-security:

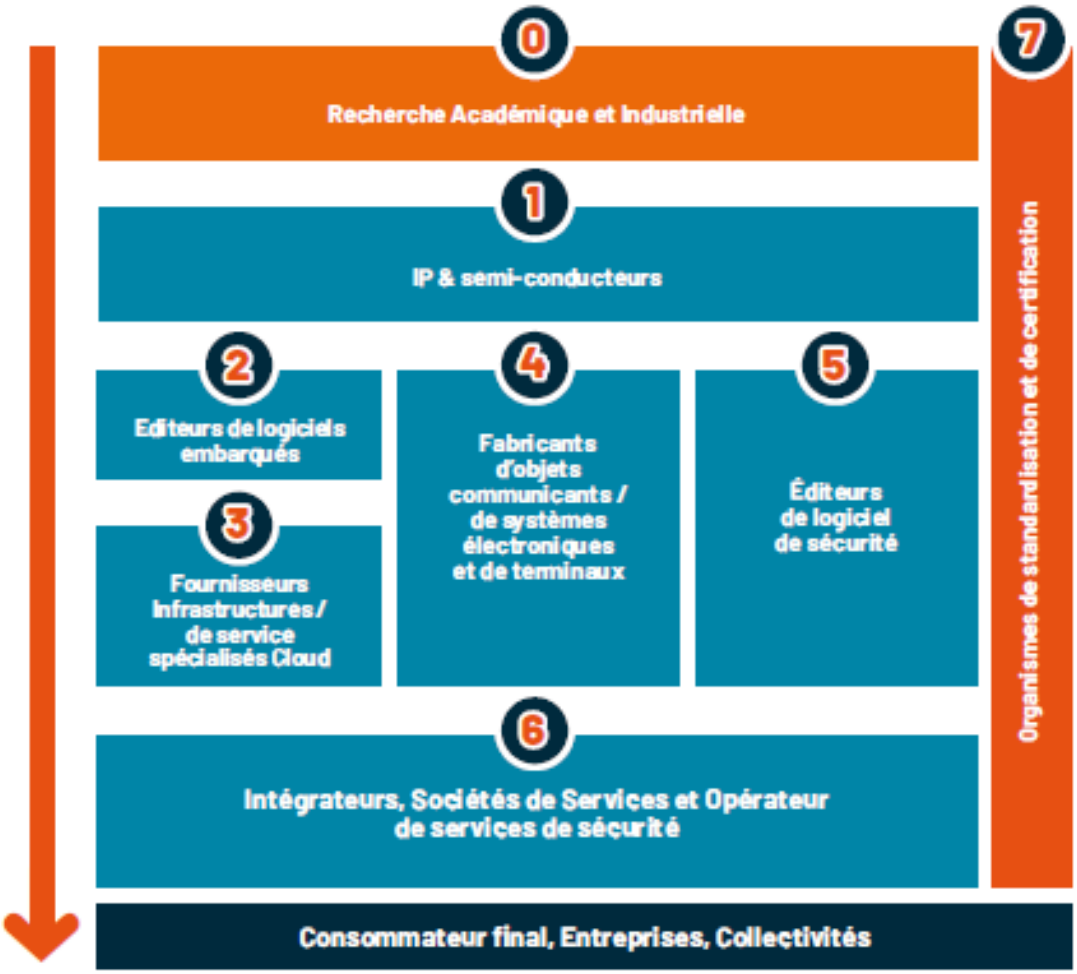

Figure 10. Digital and cyber-security value chain mapping – source: SCS 2021

Value chain distribution of SCS players:

0- Academic and industrial Research – 6 players
1- IP & semi-conductors – 6 players
2- Embedded software editors – 5 players
3- Providers of infrastructures/cloud services – 6 players
4- Manufacturers of communicating objects, electronic systems and terminals – 3 players
5- Security software editors – 4 players
6- Integrators, service providers and security services operators – 2 players
7- Standards and certification bodies – 1 players

The Region SUD has 228 digital trust establishments, including 76 companies headquartered in the territory. The latter represent a cumulative turnover of €700 million in 2019. To date, there are 27 pure players (companies where more than 50% of their activity fall within the domain). The cumulative value of the regional offer in the field of digital trust is estimated at 2.1 billion euros in 2019, representing about 20% of the national offer.

Microelectronics:

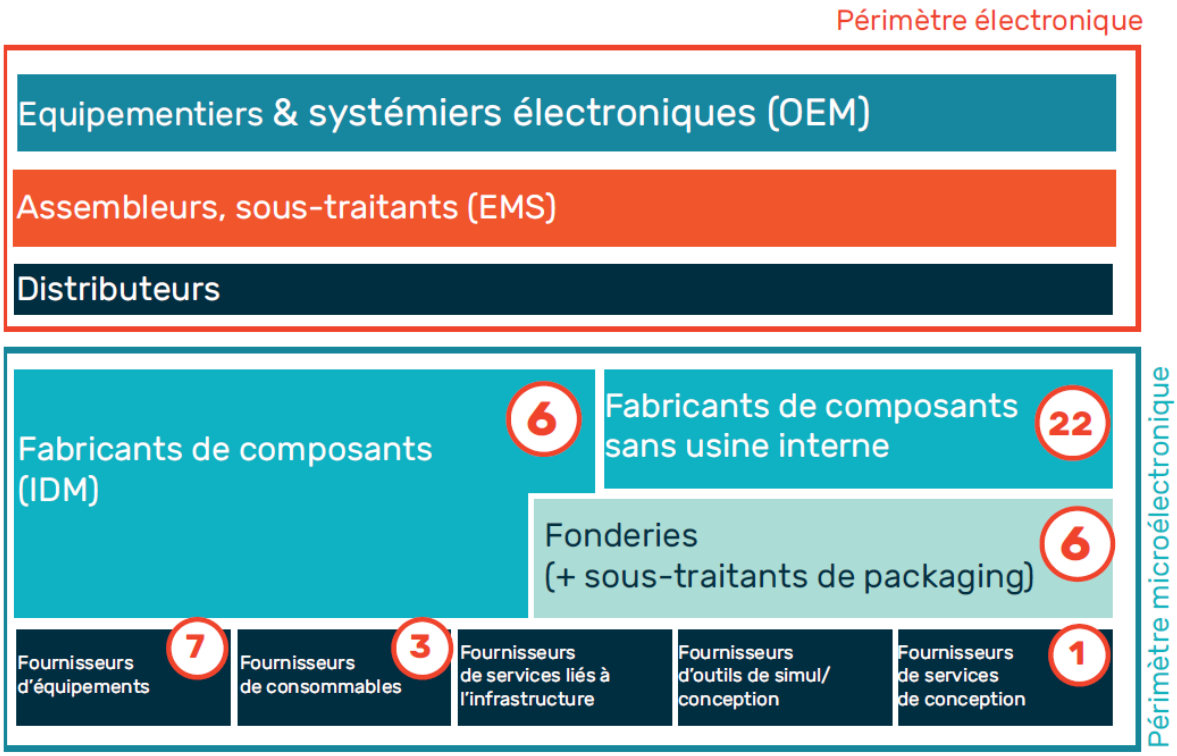

Figure 11. Value chain mapping of SCS micro-electronic players – source: SCS (2021-2022)

Within the Region SUD, several hundred players are part of the broader electronic field. There are a little more than forty (panel presented in detail below). They cover a very wide range of skills within the value chain: **Integrated Device Manufacturers** (6 companies), **Fabless component producers** (22 companies), **foundries and packaging providers** (6 companies), **equipment providers** (7 companies), **consumable suppliers** (3 companies), **suppliers of design services** (1 company).

The Region SUD demonstrates its strength to act on all links in the chain. The current dynamics of the regional locomotive, STMicroelectronics, should not, however, overshadow the difficulties of the smallest players in the current context of component shortages. Already pointed out in 2021, the historical weak cooperation at the regional level has not changed profoundly. The recovery plans and the modalities of the European Chip Act could create the conditions for a paradigm shift. Some "nuggets" have, however, managed to impose themselves in recent months.

B. Role of SCS in the EXCITE Value chain

Joint EXCITE Value Chain		e-automotive	Smart city	Energy sector	e-health/-medical
Components (nano-/microelectronics, electronics, mechanical, databases, programs)	Hardware	x	x	x	x
	Software				
Design/Architecture	Hardware	x	x	x	X
	Software	x	x	X	x
Equipment	Hardware	X	X	x	X
	Software	X	X	X	X

Materials	Hardware				
	Software				
Packaging/Assembling	Hardware	x	X	X	X
	Software				
Software Development	Hardware	X	x	X	X
	Software	x	x	X	X
Systems Integration	Hardware	x	x	X	X
	Software	x	x	X	X
Test, Analysis	Hardware	x	x	X	X
	Software	x	x	X	X
Application, implementation, User	Hardware	x	x	X	X
	Software	x	x	X	x

Table 15. Position of SCS in the EXCITE value chain

8. Strategic cross-border opportunities and transferable results

The analysis of the regional smart specialisation priorities of EXCITE partners have shown overlaps, in particular in the areas of ICT development; in particular further development of the key digital technologies in the areas of AI, IoT, Quantum technologies, high speed computing, software automation, high speed computing and Big Data, data infrastructures to enable green and digital transformation across various sectors: agricultural (developing digital solutions for Agri-Food), health, manufacturing by introducing innovative technologies and industrial processes and materials. The latter includes smart sensors and IoT applications, organic and flexible electronics, use of photonic ana laser technologies, automation and robotics.

Other areas and markets of common interest are:

- Smart systems for energy efficiency for diagnostic, monitoring, metering and management of generators, grids and customers;
- Energy and fuel production using biomass/waste and waste treatment, storage and disposal;
- Smart mobility
- Smart cities

Most of the key enabling technologies are present within the EXCITE consortium to different extent and by means of EDIHs/DIHs which represent the regional strengths can be offered across border.

In terms of technologies EXCITE partners have undertaken analysis of technical competences of their members that could serve as the basis for future cross – cluster collaboration. The technologies are listed in the below figure.

Technology/competencies	Partner					
	Silicon Saxony	DTI	BHV	MCICT	GAIA	SCS
Artificial intelligence:	x	X	x	x	X	X
Machine Learning	x	X	x	x	X	X
Natural Language Processing					X	X
						X
Artificial neural network (ANN)						X
Internet of Things	X	x	x	x	X	X
Big Data	x	x		x	X	X
Robotics / Automation	X	x	x	x		X
Sensors	X	x		x	X	X
5G/ 6G	X	x	x	x		X
Cloud Computing	X	x		x	X	X
Quantum Computing	X			x	X (we are starting)	
Edge Computing	X			x		X
Full Stack Development	x		x			
VR / AR / Extended Reality	x			x	X	X
Digital Twins	X			x	X	X
Cyber-physical systems				x	X	X
Big Data	x			x	X	X

Data Analytics	x			x	X	X
Data Science	x			x	X	X
Embedded Systems	X			x	X	X
Micro- and nanoelectronics	X			x	X	X
Tracking and tracing	x			x		X
Cybersecurity	x		x	x	X	X
Blockchain			x	x	X	x

Table 16. Mapping of EXCITE technologies

Joint activities/ collaborations

The following major areas for collaboration have been identified within the analysis:

Technologies:

- Joint development of ICT based on identified strength in EXCITE:
  - Combing technologies: eg. Cybersecurity + AI – intrusions detections (SCS + GAIA, Si-Sax+ SCS, SiSax+ GAIA, MCICT, BHV)
  - Joint development of various AI solutions for different application fields
  - Collecting & exchanging of good practices & use cases of technologies in various industries: AI for Medical;
  - Quantum technologies: SiSax sharing expertise and best practices with other regions – e.g presentations at Silicon Saxony Day
  - Robotics - deepening of collaboration between Robotics Valley, Saxony & Robotics Community, Bulgaria at the Robotic Valley Festival in Dresden
- Collaboration in the area of Microelectronics:
  - Expansion of collaboration of the existing partnership between SiSax, GAIA and SCS in the area of microelectronics (in Silicon Europe Alliance) to DTI, MCICT and BHV – eg. Invitation to the Open Innovation Day (planned to be held within Silicon Eurocluster project which aims at strengthening the self-sufficiency of the European microelectronics value chain) of suppliers from Poland, Lithuania and Bulgaria developing materials, components, equipment for microelectronics fabs in Saxony (GlobalFoundies, Bosch, Infineon, X-Fab) and France (Soitec, ST Microelectronics).
- Organisation of joint hackathons (e.g Smart Systems Hub for IoT, Saxony inviting companies from other regions to take part)
- Joint tech conferences/ co-promotion of tech events – Developers conferences – example – annual Decompiled Conference by Silicon Saxony -> expanding to other regions to share best practices
- Techno Scouting: creating a detailed catalogue on all existing technologies to offer to international partners
- Organisation of joint specialised workshops and conferences (e.g. on cybersecurity – led MCICT/ BHV; on AI – by SCS; IoT, Quantum technologies – by SiSax; smart mobility – by SCS; Smart cities – by MCICT / GAIA; green tech – by MCICT/DTI)

- Start-up pitching events: bringing together various actors, including investors (BHV has extensive experience)
- EDIH corridors – joint events and joint services/ collaborations (EDIHs of SISax and SCS have already started talks)

Research and Development and Innovation:

- Cross-border industry – academia joint project proposals (EU and national funding programmes (e.g SiSax – SCS in the area of AI)
- Co-promotion of opportunities for SMEs, etc. In funded projects (eg. Cascade funding via INNOSUP projects: Mind4Machines, SecurIT; etc.)
- Open Innovation Day to bring large companies and SME- suppliers of components, materials, equipment, digital solutions which would pitch their services based on the posed challenge of a large company.

Other areas:

- Support to start-ups: scale up events, joint start-up conferences with inviting investors: transfer of knowledge from BHV on support to start-ups on business modelling and development
- Pact 4 Skills: inclusion of EXCITE partners into the EU Chips Skills Alliance, which Silicon Saxony is currently preparing in the framework of METIS project.

Below is the summary of possible strategic collaboration areas:

What	How
Technology Technology Transfer Joint Technologies development	• Joint Hackathons • Joint specialised conferences and workshops • Cross-EDIHs collaboration • Joint start-up events
Research, Development & Innovation Open Innovation Scientific collaboration Access to test beds	• Cross-border industry -academia collaboration in EU projects • Open Innovation Day • Joint technical and scientific papers
Networking & Events Joint Specialised conferences and workshops (on technologies or/and markets)	• Matchmaking events (B2Match); • Joint Recruiting events (e.g. Speed-dating) • Joint Booths at international Trade Shows

9. Annex I: Joint value chain overview

Joint EXCITE Value Chain		e-automotive	Smart city	Energy sector	e-health/-medical
Components (nano-/microelectronics, electronics, mechanical, databases, programs)	Hardware	Mazovia Cluster ICT, GAIA, POLESCS, Silicon Saxony, ICT cluster	Mazovia Cluster ICT, GAIA, POLESCS, Silicon Saxony, ICT cluster, Business Hive	Mazovia Cluster ICT, GAIA, POLESCS, Silicon Saxony, ICT cluster	Mazovia Cluster ICT, GAIA, POLESCS, Silicon Saxony, ICT cluster
	Software	Mazovia Cluster ICT, Silicon Saxony, ICT cluster, GAIA	Mazovia Cluster ICT, GAIA, Silicon Saxony, ICT cluster, Business Hive	Mazovia Cluster ICT, GAIA, Silicon Saxony, ICT cluster	Mazovia Cluster ICT, GAIA, Silicon Saxony, ICT cluster
Design/Architecture	Hardware	Mazovia Cluster ICT, POLESCS, Silicon Saxony, ICT cluster	Mazovia Cluster ICT, GAIA, POLESCS, Silicon Saxony, ICT cluster, Business Hive	POLESCS, ICT cluster	GAIA, POLESCS, ICT cluster
	Software	Mazovia Cluster ICT, GAIA, POLESCS, Silicon Saxony, ICT cluster, Business Hive Vilnius	Mazovia Cluster ICT, GAIA, POLESCS, Silicon Saxony, ICT cluster	GAIA, POLESCS, Silicon Saxony, ICT cluster, Business Hive	GAIA, POLESCS, ICT cluster, Business Hive Vilnius
Equipment	Hardware	Mazovia Cluster ICT, GAIA, POLESCS, Silicon Saxony	Mazovia Cluster ICT, POLESCS, ICT cluster	Mazovia Cluster ICT, GAIA, POLESCS, Silicon Saxony	Mazovia Cluster ICT, GAIA, POLESCS, Silicon Saxony

	Software	Mazovia Cluster ICT GAIA POLESCS SILICON SAXONY BUSINESS HIVE	Mazovia Cluster ICT GAIA POLESCS ICT cluster BUSINESS HIVE	Mazovia Cluster ICT GAIA POLESCS SILICON SAXONY BUSINESS HIVE	Mazovia Cluster ICT GAIA POLESCS SILICON SAXONY
Materials	Hardware	Mazovia Cluster ICT GAIA SILICON SAXONY			GAIA
	Software	Mazovia Cluster ICT GAIA SILICON SAXONY BUSINESS HIVE VILNIUS	Mazovia Cluster ICT BUSINESS HIVE	Mazovia Cluster ICT GAIA BUSINESS HIVE	BUSINESS HIVE VILNIUS
Packaging/Assembling	Hardware	SILICON SAXONY Mazovia Cluster ICT POLESCS	BUSINESS HIVE POLESCS	Mazovia Cluster ICT POLESCS	
	Software	Mazovia Cluster ICT SILICON SAXONY		Mazovia Cluster ICT	
Software Development	Hardware	GAIA POLESCS ICT cluster BUSINESS HIVE VILNIUS	Mazovia Cluster ICT POLESCS SILICON SAXONY ICT cluster BUSINESS HIVE	Mazovia Cluster ICT GAIA POLESCS SILICON SAXONY BUSINESS HIVE	ICT cluster BUSINESS HIVE VILNIUS
	Software	POLESCS SILICON SAXONY BUSINESS HIVE ICT cluster	Mazovia Cluster ICT GAIA POLESCS SILICON SAXONY ICT cluster BUSINESS HIVE	Mazovia Cluster ICT GAIA POLESCS SILICON SAXONY BUSINESS HIVE	Mazovia Cluster ICT GAIA SILICON SAXONY ICT cluster BUSINESS HIVE VILNIUS

Systems Integration	Hardware				
	Software				
Test, Analysis	Hardware				
	Software				
Application, implementation, User	Hardware				
	Software				

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