ICT
Sector report

2023

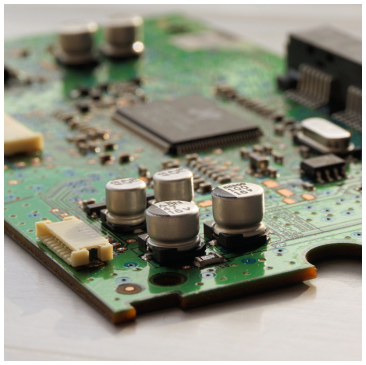
Ajuntament de Barcelona

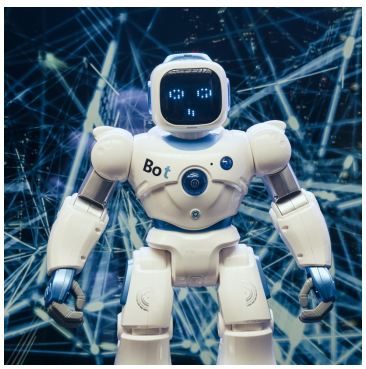
Barcelona Activa

Abstract

ICT

The Information and Communication Technologies sector (ICT) is made up of companies and economic activities that market tools and technological resources to create, store and transfer information. Thus, ICT is applied to the development of uncountable widgets and devices for different sectors of economic activity through hardware (computers, robots, tools specific to the production process) and software, in which the Internet plays a key role. ICT is the basis of the process of digitising the economy and society. The current dynamism of jobs in the ICT sector shows an imbalance between the skills that workers have and those required by companies. This is partly due to the constant innovation in ICT, which requires the continuing training of ICT professionals. Several expert voices point to the growth of ad hoc training and retraining programmes as measures to respond to a growing labour market. The widespread use of the Internet and connected devices has been one of the great spurs for the growth and popularisation of the ICT sector.





Summary

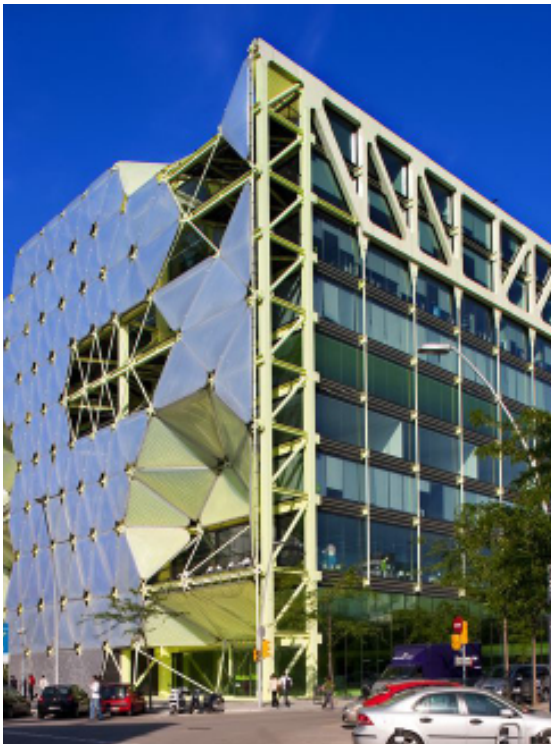
Get to know the sector

Introduction to the sector

Digitisation or digital transition refers to the intensification of the process of technological change in productive systems and its impact on consumer patterns and the way people live. Expert voices in this area highlight how our society is fully immersed in this process. This results in the growth of this sector, which is becoming more and more cross-cutting with the other sectors of the economy, as well as the creation of new employment opportunities. There is no clear vision of the duration of the digital transition process or of its long-term impacts, but experts agree that sustained growth will continue in the coming years.

Digitisation affects all areas of business across in a cross-cutting way. It is necessary to meet challenges such as automation, the creation of higher value-added products and services, the development of new business models and the implementation of new methodologies that allow better products to be designed and brought onto the market in a shorter time. Consequently, this reality means that companies, whatever type of activity they carry out, have the need for digital talent to ensure the competitiveness and sustainability of their business projects. In this way, a person trained professionally in the ICT field can find work in more than one sector of economic activity performing similar tasks.

In recent decades, the city and the metropolitan area of Barcelona have been established as an ICT hub where companies, professionals, innovative projects and research centres are concentrated. This has positioned the city as a benchmark in international technology. Barcelona offers a competitive ecosystem in the ICT sector, comparable to those in other European cities such as Amsterdam or Paris.



As has been said, the ICT sector and the structural and cultural changes it generates in the population and their consumption patterns have an undeniable impact on society as a whole. In this regard, two realities must be highlighted which should be taken into account. Firstly, the technological or digital divide, which threatens to exclude broad social sectors and therefore makes it necessary to carry out retraining processes to adapt the digital skills of working people to the new needs of the market. Secondly, there

are policies that aim to attract female talent, as the gender gap causes a low presence of women in the sector, both in terms of employment and enrolments in higher ICT education or STEAM trainings (Science, Technology, Engineering, Arts & Mathematics).

Finally, it is important to point out the impact of the Covid-19 pandemic. It has led to an acceleration of digitisation and a more intensive use of ICT, for example in the relationship between citizenship and the Government (information, assistance and generic procedures, health care, and many others) or with the growing trend of working remotely, which involves new cultural changes.

Barcelona and the ICT sector

Barcelona and its metropolitan area have a remarkable international projection largely because of the ICT industry and services. The lack of match between supply and demand of ICT professionals is notable in metropolitan areas such as Barcelona, which has leading companies and is positioned internationally as one of the sector's referents, to the point that ICT sector salaries in Barcelona are above the city average.

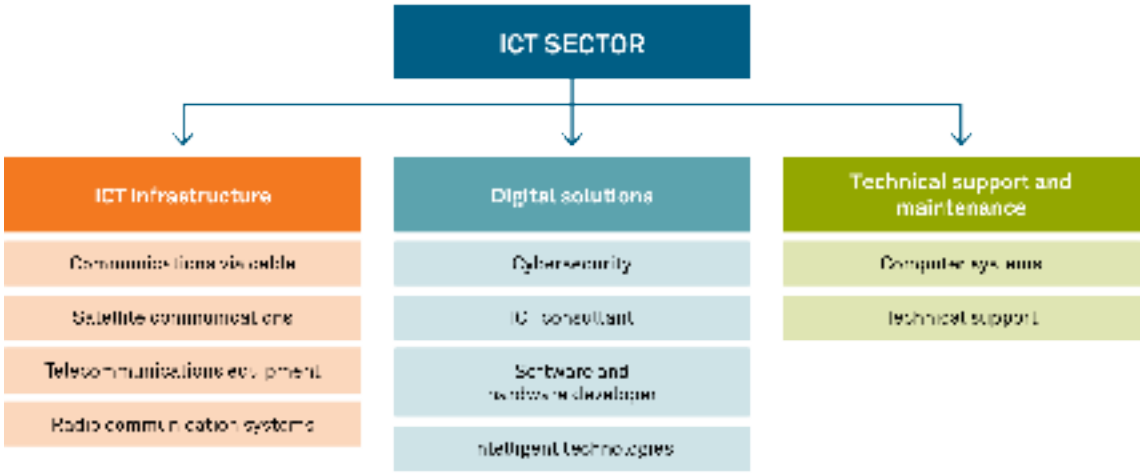
In this context, as we mentioned earlier, companies in this sector have established their headquarters for technological developments in Barcelona and the supply of tech jobs is constantly increasing. The ICT sector generated 24,648 jobs in 2022 in Catalonia (the vast majority in the Barcelona area), to a total of 120,000 professionals. Public entities support the ICT sector for what it entails in terms of wealth generation, impact and social transformation, an example of these alliances is the Barcelona Digital Talent public-private partnership platform, fostered by the Mobile World Capital Foundation. The task of this entity reveals the impact of Mobile World Congress on the city.

The importance of this alliance is characterised by the fact that it organises and stimulates year-round actions, all aimed at improving people's employability in digital skills. Therefore it is an organisation clearly focused on employment in the ICT sector. That is why the Barcelona Digital Talent is today the hub for the development of talent and for employment, through three main pillars: professional guidance, training and work. To make this possible, it involves the participation of the main economic and social agents of the city: the Barcelona City Council and the Generalitat of Catalonia as public bodies, as well as the organisations that constitute the ecosystem of the ICT sector in the city -the 22@network association, which represents the city's technological district; Tech Barcelona, which hosts the set of start-ups and innovation processes in the international digital and technological scene; Cercle Tecnològic as a benchmark space of the Catalan technological ecosystem; Barcelona Global, which develops strategic proposals for the future of talent in Barcelona, among other corporate partners that essentially make up the multinational companies that have placed their technological centres or digital development platforms in the Barcelona area. Some relevant training centres actively participating in the alliance are IT Academy and Cibernarium of Barcelona Activa, Nuclio Digital School, Iron Hack and Assembler – Institute of Technology. Furthermore, it should be mentioned that every year Barcelona Digital Talent produces benchmark reports which present a thorough knowledge of the state of the sector.

Fields of activity

The Information and Communication Technologies sector is divided into three subsectors of activity: the process of producing widgets, communication devices and hardware in general, software creation and digital solutions, and lastly the need for technical support and maintenance, which is intrinsic to the sector.

Figure 1. Structure of the ICT sector, by areas of activity.



Source: Own preparation

ICT Infrastructure

ICT Infrastructure includes technological communications -as well as the equipment and systems that make them possible- to gather, transmit and present data and information electronically. In other words, this subsector of economic activity refers to the components which, when properly combined, facilitate the management of ICT services of the company and its environment.

In this field, several job types can be found:

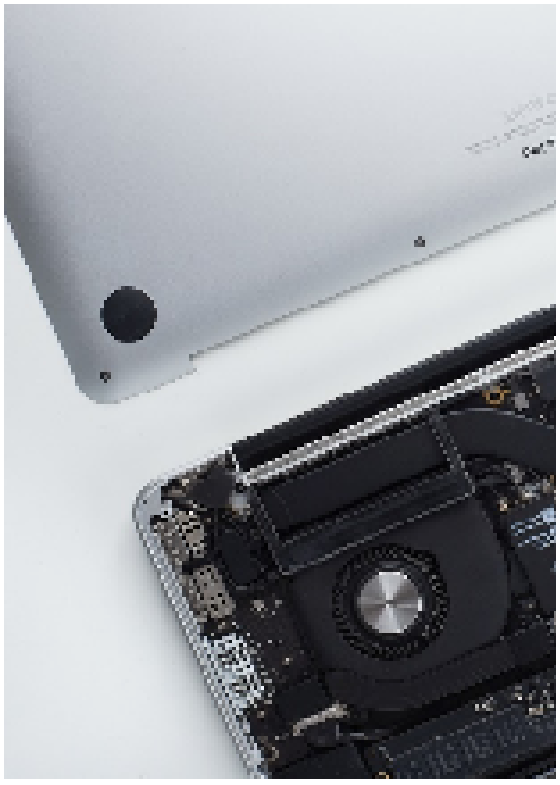
- those associated with the cable telecommunications infrastructure, dedicated to the installation of terrestrial transmission systems located on intercity, international and intercontinental lines for communications requiring bandwidth, such as fibre optics, for example;

- professionals in the field of satellite communications, who work with voice and video transmission systems, the Internet, television and radio channels;
- professional profiles that work on installing or maintaining telecommunication systems, who are in charge of regular check-ups and/or repairs for the good development of the technical specifications of the relevant telecommunication infrastructure;
- finally, there are jobs linked to radio communication equipment, which deal with systems that work by electromagnetic or radio frequency.

There is a common distinction between traditional ICT infrastructure and cloud infrastructure. The former consists of the usual hardware and software components: installations, data centres, servers, telecommunications systems, among others. This equipment requires a physical space to install ICT infrastructures, especially terrestrial telecommunications equipment and systems (stations, communication networks, repeaters, etc.). By contrast, in the latter, although it is similar to the traditional ICT infrastructure, end users can access ICT services via the Internet, thus facilitating the use of ICT resources to organisations without installing networks, servers and other locally available equipment, i.e. virtualising them and without the need for their physical presence at the company's or organisation's headquarters. Virtualisation connects the physical servers that a service provider maintains at any location and manages the resources on demand from wherever an Internet connection can be established.

Digital solutions

This subsector brings together companies, activities and jobs that respond to the different technological needs of companies and organisations through specific tools that facilitate the production processes of goods and services. This includes cybersecurity services, specialised ICT consultancy, the design and ad hoc development of hardware and software, as well as applications in mass data management or artificial intelligence, among others.



Digital solutions are closely linked to the digitisation of existing processes that focus on customer experience and cost reduction. They often bring results in the short term and collaborate in the digital transformation of the company or organisation. Today, the incorporation of digital solutions is unavoidable, as digitisation has many advantages in efficiency and competitiveness compared to analog or manual work, which is increasingly residual.

Technical support and maintenance

The implementation of ICT infrastructure and solutions in companies and organisations entails new demands to help solve technical problems and implement improvements in ICT services, which requires specialised support. These services may include interventions in operating system configuration, installation of hardware and software, and maintenance and administration of networks or servers, among others. Due to the increase in and implementation of ICT in all areas of business and life in general, over the last few decades, demand for these professional profiles has increased exponentially in a sector of activity that has existed for only a few decades.

The activities of this subsector include attending to users, providing expert advice on adopting ICT solutions, data management and storage capacity, security-related issues, as well as preventive maintenance (ensuring the correct operation of the equipment, as well as giving recommendations for the best use of the equipment and its possibilities for optimisation) and corrective maintenance (repair services of the components -both hardware and software- that make up the client's computer system). Thus, among other tasks specific to this subsector, the following stand out: network management, incident management, support and advice in the management of change and digitisation, the adoption of omni-channel solutions for improving customer experience or the management and storage of information. In particular, cloud computing has made it possible to use services with which we interact in our leisure time and also at work, such as YouTube, Google Drive, OneDrive, Dropbox, Evernote, Gmail or Hotmail. These services offer what is known as "software as a service" (SaaS). They are centralised on external servers and are accessed by a web client.

Trends

The strong demand for ICT and digital profiles, the persistence of the digital divide and the need for digitisation are three factors that will impact sector trends in the coming years. Even if we are increasingly familiar with ICT and accustomed to the everyday use of digital widgets, we must bear in mind that in global terms there is a significant part of the world's population that is still excluded from Internet access -as in every country there are groups of people still on the margins of the digitisation process- and that this process involves the creation and destruction of jobs with the subsequent demands for professional retraining. In addition, in general terms, there is no gender parity in access to and representation in the ICT labour market, which presents a clear under-representation of women.

Established trends

- Cloud migration. At the beginning of the digitisation process, personal data of companies and organisations were stored locally (server installed on a given team for offline and online work). Today, however, the use of the cloud as an ICT storage and management environment has been consolidated as the most widespread solution. Cloud migration has accelerated as a result of the Covid-19 pandemic: companies that still depended on their local infrastructure migrated to the cloud, and those that were already there also accelerated their digitisation process by demanding new services, which tightened the ability of cloud computing companies.

  In short, cloud migration is merely a confirmation of the trend towards the complete digitisation of business activity and hence of the professional profiles related. This process is reinforced by the placing on the market of ICT tools and devices with a large potential for scalability that allow any company to join digitisation, regardless of its characteristics.

- Data analytics and mining. The possibility of easily generating and managing large amounts of data is already transforming the creation of new businesses, which requires the retraining of professional profiles for the new technical skills being requested. Every company, no matter how small, must operate on the basis of certain data, both those generated in its own activity and other external data that it must integrate in order to improve the service or offer. It is therefore essential to be able to choose what the key data are and to make it useful information for the company, that is to say, applicable knowledge that allows for analytical decision-making. In a business world of constant digitisation, having tools to facilitate this process of data collection and analysis, and having profiles that know how to use them, will be a key factor.

Emerging trends

- Artificial Intelligence (AI) and Internet of Things (IoT). Although these technologies are in the early stages of development, they are expected to grow significantly as they can be implemented in countless economic activities. The application of AI has very diverse uses, but by way of example, we could mention the following: voice recognition when performing day-to-day arrangements with phone companies or with banks; optimisation of digital marketing campaigns, recommending the title and best time and day to send emails; data analysis to advise companies to make decisions about selling or building customer loyalty from predictive models.

  Furthermore, machine learning is one of the branches of AI, which allows the addition of the set of data of interest generated by any activity, and through an algorithm allows conclusions of value to be drawn, such as offering recommended products specially adapted to user preferences, optimising distribution routes, anticipating the demands of a product, etc. Widgets that play a key role in the development of some of these tools are sensors, which handle the collection of key information in real time. Thus, AI and the next generation of advanced wireless network technologies boost the new wave of IoT by combining connectivity and analytics with more intelligent and economical sensors that interact with objects in multiple fields: health monitoring, sporting performance and fatigue sensors in dangerous professions, for example.

- Customisation of products and services. Companies that incorporate personalisation services will have to master the techniques of collecting and processing their customers' personal data. This trend is linked to others such as artificial intelligence (algorithm-based machine learning) or cybersecurity. The aim is to improve customer experience for customisation as mobile applications facilitate any consumer experience, from shopping and banking to education. More advanced applications will allow even more personal relationships, along with immediate responses to requests or issues.

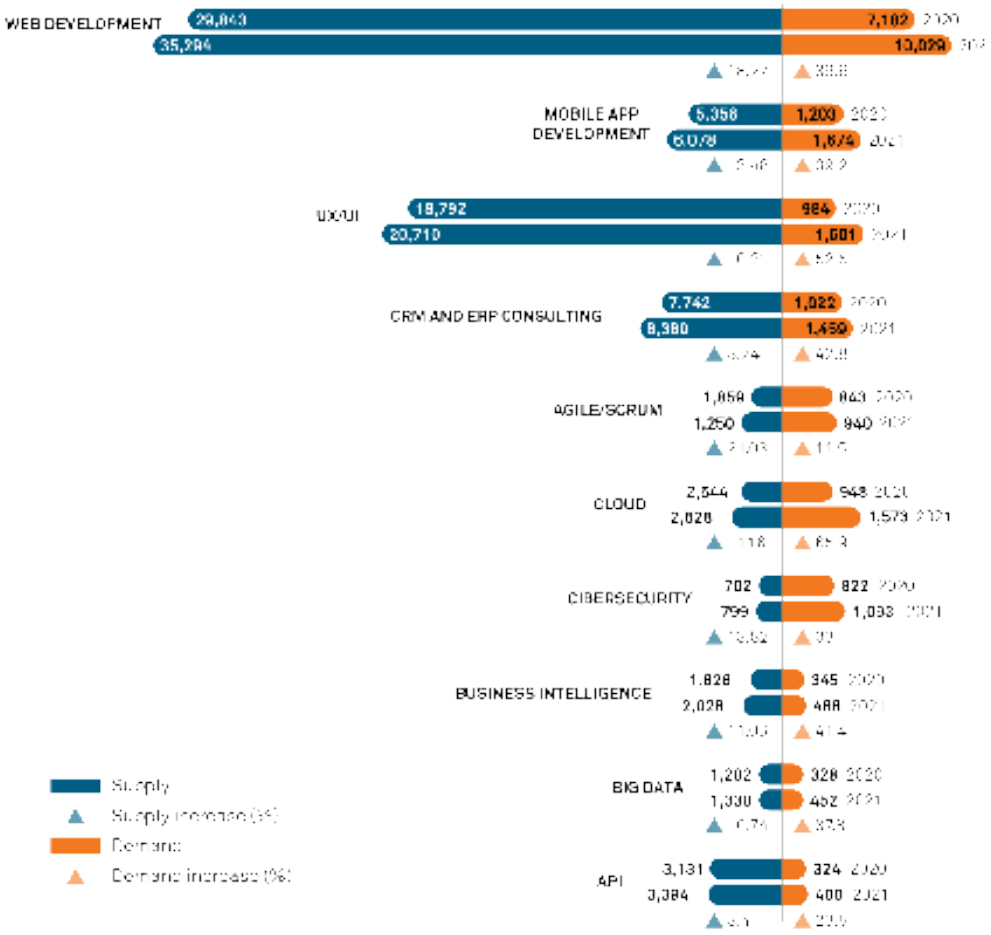
This evolution requires converting a great deal of network information into practical knowledge in real time. The combination of experience and customisation will transform customer satisfaction into loyalty and commitment.

- Privacy and security. Information managed by companies and organisations is usually strategic and confidential. With the widespread use of ICT tools and, in particular, cloud data storage and management, increased mobility and teleworking have amplified the possibilities of cyber-attacks. Similarly, the possibility of theft or loss of credentials continues to cause safety cracks, encouraging the adoption of so-called zero-trust technologies. This involves, among other processes, moving towards a passwordless future through biometric sensors. In this line, the vast majority of mobile devices used for work have built-in biometrics, and notable remarkable are predicted over the next few years until it reaches all companies.

Professional profiles

Barcelona Digital Talent periodically monitors the state of the ICT labour market in Barcelona and points out the imbalances between supply and demand for work. In their latest report, it is found that the areas with the most professional deficit are systems engineering, cloud architecture (design of solutions in cloud computing), cybersecurity, Agile/Scrum development and, most notably, web development.

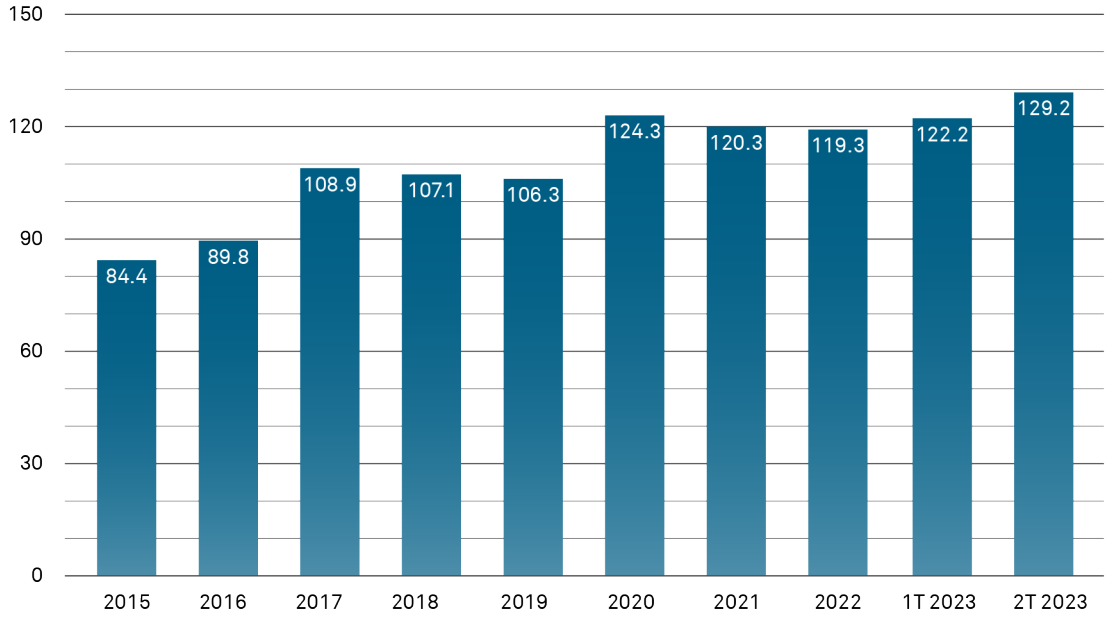
Figure 2. Talent supply and demand for established technologies (2020-2021)



Source: Prepared by the authors, based on data by Barcelona Digital Talent.

Similarly, the ICT sector has proved its resilience during the Covid-19 pandemic of 2020–2021 and has driven a structural change in the labour market that has, in fact, gradually occurred since 2014. Specifically, the last available quarter of 2023 closed with 129,200 sector employees in Catalonia, which account for almost 3.5% of the total employment according to the Active Population Survey (EPA). Thus, the ICT sector has been the only one, along with construction, to generate employment -from 96,500 employed on the second trimester in 2020 to 129,200 on the second trimester in 2023.

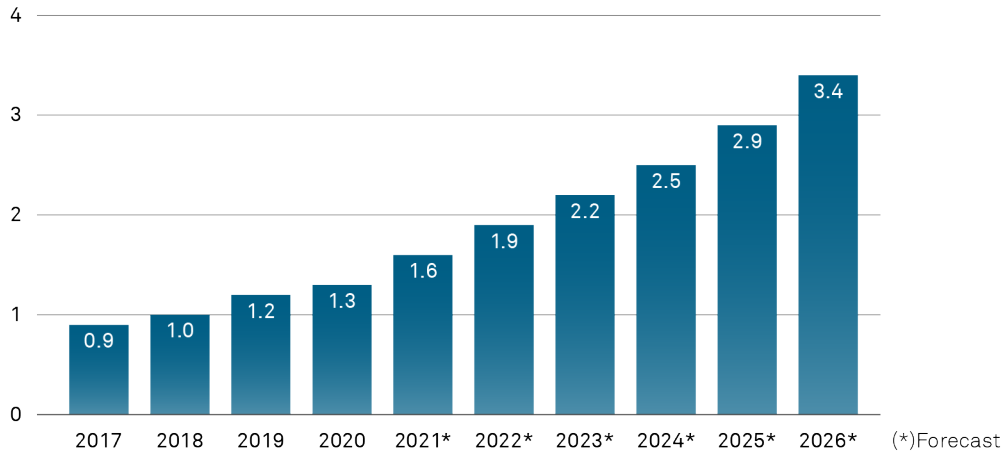
Figure 3. People employed in the ICT sector in Catalonia, in thousands (2015-2023)



Source: Prepared by the authors, based on data by Cambra de Comerç de Barcelona.

In addition, due to the importance of digital transformation globally, transversal to all economic sectors of society, digital spending by 2026 is expected to double that of 2021.

Figure 4. Expenditure on digital transformation technologies and services worldwide (trillions of dollars)



Source: Own elaboration based on the report The Digital Economy in Catalonia 2023, ACTION.

In short, there are growth areas within the ICT sector with a high demand for qualified professional profiles. More specifically, professional profiles in the ICT sector with the highest demand in the coming years will be:

Big Data Expert

They design the process of applying systems for big data management, which ranges from analysing the needs related to data exploitation (data volume to be treated, data type and storage capacity) to system scaling based on these needs as well as the design and planning of the system security, as well as tracking and finally providing support for its implementation. This professional profile is one of the most in-demand jobs in the ICT sector.

Big Data Experts typically work in technology consultancy companies that design applications for other companies using specific software and integrating security or business intelligence solutions.

Database administrator

They manage database software and determine how to organise and store digital information, verifying data integrity and taking responsibility for its security. They are responsible for the design, development and maintenance of these databases, for the coordination of changes, for checking that they work correctly and for the effectiveness of access to data by providing services to external or internal clients. This position has gradually become more important, as the analysis of big data and the jobs associated with it require specific and need-oriented databases in each case.

The services of this professional are key to obtaining the appropriate data to create the machine learning algorithm required by a company at a certain time, for example. These professionals allow companies to store data, organise it, extract it and share it through networks. They also develop safety regulations and standards.

Engineer in artificial intelligence

They perform programming actions based on artificial intelligence. They work with intelligent agents, which are computational systems that are located within an environment and that are able to perform autonomous actions to achieve their goals. In this process, many dynamic elements interact, learning from each other or their habitat (databases and information systems, among others), allowing them to emulate behaviours of people or machines, and to make decisions according to the mission for which they have been programmed.

Artificial intelligence is a discipline that has appeared relatively recently, and in which specialised professionals are scarce, despite being one of the most forward-looking technologies, basically because it combines multiple areas of work: robotics, natural language processing, machine learning, neural networks, artificial vision, intelligent agent modelling, big data, recommendation system and predictive analysis, among others.

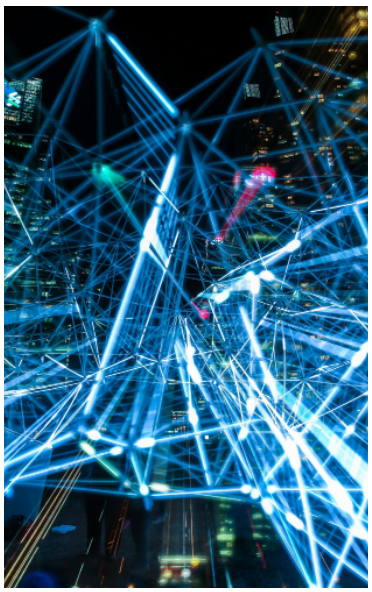
Software Developer

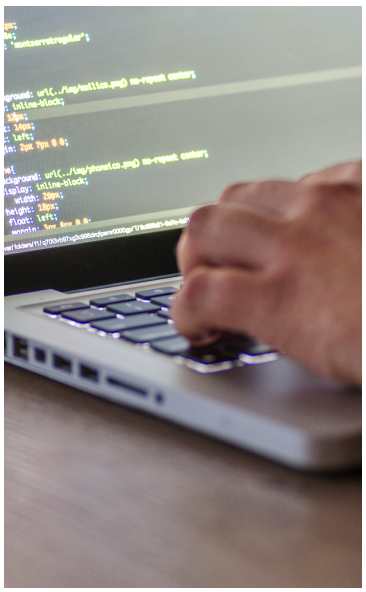
Software development is the process of creating, testing, debugging, and maintaining all programs, procedures, and documentation relating to some computing task. It incorporates conceptualisation, programming, testing, documentation and error resolution into the creation and maintenance of applications and frameworks resulting in a software product. In business management, there is a demand for a professional profile focused on the implementation of CRM (Customer Relationship Management) and ERP (Enterprise Resource Planning) specific software.

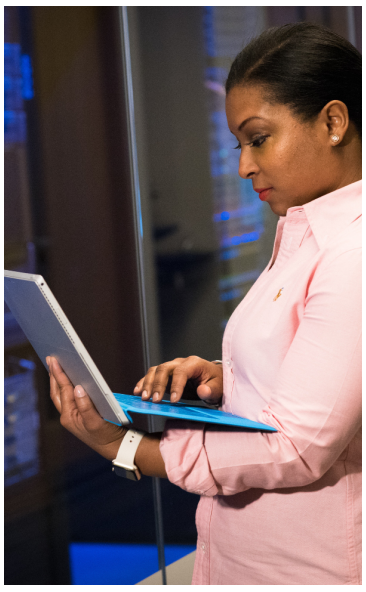
These professionals may be specialists in a certain area or engage in general programming, and write code in various programming languages. Software can be developed for a variety of purposes such as the production of graphic interfaces, multimedia signal processing, information management, and so on.

IoT specialist

The Internet of Things refers to the interconnection of everyday objects or tools we commonly use with the Internet. The incorporation of microprocessors and sensors into objects combined with the automatic connection to the network has allowed data to be collected and transferred, and has automated many processes that were previously manual, without requiring user interaction.







An IoT specialist is in charge of applying IoT strategies to everyday objects and encourages new features and uses within this larger hyperconnectivity scenario. These are, however, emerging professionals, and today, specific jobs in this area are only beginning to be created.

Systems analyst

They identify the needs of a company's ICT systems and prepare a project offering an integrated solution. In this case, systems in which they work can refer to both hardware and software as well as communications devices (networks, servers, etc.).

System analysts design new systems, incorporating hardware or software, or add applications to make the most of the technology used and meet the needs required by the client company. It is important to note that a system analyst works with the full range of ICT and often specialises in a business area: finance, accounting, etc.

Systems technician

A professional specialised in technical support in the Systems Department. They support and develop computer system, network and server maintenance tasks. They are therefore responsible for the computer support tasks that any worker in an organisation may require.

Computer security technician

A professional responsible for the security of the company's computer systems. They analyse and identify protection needs to prevent external intrusions or data leaks from the company itself. This professional must be prepared to face usually critical situations, such as the entry of a virus or a breakdown.

They must periodically update their knowledge of new antivirus programs released on matters of computer security and types of protection, and also of new threats such as viruses and attack systems. Today, this is one of the ten most in-demand professional profiles of the ICT sector by companies, as there are still few professionals specialised in this field in Catalonia.

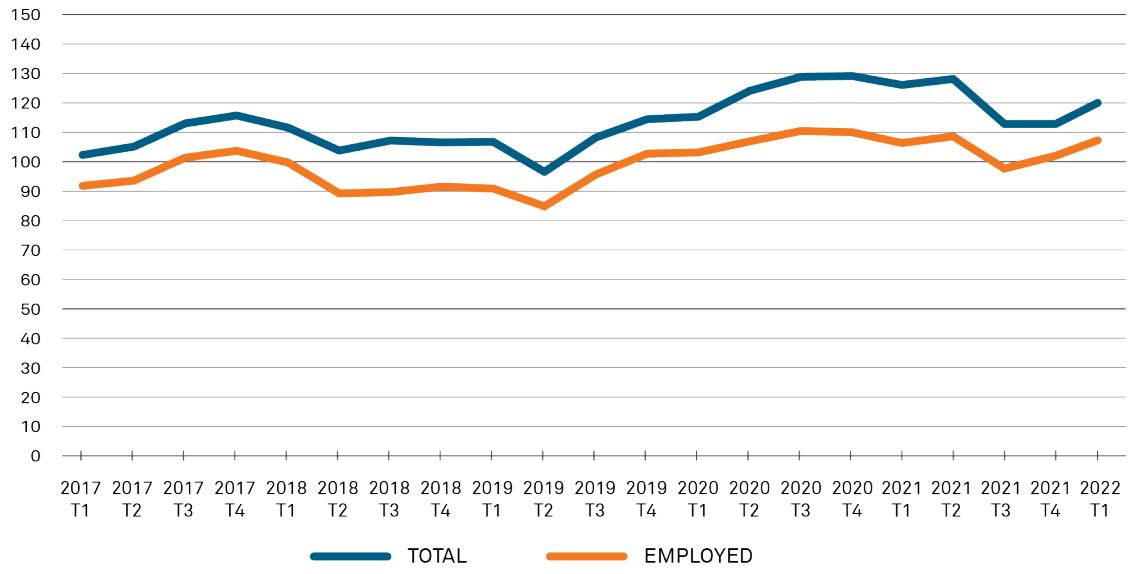
In short, because of the briskness of jobs in the ICT sector, which is constantly changing, there is an inevitable mismatch between the skills that professional profiles have and those that companies need. Thus, the sources consulted point to the need for training and retraining to boost the growth of jobs with good prospects in the labour market, especially for ICT jobs related to data analysis, computer programming and application development and, finally, jobs related to the 4.0 industry (cybersecurity, robotics, artificial intelligence, Internet of Things and additive manufacturing).

The sector in figures

In 2023, the ICT sector accounted for 12.4% of Catalonia's GDP, with a turnover of around EUR 30 billion, and employsed182,820 people. A total of 22,041 companies form the Catalan digital economy, 88% of which are located in the Barcelona area, and 91.6% of the total turnover and 92.2% of the total employed people in the sector come from companies in the province of Barcelona. This business fabric consists mainly of young companies (ten years or less) or micro and small companies (less than 50 workers).

According to studies regularly performed by Barcelona Digital Talent, Barcelona is one of the greatest hubs of digital talent in southern Europe and has 93,516 professionals, representing 95% of the digital talent in Catalonia. In addition, in terms of population evolution, digital talent has gained importance in recent years. In 2023, the population employed in the ICT sector increased by approximately 120,000 professionals in Catalonia. Freelance professionals are increasing in parallel with employees, and the sector is also growing.

Figure 5. People employed in the ICT sector by professional status (in thousands). Catalonia, 2017-2022.



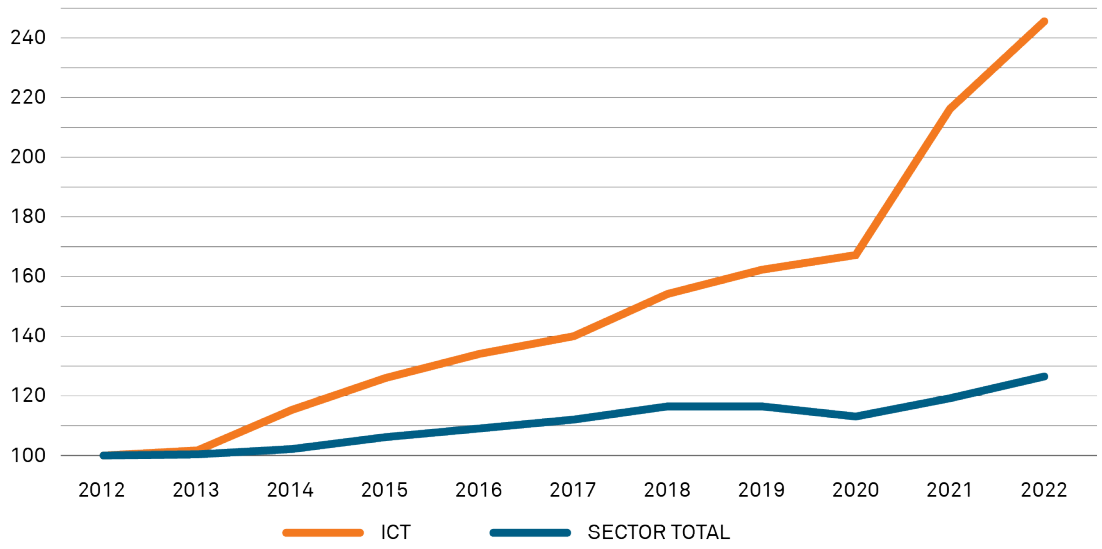
Source: Prepared by the authors, based on data by Cambra de Comerç de Barcelona.

In the case of Catalonia, according to the report The Digital Economy in Catalonia (produced by ACCIÓ, the organisation of the Generalitat of Catalonia promoting business competitiveness), in 2023 there were 22,041 ICT service-providing companies, 15.1% more than in 2021. However, to understand growth, it is important to note that the ICT sector has increased by 26.7% in the last 5 years. The report mentions vendors of software, hardware, telecommunications, manufcturing equipment and components, as well as specialized consultancy services (some of the great exponents, but not the only ones in their field, could be Oracle, Cisco, Siemens, Ficosa or Atos).

However, the ICT sector is cross-cutting across the economy as a whole and there are certain areas of economic activity that present an intensive use of ICT, which the sectoral report emphasises above the rest for several reasons:

- The Catalan video game industry is one of the most dynamic in the digital field. Currently, there are 206 companies in Catalonia that employ 3,933 people and their annual turnover accounts for 50% of the volume of business generated by the Spanish ecosystem of the video game industry.
- The audiovisual sector has a long history in Catalonia, as well as experience and entrepreneurship. Today there are 3,695 companies dedicated to this industry that employ 32,578 people. The Catalan audiovisual sector is becoming an essential industry in Catalonia after growing 5.6% in a year and overcoming an economic impact of 7 billion euros.
- In the field of logistics operations and e-commerce, Catalonia has an attractive location for last mile logistics, which directly promotes e-commerce. In this regard, there are 827 companies, employing 18,334 people, dedicated to providing added value services to the Catalan industry. This geostrategic position attracts investments and initiatives tto place logistics hubs for the South of Europe in the territory.
- The most advanced engineering centers thrive in Catalonia, as they have an extensive critical mass in experience and industrial specialization. Catalonia hosts 194 companies, 44% of which specialise in providing digital services to industry 4.0. In total, they employ 28,701 people.
- The ICT industry focused on providing digital solutions in cities to improve quality of life is also a relevant sector in Catalonia, as it is a pioneering territory in adopting solutions for urban management and renowned municipal strategies. This area is home to 471 companies employing 46,077 people.
- Finally, it is important to highlight the 2,022 start-ups associated with the ICT sector, which employ 19,138 people. 76% of these companies work with technologies linked to Industry 4.0, a fundamental issue in the context of digitisation and technological transformation of the productive ecosystem in Catalonia.

Figura 6. Evolution of jobs in ICT and in the whole of Barcelona's economy 2011-2020 (Index 2012=100)

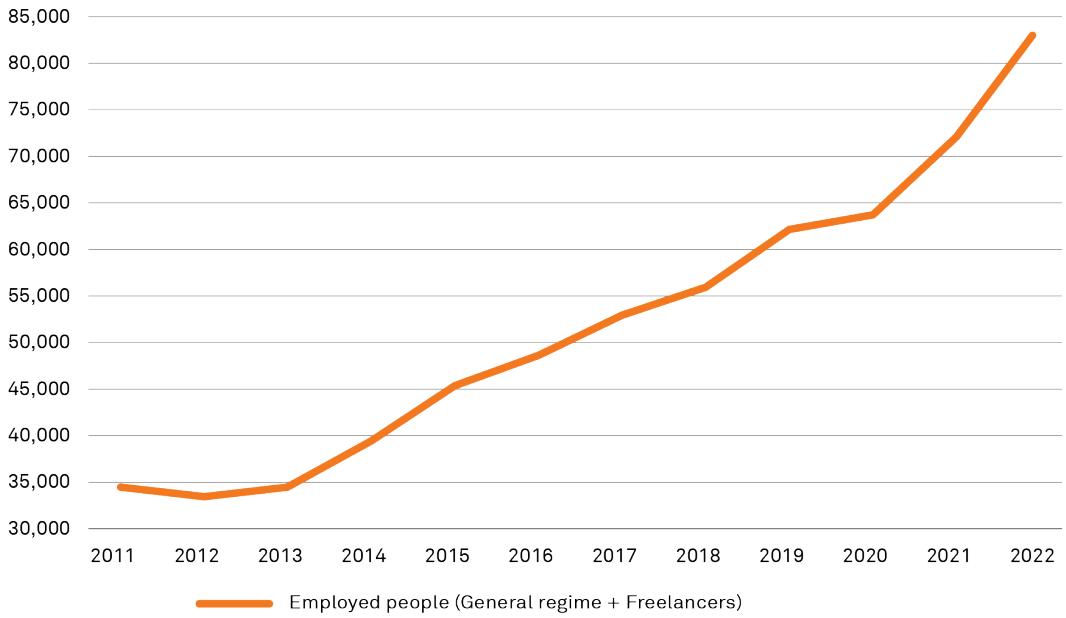


Source: Prepared by the authors, based on data by Barcelona Activa, "Indicadors laborals del Sector TIC a Barcelona", 2020

Some of the pioneering companies located in Barcelona in the aforementioned fields of activity that are characterised by intensive use of ICT are: King, Mediapro, Privalia, Amazon, Indra, Accenture, Inbrain and The Hotels Network.

In terms of employment, in 2021, the ICT sector exceeds the 70,000 people employed in Barcelona for the first time, after creating more than 35,000 jobs since 2012. During the 2011-22 period, job creation intensified, as shown in the following graph:

Figure 7. Evolution of Jobs in the ICT sector in Barcelona 2011-2022



Source: Prepared by the authors, based on data by Barcelona Activa, "Indicadors laborals del Sector TIC a Barcelona", 2022.

Projection

and future scenarios

The ICT sector has a great expectation of growth ahead, especially in terms of creating jobs requiring medium and high qualifications. The intensity of such growth is not exactly known, but it will be sustained and lasting at least in the medium term. It will be particularly linked to the digital transition process and the accelerated technological change that has an impact on new ways of working, consuming and living together. It is therefore a sector of interest for people in a process of job transition.

In order to access professional profiles, there is a public and private training offer that enables candidates to achieve the required skills and qualifications both in highly qualified positions and in intermediate technical levels, which are also indispensable, well-valued by the market and more abundant.

Opportunities

- Today, the majority of the purchase and sale of goods and services in the ICT market is between companies, i.e. B2B. Most of the clients of technological companies are industrial and service organisations, and there is a low impact in the other economic sectors, such as trade and tourism or food. Therefore, there are still markets where the ICT sector can expand.
- Barcelona is a hub of recruitment and generation of economic activities linked to ICT. The city is heavily consolidated in international mobility flows and has not yet exhausted its potential to generate new attractiveness. This is proven by the fact that no skilled professionals are found for some jobs, or that wages are above the average in other sectors. Barcelona is among the top 10 most desired global cities to work for digital professionals, and the sector accounts for around 5% of the city's business ecosystem.
- There is a great awareness in society (businesses, administrations, education sector and professionals, among others) of the radical importance of the ICT sector to general economic growth, and how the digital divide can become a source of social exclusion. In this regard, efforts are being made so that citizens can easily access training in digital competences by encouraging public-private partnerships so that digitisation leaves no one behind and becomes a source of opportunities for the whole population. Therefore, the digitisation of society is an opportunity to generate greater social cohesion.

Threats

- In some areas and positions of the labour market there is a lack of specialised professionals, which creates difficulties in covering ICT jobs. This is currently one of the main obstacles to the development of the sector.
- The process of ICT intensification (or digitisation) causes the automation of jobs, resulting in job losses. Against this threat, training for requalification and digital upgrade must be activated, to create new ICT professionals through retraining.
- The technological or digital divide involves the exclusion of significant social groups (elderly people, young people in a situation of school failure, etc.) in access to the labour market and many civic inclusion processes, such as access to public services and other essential services (health, financial services, education, etc.). Therefore, a coordinated effort is required between all those involved to minimise the effect of this gap, so that it does not become a new axis of inequality.

Strengths

- The ICT sector is stronger than other economic sectors. Demand for emerging technology profiles increased by 53.9% in 2021. The fastest growing areas are 3D printing (82.5%) and computer vision (68%). On the other hand, the offer of specialized profiles that have grown the most belongs to the areas of computer vision (19.7%), artificial intelligence (17.2%) and blockchain (16.9%).
- In Barcelona and its metropolitan area there is a broad training offer that provides technical training to access the ICT labour market. In particular, we should highlight the offer of intermediate and higher vocational training programmes of professional families linked to ICT, as well as the public bet for professional training with innovative methodologies such as boot camps for digital training.
- The perception of the strategic importance of ICT by the public administrations leads to the sector having it easier when it comes to favouring the creation of companies and the arrival of new companies, especially in the Barcelona area, including fairs and congresses (among which MWC stands out), support for business development and efforts to bring training closer to the population.

Weaknesses

- The gender gap involves a net loss of female talent in the ICT sector. There is a clear lack of female representation in the sector. In Barcelona, for example, the percentage of women in the digital sector is 29%, which is equivalent to that in other European cities. While there is a positive trend towards women's inclusion in the sector, it is still a long way from the 50% target.

- The rapid growth of the sector causes tensions in the labour market. There is a mismatch in the supply and demand for ICT profiles at European level, where most companies in the sector have difficulty filling vacancies of ICT specialists. Thus, despite positive developments in recent years in terms of new incorporations of professionals to the market, the shift between demand and supply of ICT specialists in Europe is expected to grow further due to the increasing use of digital technologies in critical sectors such as transport, energy, health and finance.
- Professionals in the ICT sector (highly qualified staff) that are located in a digital ecosystem of a city or territory (such as Barcelona) can be hired to work remotely for companies located in other countries, so that the economic value and knowledge which is generated locally has an impact and favours other economies. This is a risk to be taken into account in a globalised labour market and is one aspect of the 'war on digital talent' battled by companies and territories.

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