Mapping and Analysis of Industry 4.0 in Catalonia

Executive Summary

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Mapping and Analysis of Industry 4.0 in Catalonia

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Government of Catalonia
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1. Study Goals, Scope and Main Data
Study Goals and Scope

Main Goal

The main goal of the study is to prepare a mapping and an analysis of opportunities of Industry 4.0 in Catalonia to indicate how this international macro-trend is being implemented in the region.

The aim is to assess the potential for business opportunities for Catalan companies and for firms from other regions that may invest in Catalonia.

Specific Goals:

- To define the Industry 4.0 phenomenon in Catalonia: description, definition, scope and features.
- To map business supply and demand, and related agents (technology centres and universities, institutions, associations, etc.). To quantify the mapping results.
- To provide a strategic segmentation of the companies and agents identified in the mapping.
- To use benchmarking to identify the main international regions in this field. To compare Catalonia to other regions and collect examples of successful experiences.
- To identify opportunities for innovation and internationalization for Catalan firms.
- To identify opportunities for attracting foreign investment in terms of potential companies/markets.
- To identify strategic challenges, weaknesses and threats for the industry as a whole and specific segments.
- To identify the potential and synergies of the companies in the mapping to work jointly on projects in some areas.
Industry 4.0 in Catalonia

MAIN INDUSTRY DATA

— Industry 4.0 refers to the digitization of industrial processes to make them more independent, which is achieved through the use of cyber-physical systems.

— A high level of awareness has been detected in Catalan companies of the need to digitize their processes, but few have actually begun this undertaking. The ones that have are generally large firms.

— 365 companies supplying Industry 4.0 products and services have been identified. They have an aggregate revenue of €1.224B from Industry 4.0 technologies and employ 23,154 people (2015).

— Revenue of €1.224B represents 0.6% of total Catalan GDP (2015).

— 82.7% of the companies identified employ fewer than 50 people and only 3% are large companies (250 employees or more).

— 44% of the companies identified are exporters and 13% have a foreign subsidiary.

— Companies in the data and connectivity segment represent 41% of all Industry 4.0 companies. The segments with the highest aggregate revenue are control and automation, and data and connectivity (35%, each).
Industry 4.0 in Catalonia

MAIN INDUSTRY DATA

— In Catalonia, **different organizations promote Industry 4.0**, including the **21 centres in the TECNIO network**, and important trade fairs such as the IoT Congress, Advanced Factories Expo and the recently created Global 3D Printing Hub. Professional associations also play a relevant role in promoting Industry 4.0.

— There are **10 clusters** linked to the concept of Industry 4.0.

— The **demand sectors with the greatest potential for applying Industry 4.0** are the automotive industry, capital goods, health and medical equipment, as well as the transport, logistics and distribution industries.

— The companies developing Industry 4.0 technologies are **mainly start-ups** whose products are still in the pilot phase.

— In Catalonia, there are **more companies integrating the technology than developing it**. Many of the large developing companies do not have decision-making centres in Catalonia. In the strategic segments identified, many companies were detected in the data and connectivity segment, whereas few companies were found in the production resources segment.
2. Definition of Industry 4.0 and Main Technologies
Definition

INDUSTRY 4.0 WITHIN THE CONTEXT OF THIS STUDY

The Fourth Industrial Revolution, i.e. Industry 4.0, is an industrial transformation process based on the combination of production methods and advanced information technologies to make manufacturing more adaptive and flexible.

The concept of Industry 4.0 is not applicable only in factories, but all along the value chain.

It is based on the availability of complete information in real time through the integration of all the parties making up the value chain. The interaction of people, machines and systems creates dynamic value networks of self-organized agents that can be optimized based on different criteria in real time.
Definition

FROM INDUSTRY 1.0 TO INDUSTRY 4.0

First Industrial Revolution
Steam engine, mechanical production equipment

Second Industrial Revolution
Chain production, the main source of energy is electricity

Third Industrial Revolution
Automatic production, electronic and IT

Fourth Industrial Revolution
Cyberphysical systems

1784
1870
1969
TODAY
Industry 4.0 Technological Tools

The digital transformation represented by Industry 4.0 is based on a series of technological tools, including:

- Advanced robotics
- Additive manufacturing
- Simulation
- Systems integration
- Augmented reality
- The Internet of Things
- The cloud
- The cloud
- Big data
- Cybersecurity
- Data and connectivity
- Production resources
- Intelligence
3. World Data on Industry 4.0
DIGITIZATION LEVEL BY COUNTRY

The Networked Readiness Index (NRI) assesses each country’s use of digitization to promote competitiveness and well-being. It can provide a picture of a country’s level of preparation to benefit from the Fourth Industrial Revolution.

2016 NRI Ranking

1. Singapore
2. Finland
3. Sweden
4. Norway
5. USA
6. Netherlands
7. Switzerland
8. United Kingdom
9. Luxembourg
10. Japan

NRI Comparison

The countries with the highest NRI ranking have the highest scores in skills, individual usage, and infrastructure and digital content.

According to data from PWC’s 2016 Global Industry 4.0 Survey, the level of digitization in industrial sectors will grow very quickly in the next five years.

Sectors such as logistics, chemicals and metals, whose digitization levels are currently very low among the sectors analysed, will evolve more favourably. These sectors are important for the Catalan economy: the chemical and metal industries jointly account for 17.8% of industrial GVA\(^1\) (2015), while transport and logistics represent 12% of services GVA\(^2\). There is thus a clear risk of losing competitiveness in important sectors in Catalonia.

In the case of Spain as a whole, where the level of digitization in industrial sectors (8%) is considerably below the global average (33%), evolution is expected to be slower and reach 19% in five years’ time, which is far removed from the 72% anticipated at the global level.

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\(^1\) Catalan Government (2016): “Informe anual sobre la Industria a Catalunya 2015”

\(^2\) Barcelona City Council (2015): “El sector logístico a Barcelona”

THE TECHNOLOGIES THAT ARE REVOLUTIONIZING INDUSTRY

Of the different technological tools that form part of the Fourth Industrial Revolution, some are expected to have a major short-term impact and lead to a complete transformation of industry.

According to some sources, the technologies that will have the greatest impact will be the Internet of Things and big data, probably due to the ease of implementation, and the cloud, which will provide global interconnection. However, implementation of these technologies will call for developing cybersecurity, which represents one of the most important barriers for many companies, along with the risks involved in being connected to the cloud.

Finally, though there is less consensus, some sources emphasize the impact of other technologies, such as additive manufacturing and augmented reality (which provides a display mode for Industry 4.0).

4. Mapping of Industry 4.0 in Catalonia
**MAPPING – DATABASE SEGMENTATION**

All the companies in the database were segmented into four major blocks:

1. **Production Resources**
   - 1A. Control and Automation
   - 1B. Advanced Robotics
   - 1C. 3D Printing

2. **Intelligence**

3. **Data and Connectivity**

4. **Consulting and Professional Services**
Impact of Industry 4.0 on companies:

• Because the Industry 4.0 concept is relatively new (2013), very few companies’ business model is wholly devoted to this field. In many cases, companies were found to have integrated a line of business in this field alongside their traditional operations.

• However, some companies operating in more innovative sectors may be more likely to focus their core business on Industry 4.0. This is the case of the many start-ups working in this field.

One priority was therefore to estimate Industry 4.0’s weight in companies based on a hypothesis that attempts to match the reality:

<table>
<thead>
<tr>
<th>Level</th>
<th>Impact of Industry 4.0 on company business</th>
<th>Database Segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong</td>
<td>80%</td>
<td>Tech start-ups in any segment</td>
</tr>
<tr>
<td>Very relevant</td>
<td>50%</td>
<td>Robotics (segment 1B)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3D printing (segment 1C)</td>
</tr>
<tr>
<td>Relevant</td>
<td>30%</td>
<td>Control and automation (segment 1A)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Intelligence (segment 2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Data and connectivity (segment 3)</td>
</tr>
<tr>
<td>Moderate</td>
<td>10%</td>
<td>Professional services (segment 4)</td>
</tr>
</tbody>
</table>
### QUANTIFICATION OF THE INDUSTRY 4.0 MARKET

#### 1. Production resources
- 1A. Control and Automation
- 1B. Advanced Robotics
- 1C. 3D Printing

#### 2. Intelligence

#### 3. Data and Connectivity

#### 4. Consulting and Professional Services

<table>
<thead>
<tr>
<th>No. of companies</th>
<th>No. of employees</th>
<th>Turnover (€M)</th>
<th>% from Industry 4.0</th>
<th>Revenue from Industry 4.0 (€M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>4,324</td>
<td>1,428.16</td>
<td>30%</td>
<td>428.45</td>
</tr>
<tr>
<td>8</td>
<td>237</td>
<td>94.05</td>
<td>50%</td>
<td>47.03</td>
</tr>
<tr>
<td>71</td>
<td>2,008</td>
<td>453.79</td>
<td>50%</td>
<td>226.89</td>
</tr>
<tr>
<td>99</td>
<td>6,569</td>
<td>1,976</td>
<td>10%</td>
<td>86.46</td>
</tr>
<tr>
<td>32</td>
<td>259</td>
<td>29.32</td>
<td>30%</td>
<td>8.80</td>
</tr>
<tr>
<td>150</td>
<td>7,437</td>
<td>1,421.99</td>
<td>30%</td>
<td>426.60</td>
</tr>
<tr>
<td>84</td>
<td>8,889</td>
<td>864.58</td>
<td>10%</td>
<td>86.46</td>
</tr>
<tr>
<td>365</td>
<td>23,154</td>
<td>4,291.90</td>
<td></td>
<td>1,224.22</td>
</tr>
</tbody>
</table>

Note: Some medium-size and large companies that have work centres in Catalonia but do not have a Catalan tax ID were not included in the quantification of the volume of revenue or number of employees. This is the case of HP, Universal Robots, Rockwell Automation, Omron and Atos, among others.
MAIN COMPANIES IN CATALONIA IN TERMS OF REVENUE OR RELEVANCE
Map of Agents

Knowledge providers

Clusters and associations

Training

Other entities

SOLUTION PROVIDERS

- Production resources
  - Robotics
  - Additive manufacturing

- Data and connectivity
  - The Internet of Things
  - Big data
  - The cloud
  - Cybersecurity

- Intelligence
  - Simulation
  - Integration
  - Augmented reality

INTEGRATING AGENTS

- Installers
- Engineering firms
- Consultancies

END USERS

- Automotive and motorcycle industry
- Machinery, metallurgy and capital goods
- Healthcare and medical equipment
- Logistics, e-commerce and distribution
- Chemicals and plastics
- Pharmaceutical industry
- Energy and resources
- Food
- Circular economy

Knowledge providers:
- TECNIO
- Catalonia Clusters

Clusters and associations:
- UdG
- laSalle
- Universitat Politècnica de València

Training:
- UOC

Other entities:
- IOT Solutions
- Engineers
- Telecos

DISTRIBUTORS

Other entities:
- Knowledge providers
  - Clusters and associations
- Other entities

Knowledge providers:
- Clusters and associations
- Other entities
The Industry 4.0 Ecosystem in Catalonia

CLUSTERS IN THE CATALONIA CLUSTER PROGRAM

- Clúster Digital
- CEEC Cluster d’Elevació Energètica de Catalunya
- Packaging Cluster
- ciac Clúster de la Industria d’Automoció de Catalunya
- FEMAC
- railgroup
- HealthTech Cluster
- SECPho Light Technologies Cluster
- Clúster MAV Cluster de Materiais Avançats de Catalunya
- CEQUIP

PROFESSIONAL ASSOCIATIONS

- Enginyers Industrials de Catalunya
- Telecos.cat enginyers de telecomunicació
- ENGINYERS Bcn
- informàtiques
- ENGINYERS MANRESA Col·legi Professional Associació Enginyers Tècnics Industrials Graduats Manresa | Catalunya Central
- ENGINYERS GI Col·legi d’Enginyers Graduats i d’Enginyers Tècnics Industrials Girona
- ENGINYERS TARRAGONA
- COETIC Col·legi d’Enginyeries Tècniques i Grau en Enginyeria Informàtica de Catalunya
- Agrònoms Col·legi Oficial d’Enginyers Agrònoms de Catalunya
- Camins.cat Col·legi d’Enginyers de Camins, Canals i Ports - Catalunya

ACCió | Generalitat de Catalunya
The Industry 4.0 Ecosystem in Catalonia

**BUSINESS ASSOCIATIONS**
- amec
- AnellaIndustrial.cat
- Foment de Treball Nacional
- secartys
- pimec
- cecot

**TRADE FAIRS AND EVENTS**
- IOT SOLUTIONS WORLD CONGRESS
- MOBILE WORLD CONGRESS
- BARCELONA INDUSTRY 4.0 WEEK

**OTHER ENTITIES**
- GLOBAL 3D PRINTING HUB

*From the 1st till the 6th of October 2017, Barcelona will host eight industrial events covering solutions from raw materials, chemicals, plastics & plastic transformation, material processing and surface technologies, to novel manufacturing strategies (Advanced Manufacturing) and the uses of data and sensing in an industrial environment (IOT).*
### INTENSITY OF DIGITAL TRANSFORMATION IN SOME SECTORS OF THE CATALAN ECONOMY

**Sectors that have made the most progress in terms of digital transformation**

<table>
<thead>
<tr>
<th>Sector</th>
<th>Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automotive and motorcycle industry</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Machinery, metallurgy and capital goods</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Healthcare and medical equipment</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Other transport industries</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Logistics, e-commerce and distribution</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Chemicals and plastics</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Pharmaceutical industry</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Energy and resources</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Food</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Circular economy</td>
<td>★★★★★</td>
</tr>
</tbody>
</table>

Source: The authors, based on interviews.
MAIN APPLICATIONS OF THE MOST DEVELOPED INDUSTRY 4.0 TECHNOLOGIES IN CATALONIA

Source: The authors, based on interviews.
5. Industry 4.0 Trends
## Industry 4.0 Trends

<table>
<thead>
<tr>
<th>CONTEXT</th>
<th>TECHNOLOGY</th>
<th>BUSINESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Mass customization</td>
<td>5 Development of peripheral technologies</td>
<td>7 Smart manufacturing</td>
</tr>
<tr>
<td>2 Servitization of industry</td>
<td>6 Integration of technologies</td>
<td>8 On-demand manufacturing</td>
</tr>
<tr>
<td>3 Relocation of manufacturing</td>
<td></td>
<td>9 From product-based business models to customer-based business models</td>
</tr>
<tr>
<td>4 Circular economy</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6. Benchmarking
Benchmarking - Europe

EUROPE

- smart industry
- PRODUKTION 2030
- fimecc
- DIGILE
- INTERNET OF THINGS
- INDUSTRIE 4.0
- AUTONOMIK
- Scottish Enterprise
- MADE DIFFERENT
- TECHNOLOGY GATEWAYS
- CATAPULT
- PLAN MARSHALL
- INDUSTRIE 2025
- INDUSTRIE 2025

Mittelstand: Digital

ACCió Generalitat de Catalunya
Benchmarking - Other Regions

OTHER REGIONS

- Yves Landry Foundation
- FedDev Ontario
- K-Startup
- Manufacturing USA
- Israel Advanced Technology Industries
- Made in China 2025
MAIN CONCLUSIONS FROM BENCHMARKING

THE PUBLIC SECTOR LEADS MOST INITIATIVES, BUT ATTEMPTS TO INCLUDE OTHER AGENTS FROM THE QUADRUPLE HELIX

ONE OF THE MOST COMMON GOALS IS TO ESTABLISH STANDARDS

MANY INITIATIVES INVOLVE PERFORMING PILOT PROJECTS, BUT APPLICATION IS ALSO PURSUED IN REAL CASES (LIVING LABS/FAB LABS)

A COMMON CONCERN IN MANY REGIONS IS THE NEED TO CREATE SPECIFIC PROFILES AND GENERATE TALENT FOR INDUSTRY 4.0

THOUGH MANY INITIATIVES PROMOTE RESEARCH, A COMMON CONCERN IS MAKING USE OF AND CAPITALIZING ON EXISTING KNOWLEDGE

DIFFERENT INITIATIVES INCLUDE THE DEVELOPMENT OF TECHNICAL DIAGNOSTICS TO IDENTIFY THE BAT\(^1\) CORRESPONDED TO EACH INDUSTRY

\(^1\) Best available technology
7. Business Opportunities
Innovation Opportunities

Manufacturing (automotive, plastics, toolings)
- Advanced robotics
- Additive manufacturing
- Augmented reality
- Simulation

Capital goods
- Parts optimization
- Tooling manufacture
- Training

Healthcare and medical technologies
- Marketing
- Customer interaction
- Customization

Retail
- Picking
- Location
- Marketing
- Customization

Transport and logistics
- Dangerous maintenance activities
- Picking
- Maintenance aid
- Training

Utilities
- Application to highly non-ergonomic activities
- Maintenance aid
- Training

Consumer goods
- Application to highly non-ergonomic activities
- Maintenance aid
- Training

Environment
- Dangerous maintenance activities

Quality control
- Knowledge of manufacturing processes
- Predictive/preventive maintenance
- Avoiding process interruptions due to external causes

Traceability
- Preventive maintenance
- Service interruptions

Process optimization
- Maintenance
- Training
- Screening

Stock control
- Customer knowledge
- Avoiding knowledge leaks

Instruction manual
- Predictive/preventive maintenance
- Service interruptions

Instruction manual
- Predictive/preventive maintenance
- Service interruptions

Customer knowledge
- Preventive maintenance
- Service interruptions

Maintenance aid
- Predictive/preventive maintenance
- Service interruptions

Maintenance aid
- Predictive/preventive maintenance
- Service interruptions

Augmented reality
- Systems integration
- The Internet of Things
- The cloud
- Cybersecurity

Strategy & Competitive Intelligence
Industry 4.0 TECNIO Centres

3D printing
- EURECAT
- LBRTAT
- IQS TECH TRANSFER (URL)
- IRIS
- IRTA

Augmented reality
- CVC
- GTI (UPF)
- I2CAT
- LA SALLE R&D (URL)
- TIG (UdG)
- EURECAT

Big data / analytics
- CRISTECH (URV)
- DAMA (UPC)
- EASY (UdG)
- EURECAT
- GCD (UB)
- GTI (UPF)
- InLab FIB (UPC)
- I2CAT
- MCIA (UPC)
- IRTA

Collaborative robotics
- CEMIC (UB)
- CTTC
- CVC
- EURECAT
- GCEM (UPC)
- I2I (CSIC)
- LA SALLE R&D (URL)
- LBRTAT
- IRIS
- IRTA

Simulation
- EURECAT
- GCD (UB)
- IRTA

Horizontal and vertical integration
- CTTC
- CVC
- DAMA (UPC)
- EASY (UdG)
- I2I (CSIC)
- InLab FIB (UCP)
- EURECAT
- IRIS

IoT / The cloud
- CD6 (UPC)
- CEMIC
- CITCEA (UPC)
- CTTC
- CVC
- DAMA (UPC)
- GTI (UPF)
- I2I (CSIC)
- LA SALLE R&D (URL)
- STARLAB
- IRIS
- EASY (UdG)

Cybersecurity
- CRISTECH (URV)
- EASY (UdG)
- EURECAT
- InLab FIB (UPC)
- I2CAT
- LA SALLE R&D (URL)
- LBRTAT
Internationalization Opportunities

The main internationalization opportunities for Catalan companies offering Industry 4.0 products and services are in industrialized countries that are currently not leading the way in terms of implementation of Industry 4.0.

Based on the classification in the figure, the countries of greatest interest in Europe are referred to as Potentialists and very often as Traditionalists, especially when there is a strong industrial fabric, meaning that commercial actions are focused on a much larger market. Hesitators may also be of interest.

- **FRONTRUNNERS** are characterized by having an established industrial base and a modern business culture, and making use of current technologies.
- **TRADITIONALISTS** are mainly Eastern European countries that have started up some initiatives to bring their manufacturing industries into the digital age.
- **HESITATORS** are countries without a reliable industrial base that suffer from serious tax problems. They are not fully aware of the potential that digital transformation has to offer.
- **POTENTIALISTS** are countries that have witnessed a decline in their industrialization in recent years, but have the know-how and mentality to react in the future.

COUNTRIES OF INTEREST FOR THE INTERNATIONALIZATION OF CATALAN COMPANIES

- Canada
- United Kingdom
- Poland
- USA
- France
- United Arab Emirates
- China
- Mexico
- Italy
Opportunities for Attracting Foreign Investment

The links on the value chain that are currently the least represented in Catalonia are suppliers of solutions in the area of production resources and intelligence.

Leading world companies in the different segments

<table>
<thead>
<tr>
<th>Segment</th>
<th>Some leading companies</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A- Control and automation</td>
<td>EMERSON TOSHIBA Honeywell GE YOKOGAWA SIEMENS MITSUBISHI ELECTRIC AUTOMATION SYSTEMS</td>
<td>Most of the companies in the sector already have a presence in Catalonia. It is often only a branch office.</td>
</tr>
<tr>
<td>1B- Advanced robotics</td>
<td>KUKA adept APEX ROBOTICS YASKAWA DASSAULT SYSTEMES</td>
<td>Catalonia boasts companies dedicated to robotics, but their decision-making centres and development units are generally located in other countries.</td>
</tr>
<tr>
<td>1C- 3D printing</td>
<td>HP EOS SIENA system SISMA AMORPH ExOne</td>
<td>In Catalonia, there is one company considered to be the leader in 3D printing in the short term (HP). Other major companies in the sector do not have a headquarters in Catalonia or have only a branch office.</td>
</tr>
<tr>
<td>2- Intelligence</td>
<td>Google SAP eon reality IBM ORACLE = exact jobBOSS</td>
<td>In augmented reality, the main companies have their headquarters in the United States, the United Kingdom and Israel. The major companies in the simulation and integration sector have branch offices in Catalonia.</td>
</tr>
</tbody>
</table>
8. Cross-Cutting Strategic Challenges and Conclusions
CROSS-CUTTING STRATEGIC CHALLENGES

TALENT

1. Public-private education association: industry-based training
2. Need for new professional profiles: ICTs focused on industry Cross-cutting vision of I 4.0 Mathematicians and data scientists
3. Promoting specialized professional training

APPLICATIONS

4. Raising awareness and publication, preferably about successful cases
5. More emphasis on IT
6. Development of solutions suited to SMEs
7. Reduction of return on investment time
8. Development of specific solutions with and for main industrial sectors in Catalonia
9. Diagnostics to identify key technologies in each sector
10. Communications standardization

MARKET

11. Pilot project scalability
12. Investment to facilitate growth of start-ups
13. Ensuring Industry 4.0 technologies reach the mainstream
14. Encouraging SMEs to start moving towards Industry 4.0
Main Study Conclusions

On the concept of Industry 4.0 and its application in Catalonia

- Industry 4.0 represents a paradigm shift. Technologies are the tool for making this shift, but not an end in themselves.
- Industry 4.0 refers to the digitization of industrial processes to make them more independent, which is achieved through the use of cyber-physical systems.
- A high level of awareness has been detected in Catalan companies of the need to digitize their processes, but few have actually begun this undertaking. These few are generally large firms.
- Companies have not made progress in the digitization of their industrial processes due to the lack of a clear vision of the benefits it can provide and the return on investment.

The situation of Industry 4.0 in Catalonia

- The companies developing Industry 4.0 technologies are mainly start-ups whose products are still in the pilot phase.
- In Catalonia, there are more companies integrating the technology than developing it. Many of the large developing companies do not have decision-making centres in Catalonia. In the strategic segments identified, many companies were detected in the Data and Connectivity segment, whereas few companies were found in the Production Resources segment.
- The mapped companies’ aggregate revenue from Industry 4.0 is estimated at €1.224B. This amount can be considered relatively low, probably because Industry 4.0 is in its early stages and many pilot projects still have to be scaled up.
- The sectors that have made the most progress in the digitization process are the automotive industry, medical technologies and capital goods.
Main Study Conclusions

Opportunities deriving from Industry 4.0

• Innovation opportunities: increased process traceability and standardization, mass product customization, improved maintenance processes (predictive and preventive), relocation of industrial processes, reduction of human participation in non-ergonomic and hazardous processes, staff training, and reduction of energy costs.

• Internationalization opportunities: countries of interest have been identified for the internationalization of Catalan companies. These countries have witnessed a decline in their industrialization in recent years, but have the know-how and mentality to react in the future. Their industrial GDP is outstanding and they have a suitable business environment. They include the United States, Canada, the United Arab Emirates, New Zealand and Taiwan.

• Opportunities for attracting foreign investment: opportunities have been detected from attracting leading companies in the sector to Catalonia, but more opportunities would come from attracting the development centres of companies that already have headquarters in Catalonia.

Strategic challenges of Industry 4.0 in Catalonia

• Professionals must adapt to the new reality. An emphasis must therefore be placed on university education and vocational training.

• New professional profiles are required such as mathematicians and data scientists.

• Suitable solutions must be developed for SMEs while focusing on sectors with a high presence in Catalonia.

• The segmented vision of Industry 4.0 can be dismissed by pursuing synergies between companies in different segments.

• Defining a comprehensive industrial strategy for the concept of Industry 4.0.

• Providing support for company internationalization.

• Focusing action to make an impact on companies’ bottom line.