1

Executive summary

1. EXECUTIVE SUMMARY

I. The *Baròmetre* as the reference study of the Catalan ICT sector

The 16th edition of the *Baròmetre* breaks the record of participation and consolidates its position as a reference study

The *Baròmetre of the Cercle Tecnològic de Catalunya* of 2024 is the 16th edition of the reference study that measures the state and evolution of Catalonia's digital technological ecosystem. In this new edition, a representative sample of the Catalan ICT ecosystem has been achieved, with an unprecedented participation of 1,537 professionals, an increase of more than 21% compared to last year results.

Of the **1,537 participants, 804 represent ICT companies**, divided among **106 from HR departments** and **698 from technical and executive positions**.

The remaining 733 participants work at non-tech companies: 366 in companies with ICT departments and 367 in companies without ICT departments.

Furthermore, this edition introduced the SmartDelphi system: an online tool based on the Delphi method that has allowed the collection and synthesis of opinions from five groups of experts asynchronously, **promoting consensus on five issues related to the Catalan ICT sector**. This year's edition involved a total of 35 experts, distributed across five thematic tables:

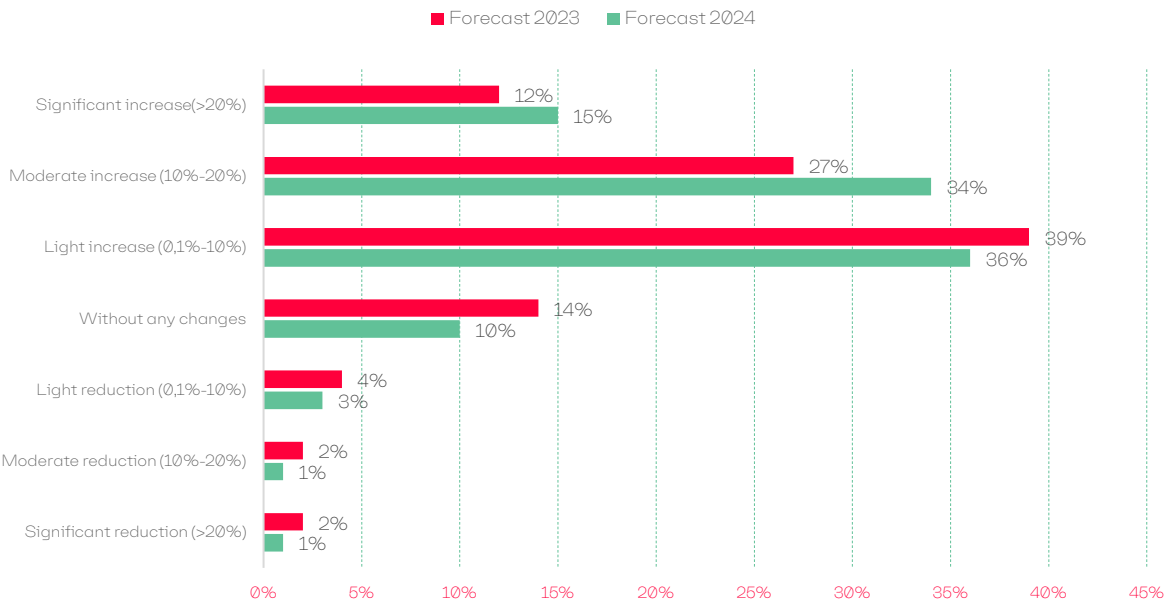
- Table 1: ICT talent in Catalonia
- Table 2: Knowledge transfer
- Table 3: Growth lines of the ICT sector
- Table 4: Impact of technology on various economic sectors
- Table 5: Impact of technology on society

The combination of these information sources has facilitated an exhaustive diagnosis of the ICT sector and its ecosystem, complemented by relevant information extracted from secondary sources.

II. The ICT sector as one of the engines of the Catalan economy

The ICT sector represents 9% of Catalonia's GDP, surpassing the chemical, automotive, and construction industries

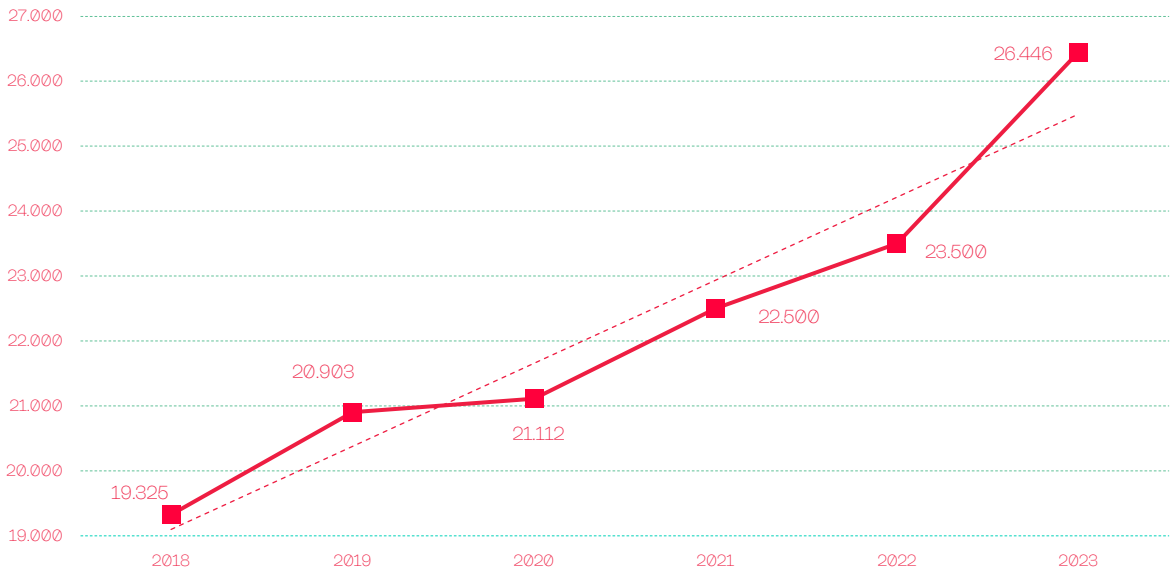
According to data in the *Baròmetre of the 2024*, 8 out of 10 companies expect an increase in sales.



How do you foresee the year-end closing of the company that you work at? Comparison 2023 and 2024
Source: Survey of the *Baròmetre 2024*, *Baròmetre 2023*
Sample: 804 people

These expectations align with the macroeconomic data of the sector.

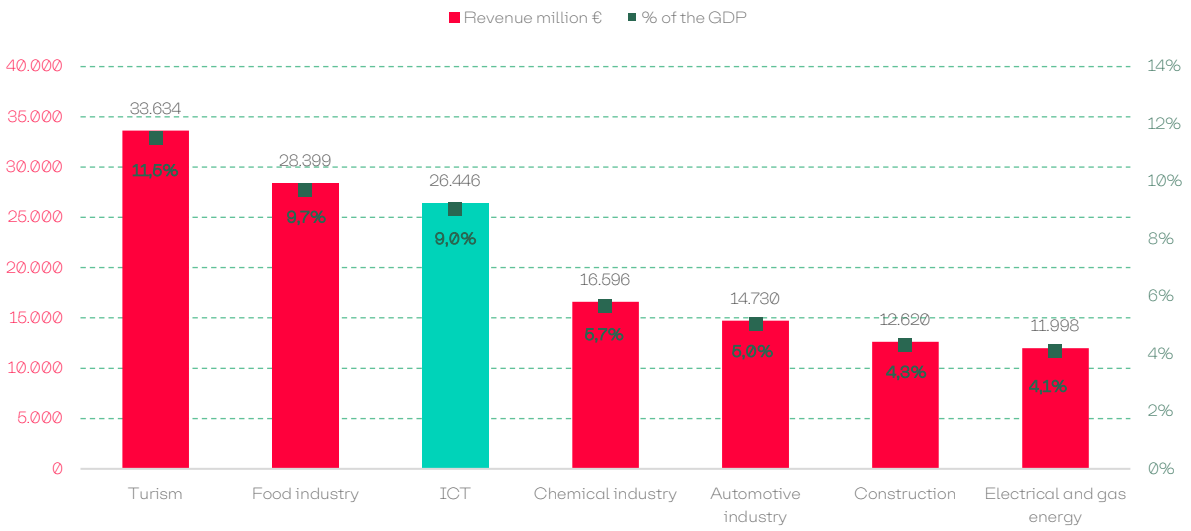
In 2023, Catalan ICT companies billed 26,446 million euros, representing an increase of **12,5%** compared to the previous year and **the most notable growth of the last five years.**



Increase of the Catalan ICT companies' yearly revenue (in million euros)
Source: IDESCAT

Hence, in 2023, **the revenue of the ICT industry represented the 9% of the Catalan GDP**. This data shows the great importance of this sector for the Catalan economy.

When comparing the ICT sector with other significant industries of the Catalan economy, such as the tourism and the food industries, **a higher weight over the GDP can be observed (estimated at 12,8% for the tourism sector and 9,7% for the food industry).** On the other hand, the chemical industry has a business volume of 16,596 million euros, equivalent to 5,7% of GDP, significantly below the ICT sector. Similarly, the automotive sector represents 5% of GDP, followed by the construction sector with 4,3%, among others.

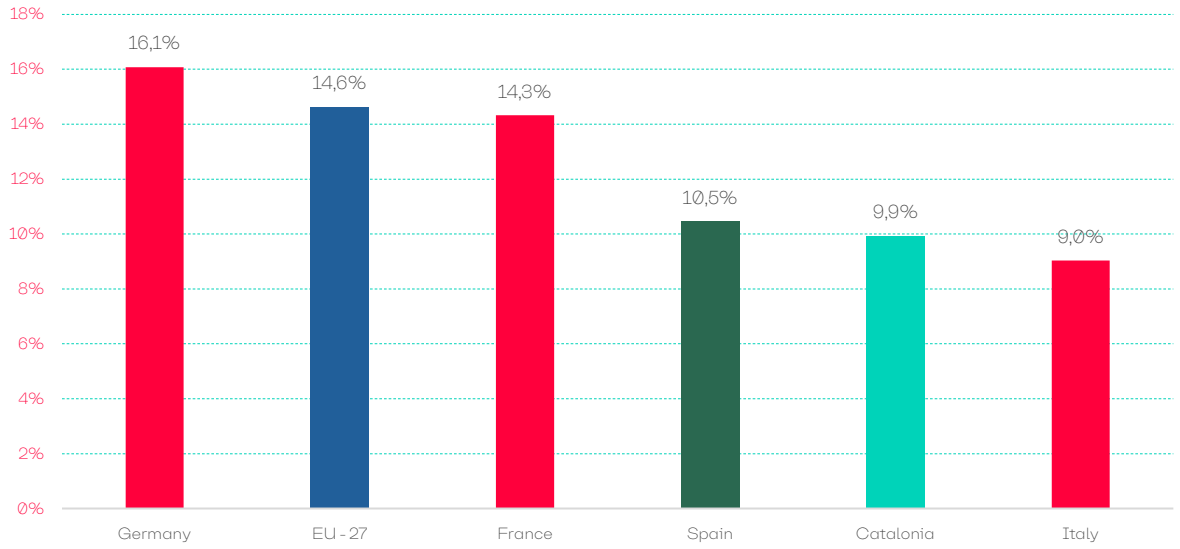


Revenue of different Catalan industries (million euros) and their weight over the GDP.
Source: Structural Business Statistics of the Industrial Sector (EIE) (2022) i and Customs (2022).
INSS (2022) through the work observatory and productive model
Source of the revenue of the Touristic Sector: Departament d'Economia, Generalitat de Catalunya

To compare the contribution to the GDP of the ICT industry between Catalonia and Europe, the most recent data available is from 2021[1]. For that year, the ICT sector in Catalonia, **with a contribution of 9,9% of the GDP** (that year, despite the influence of the global pandemic, the ICT sector was amongst the ones that best resisted the economic impact; hence, the greater weight over the GDP compared to 2023), shows a **relatively lower weight than the European average, which was 14,6%.**

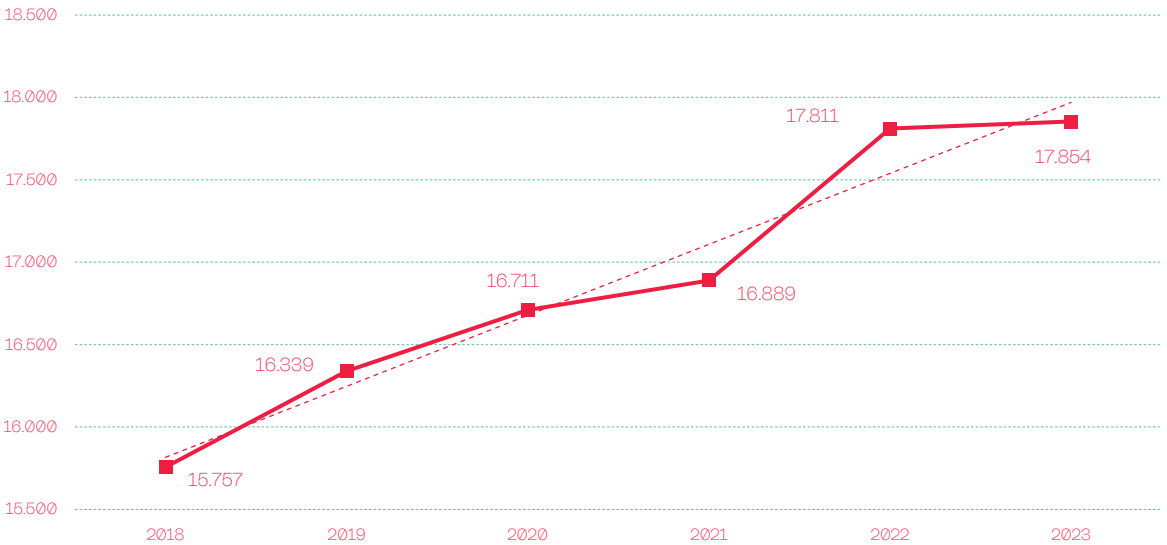
Germany leads the list of countries whose ICT sector contributes the greatest to their GDP, as it represents 16,1% of its GDP (with a revenue of 300.5880 million euros); France follows the list with a 14,3% of its GDP (with a revenue of 2104.59 million euros); Spain, with a 10,5% of its GDP (with a revenue of 851.151 million euros); and Italy, with a 9,0% of its GDP (with a revenue of 103,292 million euros).

1 GDP percentage calculated from Eurostat data. Year of reference: 2021 (last data available).



Weight of the ICT industry over the GDP
Source: Catalan GDP, IDESCAT (2021). GDP of EU countries, Eurostat(2021)

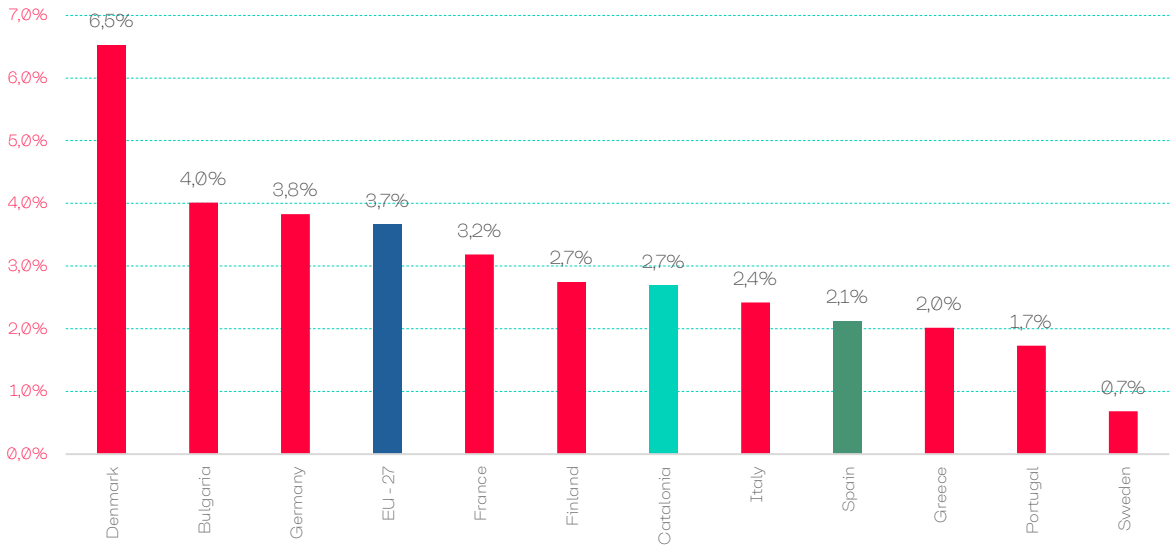
The number of ICT companies in Catalonia reached **17,854 in 2023**, an increase of 0,2% compared to the previous year. Despite this being a seemingly small increase, it contrasts with **the 0,7% decrease in the number of ICT companies in Spain during the same period**, according to data from the INE: in a context of national decline, the Catalan ICT ecosystem has managed to slightly increase the number of companies.



Increase of the number of ICT companies in Catalonia
Source: IDESCAT

At the state level, of the 72,521 ICT companies in Spain, **20% are headquartered in Catalonia.**

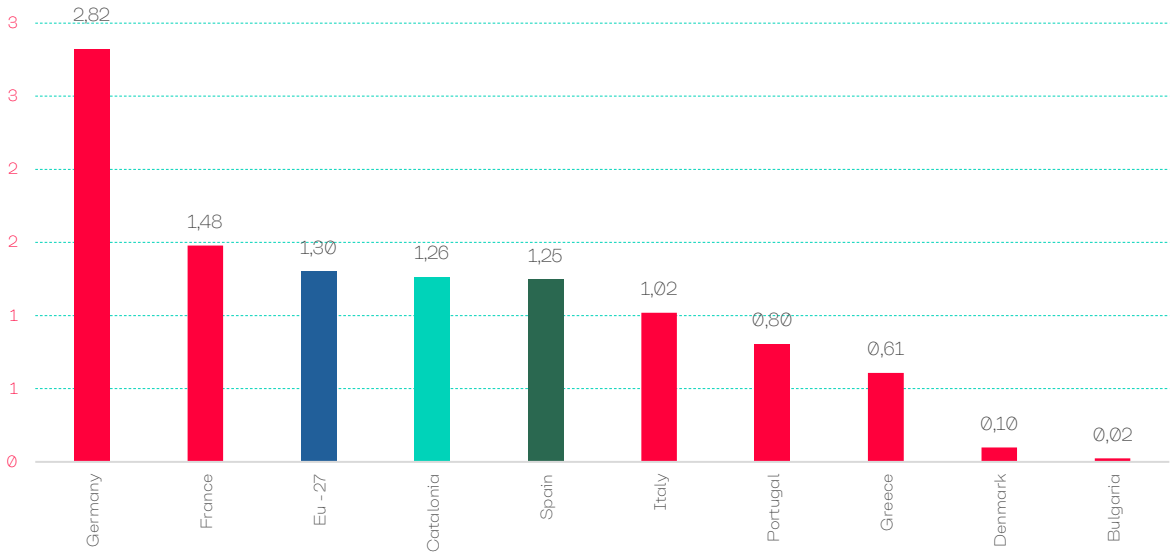
At the European level, the average proportion of ICT companies over the total amount of companies is 3,7%. The country which has the highest relative amount of ICT companies is Denmark (6,5%), followed by a second group (Bulgaria, Germany and France, with 4,0%, 3,8% and 3,2% respectively).



Comparison of the percentage of ICT companies over the total amount of companies, by country
Source: Eurostat[2]

However, **when analyzing the average turnover, Catalan companies align with French and Danish companies.** German companies are leading the ranking since their average sizes are the largest.

2 To make the comparison, the total amount of companies has been estimated with data from 2021 and the total amount of ICT companies, with data of 2020. There is no data available of the two variables from the same year.



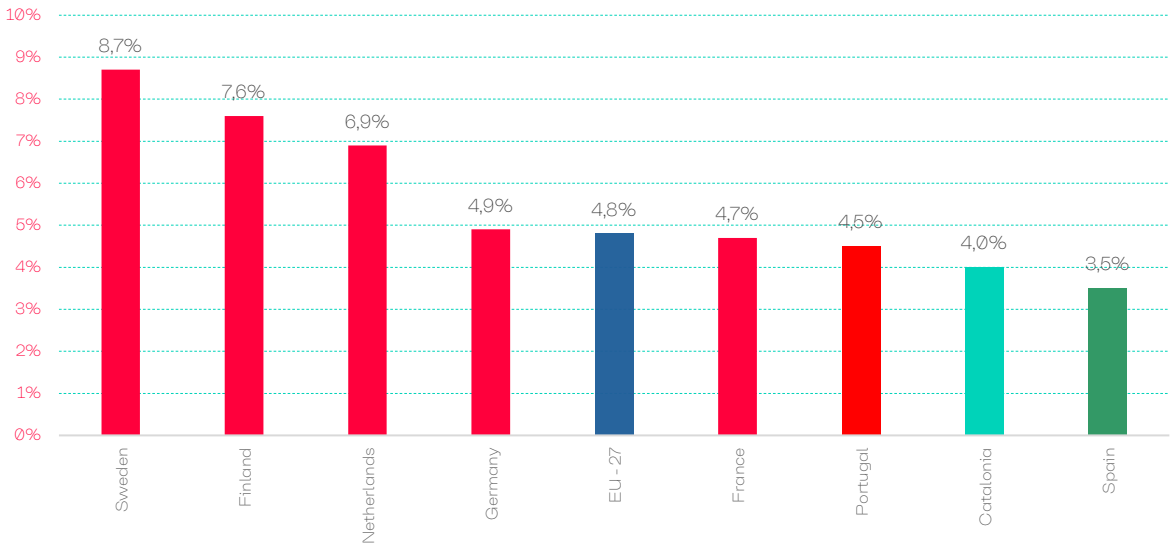
Average revenue of ICT companies, by country (2020), in million euros
Source: IDESCAT, Eurostat

In the same growth trend, for the first time, the ICT sector workers constitute almost 4% of the total employed population in Catalonia, **with a total of 135,200 employed people**, according to IDESCAT and INE data[3], for the first quarter of 2024. In Spain, the proportion of employed professionals in the ICT sector over the total labor force is 3,5%, according to the cited sources, during the same period. Therefore, **the Catalan technology sector holds significant relevance within the regional and state economy.**

Increase of the amount of ICT workers in Catalonia
Source: IDESCAT

3 IDESCAT, Població ocupada en el sector TIC. Per situació professional. Catalunya. T1/2019–T1/2024

In the European context, the total number of ICT workers in the European Union represents 98 million professionals, 4,8% of the total workforce in Europe. Sweden leads in the percentage of ICT workers with 8,7% of its workforce, followed closely by Finland with 7,6%. The Netherlands occupies the third position with 6,9%. Germany with 4,9% and France with 4,7% complete the top five positions. Catalonia, with 4%, and Spain, with 3,5%, are below the European average, according to Eurostat data[4].



Average number of ICT employees over the total amount of workers
Source: for Catalonia, IDESCAT. For EU countries, Eurostat

Since the weight over the GDP in Catalonia is relatively higher and the employment weight is relatively lower, it can be concluded that the added value of the ICT sector in Catalonia is relatively high.

4 Percentatge d'especialistes TIC ocupats a partir de dades de l'Eurostat. Any de referència: 2023 (última dada disponible).

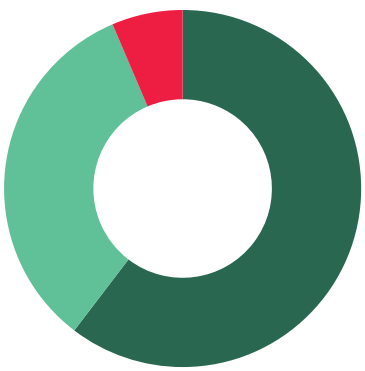
III. The big challenge of the ICT sector: talent

Catalonia exceeds the demand for qualified talent compared to the supply of ICT professionals

In 2023 there was an average of 9,231 vacancies not covered in the ICT[5] sector. In case they would have been covered, the sector would have increased its value over the total GDP from 9 to 9.56%[6] (around 1.805 million euros more). Therefore, **the lack of talent significantly limits the growth potential of the ICT sector.**

As we will see, this lack is caused by a double effect: **the dynamism of the demand for professionals from ICT companies and the rigidity of the offer of professionals out of the education system.**

According to the demand, **60.3% of respondents expect their companies to increase personnel hiring during the next year:** this figure, although still below pre-pandemic levels, confirms the sector's growing optimism. According to gathered data, the 33.2% of respondents indicate that their company intends to maintain the current team size, while 6.4% considers the possibility of reducing it.



60,3%
Expect their team to grow

33,2%
Expect their team to stay the same size

6,4%
Expect their team to be reduced

During 2024, will the company where you work at increase its team?
Source: Survey of the *Baròmetre 2024*
Sample: 804 professionals

5 INE, Quarterly survey of the cost of labour, 2023.

6 You can consult the calculation of the potential for increasing the GDP of the ICT sector in the section of Talent TIC of the full report of the *Baròmetre 2024*

This dynamism is corroborated by other sources. According to the Report on the state of the Digital Decade 2023[7] it is expected that by 2030, 10 million more ICT professionals will be required in Europe to achieve the goal of 20 million employed in the sector. In Catalonia, an increase of 156,000 new professionals is expected, reaching approximately 306,000 employed professionals by 2030. In Spain, an increase of 588 thousand new professionals is expected, reaching more than 1 million employed in the sector during the same period.

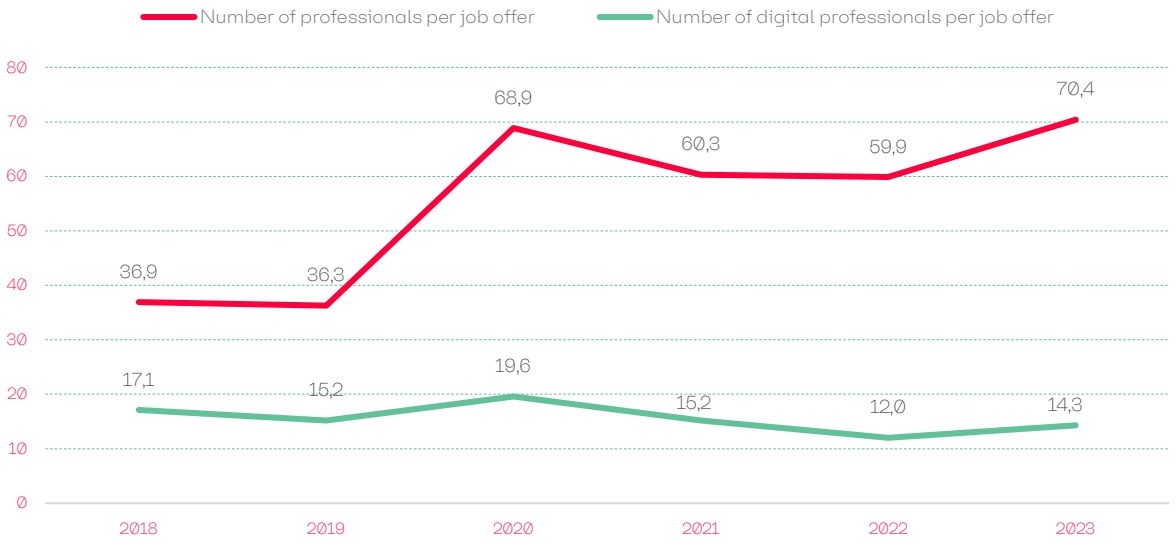
The high demand, despite being an indicator of the sector's vitality, also raises significant concerns: while in recent years there were approximately 17 applications for each ICT job offer[8], as of the last available data, **this figure had decreased to 14.3.**

The cause of the decline must be sought in the mismatch between demand and the labor offer due to a double quantitative and qualitative effect. Regarding the quantitative effect, **there is a greater demand for ICT roles than the number of professionals who join the labor market**. As for the qualitative effect, **the profiles** requested (which require for example, minimum experience and specialized knowledge) **are scarce.**

In contrast, the average number of applications per offer in other economic sectors was of 70,4, according to Eurostat itself. In conclusion, the Catalan ICT sector has a pool of potential candidates 5 times smaller than any other economic sector.

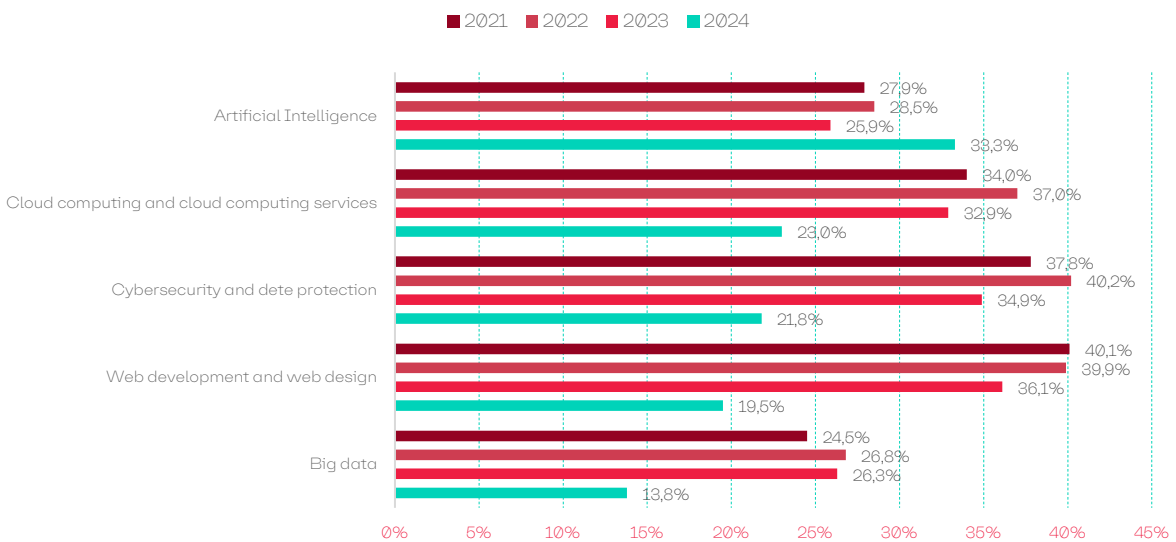
7 European Comission. (2023). Report on the state of the Digital Decade 2023.

8 Data cited at the Digital Talent Overview 2024, Mobile World Capital Barcelona. Original source : TalentUp for Mobile World Capital Barcelona, 2024.



Market tension
Source: TalentUp for Mobile World Capital Barcelona, 2024

In terms of professional profiles, for the first time in the last four years, **more AI professionals are needed than in other areas**, according to data collected in the *Baròmetre 2024*.



Most demanded ICT fields of expertise
Source: Survey of the Baròmetre 2024, previous Baròmetres
Sample for the year 2024: 804 professionals

According to the study *Jobs of Tomorrow: Large Language Models and Jobs*, 2023, by the World Economic Forum, it is highlighted that some tasks performed by ICT roles can be automated. However, **non-automatable tasks will become more important and crucial for organizations**. AI will also create new job categories, such as AI trainers and sustainers, among others.

Additionally, a 2023 report from the ILO[9] indicates that AI tools such as ChatGPT will likely complement jobs rather than destroy them, automating some tasks but leaving time for other responsibilities.

Historical data of professionals working in the ICT sector, presented previously, reflect a continuous upward trend. **In five years, the total number of professionals in the sector grew by 32%, and forecasts suggest that the need for talent will increase year after year**, while the stock of professionals in the sector diminishes.

All this information offers an important counterpoint to the perception that technological innovation displaces jobs: certainly, **positions are transformed, and tasks are automated, but more importance is given to others of greater value.**

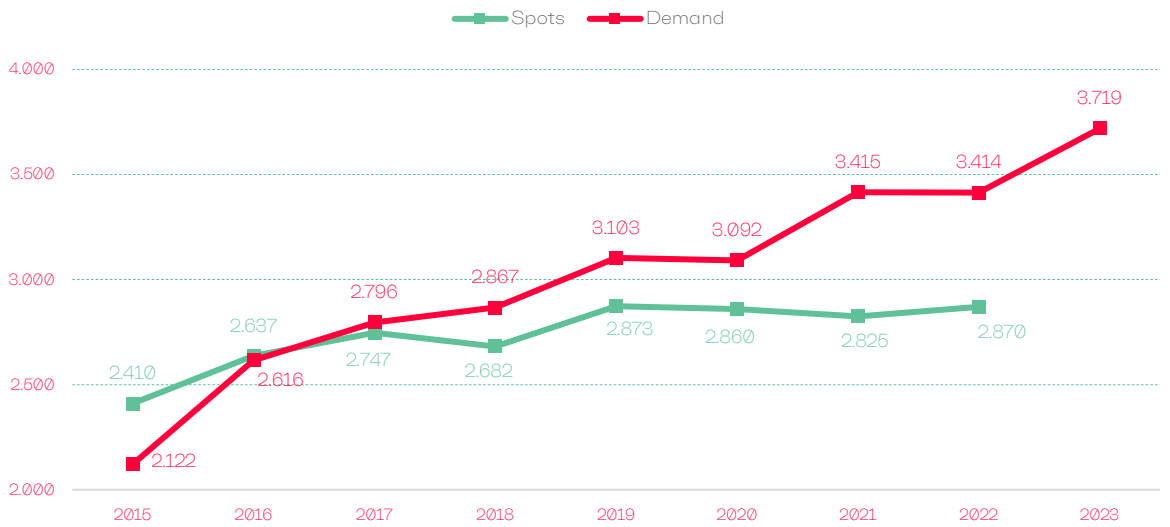
The educational system is not meeting the demand for professionals

According to the 2023 report by the AQU[10] (*Agència per a la Qualitat del Sistema Universitari de Catalunya*) , **three out of four companies report difficulties in hiring the right people for their job positions**. The ICT sector is the second economic sector with the most obstacles when hiring qualified professionals, only behind nursing[10].

9 International Labour Organization, Generative AI Likely Augment Rather Than Destroy Jobs, 2023.

10 AQU, The employment of graduates from Catalan universities. 2023.

According to INE data[11] , 9,231 ICT positions remain vacant in 2023, more than tripled the study places in ICT degrees (2,900 in 2022[12]). And in recent years, the offer of study places in ICT degrees is stagnant, while vacancies have continued to rise (23% in 2023). The data illustrate a context in which the offer of places in ICT degrees does not follow the pace of demand of these professionals.



Evolution of the supply and demand of spots in ICT degrees
Source: Catalan Department of Universities

11 INE, Quarterly survey of the cost of labour, 2023.

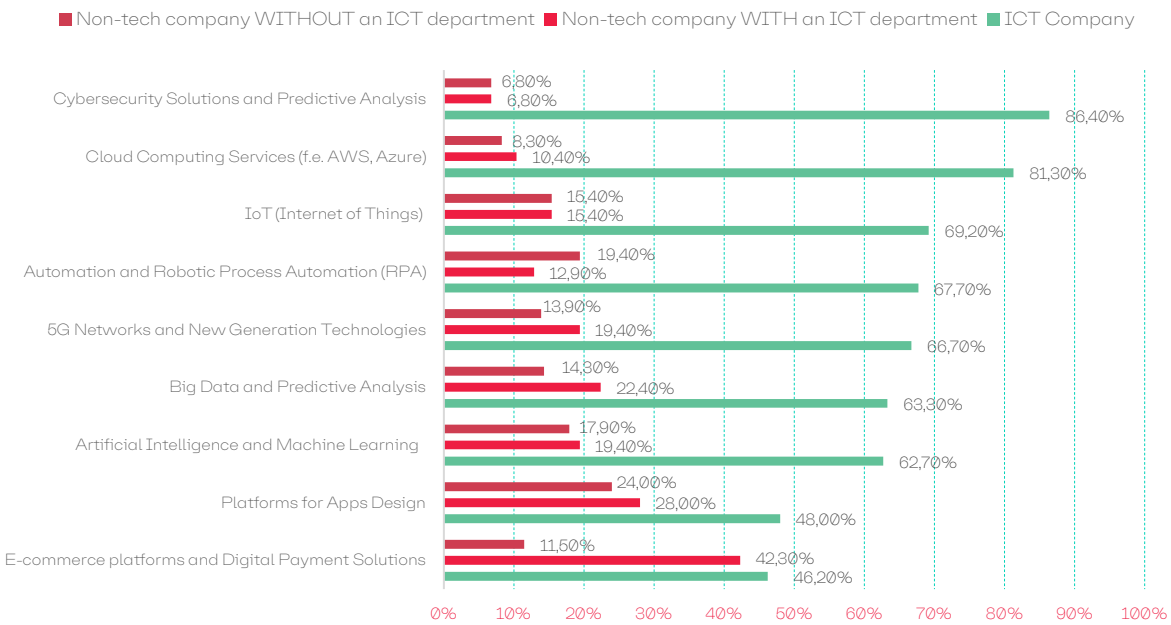
12 AQU, "La inserció laboral dels graduats i graduades de les universitats catalanes. 2023".

IV. Trends

Artificial Intelligence (AI): the technology is consolidated as the trend with the greatest potential in the business of ICT companies

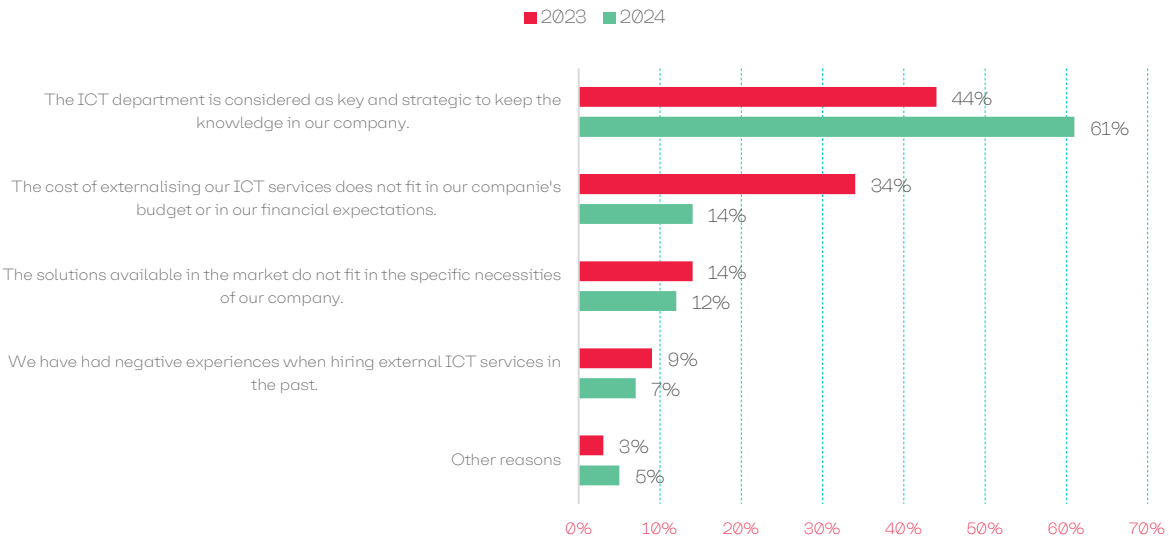
Artificial intelligence represents the most significant breakthrough the ICT sector has experienced in recent years. As seen in the following chart, artificial intelligence, cloud computing, big data, and cybersecurity have a substantial impact on the revenue of ICT companies.

On the other hand, non-tech companies with an ICT department generate income through AI and big data but not so much with cloud computing or cybersecurity. Conversely, e-commerce platforms and mobile application design generate more income for them. Finally, non-tech companies without an ICT department lean more towards AI and big data to generate income. To a lesser extent, they also generate income through automation and robotic process automation (RPA).



ICT trends that generate revenue to the surveyed companies
Source: Survey of the Baròmetre 2024
Sample: 1537 professionals

In addition to using technology to generate income, non-tech companies are increasingly aware of the importance of ICT skills within their organizations. 61% of such companies consider this area important and strategic within their companies. This percentage has increased significantly compared to the 44% from last year. **The change in trend emphasizes once again the importance of such technical knowledge within non-tech companies.**

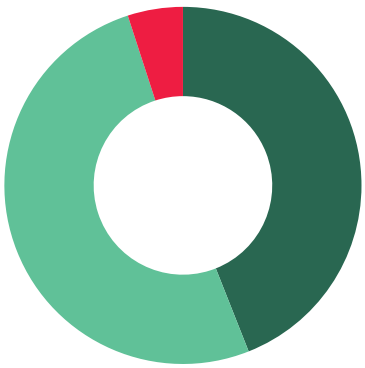


Due to which reasons has your company developed an ICT department?
Source: Survey of the Baròmetre 2024
Sample: 366 professionals

V. Sustainability

Digitalization: the key to a sustainable economy

In terms of the ecological footprint of the ICT sector itself, **sustainability is one of the most important challenges it has in the incoming future.** In the survey of the *Baròmetre 2024*, 95% of participants state that they are taking sufficient measures to reduce their ecological footprint, which they consider positive or neutral.



44%

Positive: it contributes significantly to sustainability

51%

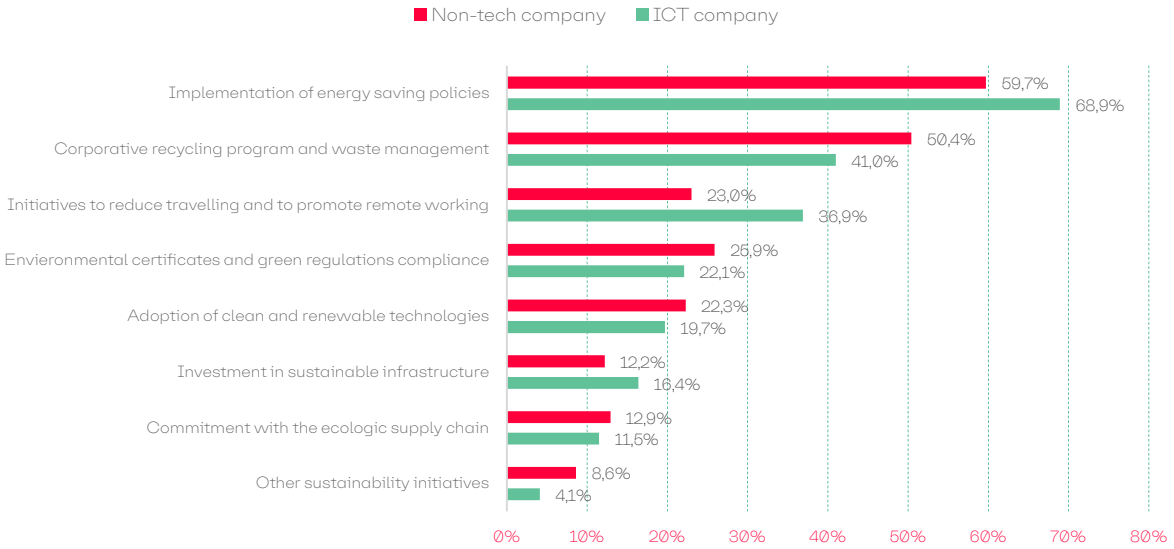
Neutral: it has a minimum or controlled impact over the environment

5%

Negative: it could improve in terms of sustainability

How do you value the environmental impact of the technologies developed or implemented by your company?
Source: Survey of the *Baròmetre 2024*,
Sample: 804 professionals

Specifically, most respondents (ICT and non-ICT) believe that **energy-saving** policies and **efficient waste** management have contributed most to this improvement. On the other hand, and to a lesser extent, the promotion of **telework** (and the consequent reduction in commuting) is considered an important contributor to energy savings.

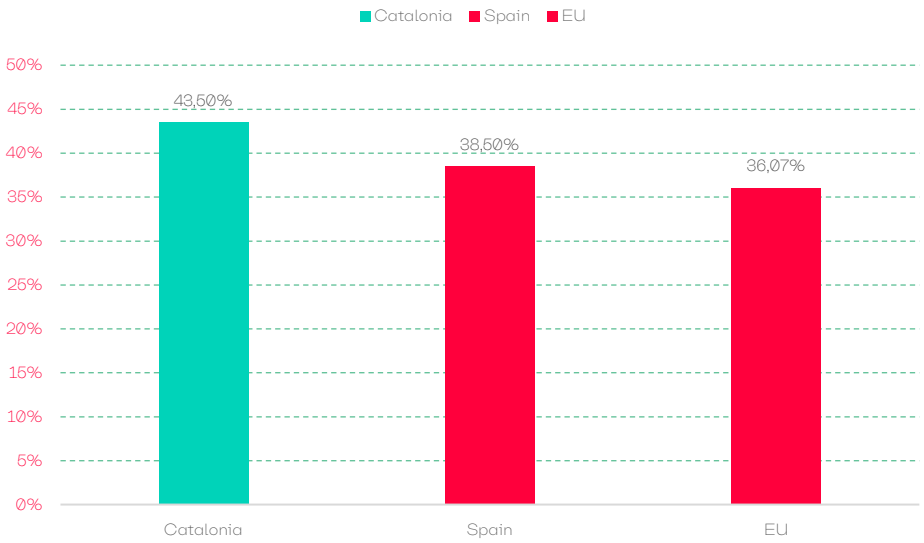


Which strategies has your company implemented to reduce its ecological footprint?
Source: Survey of the *Barômetre 2024*
Sample: 1537 professionals

However, among the participants of the SmartDelphi table *Impact of technology on society*, there is a conviction of a significant challenge: **there is no collective awareness of the large energy consumption involved in computing and storing vast amounts of information due to AI, big data, etc.** More active public policies are needed to incentivize the increase in renewable energy sources and their use in ICT companies, especially the most consuming ones (data centers, etc.).

In terms of the use of ICT (in all companies) as a tool for environmental sustainability, the vision is more aligned: **digital technologies are helping to reduce environmental impact of all companies.**

According to data from the latest *Digital Economy and Society Index*, regarding the use of digital technology for sustainability in all companies, **Catalonia (43.5%) is above the European average (36.07%).** Therefore, Catalonia is better placed to achieve positive environmental impacts thanks to ICT technologies.



Comparison of the degree of integration of digital technology for sustainability in all companies
Source: Digital Economy and Society Index, 2022