

Barcelona Treball

# Telecommunications & ICT

Sector Report 2013

*Co-financed by:*

# The 10 keys to understanding the sector

**As well as being a productive sector in its own right, the telecommunications and ICT industry cuts across and drives other areas of the economy. Improving the competitiveness of the business sector in Catalonia and Spain depends largely on the development of the telecommunications sector and ICT.**

## The sector

The telecommunications and ICT industry comprises the technologies, tools and services necessary to manage, process and transmit information via any channel of communication, whether using cables or wirelessly. It is divided into two broad categories: telecommunications, covering communications infrastructure, and ICT, covering products and services whose purpose is to process and communicate information and to give support to information and communications processes using electronic means.

## Main areas of activity

The area of telecommunications includes communications activities relating to satellites and positioning, to cable communications and to mobile and radio-link communications.

The area of ICT includes the fields of digital data processing; of systems administration, consulting and integration; of security for, and design and development of software and hardware; and of commercial, technical support and maintenance services.

## Trends

The telecommunications and ICT industry has always been associated with the emergence and development of new technologies and applications. Currently, these technologies and applications are related to developing systems that enable access to stored information using the Internet, from anywhere and using any device (cloud computing), which gives people greater flexibility and facilitates their mobility. Also in the intelligent use of information in a company (business intelligence) to facilitate decision making.

Similarly, the sector has experienced the boom of mobile applications (apps), for example, NFC (Near Field Communication) which allows data transmission at short distances and without intermediaries. It is a new market that responds to the growing demand of users of smart phones. The apps are a great opportunity for the sector because more and more companies want to develop their own application.

## Economic importance

The telecommunications and ICT, with a turnover of €104.374 million (2010), contribute by 6% to the overall GDP of Spain. The sector has around 25.000 (1,6% of all companies in Spain), 96% are micro or SMEs (1 and 49 employees). Catalonia is, after Madrid, the second region with more telecommunications and ICT companies (5.203 companies, representing 21,3% of the 25.000 companies that there are in Spain, and 1,9% of all companies in Catalonia).

## Employment

In 2011, Spain had 386.009 workers in the sector, almost 200.000 (50,5%) were engaged in the information technology (software, hardware and IT services). Secondly, there was 77.741 employee in companies engaged in digital content creation (20,1%) and 68.397 employees performing tasks as operators/providers of telecommunications services (17,7%). Catalonia, after Madrid, is the second region with more jobs in the telecommunications and ICT. Specifically, in 2011 there were 80.000 jobs, representing 20,7% of the Spanish employment in this sector.

The trend of employment in the industry in 2008 to 2010 was negative. Thus, between 2008 and 2009 the number of employees fell by 3,6%, and between 2009 and 2010 by 1,5%. In absolute terms there has been a loss of 24.506 jobs between 2008 and 2010. This trend is explained largely by the impact of the economic crisis. But people who lost their jobs were mainly those in less-qualified roles, with the more-qualified roles remaining and in some cases even increasing. It should be stressed that telecommunications and ICT require a greater number of qualified personnel than other economic sectors.

## Professional profiles most in demand

The industry requires professional profiles with intermediate- and higher-level qualifications especially in the fields of technology consultancy. The basis of the training for these profiles must be in technology, but complemented with business management training.

## Occupations most in demand

The areas with the greatest need for workers are those in services consultancies and the development of IT applications, for example ICT consultant or IT professional; those in the development and sale of mobile communications systems, for example shop sales assistant; and those in maintaining and repairing devices, for example systems maintenance technician.

## Future scenarios

The development of technology solutions adapted to the needs of e-business that will become more efficient and effective and the creation of new systems of universal access to information will have a great impact on the development of new technologies. This means continuing to nurture and encourage research and innovation as the engine of development.

## Weaknesses

One of the great challenges for the industry is managing to persuade large companies to locate their decision-making centres (head offices) in Catalonia. This industry is also very competitive at the international and European level, and labour and production costs could become a reason for companies to relocate.

Also, it has to be considered that one of the main problems of the sector is market size (not enough for a full development of the sector) indicating that internationalization strategies are one of the main challenges for technology companies of Spain and Catalonia. In this sense, alliances and public-private partnerships are a crucial element.

The lack of qualified professionals (with specific knowledge and specialization) is one of the main weaknesses of the sector.

## Opportunities

Increased public and private investment in developing technology solutions could be used to create products with high value added, thus decreasing Spain and Catalonia's dependence on foreign markets. It should be stressed that Catalonia has human resources sufficient in number, level of specialisation and level of telecommunications and ICT training and qualification.

In the future it will be necessary to bet for specialized fields with good business prospects in Catalonia such as the mobile phone apps, smart cities, and health and biotechnology.

# 01 Introduction to the sector

The telecommunications and ICT industry comprises the activities necessary to manage, process and transmit information using any communications channel. Specifically, it covers all technologies that enable the detection, acquisition, production, storage, processing, communication, recording and presentation of information, whether audio, video, images or data.

The industry is divided into the two areas of telecommunications and ICT. Telecommunications comprises all technologies, tools and systems for communication using cables, mobile telephony and satellites, meaning that it includes landline and mobile telephony, Internet access and communication using electromagnetic waves. In turn, ICT covers all activities related to the production of consumer goods, such as the manufacturing of hardware, the development of software and IT or multimedia applications, the provision and sale of IT services and consumer electronics.

Moreover, as well as being a productive sector in its own right, the telecommunications and ICT industry cuts across and drives other sectors of the economy. The technologies, tools and systems that are developed in this industry are a means of helping others to become more competitive, giving them the tools to make themselves more effective and their production more efficient.

It should be noted that, in the 22@Barcelona project, Barcelona has set up a venue in which the industry's companies and institutions can interact with knowledge centres, universities and R&D centres with the goal of boosting the telecommunications and ICT industry, making it into an engine of the economy and putting the city at the forefront of the industry in Spain and Europe.

# 02

## Main areas of activity

### Telecommunications

The area of telecommunications includes communications activities relating to satellite and positioning, cable communications and mobile and radio-link communications.

- **Satellite and positioning communications**  
GPS and GLONASS systems. These technologies enable the identification of the position and velocity of a moving entity (vehicle, person, object, etc.) and their practical application is mainly in manufacturing GPS and radar systems and in coordinating fleets of vehicles (trucks, fire engines, law enforcement agencies, etc.), amongst other applications by private companies. The field of satellite and positioning communications also includes the development of prediction technologies for the weather, transport, earth movements, etc.
- **Cable communications**  
Activities relating to cable communications are those creating infrastructure and developing technology for telephony and data transfer using coaxial or fibre optic cables. Specifically, it covers providing services and developing technological applications such as on-demand video, pay-per-view TV, Internet access using a telephone line, landline telephony, etc.
- **Mobile and radio-link communications**  
Mobile and radio-link communications is the area including communications infrastructure between mobile terminals (telephones) and other data transferred wirelessly. It therefore includes the development of Wi-Fi technologies, the manufacture of aerials, the designing of the radio spectrum, the production of mobile devices (telephones, PDAs, etc.) and the transmission and reception of data using wireless networks (the Internet and Wi-Fi modems).

### ICT

The area of ICT includes the fields of digital data processing; systems administration, consulting and integration; security for, and design and development of software and hardware; and commercial, technical support and maintenance services.

- **Data processing**  
This area includes activities relating the production of digital and multimedia content, including the processing of audiovisual data, digital publications, processing images and sound in multimedia production, developing mobile content, etc.
- **Systems administration, consulting and integration**  
Systems administration, consulting and integration is an area of activity in which systems integrating and connecting communications hardware, software and devices are developed, for example the interconnection of servers with mobile devices. This area also includes services for designing and implementing high-quality technical solutions for companies and government.
- **Security for, and design and development of software and hardware**  
The area of security for, and design and development of software and hardware includes all activities associated with developing IT systems, manufacturing electronic devices, developing programs, standard applications and office software, and with providing telematic and IT-security services.
- **Commercial, technical support and maintenance services**  
The field of commercial, technical support and maintenance services involves activities relating to e-commerce, the maintenance of systems and devices and the sale of electronic equipment, including consumer goods (cameras, printers and other peripheral devices). This area also includes technological advice and the provision of pre- and post-sale services relating to the management and maintenance of applications and systems.

# 03

## Sector trends

**Telecommunications and ICT are becoming ubiquitous: information can increasingly be accessed from anywhere and using any device.**

### Cloud computing

Cloud computing is a set of services available in an Internet cloud, a catalogue of standard products that are compatible with a large number of devices. This type of service enables users to store, consult and access the information or service from anywhere and using any device, without moreover needing advanced knowledge of how to use IT tools. Companies' need to continuously access information has already generated continuous exponential growth in the use of these services as they perfectly meet the needs of business, increase the competitiveness of companies that use them, are innovative and increase workforce flexibility. In fact, according to the International Data Corporation the business of cloud computing will increase by 26% per annum for the next four years.

### Green IT and renewable energy investments

The sector's environmental commitment will go from being a commercially-valuable label to become fundamental to the establishment of specifications, standards and requirements for manufacturing products. This will take place in two areas in particular: energy saving, by increasing the efficiency of all the components included in designs, and the search for new materials from which to make devices, which will need to be easily recyclable. In fact, a team of scientists from the University of California has published research which shows that the future of computers is linked to magnetic microprocessors that can use the least amount of power allowed by the laws of physics.

In addition, substantial investment in renewable energy to power communications infrastructure is forecast. In fact, some reports predict that 4.5% of communications stations will be powered by renewable energy in 2014 compared to the 0.11% today. Furthermore, this percentage is expected to reach 8% in emerging economies and developing countries.

### Mobile Internet access and technological convergence

The production of Internet-connected, multimedia mobile devices and people's need for continuous Internet access, whether for personal or work reasons, have been two factors that have led the industry to rethink its mobile communications business model in two ways: more applications will be needed that are compatible with mobile devices, and the quality of broadband Internet access service will have to be improved for a growing number of mobile users. In fact, figures from consultants Frost & Sullivan and the IDC suggest that mobile broadband already accounted for 30% of connections in Latin America in late 2009 with about 15 million mobile broadband connections and 34 million landline broadband connections. This rethink has and will continue to have an impact on the business model, in the same way as happened to landline telephony when mobile telephones first appeared in the market.

Nevertheless, Internet service providers need to invest heavily in order to ensure adequate speed and service quality for anyone who requests fixed or mobile Internet access, plus companies need to think about the possibility of adapting their applications (websites, portals, accessing data from the server, etc.) to make them completely compatible with and accessible from mobile devices. In fact, telephony and Internet service providers have already launched commercial campaigns designed to bring all services together in one services package with a single bill, meaning that the convergence of already available networks and telecommunications services can lead to new uses.

### ICT and SMEs and use of technologies

The Spanish and Catalan production system, made up mainly of micro, small and medium enterprises, will have to adapt to emerging technologies. In the same way, they remain the market niche to which manufacturers and distributors are currently looking in order to get back on the path to economic growth. To meet this challenge, only a joint effort based on defining products and services designed by the manufacturer in accordance with the needs of this group (micro and SMEs) – which is varied and heterogeneous, and whose needs have to be dealt with on an individual basis – will lead to the readjustment of investment and to the industry's development in economic and employment terms.

Moreover, according to an IDC study company employees use an average of 4 types of technological devices in their jobs (phone, PC, laptop, tablet, etc.) and in their spare time they research new technologies and devices that can make

their work easier. This means that the current position is the opposite of what had been the case to date as the use of new technologies is being driven largely from the bottom upwards, i.e. not by corporate departments in companies but rather by employees with greater technology skills.

### **Software and social networking**

This includes a wide range of technologies related to social networking or working online. Businesses and organisations will have to take into account this social aspect of technology when developing their websites, portals or applications, and adopt one or more web 2.0 platforms in order to make themselves known to and interact with society. Otherwise, many will remain outside the market or fail to make use of an increasingly large-scale and effective means of dissemination.

### **Development of Business Intelligence**

Business intelligence (BI) is a set of solutions and technological applications to generate and analyze data and information within the company and to facilitate decision making. In an economic environment very dynamic and changing, even uncertain, the use of specific technologies and applications for business management and BI to help make decision more realistic and fast, allow companies to store and organize data and products and use them more efficiently. BI systems make possible the analysis of all company information and its transformation into knowledge, and therefore become a key tool to define new processes or introduce organizational changes.

Currently, major technology suppliers (Microsoft, IBM, Oracle, SAP, etc.) have designed created and manufactured specific technology platforms to implement business intelligence systems for businesses and organizations.

### **Railways and mobility**

State-owned rail infrastructure manager Adif has announced it will invest €2.6 million in the coming years to upgrade its fibre optic network to improve its communications service and meet the demands of new plans that communications operators want to implement. The extension of the fibre optic network will be installed in the stations at Bellvitge and the airport, and specifically along the Barcelona Sants-Estació de França, Vacarisses-Manresa and Mollet Santa Rosa-Montcada Bifurcació routes. This increase in features will improve the quality of rail telecommunications and the technology will be available to provide multimedia, data and voice services. Hence the rail industry is in line with the extension and optimisation of communications that Spain and Catalonia need. Indeed, national rail operator RENFE is expected to add a new Wi-Fi service to its high-speed trains in 2012.

### **Near Field Communication (NFC) technology. How can it change our day to day?**

NFC is a short-range wireless technology that enables easy and intuitive interconnection between electronic devices available in various places around the world and mainly serves to exchange data between two mobile devices, for example to make payments using mobile phones. Thus the NFC mobile payment system, which enables users to pay for goods and services using a mobile phone signal instead of credit cards or cash, has recently begun to roll out across many cities in the United States. Indeed, mobile phone manufacturers are planning to build this technology into their terminals: Nokia will include it in all new models starting in 2011, Apple might introduce it in version 5 of the iPhone, just like BlackBerry, and Google has already integrated it into the Nexus S and given support to do the same in the Android 2.3.

In Spain there are companies in the banking and finance starting to bet on this technology. Thus, La Caixa, together with Visa, are boosting a Contactless project in Barcelona in order to facilitate payment through NFC in some shops in the city.

### **The boom in apps**

The emergence of smart phones and mobile Internet has created a new market in the field of ICT applications for mobile phones. These are specific programs for accessing content directly from mobile devices. It is used similarly to a website but adapted to the requirements and features of a mobile phone.

It can be talk about a real boom in apps (known as mobile applications) that is generating a wide range of needs: consumers, who have access to a greater offer; companies, who can have their own applications; and technology developers, who have professionals able to respond to market demands. According to the study conducted by The App Date<sup>1</sup> (the entity that organizes one of the most important event to put in contact professionals apps) 1 in 4 Spanish people uses mobile application, and there are 2,7 million of downloaded apps per day. In addition, Spain is in the second position in terms of smartphone penetration in Europe, with 18 million devices.

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<sup>1</sup> <http://madrid.theappdate.com/>

These data do nothing to demonstrate the growing importance of apps can have on the telecommunications and ICT industry, both in terms of creating business and jobs. Specifically, companies involved in apps development (many of them newly established or start-ups) bill on average €780.000/year and 88% of these have experienced a growth in sales during 2012.

# 04

## The sector in figures

### Economic data

- According to the Association of electronics companies, information technology, telecommunications and digital content (AMETIC)<sup>2</sup>, the telecommunications and ICT represents 6% of Spain's GDP (2011).
- Also, according to the AMETIC, there are 24.371 companies (1,6% of all companies in Spain). 96% of these, are SMEs and micro-enterprises (with 1 to 49 employees).
- 59,4% of the companies are engaged in ICT (hardware, software and IT services), 25,3% in digital content, 7,9% are operators/providers of telecommunications services, 3,8% in electronics for consumers, 1,8% in electronic components, 0,8 are telecommunications industries, 0.5% in professional electronics and 0.5% in other ICT activities.
- Catalonia is the second region with more Telecommunications and ICT companies (5.203, representing 21,3% of the nearly 25.000 companies that there are in Spain and 1,9% of all companies in Catalonia). Madrid is the first with 6.972 companies (28,6%). Madrid, Catalonia, Andalusia, Valencia and the Basque Country account for 75% of these companies.
- Regarding the 15.000 Spanish companies of ICT (hardware, software and services), most of them are engaged in providing consulting services and application development (94,6%). Only these kind of companies represent 38% of total industry. The majority of these companies are located in Madrid (4.322, representing 29,9% of them) and in Catalonia (3.193, representing 22,1%).
- According to data published by the Ministry of Industry, Energy and Tourism on 2010, the telecommunications and ICT had a turnover of €104.374 million (61,9% of ICT companies, and 38,1% of telecommunication companies) value representing a decrease of 7,3% compared to 2009. The highest turnover occurred in 2008 (€115.000 million).
- The National Observatory of Telecommunications and the Information Society (ONTSI), an organization under the assessment of Ministry of Industry Energy and Tourism, said that industry companies have invested €16.681 million in 2010, representing a 0,55% more than in 2009. Most of this investment were in ICT companies (73,1%).
- According to the Telecommunications Market Commission (CMT), the income industry have been of €39.787 million (2010), which means a reduction of 3,5% compared to 2009. This downward trend is a constant since 2008 (the year in which they reached the maximum level of revenues, €44.130 million). The fix phone service is the one which has generated more revenue (42%), followed by mobile (18%). Internet services accounted for 12%.
- According to the Barometer of the technology sector in Catalonia<sup>3</sup>, this sector had a turnover of €11.934 million in 2010. It is a value slightly lower than in 2009 (€11.972 million) and much lower than in 2008 (€13.941 million). Therefore, despite the sharp drop between 2008 and 2009, the actual situation is stable. Considering the sub-activity, highlight billing of telecommunications (51%), while the ICT service companies represent 32%. The rest is up to manufacturing electronic components, computers and consumer electronics (16%), and 1% to editing software.
- The sector of electronic components, computers and consumer electronics is the one who has suffered more the crisis and its turnover has been reduced by almost a half in two years: from €3.200 million of turnover in 2008 to €1.944 million in 2010.
- Regarding the investment, according to the Barometer of the technology sector in Catalonia, spending on research and development was €15.000 million in 2010 (0,1% more than in 2009), 1,39% of Spain's GDP.
- In 2011, according to the Economic Report of Telecommunications Market Commission (CMT), fixed broadband

<sup>2</sup> Hipersectorial Map of ICT, January 2012 edition.

<sup>3</sup> Barometer of the technology sector in Catalonia 2012. Cercle Tecnològic de Catalunya.

lines rose by 4,8% compared to 2010, surpassing the 11 million access assets, and more than 24 lines of this kind of Internet per 100 inhabitants. As for mobile broadband growth by 65% between 2010 and 2011 in number of users, consolidating 19,3 million users and a penetration of 42 lines per 100 inhabitants.

- Regarding access speed, highlights the increased network capacity for fixed-line broadband access up to the fact that 54% of these had a speed greater than or equal to 10 Mbps (megabytes per second). It is more than the average for the European Union.
- According to the same report of the CMT, the industry in 2011 experienced a general fall in prices of communication services: 16% of mobile communications and 7.5% in the combined packet telephony and fix broadband.
- Similarly, 2011 is the year in which the coverage of 3G networks has become almost universal because it reaches 95% of the population. Also is the year that has begun to pilot the first 4G network in Barcelona and Madrid.
- The market share (2011) of the lines associated with Datacard (data lines in mobile communications) are distributed as follows: Movistar with 39% (42,6% in 2010); Vodafone with 28,2% (29,9% in 2011); Orange with 20,5% (19% in 2010); virtual mobile operators with 6,8% (5,6% in 2010); and Yoigo to 5,3% (2,9% in 2010). Therefore, there is a general increase in the market share of small mobile telecommunications operators to the detriment of the largest ones.
- A CMT (2012), mobile phone has lost 1,31 million mobile lines in the first eight months of the year. In absolute terms there are 54,45 million mobile telephone lines, which is 2,1% less than in 2011. Vodafone and Movistar have lost more contracted lines than the other operators.
- Regarding fixed communications, CMT report say that have fallen again, and in 2011 there was 343.055 line cancelation. This situation has also affected the level of turnover, which fell between 2010 and 2011 by 9,2% (almost 5.300 million less). Also, note that this decline is concentrated mainly in companies.
- 97,1% of Catalan businesses have Internet access (2012)<sup>4</sup>, 99,7% have a fixed broadband connection. Also, note that the 76,2% of companies which have Internet connection have also their own website.

## Employment data

- According to Hipersectorial Map of ICT prepared by Business Association of electronics, information technology, telecommunications and digital content (AMETIC), in 2011, in Spain, there was 386.009 employed in the sector ; almost 200.000 (50,5%) were engaged in information technology (software, hardware and IT services). There are 77.741 people employed in companies of digital content creation (20,1%) and 68.397 in operators/providers of telecommunications services (17,7%).
- Catalonia, after Madrid, is the second region with more employed people in the field of Telecommunications and ICT. Specifically, in 2011 there were 80.013 employees, representing 20,7% of the Spanish employment in this sector.
- According to the same study (AMETIC), companies , on average, have 15,8 employees (2011), representing 3.6 workers more than the average of Spanish companies (12,2 employees per company). In Catalonia, this value is 15,4.
- According to the National Observatory of Telecommunications and the Information Society (ONTIS), the trend of employment in telecommunications and ICT industry is negative. Thus, between 2008 and 2009 the number of employees fell by 3,6%, and between 2009 and 2010 by 1,5%. In absolute terms there has been a loss of 24.506 jobs between 2008 and 2010.
- The loss of jobs brought about by the economic crisis has mostly affected people with lower qualifications. The number of qualified people who lost their jobs was 1.1% in 2009 compared to 12.4% of people without qualifications who lost their jobs in the same year in the sector.
- The development of applications for mobile phones (smartphones) is an area of activity that generates employment. According to the Third Report on applications made in Spain by The App Date<sup>5</sup>, 84% of Spanish companies dedicated to creating and designing applications have generated jobs in 2012.

<sup>4</sup> National Observatory of Telecommunications and the Information Society (ONTSI).

<sup>5</sup> <http://madrid.theappdate.com/>

- The restructuring of the workforce that has been carried out in the sector has been primarily in the areas of software development, management, finance, and sales and marketing.
- Women continue to increase their presence and participation in the sector, especially in the higher skilled positions.
- The occupations most in demand are in services, consulting and maintenance of devices.

Sources. Latest data available: Spanish National Statistics Institute (INE); *Estudi del mercat de les tecnologies de la informació i la comunicació a Catalunya: 2007-2010* (Study of the information and communications technology market in Spain: 2007-2010); Spanish Association of Electronics, Information Technology and Telecommunications Companies (AETIC); IBM Institute for Business Value; Association of electronics companies, information technology, telecommunications and digital content (AMETIC); National Observatory of Telecommunications and the Information Society (ONTSI); Ministry of Industry, Tourism and Trade; Hipersectorial Map of ICT , January 2012; Telecommunications Market Commission (CMT); Barometer of the technology sector in Catalonia; and The App Date: <http://madrid.theappdate.com/>

# 05

## Professional profiles most in demand

### Most highly qualified professional profiles

#### Training profile

The telecommunications and ICT industry is a highly specialised one that requires very specific profiles and, in particular, qualified people. In fact, as is described in the report on *Las tecnologías de la información en España* (Information Technology in Spain), prepared by the Government of Spain's Ministry of Industry, Tourism and Trade through the Spanish Association of Electronics, Information Technology and Telecommunications Companies (AETIC), 60.1% of people working in the industry have a degree and some other high-level qualification.

Specifically, the most-needed professional profiles are people with a foundation or higher level engineering degree in telecommunications and IT, which are also the same people who the industry has traditionally employed. However, profiles with degrees in subjects related to business management are also required, such as business administrators and managers, as well as people with training in both technology and management.

It is the more qualified professionals who undertake and manage telecommunications and ICT projects and, in order to do so, they need a general knowledge of the field, requiring an understanding of IT, telecommunications and networks, as well as of managing all of them. Therefore, professional project managers need to undertake specialist studies, such as master's or postgraduate courses, that supplement the area that was not focused on strongly in their initial or basic training. Moreover, these profiles require certifications in the technologies of manufacturers such as Microsoft, Cisco, Oracle and SAP.

Furthermore, these professional profiles require a good level of English, as that is the language of much of the related documentation that is generated (technological standards, applications, etc.) and, moreover, companies whose business is based on developing software and hardware, or on manufacturing equipment, maintain direct contact with companies that are active outside Spain; in this situation, the most common *lingua franca* is English.

Finally, it should be stressed that, according to *Las tecnologías de la información en España*, the operational areas of the industry that need the greatest number of qualified people are management, software development, training, consultancy, R&D and marketing.

#### Skills profile

Knowledge of technology and of project management is needed to work in the telecommunications and ICT industry, but each job requires different skills. For example, software programmers need, above all, a capacity for abstraction, while hardware designers need skills that have more to do with thoroughness and precision. However, the most-valued skills in the industry are the ability to adapt to change, flexibility, the capacity for independent learning and the ability to work as part of a team.

It should be stressed that this industry is constantly evolving and changing (new technologies, uses and products appear every year), meaning that anyone wanting to work there needs, above all, initiative and the ability to manage the changes that occur.

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#### Examples of jobs in the web Barcelona Treball directory

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- ✓ [ICT consultant](#)
  - ✓ [Multimedia applications engineer](#)
  - ✓ [Common infrastructure engineer](#)
  - ✓ [Telematic security specialist](#)
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## Less qualified professional profiles

### Training profile

Within the industry, there are also professional profiles with qualifications such as higher- or medium-level vocational training: the studies involved ensure adequate preparation for the industry. However, such individuals should not stop learning throughout their lives and should complement their training with more that is related to the tasks involved in their job.

The training profile of the industry's less-qualified professionals corresponds to people qualified from medium- or higher-level vocational courses in the professional categories of IT and communications, electricity and electronics and images and sound. These professionals do work related to installation, maintenance and operation of infrastructure and services. Workers with the same level of qualification can also be found in the field of software development (programmers), but they carry out lower value-added work.

It is also advisable for the industry's less-qualified professionals to have a basic knowledge of the technical English applicable to telecommunications and ICT, and to obtain some form of certification in the technologies of manufacturers such as Microsoft, Cisco, Oracle and SAP, especially those professionals categorised as technicians.

It should be stressed that, according to *Las tecnologías de la información en España* report, and in contrast with other, less-specialised industries, only 39.9% of the people working in the industry are not graduates. More specifically, the areas of the industry that require less-qualified personnel are multimedia, maintenance and repair, network installation, hardware manufacture and sales.

### Skills profile

The skill requirements demanded from these professional profiles are varied and depend on the area in which they work. Nevertheless, the skills that are generally viewed positively are a concern for the quality of the final product, customer focus, flexibility, adaptability to change, teamwork, the capacity for independent learning and the ability to practically apply the knowledge acquired throughout working life.

It is also essential for these professionals to be competent in the use of computers and, at the least, be skilled in the use of office-based IT applications.

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#### Examples of jobs in the web Barcelona Treball directory

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- ✓ [Helpdesk operator](#)
  - ✓ [Image and sound technician](#)
  - ✓ [Hardware-maintenance technician](#)
  - ✓ [Systems-maintenance technician](#)
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# 06

## Future scenarios

### Weaknesses

- Lack of physical communications infrastructure in areas that require high levels of investment because of their location and relief, and in industrial estates that lack the ICT services necessary for efficient management.
- Spain's high technological dependence on the international ICT market; the industry had a negative balance of trade in 2009 (-€3.56 billion). Although exports have increased significantly in recent years, imports (€4.9 billion) were far in excess of exports (€1.34 billion) in 2009.
- The lack of a tradition of companies working together to create business clusters, which would facilitate access to and the introduction of new technologies.
- Qualified personnel's low level of English. In order to work in the field of telecommunications and ICT, it is essential to be able to read and write English to an advanced level, as that is the language in which the majority of related documentation is published. Moreover, many of the leading technology companies are multinationals with offices across the world in which the most common *lingua franca* is English. Therefore, a lack of English speakers could make it hard for Spanish and Catalan companies to enter the international market.
- Lack of qualified professionals with specific expertise and management skills and team management.
- Low level of internationalization of companies, according to the Barometer of the technology sector in Catalonia made by Cercle Tecnològic de Catalunya, 2011.
- Insufficient public R&D investment in the industry. Public investment in research in the European Union is far lower than in the United States. Furthermore, when comparing research and development investment levels among EU Member States, Spain comes at the bottom of the list. As a result, the lack of public investment in telecommunications and ICT could make Spanish companies less competitive, as well as inducing the country's highly qualified professionals (researchers) to seek jobs in other countries where working in research and development is more attractive, not just because of better pay but also because of the greater social recognition they are accorded.
- Inadequate scale or size of the business market, the business structure of mainly small and medium companies (fragmentation of the sector) and the lack of private financing (Barometer of technology sector in Catalonia).

### Threats

- Worldwide competition in a globalised market as well as European competition from countries such as Ireland, Hungary, the Czech Republic and Slovenia, which have intensive manpower and lower production and labour costs, is leading companies to relocate away from Catalonia to these countries.
- Lack of short- and medium-term private investment may make Catalan companies less competitive compared to other companies in nearby areas.
- The main large companies are not headquartered in Catalonia, even though it hosts 20% of the companies in the industry in Spain.
- The existence of barriers to demand for ICT services from traditional sectors, partly as a result of high levels of dissatisfaction with telecommunications services or widespread decline in demand and consumption.
- Technology companies require qualified personnel or specialist human resources. Job offers in ICTs are not covered by the supply of qualified people in the sector. Hence the sector's growth has not been accompanied by an increase in people's interest in training for it.
- Lack of coordination and organization of university training in the field of ICT.
- Reduction of aid aimed at promoting innovation in SMEs.

## Strengths

- The industry's stability as regards employment and economic growth. Although the telecommunications and ICT industry shrank slightly in economic and employment terms in 2009, this was caused in large measure by the global crisis.
- High competitiveness in terms of labour and production costs compared with other countries in the European Union: France, Germany, the Netherlands, etc.
- The existence of a solid base of leading customers for the telecommunications and ICT industry, specifically major customers in areas such as banking, finance, insurance and industry.
- Strategic commitment by local public entities to the telecommunications and ICT sector. The Catalan Government is committed to the mobile industry, as can be seen in the consolidation of Barcelona's position as host for the Mobile World Congress 2012 after the successes of previous years.
- The high level of skills of sector professionals. Catalonia has human capital trained to work in the sector and a sufficient range of higher education facilities (universities and research centres) to meet personnel requirements.
- The consolidation of Catalonia as a centre of excellence in the sector increases its ability to attract qualified professionals from outside the country.
- Sector companies are strongly entrepreneurial, innovative and creative and able to operate internationally.
- The ease with which sector companies are able to build new technologies into their production processes means they are more competitive and flexible at the same time as it makes them more likely to withstand an economic crisis like the present one.
- Precedents in Catalonia of successful experiences in the technology sector, with companies that have managed to internationalize their products starting from small local start-ups. These companies may be key to motivating and supporting the internationalization of new business projects.
- Tradition of internationalization of Catalan SMEs.

## Opportunities

- Use R&D investment by government and private companies to grow the industry. The collaborative models based on concepts with Open Innovation (innovation management model of companies that instead of relying only on the development of new internal ideas, open its relations and cooperate with other companies, institutions or external experts) may be useful to unify efforts of public and private sector.
- Encourage the introduction of ICT into SMEs using existing plans and grants.
- Take advantage of the knowledge base of the region's research centres and universities to promote links between the sector, industry and R&D stakeholders in order to facilitate technology transfer following the triple helix model which consists of interaction between universities, government and businesses.
- Encourage the coordination of the industry's companies, entrepreneurs, research centres, business springboards and technology parks to enhance the competitiveness and internationalisation of local suppliers.
- Make use of the robust public investment in introducing ICT applications (e-government, e-learning for formal education, e-health) to develop new technologies and systems.
- Improve access to finance through a context that promotes interactions between entrepreneurs, established companies, venture capital and business angels.
- Take advantage of the attraction of Barcelona and 22@Barcelona to bring in sound companies with a good international presence and to promote and consolidate Barcelona's international image as a leading city in the development of the knowledge society.
- Promote Smart Cities so they can introduce ICT on a massive scale in order to provide benefits and services based on the smart use of available information and data for the public and businesses. This will involve changing government procurement to provide for the possibility of longer timeframes in some contracts and also increasing the ability to put in place agreements covering more than one town so as to achieve economies of scale and ensure the interoperability of solutions between the various utility companies (electricity, gas, water, etc.) and manufacturers.
- Increase the specialisation of existing research centres and taking advantage of the prioritisation of the industry's

clusters in Catalonia.

- Tailor and integrate technology from the leading technology sectors into other more traditional sectors in Catalonia. The gradual introduction of new technology in companies in other economic sectors could become a growth opportunity for consulting or programming firms or other service providers.
- Increasing lifelong learning for professionals is essential to keep staff up-to-date and able to adapt to new contexts, something which is very common in telecommunications and ICT.
- Identify projects and initiatives with potential for expansion that are being developed on a small scale and give them support.
- Take advantage of the growing demand for technology and technological devices on the part of users, as on average people have more than one electronic device (tablet, PC, mobile phone, music player, etc.).
- Promote the internationalization of technology companies with strategies to overcome alliances and, therefore, the excessive fragmentation of the sector.

# 07

## Useful links

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### International organisations

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International Telecommunications Union (ITU)

<http://www.itu.int/net/home/index.aspx>

The Internet Society (ISOC)

<http://www.isoc.org/>

World Information Technology and Services Alliance (WITSA)

<http://www.witsa.org/>

European Information Technology Observatory (EITO)

<http://www.eito.com/>

GSMA World

<http://www.gsmworld.com>

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### Spanish organisations

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Association of electronics companies, information technology, telecommunications and digital content – AMETIC

<http://www.ametic.es/>

Spanish Telecommunications Market Commission – CMT

<http://www.cmt.es/>

Spanish Confederation of Information and Communication Technology and Electronics Companies – CONETIC

<http://www.conetic.info/>

Catalan Local Consortium for Developing Telecommunications Networks and New Technologies – LOCALRET

<http://www.localret.cat/>

Spanish Association of Internet Users – AUI

<http://aui.es/>

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### International events (fairs, conferences, etc.)

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Mobile World Congress 2013

<http://www.mobileworldcongress.com/>

BDigital Global Congress 2012

<http://www.bdigitalglobalcongress.net/>

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### Spanish events (fairs, conferences, etc.)

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International ICT Services and Solutions Trade Fair – SIMO 2012.

[http://www.ifema.es/simonetwork\\_01](http://www.ifema.es/simonetwork_01)

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Sonimagfoto

<http://www.sonimagfoto.com/>

Mundo Internet – International Congress of Internet, Telecommunications and the Information Society

<http://reddt.apte.org/info/Eventos/mundointernet/>

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### International themed portals

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Digital Agenda for Europe. A Europe 2020 initiative. European Commission.

<https://ec.europa.eu/digital-agenda/>

DigitalEurope

<http://www.digitaleurope.org/>

The World Wide Web Consortium (W3C)

<http://www.w3.org>

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### Spanish themed portals

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Red.es (Spanish public company)

<http://www.red.es>

Barcelona Digital Foundation

<http://www2.bcndigital.org/>

MAPATIC – ICT Map

<http://www.mapatic.net>

Telecos.cat – Telecommunications Engineers

<http://www.telecos.cat>

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