Industry 4.0 in Catalonia: Sector Snapshot

ACCIÓ
Government of Catalonia

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Prepared by
IDOM and ACCIÓ’s Strategy and Competitive Intelligence Unit

Barcelona, March 2019
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1. Industry 4.0
Definition of Industry 4.0 (I)

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.

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

**Main technological tools**

- **Production resources**
  - Advanced robotics
  - Additive manufacturing

- **Intelligence**
  - Augmented reality
  - Simulation
  - Systems integration

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

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Catalonia Trade & Investment
Generalitat de Catalunya
Government of Catalonia
Definition of Industry 4.0 (II)

Map of Industry 4.0 agents

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

Clusters and associations

Other entities

Knowledge providers

DISTRIBUTORS
World data on Industry 4.0

Digitization level by country (2016 NRI Ranking)

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

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Digitization Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Singapore</td>
<td>77%</td>
</tr>
<tr>
<td>2</td>
<td>Finland</td>
<td>76%</td>
</tr>
<tr>
<td>3</td>
<td>Sweden</td>
<td>75%</td>
</tr>
<tr>
<td>4</td>
<td>Norway</td>
<td>72%</td>
</tr>
<tr>
<td>5</td>
<td>USA</td>
<td>71%</td>
</tr>
<tr>
<td>6</td>
<td>Netherlands</td>
<td>69%</td>
</tr>
<tr>
<td>7</td>
<td>Switzerland</td>
<td>65%</td>
</tr>
<tr>
<td>8</td>
<td>United Kingdom</td>
<td>62%</td>
</tr>
<tr>
<td>9</td>
<td>Luxembourg</td>
<td>61%</td>
</tr>
<tr>
<td>10</td>
<td>Japan</td>
<td>60%</td>
</tr>
</tbody>
</table>

Digitization level by sector

(anticipated evolution of the level of digitization)

<table>
<thead>
<tr>
<th>Sector</th>
<th>2016</th>
<th>2021 (estimate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronics</td>
<td>45%</td>
<td>77%</td>
</tr>
<tr>
<td>Aerospace and defence</td>
<td>32%</td>
<td>76%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>35%</td>
<td>76%</td>
</tr>
<tr>
<td>Chemicals</td>
<td>32%</td>
<td>75%</td>
</tr>
<tr>
<td>Paper and packaging</td>
<td>38%</td>
<td>72%</td>
</tr>
<tr>
<td>Transport and logistics</td>
<td>28%</td>
<td>71%</td>
</tr>
<tr>
<td>Engineering and construction</td>
<td>30%</td>
<td>69%</td>
</tr>
<tr>
<td>Automotive</td>
<td>41%</td>
<td>65%</td>
</tr>
<tr>
<td>Metal</td>
<td>31%</td>
<td>62%</td>
</tr>
</tbody>
</table>

Estimated impact of different technologies on company performance

The technologies that will have the greatest impact will be the Internet of Things, big data and the cloud. Implementation of these technologies will call for developing cybersecurity, which represents one of the most important barriers for many companies.

- Big data analytics
- IoT / cyber-physical systems
- Advanced robotics
- Digital manufacturing
- Additive manufacturing
- The cloud
- Augmented reality

2. Industry 4.0 in Catalonia
Catalonia, prepared for the adoption of Industry 4.0

Catalonia has the perfect mix

- Industrial ecosystem (21% of GVA)
- Technology
- Industry Labs

Industry 4.0 in Catalonia: key data

- An ecosystem supporting Industry 4.0
- On the top digital market transformation
- World-class innovation hub
- Barcelona, the driving force of Catalonia’s entrepreneurial engine

Source: EIC (DGI – ACCIÓ)
Industry 4.0 in Catalonia: key data

Mapping of Industry 4.0 in Catalonia

- **365 companies**
- **€1,224B turnover**
- **23,154 employees**

Main companies in Catalonia

Companies

- Control and Automation: 5.5%
- Intelligence: 8.6%
- 3D Printing: 19.5%
- Consulting and Professional Services: 7.0%
- Advanced Robotics: 3.8%
- Data and Connectivity: 41.1%

Turnover

- Control and Automation: 35.0%
- Data and Connectivity: 34.9%
- 3D Printing: 18.5%
- Consulting and Professional Services: 7.0%
- Intelligence: 0.7%
- Advanced Robotics: 3.8%

Employees

- Consulting and Professional Services: 38.4%
- Intelligence: 1.1%
- Advanced Robotics: 3.8%
- Control and Automation: 18.7%
- Data and Connectivity: 32.1%
- 3D Printing: 8.7%

Source: EIC (DGI – ACCIÓ) based on interviews made by ACCIÓ
Data for companies are 2017 data and turnover and employees are 2015 data.
An ecosystem supporting Industry 4.0

Universities offering Industry 4.0 related studies

Trade fairs and events linked to Industry 4.0

Clusters and business associations linked to Industry 4.0

Best pool of local and international talent

Talent from all over the world and availability of qualified multi-lingual personnel thanks to its high quality of life, cosmopolitan atmosphere and trading history. Barcelona is a magnet for professionals and a key city in the availability of scientists and engineers.

Source: EIC (DGI – ACCIÓ)
On the top digital market transformation (I)

Main applications of the most developed industry 4.0 technologies in Catalonia

<table>
<thead>
<tr>
<th>Design and personalization</th>
<th>Prototyping</th>
<th>Manufacturing and assembly</th>
<th>Verification</th>
<th>Maintenance</th>
<th>Marketing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additive manufacturing</td>
<td>Additive manufacturing</td>
<td>Additive manufacturing</td>
<td>Augmented reality</td>
<td>Augmented reality</td>
<td>The Internet of Things</td>
</tr>
<tr>
<td>Simulation</td>
<td>Simulation</td>
<td>Advanced robotics</td>
<td>The cloud</td>
<td>Simulation</td>
<td>Big data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Systems integration</td>
<td>Cybersecurity</td>
<td>The Internet of Things</td>
<td>Augmented reality</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The cloud</td>
<td>The cloud</td>
</tr>
</tbody>
</table>

ICT Catalan sector is ready to accompany industry in the digital transformation process

15,757 COMPANIES (2018)
€16,667 M TURNOVER (2016)
106,400 EMPLOYEES (4th quarter, 2018)

Source: EIC (DGI – ACCIÓ) based on interviews made by ACCIÓ. Secretariat of Telecommunications, Cybersecurity and Digital Society
## On the top digital market transformation (II)

Industry has a relevant weight in Catalan economy. **Catalan industrial GVA gets to 21%, above European average.**

### Sectors that have made the most progress in the application of Industry 4.0’s technologies

<table>
<thead>
<tr>
<th>Sector</th>
<th>Logo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automotive and motorcycle industry</td>
<td><img src="image1.png" alt="Logos" /></td>
</tr>
<tr>
<td>Machinery, metallurgy and equipment</td>
<td><img src="image2.png" alt="Logos" /></td>
</tr>
<tr>
<td>Healthcare and medical equipment</td>
<td><img src="image3.png" alt="Logos" /></td>
</tr>
<tr>
<td>Other transport industries</td>
<td><img src="image4.png" alt="Logos" /></td>
</tr>
<tr>
<td>Logistics, e-commerce and distribution</td>
<td><img src="image5.png" alt="Logos" /></td>
</tr>
<tr>
<td>Chemicals and plastics</td>
<td><img src="image6.png" alt="Logos" /></td>
</tr>
<tr>
<td>Pharmaceutical industry</td>
<td><img src="image7.png" alt="Logos" /></td>
</tr>
<tr>
<td>Energy and resources</td>
<td><img src="image8.png" alt="Logos" /></td>
</tr>
<tr>
<td>Food</td>
<td><img src="image9.png" alt="Logos" /></td>
</tr>
<tr>
<td>Circular economy</td>
<td><img src="image10.png" alt="Logos" /></td>
</tr>
</tbody>
</table>

Source: EIC (DGI – ACCIÓ) based on interviews made by ACCIÓ. IDESCAT
World-class innovation hub

With the Eurecat Technology Centre or the Barcelona Supercomputing Centre, Catalonia is extremely well positioned to foster technology transfer and collaboration between academia, industry and public administration.

**Catalonia**
- 1.47% of its GDP dedicated to R&D (2017).
- 9,282 innovative companies, representing 22.2% of the Spanish total (2016).
- ACCIÓ, winning agency for Best R&D Support (FDI Strategy Awards, 2017)

**Barcelona**
- **1st** European capital of innovation (iCapital Prize 2014).
- **5th** City in Europe in terms of scientific academic production (UPC, 2017).
- **2nd** Smart City in the world (Juniper Research 2016).
- **5th** City in Europe in terms of innovation (Innovation Cities Index, 2016/2017).

31 technological centers with TECNIO accreditation linked to Industry 4.0

Source: EIC (DGI – ACCIÓ) based on INE, TECNIO
Barcelona, the driving force of Catalonia’s entrepreneurial engine

Over 1,300 startups in Catalonia

Industry 4.0 technology startups are the most numerous, representing the 17%.

13% of Catalan startups are Deep Tech.

3 out of every 4 Catalan startups have obtained financial backing.

13,820 jobs related to Catalan startups.

Source: startupshub.catalonia.com (Barcelona & Catalonia Startup Hub)
3. Opportunities in the Industry 4.0
Technological and business opportunities in Catalonia

Manufacturing (automotive, plastics, toolings)
- Application to highly non-ergonomic activities
- Parts optimization
- Tooling manufacture
- Maintenance aid
- Training
- Screening
- Instruction manual
- Process optimization
- Traceability
- Quality control
- Knowledge of manufacturing processes
- Predictive/preventive maintenance
- Avoiding service interruptions due to external causes

Capital goods
- Marketing customer interaction
- Customization
- Maintenance aid
- Training
- Stock control
- Traceability
- Customer knowledge
- Avoiding service interruptions due to external causes

Healthcare and medical technologies
- Marketing
- Customization
- Maintenance aid
- Training
- Process optimization
- Traceability
- Predictive/preventive maintenance
- Customer knowledge
- Avoiding service interruptions due to external causes

Retail
- Picking, location
- Process optimization
- Maintenance aid
- Training
- Marketing (display)
- Customization
- Process optimization
- Predictive/preventive maintenance
- Customer knowledge
- Avoiding service interruptions due to external causes

Transport and logistics
- Maintenance aid
- Training
- Marketing
- Customization
- Process optimization
- Predictive/preventive maintenance
- Customer knowledge
- Avoiding service interruptions due to external causes

Utilities
- Picking
- Customization
- Maintenance aid
- Training
- Process optimization
- Predictive/preventive maintenance
- Customer knowledge
- Avoiding service interruptions due to external causes

Consumer goods
- Application to highly non-ergonomic activities
- Maintenance aid
- Training
- Marketing
- Customization
- Process optimization
- Predictive/preventive maintenance
- Customer knowledge
- Avoiding service interruptions due to external causes

Environment
- Dangerous maintenance activities
- Maintenance aid
- Training
- Process optimization
- Predictive/preventive maintenance
- Customer knowledge
- Avoiding service interruptions due to external causes

Source: EIC (DGI – ACCIÓ)
International opportunities for Catalan companies

ACCIÓ’s global business opportunity index in the 4.0 industry.

Note: Index represents a value between 0 and 10
Source: Global trade mapping, 2018 by EIC (DGI – ACCIÓ)
Take a look at the full report:

Further information about the sector and opportunities:
http://catalonia.com/trade-with-catalonia/industry-40.jsp