



Digital Talent Overview 2022

Analysing the state of digital talent



**Barcelona
Digital Talent**

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On

Barcelona Digital Talent

Barcelona Digital Talent combats the current digital talent gap to promote market competitiveness. To position Barcelona as the talent capital, the programme promotes reskilling digital skills for local professionals and attracting new professionals to the market, both nationally and internationally.

Mobile World Capital Barcelona spearheads this alliance, Cercle Tecnològic, 22@Network, Tech Barcelona, Foment del Treball, Barcelona Global, PIMEC, Barcelona City Council and Government of Catalonia.

For more information, visit barcelonadigitaltalent.com/

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Methodology

THE SAHARA

THE HUMAN BRAIN IN EACH MONTH OF THE YEAR

FACT:

- The Sahara is the world's largest hot desert, covering 4.5 million square kilometers (1.8 million square miles). About the size of the South American country of Brazil, the Sahara makes up 25 percent of the continent.
- High air pressure of heat and green that make up 75 percent of the Sahara. The green on the desert, but it only covers 20 percent of the Sahara. The rest is sand. The green is made up of small plants, like grass, shrubs, and trees. It is not a large number of plants, but it is enough to make the Sahara look green.
- The popular notion about "left brain" and "right brain" is a simplification of a much more complex process. The brain is a highly integrated system that processes information in a way that is not easily divided into "left" and "right" hemispheres. The brain is a complex system that processes information in a way that is not easily divided into "left" and "right" hemispheres. The brain is a complex system that processes information in a way that is not easily divided into "left" and "right" hemispheres.



Methodology

At the methodological level, this study draws on different sources of information:

- Firstly, based on a desk research phase, reference publications are identified locally and internationally, providing reliable indicators for monitoring different parameters linked to digital talent.
- Secondly, through data analytics, different job offer platforms are scanned to obtain market data on both the demand side (hiring companies) and the supply side (professionals with a digital profile) through job platform tracking tools such as TalentUp and Job Market Insights.
- Finally, the views of senior management of relevant companies in the sector are added to reinforce or qualify the data analysed.

	Series 1	Series 2
1/1/2016	0.17	5.60
2/1/2016	0.95	8.52
3/1/2016	1.56	8.74
4/1/2016	2.09	1.08
5/1/2016	2.69	5.54
6/1/2016	2.73	3.03
7/1/2016	3.49	6.00
8/1/2016	3.65	5.78
9/1/2016	4.01	4.32
10/1/2016	4.57	7.56
11/1/2016	5.45	5.90
12/1/2016	5.45	2.43
1/1/2017	0.17	5.60
2/1/2017	0.95	8.52
3/1/2017	1.56	8.74
4/1/2017	2.09	1.08
5/1/2017	2.69	5.54
6/1/2017	2.73	3.03
7/1/2017	3.49	6.00
8/1/2017	3.65	5.78
9/1/2017	4.01	4.32
10/1/2017	4.57	7.56
11/1/2017	5.45	5.90
12/1/2017	6.16	2.43



Series 2
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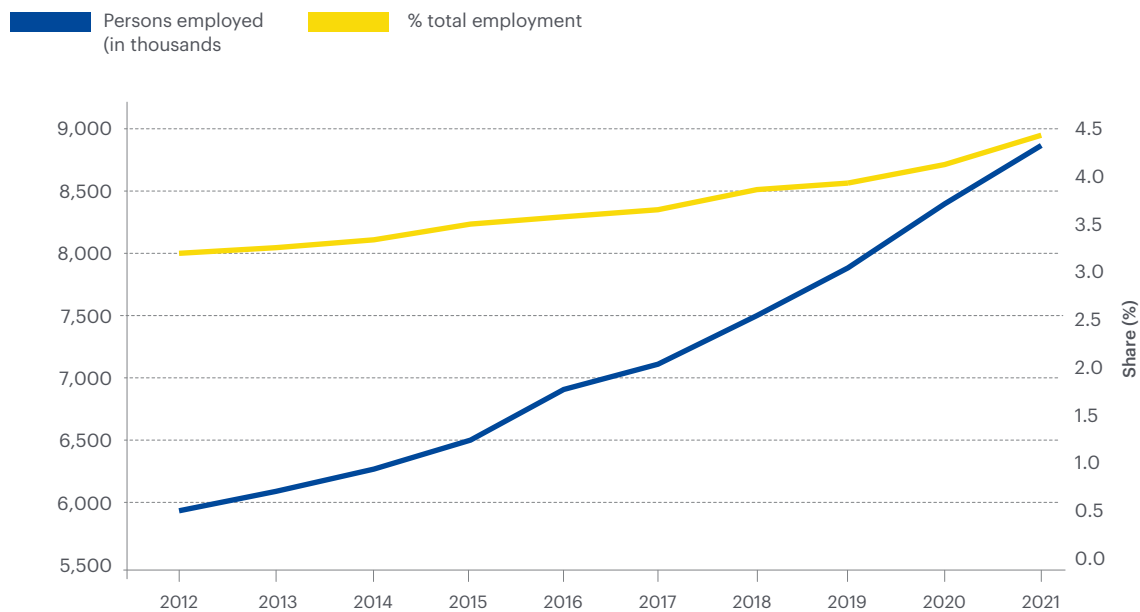
Executive Summary

In the last decade, Europe has gained 3 million ICT employees

In the last ten years, the employment of ICT specialists has grown by **50%**, **8 times higher** than overall employment in Europe. The number of digital professionals has reached **9 million**, representing **4.5%** of employment. Once again, this year, **Sweden (8%)** and **Finland (7.4%)** lead the ranking of countries with the highest proportion of ICT specialists. **Germany**, with more than **2 million** professionals and **France**, with **1.2 million**, are the economies that contribute the most in terms of talent.

Persons employed as ICT specialists in the EU (in thousands and percentages)

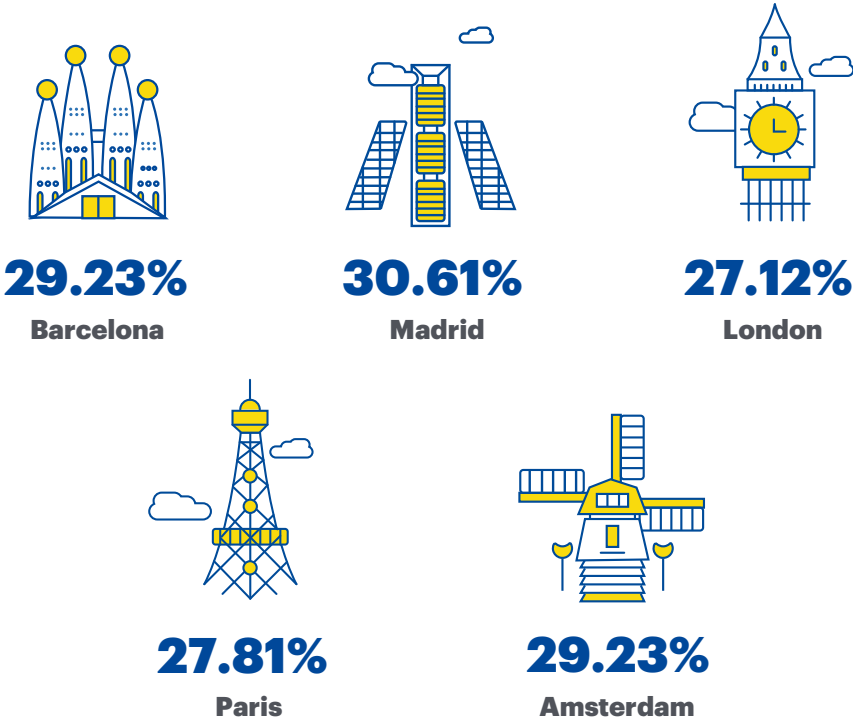
2012-2021



The gender gap persists in the digital sector

Women account for **19.1%** of employment in digital professions in Europe. Since 2012, the percentage of women in the ICT sector has increased by **2.1 percentage points**. In the top positions are countries such as **Bulgaria (28.2%), Romania (26%) and Malta (25.6%)**. Among the countries that have experienced the greatest growth over the last decade are **Malta (15.1 per cent), Luxembourg (9.3 per cent) and Portugal (6.5 points)**.

At the local level, **Barcelona** has a presence of women in the sector of 29.23%, very similar to last year's 29.07%. **UX/UI**, with **50.7%**, is the speciality with the highest proportion of women. On the contrary, **blockchain (10.8%) and cybersecurity (15.5%)** are the disciplines where the gender gap is most significant.



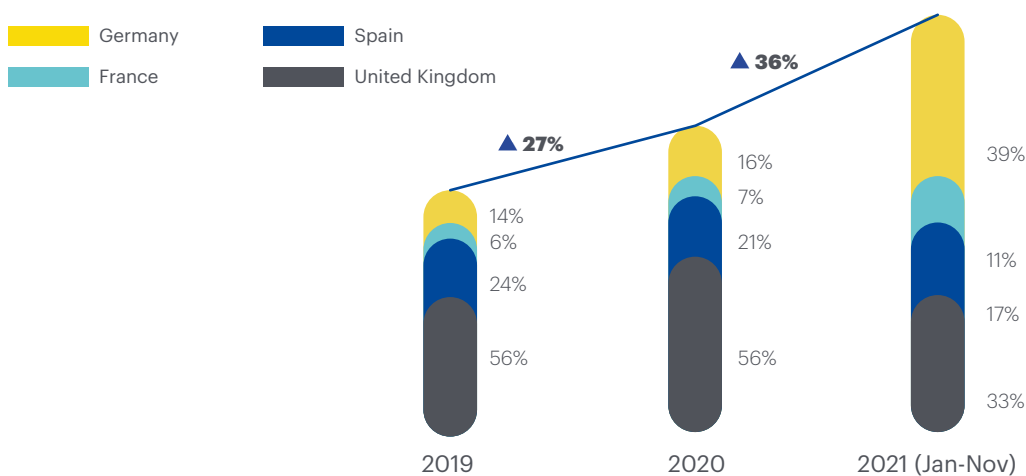
Formal training is growing, while the figure of the citizen developer is emerging

The percentage of European ICT specialists with **formal training** (university degrees or vocational training) has risen from 55.1% in 2012 to 64.5% in 2021. However, the origin of the training of these professionals is often found at earlier stages. More than **65%** say they wrote code before they were 17. **Java** is set to be the most popular programming language in 2021, and **Symfony**, a working environment for developing solutions with PHP language, stands out among programming frameworks.

In addition, the **demand for citizen developers**, professionals who are not necessarily technologists and who are proficient in low-code programming tools, has grown by **73%** among the major European economies in the last two years. Analysts predict sustained growth of **40%** per year until 2025.

Evolution of the demand for Low-Code profiles in the UK, Germany, France and Spain

2019-2021



UK and Switzerland lead the way in university excellence in technology in Europe

The analysed rates highlight British and Swiss universities' top European rankings for technology and engineering education. The **quality of research** and the **academic reputation** are some indicators that make up the index.

The Universitat Politècnica de Catalunya (UPC) remains at the top of the national ranking. However, the absence of Catalan universities in the top positions of the global technology rankings is still a pending issue.



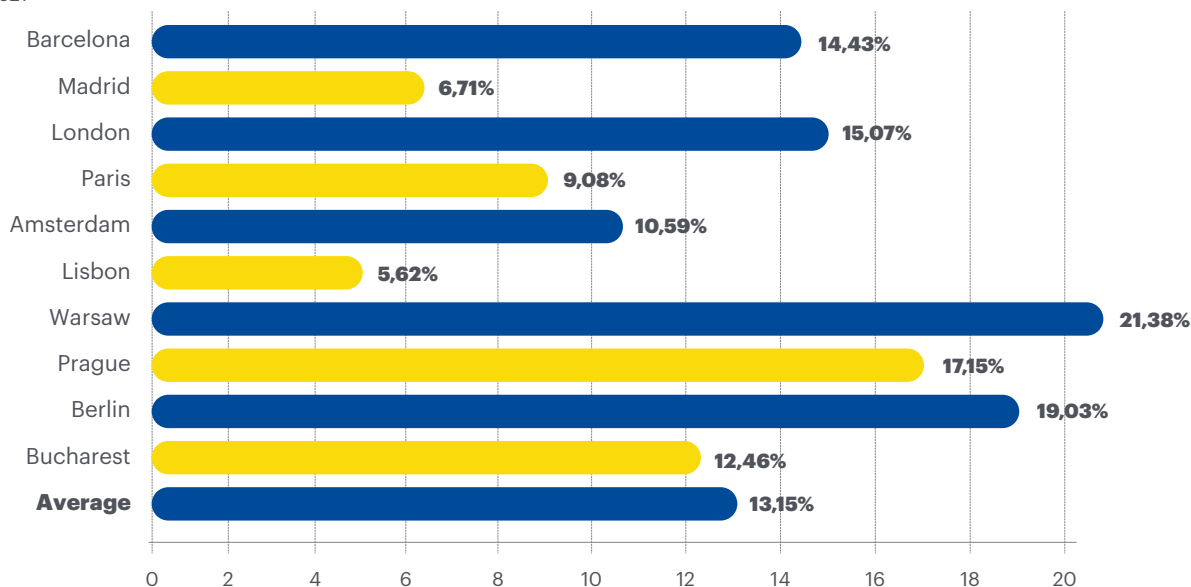
Telework and staff on-demand, new modes of ICT employment

ICT job vacancies in teleworking mode have risen from **4%** in January **2020** to **14%** by the end of **2021** in economies such as the **Spanish**. Among the cities analysed, **Warsaw (21.4%)** and **Berlin (19.0%)** offer the most remote work. **Barcelona**, with **14.4%**, is slightly above the average.

The index that measures the demand for digital professionals by projects (**staff on demand**) has also increased over the last two years. **The United States accounts for more than 11% of the global demand for on-demand professionals. At the same time, India, Pakistan and Ukraine** are the economies **with the most professionals working** in this modality.

Remote job offers in European cities (%)

2021



Catalonia approaches 100,000 digital professionals, with Barcelona as a major talent hub

Catalonia adds **10,500 new digital professionals** by 2021, which represents an annual increase of **12%**. The availability of these profiles has increased in all the Catalan regions. However, **Barcelona** accounts for **95% of all digital talent in Catalonia** and **97% of job offers**. Enter **Tarragona** (420), **Girona** (276) and **Lleida** (216) were published **nearly 1,000 digital job offers**. Digital professionals are employed in a wide range of sectors. The technology sector alone accounts for only **14%** of the profiles in **Girona**, **12% in Lleida**, **10.5% in Tarragona** and **15.1% in Barcelona**.

Tarragona, Lleida and Girona offer very similar average salaries, ranging between **28.700€** and **30.500€**. Girona is where programmer salaries have risen the most (**+5.2%**), although it is still a long way from the remuneration received by these profiles in Barcelona (**€39,700**).

Supply and demand of digital profiles in Catalonia

2021

	Catalonia	Barcelona	Girona	Lleida	Tarragona
Digital professionals total in 2021	98,782	93,516	1,182	968	3,116
Total digital demand in 2021 (3M)	25,560	24,648	276	216	420
Number of digital professionals per offer of work (2021)	15	15	17	18	30

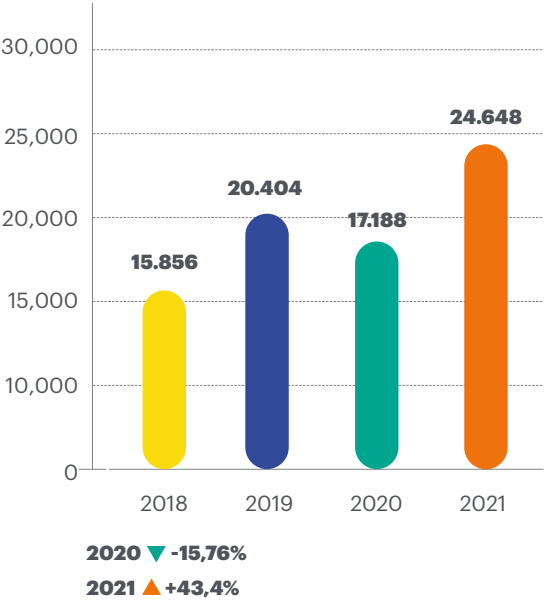
Demand for digital talent already exceeds pre-pandemic figures in Barcelona

In 2021, 9,400 new digital professionals entered the labour market, **40% more** than those added in 2020. This acceleration in the creation of talent has allowed us to reach the figure of **93,516 digital profiles in Barcelona**, whose weight now accounts for **5.42%** of the total number of professionals.

The **demand for digital talent grew by 43%** over the previous year. In 2021, more than **24,600 digital job offers, a figure that exceeds the demand in 2019**. This rapid sector recovery contrasts with the demand for employment in all sectors, which is still far from the pre-pandemic figures. **For every job offer** in the digital sector, there is an average of **15 workers** in the market; compared to all sectors, the ratio is **1:60**.

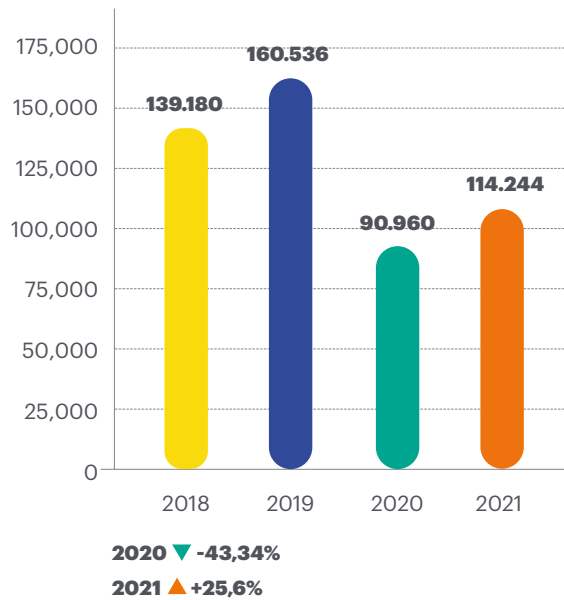
Demand for digital professionals and the total number of professionals

2019-2021



Demand all sectors

2019-2021



Developers, UX/UI profiles and CRM/ERP consultants concentrate the supply and demand for talent

Web/app developers, user interface and user experience designers and enterprise software implementers (CRM and ERP) account for 67% of digital talent and 60% of the demand for profiles.

The demand for **UX/UI design** profiles has particularly accelerated **(+53%)** along with that of **cloud professionals (+66%)**. The latter are also some of the **most difficult to find** on the market. For **each job offer**, there are only **seven professionals**. Specialists in **cybersecurity** specialists are still the most scarce: the ratio of job offers to professionals is **one to three**.

Among the emerging professions, the **Internet of Things (342 vacancies)** and **artificial intelligence (153 offers)** were the most in-demand in 2021.

Number of digital professionals available for each job offer

2020-2021

2020 2021

Web Development

2020 = 16.62
2021 = 14.08

App Development

2020 = 17.81
2021 = 14.52

UX/UI

2020 = 76.39
2021 = 55.19

CRM & ERP Consultant

2020 = 30.30
2021 = 22.97

Agile/Scrum

2020 = 8.82
2021 = 9.57

Cloud

2020 = 10.73
2021 = 7.19

Cybersecurity

2020 = 3.42
2021 = 2.92

Business Intelligence

2020 = 21.17
2021 = 16.62

Big Data

2020 = 14.65
2021 = 11.77

API

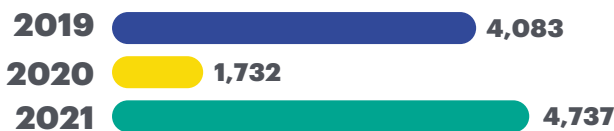
2020 = 38.65
2021 = 33.94

Barcelona attracts more international talent than ever

Half of the new digital talent generated in 2021 comes from other economies. Following the incorporation of **4,700 new profiles, 2.3 times more** than those incorporated in 2020 marked by mobility restrictions, professionals from other geographies already account for 31.4% of digital talent. Cybersecurity profiles (40.55%) and **application developers (40.31%)** are the ones that attract the most talent from other cities, following the pattern of the previous year. **London (11.44%)** and **Madrid (10.15%)** are the cities that export the most talent to Barcelona.

Attracting new digital professionals from other cities to Barcelona

2019 - 2021



Between universities and ICT vocational training, more than 4,000 graduates were generated

Catalan **universities** generated **1,869 graduates** in ICT degrees in the 2020-2021 academic year. The number of graduates **increased by 7.79% compared to the 2019-2020** academic year and **27%** over the last **five years**. However, 40% of those enrolled in ICT degrees **drop out** or **change disciplines**.

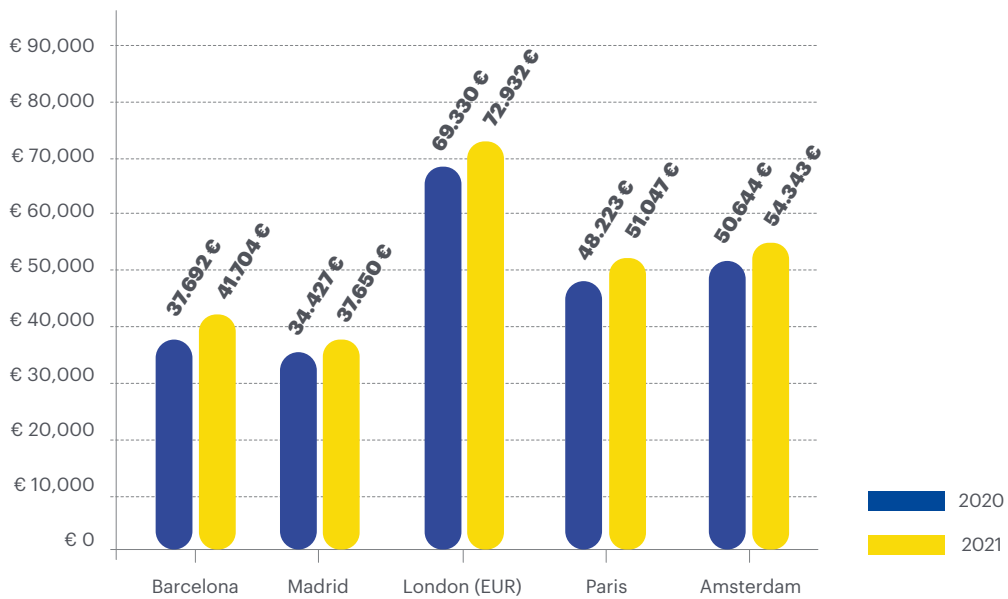
On the other hand, **vocational education and training** specialised in ICT generated **2,285 graduates**, which is less than the **2,700** achieved in **2020**. **The gender gap** in these studies **has narrowed**, although the percentage is still low (10%).

The recovery in demand for profiles pushes up salaries

The average salary of digital professionals in **Barcelona** is **€41,704 gross, 11% more** than the 2020 figure. Compared with 10 European cities, Barcelona's salary is slightly below average. **London (€72,932)** and **Bucharest (€22,520)** stand out at the **top and bottom of the range**. By adjusting wages to the **cost of living and rent, salaries in Barcelona** have become more competitive, placing them in line with the European average and even offering **greater purchasing power** than salaries in large technology hubs such as Paris, Amsterdam or Lisbon.

Digital Professional Salaries by City

2020 - 2021





1

Global digital talent trends

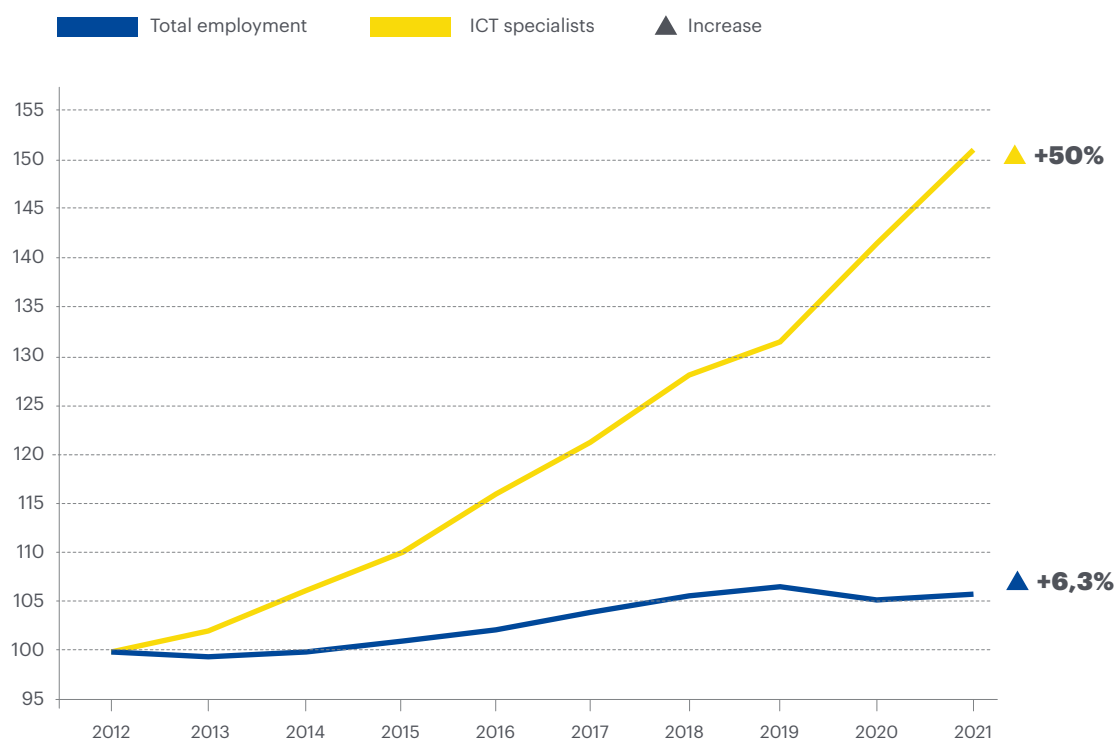
The occupation of digital talent in Europe

The evolution of employment in the ICT sector over the last decade is 8 times higher than the growth of employment as a whole. While EU employment has grown by 6.3 per cent in the last 10 years, employment in the ICT sector has grown by more than 50 per cent.

The changes in the last two years are linked to the impact of Covid-19 on the labour market as a whole. The destruction of jobs due to the pandemic contrasts with the acceleration in demand for ICT jobs in the same period.

Ratio of the number of people employed as ICT specialists to total employment, EU

2012-2021

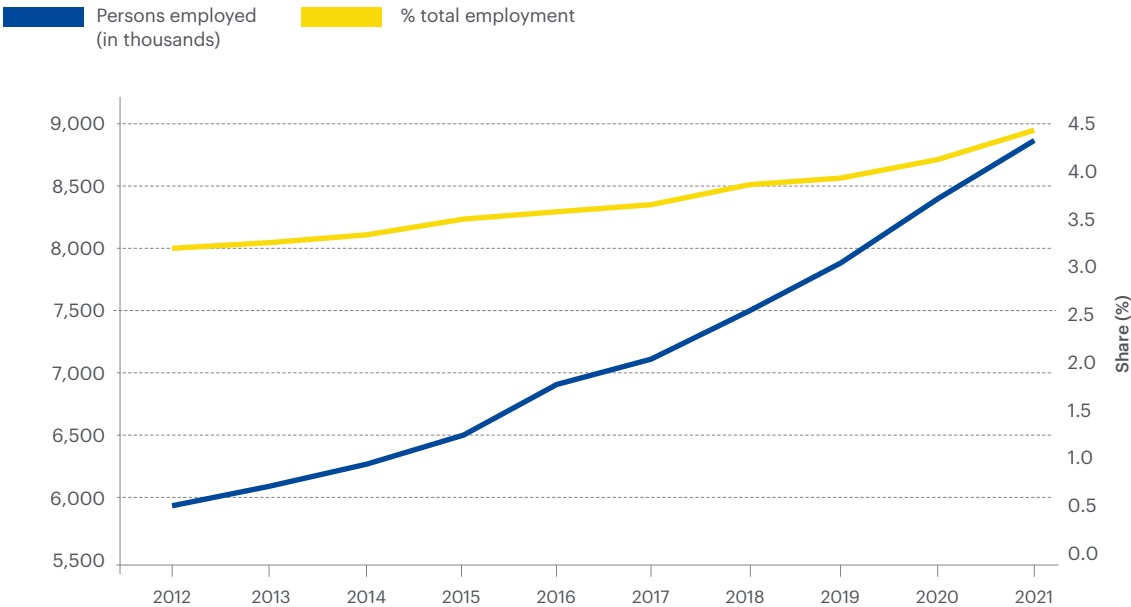


The European Union will have 8.9 million ICT employees by 2021, creating 3 million more ICT jobs in the last decade.

As a result, the share of ICT specialists has risen from 3.2% to 4.5% of employment in the European Union as a whole.

Persons employed as ICT specialists in the EU (in thousands and percentages)

2012-2021



Source: Eurostat



“The digital transformation and sustainability process that we are experiencing has accelerated the demand for talent with digital skills and technological knowledge, especially in important areas such as cybersecurity, cloud, artificial intelligence and data management. It is a transformation that requires a dynamic market with the ability to attract the best talent, invest in their development, and enhance their technological skills.

There is also a process of transformation of business culture, moving from “always connected” to “Omni-connected”, a hybrid work model where collaboration, the experience of professionals and the connection with the purpose of the company, projects and teams are paramount, and which must be managed by empathetic and transparent leaders, who foster closeness, authenticity, well-being and flexibility, empowering people through technology.”

Amparo Boria

Director of Talent Acquisition at Accenture Iberia

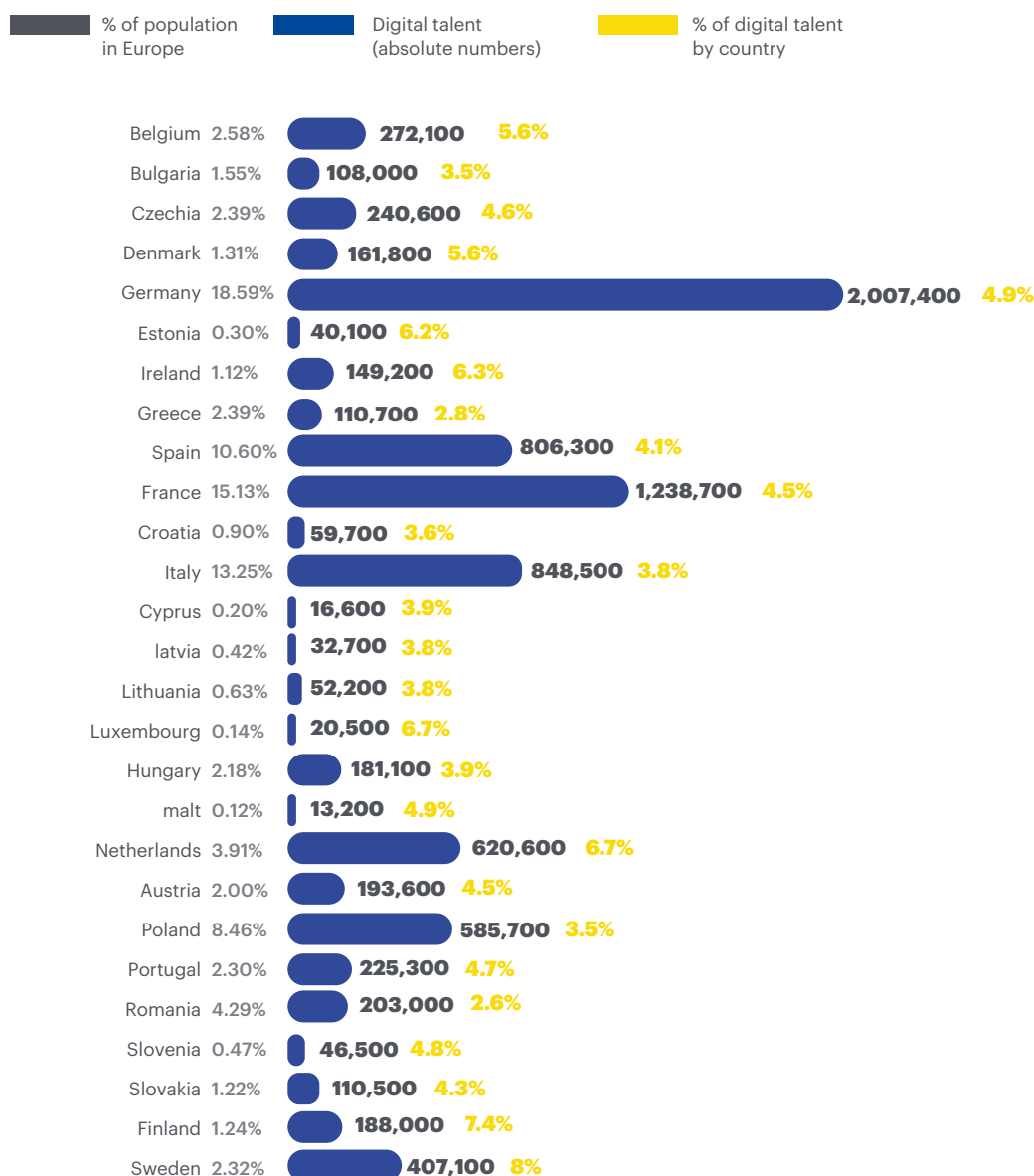
Once again, this year Sweden (8%) and Finland (7.4%) lead the ranking of countries with the highest proportion of ICT specialists.

Below the European average of 4.5% are mostly southern countries such as Spain (4.1%), Italy (3.8%) or Greece (2.8%) and eastern countries such as Bulgaria (3.5%), Poland (3.5%) or Romania (2.6%).

Germany, with more than 2 million professionals and France, with 1.2 million, are the economies that contribute the most in terms of talent.

Number of ICT employees by country

2021



Source: Eurostat

Germany, France, Italy, and Spain are the leading European countries with the highest number of working digital professionals. However, Italy and Spain are below the average percentage of ICT professionals at the European level.

Quadrant % of digital talent by country vs % of population in Europe

2021



Source: Digital Economy and Society Index (DESI)



“We are in a stage of digital talent shortage; our growth forecast is to incorporate around 3,000 professionals in Spain alone this coming year. The pandemic has accelerated a scenario of offshoring of digital talent with a shift towards a more global approach to the localisation of professionals in the labour market.

The profiles most in demand internally are: frontend developers, java developers, data scientists, systems administrators, software architects, DevOps engineers, QA engineers, security engineers, cloud engineers, among others. IT professionals are in high demand and value aspects such as working with cutting-edge technologies, training, leadership, climate, and methodologies, in addition to culture and values, to be able to work in environments of freedom and flexibility, where remote working is offered.”

Vanessa Paulino

People Manager at NTT DATA

Estimating occupational growth in the ICT sector

By 2030, the number of new jobs in the programming sector is expected to increase across the board for all EU countries. In particular, an average increase of 1.5% of specific programmer positions in Europe is expected.

Only Iceland, Hungary and Slovakia will have negative growth rates related to creating new jobs.



“Two trends are shaping the sector and, by extension, the economy: the accelerated digitisation of companies and the shortage of skilled professionals. On the one hand, 8 out of 10 organisations say they cannot find the talent with the skills they need. At the same time, technology companies lead global hiring intentions every quarter.

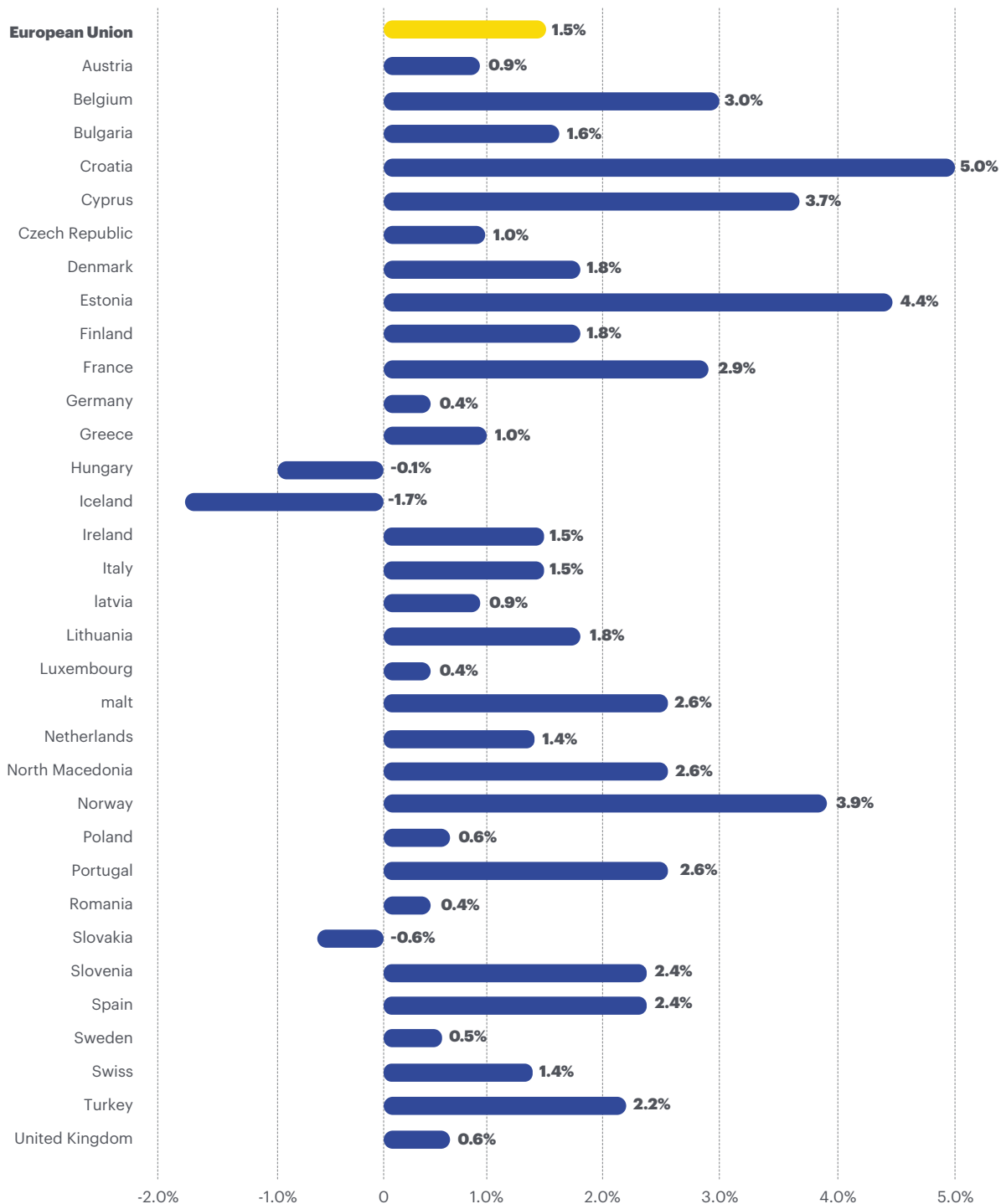
This fact leads us to a situation of inflationary salaries but also to the opportunity to turn our cities -such as Barcelona, Malaga or Valencia- into digital talent capitals or Tech Cities due to their high quality of life and the added attraction they offer to profiles that prefer teleworking or are digital nomads.”

Francisco Ribeiro

Country Manager at ManpowerGroup

Estimated new jobs in Europe in the computer programming sector

2021-2030



Source: CEDEFOP Skills Forecast

The gender gap in the ICT sector in Europe

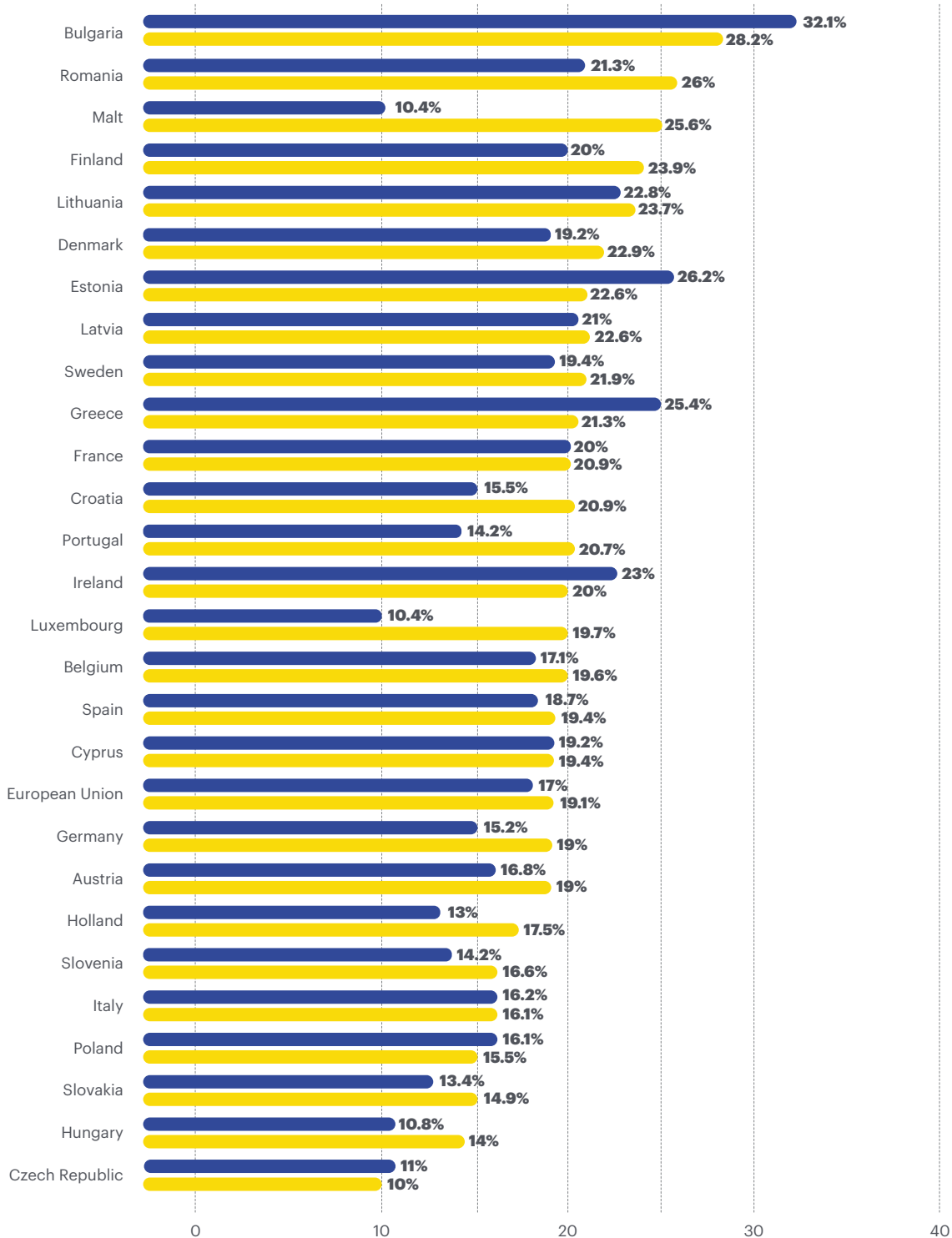
Women account for 19.1% of employment in digital professions in Europe. Above the European average and in top positions are countries such as Bulgaria (28.2%), Romania (26%) and Malta (25.6%).

Since 2012, the percentage of women in the sector has increased by 2.1 per cent. Among the countries that have experienced the greatest growth over the last decade are Malta (15.1 per cent), Luxembourg (9.3 per cent) and Portugal (6.5 per cent).

Women ICT specialists recruited (%) in Europe

2012 - 2021

■ 2012
■ 2021



Source: DESI

Level of training in digital skills in Europe

Finland stands out as the country with the highest rate of advanced ICT skills and development. Sweden, Estonia and Ireland follow it. Below the European ICT skills average are Spain, Croatia, France and Portugal, among others.

This index is part of the Digital Economy and Society Index. It is based on the weighting of four variables: ICT graduates, companies that train their workers in ICT, the number of ICT professionals and the number of women ICT specialists employed in the country.

« »

“The current education system in Spain is broken. 60% of students do not believe that the university prepares them for the challenges of the work world. Many of today’s university programmes are far removed from business reality, the student learns a lot of theory, but not the skills needed to face the challenges of companies.

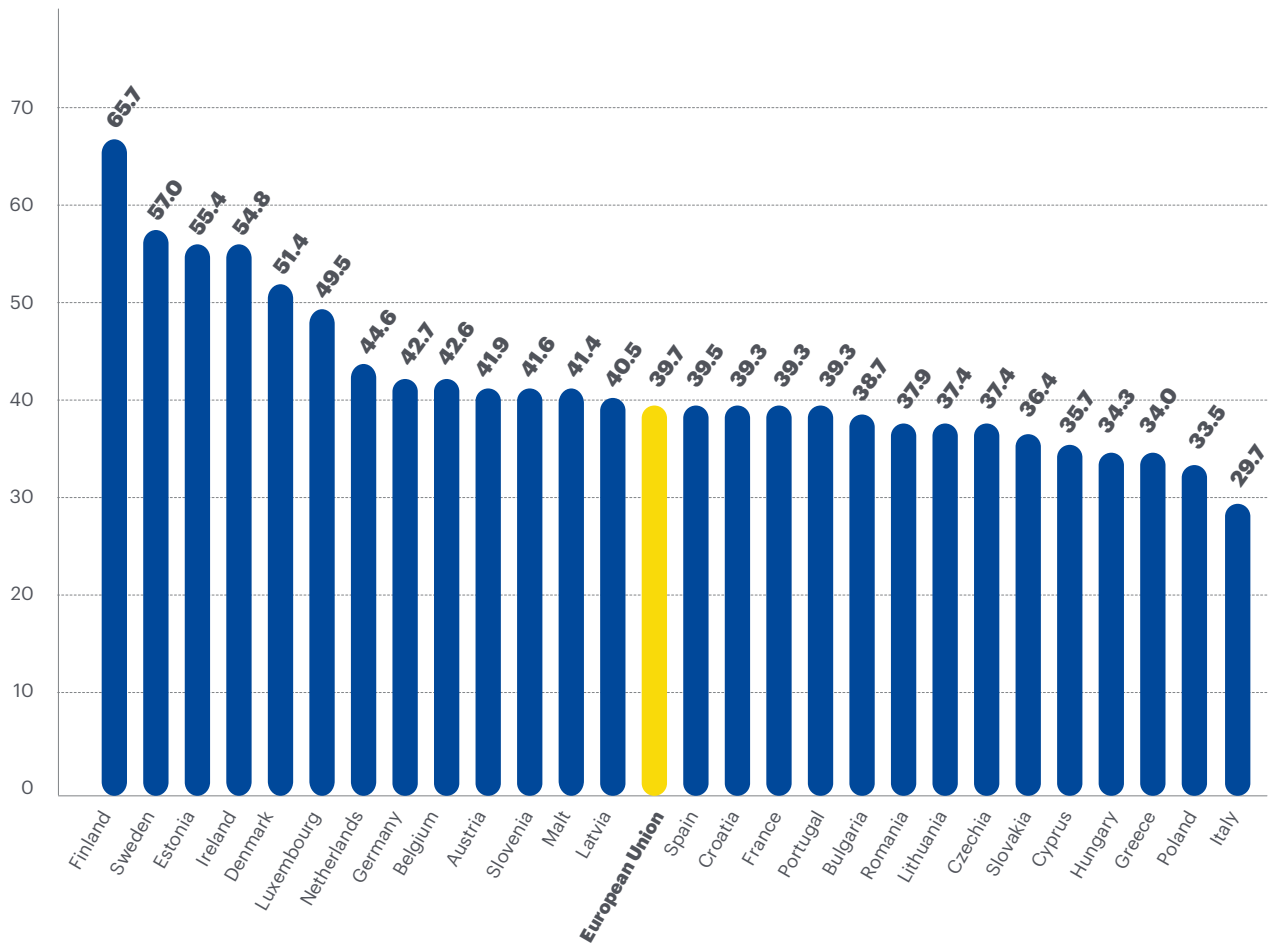
At Assembler Institute of Technology, we offer an alternative to boot camps and university programmes, for technology profiles in high demand such as full-stack developers or data analysts, with a clear focus on soft skills.”

Kasia Adamowicz

Co-founder & Chief Operating Officer of Assembler Institute of Technology

Index of advanced skills and development in ICT specialists. Score 0 - 100

2021



Source: Digital Economy and Society Index (DESI)

Digital training in Europe

At the European level, the share of ICT specialists with a tertiary level of education increased over the most recent decade for which data is available, from 55.1% in 2012 to 64.5% in 2021. This classification includes university degrees and vocational training.

Countries such as Italy (58%) or Germany (48%) have high levels of specialists trained outside formal education (58% and 48% respectively). This contrasts with Spain, one of the countries with the highest percentage of specialists with higher education (82%).



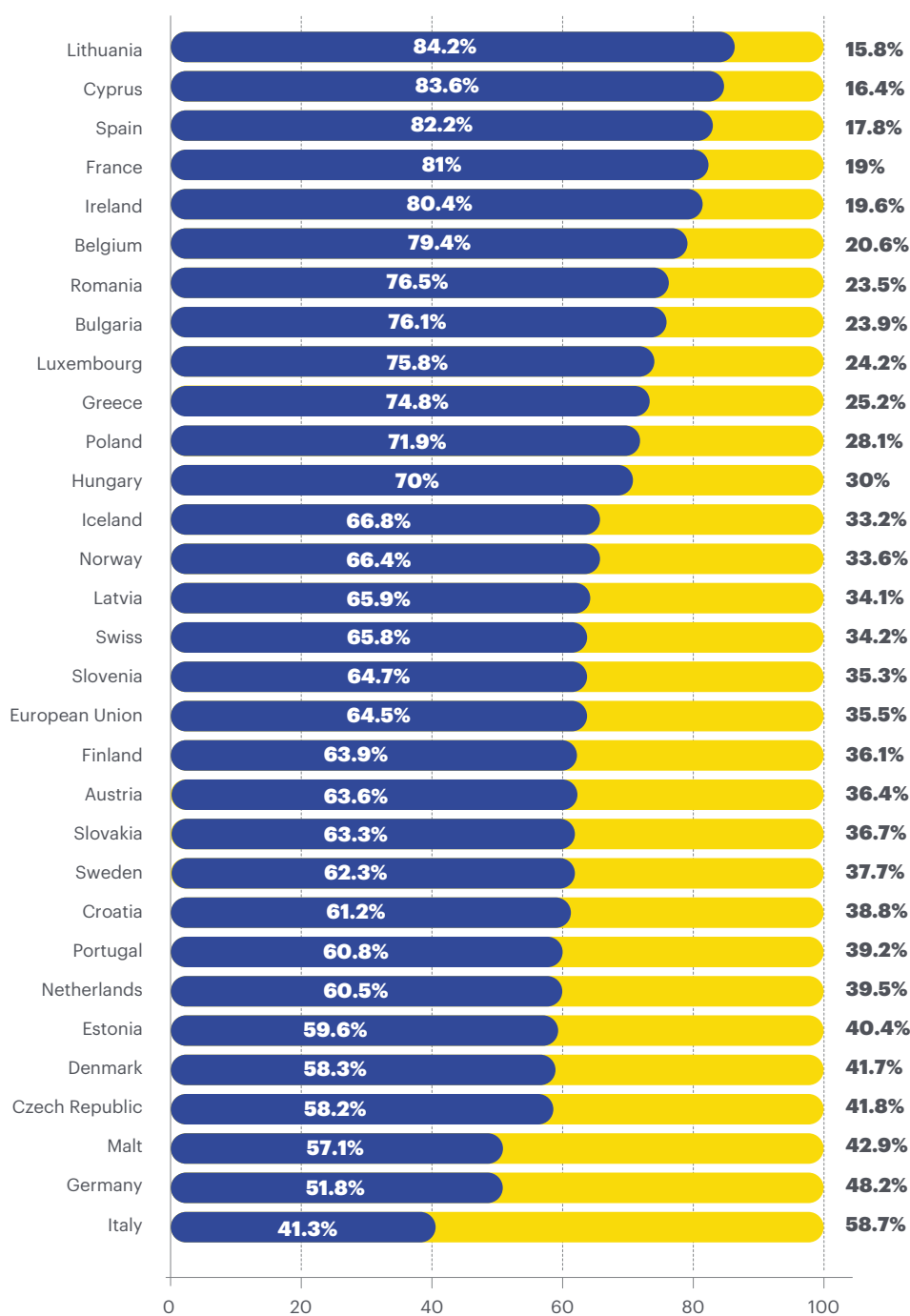
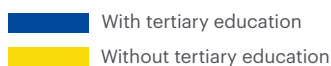
“Training to retrain people for the IT sector requires flexibility and constant adaptation to the needs of companies to train highly attractive professionals for the labour market. Companies demand professionals specialised in specific technologies (software developer, cybersecurity, data science, ...). Still, they require people with a capacity for self-learning, agile, flexible, achievement-oriented, analytical skills and high technological curiosity”.

Sara Díaz Roig

Director of Digital Talent Development at Barcelona Activa

Distribution of ICT specialists by level of education per country

2021



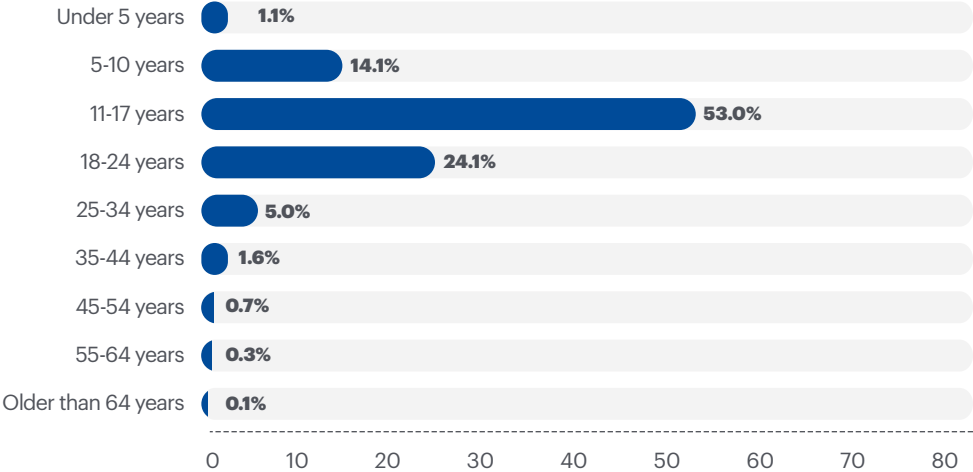
Source: Eurostat

Most developers start writing code before finishing secondary school. 53% wrote their first line of code between 11 and 17. Only 24% start writing during their university or higher education.

The first training professionals receive is mainly from non-formal online resources with self-learning (60%), at school (54%) and from specialised physical books (51%).

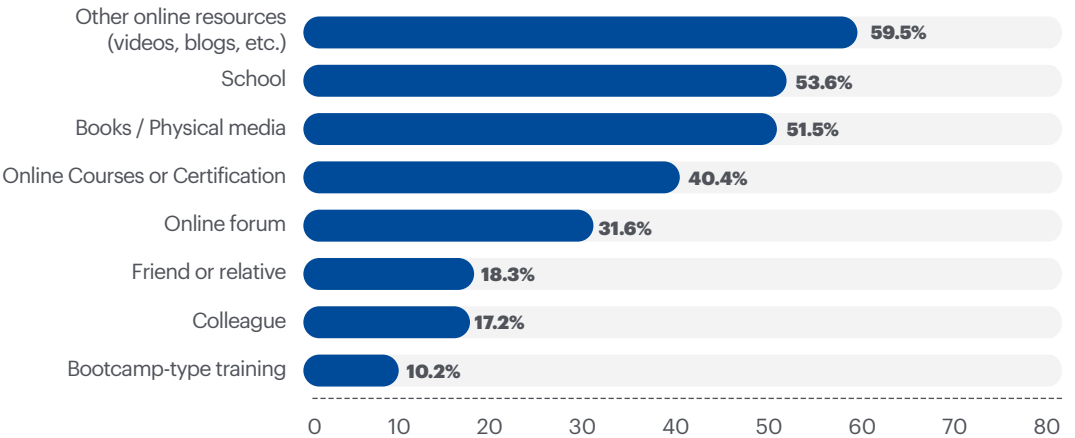
Age at which developers started writing code

2021



Origin of developer training

2021



Source: Stack Overflow Developer Survey



“The market offers different training modalities for digital profiles. The boot camp model, such as the one offered by Ironhack, responds to the market’s main needs due to its intensity, immediacy, and practical component, designed to solve the technological challenges of companies as soon as possible.

Ironhack offers a solution not only to students but to the market, providing companies with quality junior professionals with soft skills such as resilience, shared leadership, creative problem solving, and adapting to constant change.”

Tiago Santos

General Manager of Iberia at Ironhack

Difficulty in finding competent profiles in Europe

The list of jobs in the ICT sector difficult to fill remains stable over the three years analysed, with a slight overall downward trend.

The countries with the most dynamic labour market in the ICT sector are those that have increased the difficulty of recruiting ICT profiles, with Ireland and Denmark at the forefront. Belgium, France and Portugal are the countries where the perception of difficulty in accessing talent has improved the most. It so happens that the latter two countries have, in recent years, introduced technological visas to facilitate the attraction of talent from outside the Schengen area.



“With the return to normality, people demand more flexible working arrangements to balance their personal and professional lives. In this context, implementing a hybrid model with flexible working hours is the ideal option, teleworking three days a week and meeting on Tuesdays and Wednesdays in the office.

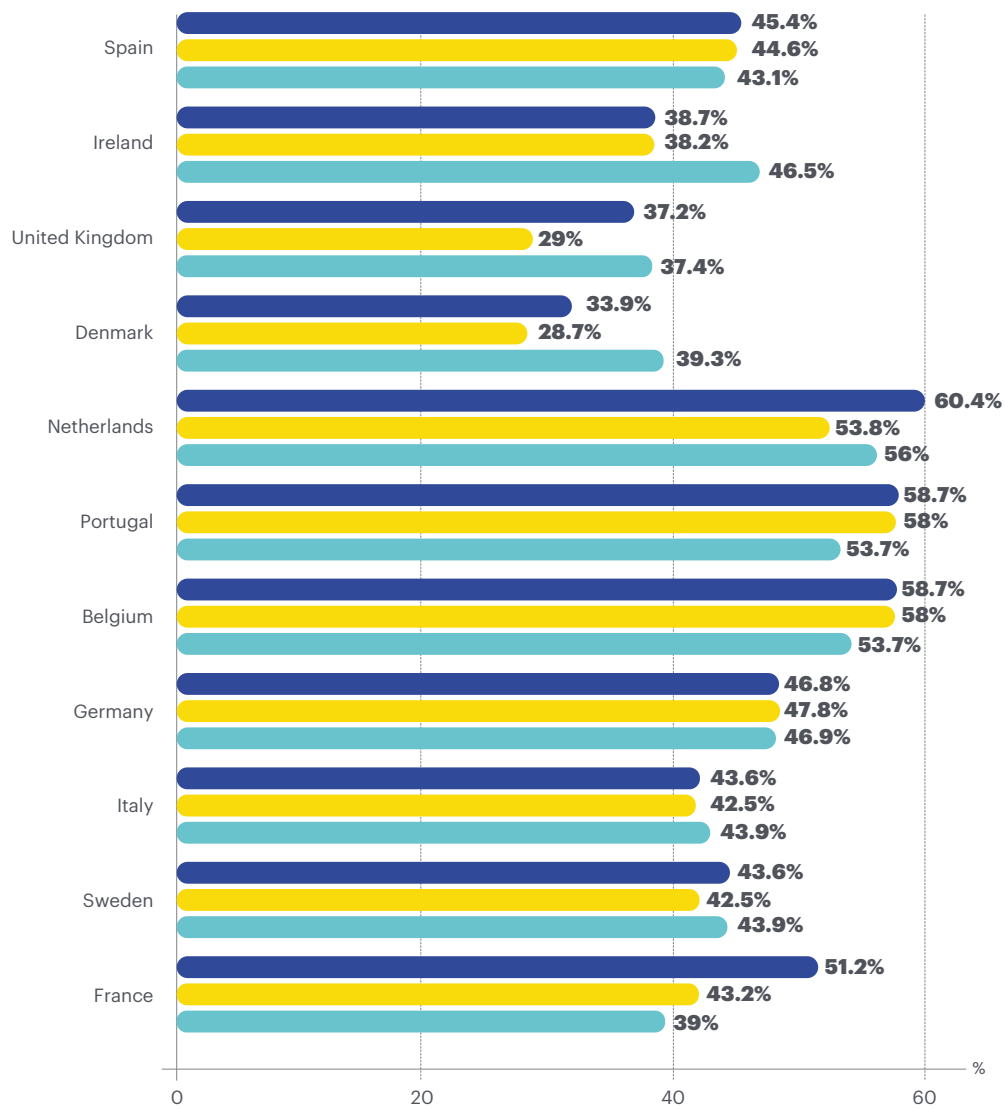
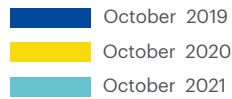
In this way, people can enjoy flexible working hours and teleworking while improving creativity, one of the aspects most affected by remote working, and strengthening team spirit and cohesion.”

Gerardo Cid

HR Business Partner Wolters Kluwer Tax and Accounting España

List of hard-to-fill technology jobs

2019-2021



Factors that make a job attractive

Work flexibility, including remote working, is a determining factor for developers when choosing which company to work for.

Teleworking or flexible working hours is already a must for developers when choosing a job. While the leading factors that make a company attractive are the focus on the developer's experience (53%) or the salary transparency regarding the different roles (41%), the negative factors that make the candidate company less attractive are the lack of access to consulting portals, such as StackOverflow (59%), the lack of flexible working hours (56%) or face-to-face work (50%).



“We have a clear purpose, to improve people’s health, and each of us brings value to that purpose. “Pursue progress. Discover extraordinary” sums up the experience of Sanofi employees.

Progress needs people, and every Sanofian contributes to creating a working environment where courage and ideas are valued. We work on global projects with multicultural teams, with continuous learning and the opportunity to stretch and develop a professional career.

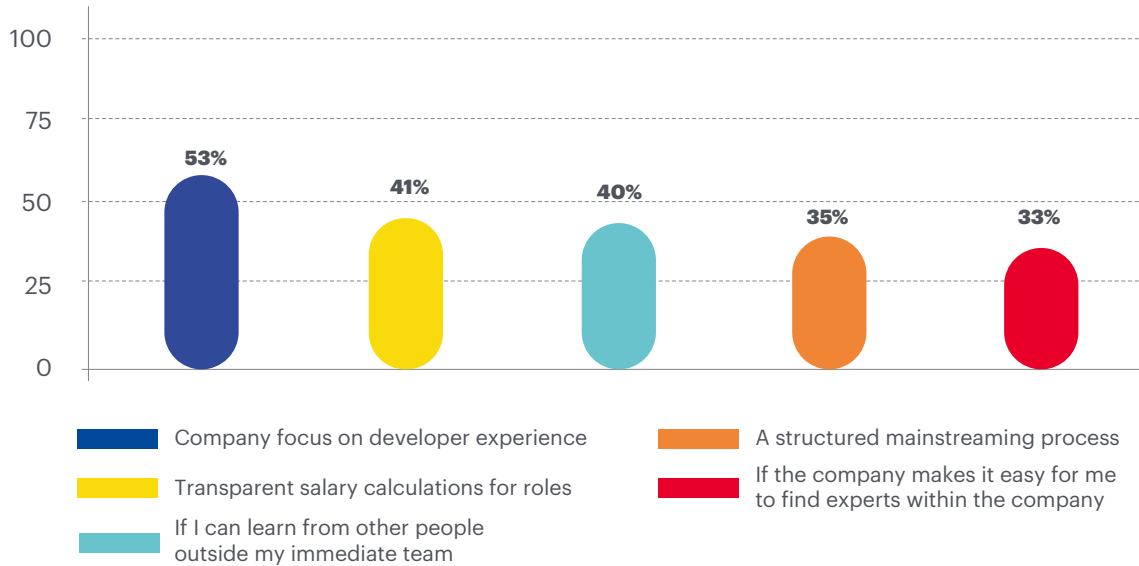
We rely on strategic partners such as Barcelona Digital Talent to attract talent and maintain a close relationship with universities. This year we have especially focused on showing digital profiles how they help us with our purpose.”

Heidi Van De Woestyne

HR Business Partner Global Innovation Center en Sanofi

Factors that make a company more attractive to work for

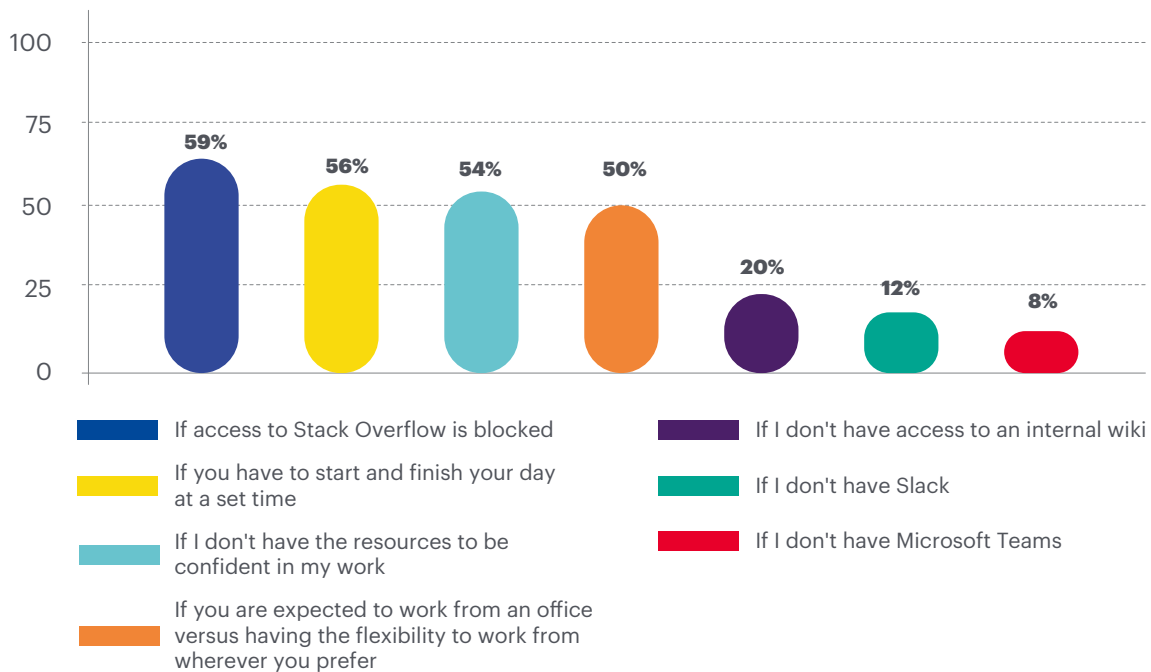
2021



Source: Stack Overflow Developer Survey

Factors that make a company more attractive to work for

2021



Source: Stack Overflow Developer Survey



Excellence training centres in Europe

The United States once again leads the world's top rankings for academic excellence in educational subjects such as computer science and information systems. The UK and Switzerland complete the ranking, and Singapore joins the list, ousting Canada from the international top 10.

The leading universities in digital skills at the European level are mainly in the UK and Switzerland. Germany, France, and the Netherlands also have universities with recognised prestige in the field.

The Universitat Politècnica de Catalunya remains at the top of the national ranking. However, the absence of Catalan universities in the top positions of the global rankings is still a pending issue.

Most recognised training centres in Computer Science and Information Systems

2021

International Top 10



University

1. **Massachusetts Institute of Technology (MIT)**
2. Stanford University
3. Carnegie Mellon University
4. National University of Singapore (NUS)
5. University of California, Berkeley (UCB)
6. University of Oxford
7. Harvard University
8. University of Cambridge
9. École polytechnique fédérale de Lausanne (EPFL)
10. ETH Zurich - Swiss Federal Institute of Technology



Country

- United States**
- United States
- United States
- Singapore
- United States
- United Kingdom
- United States
- United Kingdom
- Switzerland
- Switzerland

Europe Top 10

2021

 University	 Country	Position in international ranking
1. University of Oxford	United Kingdom	6
2. University of Cambridge	United Kingdom	8
3. École polytechnique fédérale de Lausanne (EPFL)	Switzerland	9
4. ETH Zurich - Swiss Federal Institute of Technology	Switzerland	10
5. Imperial College London	United Kingdom	16
6. University College London (UCL)	United Kingdom	=23
7. The University of Edinburgh	United Kingdom	26
8. Technical University of Munich	Germany	=35
9. Université PSL	France	=35
10. University of Amsterdam	The Netherlands	40

Source: QS Top Universities

Spain Top 10

2021

 University	 Country	Position in overall ranking
1. Universitat Politècnica de Catalunya BarcelonaTech (UPC)	Catalunya	79
2. Universidad Politécnica de Madrid (UPM)	Madrid	125
3. Universitat de Barcelona	Catalonia	136
4. Universidad Carlos III de Madrid	Madrid	145
5. Universidad Complutense de Madrid	Madrid	151-200
6. Universidad de Granada	Andalusia	201-250
7. Universitat Politècnica de València	Community of Valencia	251-300
8. University of Seville	Andalusia	451-500
9. Universidad Rey Juan Carlos	Madrid	451-500
10. Universidad de Navarra	Navarra	501-550

Source: QS Top Universities

United States

- **Massachusetts Institute of Technology (MIT)**
- Stanford University
- Carnegie Mellon University
- University of California, Berkeley (UCB)
- Harvard University

United Kingdom

- **University of Oxford**
- University of Cambridge
- Imperial College of London
- University College London
- The University of Edinburgh

Germany

- Technical University of Munich

The Netherlands

- University of Amsterdam

Switzerland

- École Polytechnique Fédérale de Lausanne (EPFL)
- ETH Zurich - Swiss Federal Institute of Technology

France

- Université PSL (Paris Sciences & Lettres)

Spain

- **Universidad Politècnica de Catalunya BarcelonaTech (UPC)**

Singapore

- National University of Singapore (NUS)



International

Massachusetts Institute of Technology (MIT)

United States



European

University of Oxford

United Kingdom



Spanish

Universitat Politècnica de Catalunya

Catalonia

Companies also carry out training in ICT of its employees

19.7% of European companies offer digital skills training to their employees. Above the European average are Finland, Belgium and Sweden, among others.

« »

“At PepsiCo Global, we have several channels and resources that allow our employees to set their career development plan. We work hand in hand with the online platform PEPU Degreed which, depending on their competences, skills, and interests, generates a proposal of itineraries that respond to their own needs at the time.

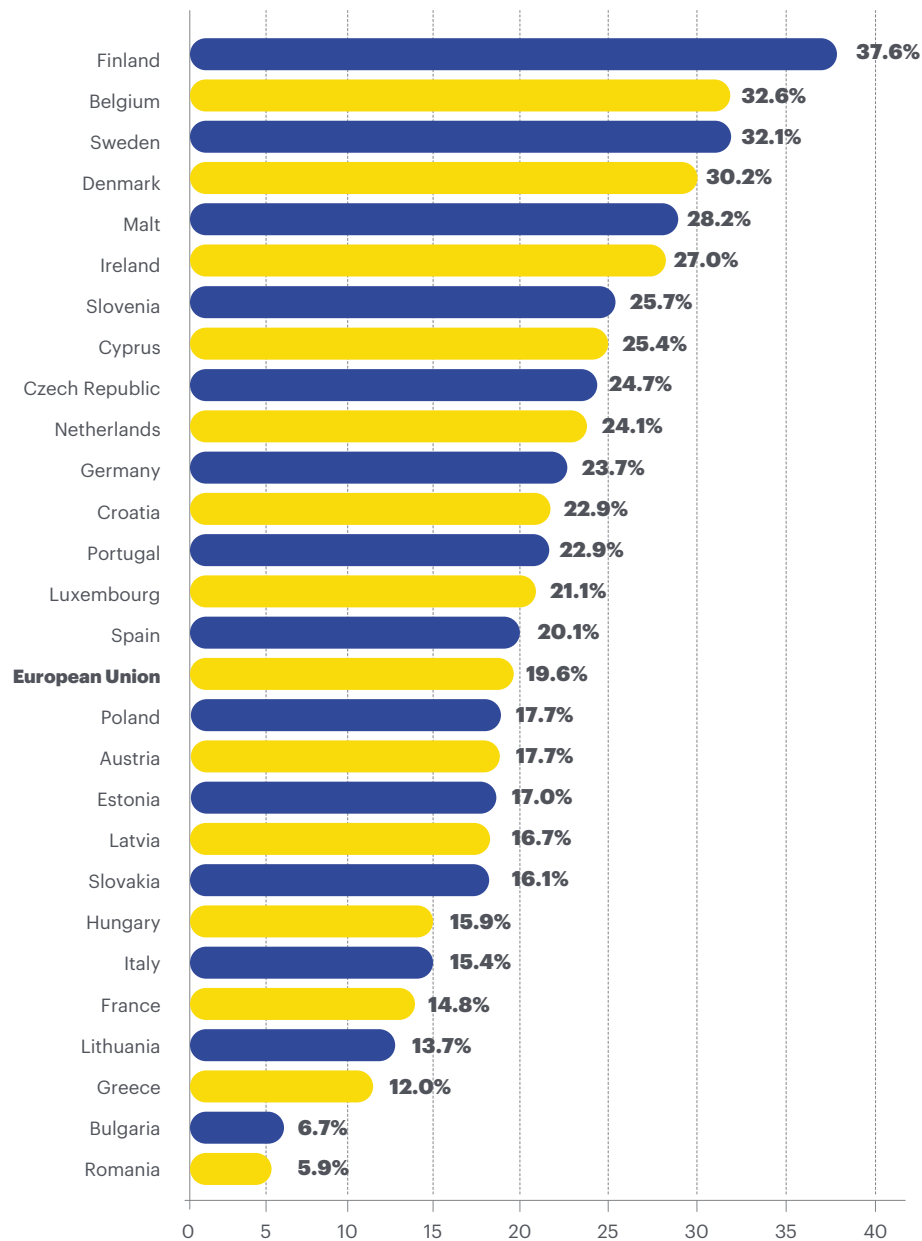
We have a dedicated talent management team that offers a wide range of annual training courses, such as cross-cutting training courses such as First Time Manager or Communication Skills to more technical training specific to the day-to-day work of the Digital HUB. In addition, we are committed to continuous and shared learning between teams. We share technical and functional knowledge in the buddy programme with new employees and organise internal workshops to share projects and receive feedback from the teams.”

Gaston Besanson

Global VP Data Science at PepsiCo

Percentage of companies providing ICT training

2021



Source: DESI

Digital skills of ICT professionals from a business perspective

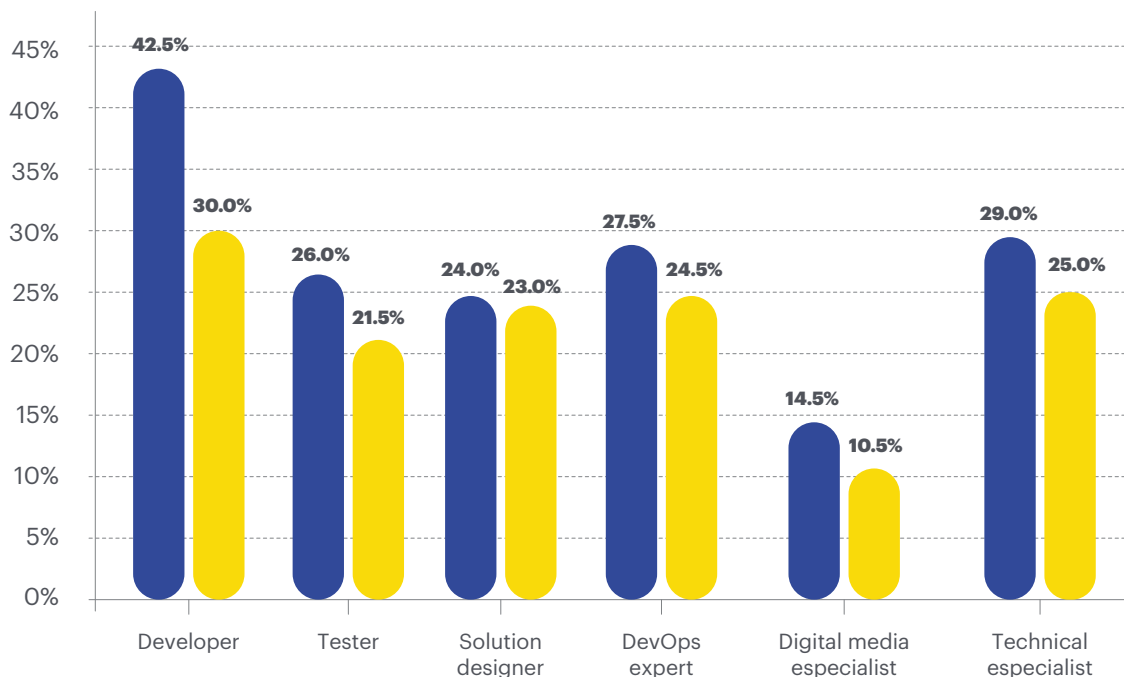
Developmental skills are the skills that companies are most looking to hire.

Approximately 42.5% of companies prefer to hire professional programmers compared to 30% who prefer to train their staff in these skills. The rest of the specialities are usually incorporated into the company with already trained profiles or by training professionals who already work for them; there are usually no major differences in this respect.

How companies fill jobs (recruitment and/or training)

2021

- Companies that hire people with the right skills
- Companies that train their own staff in the right skills



Source: Europe's Most Needed Software Roles and Skills. Report 2021 [European Software Skills Alliance (ESSA)]



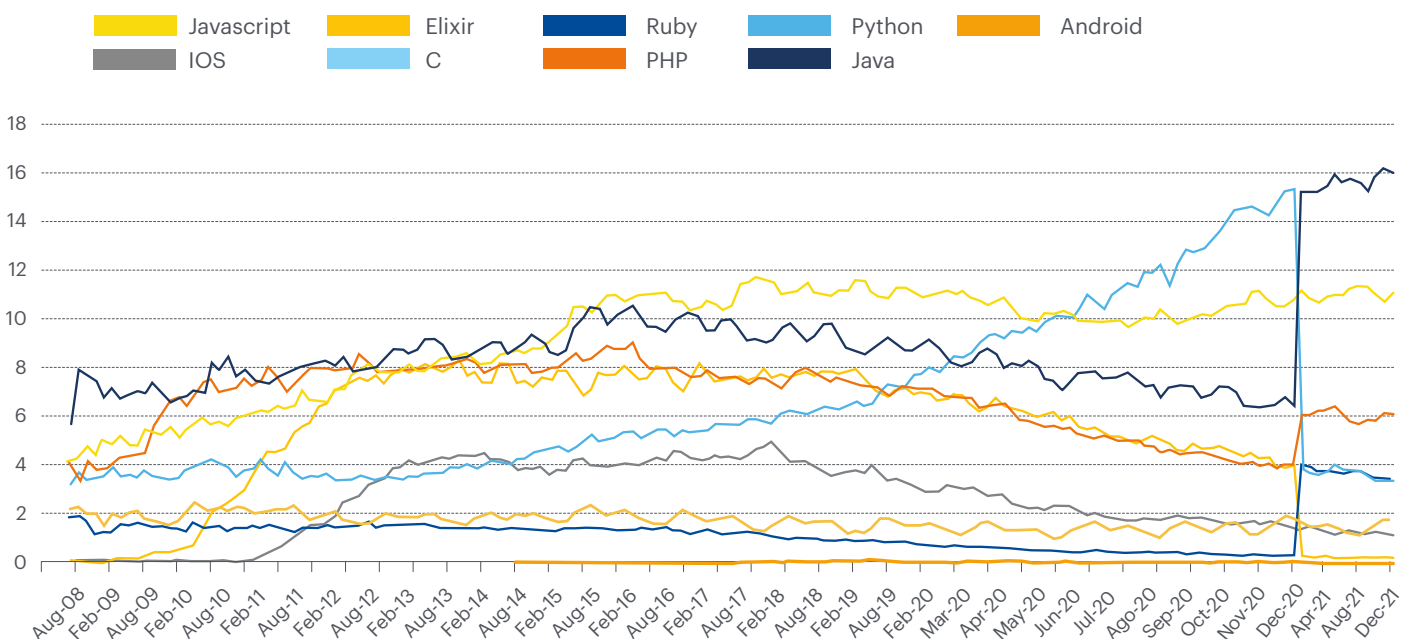
The most popular programming languages in the digital ecosystem

In the last year, there has been a shift in usage trends in both programming languages and frameworks. Java is now the most widely used language, and Python, the most popular in recent years, is now used less than JavaScript and PHP. Also noteworthy is the increase in the use of Ruby, which had been declining in recent years, and the decline of Android in the last year.

Symfony will emerge in 2021 as the most popular framework. While Node.js continues to increase its presence gradually and remains in the same position as last year, the use of React has declined sharply. Despite this, React is still more widely used than other frameworks such as vue.js, angular or Ruby on Rails.

Global trends. Programming languages (%)

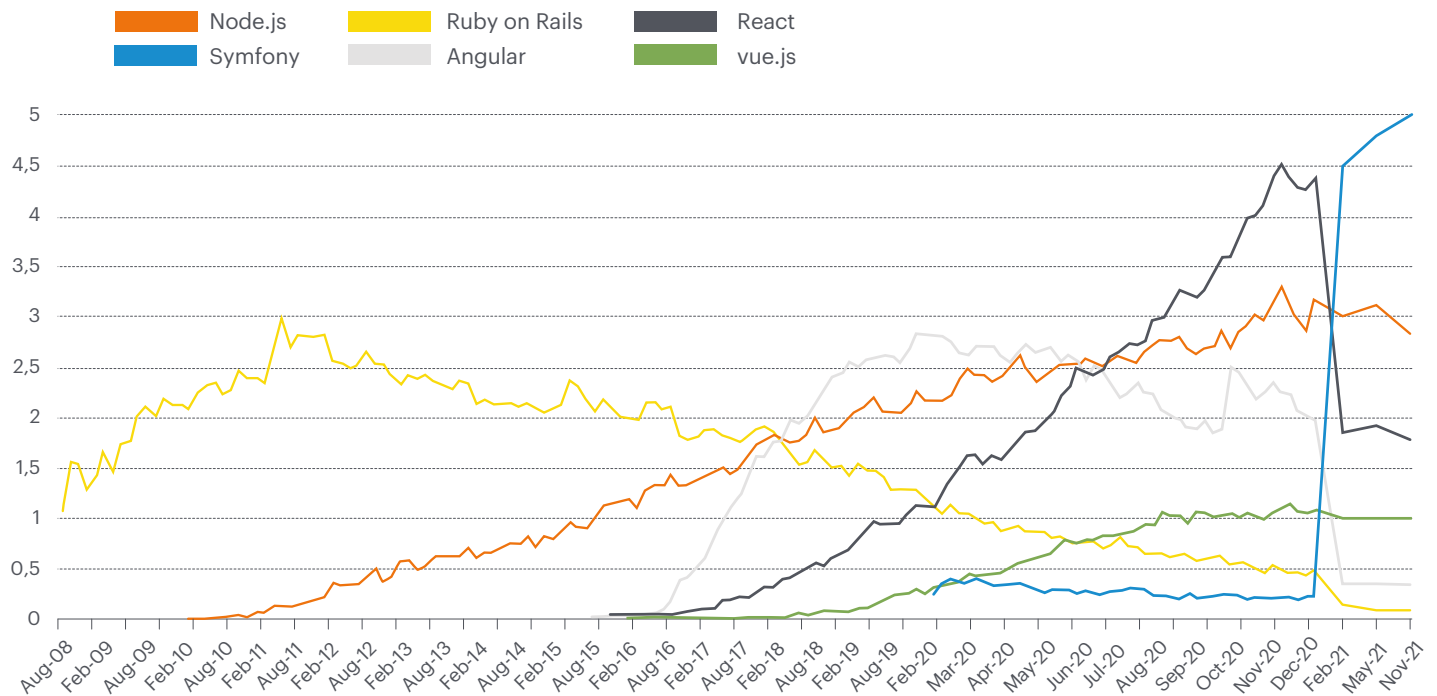
2008-2021



Source: TalentUp

Global trends. Frameworks (%)

2008-2021



Source: TalentUp



“This year’s development has been marked by mobile apps, blockchain, web 3.0 and the metaverse. This leads to the emergence of new frameworks and languages. Still, the market is the one that imposes its demand, as they will be more versatile, useful and sustainable in the future.

At Nuclio Digital School we have that vision, we teach: Java Script, with more than 17.5 million developers using it; as frameworks: React, which allows creating easy and fast user interfaces and; Node.js, designed to create scalable network applications. We train according to demand but with a view to the future.”

Jared Gil

CEO & Co-Founder of Nuclio Digital School

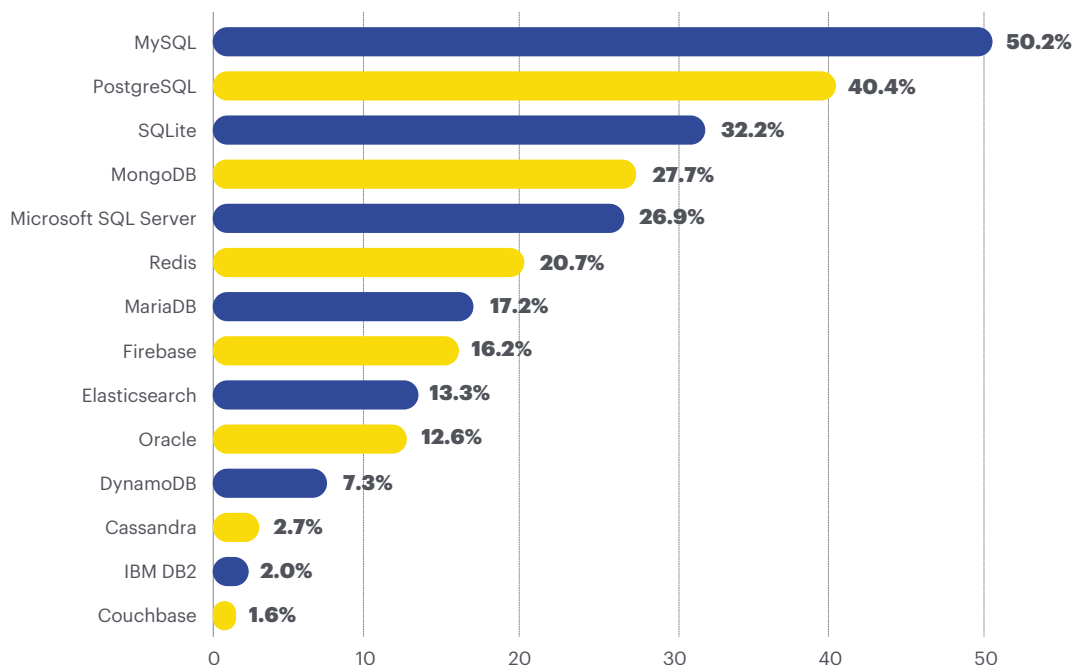
Most popular Cloud database systems in the digital ecosystem

The database systems most used by developers are MySQL (50%) and PostgreSQL (40%).

The cloud infrastructures most used by developers are AWS (54%), Google Cloud Platform (31%) and Microsoft Azure (31%).

Databases most used by developers

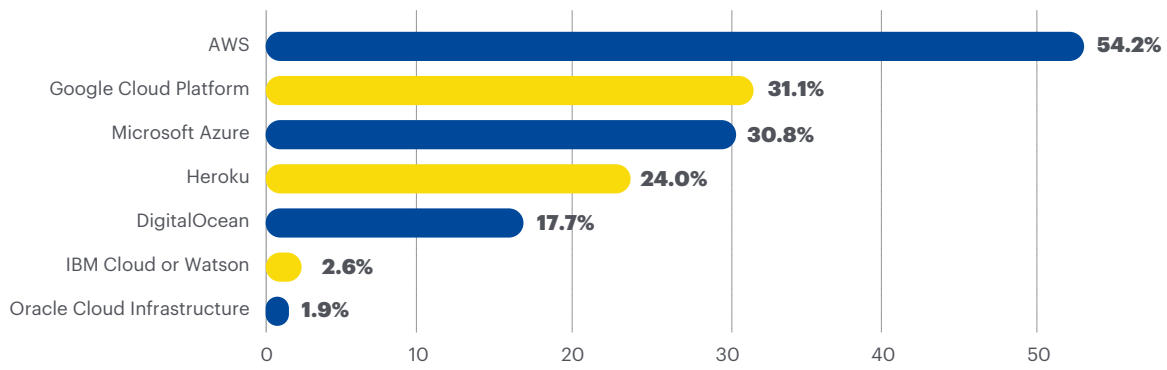
2021



Source: Stack Overflow Developer Survey

Cloud platforms most used by developers

2021



Source: Stack Overflow Developer Survey

Low-Code: the new paradigm in software development

In the last two years, job offers related to low-code skills have grown by 73% in major European markets such as the UK, Germany, France and Spain.

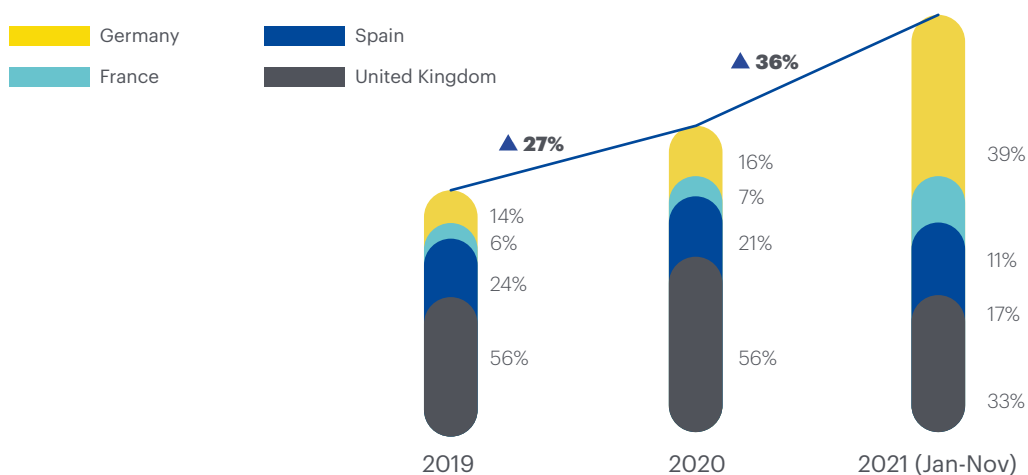
Low-Code technologies minimise or even eliminate (No-Code) manual coding in the development of software applications.

The short learning curve allows professionals from non-technological areas in companies to adopt software development skills. Various studies show that 40% to 60% of organisations have opted for Low-Code reskilling of non-technological professionals to overcome the difficulties in recruiting digital profiles.

IDC forecasts that the number of Low-Code developers worldwide will grow at a compound annual growth rate of 40.4% between 2021 and 2025, which is approximately 3.2 times the expected growth rate for developers worldwide (12.5%). In the same vein, Gartner predicted that by 2023, the number of Citizen developers in large companies would be at least four times the number of professional developers.

Evolution of the demand for Low-Code profiles in the UK, Germany, France and Spain

2019-2021



Source: In-house based on the Job Market Insights tool

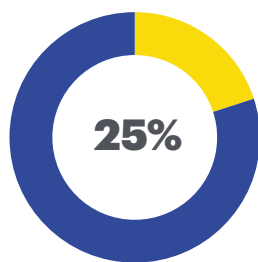
Microsoft Power Platform, Appian, Mendix, ServiceNow, Salesforce and Outsystems are currently at the top of Low-Code platforms, with the highest level of adoption among the companies interviewed

One of the barriers identified in the Low-Code adoption process is the difficulties in recruiting profiles with Low-Code knowledge to be incorporated into the ICT departments of organisations, as there is still not a sufficient volume of talent trained in this type of platform, and practically all of these professionals are at vendors or ICT service providers, generating a dependence on them.

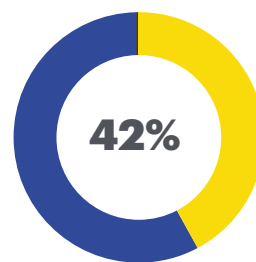
Companies are working on different lines of action to incorporate these new competences linked to the Low-Code in their organisations.

Lines of action to incorporate new competences linked to Low-Code

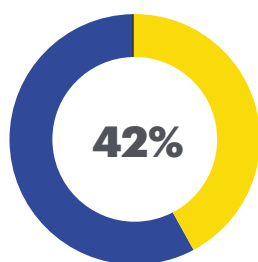
2021



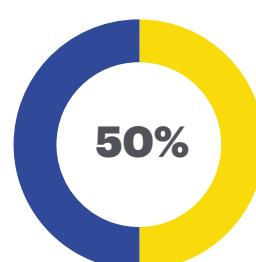
Of the companies opting to hire new profiles



Of companies choose to train IT developers



Of companies choose to train non-IT profiles



Of companies choose to outsource profiles through consultancy firms



“The Low-Code allows us to respond to an opportunity and demand that historically was not answered by the department. Previously, IT solutions did not enable this possibility. We understood that with the launch of the application ecosystem such as Microsoft PowerApps, a window of opportunity was opening up to accelerate and democratise the use of advanced microcomputing.

The great mass of people who create applications still have software development skills, but this is not the case when small changes to existing applications or simple individual efficiency flows. Processes are required, in which case the non-tech contributors are autonomous. This technology competes with other open development architectures.”

Oscar Pallisa

Chief Information Officer at Zurich Insurance Group

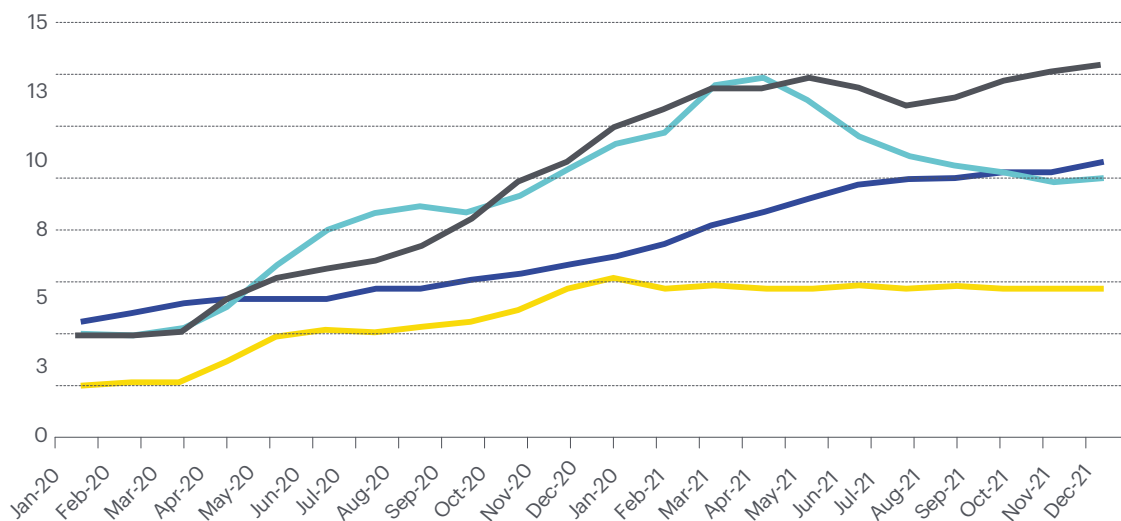


Increasing options for telework

The number of telework positions has grown significantly by 2021. In Spain, this growth is particularly significant, as the rate has multiplied by a factor of 4. This amounts to around 10% on average per month in a year.

Proportion of remote job offers (%)

2021



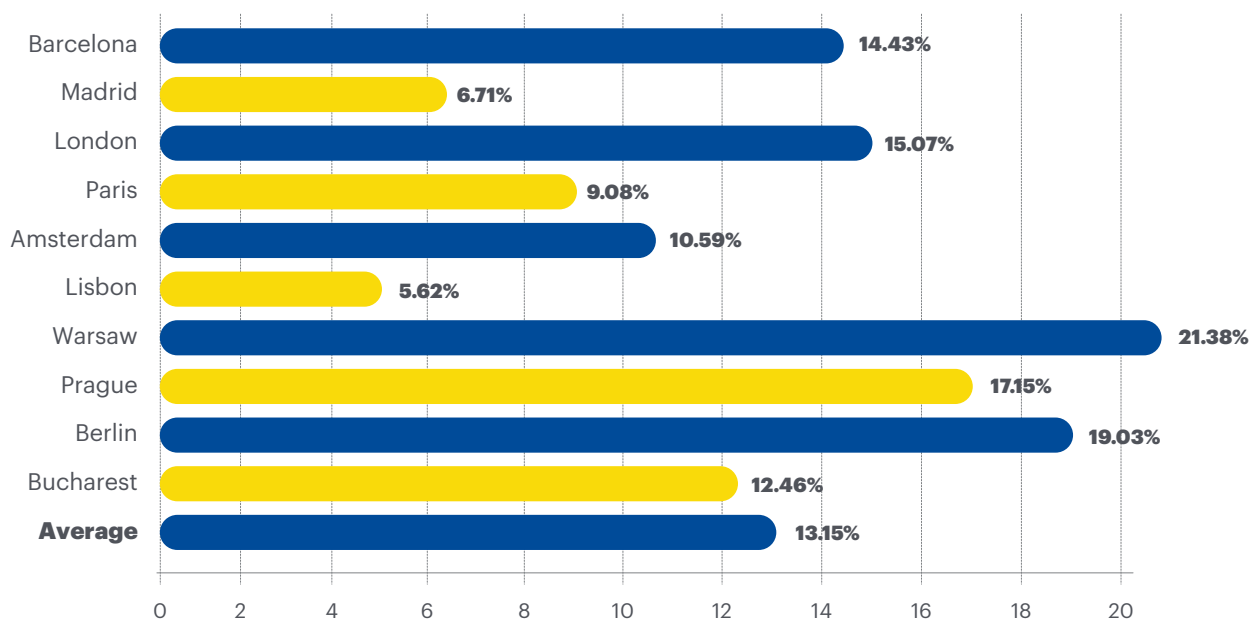
Source: The State of European Tech (Atómico, 2021)

Barcelona offers more remote jobs than the average of the cities analysed.

Warsaw is the city that offers the most remote jobs offers (21%) among the cities analysed, followed by Berlin (19%) and Prague (17%).

Remote job offers in European cities (%)

2021



Source: TalentUp.io



“At ManoMano, we are convinced that giving the employee freedom of choice over the work model is the key to motivation and talent retention.

We are a company focused on innovation. We recently implemented our “WorkAtom” working policy, where employees can choose the number of days they wish to work from home, from 0 to 5 per week. This has not affected performance, while we have improved work-life balance and satisfaction. We also enhance the community life of our teams with six face-to-face events per year.”

Isabel Salazar

Country Manager at ManoMano Spain

Staff on demand

The market for developer jobs for specific projects (staff on demand) has fluctuated recently. Still, its rate is always above the pre-pandemic period. The increase in jobs per project is centred on three very specific periods: May 2020, May 2021, and March 2022. Although the increase in this type of recruitment is not linear and there are months of the year in which this type of figure declines, the previous year's maximum number of jobs is exceeded each year.

The hiring of freelance software and technology developers as staff on demand has been growing steadily over the last two years. Although it has moderated in 2022, the increase since May 2020 consolidates an upward trend.



“For us at Bayer, it is essential for all employees to be able to connect with our LIFE values (Leadership, Integrity, Flexibility, Efficiency) from the very first moment they join our company.

Our Smartworking model and constant efforts to improve the digitisation and upskilling of the leadership team allow us to not only to work in multidisciplinary teams that share a common purpose, but also anticipate market challenges, generating value by fostering the collective intelligence of our team and generating a positive and sustainable impact for the improvement of our society today and in the future”.

Ona Garcia

Responsable de Talent Management Iberia de Bayer

Demand for projects by speciality (Software development)

2020-2022

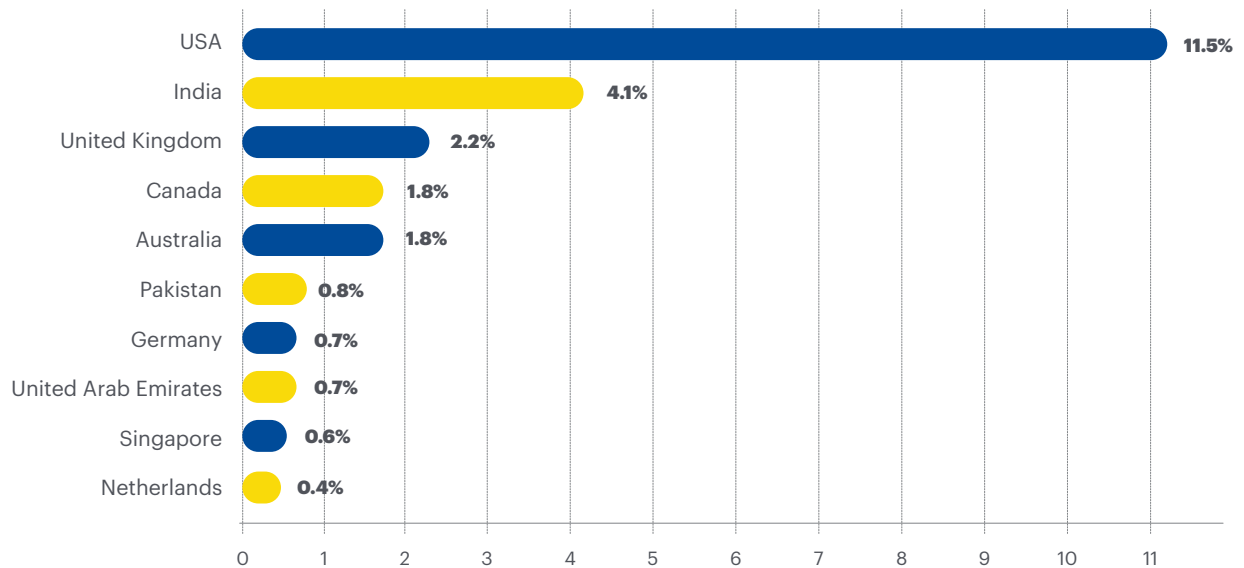


Source: Online Labour Index (Oxford Internet Institute)

The United States and Europe lead the world in demand for staff-on-demand developer positions.

Developer demand by project by employing region

2020-2022

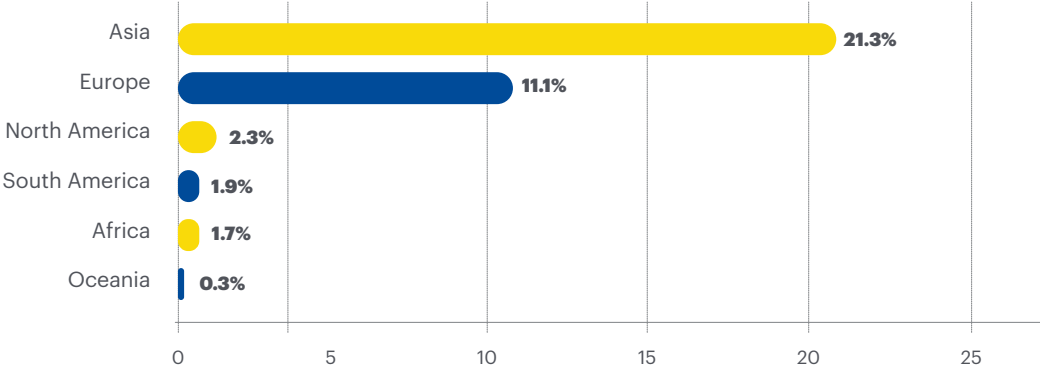


Source: Online Labour Index (Oxford Internet Institute)

The index that measures the demand for digital professionals by projects (staff on demand) has also increased over the last two years. The United States accounts for more than 11% of the global demand for on-demand professionals, while India, Pakistan and Ukraine are the economies with the most professionals working in this modality.

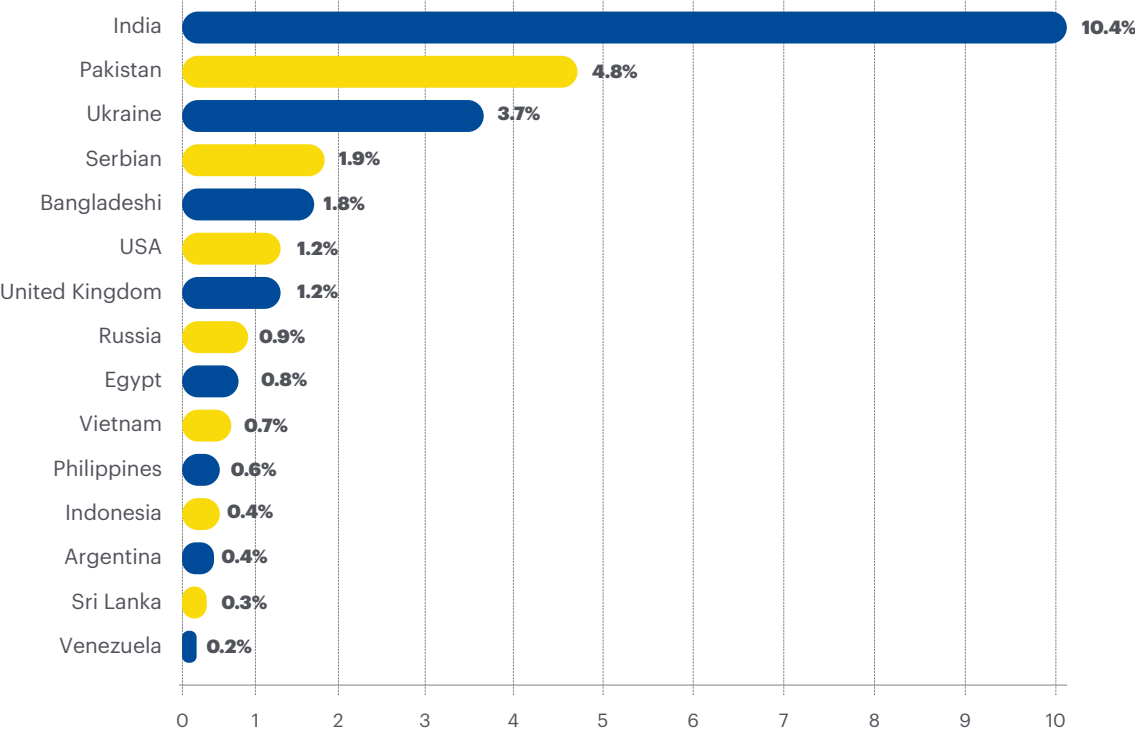
Occupation contributed by the country of the workers

2022



Top 15 countries contributing workers

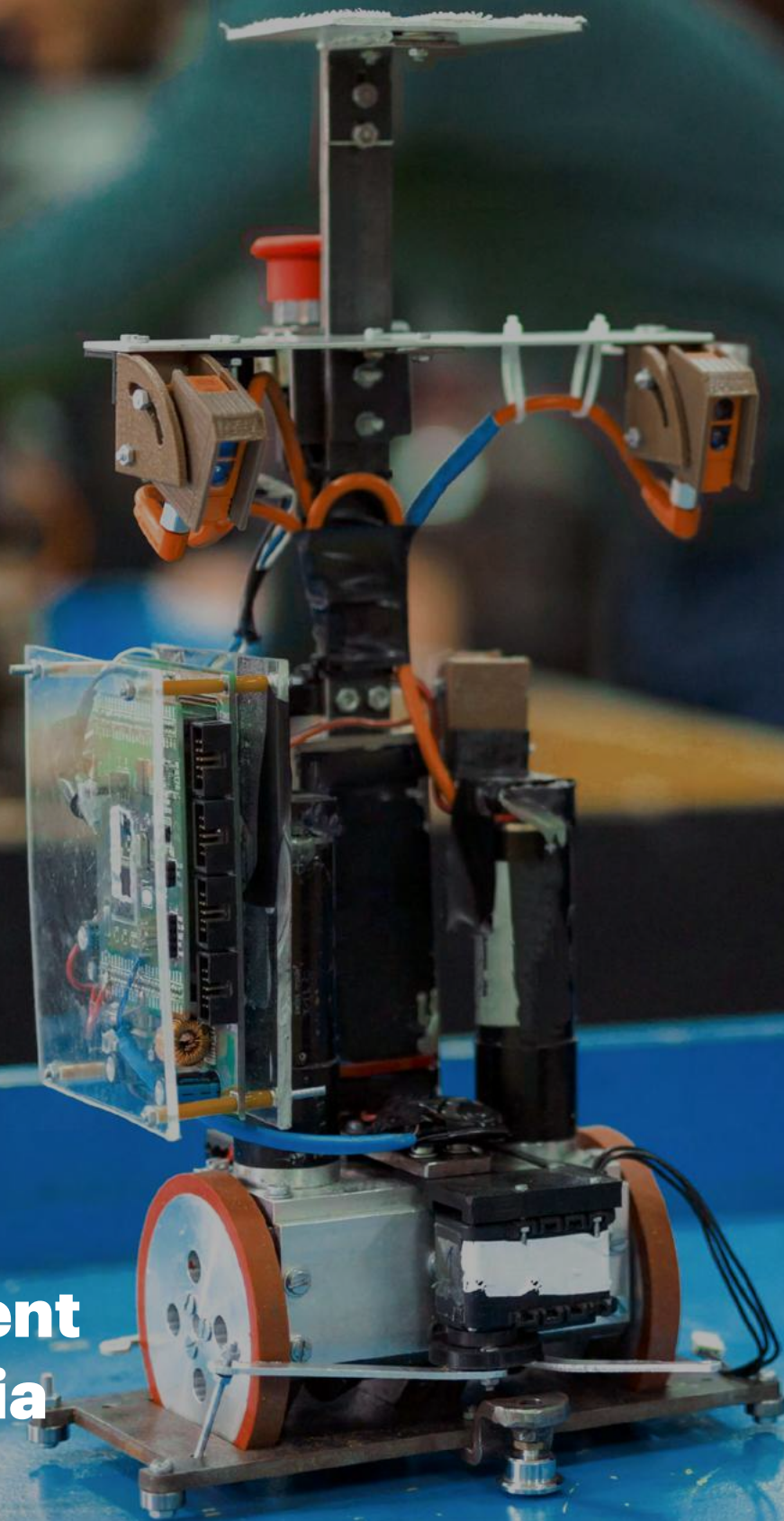
2022



Source: Online Labour Index (Oxford Internet Institute)



2 **Digital talent** **in Catalonia**



Supply and demand of digital profiles

Catalonia added 10,500 new digital profiles in 2021, an annual increase of 12%. The availability of these profiles has grown in all Catalan regions, although Barcelona continues to account for 95% of all digital talent in Catalonia.

The availability of professionals per job offer is decreasing compared to the previous year. The Tarragona region continues to be the territory with the highest volume of digital talent per job offer. However, it is also the region that experiences the

the most notable reduction in the number of professionals per offer. This year the figure is 30 professionals, compared to 36 in the last measurement in 2020. The average for Catalonia as a whole is 15 professionals for each job offer.

For their part, Lleida and Girona are still very close in terms of total digital demand reached in 2021. Both regions achieved significant increases compared to 2020, although Tarragona continues to lead the increase in demand, rising from 62 to 105 professionals per quarter.

The Barcelona area concentrates the greatest supply (95%) and demand (97%) of digital talent in Catalonia.

Supply and demand of digital profiles in Catalonia

2021

	Catalonia	Barcelona	Girona	Lleida	Tarragona
Digital professionals total in 2021	98,782	93,516	1,182	968	3,116
Total digital demand in 2021 (3M)	25.560	24.648	276	216	420
Number of digital professionals per offer of work (2021)	15	15	17	18	30

Note: Demand is annualised based on data for one quarter of 2021. The 'Number of digital professionals per job offer' is calculated based on quarterly demand (dividing annual demand by four).

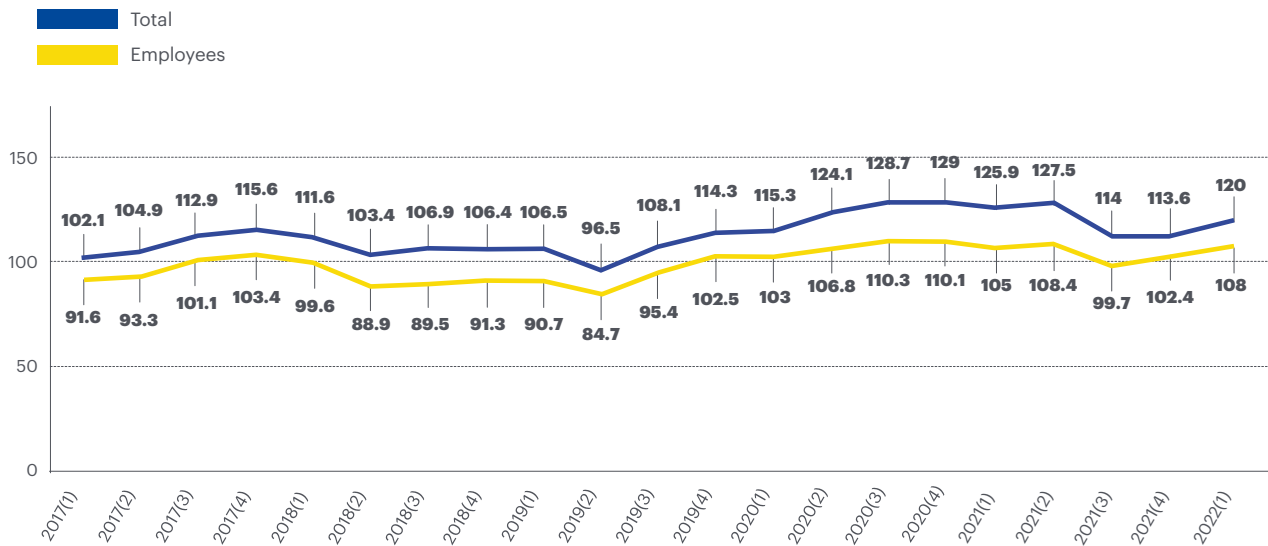
Source: TalentUp

Compared to the previous year, 2021 has seen a contraction in the number of people employed in the ICT sector. However, in the first quarter of 2022, a significant upturn in occupancy figures can already be observed, bringing them closer to 2020.

The year-on-year variation of the employed population in the ICT sector in Catalonia and Spain shows a remarkable recovery in the first quarter of 2022.

**Population employed in the ICT sector in Catalonia by professional status.
In thousands of people**

2016 - 2022



Note: : It should be noted that this data refers to the total number of employees in the ICT sector and therefore does not reflect digital professionals in other sectors, nor does it distinguish between digital professionals and other types of employment within the sector itself. The methodology used in the EPA, based on a sample survey, also differs from the method used by Barcelona Digital Talent, which analyses the total universe of supply and demand for digital talent.

Source: Idescat (based on INE's EPA data)

In 2021, the drop in the number of people employed in the ICT sector in Catalonia (-4.7%) contrasts with a greater decline in the Spanish economy as a whole (-16%).

Population employed in the ICT sector. In thousands of people

2021 - 2022

	T1/2021	T1/2022	Difference	Percentage
Catalonia	125,900	120,000	-5,900	-4.7% growth
Spain	654,400	549,800	-104,600	-16% decrease

Source: Idescat (based on INE's EPA data)



“The technology sector has been and continues to be a booming sector. This reality is even more accentuated in cities such as Barcelona, where we regularly read news of large technology multinationals setting up in the city. As a result, companies compete to attract and retain talent, which is essential to achieving the organisation's objectives.

Profiles in telecommunications, cybersecurity or artificial intelligence are in great demand. However, we do not forget developers or project management profiles, which are still in great demand.”

Roger-Wolf Onnen Grima

Head of the People & Talent Department of the i2CAT Foundation

The muscle of the technology sector in Catalonia: business and ICT services companies

Business services represent between 16% and 19% of all digital jobs in Catalonia. These percentages maintain the trend detected in previous years.

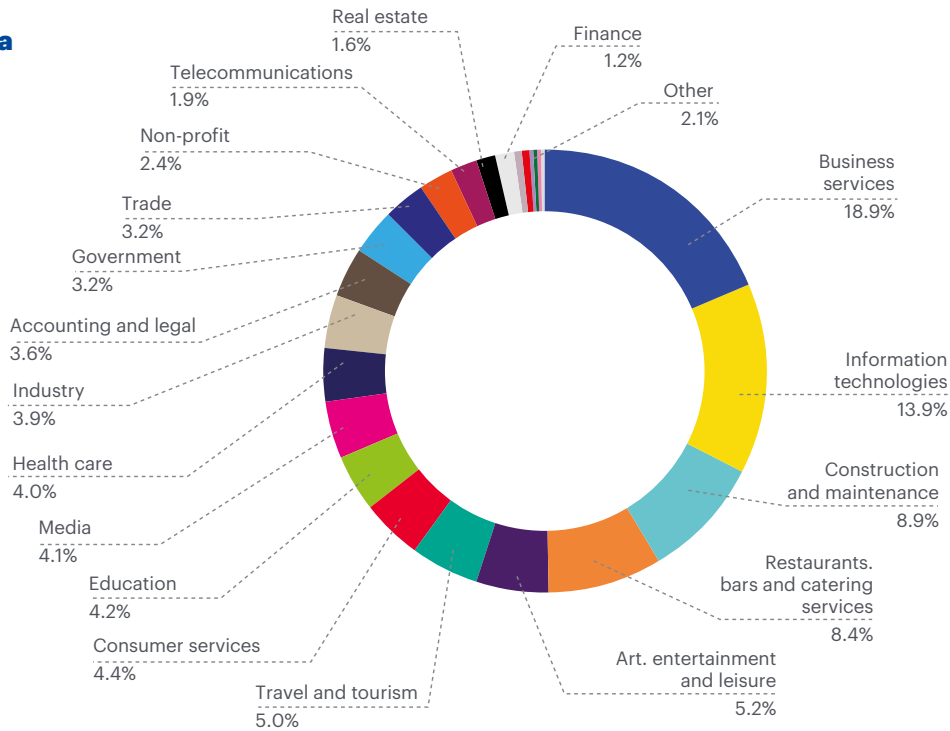
The second sector with the largest number of digital jobs is information technology (ICT). The latter stands out with the highest percentage in Barcelona, representing 14.3% of the total, and the lowest in Tarragona (10.5%).

By specific areas of specialisation, Girona stands out in the catering sector with 8.4% of ICT profiles and in art, entertainment, and recreation with 5.2%. For its part, Lleida brings together 6.9% of the technological muscle around the health sector and 5.9% in consumer services. In Tarragona, the manufacturing sector and education tie with 6.9%, significantly distancing themselves from the following sectors. Finally, Barcelona is almost equally represented in the arts and entertainment sector (5.9%), health services (5.8%) and media (5.2%).

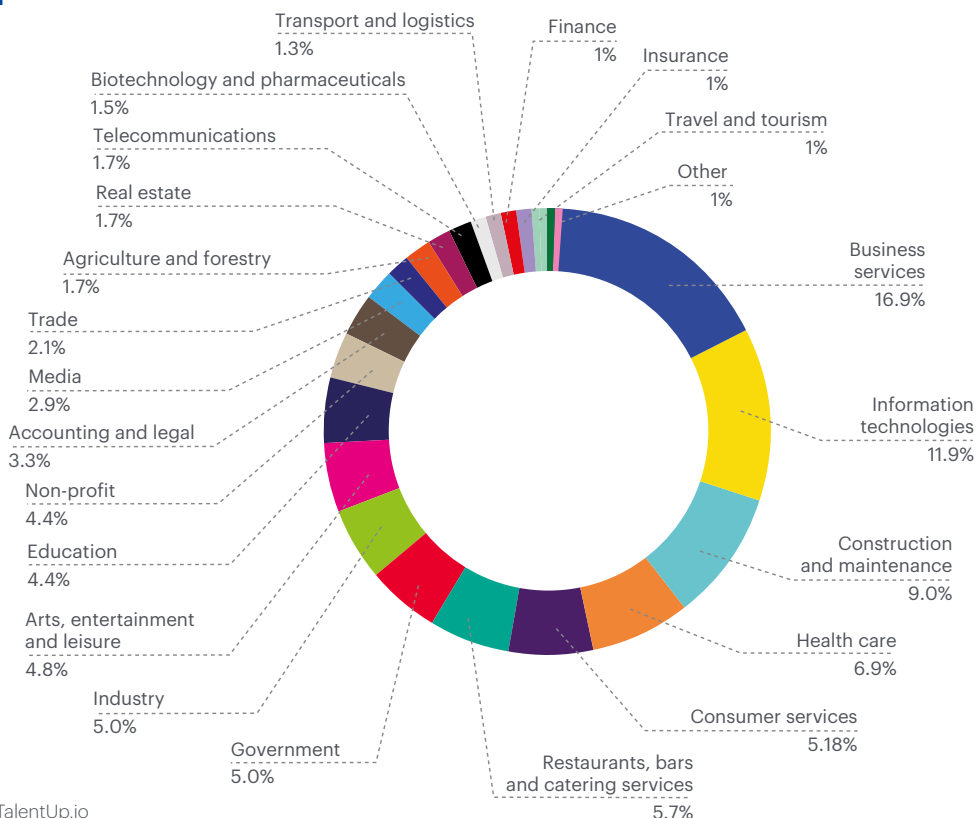
Distribution of companies where ICT profiles work, by area

2021

Girona

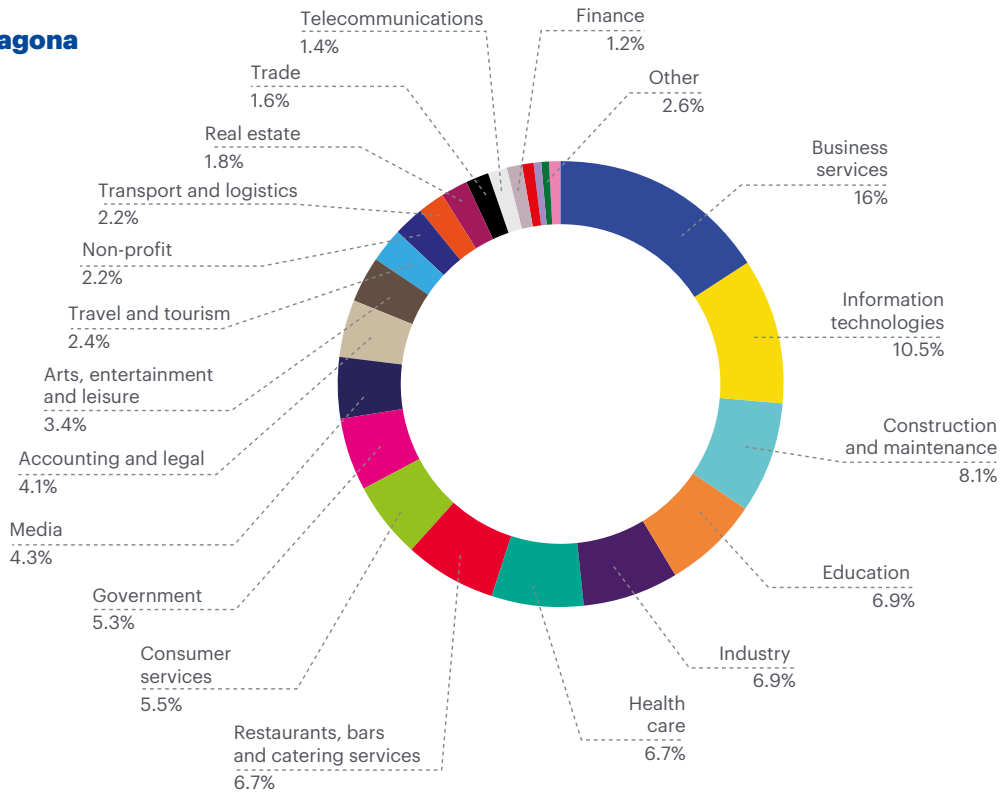


Lleida

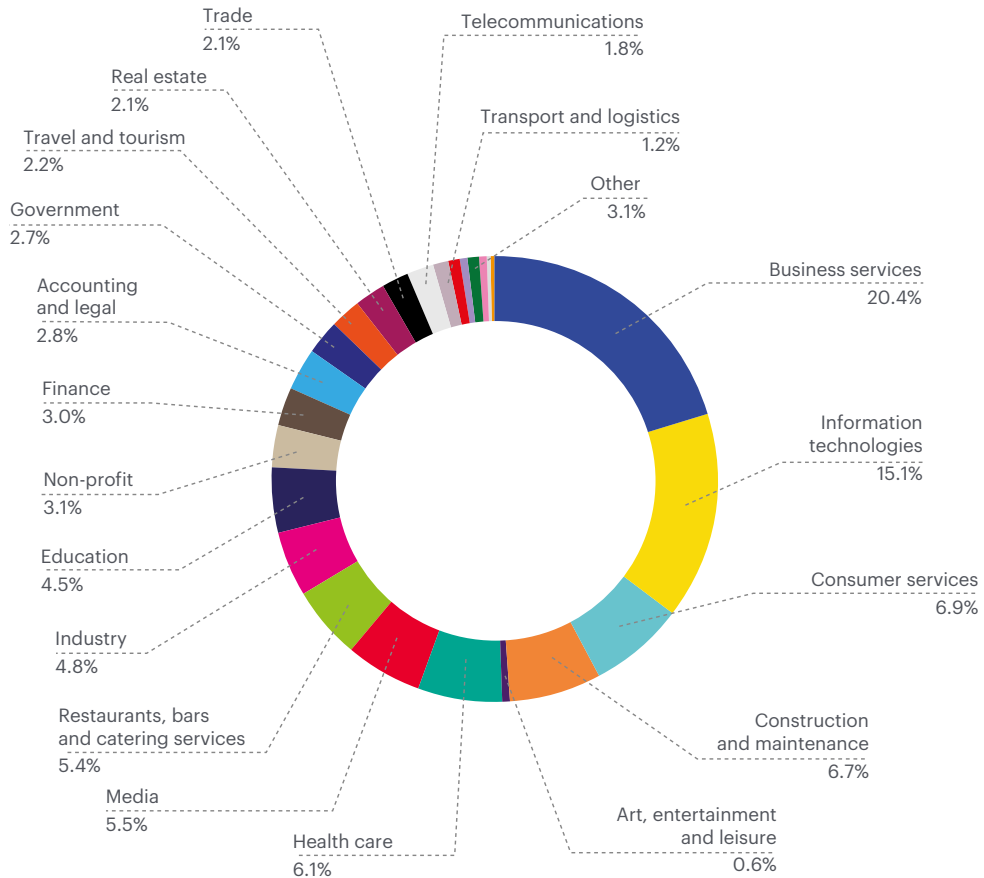


Source: TalentUp.io

Tarragona



Barcelona



Source: TalentUp.io



“At the CaixaBank Group, the profiles that we see as most relevant in the current and future context will be: software engineers and architects, especially with experience in cloud and SaaS architectures more relevant in the market; analysts and data scientists, capable of building AI models and developing use cases with impact for business and operations and also specialists in digital marketing: digital media campaigns, CRM, programmatic, among others.”

Joan Antoni Cabrer

Director of Digital Transformation at Caixabank

The companies that hire the most digital profiles

The top employers of digital talent remain the same in Barcelona as in 2020. Glovo consolidates its leadership as a recruiter in Barcelona, while in Girona, Lleida and Tarragona, new companies join the ranking.

In 2021, further diversification was seen as a result of an increase in the number of companies involved in developing technical solutions. The entry of Hipra in Girona, a company dedicated to manufacturing the only vaccine developed in Spain against Covid-19, stands out in this ranking.

Among all the large employers, only one is public. This is the Nextret initiative, linked to Girona City Council and focused on digital monitoring and auditing actions.

Top technology employers in Catalonia

2021

Barcelona	Girona	Lleida	Tarragona
Glovo	DXC Technology	Indra	T-Systems
Inetum	Sunweb Group	Minsait	Inetum
Capgemini Engineering	Nextret	GFT Technologies	Lear Corporation
NTT DATA	Hipra	BonArea	Applus Idiada
Zurich	Tavil Ind	Lleida.net	Freshly Cosmetics

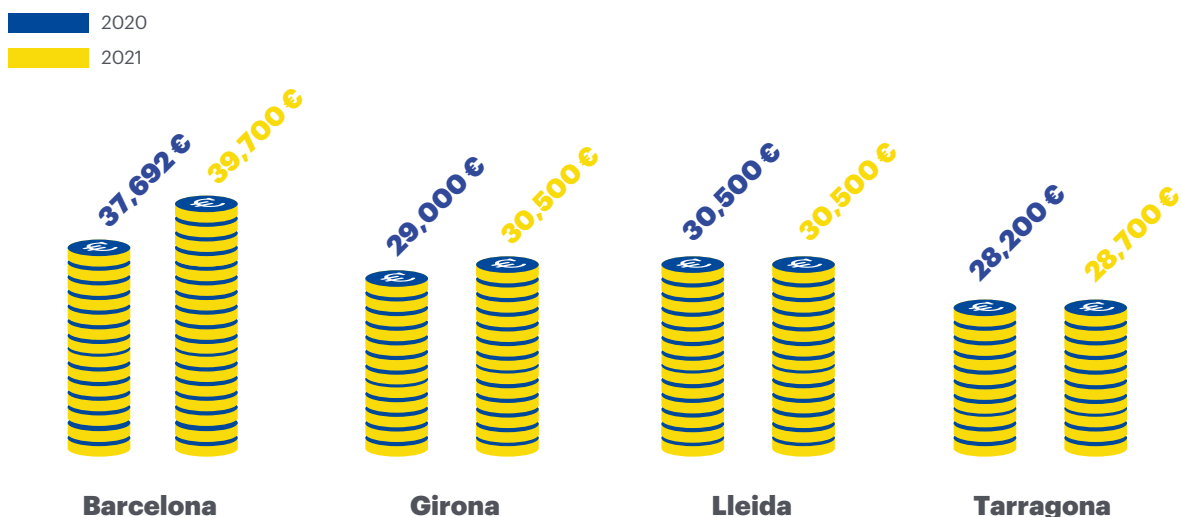
Software developer salaries higher in Catalonia

Barcelona continues to offer the most competitive salaries in Catalonia for software developers with three to four years of experience. The average salary in Barcelona increases notably (€2,000), and Girona is the second city that offers, on average, a higher salary increases to professionals (€1,500), putting it on a par with Lleida, which maintains the same 2020 salary range.

In last place is Tarragona, which continues to offer the least stressed environment in the supply-demand relationship for talent. However, it has also increased the average salary by around €500 gross per year.

Average salary for a software developer position with 3-4 years of experience

2020 - 2021





3

**Digital talent
in Barcelona**

The digital professionals in Barcelona

In absolute terms, the volume of digital professionals grew to 9,396 people in 2021, 40% more professionals than added in 2020.

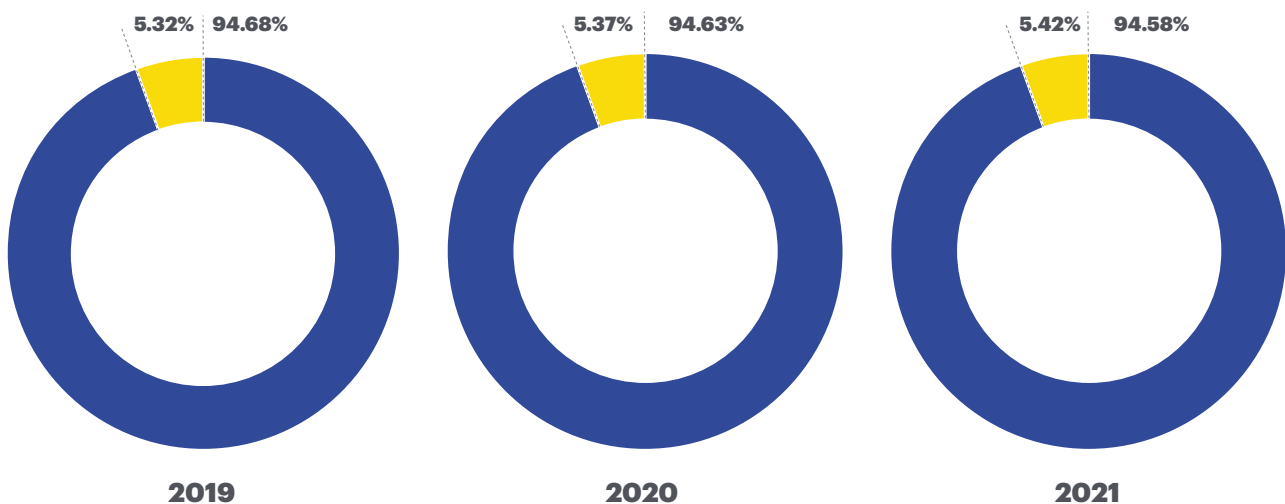
The digital sector in Barcelona occupies 5.42% of professionals. This percentage refers to the 93,516 digital professionals that make up the sector. The increase in 2021 is 9,400 professionals.

The growth rate of digital professionals (11.17%) continues to outpace that of all sectors (10.8%).

Percentage of digital professionals vs. global market

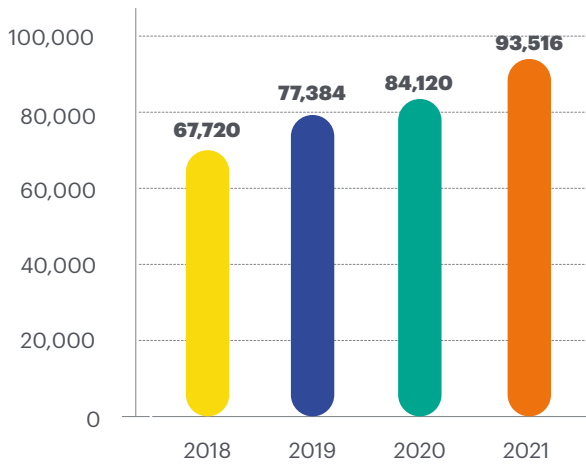
2020-2021

■ Global market
■ Digital professionals



Total number of digital professionals

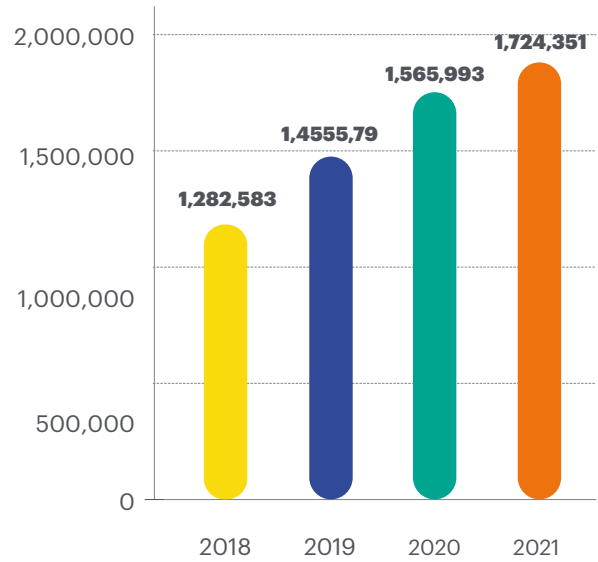
2019-2021



2019 ▲ +14.27%
2020 ▲ +8.7%
2021 ▲ +11.17%

Total professionals (all sectors)

2019-2021



2019 ▲ +13.49%
2020 ▲ +7.59%
2021 ▲ +10.8%

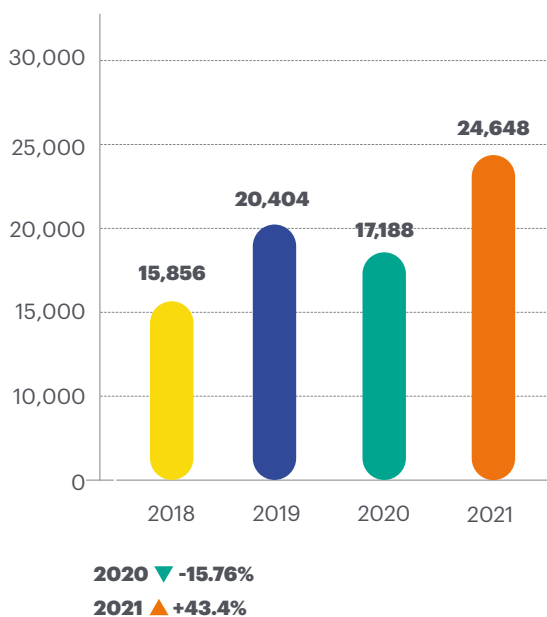
The demand for employment of the ICT sector

The number of jobs in the digital sector soars in 2021, up 43.4% compared to the previous year, almost four times more than the increase in the number of professionals (11.17%). Annualised figures show that in 2021 the digital sector offered 24,648 jobs.

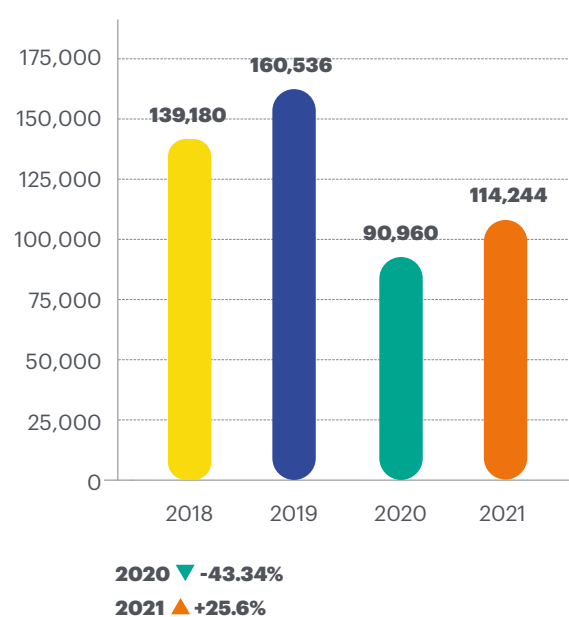
These figures could indicate a clear recovery of digital talent employment after the impact of Covid-19. While the demand for digital talent is already above pre-pandemic figures, the same is not true for the economy as a whole, which is still far from 2019 rates.

In 2021, 2 out of 10 job offers will be digital (21.57%).

Demand for digital professionals and the total number of professionals (last quarter)



Demand all sectors
2019-2021



Note: Demand is annualised based on data for one quarter of the year 2021.

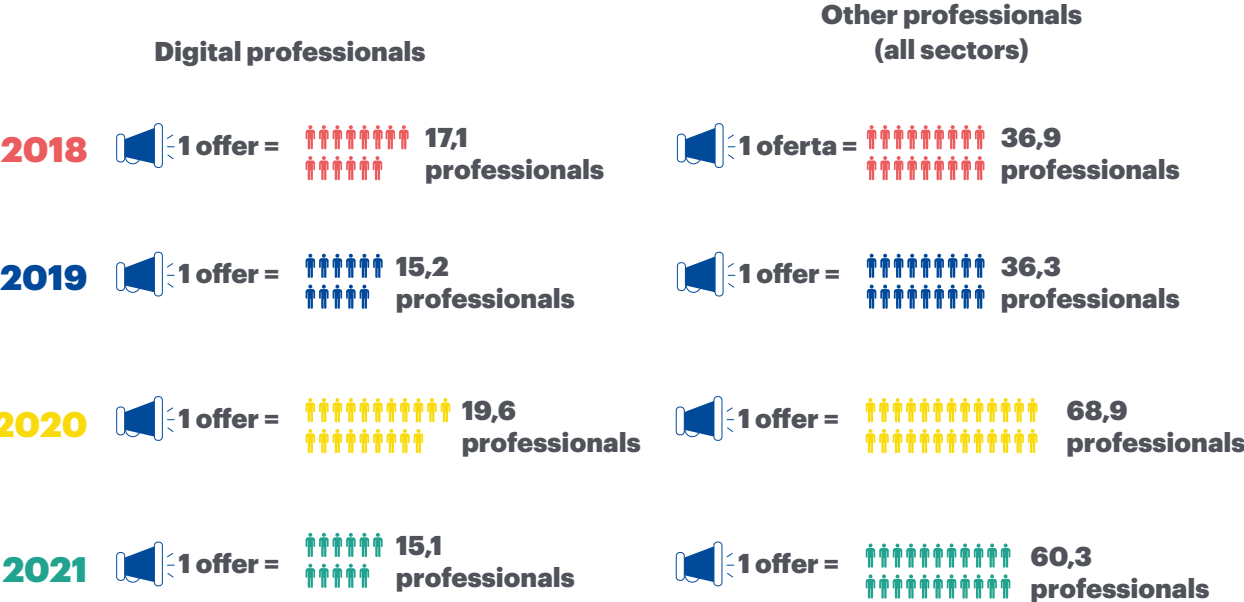
Source: TalentUp.io

Increased tension between supply and demand of digital talent. In 2021, the number of professionals available for each job dropped from 19.6 in 2020 to 15.2 in 2021.

The job market tension for digital professions (15.2) is four times higher than for the job market as a whole (60.3).

Market tension

2018-2021



Note: The 'Number of digital professionals per job offer' is calculated based on quarterly demand (dividing annual demand by four).

Source: TalentUp.io



Supply and demand of talent of well-established technologies

In Barcelona's digital ecosystem, the web developer profile continues to be the most common, accounting for 37.7% of digital professionals. It is followed by UX/UI designers (22.2%) and CRM+ERP consultants (9%).

The most significant increase in the supply of professionals is in the area of Agile/Scrum developers with 21%. However, significant increases were also recorded in profiles specialising in web development (18.3%), cybersecurity (13.8%) and app developers (13.5%).

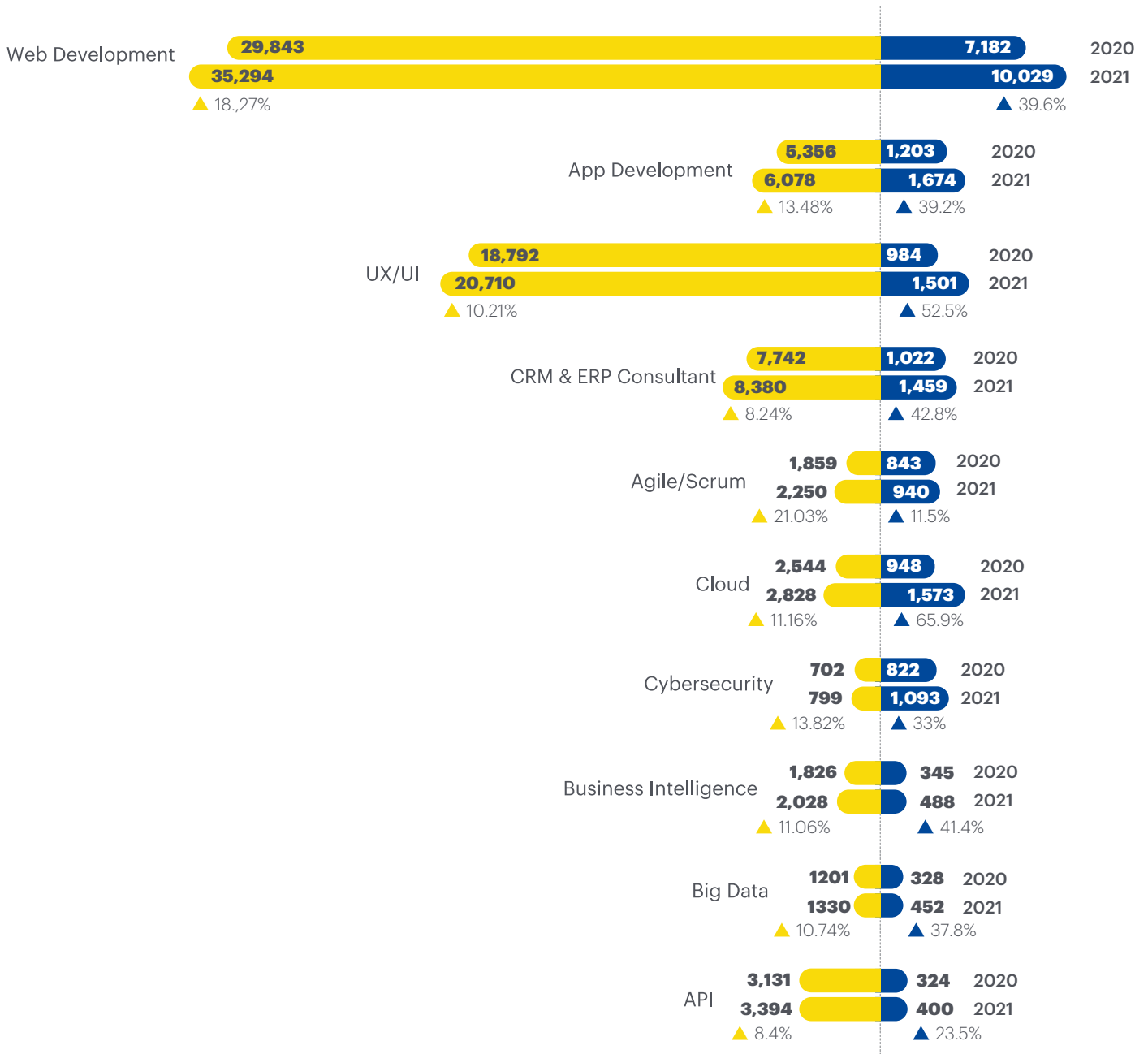
Certain specialisations are higher in demand for profiles than in the previous year. The increases in demand for digital professionals are in the areas of cloud developer (65.9%), UX/UI developer (52.5%) and CRM+ERP Consultant (42.8%). Overall, there has been a significant increase in all specialities.

Among the ten most popular digital profiles, those that find it most difficult to access talent due to their scarcity, are cybersecurity (2.92 professionals per quarterly offer), cloud (7.19) and agile/scrum (9.57).

Talent supply and demand for well-established technologies

2020-2021

Supply ▲ Increased supply Annual demand ▲ Increased demand



Note: Demand is annualised based on data from one quarter of 2021; the supply is the sum of digital professionals at the end of 2021.

Number of digital professionals available for each job offer

2020-2021

2020 2021

Web Development

2020 = 16.62
2021 = 14.08

App Development

2020 = 17.81
2021 = 14.52

UX/UI

2020 = 76.39
2021 = 55.19

CRM & ERP Consultant

2020 = 30.30
2021 = 22.97

Agile/Scrum

2020 = 8.82
2021 = 9.57

Cloud

2020 = 10.73
2021 = 7.19

Cybersecurity

2020 = 3.42
2021 = 2.92

Business Intelligence

2020 = 21.17
2021 = 16.62

Big Data

2020 = 14.65
2021 = 11.77

API

2020 = 38.65
2021 = 33.94

Note: The ratios are calculated based on quarterly demand (annual demand divided by 4).

Source: TalentUp.io



“With the digitisation of the water sector to meet the growing climate challenges, we increasingly require digital profiles to develop solutions that contribute to optimal resource management. The digital profiles most in demand recently are: software developers and architects, systems engineers, product owners, data engineers and machine learning engineers.

The current technological boom means that the shortage of these profiles makes it difficult for us to access them. The main difficulty in recruitment is the flexibility of work demanded by the e-profiles which, thanks to the ambitious hybrid telework model we have implemented, we can mitigate. We are also working on adapting development and retention plans to the needs of these profiles, as well as on a junior programme that helps us attract this talent from the ground up”.

Laura Masa Vidal

Director of People and Organisation of the Solutions and Technologies area at Agbar

Among the most in-demand professions in the top 10 most popular fields of knowledge in the digital sector, only web developers, UX/UI user experience designers and Big Data scientists remain at the top of the list compared to 2020. In the remaining specialisations, priorities are changing, resulting from the dynamism and constant evolution of the technology sector.

Most popular positions for well-established technologies

2021



1

2

3

Web Developers	Software Developer	Frontend Developer	Java Developer
App Developers	Android Developer	iOS Developer	Mobile Developer
UX/UI	User Experience Designer	Visual Designer	Ui/Ux Designer
CRM + ERP Consultant	.Net Developer	Sap Developer	Salesforce Developer
Agile/Scrum	Scrum Master	Software Engineer	Software Developer
Cloud (AWS)	Cloud Architect	Software Engineer	Devops Engineer
Cybersecurity	Security Consultant	Security Engineer	Security Analyst
Business Intelligence	Business Development Manager	Bi Consultant	Bi Developer
Big Data	Data Scientist	Data Analyst	Data Engineer
API	Developer	Software Developer	Backend Developer

Supply and demand of talent from emerging technologies

The demand for specialist profiles in emerging technologies increased by 53.9% in 2021, while the volume of professionals has grown well below this rate (22.6%). As a result, market tension has increased. Overall, there are 6.86 professionals in these specialities for every job offer, compared to 9.89 in 2020.

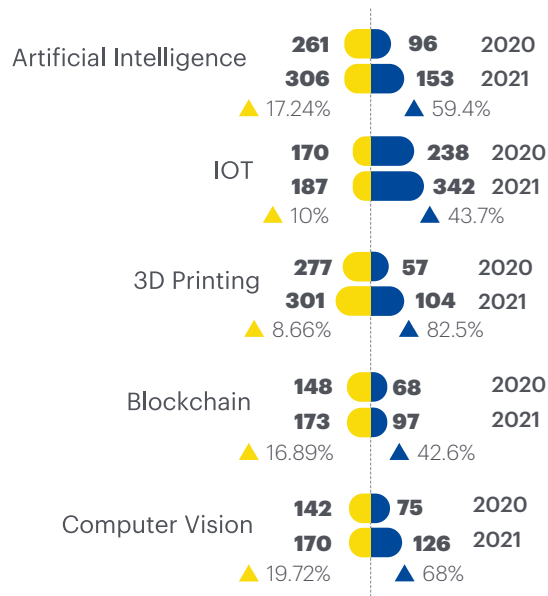
The tension is more evident in some profiles: while in the area of 3D Printing, there is an average of 11.58 digital professionals per job offer, in the area of the Internet of Things (IoT), there are only 2.19 digital professionals.

The highest increases in demand are for specialists in 3D printing (82.5%) and computer vision (68%). On the other hand, the supply of specialised profiles that has grown the most is in the areas of computer vision (19.72%), artificial intelligence (17.24%) and blockchain (16.9%).

Talent supply and demand for emerging technologies

2020-2021

Supply ▲ Increased supply Annual demand ▲ Increased demand



Note: Demand is annualised based on data from one quarter of 2021; the supply is the sum of digital professionals at the end of 2021.

Source: TalentUp.io

Number of professionals available for each job offer

2020-2021

2020 2021

Artificial Intelligence

2020 = 10.87
2021 = 8

Internet of things

2020 = 2.86
2021 = 2.19

3D Printing

2020 = 19.44
2021 = 11.58

Blockchain

2020 = 8.71
2021 = 7.13

Computer Vision

2020 = 7.57
2021 = 5.4

Nota: Las ratios se calculan en base a la demanda trimestral (demanda anual dividida entre 4).

Source: TalentUp.io

The most in-demand specialities for emerging technologies incorporate new profiles compared to previous years.

Most popular positions for established technologies

2021



1

2

3

Artificial Intelligence	Artificial Vision Engineer	AI Analyst	AI Engineer
IOT	Director of Engineering	VP of Engineering	IOT Analyst
3D Printing	3D Printing Support Engineer	3D Printing Product Engineering	3D Printing Customer Assurance
Blockchain	Blockchain Developer	Blockchain Software Engineer	Blockchain Architect
Computer Vision	Computer Vision Engineer	Computer Vision Scientist	Computer Architecture Engineer

Source: Job Market Insights

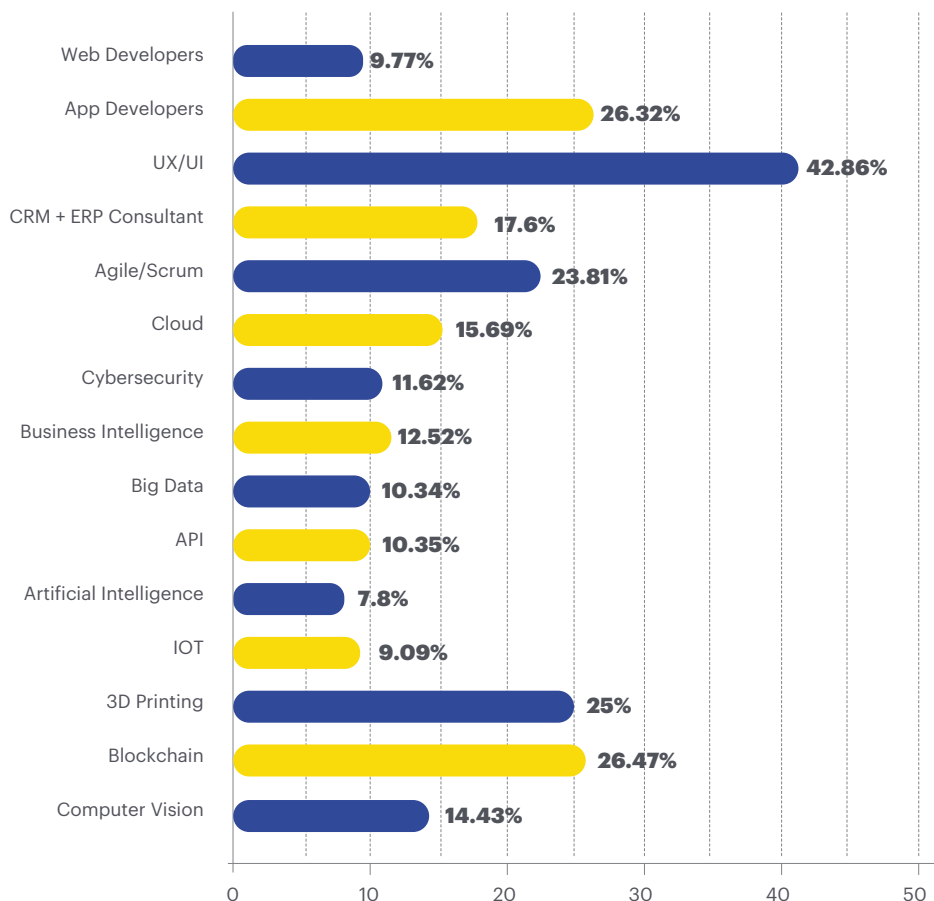
Remote job offers in Barcelona

14% of job offers for digital professionals in Barcelona have the condition of being able to work remotely.

UX/UI offers are the ones that show the most teleworking options (43%), with a great difference concerning the rest of the specialities. UX/UI design is followed by jobs for blockchain development (26% of remote offers) and application developers (26%). The digital professionals with the fewest telecommuting options in the job offer itself are those specialising in Artificial Intelligence (8%), IOT (9%) and web developers (10%).

Remote job offers Barcelona (%)

2021



Source: TalentUp.io

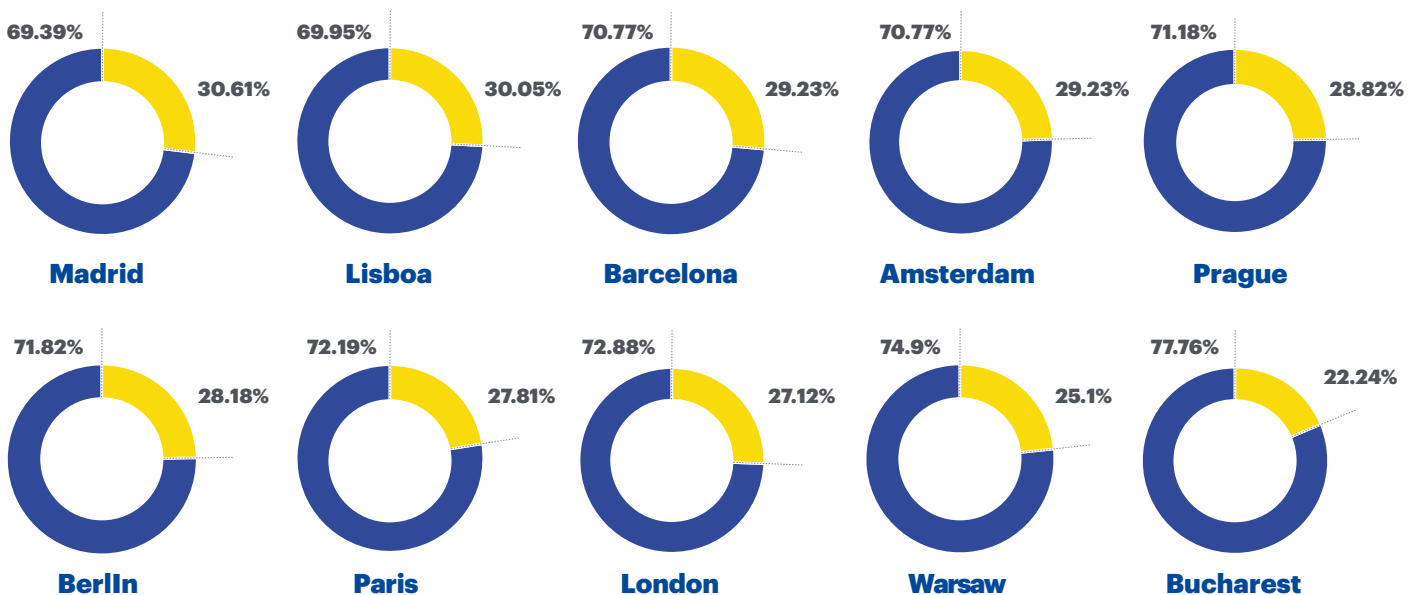
Barcelona is one of the cities with the most women in the digital sector

Barcelona has 29.23% of female workers in the digital sector, a figure very close to the third of active digital professionals in the city and higher than the average of the ten cities analysed.

Madrid (30.61%) and Barcelona (29.23%) stand out for having the highest percentages of women in the digital sector of all the European cities studied. Lisbon (30.05%) and Amsterdam (29.23%) also follow this trend, above the average of the cities analysed. Bucharest (22.24%) ranks as the European city with the lowest proportion of women as digital professionals in the sector.

Women in the sector by city (%)

2021



Source: TalentUp.io

Barcelona reaches parity in the digital sector in the speciality of UX/UI design (50.68%)

Cities such as London, Paris, Amsterdam, Berlin or Bucharest still have not reached parity in any digital specialisation.

Barcelona has yet to reduce the gender gap in other specific positions such as Cloud, Cybersecurity or Blockchain, where the recruitment of women in the sector has a lower incidence.

Percentage of women in the sector by city and by well-established technology

2021

	Barcelona	Londres	Madrid	Paris	Amsterdam
Web Developers	25.49	25.09	27.71	21.64	22.35
App Developers	22.16	21.93	26.16	21.89	18.41
UX/UI	50.68	37.74	50.65	47.18	32.40
CRM + ERP Consultant	25.95	30.25	20.77	20.55	22.52
Agile/Scrum	31.56	36.95	37.36	28.81	36.51
Cloud	17.63	22.08	19.27	21.41	19.40
Cybersecurity	16.51	18.26	29.17	23.18	28.11
Business Intelligence	31.11	28.56	41.65	20.12	21.93
Big Data	31.49	29.71	33.05	33.36	34.81
API	28.11	28.09	29.05	27.25	25.76
Artificial Intelligence	29.91	22.77	10.91	16.66	12.77
IOT	24.48	27.71	27.67	18.37	30.22
3D printing	40.52	37.82	42.16	40.20	34.61
Blockchain	10.79	10.09	24.52	33.47	13.37
Computer vision	29.76	20.39	17.32	18.54	28.86

Source: TalentUp.io

Percentage of women in the sector by city and by well-established technology

2021

	Lisboa	Warsaw	Prague	Berlin	Bucharest
Web Developers	25.99	19.54	23.27	22.60	19.80
App Developers	18.93	22.36	16.39	32.44	11.01
UX/UI	28.59	40.44	32.67	44.46	25.89
CRM + ERP Consultant	17.90	16.02	16.26	24.51	15.48
Agile/Scrum	21.34	35.57	42.10	37.15	23.70
Cloud	16.55	18.75	22.02	12.80	9.25
Cybersecurity	9.57	50.36	37.35	16.65	25.47
Business Intelligence	36.73	13.76	50.73	28.68	15.62
Big Data	26.40	42.54	25.50	31.09	22.61
API	15.54	16.23	14.36	15.95	15.69
Artificial Intelligence	25.21	27.81	31.16	28.67	10.30
IOT	25.98	28.78	20.58	25.30	16.85
3D printing	48.46	40.29	33.30	36.11	25.84
Blockchain	22.86	29.52	14.45	21.76	11.85
Computer vision	16.50	16.13	37.20	22.09	34.22

Half of the new digital talent generated comes from outside Catalonia

The attraction of international talent in Barcelona is reactivating, improving quotas from previous years. Professionals from other economies now account for 31.4% of digital talent.

Barcelona attracted more than 4,700 people in the digital sector in 2021. This figure exceeds the number of digital professionals in Barcelona who came from other cities before the pandemic.

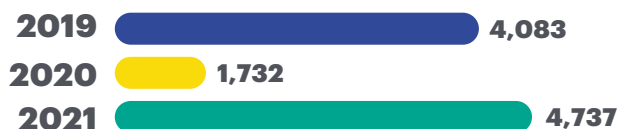
The final stage of the pandemic has significantly reactivated the incorporation of professionals from other cities into the digital sector in Barcelona. The number of digital professionals from other cities has increased from 1,732 in 2020 to 4,083 in

2021, which is 2.35 times more than the previous year and exceeds the levels of 2019.

Cybersecurity profiles (40.55%) and application developers (40.31%) are the ones that attract the most talent from other cities, following the pattern of the previous year.

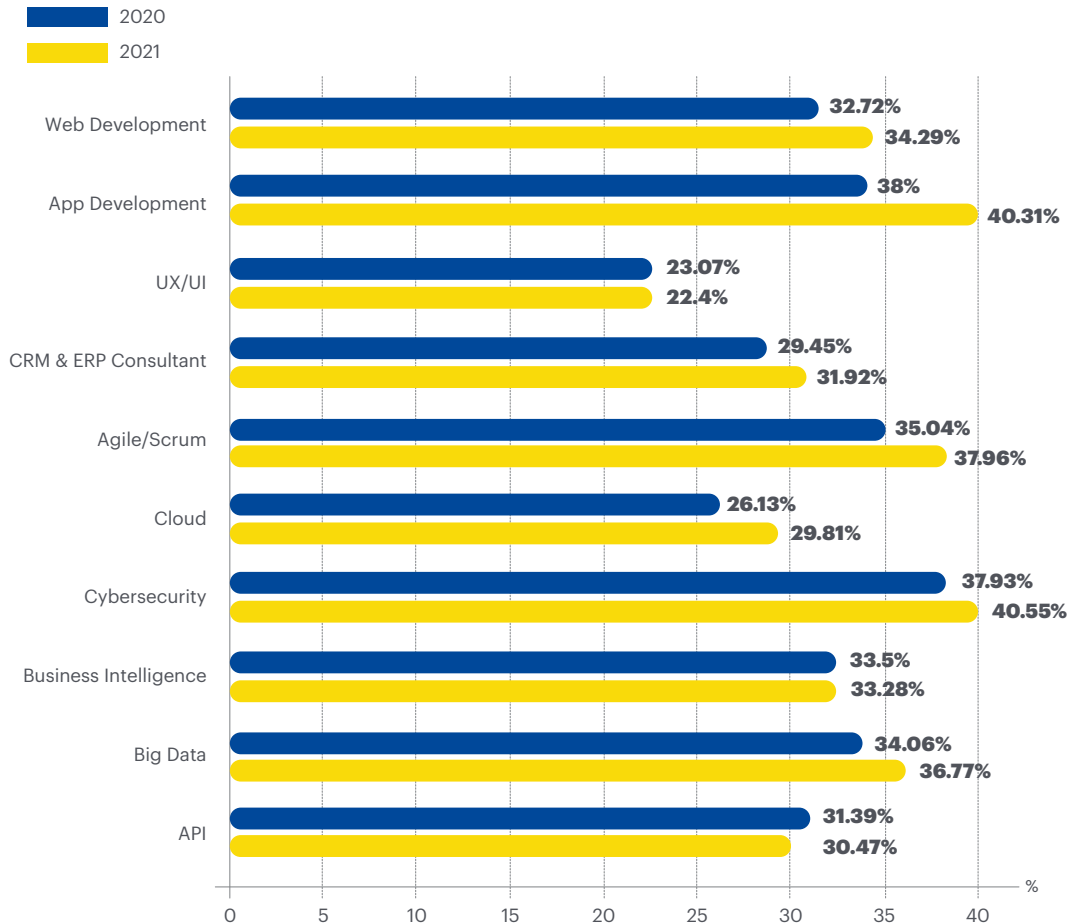
Attracting new digital professionals from other cities to Barcelona

2021



Specialities that attract more digital talent from other cities (%)

2021



Source: TalentUp.io



“In this highly competitive labour market, we have a collective responsibility to work together to position Barcelona as a decision-making hub, capable of generating purposeful employment that adds value and allows us to attract and retain local and international talent.

Diversity of culture, background, gender and experience is the engine of innovation. As companies, we have the great opportunity to reflect, through our internal culture, the spirit of the city itself: diverse, cosmopolitan and multicultural, incentives for the internationalisation of Barcelona's digital talent.”

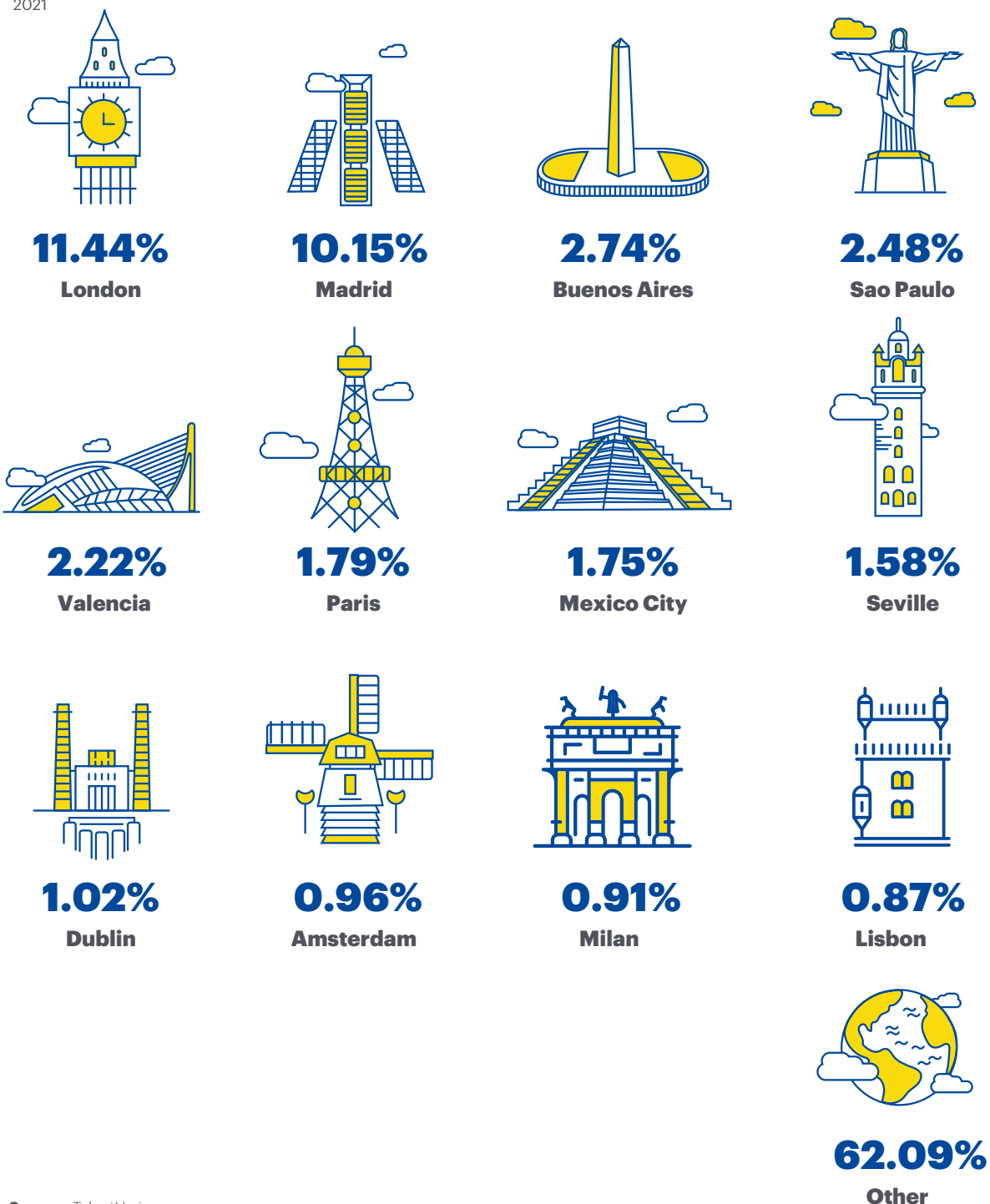
Guillem Vila Palau

Director of Technology Centres at Ocado Technology

London (11.44%) and Madrid (10.15%) are the cities that export the most talent to Barcelona. More profiles from London are specialised in CRM and ERP consultancy, and web developers and UX/UI designers from Madrid.

Migration to Barcelona

2021



Source: TalentUp.io

Migration to Barcelona by well-established technologies and by city

2021

	London	Madrid	Paris	Warsaw	Valencia	Caracas
Web Developers	5.3	15.4	3.1	1.1	3.1	1.4
App Developers	13.4	12.4	0.1	3.1	0.2	0
UX/UI	12.3	16.3	0.1	0.1	0.1	0.1
CRM + ERP Consultant	30.2	12.3	0.2	0.2	5.6	0.2
Agile/Scrum	13.1	5.7	4.2	0.1	0.2	0.2
Cloud (AWS)	12.4	3.7	0.1	0	8.3	0.1
Cybersecurity	9.3	4.6	5.4	0	0.1	0
Business Intelligence	4.5	12.1	0.3	0	0.2	2.5
Big Data	3.7	11.5	0.3	0.2	4.3	2.8
API	10.2	7.5	4.1	3.4	0.1	0.2

	Dublin	México City	Sao Paulo	Buenos Aires	Amsterdam	Seville	Other
Web Developers	0.1	1.7	1.6	3.6	0	0.1	63.5
App Developers	0.2	0.2	3.2	3.3	3	1.8	59.1
UX/UI	0.1	0.2	3.5	6.5	0.1	5.8	54.8
CRM + ERP Consultant	0	4.8	4.2	0.2	0.2	3.7	38.2
Agile/Scrum	2.6	0.2	6.6	10.1	2.8	4.4	49.8
Cloud (AWS)	3.9	3	0	0	3.5	0	65
Cybersecurity	0.1	0.1	5.4	3.5	0	0	71.5
Business Intelligence	0	7.1	0.1	0	0	0	73.2
Big Data	3.1	0	0.2	0	0	0	73.9
API	0.1	0.2	0	0.2	0	0	74

Source: TalentUp.io

Diversity of profiles business-to-business that recruit the most digital talent

The 3 companies that recruit the most profiles per specific position in the sector are of a different nature and sector; we find corporations from traditional sectors, technology companies, startups, digital service centres (hubs), consultancies and technology service providers.

Some companies such as Glovo, Accenture, HP, Zurich, Adevinta, and Capgemini are consolidating their position compared to the previous year as the companies with the highest demand for digital profiles in the sector.

Companies that more digital talent demanded in Barcelona

2021

	Empresa	Sector
1	Glovo	Logistics 
2	Inetum	Technology 
3	Capgemini Engineering	Consultancy 
4	NTT Data	Consultancy 
5	Zurich	Insurance 
6	Seidor	Consultancy 
7	Adevinta	Advertising 
8	Hewlett Packard (HP)	Technology 
9	Accenture	Consultancy 
10	T-Systems	Consultancy 

Source: Job Market Insights

Top recruiters 2021

2021



1

2

3

Web Developers	Capgemini Engineering	Zurich	Sogeti (Capgemini)
App Developers	Capgemini Engineering	Zurich	ManoMano
UX/UI	NTT Data	IBM	eDreams Odigeo
CRM + ERP Consultant	Glovo	Sogeti (Capgemini)	Avanade
Agile/Scrum	Mano Mano	Capgemini Engineering	Allianz
Cloud (AWS)	Webhelp	T-Systems	Tech Data
Cybersecurity	EY	Ibermatica	Capgemini Engineering
Business Intelligence	Glovo	Chiesi España	Hewlett Packard (HP)
Big Data	Glovo	ADEVINTA	Criteo
API	N26 Bank	BCNC Group	Media Markt
Artificial Intelligence	Amazon	T-Systems	Chiesi España
IOT	Glovo	Giesecke & Devrient	T-Systems
3D Printing	Hewlett Packard (HP)	Idneo Technologies	Webhelp
Blockchain	GFT Technologies	Fundació i2cat	Eurecat
Computer Vision	Barcelona Supercomputing Center (BSC)	Aizon	Eurecat

Source: TalentUp.io

Evolution of ICT studies in the university

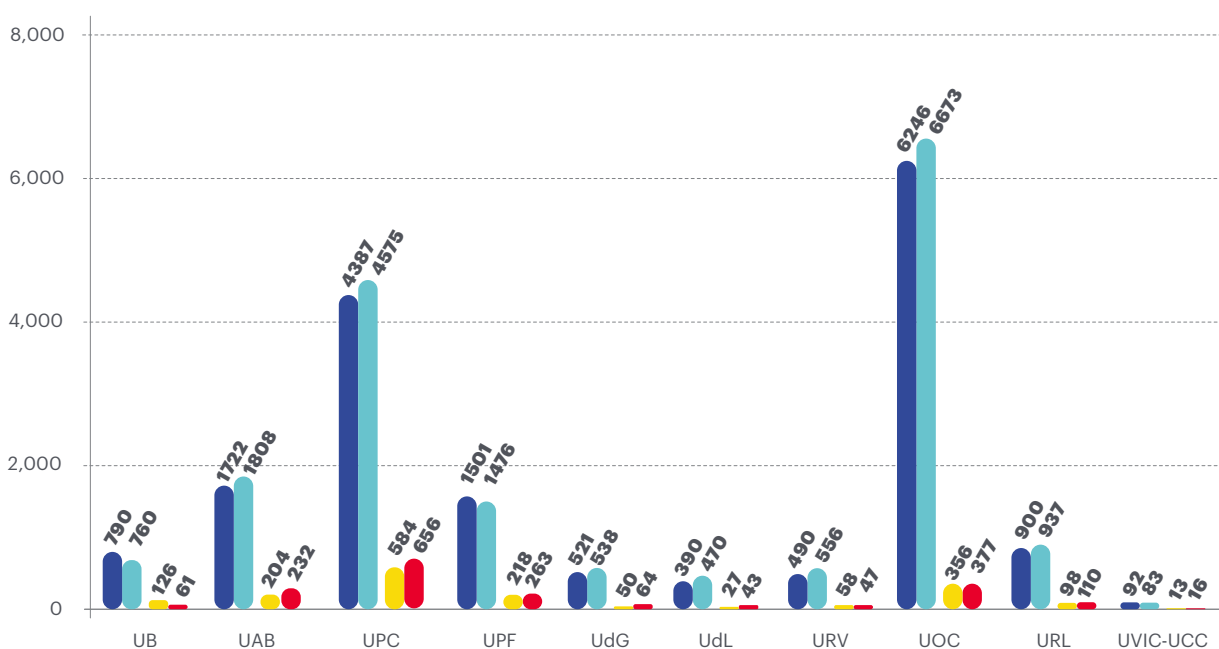
The demand for ICT degrees is on an upward trend each academic year. In 2020-2021 the number of students enrolled increased by 4.91% compared to the previous academic year, with a total of 17,876 students.

Public universities are centres of reference for the training of digital talent. They cover 57% of students enrolled in ICT degrees in the 2020-2021 academic year, with the Universitat Politècnica de Catalunya (UPC) standing out for its broad educational capacity in the ICT field. The Universitat Oberta de Catalunya (UOC) stands out as the private sector's training centre with the greatest training capacity.

Catalan universities generated 1,869 graduates in ICT degrees in the 2020-2021 academic year. The number of graduates increased by 7.79% compared to the 2019-2020 academic year.

Students enrolled and graduates in official ICT degrees in Catalonia

2021

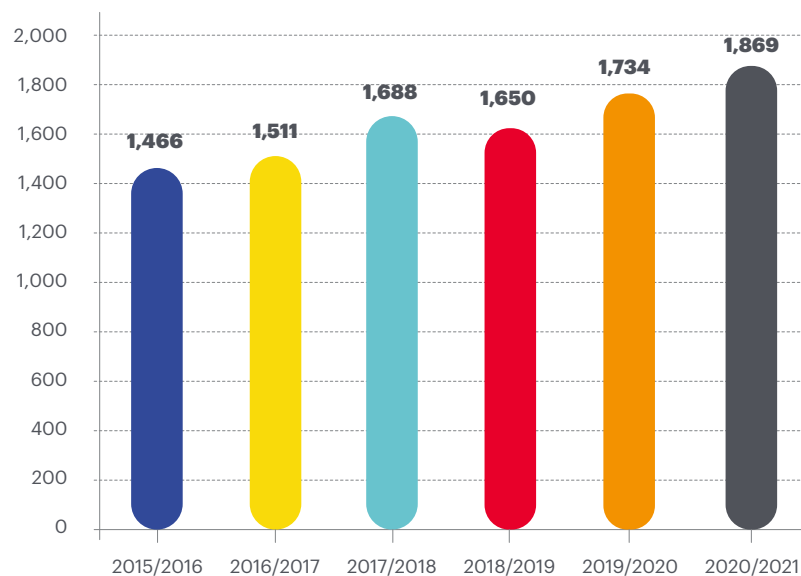


Source: Department of Universities and Research, Department of Enterprise and Knowledge of the Government of Catalonia

***It includes the following ICT degree courses:** Bioinformatics, Data Science and Engineering and Physics, Applied Sports and Fitness Science and Technology, Telecommunications Science and Technology, Interactive Digital Content, Digital Design and Creative Technologies, Video Game Design and Development, Video Game Design and Production, Data Engineering, Audiovisual Systems Engineering, Telecommunications Systems Engineering, Electronic Systems Engineering, Telecommunications Systems and Services Engineering, ICT Systems Engineering, Telecommunication Technologies and Services Engineering, Telecommunication Technologies and Services Engineering and Physics, Telecommunication Technologies and Services Engineering and Computer Science, Telecommunication Networks Engineering, Telecommunication Electronics Engineering, Geoinformation and Geomatics Engineering, Computer Science Engineering, Information and Communication Technologies Organisation Engineering, ICT Organisation Engineering, Audiovisual Systems Engineering, Industrial Technologies Engineering and Computer Science, Computer Engineering, Computer Engineering - Mathematics, Management and Information Systems Computer Engineering, Computer Engineering and Business Administration, Computer Engineering and Biotechnology, Computer Engineering and Telecommunication Systems Engineering, Computer Engineering and Physics, Multimedia Engineering, Telematics Engineering, Photography and Digital Creation, Computer Science and Services, Audiovisual Media, Multimedia, Applications and Video Games, Software Application Techniques, Web and Mobile Application Development Techniques, Digital Interaction and Computing Techniques, Telecommunication Technologies

Graduates in ICT degrees

2021



Upskilling from university master's degrees

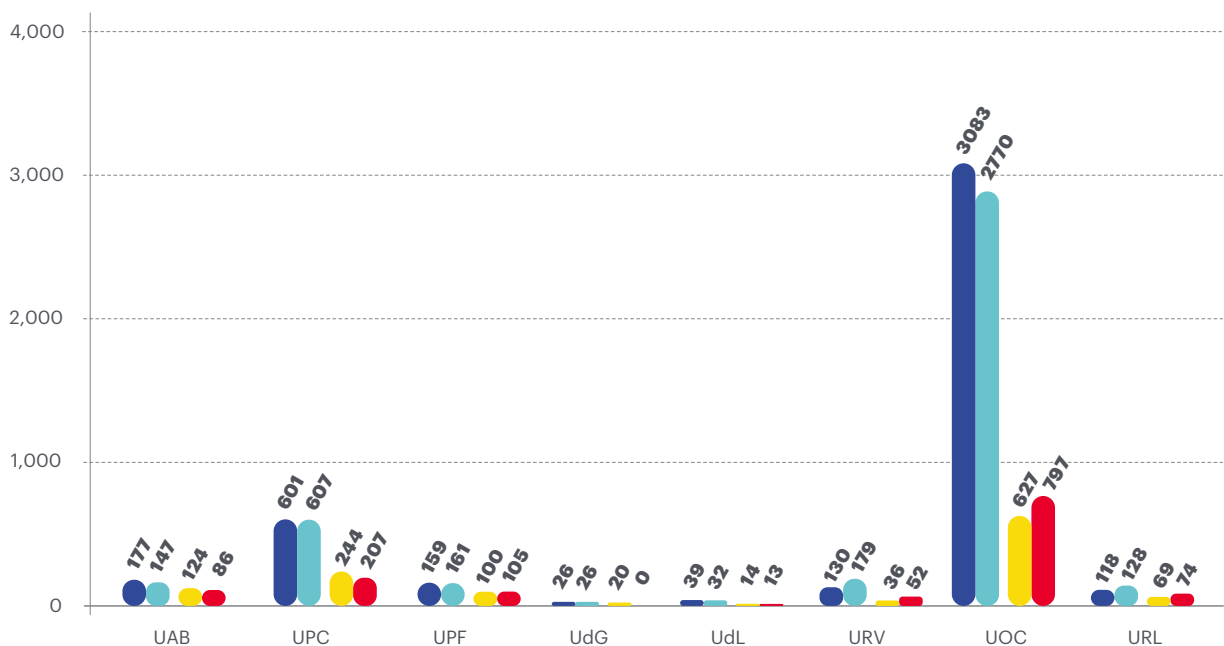
An 8.1% increase in the number of ICT master' degree graduates in the 2020-2021 academic year compared to the previous year. Catalonia generated 1,334 specialised graduates.

Enrolment in ICT master's degrees decreases by -6.53% concerning the 2019-2020 academic year but remains stable concerning the 2018-2019 academic year.

The UPC is the public university that generates the most enrolments and graduates. In the private sector, the UOC also leads this type of training.

Students enrolled and graduates in official ICT master's degrees in Catalonia

2021



Source: Department of Universities and Research, Department of Enterprise and Knowledge of the Government of Catalonia

***It includes the following ICT degree courses:** [UAB] Bioinformatics; Telecommunication Engineering; Computer Vision; Remote Sensing and Geographic Information Systems; Geoinformation; Internet of Things for Digital Health; [UPC] Automatics and Robotics; Computer Engineering; Innovation and Research in Computer Science; Artificial Intelligence; Telecommunication Engineering; Applications and Management of Telecommunication Engineering; Advanced Telecommunication Technologies; Cybersecurity; Neuroengineering and Rehabilitation; [UPF] Bioinformatics for Health Sciences; Cognitive Systems and Interactive Media; Interactive Intelligent Systems; Sound and Music Technologies; Computational Biomedical Engineering; [UdG] Computer Engineering; Erasmus Mundus in Medical Imaging and Applications; [UdL] Computer Engineering; [URV] Computational and Mathematical Engineering; Computer Security Engineering and Artificial Intelligence; [UOC] Information and Communication Technology Security; Multimedia Applications; Computer Engineering; Telecommunication Engineering; Bioinformatics and Biostatistics; Mobile Application Development; Web Application and Site Development; Digital Health; User Experience and Interaction Design; Video Game Design and Programming; Cybersecurity and Privacy; [URL] User Experience and Interaction Design; Cybersecurity and Privacy; [URL] Information and Communication Technology Management; Telecommunication Engineering; High Performance Web Programming; Big Data Engineering



“Profiles with skills in newly created fields such as data science or virtual reality are increasingly in demand.

At EAE Business School Barcelona, we integrate these trends into our programmes, aware that they correspond to global demand, especially in a city like Barcelona, an established hub of innovation and digital talent in Europe.”

Aroa Corvillo

Chief Marketing Officer of EAE Business School Barcelona

The great capacity of Catalan universities to train digital talent is reflected in their figures. Almost 6,000 places in ICT degrees were offered in the 2020-2021 academic year, 84.3% of which were filled. The average coverage rate is higher in public universities (97.7%), where places are almost filled.

Cohort data for ICT degrees show how demanding these studies are. The graduation rates for the 2017-2018 graduating class (expected to graduate in 2020-2021) show that: 20% of those enrolled graduate in 4 years, 20% of those enrolled graduate one year later, 23.5% leave the university system, 19.5% continue studying, and 16.6% decide to change degree.

Access rate to university studies (ICT)

2020-2021

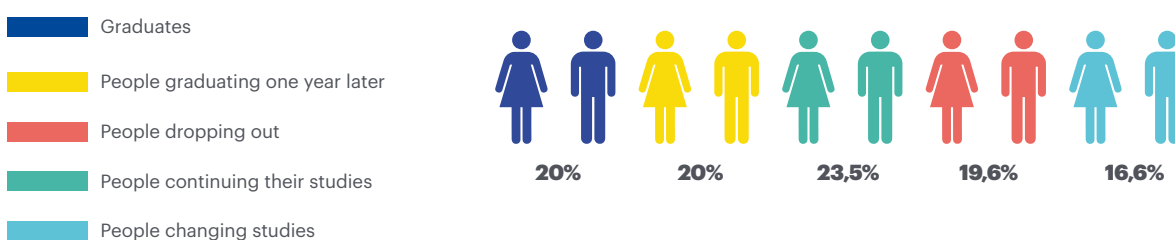
	Places offered	Demand 1st preference - June	New access	% Coverage Places (new access/places)
Public	2,695	3,186	2,634	97.70%
Private	350	nd	243	69.40%
Total Face-to-Face Univ,	3,045	3,186	2,877	94,50%
Non-Face-to-Face	2,800	nd	2,050	73.20%
Total Non-Face-to-Face Univ,	2,800	nd	2,050	73,20%
Total Catalan University System	5,845	3,186	4,927	84,30%

(*) Only available for public universities. Demand from private or non-face-to-face universities is not available at the time of the study

Cohort analysis degrees (ICT)

Análisis de cohorte grados (TIC)

If 10 persons were enrolled in the academic year 2017 - 2018, in the academic year 2020 - 2021:



Source: Department of Universities and Research, Department of Enterprise and Knowledge of the Government of Catalonia



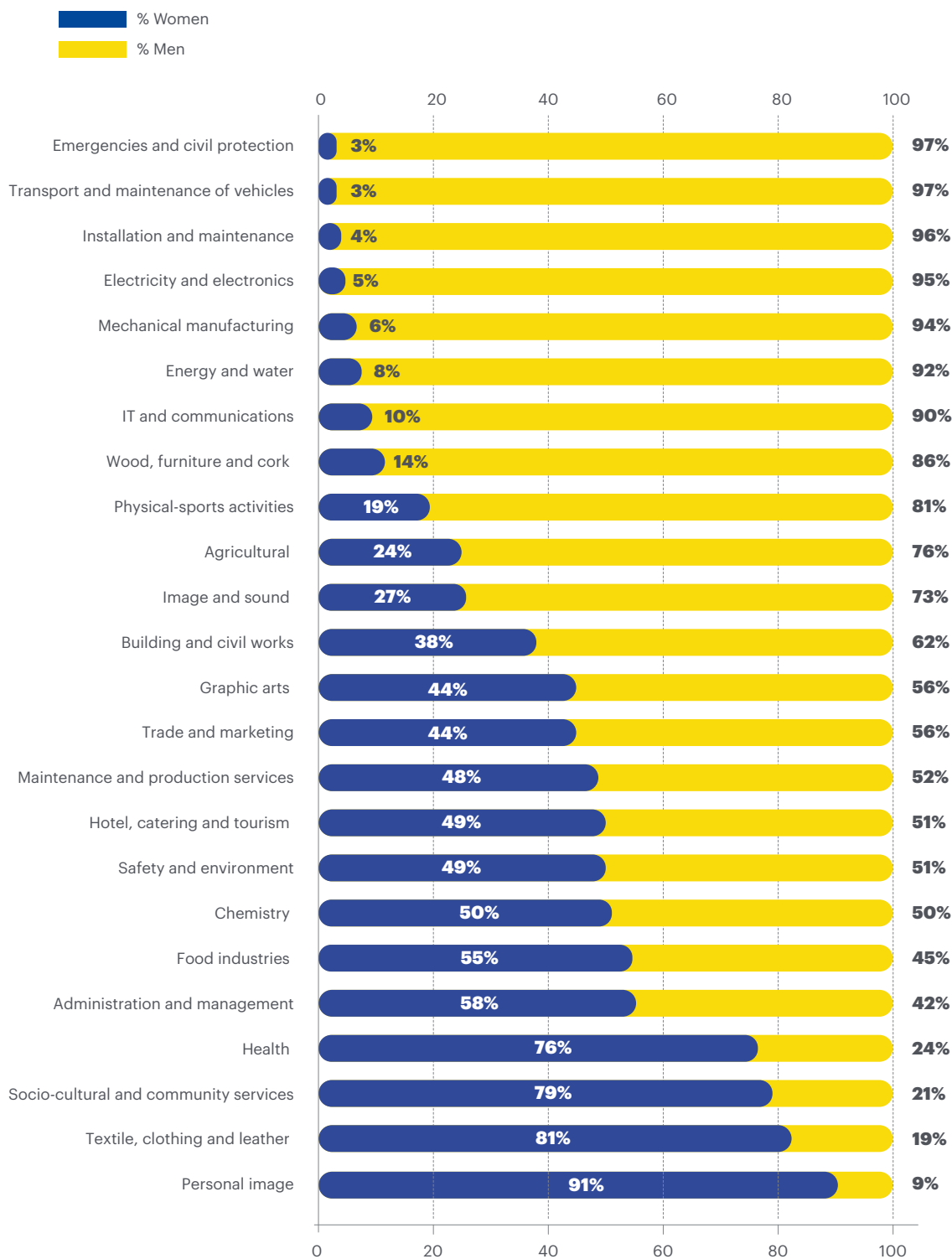
ICT studies in Vocational Education and Training (VET)

The gender gap in vocational studies in information and communication technology has decreased. Although the percentage of women is still low (10%), the increase of women in the classroom is slowly progressing. The enrolment of women in technological vocational training will increase by 23.49% in the 2020-2021 academic year compared to the previous year, with a total of 1,367 women.

Barcelona continues to expand the ICT training capacity in VET. In the academic year 2020-2021, the number of places offered in the Computer and Communications family has increased by 13.33% (13,654 places).

VET enrolment by professional families. Barcelona Metropolitan Area

2020-2021

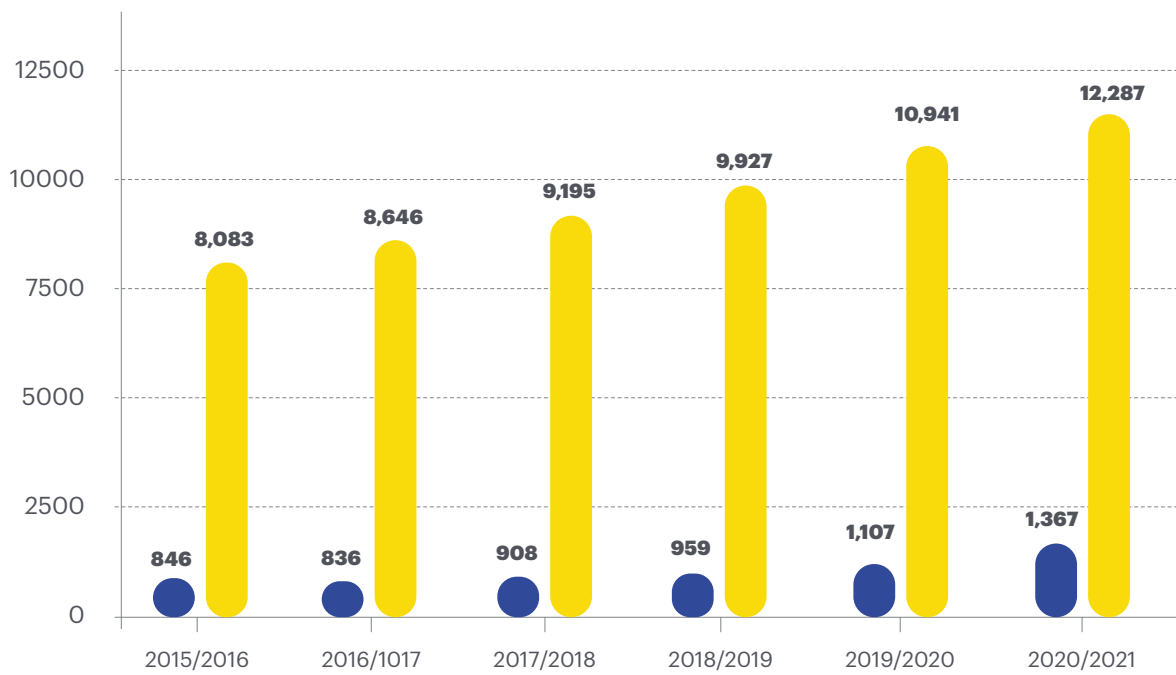


Source: Data compiled by Fundació BCN Formació Professional based on data from the Department of Education of the Government of Catalonia.

Enrolment VET in Computer Science and Communications. Barcelona Metropolitan Area

2020-2021

Women
Men



Source: Data compiled by Fundació BCN Formació Professional based on data from the Department of Education of the Government of Catalonia

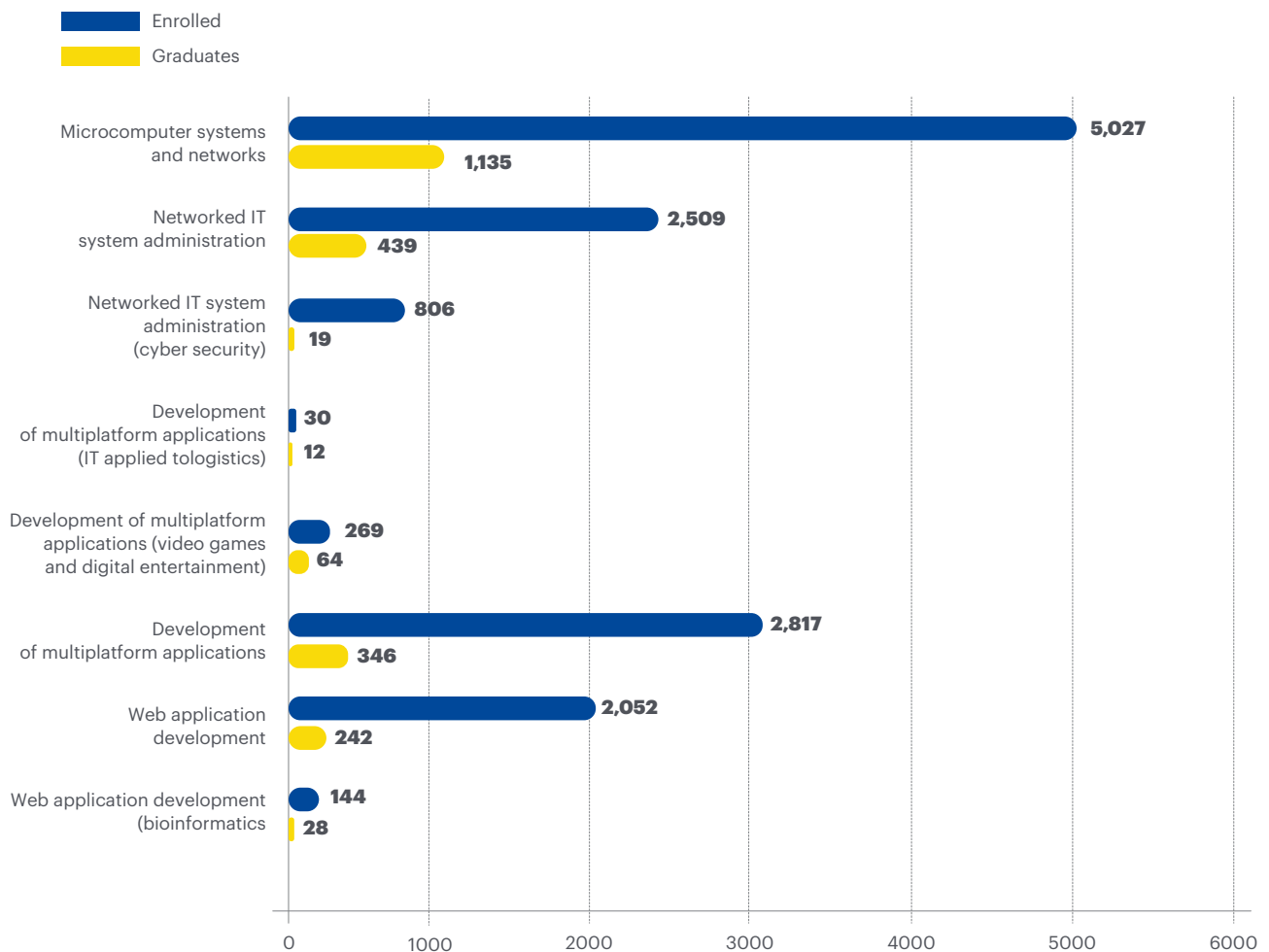
Specialised vocational education and training in ICT generated 2,285 graduates in the 2020-2021 academic year, of which approximately half specialised in Microcomputer Systems and Networks.

Specialisations such as multi-platform application development and bioinformatics have a smaller number of places and thus a much smaller number of graduates than other courses.

Vocational education and training specialised in ICT generated 2,285 graduates, less than the 2,700 achieved in 2020.

Enrolled students and graduates VET Professional family “Computing and Communications”. Barcelona Metropolitan Area

2020-2021



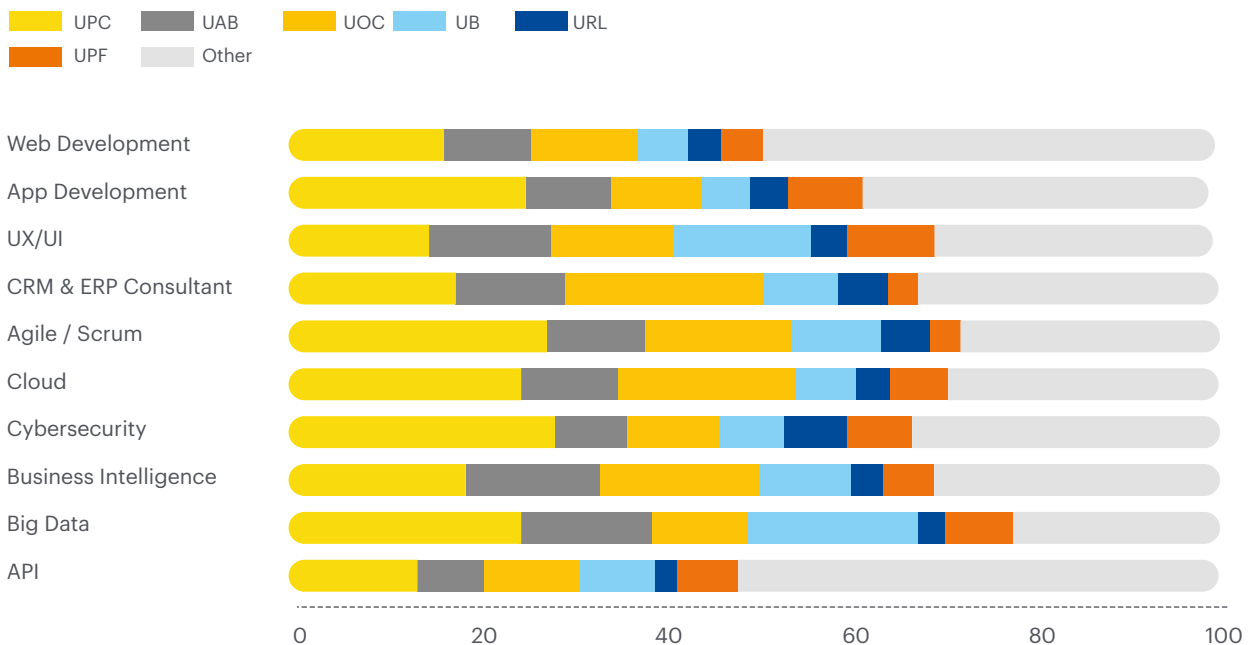
Centres where digital talent has been trained in Barcelona

The UPC is a leader in training in well-established and emerging technologies. Universities are the centres with the greatest training capacity.

Bootcamps specialising in digital skills, such as Ironhack, Nuclio Digital School, ISDI Coders and other training centres such as Assembler Institute of Technology also stand out, as trainers of today's digital talent in specific specialities such as web development, application development and UX/UI design.

Training centres in well-established technologies

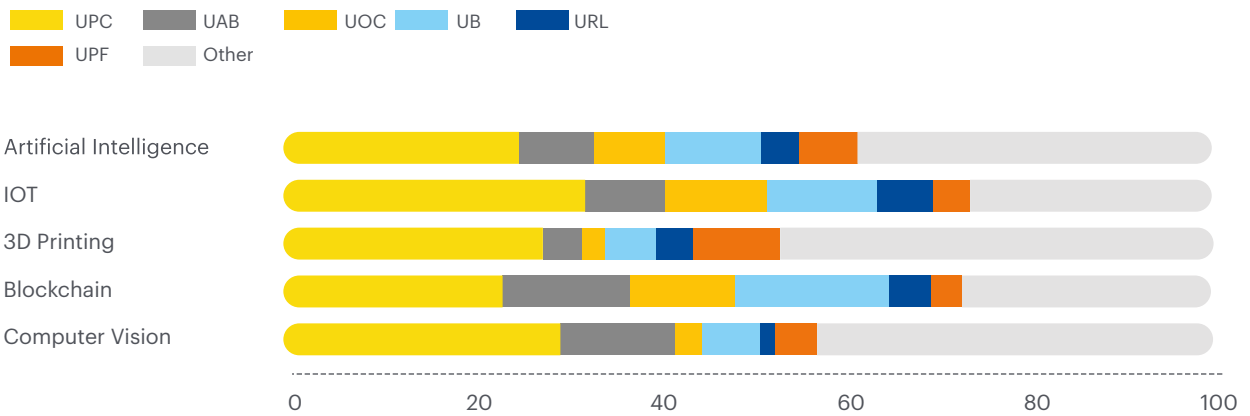
2021



Source: TalentUp.io

Training centres in emerging technologies

2021



Source: TalentUp.io

Barcelona offers competitive salaries in relation to other European cities

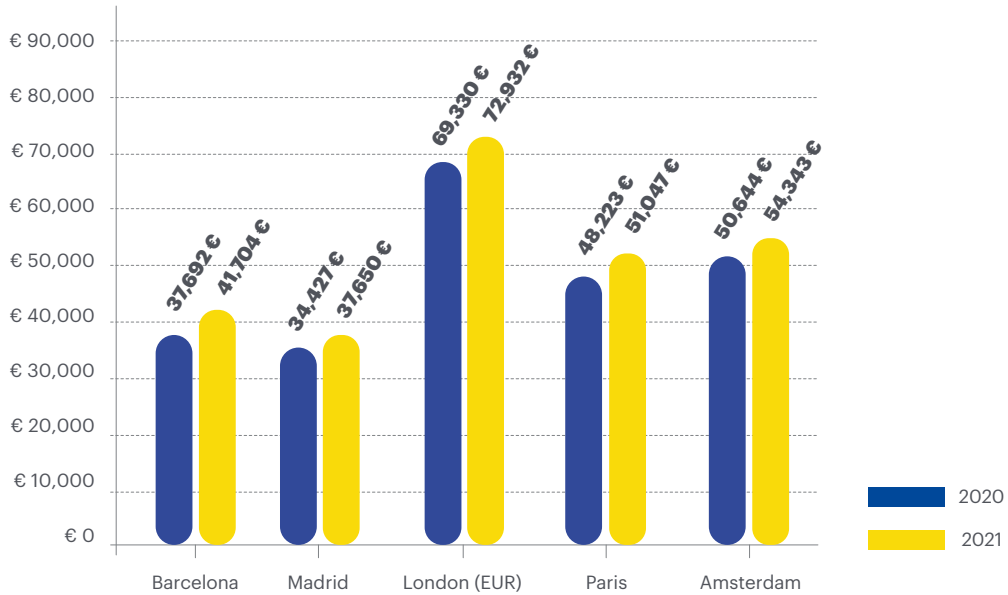
The normalisation of salaries considering the cost of living and the average rent price in each city reveals that salaries in Barcelona are much more competitive than they may appear in absolute numbers.

Barcelona has similar salaries to other European cities of reference, such as London, surpassing the figures for Madrid, Paris, Amsterdam, Lisbon and Bucharest, after adjusting for the cost of living. Berlin is well above the average for European digital professionals' salaries.

While user interface design (UX/UI) tends to be the lowest-paid (average €36,200 per year in the cities surveyed), jobs with technologies such as Cloud and Cybersecurity are the best paid (average €50,306 and €48,453 per year in the cities surveyed).

Digital professional salaries by city

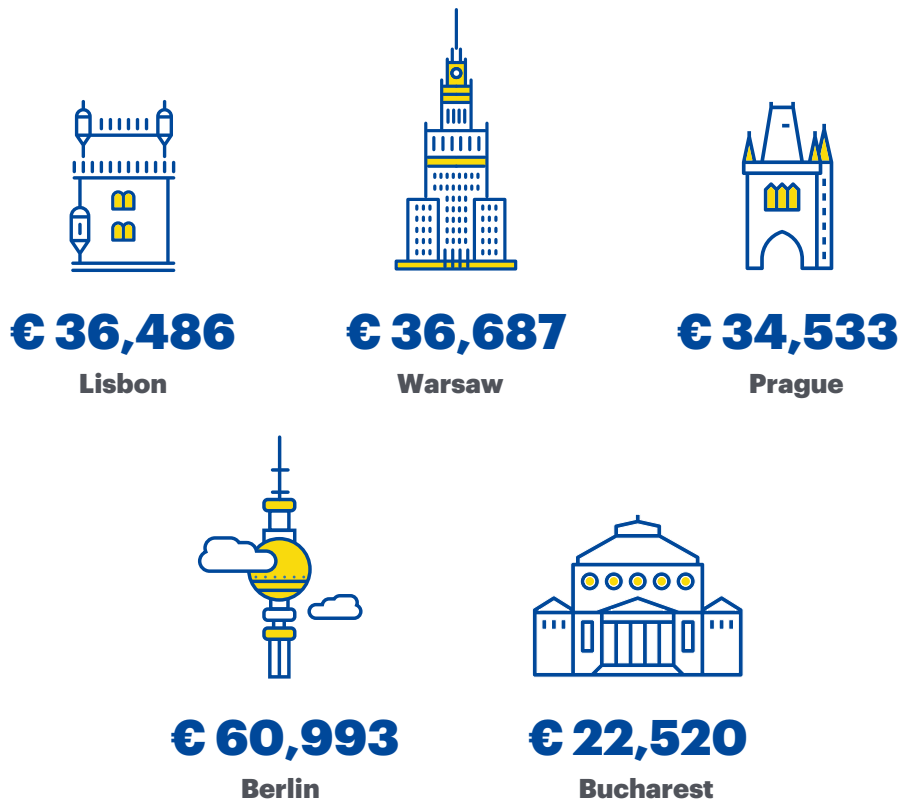
2020-2021



Source: TalentUp.io

Digital Professional Salaries by City

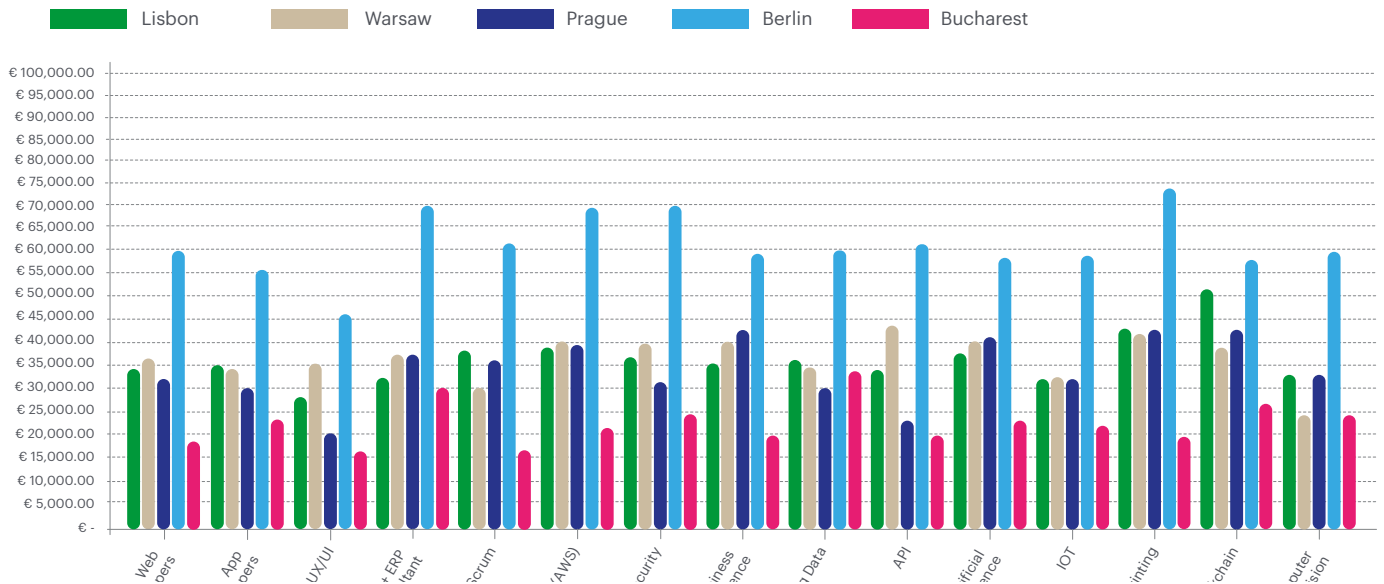
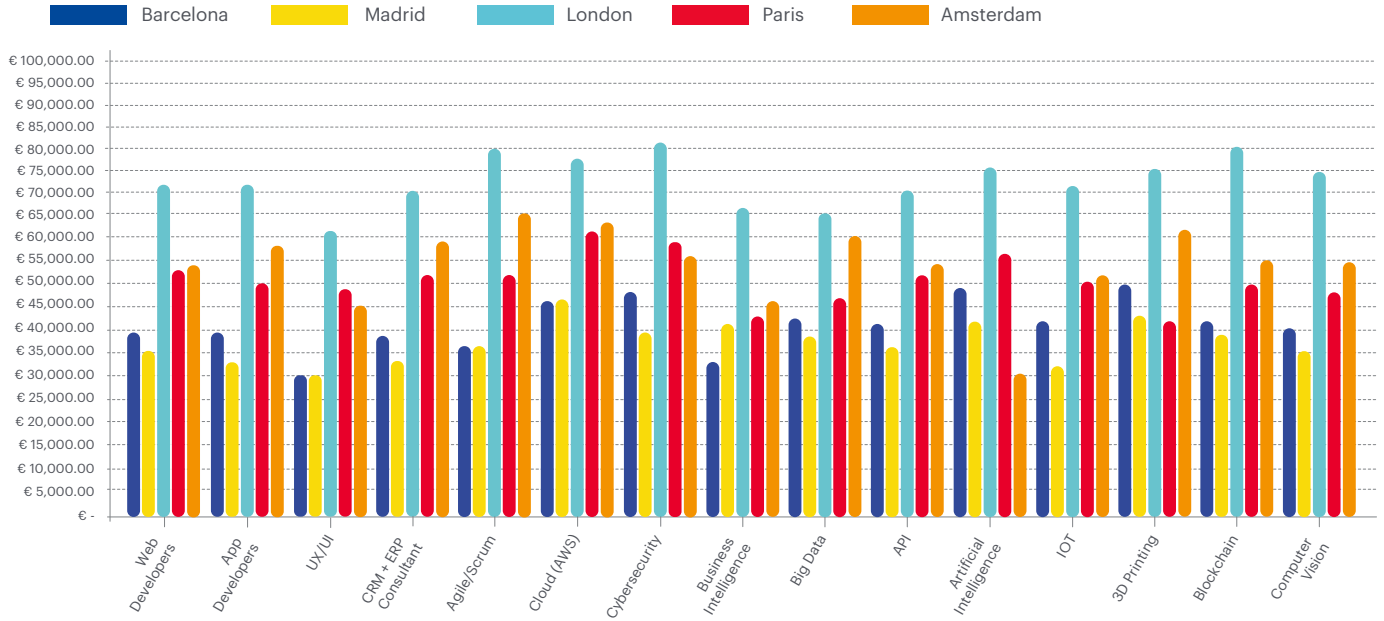
2021



Source: TalentUp.io

Salaries by city by speciality

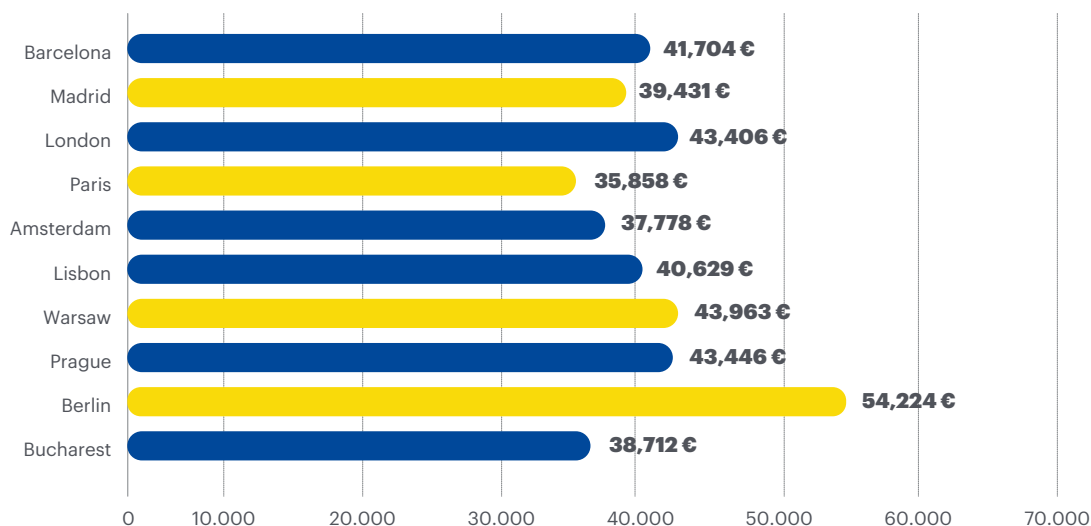
2021



Source: TalentUp.io

Average standardised salaries by cost of living

2021



Source: TalentUp.io

Cost of living* vs cost of living + rent

2021

	Barcelona	Madrid	London	Paris	Amsterdam	Lisbon
Cost of living + rent	48.94%	46.73%	82.23%	69.67%	70.4%	43.95%

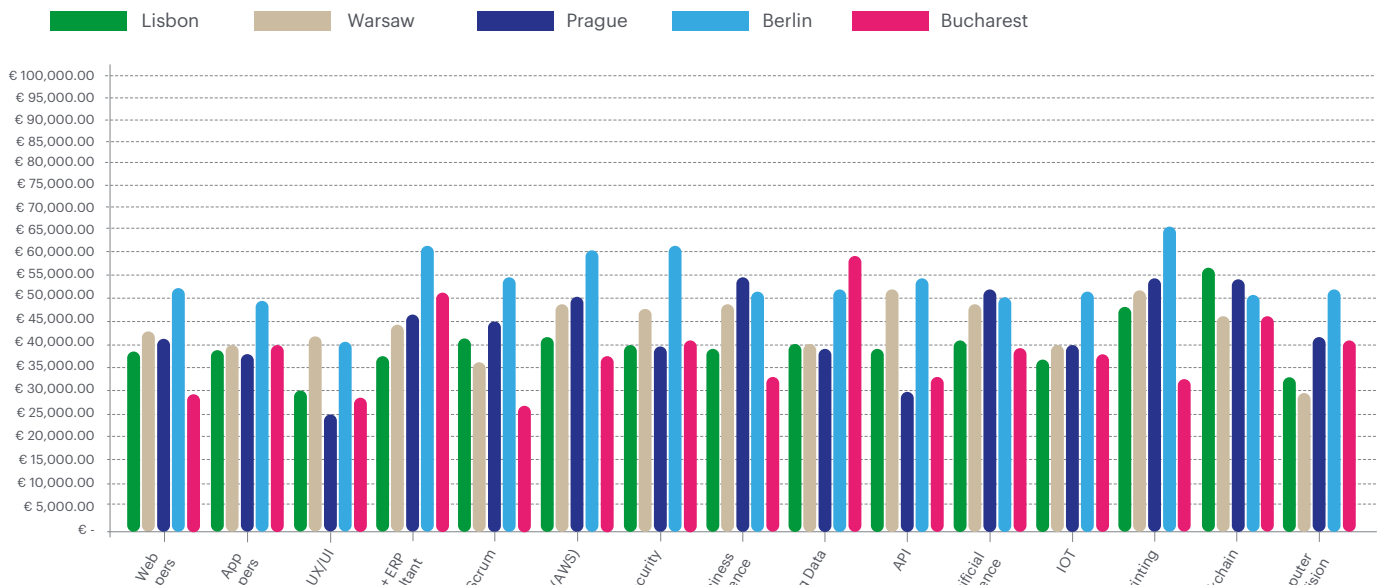
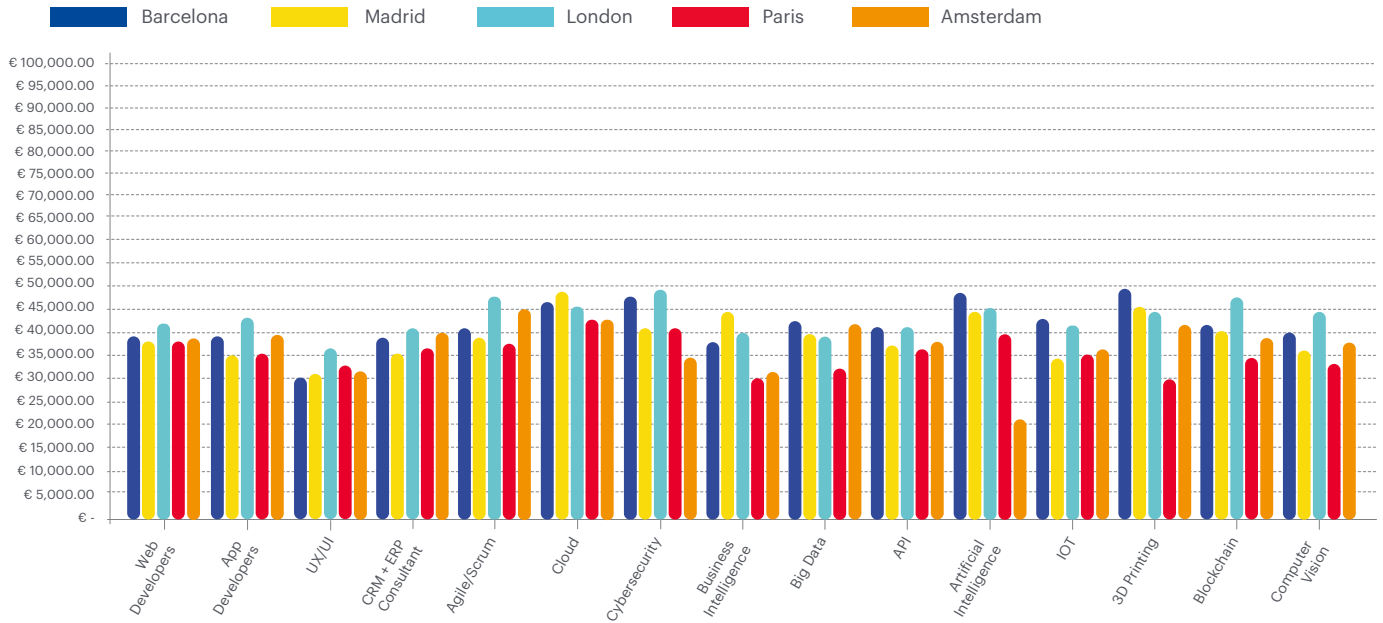
	Warsaw	Prague	Berlin	Bucharest	NYC
Cost of living + rent	40.84%	38.9%	55.05%	28.47%	100%

*Note: e.g. for the Madrid standard salary: $\text{Salary}_{\text{Madrid}} \times \text{cost_of_living_bcn} / \text{cost_of_living_madrid}$. All salaries

Source: Numbeo

Average standardised salaries by cost of living and rent

2021







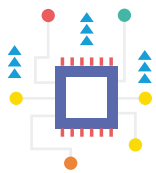
4

Fighting the digital talent divide

Priority axes for action

Based on the results and main conclusions drawn in the Digital Talent Overview 2022, below is a proposal for recommendations and lines of action to generate and attract more and better talent to the Barcelona ecosystem:

1 **Generate more digital talent through the promotion of STEAM vocations, the proactive attraction of international talent and reskilling policies**



- Promoting **STEAM skills and, in particular, technology skills** at an early age is a lever to accelerate enrolments in careers, cycles and other technology training formats. The **Next Generation funds**, with their earmarked budget, should become a multiplier for promoting vocations. It should be noted that most developers start writing code before finishing secondary school.
- **Reskilling** is the most effective measure to increase the volume of digital talent in the short term. Intensive bootcamp training programmes have proven to be successful in generating employability. However, the main challenge lies in **raising awareness** among the adult population of the opportunity to reorient their careers towards digital professions. To a large extent, the impact achieved by reskilling policies will be subject to implementing **communication and career guidance** actions.

Beyond the established reskilling training such as software and app development, UX/UI or big data, **Low-Code** technologies can become a quick entry point to programming for professionals from other fields. Analysts such as Gartner foresee that Low-Code developer (**citizen developer**) will outnumber the professional developer in the coming years. To this end, **training initiatives in Low-Code skills must be promoted** and the business fabric must be accompanied when adopting this new paradigm in software development.

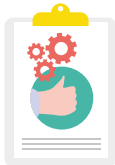
Reskilling initiatives must target **new audiences** beyond the groups that usually demand this type of training. **Students who drop out of technological engineering studies**, which in Catalonia account for 40% of those enrolled in the first year, would be an example of a target group.

Another target group likely to participate in training initiatives of this type are **people at risk of social exclusion**. In this sense, initiatives such as **Barcelona Inclusive Coding**, aimed at training 10,000 people at risk of social exclusion in digital skills, should contribute to generating employability and raising awareness of the opportunities that the digital sector can generate for these groups.

- Policies to **attract international talent** are essential to compete in a globalised talent market. Barcelona already has more than 31% of digital professionals from other economies. In addition, the Spanish economy has launched a visa for digital nomads. However, this is not enough to close the digital talent gap. One of the recurring recommendations for strengthening the positioning of the global hub in terms of talent is to have a **technological visa** in the way of those implanted in economies such as Portugal and France. It is also advisable to expand on the international promotion actions **of Barcelona's digital ecosystem** and to **build the loyalty of the international talent** already present in the city.

2

Tackling the gender gap in the digital professions



Despite slight improvement in the data, the gender gap remains one of the main challenges facing the digital sector. The promotion of **STEAM vocations in primary and secondary education** and the approach of **Role Models** to inspire girls at an early age are some of the most recurrent prescriptions, although they are still only half-heartedly implemented in our education system. In addition, there is a lack of **greater coordination between STEAM for girls initiatives** promoted by public administrations and private companies. Initiating **initiatives in partnership** between different actors (education departments, local administrations, schools, companies, digital professionals, business associations, etc.) is key to maximising the impact of the efforts made.

3 Democratising access to digital talent in companies and territories that have historically had difficulties in attracting technological profiles



SMEs, excluding technology, are the business segment with the lowest density of digital professionals. In an environment of wage inflation in the sector, digital profiles are even more inaccessible to these companies. In this regard, support initiatives are **suggested for recruitment of digital professionals by SMEs** and digital **reskilling** programmes for their own employees.

Regarding the territorial divide, our report highlights that Barcelona accounts for 95% of the digital talent in Catalonia. In a scenario where teleworking in the digital sector is commonplace, there is an opportunity to **stimulate the distribution of technology talent in less densely populated areas**. Initiatives such as Catalunya Rural Hub, aimed at enabling digital professionals in Barcelona to experience teleworking in rural areas, are an example of measures that can be deployed along these lines.

4 Improving the skills of digital talent and aligning them to market needs



Although the UPC continues to be the best polytechnic in Spain, most of the universities in Barcelona are still far from the top positions in the rankings analysed. Improving the **transfer of technology to the market and aligning training courses with the skills demanded by employers** are some of the levers that would enable further progress in the excellence rates.

Likewise, public and private training strategies should focus on areas with the greatest talent shortage (such as Cybersecurity, Cloud or Agile/Scrum) and on technologies with the greatest projection, such as artificial intelligence or blockchain.

5

Optimising companies' ability to attract talent in an environment where there is a shortage of profiles



In an environment of high competition for talent and wage inflation, companies must rely on new strategies to optimise their ability to attract technology professionals. Beyond the salary, digital profiles weigh up the fact that companies **provide them with the learning processes** (especially through peers), **flexibility in working arrangements and schedules**, and a unique **employee experience**.

Full-time teleworking, which already accounts for 14% of vacancies in Barcelona, can also be an alternative when it comes to filling vacancies in profiles that are difficult to access, allowing recruitment in locations far from the Barcelona hub. Conversely, economies with higher salaries will be more able to hire experienced profiles in Barcelona remotely.

Staff on demand, a trend that is more deeply rooted in Anglo-Saxon countries, has also been consolidated as a tool to cover profile needs. At the same time, companies gain agility when temporarily supplying technical skills that are in short supply in their workforces.



Barcelona Digital Talent

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