Digital Talent Overview 2023

Analysing the state of digital talent

MOBILE WORLD CAPITAL™ BARCELONA

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About
Mobile World Capital Barcelona

Mobile World Capital Barcelona spearheads the digital development of society to improve the lives of people around the globe.

With public and private capital, MWCapital's activity revolves around four core areas: acceleration of innovation via digital entrepreneurship; transformation of the industry via digital technology; growth in digital talent among the new generations and professionals; and reflection on the impact of technology in our society. Together, our programmes successfully transform the economy, education and society.

MWCapital hosts MWC Barcelona and founded 4 Years From Now [4YFN], the business platform for the start-up community present at all MWC events worldwide.

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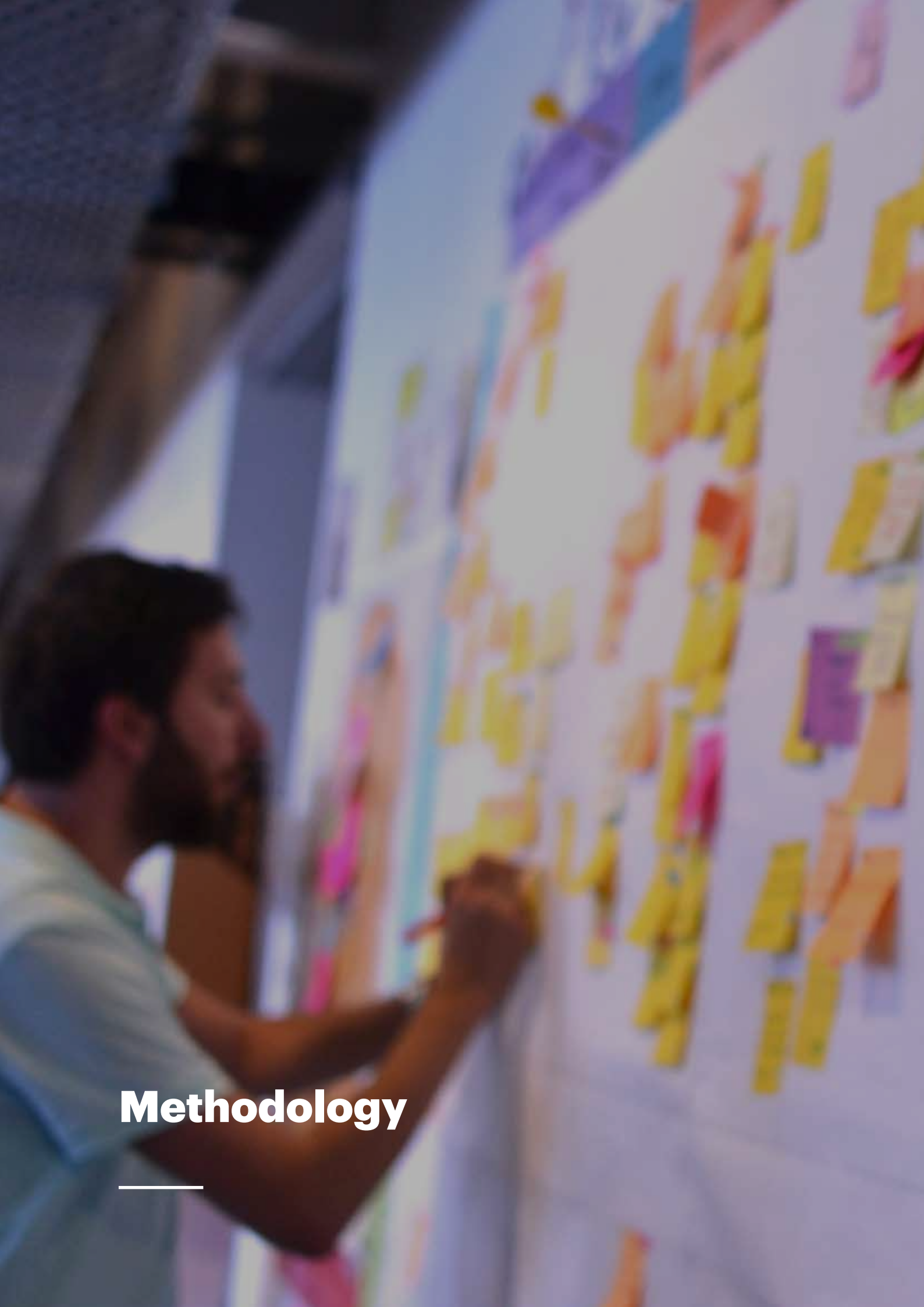


Methodology

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.

Executive Summary

Global digital talent trends

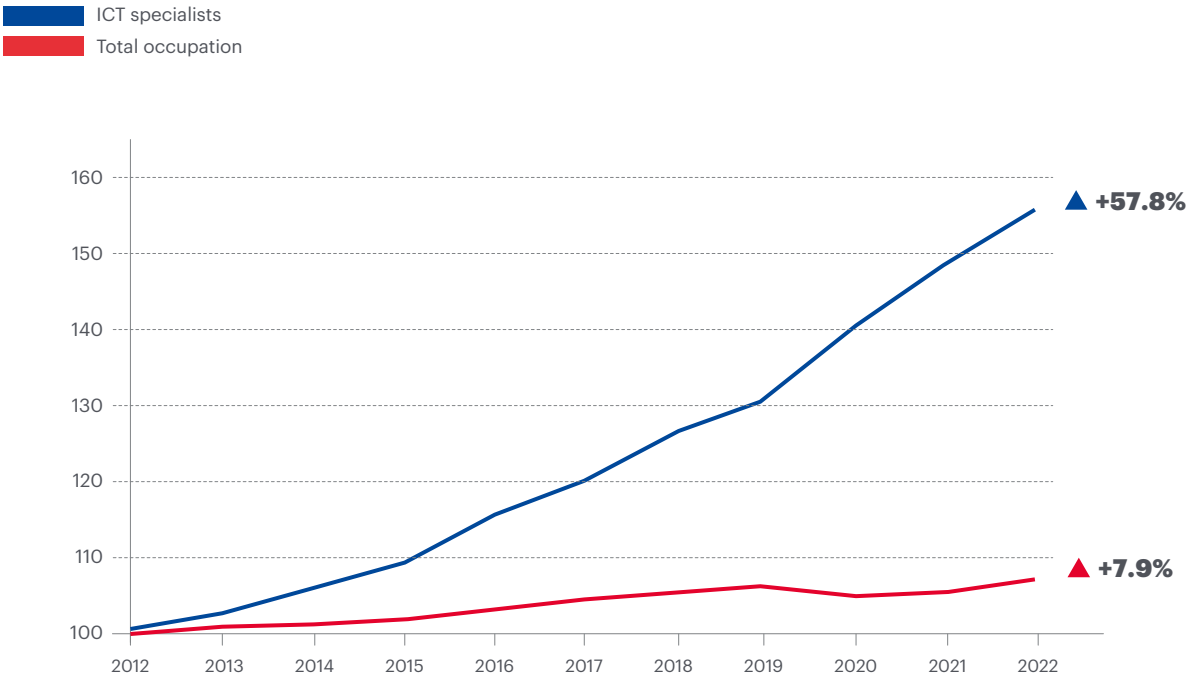
ICT employment in the European Union is growing 7 times faster than the overall employment rate

While overall employment in Europe has increased by 7.9 points in the last decade, ICT jobs have grown by 57.8% in the same period. This acceleration has led to 9.3 million ICT jobs (2022), representing 4.6% of European employment.

Germany has the highest number of ICT workers (2.1 million). Sweden (8.6%), Luxembourg (7.7%) and Finland (7.6%) are the economies with the most digital talent relative to their country's population.

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

2012-2022



***Note to the graph:** the index is based on 2012 values (2012 = 100)

The US continues to lead in ICT academic excellence rankings

Five of the world's top ten ICT universities are in the US, with MIT in Boston again topping the ranking. The UK, led by Oxford and Cambridge, dominates the European ranking, with five universities in the TOP 10. The Universitat Politècnica de Catalunya (UPC) is at the top in Spain.

Python is still the most popular programming language

In addition to Python, there is Javascript, used for web development, and Java. In recent years, the frameworks that have grown almost vertically have been React and Node.js, both oriented towards developing websites written in Javascript.

Amazon Web Services (AWS) is the most popular cloud platform among developers (51% use it), followed by Microsoft Azure (28.7%) and Google Cloud (26.8%).

The AI specialist profession will be the fastest growing, and analytical thinking will be the highest priority soft skill

Estimates for 2027 predict that AI and ML specialists, business intelligence analysts, information security analysts and fintech engineers will be the fastest-growing professions. Soft skills, analytical thinking, critical thinking, and leadership skills are priorities for the coming years.

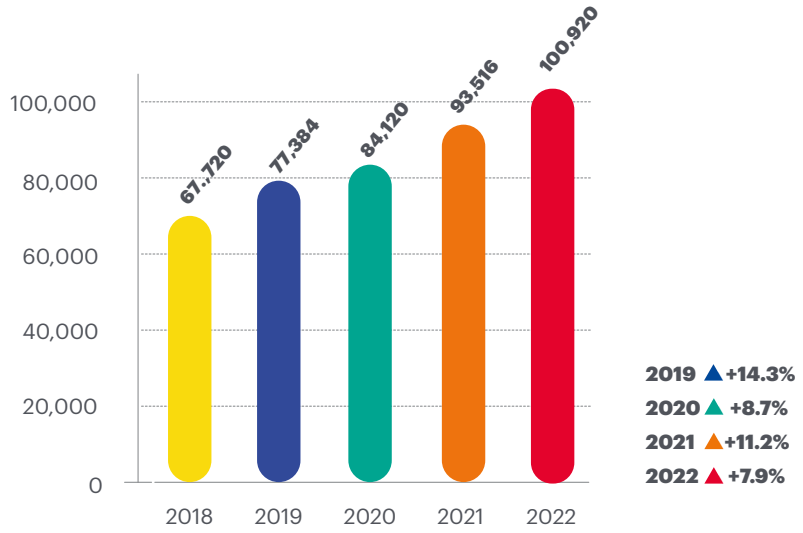
Digital Talent in Barcelona

In the period 2018-2022, Barcelona has generated 33,200 new ICT jobs (+49%)

After adding 7,404 digital professionals in the last year, Barcelona will reach 100,920 ICT jobs in 2022, a growth of 8% compared to 2021 and 49% compared to 2018. If the digital marketing specialist profile is considered, the current figure is 108,685 jobs.

Total digital professionals

2018-2022



Note: Data does not include digital marketers

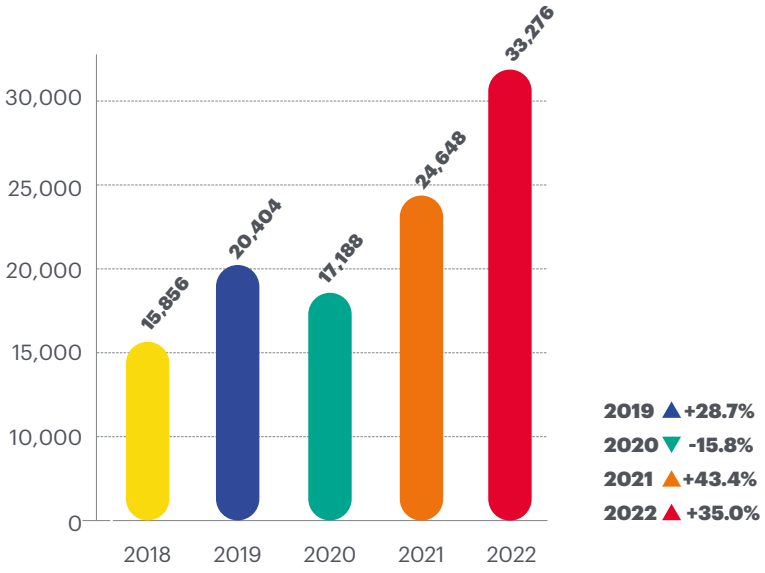
One in four job offers in Barcelona is now digital

In 2022, 32,276 digital job offers were published. This figure is double the demand for jobs in 2018 (15,856) and represents a 35% growth compared to 2021. While in 2018, one in ten job offers were digital (11%), by 2022, they will be one in four (26%).

Despite the good figures for talent generation and attraction, the acceleration in demand is increasing the shortage of ICT professionals. If in 2018, for every job offer, there were an average of 17 digital professionals. By professionals, the ratio dropped to 12 professionals. This figure contrasts with the labour market, where there would be an average of 60 professionals for every job offer.

Demand for digital professionals

2018 - 2022



Note: Demand is annualised based on data for one quarter of 2022. Digital professional data does not include digital marketers.

Web Development, App Development, CRM/ERP and Cloud Consultants, the most in-demand specialisations

Professionals in Web Development (39,660), UX/UI (20,755) and CRM/ERP Consultants (11,070) account for 71% of ICT employment. Web Development was the most offered position in 2022, with 11,219 vacancies.

Among the most popular digital professions, companies experience greater difficulty recruiting cybersecurity specialists (2.97 professionals per job vacancy) and Cloud (7.63 professionals per vacancy).

Demand for Artificial Intelligence specialists has tripled in the last year.

The job vacancies showing the greatest increase in the last year have been in artificial intelligence (+312%) and 3D printing (+70%). In terms of ICT professionals, Blockchain (+109%), Artificial Intelligence (+87%) and IoT (+79%) have seen the greatest growth in the volume of talent.

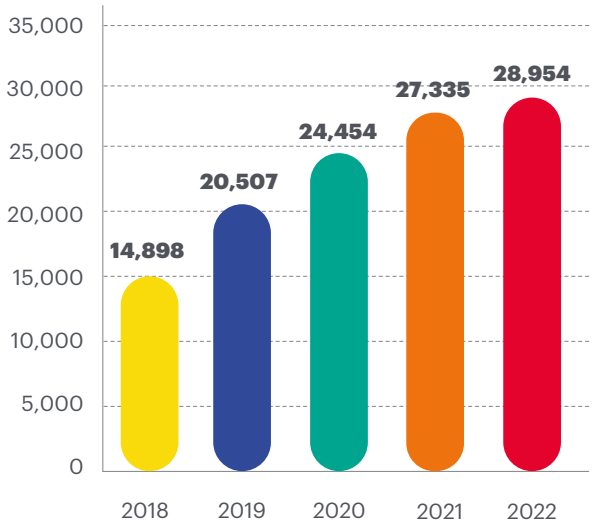
In the last five years, the number of women in ICTs has doubled

If in 2018, there were around 15,000 women in digital professions, by 2022, there will be more than 29,000. This acceleration has increased women's weight in the digital professionals' group from 22% to 28.7%.

Digital Marketing (46%) and UX/UI (43%) are the professions with the highest female presence.

Women in the sector by city (%)

2022



Nearly half of the digital talent entering the market in 2022 came from outside Catalonia.

Barcelona has attracted nearly 14,000 digital professionals since 2018, 3,300 of which last year. Overall, the weight of digital professionals from other territories was 32.4% in 2022.

The specialisations with the highest proportion of talent from other regions are cybersecurity (43.8%), app development (42.3%) and web development (33.8%).

London, with 11.56%, and Madrid, with 10.97%, are the cities that export the most talent to Barcelona.

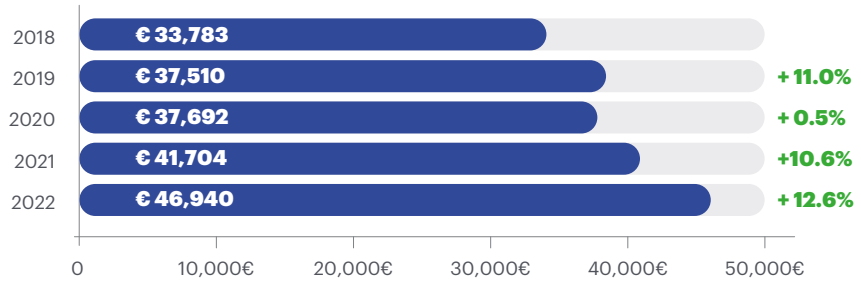
ICT vocations are growing: between university degrees and ICT vocational training, 5,230 students graduated in 2022, 26% more than the previous year

In 2022, 2,350 students in Catalonia will graduate with ICT degrees (1,869 in 2021), 39% more than in the 2017-2018 academic year. The UPC (768) and the UOC (465) have the most graduates.

ICT Vocational Training in the Barcelona metropolitan area generated 2,880 graduates in 2022, significantly more than the 2,285 of the previous year. The specialisations that generated the most graduates were microcomputer systems and networks (1,237), system administration (528) and cross-platform application development (524).

The average salary of a digital professional in Barcelona in 2022 46,940, 39% more than in 2018 (€33,783) and +12.6% compared to 2021.

Cybersecurity (€56,000), API (€53,800) and Artificial Intelligence (€51,600) are the highest-paid profiles. Digital Marketing is the profession whose salary is furthest from the average, with an average gross salary of €32,500.



Digital talent in major European cities

Barcelona has a slightly better balance between supply and demand for digital employment than the European and Spanish average

Among the 20 European cities analysed, London (2.62 digital professionals per job vacancy), Bucharest (2.98) and Vienna (3.38) have the most stressed market. At the other extreme are the cities with the highest abundance of professionals per job offer, with Helsinki (31.63) and Zagreb (21.5) leading the way.

The 12.29 professionals per job offer in Barcelona places the city slightly better than in Europe (10.89) and Spain (11.81), where Bilbao is the city with the greatest abundance of talent per job offer (15.21) and Zaragoza the city with the greatest shortage (5.95).

Barcelona offers the highest salaries in Spain, but below the European average

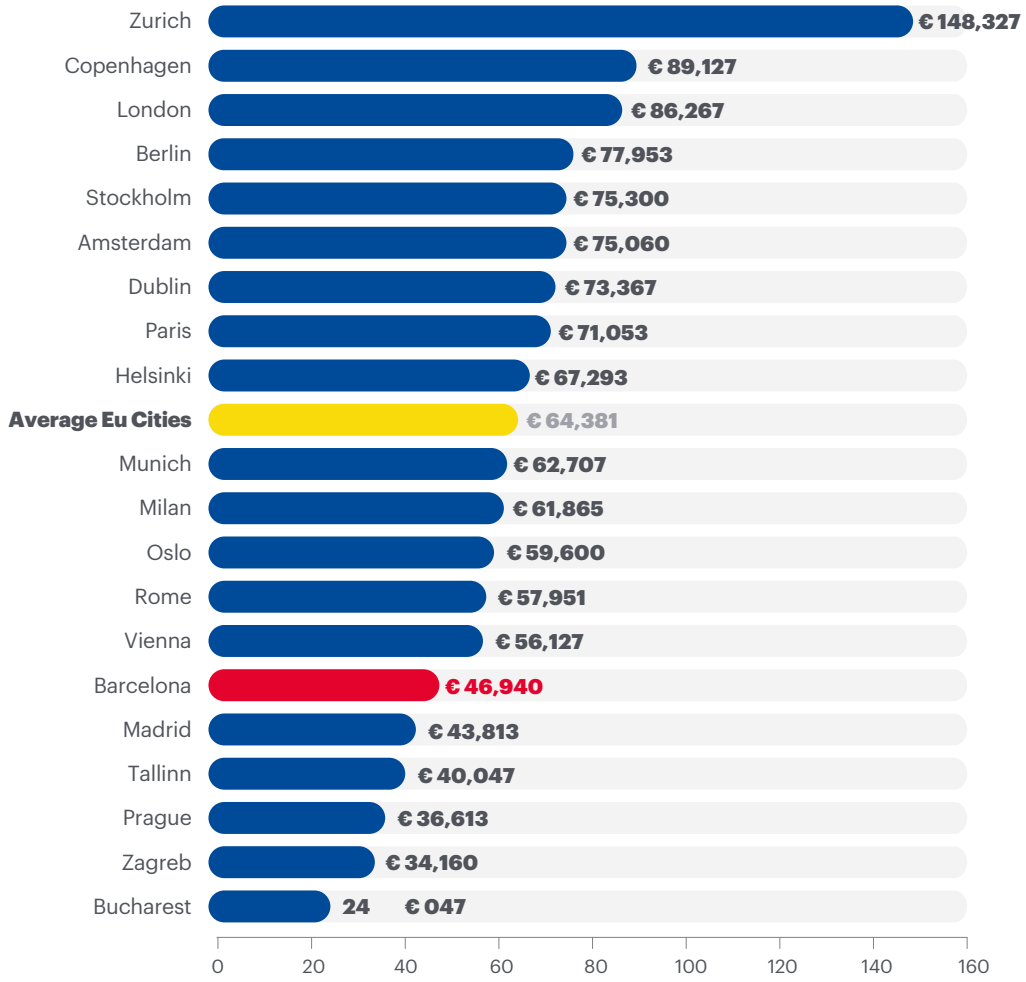
Zurich leads the ranking, followed by Copenhagenn (€87,400), London (€83,731), Berlin (€75,494) and Stockholm (€73,963). The cities studied with the lowest salaries are Bucharest (€23,494), Zagreb (€33,413).

The average salary in Barcelona (€46,940) is almost €10,000 higher than the average for the Spanish cities analysed (€37,266).

If salaries are adjusted to the cost of living, Barcelona is in the majority block of 13 European cities, with salaries between €45,000 and €55,000 per year and close to the European average of €51,664.

Digital professional salaries by city

2022



Barcelona, among the European cities with the most women in ICTs

The average number of women in the digital sector in the European cities analysed is 27.8%. Barcelona is almost one point above (28.69%), while the European cities analysed with the highest presence of women are Milan (32.77%) and Madrid (30.19%).

At the bottom of the list are Bucharest (22.14%) and Zurich (23.71%). Digital Marketing (48.21%) and CRM&ERP Consultants (45.28%) are the specialities with the highest presence of women. The Cloud speciality has the biggest gender gap, with only 18.4% of women.

Impact of application of generative AI on the labour market

Due to the strong emergence in the past year of the use of generative AI and the expected impact on the nature of employment, this report includes an analysis based on the findings of the most recent publications and the contributions of 20 experts in the field.

Generative AI could perform 25% to 50% of the tasks of most jobs

According to Goldman Sachs, two-thirds of US occupations are exposed to some automation by AI, and most could have between 25% and 50% of their workload affected.

According to the experts consulted for this report, the main benefits of AI in the workplace are the elimination of routine work and time savings.

Another highlight is the positive correlation between exposure to generative AI and skill level, as reported in a recent publication by OpenAI in conjunction with AI Research and the University of Pennsylvania. Consequently, the higher the salary received, the higher the exposure to automation.

Structured information processing and language-intensive jobs are most at risk

The experts agreed that the professions most exposed to AI include legal, journalism and programming jobs, and languages, such as dubbers and writers.

The report recently published by OpenAI also highlights mathematicians, tax managers, accountants, financial analysts and web designers.

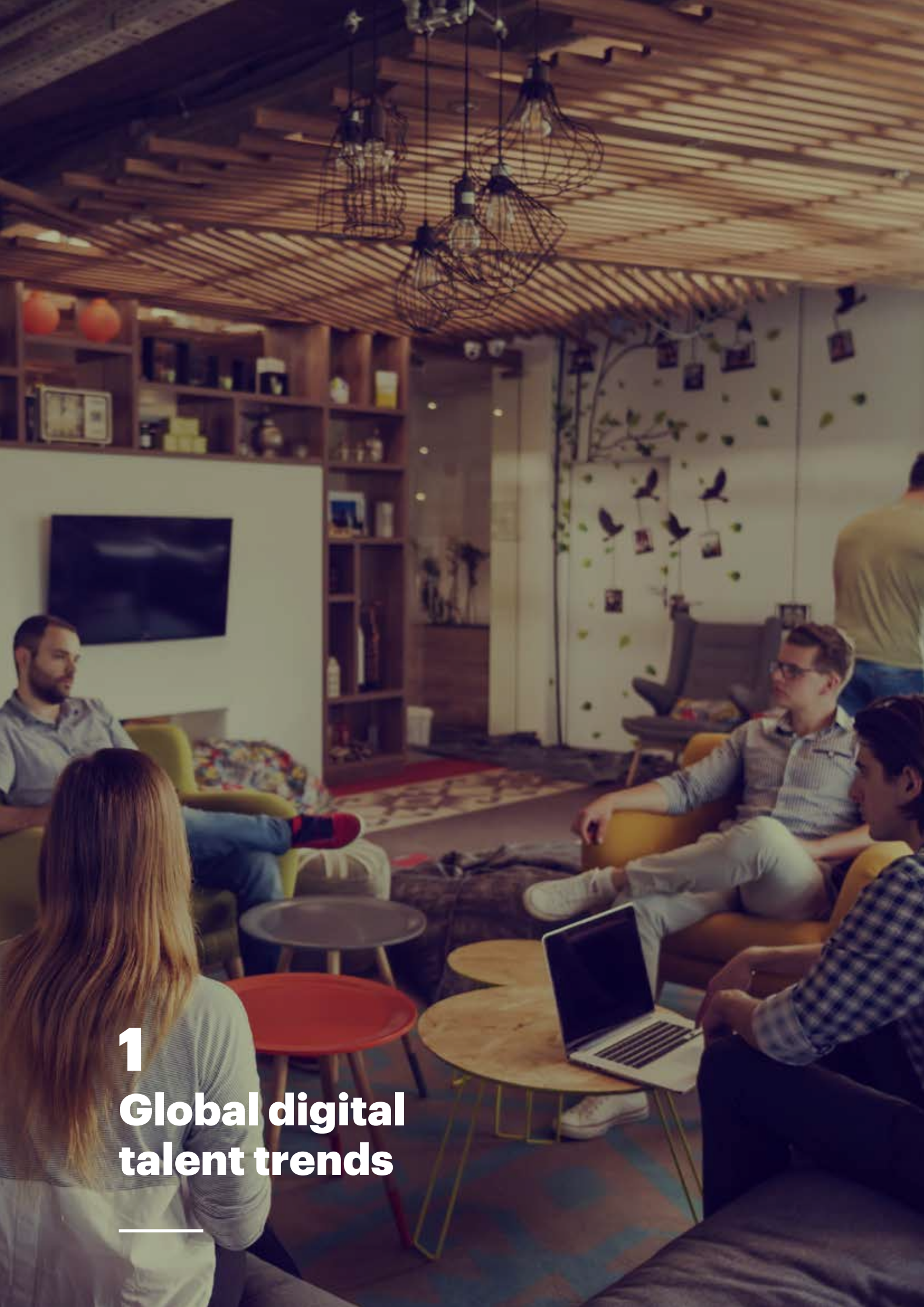
As for the least exposed professions, respondents agree they will require manual dexterity under changing situations (such as carpenters or surgeons) and jobs based on interaction with people (nursing, health care, personal care and education).

AI will spawn new professions, such as the Prompt Engineer, and accelerate the demand for skills such as critical thinking

Among the new professions emerging from AI, the people consulted highlight the figure of the Prompt Engineer, whose main function will be to liaise between the technician and the generative AI. Another position that will emerge is related to the ethics of AI, such as fairness and bias auditors of algorithms. It is also expected that positions will emerge on the law applied to generative AI and the legal limits that this technology should have, and also positions related to the auditing of AI to verify the information generated and its privacy.

In addition, a demand increase is expected for AI experts, trainers, data analysts, data governance specialists, interface designers and usability experts for AI systems or cybersecurity experts, among others.

Critical thinking, adaptability to changing environments, or creative problem-solving are expected to become more important as AI transforms employment.



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Global digital talent trends

The use of digital talent in Europe

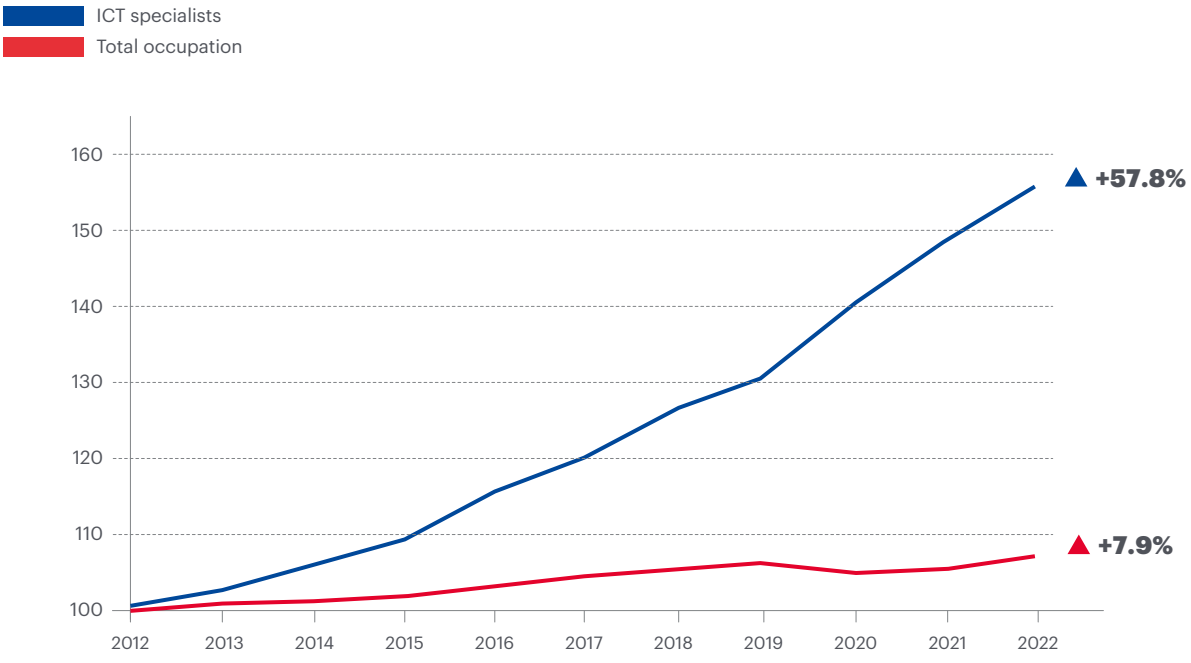
The evolution of employment in the ICT sector over the last decade is 7 times higher than employment growth. While EU occupation has grown by 7.9 per cent in the last 10 years, employment in the ICT sector has grown by more than 57 per cent.

The employment of ICT professionals continues the upward trend of the last decade. Since 2019, it has experienced accelerated growth (+19.3%), while employment has grown by 1.2%

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

2012-2022

Source: Eurostat



***Note to the graph:** the index is based on 2012 values (2012 = 100)

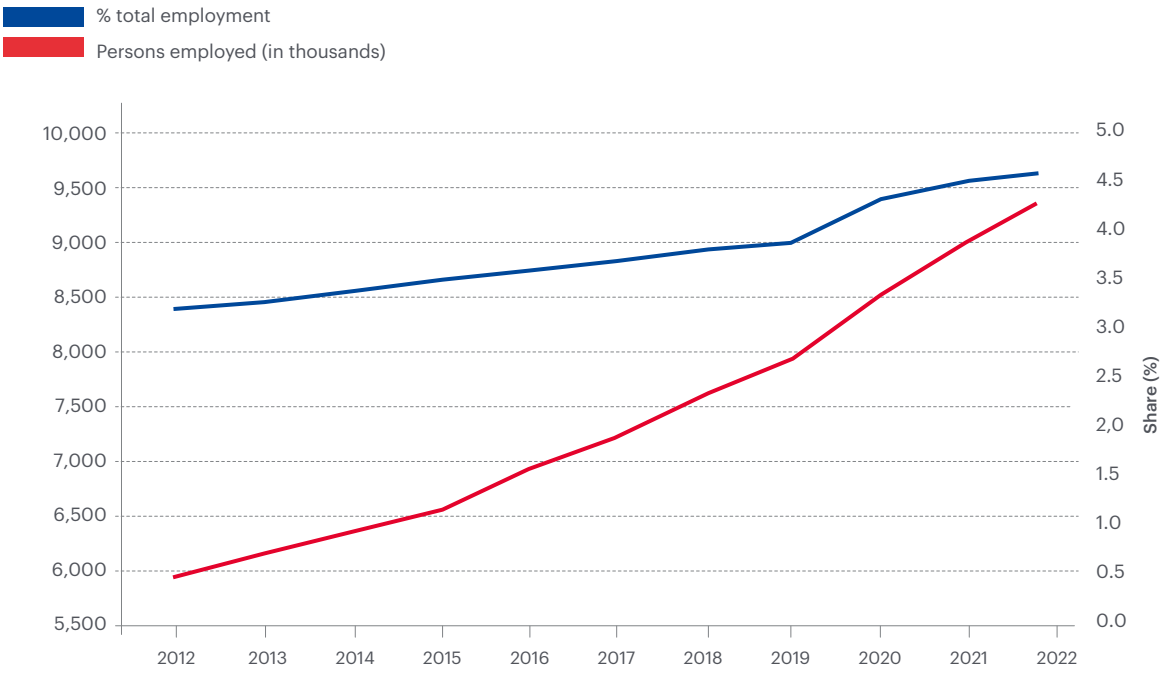
There are currently more than 9.3 million ICT employees in the European Union, an increase of almost 1 million in the last two years

The total share of ICT specialist hires in the EU as a percentage of total hires has increased by more than 30% compared to 2019, from 3.9% of total employment to 4.6%.

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

2012-2022

Source: Eurostat



"The digital talent shortage is not just a reality, but a growing concern for all sectors of activity. It is time to commit to diversity to drive innovation and organisational resilience. Including people with different skills and experiences gives us a competitive advantage and allows us to tackle complex problems effectively."

Pino Álvaro Caballero

Multilingual HR Director at Majorel Iberia & Latam

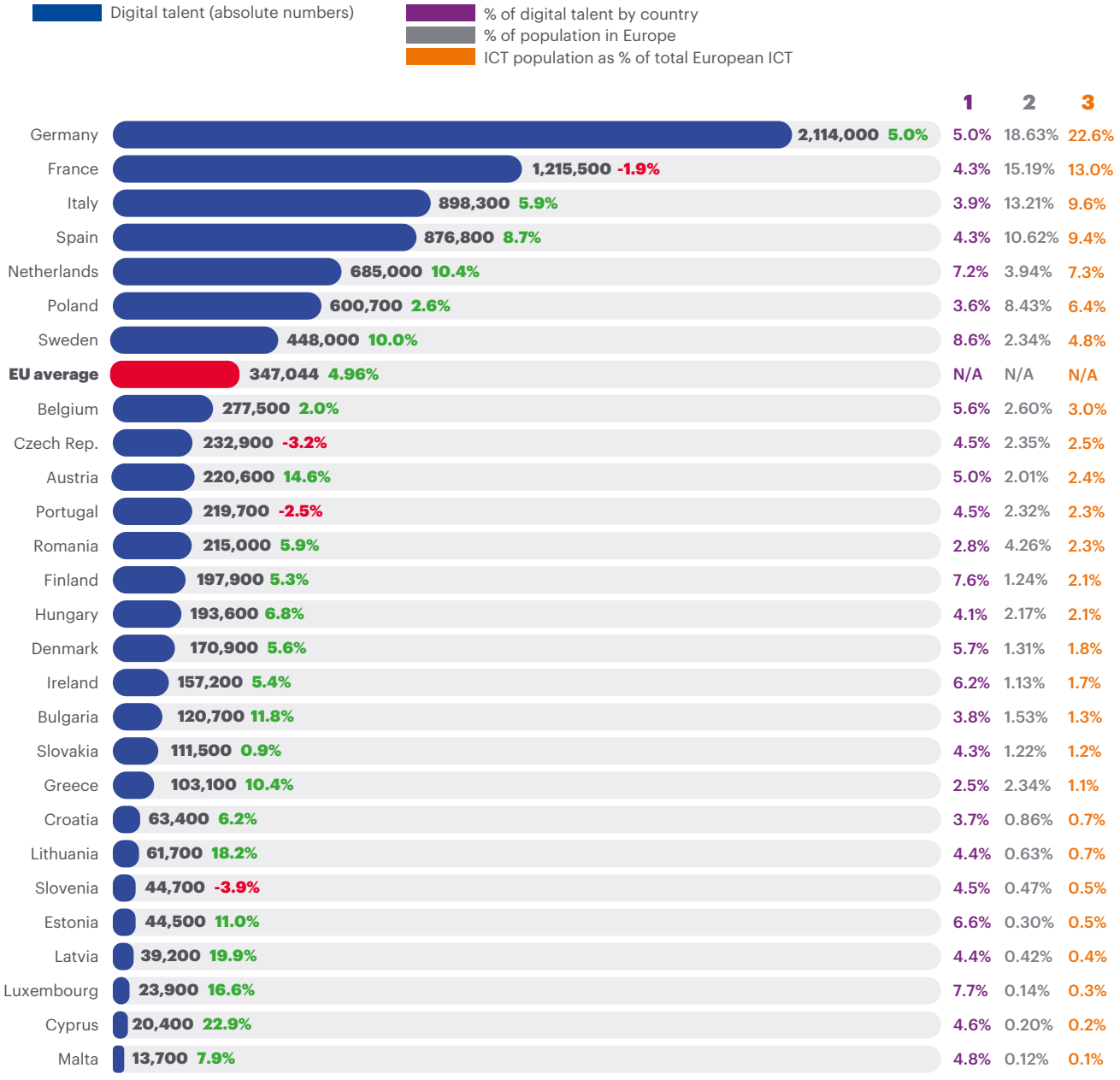
Germany leads the EU in digital talent with more than two million ICT profiles, a 5% growth compared to the previous year

Both Sweden (8.6%), Luxembourg (7.7%) and The Netherlands (7.2%) are the countries with the most digital talent relative to their country's population.

Number of ICT employees by country

2022

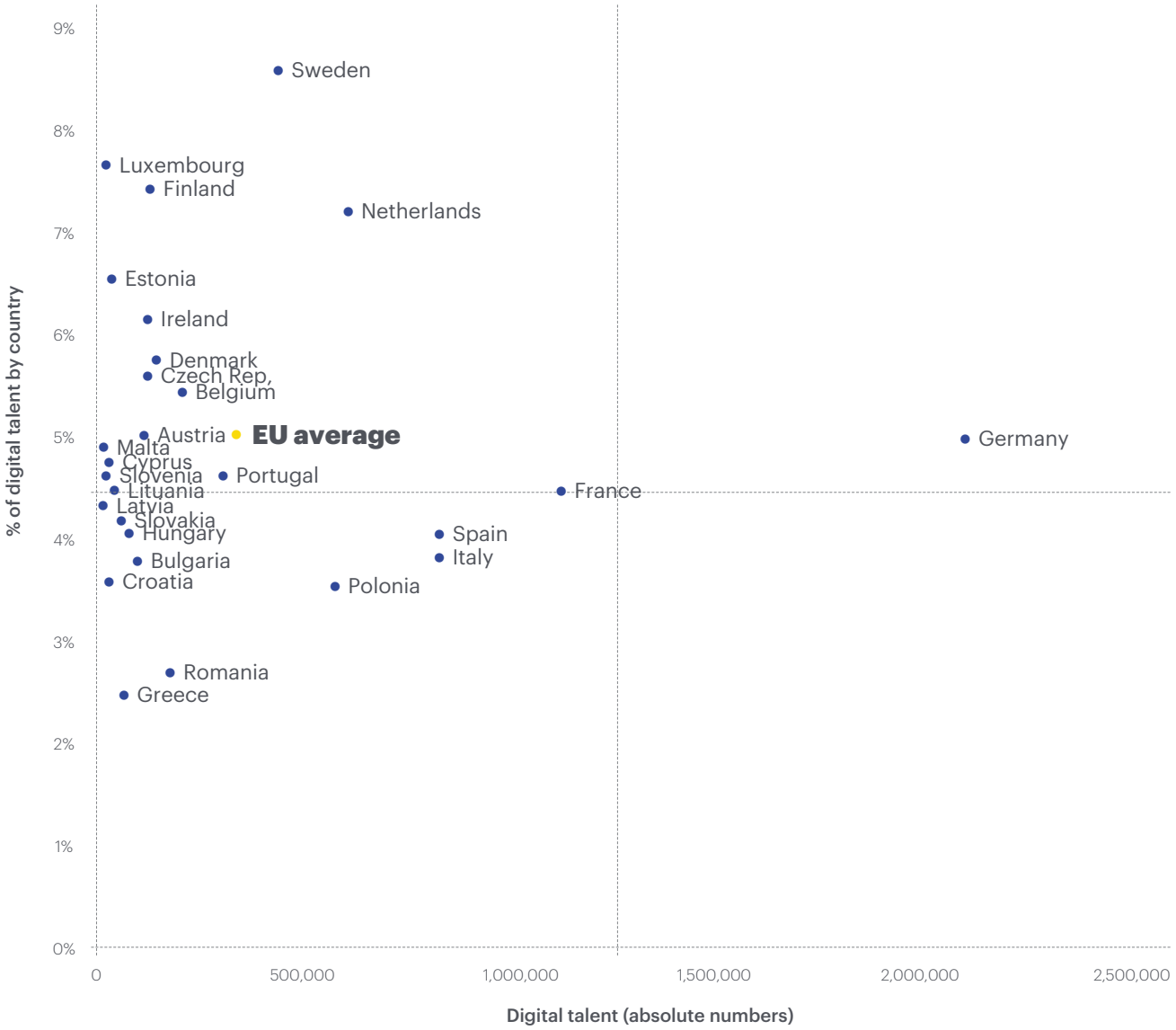
Source: Eurostat



Quadrant of absolute number of digital talent vs % of population in Europe

2022

Source: In-house document based on Eurostat data.



Estimated employment growth in the ICT sector

Software and IT service employment is expected to grow across Europe by 2030. Although the average growth rate in the European Union is 1.2%, some countries are expected to grow faster, such as Norway (5%) and Estonia (4.3%)

Breaking the general European trend, some countries are forecasting a slight reduction in employment in this sector, namely Lithuania, Germany, Iceland and Hungary. The fact explains Germany's case that it is currently the European country with the highest volume of digital talent and that this figure will stabilise in the coming years.

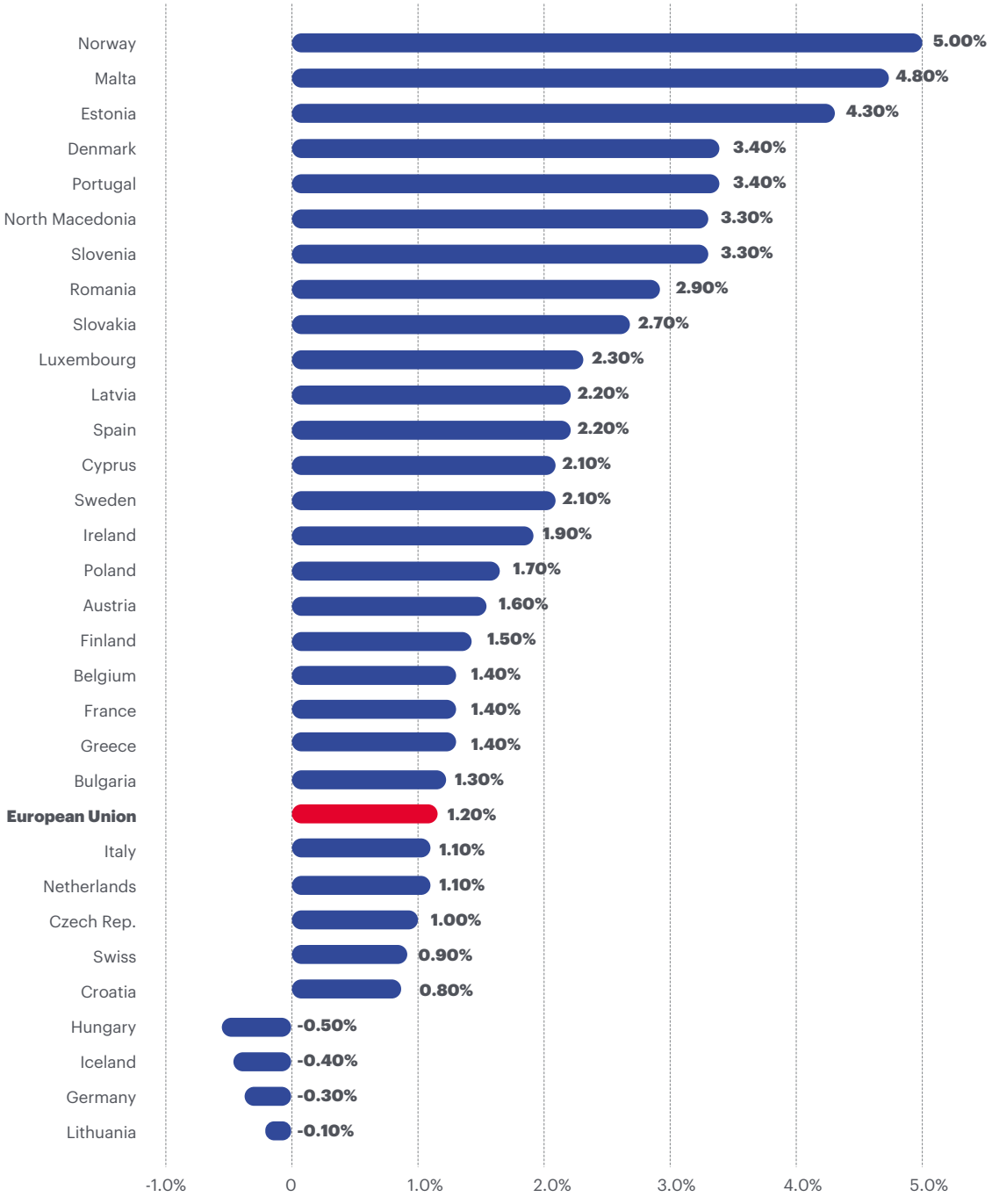
"At the Bayer Hub, we understand that the growth of our business lies in the knowledge and commitment of our employees. For this reason, we promote a culture of constant learning and enhance digital skills to foster innovation and contribute to our strategic objectives. This investment in training helps our teams grow and adapt to the changing needs of our customers, strengthening our competitiveness."

Marc Ferré Hausmann
Managing Director at Bayer GBS Barcelona

Estimated new jobs in Europe in the software and services sector

2021 - 2030

Source: CEDEFOP Skills Forecast



As can be seen, technologies will play a key role in creating new jobs in the ICT sector, with the adoption of Big Data analytics technologies creating the most jobs

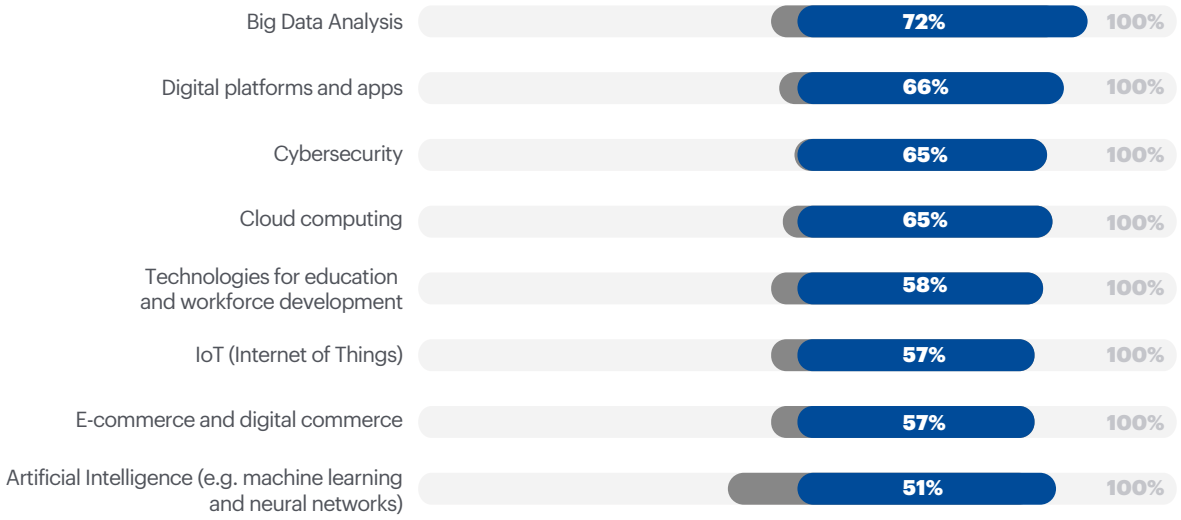
Between now and 2027, many jobs related to new technologies will be created. Jobs in any of the following roles will have an estimated growth of more than 25%:

- Specialists in machine learning and AI
- Business Intelligence Analysts
- Security Analysts
- FinTech engineers
- Data Scientist / Analysts

Impact of technologies on the creation and destruction of ICT jobs

2023-2027

Source: World Economic Forum, Future of Jobs Survey 2023

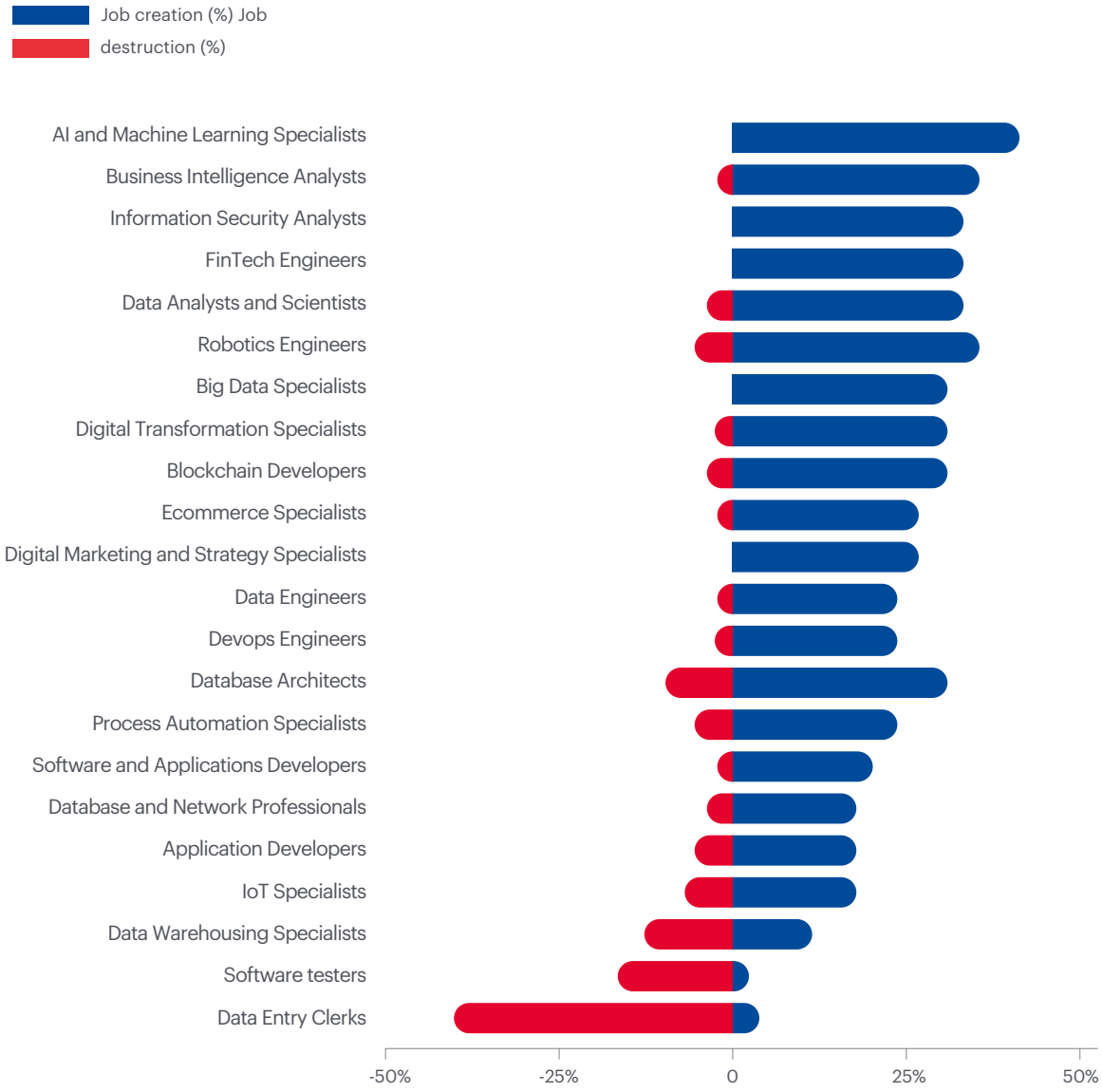


Note: This graph shows the net effect, calculated by the proportion of respondents who see a technology as a net job creator minus the proportion of respondents who see a technology as a net job displacer.

Estimated job creation and destruction by role (2023-2027)

2023-2027

Source: World Economic Forum, Future of Jobs Survey 2023



The gender gap in the ICT sector in Europe

In the European Union, women account for 18.9% of employment in the ICT sector

The countries with the highest proportion of women in this sector are Bulgaria (28.9%), Romenia (25.2%), Estonia (24.5%) and Finland (23.8%). In relative terms, the countries with the largest increases in women's presence in the digital economy are Luxembourg (+10.2%), Malta (+7.8%), the Netherlands (+6.4%) and Portugal (+6.2%).

However, most countries remain at similar levels to the previous year.
In the EU countries, the presence of women in the digital sector increased by +1.9% compared to the previous year.

« »

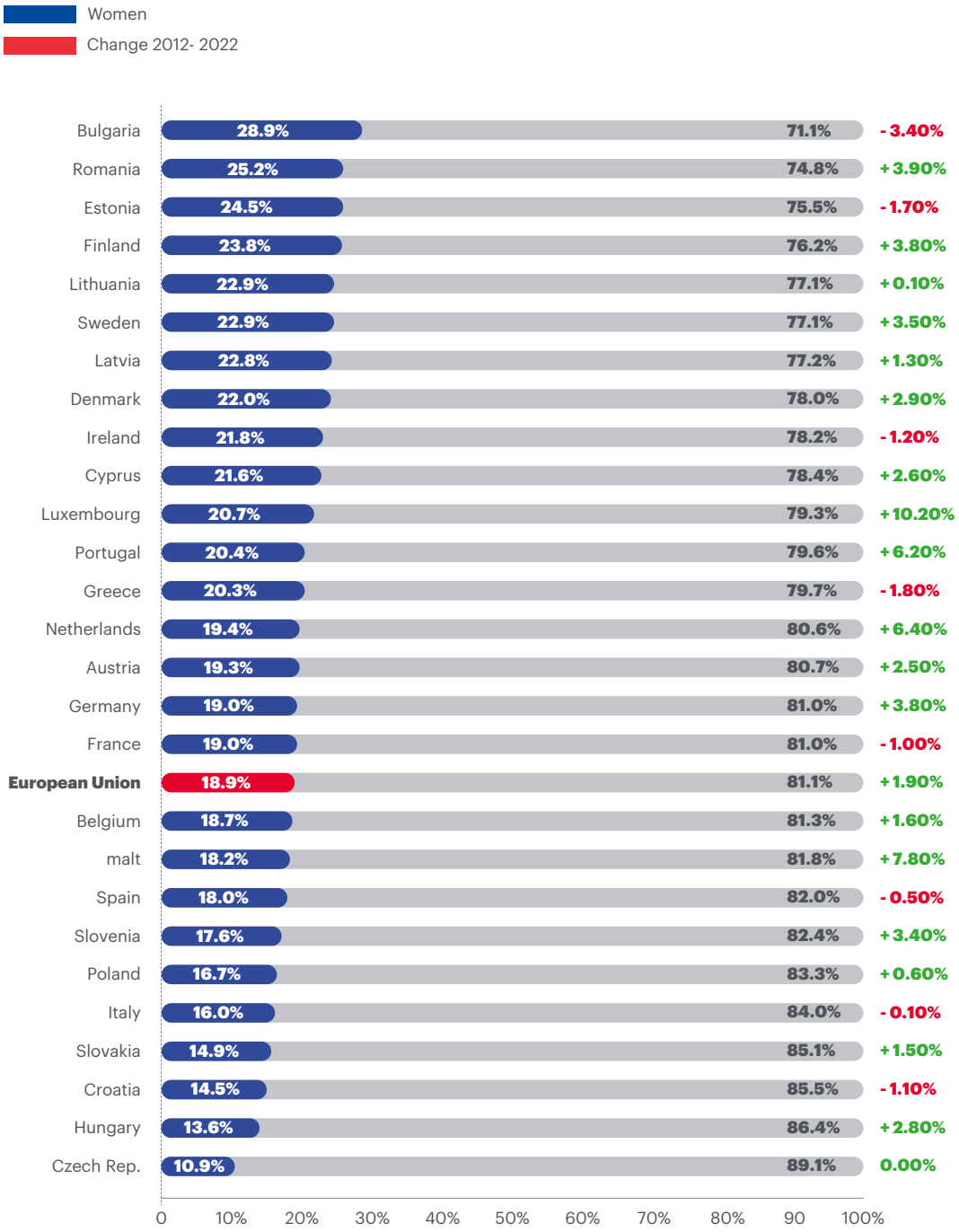
"Human beings have always adapted to new technologies and ways of improving things. Combining innovation, technology, and human ingenuity will help us overcome major challenges. Much has been said that robotisation will destroy jobs, but what we anticipated has finally happened: technology drives human capabilities rather than replacing them. Our world is improving, but to make further progress, we must strive to overcome divisions, accelerate human progress and reduce inequalities. The way to build a common horizon and increase prosperity for the many, not just the few, is to equip people with the skills to use technology and thus create a future of employment closer to what professionals want."

Francisco Ribeiro
Country Manager of ManpowerGroup España

Women ICT specialists recruited (%) in Europe

2012-2022

Source: Digital Economy and Society Index (DESI)



Level of digital skills training in Europe

The Scandinavian countries stand out as having a higher rate of advanced skills and ICT development. Finland leads the ranking, followed by Sweden and Ireland

Spain obtains 40% of this index, close to the European average of 40.8%. Italy, Hungary and Greece are at the bottom in advanced ICT skills and development.

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.

« »

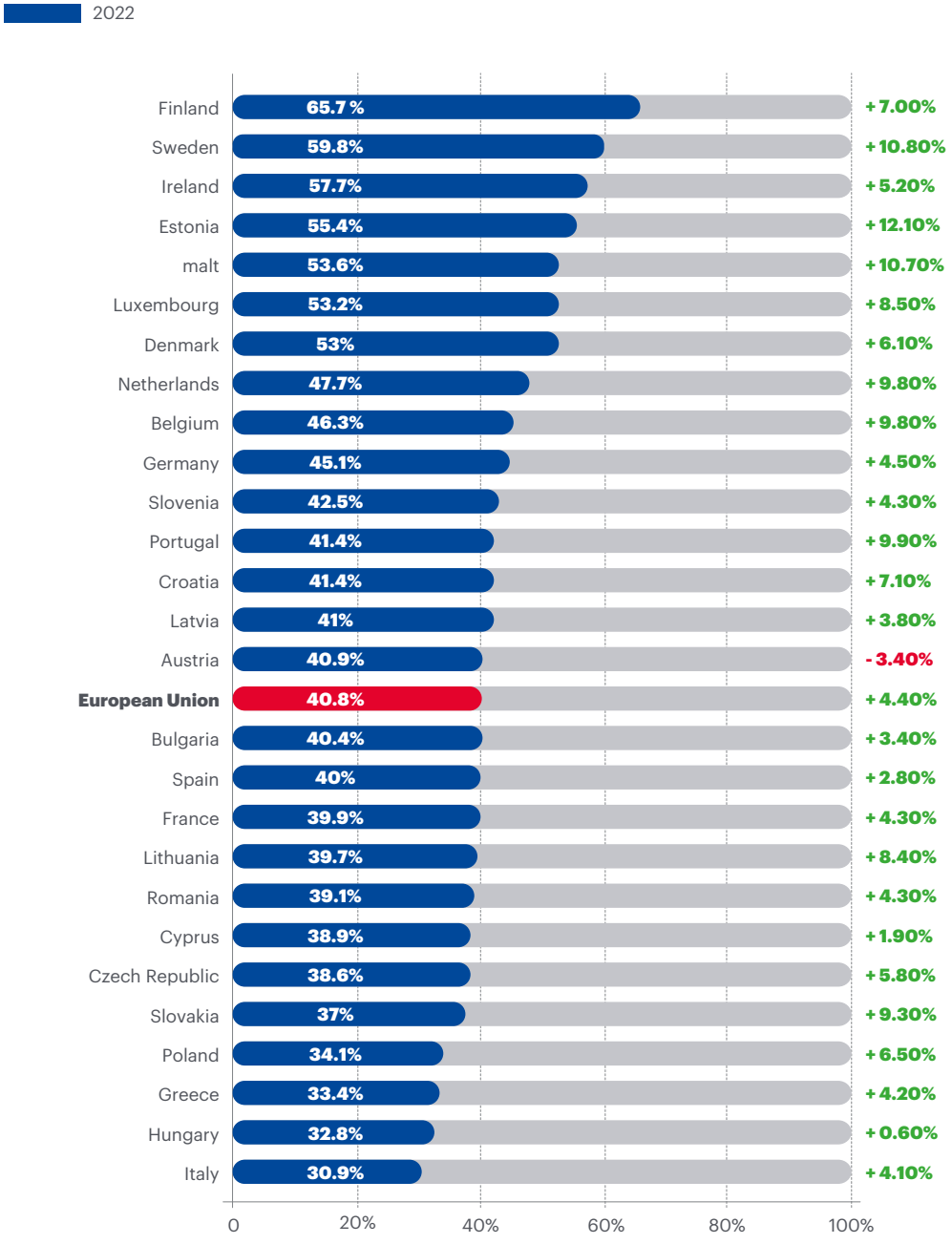
"At IBM, we value diversity and curiosity of digital talent as drivers of excellence. We encourage creativity and passion in the new profiles to embrace global trends and build an inclusive and stimulating future for our organisation and customers. Together, we will forge a path to innovation and success in this ever-evolving digital environment."

Oriol Viaplana
Consulting Executive Partner at IBM

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

2022

Source: Digital Economy and Society Index (DESI)



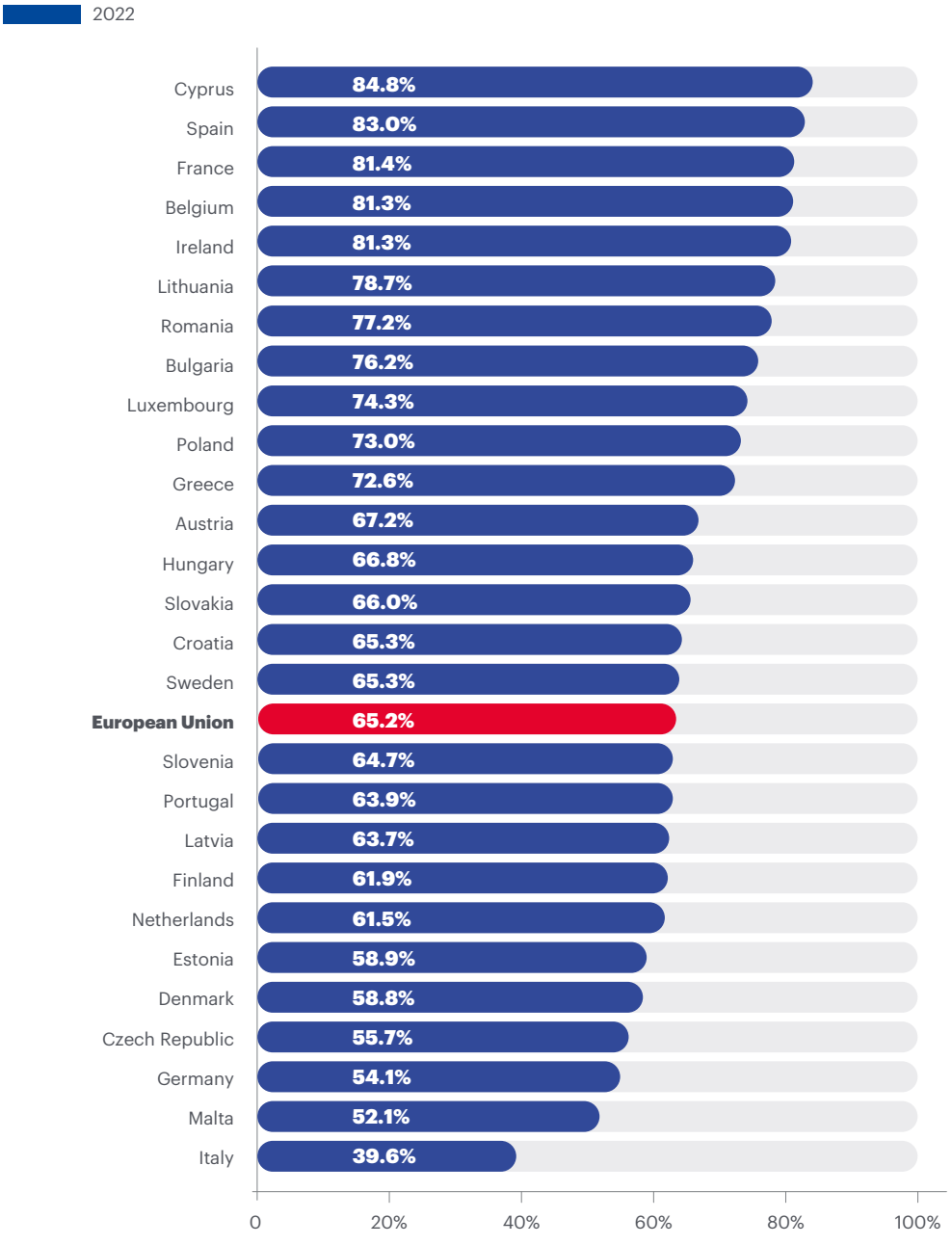
2 out of 3 ICT specialists in the EU are university graduates

Cyprus, Spain, France, Belgium and Ireland have more than 80% of ICT specialists with tertiary education. Estonia, an EU digital benchmark country, has less than 60% of ICT specialists with tertiary education.

ICT specialists with higher education by country

2022

Source: Eurostat



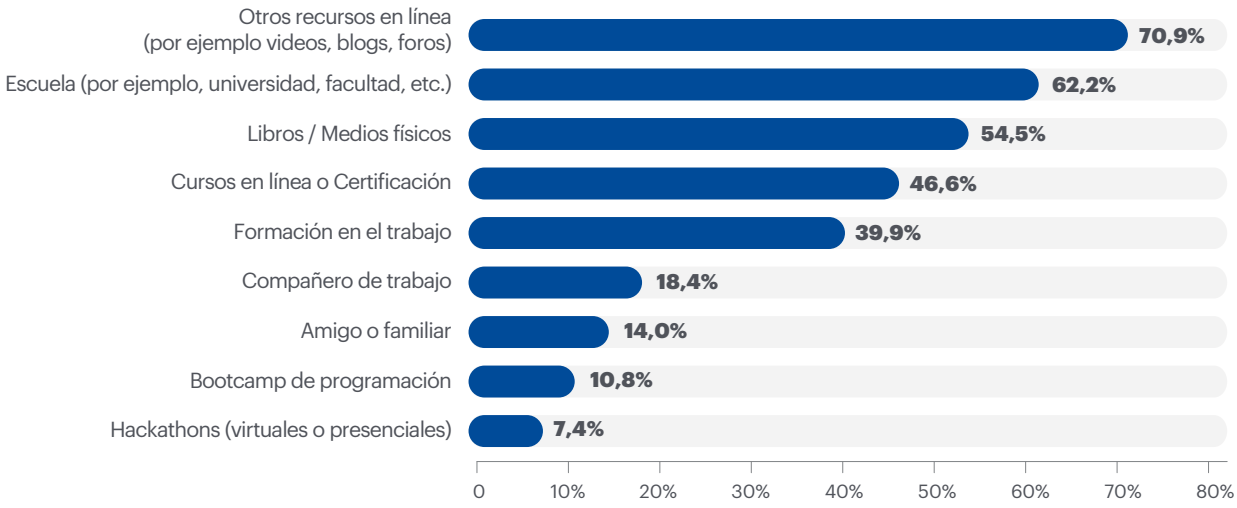
Regarding channels for learning to program, online resources stand out, used by 70.91% of professionals, with a growth of 11.4% compared to the previous year. This channel is higher than formal training (62.18%).

Let's consider the age of the developers. It stands out that online resources are the main channel up to age 35. In contrast, books and physical media become the most used resources.

Origin of developer training

2022

Source: Stack Overflow Developer Survey (encuesta mundial)

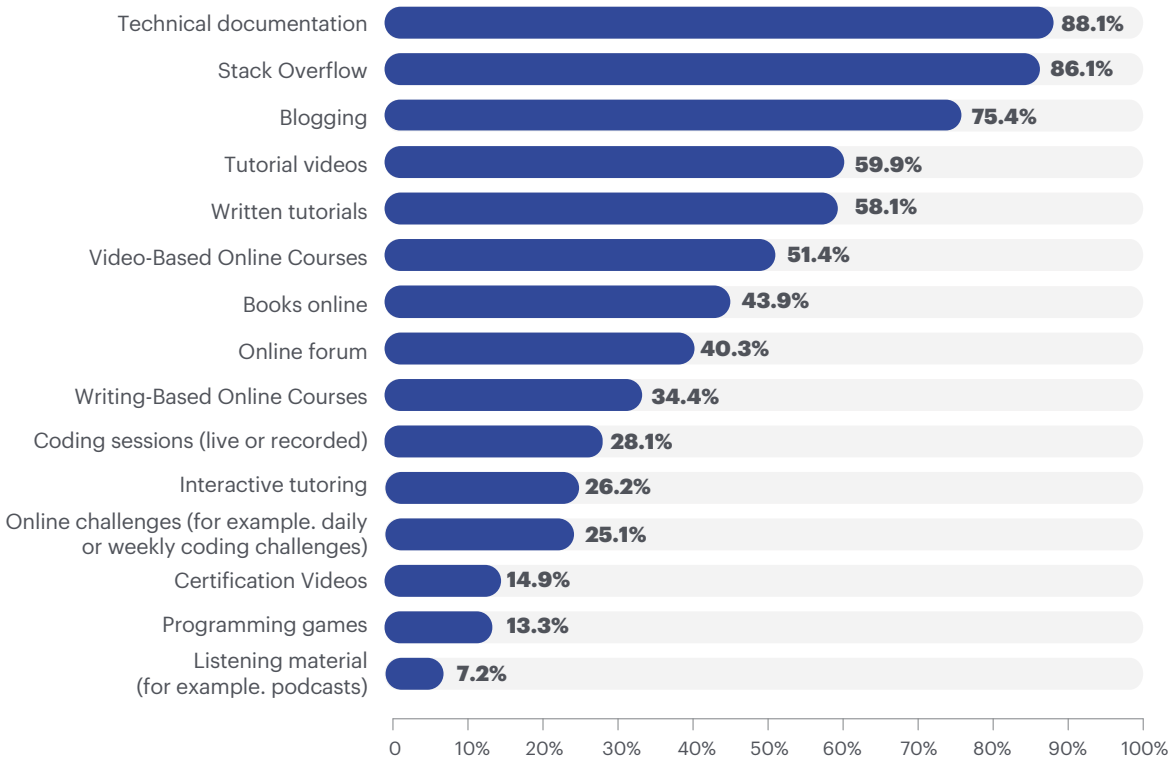


The most commonly used online resources are technical documentation, Stack Overflow and blogs, which more than 75% of professional developers use

Typology of online resources used to learn to program

2022

Source: Stack Overflow Developer Survey (global survey)

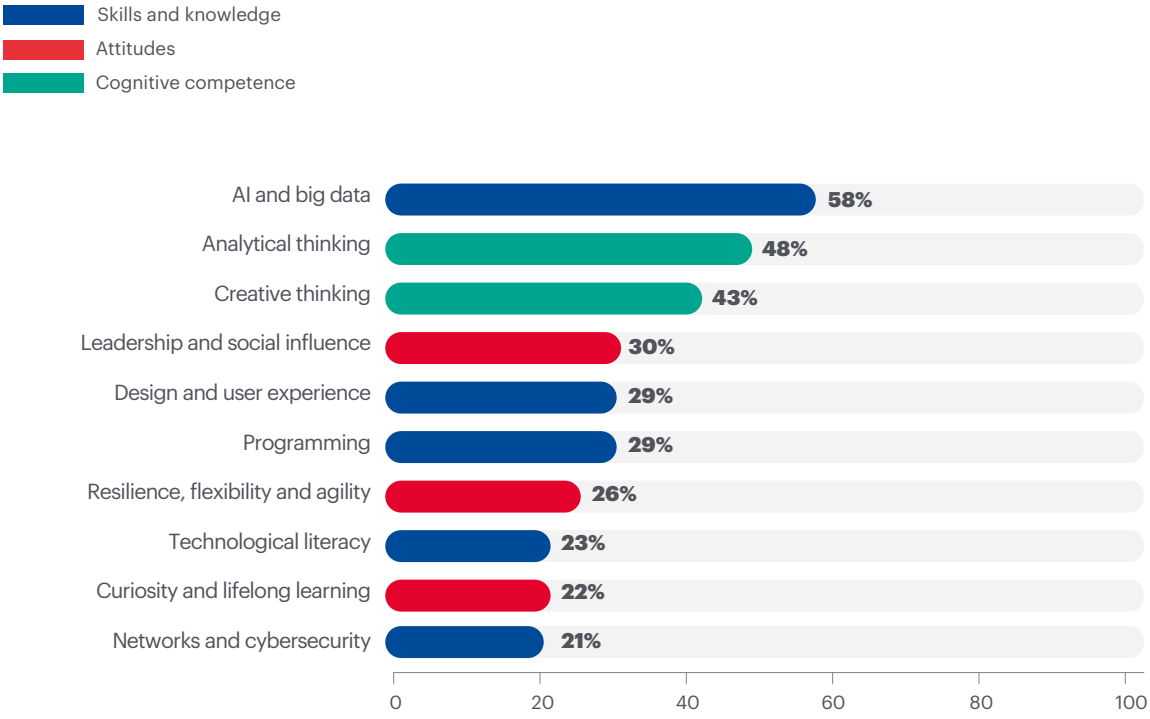


Not only will technical skills be important for reskilling, but it is clear that analytical, creative and leadership skills will be critical to success

Estimated priority skills for reskilling over the next 5 years

2023 - 2027

Source: World Economic Forum, Future of Jobs Survey 2023



Training centres of excellence in Europe

The United States again topped the list in Computer Science and Information Systems academic excellence. Followed by the United Kingdom, Singapore and finally Switzerland

At the European level, the UK leads the educational ranking, with 5 of the top 10 universities in Europe. The ranking is followed by Switzerland, with two centres, and Germany, France and Italy, with one recognised centre in each country.

The UPC leads the ranking of the best state universities for acquiring the most in-demand ICT technical skills.

Most recognised training centres in Computer Science and Information Systems

2022

International Top 10

	University	Country
1.	**Massachusetts Institute of Technology (MIT)**	**United States**
2.	Carnegie Melon University	United States
3.	Stanford University	United States
4.	University of California, Berkeley (UCB)	United States
5.	University of Oxford	United Kingdom
6.	National University of Singapore (NUS)	Singapore
7.	University of Cambridge	United Kingdom
8.	Harvard University	United States
9.	ETH Zurich	Switzerland
10.	EFPL	Switzerland

Source: QS Top Universities

Top 10 Europa

2022

	University	Country	Position in international ranking
1.	**University of Oxford**	**United Kingdom**	**5**
2.	University of Cambridge	United Kingdom	7
3.	ETH Zurich	Switzerland	9
4.	EPFL	Switzerland	10
5.	Imperial College of London	United Kingdom	15
6.	The University of Edinburgh	United Kingdom	20
7.	UCL	United Kingdom	24
8.	Technical University of Munich	Germany	29
9.	Institut Polytechnique de Paris	France	31
10.	Politecnico de Milano	Italia	33

Source: QS Top Universities

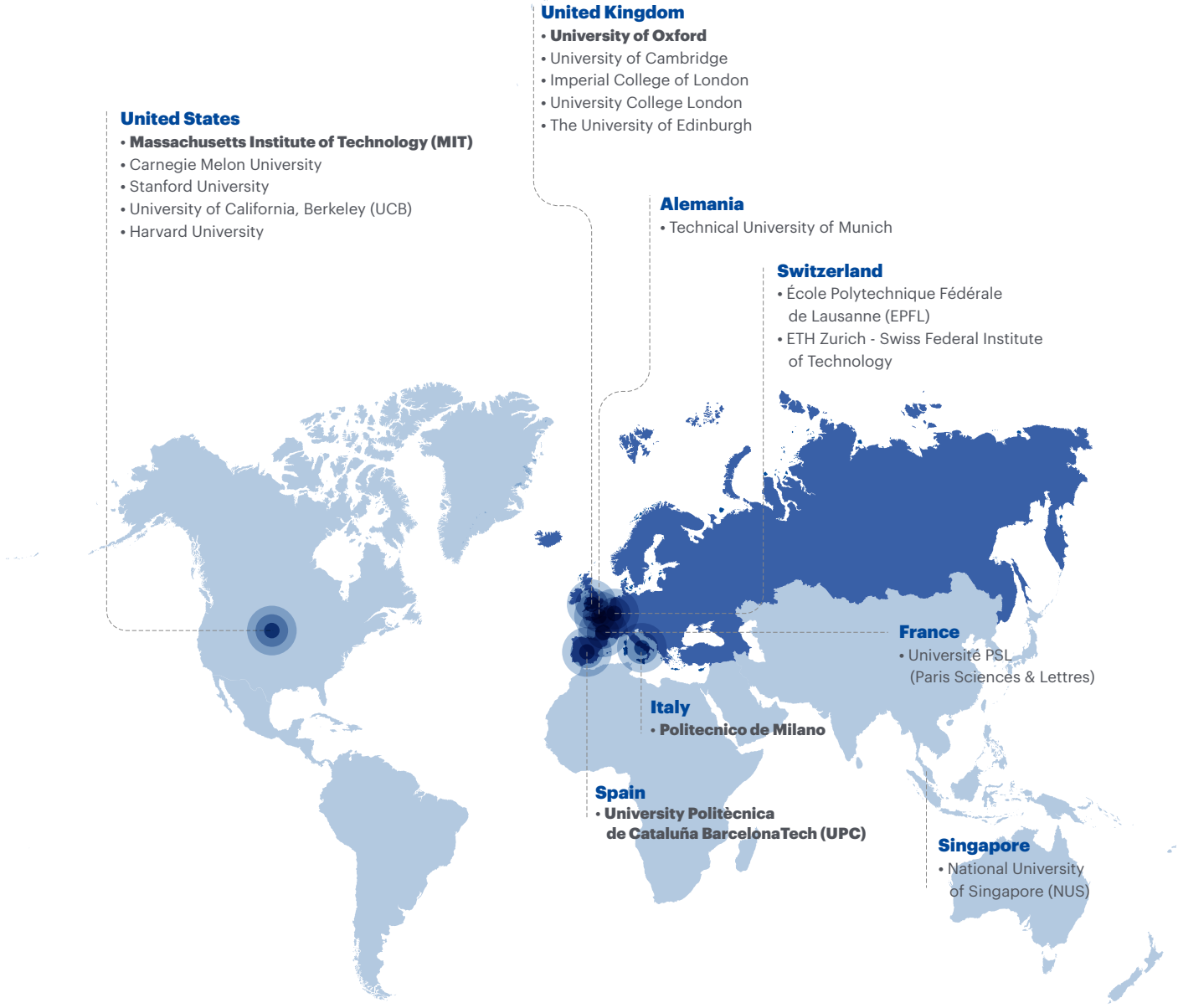
Top 10 España

2022

	University	Country	Position in global ranking
1.	**Universitat Politècnica de Catalunya BarcelonaTech (UPC)**	**Catalonia**	**82**
2.	University Politécnica de Madrid (UPM)	Madrid	118
3.	University Carlos III de Madrid (UC3M)	Madrid	151-200
4.	University de Barcelona	Catalonia	151-200
5.	University Complutense de Madrid	Madrid	201-250
6.	University Politécnica de Valencia	Region of Valencia	201-250
7.	University de Granada	Andalusía	201-250
8.	University de Sevilla	Andalusía	401-450
9.	University de Valencia	Region of Valencia	501-550
10.	University Rey Juan Carlos	Madrid	551-600

Source: QS Top Universities

Note: : The QS Top Universities rankings assess the following criteria: academic reputation, employer reputation, student/faculty ratio, citations per faculty, international, and proportion of international faculty.



1 **Internacional**
Massachusetts Institute of Technology (MIT)
United States

1 **European**
University of Oxford
United Kingdom

1 **Spanish**
University Politècnica de Catalunya
Catalonia

Businesses are also participating in the ICT training of their employees

22.4% of European companies offer digital skills training to employees, 13.7% more than the previous year

The companies that train their employees the most in digital skills are Finland, Sweden, Denmark and Belgium.

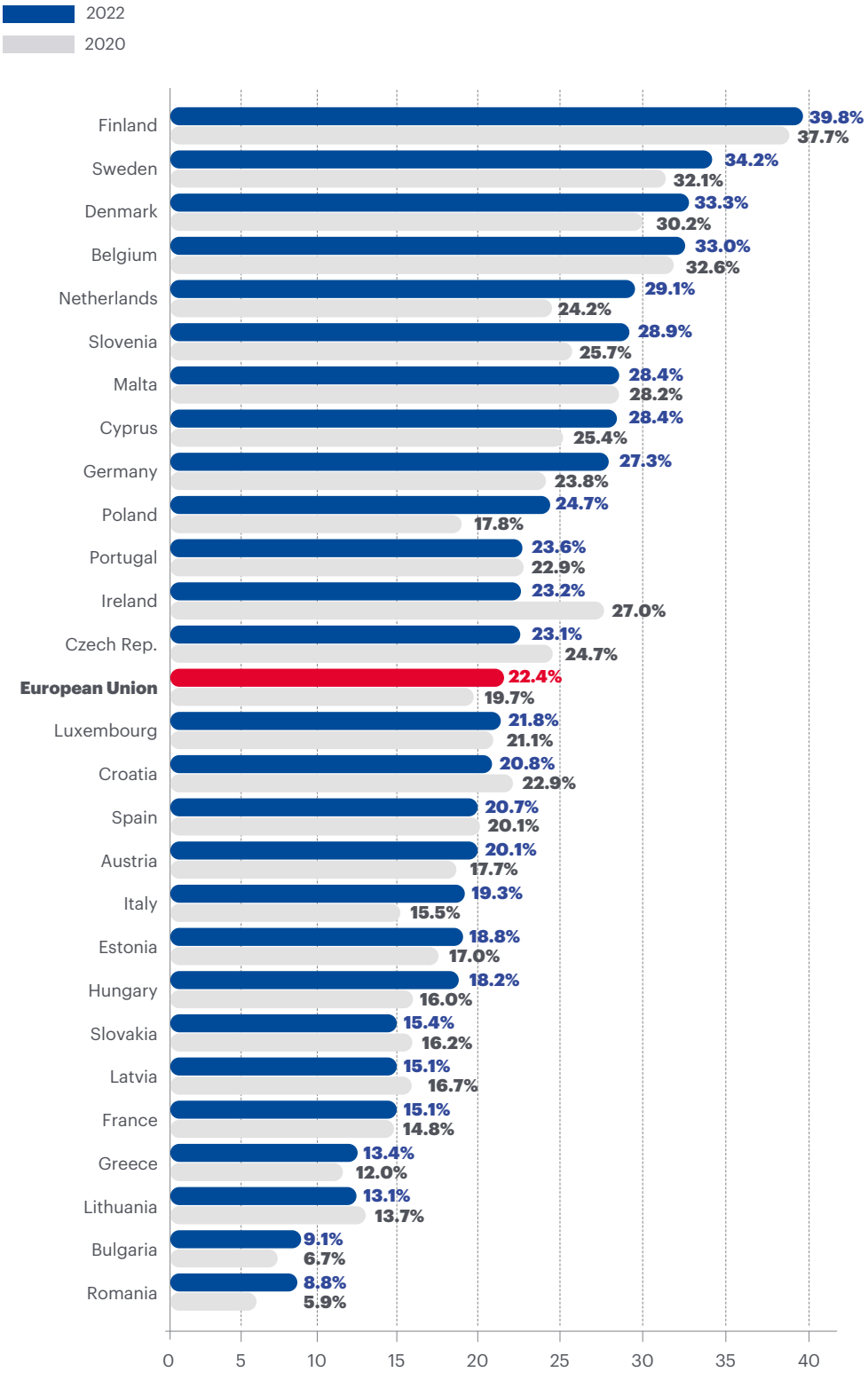
"We are in a context of a paradigm shift and immersed in a digital transformation that is transversal on organisations and where the need to incorporate profiles with digital skills is latent. At Schneider Electric, we are committed to the evolution of people within the organisation based on equal opportunities and inclusion for all, empowering them to build their future and contributing to the company's sustainability goal. With all this, in Barcelona, we have created one of the most important of our 5 global digital hubs to accelerate a change process with the best talent and contribute to our customer's digital transformation."

Eva Roca
Iberian Head of Talent at Schneider Electric

Percentage of businesses providing ICT training

2022

Source: Digital Economy and Society Index (DESI)



The most popular programming languages in the digital ecosystem

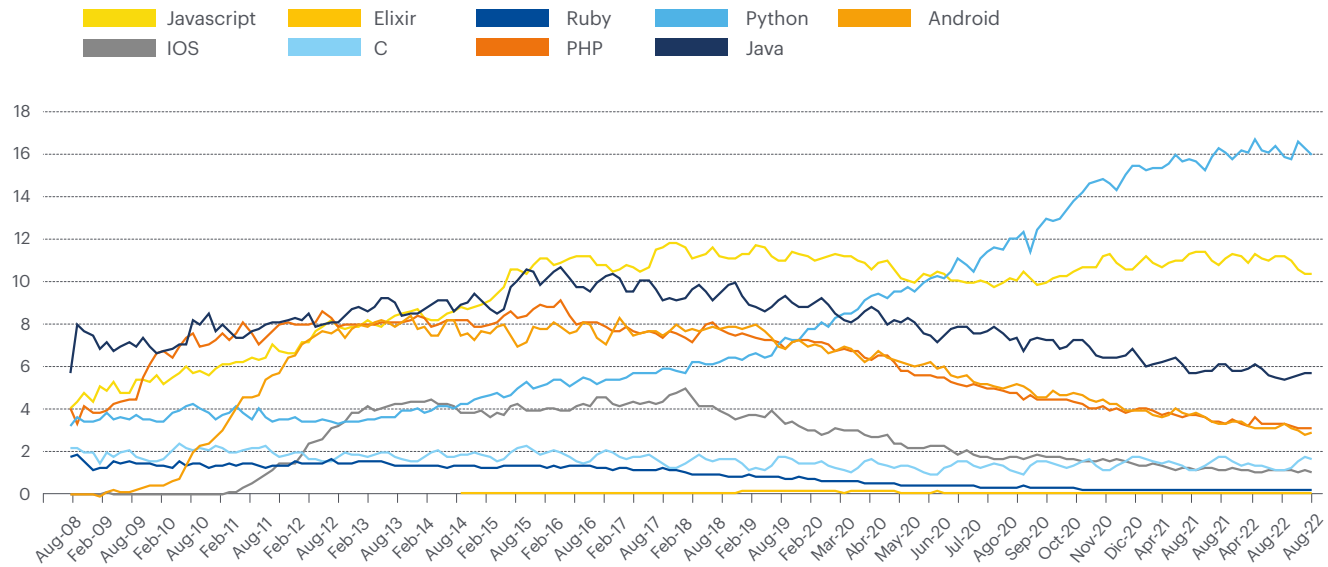
Python is the most popular programming language for yet another year, ahead of Javascript. As far as Java is concerned, it shows a decreasing trend, like PHP and Android, over the last few years

In recent years, the framework that has grown almost vertically has been React, Node.js is the second framework in trends. Angular, which closes the Top 3 frameworks, has a decreasing trend.

Evolution of the popularity of programming languages globally (%)

2008-2022

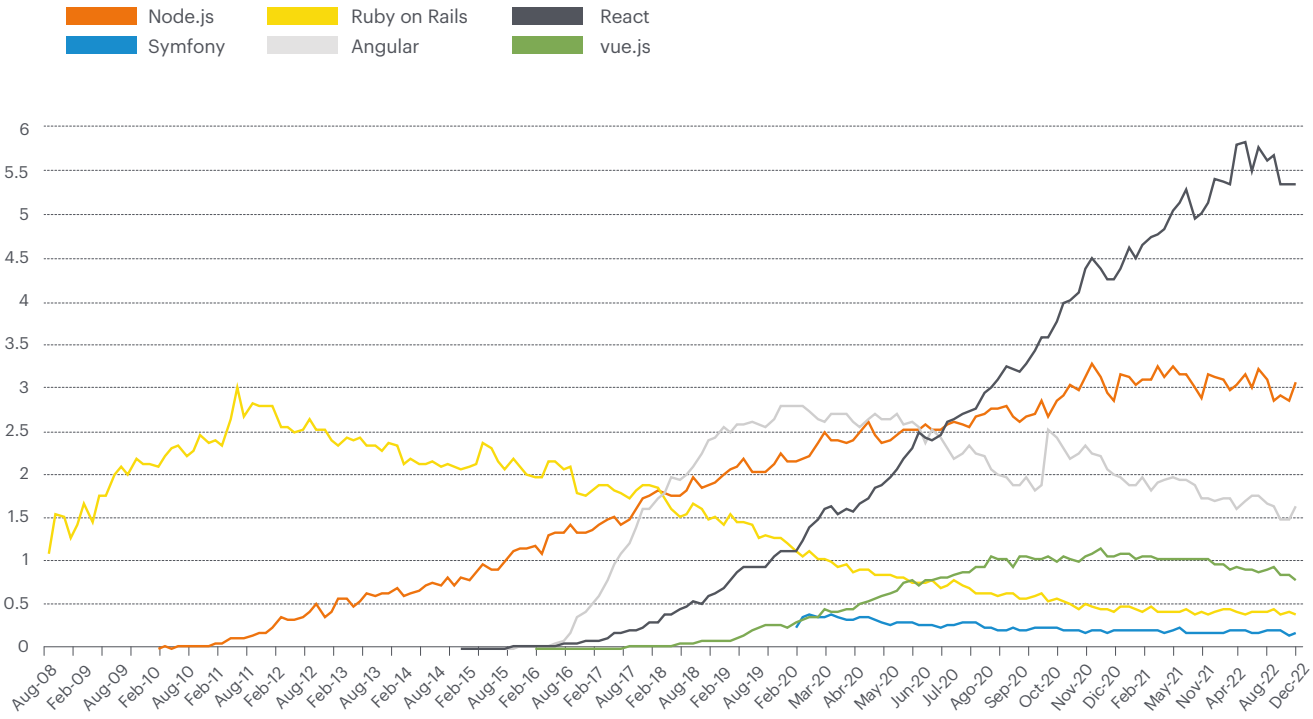
Source: TalentUp



Evolution of the popularity of frameworks globally (%)

2008-2022

Source: TalentUp



Note: A framework provides the support and guidance needed to accelerate your development and achieve your goals. In most cases, these will be in libraries or components that allow you to jump straight to the core of your task rather than start from scratch each time.

"Organisations worldwide have ambitious plans to become more digital and sustainable in an environment where ever faster technology cycles lead to disruptive and constant changes in how they work. The next decade will be defined by three technological megatrends: the cloud, the metaverse and artificial intelligence, leading to the emergence of new professions and the rise of digital professions. Businesses must attract and retain the best talent to make this transformation happen, develop innovation and create a competitive advantage."

Amparo Boria

Director of Talent Acquisition at Accenture Iberia

Most popular cloud database systems in the digital ecosystem

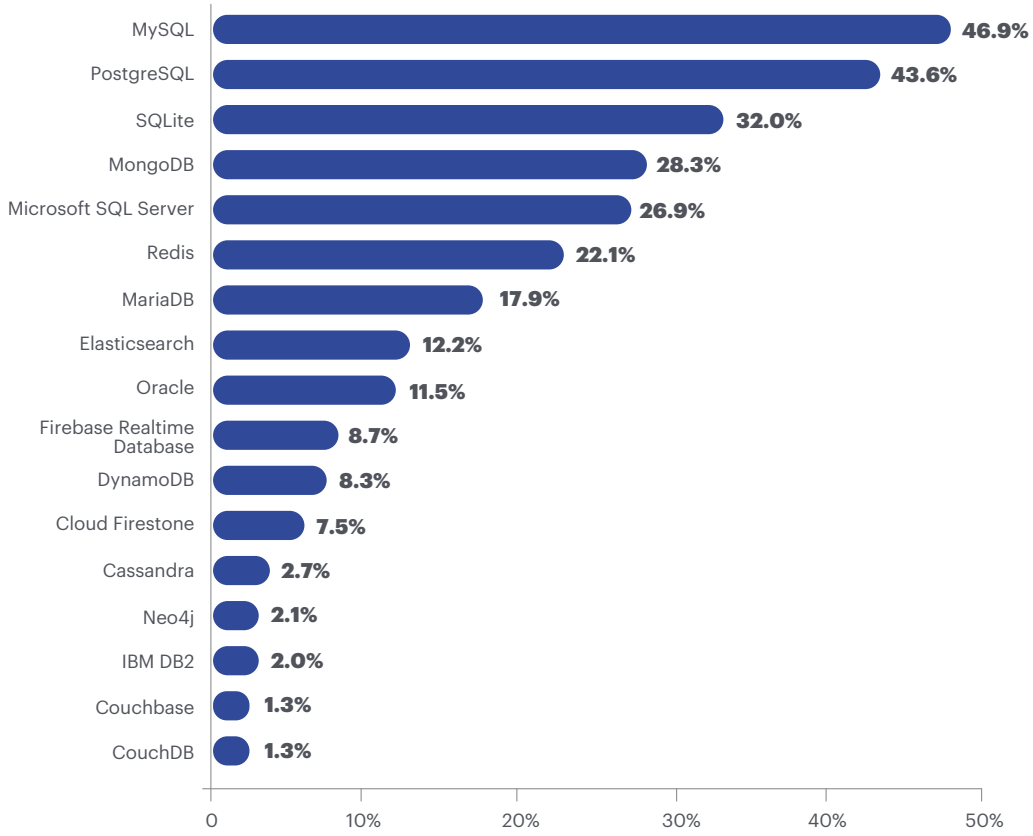
The database systems most used by developers are MySQL (47%) and PostgreSQL (43.6%).

In terms of cloud systems, the most used systems are AWS, with more than 50%, and Microsoft Azure, with 29%.

Databases most used by developers

2022

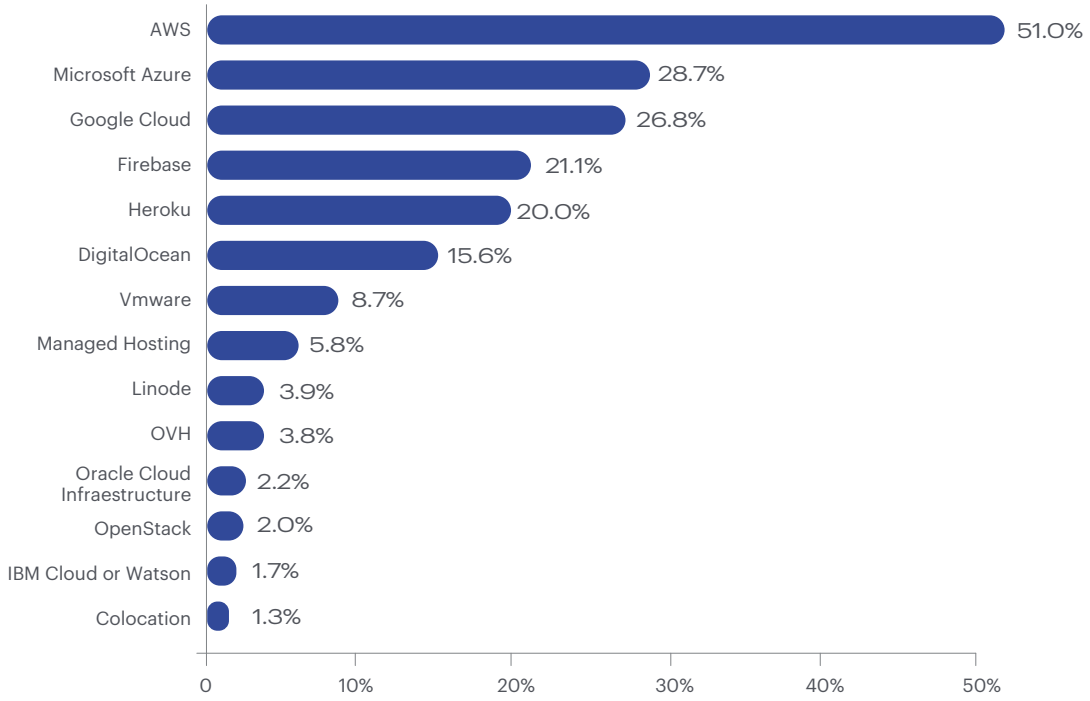
Source: Stack Overflow Developer Survey



Cloud platforms most used by developers

2022

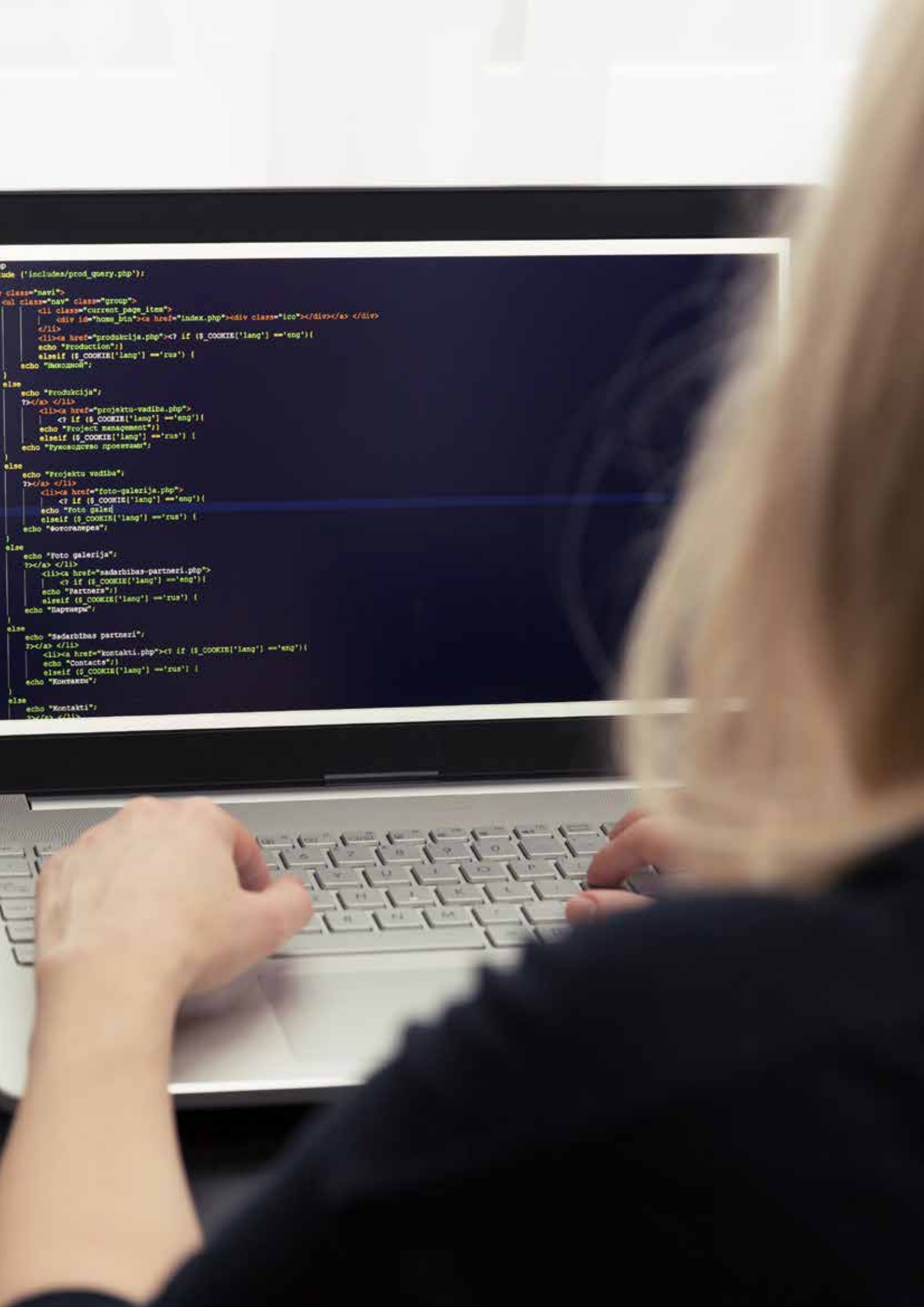
Source: Stack Overflow Developer Survey



"The demand for digital profiles will continue to grow, and will bring strategic knowledge of Artificial Intelligence, Cybersecurity or Cloud, as examples, will be a priority to position ourselves as a reference in the future. The keys to this are: offering a flexible working model, bringing in professionals from other countries with a simple landing offer that considers families, and finally, being proactive and prioritising greater inclusion in gender diversity with a greater female presence."

Josep Badal

People Lead at Technology Delivery Center in the Zurich Group



Recruitment Processes to attract digital talent

3 out of 4 digital professionals perceive they have positive bargaining power

84% of the respondents have had several job offers during the year, 46% of whom contacted weekly or monthly with proposals for new jobs.

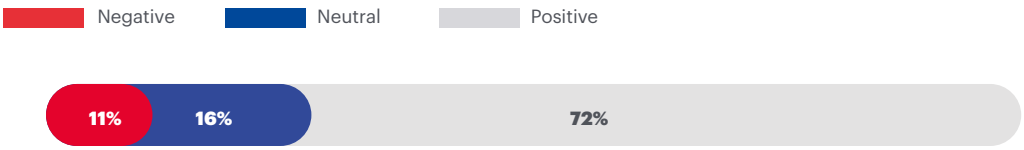
Perception of the bargaining power of ICT and AI practitioners

2022

Source: BCG/ The Network

People with digital experience receive many job offers and are considered with strong bargaining power

How do you perceive your bargaining power?

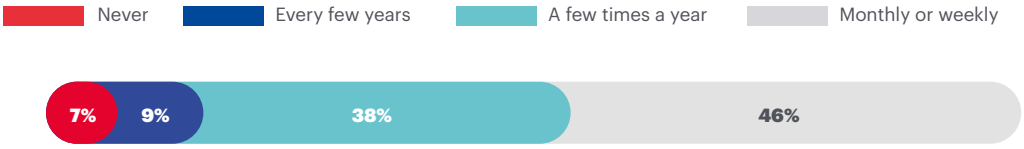


Frequency with which ICT and AI professionals are approached to offer a job position

2022

Source: BCG/ The Network

How often are you approached with potential job opportunities?



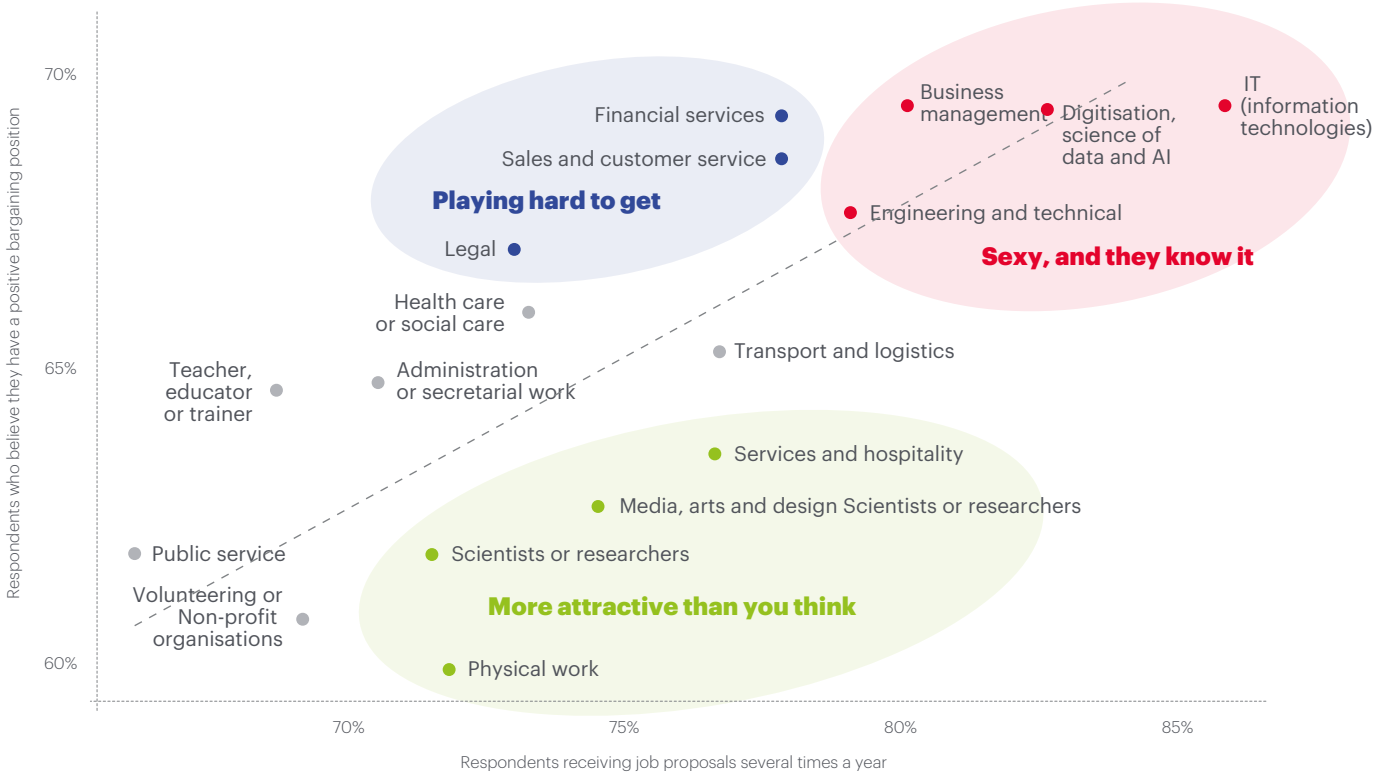
The 3 roles with the most bargaining power, real and perceived, are IT roles, digital profiles such as AI experts or data scientists, and business management

These profiles have the most bargaining power, both perceived and real. They are recognised as experts, which provides a strong negotiating position.

Bargaining power - real and perceived - varies according to role

2022

Source: BCG/ The Network



Factors that make a job attractive

In Spain, developers are most happy with their work (90%). The key factors for employees' job satisfaction are a good work-life balance and a fair wage

On the other hand, the feeling of personal unproductivity is one of the biggest reasons why developers are unhappy with their work.

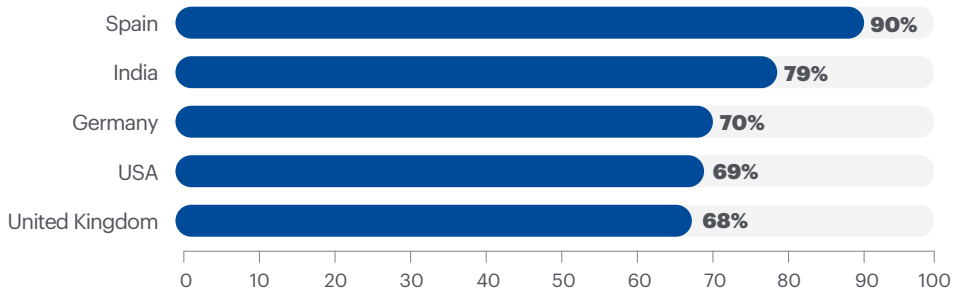
"The labour market situation for ICT talent has not changed much in recent years; we have difficulty filling vacancies. NTT Data has also developed many initiatives to foster this talent in schools. We are proud to be part of the growing prestige of our industry in the job market and to be the front-runner in terms of employability and the solutions being brought to society, especially in the younger sector."

Alex Fabra
Public Sector Partner at NTT Data

Ranking of countries with the most developers happy with their work

2022

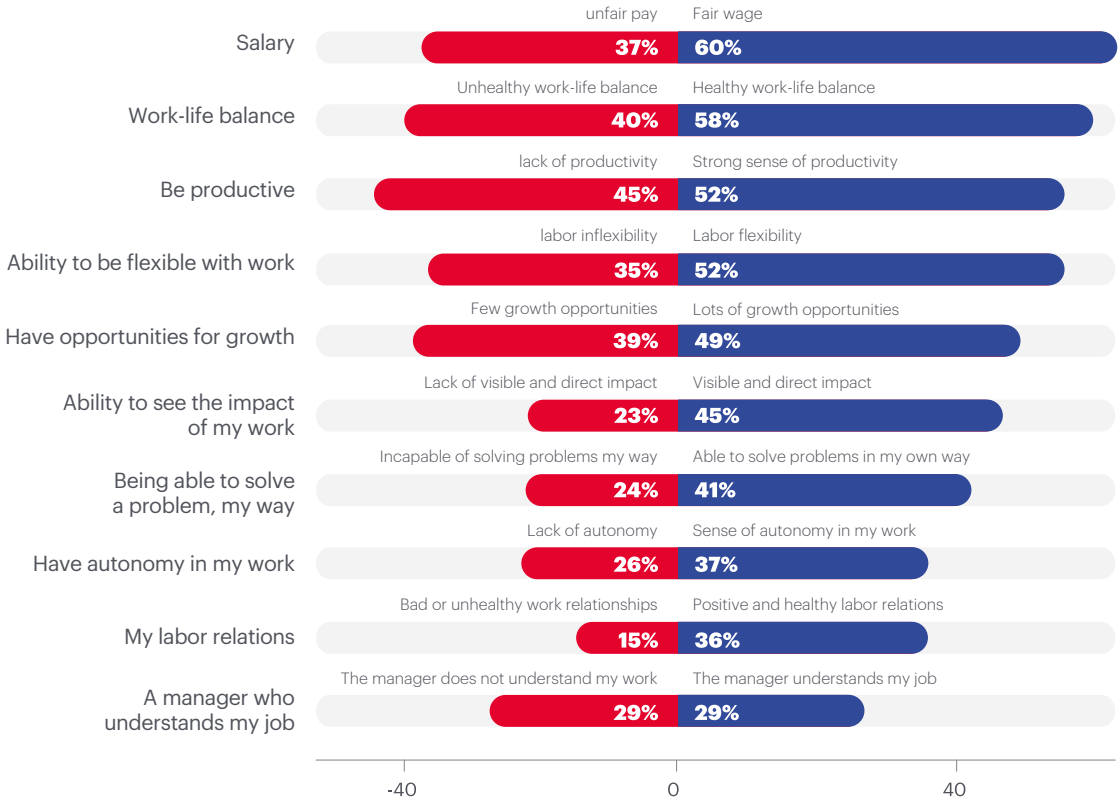
Source: Stack Overflow Developer Survey



What do developers like and dislike most and least about their work?

2022

Source: Stack Overflow Developer Survey



In Europe, one of the main reasons for changing jobs is to have opportunities for growth and leadership and to work with new technologies, second only to the search for a better salary

The elements that make a job attractive can also be identified by analysing the motives that push developers to seek a new job. More than 60% of European developers are motivated to change jobs because of better pay, followed by growth and leadership opportunities (almost 40%).

Reasons why ICT specialists want to change jobs

2022

Source: Stack Overflow Developer Survey

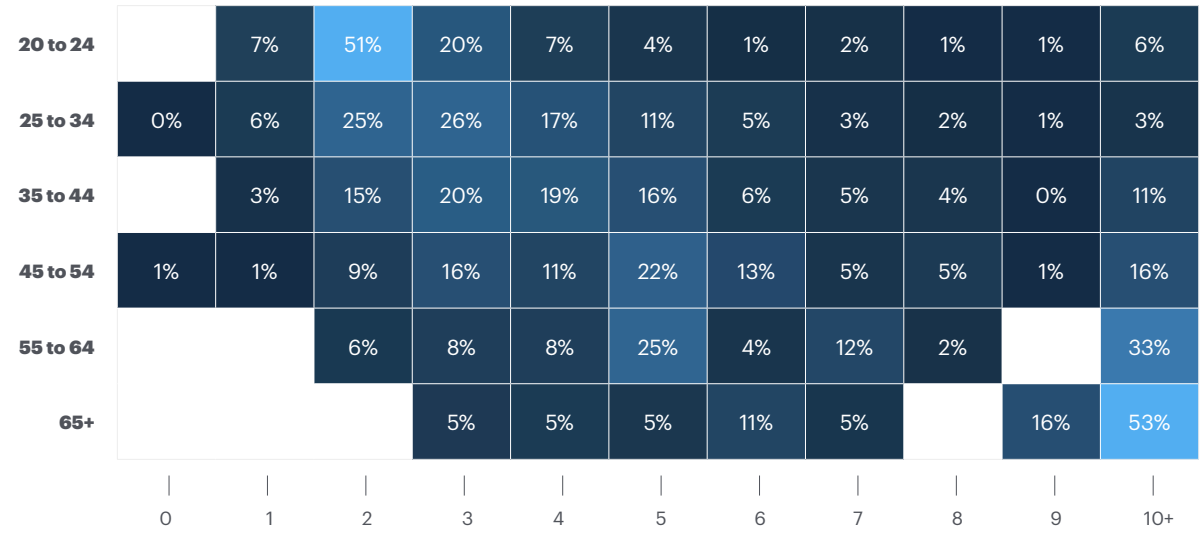
Developers change jobs frequently throughout their careers, although 66% of professionals seek a stable job and a good work-life balance. For this reason, it is becoming increasingly important for companies to attract talent and consider their motivations and interests to retain them.

There is a large variability in the number of jobs held by developers according to their age. 70% of developers aged 20-24 have worked in 2 or 3 different positions, while those aged 25-34 have worked in an average of 2-5 positions. However, there is a significant difference in the 35-44 age group, where 11% of workers have held more than 10 jobs. 62% of workers aged 45-54 have worked 5 or more jobs.

Number of positions developers have held during their professional career by age

2022

Source: Stack Overflow Developer Survey



Note: according to the source methodology, not all percentages add up to 100%

« »

"Human beings have always adapted to new technologies and ways of improving things. Combining innovation, technology, and human ingenuity will help us overcome major challenges. Much has been said about how robotisation will destroy jobs, but what we anticipated has finally happened: technology drives human capabilities rather than replacing them. Our world is improving, but to make further progress, we must strive to overcome divisions, accelerate human progress and reduce inequalities. The way to build a common horizon and increase prosperity for the many, not just the few, is to equip people with the skills to use technology and thus create a future of employment closer to what professionals want."

Francisco Ribeiro

Country Manager of ManpowerGroup España


MIND
MATTER

Staff on demand

In 2022, the demand for project-based developers (staff on demand) decreased slightly

Over the last two years, there has been a drop in demand in April and a slight recovery in May without reaching pre-pandemic levels.

« »

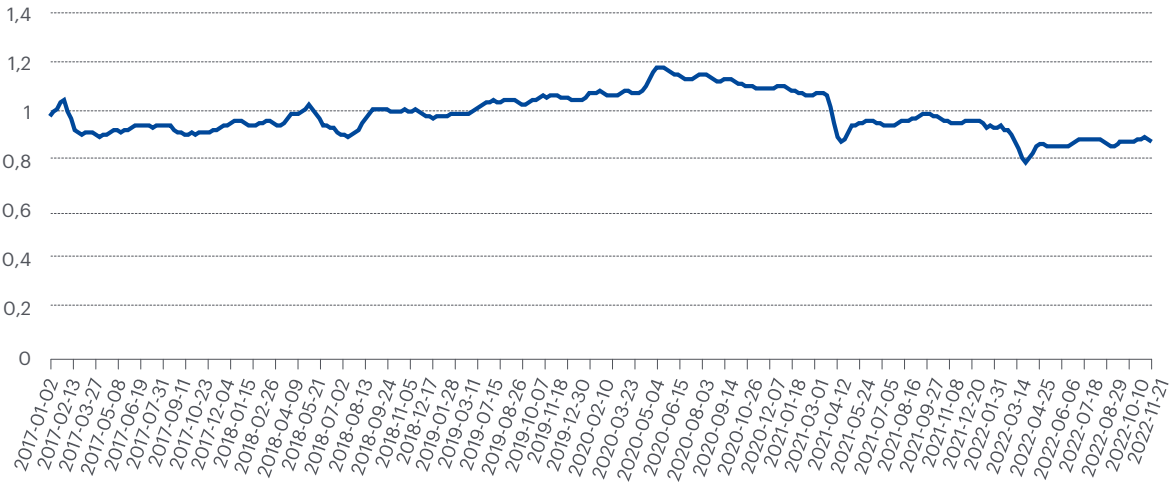
“Digital talent in Europe has seen remarkable growth in recent years, becoming an undoubted source of quality jobs that will continue to grow. At Ingram Micro, we understand that digital talent is key to driving and adapting to fast-moving global trends and necessary to remain competitive in an increasingly demanding and changing environment. In this challenging landscape, finding the right talent becomes a difficult but critical task for companies' digital success and development for the coming decades.”

Jose Luis Sánchez
Director of Ingram Micro Cloud in Spain

Demand for projects by software development professionals

2020-2022

Source: Online Labour Index (Oxford Internet Institute)

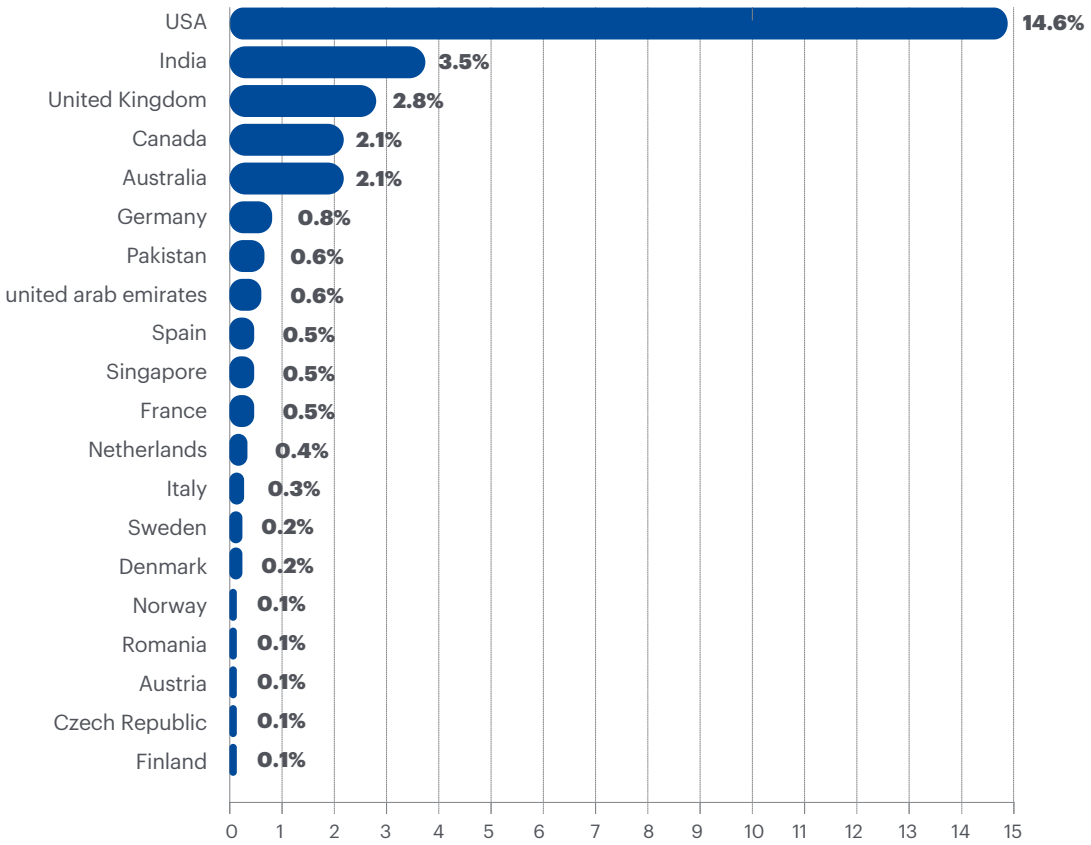


The United States has the highest developer demand for projects (14.6%). India (3.5%) and the United Kingdom (2.8%) follow with a much lower volume.).

Developer demand by project by employing region

2022

Source: Online Labour Index (Oxford Internet Institute)

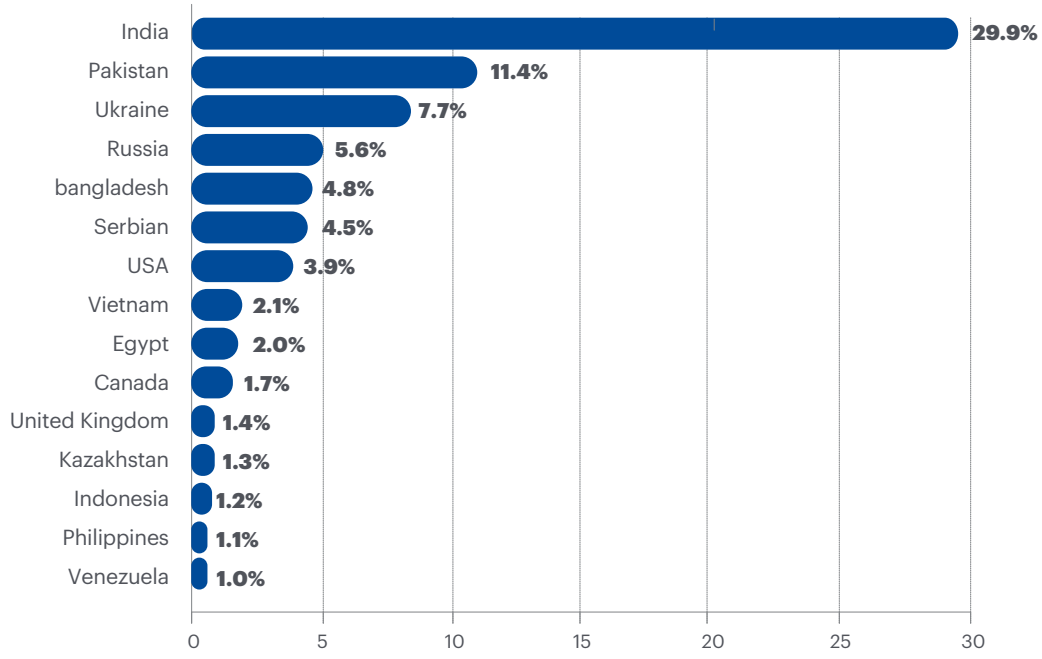


Almost 1 out of every 3 workers is from India (29.9%), making it the top country in project-based developer contribution.

Top 15 countries contributing workers

2022

Source: Online Labour Index (Oxford Internet Institute



2
Digital Talent in Barcelona

Digital professionals in Barcelona

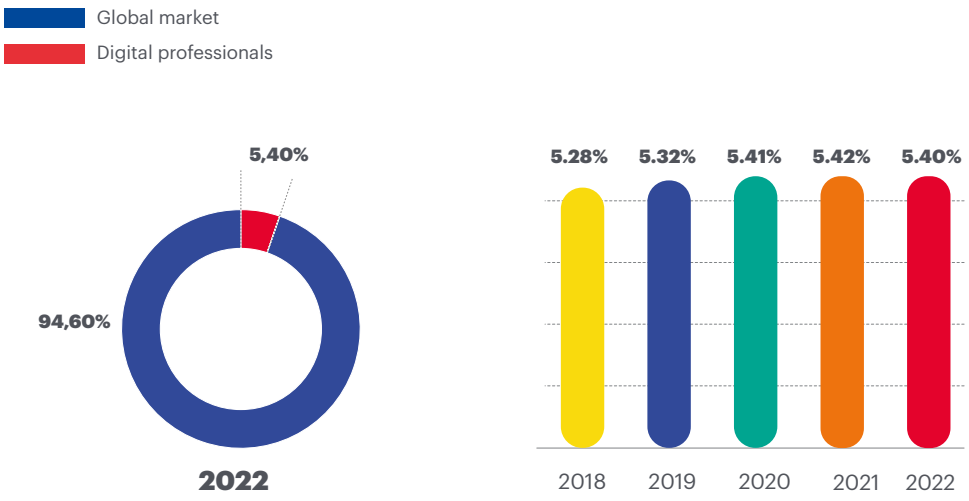
In the 2018-2022 period, ICT employment has grown by almost 50% in Barcelona. Specifically, the city has 33,200 more professionals

The total number of digital professionals in Barcelona continues to increase, with 7,404 more professionals than the previous year. The share of digital professionals in the overall market stabilised at 5.4%.

Percentage of digital professionals vs Total employment

2020-2021

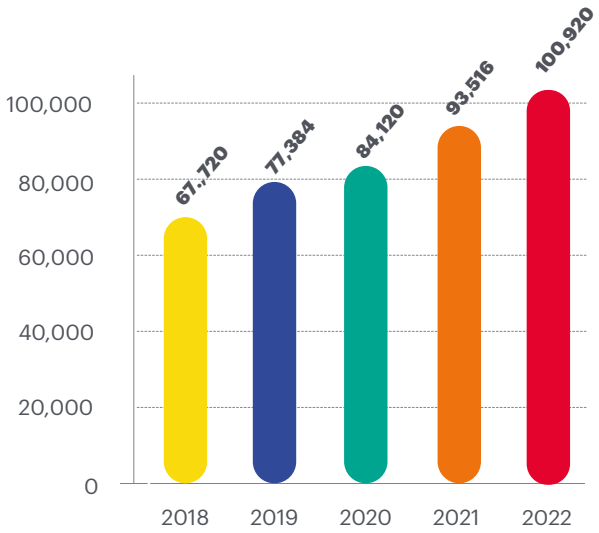
Source: TalentUp.io for Mobile World Capital Barcelona



Note: Data on overall sectors do not include blue-collar workers.

Total digital professionals

2018-2022

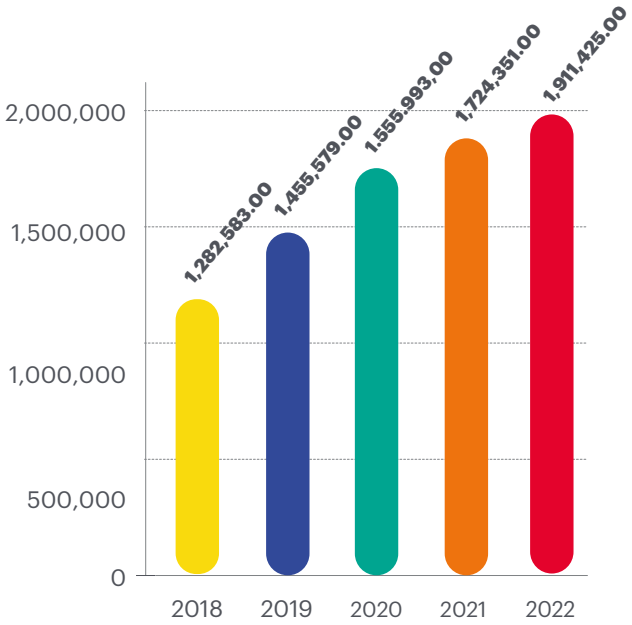


2019 ▲ **+14.3%**
2020 ▲ **+8.7%**
2021 ▲ **+11.2%**
2022 ▲ **+7.9%**

Note: Data does not include digital marketers

Total professionals (all sectors)

2018-2022



2019 ▲ **+13.5%**
2020 ▲ **+6.9%**
2021 ▲ **+10.8%**
2022 ▲ **+10.8%**

Note: Data on overall sectors does not include blue-collar workers.

Source: TalentUp.io for Mobile World Capital Barcelona

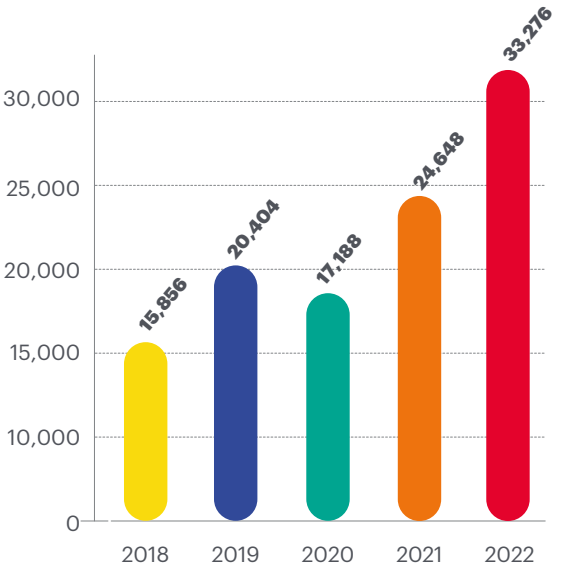
ICT sector demand

In the last two years, the demand for digital professionals has almost doubled; by 2021, it has increased by 35%

In 2018, the demand for digital professionals represented 11% of total demand across all sectors, while in 2022, this percentage increased to 26%.

Demand for digital professionals

2018 - 2022

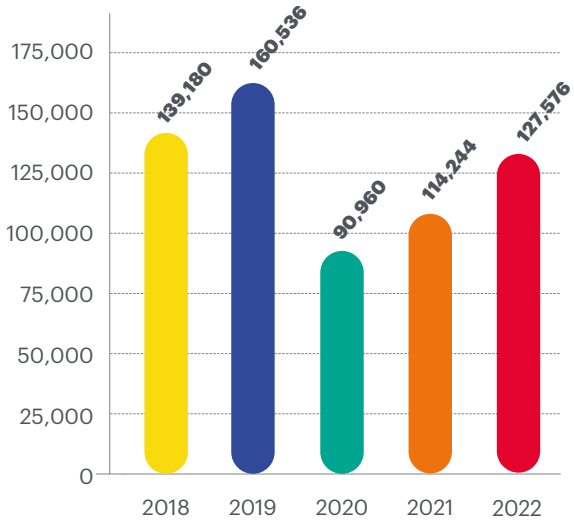


2019 ▲ **+28.7%**
2020 ▼ **-15.8%**
2021 ▲ **+43.4%**
2022 ▲ **+35.0%**

Note: Note: Demand is annualised based on data for one quarter of the year 2022.
Digital professional data does not include digital marketers.

Demand all sectors

2018 - 2022



2019 ▲ **+15.3%**
2020 ▼ **-43.4%**
2021 ▲ **+25.6%**
2022 ▲ **+11.7%**

Notes: Demand is annualised based on data for one quarter of 2022.
Data on overall sectors do not include blue-collar workers.

Source: TalentUp.io for Mobile World Capital Barcelona

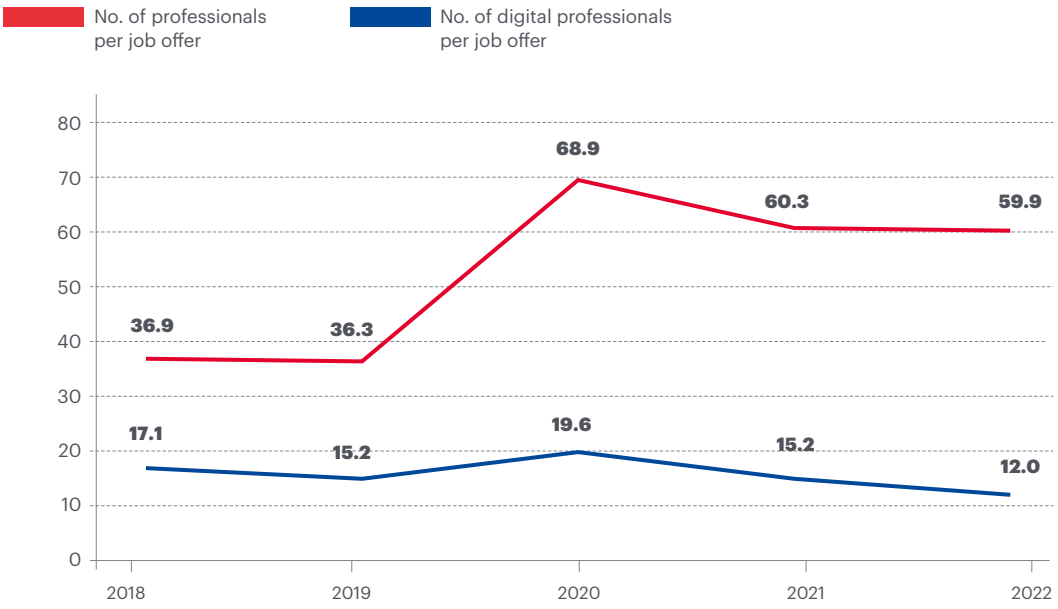
Shortage of employees in the ICT sector. The number of digital professionals per job offer has been decreasing over the last 2 years, from 20 to 12 professionals

The number of professionals per job offer outside the digital domain remains at the same level as the previous year, with 60 professionals per job offer.

Market tension

2018-2021

Source: TalentUp.io for Mobile World Capital Barcelona



Note: The ratio 'Number of digital professionals per job offer' is calculated based on quarterly demand.

Note: Data on overall sectors does not include blue-collar workers.

Established technology talent supply and demand

The most demanded and offered talent profile in 2022 was the Web Developers profile. The job vacancies with the greatest shortage of professionals are cybersecurity vacancies, followed by Big Data and Cloud (AWS)

60% of the talent supply is based on two technologies, Web Development and UX/UI. CRM/ERP Consultants are the third most offered profile. The profile that has grown the most is Business Intelligence (+60%), followed by Scrum/Agile professionals (+41%).

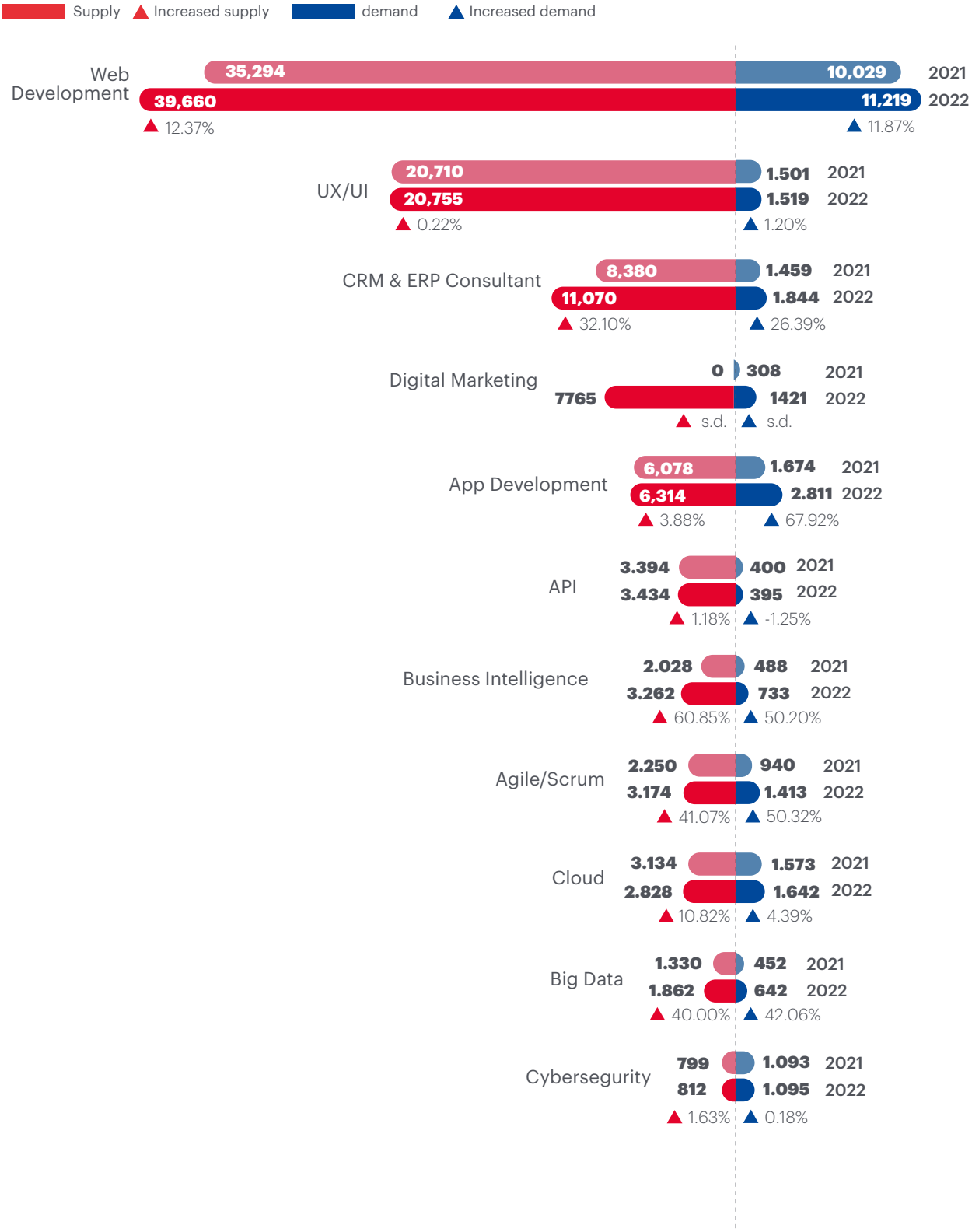
"At Agbar, digital talent ranges from generating knowledge in the CETAQUA technology centres to creating solutions based on sensorisation and data exploitation for smart water management. Our strategy for attracting and retaining talent is based on a flexible working model, continuous learning, project-oriented development opportunities and an unbeatable purpose: improving people's and the environment's quality of life."

Lluc Pejó
Director of Talent at Agbar

Talent supply and demand for well-established technologies

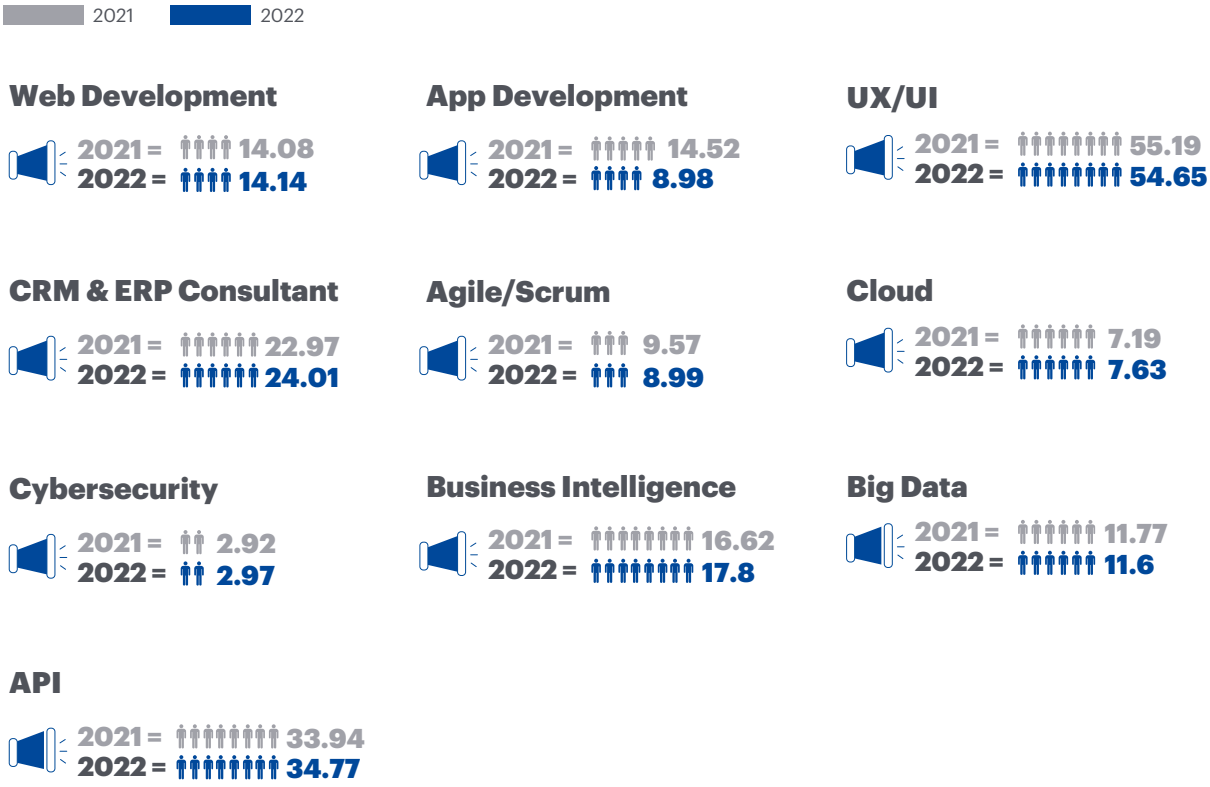
2021 - 2022

Source: TalentUp.io for Mobile World Capital Barcelona



Let's consider the number of digital professionals available for each job offer. We observe that the most saturated technologies are cybersecurity, with 3 professionals per job offer, Cloud (AWS), 8 professionals, App Developers, and Agile/Scrum profiles, with 9 professionals. The least saturated, and therefore, the jobs requiring the most talent, are those seeking UX/UI profiles, with 55 professionals per job offer, and API, with 35 professionals.

Number of digital professionals available for each job offer
2021-2022



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

Within the top 10 most popular fields of expertise in digital compared to 2020 and 2021, the three most popular professional roles remain constant: Web Developer, User Experience Designer and Data Scientist. The other positions have varied over the years.

Most popular positions for well-established technologies

2022

Source: TalentUp.io for Mobile World Capital Barcelona

	1	2	3
Web Developers	Web Developer	Frontend Developer	PHP Developer
App Developers	iOS Developer	Developer	Mobile Developer
UX/UI	User Experience Designer	Ui/Ux Designer	User Interface Designer
CRM&ERP Consultant	Crm Manager	Erp Consultant	Salesforce Developer
Agile/Scrum	Software Engineer	Software Developer	Scrum Master
Cloud (Aws)	Software Engineer	Devops Engineer	Cloud Engineer
Cybersecurity	Security Engineer	Security Consultant	Cyber Security Engineer
Business Intelligence	Business Intelligence Analyst	Business Intelligence Developer	Business Consultant
Big Data	Data Scientist	Data Engineer	Data Analyst
API	Backend Developer	Data Engineer	Frontend Developer
Digital Marketing	Digital Marketing Strategist	Digital Marketing Manager	Marketing Manager

Note: Dentro del ámbito de la seguridad podemos tener un perfil de Security Engineer, más generalista (sistemas, infraestructura, redes, software...) mientras que el ingeniero de Ciberseguridad está más orientado a amenazas del exterior a escala digital: autenticación, vulnerabilidades , pentesting o respuesta y control de ataques o incidencias, recovery plan. Garantiza el sistema y seguridad de los datos y la información.

Emerging technologies talent supply and demand

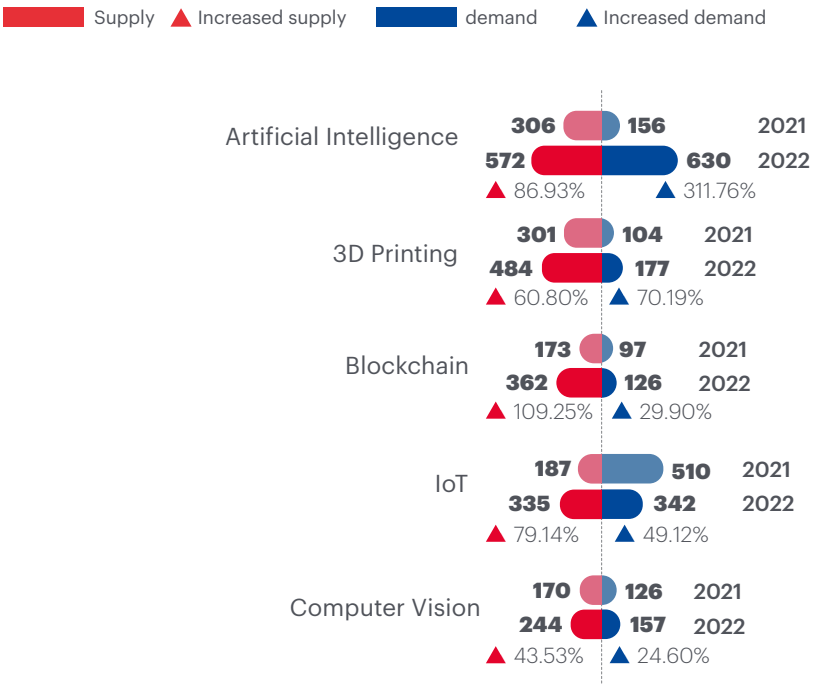
The demand for Artificial Intelligence profiles has tripled by 2021, while the number of professionals has grown by 87%

The demand for emerging technologies has increased concerning the year 2021, as has the number of professionals. This volume of professionals does not cover the demand for Artificial Intelligence and IoT. In contrast, they cover the demand for 3D printing, Blockchain and Computer Vision.

Talent supply and demand for emerging technologies

2021- 2022

Source: TalentUp.io for Mobile World Capital Barcelona

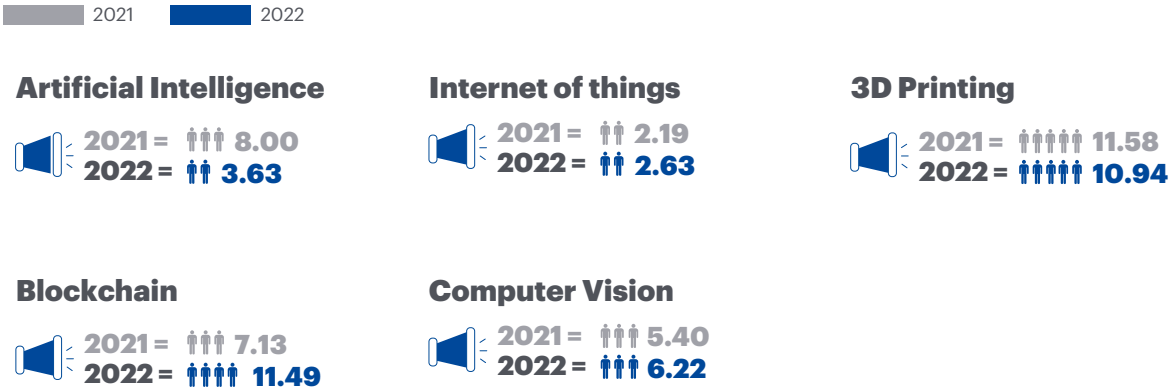


Emerging technologies such as Blockchain, computer vision, or IoT have more professionals available for each job offer than the previous year, while the most significant reduction is in Artificial Intelligence technologies. The most popular positions in these emerging technologies are Intelligence Analysts for Artificial Intelligence, Backend developer for IoT, 3D designer for 3D printing, Blockchain developer for Blockchain and Computer vision engineer for Computer Vision.

Number of professionals available for each job offer

2021-2022

Source: TalentUp.io for Mobile World Capital Barcelona



Most popular positions for emerging technologies

2022

Source: TalentUp.io for Mobile World Capital Barcelona

	1	2	3
Artificial Intelligence	Intelligence Analyst	Artificial Intelligence Specialist	Artificial Intelligence Project Manager
IoT	Backend Developer	Frontend Developer	Full Stack Developer
3D Printing	3D Designer	R&D Engineer	Technical Support Engineer
Blockchain	Blockchain Developer	Blockchain Engineer	Blockchain Architect
Computer Vision	Computer Vision Engineer	Computer Software Engineer	Data Engineer

Remote job offers in Barcelona

It highlights the growth of telework in IoT offerings, increasing by 360% by 2021. 3D printing and Artificial Intelligence have seen a growth in remote job offers

IoT (41.84%), 3D printing (40.91%) and UX/UI (35%) are the most popular remote jobs. The job offers with the least remote work are Business Intelligence (9.71%), Big Data (13.06%) and Digital Marketing (16.27%).

The average number of remote job offers in Barcelona in 2022 for the 15 selected digital profiles is 23.15%, slightly higher than in 2021, which was 22.02%.

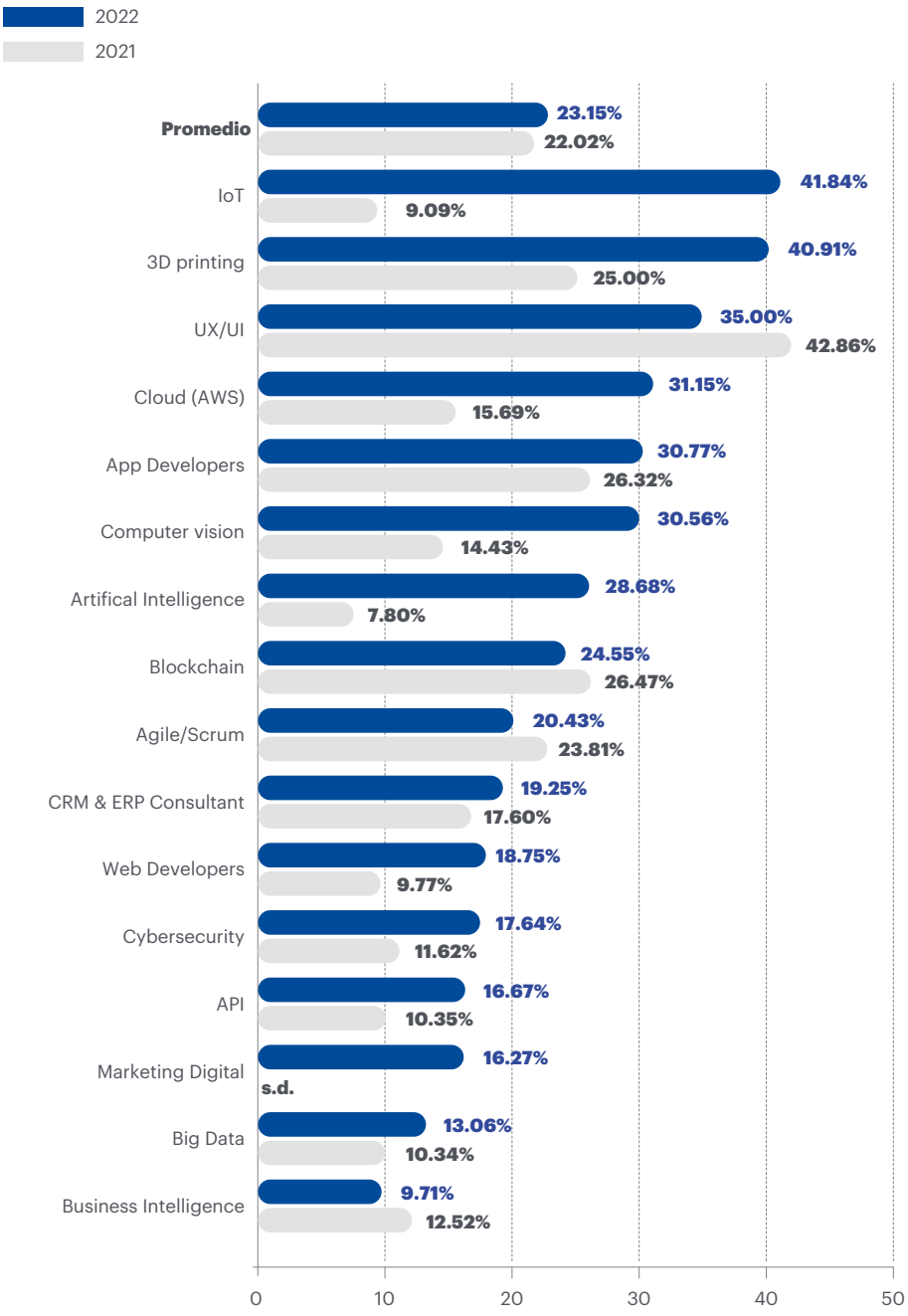
"Barcelona can be proud to be a digital hub, establishing itself as a city of national and international reference. In this unfavourable global context, the digital sector persists in its unstoppable growth and digital profiles are consolidating their position as the most sought-after in the labour market. It is also fascinating and crucial to highlight the importance of profiles linked to Artificial Intelligence, which, until now, have not been given the prominence they deserve."

Jared Gil
CEO & Co-Founder at Nuclio Digital School

Evolution of remote job offers in Barcelona (%)

2022

Source: TalentUp.io for Mobile World Capital Barcelona



Note: The average figure does not consider the digital marketing profile. Only the profiles analysed in the graph are taken into account for the calculation of the average.

Barcelona is among the cities with the most women in the digital sector

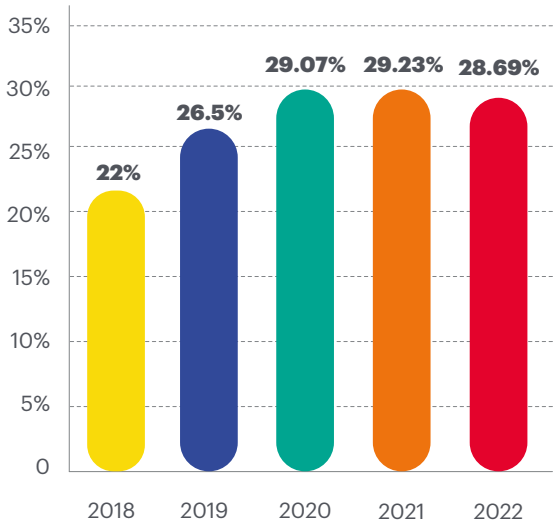
In 2018, the female presence in the sector stood at 22%. In 2022, almost 1 in 3 digital professionals in Barcelona will be women, specifically 28.69%

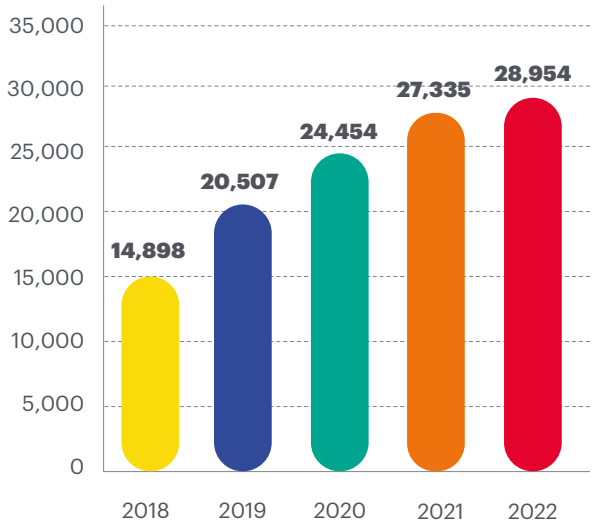
Women's presence has increased in recent years, with increases of 4.5 points in 2019 and 2.6% points in 2020. However, in 2021, the pace slowed to an increase of 0.2%; in 2022, it slowed slightly to -0.5%.

Women in the digital sector by city (%)

2022

Source: TalentUp.io for Mobile World Capital Barcelona





About 1 in 2 Digital Marketing professionals (45.71%) and UX/UI professionals (42.78%) are women

The categories that have seen the greatest growth in the number of women in the last year are CRM & ERP Consultant, Cloud (AWS) and Cybersecurity, with a growth of more than 11 points. The technologies where the presence of women has decreased the most are 3D Printing and UX/UI.

Percentage of women by established technology

2022

Source: TalentUp.io for Mobile World Capital Barcelona

	2020	2021	2022	variation 21-22
Digital Marketing	-	-	45.71%	**s.d.**
UX/UI	48.23%	50.68%	42.78%	**- 7.90%**
CRM & ERP Consultant	25.57%	25.95%	37.89%	**+ 11.94%**
Business Intelligence	30.11%	31.11%	35.61%	**+ 4.50%**
Big Data	29.58%	31.49%	33.11%	**+ 1.62%**
3D Printing	-	40.52%	31.58%	**- 8.94%**
App Developer	21.95%	22.16%	30.65%	**+ 8.49%**
API	27.82%	28.11%	30.57%	**+ 2.46%**
Computer Vision	-	29.76%	29.66%	**- 0.10%**
Artificial Intelligence	-	29.91%	29.53%	**- 0.38%**
Agile/Scrum	20.00%	31.56%	29.12%	**- 2.44%**
Cloud (AWS)	17.57%	17.63%	28.79%	**+ 11.16%**
IoT	-	24.48%	28.29%	**+ 3.81%**
Cybersecurity	12.97%	16.51%	27.65%	**+ 11.14%**
Web Developer	24.52%	25.49%	26.20%	**+ 0.71%**
Blockchain	29.76	10.79%	25.10%	**+ 14.31%**

Digital talent from outside Catalonia

Barcelona has 32.4% of professionals from outside the city. In 2022, it managed to attract more than 3,300 digital professionals. Since 2018, the city has attracted close to 14,000 digital professionals.

Nearly half of the digital talent entering the market last year came from outside Catalonia.

The specialities that attract the most talent from other cities are cybersecurity (43.8%) and app (42.3%), and web (33.8%) developers.

International talent attracted:

+3,300
digital professionals in 2022

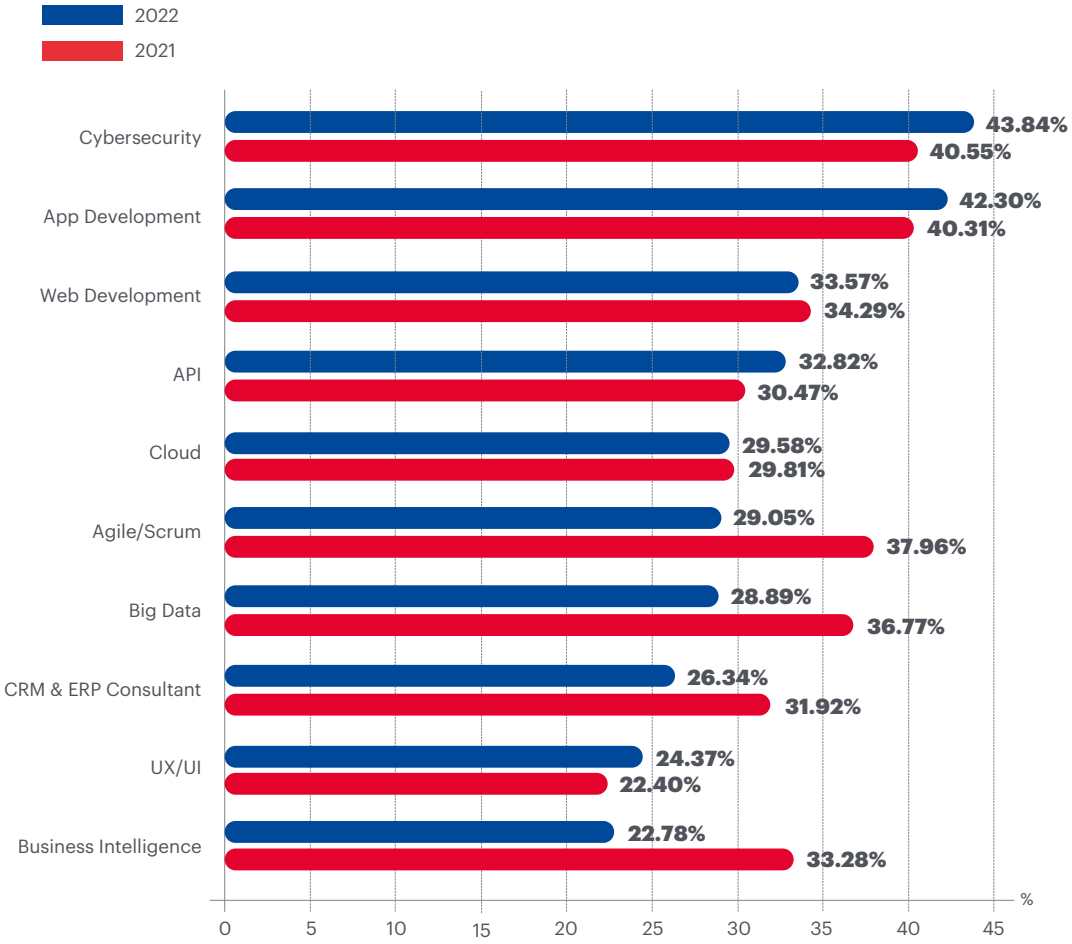
+14,000
digital professionals 2018-2022

Note: data does not include digital marketing in any of the years analysed

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

2021-2022

Source: TalentUp.io for Mobile World Capital Barcelona



"In technology, the demand for talent in fields such as development and programming, data science, artificial intelligence and cybersecurity continues to rise. At Assembler Institute, we continue to be leaders in programming and data science training without neglecting new trends, training highly qualified profiles in the most demanded hard skills and soft skills. At AIT, we not only prepare our students for the present, but we also propel them into the future."

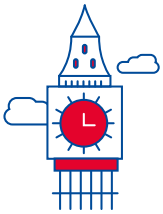
Kasia Adamowicz

COO & Co-Founder at Assembler Institute of Technology

London, with 11.56% and Madrid, with 10.97%, are the cities that export the most talent to Barcelona. These positions are unchanged from the previous year, although Madrid has grown more than London

Migration to Barcelona

2022



London

11.5%

▲ 0.12%

Madrid

10.9%

▲ 0.82%

Buenos Aires

3.4%

▲ 0.74%

Valencia

2.7%

▲ 0.49%

Sao Paulo

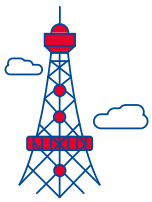
2.6%

▲ 0.16%

México D.F

2.2%

▲ 0.53%



Paris

2.2%

▲ 0.48%

Seville

2.0%

▲ 0.44%

Ámsterdam

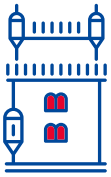
1.6%

▲ 0.68%

Milan

1.3%

▲ 0.45%



Lisbon

1.3%

▲ 0.46%

Dublin

1.2%

▲ 0.21%

Other

56.1%

▲ -5.92%

Source: TalentUp.io for Mobile World Capital Barcelona

Migration to Barcelona by well-established technologies and by city (%)

2022

	London	Madrid	Buenos Aires	Sao Paulo	Valencia	Paris
Web Developers	5,76	16,05	3,87	1,82	3,34	3,3
App Developers	13	12,44	3,85	3,43	1,08	0,93
UX/UI	13,06	16,52	7	4	0,36	0,41
CRM & ERP Consultant	31,16	12,4	0,62	4,31	6,41	0,75
Agile/Scrum	13,73	5,85	10,92	6,76	0	4,76
Cloud (AWS)	12,89	4,06	0,67	0,7	8,62	0
Cybersecurity	10,01	5,4	4,4	5,9	0,72	6,26
Business Intelligence	4,55	12,29	0,53	0,6	0,48	1,06
Big Data	3,97	12,31	0,48	0,32	4,65	1,11
API	10,98	8,05	0,63	0,02	0,96	4,46
Digital Martketing	8	15,3	5,3	1,2	3,2	1,9

	Mexico City	Seville	Dublin	Amsterdam	Milan	Lisbon	Other
Web Developers	2,59	1,04	0,67	1	2,45	1,75	56,36
App Developers	0,57	2,51	0,88	3,96	3,35	0,49	52,86
UX/UI	0,38	5,86	0,11	0,45	0,52	0,91	49,75
CRM & ERP Consultant	5,73	3,88	0,72	1,1	0,64	1,14	31,14
Agile/Scrum	0,94	4,48	2	3,39	0,62	0,59	44,72
Cloud (AWS)	3,84	0	3,93	4,17	0,99	0,97	58,53
Cybersecurity	0,77	0,72	0,16	0,25	0,71	0,38	64,32
Business Intelligence	7,32	0,35	0,67	0,52	0,39	3,12	68,12
Big Data	0	0	3	1	1,06	3,38	67,91
API	0,85	0,93	0,97	0,63	3,25	0,7	67,57
Digital Martketing	2,1	2,4	0,43	1,6	0,94	1,2	56,43

Source: TalentUp.io for Mobile World Capital Barcelona

The leading contracting companies in the digital sector

Diversity of business profiles among the companies that hire the most digital talent

Barcelona's digital sector comprises a mix of consultancies, technology hubs, scaleups and research centres. Various sectors are represented, including technology, insurance, advertising, and delivery.

Compared to 2021, most companies remain in the ranking. Barcelona Supercomputing Centre (BSC), Capgemini and Amazon are new additions.

Companies with the highest demand for digital profiles in Barcelona

2022

Source: Job Market Insights

	Company	Sector
1	NTT Data	Consulting
2	Seidor	Consulting
3	Zurich	Insurance
4	Adevinta	Advertising
5	HP	Technology
6	Accenture	Consulting
7	Glovo	Delivery
8	Capgemini	Consulting
9	BSC Barcelona Supercomputing Center	Technology
10	Amazon	Delivery

Top 10 recruiters 2022

2022

Source: Job Market Insights

	1	2	3
Web Developers	ERNI	Webhelp	King.com
App Developers	Veepee	Zurich	Accenture
UX/UI	HP	Cimpress	King.com
CRM & ERP Consultant	FreeNow	Glovo	HP
Agile/Scrum	Allianz	SAP	Zurich
Cloud (AWS)	Accenture	Webhelp	NTT Data
Cybersecurity	NTT Data	Ibermática	EY
Business Intelligence	Amazon	Deloitte	Bismart
Big Data	Capgemini	Accenture	Minsait
API	Allianz	NTT Data	Sanofi
Artificial Intelligence	Amazon	Deloitte	Accenture
IoT	Giesecke & Devrient	Fundació i2cat	Nestlé
3D Printing	HP	Sogeti	Leitat Technological Center
Blockchain	Freeverse	GFT	Scopely
Computer Vision	BSC	Ficosa	Hipra
Digital Marketing	Grupo Planeta	Gartner	HP

Evolution of ICT studies in the university

The demand for degree programmes in the digital/ICT field shows a positive trend. In the 2021-2022 academic year, the number of students enrolled has increased by 4.2% compared to the previous academic year, 2020-2021

Significant increase in ICT graduates in the last 5 years to reach 2,350 graduates in the 2021-2022 academic year.

The educational centre with the highest number of students enrolled is the Universitat Oberta de Catalunya (UOC), which concentrates 40.3% of the total number of students enrolled in official degree programmes in ICT. The second most important university is the Universitat Politècnica de Catalunya (UPC). During the 2021-2022 academic year, 2,350 students graduated, representing an increase of 25.7% compared to the previous academic year, 2020-2021, with the UPC standing out as the university with the most graduates.

« »

"At EAE Business School Barcelona and its team of professionals who accompany our students, we note that whether they choose the path of business or entrepreneurship, the "digital first" mentality must be present to connect talent with solid professional opportunities worldwide, especially in Barcelona as a hub of innovation, entrepreneurship and digitalisation."

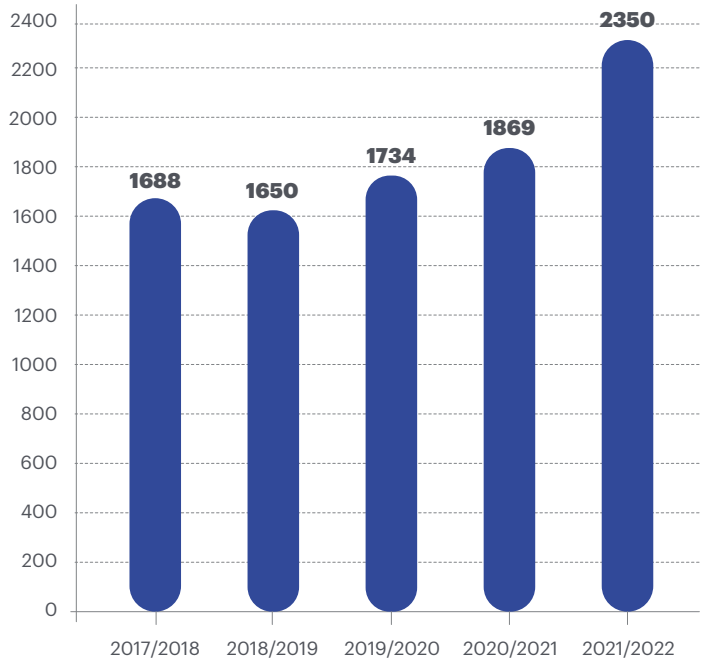
Anna Boixader

Director of the Talent for Impact Center at EAE Business School Barcelona

Graduates with ICT degrees

2022

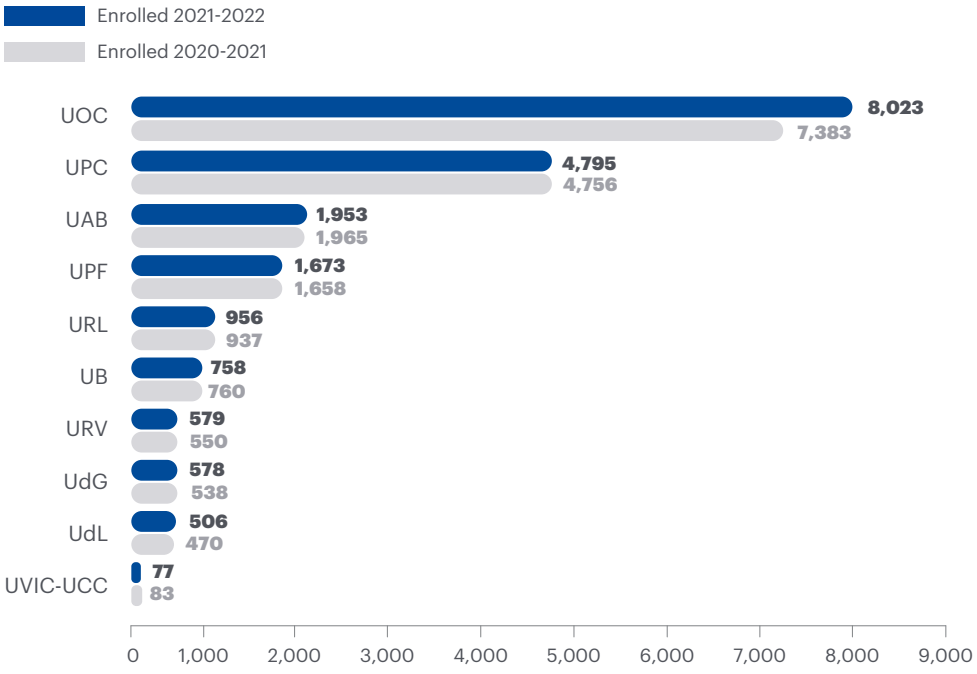
Source: Departament de Recerca i Universitats de la Generalitat de Catalunya



Students enrolled in official ICT degrees in Catalonia

2022

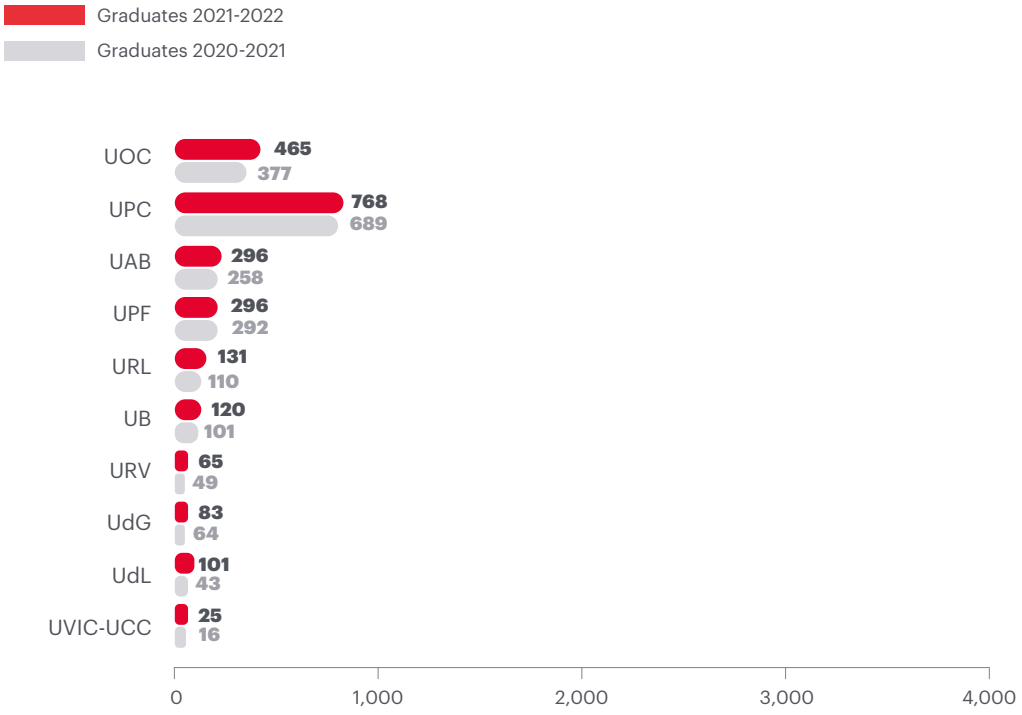
Source: Departament de Recerca i Universitats de la Generalitat de Catalunya



Graduates with official ICT degrees in Catalonia

2022

Source: Departament de Recerca i Universitats de la Generalitat de Catalunya



***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, Computer Engineering - Management and Information Systems, 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 Applications Techniques, Web and Mobile Applications Development Techniques, Digital Interaction and Computing Techniques, Telecommunication Technologies

Upskilling from university master's degrees

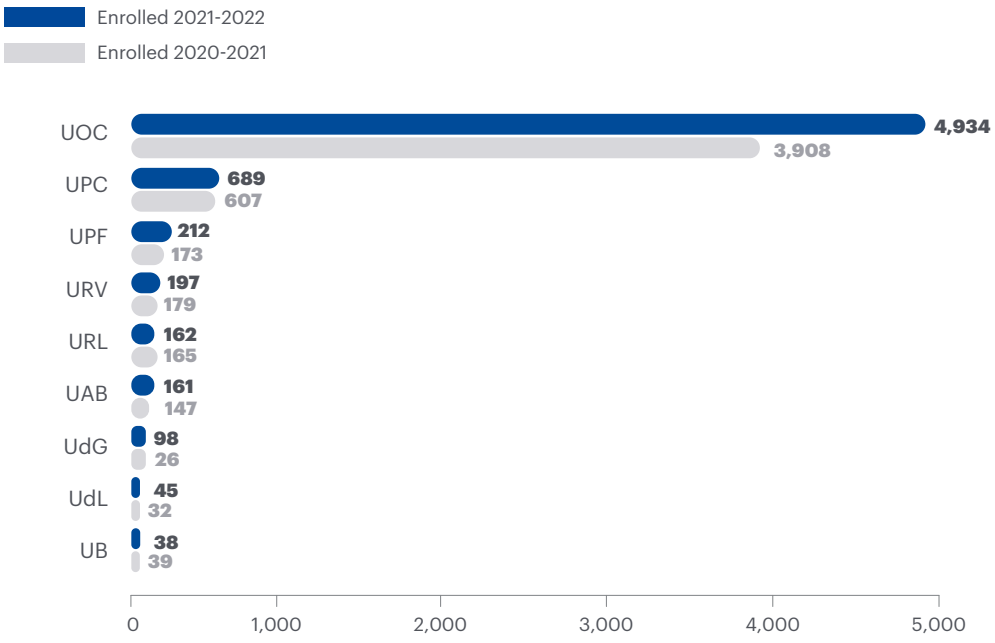
The number of students enrolled in official master's degrees has experienced a general increase (23.9%) during the academic year 2021-2022 compared to the previous year, reaching 6,536 students

The number of graduates has increased by more than 12% compared to the previous academic year, 2020-2021, with 1,800 students graduating in the 2021-2022 academic year. The universities that contribute the most graduates to digital talent in absolute terms are the UOC, the UPC and the UPF. Regarding the graduate/enrolment rate, approximately 80% of students enrolled at the UAB obtain their degree, followed by UPF, URL and UB, with more than 60% of students obtaining the degree.

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

2022

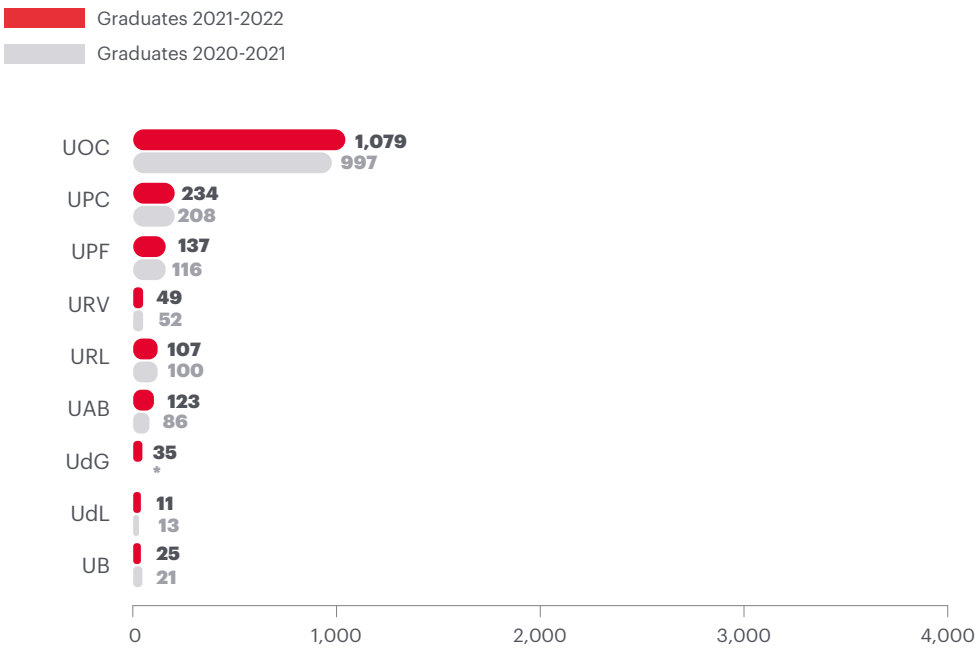
Source: Departament de Recerca i Universitats de la Generalitat de Catalunya



Graduates with official ICT degrees in Catalonia

2022

Source: Departament de Recerca i Universitats de la Generalitat de Catalunya



***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; Biomedical Computational 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 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

The great capacity of Catalan universities to train digital talent is reflected in their figures. More than 6,500 places in ICT degrees were offered in the 2021-2022 academic year, and 84% of these places were filled. Public universities cover almost 100% of the places offered

Of the total number of students enrolled in the last year of the degree, only 26% obtained their degree in the same year. 55% continue studying, and 19% drop out of the Catalan University System.

Access rate to university studies (ICT)

2022

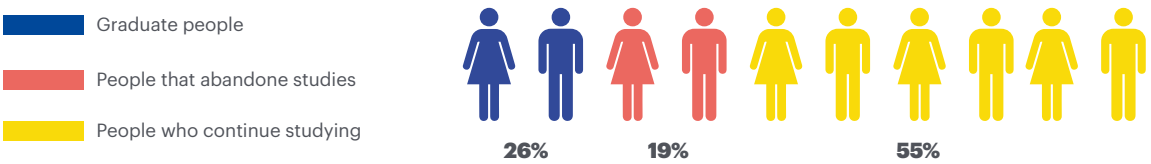
	Places offered	Demand 1st preference - June	New access	% Covering Places (new access/places)
Public	2870	3402	2787	97.10%
Private	350	nd	248	70.90%
Total Face-to-Face Univ	**3220**	**3402**	**3035**	**94.30%**
Non-face-to-face	3350	nd	2486	74.20%
Total Non-Face-to-Face Univ.	**3350**	nd	**2486**	**74.20%**
Total Catalan University System	**6,570**	**3,402**	**5,521**	**84.00%**

Cohort analysis degrees (ICT)

2022

Source: Departament de Recerca i Universitats de la Generalitat de Catalunya

Status in the last SUC enrolment year



ICT studies in Vocational Education and Training (VET)

VET is consolidated as one of the mechanisms for generating ICT profiles, reaching 2,880 graduates in 2022

A gender gap persists in computer and communications studies, with a similar proportion to the previous year (10.9% of women). Although this percentage is low, there has been a significant absolute increase in the number of women enrolled in computer vocational training programmes, with an increase of 1,311 students, representing an increase of more than 10% compared to the previous academic year.

Barcelona continues to expand its training capacity in VET. In the academic year 2021-2022, the number of places offered in Computer Science and Communications has increased by more than 11% (15,264)

Evolution of VET graduates in the ICT field

2022

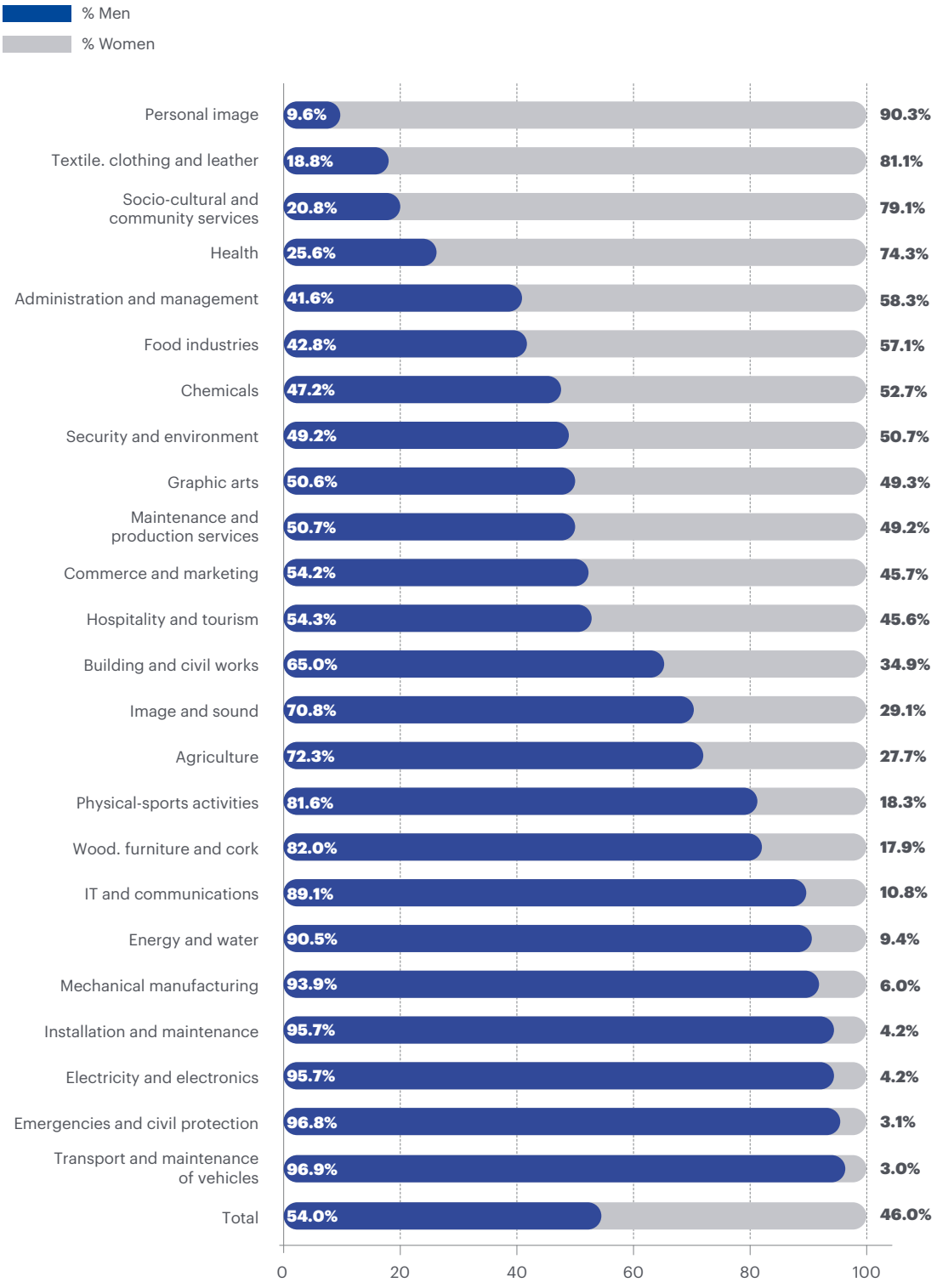
Source: Datos elaborados por la Fundació BCN Formació Professional a partir de datos del Departament d'Ensenyament de la Generalitat de Catalunya

"Barcelona has become a unique and growing ecosystem, a pole of attraction for companies and professionals worldwide. The report accounts for this transformation and becomes a benchmark for strategic planning. For ESIC and our commitment to training marketing and digital business professionals, the challenge is to combine the attraction of international digital talent that wants to come and train in Barcelona with the promotion of local talent, which is essential to maintain the uniqueness of the city's digital ecosystem."

Dr. Joan Baltà Pelegrí
Academic and quality director at ESIC Catalonia

VET enrolment by professional families and gender. Barcelona Metropolitan Area

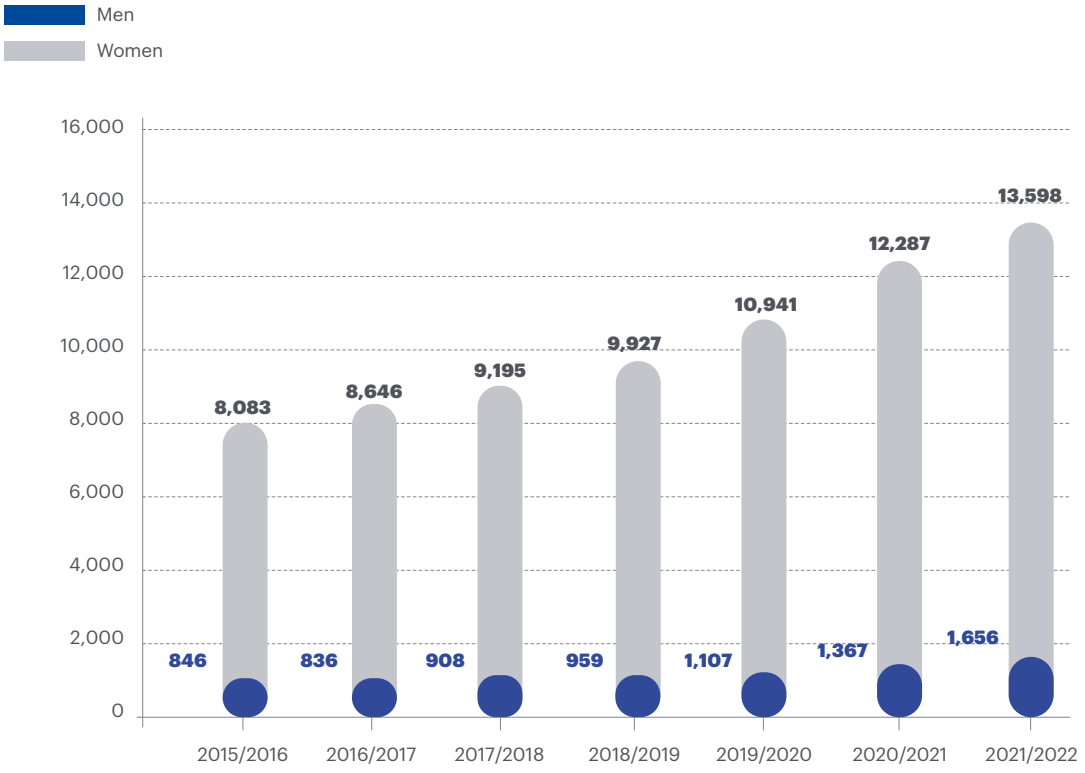
2021-2022



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

2021-2022



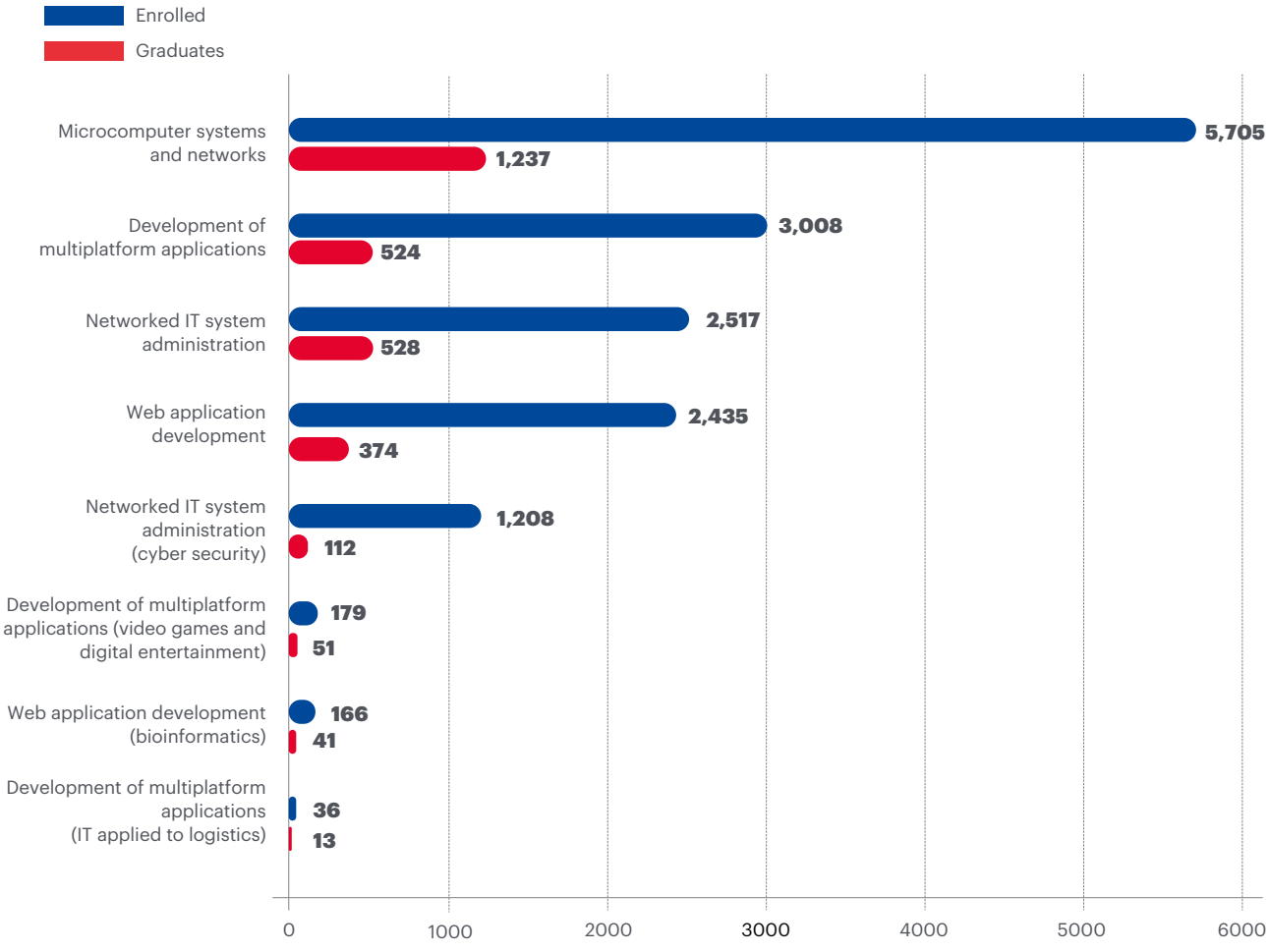
Source: Data compiled by Fundació BCN Formació Professional based on data from the Department of Education of the Government of Catalonia.

Vocational education and training specialised in ICT generated 2,880 graduates in the 2020-2021 academic year. Of these, about half specialised in microcomputer and network systems

The most demanded VET courses are Microcomputer systems and networks, with more than 5,500 enrolments, Multiplatform application developers (3,008), Administration of networked computer systems (+2,500) and Web application development (+2,430).

Enrolled students and graduates VET, "IT and Communications" professional family. Barcelona Metropolitan Area

2021-2022



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

Centres where digital talent has been trained in Barcelona

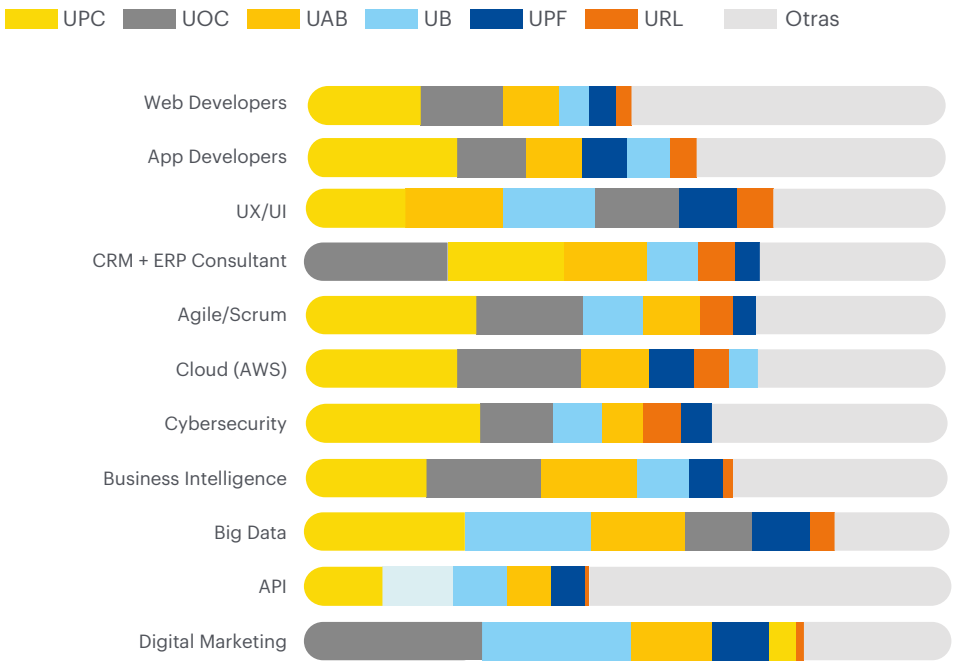
The Polytechnic University of Barcelona is a leader in training in all emerging and practically all established technologies. The only technologies that do not lead in training are CRM & ERP consultant and Digital Marketing, in which the UOC occupies the first position regarding the volume of people trained.

It should be noted that the "other" category includes bootcamps specialising in digital skills, such as Ironhack or Skylab, as well as other centres such as Nuclio Digital School, Assembler, Le Wagon, IT Academy. In the Digital Marketing segment, centres such as ESIC or EAE also stand out.

Centres where specialists in established technologies have been trained

2022

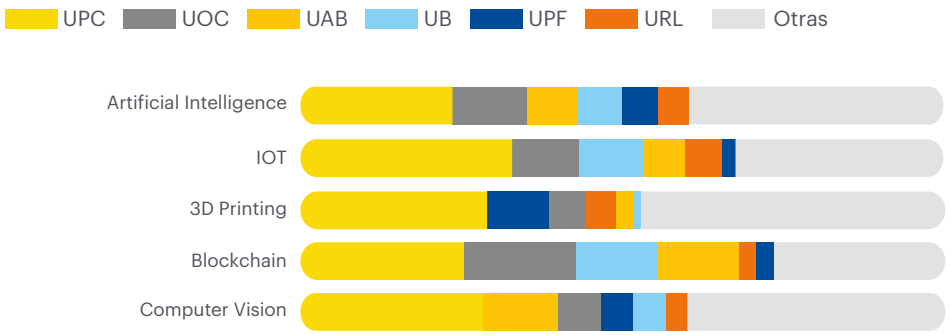
Source: TalentUp.io for Mobile World Capital Barcelona



Centres in which specialists in emerging technologies have been trained

2022

Source: TalentUp.io for Mobile World Capital Barcelona



"Faced with a reality and a market in constant change, Ironhack offers training for digital profiles in Bootcamp format, with a strong practical component and an emphasis on soft skills. Ironhack is a solution not only to students but to the changing needs of the market, providing companies with quality junior professionals and thus responding to the main technological challenges of companies."

Hel·lena Prat

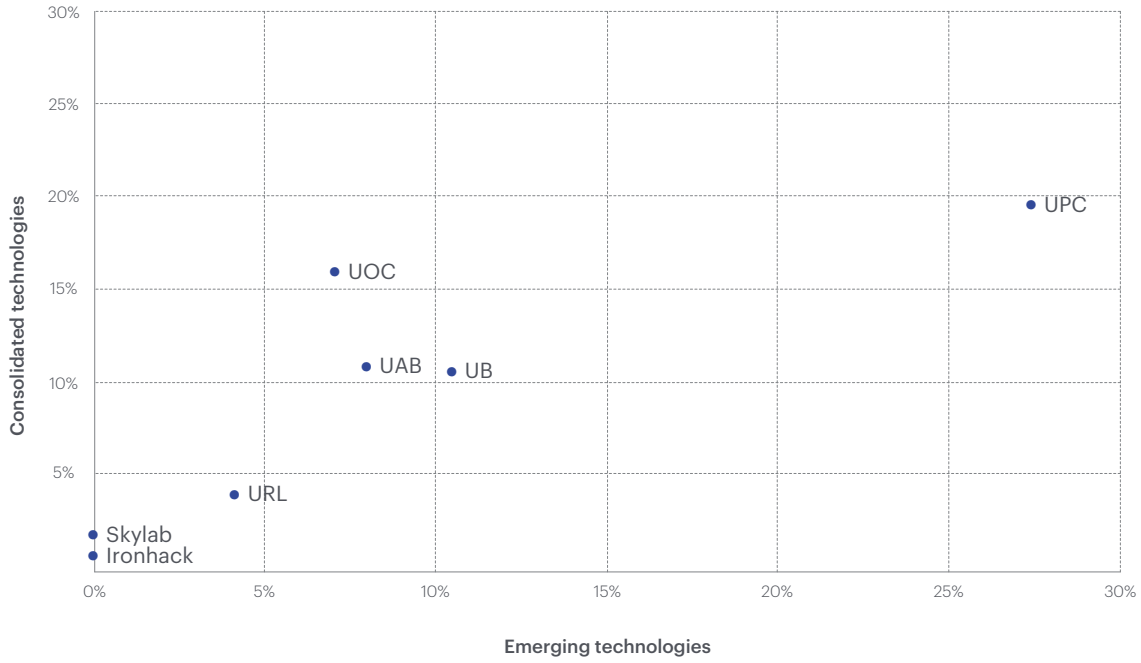
General Manager Ironhack Spain

The UPC is a leader in training in well-established and emerging technologies. In established technologies, the UOC is the second largest training centre, followed by the UAB and the UB. In emerging technologies, the UPC is the training centre that has adapted most quickly to these new technologies, followed by the UB.

% of professionals trained: established and emerging technologies

2022

Source: TalentUp.io for Mobile World Capital Barcelona



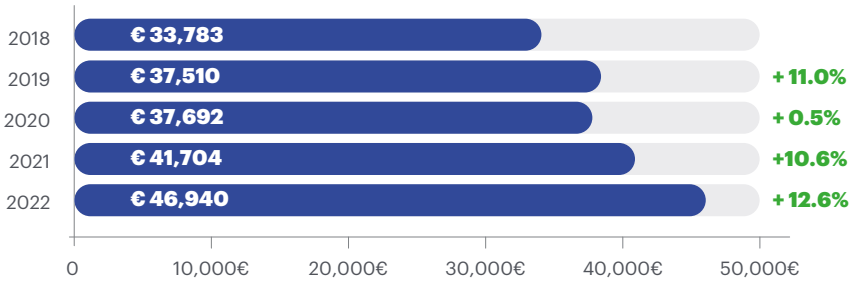
Note: The axes represent the weight of each centre in training in established and emerging technologies.

Digital professionals' wages by speciality

The average salary of a digital professional in Barcelona in 2022 is €46,940 and follows a positive trend in recent years

All profiles of digital professionals have experienced a salary increase compared to the previous year. However, in some cases, such as 3D Printing, it is very low (+0.2%).

Cybersecurity (€56,000), API (€53,800) and Artificial Intelligence (€48,954) are the highest-paid profiles. Digital Marketing is the profession whose salary is furthest from the average, with an average gross salary of €32,500.



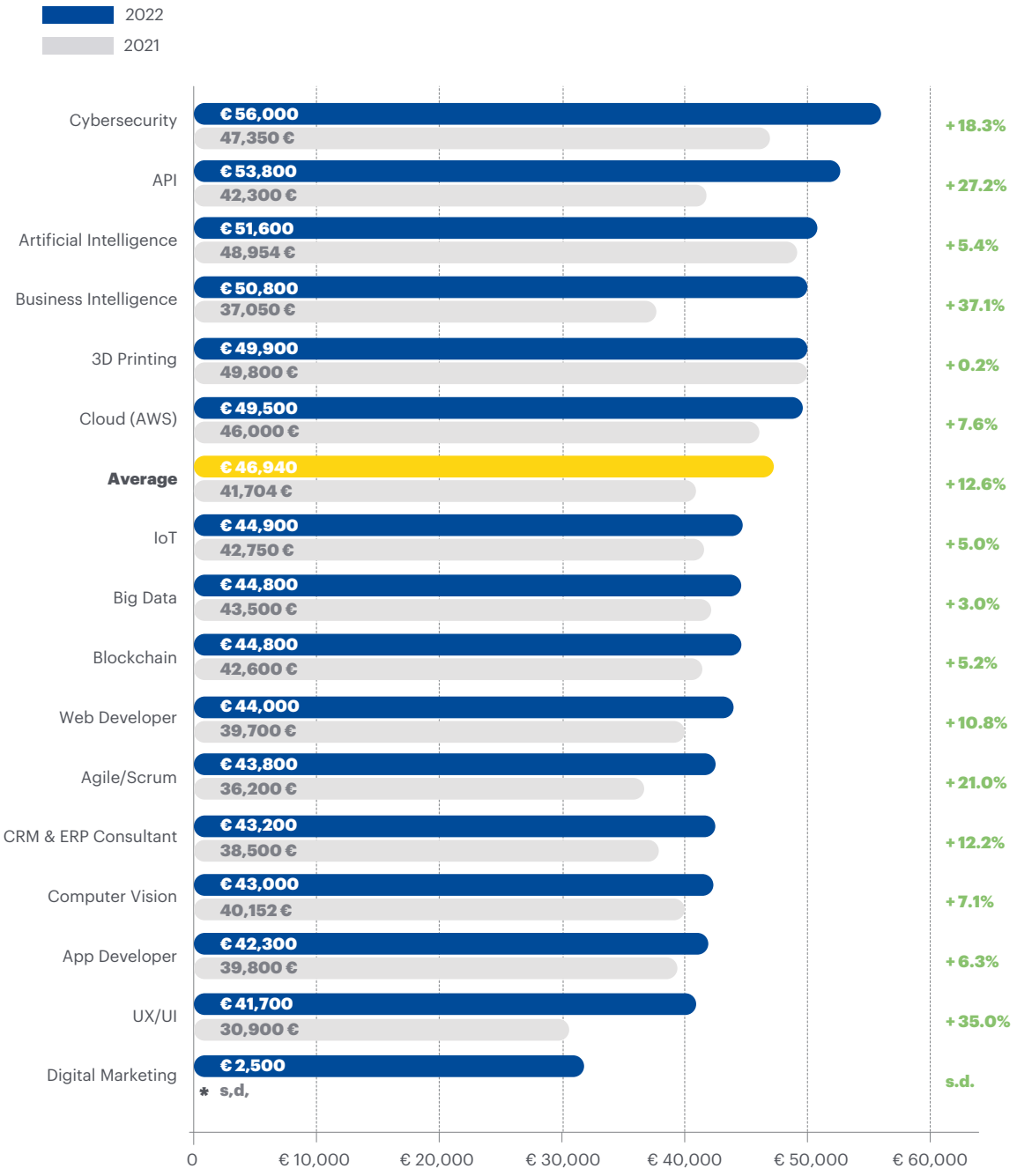
"EThe Barcelona Talent Map highlights the diversity and balance of the digital sector, with 29% of professionals from the business and legal fields, 12% from the humanities and 15% from the creative sectors, complementing the remaining 44% from scientific, technical and digital disciplines. Therefore, the great attractiveness of this sector in Barcelona can be seen while at the same time which, unfortunately, also shows that much more female talent needs to be brought in, and this is one of the priorities of Barcelona City Council."

Felix Ortega
General Manager of Barcelona Activa

Digital professionals' wages by speciality

2022-2023

Source: TalentUp.io for Mobile World Capital Barcelona



3
Digital talent in major European cities

Market tension in European cities

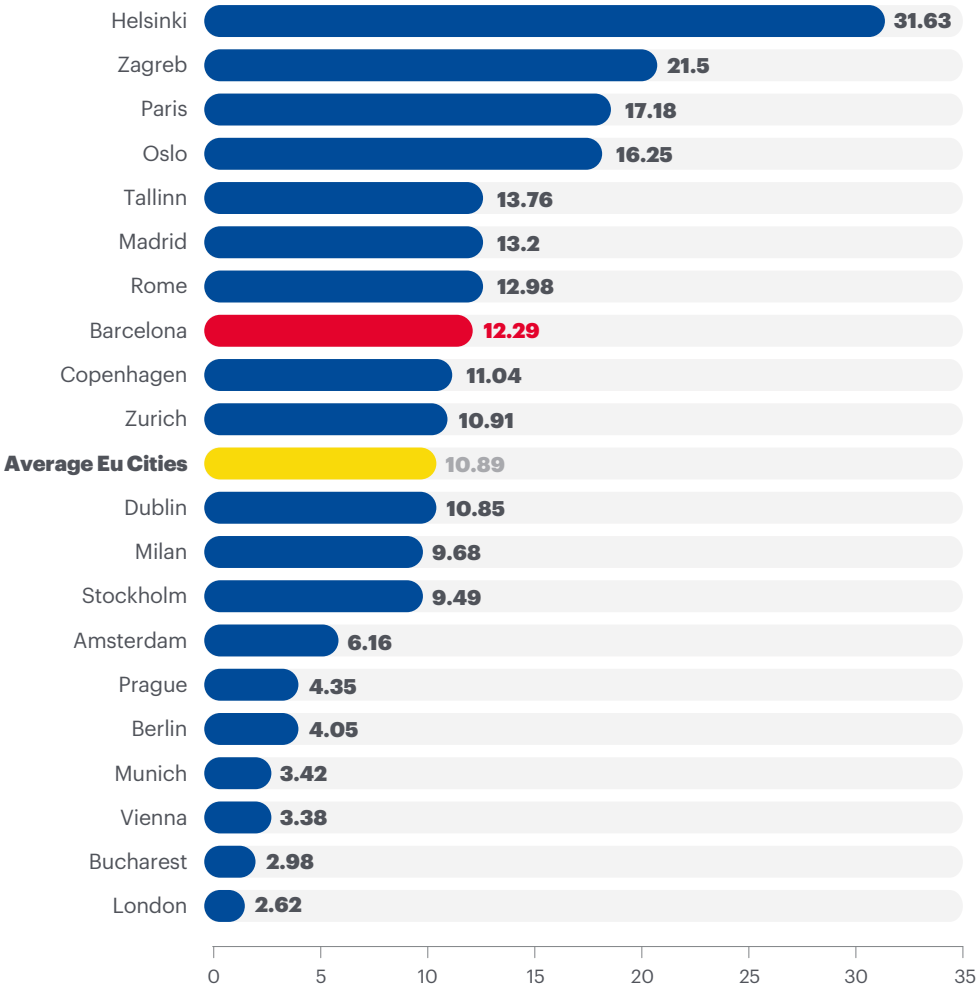
Market tension is the ratio between supply and demand, which indicates how many professionals there are for each supply in the market. The European city surveyed with the highest market tension is London, with 2.62 workers per job offer, followed by Bucharest (2.98) and Vienna (3.38). Barcelona is close to the European average (10.89), with 12.29 workers per job offer

The least stressed cities and with the highest abundance of professionals per job offer are Helsinki, with 31.63 workers per job offer, followed by Zagreb (21.5) and Paris (17.18).

Market stress: number of professionals per job offer in European cities

2022

Source: TalentUp.io for Mobile World Capital Barcelona

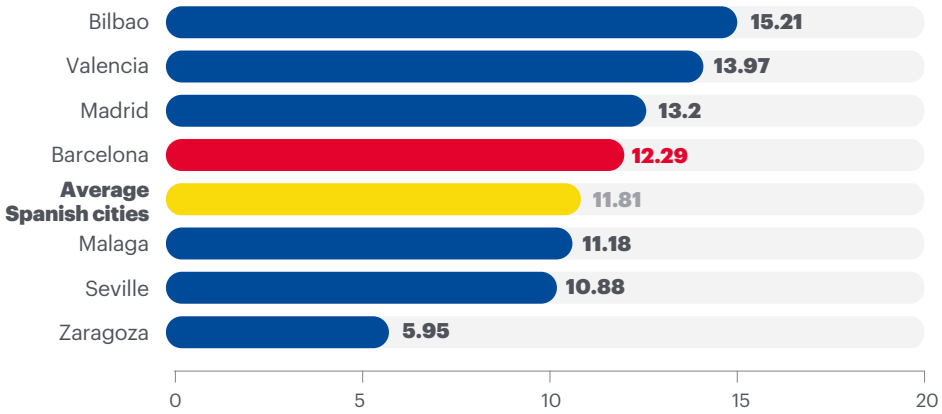


Zaragoza is the most stressed Spanish city concerning the labour market in the digital sector, with 5.95 workers per job offer. Zaragoza is followed by Seville, with 10.88 workers per job offer, and Malaga, with 11.18. The city with the least tension between supply and demand is Bilbao (15.21). Barcelona, with 12.29 workers per job offer, is slightly above the Spanish cities average (11.81)

Market stress: number of professionals per job offer in Spanish cities

2022

Source: TalentUp.io for Mobile World Capital Barcelona



Digital salaries in European cities

Barcelona offers the highest salaries in Spain, although they are below the European average

The ranking is led by Zurich (€148,327), followed by Copenhagenn (€89,127), London (€86,267), Berlin (€77,953) and Stockholm (€75,300). The cities studied with the lowest salaries are Bucharest (€24,047), Zagreb (€35,488) and Prague (€35,488). Barcelona, at €46,038, is below the average of the European cities analysed (€63,059).

« »

"At Sanofi's Global Innovation Center, we strive every year to understand the attributes, motivations and needs of our "candidate people", who are very international and have diverse technology profiles. We collect quantitative and qualitative data both internally and externally to better connect our value proposition as an employer with the needs of these profiles."

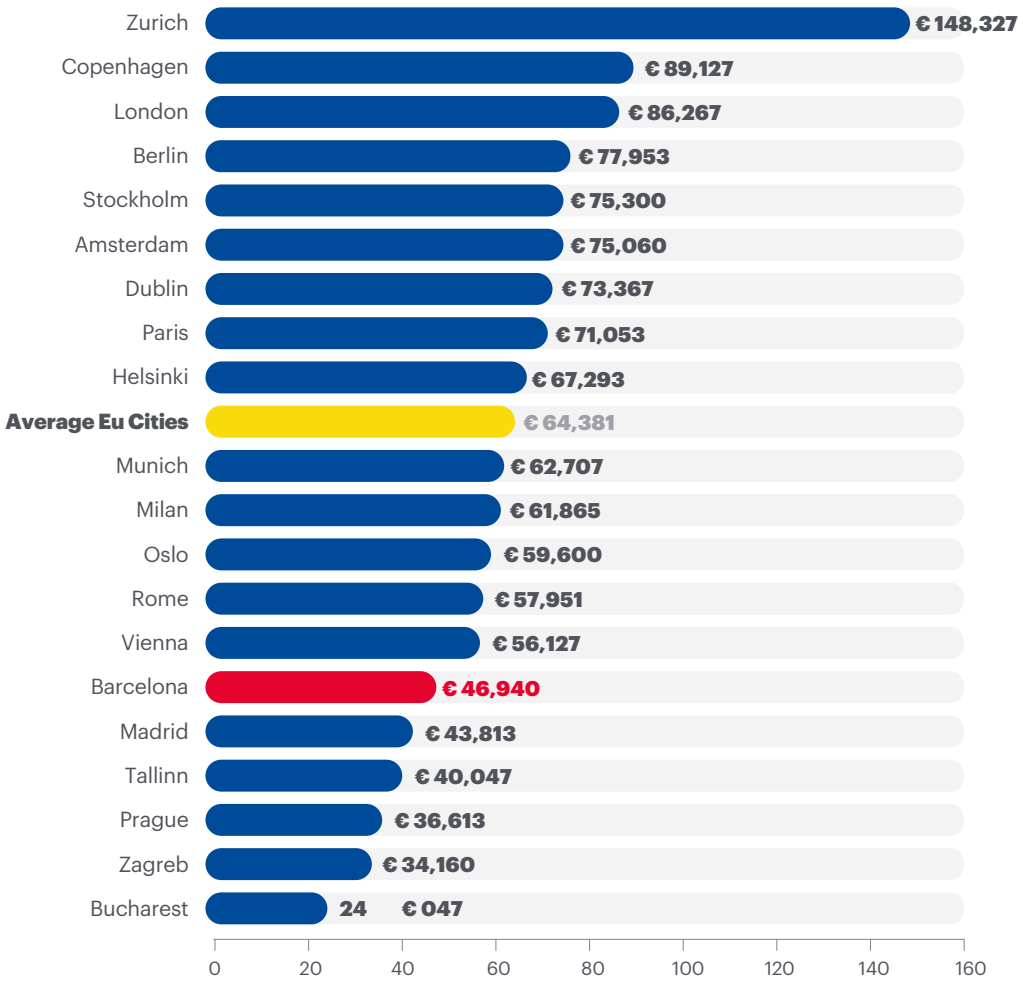
Irena Herrero Viñas

Talent Acquisition Lead - Global Innovation Center at Sanofi

Digital professional salaries by city

2022

Source: TalentUp.io for Mobile World Capital Barcelona



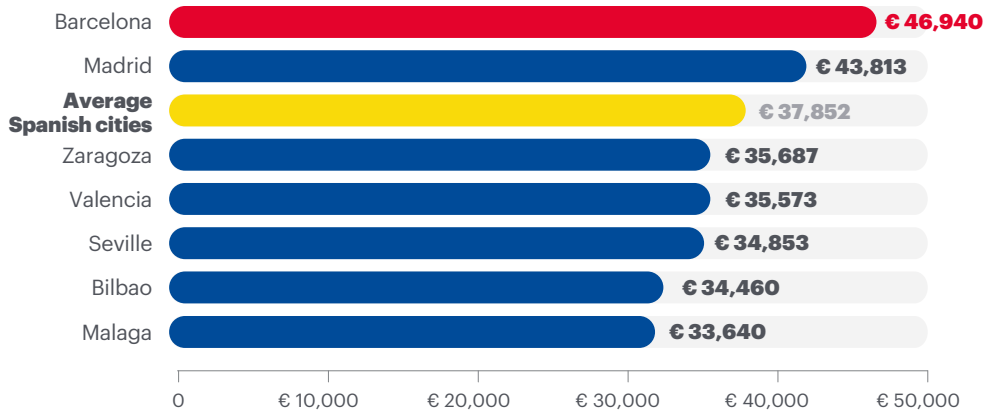
***Note:** The data corresponds to the aggregate of all digital profiles, except for Digital Marketing.

The salaries of digital professionals in Spanish cities range from €33,000 to €47,000 per year, with the average salary being €37,266. The city that leads the ranking is Barcelona, with a salary of €46,940 (25% higher than the average), followed by Madrid, €43,813 and Zaragoza, €35,687

Digital professional salaries by Spanish city

2022-2023

Source: TalentUp.io for Mobile World Capital Barcelona



Note: The data corresponds to the aggregate of all digital profiles

Salaries by European cities in established technologies

Zurich stands out from the rest of the cities, with salaries ranging from €97,000 to €159,000 depending on the technology used

Salaries by city by established technology speciality

2022

Source: TalentUp.io for Mobile World Capital Barcelona

	Web Developers	App Developers	UX/UI	CRM + ERP Consultant	Agile/Scrum	Cloud (AWS)
Zurich	€159,300	€109,000 €	€135,700	€158,100	€149,200	€159,500
Copenhaguen	€95,700	€65,500	€81,500	€94,900	€89,600	€95,900
London	€76,000	€84,700	€84,000	€83,900	€84,400	€74,300
Berlin	€77,000	€69,600	€68,300	€67,800	€76,600	€73,600
Stockholm	€83,000	€59,200	€70,700	€82,500	€77,800	€83,100
Ámsterdam	€66,000	€75,300	€58,100	€71,800	€81,000	€77,400
Dublin	€79,200	€56,400	€67,500	€78,700	€74,300	€79,400
Paris	€68,800	€56,900	€59,600	€67,300	€73,200	€69,100
Helsinki	€75,200	€53,600	€62,600	€74,700	€70,600	€75,400
Munich	€70,700	€50,400	€58,700	€64,200	€66,300	€70,800
Milan	€61,810	€48,320	€60,160	€59,280	€66,160	€70,800
Oslo	€49,000	€47,400	€84,600	€75,500	€50,000	€47,100
Rome	€63,705	€45,477	€50,964	€71,889	€59,799	€63,891
Viena	€61,500	€43,900	€51,100	€61,000	€57,600	€61,600
Barcelona	€44,000	€42,300	€41,700	€43,200	€43,800	€49,500
Madrid	€39,000	€39,500	€42,100	€38,300	€37,900	€48,200
Tallinn	€43,100	€30,700	€35,800	€42,800	€40,400	€43,200
Prague	€34,300	€32,100	€32,800	€40,600	€37,200	€41,800
Zagreb	€36,500	€26,000	€30,300	€36,200	€34,200	€36,600
Bucharest	€18,300	€ 24,700	€17,900	€30,800	€16,400	€24,000

	Cybersecurity	Business Intelligence	Big Data	API	Digital Marketing
Zurich	€130,300	€155,300	€169,700	€158,800	€97,100
Copenhaguen	€78,300	€93,300	€101,900	€95,400	€61,500
London	€66,300	€85,800	€89,900	€70,300	€45,700
Berlin	€69,500	€81,200	€83,100	€74,800	€38,600
Stockholm	€58,800	€80,900	€75,300	€82,800	€53,900
Ámsterdam	€80,900	€70,000	€82,400	€73,800	€44,900
Dublin	€56,200	€77,300	€71,900	€79,100	€48,300
Paris	€81,800	€68,700	€66,500	€54,800	€53,000
Helsinki	€53,400	€73,400	€68,300	€75,100	€45,900
Munich	€50,200	€68,900	€64,200	€66,700	€43,100
Milan	€50,080	€68,880	€64,160	€70,480	€43,040
Oslo	€81,100	€47,400	€80,200	€49,000	€60,400
Rome	€45,198	€62,217	€57,846	€63,519	€38,874
Viena	€43,600	€60,000	€55,800	€61,400	€28,300
Barcelona	€56,000	€50,800	€44,800	€53,800	€32,500
Madrid	€57,100	€48,100	€41,200	€46,900	€31,800
Tallinn	€36,300	€42,000	€39,100	€42,900	€41,800
Prague	€31,400	€45,700	€31,600	€24,500	€18,600
Zagreb	€30,700	€35,600	€33,200	€36,400	€22,200
Bucharest	€24,500	€21,500	€37,600	€21,400	€15,200

Salaries by European cities in emerging technologies

Regarding emerging technologies, Zurich remains at the top of the ranking. The emerging technologies with the highest-paid workers are Computer Vision and Blockchain

Salaries by city by emerging technology speciality

2022

Source: TalentUp.io for Mobile World Capital Barcelona

	Artificial Intelligence	IoT	3D Printing	Blockchain	Computer Vision
Zurich	€140,400	€149,300	€126,700	€131,400	€192,200
Copenhaguen	€80,800	€89,700	€76,100	€82,800	€115,500
London	€75,100	€95,400	€91,300	€116,300	€116,300
Berlin	€76,000	€61,700	€73,800	€108,100	€108,200
Stockholm	€70,000	€71,700	€66,000	€67,500	€100,200
Ámsterdam	€80,000	€63,800	€85,600	€97,800	€62,000
Dublin	€76,500	€68,400	€63,000	€76,900	€95,700
Paris	€72,100	€51,700	€76,600	€105,100	€93,600
Helsinki	€53,600	€65,000	€59,800	€57,800	€90,900
Munich	€47,900	€61,000	€56,200	€59,100	€85,300
Milan	€51,040	€60,960	€56,160	€54,400	€85,280
Oslo	€52,000	€58,000	€44,800	€63,800	€64,100
Rome	€46,686	€55,056	€50,685	€55,335	€77,004
Viena	€54,200	€53,100	€48,900	€53,900	€74,300
Barcelona	€51,600	€44,900	€49,900	€44,800	€43,000
Madrid	€44,000	€42,300	€53,900	€41,700	€37,000
Tallinn	€42,100	€37,200	€34,300	€38,800	€52,000
Prague	€41,600	€33,100	€43,300	€43,600	€35,600
Zagreb	€38,500	€31,500	€29,000	€33,700	€44,000
Bucharest	€23,200	€23,700	€21,300	€30,500	€24,900

In Spain, Barcelona has the highest salaries in most established technologies. The technology with the highest salary in the city of Barcelona is cybersecurity (€56,000), followed by API developers (€53,800) and Business Intelligence (€50,800). In Barcelona, all technologies have a salary above €40,000 per year, except for Digital Marketing professionals

Salaries per city by speciality of established technologies in the main Spanish cities

2022

Source: TalentUp.io for Mobile World Capital Barcelona

	Web Developers	App Developers	UX/UI	CRM + ERP Consultant	Agile/Scrum	Cloud (AWS)
Barcelona	€44,000	€42,300	€41,700	€43,200	€43,800	€49,500
Madrid	€39,000	€39,500	€42,100	€38,300	€37,900	€48,200
Zaragoza	€33,200	€28,000	€31,900	€34,000	€33,400	€48,200
Valencia	€33,200	€25,800	€31,500	€35,400	€37,400	€46,300
Seville	€32,200	€25,200	€30,500	€34,400	€36,200	€47,200
Bilbao	€29,800	€27,600	€28,700	€35,700	€34,700	€47,700
Malaga	€31,000	€24,100	€29,300	€33,100	€34,900	€45,100

	Cybersecurity	Business Intelligence	Big Data	API	Digital Marketing
Barcelona	€56,000	€50,800	€44,800	€53,800	€32,500
Madrid	€57,100	€48,100	€41,200	€46,900	€31,800
Zaragoza	€34,800	€32,600	€35,500	€34,500	€27,200
Valencia	€33,900	€30,400	€35,200	€34,400	€28,300
Seville	€31,900	€29,500	€34,200	€33,400	€27,500
Bilbao	€34,800	€36,400	€32,000	€31,000	€25,600
Malaga	€33,900	€28,400	€32,900	€32,100	€26,400

Barcelona has generally higher salaries in emerging technologies, with the average salary being €46,840. Barcelona stands out in emerging technologies such as Artificial Intelligence, with the salary being 37% higher than the rest of the Spanish cities analysed, or the IoT, with a salary of 28% higher than the average

Salaries per city by speciality of emerging technologies in the main Spanish cities

2022

Source: TalentUp.io for Mobile World Capital Barcelona

	Artificial Intelligence	IOT	3D Printing	Blockchain	Computer Vision
Barcelona	€51,600	€44,900	€49,900	€44,800	€43,000
Madrid	€44,000	€42,300	€53,900	€41,700	€37,000
Zaragoza	€37,000	€32,300	€35,700	€34,400	€51,700
Valencia	€30,600	€33,300	€36,900	€34,900	€53,500
Seville	€35,000	€32,300	€35,900	€33,800	€52,100
Bilbao	€34,000	€29,100	€34,900	€30,900	€49,600
Malaga	€32,200	€31,000	€34,400	€32,500	€49,700

Standard salaries by European cities by cost of living and rent

Barcelona's average standard salary is on par with cities such as Amsterdam, Paris and Dublin

The European city with the highest standard salary is London, followed by Zurich, which loses the first position, and Berlin in third. The average standard salary in the European cities surveyed is €52,752. 45% of cities are in a salary range between €45,000 and €55,000 per year in cities such as Amsterdam, Paris, Dublin, Barcelona and Madrid.

Prague (€44,063), Bucharest (€41,336), and Oslo (€36,415) close the ranking of European cities studied by average standard salary.

« »

"Europe's got talent. In a tech world packed with buzzwords talking about future trends, which might or might not become a reality, digital talent is the reality, an engine that drives innovation. The "old continent" is in a privileged position to create, attract and retain this talent, and we have the joint responsibility to leverage our differences and strengths, and build a diverse, international workplace."

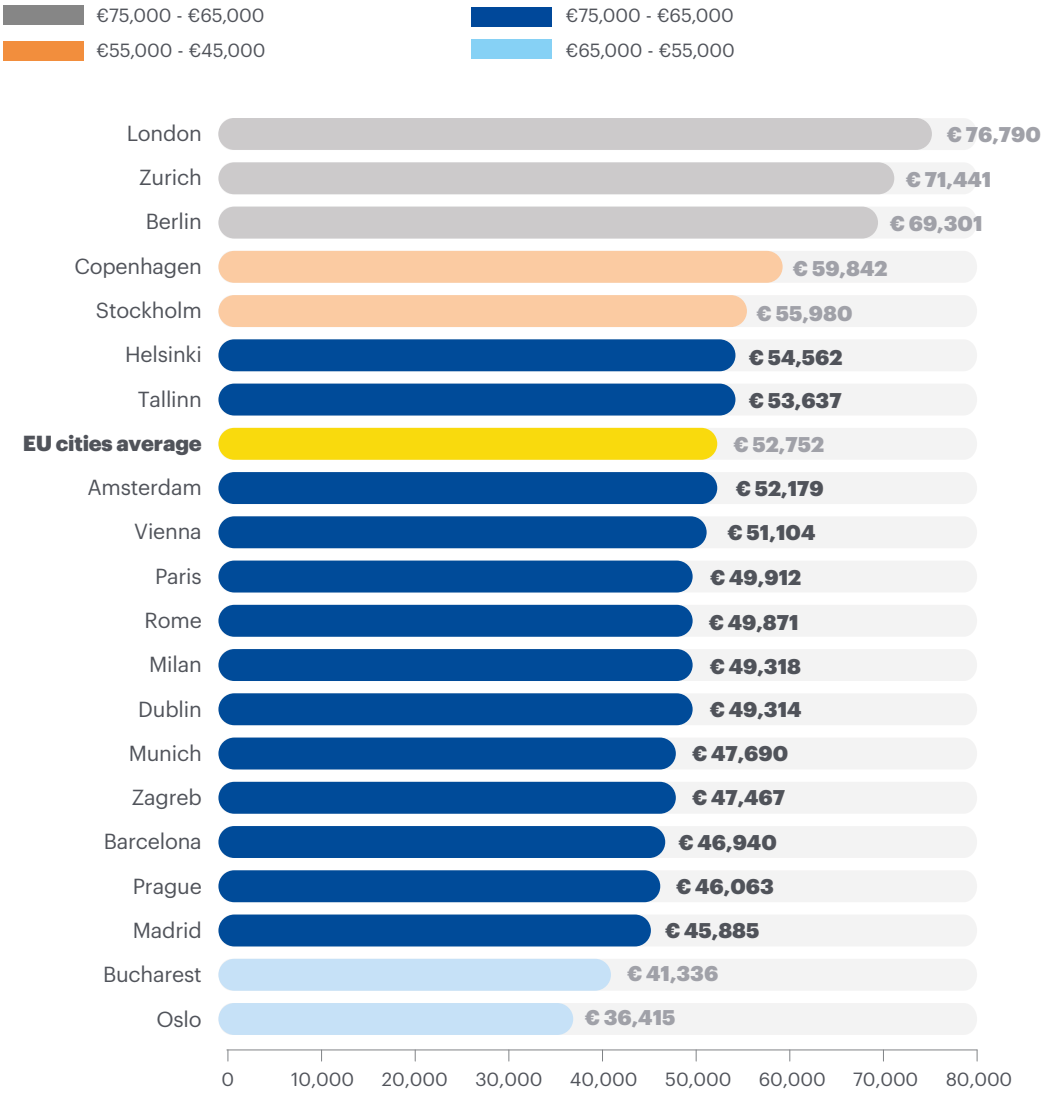
Guillem Vila

Director of Technology Centres at Ocado Technology

Average standardised salaries by cost of living and rent

2022

Source: TalentUp.io for Mobile World Capital Barcelona



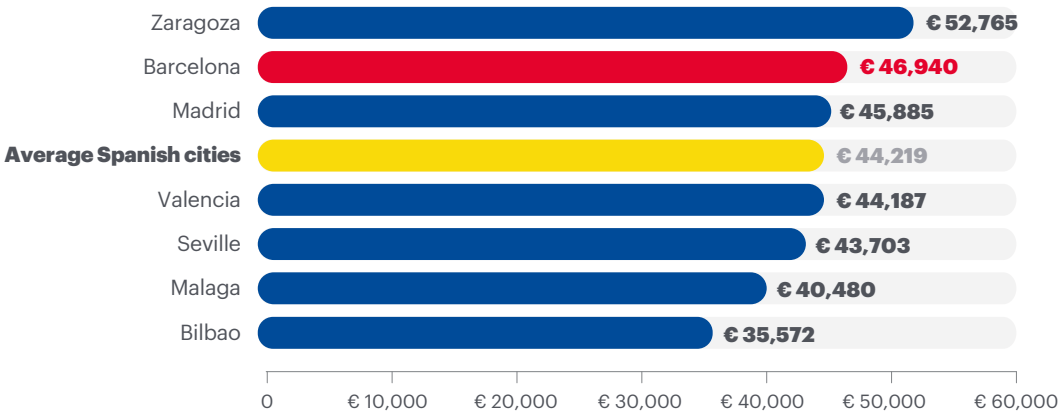
Note: The data corresponds to the aggregate of all digital profiles

With standard salaries by cost of living and rent, Zaragoza is the Spanish city with the highest salary (€52,765), followed by Barcelona (€46,940) and Madrid (€45,885)

Average standard salaries by cost of living and rent of the main Spanish cities

2022

Source: TalentUp.io for Mobile World Capital Barcelona



Note: The data corresponds to the aggregate of all digital profiles

Cost of living* vs cost of living + rent

2022

Source: TalentUp.io for Mobile World Capital Barcelona

Barcelona	Bilbao	Madrid	Malaga	Valencia	Seville	Zaragoza
48.94%	47.41%	46.73%	40.67%	39.4%	39.03%	33.1%

Note: The data corresponds to the aggregate of all digital profiles

Standard salary by cost of living and rent for established technologies

London leads the ranking of standard salaries, with Big Data being the established technology with the highest standard salary (€80,024). In second place is Zurich, with the profile of Big Data (€81,735) as the highest-paid salary. Berlin is in third place in the ranking, with the Big Data profile with €73,877 as the highest paid

"At Le Wagon, we've helped more than 20.000 talented individuals in successfully pivoting their careers to tech, being it as junior developers, data specialists, digital freelancers or startup builders. Our unique learning approach focuses on 3 pillars: i) product first, empowering students to build end-to-end solutions; ii) soft skills, with a bias for teamwork, peer reviews and autonomy; iii) job readiness, by covering multiple languages and providing expert careers advice and partners."

Nuno Loureiro

General Manager Southern Europe at Le Wagon

Average standardised salaries by cost of living and rent (established technologies)

2022

Source: TalentUp.io for Mobile World Capital Barcelona

	Web Developers	App Developers	UX/UI	CRM + ERP Consultant	Agile/Scrum	Cloud (AWS)
London	€67,651	€75,395	€74,772	€74,683	€75,128	€66,138
Zurich	€76,726	€52,499	€65,359	€76,148	€71,862	€76,822
Berlin	€68,454	€61,875	€60,719	€60,275	€68,098	€65,431
Copenhaguen	€64,255	€43,978	€54,721	€63,718	€60,159	€64,389
Stockholm	€61,705	€44,011	€52,561	€61,333	€57,839	€61,779
Tallinn	€57,726	€41,118	€47,949	€57,324	€54,110	€57,860
Helsinki	€60,972	€43,459	€50,756	€60,567	€57,243	€61,134
Amsterdam	€45,881	€52,346	€40,389	€49,913	€56,309	€53,806
Viena	€55,996	€39,971	€46,527	€55,541	€52,445	€56,088
Paris	€48,329	€39,970	€41,866	€47,275	€51,420	€48,540
Rome	€54,822	€39,136	€43,858	€61,865	€51,461	€54,982
Milan	€49,275	€38,521	€47,959	€47,258	€52,743	€56,442
Dublin	€53,235	€37,910	€45,371	€52,899	€49,942	€53,370
Munich	€53,769	€38,331	€44,643	€48,826	€50,423	€53,845
Zagreb	€50,719	€36,128	€42,103	€50,302	€47,523	€50,858
Barcelona	€44,000	€42,300	€41,700	€43,200	€43,800	€49,500
Madrid	€40,844	€41,368	€44,091	€40,111	€39,692	€50,480
Prague	€43,153	€40,385	€41,266	€51,079	€46,801	€52,588
Bucharest	€31,458	€42,459	€30,770	€52,945	€28,192	€41,256
Oslo	€29,938	€28,961	€51,689	€46,129	€30,549	€28,777

	Cybersecurity	Business Intelligence	Big Data	API	Digital Marketing
London	€59,016	€76,374	€80,024	€62,577	€40,679
Zurich	€62,758	€74,800	€81,735	€76,485	€46,768
Berlin	€61,786	€72,188	€73,877	€66,498	€34,316
Copenhaguen	€52,572	€62,644	€68,418	€64,054	€41,292
Stockholm	€43,714	€60,143	€55,980	€61,556	€40,071
Tallinn	€48,619	€56,253	€52,369	€57,458	€55,985
Helsinki	€43,297	€59,513	€55,378	€60,891	€37,216
Amsterdam	€56,239	€48,662	€57,282	€51,304	€31,213
Viena	€39,698	€54,631	€50,807	€55,905	€25,767
Paris	€57,461	€48,259	€46,713	€38,495	€37,230
Rome	€38,896	€53,541	€49,780	€54,662	€33,453
Milan	€39,924	€54,911	€51,148	€56,187	€34,311
Dublin	€37,775	€51,958	€48,328	€53,168	€32,465
Munich	€38,179	€52,400	€48,826	€50,727	€32,779
Zagreb	€42,659	€49,468	€46,133	€50,580	€30,848
Barcelona	€56,000	€50,800	€44,800	€53,800	€32,500
Madrid	€59,800	€50,375	€43,148	€49,118	€33,304
Prague	€39,504	€57,495	€39,756	€30,823	€23,401
Bucharest	€42,116	€36,959	€64,634	€36,787	€26,129
Oslo	€49,551	€28,961	€49,001	€29,938	€36,904

Standard salary by cost of living and rent for emerging technologies

The emerging technology with the highest standard salary is Computer Vision, followed by Blockchain. The cities with the highest salaries are London, Zurich and Berlin

"In the technology sector, supply and demand for talent are intertwined, driven by innovation, creating an ecosystem in which adapting and evolving is critical. The ability of professionals to acquire new skills, with an attitude of continuous learning, and the commitment of companies to develop their talent are determining factors. We understand this at Wolters Kluwer by offering career opportunities and training as the main pillars of talent development."

Gerardo Cid

HR Business Partner of Wolters Kluwer Tax & Accounting España

Average standardised salaries by cost of living and rent (emerging technologies)

2022

Source: TalentUp.io for Mobile World Capital Barcelona

	Artificial Intelligence	IOT	3D Printing	Blockchain	Computer Vision
London	€66,850	€84,920	€81,270	€103,523	€103,523
Zurich	€67,623	€71,910	€61,024	€63,288	€92,572
Berlin	€67,565	€54,852	€65,609	€96,102	€96,191
Copenhaguen	€54,251	€60,227	€51,095	€55,594	€77,549
Stockholm	€52,040	€53,304	€49,066	€50,182	€74,492
Tallinn	€56,387	€49,824	€45,940	€51,967	€69,646
Helsinki	€43,459	€52,702	€48,486	€46,864	€73,702
Amsterdam	€55,614	€44,352	€59,507	€67,988	€43,101
Viena	€49,350	€48,348	€44,524	€49,077	€67,651
Paris	€50,647	€36,317	€53,808	€73,828	€65,750
Rome	€40,176	€47,379	€43,617	€47,619	€66,266
Milan	€40,689	€48,597	€44,771	€43,368	€67,985
Dublin	€51,420	€45,976	€42,346	€51,689	€64,326
Múnich	€36,429	€46,392	€42,742	€44,947	€64,873
Zagreb	€53,498	€43,771	€40,297	€46,828	€61,140
Barcelona	€51,600	€44,900	€49,900	€44,800	€43,000
Madrid	€46,081	€44,300	€56,449	€43,672	€38,750
Prague	€52,337	€41,643	€54,476	€54,853	€44,788
Bucharest	€39,881	€40,740	€36,615	€52,430	€42,803
Oslo	€31,771	€35,437	€27,372	€38,981	€39,164

Barcelona has 4 established technologies with salaries above €49,000, with cybersecurity as the technology with the best salaries, with an average of €56,000, followed by API developers (€53,800), Business Intelligence (€50,800) and Cloud AWS (€49,500). Zaragoza has the highest (standard) salaries in established technologies, with salaries in Cloud technologies standing out (€68,475)

Average standardised salaries by cost of living and rent (established technologies) of the main Spanish cities

2022

Source: TalentUp.io for Mobile World Capital Barcelona

	Web Developers	App Developers	UX/UI	CRM + ERP Consultant	Agile/Scrum	Cloud (AWS)
Zaragoza	€49,088	€41,399	€47,166	€50,271	€49,384	€68,457
Barcelona	€44,000	€42,300	€41,700	€43,200	€43,800	€49,500
Madrid	€40,844	€41,368	€44,091	€40,111	€39,692	€50,480
Valencia	€41,239	€32,047	€39,127	€43,971	€46,456	€58,629
Seville	€40,376	€31,598	€38,244	€43,134	€45,391	€57,931
Málaga	€37,304	€29,001	€35,258	€39,831	€41,997	€54,271
Bilbao	€30,762	€28,491	€29,626	€36,852	€35,820	€49,239

	Cybersecurity	Business Intelligence	Big Data	API	Digital Marketing
Zaragoza	€51,454	€48,201	€52,489	€51,010	€40,217
Barcelona	€56,000	€50,800	€44,800	€53,800	€32,500
Madrid	€59,800	€50,375	€43,148	€49,118	€33,304
Valencia	€42,108	37,761 €	€43,723	€42,729	€35,152
Seville	€40,000	€36,990	€42,884	€41,881	€34,482
Málaga	€40,793	€34,175	€39,590	€38,627	€31,768
Bilbao	€35,923	€37,575	€33,033	€32,000	€26,426

Barcelona has high standard salaries, but Zaragoza is the Spanish city with the highest average standard salary, with the highest paid emerging technologies being Computer Vision (€76,441) and Artificial Intelligence (€54,706). In Barcelona, the emerging technologies with the highest salaries are Artificial Intelligence technologies, with a salary of €51,600 and 3D printing, with a salary of €49,900

Average standardised salaries by cost of living and rent (established technologies) of the main Spanish cities

2022

Source: TalentUp.io for Mobile World Capital Barcelona

	Artificial Intelligence	IOT	3D Printing	Blockchain	Computer Vision
Zaragoza	€54,706	€47,757	€52,784	€50,862	€76,441
Barcelona	€51,600	€44,900	€49,900	€44,800	€43,000
Madrid	€46,081	€44,300	€56,449	€43,672	€38,750
Valencia	€38,009	€41,363	€45,835	€43,350	€66,454
Seville	€43,887	€40,501	€45,015	€42,382	€65,329
Málaga	€38,748	€37,304	€41,395	€39,109	€59,806
Bilbao	€35,097	€30,039	€36,026	€31,897	€51,201

Remote job offers in major European cities

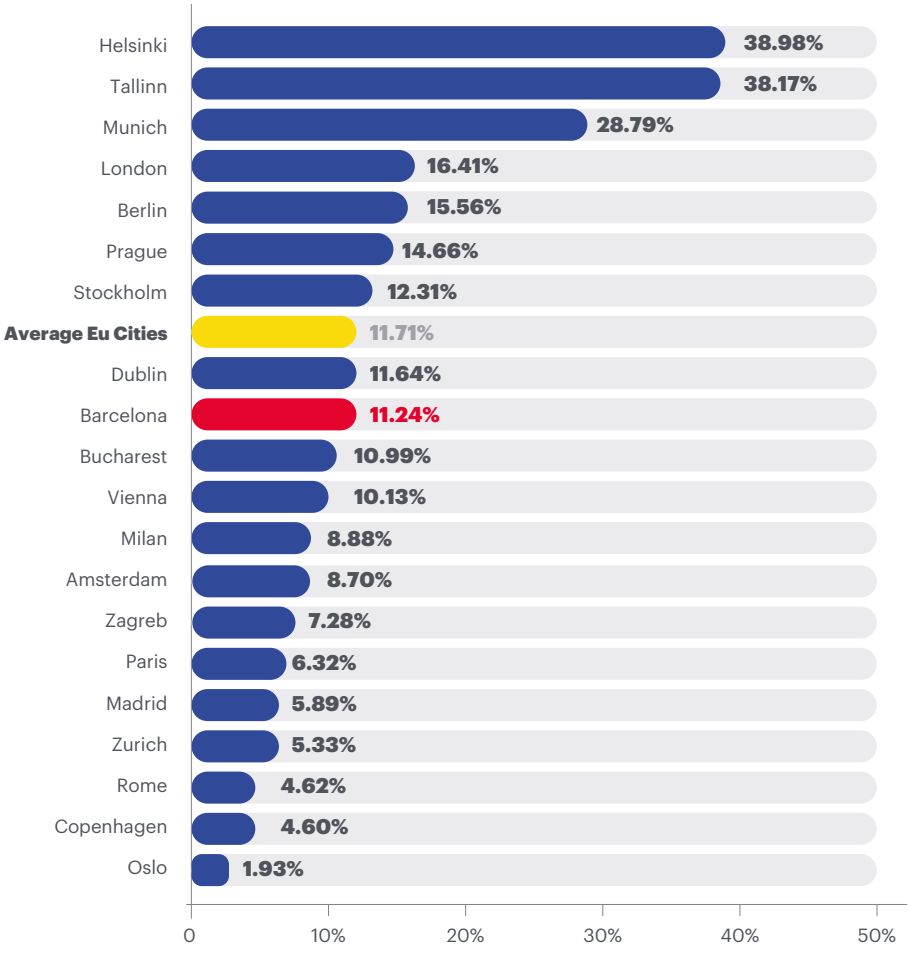
Currently, in Barcelona, 11.24% of job offers are remote. The weight of this type of supply has decreased slightly with respect to the previous year (14.43%), but it is still in line with the European average (11.71%).

Helsinki (38.98%) and Tallinn (38.17%), followed by Munich, where more than 1 in 4 people work remotely (28.79%), are the countries with the highest proportion of remote jobs.

Remote job offers by city

2022

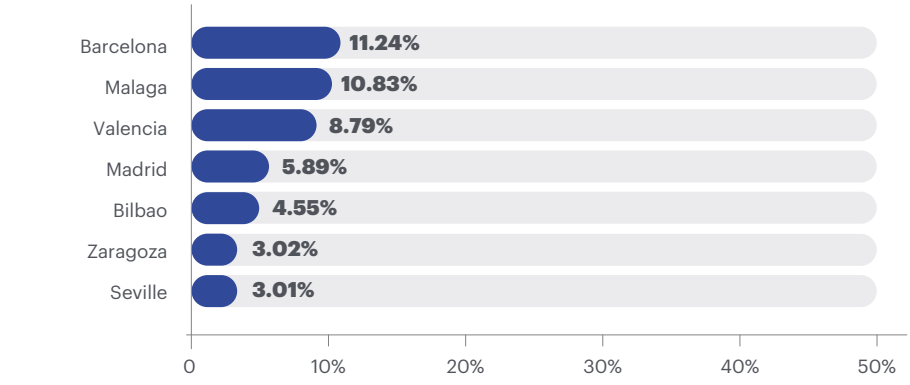
Source: TalentUp.io for Mobile World Capital Barcelona



Remote job offers by Spanish cities

2022

Source: TalentUp.io for Mobile World Capital Barcelona



Digital profiles such as App Developer, Cybersecurity, Artificial Intelligence, IoT, or Blockchain stand out regarding remote job offers. Regarding cities, Helsinki stands out clearly with several profiles with remote offers.

Remote job offers by city and speciality

2022

Source: TalentUp.io for Mobile World Capital Barcelona

90% or more
80 to 90%
70% to 80%
60% to 70%
50% to 60%

	Web Developers	App Developers	UX/UI	CRM + ERP Consultant	Agile/Scrum	Cloud (AWS)	Cyber-security	Business Intelligence
Barcelona	18.75%	30.77%	35.00%	19.25%	20.43%	31.15%	17.64%	9.71%
London	45.45%	58.09%	50.28%	30.64%	53.22%	48.84%	65.67%	35.90%
Madrid	16.31%	34.87%	17.91%	15.04%	24.69%	24.40%	12.26%	8.84%
Paris	11.11%	10.87%	12.22%	5.09%	11.67%	14.09%	15.59%	5.30%
Amsterdam	76.28%	8.11%	52.28%	15.67%	38.73%	41.75%	34.68%	8.42%
Prague	66.48%	8.61%	6.86%	7.60%	19.95%	19.18%	14.80%	42.92%
Berlin	14.02%	39.45%	38.30%	17.26%	51.06%	38.24%	14.24%	25.34%
Bucharest	41.67%	26.06%	22.61%	14.19%	24.15%	24.35%	28.21%	19.05%
Stockholm	10.24%	14.16%	13.87%	13.56%	18.09%	22.92%	14.52%	7.83%
Munich	17.65%	31.43%	58.79%	14.22%	63.93%	54.97%	10.26%	35.84%
Zurich	35.20%	4.55%	47.59%	18.64%	19.65%	52.80%	20.75%	5.34%
Helsinki	53.13%	96.32%	88.67%	34.26%	76.18%	84.50%	69.20%	85.98%
Milan	8.91%	8.64%	22.01%	4.51%	7.14%	9.13%	3.06%	4.60%
Tallinn	20.00%	33.33%	23.40%	1.33%	24.49%	12.07%	20.00%	5.26%
Vienna	12.63%	56.99%	39.54%	6.20%	28.68%	30.31%	5.48%	8.14%
Oslo	33.70%	25.93%	6.75%	20.27%	9.38%	25.19%	11.76%	10.34%
Dublin	16.44%	32.95%	21.46%	5.27%	15.18%	20.78%	23.61%	32.63%
Zagreb	12.50%	8.46%	10.00%	11.11%	45.60%	44.90%	16.67%	13.45%
Copenha-genn	5.06%	51.12%	12.18%	6.91%	14.62%	14.51%	31.18%	8.76%
Rome	9.60%	15.91%	11.02%	3.70%	9.46%	7.95%	7.89%	4.75%
Valencia	16.91%	58.33%	34.64%	11.49%	22.96%	26.22%	61.54%	32.20%
Malaga	10.44%	15.38%	35.62%	15.38%	16.98%	30.14%	53.18%	32.56%
Sevilla	28.47%	11.11%	15.91%	21.38%	21.21%	16.24%	73.75%	19.52%
Zaragoza	1.94%	0.97%	7.84%	0.40%	11.75%	23.22%	37.03%	14.06%
Bilbao	16.98%	47.50%	8.33%	16.58%	8.16%	27.27%	88.89%	19.36%

90% or more
80 to 90%
70% to 80%
60% to 70%
50% to 60%

	Big Data	API	Artificial Intelligence	IOT	3D printing	Blockchain	Computer vision	Digital Marketing
Barcelona	13.06%	16.67%	28.68%	41.84%	40.91%	24.55%	30.56%	16.27%
London	41.75%	49.86%	41.79%	47.68%	72.27%	54.81%	26.85%	30.52%
Madrid	14.43%	34.00%	34.20%	19.51%	28.49%	6.52%	15.04%	18.44%
Paris	9.90%	18.59%	21.09%	20.52%	10.78%	4.50%	4.96%	11.78%
Amsterdam	56.04%	17.19%	51.19%	30.18%	6.94%	40.08%	14.89%	56.65%
Prague	2.19%	12.13%	13.56%	10.86%	5.94%	35.34%	0.74%	9.47%
Berlin	40.62%	38.58%	51.04%	40.20%	2.98%	39.83%	54.81%	45.45%
Bucharest	24.35%	17.49%	44.55%	22.08%	29.11%	43.11%	11.02%	19.55%
Stockholm	8.42%	16.28%	28.00%	18.72%	5.43%	13.50%	7.87%	6.08%
Munich	37.61%	65.16%	44.73%	59.89%	4.65%	39.69%	64.20%	22.12%
Zurich	8.91%	42.39%	8.59%	32.27%	22.48%	73.14%	8.68%	23.68%
Helsinki	83.03%	36.93%	75.95%	79.79%	50.00%	39.13%	95.73%	67.29%
Milan	2.82%	43.51%	9.50%	16.94%	9.84%	32.22%	6.61%	21.75%
Tallinn	3.75%	7.02%	14.21%	81.75%	29.90%	25.00%	26.79%	28.57%
Vienna	52.76%	52.54%	1.86%	58.41%	51.85%	1.88%	13.37%	8.06%
Oslo	21.12%	9.98%	38.89%	13.53%	63.64%	71.88%	26.32%	66.67%
Dublin	14.59%	26.98%	59.47%	43.24%	10.98%	46.72%	14.62%	6.61%
Zagreb	20.83%	2.98%	4.78%	8.33%	14.18%	9.92%	1.20%	0.91%
Copenhagenn	7.38%	13.25%	7.69%	22.20%	12.50%	15.57%	2.36%	7.72%
Rome	6.13%	14.83%	11.01%	12.94%	3.85%	23.40%	15.28%	3.71%
Valencia	34.29%	43.30%	48.80%	19.69%	28.68%	48.57%	43.55%	20.27%
Malaga	25.00%	10.24%	57.14%	9.01%	29.38%	59.01%	12.50%	15.38%
Sevilla	27.50%	18.87%	37.80%	9.41%	15.80%	62.50%	10.00%	41.04%
Zaragoza	45.83%	10.32%	48.92%	2.04%	11.80%	33.33%	6.89%	6.82%
Bilbao	31.12%	19.51%	42.20%	13.17%	45.60%	40.00%	16.43%	20.75%

90% or more
80 to 90%
70% to 80%
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	Web Developers	App Developers	UX/UI	CRM + ERP Consultant	Agile/Scrum	Cloud (AWS)	Cyber-security	Business Intelligence
Barcelona	18.75%	30.77%	35.00%	19.25%	20.43%	31.15%	17.64%	9.71%
Madrid	16.31%	34.87%	17.91%	15.04%	24.69%	24.40%	12.26%	8.84%
Valencia	16.91%	58.33%	34.64%	11.49%	22.96%	26.22%	61.54%	32.20%
Malaga	10.44%	15.38%	35.62%	15.38%	16.98%	30.14%	53.18%	32.56%
Seville	28.47%	11.11%	15.91%	21.38%	21.21%	16.24%	73.75%	19.52%
Zaragoza	1.94%	0.97%	7.84%	0.40%	11.75%	23.22%	37.03%	14.06%
Bilbao	16.98%	47.50%	8.33%	16.58%	8.16%	27.27%	88.89%	19.36%

	Big Data	API	Artificial Intelligence	IOT	3D printing	Blockchain	Computer vision	Digital Marketing
Barcelona	13.06%	16.67%	28.68%	41.84%	40.91%	24.55%	30.56%	16.27%
Madrid	14.43%	34.00%	34.20%	19.51%	28.49%	6.52%	15.04%	18.44%
Valencia	34.29%	43.30%	48.80%	19.69%	28.68%	48.57%	43.55%	20.27%
Malaga	25.00%	10.24%	57.14%	9.01%	29.38%	59.01%	12.50%	15.38%
Seville	27.50%	18.87%	37.80%	9.41%	15.80%	62.50%	10.00%	41.04%
Zaragoza	45.83%	10.32%	48.92%	2.04%	11.80%	33.33%	6.89%	6.82%
Bilbao	31.12%	19.51%	42.20%	13.17%	45.60%	40.00%	16.43%	20.75%

Female presence in the ICT sector in European cities

Barcelona is among the cities with the most women in the digital sector

Almost 1 in 3 digital professionals in Barcelona will be women, specifically 28.69%. Barcelona has a higher weight than the average of the cities analysed (27.79%). Bucharest (22.14%) and Zurich (23.71%) are the cities with the lowest proportion of women in the digital sector.

Seville (33.11%) and Bilbao (31.14%) stand out as the cities with the highest percentage of women in the digital sector.

« »

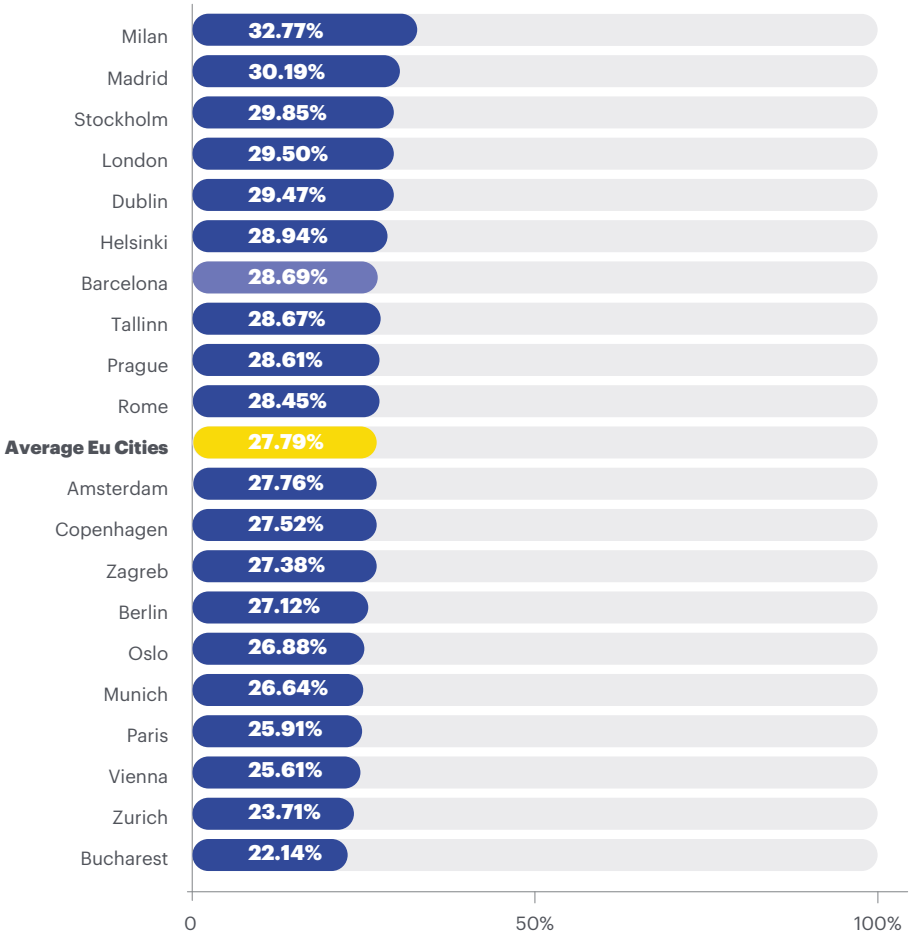
"At Nestlé, diversity and inclusion are an integral part of the corporate culture, and we continue to accelerate towards equal opportunity. Almost 40% of the staff are women at the Global IT Hub in Barcelona. This percentage rises to almost 50% in management positions. Gender balance has always been our priority since the Hub's inception. This has helped us achieve a much more diverse and creative team with different perspectives and points of view."

Susana Pastor
Global IT Barcelona Hub Manager at Nestlé

Women in the sector by European cities (%)

2022

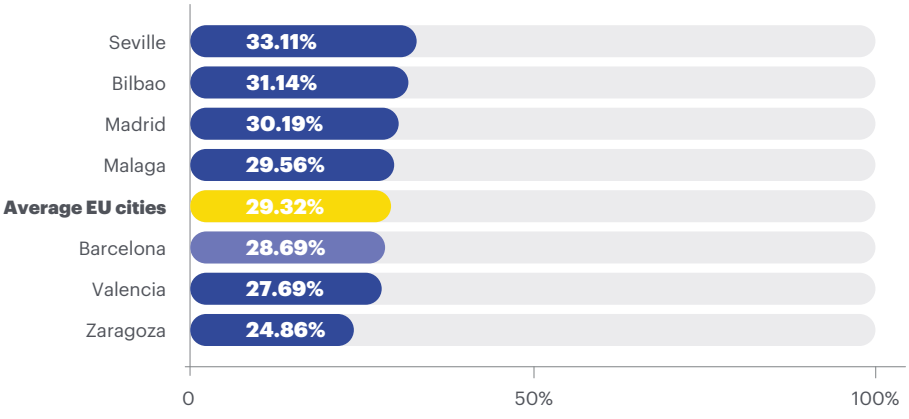
Source: TalentUp.io for Mobile World Capital Barcelona



Women in the sector by Spanish cities (%)

2022

Source: TalentUp.io for Mobile World Capital Barcelona



Presence of women by technology

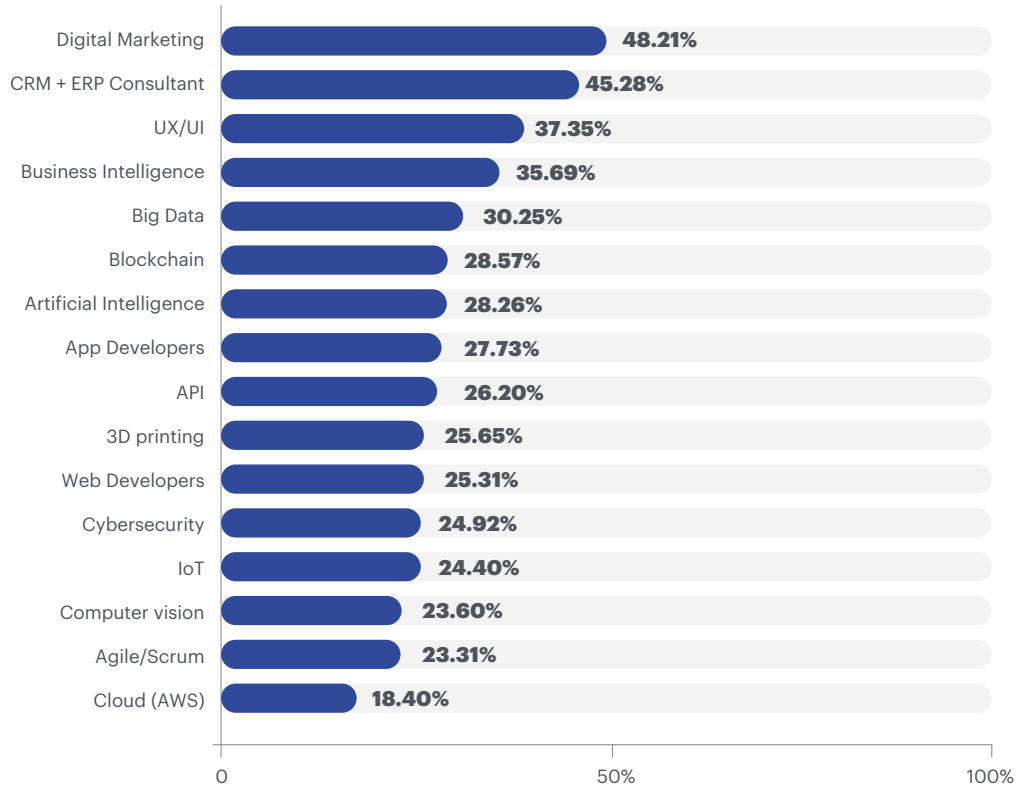
Around 1 in 2 professionals in the Digital Marketing sector (48.21%) and ERP Consultants (45.28%) are women

UX/UI, Business Intelligence and Big Data complete the top 5 sectors with more women digital professionals. The technology sectors with the least female digital professionals are Cloud (AWS), Agile/Scrum, Computer Vision, IoT and Cybersecurity. The sectors mentioned above have less than 25% of female professionals.

Percentage of women in the sector by technology (average among European cities analysed)

2022

Source: TalentUp.io for Mobile World Capital Barcelona



Percentage of women by technology and European city

Regarding profiles with more female presence, UX/UI, CRM & ERP Consultant, Business Intelligence and Digital Marketing stand out. On the other hand, the profiles with the lowest female presence are Cloud, Agile/Scrum and Computer Vision

Among the Spanish cities, Malaga stands out with an outstanding female presence (35.77%), followed by Barcelona. If we consider the city and sector, Digital Marketing in Malaga and Zaragoza is where there is a greater weight of women, where 3 out of 4 workers are women.

"At the PepsiCo Digital Hub, we have a key role in transforming and accelerating the business while driving change to help close the gender gap in Digital. We have an attraction and retention strategy focused on female talent based on partnerships with third parties, branding campaigns, graduate programmes for young talent and reskilling. We have mentoring programmes to promote and empower women's leadership, and we actively work for a bias-free culture with training courses."

Gaston Besanson
Global VP Data Science at PepsiCo

Percentage of women by technology and European city

2022

Source: TalentUp.io for Mobile World Capital Barcelona

70% or more
60 to 70%
50 to 60%
40 to 50%

	Web Developers	App Developers	UX/UI	CRM + ERP Consultant	Agile/Scrum	Cloud (AWS)	Cyber-security	Business Intelligence
Barcelona	26.20%	30.65%	42.78%	37.89%	29.12%	28.79%	27.65%	35.61%
London	24.78%	30.59%	36.78%	59.03%	24.33%	14.01%	16.35%	39.24%
Madrid	31.11%	26.12%	35.04%	45.28%	27.61%	18.75%	27.27%	38.27%
Paris	24.45%	23.06%	41.18%	58.26%	20.95%	15.63%	27.27%	38.51%
Ámsterdam	29.40%	25.00%	48.72%	54.35%	22.16%	19.05%	23.40%	49.21%
Prague	23.04%	32.50%	30.00%	40.00%	25.13%	17.80%	21.50%	45.45%
Berlin	26.78%	28.70%	38.64%	43.28%	22.80%	20.00%	26.70%	48.16%
Bucharest	16.35%	21.93%	15.38%	11.11%	17.38%	15.79%	18.84%	39.58%
Stockholm	18.96%	33.67%	48.84%	64.71%	20.77%	10.53%	23.10%	37.50%
Munich	25.71%	18.18%	33.93%	58.09%	23.94%	19.05%	16.67%	40.43%
Zurich	26.79%	30.23%	39.13%	51.90%	20.39%	7.89%	30.00%	27.27%
Helsinki	21.71%	41.00%	48.89%	50.00%	19.45%	28.95%	24.31%	29.67%
Milan	27.42%	19.75%	48.48%	48.41%	20.82%	31.82%	43.48%	27.82%
Tallin	20.00%	33.33%	50.00%	46.80%	25.00%	16.90%	23.34%	25.83%
Viena	19.05%	38.71%	25.00%	43.75%	23.17%	6.89%	40.00%	27.78%
Oslo	23.57%	32.26%	20.00%	40.74%	17.91%	11.11%	31.12%	46.15%
Dublin	34.09%	27.80%	23.53%	60.00%	24.56%	16.67%	22.56%	47.62%
Zagreb	26.67%	12.50%	29.12%	35.10%	23.68%	17.60%	20.06%	22.72%
Copenhagen	25.98%	16.79%	37.25%	70.69%	18.11%	11.76%	22.31%	26.37%
Rome	24.18%	8.65%	47.62%	47.73%	22.70%	13.64%	19.62%	45.59%

70% or more
60 to 70%
50 to 60%
40 to 50%

	Big Data	API	Artificial Intelligence	IOT	3D printing	Blockchain	Computer vision	Digital Marketing
Barcelona	33.11%	30.57%	29.53%	28.29%	31.58%	25.10%	29.66%	45.71%
London	36.14%	27.88%	32.33%	26.60%	25.15%	28.33%	24.07%	29.27%
Madrid	35.97%	25.14%	36.33%	26.84%	21.62%	27.51%	16.24%	60.00%
Paris	27.88%	20.62%	33.19%	18.18%	23.62%	26.26%	22.67%	35.71%
Ámsterdam	32.31%	19.10%	31.41%	22.43%	18.70%	27.19%	30.65%	33.33%
Prague	25.00%	33.33%	34.42%	37.63%	25.00%	35.48%	50.00%	33.33%
Berlin	35.67%	25.24%	34.03%	24.26%	22.22%	30.47%	23.92%	50.00%
Bucharest	25.71%	5.71%	28.37%	21.27%	28.43%	31.00%	35.71%	18.18%
Stockholm	20.21%	24.73%	35.98%	25.35%	26.32%	41.79%	18.34%	28.57%
Munich	29.69%	23.84%	22.53%	27.19%	26.23%	27.00%	20.45%	62.30%
Zurich	32.61%	29.27%	28.94%	24.39%	12.90%	25.43%	29.09%	40.00%
Helsinki	36.05%	49.49%	29.55%	22.44%	40.00%	27.27%	11.89%	62.50%
Milan	32.95%	31.82%	31.30%	19.20%	20.37%	31.88%	32.47%	66.67%
Tallin	31.01%	29.09%	14.81%	28.38%	32.22%	33.33%	33.33%	38.20%
Viena	34.48%	37.04%	31.01%	20.00%	20.83%	22.22%	26.67%	25.00%
Oslo	30.28%	29.41%	32.00%	28.70%	15.00%	15.56%	31.37%	64.90%
Dublin	28.07%	41.38%	33.10%	8.89%	28.21%	20.00%	11.54%	40.00%
Zagreb	32.97%	50.00%	11.54%	33.33%	31.84%	26.78%	23.00%	35.70%
Copenhagen	27.78%	25.31%	25.58%	21.14%	11.67%	38.75%	21.05%	50.00%
Rome	27.35%	10.92%	20.00%	18.44%	29.41%	14.75%	19.64%	55.55%

Percentage of women by technology and Spanish city

2022

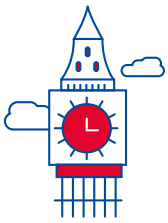
Source: TalentUp.io for Mobile World Capital Barcelona

70% or more
60 to 70%
50 to 60%
40 to 50%

	Web Developers	App Developers	UX/UI	CRM + ERP Consultant	Agile/Scrum	Cloud (AWS)	Cyber-security	Business Intelligence
Barcelona	26.20%	30.65%	42.78%	37.89%	29.12%	28.79%	27.65%	35.61%
Madrid	31.11%	26.12%	35.04%	45.28%	27.61%	18.75%	27.27%	38.27%
Valencia	25.91%	28.81%	50.94%	26.15%	26.74%	20.00%	20.00%	22.03%
Malaga	22.45%	45.95%	53.85%	35.90%	30.30%	30.43%	27.03%	42.86%
Seville	23.74%	18.64%	47.06%	36.84%	32.00%	31.51%	18.87%	25.00%
Zaragoza	27.27%	20.69%	26.32%	36.21%	21.88%	17.65%	25.00%	38.46%
Bilbao	37.10%	47.62%	15.38%	29.79%	21.84%	17.69%	26.67%	25.00%

	Big Data	API	Artificial Intelligence	IOT	3D printing	Blockchain	Computer vision	Digital Marketing
Barcelona	33.11%	30.57%	29.53%	28.29%	31.58%	25.10%	29.66%	45.71%
Madrid	35.97%	25.14%	36.33%	26.84%	21.62%	27.51%	16.24%	60.00%
Valencia	34.15%	10.53%	40.00%	16.87%	22.80%	25.00%	10.53%	62.50%
Malaga	32.20%	28.85%	37.80%	30.97%	36.70%	33.33%	8.73%	75.00%
Seville	23.40%	29.81%	19.50%	31.82%	25.20%	28.03%	28.57%	57.14%
Zaragoza	21.05%	7.69%	8.24%	16.33%	33.33%	39.23%	7.14%	77.78%
Bilbao	30.19%	8.22%	25.00%	30.95%	31.83%	32.59%	23.33%	57.80%

Fichas por ciudad

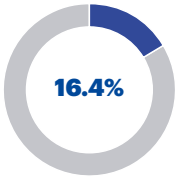


London

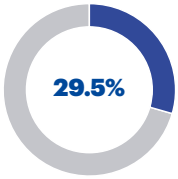
#1 Digital professional salaries

Highest paid positions

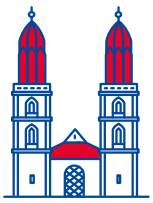
Blockchain	€103,523
Computer Vision	€103,523
IOT	€84,920
3D Printing	€81,270
Big Data	€80,024



#4
of remote jobs



#4
of women
in the digital sector

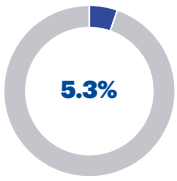


Zurich

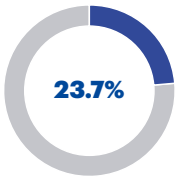
#2 Digital professional salaries

Highest paid positions

Computer Vision	€ 92,572
Big Data	€ 81,735
Cloud (AWS)	€ 76,822
Web Developers	€ 76,726
API	€ 76,485



#17
of remote jobs



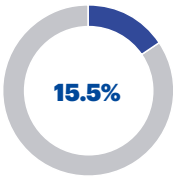
#19
of women
in the digital sector

Berlin

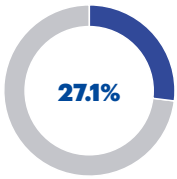
#3 Digital professional salaries

Highest paid positions

Computer Vision	€ 96,191
Blockchain	€ 96,102
Big Data	€ 73,877
Business Intelligence	€ 72,188
Web Developers	€ 68,454



#5
of remote jobs



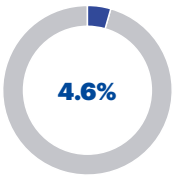
#14
of women
in the digital sector

Copenhagen

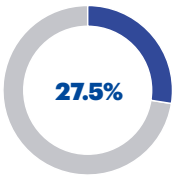
#4 Digital professional salaries

Highest paid positions

Computer Vision	€ 77,549
Big Data	€ 68,418
Cloud (AWS)	€ 64,389
Web Developers	€ 64,255
API	€ 64,054



#19
of remote jobs



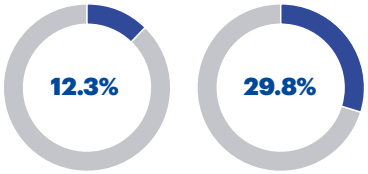
#12
of women
in the digital sector

Stockholm

#5 Digital professional salaries

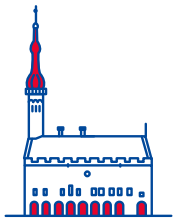
Highest paid positions

Computer Vision	€ 74,492
Cloud (AWS)	€ 61,779
Web Developers	€ 61,705
API	€ 61,556
CRM + ERP Consultant	€ 61,333



#7 of remote jobs

#3 of women in the digital sector

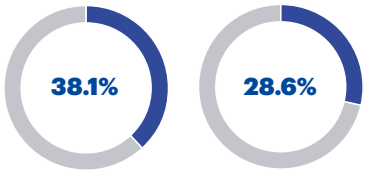


Tallinn

#6 Digital professional salaries

Highest paid positions

Computer Vision	€ 69,646
Cloud (AWS)	€ 57,860
Web Developers	€ 57,726
API	€ 57,458
CRM + ERP Consultant	€ 57,324



#2 of remote jobs

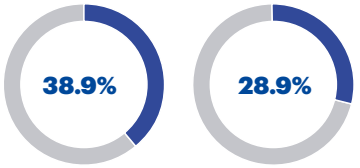
#8 of women in the digital sector

Helsinki

#7 Digital professional salaries

Highest paid positions

Computer Vision	€ 73,702
Cloud (AWS)	€ 61,134
Web Developers	€ 60,972
API	€ 60,891
CRM + ERP Consultant	€ 60,567



#1 of remote jobs

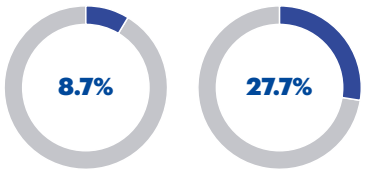
#6 of women in the digital sector

Amsterdam

#8 Digital professional salaries

Highest paid positions

Blockchain	€ 67,988
3D Printing	€ 59,507
Big Data	€ 57,282
Agile/Scrum	€ 56,309
Cybersecurity	€ 56,239



#13 of remote jobs

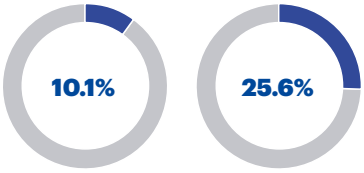
#11 of women in the digital sector

Vienna

#9 Digital professional salaries

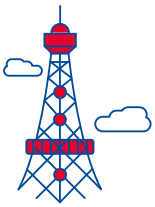
Highest paid positions

Computer Vision	€ 67,651
Cloud (AWS)	€ 56,088
Web Developers	€ 55,996
API	€ 55,905
CRM + ERP Consultant	€ 55,541



#11 of remote jobs

#18 of women in the digital sector

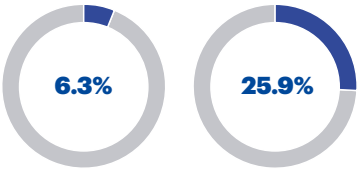


Paris

#10 Digital professional salaries

Highest paid positions

Blockchain	€ 73,828
Computer Vision	€ 65,750
Cybersecurity	€ 57,461
3D Printing	€ 53,808
Agile/Scrum	€ 51,420



#15 of remote jobs

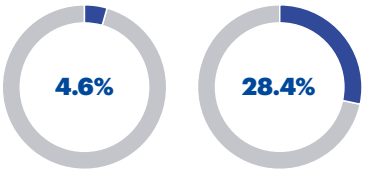
#17 of women in the digital sector

Rome

#11 Digital professional salaries

Highest paid positions

Computer Vision	€ 66,266
CRM + ERP Consultant	€ 61,865
Cloud (AWS)	€ 54,982
Web Developers	€ 54,822
API	€ 54,662



#18 of remote jobs

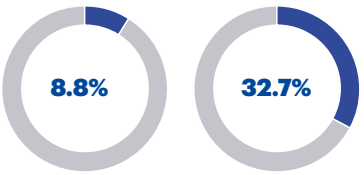
#10 of women in the digital sector

Milan

#12 Digital professional salaries

Highest paid positions

Computer Vision	€ 67,985
Cloud (AWS)	€ 56,442
API	€ 56,187
Business Intelligence	€ 54,911
Agile/Scrum	€ 52,743



#12 of remote jobs

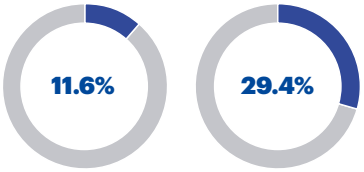
#1 of women in the digital sector

Dublin

#13 Digital professional salaries

Highest paid positions

Computer Vision	€ 64,326
Cloud (AWS)	€ 53,370
Web Developers	€ 53,235
API	€ 53,168
CRM + ERP Consultant	€ 52,899



#8 of remote jobs

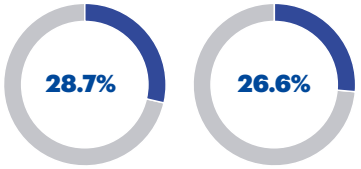
#5 of women in the digital sector

Munich

#14 Digital professional salaries

Highest paid positions

Computer Vision	€ 64,873
Cloud (AWS)	€ 53,845
Web Developers	€ 53,769
Business Intelligence	€ 52,400
API	€ 50,727



#3 of remote jobs

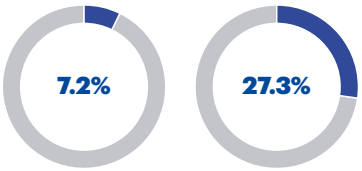
#16 of women in the digital sector

Zagreb

#15 Digital professional salaries

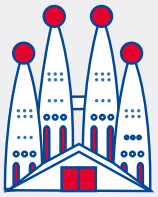
Highest paid positions

Computer Vision	€ 61,140
Artificial Intelligence	€ 53,498
Cloud (AWS)	€ 50,858
Web Developers	€ 50,719
API	€ 50,580



#14 of remote jobs

#13 of women in the digital sector

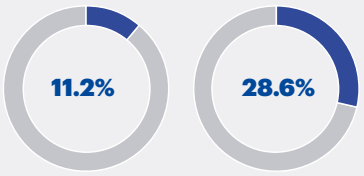


Barcelona

#16 Digital professional salaries

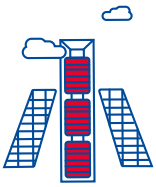
Highest paid positions

Cybersecurity	€ 56,000
API	€ 53,800
Artificial Intelligence	€ 51,600
Business Intelligence	€ 50,800
3D Printing	€ 49,900



#9 of remote jobs

#7 of women in the digital sector

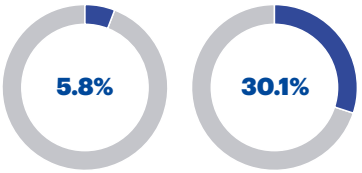


Madrid

#17 Digital professional salaries

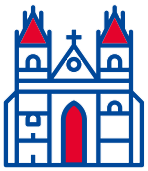
Highest paid positions

Cybersecurity	€ 59,800
3D Printing	€ 56,449
Cloud (AWS)	€ 50,480
Business Intelligence	€ 50,375
API	€ 49,118



#16 of remote jobs

#2 of women in the digital sector

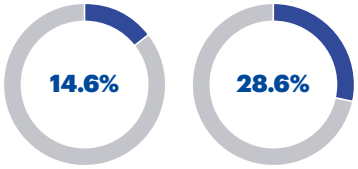


Prague

#18 Digital professional salaries

Highest paid positions

Business Intelligence	€ 57,495
Blockchain	€ 54,853
3D Printing	€ 54,476
Cloud (AWS)	€ 52,588
Artificial Intelligence	€ 52,337



#6 of remote jobs

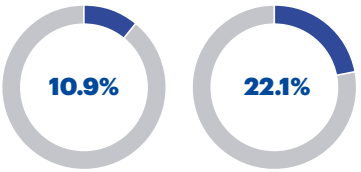
#9 of women in the digital sector

Bucharest

#19 Digital professional salaries

Highest paid positions

Big Data	€ 64,634
CRM + ERP Consultant	€ 52,945
Blockchain	€ 52,430
Computer Vision	€ 42,803
App Developers	€ 42,459



#10 of remote jobs

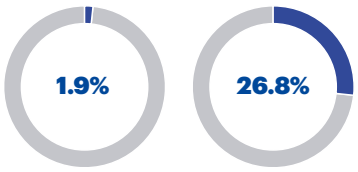
#20 of women in the digital sector

Oslo

#20 Digital professional salaries

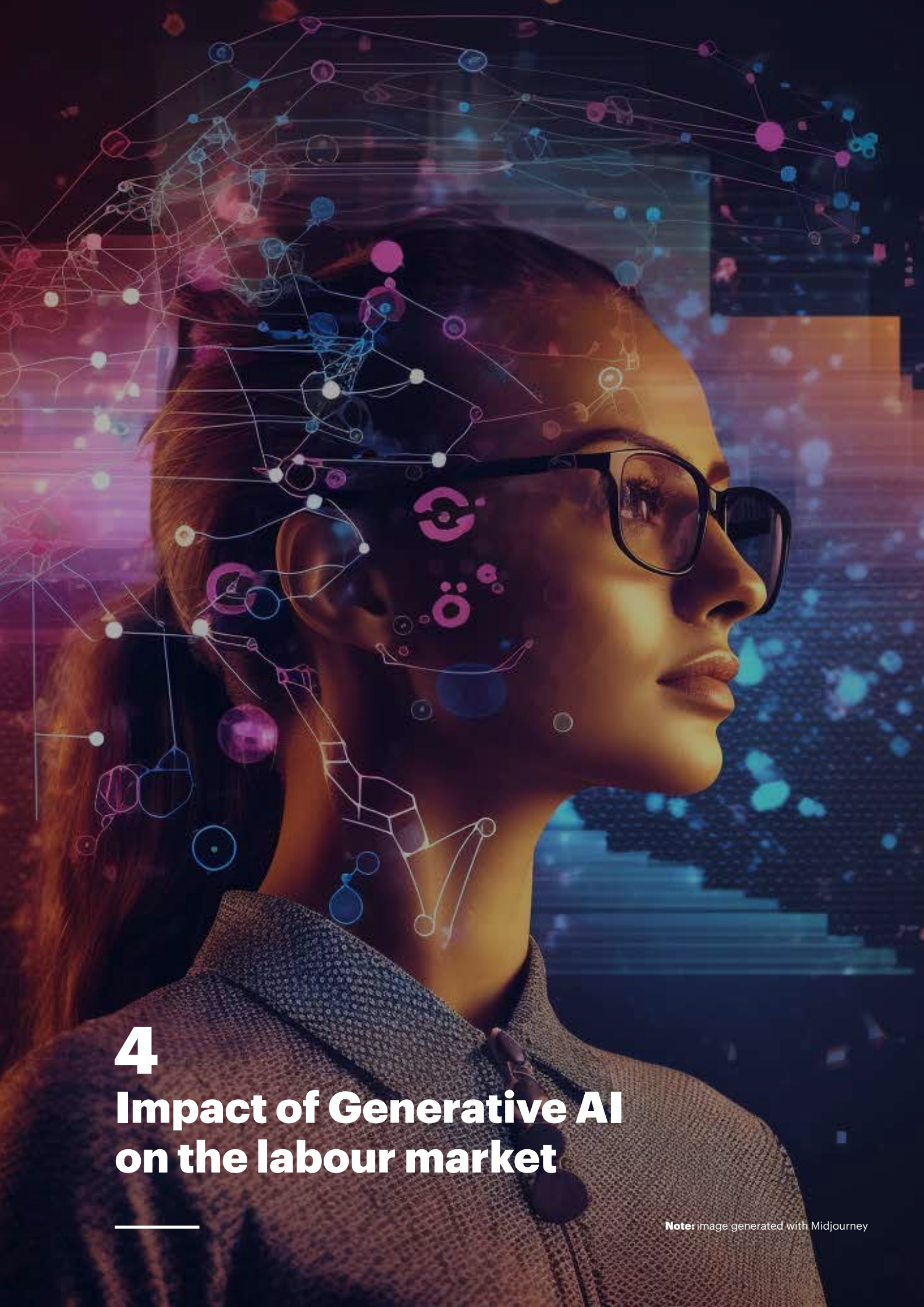
Highest paid positions

UX/UI	€ 51,689
Cybersecurity	€ 49,551
Big Data	€ 49,001
CRM + ERP Consultant	€ 46,129
Computer Vision	€ 39,164



#20 of remote jobs

#15 of women in the digital sector



4
Impact of Generative AI on the labour market

Note: image generated with Midjourney

Introduction

Generative AI is a branch of AI that focuses on **creating all kinds of original content, such as text, images and high-quality videos, in seconds and with easy-to-use interfaces**. AI models are trained on large amounts of existing data and then use this knowledge to produce new content. The differentiating factor of generative AI is the capacity for creativity, which enables collaboration with people to develop new ideas. ChatGPT is an example of a text-generative AI system, which is based on the GPT(*Generative Pretrained Transformer*) architecture that has been developed to learn linguistic and contextual patterns so that the programme can "understand" what is being asked of it and generate coherent and useful responses. There are currently several generative AI products, such as **OpenAI's ChatGPT** and **Google's Bard** for text generation and **OpenAI's Stable Diffusion, Midjourney**, or Dall-e for image generation.

According to **Klaus Schwab**, founder and executive chairman of the World Economic Forum: **"The progressive implementation of technology based on generative AI models in companies and organisations will be the basis of a new 'industrial revolution'**, and will have a direct impact, especially on the way jobs are carried out."

It argues that this impact will be directly on the activities of so-called "white-collar" jobs (office jobs) and, to a lesser extent, of "blue-collar" activities (workers in industry, factories and workshops) because it affects information management and creative activities. Any emergence and adoption of technology with a certain degree of disruption and generative AI is characterised by this potential and has always caused, as in previous industrial revolutions, among other effects, a significant change in production processes and how people work.

Therefore, in the preparation of this report, it has been considered essential to dedicate a special section to AI and, in particular, to the **impact of generative AI in the workplace** to answer or, at least, shed some light on some current issues:

- How will the way we work with these technologies change in the coming years?
- What new jobs are likely to appear?
- What skills will be needed in this changing environment?

To get an overview of all these issues, a review of the current state of AI was carried out, followed by a review of the latest reports published internationally, and **20** national and international experts in generative AI were questioned.

In addition to the 20 experts, the same questions have also been transferred to the English version of ChatGPT, and the answers have been added to the overall computation.

United States

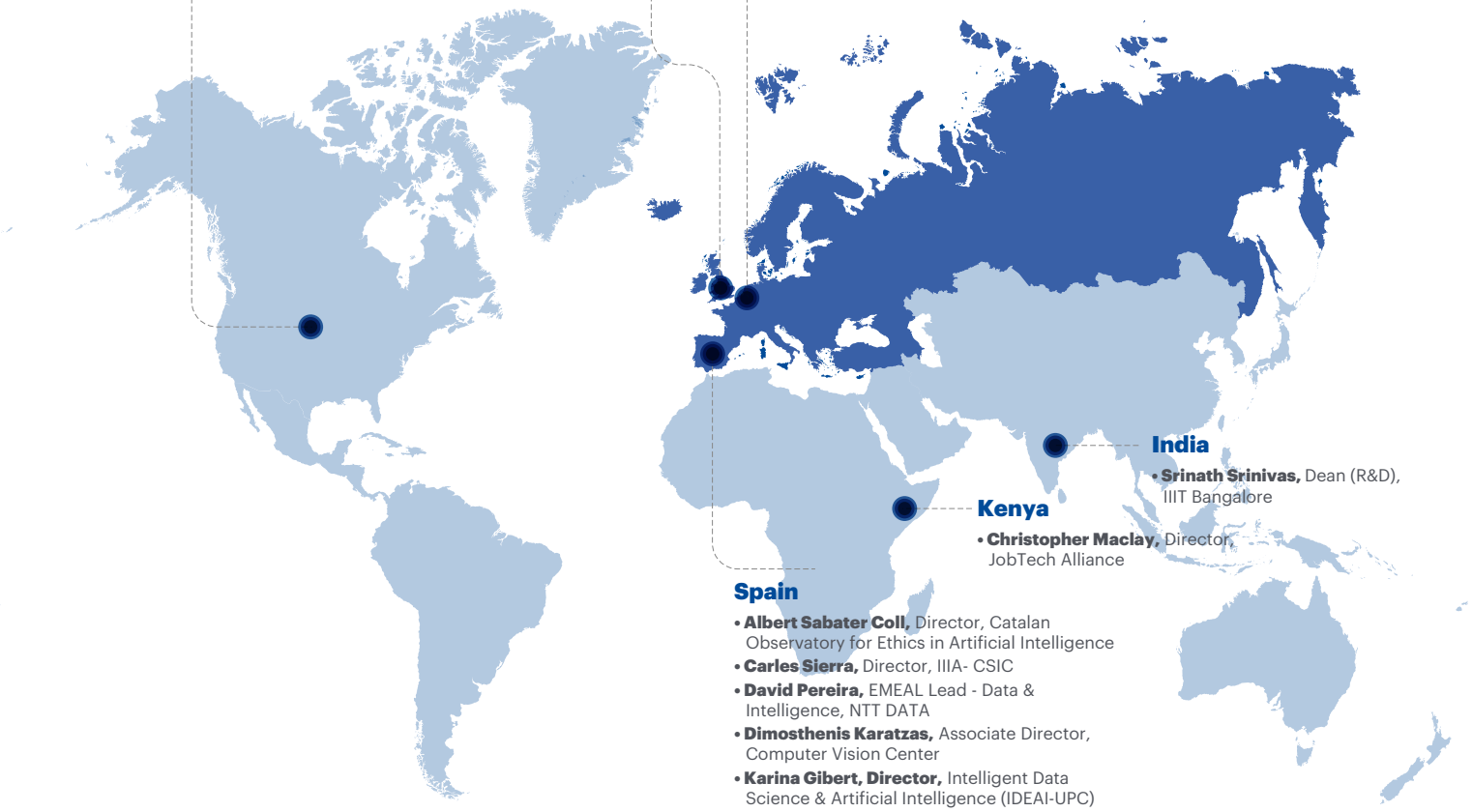
- **Peggy Tsai,** Chief Data Officer, BigID
- **Ricardo Baeza-Yates,** DIrector of Research, Institute for Experiential AI at Northeastern University
- **Sudha Jamthe,** IA Prof, Stanford
- **Salema Rice,** Chief Executive Officer, CDO Today

United Kingdom

- **Christian Mastrodonato,** CTO, Barcelona Technology School

Belgium

- **Rob van Kranenburg,** Chief Innovation Officer, Asvin.io



India

- **Srinath Srinivas,** Dean (R&D), IIIT Bangalore

Kenya

- **Christopher Maclay,** Director, JobTech Alliance

Spain

- **Albert Sabater Coll,** Director, Catalan Observatory for Ethics in Artificial Intelligence
- **Carles Sierra,** Director, IIIA- CSIC
- **David Pereira,** EMEAL Lead - Data & Intelligence, NTT DATA
- **Dimosthenis Karatzas,** Associate Director, Computer Vision Center
- **Karina Gibert, Director,** Intelligent Data Science & Artificial Intelligence (IDEAI-UPC)
- **Anna Freire,** Vice Dean, Social Impact and Academic Innovation UPF
- **Carlos Santanal,** Ingeniero y Divulgador en IA, Dot CSV
- **Enrique Ruiz,** Data Center Cloud Region Lead & Chief Employability Officer, Microsoft Spain
- **Josep M Ganyet,** CEO, Mortensen, S.L., new media professor, UPF
- **Ulises Cortés,** Scientific Coordinator High Performance Artificial Intelligence, Barcelona Supercomputing Center España
- **Joan Mas,** Director, CIDAI, Digital Technologies Division Director, Eurecat
- **Cecilia Tham** (Cecilia MoSze Tham), CEO and co-founder, Futurity Systems

General AI data

AI has boomed in recent months thanks to numerous applications that have emerged after the ChatGPT release. But this solution boom is not a one-off event or a consequence of the publication of this OpenAI tool, but rather the result of years of investment by many companies in the research and development of this technology.

Business investment in AI

Private investment in AI has increased over the last few years (reaching $91.9 billion by 2022, according to Stanford University's annual AI report[1]).

According to McKinsey & Company's State of AI report[2], adoption and investment in AI have accelerated over the past five years. AI has become a priority for businesses. In this regard, AI adoption has more than doubled since 2017, from 20% to 50% of organisations surveyed. Furthermore, 63% of companies expect investment in AI to increase over the next three years.

The figure below shows the evolution of the degree of adoption of AI by enterprises. While global adoption is 2.5 times higher today than in 2017, it has stabilised recently.

Percentage of respondents who say that their organisations have adopted AI in at least one business unit or function, %

Source: The state of AI in 2022—and a half decade in review 2022, *McKinsey*.

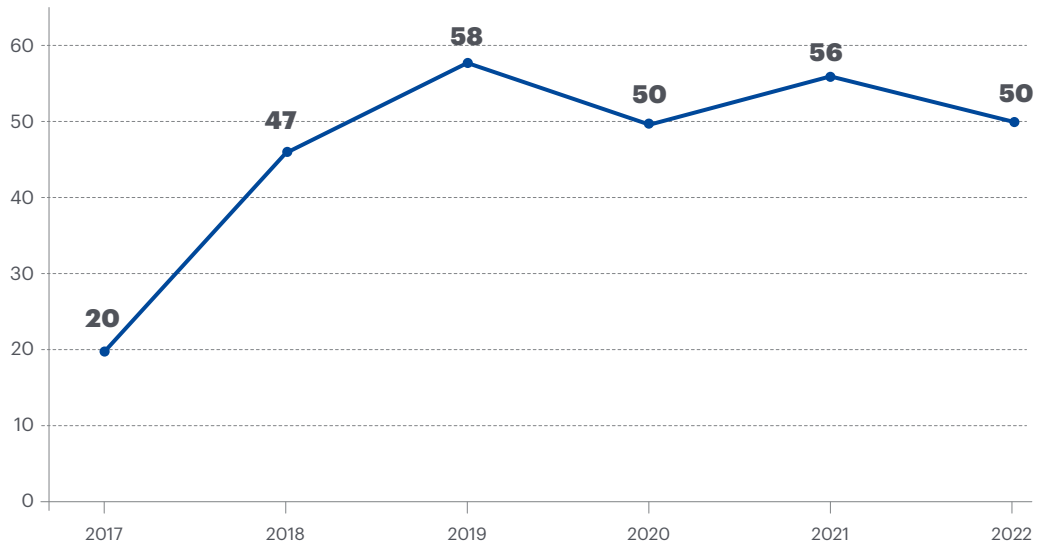


Figure 1: Adoption AI companies.

[1] Artificial Intelligence Index Report 2023. Stanford University.

[2] The state of AI in 2022—and a half decade in review. (2022). McKinsey

The same study reviews the AI functionalities adopted by the surveyed companies in at least one business area. Automating processes with robotics, computer vision, language algorithms, *chatbots*, and deep learning are worth mentioning.

Percentage of respondents who say that the given AI capability is integrated into products or business processes in at least one business function or unit

Source: McKinsey & Company: *The state of AI in 2022- and half a decade in review.*

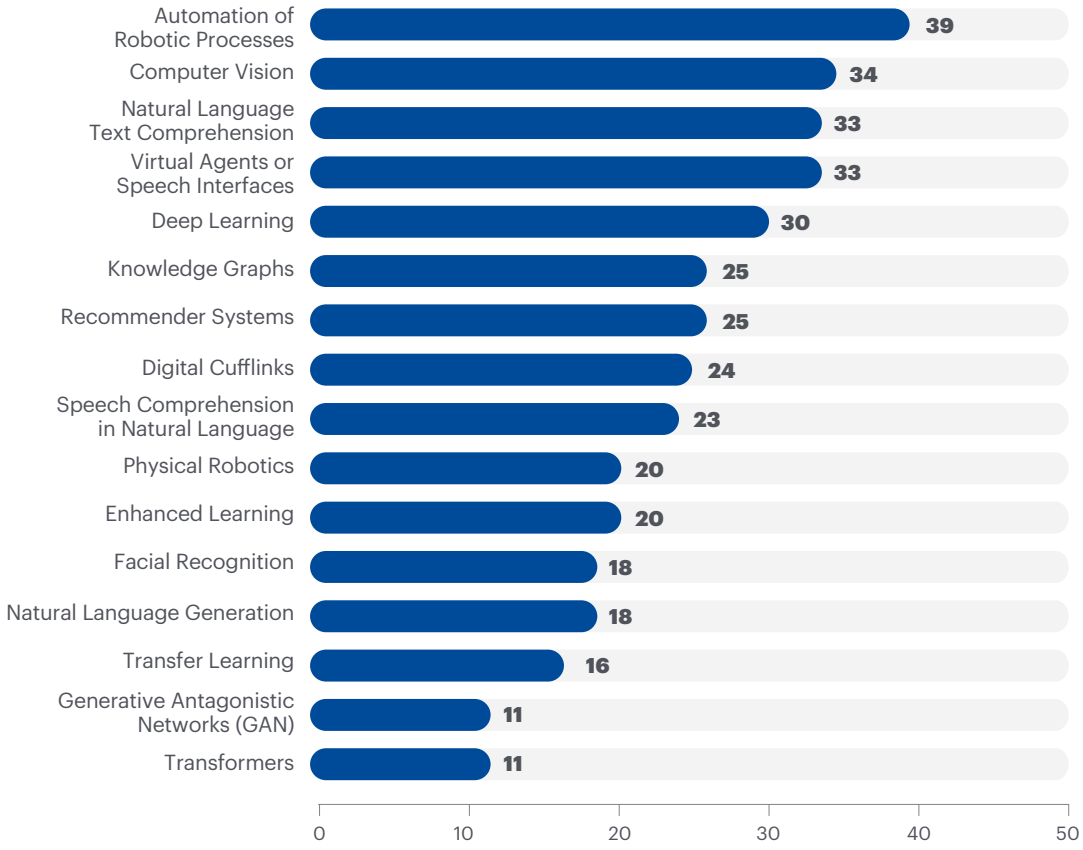


Figure 2: Processes where AI has been integrated into the surveyed companies.

It should be noted that technologies related to natural language understanding have experienced significant growth, ranking third compared to previous years. These developments have mainly been used to optimise service operations (24%), the creation of new AI-based products (20%), apply analytics to customer services (19%), segment customers (20%) and AI-based product enhancements (19%), among others.

The most popular AI use cases cover a variety of functional activities. Most commonly adopted AI use cases by function:

Source: McKinsey & Company: *The state of AI in 2022- and half a decade in review.*

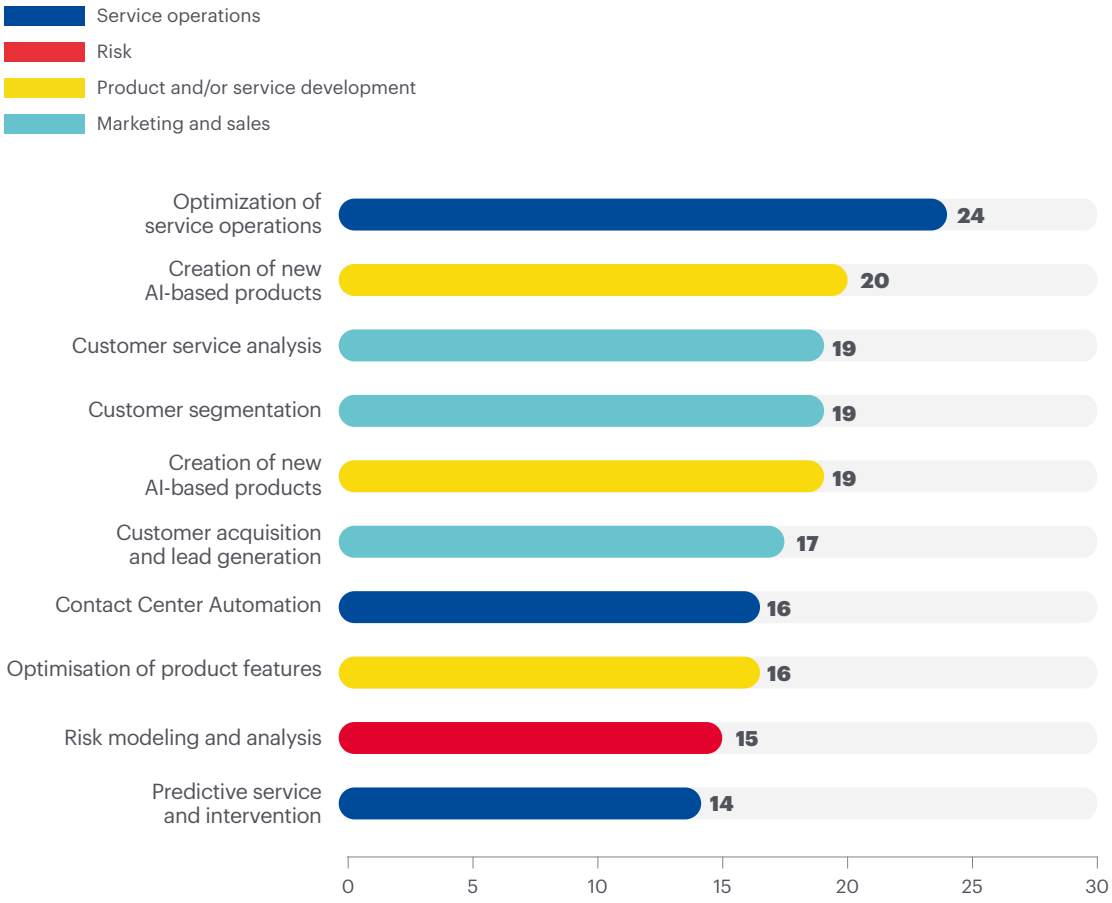


Figure 3: Most common uses of AI adoption.

Current demand for AI experts in the labour market

Investment in AI in companies is related to the hiring of AI experts. The most hired AI roles by 2022 companies are: software engineers (39%), data engineers (35%), AI data scientists (33%), machine learning engineers (30%) and data architects (28%). Thus, it can be seen that data experts occupy the top positions. The following figure shows the distribution and percentage of these profiles:

AI-related functions hired by respondents' organisations in the past year (% of respondents)

Source: McKinsey & Company: *The state of AI in 2022- and half a decade in review.*

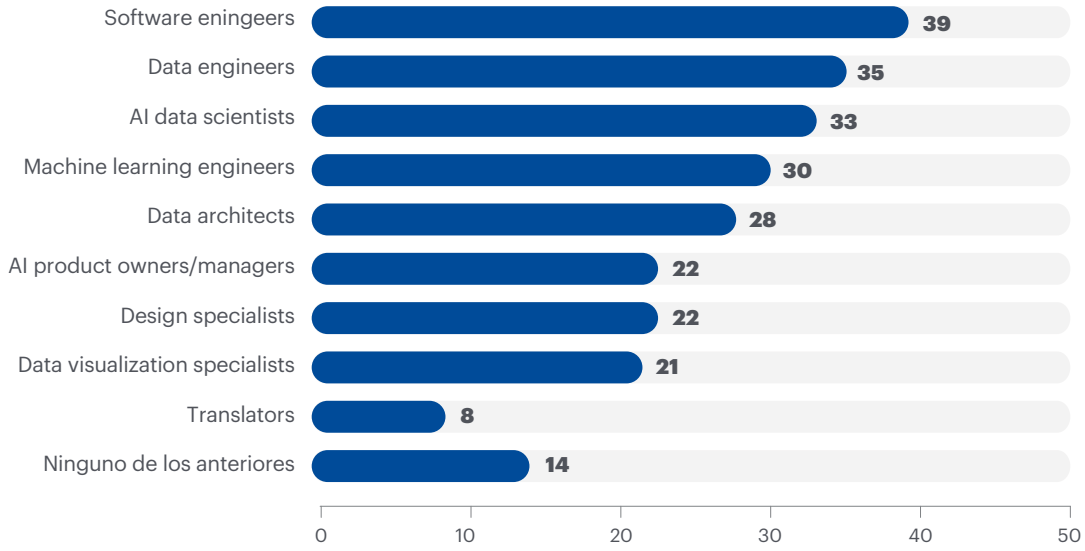


Figure 4: AI distribution of company recruitments according to role.

According to McKinsey & Company, recruiting AI professionals remains a challenge for companies for almost all profiles, and the degree of difficulty is not discernible to have changed substantially in recent years. Thus, companies opt to reskill their employees (47% of companies are doing so) and mainly recruit directly from universities or other technology companies.

Generative AI and its impact on the labour market

If AI changes the world as we know it today, generative AI will change how we relate to our environment and above all, it will change the labour market, affecting a multitude of professions that will see how AI impacts their day-to-day lives. According to Goldman Sachs[3] in its paper The Potentially Large Effects of Artificial Intelligence on Economic Growth, two-thirds of US occupations are exposed to some degree of automation by AI. Of those exposed occupations, most could have 25-50% of their workload affected.

In the same report, extrapolating from its estimates, globally, generative AI could expose the equivalent of 300 million jobs from full-time work to automation. This is especially true for repetitive clerical work or administrative and legal support jobs. However, the report notes that AIs will perform these repetitive tasks so that humans can focus on more complex and higher-value tasks.

Another relevant player that has published its forecast of the impact of generative AI on the labour market is OpenAI. The paper "*GPTs are GPTs: An Early Look at the Labor Market Impact Potential of Large Language Models*[4]", published by the company together with AI Research and the University of Pennsylvania, estimates that 80% of US jobs could have at least 10% of their tasks impacted by generative AI, and 19% of workers would be impacted by 50% of their tasks.

Predicted Impact of Generative AI on the Professions

	Goldman Sachs	Open AI
Exposure to AI	66%	80%
% of impacted tasks	25%-50%	10%-50%

According to a Goldman Sachs report: globally, generative AI could expose the equivalent of 300 million full-time jobs to automation.

[3] The Potentially Large Effects of Artificial Intelligence on Economic Growth (Briggs/Kodnani). (2023, 27 marzo). GS Research

[4] University of Pennsylvania, Princeton, & New York University. (2023). How will Language Modelers like ChatGPT Affect Occupations and Industries? Arxiv.org. Recuperado 9 de junio de 2023

But what types of occupations will be affected by generative AI? The OpenAI study analyses the level of occupations' exposure to generative AI solutions. **The following table shows the list of occupations with the highest exposure according to each measurement in the scientific study.** The final row lists the occupations with the highest σ2value, indicating they have the highest variability in exposure scores. Exposure rates indicate the proportion of an occupation's task exposed to GPT(α) or software with GPT technology(β and ζ), where exposure is defined as reducing the time it takes to complete the task by at least 50%.

The occupations listed in this table are those where it has been estimated that GPT and software with GPT technology can save workers significant time in completing a large part of their tasks. Still, it does not necessarily suggest that these technologies can automate their tasks.

Group	Occupations with the highest exposure	% Exposure
Human Alpha	Interpreters and Translators	76.5
	Survey researchers	75.0
	Poets, lyricists and creative writers	68.8
	Animal scientists	66.7
	Public Relations Specialists	66.7
Human Beta	Supervisory Investigators	84.4
	Writers and Authors	82.5
	Interpreters and Translators	82.4
	Public Relations Specialists	80.6
	Animal scientists	77.8
Human Zeta	Mathematicians	100.0
	Tax preparers	100.0
	Quantitative Financial Analysts	100.0
	Writers and Authors	100.0
	Web and digital interface designers	100.0
Model Alpha	Mathematicians	100.0
	Mail clerks	95.2
	Blockchain engineers	94.1
	Court reporters and simultaneous subtitlers	92.9
	Proofreaders and copy markers	90.9
Model Beta	Mathematicians	100.0
	Blockchain engineers	97.1
	Court reporters and simultaneous subtitlers	96.4
	Proofreaders and copy markers	95.5
	Mail clerks	95.2

Group	Occupations with the highest exposure	% Exposure
Model Zeta	Chartered Accountants and Auditors	100.0
	News analysts, reporters and journalists	100.0
	Legal Secretaries and Administrative Assistants	100.0
	Clinical data managers	100.0
	Climate change policy analysts	100.0
Greatest change	Search Marketing Strategists	14.5
	Graphic designers	13.4
	Hedge Fund Managers	13.0
	Finance Managers	13.0
	Insurance appraisers, motor vehicle damage	12.6

Figure 6: Occupations with the highest exposure according to each measurement. Source: GPTs are GPTs: An Early Look at the Labor Market Impact Potential of Large Language Models, OpenAI, Open Research, University of Pennsylvania

For the final list of occupations where generative AI may have the greatest impact, the following image shows a summary table from the FinancialTimes[5] based on the OpenAI report, listing some of the jobs most exposed to AI. Some of them are: genetic counsellors, purchasing agents, financial analysts, judges, court clerks, solicitors, accountants and auditors, tax agents, insurance agents, office administrative tasks or software programmers (for more details, see Annex).

Jobs more exposed to AI

Base case AI	Language-based AI
Genetic counsellors	English Language and Literature teachers
Financial examiners	Foreign language and literature teachers
Actuaries	History teachers
Purchasing agents	Law professors
Budget analysts	Professors of philosophy and religion
Judges, magistrates Judges, magistrates	Sociology professors
Production employees	Professors of political science Accountants
Accountants and auditors	Professors of criminal justice and law enforcement
Mathematicians	Sociologists
Court clerks	Social work teachers

Figure 7. List of occupations most exposed to AI: Source: Financial Times.

[5] Accountants/AI: exit, pursued by a chatbot. (2023, 9 abril). Financial Times

It is interesting to note the results of the joint report by Princeton, Pennsylvania and New YorkUniversities[6] (published by the Financial Times), which analyses the relationship between occupations' exposure to generative AI and salaries and highlights a high correlation between them.

As shown in Figure 8, the report relates salary to exposure to the impact of AI. The dots indicate the professions listed in Figure 7, and the further to the left they are, the less impact AI will have on their profession. Conversely, the further to the right, the greater the impact of AI on the profession. On the ordinate axis, it indicates the salary (in thousands); the higher it is, the higher the wage.

Therefore, according to this report, the higher the salary (and it follows that the higher the qualification of the profession), the greater the exposure to the impact of AI, given that the occupations that seem to be most exposed to algorithms are the "white collar" professions, i.e. highly skilled professions. And at lower salaries, there is less exposure to the professions associated with the impact of AI.

Higher-paid jobs more exposed to AI

Job vulnerability to replacement with language-based AI

Source: University of Pennsylvania, Princeton, & New York University. (2023). How will Language Modelers like ChatGPT Affect Occupations and Industries?

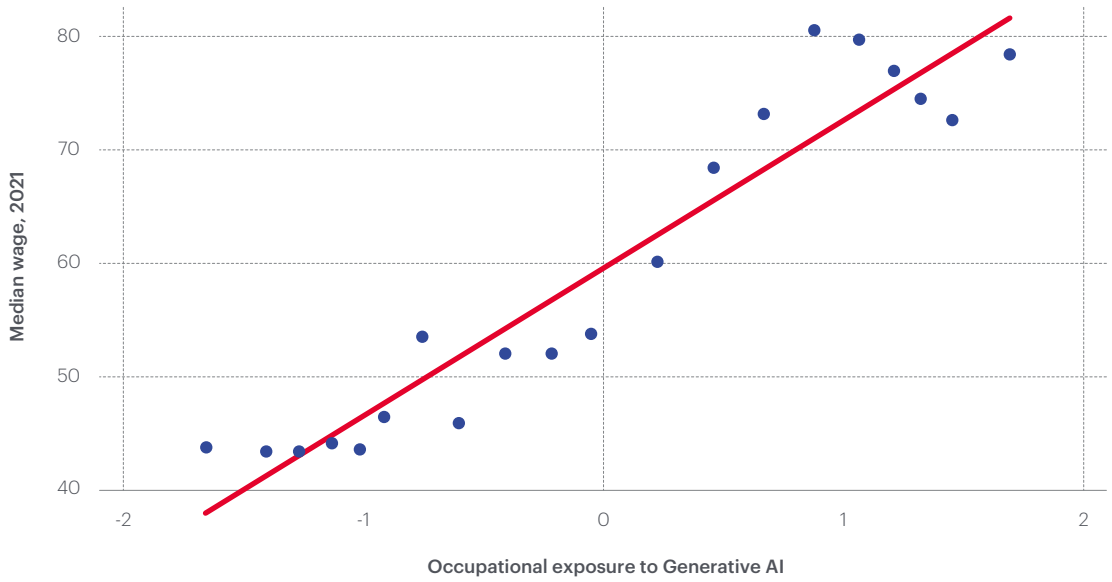


Figure 7. Relationship between occupational exposure to AI language modelling (AIOE) and average occupation

[6] University of Pennsylvania, Princeton, & New York University. (2023). How will Language Modelers like ChatGPT Affect Occupations and Industries? Arxiv.org. Recuperado 9 de junio de 2023

Revolution in the labour market

At this point, we agree that generative AI will revolutionise the labour market. Does this mean that all humans will be out of work? Can we imagine a utopia where machines do the work and we devote our time to leisure? The answer to these questions is no. The most likely scenario is that jobs, as we know them today, will evolve with the support of these tools.

The view of the experts consulted

This section presents the analysis of the surveys carried out with people (20) from different fields, all related to generative artificial intelligence, whether as researchers, scientific disseminators, company technicians or ChatGPT itself, which also participated in the surveys.

Impact on daily tasks

Respondents were asked which tasks they believe generative AI can generate the most benefits across various activities (increased creativity and high quality, decision support, time-saving, eliminating routine tasks).

The experts consulted overwhelmingly indicate that where generative AI can have the most positive impact in the elimination of routine tasks, closely followed by time savings (most likely resulting from the elimination of routine tasks). To a lesser extent, they argue that it will impact high creativity and quality activities, and finally, as decision support.

Benefits of Generative AI in the workplace (from 1 to 5, from least to most important)

Source: in-house, from surveys of sector experts

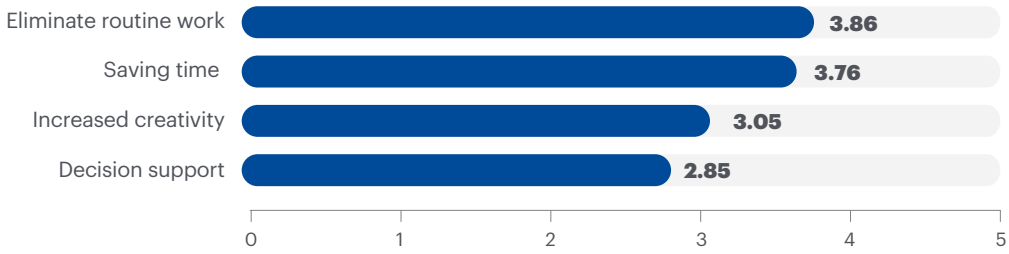


Figure 9. Benefits of generative AI in the workplace.

It is interesting to note other benefits suggested by experts; for example, Joan Mas points out that ***"one advantage of generative AI is that it eliminates the blank page syndrome. It can help you to be more productive. However, once the AI has provided you with initial information, the recommendation is to verify it, contrast it and elaborate it with a personal style."***

Josep Maria Ganyet says, "***Generative AI is very good for getting it wrong more efficiently. You can explore faster. You can go wrong before in every possible way."***

For Enrique Ruiz Perez, an additional benefit of AI will be to "facilitate the use of complex tools by non-experts".

Employment

In this section, many questions related to the direct impact on today's positions have been asked, to which the experts have responded:

What will be the jobs whose skills will be most affected by generative AI?

Experts point out that, without specifying a specific role, it will affect those jobs where efficiency is more important than creativity. Still, some experts point out the opposite: it will affect positions that stand out for their creativity, such as design jobs. Responses are that AI can help replace routine tasks and creative tasks, but there is no consensus.

About which positions will be most affected, the majority of the answers do hold that it will be jobs related to the legal field (documentation), journalism and programming, as well as those related to language, such as dubbers or writers.

Karina Gibert states, "***All job positions that use language extensively will be strongly transformed: translators, dubbers, literary critics, transcriptionists, etc. It will also greatly impact the interfaces we communicate with technology (we can interact much more with the voice)."***

According to Josep Maria Ganyet: "AI may ***negatively impact the positions of trainees or apprentices, who may be replaced."*** He argues that these positions generally perform routine tasks while learning. Still, it is a basic process for any professional to gain knowledge and experience.

Even so, a human will always be needed to review the outcome of the generative AI's work.

What will be the jobs whose skills will be most affected by generative AI?

Regarding this matter, most experts agree that the jobs whose skills will be least affected by generative AI require manual labour, from carpentry to mostly jobs related to interaction with people, specifically caring for people (nursing, healthcare or personal care) and education.

Penetration

In the next block, specialists have indicated the percentage of daily tasks that can be automated based on generative AI from the following professions: chef, programmer, illustrator, lawyer, doctor and teacher.

As shown in Figure 10, the experts consulted think that the profession where generative AI will automate the most daily tasks is illustrators, followed by lawyers and programmers, with equal scores. Teachers and doctors (medicine) are thought to have a relatively small percentage of automation. Finally, cooks are thought to have the lowest percentage of tasks that can be automated with generative AI of all the professions analysed.

Percentage of tasks that can be automated using generative AI

Source: in-house, from surveys of sector experts..

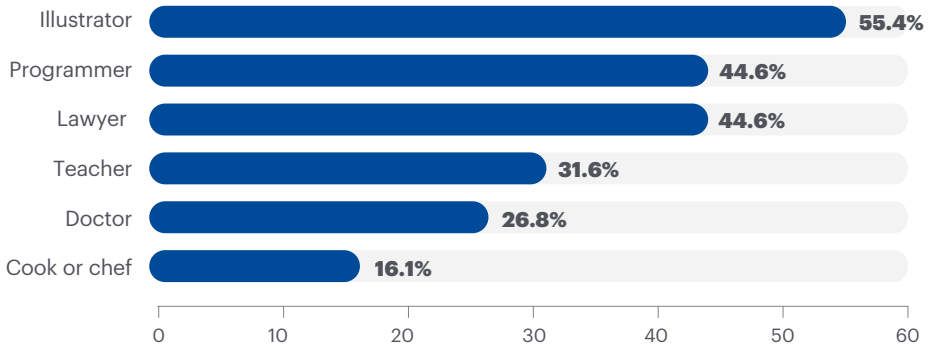


Figure 10. What percentage of daily tasks can be automated based on generative AI among the following professions?

Can you identify new professions that may emerge thanks to generative AI?

Adopting generative AI will mean changes in the labour market as we know it today, to the extent that new professions will emerge. The experts consulted in this article agree that the position of Prompt Engineer will be key shortly, with the main function being to liaise between the technician and the generative AI. Generative AI will gradually improve its knowledge, and to get the most out of this tool, it will be necessary to know in depth the type of questions and the interaction to have with them.

As most technicians will not have this knowledge, this position will take care of this permanent interaction with generative AI in any field. Most companies will have one or more such profiles (depending on the size of the company) to help technicians consult the tool, as well as develop best practice guides and raise awareness among workers that AI is not the solution to all problems and that the jobs it performs need to be reviewed.

It is interesting to note Ricardo Baeza-Yates' comment that ***"it may be a profession that in time, with the improvement of generative AI, will no longer be necessary"***. Along the same lines, Ricardo Baeza-Yates advocates the figure of the ***"new scribe, people who know how to use technology will teach or help people who don't know how to use it".***

Another position that will emerge is related to the ethics of AI, fairness and bias auditors of algorithms. The widespread adoption of AI in our lives brings many challenges regarding the transparency of AI tools, their intelligibility and neutrality, as discussed in the section on risks. This is why experts in this field will be needed.

Related to the above, there will also arise positions of law applied to generative AI and the legal limits that this technology should have, and also positions related to the auditing of AI to verify the information generated and its privacy.

They also agree that there will be much demand for AI experts, trainers, data analysts, data governance specialists, interface designers and usability experts for AI systems, and cybersecurity experts.

Impact on the labour market

This section has asked about the impact of generative AI on the labour market, particularly on replacing people with intelligence.

What level of job replacements do you expect in the future due to generative AI?

This question addresses whether generative AI will affect replacing positions as we know them today. The question was asked with a time horizon of 3 and 10 years, and three options were given (low replacement, medium or high).

Analysing the responses depicted in Figure 11, most experts believe there will be little significant replacement in the short term (3 years), affecting a few work areas. On the other hand, most experts also believe that in the long term (10 years), there will be more replacements based on the job positions we know today.

3- and 10-year vision on the impact of generative AI on professions

Source: in-house, from surveys of sector experts.

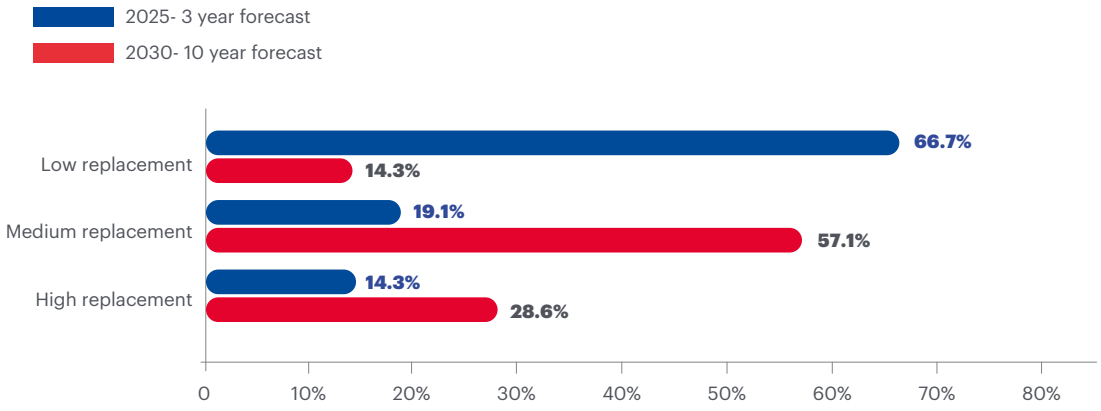


Figure 11. Impact of replacement 3 and 10 years ahead.

Do you think that, due to the massive deployment of AI in the economy, the balance of the impact on net job creation will be positive or negative in the coming years (until 2025)?

This question has been the most controversial and the one that has generated the most debate in the surveys and interviews conducted for this article.

What is quite clear, and what everyone is arguing for, is that the mass adoption of generative AI will generate new jobs. There will also be jobs that will reduce their tasks in favour of AI. In the short term, this gap is likely to be negative. However, in the medium to long term, adopting AI will generate new jobs (other than those mentioned above) and new business opportunities that will absorb the surplus of workers.

Carlos Santana states, ***"While history indicates that technological advances generally lead to an overall increase in employment opportunities, the transition period can pose significant challenges. This underlines the importance of proactive measures such as education, training and social protection systems."***

According to Karina Gibert, "Generative AI should not replace people. It has to be a tool to help them. ***AI models still need to improve and increase the quality of responses. In addition, they should be modified to cite sources and thus allow an assessment of the correctness of their answers or creations."***

Another factor to consider is the regulation that may be applied, as it will directly affect the adoption of the technology and its effect on the labour market.

The conclusion reached by most experts on this question is that the benefit of generative AI is undisputed and that adoption will come sooner rather than later. As with all technological revolutions, there is always a fear of job losses.

Still, these revolutions eventually generate new needs and jobs in the long run. The conclusion reached by most experts is that the benefit of generative AI is undisputed. Adoption will come sooner rather than later, and as with all previous technological revolutions, there is a fear of job losses. In the long run, such revolutions transform the labour market and generate new needs and jobs.

Salema Rice notes: ***"There will be a greater need for people able to understand, interpret and manage systems. In addition, those with skills that complement AI capabilities will be in high demand. Job creation is already taking place. New opportunities arise virtually every day. Overnight we need people to oversee and manage the systems of generative AI, or to ensure ethical and responsible AI and responsible data, analysts who can provide inputs, customisations, and interpret and validate outputs. It will have a significant impact on the labour market. Still, it will be more like a co-pilot than a substitute."***

Skills

Experts have been asked about the necessary skills workers should have in a future where generative AI is widely implemented in the economy.

Critical thinking is a concept that is repeated in several answers. Curiosity, knowledge of digital tools and data concepts and, above all, having dialogue skills with generative AI are other skills most often mentioned.

Specifically, Dimosthenis Karatzas argues, ***"Basic programming skills and some basic notions of AI and machine learning should be taught as early as primary education and included in all university degrees to ensure everyone understands the possibilities and limits of such technologies in their field of expertise. At the same time, certain humanities subjects should be taught more in engineering courses, ensuring that future AI engineers can think philosophically and ethically rather than have some "ethics for AI" principles."***

Sudha Jamte recommends ***"data literacy and responsible AI: the ability to check AI bias to know when to believe AI results and to question generative AI".*** Computational thinking, data analysis, technological innovation or telecommunications have also been highlighted.

Another set of skills that have been highlighted are those related to humanity, regulation, ethics and how to interact between humans without the need for technology. According to Joan Mas, "studies in the humanities should be promoted to maintain the specificity of man as an individual, enhancing all his cognitive and emotional capacities."

Finally, the focus is also on what is known as softskills or soft skills, such as flexibility and resilience to change or emotional intelligence. Figure 12 shows the concepts most frequently cited by the experts.

Figure 12. Cloud of skills most frequently mentioned by experts.

Risks

The expert group has been specifically asked about the risks that the adoption of generative AI may entail. In this regard, **one of the main risks identified is the reliability of the results, which may be inaccurate or false depending on the data** (if the AI is trained with erroneous data, the information it provides may not be accurate).

Information may be biased based on the people's opinions or data that train the AI. For example, if men train the AI, it will likely have a gender bias. Along these lines, it is also possible that results may be biased along economic lines, sexual orientation or political ideology.

On the other hand, it is also possible to reach a situation of normalisation of the results, i.e. if most people consult the same source, the result provided by the algorithm will likely be similar.

Another risk of AI is intellectual property. At the time of writing, the regulation has not yet been pronounced, so the result of the work of a generative AI has no owner. Moreover, the AI does not reference the source of the information at the moment so the user may be committing a plagiarism offence. Moreover, in addition to this risk of authorship of the source, there is also the risk of transparency and accountability. Generative AI models are complex, making understanding and controlling their decision-making difficult. This lack of transparency raises accountability issues, as it is difficult to trace errors, biases or malicious actions back to their source.

Finally, the lack of ethics of generative AI has been commented on during the interviews. It is, therefore, of utmost importance that the persons receiving the information can discern whether the information they receive is ethically correct.

Conclusions

Generative AI is expected to **majorly impact** today's jobs, potentially affecting 10-50% or 25-50% of tasks depending on the source.

Unlike other industrial revolutions, this will affect higher-paid skilled positions because it affects information management and creative activities. These occupations may include translators, mathematicians, programmers, accountants, graphic designers, and scriptwriters.

If generative AI confirms the performance expectations, in a few years, it will be unthinkable to work without this type of tools, as is currently the case with computers, internet connection, software tools, etc. It does not necessarily imply a reduction in net work. However, fewer people may be required to carry out some current tasks (the ones we have mentioned that may be more routine and repetitive), new jobs may be created, or new tasks may arise. The impact seems more likely in the long term, about 10 years ahead, than in the short term.

As AI can solve tasks related to creativity, searching and processing information, it seems necessary for workers to develop more "human" and supervisory skills such as emotional intelligence, adaptability, leadership, etc. or critical thinking. Experts also point out that basic programming skills and knowledge of AI are recommended to know how to interact with AI tools and to be able to monitor the logic and quality of the results provided.

The evolution and impact of generative AI solutions in the workplace will depend on how companies and individuals respond to the changes they bring and, therefore, on their ability to adapt to these new technologies.

Annex 1

Cost of living* vs cost of living + rent

2022

Source: TalentUp.io for Mobile World Capital Barcelona

Zurich	New York	Oslo	Copenhagen	Dublin	Amsterdam
101.61%	100%	80.1%	72.89%	72.81%	70.4%

Paris	Stockholm	Munich	Milan	Helsinki	Rome
69.67%	65.83%	64.35%	61.39%	60.36%	56.87%

Berlin	London	Vienna	Barcelona	Madrid	Prague
55.05%	54.98%	53.75%	48.94%	46.73%	38.9%

Tallinn	Zagreb	Bucharest
36.54%	35.22%	28.47%

Annex 2

Ranking	Top 20 Occupations From Original AIOE	Top 20 Occupations after Language Modeling Adjustment
1	Genetic Counselors	Telemarketers
2	Financial Examiners	English language and literature teachers
3	Actuaries	Foreign language and literature teachers
4	Purchasing Agents, Except Wholesale, Retail and Farm Products	History teachers
5	Budget Analysis	Law teachers
6	Judges, Magistrate Judges and Magistrates	Philosophy and religion teachers
7	Procurement Clerks	Sociology teachers
8	Accountants and Auditors	Political science teachers
9	Mathematicians	Criminal justice and law enforcement teachers
10	Judicial Law Clerks	Sociologists
11	Education Administrators, Postsecondary	Social work teachers
12	Clinical, Counseling and School Psychollogists	Psychology teachers
13	Financial Managers	Communications teachers
14	Compensation, Benefits, and Job Analysis	Political scientists
15	Cretdit Authorizers, Chekers and Clerks	Cultural studies teachers
16	History Teachers, Postsecondary	Arbitrators, mediators and conciliators
17	Geographers	Judges, magistrate judges and magistrates
18	Epidemiologists	Geography teachers
19	Management Analysts	Library science teachers
20	Arbitrators, Mediators and Conciliators	Clinical, counseling and school psychologists

Note: This table lists the top 20 occupations most exposed to AI from the original AIOE (Felten et al., 2021) and the top 20 occupations most exposed to advances in AI language modelling.

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