



Analysis of National Initiatives for Digitising Industry.

Spain: Industria Conectada 4.0



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Disclaimer: The views expressed in this document are those expressed by the experts conducting the analysis of the National Initiatives on digitising industry and do not necessarily represent the view of the European Commission and the National Initiative on the subject.

Table of Contents

Executive Summary 3

- 1. Introduction 7
- 2. National Strategy towards “Digitizing European Industries” 12
- 3. Digitising European Industry (DEI) Pilar 1 - Digital Industrial Platforms & Research, Development and Innovation actions. 14
- 4. Digitising European Industry (DEI) Pilar 2 - Standardization actions, regulation and testbeds 22
- 5. Digitising European Industry (DEI) Pillar 3 - Digital Innovation Hubs actions 23
- 6. Digitising European Industry (DEI) Pilar 4 - Skills development. 26
- 7. Specific National Measures. 28
- 8. Investments for Digitising European Industry..... 30

Executive Summary

General Background: The Spanish economy is the 5th EU economy and the 13th worldwide one. The motors of the Spanish economy, in many cases with global leaders in business and innovation are food and beverages, metal Manufacturing, motor vehicle manufacturing and component manufacturing. The industrial Spanish fabric is characterized by a strong SME presence. The GAV SME contribution is above the EU27 average and as a consequence plays an important role in the development of the Spanish economy. The Industria Conectada 4.0 (Connected Industry 4.0 - CI4.0) initiative aims at (1) increasing the industrial added value and quality employment. (2) Developing a unique and competitive model for the industry of the future and promote a strong local offering of digital solutions for the manufacturing sector (3) promoting and enhancing differential competitive levers that favour industry and boost exports. Concerning digitization, Spain ranks 14th in DESI 2017. Spain's performance in the use of digital technologies by enterprises and in the delivery of online public services is above EU average. In Connectivity, progress is particularly strong in terms of subscriptions to fast broadband and NGA coverage is also high. Spanish companies are making progress in integrating digital technologies in their business processes and a fifth of SMEs are actively selling online. They show a good adoption rate of cloud computing (13%, rank 15), with a good number (19%, rank 9) selling online. 25% of Spanish companies are using electronic invoicing (rank 6), and but only 5,9% are selling online cross-border (rank 20).

The report "Spanish Industry Digital Transformation" provides a complete perspective of the background motivating a comprehensive set of strategic measures and action lines to deal with effective digital transformation of Spanish industry. The Spanish strategy is strongly building on the renovation of the manufacturing machinery and development of new digital processes. The strategy is already clearly planning the development of DIH and Platform strategies to make sure that a coordinated action at national level ensures that every Spanish SMEs hold the necessary instruments to establish a digital transformation plan and the access to finance and support from the business innovation stakeholders and competence centres to realise their digital transformation actions. The CI4.0 is supported by additional and complementary set of actions from various Ministries to strengthen the digital skill dimension and to further support the development of new R&I industrial projects.

National Strategies towards "Digitizing European Industries": The CI4.0 initiative is part of the overall Spanish Digital Agenda and the Agenda for Strengthening the Industrial Sector in Spain. The CI4.0 was launched in 2015 by the General Secretary of Industry and SME, within the Ministry of Economy, Industry and Competitiveness. The initiative has defined a governance model that contemplates the creation of several bodies coordinated by a Secretariat. The main executive bodies comprise the Governing Board Connected Industry 4.0 and the Executive Board Connected Industry 4.0, which is chaired by the Ministry of Economy, Industry and Competitiveness and sits the General Secretaries of the Ministries involved in the initiative. The executive Board is co-chaired by the General Secretary of the Ministry of Telecommunication and Information Society and the General Secretary of Industry and SME. The executive Board also sits representative from industry, academia, social agents, scientific community and industrial associations with a role in the development of Industry 4.0 in Spain. These two Boards are supported by an Advisory Board and a set of Working Groups dealing with Platform, DIH, R&I and Standardisation & Regulation activities among others. The Working Groups bring together all stakeholders involved in the development of the various

strategic action lines (8 in total) planned for the development of the CI4.0 action plan. The Secretary of the national initiative is provided by the General Secretary of Industry and SME. Connected Industry 4.0 (CI4.0) strategy aims at introducing digital technology in industry to improve the competitiveness of Spanish industry in an increasingly global market with the development of an Industry 4.0 model where innovation is collaborative, the production means are connected, the supply chains are integrated and with digital distribution channels and customer service.

Digitising European Industry (DEI) - Pillar 1 – Digital Industrial Platforms and R&I actions

Digital industrial Platform actions: One of the main goals of the national initiative is to increase the awareness about Industry 4.0 and in particular with the development of a marketplace where suppliers of potential solutions for Industry 4.0 and customers of such services and products can get connected. The Digital platform vision is one that connects the initiatives and mirror actions planned and intended for such purposes at regional level. The role of digital platforms is also the development of a collaborative environment for best-practice and success story sharing. Around the initiative CI4.0, AMETIC (the Spanish Association on Information and communication technologies and electronics) has set up the National Committee on Industry 4.0 with over 83 companies working on various committees dealing in the development of common white papers and collaborative projects in the areas of (1) technology enablers (2) Co- Creation Industrial Fabric (3) Talent 4.0 (5) Benchmarking and Dissemination.

As part of the Industria Conectada 4.0, it is worth mentioning that Spain holds one, if not the one, of the largest fiber optic deployments in Europe, which makes the access for Spanish Industry to broadband high-speed service very easy. The national plan considers the annual investment of 100M€ on the continuous development of the broadband national plan.

Research, Development and Innovation Actions: The R&I actions dealing with CI4.0 can be split in two major streams. On one hand, a yearly programme of 100M€ directly related CI 4.0 and then a complementary programme of 80M€ from the Strategic Action on Digital Economy and Society (AEESD), which deal with the development of industrial development projects in the areas of Components and systems, Internet of the future, Cloud Computing, Massive data processing, High Performance Computing, Robots and autonomous systems, Internet of Things, Additive Manufacturing. Additionally, the Centre for the Development of Industrial Technology (CDTI) manages an annual budget of 1.000 M€ in loans and grants for the development of industrial projects, where the subject of Industry 4.0 is one of the priorities supported by the Centre. CDTI programmes and funds allow for trans-national collaboration in the context of ERA-Net in the areas of materials and advanced manufacturing (ManuNET, CoBioTech, SUSFood, EuroNANOMED). The CDTI also supports European cooperation through the EUREKA and EUROSTARS programmes and international bilateral cooperation programmes with countries such as Argelia, Brazil, Canada, China, South Korea, Egypt India, Japan, Malaysia, Russia, South Africa, Thailand.

Digitising European Industry (DEI) - Pillar 2 - Standardization actions, regulation and testbeds

Standardization actions: The Working Group on Standardisation of the CI4.0 National initiative has been set up in July 2017. The Executive Committee of the Standardization Working Group has been

set up, which will be technically coordinated by the Spanish Standardization Association, UNE, and the Mondragon Corporation. It will also include industrial sector associations, companies and universities.

Digitising European Industry (DEI) - Pillar 3 - Digital Innovation Hubs actions.

Digital Innovation Hubs actions: The digital innovation hub strategic action line of the CI4.0 national initiative is framed in the context of the Clustering national strategy that has supported the development of up to 98 (Innovation Enterprise Association) with annual investments in the order of 11 M€. The national initiative, kicked off the DIH Working Group activities in May 2017 with an event hosted by the Ministry and with the participation of the Basque Industry 4.0 Digital Innovation Hub, Innovalia I4MS CPPS Innovation Hub at the Automotive Intelligence Centre, the European Commission, the Spanish Ministry and Tecnalia as partner in the development of the European Catalogue of DIH, recently published by the JRC in the Smart Specialisation Platform (S3, <http://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool>). The national initiative is currently working on the modification of the AEI legal framework to accommodate the development of the Spanish DIHs in the next call for proposals in 2018. The mission of the national DIH initiative will be to (1) to coordinate the services and functions of the Spanish HUBS (2) order their creation and development (3) promote collaborative actions inter-HUBS (4) develop a complete portfolio of services of national HUBS (5) Promote DIH among other public initiatives.

In this context, the national initiative CI4.0 has already made available HADA, the tool for Industry 4.0 maturity self-assessment and has put in place in September 2017 the ACTIVA 4.0 initiative to support Spanish Industry in the development of digital transformation plans. With an investment of 4M€ in the first year of application of the programme and topped up by equal funds from the regional governments involved and the private companies engaging in the programme, this initiative, managed by the EOI dependant from the Spanish Ministry of Economy, Industry and Competitiveness informed, for the promotion of digitisation and improvement of the competitiveness of industrial companies, will reach more than 370 industrial companies in 17 autonomous communities.

At the national level, various regions have announced the operation of various DIH with additional investments (public-private investments). In the areas of automotive, Innovalia has set up a privately funded DIH, in the context of the I4MS initiative, at the Automotive Intelligence Centre (AIC) in Boroa, Basque Country, which should complement and co-exist with the already ongoing public-private partnership of the Basque Automotive Industry, Basque Government and the Regional Government of Biscay. In a similar line of action, Rolls-Royce/ITP has lead in collaboration with the Basque Government, the regional government of Biscay and the Technology Park of Biscay the creation of advanced manufacturing center in aeronautics (CFAA) under the management of the UPV/EHU university and with the collaboration of 39 of the leading aeronautic companies and the top research centres in the region. It is also worth mentioning the advanced 3D printing hub created in Catalonia with an investment of 28M€ and the direct collaboration of research centres and top companies in the area, such as HP, RICOH and Renishaw.

Digitising European Industry (DEI) - Pillar 4. Skills development.

Skills development: The National Initiative considers skills as a central element of the national initiative. The CI4.0 is supported by the digital training programme managed by Red.es and also dependent of Ministry of Economy, Industry and Competitiveness. The digital skills programme is supported by a yearly budget of 45M€ in the first year of application of the Programme, with a lifelong training approach, which supports the complete educational and training lifecycles from early vocational training and youth employment up to continuous training and entrepreneurial dimensions of digital skills developments.

Specific national measures

Innovation promotion: Spain is not providing a dedicated or strong policy focus yet on tax incentives as part of the national strategy. However, there are already in place some dedicated resources in the form of soft loans (15M€ yearly) in the ENISA credit line for the development of new digital businesses in the context of the Spanish Digital Agenda. Also, before the national initiative was set up and put in place, Spain is operating a patent-box scheme and incentives for the R&I activities.

Fiche of Spain

1. Introduction

1.1. Overall economic situation of the country

Spanish economic landscape. Spain with a Gross Domestic Product (GDP) of \$1.232.088 M is the 5th European economy behind Germany, France, UK and Italy and the 13th worldwide with the US leading the ranking. In terms of Industrial Aggregated Value, the ranking of Spanish economy is very similar but in this case China leads the overall ranking closely followed by US.

Industry ecosystem structure. The Spanish industry presents some peculiarities that of high relevance to understand the main drivers of the Industry 4.0 strategy; i.e. Industria Conectada 4.0 (CI4.0). The industrial Spanish fabric is characterized by a strong SME presence and role. Although, the SME percentage and industry distribution by business size is similar to the rest of the EU, the Gross Added Value (GAV) contributed by large industry in Spain is smaller than the one generated by similar companies in the EU27 or Germany. Therefore, the GAV SME contribution is above the EU27 average and as a consequence plays an important role in the development of the Spanish economy.

Economic Motors. Four economic sectors concentrate 50% of the added value generated by Spanish economy and job occupation. These sectors are:

- Food and beverages.
- Metal Manufacturing.
- Motor vehicle manufacturing.
- Component Manufacturing.

In terms of added value, one should then consider the Chemical Sector and the textile sector in terms of job occupation. These sectors are also the ones that exhibit higher traction of associated value chains and related businesses.

Contribution to growth and jobs. With the EU vision of 20% contribution of manufacturing to GDP by 2020, Spanish industry (manufacturing alone) contributes to 13% of the GDP. However, this value raises to 17% if utilities are included in the calculation. Manufacturing accounts for 11% of the job population¹ and has created 43% of the new jobs in Spain. Manufacturing is the main contributor to the positive commercial balance of the country with an average 4,8% growth since the year 2000.

Exports over the GAV of Spanish economy are below the vast majority of EU countries regardless of their size. However, the presence of global companies in Spain is highly relevant in particular Original Equipment Manufacturers (OEMs). The challenge for the Spanish economy is not just the one of increasing the relative contribution of exports to the GAV but also to retain and attract international investments into Spanish territory. In terms of productivity, Spain is in the average of EU with 53K€ of GAV generated per manufacturing worker employed.

¹ Fuente: INE, Contabilidad Nacional de España

I.2. Overall strategy / situation concerning the digitization of manufacturing / production

Context. The next technology developments, the increased hyper-connectivity and the globalization of the economy along with the recovery from the financial crisis are bringing important opportunities as well as challenges to the manufacturing domain. Manufacturing industry is increasingly delivering integrated goods and services. They have migrated for the essential delivery of goods towards business models where services play a key role; e.g. maintenance. Around 40% of the EU jobs in the industrial domain are now related to services and the boundaries across services and goods are now blurring. Digital Services are therefore a key enabler for the growth of the manufacturing domain. In terms of digital technologies to enhance productivity, one important aspect is the obsolescence of the manufacturing equipment. Spanish industry is characterized by longer depreciation periods for manufacturing equipment, which could limit the early adoption of Industry 4.0 solutions

Timing. Launched in 2015 by the General Secretary of Industry and SME, within the Ministry of Economy, Industry and Competitiveness, the “Connected Industry 4.0 (CI 4.0)” (<http://www.industriaconectada40.gob.es/Paginas/index.aspx#inicio>) aims at digitising and enhancing competitiveness of Spain’s industrial sector. It is aligned and complementary to two national initiatives approved by the Council of Ministers in 2014:

- Digital Agenda (<http://www.agendadigital.gob.es/Paginas/index.aspx>)
- Agenda for Strengthening the Industrial Sector in Spain (<http://www.minetad.gob.es/industria/es-ES/Servicios/Paginas/agenda-sector-industrial.aspx>)

The Ministry of Economy, Industry and Competitiveness is going to present the new Industrial Strategic Framework, been digitization one of its 10 competitive levers.

Goals. Connected Industry 4.0 (CI4.0) strategy aims at introducing digital technology in industry to improve the competitiveness of Spanish industry in an increasingly global market with the development of an Industry 4.0 model where innovation is collaborative, the production means are connected, the supply chains are integrated and with digital distribution channels and customer service. All the above in the context of a servitised industry with a smart a customised intelligent product that sets the ground for new business models. The goals of the CI4.0 strategy are (1) ensuring widespread knowledge of Industry 4.0 technologies and suitable skill development of Industry 4.0 in Spain (2) encourage digitised collaborative environments and platforms, such as Digital Innovation Hub, Industrial Platforms or Clusters, (3) enhance the development of digital enablers; and (4) promote industry 4.0 solutions adapted to the industrial needs; including those of SMEs.

Digitization represents a key opportunity to attract international investments and generate quality jobs. CI4.0 strategy aims at leveraging a far-reaching transformation required to ensure that Spain doesn't lag behind in this new industrial revolution. The Industria Conectada 4.0 will boost digital transformation of Spanish industry by:

1. Increasing the industrial added value and quality employment.

2. Developing a unique and competitive model for the industry of the future and promote a strong local offering of digital solutions for the manufacturing sector
3. Promoting and enhancing differential competitive levers that favour industry and boost exports.

Strategic Action Lines. The strategy responds to four main challenges that Spanish industry will face in their digital transformation:

- Lack of knowledge about the I4.0 initiative.
- Definition of the technologies to use and how to use them.
- Availability of digital enablers.
- The lack of qualified, experienced resources to undertake the transformation, especially in smaller companies.



The initiative comprises **four main action lines** and **eight strategic areas of action** focused on strengthening both the demand range of digital enablers for Spain's Industry 4.0.

Action Line	Strategic Areas	Objectives
1. Awareness and education	1. Awareness creation and communication	• Guarantee knowledge of I 4.0, its enablers, and its benefits
	2. Academic and job training	• Ensure the availability of I 4.0 skills
2. Encourage multidisciplinary collaboration	3. Collaborative environments and platforms	• Foster collaboration by promoting environments and platforms that are adapted to industry and focused on 4.0 technology
3. Enhance digital enablers	4. Promote digital enablers	• Boost R&D&I in I 4.0 technologies
	5. Support technological businesses	• Boost the business development of technology providers
4. Support the digital transformation of the Industry and SME strategic areas	6. Support to industry's adoption of I 4.0	• Support and enhance the adoption of Industry 4.0 by the companies
	7. Regulatory framework and standardization	• Regulatory framework and standardization
	8. I 4.0 projects	• Financing Industry 4.0

Digital Industrial Transformation Enablers. The CI4.0 strategy envisions a manufacturing industry smart and connected where devices and manufacturing systems work together to bring about changes in processes, products, and business models. The CI4.0 vision is connected to the development of digital enablers that are both the source of the challenges that Industry 4.0 poses as well as the tools for addressing them.

- **Hybridization of the physical and digital worlds.** The enablers for the hybridization of the physical and digital worlds will connect the two worlds, either by capturing information from the physical world or transforming digital information into a physical element, as with sensor systems or 3D printers. There are also enablers, such as advanced robotics, to make this a bidirectional relationship.
- **Communication and data processing.** Connectivity through fixed or mobile communication infrastructures is a key element for digitizing industry. Connectivity and mobility, Computing and cloud, Cybersecurity.
- **Management applications.** These process the information from the other two categories and apply intelligence to exploit it. Supply chain solutions, Commercial solutions, Financial solutions, HR Solutions. Control, Big Data and Analytics, Collaborative platforms.

National Initiative Coordinates. The strategy will be followed up on an ongoing basis and the action plan will be continuously updated on the basis of the Working Groups that are currently (September 2017) being organized and set up.

Facts on the Spanish National Strategy 'Industria Conectada 4.0'	
Ministry in Charge	Ministerio de Economía, Industria y Competitividad ² [Website]
Contact Person	Mrs. Begoña Cristeto Blasco. Secretaria General de Industria y Pyme Mr. Mario Fernando Buisán García. Director General de Industria y de la Pequeña y Mediana Empresa Mr. Fernando Valdés Verelst. Subdirector General de Digitalización de Industria y Entornos Colaborativos, Phone Tel. (+34) 91 3492 248 f.valdes@mineco.es
Main Strategy Documents	Industria Conectada 4.0 ³
Related Strategy documents	Digital Agenda ⁴ Agenda for Strengthening the Industrial Sector in Spain ⁵ Plan digital 2020, CEOE ⁶ Informe España 4.0, SIEMENS ⁷

I.3. Digitization level of the country

Qualitative analysis. Spain ranks 14th in DESI 2017. Spain's performance in the use of digital technologies by enterprises and in the delivery of online public services is above EU average. In Connectivity, progress is particularly strong in terms of subscriptions to fast broadband and NGA coverage is also high. Compared to last year, Spain made progress on all dimensions, except for Human Capital. Spain belongs to the cluster of medium performing countries.

² <http://www.industriaconectada40.gob.es/Paginas/index.aspx#actuacion>

³ <http://www6.mityc.es/IndustriaConectada40/informe-industria-conectada40.pdf>

⁴ <http://www.agendadigital.gob.es/Paginas/index.aspx>

⁵ <http://www.minetad.gob.es/industria/es-ES/Servicios/Paginas/agenda-sector-industrial.aspx>

⁶ plandigital2020.ceoe.es/

⁷ https://w5.siemens.com/spain/web/es/estudioidigitalizacion/Documents/Estudio_Digitalizacion_Espana40_Siemens.pdf

Quantitative analysis. In DESI 2017, Spain has an overall score of 0.54 and ranks 14th out of the 28 EU Member States (0.52). Concerning connectivity, Spain has a medium rank in fixed broadband take up (15), while it scores low (20) in 4G coverage and rank 10 in mobile broadband take-up. During the past year, Spain has improved in fast broadband subscriptions (49%). Over three quarters of Spain (76%) are online and 53% of the population has basic digital skills. ICT professionals remain a decreasing share of employment (2,4%; rank 21), but the number of STEM graduates is significantly high enabling companies to recruit the ICT specialists they need (rank 6). Spain ranks medium in the use of internet by citizens (17). Spanish Internet users engage in a variety of online activities, but when transactions are involved, as in eBanking and eCommerce, they do so less than other European citizens with 54% and rank 18 in this category.

Spanish companies are making progress in integrating digital technologies in their business processes and a fifth of SMEs are actively selling online. They show a good adoption rate of cloud computing (13%, rank 15), with a good number (19%, rank 9) selling online. 25% of Spanish companies are using electronic invoicing (rank 6), but only 5,9% are selling online cross-border (rank 20). Spain performs solidly above EU average in the delivery of online public services and leads the rankings in Open Data (91%, 1).

2. National Strategy towards “Digitizing European Industries”

“Connected Industry 4.0 (CI 4.0)” was announced in 2015 aiming at digitising and enhancing competitiveness of Spain’s industrial sector. The initiative equally seeks to provide a strategy to support companies in their digital transformation. The CI 4.0 is driven by the General Secretary of Industry and SME but is the result of a wide and open consultation process involving public and private organisations, scientific, academic, political parties, civil society and trade unions. The initiative is defined as a public-private initiative, yet driven and financed to higher degrees by the state. In the future, the government seeks to increase industry’s responsibilities in terms of content provision and financial support.

The Spanish government has allocated significant resources in ensuring that a Spanish model responding to increasingly globalised, competitive industrial markets. Altogether eight core challenges and competitive requirements of Industry 4.0 are defined. Despite the coverage of new technologies (digital transformation enablers), CI 4.0 has put particular attention on the development of skills as well as knowledge sharing. Given the insufficient knowledge of digitisation among enterprises, particularly SMEs, awareness raising, digital transformation strategic plan development, training and caching/mentoring on the opportunities provided by Industry 4.0 in Spain, the benefits and required skills of digitalisation are the first actions put in place while the CI 4.0 governance model and activities are extended. This proactive campaign can trigger a chain reaction in enterprises’ perceived need to digitise processes, products and services, which in a second stage should be addressed in a sustainable manner by new innovation infrastructures such as DIH, also focus of the CI4.0 strategy.

Policy levers for Spain’s Industria Conectada 4.0



Source: Digital Transformation Monitor

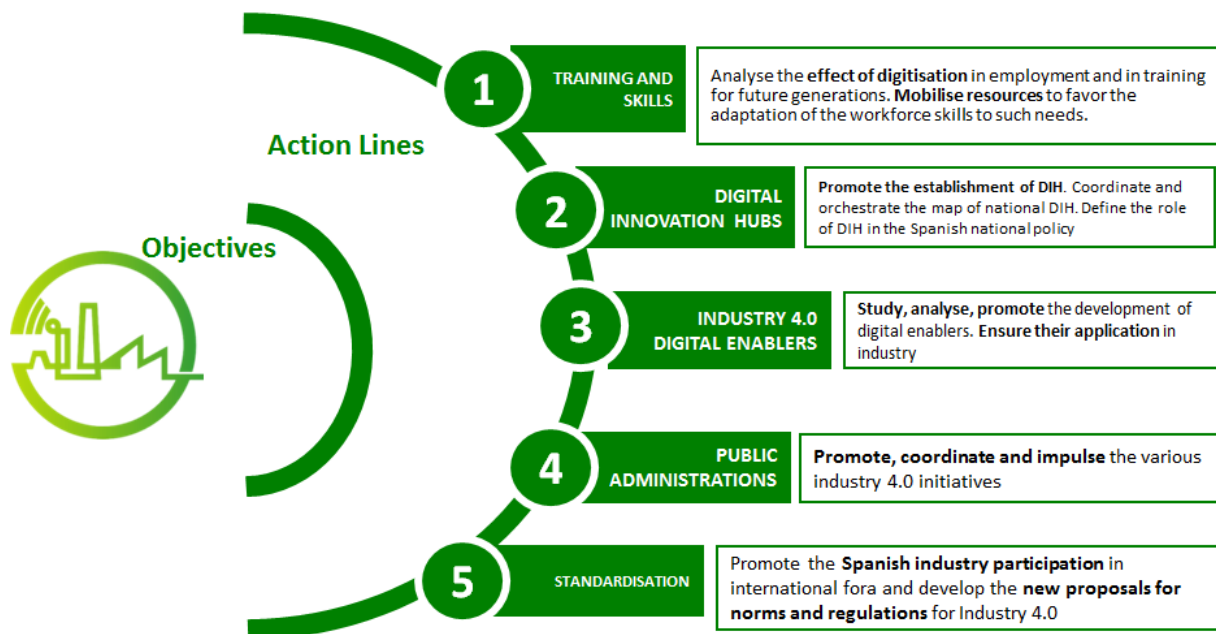
CI 4.0 was established as a new entity to lead and coordinate the various actions from government. The national initiative has been piloted during 2016, where first budget allocations took place and the governance model is being established during 2017 to leverage on all the pillars of the national strategy; i.e. DIH and platform building.

To stimulate intra-enterprise collaboration and optimal transfer between technology and industry, CI 4.0 creates multidisciplinary, collaborative environments and platforms seeking to develop new collaboration tools and sector specific solutions. Creating a specific model in line with the industrial reality of Spain, rather than imitating schemes of other EU countries, has allowed the initiative to spark the interest and pick up momentum from the private sector.

Furthermore, digital enablers play also key role in Spain's Industry 4.0 model. Through its research project calls and the advisory scheme, the initiative targets industrial enterprises seeking to employ digital technologies in their products and services.

Given the infant stage of the initiative's implementation since 2015, and with the first Congress on Industria Conectada 4.0 taking place in September 2017, ensuring an open collaboration environment and the effective set-up and operation of the various Working Groups which should drive the activities related to platform building and DIH development are clearly some of the challenges ahead. R&D&I programmes and financial resources are already in place to ensure that effective digital enablers for CI4.0 are leveraged and that the necessary modernization of manufacturing assets takes place timely as a result from the dissemination and awareness raising foundations of the CI4.0 strategy.

Governance: WORKING GROUPS



3. Digitising European Industry (DEI) Pilar 1 - Digital Industrial Platforms & Research, Development and Innovation actions.

The initiative CI4.0 during the second half of 2017 is starting to establish new working groups and activities directed towards the development of digital platforms. As it was announced in May 2017, the objective is to design, develop and deploy the CI4.0 platform. The vision of the platform is a combination of a multi-sided marketplace putting together providers and clients of Industry 4.0 solutions and products. The CI4.0 platform should also leverage a collaborative environment for sharing of best practices and fast-track to industry 4.0 learning. The vision of the CI4.0 platform is also to act as a federation of regional platforms and initiatives; i.e. the platform of platforms.

AMETIC Committee Industry 4.0. The initiative CI4.0 platform vision is supported by the AMETIC Committee Industry 4.0. AMETIC launched the Industry Committee 4.0 on July 2, 2015, with short-term goal of responding to the invitation of the Committee on Industry, Energy and Tourism of the Congress of Deputies to discuss the need for reindustrialise Spain to Industry through 4.0 and the Internet of Things. After more than a year of operation the Committee on Industry 4.0 of AMETIC already has 83 companies and created the following Working Groups that work the strategic guidelines set by our partners in this area:

1. Smart Agri-food, created on June 9, 2016.
2. Technology enablers
3. Co- Creation Industrial Fabric
4. Talent 4.0
5. Benchmarking and Dissemination

Last September 2016 the new Strategic Plan of the Commission of Industry 4.0 of AMETIC with the aim of placing Spain as a reference for Industry 4.0 in Europe and Latin America, in close cooperation with the initiative Industria Conectada 4.0 and the set of strategies and existing at European and international level plans in order to draw the Spanish track in a global context to the fourth industrial revolution.

The Strategic Plan has the following pillars:

1. Co-creation plan with goal of industrial digital transformation 4.0, both for large companies and small and medium enterprises industrial fabric.
2. Development plan for enabling technologies.
3. Development plan for talent 4.0.
4. Strengthening international relations and benchmarking.
5. Communication plan and institutional collaboration project to raise awareness.

As part of the Industry 4.0 committee it has set the objective of contribute to the overall CI4.0 strategy through (1) identification and dissemination of major companies working with Industry 4.0 (2) contribute in the development of a National Plan of Industria Conectada 4.0 (CI 4.0) (3) collaborate with the momentum of regional plans for I4.0, through the Plan of Action Autonomous Communities of the Committee on Industry 4.0. (4) Facilitate networking sessions to promote companies that make up the Committee on Industry 4.0 (5) Promote legislative / regulatory actions in collaboration

with Parliament Committee on Industry 4.0 (6) Increase participation of Spanish companies in R & D I4.0 (7) Identify the map of European initiatives in this area and (8) Promote the creation of an observatory Industry 4.0. AMETIC collaborates with institutions for the development of the fourth industrial revolution, aligned with the strategy of the European Union H2020.

Comisión AMETIC Industry 4.0	
Web - http://ametic.es/es/areas-de-actuacion/idi/comisi%C3%B3n-industria-40	
Contact Person	President: Verónica Pascual (ASTI) Director: Juan Gascón (AMETIC)
Reference document	España 4.0 – Strategic Plan ⁸

R&D&I programmes for Digital transformation enablers.

Through 64 national and regional programmes, Spain has been allocated EUR 37.4 billion from ESI Funds over the period 2014-2020. With a national contribution of EUR 15.88 billion, Spain has a total budget of EUR 53.28 billion to be invested in areas closely linked with the Europe 2020 objectives and identified national challenges, from helping (especially young) people enter the labour market and improving social integration and qualifications, to easing SMEs' access to finance as well as providing an innovation-friendly business environment and a better use of natural resources.

This Smart Growth OP forms part of the programmes using European Structural and Investment Funds that for Spain will represent aid worth 37,4 billion euros for the period 2014-2020, of which 19.4 billion euros correspond to European Regional Development Funds (ERDF). This is one of three Operational Programmes of a national scope that the State is to finance with ERDF, the other two being the Sustainable Growth Programme and the SME Initiative Programme.

The objective of this OP is to address factors that may help develop a smarter growth model in Spain. In terms of its geographic scope, the Programme covers Spain in its entirety, although it pays special attention to the most underdeveloped, outermost and transitional areas.

Eje	Ayuda FEDER	Contrapartida Nacional	Financiación Total
1	2.894.725.353	1.426.144.163	4.320.869.516
2	748.296.994	351.696.663	1.099.993.657
3	268.588.169	132.694.282	401.282.451
AT	27.574.294	13.475.030	41.049.324
Total	3.939.184.810	1.924.010.138	5.863.194.948

On the one hand, the so called Thematic Objective 1, designed to drive research, technological development and innovation, with a provision of 2.89 billion euros of ERDF aid. Thematic Objective 2 aims to enhance the use and quality of and access to information and communication technologies,

⁸ http://ametic.es/sites/default/files//BORRADOR_AMETIC-spa%C3%B1a%204%200_Estrategia%20i40_md.pdf

with a total investment of 748 million euros. Finally, 269 million euros have been earmarked for Thematic Objective 3, designed to improve the competitiveness of SMEs.

Each of these Objectives involves a number of milestones, among which the Secretary of State highlighted those of achieving R&D investment equivalent to 2% of GDP, increasing the percentage of companies making technological innovations from the current 15% to 25%, fostering greater cooperation with public and private universities and research centres to enable this cooperation to grow from the present 18% to 41%, developing the digital economy, increasing the number of SMEs selling online from the current 14% to a little over 51%, and improving Internet connectivity of educational centres and their networks and infrastructures, thereby increasing the percentage of the national school population covered by public digital education services from 4.17 to 100%.

Through the operational programme the Ministry of economy, Industry and Competitiveness yearly mobilises

- **309M€ on talent mobilization.** The objective is to encourage training, specialization, insertion employment and mobility of human resources in R + D + i. The actions included are intended to finance, through calls in competitive competition, recruitment both in the public R + D + i sector and in the business sector.
- **183M€ in Scientific research excellence.** The objective of the programme is to encourage the generation of knowledge both scientific and technological, without previously defined thematic orientation, contributing to advance the frontier of knowledge as well as the development of emerging technologies. The necessary aspects for the development of said activities are considered international scientific-technical collaboration and the acquisition of scientific-technical infrastructures and equipment for the execution of said activities. It is integrated by three subprograms: (1) GENERATION OF KNOWLEDGE (2) INSTITUTIONAL STRENGTHENING (3) TECHNO-SCIENTIFIC INFRASTRUCTURES AND EQUIPMENT
- **493M€ in Research & Innovation Industrial excellence.** The main objective of this programme is to ensure that Spanish companies increase their competitiveness through the generation and incorporation of knowledge, technologies and innovations aimed at improving processes and creating products and technologically advanced services with greater added value. The actions of this PROGRAM are aimed at: (a) boosting the capacity of execution of R & D activities by business agents; (b) facilitate the development and subsequent dissemination and adoption of key technologies, of a transversal nature and whose applications in the rest of the manufacturing and services sectors of the Spanish economy decisively contribute to the modernization of the business sector and its competitiveness and (c) promote public-private collaboration as a result of the early identification of the business interest of the results of R & D & I derived from the activities of public research agents and other public R & D centers and private, thereby promoting the transfer and circulation of knowledge scientific-technical and its multiple applications. It integrates three SUBPROGRAMS(1) ENTERPRISE R + D + I (2) IMPULSE TO FACILITATING TECHNOLOGY ENABLERS (3) PROMOTION OF COLLABORATIVE R & D + I FOR THE DEMANDS OF THE PRODUCTIVE FABRIC.

- **1,5B€ in the area of research and Innovation for societal challenges.** This programme aims to:
 1. Stimulate the generation of a critical mass in R & D & I of interdisciplinary nature and necessary to move forward in the search for solutions in accordance with the priorities established in each of the Challenges.
 2. Promote a close relationship between scientific and technical research, development of new technologies and the business application of new ideas and techniques, and medium and long term, contribute to its translation into products and services.
 3. Strengthen the international leadership capacity of the Spanish Science System, Technology and Innovation and its agents, and contributing to improve the competitiveness of business tissue.
 4. Articulate the R & D & I capacities as well as the promotion and financing instruments with other regional and international agents, mainly European, to develop a true joint programming.

The CHALLENGES contemplated are:

- HEALTH, DEMOGRAPHIC CHANGE AND WELFARE, within which LA is framed STRATEGIC ACTION IN HEALTH
- FOOD SAFETY AND QUALITY; AGRICULTURAL AND PRODUCTIVE ACTIVITY SUSTAINABLE, SUSTAINABILITY NATURAL RESOURCES, MARINE RESEARCH AND MARITIME;
- SAFE, EFFICIENT AND CLEAN ENERGY;
- SUSTAINABLE, INTELLIGENT AND INTEGRATED TRANSPORTATION;
- ACTION OF CLIMATE CHANGE AND EFFICIENCY IN THE USE OF RESOURCES AND RAW MATERIALS;
- CHANGES AND SOCIAL INNOVATIONS;
- ECONOMY AND DIGITAL SOCIETY
- SECURITY, PROTECTION AND DEFENSE

In particular the following Research & Innovation Programmes are of relevance to the DEI Pillar 1 initiative:

- **PROYECTOS INTERNACIONALES.** The programme is aimed at encouraging the implementation of research projects, industrial and experimental development that have obtained the label to a EUREKA ICT cluster (ITEA 3, Celtic-Plus, CATRENE, PENTA and EURIPIDES). The minimum contribution of national entities in European projects will be 5%. Applications must be made individually and may include subcontracting. The main targets for the programme are industrial companies.
- **GRANDES PROYECTOS I+D+i TIC.** The programme is aimed at encouraging the implementation of research projects, industrial and experimental development framed within the thematic priorities (components and systems, Internet of the future, Cloud Computing, mass treatment of data, High Performance Computing, robots and autonomous systems, smart cities, Internet of things, additive manufacturing and Industry 4.0) that have a

great social and economic impact and high potential for traction and socioeconomic impact. The minimum budget of the projects to be executed will be € 1,000,000 and the maximum € 10,000,000. The projects must be carried out in the individual modality, and may include minimum subcontracting of 25%.

- **PROYECTOS IMPULSO TECNOLÓGICO.** The programme aims to promote technologies with low level of maturity and high transformation potential of the ICT sector through the execution of high-quality projects of technological risk. Industrial research and experimental development projects should be framed within thematic priorities defined in the call (industries of the future, industry 4.0, cybersecurity and digital trust, health and wellbeing, agri-food, environmental management and energy efficiency, transport and logistics and digital content) The minimum budget of the projects to be executed will be € 200,000 and the maximum € 1,000,000. The projects must be carried out in the individual modality, and include subcontracting.
- **«FEDER ININTERCONECTA».** Projects of experimental development in cooperation, that respond to any of the following Social Challenges: a) Health, demographic change and well-being, b) Safety and quality food; productive and sustainable agricultural activity, natural resources, research marine and maritime, c) Energy, safe, efficient and clean, d) Intelligent transport, sustainable and integrated, e) Action on climate change and efficiency in the use of resources and raw materials, f) Changes and social innovations, g) Economy and society digital, h) Security, protection and defense. Consortiums, from two to six companies, at least one SME, the leader must be a medium or large company, that develop the project in one of the communities autonomous regions considered as less developed or in transition according to the Intelligent Growth Operative Programme.
- **PROYECTOS DE INNOVACIÓN TECNOLÓGICA «LINEA DIRECTA INNOVACIÓN CDTI» RETOS EMPRESA.** The programmes are intended to finance projects that allow the incorporation and adaptation of innovative sectoral technologies whose implementation represents an advantage competitive for the company including: (1) the incorporation and active adaptation of technologies for the company and the processes of improvement and technological adaptation to new markets; (2) The application of industrial design and product and process engineering for technological improvement; and (3) the application of a production or supply method new or significantly improved.
- **PROYECTOS DE I+D «RETOS EMPRESA» .** The programme targets business projects, of an applied nature, for the creation and significant improvement of a productive process, product or service that responds to technological demands oriented and that allow to respond to the challenges of the society.
- **PROYECTOS DE I+D+i «RETOS COLABORACIÓN».** Programme is intended to finance experimental development projects carried out in collaboration between research centers, public and private, and companies with a view to to promote the development of new technologies, the business application of knowledge and of new ideas and techniques, and contribute to the resolution of society's challenges through the development of new products and services. The minimum budget of the projects will be € 500,000. The support will be in the form of a loan, subsidy and reimbursable advances FEDER, or a combination of both.

- **CONSORCIOS ESTRATEGICOS DE INVESTIGACIÓN EMPRESARIAL (CIEN).** Programme for the realization of large industrial research and development projects in new technologies oriented to the creation or improvement of products, processes or services and in strategic areas and with international impact. The minimum amount of the projects will be € 7,000,000 and the maximum € 20,000,000.
- **INNOGLOBAL.** The programme intends to promote international cooperation in R & D, through the execution of R & D projects in cooperation with companies and entities from other countries, in multilateral, bilateral, unilateral programs and large scientific facilities.
- **INTEREMPRESAS INTERNACIONAL «CDTI euros TARS».** The Programme is intended to encourage the development of R & D projects in consortium led by SMEs intensive in R & D and that represent a break with the state of the technical art and a commercial challenge that allow these companies to make a qualitative leap important in its market position.

With respect to enhancement of the digital infrastructures the national initiative considers investments in the following programme:

- **BANDA ANCHA I+D+i (Broadband plan).** The Plan is intended to actions aimed at extending the coverage of the new generation broadband networks. There are three lines of action: a) extension of coverage of very high speed NGA access networks (100 Mbps or superior), b) extension of coverage of access points (backhaul) suitable for the connection of NGA access networks of high speed and very high speed, and c) the extension of coverage of high-speed access networks (30 Mbps or greater). Up to 4M€ projects.
- **INFRAESTRUCTURAS CIENTÍFICO-TÉCNICAS SINGULARES (Singular Scientific Infrastructures).** The objective of this programme is to provide, maintain and update the Singular Scientific Infrastructures (ICTS) collected on the map approved by the Policy Council for Science, Technology and Innovation at its meeting of October 8, 2014. The programme is aimed at the construction, development, instrumentation, and equipping of such ICTS and exclusively cover the co-financing of those actions previously selected in the framework of the Intelligent Growth Operative Program and eligible to receive funding from FEDER funds.

In terms of international cooperation and joint programming it is worth mentioning two programmes that support international cooperation:

- **ERA-NETs CDTI.** The Spanish companies that participate in the projects may be beneficiaries of R & D projects that have been selected by the governing bodies of the ERANETs. This includes participation in ERANETs such as MANUNET
- **ACCIONES COMPLEMENTARIAS DE PROGRAMACIÓN CONJUNTA INTERNACIONAL**

In terms of digital skilling and upskilling the following programmes are of interest in the context of the analysis

- **CONTRATACIÓN DE PERSONAL DE I+D+i EN EMPRESAS «EMPLEA»** Programme aimed at encouraging full-time hiring, for a period not less than three years, of university graduates and non-university graduates for the development of R + D + i activities related to ongoing projects or planned actions by companies.

- **CONTRATACIÓN DE DOCTORES EN EMPRESAS «TORRES QUEVEDO».** The programme is intended for the indefinite hiring of doctors in the private sector with the aim of boosting the employability of researchers and stimulating demand of doctors who will contribute to the development of R & D capacities in companies, allowing to address R & D & i projects of impact and relevance and favoring the consolidation of newly created technology companies.
- **FORMACIÓN DE DOCTORES EN EMPRESAS «DOCTORADOS INDUSTRIALES».** The companies will use these grants to co-finance the hiring of personnel researcher in training who develops his doctoral thesis in the company itself and as part of a industrial research or experimental development project. The research staff will make compatible this activity with the doctoral training he receives at the university to obtain the Doctor's degree
- **PROGRAMA DE FORMACIÓN PARA EL EMPLEO JUVENIL EN LA ECONOMÍA DIGITAL.** Training program for youth employment aimed at entities that develop comprehensive employment projects in the field of ICT and the Digital Economy. It offers young people training aimed at the digital industry and new business models and facilitates their access to jobs that promote the digital transformation of companies. These grants are co-financed with the European Social Fund (ESF) for the 2014-2020 programming period, specifically under the Youth Employment Operative Program (POEJ) financed by the Youth Employment Initiative.
- **PROGRAMAS FORMATIVOS EN ECONOMÍA DIGITAL.** Support training programs of educational entities and universities, both public and private, in the field of digital economy, to support the training of students of these programs. Public or private entities that offer training programs in the field of digital economy can take part in the Programme.

In the context of CI4.0, the national initiative is promoting the development of the Spanish offer for digital enablers through the “Acción Estratégica de Economía y Sociedad Digital (AEESD)⁹ and the development of technology based companies through dedicated credit lines (Digital Agenda Line) from ENISA¹⁰. The AEESD programme is looking at the ICT sector with application in the manufacturing and industrial vertical. The priorities of Industries of the future include:

- Components and systems
- Internet of the future
- Cloud Computing
- Massive data processing
- High Performance Computing
- Robots and autonomous systems
- Internet of Things
- Additive Manufacturing

On the other hand, the programme Industria Conectada 4.0, with a clear focus on the manufacturing sector, has priorities on IoT, Robotics, 3D printing and data analytics. These programmes are the ones

⁹ <http://www.minetad.gob.es/PortalAyudas/AEESD-2017/Paginas/Index.aspx>

¹⁰ <http://www.agendadigital.gob.es/agenda-digital/noticias/Documents/150603PGPresentacion-Enisa-Agenda-Digital.pdf>

supporting at national level the development of future digital enablers and advanced digital manufacturing processes. The R&D&I projects must have a minimum budget of 100 K€ euros and may not exceed 10 M€ euros. Projects with a budget of more than 1M€ euros, must have subcontracts for an amount that accounts to at least 25% of their budget. The funding rate ranges from 30% to 50% for SMEs and 20% to 40% for large industry.

4. Digitising European Industry (DEI) Pilar 2 - Standardization actions, regulation and testbeds

The Working Group on Standardization of the Connected Industry Initiative 4.0 of the Ministry of Economy, Industry and Competitiveness has been set up in July 2017. This initiative has been created with the aim of promoting the digital transformation of Spanish industry through the joint and coordinated action of the public and private sector. The concept of Industry 4.0 refers to the fourth industrial revolution, characterized by the massive incorporation of information technology to the entire value chain of manufacturing processes.

One of the Strategic Areas of the Initiative is devoted to standardization as a fundamental tool for the implementation of the manufacturing model of the future. To meet this need, the Executive Committee of the Standardization Working Group has been set up, which will be technically coordinated by the Spanish Standardization Association, UNE, and the Mondragon Corporation. It will also include industrial sector associations, companies and universities.

The first missions of this working group of standardization will be

1. to make Spanish industry aware of the benefits of participation in the standardization system;
2. increase such participation to the levels of the most advanced countries; and
3. the identification of those priority sectors that want to get involved and benefit from this initiative.

Standardization plays a fundamental role in the implementation of Industry 4.0 processes, since a degree of integration between systems of different domains is required, which is only possible if it is based on technical standards and specifications based on consensus. This Working Group is coordinated, from a technical point of view, by UNE (the national organism of standardisation) and Mondragon.

5. Digitising European Industry (DEI) Pillar 3 - Digital Innovation Hubs actions

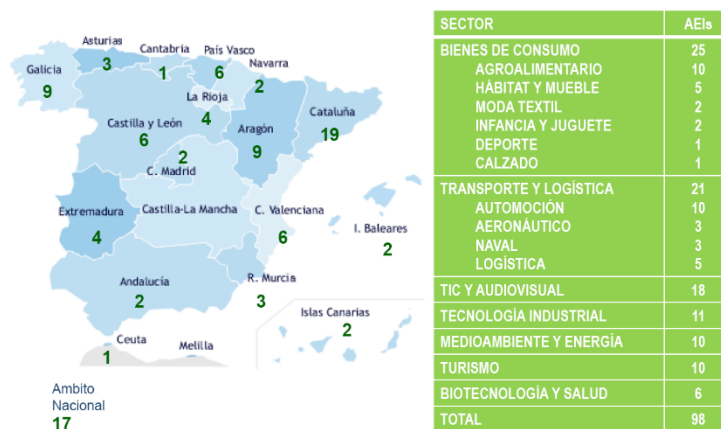
A national innovation digital hub is foreseen to be implemented during 2017. In May 2017, it was announced that a working group would be established with the following mission:

- to coordinate the services and functions of the Spanish HUBS,
- order their creation and development,
- promote collaborative actions inter-HUBS,
- develop a complete portfolio of services of national HUBS,
- Promote DIH among other public initiatives.

The establishments of the DIH strategy is required since Industry 4.0 and particular SMEs exhibit:

- Difficult access of SMEs to innovation in general
- Ignorance of the concept of digital transformation
- Shortage of ICT experts
- Difficulty in realizing real success projects

As a result, this could generate an SME divide in the digital transformation process. Therefore, a one-stop-shop is required to facilitate an easier and more effective access to digital transformation services. The CI4.0 initiative has the following vision for the Spanish DIH. The portfolio of services provided by DIH is structured around three broad areas: training, innovation and entrepreneurship. The HUB must incorporate public administration, technology centres, investors, tractors, SMEs, incubators, etc.



The implementation of DIH is linked to the AEI (Innovating Enterprise Association) strategy, which has already set close to 100 of such clusters <http://clusters.ipyme.org/es-es/Paginas/Home.aspx>. The services provided by AEIs are closely related to the services envisioned for future DIH:

- Technological Surveillance and Competitive Intelligence in I4.0.
- Dissemination and training
- Sectoral diagnosis
- Stimulate projects for SMEs
- Connection between Industry and the ICT domain: inter-cluster, Intra-cluster ...
- Funding support
- Development of demonstrators

As a consequence, the CI4.0 initiative is currently analysing a future modification of the legal framework for AEIs to be able to leverage the funding of R&D&i project in the framework of Industry 4.0 to support the operation and excellence of Spanish IHL.

In parallel the Ministry is also supporting a programme for the development of technology platforms. The programme is intended for the creation and consolidation of the state network of technological platforms promote the improvement of the technological capacity and the competitiveness of the Spanish System of Science, Technology and Innovation, which carry out knowledge exchange activities, of planning and dissemination.

Moreover, there are two programmes included in 2017 in Industria Conectada 4.0 action plan:

- HADA¹¹ is an online Industry 4.0 self-assessment tool. It gives a high-level assessment of your company's strengths and weaknesses in respect of Industry 4.0.
- ACTIVA INDUSTRIA 4.0 (<https://www.eoi.es/es/empresas/industria-40>) is a specialized and customized consulting support program that will be carried out by recognized business and technology consulting firms with experience in Industry 4.0. The objective is to guide companies in their digital transformation process. The programme is a joint collaboration between regional governments, the national government and industry. The programme which will select the companies that will benefit from the strategic digital transformation planning will be set in September 2017. The 17 regions have signed a collaboration agreement with this initiative.



In parallel the Board of Directors of Red.es, a public business entity ascribed to the Ministry of Energy, Tourism and the Digital Agenda, has given the green light in October 2017 to two programs to promote the digital transformation of SMEs worth 10 M€. Both programs are co-financed by the European Regional Development Fund (ERDF), in charge of the Smart Growth Operating Program.

In the first place, the Digital Advisors programme, with a budget of 5 M€, is aimed at promoting the digital transformation of SMEs through individualized advice by specialized agents. This service will materialize in the realization of a Digitalization Plan for the incorporation of ICT in its processes (business management, relationship with third parties, electronic commerce, digitalization of services and solutions).

The program will include a diagnosis of the state of digitalization of SMEs and an action plan for its digital transformation. On the one hand, a call for grants of up to 5,000 euros per SME will be enabled to select, among them, the beneficiaries of the advisory services. On the other hand, an invitation will be published for the development of a register of digital advisors that provide this individualized advice.

The second approved program is that of Digital Transformation Offices, which is aimed at associations and professional associations, with the aim of strengthening the ecosystem of support for entrepreneurs in the digital sphere and the SME in ICT matters.

¹¹ https://hada.industriaconectada40.gob.es/es/register/0ff89de99d4a8f4b04cb162bcb5740cf/industria_conectada_40/

Analysis of National Initiatives for Digitising Industry: Spain
Industria Conectada 4.0

This program contains, in turn, a budget of 5 M€ in aid for beneficiary entities to develop the action plan, for a period of one year. The minimum amount of the aid is 100,000 euros for each beneficiary entity and the maximum of 200,000 euros.

6. Digitising European Industry (DEI) Pilar 4 - Skills development.

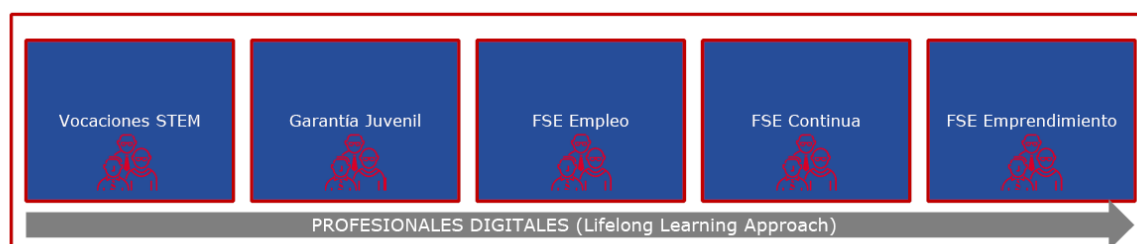
Industria Conectada 4.0 promotes the incorporation of related Industry 4.0 and digital enablers on job training in order to ensure that the needs of industrial companies with regard to Industry 4.0 are met and supports the inclusion of content and specific courses of Industry 4.0 in the academic curricular training.

In July 2017, Red.es and AMETIC presented their approach to Talent 4.0 in the context of Industria Conectada 4.0 and the digital transformation of the Spanish Industry. It is clear, that Digital Transformation of Spanish industry requires new profiles since:

- 40% of European employers find it difficult to find profiles with the necessary digital skills for grow and innovation.
- The demand for digital professionals has grown by 4% per year in the last 10 years.
- By 2020, 750,000 vacant posts will be created in Information and Communication Technologies (ICT).
- Digital Transformation will generate 1.25 million jobs in the coming years five years (till 2021), among highly qualified jobs (STEM).

According to DESI indicators Spain is lagging behind EU average in terms of advanced skills of ICT specialists. In fact, only 22% of companies receive digital training on a regular basis. So, specific training for digital industry-and new business models is required to facilitate the digital transformation of enterprises.

The national initiative will activate 45M€ from ESF to support training and quality job creation. The approach is based on **lifelong learning scheme**, with instruments to promote training in all stages of professional carrier to enhance digital talent and face a new scenario in sectors going through a digital transformation. The approach embraces from early vocational training to the dimension of self-employment and entrepreneurship, with particular attention to **youth employment**, which is particularly important in the context of Spanish economy.



Additionally the programme considers training programmes directed to sectors and active professionals with the support from:

- **Higher education and graduate programmes on digital economy.** The national initiative will also provide support to graduate programs with little training offer and high demand for professionals: masters, higher education programs or specialization in Digital Economy.

- **Continuous training and upskilling.** The initiative will support training projects tailored to the competences for digital transformation as well as horizontal training programmes on digital technical enablers and digital competences required for the digital transformation (critical thinking, creative and design thinking, emotional intelligence, lean startup....). A Working Group is about to be created between the Secretary General for Industry and SME, the Secretary of State of Education and the Secretary of State of employment in order to coordinate initiatives and enhance public investment in digital training. The EOI Foundation, ascribed to the Secretary General, is now preparing different educational programs to support this goal. Such as the one already issued with google: <http://www.eoi.es/blogs/open/cursos-mooc-competencias-digitales-eoi-red-google/>.

7. Specific National Measures.

According to PwC report on Digital Tax Index 2017: Locational Tax Attractiveness for Digital Business Models, Spain scores 20 in the ranking of more attractive location for setting up a digital business with Sweden scoring 30th and Germany scoring 31st respectively. The ranking is directly related to the taxation scheme and some specific fiscal instruments related to “Patent Box” and fiscal incentives to R&D&I. However, the taxation is still high compared to other EU countries such as Hungary that score high in the rank, or Italy that has designed a dedicated set of instruments to foster private investment on industry 4.0 and digital businesses.

Beyond those instruments on of the specific instruments leveraged by the national initiative are the loans leveraged by the **Industria Conectada 4.0 programme**. This national programme seeks to support projects that promote the digital transformation of industrial companies, thus complementing business efforts aimed at achieving their evolution to the digital economy.

In particular, this action aims to support the incorporation of knowledge, technologies and innovations for the digitization of processes and the creation of technologically advanced products and services with greater added value in industrial companies. Support is given to industrial research projects, experimental development projects, as well as innovation projects in the organization and processes of small and medium-sized enterprises. The action is framed within the initiative Connected Industry 4.0, which seeks to develop competitive levers differential and the creation of the appropriate conditions to favour the competitiveness of Spanish companies, thus building the Spanish model for the industry of the future.

The programme supports 4 different types of projects:

- **Industrial research projects.** Acquisition of new knowledge and techniques that may be useful for the creation of new products, processes or services, or contribute to a significant improvement in existing products, processes or services. It includes the creation of components of complex systems that are necessary for industrial research, especially the validation of generic technology, except prototypes
- **Experimental development projects.** The acquisition, combination, configuration and use of existing knowledge, techniques, scientific, technological, business or other, with a view to the elaboration of plans and structures or designs of new products, processes or services, modified or improved
- **Innovation projects in the organization of SMEs.** The application of a new organizational method to business practices, organization of the workplace or external relations in an SME; do not include changes based on organizational methods already employed in the company, changes in management strategy, mergers and acquisitions, abandonment of a process, mere substitution or capital increase, changes exclusively derived from price variations factories, custom production, adaptation to local uses, seasonal changes or other cyclical changes and trade in new or significantly improved products.
- **Innovation projects in the field of SME processes.** The application of a new or significantly improved method of production or supply (including significant changes in techniques, equipment or software) in an SME; the changes or improvements of minor importance are

not included, increases in production or service capacity by introducing manufacturing or logistics systems very similar to those already used, abandonment of a process, mere replacement or capital increase, changes resulting exclusively from changes in factor prices, custom production, adaptation to local uses, seasonal changes in seasonality or other cyclical changes, and trade in new or significantly improved products.

Industria Conectada 4.0 projects are close to market activities with a time horizon of 18 months and will be supported by public funds between 50 and 70% of the project budget for SMEs and between 25% and 50% for large enterprises. The programme provides a 0% interest loan for up to 80% of the project budget with a minimum project size of 150K€.

Venture capital. In parallel to Industria Conectada 4.0 programme, the national initiative is also being supported by a ENISA credit line for the digital agenda (development of new digital businesses). This credit line is intended to encourage the creation, growth and consolidation of the Spanish company and to stimulate the risk capital market. The ENISA Line on Digital Agenda was established in 2013. The ENISA line provides a financial instrument between traditional loan and venture capital and does not require guarantees, interest rate linked to results and operates on tax deductible interests. The loan conditions provide a long-term maturity (4 to 9 years), long grace period (1 to 7 years) and interests in two tranches. The credit made available by ENISA for Digital Agenda investments range from € 25,000 - € 1,500,000.

Additionally, Red.es is setting up the **Programme for Technological Entrepreneurship** since 2017. The objective of this 'Public Invitation to support initiatives to promote technological entrepreneurship in the digital economy' is to provide support to companies, through incubation and acceleration services. In this environment, networking is encouraged, experts are accessed and training and entrepreneurs' training is facilitated. Red.es allocates 700,000 euros to this action, in addition to the 1.9 million contributed by the collaborating entities. The aid allocated to each beneficiary is between 4,000 and 15,000 euros, including those that are direct (financial or in kind) as management expenses. With this initiative, the work of public-private organizations is strengthened, offering entrepreneurs training, advice and mentoring, reaching more and more interested parties. Among the initiatives selected, some of them are national, such as 'Talentum Startups' or 'Yuzz', coordinated respectively by Telefónica and the Santander International Entrepreneurship Center (CISE), with the support of Banco Santander. The initiative is part of the 'Plan for the promotion of the digital economy and digital content' of the Digital Agenda for Spain.

8. Investments for Digitising European Industry

The following tables summarises both the annual budget made available by the various funding agencies and the Ministry of Economy, Competitiveness and Industry (responsible for the Industria Conectada 4.0) to leverage the digital transformation of the Spanish industry.

Digitising European Industry (DEI) Pillar	Action Lines (National Programme)	Budget		Overall Investment (Yearly)	
		Public Investment (M€)	Total Investment (M€)	2016 or 2017	
				Public Investment (M€)	Private Investment (M€)
P1 - Digital Platforms (Infrastructures and R&I)	Ministry of Economy, Competitiveness and Industry	100 €	100 €	100 €	- €
	Ultra Broadband Plan - 0% Loans	100 €	100 €	100 €	- €
	Ministry of Economy, Competitiveness and Industry	189 €	464 €	172 €	292 €
	PROYECTOS IMPULSO TECNOLÓGICO - AEESD. Assumption - 70% Funds allocated i4.0 & digital technologies. 40% private funding	60 €	105 €	42 €	63 €
	GRANDES PROYECTOS I+D+i TIC. Assumption - 100% Funds allocated i4.0 & digital technologies. 50% private funding	20 €	40 €	20 €	20 €
	PROYECTOS I+D+i INTERNACIONALES (ITEA,CELTIC, PENTA, CATRINE, EURIPIDES...). Assumption - 80% Funds allocated i4.0 & digital technologies. 60% private funding	12 €	24 €	10 €	14 €
	Industria Conectada 4.0 (Loans) - Assumption - Based on first call (2016) data if all the budget is consumed industry contributes with 195M€ of asset not funded	97 €	295 €	100 €	195 €
	CDTI	1.330 €	437 €	277 €	159 €
	«INNOGLOBAL». Assumption - 30% Funds allocated i4.0 & digital technologies. 60% private funding	10 €	8 €	3 €	5 €
	PROYECTOS DE INNOVACIÓN TECNOLÓGICA «LINEA DIRECTA INNOVACIÓN CDTI» RETOS EMPRESA (loans) - Assumption - 60% Funds allocated i4.0 & digital technologies. 25% private funding	53 €	42 €	32 €	11 €
	PROYECTOS DE I+D+i «RETOS COLABORACIÓN» (loans) - Assumption - 15% Funds allocated i4.0 & digital technologies. 0% private funding	586 €	88 €	88 €	- €
	PROYECTOS DE I+D «RETOS EMPRESA» (loans) - Assumption - 20% Funds allocated i4.0 & digital technologies. 25% private funding	189 €	50 €	38 €	13 €
	PROYECTOS INNOVACIÓN TECNOLÓGICA LÍNEA DIRECTA DE INNOVACIÓN (LIC) CDTI - loans. Assumption - 30% Funds allocated i4.0 & digital technologies. 60% private funding	69 €	52 €	21 €	31 €
	PROYECTOS INNOVACIÓN TECNOLÓGICA LÍNEA INNOVACIÓN GLOBAL (LIG) CDTI - loans. Assumption - 30% Funds allocated i4.0 & digital technologies. 60% private funding	15 €	11 €	5 €	7 €
	CONSORCIOS ESTRATÉGICOS DE INVESTIGACIÓN EMPRESARIAL «CIEN». Assumption - 30% Funds allocated i4.0 & digital technologies. 70% private funding	100 €	100 €	30 €	70 €
	«FEDER ININTERCONECTA». Assumption - 20% Funds allocated i4.0 & digital technologies. 40% private funding	50 €	17 €	10 €	7 €
	PROYECTOS I+D+i (loans). Assumption - 20% Funds allocated i4.0 & digital technologies. 25% private funding	258 €	69 €	52 €	17 €
P2 - Standardization actions, regulation and testbeds	CDTI	32 €	15 €	7 €	8 €
	INTEREMPRESAS INTERNACIONAL «CDTI eurosTARS». Assumption - 20% Funds allocated i4.0 & digital technologies. 50% private funding	10 €	4 €	2 €	2 €
	ACCIONES DE PROGRAMACIÓN CONJUNTA INTERNACIONAL -ECSEL... Assumption - 30% Funds allocated i4.0 & digital technologies. 60% private funding	15 €	9 €	5 €	5 €
	AYUDAS CDTI - ERANETS. Assumption - 10% Funds allocated i4.0 & digital technologies. 60% private funding	7 €	2 €	1 €	1 €
P3 - Digital Innovation Hubs	Ministry of Economy, Competitiveness and Industry	41 €	43 €	35 €	8 €
	AEI	11 €	11 €	11 €	- €
	Technology Platforms	6 €	6 €	6 €	- €
	INFRAESTRUCTURAS CIENTÍFICO-TÉCNICAS SINGULARES (ICTS) - Assumption - 15% Funds allocated i4.0 & digital technologies. 80% additional funding	7 €	5 €	1 €	4 €
	AYUDAS «NEOTEC»	15 €	15 €	15 €	- €
Activa Industria 4.0. Assumption - 33% Funds central government, 33% industry, 33% regional funds	2 €	6 €	2 €	4 €	
P4 -Digital Skills Development	Ministry of Education, Culture and Sports	24 €	8 €	6 €	2 €
	Industrial PhD Assumption - 20% Funds allocated i4.0 & digital technologies. 20% additional funding	3 €	2 €	1 €	2 €
	PhD Contracts for Industry- 20% Funds allocated i4.0 & digital technologies. 0% additional funding	15 €	3 €	3 €	- €
	Programme EMPLEA - Assumption - 40% Funds allocated i4.0 & digital technologies. 0% additional funding	6 €	2 €	2 €	- €
	Red.es	42 €	42 €	42 €	- €
	Apoyo de programas formativos en materia de economía digital	2 €	2 €	2 €	- €
	Programa de formación para el empleo juvenil en la economía digital	20 €	20 €	20 €	- €
	Digital Transformation Offices	10 €	10 €	10 €	- €
Plan de impulso de la economía digital y los contenidos digitales	10 €	10 €	10 €	- €	
Tax Incentive Provisioning	ENISA (Empresa Nacional de Innovación, SME, SA)	15 €	15 €	15 €	- €
	ENISA Agenda Digital - Assumption: 100% targeting digital businesses	15 €	15 €	15 €	- €

As it has been made apparent in the previous Sections a number of Ministries and agencies (CDTI, Red.es, EOI, etc...) contribute to the implementation of the digital transformation of Spanish industry. Also various associations and large industrial players are engaged and committed in this process. The Table depicts the yearly budget as well as the expected investments (private and public) that such resources will leverage. The Figures provided are based both in the data provided by the Official State Bulletin in charge of communicating the budget made available for various programmes, actions and activities as well as from analysis of the outcomes of previous calls, which have served to set some assumptions in terms of expectations of the resources that will finally contribute to the development of digital technologies and industry 4.0 products, services and manufacturing processes.