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INNOVATION ECOSYSTEMS FOR I4.0 TRANSITION

40READY FINAL HIGH LEVEL POLITICAL EVENT

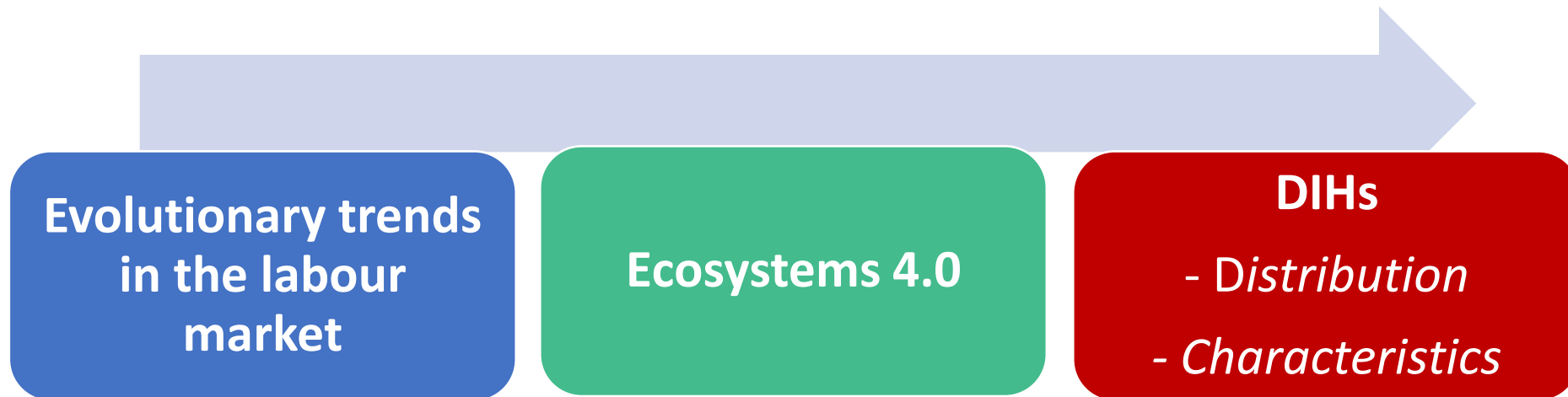
09 MAY 2023 - VENUE: NANA BIANCA, PIAZZA DI CESTELLO 10, 50124 FLORENCE, ITALY



European Union | European Regional Development Fund



This **focus on DIHs** is part of a broader research of a qualitative-quantitative nature aimed at analysing local labour markets and production systems to better understand the transformations taking place, brought about by the phenomenon now identified under the label '**Industry 4.0**'. The survey was carried out in stages in three temporal and methodological steps.



In this presentation, we focus exclusively on the phenomenon of **Digital Innovation Hubs**, attempting to take a snapshot of their territorial spread across Europe and some of their characteristics in terms of services offered, sectors in which they operate, technologies on which they are based and technological maturity achieved.

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THE NEW KNOWLEDGE-BASED TERRITORIAL COMPETITIVENESS



The debate on the impacts of the fourth industrial revolution pits **optimists** and **pessimists** against each other. Opinions are varied and often divergent. However, all agree on the importance of **cognitive capital**, which is recognised as strategic for the new competitiveness of companies and territories.

In this new scenario, **education and training** take on new importance as the challenge between territories is to be able to train **adequate skills** for the new **4.0 requirements**.

The challenge will also be based on the capacity of territories to **produce cognitive capital**, for which contextual policies will be needed to facilitate the **creation of fertile environments** for the reception of **new business models**.



If territories become valuable not only for their capacity to produce but also for their ability to **generate knowledge**, the '**Ecosystems 4.0**' take on fundamental importance as a possible evolution of local production systems that will make the innovations of the fourth industrial revolution possible.

One of the possible '**Ecosystem 4.0**' models has been identified in the **DIHs**. Promoted by various initiatives at European and individual state level, they are **support structures** aimed at helping companies to increase their competitiveness. The services provided enable all companies to access the **latest, cutting-edge knowledge, skills and technologies**, to test and experiment with digital innovation in their products, processes and business models. DIHs also act as a point of **contact with investors**, facilitate access to financing for digital transformation, help connect users and providers of digital innovation along the value chain and stimulate **synergies between digital technologies and other important enabling technologies**.

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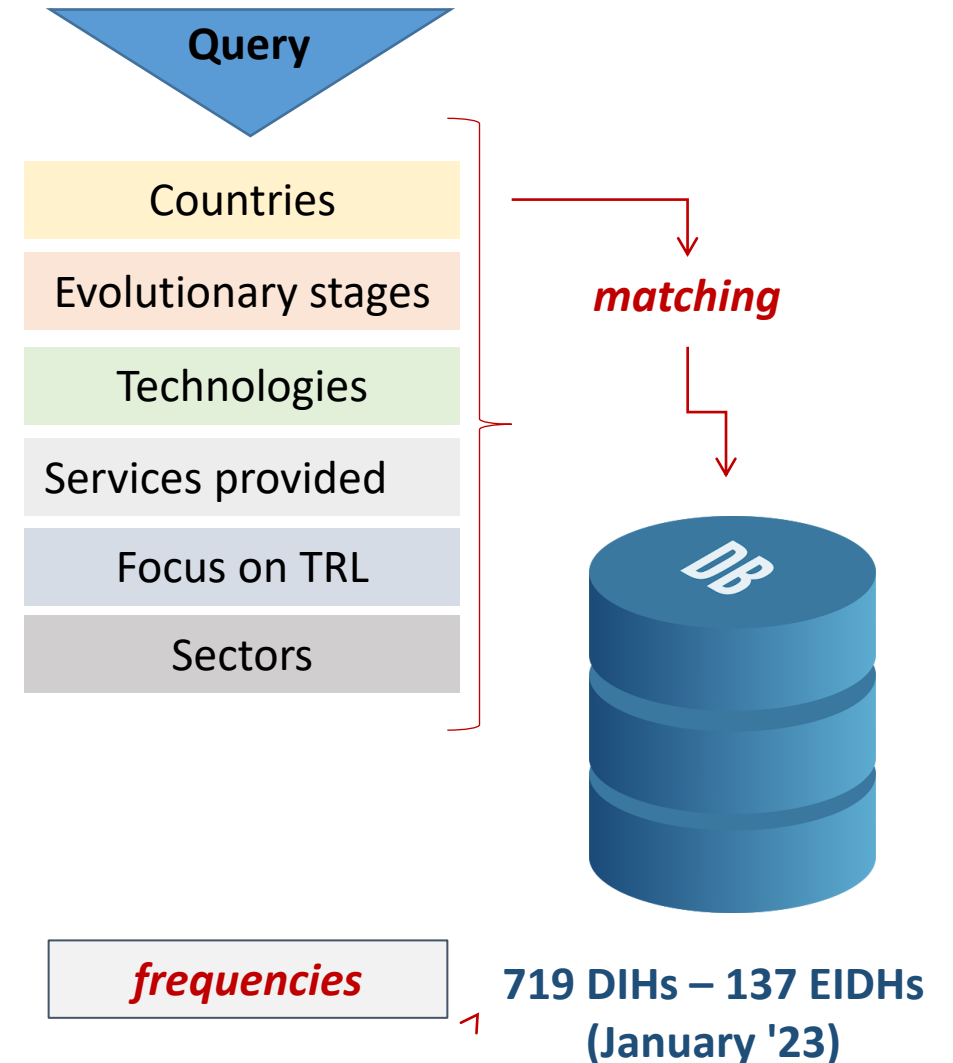
The quantitative analysis on DIHs was carried out on the catalogue:

<https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool>

The purpose of the catalogue is to support the networking of digital innovation hubs and it functions like **yellow pages**.

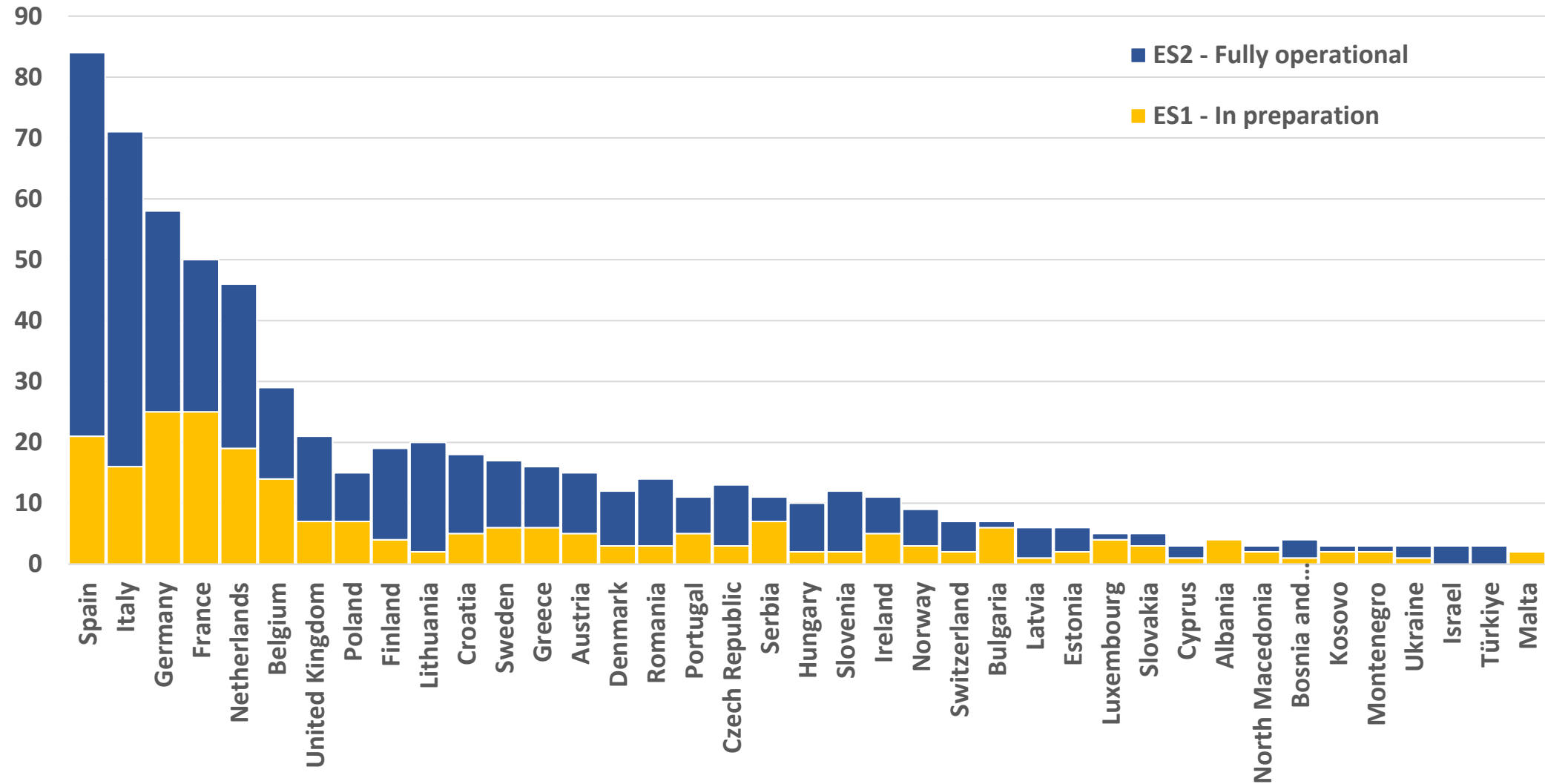
Within the catalogue, information is provided on a voluntary basis and hubs are admitted if they fulfil **4 criteria**:

1. they are a **non-profit organisation**;
2. they participate in a regional, national or European business digitisation **policy initiative**;
3. they are **based in a European region** and present on an up-to-date website the **activities and services** provided in relation to digital transformation;
4. they present at least **3 examples** of how they have helped a company in its digital transformation.



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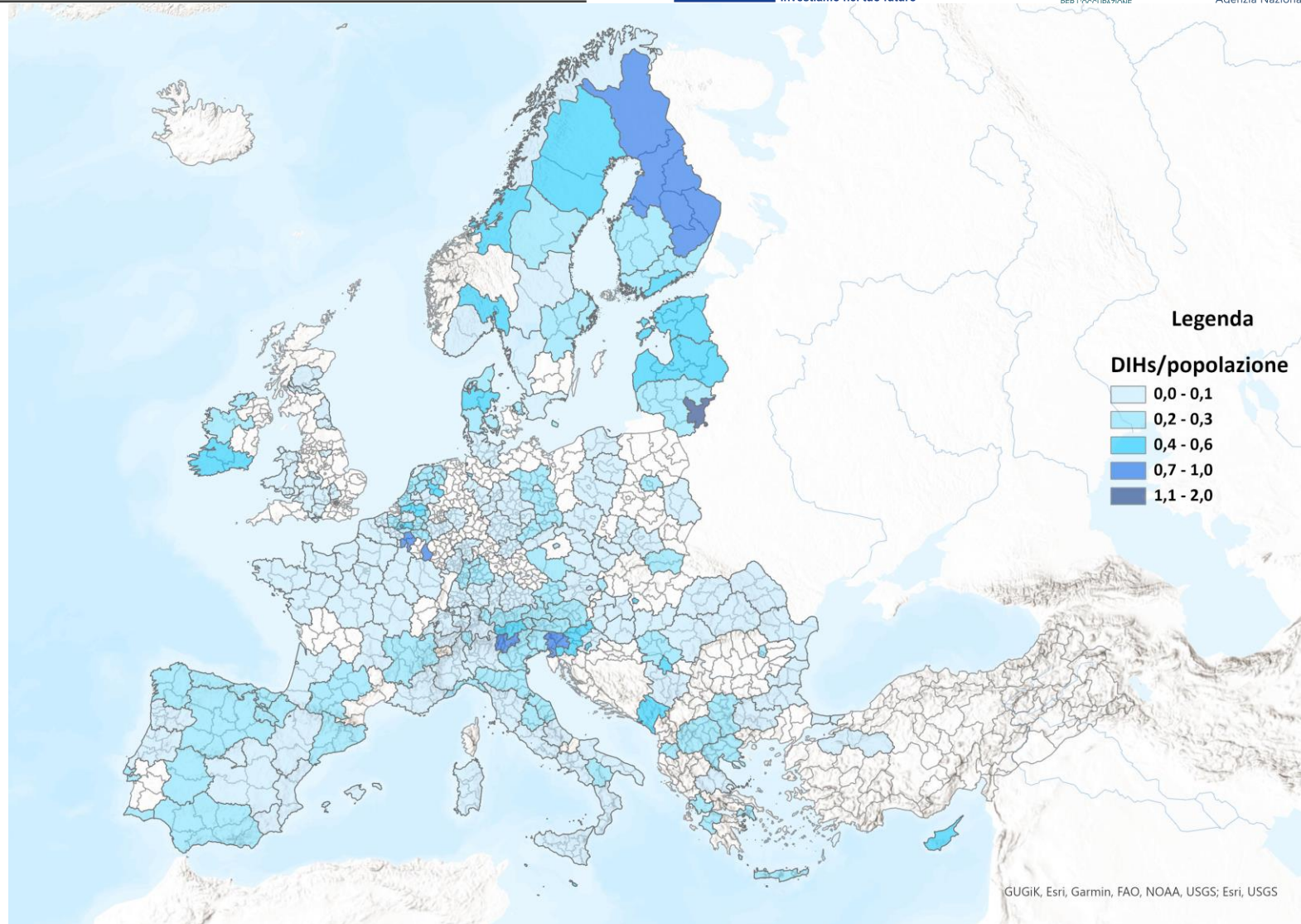
DISTRIBUTION OF DIHs BY COUNTRY AND EVOLUTIONARY STAGE



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DISTRIBUTION PER NUTS2 OF DIHS/POPULATION RATIO



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CORRELATION OF DIHS WITH EUROPEAN DEVELOPMENT INDICATORS



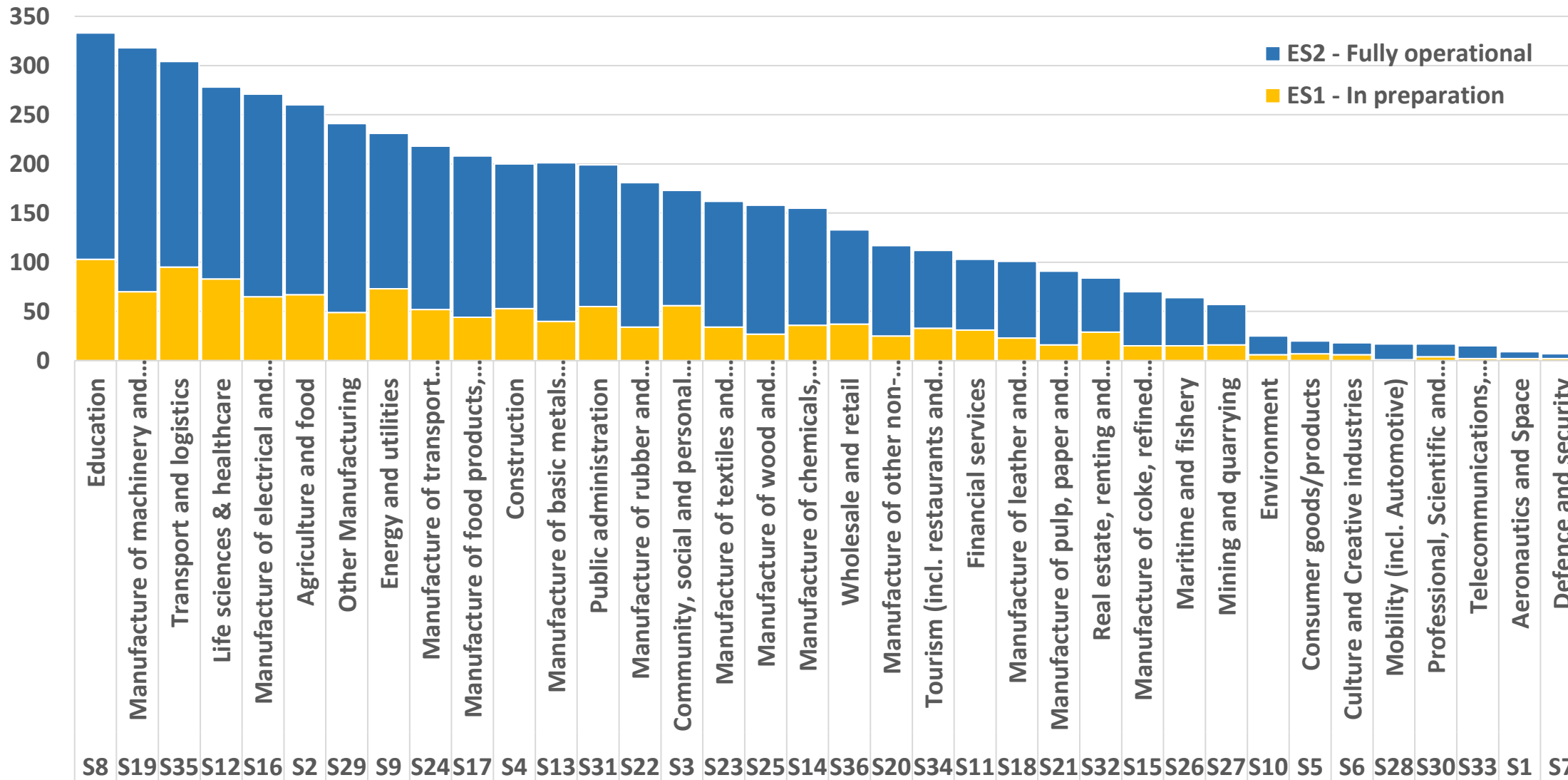
Source	Indicators used to calculate the correlation index of the number of DIH per NUTS1	Correlation indices*	Degree of correlation
European and Regional Innovation Scoreboards 2022	Summary Innovation Index	0,30	Weak
	1.1.2 Population with tertiary education (Regional)	0,00	Weak
	1.1.3 Population involved in lifelong learning (Regional)	0,13	Weak
	1.2.1 International scientific co-publications (Regional)	0,04	Weak
	1.2.2 Scientific publications among the top 10% most cited (Regional)	0,33	Weak
	1.3.2 Individuals with above basic overall digital skills (Regional)	0,28	Weak
	2.1.1 R&D expenditure in the public sector (Regional)	0,32	Moderate
	2.2.1 R&D expenditure in the business sector (Regional)	0,27	Weak
	2.2.2 Non-R&D innovation expenditures (Regional)	0,14	Weak
	3.1.1 SMEs introducing product innovations (Regional)	-0,01	Weak
	3.1.2 SMEs introducing business process innovations (Regional)	0,12	Weak
	3.2.1 Innovative SMEs collaborating with others (Regional)	0,05	Weak
	3.2.2 Public-private co-publications (Regional)	0,07	Weak
	3.3.1 PCT patent applications (Regional)	0,28	Weak
	3.3.2 Trademark applications (Regional)	0,12	Weak
	3.3.3 Design applications (Regional)	0,30	Weak
	4.1.1 Employment in knowledge-intensive activities (Regional)	0,02	Weak
	4.1.2 Employment in innovative enterprises (Regional)	0,12	Weak
	4.2.3 Sales of new-to-market and new-to-firm innovations (Regional)	0,32	Moderate
	4.3.2 Air emissions by fine particulates (Regional)	0,24	Weak
Eurostat	Population	0,60	Moderate
	Students enrolled in tertiary education	0,34	Moderate
	Ratio of the proportion of tertiary students over the proportion of the population	0,00	Weak
	R&D personnel and researchers	0,72	Strong
	Employment in technology and knowledge-intensive sectors	0,69	Moderate
	Gross domestic product (GDP) at current market prices per capita	0,06	Weak
	Business demography by size class - Total size	0,71	Strong
	Business demography by size class - Size 1-9	0,69	Moderate
Business demography and high growth enterprise	0,92	Strong	

* What degree of correlation is assumed:
 if $0 < |\rho_{XY}| < 0,3$ = "weak";
 if $0,3 < |\rho_{XY}| < 0,7$ = "moderate";
 if $|\rho_{XY}| > 0,7$ = "strong".

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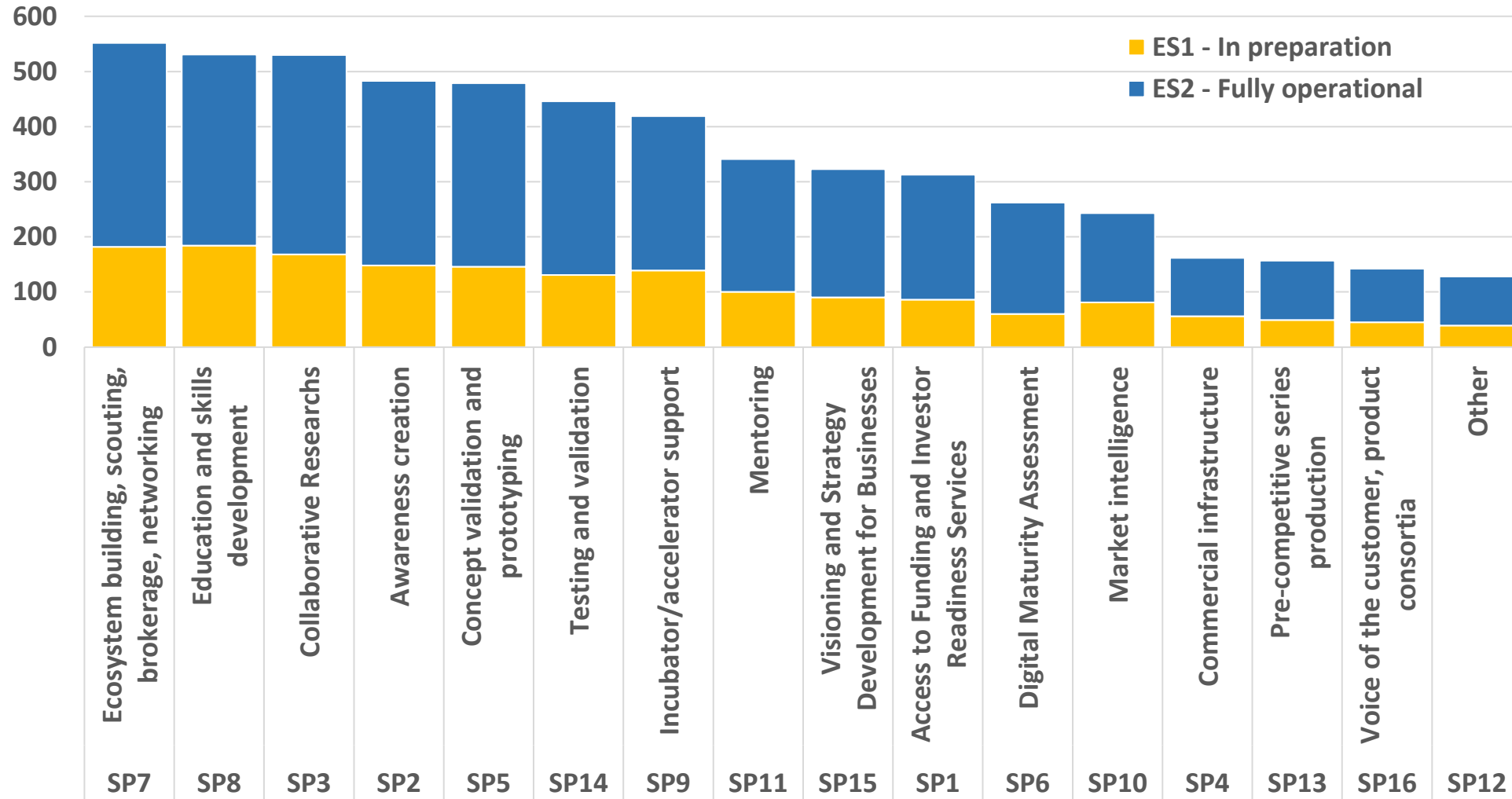
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BREAKDOWN OF DIHS BY SECTOR OF ACTIVITY



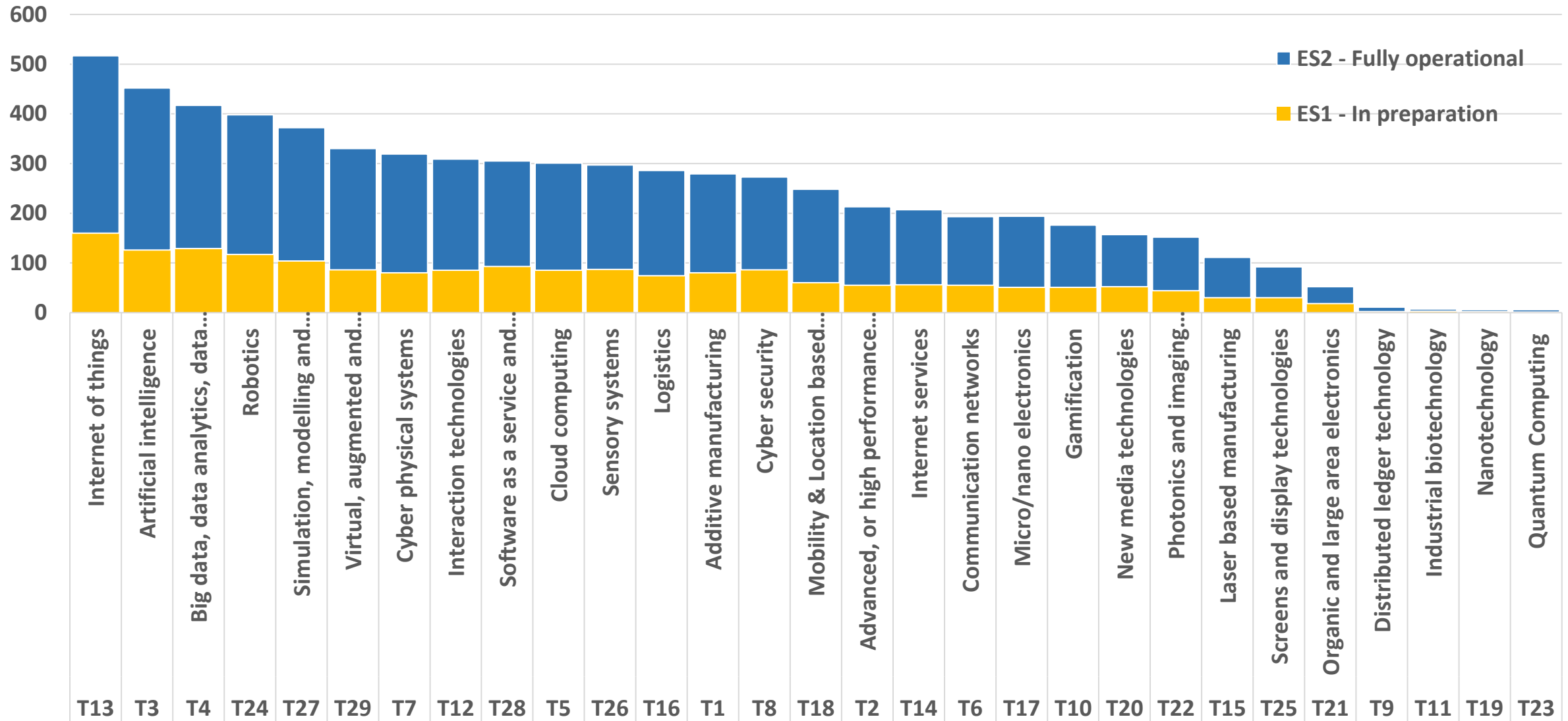
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BREAKDOWN OF DIHS BY SERVICES PROVIDED



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BREAKDOWN OF DIHS BY TECHNOLOGY



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TRL(TECHNOLOGY READINESS LEVELS) BY TECHNOLOGY TYPE



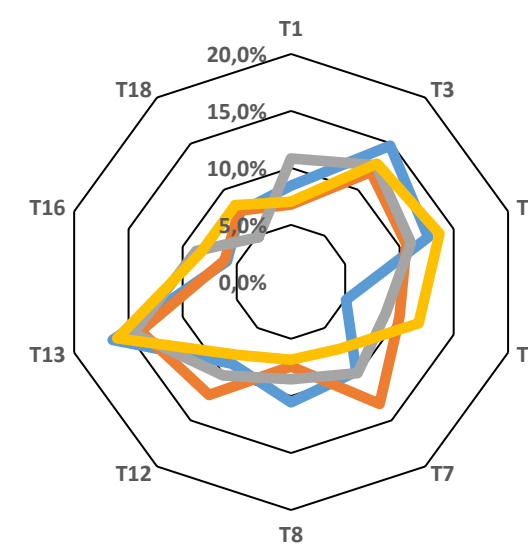
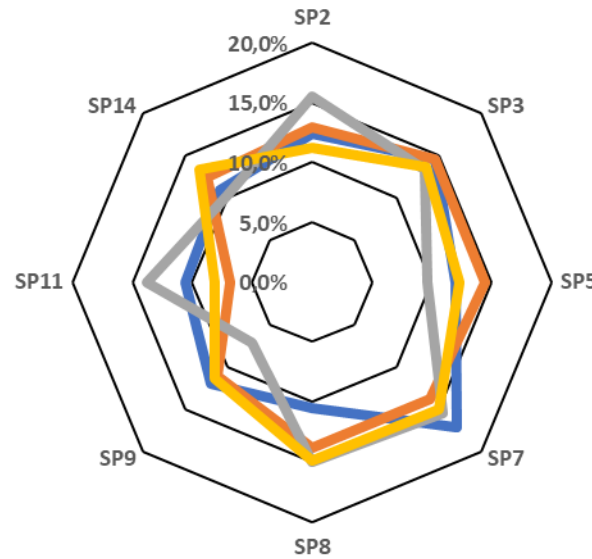
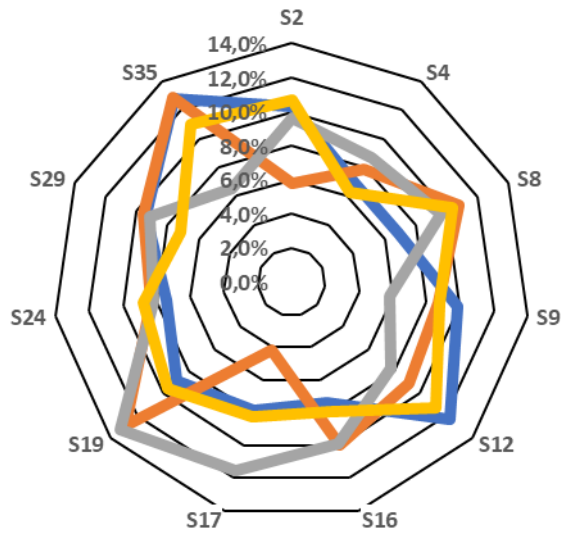
Technologies Technology Readiness Level (TRL)		TRL1	TRL2	TRL3	TRL4	TRL5	TRL6	TRL7	TRL8	TRL9
		TRL1 - Basic principles observed and reported	TRL2 - Technology concept and/or application formulated	TRL3 - Analytical and experimental critical function and/or characteristic proof of concept	TRL4 - Component and/or breadboard validation in laboratory environment	TRL5 - Component and/or breadboard validation in relevant environment	TRL6 - System/subsystem model or prototype demonstration in a relevant environment	TRL7 - System prototype demonstration in an operational environment	TRL8 - Actual system completed and qualified through test and demonstration	TRL9 - Actual system proven through successful mission operations
T1	Additive manufacturing	6,6%	8,8%	11,0%	12,5%	13,7%	14,4%	13,9%	11,1%	8,1%
T2	Advanced, or high performance computing	7,4%	9,3%	11,3%	12,6%	13,5%	14,2%	13,2%	10,1%	8,3%
T3	Artificial intelligence	7,3%	9,1%	10,9%	12,4%	13,5%	14,2%	13,5%	10,7%	8,4%
T4	Big data, data analytics, data handling	7,2%	9,1%	11,1%	12,0%	13,3%	14,3%	13,6%	11,0%	8,4%
T5	Cloud computing	8,0%	9,3%	10,6%	11,6%	13,0%	14,1%	13,6%	10,9%	8,9%
T6	Communication networks	7,6%	9,2%	10,7%	11,7%	13,1%	14,1%	14,0%	10,9%	8,8%
T7	Cyber physical systems	7,0%	8,6%	10,7%	12,4%	13,7%	14,9%	13,9%	10,9%	8,0%
T8	Cyber security	7,7%	9,5%	10,6%	11,5%	12,9%	14,0%	13,7%	11,3%	8,8%
T9	Distributed ledger technology	4,7%	7,8%	10,9%	10,9%	12,5%	15,6%	17,2%	12,5%	7,8%
T10	Gamification	7,9%	9,5%	11,1%	11,6%	12,6%	13,8%	13,0%	11,0%	9,4%
T11	Industrial biotechnology	6,1%	6,1%	12,1%	12,1%	12,1%	18,2%	18,2%	12,1%	3,0%
T12	Interaction technologies	7,1%	9,3%	10,9%	12,5%	13,3%	14,4%	13,4%	10,8%	8,4%
T13	Internet of things	7,4%	9,2%	10,8%	12,0%	13,3%	14,3%	13,8%	10,9%	8,3%
T14	Internet services	8,4%	10,3%	11,0%	11,3%	12,5%	14,0%	12,9%	10,8%	8,8%
T15	Laser based manufacturing	6,1%	7,9%	10,9%	12,7%	13,5%	14,7%	13,9%	11,5%	8,5%
T16	Logistics	8,6%	9,8%	10,5%	11,3%	12,4%	14,0%	13,4%	10,9%	9,1%
T17	Micro/nano electronics	7,4%	9,3%	11,0%	12,5%	13,4%	14,4%	13,2%	10,8%	7,9%
T18	Mobility & Location based technologies	7,3%	9,0%	10,8%	11,9%	13,2%	14,2%	14,0%	11,2%	8,4%
T19	Nanotechnology	8,6%	11,4%	14,3%	14,3%	11,4%	14,3%	14,3%	8,6%	2,9%
T20	New media technologies	9,2%	10,8%	11,3%	11,3%	12,1%	13,3%	13,3%	10,1%	8,7%
T21	Organic and large area electronics	7,4%	9,8%	11,3%	12,5%	13,7%	14,0%	13,1%	10,4%	7,7%
T22	Photonics and imaging technologies	6,5%	8,5%	11,0%	13,4%	13,8%	14,4%	13,7%	10,5%	8,1%
T23	Quantum Computing	6,7%	6,7%	10,0%	10,0%	13,3%	13,3%	16,7%	13,3%	10,0%
T24	Robotics	7,5%	9,3%	10,9%	12,1%	13,2%	14,4%	13,9%	10,8%	8,0%
T25	Screens and display technologies	7,7%	9,6%	10,5%	11,6%	12,9%	13,7%	13,5%	11,6%	8,9%
T26	Sensory systems	7,0%	9,0%	11,0%	12,4%	13,7%	14,9%	13,7%	10,6%	7,6%
T27	Simulation, modelling and digital twins	7,0%	9,1%	11,0%	12,6%	13,6%	14,6%	14,0%	10,5%	7,7%
T28	Software as a service and service architectures	7,8%	9,4%	10,8%	11,5%	13,0%	13,9%	13,4%	11,4%	8,8%
T29	Virtual, augmented and extended reality	7,5%	9,4%	10,6%	11,9%	12,9%	14,0%	13,5%	11,1%	8,9%
average calculated for 29 technologies		7,33%	9,12%	11,02%	12,04%	13,08%	14,36%	13,98%	10,97%	8,10%

TRL1	TRL1 - Basic principles observed and reported	7,33%
TRL2	TRL2 - Technology concept and/or application formulated	9,12%
TRL3	TRL3 - Analytical and experimental critical function and/or characteristic proof of concept	11,02%
TRL4	TRL4 - Component and/or breadboard validation in laboratory environment	12,04%
TRL5	TRL5 - Component and/or breadboard validation in relevant environment	13,08%
TRL6	TRL6 - System/subsystem model or prototype demonstration in a relevant environment	14,36%
TRL7	TRL7 - System prototype demonstration in an operational environment	13,98%
TRL8	TRL8 - Actual system completed and qualified through test and demonstration	10,97%
TRL9	TRL9 - Actual system proven through successful mission operations	8,10%

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STRATEGIC POSITIONING OF DIHs



Sector2	Agriculture and food
Sector4	Construction
Sector8	Education
Sector9	Energy and utilities
Sector12	Life sciences & healthcare
Sector16	Manufacture of electrical and optical equipment
Sector17	Manufacture of food products, beverages and tobacco
Sector19	Manufacture of machinery and equipment
Sector24	Manufacture of transport equipment
Sector29	Other Manufacturing
Sector35	Transport and logistics

SP2	Awareness creation
SP3	Collaborative Researchs
SP5	Concept validation and prototyping
SP7	Ecosystem building, scouting, brokerage, networking
SP8	Education and skills development
SP9	Incubator/accelerator support
SP11	Mentoring
SP14	Testing and validation

T1	Additive manufacturing
T3	Artificial intelligence
T4	Big data, data analytics, data handling
T5	Cloud computing
T7	Cyber physical systems
T8	Cyber security
T12	Interaction technologies
T13	Internet of things
T16	Logistics
T18	Mobility & Location based technologies

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NETWORK OF DIH

Main characteristics

- Single hubs set up at provincial level and only later connected to a network with a central coordination to create an effective and systematic regional project.
- Created within existing structures operating in various sectors and with different purposes

Strengths

- Enhancement of characteristics of a specific territorial area
- Greater effectiveness in satisfying needs of local businesses
- Strengthening of territorial links between local stakeholders
- Dissemination of network culture

Challenges

- Need of connection with subjects even outside the Region/local area to acquire new skills and funding

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BEST PRACTICES

IP4FVG

Industry Platform 4 FVG

HUB & SPOKE MODEL

- Central hub guarantees the coordinated access of enterprises to the services and competencies
- Nodes → territorial proximity departments for target users. Provide highly specialised services in the domains of 1. Advanced technology, 2. Data analytics & artificial intelligence 3. Data optimization & simulation. 4 internet of things
- Is one of the 45 digital innovation hubs nominated by the Ministry of Economic Development to become a European Digital Innovation Hub.

Dih Confindustria

- Dih Lombardia: Network of 8 territorial hubs (one for each province or group of provinces)
- Dih Veneto: Confindustria Veneto and Local Associations signed a Pact on Industry 4.0 to develop common actions among provincial hubs

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1. Research&Development, innovation, new technologies

Main characteristics

- Most of them promoted by Universities / Science and Technology Parks, Research Centres
- Collaboration with other Universities also at international level

Strengths

- Link between business/university and research
- Research based on specific business needs

Challenges

- Strengthen the involvement of SMEs
- Focus not only on technologies, but also on other key factors (skills / development of new business organization models)

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BEST PRACTICE

Medisdih: Digital Innovation Hub And Mechatronic Tecnological District of Puglia Region

Evolution of the Mechatronic Technological Cluster – MEDIS (Politecnico di Bari, University of Bari, public and private research centers, large industrial groups, companies and local SMEs operating in highly technological industrial sectors. The Cluster integrated the DIH activities in its pre-existing ones

Integration of industrial research activities and training

- The industrial research projects carried out have always integrated a training project aimed at employment, professional qualification and skills development

Employment is the main objective

- Training for unemployed people aimed at creating high-profile technicians and increase employment

Coordination role

- Training is carried out by the University of Bari and research centers partners of DIH (CNR, Fiat research center, ecc)

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2. Training/skills development

Main characteristics

- Focus on 4.0 skills
- Support companies in identifying and training professional needs

Strengths

- Strengthening the link between business/education
- Training programs based on the companies needs

Challenges

- Stronger links between education, training and working systems

BEST PRACTICE

DIH Belluno (Veneto)

Institutional board: the Province of Belluno, Consortium of Municipalities BIM Piave, Confindustria Belluno Dolomiti, Municipality of Feltre, University of Trento, Institute of Higher Education Negrelli Forcellini and Polo di Feltre

Technological board: a group of entrepreneurs and managers → operational team firmly rooted in the Belluno area and highly specialized

Located at the Negrelli Forcellini Technological Institute of Feltre (ITS)

- ✓ Integration of education/training and business
- ✓ Experimental training courses on 4.0 new technologies in collaboration with Trento University
- ✓ The technological board works with ITS for a better definition of school programs

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FINAL REMARKS



Since 2016, the Digital Innovation Hubs have been promoting the **ecosystem** needed to support companies in the 4.0 transition.

Governance models are varied and predominantly arise from **public-private partnerships** and could further benefit from greater participation of regional or local authorities, which would create an even closer link with the development and innovation promotion policies of an area.

The geographic scope of DIHs is mainly **regional and national** (in Italy they account for 71%), although there is a trend to widen the scope to the **European level** as witnessed by the first EDIHs. Networking of DIHs reduces duplication of services, promotes pooling of resources and knowledge with economies of scale.

DIHs are mainly based on **public funding**, leveraging fund raising from various European (structural funds), national and regional sources, some are projected to increase the percentage of funding from the private sector, but at this early stage need to tap into start-up funding.

These ecosystems are **variable in geometry** and have the capacity to adapt to different spatial scales, to integrate with existing initiatives and to fill any gaps in service provision, and thus present themselves with changing aspects in time and space.

The territorial spread of DIHs seems to follow the greater presence in the territory of **companies** (especially small ones with higher growth performance), **researchers** and **highly qualified employment**. The connection, however, to the overall growth of innovation in the territories still seems to be weak, most likely due to the development path of technologies that in most cases have not yet reached the markets.

Services are predominantly aimed at **businesses**, while public administrations are less considered among the recipients despite the emphasis placed on this target group by the EU.

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REFERENCES



- Commissione Europea (2016) *Comunicazione della Commissione - Digitalizzazione dell'industria europea Cogliere appieno i vantaggi di un mercato unico digitale* - Bruxelles, 19.4.2016 COM(2016) 180 final
- Commissione Europea (2017) *Roundtable on digitising European Industry WG 1 – Report June 2017*
- Commissione Europea (2019a) *Report of the high-level expert group on the impact of the digital transformation on EU labour markets*
- Commissione Europea (2019b) *European Digital Innovation Hubs in Digital Europe Programme - Draft working document, 12/11/2019*
- Commissione Europea (2019c) *Exploring heterogeneous Digital Innovation Hubs in their context. A comparative case study of six (6) DIHs with links to S3, innovation systems and digitalisation on a regional scale*
- COMMISSIONE EUROPEA (2021) *European Digital Innovation Hubs in Digital Europe Programme Draft working document 25-01-2021*
- Confindustria (2018) *Digital Innovation Hub La Rete Di Confindustria – Report Giugno 2018*
- Confindustria (2019) *La rete dei Digital Innovation Hub – Report Luglio 2019*
- FUGGETTA A., DE MICHELIS G. (2020), *Le forme di supporto all'innovazione tecnologica e organizzativa delle imprese italiane: ecosistema dell'innovazione e intervento pubblico, in Studi organizzativi: XXII, special issue, 2020. Milano. Franco Angeli, 2020*
- GUSTIN G. A., KARANIKOLOVA K., UGUEN O. (2020), *D5.1 Segmentation of DIHs services and business models per thematic/ topic/activities, DIHNET.EU – Europe 's Network of Digital Innovation Hubs*
- HETZKOWITZ H., LEYDESDORFF L. (1995), *The Triple Helix of University-Industry-Government relations: a laboratory for knowledge based economic development, in "EASST Review", 14 (1995), 11-19*
- V. Iadevaia, M. Resce (2019) *Ecosistemi 4.0, Digital innovation hub, Competence center, "Professionalità Studi" n. 3/II gennaio-febbraio 2019, ISSN 0392-2790, Bergamo 2019.*
- V. Iadevaia, M. Resce C. Tagliaferro (2018), *Tendenze evolutive del mercato del lavoro ed ecosistemi 4.0, "Professionalità Studi" n. 5 maggio-giugno 2018, ISSN 0392-2790, Bergamo 2018.*
- ISFOL, RICHINI P. (a cura di), *Modelli di governance territoriale per sviluppare innovazione e conoscenza nelle PMI: i risultati di un'indagine qualitativa in tre regioni italiane, Roma, Isfol, 2015. Isfol*
- V. Iadevaia, M. Resce (2022) *Territori ed ecosistemi di innovazione per la transizione 4.0. Una comparazione internazionale sulla diffusione e il posizionamento dei Digital Innovation Hub, Sinapsi, XI, n.3/2021.*
- KALPAKA A., SÖRVIK J. AND TASIGIORGOU A. (2020), *Digital Innovation Hubs as policy instruments to boost digitalization of SMEs, Kalpaka, A., Rissola, G. (Eds.), EUR 30337 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-21405-2, doi:10.2760/085193, JRC121604*
- MIÖRNER J., KALPAKA A., SÖRVIK J. AND WERNBERG J., (2019) *Exploring heterogeneous Digital Innovation Hubs in their context. A comparative case study of six (6) DIHs with links to S3, innovation systems and digitalisation on a regional scale, Rissola, G and Kalpaka, A. (Eds.), EUR 29851 EN, Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-76-11108-5, doi:10.2760/627437, JRC117976.*
- Resce, Massimo. 2018. *"Produttività del lavoro in Italia e misure di sostegno nella contrattazione aziendale."* *Economia & Lavoro* 3: 153–178.
- Rete DIH, CC (2019) *"Ampliamento scope dei CC e dei DIH: Nuovi servizi e iniziative per supportare le aziende nazionali ad affrontare la ripresa dall'emergenza COVID-19 nella "fase 2" e nella fase di "nuova normalità"*

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THANK YOU FOR YOUR ATTENTION

