SPANISH NATIONAL REPORT

Fostering the Adoption of ICT-enabled AMTs by European SMEs

Lead organization
CENFIM

FAME – Fostering the Adoption of
ICT-enabled AMTs by European
SMEs
2018-1-FR01-KA202-04780

Revision History

Version	Date	Author	Description	Action	Pages
A	16/12/2018	CENFIM	Creation	C	14
B	21/01/2018	CEMFIM	Update template	U	22

(*) Action: C = Creation, I = Insert, U = Update, R = Replace, D = Delete

Referenced Documents

ID	Reference		Title
1	2018-1-FR01-KA202-04780		FAME Proposal
2			

Applicable Documents

ID	Reference	Title
-	-	-

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Introduction

To understand the importance of the ICT - enabled AMT in Spanish's SMEs, is necessary, first of all, to get in context.

In Spain, there are 3.226.582 enterprises. Of this amount, only the 38,9% of enterprises can be considered as large enterprises. The remaining 61,1% of enterprises are SMEs.

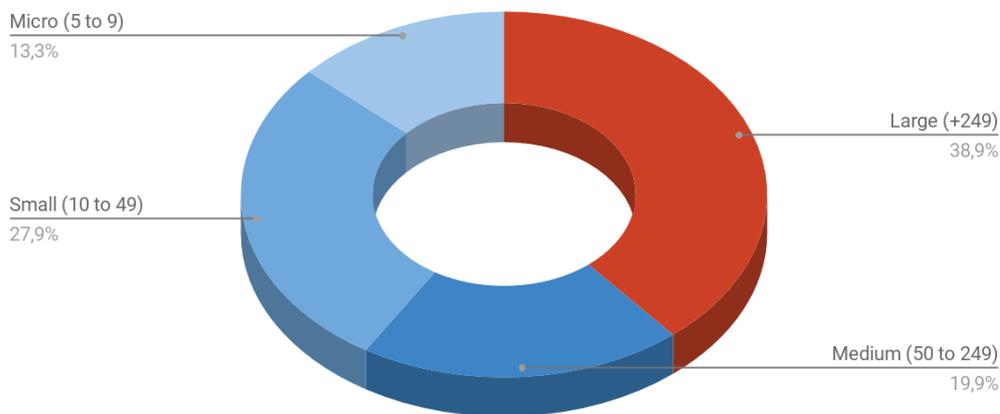## Spanish enterprises distribution by employees number

Figure 1 Spanish enterprises distribution by employees number. #Ref [5]

Considering this information, it's necessary to assume that the engine of the Spanish economy is supported by these SMEs.

With this project, we want to introduce or improve the ICT - enabled AMT adoption in these companies.

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Fame will focus on 4 sectors:

- Food Industry
- Wood Industry
- Metal industry
- Electronic and Electronical equipment industry

The objective of the implementation of ICT-enabled for AMT is the necessity to introduce the industry 4.0

The actual situation of ICT - enabled for AMT in Spain

Nowadays, the traditional industries are living a big challenge to recycle themselves and start using new technologies to become more competitive. These new opportunities are difficult to adopt, but

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this digital transformation era will redefine them from the core to the last cell, usually modifying from the business model to the production lines and logistics.

Regarding the economy, Spain is the 5th EU economy and the 13th worldwide, and the big representatives of this economy are considered global leaders in business and innovation in food and beverages, metal manufacturing, motor vehicle, and component manufacturing.

Also, the GAV SME contribution is above the EU2 average and as a consequence, plays an important role in the development of the Spanish economy.

Spain is already doing good progressing about adopting technologies. For example, cloud computing (13%), selling online (19%), using electronic invoicing (25%), and but only are selling online cross-border (5,9%).

(*"Analysis of National Initiatives for Digitising Industry. Spain: Industria Conectada 4.0" #Ref [2]*)

This adoption of technologies is due to the infrastructure that Spain is already developing.

As we can see in *Fig. 2* (scale 1 to 7), Spain in collaboration with other organisms is already working in the ICT infrastructure and affordability to be competing against more developed markets.

Also, we can appreciate the needing of skills and education for the use of ICT - enabled AMT.

(*"CaixaBank Research, based on data from the World Economic Forum" #Ref [3]*)

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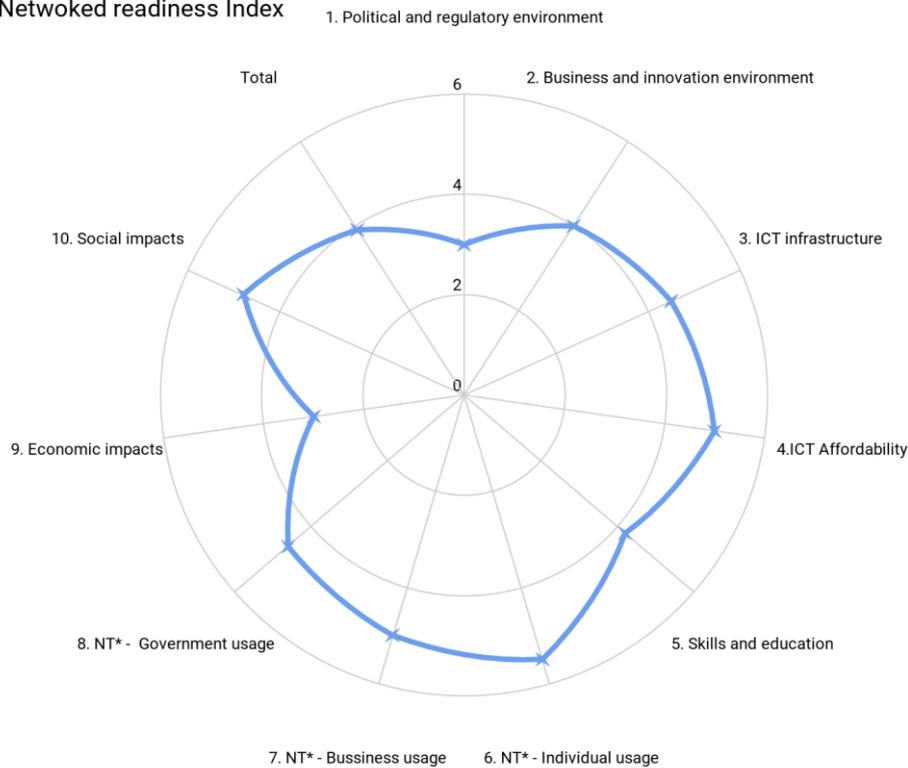SMEs
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Figure 2 Spanish Networked Readiness Index. #Ref [3]

(NT* = new technologies)

One of the attributes which allow boosting the ICT Infrastructure is the implantation of fiber optic, where Spain is the 3rd country in the OECD with greater growth. (*"ICEX, Information and Communication Technologies sector, 2016" #Ref [4]*).

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Despite this, the study of the European Commission determines that the companies with more than ten employees, working in sectors where less than 30% have a high level of digital intensity, are:

- Manufacturer: food, beverages, tobacco, textile, leather, wood, paper; publishing and printing.
- Manufacturer: coke, petroleum, chemical, plastics, other non-metallic mineral products.
- Manufacturer: basic metals & fabricated metal products excluding machines & equipment.
- Manufacturer: computers, electric & optical, motor vehicles, transport equipment, furniture, repair.
- Electricity, gas, steam, air conditioning; water supply, sewerage, waste management & remediation.
- Construction.
- Retail trade, except motor vehicles and motorcycles.
- Transport and storage.
- Administrative and support service activities.

(*"Digital Scoreboard 2016 and other information relevant for decisions about Digital Innovation Hubs. Spain" #Ref [11]*)

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Use of ICT - enabled AMT in Spain

This is the actual situation of use of TIC in SMEs.
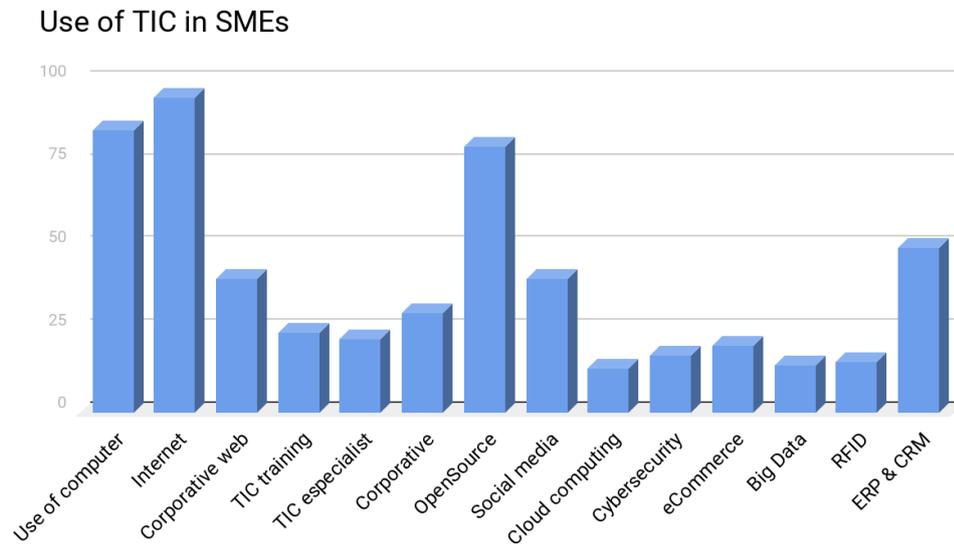
Use of TIC in SMEs

Figure 3 Use of TIC in SMEs. #Ref [5]

Talking about industry 4.0, it's possible to see that the industry 4.0 has not been already introduced properly into the industry.

Some technologies have been adopted during this years, like cybersecurity, cloud computing, and big data, but generally, these technologies have been adopted by large enterprises.

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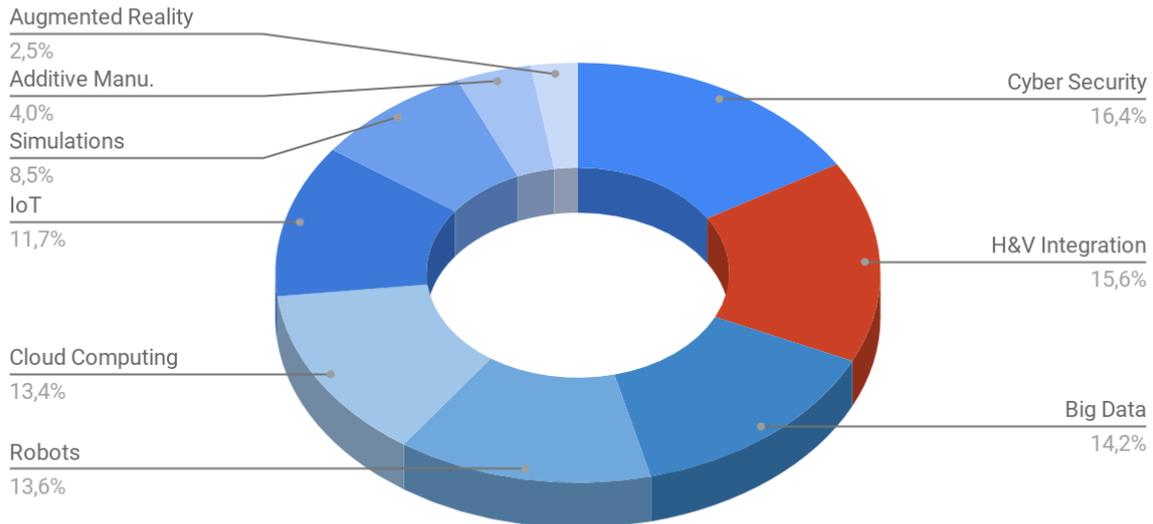
Use of ICT - enabled AMT in Spain

Figure 4 Use of ICT - enabled AMT in Spain. #Ref [1]

As we can appreciate in *Fig 4. Use of ICT - enabled AMT in Spain* all the 4.0 industries technologies are being adopted more or less progressively, especially in large companies, but it's necessary for the SMEs to understand the importance of this technologies.

Due to this lack of knowledge and the being deficient in good practices, the SMEs are not being as profitable as they could be, and this factor is really important due to their weigh on the Spanish Economy.

Some opportunities are better prepared to be implemented than others. This happens because of the infrastructure already built, the previous adoption of the technologies by large companies, previous experience in different markets, etc. But it's important to start training the companies for the full adoption of these technologies. With education and know-how, the SMEs will increase their revenues and improve their performance.

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Best opportunities in the Spanish ICT sector

According to the information from (*"ICEX, Information and Communication Technologies sector, 2016" #Ref [4])*, there are technologies that would contribute with bigger opportunities for the Spanish industry because of the previous implantation and are more favorable to be exploited.

These technologies especially influence the society and the industry in these facets:

Big Data

Big data is a term that describes the large volume of data – both structured and unstructured – that inundates a business on a day-to-day basis. Big data can be analyzed for insights that lead to better decisions and strategic business moves.

- **User**: Understand the profile, needs, and feelings of the industry costumers. Adapt the way the company interacts with its clients.
- **Demand**: Benefit to businesses, organizations and the general public. Allows detecting patterns, trends, and correlations to make informed decisions.
- **Company**: Get value through the use of information by developing new products that meet these business needs.

Cybersecurity

Cybersecurity consists of technologies, processes, and controls that are designed to protect systems, networks, and data from cyber-attacks.

- **User**: Create defense mechanisms against online risks for the 4 types of consumer's cybersecurity solutions: Central government, Critical infrastructure, SMEs and citizens.
- **Company**: Opportunity to work on a new business line.
- **Society**: Society is prone to interact with the companies if they feel secure while is on the internet.

Internet of Things

The Internet of things (IoT) is the network of devices, vehicles, and home appliances that contain electronics, software, actuators, and connectivity which allows these things to connect, interact and exchange data.

- **User**: The user will gain in cost savings, comfort, personalization and analysis and real-time information.

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- **Business**: Fit the products and services in the markets offering the customers higher quality and solutions for their demand. New business opportunities.
- **Technology**: New era of development has arrived and with it, revolutionary applications with the potential to improve the way people live, learn work and play.
- **Company**: To launch products that archive the conversion of data into information and knowledge.

Benefits could provide other ICT

Moreover, it's necessary to don't forget about the technologies with a great potential for the industry development and how they can help.

Additive manufacturing (3D Printing)

Additive Manufacturing (AM) is an appropriate name to describe the technologies that build 3D objects by adding layer-upon-layer of material, whether the material is plastic, metal, concrete and other materials.

- **User**: Rapid prototyping of an industrial idea, the efficient use of resources, production in small batches and streamlined production.
- **Company**: Rapid prototyping of an industrial idea, reducing costs and achieving personalized production.
- **Society**: Advances in key sectors which will help in different targets, producing an increase of interest for the consumer.

Cloud Computing

Cloud computing is shared pools of configurable computer system resources and higher-level services that can be rapidly provisioned with minimal management effort, often over the Internet. Cloud computing relies on sharing of resources to achieve coherence and economies of scale, similar to a public utility.

- **User & Company**: The use of cloud computing will provide different advantages, as cost saving, security, flexibility, mobility, increased collaboration, data recovery, automatic software updates, etc.
- **Society**: Cloud computing will create a new form of communication and work style.

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Horizontal and vertical integration

A horizontal integration consists of companies that acquire a similar company in the same industry, while a vertical integration consists of companies that acquire a company that operates either before or after the acquiring company in the production process.

- **Company**: Thanks to this strategy, the companies will increase their competitiveness, have a greater process control, increase the market share, increase the supply chain coordination a decrease the production costs.
- **User**: Reduced costs in products and services, gaining quality and increasing satisfaction.

Robotics

Machines that can substitute for humans and replicate human actions. Robots can be used in many situations and for lots of purposes.

- **User**: Have a lighter, safer, faster work.
- **Company**: Decrease production costs, shorter cycle times, improved quality and reliability, reduced waste, increased safety, etc.
- **Society**: The society will be more interested in the sectors which use robotics due to the cost reductions of products and services, the improvement of quality, shorter cycle times, etc.

Augmented / Virtual reality

AR is an interactive experience of a real-world environment where the objects that reside in the real-world are "augmented" by computer-generated perceptual information, sometimes across multiple sensory modalities.

VR is an interactive computer-generated experience taking place within a simulated environment.

- **User & Society**: The user will be able to see the product before it has been even produced, the necessities will fit perfectly with the desire, which will reduce final costs and elevate the satisfaction.
- **Company**: Decreasing costs by having the correct design before the production, increase the speed of work thanks to the AR, for example when assembling furniture, generating a new style for training or showing new ambient using VR, etc.

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Simulation

Imitation of the operation of a real-world process or system.

- **User**: Like the other ITC, it will report reduction costs to the final user and better products and services.
- **Company**: Real life experience, immediate feedback, cooperation, no risks, reduce the costs and production time are some of the benefits this technology can provide.

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Scenario by sector

Referring to the document (*"Informe e-Pyme 2017" #Ref [5]),* The Food industry represents the 14,8% of the industry sector, Wood the 11,4%, Metal 17,9% and Electronics the 2,3% of Spanish Industry

Spanish industry

Electronic and electronical Industry
2,3%

Metal Industry
17,9%

Wood Industry
11,4%

Food Industry
14,8%

Rest of Industries
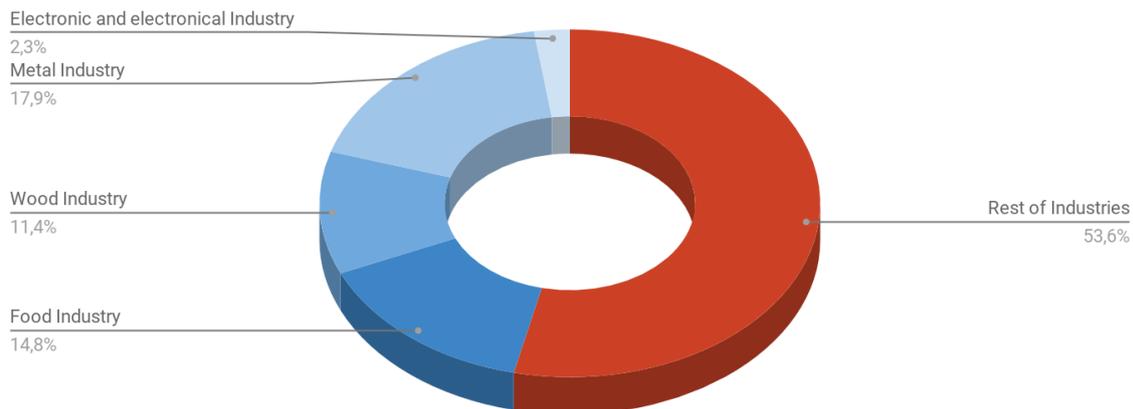53,6%

Figure 5 Spanish Industry by sector. #Ref [5]

Based on this scenario, we must analyze the status of this four industries in different branches that will be englobed as:

- **VR / Simulation**: Virtual reality and simulations.
- **Management**: Big data, Robotics, Horizontal and Vertical Integration.
- **ICT - tools**: Cloud computing, Cybersecurity, IoT and Additive manufacturing.

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VR / Simulation

Food industry

The Food industry is adapting itself to the possibilities of the VR / simulations technologies. These possibilities go from training the employees, virtual reality tours, giving extra information to the customers to market study about packaging.

The possibilities focused in the costumers thank the VR / simulations are limitless. The most important field to exploit is marketing, where the customer will be able to have extra information about products.

Some of the big companies, as Mahou San Miguel, has developed an APP called Magic Beer (developed by Smartech Group) which allows the client to interact with their bottles, based in patterns. This interaction will show videos, images, logos, etc. which permit a lot of possibilities for different campaigns.

Another use of this technology is to get closer to the customer by showing their installations and how they work. For example, Nestle is offering a guided virtual tool to show the company.

b) Wood industry

In the Wood industry, the VA / Simulation are really interesting technologies to continue adopting.

The possibilities in this industry are really important, not only speaking about design and prototypes but also customer focused market.

These technologies improve the perception of the client on the final product they will be buying, to have an idea where to place the furniture or how will look like their home after a remodeling.

Ikea, for example, has developed an APP that allows to place virtual furniture at your own home and to decide if it will fit correctly at the dining room.

Some furniture stores will also include different patterns that will give extra information of the item only by pointing it with our smartphone.

Also, is important the simulation when designing, for example, Polyboard is a software that allows the designer to create their own furniture adapting them to a specific space.

c) Metal industry

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In the Metal industry, VR / Simulation is especially used in training, design and quality and production control using AI. Also, it's possible to create instructions and superimpose them on the worker's vision. This will allow the worker to know in a didactic and intuitive way how a machine works, or what it's necessary to do, look for errors and a wide range of different problems.

Some companies, use the AR to training their employees for a new workstation. This type of training, allows the company to train the worker easier, faster and safer.

Business core of Solid Virtual, for example, is to create adapted VR training for the metal industry.

Finally, is important to highlight the possibilities that VR / Simulation gives to the industry about quality control automatized with IA.

Taucon S.A, for example, is a company that is dedicated to developing projects to help other enterprises of the metal sector to have a better quality control and automation. This allows to reduce personnel costs and have a higher quality.

d) Electronic and electronical equipment industry

For electronic and electronical equipment industry, the use of the VR / simulations is similar to the metal industry.

This industry focuses the utility of VR / Simulation in the design and production lines to reduce production cost and avoid losses due to the virtual designs and quality controls.

Otherwise, Industry is using IA to control their production lines, developing self-controlled lines which give the workers more independence and they can be more productive, control other processes and use this time to carry out different process at the same time.

Management

Food industry

This kind of tools are very important for all the sectors, but in this case, the industry is feeding itself by costumer's data using the big data, winning operational efficiency, reducing delivering times and improving quality and customer service due to customer opinions.

The use of robotics and management software as CRM & ERP has developed a new business panorama. Time to market lifecycles, production, revenues, customer satisfaction are the most important points

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that technology give to this industry.Also, it's important for this industry the vertical and horizontal integration, which allows reducing costs, being self-sufficient and have better products.

In Catalonia, for example, Guissona is a great example of vertical and horizontal integration. This company has their own farms where the product can follow a determined quality standard. Guissona also has their own logistics. In this ecosystem, is possible to control from when an animal is born to when it's sold as a final product, following their own procedures, reducing costs, and assuring quality.

b) Wood industry

In the Wood industry, the companies are adopting customized software as CRM & ERP to improve their performance, have better control of the clients and products and using big data to know what are the preferences of the customers to develop products that adapt better to their desires.

The robotics is one of the big adoptions that Wood industry has done too. The robots help the companies to automate several production processes, allowing to allocate human resources to other areas of the company.

Also, new robots are improving the quality of products including a new type of machines as lumber edgers, different saws, etc.

A lot of companies are working hard developing and producing new tools to improve the wood industry's production. Felder Group, for example, is a company who is specialized in wood machinery.

c) Metal & Electronic and electronical Industry

Speaking of Metal Industry and Electronic and electronical Industry, the innovation comes by the management software used to control the clients & supplies. CRM & ERP are innovative tools being adopted and generating important revenues and helping with the control of the company.

The robotics also have been improved. Now the robots help in all the fabrication line, being self-sufficient, introducing new types of sensors which allow them to have autonomy. This is a key fact because these robots can operate with heavy machinery, dangerous materials, reducing worker's efforts and dangers, and doing a very precise work.

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IoT – tools

Food Industry

The IoT is the most disruptive innovation that the food industry has incorporated into his process.

Some of the ideas that this industry has adopted is the traceability of the products, where they come from, where they go, drones for fertilizing, planting seeds, controlling harvest, etc.

Agriculture machinery connected to the internet is also the present, smart spraying, automatic irrigation, different sensors controlling brightness, humidity...

Also, we will find the final products connected to the internet, which will include their origin, their composition and different relevant information for the consumer.

One of the most important boosters of this industry is the EIP-agri (European Innovation Partnership), who works to foster competitive and sustainable farming and forestry that 'achieves more and better from less'. It contributes to ensuring a steady supply of food, feed, and biomaterials, developing its work in harmony with the essential natural resources on which farming depends.

b) Wood industry

The cloud computing, working together with cybersecurity and IoT is the future of this industry. At this moment, all the machinery is starting to be connected to the internet, where they can find information in the cloud about the process to follow, they can be controlled over the internet from everywhere, report data and errors.

The system offers different advantages, such as increased productivity and decreased downtime, continuous improvement, and control of operating costs, lower maintenance costs and the ability to control parameters and machine performance in real time, at any time moment and place and to be able to correct any fault at any time.

There are different partnerships who are pushing these companies to the innovation in Spain, as CENFIM, CETEM, AEI de madera y mueble de la Rioja, etc.

c) Metal industry

Like other industries, the Metal industry is also including different ICT - tools innovations.

The technology that is revolutionizing the metal industry in ICT - tools innovation is the additive manufacturing. This technology is providing possibilities that weren't seen before.

In this type of companies where production is the key process, the prototypes are crucial for them.

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The additive manufacturing is giving the potential to develop a prototype in hours without the necessity of spend hours and wasting materials and efforts like years ago.

IoT is also a field where this industry can find benefits. The existence of an ecosystem where every machinery is connected with others makes the sector much more productive, secure and profitable.

d) Electronic and electronical Industry

As Metal industry counterpart, Electronic and electronical industry is using the ICT - tools possibility to connect their machinery to the internet, the cloud. This machinery is being accessible from everywhere and giving extra information, collecting data for future analysis, etc.

The possibilities of additive manufacturing are exploited too in elecetronic industry. The design and production of prototypes are pushing forward the revenues and the gains. These advantages are decisive for the industry, reducing time to market times, personalizing products, reducing costs, etc.

This Industry is also working with Radio-frequency identification (RFID), that uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically-stored information. RFID will help in the industry by providing extra - information of objects and personnel.

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Conclusion

After the information recompilation and study, we come to the conclusion that Spain is a country which is adopting the innovation, but there are some points that must be strengthened. Foremost conclusions are:

- The SMEs are more than the 60% of enterprises in Spain.
- The studied sectors (food, wood, metal, electronic and electronical) represent the 46.4% of the industry in Spain.
- The ICT structure and affordability is prepared for the adoption of the industry 4.0 technologies.
- The skills and education are below the desired level. Is necessary the introduction of training plans to form new ICT Experts.
- Due to the path the large enterprises, which have more resources and is easier for them to introduce innovation, there are prone technologies to be suited before than others in the SMEs as:
    - Bid data
    - Cybersecurity
    - Internet of Things

- There are other technologies that can provide a large number of benefits, but their fostering is being more gradual, so the adoption should be helped with formation, training, and ICT Experts as:
    - Virtual Reality
    - Simulation
    - Cloud Computing
    - Additive manufacturing
    - Internet of Things

By all these facts, is considered that is necessary to create a platform where the SMEs can find different trainings and take what they consider more important for their development.

With this platform, we can fight the actual lack of knowledge about technology in Spanish Industry, forming new ICT Experts and pushing the industry to a new level, introducing it into the industry 4.0.

This platform needs to be connected to a network, where the good practices will be shared so the capacities of SMEs will be strengthened.

Conclusion table

Finally, in the next table, it's possible to see the content of the report in a simple and resumed way and understand which technologies are in need to be strengthened and in which sector, considering the lack of skills or tools for the adoption of Industry 4.0

ES		VR / Simulation		Management			ICT - Tools			
		Virtual Reality	Simulations	Big Data	Robotics	H & V Integration	Cloud Computing	Cyber Security	Internet of Things	Additive Manufacturing
Food & Beverages	Skills	⚠	⚠	⚠			⚠	⚠	⚠	⚠
Food & Beverages	Tools	⚠	⚠	⚠	⚠	⚠		⚠		⚠
Wood Industry	Skills			⚠	⚠		⚠		⚠	
Wood Industry	Tools	⚠	⚠			⚠	⚠		⚠	⚠
Metal Industry	Skills	⚠	⚠	⚠			⚠	⚠		
Metal Industry	Tools					⚠				⚠
Electronical & electrical Industry	Skills	⚠	⚠			⚠	⚠			
Electronical & electrical Industry	Tools					⚠				⚠

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#Ref	Name
[1]	**Instituto nacional de estadíastica**
Link	http://www.ine.es/
[2]	**Analysis of National Initiatives for Digitising Industry. Spain: Industria Conectada 4.0**
Link	https://ec.europa.eu/futurium/en/system/files/ged/es_country_analysis.pdf
[3]	**CaixaBank Research, based on data from the World Economic Forum**
Link	http://www.caixabankresearch.com/sites/default/files/documents/38-39_dossiers_4_ing_1.pdf
[4]	**ICEX, Information and Communication Technologies sector, 2016**
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