Industria Conectada 4.0

Jorge Portilla

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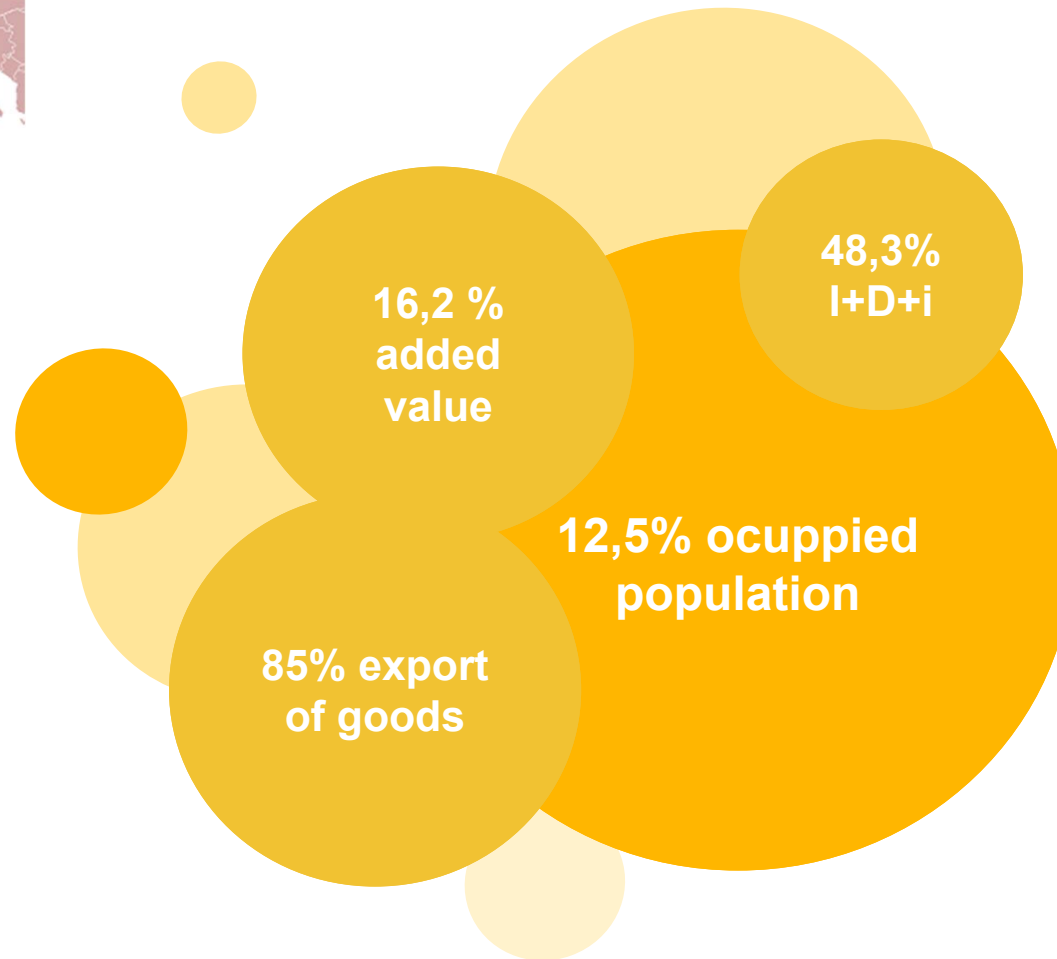CEI UPM | Centro de Electrónica Industrial

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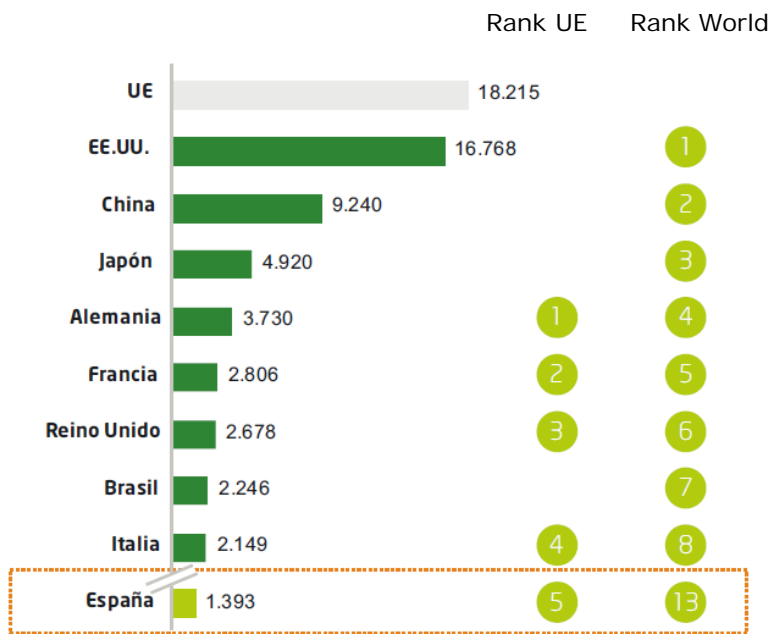# Industry in Spain

48,3% I+D+i

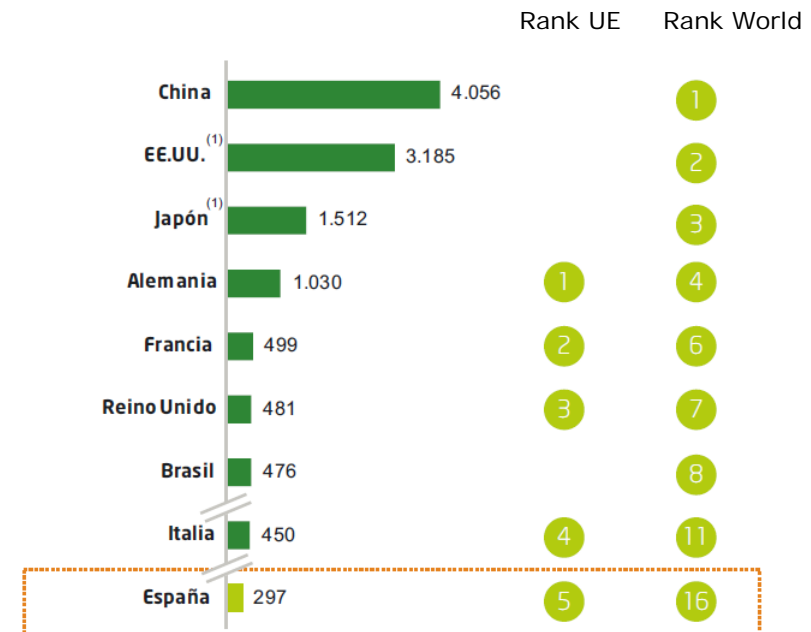16,2 % added value

12,5% ocuppied population

85% export of goods

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Industry in Spain

GDP, 2013, Billions

		Rank UE	Rank World
UE	18.215		
EE.UU.	16.768		1
China	9.240		2
Japón	4.920		3
Alemania	3.730	1	4
Francia	2.806	2	5
Reino Unido	2.678	3	6
Brasil	2.246		7
Italia	2.149	4	8
España	1.393	5	13

Source: World Bank

Value Added, 2013, Billions

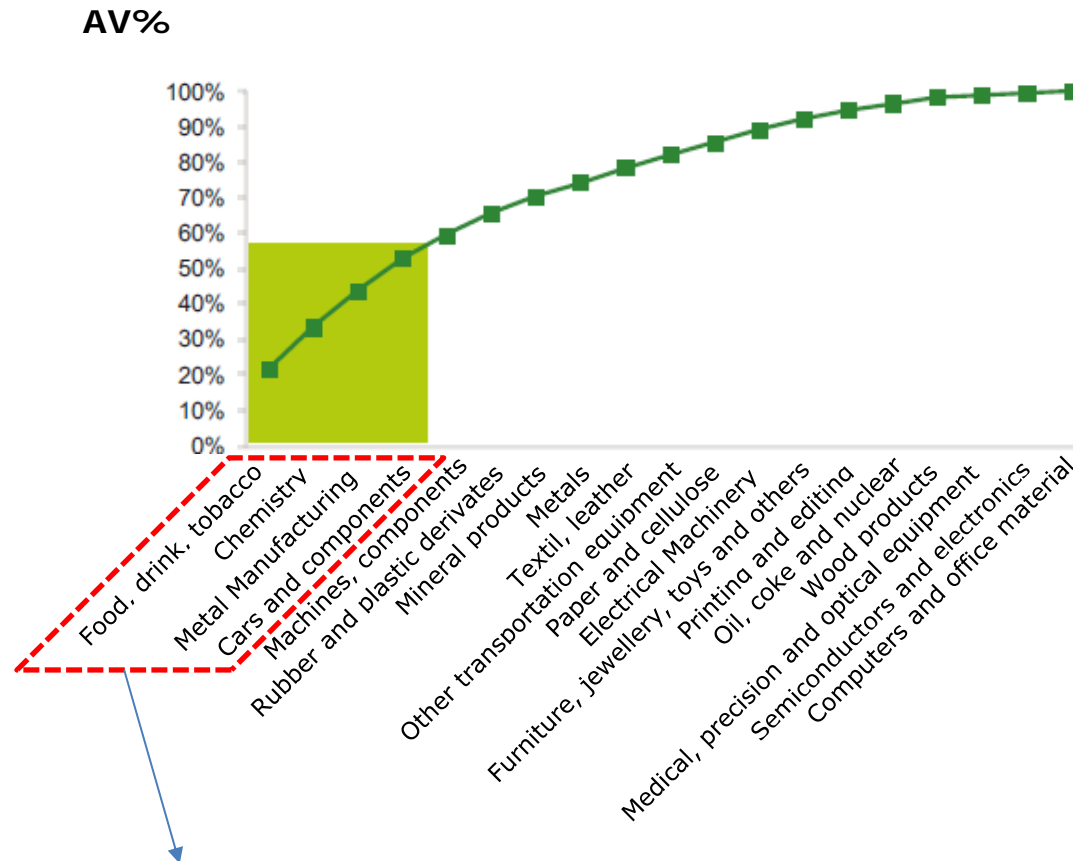|		Rank UE	Rank World
China	4.056		1
EE.UU. [1]	3.185		2
Japón [1]	1.512		3
Alemania	1.030	1	4
Francia	499	2	6
Reino Unido	481	3	7
Brasil	476		8
Italia	450	4	11
España	297	5	16

Source: World Bank
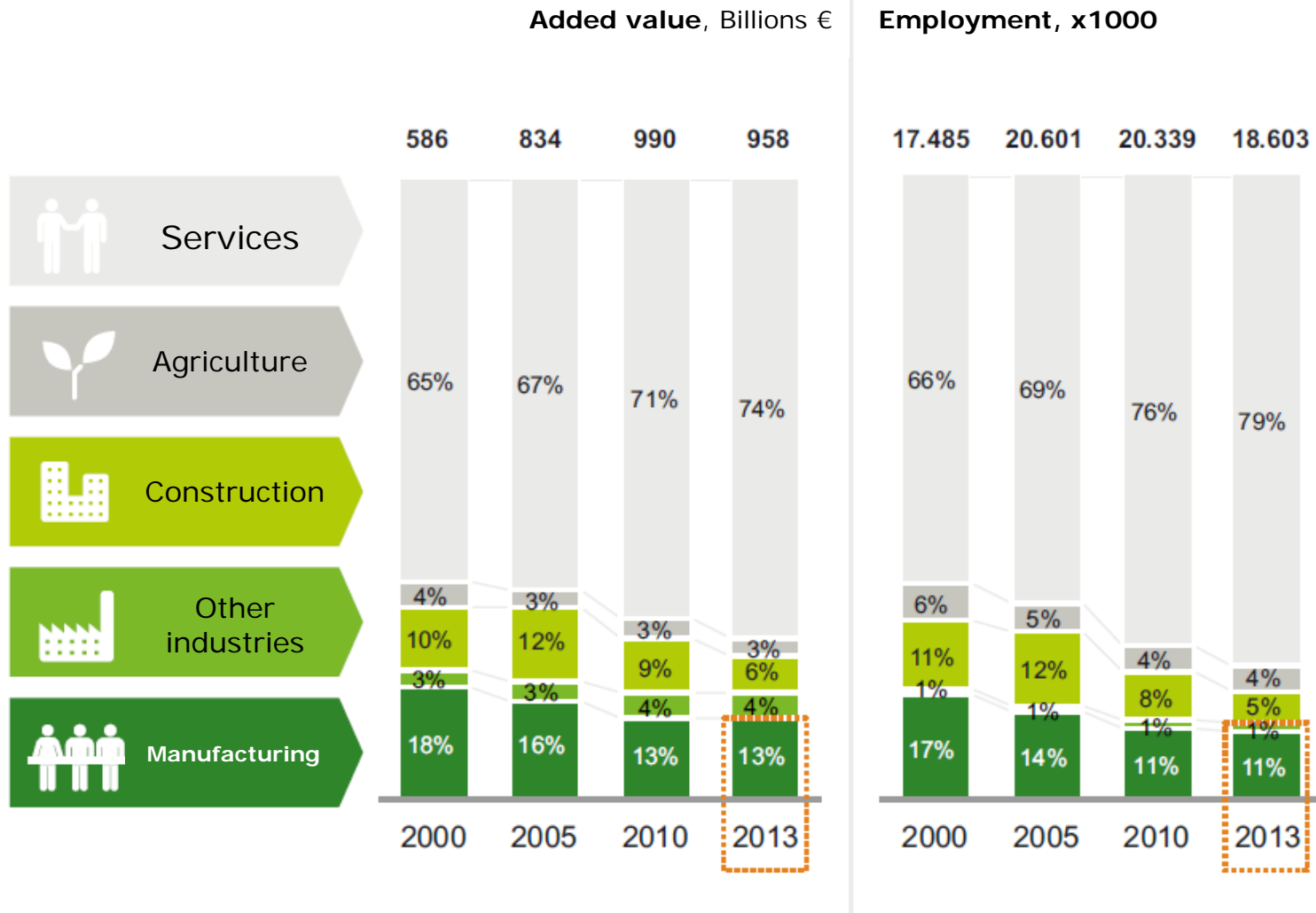Industry includes: mining, manufacturing, construction, electricity, water, gas

Industry in Spain

Accumulated contribution by sectors to added value, 2013, Billions

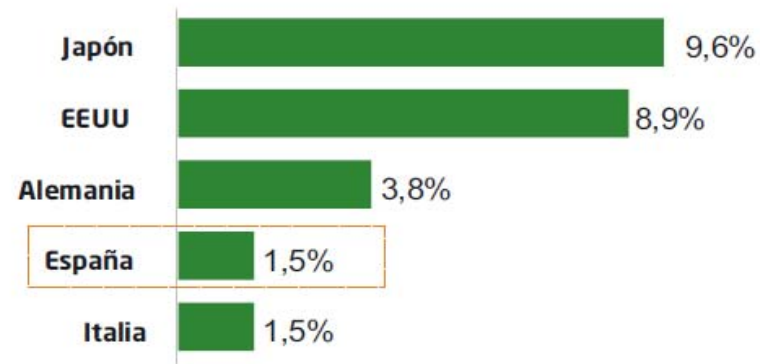Four sectors represent 50% of total added value in Spain

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Industry in Spain

Added value, Billions €

Employment, x1000

Services

Agriculture

Construction

Other industries

Manufacturing

Added value	586	834	990	958
Services	65%	67%	71%	74%
Agriculture	4%	3%	3%	3%
Construction	10%	12%	9%	6%
Other industries	3%	3%	4%	4%
Manufacturing	18%	16%	13%	13%
Year	2000	2005	2010	2013

Employment	17.485	20.601	20.339	18.603
Services	66%	69%	76%	79%
Agriculture	6%	5%	4%	4%
Construction	11%	12%	8%	5%
Other industries	1%	1%	1%	1%
Manufacturing	17%	14%	11%	11%
Year	2000	2005	2010	2013

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Industry in Spain

Exportations and importations, Billions €

Industry in Spain

Comparison of Industrial Investment in R+D / GDP in Industry, 2013

Japón	9,6%
EEUU	8,9%
Alemania	3,8%
España	1,5%
Italia	1,5%

Fuente: *The 2014 International Energy Efficiency Scorecard ACEEE*

Evolution of Industrial Spending in Innovation in Spain, Billion €

Jorge Portilla - ICITI'18   Taipei, Taiwan
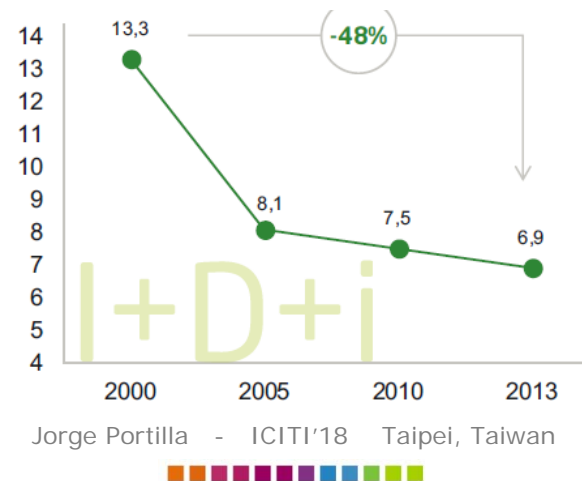
Top 20 companies in Spain by annual turnover (€)

	#	Company	Turnover	Location
🟦	1	MERCADONA SA	19.802.382.000	Valencia
🟥	2	REPSOL PETROLEO SA	15.700.593.000	Madrid
🟥	3	COMPAÑIA ESPAÑOLA DE PETROLEOS SAU	13.466.062.000	Madrid
🟥	4	REPSOL COMERCIAL DE PRODUCTOS PETROLIFEROS SA	12.282.073.000	Madrid
🟥	5	ENDESA ENERGIA SAU	11.729.683.000	Madrid
🟥	6	CEPSA TRADING SAU	10.959.335.000	Madrid
🟦	7	EL CORTE INGLES SA	10.605.372.000	Madrid
🟦	8	INDUSTRIA DE DISEÑO TEXTIL SA	9.293.959.000	Coruña
🟨	9	FORD ESPAÑA SL	8.927.336.000	Madrid
	10	SOCIEDAD ESTATAL LOTERIAS Y APUESTAS DEL ESTADO SME SA	8.809.589.000	Madrid
🟨	11	SEAT SA	8.597.300.000	Barcelona
🟨	12	RENAULT ESPAÑA SA	8.558.402.000	Valladolid
⬛	13	TELEFONICA DE ESPAÑA SAU	8.387.637.000	Madrid
🟦	14	CENTROS COMERCIALES CARREFOUR SA	7.431.262.000	Madrid
🟥	15	IBERDROLA CLIENTES SOCIEDAD ANONIMA.	7.408.323.000	Bizkaia
🟥	16	IBERDROLA GENERACION ESPAÑA SOCIEDAD ANONIMA.	6.605.662.000	Bizkaia
🟥	17	REPSOL TRADING SA.	5.777.809.000	Madrid
🟥	18	GAS NATURAL COMERCIALIZADORA SA	5.742.142.000	Madrid
🟨	19	PEUGEOT CITROEN AUTOMOVILES ESPAÑA, SA	5.153.138.391	Pontevedra
🟥	20	NATURGY ENERGY GROUP SA.	5.062.000.000	Madrid

Legend:
- 🟥 Energy
- 🟨 Automobile
- 🟦 Department stores, Supermarket
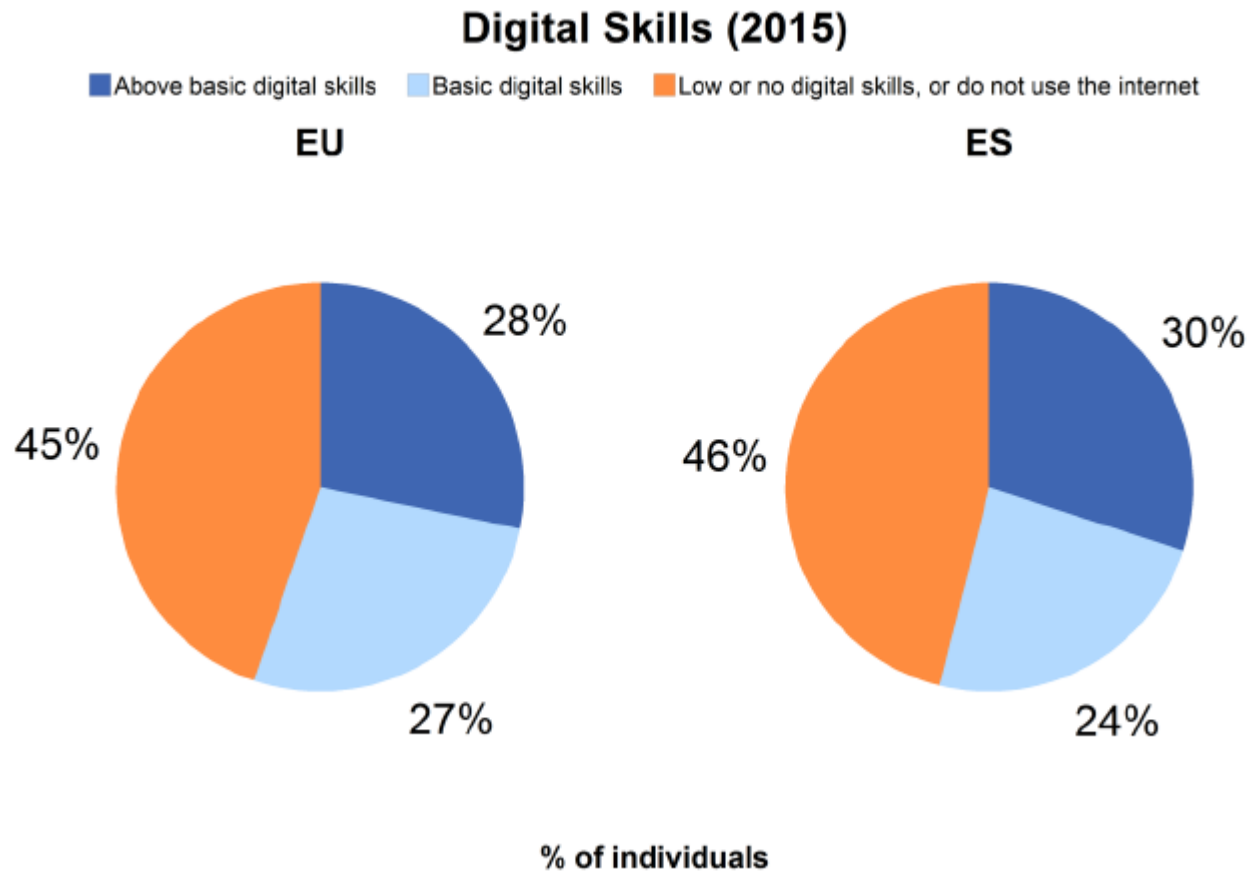- ⬛ Telecomm

Source: eleconomista.es

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Spain Digital Economy and Society Index

Digital Economy and Society Index (DESI) 2018 ranking
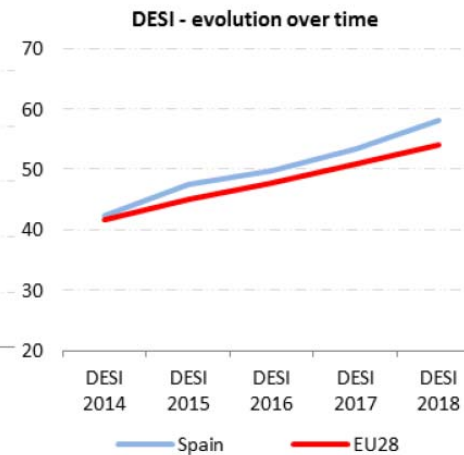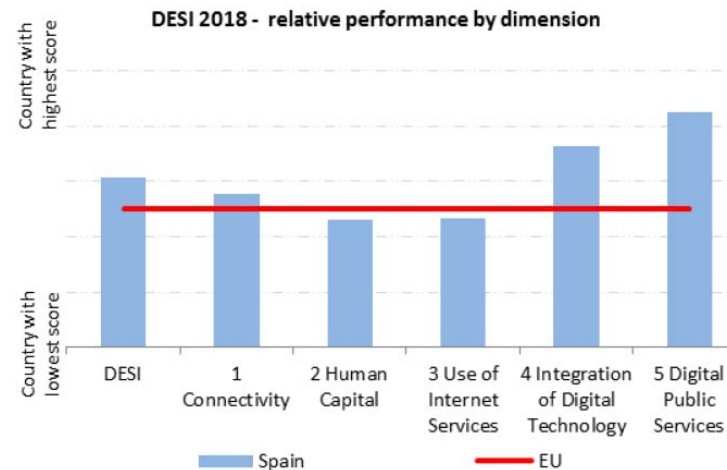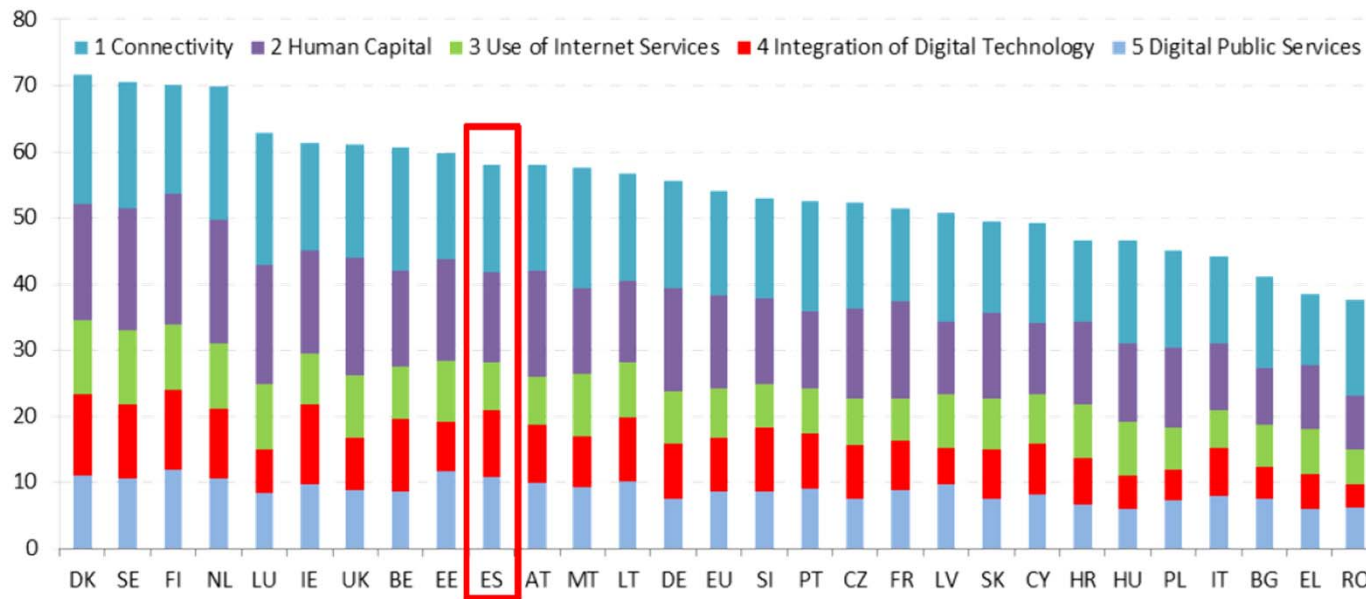
Spain Digital Skills

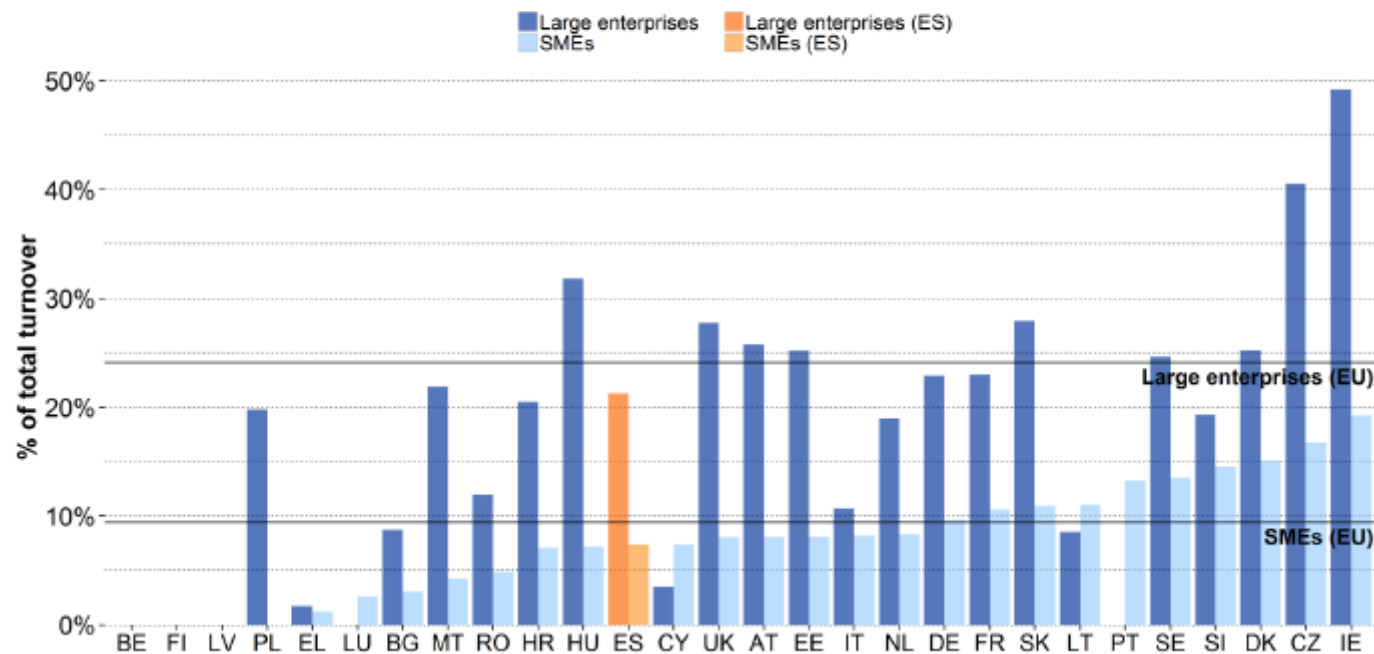## Digital Skills (2015)

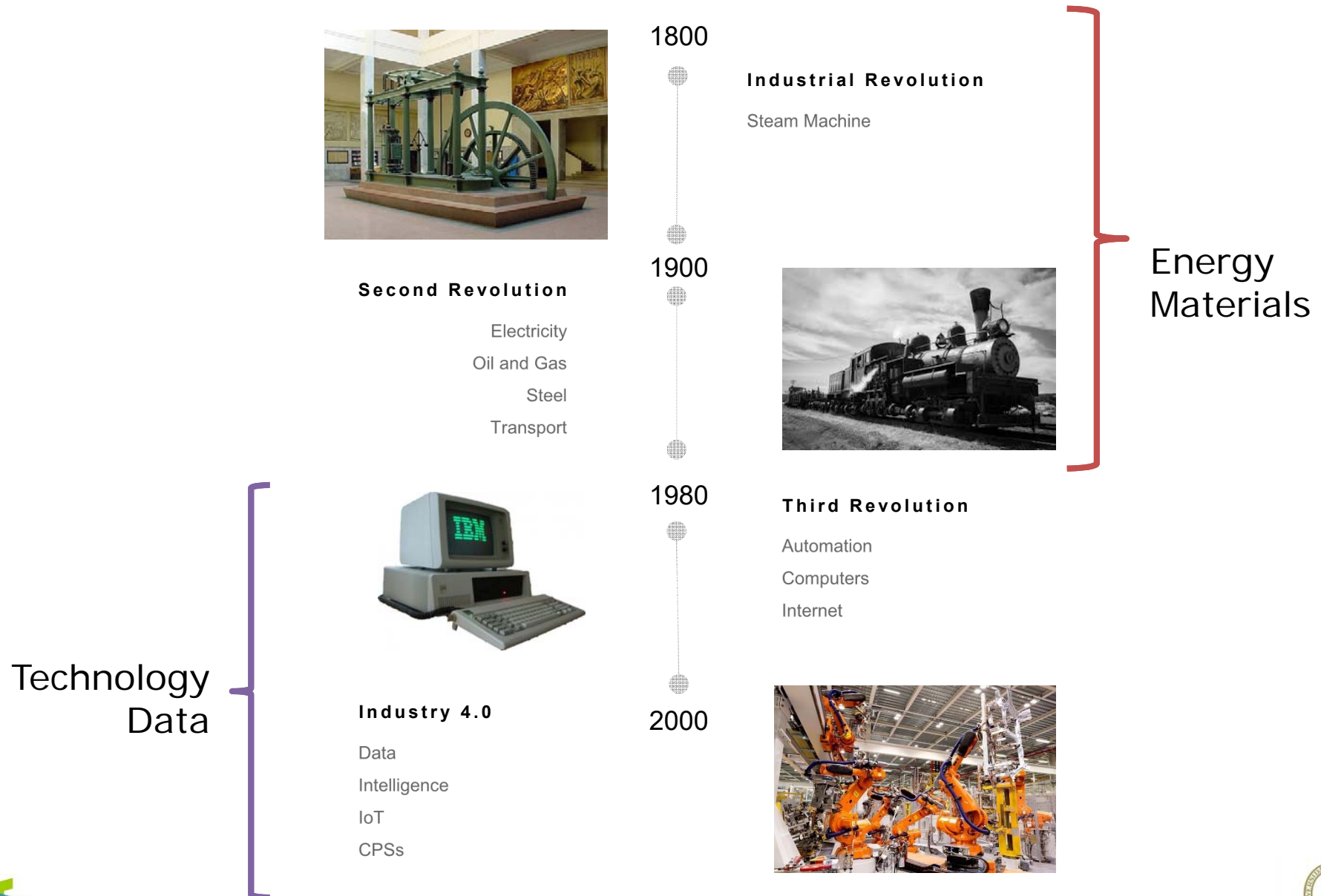■ Above basic digital skills   ■ Basic digital skills   ■ Low or no digital skills, or do not use the internet

EU

28%
45%
27%

ES

30%
46%
24%

% of individuals

Digital technologies in spanish companies

Adoption of Digital Technology by Businesses

■ ES ■ EU

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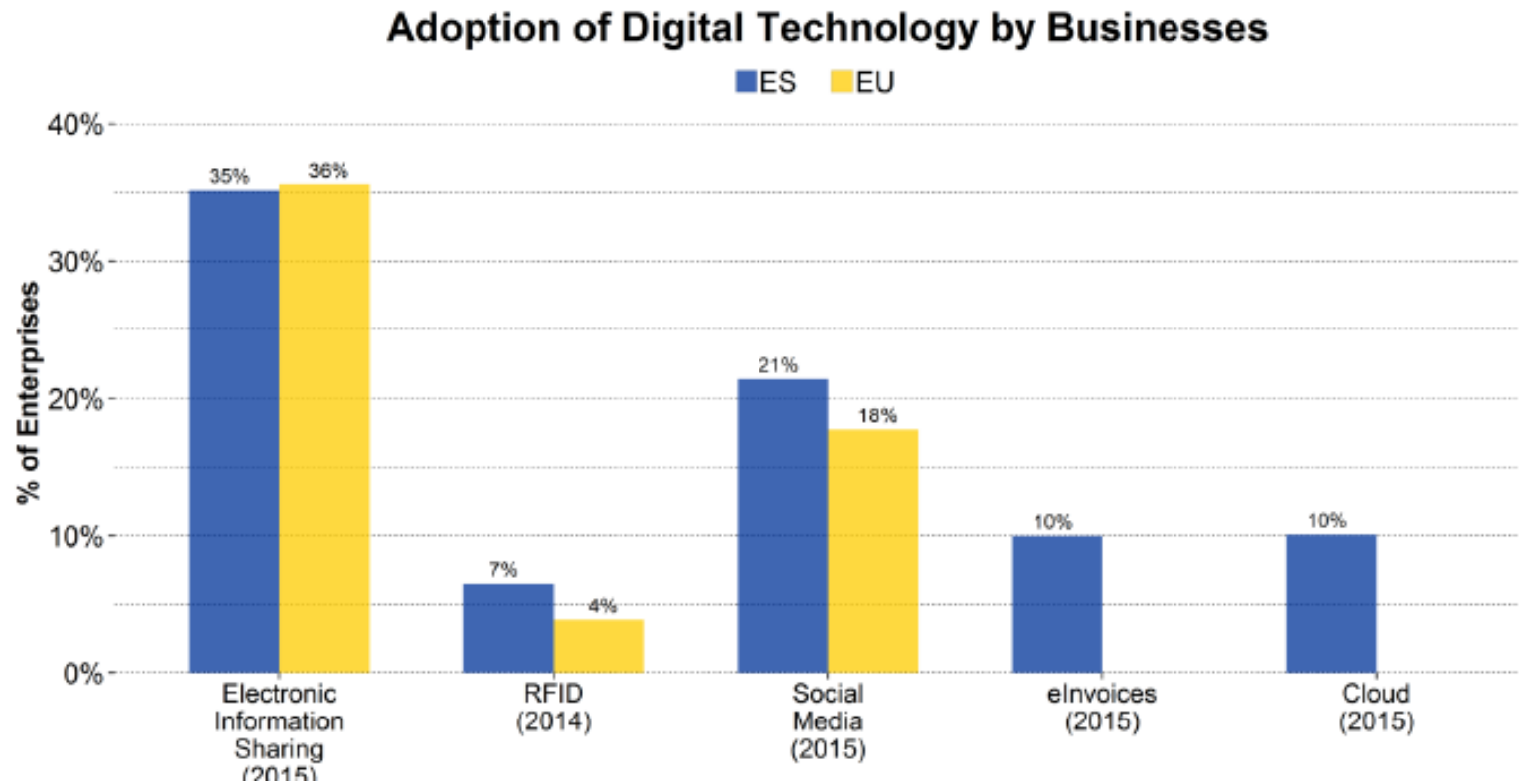
eCommerce

SMEs in Spain obtain on average 7.3% of their turnover from eCommerce (9.4% in the EU).
Large enterprises derive on average 21% of their turnover from eCommerce (24% in the EU).

Turnover from eCommerce (2015)

Industry 4.0

1800

Industrial Revolution

Steam Machine

Second Revolution

Electricity
Oil and Gas
Steel
Transport

1900

Energy
Materials

Third Revolution

Automation
Computers
Internet

1980

Technology
Data

Industry 4.0

Data
Intelligence
IoT
CPSs

2000

Industria Conectada 4.0

Spanish Innitiative: Industria Conectada 4.0

Targets (Ministry):

Value Added

Incrementing the value added and qualified employment of the industry sector

Model

Foster a proprietary model for the industry of the future and developing the local offer for digital solutions

Enablers

Promoting competitive enablers to push Spanish industry and empower the exportation

Efficiency

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Digital Transformation

New challenges
Changes for…

PROCESSES

PRODUCT

BUSINESS MODEL

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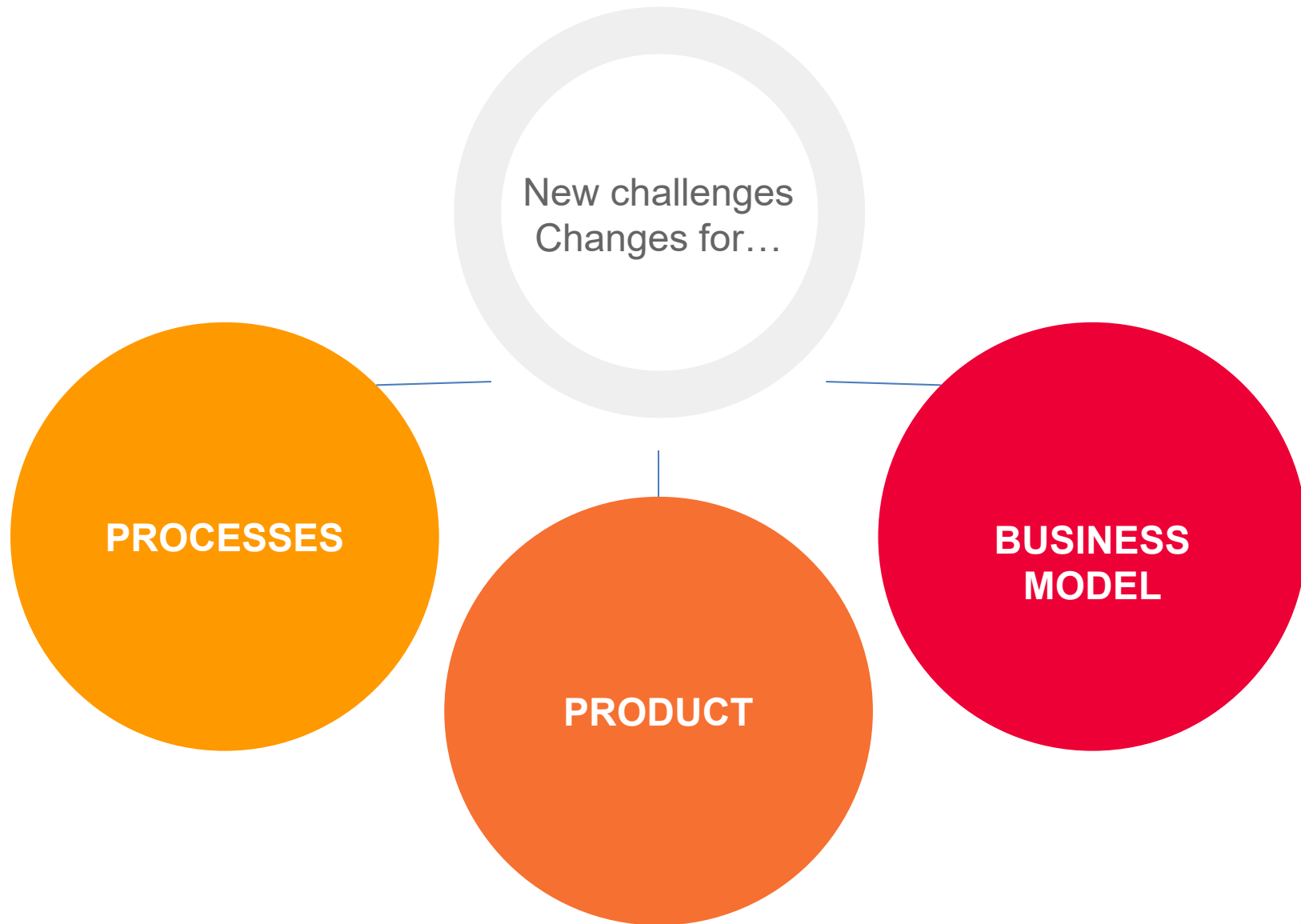
Industria Conectada 4.0

Awareness and training

1. Communication, awareness
2. Academic and employment training

Colaborative environment and platforms

3. Colaborative environment and colabortaive platforms

Pushing to digital enablers

4. Foster the development of digital skills
5. Support for technological companies

Support to to industry for digital transformation

6. Support to the industry for the adoption of the Industry 4.0
7. Funding I4.0
8. Rules, standards

Communication: II Congress "Industria Conectada 4.0"

https://cic40.es/

Industria conectada 4.0

https://www.youtube.com/playlist?list=PLapjNZJIttkvS2G7j8eIgmud3gXhsdM9z

Academy Master Executive in Industry 4.0

Master Executive en Industria 4.0 (Madrid)

THE DIGITAL AND CONNECTED FACTORY

- Introduction to operations in the industrial field
- Introduction to lean manufacturing
- From automation to the digitalization of production processes
- It all started with the PLC`s
- 100% connected systems
- Review of processes prior to the definition of the strategy
- Analysis and diagnosis of digital transformation
- Roadmap towards Industry 4.0
- Challenges of the digital and connected factory
- Trends in corrective, preventive, predictive maintenance and other denominations
- Make more, better and cheaper with emerging technologies

INTRODUCTION AND USE OF EMERGING TECHNOLOGIES FOR THE INDUSTRY 4.0.

- Introduction to telecommunications
- Introduction to communications networks
- Current panorama of emerging technologies
- Internet of Things (IoT) and RFID
- Industrial sensorization
- Design of IoT devices
- Integration and management of sensors and devices in IoT platforms
- Cyberphysical systems
- Additive manufacturing and trends in materials
- Cloud computing
- Generating and developing Big Data
- Design of algorithms in the industrial environment
- Artificial intelligence and machine learning
- Industrial robotics, trends in collaborative robots
- AGVs LGVs and intelligent storage systems
- Virtual reality in the design of services
- Augmented reality and its application
- Cybersecurity in industrial environments
- New horizons for blockchain in the industry
- New tools for technology development

NEW MODELS OF BUSINESS AND PEOPLE MANAGEMENT

- Social networks and the digital transformation of the company
- Development of new business models
- Product design 4.0: device + service
- Operating systems as business enablers
- Process innovation vs. product innovation
- Talent Strategies 4.0
- Digital transformation of organizations
- Creativity workshops
- Build the "story 4.0"
- Impact communication workshop
- R + D + i Strategies in Industry 4.0
- Financing of projects and companies
- Good practices in the implementation of emerging technologies

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Industria Conectada 4.0

Self-diagnosis online tool for companies

https://hada.industriaconectada40.gob.es/hada/register

- Available for any industrial company

- Objective: Allows to evaluate the degree of maturity of a company to face challenges of the Industry4.0.

- Results : Presents the particular result and a comparison with other similar entities

- Pioneer : inside the European Union, is the only public tool for self-diagnosis that companies can use for free.

- It will allow the creation of the "barometer" of the Industry 4.0 in Spain, to point the level of maturity o the industry

Industria Conectada 4.0

Industria Conectada 4.0

Level of digital maturity

Introduction   Development   Consolidation

Static   Aware   capable   dynamic   reference   leader

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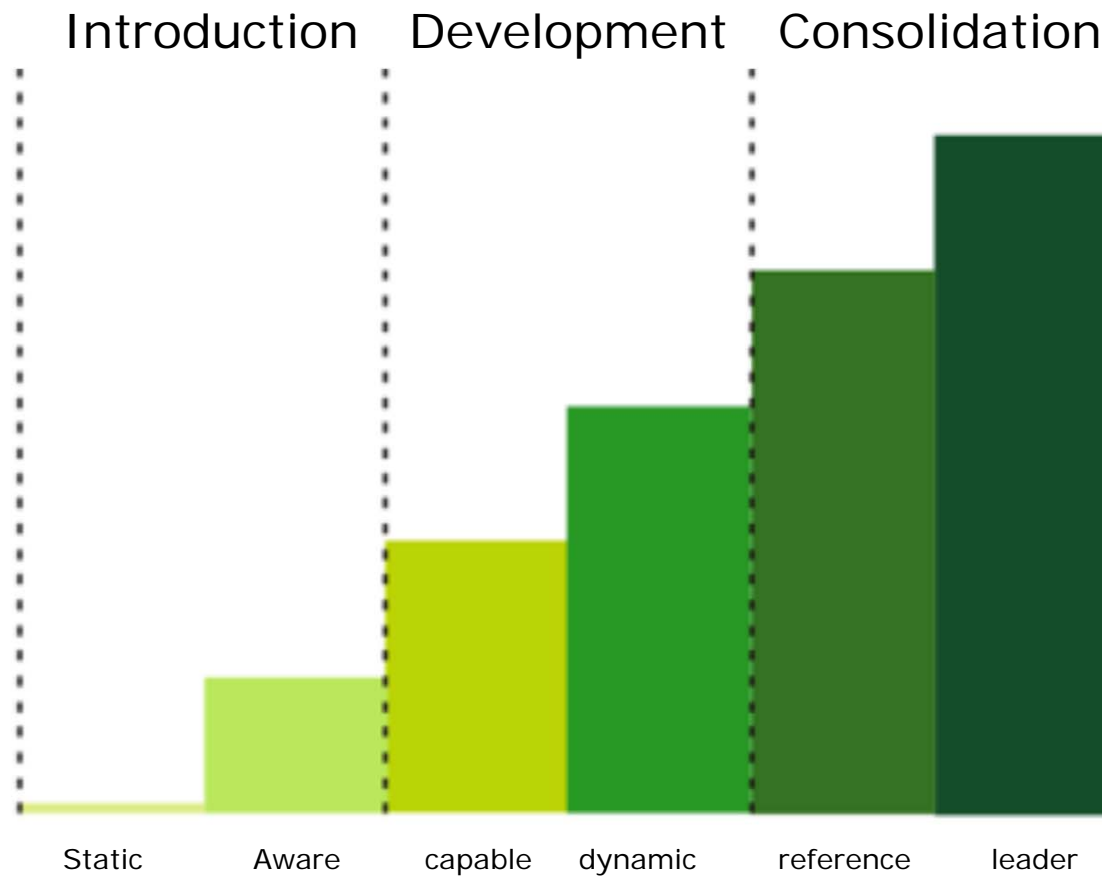
"Activa Industria 4.0" program

- Specialized and personalized advice program carried out by accredited consultants with experience in the implementation of Industry 4.0 projects
- It will allow companies to have a situation diagnosis and a transformation plan that identifies digital enablers and establishes the roadmap for their implementation
- All the Spanish Autonomies are participating
- 193 companies and 15 consultant companies
- For SMEs

Industria conectada 4.0

https://www.youtube.com/watch?v=T8kB4iP62B8

Colaborative platforms

Grouping of Innovative Companies

Asturias 4	Cantabria	País Vasco 7	Navarra 4
Galicia 8		La Rioja	Cataluña 22
	Castilla y León 8	4	Aragón 11
	8 C.Madrid		
Extremadura 3	Castilla-La Mancha	C. Valenciana 7	Islas Baleares 2
Andalucía 6		Murcia 4	Islas Canarias 2
Ceuta 1	Melilla		

National Scope 27

SECTOR	GIC
Consumer goods	25
Agrofood	11
Home and forniture	7
Fashion	3
Textil/shoes	2
Kids, toys, sports	2
Transport and logistics	20
Automotion	8
Aeronautics	4
Naval	3
	5
ICT	14
Machinery and Industrial technology	9
Environment, energy	12
Turism	8
Media	4
Materials	4

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Digital Innovation Hubs

- <u>Innititative from European commission,</u> 2016
- **Digital innovation hubs** are ecosystems that consist of SMEs, large industries, start-ups, researchers, accelerators, and investors. They aim to create the best conditions for long-term business success for all involved.
- DIHs help companies to become more competitive with regard to their business/production processes, products or services using **digital technologies**
- The rationale behind this initiative is to help European Industry, small or large, high-tech or not, to grasp the digital opportunities. The Commission focuses 500 M€ in 5 years from Horizon 2020 budget to support the development of DIHs
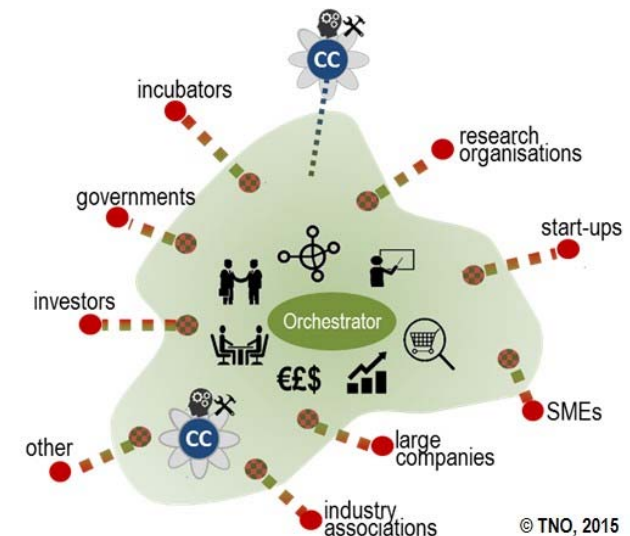
More than 50 DIHs in Spain

Technologies for the Industry 4.0

Artificial Intelligence and Machine Learning
Additive Manufacturing
Robotics
Cybersecurity
Cyber Physical Systems
Virtual and Augmented Reality
Cloud Computing (and Fog and Edge)
Big Data
Sensors
Communications
Embedded Systems
Internet of Things

DATA

Internet of Things

Identified as one of the enablers of the Industry 4.0 (in fact is composed of several ones)

IoT

Cloud

Fog

Edge

Extreme Edge

Less resources, less power

Data centers
Super Computers
Internet Core Network
Computers
Smart Phones
Smart Appliances
Wearables
Smart Sensors
Motes
Smart Dust
Zero-power sensors

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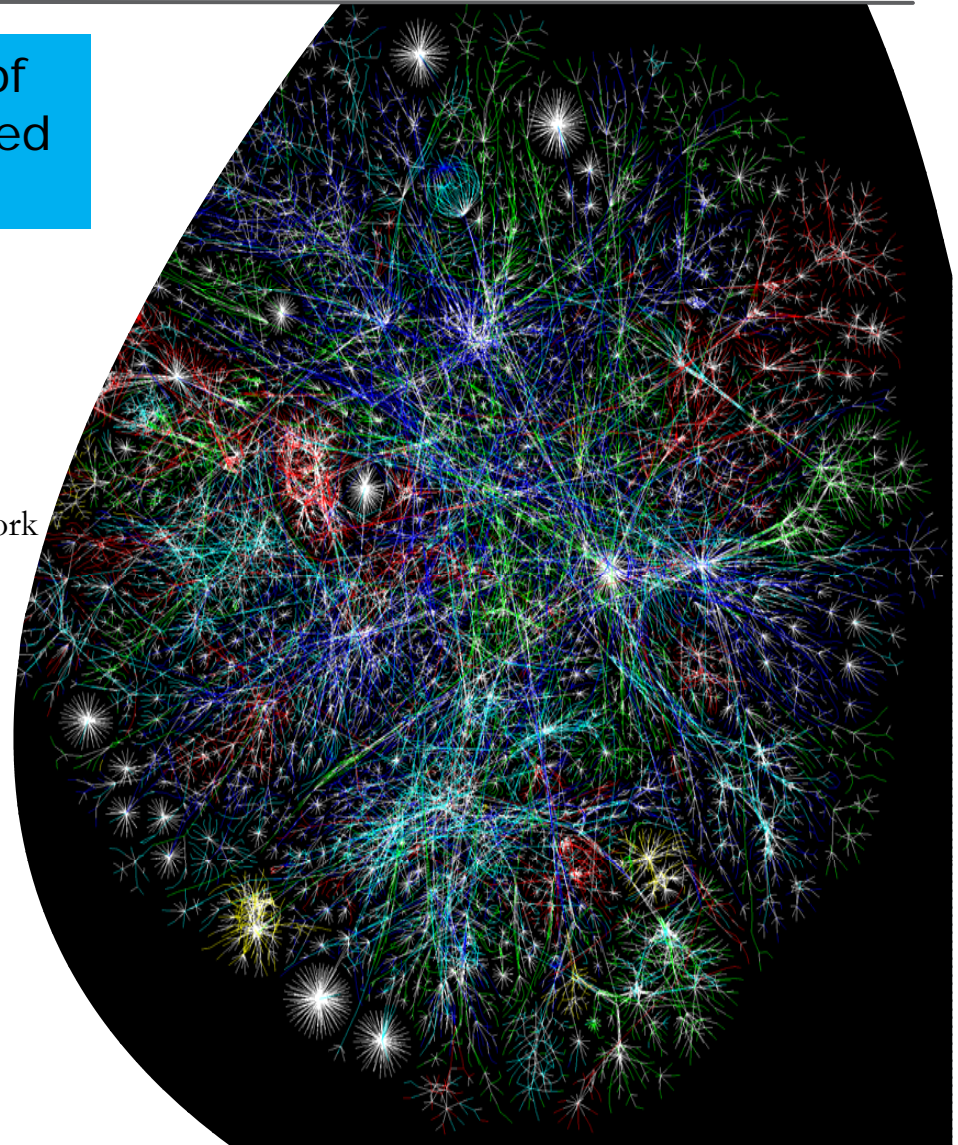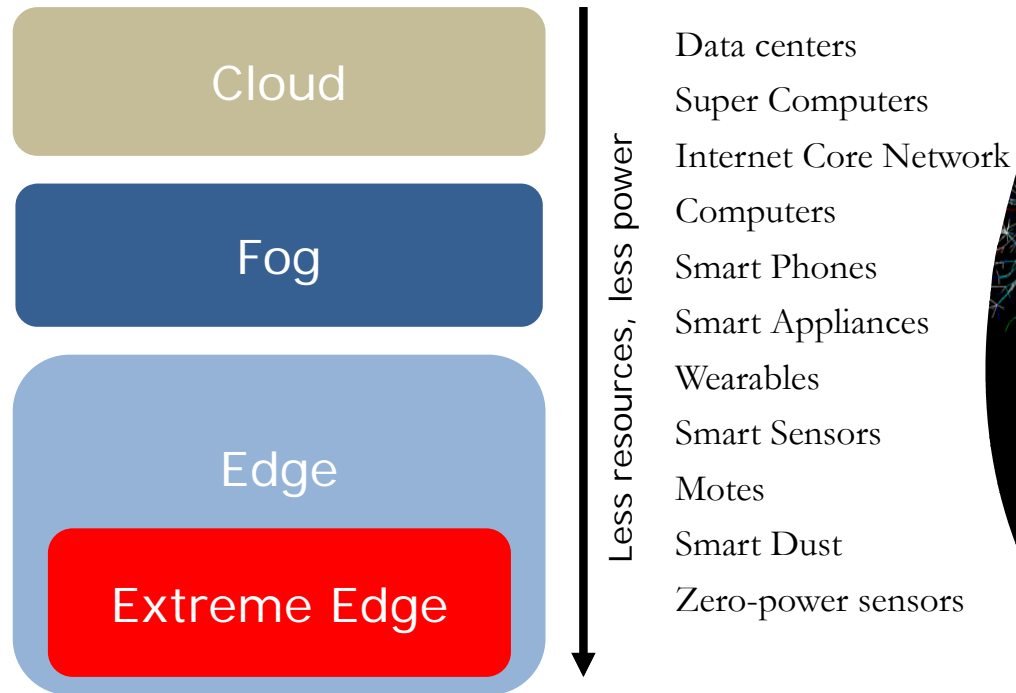
Internet of Things

1999!

"THE INTERNET OF THINGS IS ABOUT EMPOWERING COMPUTERS …SO THEY CAN SEE, HEAR AND SMELL THE WORLD FOR THEMSELVES"

KEVIN ASHTON
INVENTOR OF THE TERM
"INTERNET OF THINGS"

We need to empower computers with their own means of gathering information, so they can see, hear and smell the world for themselves, in all its random glory. RFID and sensor technology enable computers to observe, identify and understand the world—without the limitations of human-entered data.

If we had computers that knew everything there was to know about things—using data they gathered without any help from us—we would be able to track and count everything, and greatly reduce waste, loss and cost. We would know when things needed replacing, repairing or recalling, and whether they were fresh or past their best.

RFID JOURNAL — Search RFID Journal

Home | Internet of Things | Aerospace | Apparel | Energy | Defense | Health Care

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That 'Internet of Things' Thing

In the real world, things matter more than ideas.

By Kevin Ashton

Tags: IT/Infrastructure, Operations

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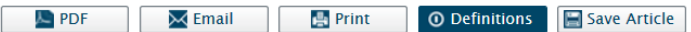
Like 160 | Tweet 912 | Google +1 84 | Share 315

Jun 22, 2009—I could be wrong, but I'm fairly sure the phrase "Internet of Things" started life as the title of a presentation I made at Procter & Gamble (P&G) in 1999. Linking the new idea of RFID in P&G's supply chain to the then-red-hot topic of the Internet was more than just a good way to get executive attention. It summed up an important insight—one that 10 years later, after the Internet of Things has become the title of everything from an article in Scientific American to the name of a European Union conference, is still often misunderstood.
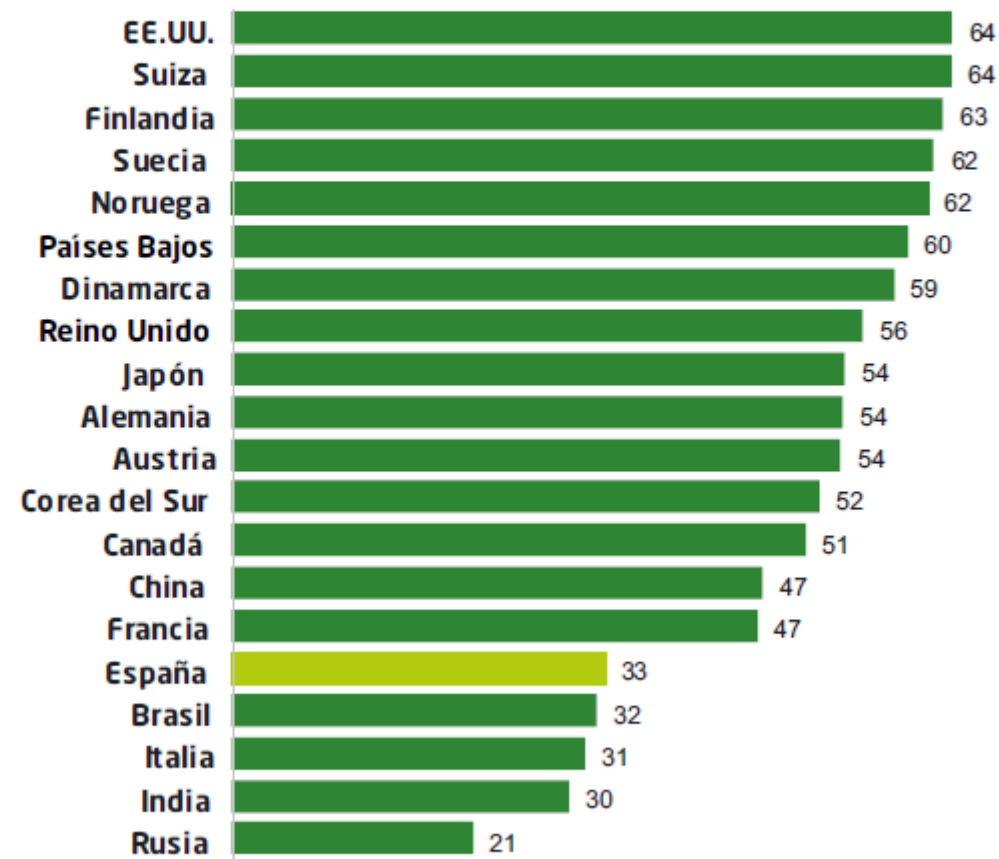
The fact that I was probably the first person to say "Internet of Things" doesn't give me any right to control how others use the phrase. But what I meant, and still mean, is this: Today computers—and, therefore, the Internet—are almost wholly dependent on human beings for information. Nearly all of the roughly 50 petabytes (a petabyte is 1,024 terabytes) of data available on the Internet were first captured and created by human beings—by typing, pressing a record button, taking a digital picture or scanning a bar code. Conventional diagrams of the Internet include servers and routers and so on, but they leave out the most numerous and important routers of all: people. The problem is, people have limited time, attention and accuracy—all of which means they are not very good at capturing data about things in the real world.

And that's a big deal. We're physical, and so is our environment. Our economy, society and survival aren't based on ideas or information—they're based on things. You can't eat bits, burn them to stay warm or put them in your gas tank. Ideas and information are important, but things matter much more. Yet today's information technology is so dependent on data originated by people that our computers know more about ideas than things.

Internet of Things

% of adoption of enablers related to the Internet of Things

País	Valor
EE.UU.	64
Suiza	64
Finlandia	63
Suecia	62
Noruega	62
Países Bajos	60
Dinamarca	59
Reino Unido	56
Japón	54
Alemania	54
Austria	54
Corea del Sur	52
Canadá	51
China	47
Francia	47
España	33
Brasil	32
Italia	31
India	30
Rusia	21

Fuente: *Winning with the industrial internet of things*, Accenture

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Wireless Sensor Networks

Wireless Sensor Networks

A Wireless Sensor Network (WSN) is a set of tiny nodes that take measurements from the environment using sensors and communicate information based on these measurements to the rest of the network wirelessly, in order to process and make decisions in a variety of applications

This is the extreme edge of the IoT
The data gatherer

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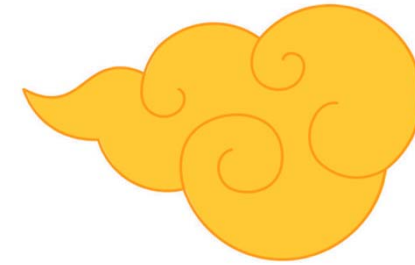
Internet of Things for the Smart Factory
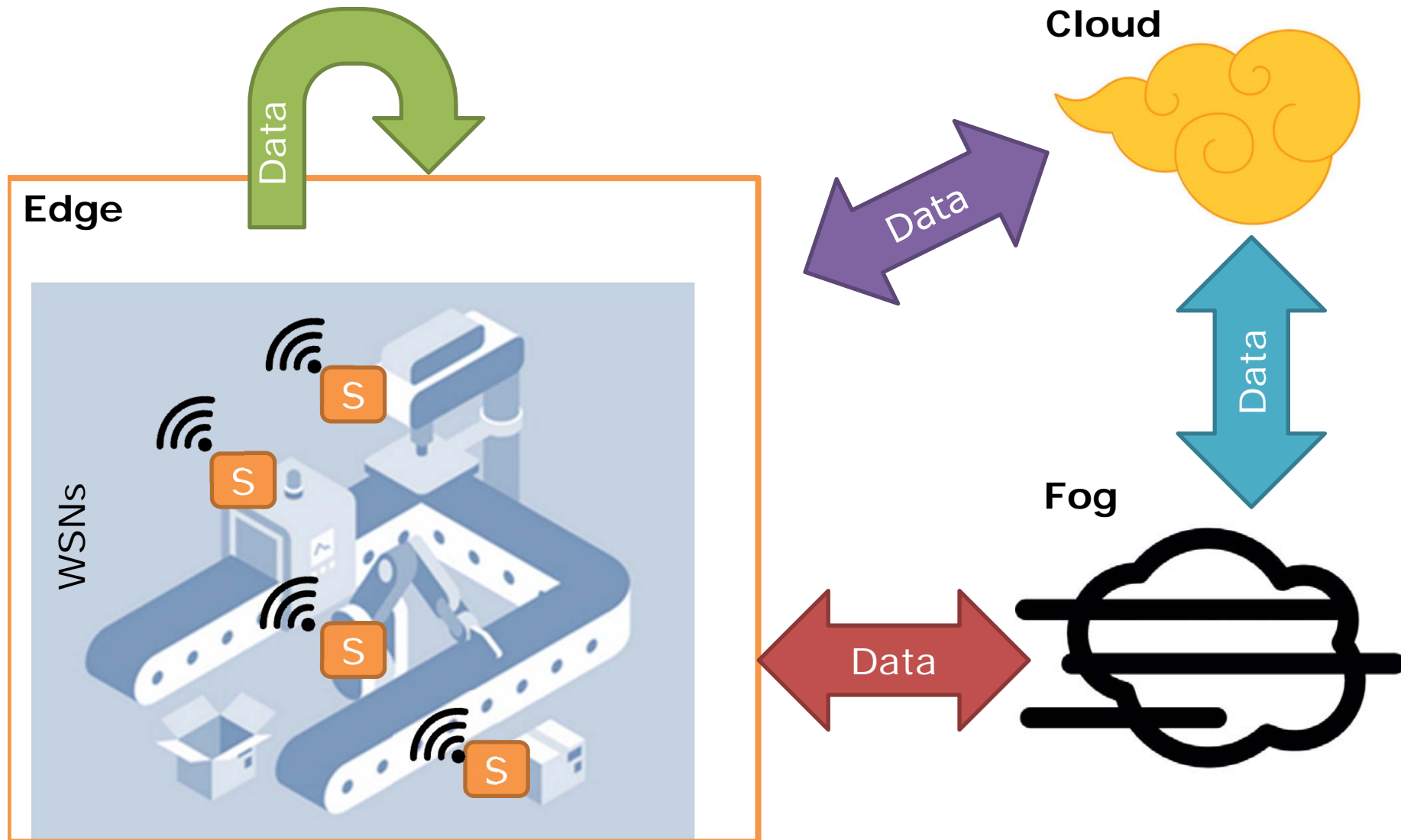
Big data, Cloud computing

Data Wave
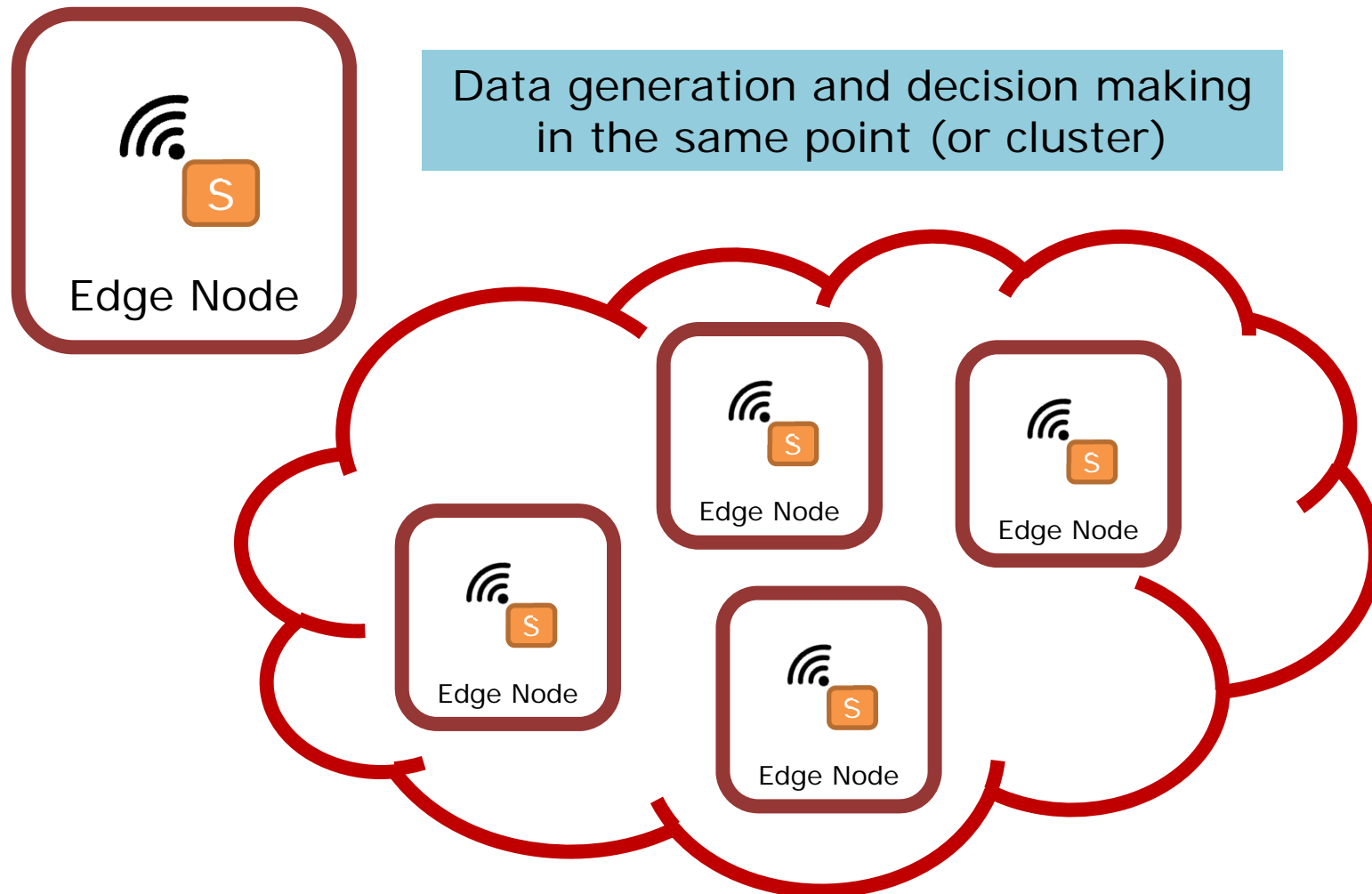

Cloud

High Processing Resources
Machine Learning
Data Centers
GPUs
Patterns
Analytics
Statistics
Big Data

"Small data", Edge computing

Bring resources where data is generated
Decrease latency
Decrease data in the network

Data generation and decision making in the same point (or cluster)

IoT at CEI-UPM

Modular edge node: The Cookie

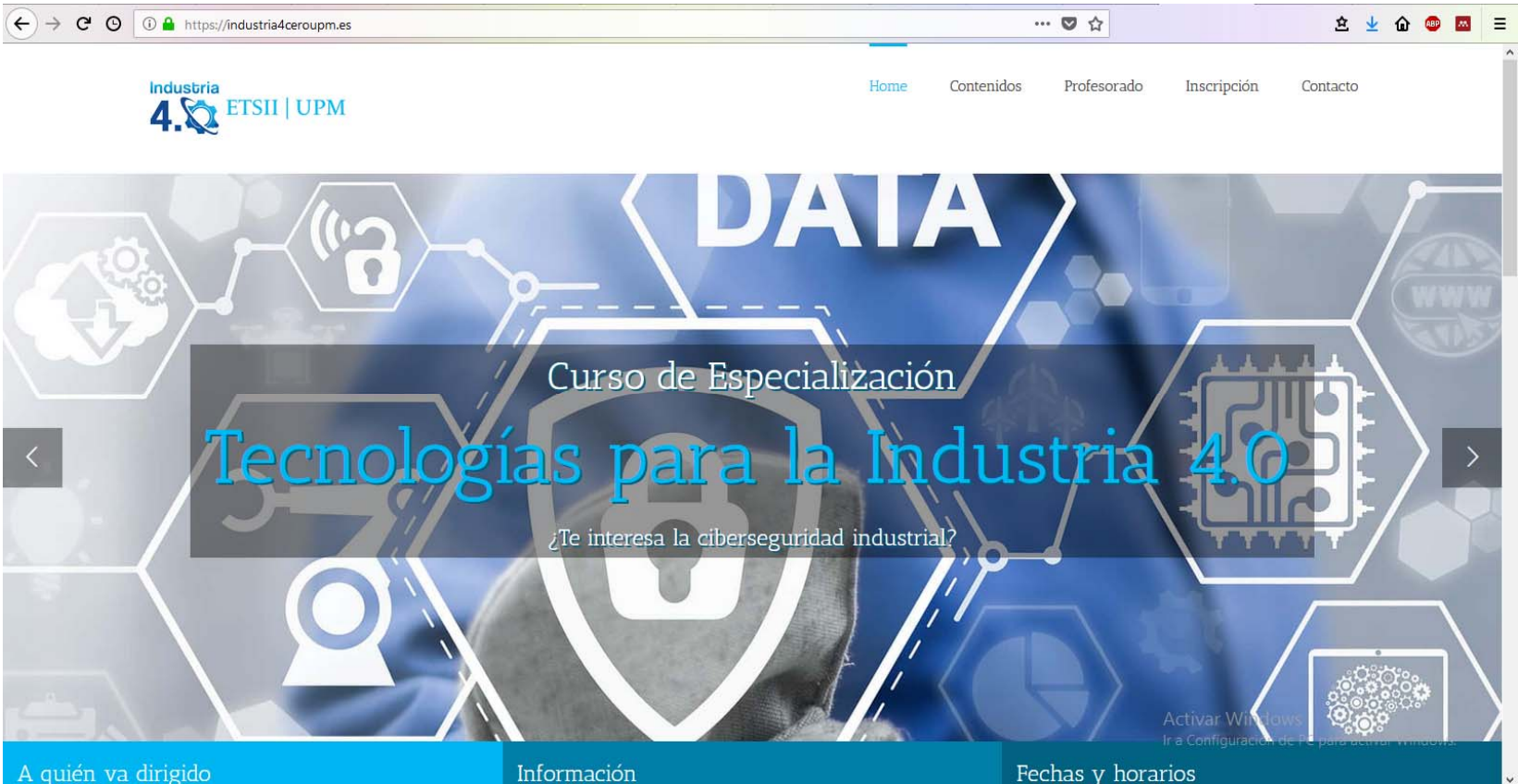http://www.cei.upm.es/research/digital/wireless-sensor-networks/

At Universidad Politécnica de Madrid

At UPM

Specialiced course on technologies for Industry 4.0
Duration: 1 year (30 ECTS credits)

https://industria4ceroupm.es/

Thank You

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