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Skills for Digital Specialists

An Assessment of the Future Skills Needs of Ireland's Digital Specialists to 2030

Expert Group on
Future Skills Needs

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Introduction to the Expert Group on Future Skills Needs

The Expert Group on Future Skills Needs (EGFSN) advises the Irish Government on the current and future skills needs of the economy and on other labour market issues that impact on Ireland's enterprise and employment growth. It has a central role in ensuring that labour market needs for skilled workers are anticipated and met.

Specifically, the EGFSN:

- Carries out research, analysis and horizon scanning in relation to emerging skills requirements at thematic and sectoral levels. Steering Groups comprising of experts from relevant enterprise sectors and the education and training sector may oversee sectoral research studies to be undertaken or commissioned by the EGFSN. Drawing on statistical input and analysis from the SLMRU and consultation with the enterprise/ education experts as part of the study, draft reports setting out the projected needs are prepared by the EGFSN.
- Engages with the Enterprise Ireland, IDA Ireland, the HEA, SOLAS, QQI, the Regional Skills Fora, and education and training providers in the course of its research.
- Engages with DFHERIS, the HEA, SOLAS and other relevant bodies to produce agreed action plans to address the skills needs identified.
- Disseminates its findings to the Regional Skills Fora and other relevant groups.

The Economic and Climate Division within the Department of Enterprise, Tourism and Employment provides the EGFSN with research and analysis support.

Foreword

Ireland's future economic growth, competitiveness and societal wellbeing are increasingly shaped by its capacity to develop, attract and retain digital specialist talent. As this report demonstrates, digital skills are no longer confined to the ICT sector but are now fundamental across all areas of enterprise, public services and innovation. The Expert Group on Future Skills Needs is therefore pleased to present ***Skills for Digital Specialists***, providing an evidence-based assessment of the scale and nature of Ireland's digital skills challenge.

Ireland begins from a position of strength. The country has built a dynamic digital economy, supported by a highly skilled workforce, strong educational institutions and a vibrant ecosystem of multinational and indigenous firms. However, the analysis presented here clearly shows that maintaining this advantage cannot be taken for granted. Demand for digital specialists will continue to grow significantly to 2030, particularly in advanced areas such as artificial intelligence, cybersecurity, data engineering and cloud architecture.

At the same time, the report highlights a persistent and widening gap between supply and demand, alongside growing competition for talent internationally. And while some IT infrastructure and technical support roles are projected to show limited growth or to decline, the majority of digital specialist roles are forecast to grow, with a general increase in demand for more specialist functions. The fear that AI will take away specialised digital jobs is not supported by the evidence presented in this report.

Importantly, the findings demonstrate that this challenge goes beyond simply increasing numbers. Employers consistently highlight gaps in applied skills, work-readiness and multidisciplinary capability. Technological change—especially the rapid evolution of AI—is reshaping the nature of work, increasing the demand for higher-level technical expertise while also placing new emphasis on softer skills like adaptability, problem-solving and business understanding. In parallel, traditional entry-level pathways are being disrupted, raising concerns about the sustainability of future talent pipelines.

The report also underlines the strategic importance of cybersecurity as a cross-cutting capability, as well as the need to address regional and gender imbalances that constrain the available talent pool. These challenges are set against a rapidly evolving global and European policy landscape, where Ireland must remain agile and responsive to maintain its leadership position.

Addressing these issues will require a coordinated and forward-looking response across government, enterprise and the education and training system. The findings point to the need for stronger alignment between education and industry, expanded work-based learning opportunities, targeted development of advanced skills, and a renewed focus on inclusion and regional capacity. They also highlight the importance of lifelong learning and flexible upskilling pathways as technologies continue to evolve.

This study was commissioned by the Expert Group on Future Skills Needs to provide an updated assessment of future demand and supply for high-level digital specialists in Ireland to 2030. The study forms part of the development of the new Roadmap for Technology Skills of the Future, the successor to Ireland's third ICT Skills Action Plan, *Technology Skills 2022*. The Roadmap is a key deliverable under Ireland's National Digital & AI Strategy*, Digital Ireland – Connecting our People, Securing our Future.*

The Expert Group will continue to work with stakeholders to ensure that Ireland's skills system remains responsive, resilient and capable of supporting sustainable digital growth to 2030 and beyond.

Colm Kelly, Chair, Expert Group on Future on Future Skills Needs

Executive Summary

This report was commissioned by the Expert Group on Future Skills Needs (EGFSN) and produced by IDC and the EGFSN Secretariat, based in the Department of Enterprise, Tourism and Employment.

The report is a quantitative and qualitative assessment of the changing skilling, upskilling and reskilling requirements of Ireland's digital specialists to 2030, and forms part of the development of the new Roadmap for Technology Skills of the Future, which will succeed Technology Skills 2022. The objective of the Roadmap is to ensure that Ireland's education and training system can respond effectively to rapidly changing skills needs of Ireland's digital specialists.

Ireland's digital skills challenge is strategic, not marginal

Digital specialist skills are now central to Ireland's competitiveness, enterprise development, innovation capacity and public service transformation. Ireland starts from a strong position: it has a large and growing digital specialist workforce, a strong multinational and indigenous technology base, high levels of graduate employment in digital specialist occupations, and a policy environment that recognises the importance of digitalisation, AI, cybersecurity, semiconductors, quantum technologies and digital public services. However, the evidence in this report shows that maintaining this position will require a more coordinated, targeted and agile response to 2030.

Demand is growing and becoming more specialised

Total digital specialist employment in Ireland was estimated at approximately 168,800 in 2025. Demand is projected to reach around 215,400 under the baseline scenario by 2030, with a range from 192,900 under a low-growth scenario to 222,700 under a high-growth scenario. This increased demand is shaped by digital transformation across all sectors, continued investment, the embedding of digital capability in non-ICT industries, and the increasing operational use of AI, cloud, data and cybersecurity technologies.

The composition of demand for digital specialists is also expected to evolve. The report considers job roles across a range of technology domains. It finds that applications development is projected to remain the largest domain, but the fastest growth is expected in machine learning, cybersecurity, data engineering, advanced analytics, AI implementation and cloud-related roles. Cybersecurity is found to be the fastest-growing domain in the demand forecast, while AI adoption is creating new requirements for implementation engineers, AI application developers, AI systems and infrastructure specialists, AI governance and risk specialists, and AI-literate business and technology leaders.

Supply is substantial, but current pipelines are unlikely to meet baseline demand

Ireland has a diversified digital specialist skills supply ecosystem, including higher education, further education and training, apprenticeships, private and industry-led training, adjacent STEM disciplines and inward migration. Higher education remains the principal route into degree-level digital specialist employment, while FET, apprenticeships and industry provision play an important role in practical, vocational, modular and work-based learning. Migration also remains an important supplementary source of specialised and experienced talent.

Despite this strong base, the gap analysis in this report indicates that current supply pipelines are unlikely to meet demand under baseline and high-growth conditions. Annual supply of digital specialists is estimated to stabilise at around 10,000 entrants per year, while annual demand, including replacement needs, rises above this level. In the baseline scenario, the annual shortfall grows to approximately 5,500 by 2030; in a high-growth scenario, the shortfall could reach approximately 7,700. These estimates are sensitive to assumptions about migration, education outputs and retention, but they clearly point to structural pressure in the labour market.

The main gap is qualitative as well as quantitative

The evidence shows that Ireland's digital specialist skills challenge is not only a numerical shortfall. Qualitative research from surveys and workshops undertaken for this report show that employers report persistent gaps in technical, practical and broader professional skills including work-readiness, applied technical capability, practical experience, business understanding, communication, critical thinking, regulation, ethics and adaptability. Workshop participants similarly highlighted curriculum lag, limited access to industry-standard tools and infrastructure, difficulty attracting practitioner expertise into education, and insufficient work-based learning opportunities.

This creates a mismatch between education outputs and employer needs. Ireland produces a substantial number of digital specialist graduates and learners, but employers increasingly need people who can operate in complex enterprise environments, apply technical knowledge to business problems, work across disciplines, and adapt quickly as tools and platforms change. The report therefore emphasises the importance of stronger work-integrated learning, industry projects, apprenticeships, shared labs, capstone challenges, internships, micro-credentials and modular pathways for both new entrants and existing workers.

AI is transforming work and increasing demand for advanced capability

AI is one of the central forces reshaping digital work. Organisations are moving from experimentation towards operational deployment, but adoption remains uneven. The survey evidence shows that many organisations are piloting or selectively using AI, while full integration remains limited. This creates demand not only for specialist AI roles, but also for wider AI literacy, governance, ethics, data capability and change-management skills across the workforce.

The study finds that AI is transforming rather than reducing demand for digital specialist skills. Routine technical tasks, basic digital work and some entry-level task bundles are increasingly exposed to automation. However, employers expect increased demand for advanced digital skills, particularly AI implementation, AI application development, data science, automation, infrastructure and governance. This shift creates both an opportunity and a risk: AI can raise productivity and enable higher-value work, but it may weaken traditional entry routes unless new early-career pathways are deliberately designed.

Cybersecurity is now a strategic cross-cutting capability

Cybersecurity has become a strategic, cross-cutting requirement for enterprises, public services and national resilience. Demand is rising across security analytics, governance, risk and compliance, forensics, identity management, cloud security, IoT security, AI-driven threat detection and post-quantum cryptography preparedness. The report identifies cybersecurity as the fastest-growing domain in the forecast and one of the areas where recruitment difficulty is most acute.

Cybersecurity is also becoming more multidisciplinary. AI is increasing the sophistication of attacks while also enabling more advanced defence. Cloud and hybrid infrastructure increase the need for security-by-design, identity management and platform-native controls. The longer-term challenge of post-quantum cryptography requires early preparation even where immediate commercial use cases remain uncertain. The report therefore concludes that Ireland needs both more specialist cybersecurity professionals and stronger baseline security capability across all digital specialist roles.

Regional, gender and participation gaps constrain the talent pool

The study highlights persistent regional and inclusion challenges. Digital specialists are heavily concentrated in Dublin and the Eastern and Midland region, while employers outside Dublin report much more constrained access to talent. Survey evidence points to salary pressures, limited career progression, weaker local training ecosystems and smaller talent pools as barriers outside major urban centres. These regional disparities limit the ability of firms and public services across Ireland to benefit fully from digital transformation.

Female participation also remains well below parity. Women account for only around one fifth of digital specialists and remain underrepresented in ICT education and digital specialist career pathways. Expanding participation through regional skills ecosystems, flexible learning, mentoring, outreach, returner pathways and inclusive recruitment would broaden the national talent base and strengthen resilience in the skills system.

The response must be coordinated, practical and future-focused

The study concludes that Ireland's digital specialist skills challenge is not simply a question of producing more people. It is a combined challenge of volume, alignment, specialisation and adaptability. Demand for digital specialists is expected to continue growing under most scenarios, while the strongest pressures are concentrated in advanced areas such as software and AI engineering, cybersecurity, data engineering, cloud architecture, AI implementation and digital transformation leadership. At the same time, AI and automation are reshaping entry-level work and increasing the importance of lifelong learning, applied experience and cross-disciplinary capability.

The report identifies seven key findings

1. Demand for digital specialists will continue growing strongly across Ireland through to 2030.
2. Digital skills shortages are likely to persist and increase under most future growth scenarios.
3. Employment growth is concentrated in advanced specialist domains such as AI, cybersecurity and data.
4. Skills provision must continue evolving to keep pace with technology and employer requirements.
5. AI is transforming digital skills needs, accelerating demand for advanced and specialised capabilities.
6. Employers increasingly value transversal skills alongside technical expertise in digital roles.
7. Entry-level pathways are weakening while gender imbalances continue to constrain talent supply.

There are nine recommended actions

1. Expand education and training capacity in high-growth digital specialist domains.
2. Regularly update digital curricula to reflect technological and labour market change.
3. Strengthen work-based learning and deepen collaboration between employers and education providers.
4. Scale up accessible upskilling provision in AI, cybersecurity, data and related fields.
5. Embed multidisciplinary, business and professional skills within digital education programmes.
6. Review and improve collaboration mechanisms between industry and education providers.
7. Strengthen diversity, participation and talent-retention measures across the digital workforce.
8. Combine strategic international recruitment with sustained domestic skills development.
9. Enhance digital skills intelligence, forecasting and labour-market monitoring capabilities.

These measures should be implemented as mutually reinforcing elements of the new Roadmap for Technology Skills of the Future, with clear ownership, monitoring and regular updating as technologies and labour-market needs evolve. Ireland must expand, adapt and diversify its digital skills pipeline to meet growing demand in advanced technology domains through to 2030.

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Introduction

1.1 Rationale, Scope and Methodological Approach

1.1.1 Rationale and Scope

Ireland's updated National Digital and AI strategy, *Digital Ireland – Connecting our People, Securing our Future* (2026) sets out the Irish Government's ambition and vision to 2030 which aims to ensure that Ireland remains a digital leader in increasingly competitive global environment shaped by rapid technological and policy change.[1] A central aim of the Strategy is to ensure that all cohorts of society are supported to thrive in a digital Ireland, including through flexible, agile and fit-for-purpose digital skills provision. This approach will span the full spectrum of skills needs, from specialist digital skills to wider workforce development.

To achieve this, a Roadmap for Technology Skills of the Future is being developed. The objective of the Roadmap is to ensure that Ireland's tertiary education and training system can respond effectively to rapidly changing digital skills requirements. Effectively, the Roadmap will succeed *Technology Skills 2022: Ireland's Third ICT Skills Action Plan.*[2]

This EGFSN study forms part of the development process for the Roadmap. It aims to provide a detailed quantitative and qualitative analysis of the evolving skilling, upskilling and reskilling needs of Ireland's digital specialists. The report analyses the demand and supply of digital specialist skills in Ireland to 2030 and identifies the quantitative and qualitative gaps between the two. The study evaluates the main drivers of change shaping these evolving skills needs.

The study recognises that Ireland, and the European Union more broadly, face compound pressures in terms of digital specialist employment: fierce international competition for talent, evolving roles that blend technical expertise with business acumen, and shifts caused by automation and sectoral disruption. The study goes beyond a sole focus on headline employment numbers and analyses future employment needs by specific job roles and technology domains and assesses in detail the transformation of existing digital specialist roles and the emergence of new ones. The study engages with the challenges posed to digital specialist career pathways as entry-level positions are transformed- or even in some cases perhaps disappear- due to technologies like generative AI.

Importantly, this study acknowledges that digital specialist skills demand is economy-wide and not confined to the ICT sector alone, with sectors like finance, healthcare, manufacturing and public services all requiring advanced digital skills.

It is also important to emphasise that while Roadmap for Technology Skills of the Future will encompass a broad spectrum of digital skills needs across the whole economy and society, this study is focussed on the skills needs of digital specialists specifically. Digital specialists are defined for the purposes of this study as those working in specific occupations and job roles within advanced digital technology domains. The digital skills needs of the wider economy and society fall outside the scope of this report.

The report has been prepared by IDC and the EGFSN Secretariat, based in the Department of Enterprise, Tourism and Employment. IDC were commissioned through a competitive tendering process to carry out the study, based on their track record of expertise and knowledge of digital trends, roles and skills. The present study builds on previous EGFSN studies in this area, including its 2013 and 2019 assessments of high-level ICT skills demand. This study is a timely update of these previous assessments in the context of a very much changed technological and policy environment.[3] [4]

1 Digital Ireland – Connecting our People, Securing our Future

2 Technology Skills 2022

3 Addressing Future Demand for High-Level ICT Skills

4 March 2029: EGFSN Forecasting the Future Demand for High-Level ICT Skills in Ireland 2017-2022

1.1.2 Methodological Approach

The methodology employed in this study reflects the fact that the changing skilling, reskilling and upskilling needs of Ireland's digital specialists are both quantitative and qualitative in nature. Digital specialist skills needs are shaped not only by changes in raw employment demand but also by rapid technological change, evolving business models and the increasing importance of lifelong learning and workforce adaptability. Particular attention is given to emerging skills needs in technology areas such as AI, cybersecurity, cloud computing and advanced digital infrastructure. Therefore, this study combines policy review, qualitative research, stakeholder consultation and quantitative labour market analysis.

The methodology employed in this assessment is outlined in detail in Appendix 3. The general methodological approach and structure of the report is as follows:

- **Sections 1.2 and 1.3** of this chapter set out the global, European and Irish context of the analysis.
- **Section 1.4** of this chapter outlines a definition of digital specialist based on 15 relevant ICT and engineering Standard Occupational Classifications (SOC). Data from the Central Statistics Office's Labour Force Survey together with IDC's ICT Job Role taxonomy are then used to identify digital specialist employment trends and to present a profile of Ireland's digital specialist workforce.
- **Chapter 2** presents an evaluation of the main technological drivers of change shaping the evolving quantitative and qualitative demand for digital specialist skills in Ireland.
- **Chapter 3** presents an examination of the multiple pathways into digital specialist occupations, including higher education, further education and training (FET), apprenticeships, reskilling and upskilling initiatives and inward migration, as well the implications of the gender imbalance in digital specialist roles. Datasets from the Skills and Labour Market Research Unit within SOLAS, the Higher Education Authority, National Apprenticeship Office and employment permit data from DETE are employed to quantify inflows into digital specialist occupations in Ireland.
- **Chapter 4** analyses current and future demand for digital specialists in Ireland. The demand-side analysis considered some of the principal technological, organisational and regulatory drivers shaping the demand for and nature of 41 specific digital specialist job roles across seven technology domains to 2030.[5] Following this, the gap between the potential supply and demand for digital specialists in Ireland to 2030 is modelled under three different growth scenarios.
- **Chapter 5** focuses on the findings of the ICT Skills in Ireland Survey undertaken for this study in August 2025. The survey gathered evidence from over 500 participants on issues such as recruitment challenges, emerging skills requirements, graduate preparedness, multidisciplinary skills and upskilling needs.
- **Chapter 6** is focused on the findings of six stakeholder workshops (three online, three in-person) which took place in November 2025. The workshops were organised with a particular emphasis on AI, cybersecurity, and emerging technologies. These workshops brought together diverse perspectives from almost 100 participants across multinational corporations, SMEs, higher education institutions, skills development organisations, and government agencies.
- **Chapter 7 and 8** spotlight the specific skills challenges in the rapidly developing fields of AI and cybersecurity.
- **Chapter 9** brings together all aspects of the research and outlines the overall findings and conclusions of the analysis and identifies six areas for priority action.

The project was guided throughout by an expert steering group consisting of representatives of industry, Government Departments, State agencies and Ireland's education and skills ecosystem. A full list of steering group members can be found in Appendix 7.

5 IDC Worldwide ICT Job Role Taxonomy

1.2 Global and National Context for the Study

1.2.1 Global Context

The rapid pace of technological change is transforming the nature of digital work and altering the quality and quantity of skills required within digital occupations. Technologies such as artificial intelligence (AI), cloud computing, cybersecurity, data analytics, automation, quantum technologies and immersive technologies are changing business processes, public services, infrastructure and production systems across the economy. These developments are increasing the demand for highly skilled new entrants to digital specialist occupations while simultaneously creating significant requirements for upskilling and reskilling across the workforce.

International evidence from organisations such as the OECD and the World Economic Forum points to a global labour market increasingly shaped by automation, AI adoption and rapid technological diffusion. While demand for digital specialists continues to grow, employers are also seeking broader transversal and cross-disciplinary foundational skills including communication, adaptability, problem-solving, change management, business acumen, industry knowledge and human centred-skills more broadly alongside technical expertise.

Digital skills shortages can be considered a global concern rather than a local or sector-specific problem. As advanced technologies take a central role in everyday business operations, organisations everywhere are competing for specialist knowledge that traditional education systems are not providing at the necessary pace or depth.

The global shortage of digital specialists has reached critical levels across all major economies. According to IDC's 2024 FutureScape research, more than 90% of organisations worldwide are projected to experience the impact of digital skills shortages by 2026, resulting in an estimated $5.5 trillion in impact from product delays, reduced competitiveness, and missed business opportunities.[6]

Table 1 below summarises projected additional overall global demand for digital specialist roles to 2030, while Table 2 highlights the expected scale of growth in demand for digital specialist talent across multiple technology domains over the same period.

Both illustrate the scale of the global digital talent challenge, with skills shortages expected across mature markets and fast-growing digital economies alike, and highlight why education, training and reskilling systems globally must adapt rapidly. For Ireland, this global gap is especially relevant because its innovation-led, FDI-driven economy depends on scarce digital specialist talent; skills deficits- whether qualitative or quantitative- therefore have the potential if left unaddressed to constrain Ireland's competitiveness, investment and long-term growth.

6 What's the cost of the IT skills gap? IDC says $5.5 trillion by 2026 | CIO Dive

Table 1: **Emerging Digital Specialist Talent Demand by World Region, 2025-2030**

Region	Digital Specialist Job Trends (2025–2030)	Projected Additional Digital Specialist Jobs by 2030	Highlights
North America	Currently estimated ICT talent is 11 million; Shortage intensifies each year.	US: Up to 6 million; Canada: 200,000–500,000.	Largest mature ICT market; annual gap grows without policy intervention.
Europe	Currently estimated ICT talent is over 10 million; Continued year-over-year increases in Western EU. Deficits in CEE.	EU: Up to 7 million; Germany: 780,000–1 million; UK: 500,000–800,000.	Most acute challenges in Germany and UK; demand outpaces supply across CEE due to outsourcing/digital expansion.
Asia-Pacific & China	Current estimated ICT talent is 16 million; Mixed: fast-growing shortfalls.	India: 1.4–1.7 million; Japan: 1 million; Others: 3-4 million	India's tech sector pivots towards AI. Advanced economies like Japan, Korea and Australia facing shortages.
China	Currently estimated ICT talent is 15 million; Increasing shortages driven by fast adoption.	China: 10 million by 2030.	China's gap: despite 1.1 million CS and 0.25M AI/Big Data graduates (2024), a severe shortfall remains.
Latin America	Currently estimated at 4 million; gaps widening annually.	Brazil: 530,000; Region: 2-3 million.	Gaps largest in big cities/tech hubs (São Paulo, Buenos Aires, Mexico City).
Middle East & Africa	Currently estimated ICT talent at 5 million; steep year-on-year growth.	Africa: ~2 million; Nigeria: 500,000; South Africa: 200,000–400,000; Middle East: ~ 2 million	Fastest gap growth rate; digital literacy programs struggle to keep pace with demand.

Source: IDC analysis, 2025 [7]

Table 2: **Projected Worldwide Digital Specialist Employment Across Technology Domains, 2025-2030**

Technology Domain	Estimated Digital Specialist Jobs 2025 (millions)	Estimated Digital Specialist Jobs 2030 (millions)	Estimated Additional Digital Specialist Jobs 2030 (millions)	Sources
Cloud	8.0	13.0	5.0	WEF, BLS
Big Data/Analytics	4.6	7.5	2.9	WEF, BLS
AI	4.5	8.0	3.5	WEF, BLS
Software Applications	24.0	38.0	14.0	WEF, BLS
IT Infrastructure	15.0	21.0	6.0	WEF, BLS
Cybersecurity	5.0	9.5	4.5	WEF, BLS
Other	0.9	2.0	1.1	WEF
Total	**61.0**	**97.0**	**36**	**WEF, BLS**

Source: IDC AI Impact Model, WEF. BLS 2025[8]

7 Data sources include World Economic Forum, Future of Jobs Report 2025; Liepin Big Data Research Institute; Zhaopin; Yicai Global; CSET; SCMP; Korea Times; 36kr; National labour statistics and published government/industry workforce reports (2024–2025).

8 World Economic Forum, Future of Jobs Report 2025; US Department of Statistics, Bureau of Statistics, January 2026

1.2.2 Irish Context

Digital technologies are now central to Ireland's economic development, enterprise competitiveness and public services. Ireland has developed a strong international position as a digital economy, supported by a concentration of multinational technology companies, a growing indigenous technology sector and a highly skilled workforce. At the same time, digitalisation is increasingly reshaping all sectors of the economy, creating demand for advanced digital specialist skills well beyond the traditional technology sector.

Recognising that digital specialists are employed in all sectors, this study takes a broad, economy-wide view, with digital specialist being defined on an occupational rather than sectoral basis. However, examining Ireland's ICT sector is a useful benchmark for scale and context. Ireland's ICT sector plays a central role in the national economy, accounting for approximately 13% of GDP and forming the backbone of a $50 billion digital economy supported by more than 1,000 domestic and multinational firms. The sector's role is reinforced by Ireland's expanding digital infrastructure, including 82 operational data centres dominated by hyperscale providers and substantial enterprise investment in data processing and storage activities, which together underpin the country's capacity for large-scale database, cloud, and data-driven operations. In addition, ICT services represent nearly 60% of Ireland's service exports, highlighting the sector's centrality to Ireland's international competitiveness and digital value creation.[9]

Beyond the ICT sector, Irish enterprise across all sectors performs strongly in terms of overall uptake of advanced digital technologies such as AI, cloud and data analytics, with 71.7% of all Irish Enterprises using at least one of these technologies in 2025, above the EU average 63.2%.[10]

Ireland also performs strongly in terms of skills, and currently ranks 6th amongst EU Member States on the percentage of digital specialists in the workforce (6.2% vs 5.0% EU average), and has exceeded the EU average on this metric since 2018.[11] Ireland also ranks second in the EU for the percentage of people with 'basic or above' levels of digital skills in 2025 (82.8%, compared to 60.4% EU average).[12] Furthermore, while many continue their education via additional courses, 77% ICT graduates at NFQ Levels 5-10 are in employment nine months after completing their course according to data from the Higher Education Authority (HEA) and SOLAS.[13]

These figures reflect both the strength of Ireland's digital technology ecosystem and the critical importance of digital skills to the national economy. However, maintaining this position requires proactive planning and strategic investment in skills development, particularly as technological change accelerates and competition for digital talent intensifies globally.

1.3 Digital Skills Policy Landscape

1.3.1 Europe

Ireland's digital skills strategy is embedded in the wider EU policy framework, particularly the Digital Decade Policy Programme (DDPP) which sets common targets for digital transformation and workforce readiness.[14]

Implementation of the DDPP is national, and each EU member state is required to develop and implement a National Strategic Roadmap with measurable targets and periodic review, with a mid-term evaluation

9 International Trade Administration – Information and Communication Technology (ICT) Ireland Country Commercial Guide: Information and Communication Technology (ICT)

10 Ireland's 2026 Digital Decade Country Report | Shaping Europe's digital future

11 Eurostat: [isoc_sks_itspt] Employed information and communications technology (ICT) specialists

12 Ireland's 2026 Digital Decade Country Report | Shaping Europe's digital future

13 2024 data. See Table 5, Chapter 3.

14 Digital Decade Policy programme | Shaping Europe's digital future

scheduled for 2026. Ireland's national roadmap was published in November 2023 and aligns with the four EU-wide pillars of the DDPP (digital skills, digital infrastructures, digitalisation of business and digital public services) while tailoring actions to its innovation-driven economy.[15] Core aims include raising the share of adults in Ireland with basic digital skills toward the common EU's target of 80% and expand advanced specialist talent through education, reskilling, and international recruitment while embedding skills policy within broader economic and labour market systems.

The EU's State of The Digital Decade 2026 progress report (based on the 2025 DESI data) shows that real progress has been made since 2022 with in addressing structural weaknesses in relation to both basic and specialist digital skills at a European level. However, the report highlights that while the average of 60.4% of adults across the EU with at least basic digital skills shows an overall improvement, this must be seen in the context the 80% target for 2030 which at the current rate of progress will not be reached until 2037. The report also notes that the 10.5 million digital specialists across the EU is still far from the 2030 target of 20 million.[16]

Alongside these targets, the EU promotes a lifelong learning approach to digital skills, supported by major funding programmes such as the Digital Europe Programme and the European Social Fund Plus.[17,18] These initiatives aim to develop both basic and advanced skills- particularly in areas like AI, cybersecurity, and data- while also addressing inclusion and participation across different groups. This reflects a broader policy view that digital transformation requires continuous reskilling across the entire workforce, not just specialist training.

The EU's AI policy links innovation with workforce capability, most notably through the AI Act, which introduces a requirement for organisations to ensure adequate AI literacy among staff.[19] In parallel, the AI Skills Strategy for Europe seeks to address talent shortages by aligning education with industry needs and promoting reskilling across a wide range of roles.[20]

For Ireland, these EU strategies provide both a framework and a support system. They shape national policy direction, provide access to funding, and ensure alignment with EU standards, which is critical for a highly globalised, technology-driven economy. At the same time, they highlight ongoing challenges for Ireland, particularly the need to expand advanced digital and AI skills and remain competitive in attracting talent. Further details on the European digital skills policy context and Europe's Digital Decade Programme can be found in Appendix 1 and 2.

1.3.2 Ireland

Ireland's digital policy landscape is fully aligned with the Digital Decade Policy Programme targets and annual assessment, reflecting the increasingly strategic importance of digital specialist skills to the Union and the country's economic competitiveness, innovation capacity and public service transformation. It also highlights the need for flexible education and training systems capable of responding to fast-changing technological and labour market requirements.

Ireland has a strong record on digital skills, in particular specialist digital technology skills, success which has been underpinned by the implementation of three successive strategic ICT Skills Action Plans, launched in 2012, 2014 and 2019.[21] These Action Plans have focused on expanding the supply of ICT graduates, strengthening pathways into digital careers and improving collaboration between enterprise and the education

15 Digital Decade Policy Programme: Ireland's National Strategic Roadmap
16 2026 State of the Digital Decade report
17 The Digital Europe Programme | Shaping Europe's digital future
18 European Social Fund Plus
19 AI Act | Shaping Europe's digital future
20 AI Skills Strategy for Europe
21 ICT Skills Action Plans

and training system. The development of each Action Plan was informed by detailed research undertaken by the EGFSN.

The 2026 Digital Decade Country Report for Ireland highlights this strong performance, with Ireland ranking second in the EU on basic digital skills, with 82.8% of adults meeting at least basic skills levels, up from 72.9% in 2023) Ireland currently ranks 6th amongst EU Member States on the percentage of digital specialists in the workforce, 6.2% of total employment compared to an EU average of 5.0%, exceeding the EU average. This however only represents a 1% growth rate between 2024 and 2025 compared to a 4% average growth rate across the EU. The report also warns of skills shortages in specialist areas.[22]

To build on Ireland's strengths and meet emerging digital challenges, Ireland's 2026 DDPP country report makes seven recommendations, including the following focussed on digital skills:

> **Digital skills:** Strengthen Ireland's ICT specialist pipeline and broader digital skills base by scaling up and better aligning ICT education, training, upskilling and reskilling with enterprise demand, including in AI and cybersecurity; broadening participation in ICT careers, notably through targeted measures to increase women's participation and reduce bottlenecks in the domestic talent pipeline; and improving the scale, accessibility and targeting of digital skills provision for groups still at risk of exclusion, notably lower-skilled adults and older people.[23]

As agreed with the European Commission, the recommendation should be viewed in the context of Ireland's strong existing performance and is aimed at supporting further progress rather than addressing fundamental weaknesses.

Ireland's current overarching National Digital and AI Strategy, *Digital Ireland – Connecting Our People, Securing Our Future*, establishes a framework to drive digitalisation and AI adoption across public and private sectors, with a view to balancing innovation and regulation, as informed by the EU AI Act.[24]

The strategy has five core ambitions, including the aim for 100% digital public services by 2030, enhancements to cybersecurity, and a focus on future skills via a new National Skills Observatory, to be established within SOLAS, and the development of the Technology Skills of the Future Roadmap by DFHERIS. DETE has established the AI Office of Ireland and is making plans for an Observatory for Business Readiness (OBAIR), which will collect data and provide intelligence on AI use by enterprises in Ireland. Digital Ireland succeeds and updates Ireland's previous national digital strategy, Harnessing Digital - The Digital Ireland Framework (2022).[25]

Similarly, the Government's White Paper on *Enterprise 2022–2030* highlights digitalisation, innovation and workforce capability as critical drivers of future competitiveness.[26] In addition, a range of sectoral and thematic strategies highlight the importance of advanced digital specialist skills across multiple domains:

- *Quantum 2030 – Ireland's Strategy for Quantum Technologies* identifies the need to develop specialist capabilities in areas such as advanced computing, engineering, mathematics and quantum research.[27]
- *Silicon Island:* Ireland's National Semiconductor Strategy highlights the importance of semiconductor-related engineering and technology skills to Ireland's future industrial development.[28]
- *The National Cyber Security Strategy 2019–2024* recognises cybersecurity as critical to protecting Ireland's economy, public services and infrastructure, while also highlighting the need to strengthen cybersecurity

22 Ireland's 2026 Digital Decade Country Report | Shaping Europe's digital future
23 Ireland Digital Decade 2026 Country Report. p.4.
24 Digital Ireland – Connecting our People, Securing our Future
25 Harnessing Digital - The Digital Ireland Framework
26 White Paper on Enterprise 2022-2030
27 Quantum 2030 - A National Quantum Technologies Strategy for Ireland
28 Silicon Island Ireland's National Semiconductor Strategy

skills capacity across enterprise and Government.[29] The successor to the National Cyber Security Strategy is currently being developed.

- Digital skills are also central to Ireland's wider industrial and research strategies. Including *Ireland's Industry 4.0 Strategy* emphasises the role of automation, AI, robotics and advanced manufacturing technologies in transforming industrial activity, while *Impact 2030 – Ireland's Research and Innovation Strategy* highlights the strategic importance of digital technologies, data-intensive research and advanced computing capability.[30, 31]

- Public sector transformation strategies, including *Better Public Services* and the *Civil Service Renewal Strategy 2030*, similarly identify digital capability, data skills and digital service delivery as priorities for the modernisation of public administration.[32, 33]

- *Creating Futures 2026-2030* builds state-of-the-art FET Colleges of the Future and expands free, flexible pathways for upskilling. Future Further Education and Training policy initiatives highlight the need for an agile and responsive skills system capable of addressing digital transformation, artificial intelligence, emerging technologies and evolving labour market requirements through upskilling and reskilling opportunities.[34]

- The National Tertiary Office strategy promotes flexible pathways between further and higher education, supporting the development of talent and skills through integrated programmes that respond to regional workforce needs and expand access to tertiary education.[35]

These national priorities are influenced by broader European and international developments. EU initiatives relating to AI, cybersecurity, semiconductors, digital resilience and digital infrastructure are reshaping skills requirements across member states. At the same time, international organisations such as the OECD and Cedefop continue to highlight the growing importance of advanced digital skills, lifelong learning and workforce adaptability in response to rapid technological change.

1.4 Digital Specialists in Ireland: Definition and Profile

1.4.1 Digital Specialists in Ireland: Definition

In the context of this study, digital specialists are defined in the first instance on an occupational basis using 15 ICT and Engineering-related Standardised Occupational Classifications (SOC), and the corresponding International Standard Classification of Occupations (ISCO). This is consistent with the approach in the previous EGFSN studies of high-level ICT skills needs (Table 3).

29 NCSC: National Cyber Security Strategy
30 Ireland's industry 4.0 Strategy 2020-2025
31 Impact 2030: Ireland's Research and Innovation Strategy
32 Better Public Services - Public Service Transformation 2030 Strategy
33 Civil Service Renewal 2030
34 Creating Futures FET Strategy 2026-30
35 National Tertiary Office

Table 3: **Standard Occupational Classifications Used for this Study, by SOC, ISCO Code and Title**

SOC Code and Title	ISCO Code and Title
1136 – Information Technology and Telecommunications Directors	1130 – Information and Communications Technology Services Managers
2123 – Electrical Engineers	2151 – Electrical Engineers
2124 – Electronics Engineers	2152 – Electronics Engineers
2133 – IT Specialist Managers	2519 – Software and Applications Developers and Analysts not elsewhere classified
2134 – IT Project and Programme Managers	2519 – Software and Applications Developers and Analysts not elsewhere classified
2135 – IT Business Analysts, Architects and Systems Designers	2511 – Systems Analysts
2136 – Programmers and Software Development Professionals	2512 – Software Developers
2137 – Web Design and Development Professionals	2513 – Web and multimedia developers
2139 – Information and Technology and Telecommunications Professionals Not Elsewhere Classified	2519 – Software and Applications Developers and Analysts not elsewhere classified
3112 – Electrical and Electronics Technicians	3113 – Electrical Engineering Technicians
	3114 – Electronics Engineering Technicians
3131 IT Operations Technicians	3511 – Information and Communications Technology Operations Technicians
3132 – IT User Support Technicians	3512 – Information and Communications Technology User Support Technicians
5242 – Telecommunications Engineers	2153 – Telecommunications Engineers
5245 – IT Engineers	7422 – Information and Communications Technology Installers and Servicers
2126 – Design and Development Engineers	2149 – Engineering Professionals Not Elsewhere Classified

These Standard Occupational Classifications are then in turn integrated with IDC's Worldwide ICT Job Role Taxonomy which disaggregates Ireland's digital specialist workforce into 41 specific job roles grouped into seven technology domains. These technology domains are:

1. Applications
2. Cybersecurity
3. Data Management/Analysis
4. IT Infrastructure
5. IT Leadership
6. Other IT/Technical
7. Technical Support

This taxonomy underpins the digital specialist demand forecast and demand-supply gap analysis to 2030 in Chapter 4. See Table 19 in Appendix 3 for a detailed matching of each SOC code with each job role and technology domain outlined in the taxonomy.[36]

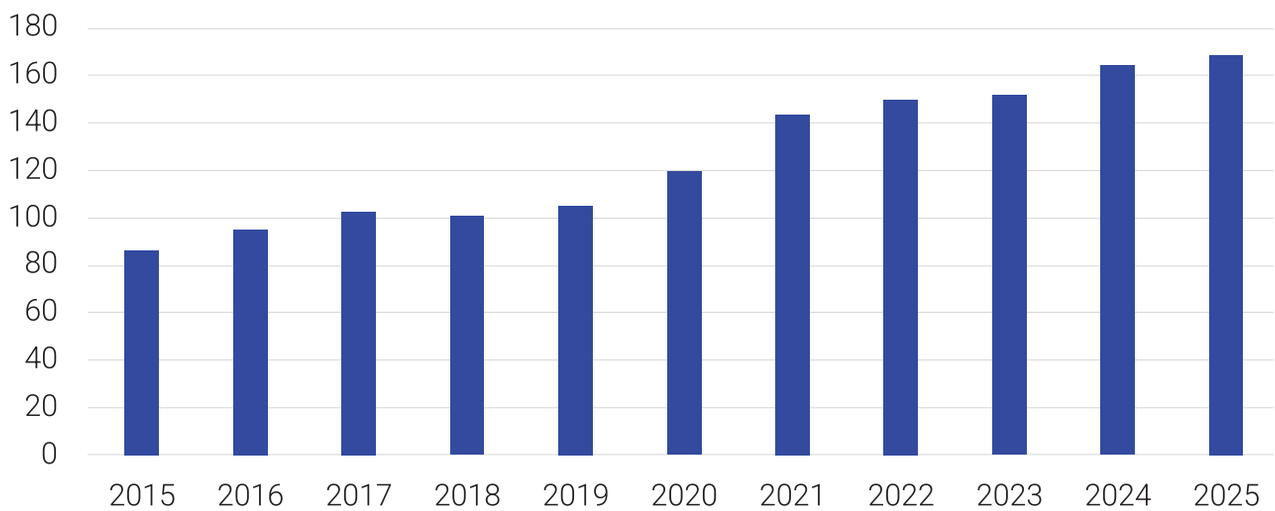
36 LEADS_D1.1-Demand-Assessment-Framework_v1.0-FINAL-5.pdf

1.4.2 Digital Specialists in Ireland: Profile

Based on the definition outlined in Section 1.4.1, this section uses data from the Labour Force Survey provided by the CSO to examine and describe the profile of Ireland's digital specialists by occupation, technology domain, sector gender, age, and region in 2025.

Employment trend: Ireland's digital specialist workforce has expanded significantly over the past decade and now represents a major component of the country's high-skilled labour force. There were approximately 168,800 digital specialists working in Ireland in 2025, up from 86,500 in 2015, representing an increase of 95% since 2015 (Figure 1).

Figure 1: **Total Digital Specialists in Ireland, 000s, 2015 – 2025**

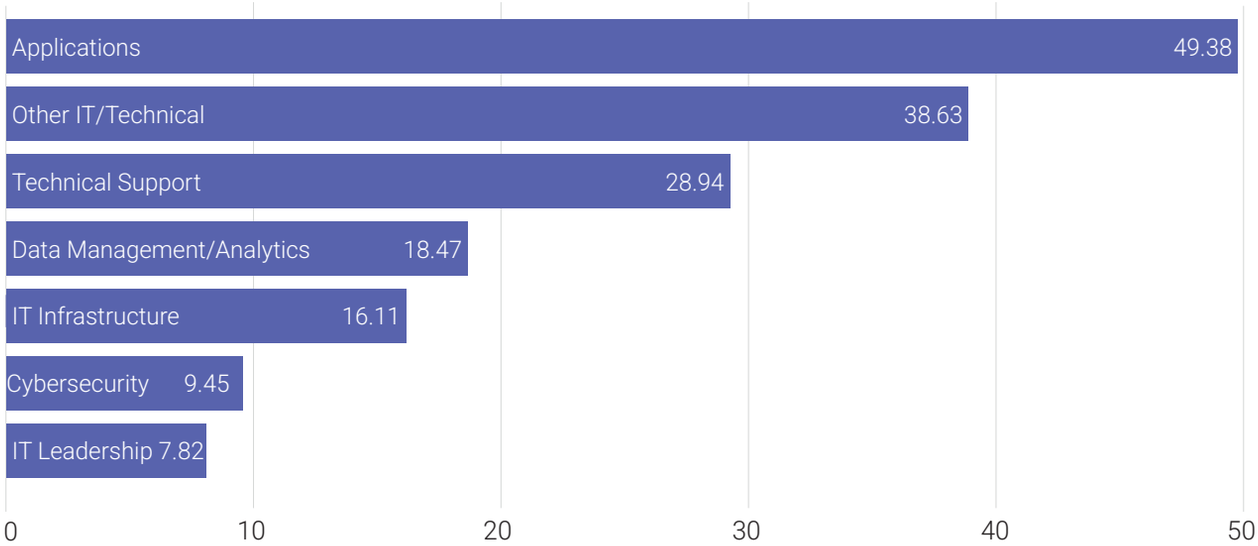


Source: CSO, Labour Force Survey

Occupation: The largest share of employment is concentrated in ICT and software-related occupations, including software developers, programmers, IT business analysts, systems designers and web professionals. Engineering occupations, including electrical and electronics engineers, also account for an important share of employment, alongside ICT managers, telecommunications specialists and IT technicians. Most occupational groups experienced sustained growth between 2015 and 2025, reflecting increasing demand for digital capabilities across the economy. In 2025, the three biggest occupational categories were as follows: just over 53% of digital specialists were programmers and software development professionals; almost 20% were IT specialist engineers; and almost 16% were IT operations technicians.

Technology Domain: Mapping CSO occupational data to IDC's ICT Job Role Taxonomy allows digital specialist employment to be analysed across seven technology domains (Figure 2). In 2025, the largest concentration of digital specialist employment in Ireland was in job roles relating to Applications (29%), followed by Other IT/ Technical roles (23%) and Technical Support roles (17%). Together, these three domains accounted for almost 70% of all digital specialist employment 2025. More specialised roles in Data Management/Analytics (11%), IT Infrastructure (10%), Cybersecurity (6%), and IT Leadership (5%) represented smaller shares of the total digital specialist workforce but are critical to the future evolution of Ireland's digital economy. See Table 20 in Appendix 3 for the estimated 2025 employment for each job role within each technology domain.

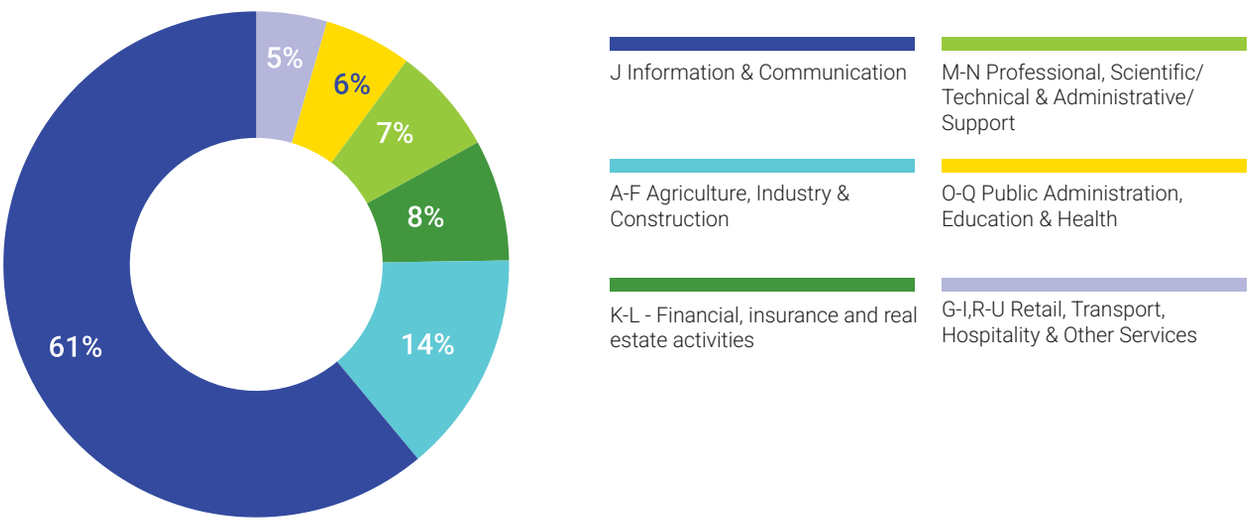
Figure 2: **Digital Specialist Employment by Technology Domain, 000s, 2025**



Source: IDC analysis of CSO Labour Force Survey Data

Sectoral Spread: Digital specialists are employed across a wide range of sectors rather than solely within the ICT industry (Figure 3). While 61% of digital specialists in Ireland were employed in information and communication activities in 2025, a significant number- nearly 40% of the total- worked in manufacturing, financial services, professional services and public administration. This highlights the extent to which digital expertise is now embedded across the whole economy.

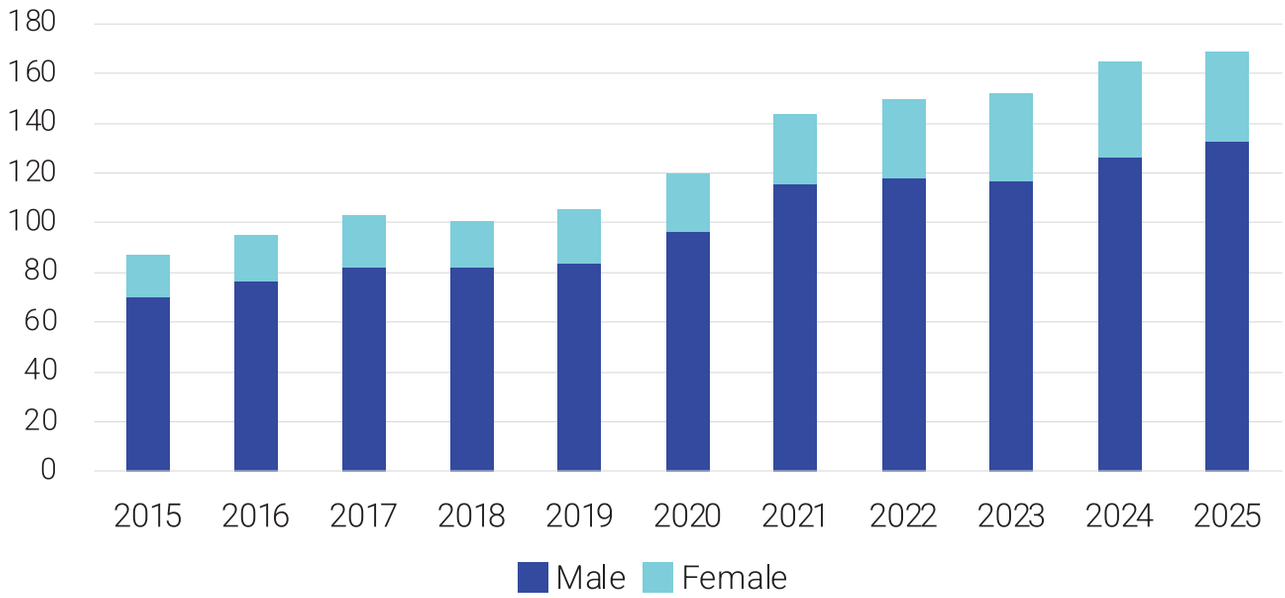
Figure 3: **Percentage Share of Digital Specialist Employment in Ireland by NACE Sector, 000s, 2025**



Source: CSO, Labour Force Survey

Gender: There were 35,800 female digital specialists in 2025, compared with 133,000 males (Figure 4). The number of female digital specialists in Ireland has increased by 19,580, (121%), between 2015 and 2025, compared an increase of 62,755 (89%) for males. The digital specialist workforce remains predominantly male however, with 79% of digital specialists being male in 2025 and 21% female- an increase of 2% since 2015. Women account for a growing share of employment in several IT professional occupations. Female participation is strongest in higher-skilled IT professional roles (SOC 2133-2139), while engineering and technician occupations continue to display larger gender imbalances suggesting that while some progress has been made in terms of gender inclusivity in digital specialist roles, considerable work remains to be done.

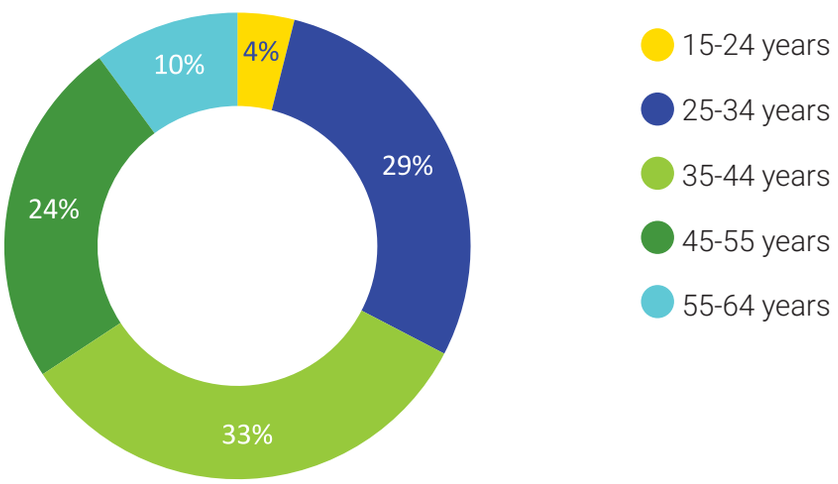
Figure 4: **Digital Specialists in Ireland by Gender, 000s, 2015 - 2025**



Source: CSO, Labour Force Survey

Age: The workforce profile of digital specialists is relatively young, with the highest levels of employment concentrated in the 25–44 age groups (Figure 5)

Figure 5: **Percentage Share of Specialists in Ireland by Age Cohort, 2025**[37]

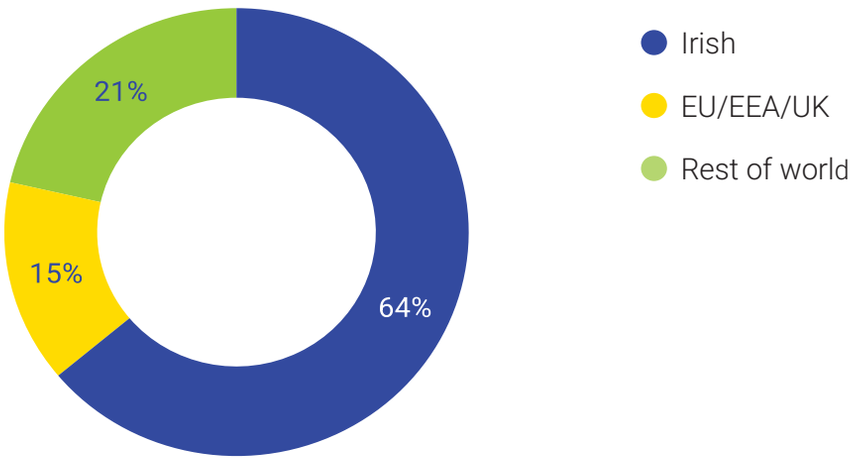


Source: CSO, Labour Force Survey

Citizenship: Ireland's digital specialist workforce is also notably international in character. Over a third of digital specialists working in Ireland are from overseas, including 15% being citizens of other EU/EEA states or the UK, and 21% being from the rest of the world (Figure 6).

37 Estimates for number of persons aged 65+ are too small to be considered reliable and are therefore not shown on Figure 3

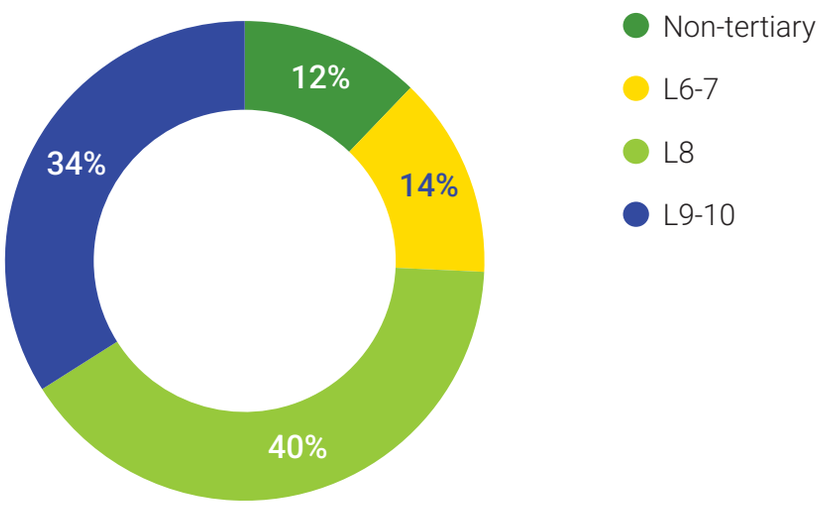
Figure 6: **Percentage Share of Digital Specialists in Ireland by Citizenship, 2025**



Source: CSO, Labour Force Survey

Education: Educational attainment levels are particularly high. Overall, almost nine in ten (88%) of digital specialists hold third-level qualifications, with just 12% having a non-tertiary level qualification level (Figure 7). Over a third (34%) have postgraduate qualifications (NFQ Levels 9-10). 40% hold an Honours Bachelor's Degree (Level 8), while 14% have qualifications at Levels 6–7 (Higher Certificate or Ordinary Bachelor's Degree). This underlines the skilled nature of the digital specialist workforce and the importance of higher education pathways in supplying digital talent.

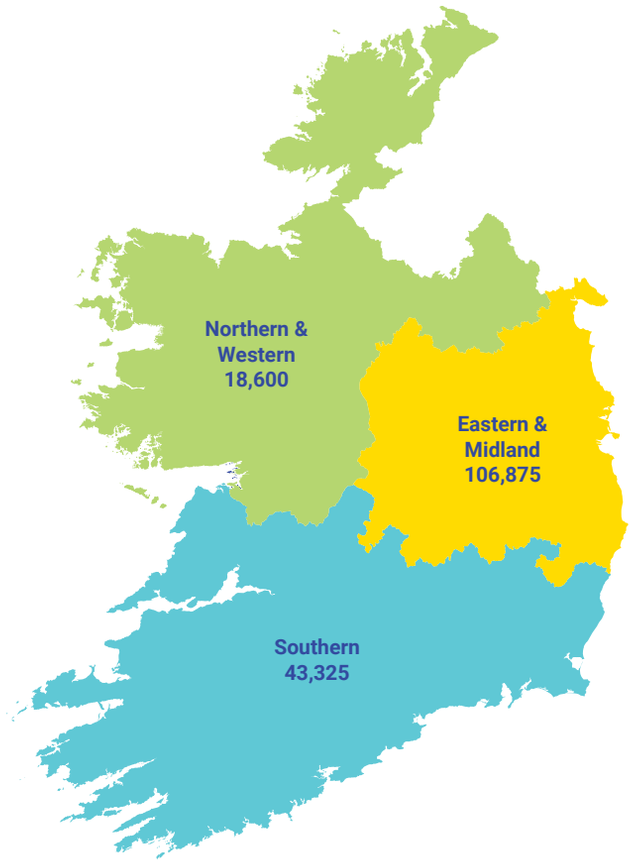
Figure 7: **Percentage share of Digital Specialists by Education Level (NFQ), 2025**



Source: CSO, Labour Force Survey

Regional Spread: There is a strong regional concentration of digital specialists within the Eastern and Midland region (63% of the total), reflecting the importance of Dublin and surrounding areas as centres for multinational technology companies and high-value business services (Figure 8). The Southern region also supports a substantial digital specialist workforce (26%), particularly around Cork and Limerick.

Figure 8: **Digital Specialists in Ireland by NUTS-2 Region, 2025**



Source: CSO, Labour Force Survey

Overall: The data presents a picture of a large and growing digital specialist workforce that is highly educated, internationally connected and concentrated in advanced sectors of the economy, a workforce which is central to Ireland's economic development and international competitiveness. However, persistent gender imbalances, regional concentration and increasing demand for advanced digital skills point to ongoing challenges in maintaining a sufficient and diverse talent pipeline.

1.5 Chapter Summary

This chapter has outlined the **rationale, methodological approach** and context for this study of digital specialists in Ireland. The chapter has also **defined** and **profiled Ireland's digital specialist workforce.** The following chapter explores the major technological drivers of change—particularly AI, cybersecurity and evolving skill requirements—and their implications for workforce demand, education and training.

2

Main Technological Drivers of Change

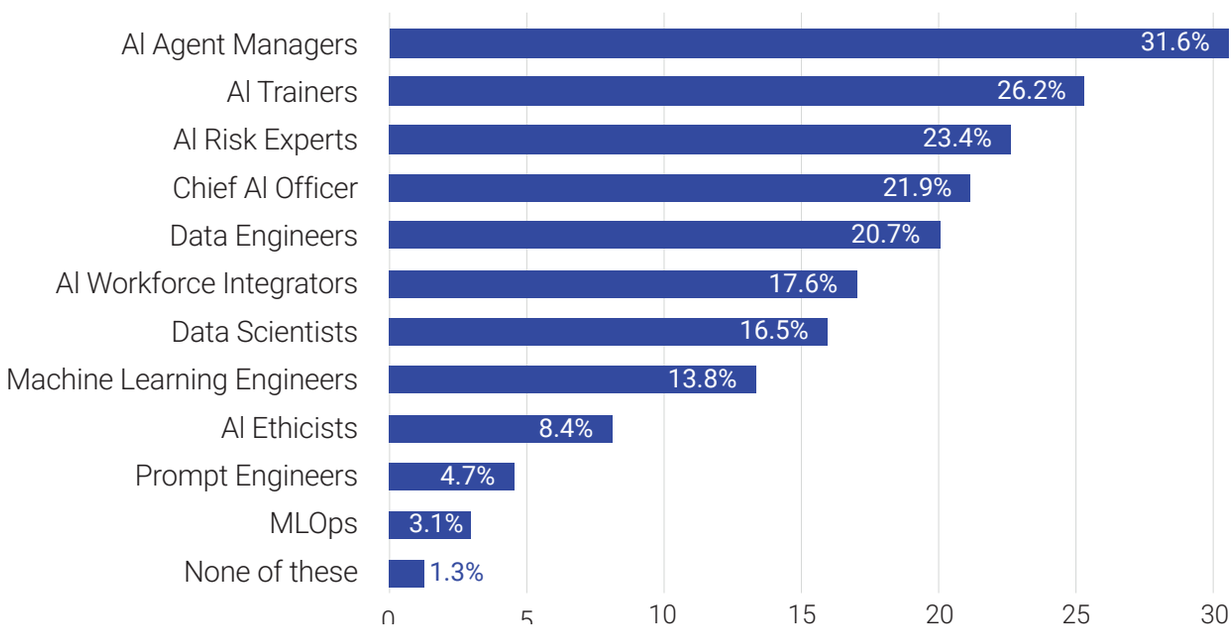
2.1 The Impact of AI

The rapid deployment of AI is reshaping the ICT workforce landscape, with senior executives increasingly viewing AI as a critical driver of revenue growth and operational transformation. However, skills shortages are a major constraint. OECD evidence shows demand for AI-related skills has grown by over 30% across OECD countries, while specialised AI roles still represent about 1% of total vacancies, indicating a structurally limited talent pool.[38] At EU level, more than half of enterprises cite lack of skilled staff as the main barrier, and 57.5% report difficulties recruiting digital specialists, particularly in AI-related roles.[39] Ireland's AI ecosystem is expanding, with 73 dedicated AI companies active as of February 2026, strengthening the country's digital innovation base and driving demand for AI capabilities.[40]

Generative AI and Intelligent Agents: The shift from basic automation to Generative AI (GenAI) and autonomous agents is transforming digital specialist roles. New specialisations such as prompt engineers, AI agents' managers, and AI risk experts are emerging. These roles require not only technical knowledge but also strong domain-specific business understanding.

Complexity and Scale in AI Implementation: Organisations are moving from experimentation to scaled AI deployment, embedding AI into workflows and decision-making. This requires skills across data management, infrastructure, deployment, security, compliance, and optimisation. However, according to IDC's EU Tech Buyer Survey (April 2025), technical roles such as Data Engineers, Data Scientists, and MLOps (Machine Learning Operations) specialists remain under-prioritised in hiring and upskilling (see Figure 9).

Figure 9: **Top Roles that Organisations Expect to Hire/Upskill in the EU over the Next 18 Months to Support AI-Related Efforts**



Source: IDC AI Tech Buyer Survey 2025, April 2025

Companies are rethinking deployment models: IDC research indicates that up to 86% of European organisations are repatriating AI workloads from public cloud to on-premises or hybrid environments to improve control over data residency, security, and compliance. Notably, 39% of organisations considering

38 OECD (2024), The Adoption of Artificial Intelligence in Firms – firm-level survey evidence showing skills shortages as a leading barrier to AI adoption and scaling.

39 Generative AI outlook report – Exploring the intersection of technology, society, and policy, Navajas Cawood, E.(editor), Vespe, M.(editor), Kotsev, A.(editor) and Van Bavel, R.(editor), Publications Office of the European Union, 2025

40 https://www.f6s.com/companies/artificial-intelligence/Ireland/co

migration focus on AI workloads, reflecting concerns around intellectual property and EU regulatory compliance. This shift increases demand for skills in hybrid infrastructure, integration, and data governance.

Sovereign AI and Regulatory Impact: The rise of "sovereign AI" introduces additional complexity. While still evolving, it reflects growing emphasis on data control, governance, and compliance. Organisations must balance immediate regulatory requirements (e.g. EU AI Act) with longer-term sovereignty ambitions.[41,42]

Demand for Transversal and Business-Integrated Skills: As AI integrates across business functions, digital specialists require analytical thinking, communication, collaboration, and ethical reasoning alongside technical expertise. AI is driving a shift toward hybrid skill profiles, combining technical and business capabilities.

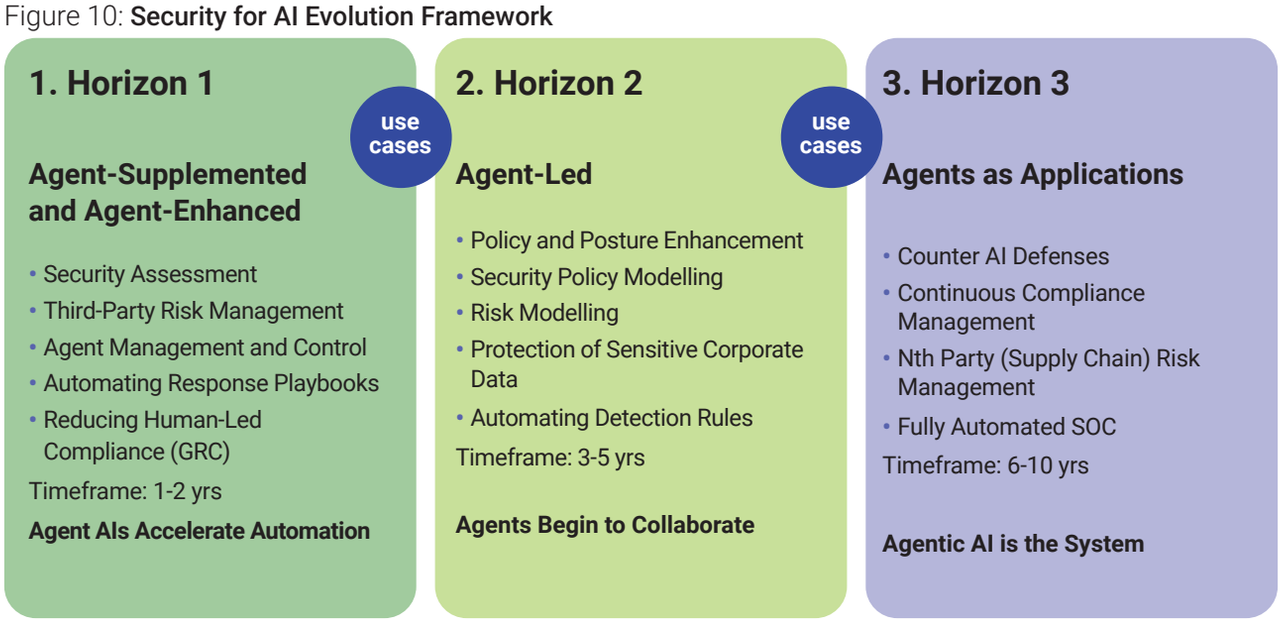
Overall, AI adoption is accelerating workforce transformation, increasing the urgency for upskilling and reskilling as AI becomes central to enterprise operations.

2.2 The Changing Cybersecurity Landscape

Digitalisation, cloud adoption, and AI are transforming cybersecurity into a strategic priority, expanding attack surfaces and increasing threat complexity.

AI, Automation, and Threat Evolution: The OECD's AI Incidents and Hazards Monitor highlights the use of AI in phishing, fraud, and deep-fake attacks which are increasing in scale and sophistication.[43] At the same time, organisations are adopting AI-driven defence tools such as security copilots to enhance detection and response. However, AI introduces new risks, including data poisoning, adversarial attacks, and shadow AI, requiring cybersecurity professionals to develop expertise in AI security and governance.

Figure 10: **Security for AI Evolution Framework**



Source: IDC 2025

41 European Parliament Think Tank, Making Europe an AI continent, September 2025

42 IDC defines AI sovereignty as " a dimension of an AI strategy that describes the ability to have free choice and control over the design, development, deployment, accessibility, operation, maintenance, and governance of AI systems and applications, and the technologies that those systems and applications depend on".

43 OECD AIM: AI Incidents and Hazards Monitor

Regulatory Pressures: New frameworks such as DORA and the NIST Cybersecurity Framework are raising expectations for resilience and compliance.[44] Cybersecurity teams must integrate technical, regulatory, and risk management capabilities.

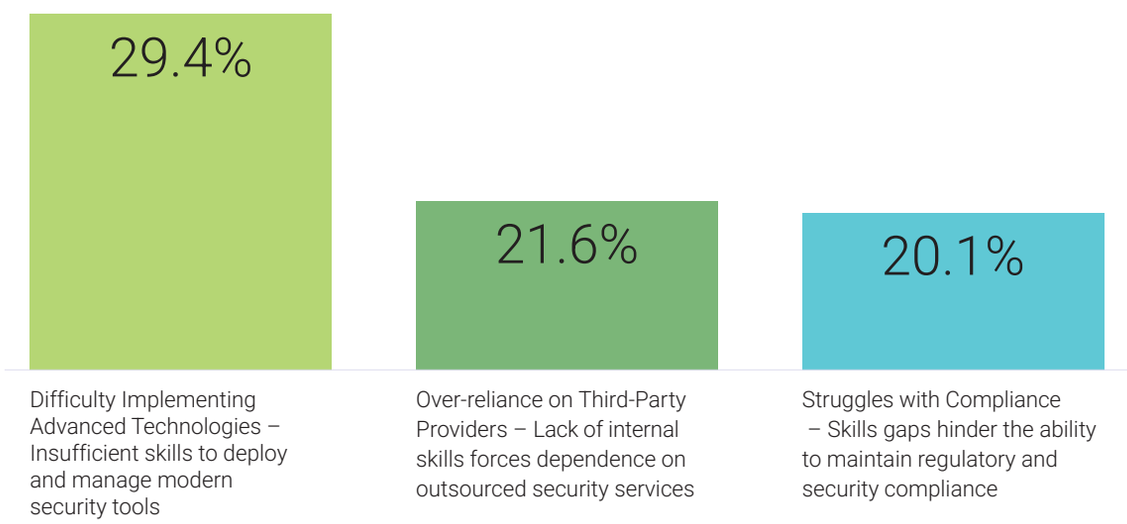
Post-Quantum Cryptography (PQC): The emergence of quantum computing introduces significant long-term risks to encryption. Organisations must begin transitioning to post-quantum cryptography, including cryptographic inventory and migration planning, especially for high-risk systems by 2026. [45,46]

Legacy Systems and Integration Challenges: Legacy systems remain prevalent across EU public sectors, increasing vulnerability and limiting digital transformation.[47] Skills are needed in legacy system maintenance, secure integration, and compensating controls such as monitoring and segmentation.

Workforce Challenges: Cybersecurity professionals face high stress levels, with 66% reporting workplace stress and 63% noting increases.[48] This contributes to talent shortages and attrition. Employers are increasingly prioritising analytical mindsets and communication skills alongside technical expertise.

Overall, cybersecurity is evolving into a multidisciplinary field, requiring integration of technical, regulatory, and business skills. The importance of addressing cybersecurity skill gaps is highlighted in Figure 11, which shows that shortages are directly affecting organisations' ability to deploy advanced security technologies, manage outsourced security services effectively, and maintain compliance obligations.

Figure 11: **Biggest Challenges Organisations Face due to Cybersecurity Skill Gaps**



Source: IDC EU Custom Survey Security 2025

44 https://www.eiopa.europa.eu/digital-operational-resilience-act-dora_en; https://nvlpubs.nist.gov/nistpubs/CSWP/NIST.CSWP.29.pdf

45 A cryptographic asset inventory is a concise, up-to-date record of all cryptographic components used across an organisation's systems, including keys, digital certificates, algorithms, protocols, and related hardware or software. It provides central visibility into where these assets are deployed, how they are configured, and who owns them, so that security teams can manage risk, prevent outages, and plan changes such as a move to quantum-safe cryptography.

46 NIST-approved post-quantum standards are a new generation of public-key cryptographic algorithms that have been formally standardized by the U.S. National Institute of Standards and Technology to resist attacks from both classical and large-scale quantum computers. They replace or augment today's widely used public-key schemes (such as RSA and elliptic-curve cryptography) with mathematically different constructions designed to remain secure even when adversaries can run algorithms like Shor's algorithm on powerful quantum hardware.

47 ECIPE – European Centre for International Political Economy (2025), Boosting Efficiency and Quality in EU Public Services: How Cloud Can Transform Public Administration in Europe, Occasional Paper No. 04/2025, Brussels.

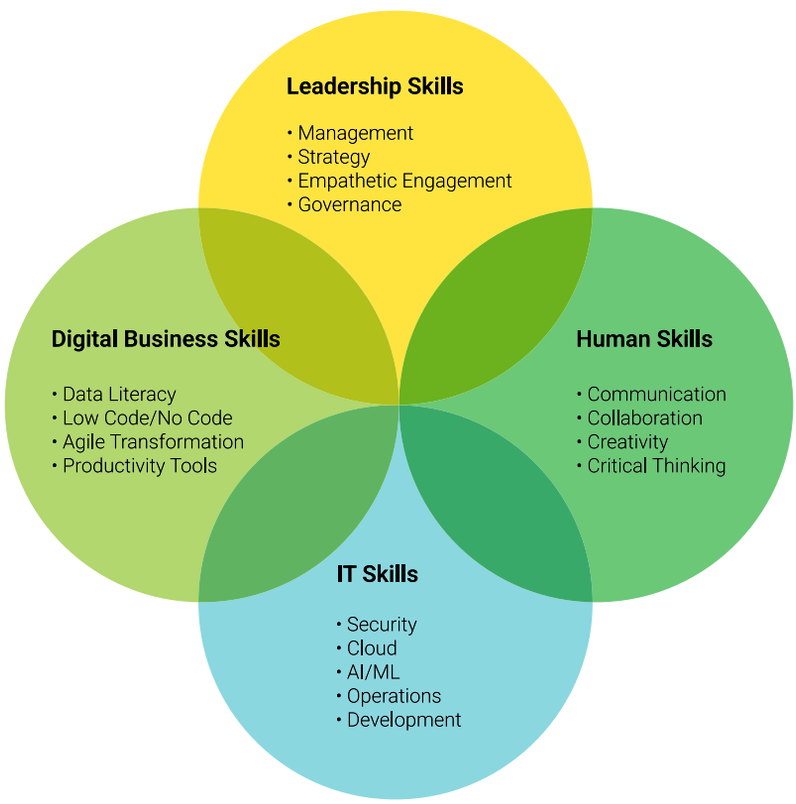
48 Tines, State of Mental Health in Cybersecurity, 2022

Ireland's National Cyber Security Strategy (2019–2024) reinforces the importance of workforce capacity and advanced skills for national resilience.[49] The Strategy recognises that addressing expanding cybersecurity risks requires not only technical controls, but sustained investment in advanced cybersecurity skills across the public sector, enterprise, and the wider workforce. In this context, cybersecurity skills increasingly overlap with AI and digital skills, encompassing areas such as secure-by-design development, AI system security and governance, threat detection and response automation, and regulatory compliance under EU frameworks including NIS2 and the AI Act.

2.3 The Emergence of T-shaped Professionals

Digital specialist roles are evolving from narrow technical specialisations into broader, multidisciplinary profiles. The demand is increasingly for T-shaped professionals—individuals with deep expertise in one area and broad capabilities across others, spanning communication, business acumen, and strategic thinking.[50] For example, an individual can maintain deep specialist expertise AI while also developing broad digital, business, and human skills that enable effective collaboration, service delivery, and leadership in complex environments (Figure 12).

Figure 12: **IDC Interdisciplinary Skills Framework**



Source: IDC 2024

2.3.1 Key Drivers of Increased Demand for T-shaped Professionals

- **Technology complexity:** Cross-functional collaboration is essential to translate technical capabilities into business value.
- **AI automation:** Routine technical tasks are increasingly automated, shifting value toward creativity, problem-solving, and ethical judgement.

49 NCSC: National Cyber Security Strategy

50 World Economic Forum, The Future of Jobs Report 2025

- **Rapid technological change:** Shorter skill lifecycles require adaptability and continuous learning.
- **Emerging hybrid roles:** Positions such as data translators, AI ethicists, and cloud financial analysts require blended expertise.

2.3.2 Implications for Education and Training

The increased demand for T-shaped professionals means that education systems must balance technical depth with foundational human (transversal) skills, including communication, teamwork, and systems thinking. There is increasing emphasis on: project-based learning; cross-disciplinary exposure; and real-world problem solving.

The ICT Skills in Ireland survey undertaken for this report highlights the following skills gaps:[51]

- **Graduates:** improvement in critical thinking (49%), communication (40%), and adaptability (30%);
- **Experienced professionals:** development in continuous learning (44%) and leadership (39%).

This suggests a shift in what is expected of digital specialists: graduates need stronger interpersonal, adaptive, and business skills, while experienced professionals are expected to combine technical expertise with strategic, ethical, and leadership capabilities. Digital specialist roles demand both technical credibility and cross-functional fluency, embodying the T-shaped model.[52] This calls for curricula that embed project-based, cross-disciplinary learning, explicit development of soft skills, and exposure to real-world, multi-stakeholder digital transformation challenges rather than narrow, tool-specific training.[53]

Figure 13: **Multi-Disciplinary Skills Needed to Implement Digital Initiatives**

Source: ICT Skills in Ireland Survey, August 2025

51 See Appendix 3 for full details of survey.

52 World Economic Forum – The Future of Jobs Report 2025

53 Cedefop, ICT professionals: skills opportunities and challenges (2023 update)

Micro-credentials and modular learning models are emerging as key tools for enabling lifelong learning and reskilling. Micro-credentials, developed with employers, could help professionals extend the horizontal bar of the T into adjacent areas while deepening their vertical expertise as technologies evolve. The formation of digital specialist professionals must prioritize adaptive, T-shaped profiles supported by high-quality, work-aligned continuous learning infrastructure, rather than one-off, front-loaded specialisation.[54]

2.4 Pressure on Entry-Level Roles

The rise of GenAI has significantly disrupted entry-level employment in digital specialist occupations, creating structural challenges in future talent development pathways. While aggregate digital specialist employment continues to expand, evidence demonstrates higher displacement among early-career workers, which are precisely the cohorts essential for sustaining long-term workforce pipelines and organisational knowledge transfer.[55]

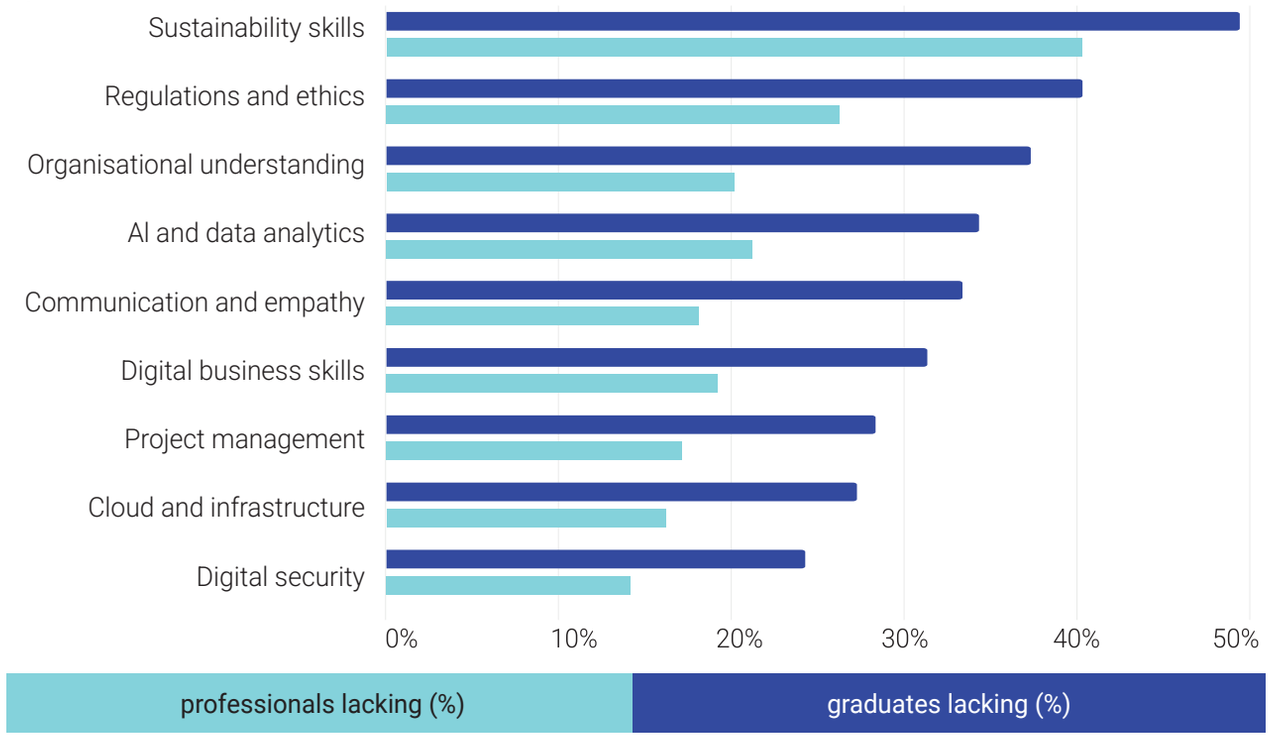
International Evidence of Displacement: Research shows: 20% employment decline among US developers aged 22–25 post-ChatGPT; 32% decline in UK entry-level digital specialist vacancies (2022–2024);[56] IDC enterprise surveys report 66% of organisations reducing entry-level hiring due to AI; and 54% of engineering leaders planning reduced junior hiring.[57]

Mechanisms Driving Change:

- **Automation of entry-level tasks:** AI tools such as GitHub Copilot automate routine tasks (e.g. debugging, documentation), reducing traditional entry and learning pathways.[58]
- **Baseline expectations escalate beyond graduate capabilities:** Employers increasingly expect new hires to arrive with AI tool proficiency, hands-on project portfolios, and advanced problem-solving skills, competencies previously developed on-the-job.[59] Only 5% of employers now require traditional degrees, favouring AI certifications and bootcamp credentials, yet paradoxically maintain experience requirements that exclude genuine newcomers.
  IDC survey findings highlight a perceived skills gap affecting recent university graduates according to Irish organisations, indicating that entry-level digital specialist talent is expected to demonstrate a far broader set of general, multidisciplinary capabilities than experienced professionals.[60] Recent graduates in Ireland are seen to lack key skills at substantially higher rates than more established professionals in areas that emphasise broad contextual, institutional, and system-level knowledge beyond narrow technical expertise, such as sustainability (40% vs 9%), regulation and ethics (26% vs 14%) and organisational understanding (20% vs 17%). Gaps are also evident in human skills such as communication and empathy (Figure 14).
- **Economic incentives:** Economic efficiency calculations favour senior retention over junior development. When senior developers augmented by AI can perform work previously requiring multiple juniors, organisations perceive junior hiring as cost centres rather than investments.

54 https://www.iua.ie/ourwork/learning-teaching/microcreds/
55 World Economic Forum – The Future of Jobs Report 2025
56 Parsons, M. (2025, December 2). What will humans do? Why I'm increasingly concerned about AI's impact on the jobs market. Employer Branding News.
57 Intuition Labs. (2026, January 29). AI's impact on graduate jobs: A 2025 data analysis.
58 OECD (2021), AI and the Future of Skills, Volume 1: Capabilities and Assessments, Educational Research and Innovation, OECD Publishing, Paris, https://doi.org/10.1787/5ee71f34-en .
59 World Economic Forum – The Future of Jobs Report 2025
60 World Economic Forum – The Future of Jobs Report 2025

Figure 14: **Percentage Share of Graduate and Professional Levels Perceived to be Lacking General Skills**



Source: ICT Skills in Ireland Survey, August 2025

Implications for Ireland: This displacement creates compounding risks for Ireland's digital economy. Hollowed talent pipelines threaten future senior capacity, today's missing juniors become tomorrow's absent technical leads and architects: tomorrow's skills shortages. AWS leadership characterized junior elimination as "one of the dumbest things you could do," recognizing that innovation depends on diverse cohorts bringing fresh perspectives.[61] Knowledge transfer mechanisms break down when apprenticeship structures vanish, potentially creating skills voids in foundational domains (debugging complex systems, understanding legacy architectures) that AI cannot replicate. Graduate anxiety intensifies career pathway uncertainty. Surveys indicate 56% of 2025 graduates feel pessimistic about career prospects, with 62% expressing concern about AI displacement—anxiety concentrated among computer science majors facing 6–7% unemployment rates despite aggregate skills shortages.[62]

Ireland's labour market is highly exposed to AI at the task level (63% of employment), with a non-trivial substitution share (30%), increasing the risk that junior task bundles get automated first.[63,64] However, Ireland's position as a digital hub provides strategic opportunity: early adoption of AI-native training models, explicit employer commitments to maintain junior cohorts despite efficiency pressures. A responsive and agile skills ecosystem including both education and training providers and industry is vital to provide the skills necessary for Ireland to benefit from AI and mitigate the risks it may pose to the supply of digital specialist skills in the future.

61 "The dumbest thing I've ever heard" - AWS CEO slams plans for AI to replace junior human workers, TechRadar, August 2025

62 https://www.bestcolleges.com/news/the-economy-ai-have-grads-worried-about-careers/

63 Williamson et al. (IGEES), Artificial Intelligence: Friend or Foe? artificial-intelligence-friend-or-foe-an-analysis-of-how-ai-could-impact-Irelands-labo.pdf; EGSFN, Skills Insights Note 2025-2, How AI is transforming the Irish Labour Market

64 EGSFN, Skills Insights Note 2025-2, How AI is transforming the Irish Labour Market

2.5 Key Findings

This chapter identifies major technological shifts—particularly AI, cybersecurity, and evolving workforce models—as the primary drivers of demand for digital specialist skills in Ireland and across Europe. A central finding is that **AI adoption is accelerating rapidly**, transforming business models, operational processes, and workforce requirements. However, this growth is constrained by **significant skills shortages**, with demand for AI skills rising sharply while the talent pool for specialised roles remains limited. This imbalance is a key barrier to scaling AI across organisations.

The chapter highlights the transition from experimental AI use to **enterprise-scale deployment**, requiring a broader and more complex skills mix. Organisations increasingly need expertise not only in data science and engineering, but also in governance, compliance, infrastructure, and security. Emerging roles such as prompt engineers and AI risk specialists reflect this shift. At the same time, the rise of **sovereign AI and regulatory requirements** is increasing demand for skills in data governance, compliance, and hybrid infrastructure management.

Cybersecurity is also evolving significantly, becoming a **strategic priority** rather than a purely technical function. The integration of AI into both cyberattacks and defence mechanisms is increasing the sophistication of threats and the demand for advanced, multidisciplinary skills. Regulatory frameworks such as DORA and NIS2 are further driving the need for expertise in risk management and compliance. Additionally, workforce challenges—particularly stress, burnout, and talent shortages—are intensifying pressures in the cybersecurity domain.

Another key finding is the growing importance of **T-shaped professionals**, who combine deep technical expertise with broader skills such as communication, business understanding, and adaptability. This reflects the need for cross-functional collaboration and the ability to translate technical capabilities into business value. Employers increasingly prioritise hybrid and transferable skills over narrow technical specialisation.

Finally, the chapter highlights **structural changes in entry-level employment** driven by AI. Automation is reducing demand for junior roles while raising expectations for new entrants, creating risks for long-term talent pipelines. The erosion of traditional learning pathways could lead to future skills shortages if not addressed.

Overall, the chapter underscores the urgent need for **continuous upskilling, education reform, and policy intervention** to ensure the digital specialist workforce remains resilient and aligned with technological change.

3

Assessment of Current Skills Supply

Ireland's digital specialist skills-supply ecosystem draws on a range of channels, including formal education, vocational pathways, private training providers, industry-led initiatives, and cross-border talent. Together, these channels must meet the growing demand for digital specialist skilling, upskilling and reskilling across all sectors of the economy.

This chapter offers a qualitative and quantitative overview of the different supply channels available in Ireland. The chapter begins by examining the supply of graduates from ICT fields of study (ISCED broad field 06)[65] between NFQ[66] level 5-10 from higher education (HE) and further education and training (FET), and transitions into digital specialist employment.[67]

The chapter then goes on to consider ICT apprenticeships and digital specialist upskilling and reskilling initiatives. The chapter then goes on to assess the contribution of graduates non-ICT fields of study to the digital specialist talent pipeline, the role of economic migration as a source of digital specialist expertise, and the challenges around gender representation in digital specialist education and employment.

The findings of this chapter inform the demand forecasting and digital specialist supply-demand gap analysis in Chapter 4.

3.1 Digital Specialist Skills Supply from ICT Education and Training

3.1.1 Higher Education ICT Awards

Higher education provision spans NFQ Levels 6-10. HE in Ireland is delivered through 7 universities, 5 Technological Universities, 2 Institutes of Technology and several specialist publicly funded institutions.[68] This is complimented by a substantial private and independent college sector.[69] Public institutions are overseen by the Higher Education Authority (HEA), which supports funding, labour-market alignment and enterprise engagement. Awards from private institutions are accredited by QQI.[70,71]

Higher education in ICT fields of study is the principal domestic pipeline for graduates entering digital specialist careers. A distinctive feature of Irish higher education is its role in ICT conversion and workforce transition. Higher Diplomas, Postgraduate Diplomas and conversion master's programmes allow graduates from non-ICT disciplines and careers, especially from STEM backgrounds but also business, humanities and other professional areas, to move into digital specialist roles. Many of these programmes are supported through initiatives such as Springboard+. Ireland's higher education system is also increasingly involved in the provision of the academic learning component of ICT apprenticeship programmes as an alternative workplace-focused pathway into digital specialist roles.

The Higher Education system supports lifelong digital specialist skills development through professional upskilling and reskilling through micro-credentials, part-time postgraduate programmes, professional diplomas and other forms of CPD provision. Ireland's higher education system is also critical to Ireland's advanced digital research capability.

65 ISCED is the reference international classification for organising education programmes and related qualifications by levels and fields. See more here: International Standard Classification of Education (ISCED) - Statistics Explained - Eurostat

66 Ireland's National Framework of Qualifications (NFQ) is a 10-level system used to classify all education and training qualifications. See more here: National Framework of Qualifications | Quality and Qualifications Ireland

67 Section 3.1.1 to 3.14 of this chapter employs ICT award data from SOLAS's Monitoring Ireland's Skills Supply 2025 which includes awards made by both public and private providers at HE and FET level.

68 List of publicly funded higher education institutions (universities and colleges)

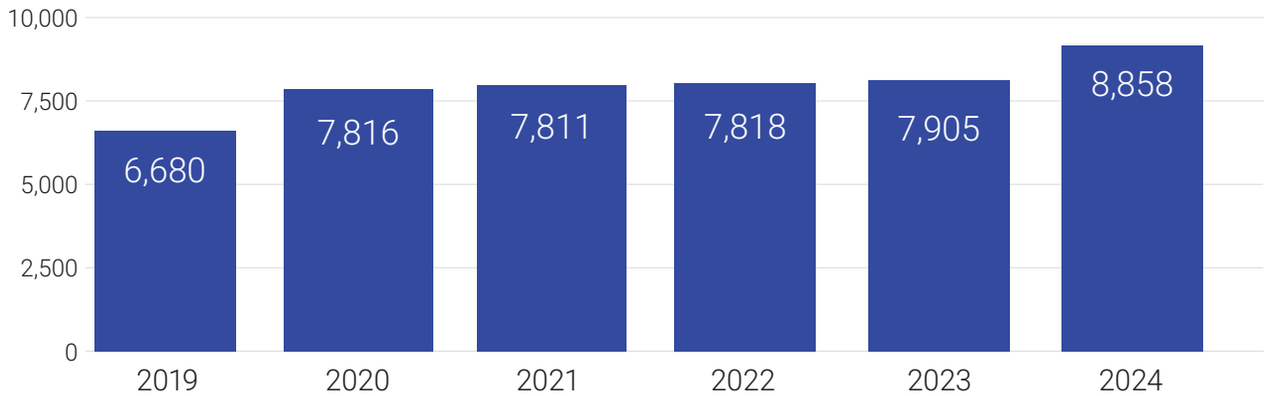
69 See Monitoring Ireland's Skills Supply 2025 for a list of private independent colleges awarding QQI-HE awards (p.77).

70 Higher Education Authority

71 Quality and Qualifications Ireland

Trends in HE ICT Graduate Output: HEA and QQI data show that ICT higher education output increased from 6,680 graduates in 2019 to 8,858 in 2024, growth of approximately 33% (Figure 15). Output rose strongly between 2019 and 2020, remained broadly stable from 2020 to 2023, and increased again in 2024.

Figure 15: **Number of ICT Higher Education Graduates (NFQ Levels 6 HE-10) in Ireland, 2019-2024**



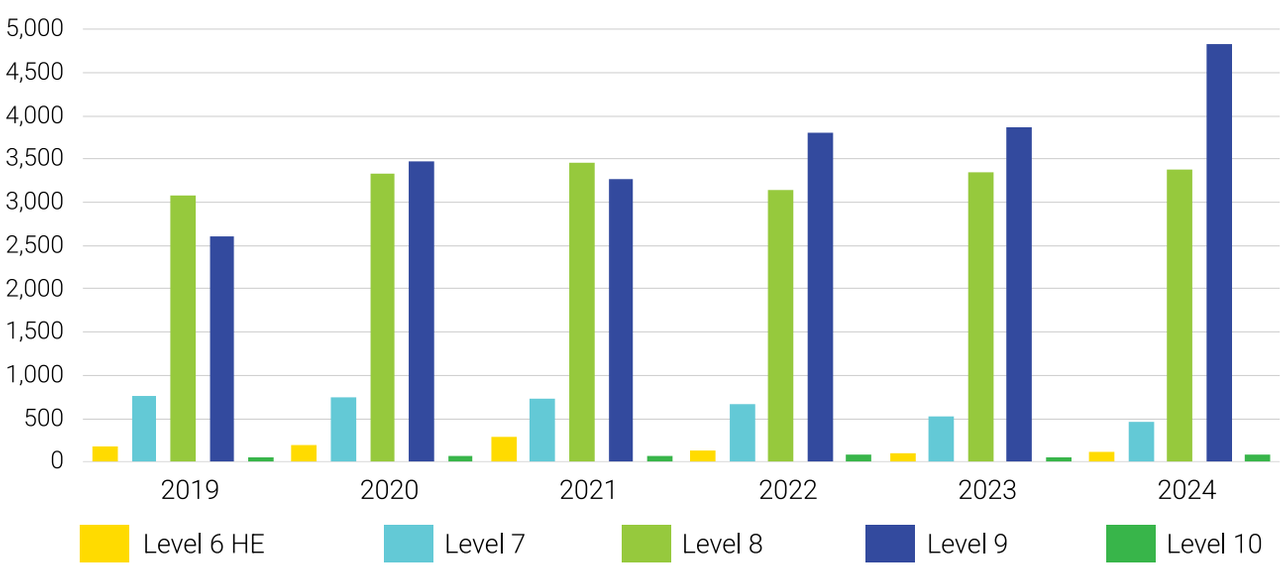
Source: HEA, QQI – MISS 2025

As well as moderate growth in overall numbers of higher education graduates in ICT fields of study, Figures 16 and 17 also show a clear rebalancing of the composition of higher education awards, with evident change in the proportion of awards made at different NFQ levels over between 2019 and 2024:

- Levels 6-7 awards declined in both absolute terms and as a share of total ICT HE awards.
- Level 8 remained broadly stable, generally between 3,000 and 3,500 graduates, with a 2% CAGR.
- Level 9 grew most strongly, from around 2,600 graduates in 2019 to almost 4,800 in 2024, an increase of 85% at 13% CAGR. Level 9 ICT awards amounted to 54% of all ICT Higher Education awards by 2024, reflecting increased demand for advanced specialist skills, taught master's and postgraduate diplomas, conversion programmes.

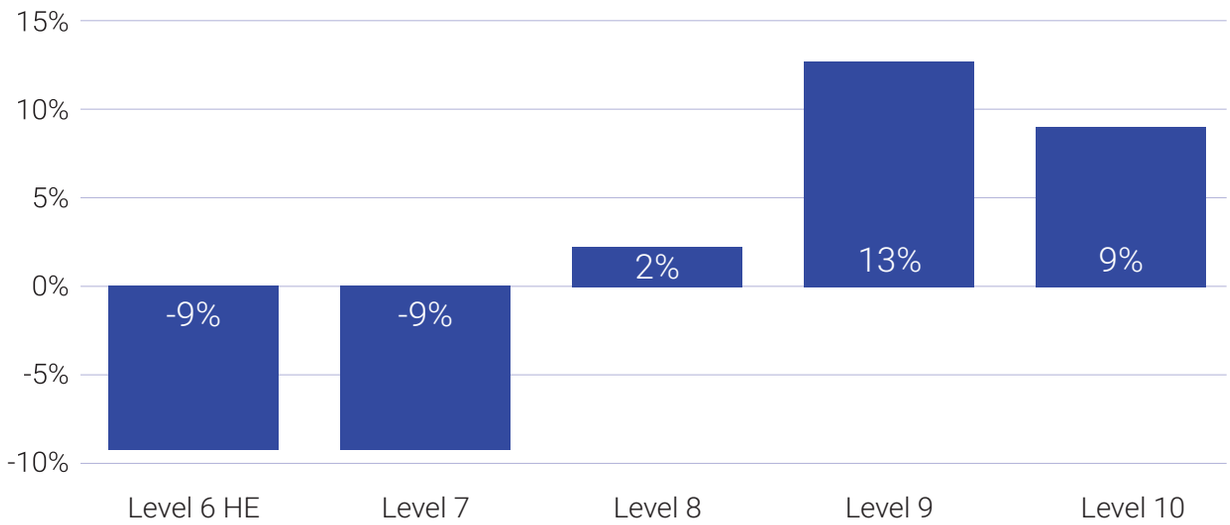
The research pipeline, including Level 10 PhDs and research-focused Level 9 master's degrees, remains thin in absolute terms, despite growth at 9% CAGR, which may limit longer-term digital specialist research and innovation capacity.

Figure 16: **Number of ICT HE Graduates in Ireland (NFQ Levels 6HE-10), 000s, 2019-2024**



Source: HEA, QQI – MISS 2025

Figure 17: **Growth Rate of ICT HE Graduates in Ireland (NFQ Level 6-10), 2019-2024**

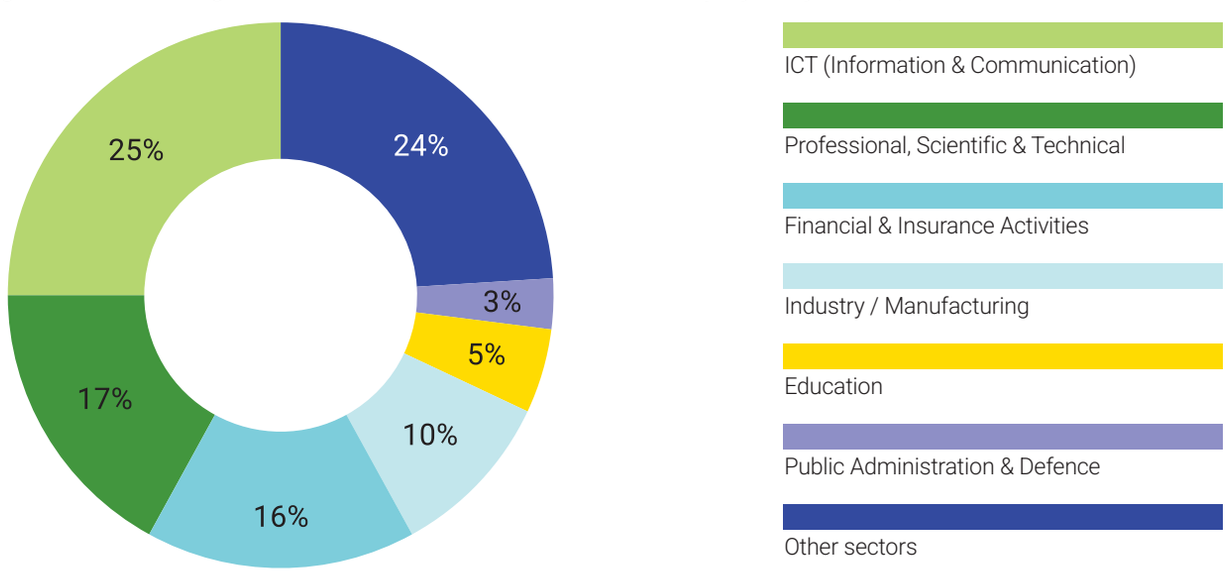


Source: HEA, QQI – MISS 2025

The Higher Education Authority's Graduate Outcomes Survey shows that more than 80% of ICT HE graduates (NFQ levels 6-10) are in work nine months after graduation, marginally ahead of the national average across all subjects. Of those employed, 52% are in professional occupations and 82% are in senior or specialist roles, compared with 73% across all graduates.[72]

The survey also finds that while the ICT sector is the largest destination for employed higher education ICT graduates (25%). 75% of recent ICT graduates from higher education are employed outside the ICT sector, highlighting the importance of digital specialists across the whole economy. 17% of recent ICT graduates are employed in professional and technical services and 16% in financial and insurance activities (Figure 18). Overall, 69% of employed ICT graduates work in four key high-value sectors (ICT, professional services, finance or industry), compared with around 40% of employed graduates across all subjects.

Figure 18: **Percentage Share of ICT HE Graduates who are Employed by Sector, 2024**



Source: HEA's Graduate Outcomes Survey, 2024

72 The employment rate for HE ICT graduates relates solely to awards made at NFQ levels 6 HE-10, and excludes awards made at NFQ levels 5-6 (FET). The combined employment rate for both HE and FET sectors (NFQ levels 5-10) is 77%. See Table 5 below.

3.1.2 Further Education and Training ICT Awards

While higher education remains a major source of graduate digital specialists, the Further Education and Training (FET) sector has become an increasingly important component of Ireland's digital skills ecosystem. Ireland's FET system, coordinated by SOLAS and delivered primarily through the 16 Education and Training Boards (ETBs), alongside other QQI-regulated providers, offers flexible pathways into digital specialist careers for school leavers, career changers and those seeking to upskill or reskill throughout their working lives.

FET delivers employer-responsive education and training through apprenticeships, traineeships, Skills to Advance, micro-credentials, industry certifications and other flexible programmes, many of which are fully or substantially government funded. FET apprenticeships enable learners to earn while they learn, combining paid employment with structured education and training leading to nationally recognised qualifications. Eligible trainees participating in traineeships may continue to receive qualifying social welfare payments and may also be eligible for a training allowance and other learner supports, helping to reduce financial barriers to participation. These pathways support both new entrants and the existing workforce across rapidly evolving technology domains, including artificial intelligence, cybersecurity, advanced manufacturing, robotics, industrial automation, cloud computing, data analytics and other digital technologies.

Increasingly, specialist FET centres are providing advanced technical capability in areas of national strategic importance. The Advanced Manufacturing Training Centre of Excellence (AMTCE), operated by Louth and Meath Education and Training Board (LMETB), is one example of how the FET sector can respond rapidly to regional and national skills priorities through close industry collaboration, applied learning environments, specialist facilities and flexible programme delivery. AMTCE delivers industry-led education and training in advanced manufacturing, Industry 4.0 technologies, cybersecurity, automation, robotics, artificial intelligence and sustainability, demonstrating the sector's capacity to develop highly skilled digital specialists in response to emerging labour market needs.[73]

Together, higher education and the FET sector provide complementary pathways that are essential to meeting Ireland's future demand for digital specialists. While higher education continues to produce graduate talent, FET plays a distinctive role in providing accessible, flexible and employer-responsive education that supports workforce upskilling, reskilling and the rapid development of applied digital skills required by industry.

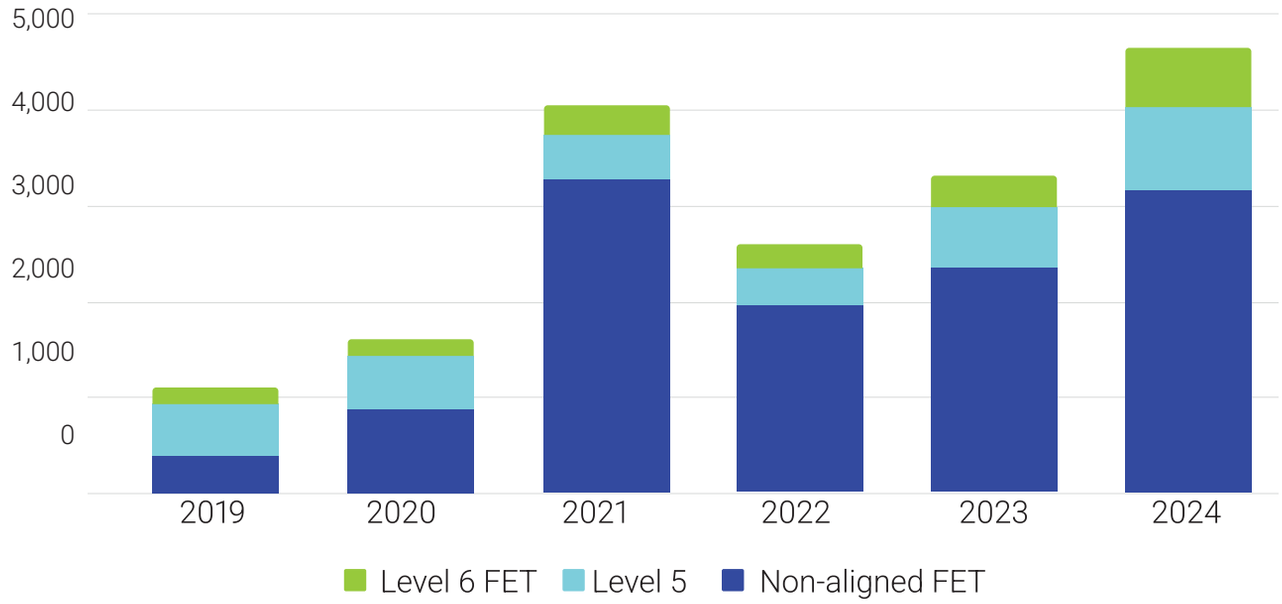
Trends in FET ICT Graduate Output: Figures 19 and 20 show strong growth in ICT-related FET awards between 2019 and 2024:

- Non-aligned FET awards increased from 372 in 2019 to 3,114 in 2024, a rise of 2,742 awards (+737%) and a 53% CAGR. This reflects growth in short, flexible and industry-focused training, including bootcamps, micro-qualifications and vendor-certified programmes. These courses mainly serve upskilling and reskilling and are therefore not included as new graduate entrants in the forecasting exercise.[74]
- NFQ-aligned Level 5 awards grew from 557 in 2019 to 881 in 2024, an increase of 58% and a 10% CAGR, after a decline in 2019–2022 and rebound in 2023–2024.
- NFQ Level 6 awards rose from 161 to 619, an increase of 284% (+458 awards) and a 31% CAGR, indicating stronger demand for advanced FET routes into technician, support specialist and mid-level digital roles.

73 The employment rate for HE ICT graduates relates solely to awards made at NFQ levels 6 HE-10, and excludes awards made at NFQ levels 5-6 (FET). NFQ Level 6 awards in Higher Education are counted separately from NFQ level 6 awards in Further and Higher Education. The combined employment rate for both HE and FET sectors (NFQ levels 5-10) is 77%. See Table 5 below.

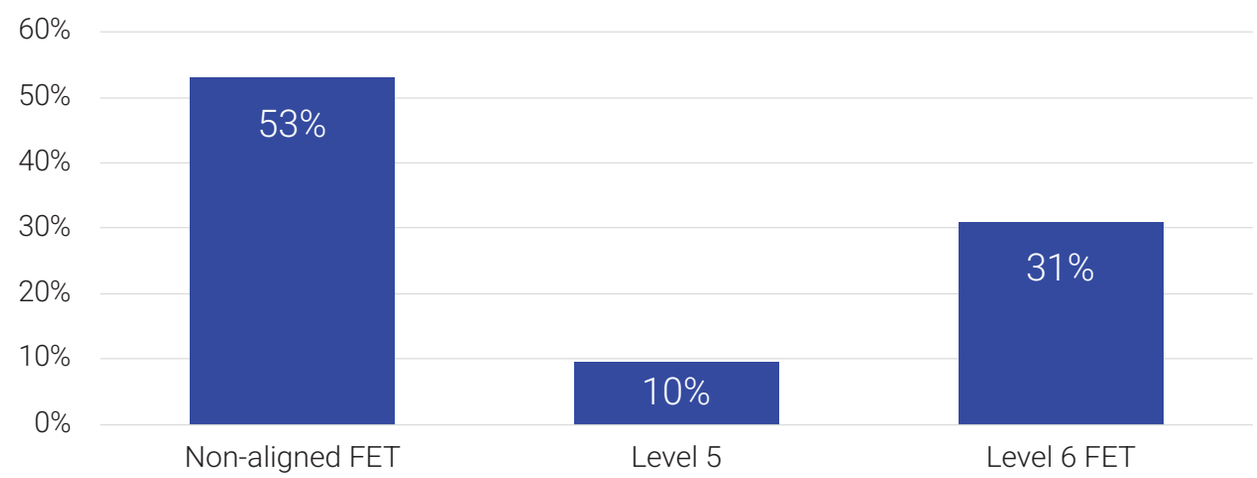
74 To avoid over-estimating the potential supply of skills to digital and ICT occupations, some FET awards (e.g. ECDL and basic MS Office awards) were deemed to be more relevant to the social science, business and fields and are therefore excluded from the analysis of ICT awards in Monitoring Ireland's Skills Supply.

Figure 19: **Number of FET ICT Awards for NFQ Levels 5-6 and Non-Aligned, 2019-2024**



Source: HEA, QQI, SOLAS/ETBI – MISS 2025

Figure 20: **CAGR of FET ICT Awards for NFQ Levels 5-6 and Non-Aligned, 2019-2024**

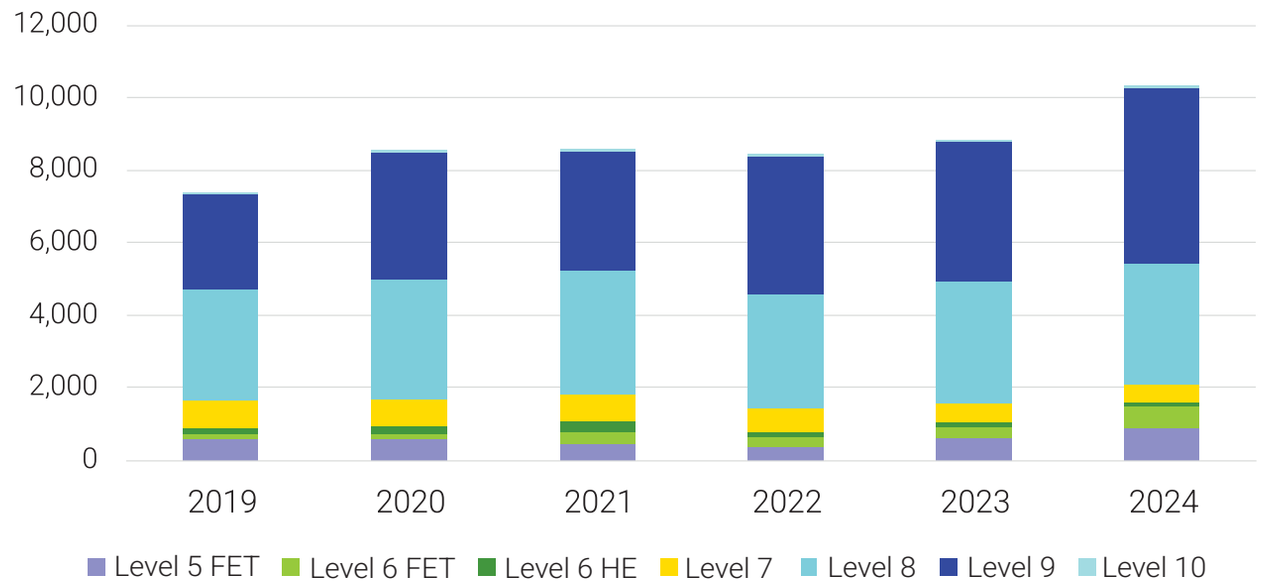


Source: HEA, QQI, SOLAS/ETBI – MISS 2025

3.1.3 Total HE and FET ICT Awards

Overall, ICT awards at HE and FET level in Ireland have increased steadily over the past five years, apart from 2022 (Figure 21). In 2024, total ICT awards reached 10,358, up 40% from 7,398 in 2019. In 2024, most awards were at Master's and Honours Bachelor's Degree levels (levels 8 and 9) at 3,380 and 4,822, respectively. Together these award levels accounted for 79% of total ICT awards in 2024. This was followed by Level 5 FET (881 awards), level 6 FET at (619 awards), level 7 HE (460 awards), and level 6 HE (112 awards). Table 4 below also provides a breakdown of HE and FET ICT awards made in 2024 at each NFQ level by detailed ISCED field.

Figure 21: **Total ICT Awards in Ireland, 2019-2024**



Source: HEA, QQI, SOLAS/ETBI– MISS 2025[75]

Table 4: **ICT Awards by NFQ Level and Detailed ISCED Field, 2024**

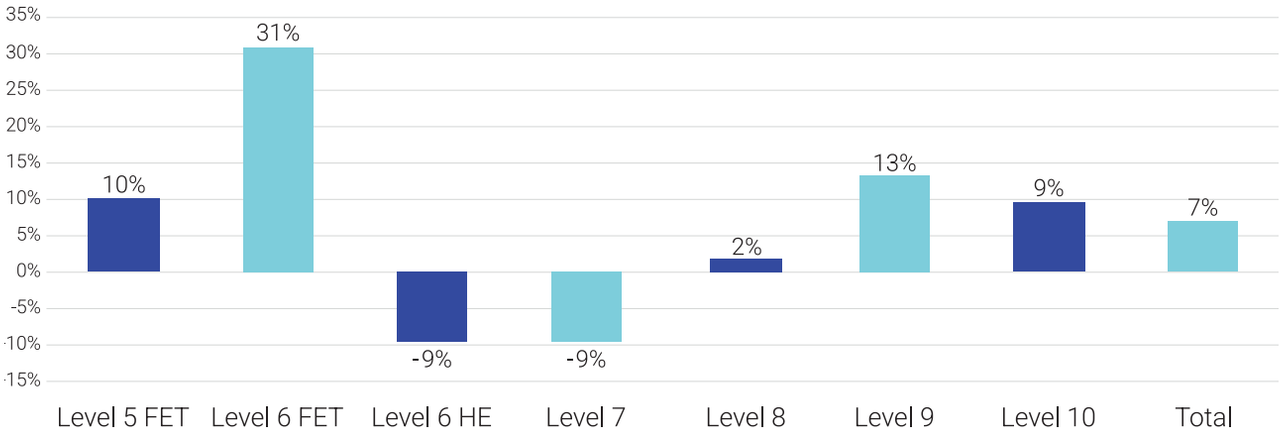
2024 awards	FET			Higher Education		
	NFQ 5	NFQ 6	NFQ 6/7	NFQ 8	NFQ 9/10	Total
Computer use	11	0	44	285	158	498
Database/network design & admin	267	65	59	250	309	950
Software development, etc.	603	502	328	1,494	1,615	4,542
Other	0	52	141	1,351	2,824	4,368
Total awards	**881**	**619**	**572**	**3,380**	**4,906**	**10,358**

Source: HEA, QQI, SOLAS/ETBI– MISS 2025

Overall, Ireland's ICT education and training pipeline has expanded and is becoming more advanced and flexible since 2019. In higher education, ICT graduate output grew by 33% overall, with output stable at Level 8 output at level 8 and rapid growth at Level 9 (Figure 22). This points to greater emphasis on advanced, specialist and conversion-based ICT programmes, although the research pipeline remains relatively small. Reflecting this shift to move advanced higher education qualifications. Awards at Levels 6 HE and 7 have declined since 2019. In FET, expansion is more dynamic and driven by non-aligned, short and flexible provision, while Level 6 FET has grown faster than Level 5. Overall, the pipeline is shifting toward postgraduate specialisation, flexible upskilling and higher technical intensity.

75 The figures for total ICT Awards shown in Figure 21 represents all ICT awards excluding non-aligned FET and level 3-4 FET.

Figure 22: **ICT Awards Growth Rate by NFQ Level, 2019-2024**



Source: HEA, QQI, SOLAS/ETBI – MISS 2025

3.1.4 ICT HE and FET Graduates Estimated Employment Supply

To estimate the number of ICT graduates entering employment from the combined higher education and FET pipeline, employment outcome rates were estimated (i.e. the percentage share of graduates in employment) for NFQ Levels 5–10 in 2024. These rates are calculated based on HEA and SOLAS data on graduate employment for output at each NFQ level. These range from 42% for NFQ Level 6HE to 87% for NFQ Level 10 (Table 5). The rates are applied to ICT awards at NFQ Levels 5–10 in 2024 to produce an estimate for the number of ICT graduates available to enter employment in digital specialist roles.

In total, out of 10,358 ICT graduates in 2024, an estimated 7,981, or 77%, entered employment (Table 5). Most of these were at higher NFQ levels 8 (honours bachelor's degree) and 9 (master's degree), at 2,738 and 4,195, respectively. These employment rates inform the demand forecasting and gap analysis in Chapter 4.[76]

Table 5: **ICT Graduates at NFQ Levels 5-10 Entering Employment, 2024**

NFQ Level	2024 ICT Awards	Share of recent ICT graduates entering employment (%)	Recent ICT graduates entering employment (n)
Level 5	881	49%	432
Level 6 FET	619	49%	303
Total FET	**1,500**	**49%**	**735**
Level 6 HE	112	42%	47
Level 7	460	42%	193
Level 8	3,380	81%	2,738
Level 9	4,822	87%	4,195
Level 10	84	87%	73
Total HE	**8,858**	**82%**	**7,246**
Total FET and HE	**10,358**	**77%**	**7,981**

Source: EGFSN analysis of MISS 2025, SOLAS, HEA, QQI, CSO[77]

76 Most of those not entering employment are continuing with their studies.

77 ICT apprenticeship awards are included in the overall FET and HE ICT award data analysed in section of 3.1 of this chapter.

3.1.5 ICT Apprenticeships

Ireland's ICT apprenticeship model provides an alternative route into digital specialist careers by combining classroom learning with practical, paid employment. The National Apprenticeship Office (NAO) is a joint body established by SOLAS and the Higher Education Authority to manage, oversee and develop all aspects of Ireland's apprenticeship system and was also responsible for implementing the national Action Plan for Apprenticeship 2021-2025.[78] The NAO acts as a single point of contact for employers, apprentices and providers in accessing information and guidance on apprenticeships.

Ireland has been rolling out Consortia-led apprenticeships since 2016 with the objective of expanding the traditional apprenticeship system beyond historical craft trades into new, emerging areas such as ICT, finance, and health. Under this system, programmes are designed and governed by industry-led steering groups (consortia). These consist of employers, education and training providers, and other stakeholders who collaborate to develop the curriculum and ensure it meets modern industry needs.

It is important to note that while HE and FET institutions provide the academic learning leading to an apprenticeship award, they do not provide apprenticeships directly as the apprentice must be first employed.

FIT-Fastrack into Information Technology- is an industry-led, not-for-profit organisation that designs and delivers ICT-focused training and acts as the national coordinator for several NFQ Level 6 ICT Apprenticeship programmes in conjunction with SOLAS and Ireland's Education and Training Boards.[79]

A total of 236 apprentices were registered in ICT-related programmes at the end of 2025, up from 125 in 2020. ICT apprentice registrations fluctuate by programme and year, with more consistent activity in Network Engineering, Software Development, Telecommunications and Data Networking, and Cybersecurity. This variability reflects a variety of factors, including employer hiring cycles, regional labour-market dynamics (Table 6).

Two new ICT-related apprenticeships were launched in 2024, Software Solutions Architecture (Level 9) and Digital Marketing (Level 6). Programmes currently under development in 2026 include Data Analyst (Level 6) and Immersive Technology (Level 6).[80]

Table 6: **ICT Apprentice Registrations 2020-2025**

ICT Apprenticeship	NFQ Level	Coordinating Provider	2020	2021	2022	2023	2024	2025	2026 Forecast
CGI Technical Artist (Animation, Games, VFX)	Level 8	TU Dublin	0	0	0	0	0	0	0
Cybersecurity	Level 6	FIT - Fastrack into Information Technology	30	6	53	35	27	46	98
Cybersecurity Practitioner	Level 8	University of Limerick	0	0	2	0	0	0	0
Computer Networking Associate	Level 6	FIT - Fastrack into Information Technology				9	11	58	120
Digital Marketing	Level 6	Mayo, Sligo, Leitrim ETB					10	26	
Network Engineer Associate	Level 6	FIT - Fastrack into Information Technology	22	11	33	46	0	0	0
Software Developer Associate	Level 6	FIT - Fastrack into Information Technology	42	53	148	90	41	90	195
Telecommunications & Data Network Technician	Level 6	TU Dublin	31	37	29	83	43	16	140
Total			**125**	**107**	**265**	**272**	**143**	**236**	**553**

Source: National Apprentice Office (NAO, SOLAS/HEA)

78 Action Plan for Apprenticeship, 2021 to 2025

79 Become a Tech Apprentice - FIT - Tech Apprenticeships and Courses

80 https://content.apprenticeship.ie/f/83224/x/dce5b6c6e4/2026-06-22-list-of-apprenticeships-as-of-june.pdf

The National Survey of Apprentices 2024 found that the top motivations for choosing an apprenticeship were to follow a specific career path (44%), gaining a qualification (36%), and the ability to earn while learning (36%). In term of apprenticeship experience, the survey found that 94% of apprentices believe their apprenticeship will provide good employment opportunities, while 76% agreed that their apprenticeship includes up to date and relevant skills for employment.[81]

Of the 38% of respondents who indicated they had seriously considered withdrawing from their apprenticeship, financial challenges scored the highest (58%), followed by transfer to another employer (20%) and personal and family circumstances (16.4%), and 16% for 'Other' reasons.

The percentage of surveyed apprentices who reported experiencing barriers in securing their apprenticeship fell from 40% in 2020 to 16% in 2024. In 2024, the top three barriers were securing an employer (64%), financial constraints (27%), and access to information on apprenticeship (26%).

3.2 Digital Specialist Upskilling and Reskilling Initiatives

The supply of digital specialist skills is not only a matter of new graduate or career-changer entry into digital specialist occupations. In the context of rapid technological and organisational change, the continuous reskilling, upskilling and lifelong learning of the existing digital specialist workforce is of fundamental importance.

To meet this need, a host of providers deliver education and training to support the upskilling and reskilling of digital specialists. This provision includes accredited and unaccredited training and delivered in a variety of settings with flexible full- and part-time options. Some of this provision is supported by funding from the National Training Fund.[82] Ireland's enterprise development agencies, Enterprise Ireland and IDA Ireland, also provide extensive support for their client companies to reskill and upskill their workers in digital skills.

Ireland's overall lifelong learning participation rate in the fourth quarter of 2024 was 16%, up from 14% in 2023. This ranks slightly above the overall EU rate of 14%, but lags Europe's leaders in lifelong learning, particularly the Nordic countries. Participation in lifelong learning by individuals working in the ICT sector in the fourth quarter of 2024 stood at 28%, notably higher than Ireland's notably higher than Ireland's overall rate of participation in lifelong learning.[83]

3.2.1 Private Industry-led ICT Upskilling Provision

Industry-led providers support rapid upskilling and reskilling, especially in emerging technologies where formal education may lag industry demand. Key providers include:

- **Skillsoft** offers flexible e-learning solutions covering programming, AI, cloud computing, IT service management, cybersecurity, tech leadership and broader digitalisation skills. 14,711 workers completed digital skills programmes with Skillsoft in 2024.[84]
- **Cisco Networking Academy** provides globally recognised certifications in networking, cybersecurity, and IoT. Over 30,000 Irish learners have benefited from Cisco Networking Academy since launch in 1997. Courses include CCNA, CyberOps Associate, and IoT fundamentals. Courses are delivered in partnership

81 National Survey of Apprentices 2024

82 The National Training Fund (NTF) was established by the National Training Fund Act, 2000.2 II is a dedicated fund to support the training of those in employment, those seeking employment and to support lifelong learning. The Act allocates funding for research to provide information on existing and likely future skills requirements of the economy. See: An Overview of the National Training Fund (NTF)

83 Lifelong learning amongst adults in Ireland, SOLAS, 2025

84 Skillsoft | AI-native Skills Management Platform

with Technology Ireland ICT Skillnet for free online and self-paced learning.[85]

- **IBM SkillsBuild and Microsoft Learn** offer specialised programs in AI, data analytics, cloud technologies, and cybersecurity. Programmes are adopted through Skillnet Ireland and corporate partnerships. [86,87]
- **PFH Technology Group** provides virtual and on-site courses for Microsoft certifications, cybersecurity, cloud, and bespoke corporate ICT training.[88]
- **Pitman Training** offers specialised in professional IT certifications and office technology skills. Courses provided include CompTIA A+, Network+, Cybersecurity, Cloud, and software packages. [89]
- **CMIT (College of Management and IT)** is an accredited e-learning provider offering ICT and business courses. Courses include IT Management, Cybersecurity, Cloud Computing.[90]
- **GuruTeam** provides advanced ICT and software development training with courses for Java, Python, DevOps, Cloud, Cybersecurity.[91]

Further initiatives include coding bootcamps and intensive programmes such as Code Institute, 4Geeks Academy and Code Labs Academy. Vendor certificates from providers such as Cisco or IBM are not included in QQI-reported FET awards because they are not QQI-validated and do not carry an NFQ classification. Consequently, data on such awards is not systematically collected or published, making it inconsistent and unsuitable for producing reliable national estimates.

3.2.2 FIT-Fastrack into Information Technology

FIT-Fastrack into Information Technology is an industry-led, not-for-profit organisation that works with education and training providers and Government agencies to develop Ireland's digital talent pipeline. Its focus is on helping people enter, re-enter or progress within the digital economy.[92]

In addition to being the national coordinator for several ICT Apprenticeship programmes in Ireland (See Table 6 above) FIT provides short, industry-focussed digital skills and ICT training courses, pre-apprenticeship programmes and programmes and aimed at jobseekers, career changers, women returning to work, and underrepresented groups in technology.

3.2.3 Skillnet Ireland

Established in 1999, Skillnet Ireland is funded through the National Training Fund and supports employer-led learning networks that help businesses and learners identify skills needs and access subsidised upskilling and reskilling provision. Technology-focused Skillnet networks play a significant role in Ireland's developing digital skills ecosystem:

- **Technology Ireland ICT Skillnet** provides professional training in areas such as AI, cybersecurity, cloud computing, data analytics, software development and quantum computing. It offers industry-recognised programmes, including MSc qualifications in AI, Sustainable Cloud Computing and Cybersecurity, alongside fully funded courses and conversion programmes for jobseekers, such as the Future in Tech initiative.[93,94] Technology Ireland ICT Skillnet reports that over its lifetime it has helped more than 14,000

85 Cisco Networking Academy
86 IBM SkillsBuild
87 Online Training – Learn New Technology Skills | Microsoft
88 PFH Technology Group, Ireland's largest ICT and Managed Services Company
89 Pitman Training | Flexible Career Developing Training Courses
90 CMIT
91 https://www.guruteamirl.com/
92 Homepage - FIT - Tech Apprenticeships and Courses
93 Technology Ireland ICT Skillnet
94 Future in Tech | Free Online Training Courses for Jobseekers

professionals across 6,000 companies develop technology skills.[95]

- **Technology Ireland DIGITAL Skillnet** delivers upskilling and reskilling programmes in AI, data analytics, cybersecurity, cloud computing and digital leadership. It also supports workforce diversity and career transitions through initiatives such as the NOVA Women in Tech Leadership Programme and Skills Connect.[96,97] Technology Ireland Digital Skillnet has also developed the DataSMART initiative in partnership with Microsoft Ireland and the Analytics Institute which aims to train 10,000 professionals in data literacy over three years.[98]
- **itag Skillnet**, based in Galway, supports technology employers across the West and Mid-West regions through subsidised training in AI, big data, cloud, cybersecurity, DevOps and software development. It also provides fully funded upskilling programmes for eligible jobseekers.[99]
- **Tech Industry Alliance Skillnet** supports technology firms in South-West Ireland through technical and leadership training, covering areas such as AI, DevOps, software testing and agile methodologies, alongside industry-focused leadership programmes and coding bootcamps.[100]

3.2.4 Micro-qualifications and Micro-credentials

Ireland is developing growing range of flexible, stackable micro-qualifications and micro-credentials to support the upskilling and reskilling of digital specialists. Micro-qualifications and micro-credentials are flexible, short-form learning opportunities that support the upskilling and reskilling of digital specialists and the wider workforce. They provide targeted, industry-relevant learning that can be completed alongside work commitments, helping individuals build skills in emerging technologies and respond quickly to changing workforce needs.

Micro-qualifications are delivered by ETBs through the Skills to Advance initiative.[101] These accredited, bite-sized programmes are designed to meet enterprise skills needs and are offered through flexible online, blended and face-to-face delivery models, typically at little or no cost to eligible learners and employers. Recent ICT-focused offerings include Introduction to Artificial Intelligence and Enhancing Productivity with AI, alongside other digital skills programmes.[102,103] Learners and businesses can also access information on AI learning pathways through the AIReady.ie portal.[104]

Micro-credentials are provided by higher education institutions and are aligned with NFQ Levels 6–9. They are quality-assured, credit-bearing modules that can be taken as standalone learning or stacked towards larger higher education awards.[105] More than 50% of the micro-credentials focus on digital skills, supporting the objectives of the National Digital and AI Strategy and reinforcing Ireland's ambition to remain a global digital leader. These digital-focused micro-credentials span a wide range of disciplines beyond ICT, highlighting the transversal nature of digital skills across the workforce.[106]

Available ICT and digital-related micro-credentials include areas such as Artificial Intelligence, Data Analytics, Cybersecurity, Cloud Computing and Digital Transformation. Learners can explore available courses through

95 Technology Ireland ICT Skillnet
96 Technology Ireland DIGITAL Skillnet
97 NOVA Women in Tech Leadership Programme
98 Data SMART Programme
99 itag Skillnet | Skillnet Ireland
100 Future Ready Technology Upskilling
101 Solas | Skills to Advance
102 Solas | Skills to Advance | Micro-Qualifications
103 AI Micro Qualifications | National Enterprise Hub
104 AI Ready - AI Made Simple for Everyone
105 MicroCreds Project Overview | Irish Universities Association
106 179 Micro-Credentials Announced with 80% Fee Subsidy for Learners in 2026 | News | Higher Education Authority

the national MicroCreds.ie portal which brings together offerings from participating higher education institutions. [107] A learner subsidy will be available on identified micro-credentials until December 2026, under the Micro-Credential Learner Fee Subsidy initiative.

Both micro-qualifications and micro-credentials are developed in partnership with industry to ensure alignment with current and emerging skills needs. Their development and expansion have been supported through national skills initiatives and funding from the National Training Fund, helping to strengthen Ireland's digital talent pipeline and workforce competitiveness.

Micro-qualifications and micro-credentials offer complementary and accessible pathways for developing ICT and digital skills. Through flexible delivery, industry-aligned content and opportunities to build recognised qualifications over time, they support digital specialists' and other professionals' lifelong learning and help individuals and employers respond to rapid technological change. As discussed in Chapter 2, micro-credentials have significant potential to facilitate the necessary cross-skilling needed for the formation of T-shaped professionals.

3.2.5 Springboard+

Springboard+ is an Irish Government higher-education initiative that supports upskilling, reskilling and digital skills development in areas of identified skills shortages. The initiative is funded by the Government of Ireland through the National Training Fund, with support from the European Union and offers free or heavily subsidised courses ranging from NFQ Level 6 (Certificate) to NFQ Level 9 (Master's/Postgraduate Diploma), enabling participants to gain qualifications aligned with evolving labour market needs, especially in areas of high demand such as ICT and digital. Courses are delivered by higher education institutions across Ireland and often include work placements, industry projects or other work-readiness elements.[108]

In the 2025/26 academic year, over 1,450 ICT places have been funded across 50 courses, reflecting the programme's long-standing focus on digital skills development.[109] Since 2025, the initiative has also provided funding support for accredited micro-credentials.

Springboard+ provides programmes in areas such as software development, data analytics, artificial intelligence, cybersecurity, cloud computing, DevOps, web development and digital skills. Examples include Higher Diplomas in Computing (Software Development), Data Analytics, Cybersecurity and Computer Science at NFQ Level 8, as well as postgraduate programmes in Artificial Intelligence, Big Data Analytics, Cloud Technologies and Cybersecurity at NFQ Level 9. These programmes support both upskilling in emerging technologies and reskilling into specialist digital careers through ICT conversion pathways.[110]

3.2.6 Enterprise Ireland and IDA Supports for Digital Skills Development

Both Enterprise Ireland and IDA Ireland provide significant financial and advisory supports to help their client companies upskill and reskill employees in areas such as artificial intelligence, cybersecurity, data analytics, cloud computing, automation, robotics, digital transformation, and related technologies.

Enterprise Ireland

Digital Discovery Grant: Funding of up to 80% of project costs (maximum grant of €5,000) to engage external digital or AI experts to assess current capabilities, identify skills gaps, and develop digital transformation plans.

107 Home – MicroCreds | Short, Flexible, Accredited Courses
108 Springboard Plus - Find a Course
109 Further and Higher Education – Tuesday, 7 Oct 2025 – Parliamentary Questions (34th Dáil) – Houses of the Oireachtas
110 Springboard Plus - Find a Course

Areas covered include AI, machine learning, data analytics, cloud systems, automation, IoT, robotics, digital twins, and enterprise software.

Company Development Training Grant and Build Capability Grant: Both grants support Irish companies in improving productivity, enhancing operational performance, and aligning people, processes, and technology to deliver strategic business objectives. The support also helps companies to identify capability gaps and develop the skills needed to support digital transformation and business growth. Funding of up to 70% of eligible training costs is available for workforce upskilling and capability building. While both grants support a wide range of organisational capability building trainings, focus on digital skills development includes areas such as digital literacy, digital systems, Artificial Intelligence (AI), Data Analytics, Machine Learning, Cloud Computing, IoT, Robotics and Automation, Big Data, and Digital Transformation. [111,112]

European Digital Innovation Hubs (EDIH): Supported by Enterprise Ireland, Ireland's four European Digital Innovation Hubs (CeADAR, Data2Sustain, ENTIRE, and FactoryXChange) act as "one-stop shops." They accelerate digital transformation by providing SMEs and public sector bodies with specialist expertise, targeted training, and vital 'test-before-invest' facilities in AI, IoT, cybersecurity, and advanced manufacturing. [113,114]

Spotlight on Skills: Delivered by Enterprise Ireland in partnership with DFHERIS, the Regional Skills Fora, and the Irish Management Institute, this programme helps companies identify skills needs and develop practical workforce plans aligned to strategic growth priorities. See Spotlight on Skills, delivered by Enterprise Ireland.[115]

Access to wider national training ecosystems: Enterprise Ireland works across the national skills ecosystem with key partners including Skillnet Ireland, SOLAS and the ETBs, the HEA and the university system. Through this wider ecosystem, companies can access training in AI, cybersecurity, cloud computing, analytics, software development, and other digital disciplines.

IDA

Training Grant Programme: Provides financial support of up to 50% of eligible training costs, to a maximum of €3 million, for workforce upskilling and reskilling programmes. Companies submit a talent development plan linked to strategic business needs. Priority digital skills areas supported by the Training Grant include AI, Data Analytics, Machine Learning, Cloud Computing, IoT, Robotics and Automation, Big Data Management, Digital Transformation and Innovation Management; and Cyber-related digital capabilities and emerging technologies.[116]

Business Development Programme (Digitalisation Consultancy Grant): Funding for external expert consultants to help companies develop strategic digital transformation roadmaps. Support can be up to €300,000 towards consultancy costs.[117]

Strategic Talent Development Programme (STDP): Delivered in partnership with Skillnet Ireland and TU Dublin, this micro-credential programme helps companies identify skill gaps, build long-term talent strategies, and foster continuous learning cultures.[118,119]

Training Grants: Financial assistance for existing client companies to upskill employees, drive digital transformation, and support environmental sustainability, covering up to 50% of training-related costs.[120]

111 Training Funding Support | Enterprise Ireland
112 Build Capability | Enterprise Ireland
113 European Digital Innovation Hubs - DETE
114 European Digital Innovation Hubs | Enterprise Ireland
115 Spotlight on Skills | Enterprise Ireland
116 About Us | Promoting Foreign Direct Investment | IDA Ireland | IDA Ireland
117 Business Development Programme | IDA Ireland
118 PDFAndFiles-Funding-Programmes-and-Incentives_2025-IDA-Skills-Needs-Assessment-Brochure.pdf
119 Skillnet Ireland and IDA Ireland announce Strategic Talent Development Micro-credential wit | Skillnet Ireland
120 IDA Ireland Training Grant | Business Support | National Enterprise Hub

3.2.7 Summary

Ireland's reskilling and upskilling system is characterised by a wide range of providers, agency supports funding streams, and programme types that collectively support ongoing digital specialist workforce. The evidence demonstrates substantial participation across Skillnet Ireland networks, Springboard+ courses and micro-qualifications and micro-credentials, with each offering different pathways for upskilling, conversion, and entry into technology roles. While programme scale varies year to year, the overall landscape reflects sustained investment, expanding modular and industry-aligned provision, and a broadening set of options for both employed and unemployed learners.

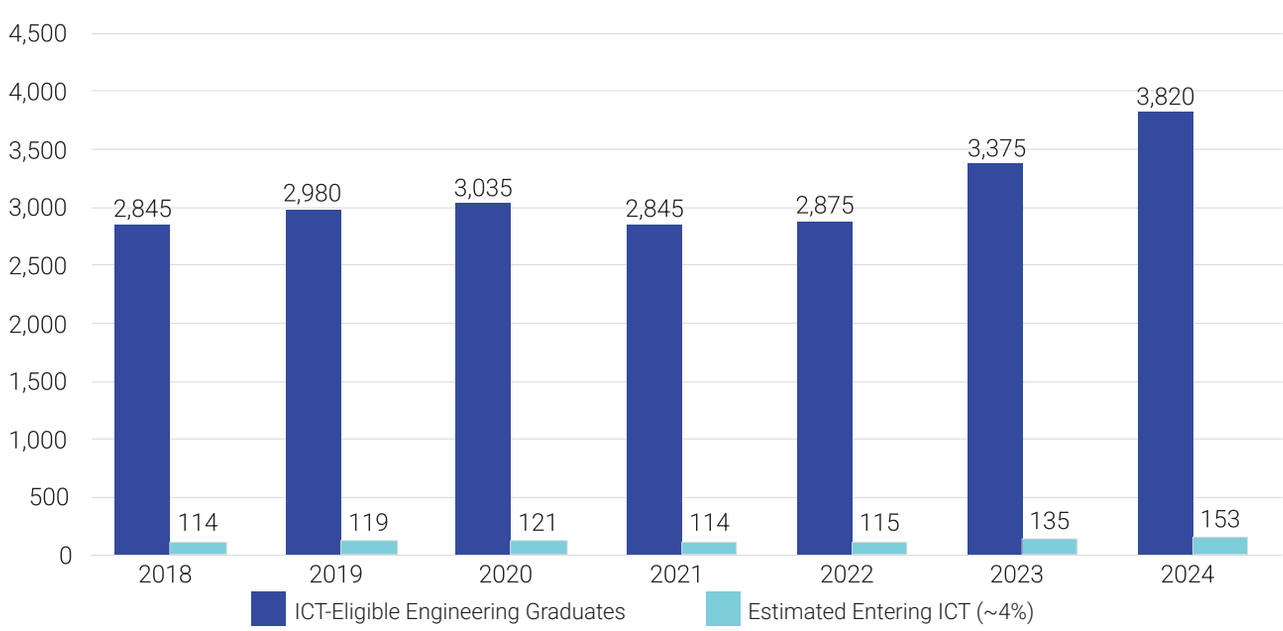
However, challenges in terms upskilling, reskilling and lifelong learning remain: Participation in lifelong learning in Ireland, despite progress, remains below that of other leading economies. Important barriers to participation exist, including cost, time and identifying the which skills individuals and companies need to prioritise in terms of training. These challenges are discussed further in Chapter 5.

3.3 Digital Specialist Talent from non-ICT Fields of Study

ICT graduates are not the only source of digital specialists, with other fields of study contributing to the digital specialist talent pipeline, particularly individuals graduating in other STEM disciplines.

Analysis of HEA data for engineering graduates show that graduates from Electronics and Automation (ISCED 0714), Electricity and Energy (0713), and Engineering Trades (0710) are most aligned with digital specialist roles, providing skills relevant to embedded systems, robotics, data-centre operations and technical support. This digital specialist-eligible engineering graduate pipeline grew from 2,845 in 2018 to 3,820 in 2024 (Figure 23), a 34% increase and a CAGR of approximately 5%. As a share of total engineering graduates, digital specialist-aligned graduates fluctuated from 40% in 2018 to 31% in 2021–2022, then rebounded to 38% in 2024, suggesting universities are responding to industry demand for automation and electronics expertise.

Figure 23: **Number of Eligible Engineering Graduates and Estimated Number of Engineering Graduates to ICT Employment, 2018 – 2024**



Source: IDC analysis of Higher Education Authority (HEA) Data, 2025

It is estimated, based on HEA graduate surveys, that an average of 4% of engineering graduates land into digital specialist roles after graduation, making this a useful but constrained supply source. These estimates indicate that 153 engineering graduates were employed in digital specialist in 2024, up from 114 in 2018 (Figure 23).

HEA Graduate Outcomes estimates suggest that around 3% of graduates from other STEM disciplines progress into digital specialist roles. In particular, Natural Sciences, Mathematics and Statistics (NS/MS) identifies a subset of disciplines with a strong potential for digital specialist career alignment. These include Physics (0533), Mathematics & Statistics (0540), Mathematics (0541), Statistics (0542), and Interdisciplinary NS/MS (Natural Sciences and Mathematics and Statistics) programmes (0588). These fields provide quantitative analysis, algorithmic thinking and data-modelling skills relevant to software development, data science, BI, AI and quantum technologies.

Other fields, including Business Administration and Management, design and creative disciplines, and Law, can support digital specialist careers in project management, consultancy, UX, digital product design, AR/VR, compliance, privacy and technology regulation. However, transitions from these fields into technical digital specialist roles are difficult to quantify because they often occur through informal upskilling, workplace learning or hybrid role reclassification, and existing datasets do not consistently distinguish technical from non-technical occupations.

3.4 Digital Specialist Talent from Economic Migration

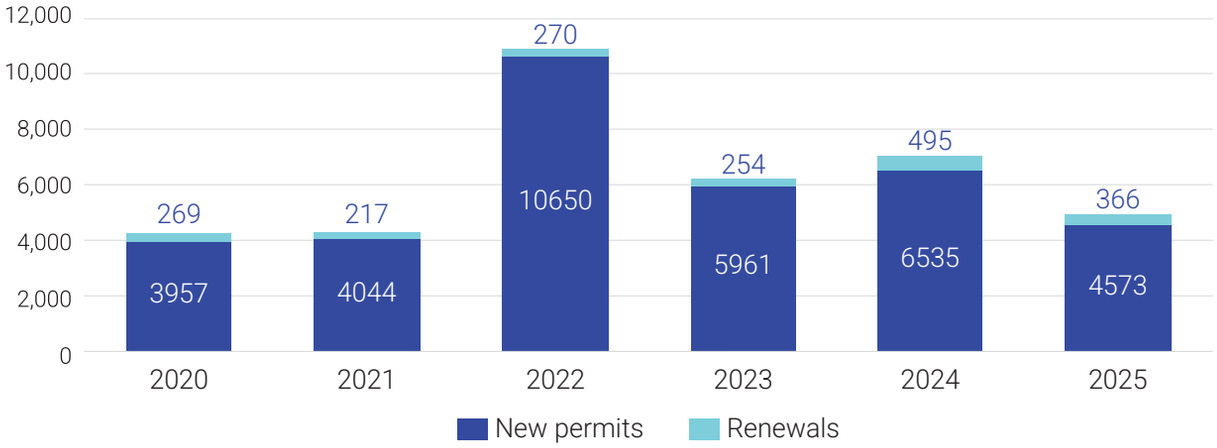
Economic migration is a critical supply channel for digital specialist skills because domestic education and training alone may not meet projected demand. The employment permit policy system in Ireland supports the attraction and retention of talent.

The Critical Skills Employment Permit (CSEP) covers occupations such as ICT professionals, engineers and technologists, including software engineers, AI specialists and cybersecurity professionals. Under the CSEP regime, ICT-eligible roles benefit from an initial two-year permit and the ability to apply for Stamp 4 residency after 21 months, with revised salary thresholds at €38,000 for listed roles (i.e. those on the Critical Skills Occupation List) and €64,000 for all other eligible roles. As a result, the following permit data largely reflects new recruitment flows rather than the longer-term stock of international digital specialists, since many workers subsequently move off the permit system while remaining in the Irish labour market.

Overall, there were 4,939 digital specialist-related employment permits issued in 2025 (Figure 24), up 17% from 2019. New permits dominate, accounting for 93%–98% of digital specialist permits between 2020 and 2024 and 92.6% in 2025. Renewals rose from 2.5% in 2022 to 7.0% in 2024 and 7.4% in 2025. Total permits fell from 7,030 in 2024 to 4,939 in 2025 (-29.7%), largely driven by a fall in new permits from 6,535 to 4,573 (-30.0%).[121]

121 Figures for digital specialist employment permits are based on the related-SOC codes defined in this study. See Section 1.1.2 Methodological Approach for more details.

Figure 24: **Total Employment Permits Issued for Digital Specialists, 2020-2025**[122]



Source: DETE

Table 7 provides the number and share of digital specialists permits by occupational level in 2025. Overall, the employment permit data point to structural reliance on non-EEA talent for advanced software and systems roles. The largest number of permits were issued to SOC Programmers and software development professionals at 1,733 permits, followed by IT business analysts, architects and systems designers (894), IT and telecommunications professionals (588), design and development engineers (385), electrical engineers (277). Permits issued for technician-level roles and telecom engineers remain low, suggesting domestic supply meets most lower-level digital specialist needs.

Table 7: **Employment Permits Issued for Digital Specialist-Related SOC Codes, 2025**

SOC Code	Title	Number	Share
2136	Programmers and software development professionals	1,733	35.1%
2135	IT business analysts, architects and systems designers	894	18.1%
2139	Information technology and telecommunications professionals n.e.c.	588	11.9%
2126	Design and development engineers	385	7.8%
2123	Electrical engineers	277	5.6%
2133	IT specialist managers	196	4.0%
2124	Electronics engineers	193	3.9%
2134	IT project and programme managers	186	3.8%
2137	Web design and development professionals	114	2.3%
3132	IT user support technicians	92	1.9%
3112	Electrical and electronics technicians	91	1.8%
3131	IT operations technicians	87	1.8%
5242	Telecommunications engineers	50	1.0%
1136	Information technology and telecommunications directors	38	0.8%
5245	IT engineers	15	0.3%
	Total	**4,939**	

Source: DETE

122 The surge in employment permits in 2022 was largely driven by a backlog caused by the impact of the COVID-19 pandemic.

Further to employment permits, the Third Level Graduate Scheme (Stamp 1G) also provides a pathway for retaining international talent. This scheme allows eligible non-EU/EEA graduates of Irish higher education institutions to remain in the State following their studies, with permission to remain for up to 24 months for master's graduates and 12 months for bachelor's graduates, full-time work rights during this period and eligibility for graduates who have achieved an Irish qualification at NFQ Level 8 or above, provided they apply within six months of completion. The analysis in this accounts for these non-EU/EEA graduates in the total digital specialist supply (see Chapter 4), based on approximately 36% of graduates being non-EU, with 71.9% assumed to remain in Ireland.

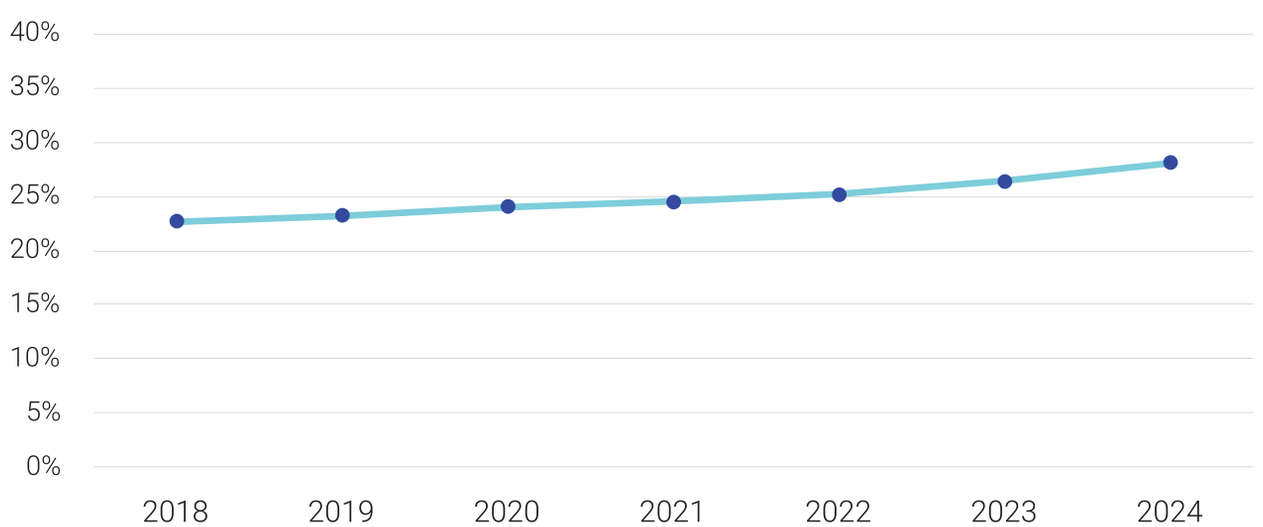
3.5 Gender Representation Challenges in Digital Specialist Education and Employment

Closing the gender gap in digital specialist occupations is both an equity issue and a strategic skills priority. Greater female participation would expand the talent pool, support innovation and problem-solving, and help Ireland meet EU digital and equality objectives. The EU Digital Decade and STEM Education Strategic Plan set targets including at least 25% female participation in vocational STEM, 40% in tertiary STEM, and one in three ICT PhD students by 2030. Horizon Europe also requires Gender Equality Plans in research projects.

Evidence suggests gender disparities are shaped by social and cultural factors rather than capability. The 2023 International Computer and Information Literacy Study (ICILS) found that girls generally outperform boys in computer and information literacy at around age 14,[123] despite persistent evidence showing that fewer girls progress into ICT study and digital specialist careers.[124] Contributing factors include stereotypes, limited career guidance, male-dominated workplace cultures and lower perceived opportunity.

HEA data show gradual improvement in Ireland but continued underrepresentation at the graduate level. Across ICT awards, the female share increased from 22.7% in 2018 to 28.1% in 2024 (Figure 25). However, women accounted for only 21.6% of Honours Degree ICT graduates in 2024, despite this being a major source of digital specialist talent. Closing the gap will require not only attracting more women into ICT degrees but also upskilling and reskilling women already in the workforce.

Figure 25: **Percentage Share of Female ICT Graduates in Ireland, 2018-2024**



Source: IDC Analysis of Higher Education Authority data, 2025

123 ICILS 2023 International Report, Results, and Resources Now Available Online | IEA.nl

124 European Commission; Women in Digital | Shaping Europe's digital future.

In a European context, Ireland performs relatively well, ranking joint second with Estonia and after Sweden on the Women in Digital Index (WiD).[125] According to Eurostat data, women represent 22.0% of employed digital specialists in Ireland in 2025, down from 24.4% in 2024.[126] Although it remains above the EU average of 19.5%, it is still far below parity given that women represent around 50% of the population. Moreover, recent research by the ESRI has found that Ireland has the largest gender gap in advanced digital skills use in Europe, with 44% of men using advanced digital skills at work compared with just 18% of women.[127]

3.6 Key Findings

Ireland's **digital specialist skills supply has expanded significantly** since 2019, but the composition of supply is changing. Total ICT graduate awards reached 10,358 in 2024, an increase of 40% since 2019. This growth is concentrated in higher-level and more flexible pathways: Level 9 provision has expanded strongly, Level 8 output has remained broadly stable, and Level 6 FET awards have grown rapidly. By contrast, higher-education routes at Levels 6 HE and 7 have declined. This points to a system increasingly oriented towards postgraduate specialisation, conversion programmes, advanced technical capability and flexible upskilling.

Employment outcomes are strong. An estimated 7,981 ICT graduates, or 77% of awards at NFQ Levels 5–10, entered employment in 2024, with particularly high employment rates at Levels 8, 9 and 10. ICT graduates are also strongly concentrated in high-value sectors and specialist roles, confirming the labour-market relevance of the pipeline. **However, the research pipeline remains thin**, which may constrain future innovation capacity in advanced areas such as AI, cybersecurity, data science and emerging digital technologies. Adjacent STEM fields add useful supplementary supply, although only a small share of graduates transition into digital specialist technical roles.

Apprenticeships, FET ICT awards, and private or industry-led training play an important complementary role. Non-aligned FET awards rose by 737% between 2019 and 2024, reflecting **increased demand for shorter, employer-facing provision**, while apprenticeships provide practical routes into areas such as software development, networking and cybersecurity. Nevertheless, **apprenticeship numbers remain modest** and volatile, and data on vendor-certified and non-QQI training is incomplete, limiting the ability to quantify the full skills contribution of these channels.

Economic migration remains critical to meeting demand for advanced digital specialist skills. 4,939 employment permits were issued for digital specialist-related SOC codes in 2025. This occupational profile shows continued reliance on non-EEA talent for software development, systems design, business analysis and specialist ICT roles.

The chapter also highlights **persistent gender imbalance in digital specialist education** and **employment**. Women's share of ICT awards increased from 22.7% in 2018 to 28.1% in 2024, but women remain underrepresented, particularly at Honours Degree level, where they accounted for 21.6% of graduates. Expanding female participation, strengthening research and advanced specialist provision, improving visibility of private and vendor-certified training, and sustaining targeted migration pathways will be central to securing Ireland's future digital specialist skills supply.

125 The Women in Digital (WiD) Index is a composite indicator designed to measure and track gender equality in the ICT and digital sector across European Union Member States and selected benchmarking countries. Link: Index - Women In Digital Index

126 Eurostat, ICT specialists in employment by sex (dataset: isoc_sks_itsps), available at: https://ec.europa.eu/eurostat/databrowser/view/isoc_sks_itsps/default/table (accessed July 2026).

127 Squandered skills? Bridging the digital gender skills gap for inclusive growth in Ireland – A comparative European perspective | ESRI

4

Demand for Digital Skills and Demand-Supply Gap Analysis

4.1 Introduction and Methodology

This chapter presents the quantitative assessment of the key factors shaping demand for digital specialist roles in Ireland to 2030. It also presents a gap analysis comparing projected demand for digital specialist professionals with estimated supply.

This analysis is based on IDC's forecasting model, which combines bottom-up estimates of workforce demand with top-down validation against labour market and macroeconomic data. Core inputs include national employment statistics, EU labour data, occupational classifications, and IDC research on technology adoption, including AI, and investment. These are adjusted to reflect Ireland's sectoral strengths and policy environment. See Appendix 3 for full detail on the methodology.

Three demand scenarios are modelled: Low Growth, Baseline and High Growth. These reflect different assumptions regarding economic conditions, investment levels, pace of digital and AI adoption, and effectiveness of policy interventions. As with all forecasting exercises, results are sensitive to changes in these underlying factors.

4.2 Demand Forecasting for Digital Specialists: Results

Overall, the analysis in this report indicates that demand for Ireland's digital specialist workforce is projected to grow from 168,800 professionals in 2025 to between 192,900 (low growth scenario) and 222,700 (high growth scenario) by 2030. This represents an increase of between 24,100 and 53,900 digital specialist job roles over the next five years.

The following section analyses these findings in more detail by technology domain and the underlying job roles.

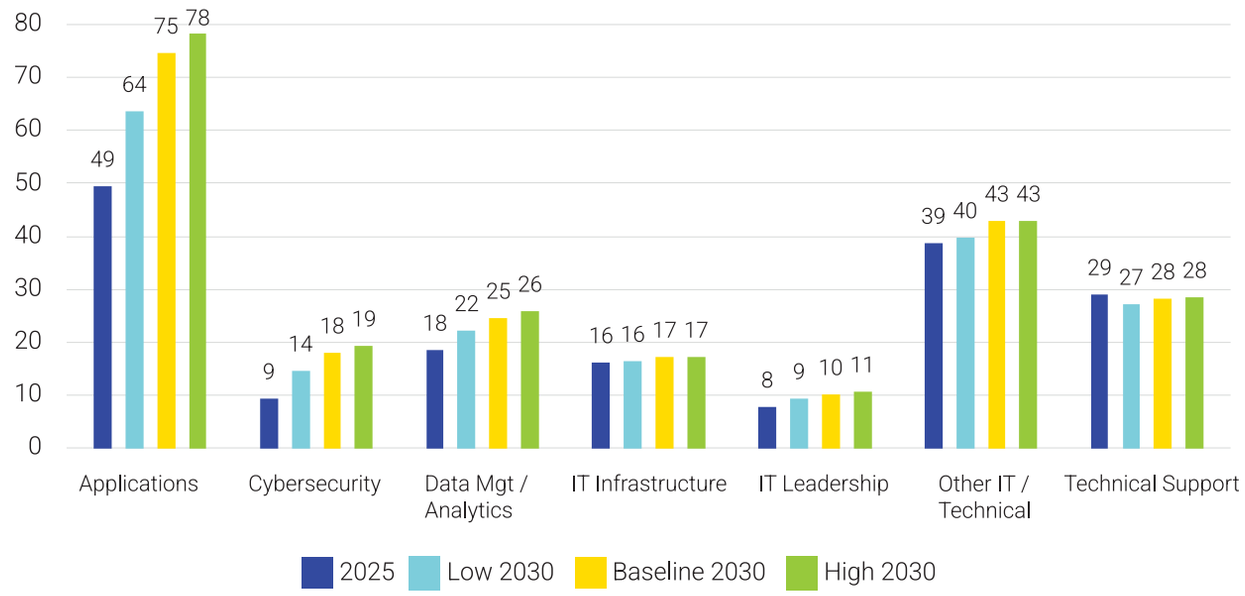
4.3 Demand Forecasting by Technology Domain and Job Role

This chapter analyses demand for digital specialist employment across 41 digital specialist job roles grouped into seven technology domains:

1. Applications
2. Cybersecurity
3. Data Management/Analytics
4. IT Infrastructure
5. IT Leadership
6. Other IT/Technical
7. Technical Support

Figure 26 presents the projected demand across these seven technology domains to 2030 by scenario. Across all scenarios, Applications is forecast to remain the largest technology domain in 2030, while IT Leadership is forecast to remain the smallest.

Figure 26: **Forecast Demand for Digital Specialists by Technology Domain and Scenario, 000s, 2025-2030**



Source: IDC, May 2026

Table 8: **Forecast Demand for Digital Specialists by Technology Domain, 2025 and 2030 Baseline Scenario**

Technology Domain	2025 Current (000s)	2030 Baseline (000s)	Difference 2025–2030 (000s)	Difference 2025–2030 (%)	CAGR 2025-2030 (%)
Applications	49.38	74.66	+25.28	+51.19%	+8.62%
Cybersecurity	9.45	17.93	+8.48	+89.74%	+13.67%
Data Management/Analytics	18.47	24.52	+6.05	+32.76%	+5.83%
IT Infrastructure	16.11	17.12	+1.01	+10.92%	+1.22%
IT Leadership	7.82	10.21	+2.39	+30.56%	+5.48%
Other IT/Technical	38.63	42.85	+4.22	+6.27%	+2.10%
Technical Support	28.94	28.14	-0.80	-2.76%	-0.56%
Grand Total	**168.80**	**215.40**	**+46.60**	**27.61%**	**+5.00%**

Source: IDC, May 2026

Table 8 details the estimated employment demand for digital specialists by technology domain in 2025 and in 2030 in the baseline scenario. In the baseline scenario, Cybersecurity is forecast to be the fastest growing domain with overall growth of 89.74% at 13.67% CAGR. This is well ahead of the second fastest-growing domain, applications, which will grow by 51.19% overall at 8.62% CAGR by 2030. Technical Support is the only domain in which employment is forecast to decline, by 2.8% overall and 0.6% annually.

The following sub-sections analyse forecasted employment demand in each of these technology domains by underlying job roles in the baseline scenario. See Table 20 in Appendix 3 for a detailed forecast for employment in each job role and technology domain to 2030 under all three growth scenarios.

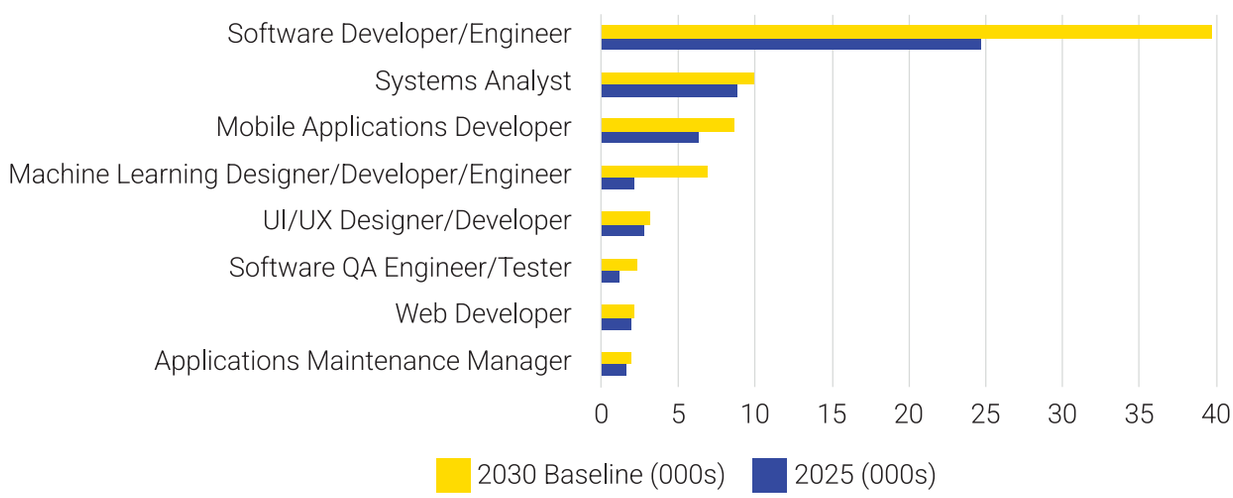
4.3.1 Applications Roles

Applications represent the largest technology domain, potentially growing from 49,380 to 74,660 specialists at 8.62% CAGR under the baseline scenario. This growth is uneven, with expansion concentrated in higher-value, specialised roles rather than across the full spectrum of occupations (Figure 27). Most of this growth is driven by machine learning roles, which is also the single fastest-growing role across all technology domains. Software developers also see strong expansion, particularly at mid-to-senior levels.

Application roles include:

- Software Developer/Engineer
- Systems Analyst
- Mobile Applications Developer
- Machine Learning Designer/Developer/Engineer
- UI/UX Designer/Developer
- Software QA Engineer/Tester
- Web Developer
- Applications Maintenance Manager

Figure 27: **Employment Demand Forecasting for Applications Roles, 000s, 2025 vs 2030**



Source: IDC, May 2026

Four key drivers explain these trends:

1. **Machine learning integration** is the primary growth engine, with organisations embedding AI into products and workflows. This is increasing demand for ML specialists with both technical and domain expertise, making these roles particularly scarce and high value.
2. **AI-augmented development** is shifting the focus of developers from coding to architecture and integration. Productivity gains from AI tools are not reducing headcount, but instead increasing the complexity of work undertaken and reinforcing demand for experienced professionals.
3. **Test automation complexity** is sustaining strong demand for QA roles despite advances in automation. Modern systems—such as micro-services and distributed architectures—require more sophisticated testing, particularly in areas such as security and compliance.
4. **Mobile-first and user experience strategies** continue to support demand for mobile developers and UX specialists, although growth is moderating as tools improve efficiency. Overall, the domain is evolving towards smaller, more specialised teams focused on delivering high-quality, complex applications.

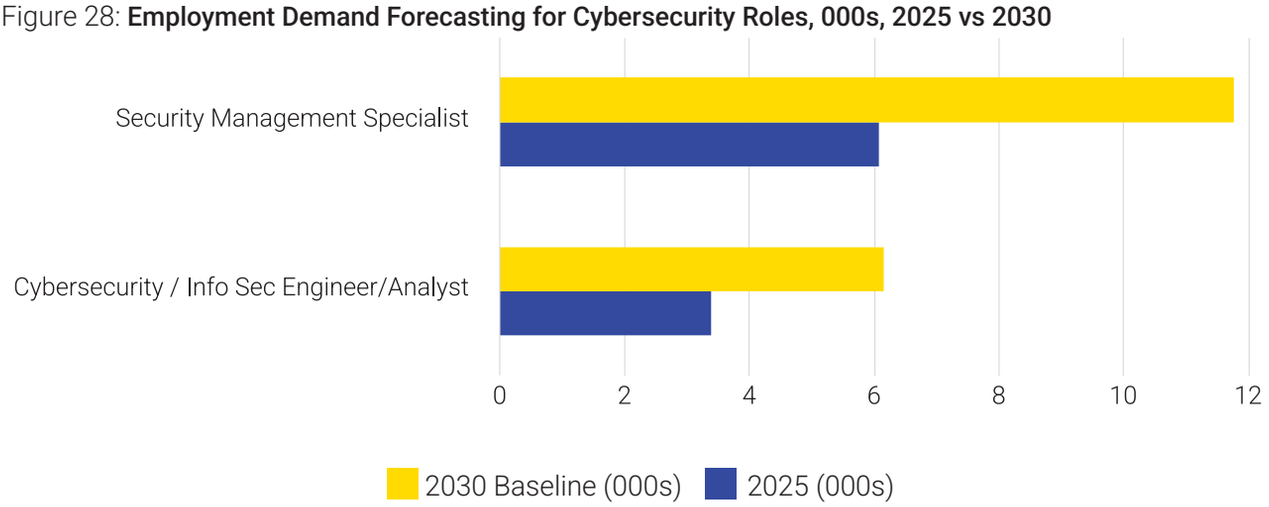
4.3.2 Cybersecurity Roles

As previously mentioned, Cybersecurity is by far the fastest-growing domain at 13.67% CAGR under the baseline scenario to 2030, with demand for employment estimated to increase from 9,450 to 17,930 specialists, bringing the workforce in this domain close to twice its current size (Figure 28). Demand is driven by the increasing scale and complexity of cyber threats, as well as stricter regulatory requirements across sectors.

Cybersecurity roles include:

- Security Management Specialist
- Cybersecurity/Information Security Engineer/Analyst
- Related specialised roles such as SOC analyst, incident responder, penetration tester, threat intelligence analyst and cybersecurity manager[128]

Figure 28: **Employment Demand Forecasting for Cybersecurity Roles, 000s, 2025 vs 2030**



Source: IDC, May 2026

Four key drivers explain these trends:

1. **Global skills shortage,** which creates structural constraints on supply. High demand combined with limited availability increases salaries and makes recruitment challenging, particularly for experienced professionals.
2. **Regulatory mandates** such as NIS2 and DORA are creating non-discretionary demand for cybersecurity capabilities, particularly in governance, risk and compliance roles.
3. **The shift to cloud and zero-trust architectures** is changing skill requirements, increasing demand for professionals with expertise in cloud security, identity management and distributed systems. Cybersecurity increasingly requires integration across platforms and environments, rather than traditional perimeter-based approaches.
4. **AI integration and evolving threat landscapes** are increasing complexity, requiring professionals to both deploy AI for defence and mitigate AI-driven threats. These pressures, combined with burnout in operational roles, contribute to ongoing recruitment and retention challenges.

Overall, cybersecurity demand is both rapidly expanding and becoming more specialised, making it one of the most constrained areas of digital specialist talent supply.

128 Figures for job roles are combined into two categories in Figure 28 due to small estimates.

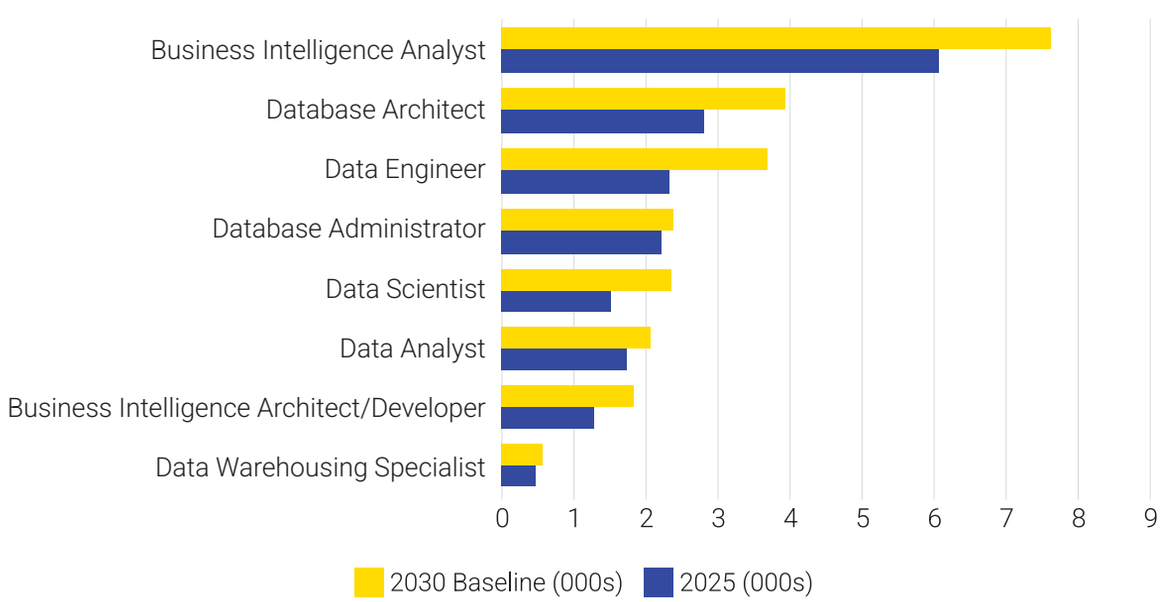
4.3.3 Data Management/Analytics Roles

Employment in this domain is forecast to grow from 18,470 to 24,520 professionals (5.83% CAGR) under the baseline scenario to 2030, with demand increasingly focused on higher-skill, cloud-based roles. Growth is strongest among data engineers, data scientists and data architects, reflecting the central role of data in AI and digital transformation (Figure 29).

Data roles include:

- Business Intelligence Analyst
- Database Architect
- Data Engineer
- Database Administrator
- Data Scientist
- Data Analyst
- Business Intelligence Architect/Developer
- Data Warehousing Specialist

Figure 29: **Employment Demand Forecasting for Data Management/Analytics Roles, 000s, 2025 vs 2030**



Source: IDC, May 2026

Four Key Drivers:

1. The growing importance of **data engineering as foundational infrastructure**, supporting AI and advanced analytics. Organisations require robust data pipelines and real-time processing capabilities, increasing demand for specialised engineering skills.
2. **Business intelligence transformation** is shifting focus from reporting to insight generation and decision support. This increases demand for BI architects and professionals who can integrate analytics into business processes.
3. **The evolving role of data scientists** reflects the impact of automation. While some routine tasks are automated, demand remains strong for advanced analytical and domain-specific expertise, particularly in sectors such as healthcare and finance.
4. The **shift to cloud-native data architectures** is driving demand for roles that combine technical and regulatory expertise. Data governance, compliance and system design are becoming increasingly important, while traditional roles such as database administration grow more slowly due to automation.

Overall, the domain is moving towards more complex, integrated and specialised roles aligned with AI-driven business models.

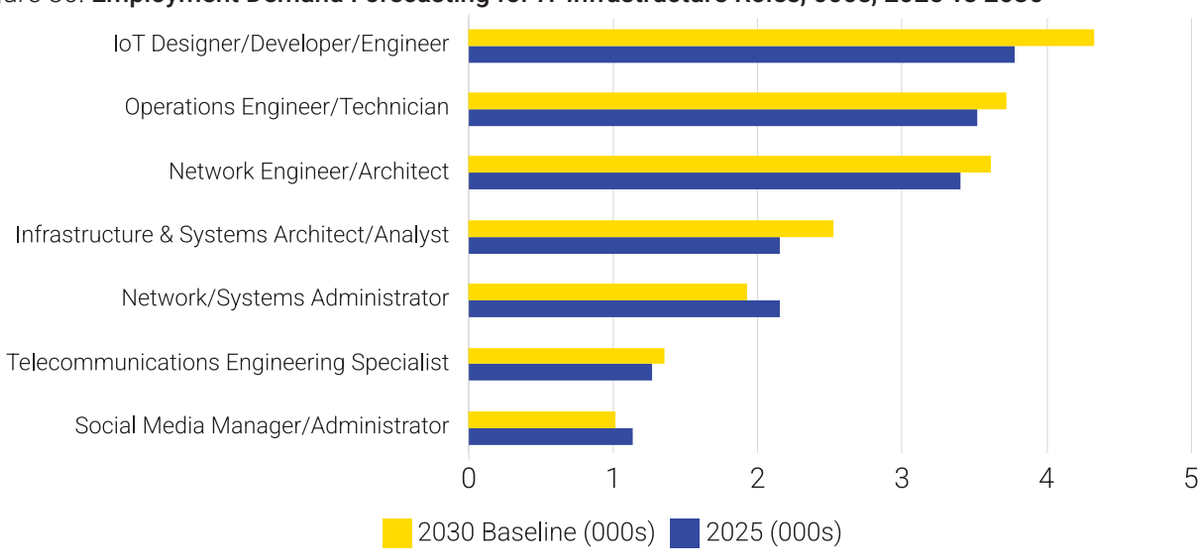
4.3.4 IT Infrastructure Roles

Employment in IT infrastructure is forecast to grow modestly from 16,110 to 17,120 specialists to 2030 (1.22% CAGR), reflecting limited overall expansion but significant internal transformation. Traditional roles decline, while specialised positions increase in importance (Figure 30).

IT Infrastructure roles include:

- IoT Designer/Developer/Engineer
- Operations Engineer/Technician
- Network Engineer/Architect
- Infrastructure and Computer Systems Architect/Analyst
- Network/Systems Administrator
- Telecommunications Engineering Specialist
- Social Media Manager/Administrator

Figure 30: **Employment Demand Forecasting for IT Infrastructure Roles, 000s, 2025 vs 2030**



Source: IDC, May 2026

Four Key Drivers:

1. **Cloud computing and automation,** which are reducing demand for routine infrastructure tasks such as system administration. Managed services and automation tools increasingly handle these functions.
2. **Multi-cloud complexity** is sustaining demand for experienced network and infrastructure professionals who can manage hybrid environments, integrate systems and ensure performance and security.
3. **Emerging technologies** such as 5G and edge computing are creating niche areas of demand, particularly for roles requiring real-time processing and distributed system expertise. However, these remain relatively small in scale.
4. **Growing importance of infrastructure architecture and cost optimisation** is driving demand for senior roles. Organisations require professionals who can design efficient, scalable systems and manage costs across complex cloud environments.

Overall, infrastructure roles are shifting away from operational tasks towards strategic planning, architecture and automation.

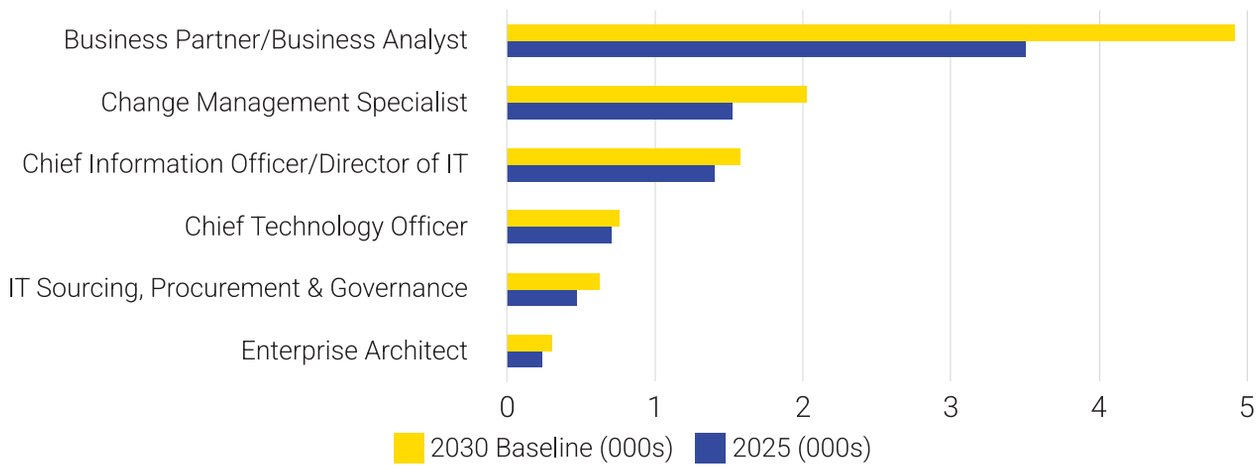
4.3.5 IT Leadership Roles

IT Leadership roles grow from 7,820 to 10,210 specialists by 2030 (5.48% CAGR), reflecting the increasing role of technology in shaping business strategy. Growth is strongest in roles that connect technology and business outcomes (Figure 31).

IT Leadership roles include:

- Business Partner/Business Analyst
- Change Management Specialist
- Chief Information Officer/Director of IT
- Chief Technology Officer
- IT Sourcing, Procurement and Governance
- Enterprise Architect

Figure 31: **Employment Demand Forecasting for IT Leadership Roles, 000s, 2025 vs 2030**



Source: IDC, May 2026

Four Key Drivers:

1. **The need for business-IT alignment,** with organisations requiring professionals who can translate technology capabilities into business value. This is particularly important in the context of digital transformation and AI adoption.
2. **The growing importance of change management** reflects the recognition that successful implementation depends on organisational adoption, not just technical delivery.
3. **The evolving role of CIOs (Chief Information Officers) and CTOs (Chief Technology Officers)** shifting towards strategic leadership, with responsibility for innovation, digital transformation and organisational change. These roles are less focused on operations and more on long-term business impact.
4. **The increasing complexity of technology ecosystems** is driving demand for sourcing, procurement and governance expertise, particularly in managing cloud services and vendor relationships.

Overall, IT leadership is becoming more strategic, with a stronger focus on business transformation and value creation.

4.3.6 Other IT/Technical and Technical Support Roles

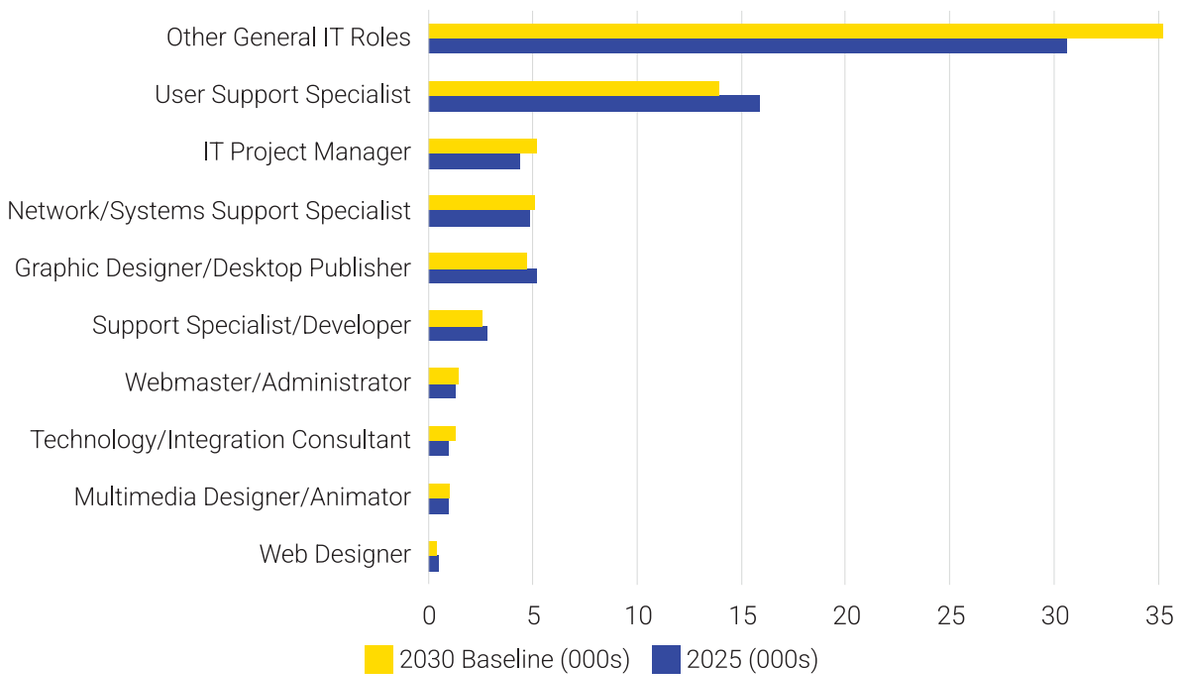
Combining the last two technology domains, employment increases only slightly (from 67,570 to 70,990) specialists to 2030 (0.99% CAGR), reflecting divergent trends within the category. Some roles are growing, while others are declining due to automation and changing technology requirements (Figure 32).

Roles in this category include:

- Other General IT roles
- User Support Specialist
- IT Project Manager
- Network/Systems Support Specialist
- Support Specialist/Developer
- Webmaster/Administrator
- Technology/Integration Consultant
- Graphic Designer/Desktop
- Publisher
- Multimedia Designer/Animator
- Web Designer

Overall, this domain represents a transition area where generalist roles are declining, and career progression depends on moving into more specialised or higher-value positions.

Figure 32: **Employment Demand Forecasting for 'Other IT/Technical Support' Roles, 000s, 2025 vs 2030**



Source: IDC, May 2026

Four Key Drivers:

1. Impact of **generative AI on entry-level roles**, particularly in design and support functions. Automation is reducing demand for routine tasks and compressing traditional entry pathways.
2. **The need for specialisation among creative professionals is increasing,** with demand shifting towards higher-value roles such as strategic design, UX and integrated content development.
3. **Role consolidation across functions** is reducing the number of distinct positions, with responsibilities increasingly absorbed into broader teams such as marketing or development.
4. **The need for adjacent technical skills** is becoming critical across all roles. Designers, support specialists and general IT professionals must develop additional technical capabilities to remain relevant.

In summary, the above analysis provides a detailed view of how demand is evolving across more than 40 distinct digital specialist roles, highlighting a clear shift towards specialisation, higher skill requirements, and changing career pathways across the labour market.

4.4 Gap Analysis between Supply and Demand

4.4.1 Methodology

The gap analysis in this section compares projected demand for digital specialist professionals with estimated supply of digital specialist professionals from domestic education, training pathways, and migration channels.

Demand is derived from the forecasting model outlined in Sections 4.2 and 4.3, which estimates total digital specialist employment under three scenarios - outlined at the beginning of this Chapter - and converts this into annual hiring requirements. To capture "true demand", the model combines two elements: net employment growth and replacement demand arising from workforce exits. A retirement rate of 1.9% is applied to total employment, meaning that annual hiring needs to reflect both expansion and replacement.

On the supply side, the analysis builds a composite estimate of new entrants into digital specialist employment. This includes:

- Graduates from higher education and further education and training (FET), categorised by National Framework of Qualifications (NFQ) Level
- Employment outcome rates applied to each NFQ level (ranging from 42% to 87%) to estimate the proportion entering digital specialist roles
- Adjustments for nationality and retention: approximately 36% of ICT graduates are non-eu, with 71.9% assumed to remain in Ireland; 90% of Irish/EU/UK graduates are assumed to stay[129]
- Additional supply from engineering graduates transitioning into digital specialist roles (estimated at 4%)
- Net new international entrants through work permits, held constant at 2025 levels for forecasting purposes

The final supply estimate is an aggregate of these streams, normalised to align with the demand forecast (in thousands of professionals), allowing direct comparison across years and scenarios.

4.4.2 Forecasts and Scenarios

Using the methodology detailed in the previous section, total supply of digital specialist professionals in Ireland is estimated to grow from 9,698 in 2025 to 9,991 in 2030 (Table 9).

Table 9: **Ireland's Digital Specialist Professionals Estimated Supply Forecasting, 000s, 2024 - 2030**

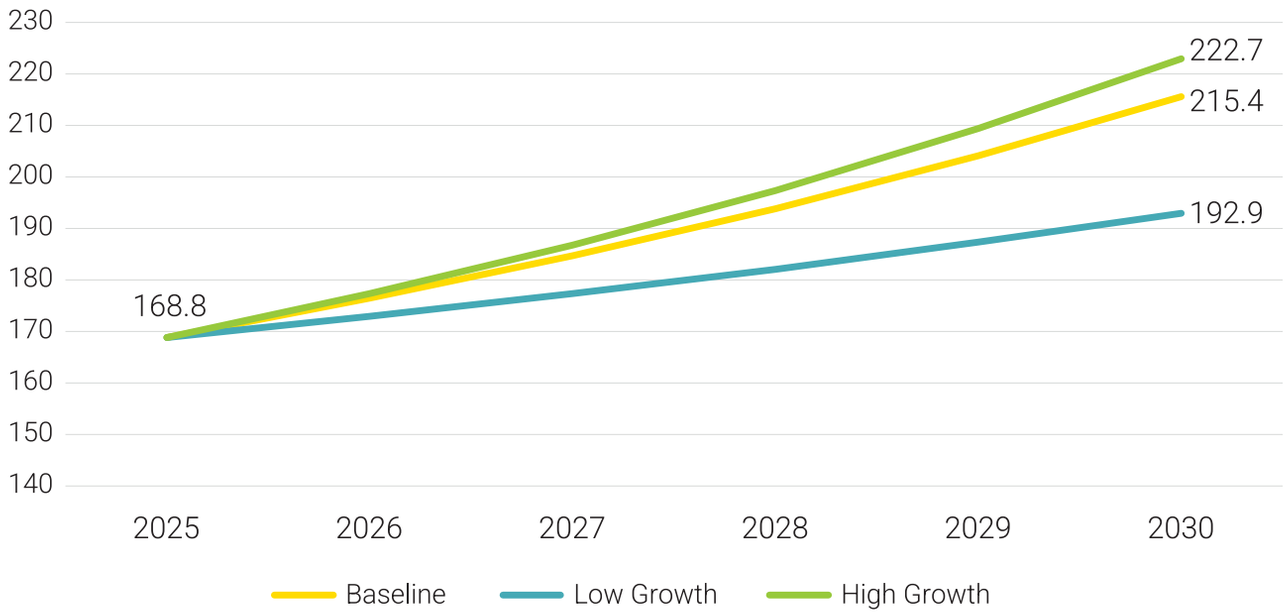
	2025	2026	2027	2028	2029	2030
ICT Graduates	6,663	6,800	6,940	6,957	6,957	6,957
Engineering graduates entering ICT employment	428	427	427	427	427	427
Other ICT entrants with different educational backgrounds	100	100	100	100	100	100
Work permits from professionals coming from overseas (excl. non-EU graduates in Ireland)	2,507	2,507	2,507	2,507	2,507	2,507
Total	**9,698**	**9,835**	**9,975**	**9,991**	**9,991**	**9,991**

Source: IDC, May 2026

Figures 33 and 34 below show projected digital specialist employment levels and annual hiring demand under each scenario. Demand increases steadily in all cases but varies significantly depending on economic and technological assumptions.

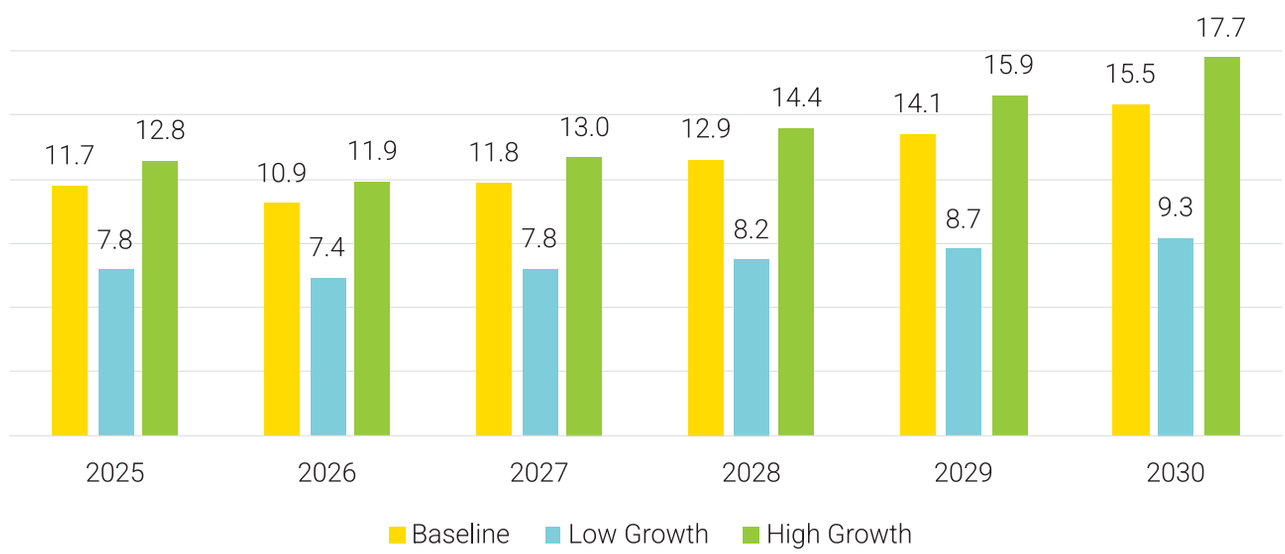
129 Based on evidence from Higher Education Authority (HEA).

Figure 33: **Ireland's Digital Specialist Professionals Demand Forecasting, 000s**



Source: IDC, May 2026

Figure 34: **Ireland's Digital Specialist Professionals Demand Forecasting, Yearly Net Increase, 000s**

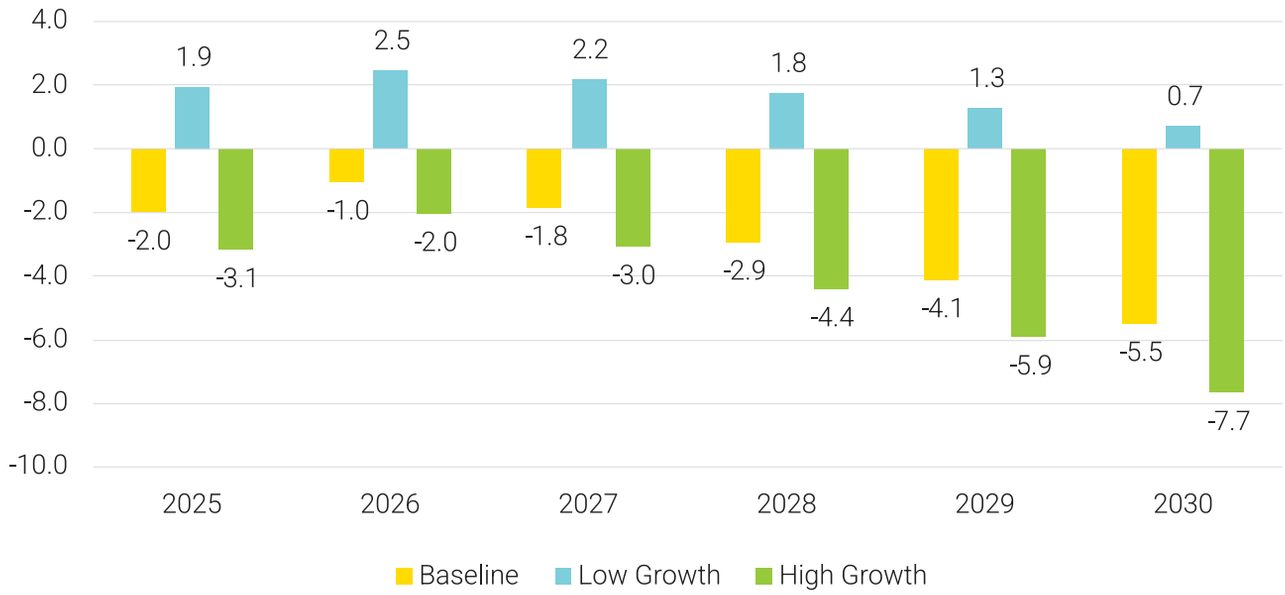


Source: IDC, May 2026

Figure 35 below shows the potential gap between supply and demand is calculated as the difference between normalised supply and the demand net increase including retirements, across baseline, low-growth, and high-growth scenarios, where:

- Positive values indicate a numerical surplus of digital specialist entrants relative to projected openings.
- Negative values indicate potential shortfalls in headcount.

Figure 35: **Demand-Supply Gap Analysis by Scenario, 000s, 2025 - 2030**



Source: IDC, May 2026

In the **Baseline scenario**, annual demand (including replacement needs) rises from approximately 11,700 professionals in 2025 to 15,500 by 2030. Supply, by contrast, stabilises at roughly 10,000 entrants per year. This results in a widening gap, with a shortfall of around 2,000 professionals in 2025, growing to approximately 5,500 by 2030.

In the **Low Growth scenario,** demand increases more slowly, resulting in a modest surplus of supply over demand. This surplus begins at around 1,900 professionals in 2025 and declines gradually to under 1,000 by 2030 as demand absorbs available supply.

In the **High Growth scenario**, demand accelerates significantly, driven by stronger investment and faster adoption of digital and AI technologies. Annual hiring requirements rise to approximately 17,700 by 2030, resulting in a substantial and widening shortfall. The gap increases from around 3,100 professionals in 2025 to approximately 7,700 by 2030.

4.4.3 Implications

The gap analysis indicates that Ireland is likely to face a persistent and growing imbalance between digital specialist labour demand and supply under two of the three growth scenarios considered (baseline and high growth). Even under baseline conditions, the system does not produce enough new entrants to meet projected demand, leading to structural shortages.

However, the analysis also shows that this gap is not fixed. One key assumption is that work permit inflows remain constant at 2025 levels. In practice, international recruitment has historically responded to demand conditions, suggesting that policy changes could partially offset projected shortages. Increased attraction of international talent would reduce the scale of the gap, particularly in high-growth scenarios.

More fundamentally, the findings highlight that the challenge is not purely one of volume. Ireland's education system produces a substantial number of ICT graduates each year, and overall supply is relatively strong by international standards. The more significant issue is alignment between graduate skills and employer needs.

Survey evidence and labour market trends point to persistent gaps in practical experience, applied technical capabilities, and broader workplace skills. Many graduates require additional training or experience before they can contribute effectively in professional digital specialist roles. This creates a situation where supply may be sufficient in quantitative terms but insufficient in qualitative terms.

As a result, addressing the digital specialist skills challenge requires a focus on both increasing supply and improving its relevance. This includes strengthening work-based learning, expanding advanced and specialised training pathways, and improving alignment between education programmes and industry demand.

4.4.4 Potentially Undersupplied Areas

The gap between supply and demand is not evenly distributed across all digital specialist roles. Instead, shortages are concentrated in specific high-growth and highly specialised areas that are expanding most rapidly.

Three priority areas stand out:

- **Software and AI engineering:** Demand for software developers, machine learning engineers and related roles is growing strongly, driven by AI adoption and digital transformation. While domestic education pathways produce substantial numbers of graduates in general software development, the pipeline is less developed for advanced and specialised roles, particularly at mid-career levels.
- **Cybersecurity:** Rapid growth in cybersecurity roles, combined with global shortages and regulatory pressures, creates sustained demand that is difficult to meet domestically. Training provision is expanding but remains relatively limited, and many programmes focus on upskilling rather than producing new entrants into specialist roles.
- **Data engineering and advanced analytics:** Demand for data engineers, architects and scientists continues to increase as organisations build AI-enabled data platforms. While education pathways in data-related fields are developing, they vary in scale and depth, and employers continue to supplement domestic supply with international recruitment.

By contrast, roles with slower or declining demand—such as basic technical support, user support and some generalist IT positions—are less affected by shortages and can generally be supplied through existing domestic pathways.

Overall, the analysis suggests that Ireland's digital specialist skills gap is primarily a skills mismatch rather than a simple shortage of people. Addressing this challenge will require targeted action to develop advanced capabilities, support career progression into specialised roles, and ensure that education and training systems evolve in line with rapidly changing industry requirements.

4.5 Key Findings

The forecasting analysis highlights **sustained growth in Ireland's digital specialist workforce to 2030**, but with significant variation across scenarios and job roles. Total **digital specialist employment is projected to increase** from 168,800 in 2025 **to between 192,900 and 222,700**, reflecting continued expansion even under less favourable economic conditions. Growth is driven primarily by digital transformation, increasing adoption of AI technologies, and ongoing demand for cloud and data capabilities.

Across all scenarios, **a clear shift is evident towards more specialised, higher-skill roles**. Applications development remains the largest domain, with **strong demand for software engineers and particularly rapid growth in machine learning roles**. **Cybersecurity** emerges as **the fastest-growing area**, nearly doubling in size, driven by rising threat levels, regulatory requirements, and global skills shortages. **Data management and analytics also expand steadily**, with increasing emphasis on advanced roles such as data engineers and scientists, while **traditional roles show slower growth due to automation.**

By contrast**, IT infrastructure and technical support functions show limited overall expansion**. In these areas, automation and cloud services are reducing demand for routine operational roles, while creating new opportunities in specialised areas such as cloud architecture and platform engineering. Similarly, Other IT and support roles are becoming more polarised, with entry-level and generalist positions declining and more specialised roles continuing to grow.

The gap analysis indicates that **Ireland is likely to face a structural skills shortfall under most scenarios**.

- In the baseline case, demand exceeds supply from 2025 onwards, with deficits rising to approximately 5,500 professionals per year by 2030.
- Under a high-growth scenario, shortages could reach around 7,700 annually, reflecting the limits of current education and migration pipelines.
- Only in a low-growth scenario does supply marginally exceed demand.

However, **the challenge is not solely one of volume**. While Ireland produces a substantial number of digital specialist graduates, **employers continue to report gaps in practical skills, experience, and job readiness**. This suggests that improving alignment between education and industry needs is as important as increasing overall supply.

The **most significant pressures** are expected **in high-growth** and **highly specialised areas**, particularly **software** and **AI engineering, cybersecurity,** and **data platform roles**. These areas already rely heavily on international recruitment and are likely to remain key priorities for policy, education and workforce development efforts.

5

ICT Skills in Ireland Survey

5.1 Overview

This chapter presents an analysis of the key cross-technology findings from the survey on digital specialist skills conducted for this study in August 2025. The survey covered 512 Irish organisations across a range of industries and sizes.[130] The chapter explores regional disparities and industry differences in digital talent availability, organisations' readiness to assess future digital skills, participation and challenges in training and upskilling programmes, and perceptions of digital specialist talent supply. Respondents included 90% digital specialist professionals and 10% HR representatives - both groups knowledgeable about their organisation's digital skills needs for the next two years, drawn from a balanced range of sectors. The report also includes a technology-specific view of survey results, presented in dedicated sections on AI and Cybersecurity.

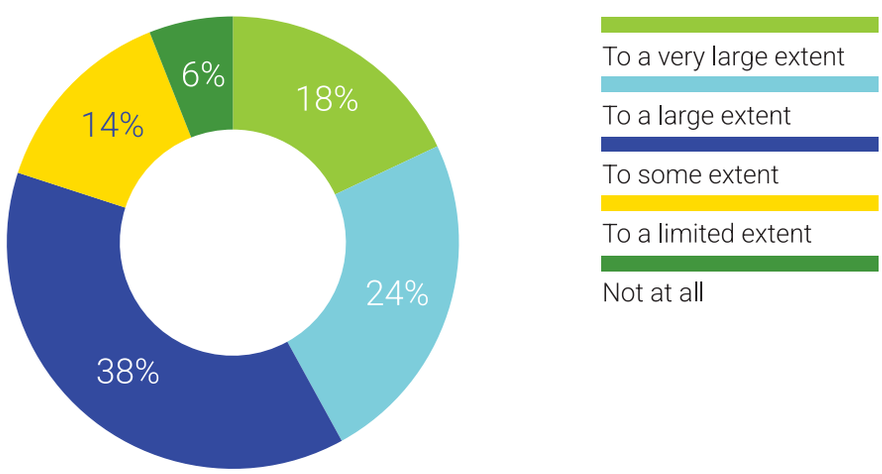
It has to be noted that survey data generally reflects respondents' perceptions, which can differ from operational reality due to common research challenges such as recall bias, sampling limitations, and uneven interpretation of questions. Despite these constraints, quantitative surveys remain highly valuable: when analysed in aggregate, they reveal consistent patterns and directional trends that offer meaningful insights. These trends help policymakers and stakeholders identify emerging issues, prioritise interventions, and design more targeted policies.

5.2 Organisational Readiness for the Future

Fewer than half of surveyed organisations have a strong grasp of the skills they need to deliver their digital strategies (Figure 36), highlighting **a key gap in Irish organisations' understanding of the skills needed for digital transformation**. Only 42% have mapped future digital skills requirements "to a very large extent" or "to a large extent." Another 38% say they have done so only "to some extent," which suggests partial visibility rather than a full understanding of future capability needs.

This distribution signals a systemic gap in strategic workforce planning: nearly half of organisations operate with incomplete or minimal clarity on the capabilities needed for transformation. The risk is twofold: underestimating future skill demand and misaligning investment in training or recruitment.

Figure 36: **Extent to Which Future Digital Skills Requirements Mapped**



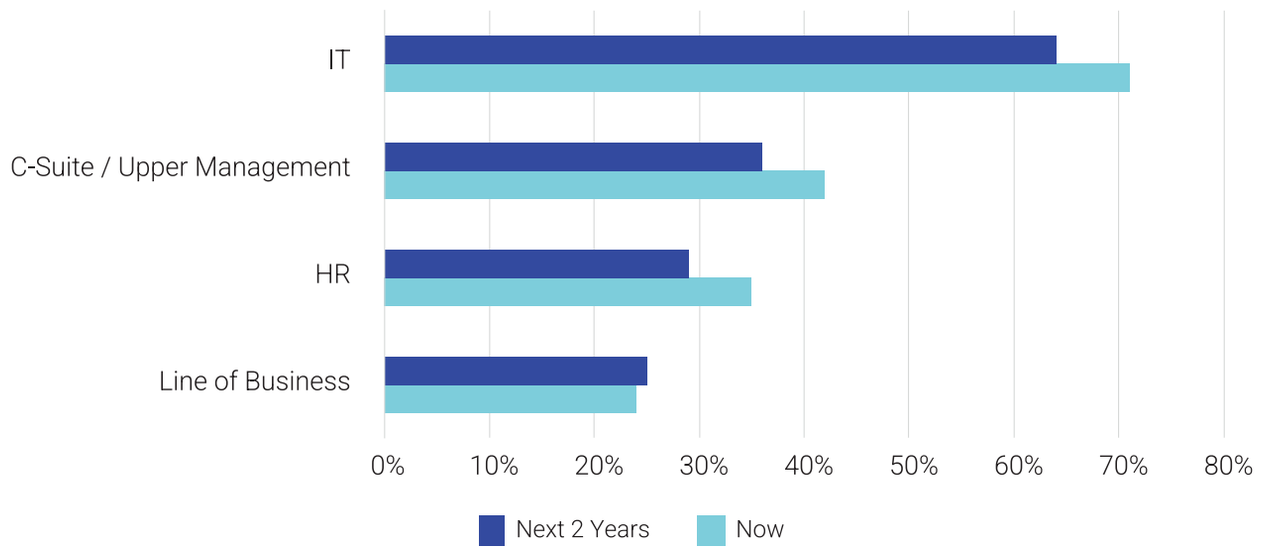
Source: ICT Skills in Ireland Survey, August 2025

130 See Appendix 3 for additional detail on the survey methodology and distribution of responses.

Concerning governance of digital skills readiness, IT departments dominate responsibility, cited by 71% of organisations today, with 64% looking ahead two years. While this reflects IT departments department's central role in technology enablement, it also suggests a siloed approach: digital transformation is enterprise-wide, yet accountability remains concentrated in technical teams.

The Institute of International and European Affairs (IIEA) emphasizes that Ireland's digital transition cannot be driven by IT departments alone.[131] Their analysis highlights that digital transformation impacts innovation, productivity, and competitiveness across all sectors, particularly SMEs. To respond effectively, governance of digital skills must be shared between IT and business leaders. Encouragingly, C-suite executives and upper management appear in 42% of responses now and 36% for the future, but this still leaves a significant share of organisations without strong executive oversight of skills strategy. Human Resources involvement is modest, despite the critical role of this function in workforce planning, recruitment, and learning pathways.

Figure 37: **Who Ensures Future Digital Skills Requirements?**



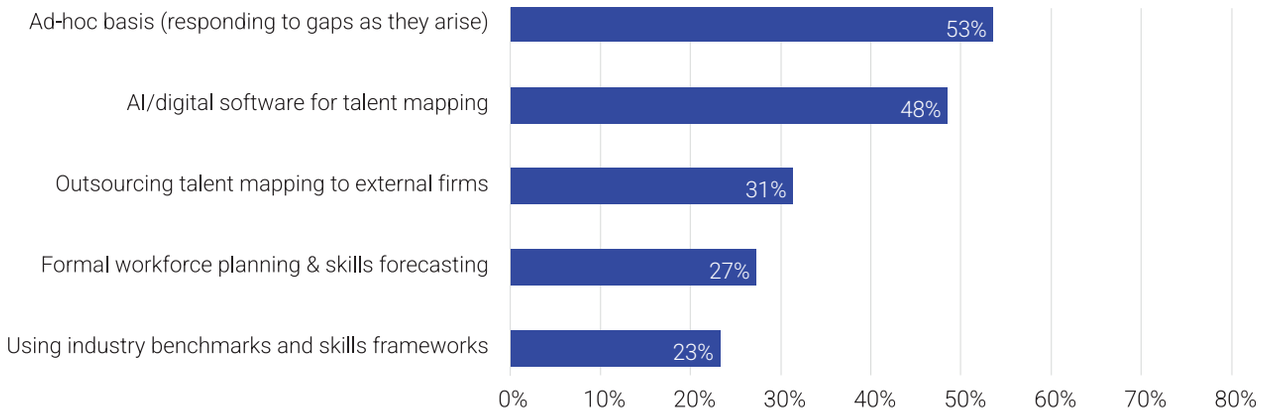
Source: ICT Skills in Ireland Survey, August 2025

Figure 38 also shows a strong reliance on reactive approaches rather than structured, predictive workforce planning. The most common method, cited by more than half of respondents, is addressing talent needs on an ad-hoc basis, responding to skill gaps as they arise, rather than proactively forecasting future requirements. While this approach can offer short-term flexibility, it risks creating bottlenecks during large-scale digital initiatives and increases dependency on urgent hiring.

However, the second most frequent method, using AI/digital software for talent mapping (48%), suggests growing adoption of technology-enabled workforce analytics. This is a positive signal: organisations leveraging digital tools can better identify skill gaps, model future needs, and align training investments, even if predictive talent planning is still far from universal.

131 Source: Skills in the Digital Age: Adapting Ireland's Workforce for the Digital Transition, 2024

Figure 38: **Methods Used to Ensure the Right Skills for the Digital Future**



Source: ICT Skills in Ireland Survey, August 2025

Outsourcing talent mapping to external firms (31%) reflects a reliance on third-party expertise, often due to internal resource constraints or lack of specialised HR capabilities. While outsourcing can accelerate assessments and benchmarking, it may also limit organisational learning and create dependency on external providers for strategic workforce insights.

5.3 Training and Upskilling: Participation and Challenges

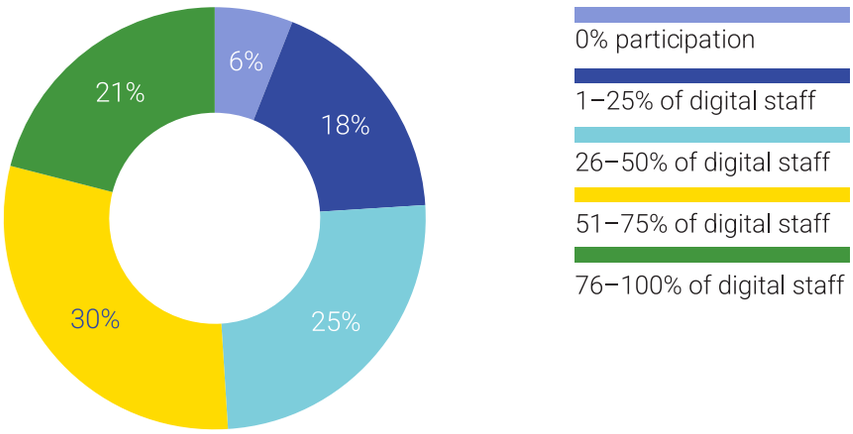
Survey analysis also highlights that the share of learning & development (L&D) budgets devoted to advanced digital/IT skills sits at an average of 24% and is expected to rise to an average of 36% over the next two years, according to respondents' estimates.

The uplift is broad-based rather than isolated: most segments (by company size and industry) indicate incremental increases rather than cuts or stagnation. Taken together, the trend signals a structural re-weighting of L&D toward advanced capabilities, such AI implementation, reflecting organisations' expectations that these skills will drive productivity and competitiveness.

In terms of participation in upskilling and reskilling programmes provided, just over half of organisations report that at least half of their digital staff participated in upskilling or reskilling. Only 6% indicate no participation, pointing to pockets of inertia but not a systemic issue. The distribution suggests that skills development is moving from ad-hoc activity to mainstream practice, though near-universal coverage (75–100%) remains the exception (21%). Compared with European adult learning benchmarks, these survey findings sit slightly above the general labour-market average but still below policy targets. Across the EU, about 39.5% of adults participated in formal or non-formal learning in 2022, and roughly 28.5% in 2024 when measured over shorter reference periods, against an EU-level objective of 60% adult participation in learning by 2030. OECD evidence similarly shows that only about two in five adults in EU and OECD countries engage in job-related education and training in a given year, underlining that even in digitally intensive sectors there remains substantial room to scale participation.[132]

132 OECD (2020), Increasing Adult Learning Participation, Getting Skills Right, OECD Publishing, Paris, based on OECD Survey of Adult Skills (PIAAC)

Figure 39: **Participation in Upskilling/ Reskilling Programmes (%)**



Source: ICT Skills in Ireland Survey, August 2025

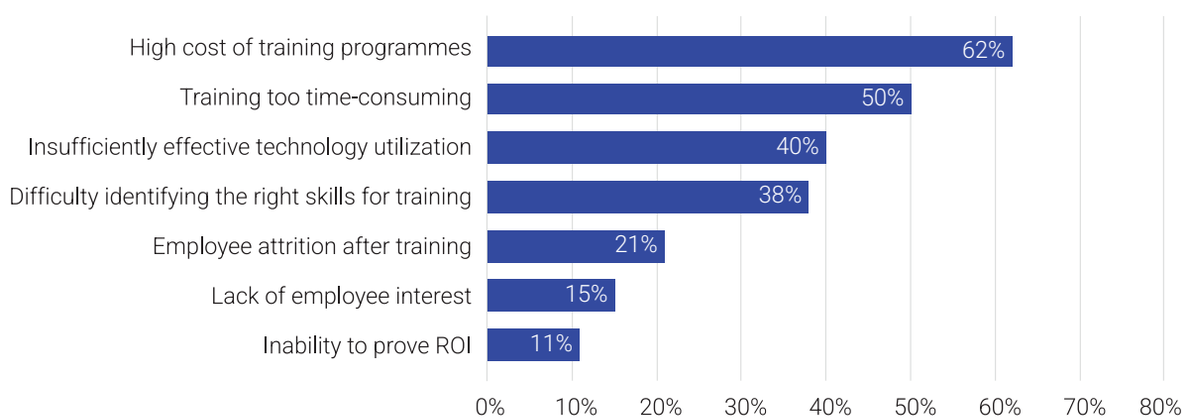
Participation in upskilling and reskilling programmes varies noticeably by company size. Micro firms (2–19 employees) are the least engaged, with many reporting little to no involvement in structured training. Participation becomes more consistent as organisations grow:

- Mid-sized firms (50–249 employees) typically have programmes that reach roughly a quarter to half of their workforce, and in some cases extend to a majority, indicating that learning efforts are established but not yet universal.
- Large enterprises (500+ employees) show the broadest reach, with structured programmes that routinely engage substantial portions of their digital workforce, often approaching or surpassing the halfway mark.

These patterns are consistent with capacity and resourcing dynamics - larger organisations have dedicated L&D teams, vendor partnerships, and program management to scale training, while smaller firms often rely on ad-hoc or project-triggered learning.

However, all organisations report significant barriers when implementing training programs to support their digital strategy. The most cited challenge is high cost (62%), followed by training being too time-consuming (50%). Beyond resource constraints, effectiveness issues are prominent: insufficiently effective technology utilisation and difficulty in identifying the right skills for training suggest that many programs lack precision and impact.

Figure 40: **Challenges in Training and Upskilling**



Source: ICT Skills in Ireland Survey, August 2025

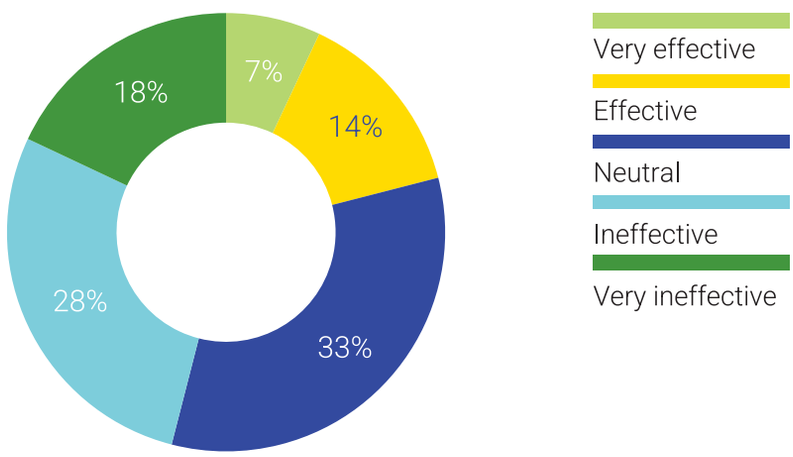
Additional concerns include employee attrition after training (21%), lack of employee interest (15%), and inability to prove Return on Investment (ROI) (11%), which collectively point to gaps in engagement and measurement.

These challenges underscore the need for structured, role-specific learning pathways tied to transformation priorities, rather than ad-hoc training. As highlighted in following paragraphs, employers are often not aware of nationally funded programs and free offerings (e.g., Skillnet, micro-credentials) to reduce cost barriers.

5.4 Perceptions of the Digital Specialist Skills Supply Ecosystem

Survey results indicate that collaboration between organisations and Irish education or training providers in meeting digital skills needs is perceived as generally weak. Only 21% of respondents rate this collaboration as effective or very effective, while one third of respondents remain neutral, suggesting limited engagement or unclear outcomes.

Figure 41: **Collaboration Effectiveness with Irish Educational Providers**

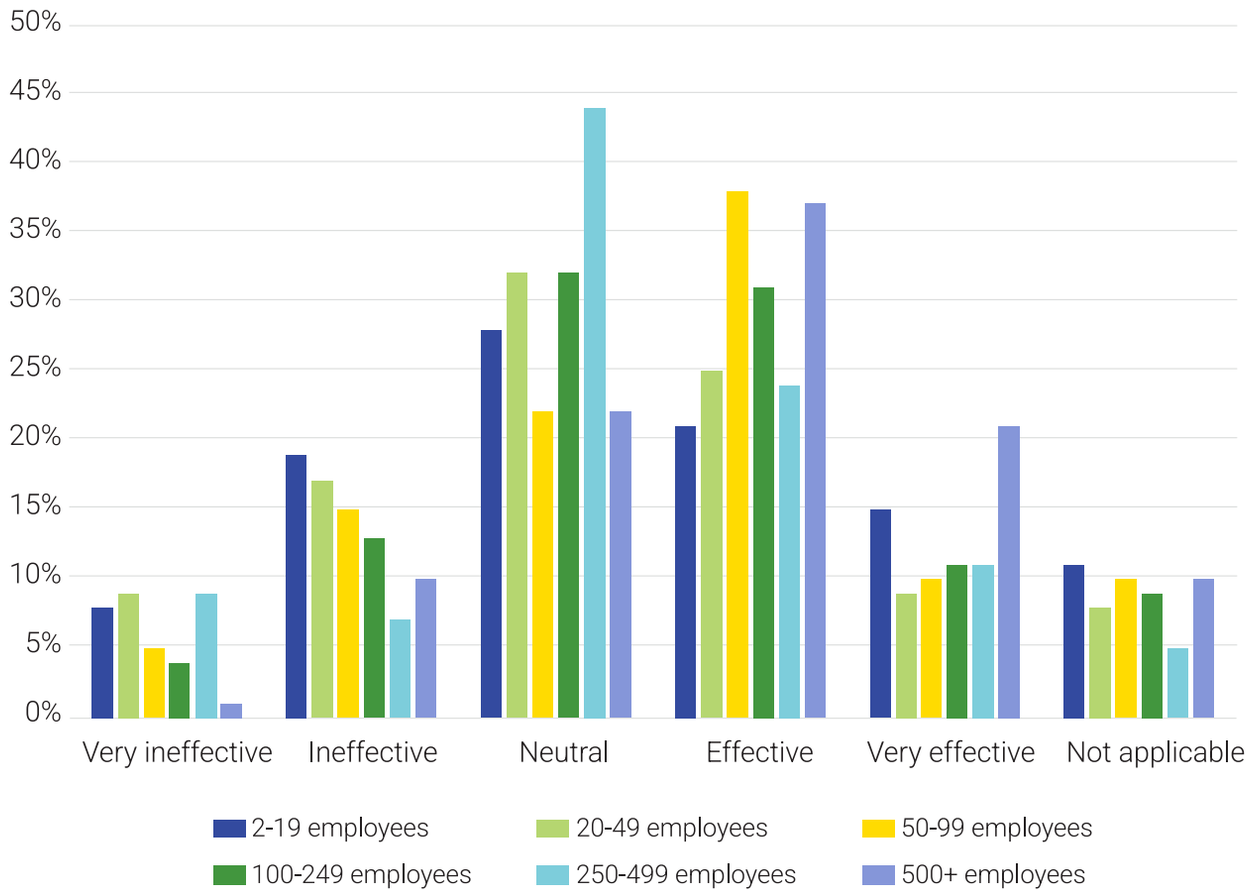


Source: ICT Skills in Ireland Survey, August 2025

This lack of strong collaboration points to a possible disconnect between academic institutions and industry requirements, which risks perpetuating skill gaps in critical areas such as AI, cybersecurity, and cloud technologies. Strengthening these partnerships is essential to ensure that graduates enter the workforce with relevant, applied competencies.

As mentioned in previous sections of this report, recent external labour-market analysis also highlights additional pressures on the digital specialist talent pipeline that extend beyond collaboration challenges. Reduced graduate hiring - driven in part by firms considering automating entry-level tasks using AI, shrinks the number of early-career roles that traditionally anchor university-industry collaboration, such as internships, project partnerships, and graduate pipelines. This may weaken the feedback loop between employers and educators, making it harder for institutions to align curricula with real-world skills needs and further challenging the overall digital specialist skills supply ecosystem.

Figure 42: **Collaboration Effectiveness by Firm Size**[133]



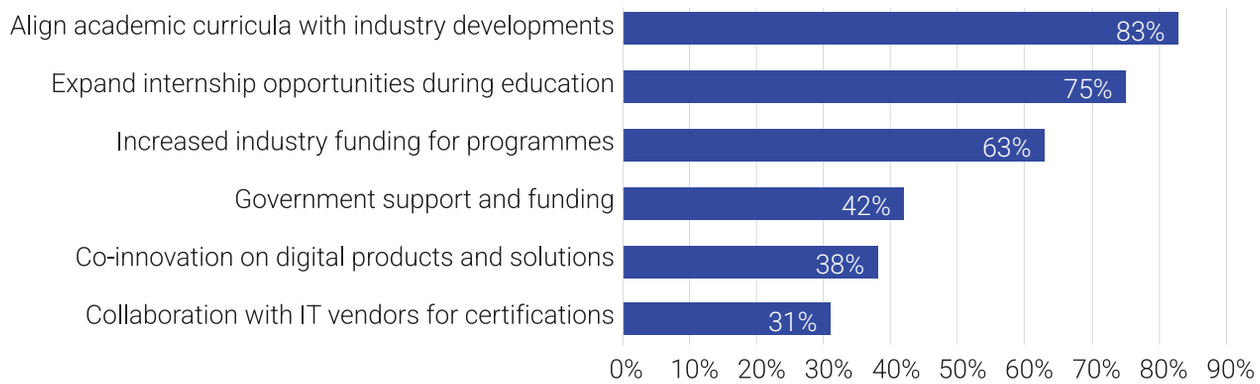
Source: ICT Skills in Ireland Survey, August 2025

Looking at firm size (Figure 42):

- Micro employers (2–19) often experience collaboration as fragmented and low-touch on both sides, but limited bandwidth and often no dedicated L&D lead mean interactions feel reactive and therefore less effective.
- Small firms (20–49 employees) generally see partnerships becoming more effective, though the experience remains uneven.
- Among mid-sized firms (50–99), collaboration is more regular, but its impact weakens when offerings are too generic; effectiveness improves significantly when training is co-designed around real use cases and supported by access to shared labs.
- For companies with 100–249 employees, collaboration tends to be adequate but not transformative, whereas upper-mid organisations (250–499) report a more consistent and effective experience.
- Large enterprises (500+ employees) rate partnerships as most effective. In many cases, these operate as bespoke academies, with training experienced as an integrated internal capability rather than an external service.

133 OECD, Getting Skills Right. Future-Ready Adult Learning Systems

Figure 43: **Main Expectations from Irish Universities on Aligning with Talent Needs**

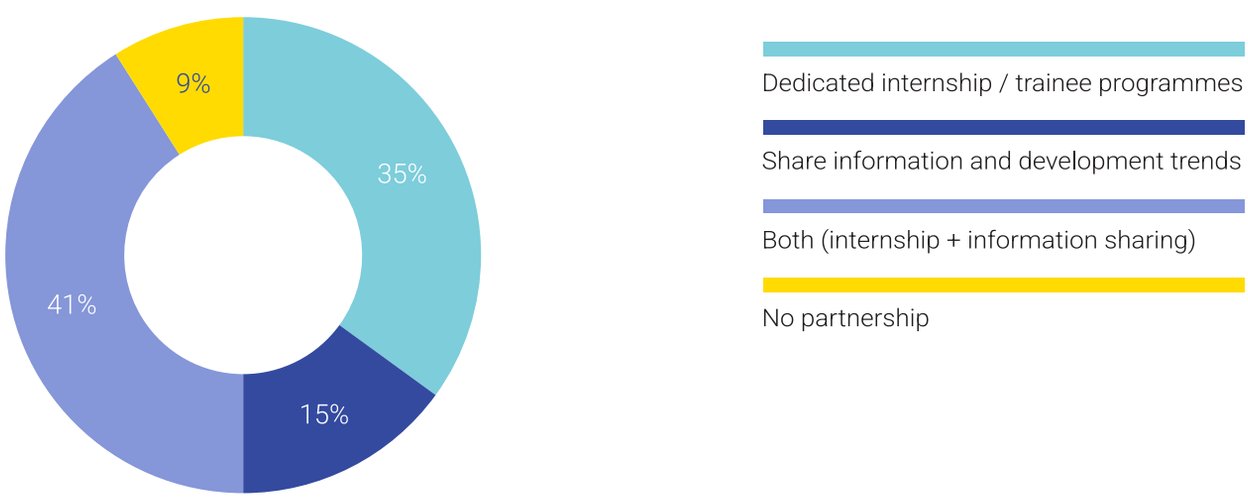


Source: ICT Skills in Ireland Survey, August 2025

Organisations can help identify clear priorities so that universities can **prepare graduates** for digital roles (Figure 43). The most cited measure to support this is aligning academic curricula with industry developments (83%), followed by expanding internships during education (75%), which reflects the need for practical, real-world experience. Other options provided cited by respondents include increased industry funding for programmes, co-innovation on digital products and solutions, and collaboration with IT vendors for certifications. It is important to note that these responses represent organisations' expectations and may not fully account for existing efforts by universities to modernise curricula or expand experiential learning. Nevertheless, the findings underscore the importance of integrating hands-on learning, vendor-aligned credentials, and industry-driven content into academic pathways. Government support, cited by 42%, remains a critical enabler for scaling these initiatives and fostering a sustainable talent pipeline.

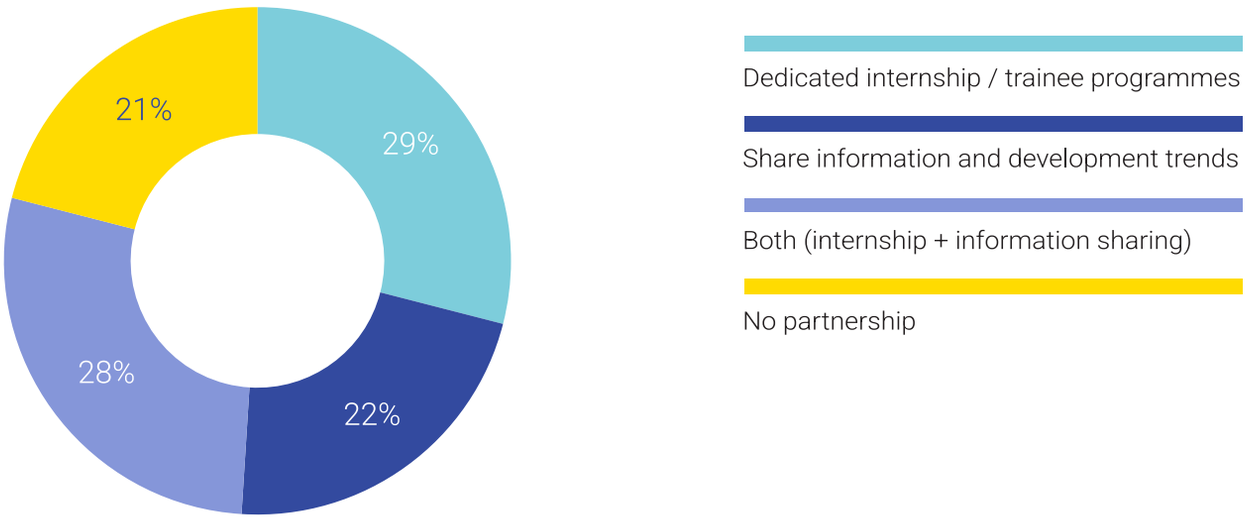
Survey responses also suggest that partnerships to attract and develop digital talent vary significantly between industry and academia (Figure 44 and 45). For collaboration with Irish companies, 35% of organisations report having dedicated internship or trainee programmes, while 15% share information and development trends. A larger share (41%) indicate they do both, and only 9% report no partnership at all.

Figure 44: **Existing Partnerships with Irish Companies**



Source: ICT Skills in Ireland Survey, August 2025

Figure 45: **Existing Partnerships with Education Institutions**

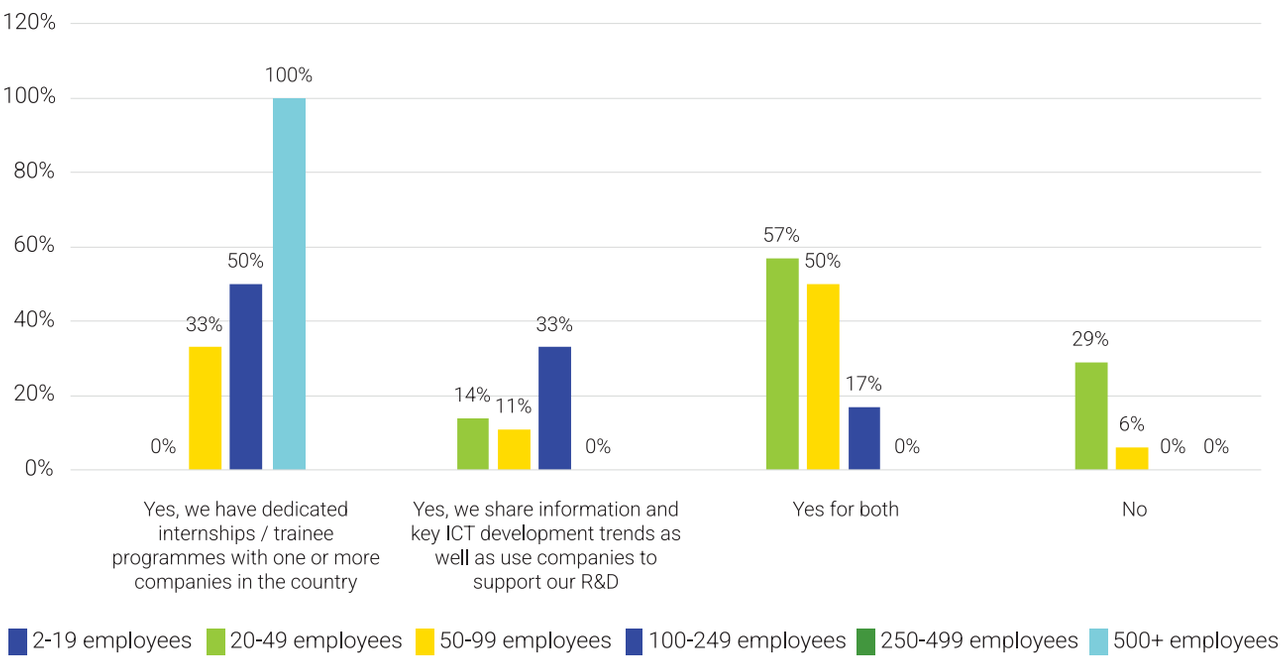


Source: ICT Skills in Ireland Survey, August 2025

In contrast, partnerships with further and higher education institutions show a slightly different pattern: 29% have internship programmes, 22% share information and research support, 28% do both, and 21% have no engagement. The data suggests that while many organisations engage in some form of collaboration within their ecosystem, a notable proportion - particularly with universities - operate without structured partnerships, which could limit access to emerging talent and slow knowledge exchange.

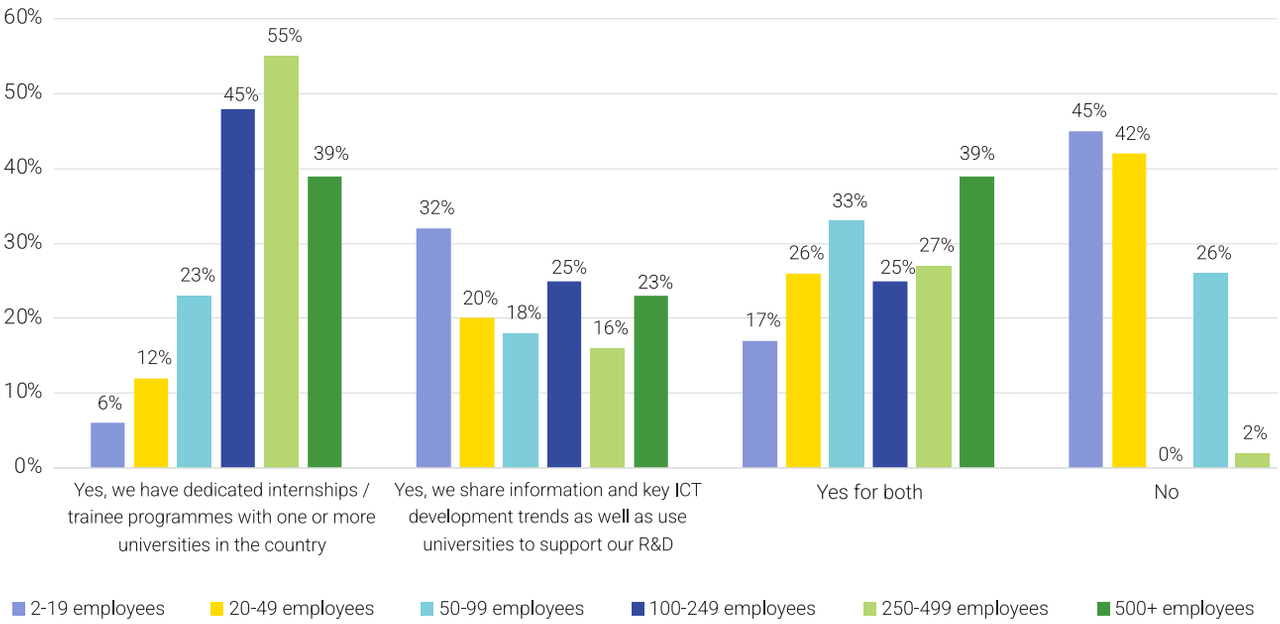
Business partnerships often provide faster access to specialised skills, shared resources, and joint projects that directly address operational needs without the longer lead times associated with academic programmes. Companies may also perceive academic engagement as less agile, with curricula and research cycles that do not always align with rapidly changing technology demands. Additionally, industry partnerships often involve mutual commercial benefits and co-development opportunities, whereas academic collaborations may require navigating administrative processes and funding structures.

Figure 46: **Existing Partnerships with Irish Companies by Firm Size**



Source: ICT Skills in Ireland Survey, August 2025

Figure 47: **Existing Partnerships with Education Institutions by Firm Size**



Source: ICT Skills in Ireland Survey, August 2025

Partnerships with other companies tend to scale with organisational size (Figures 46 and 47):

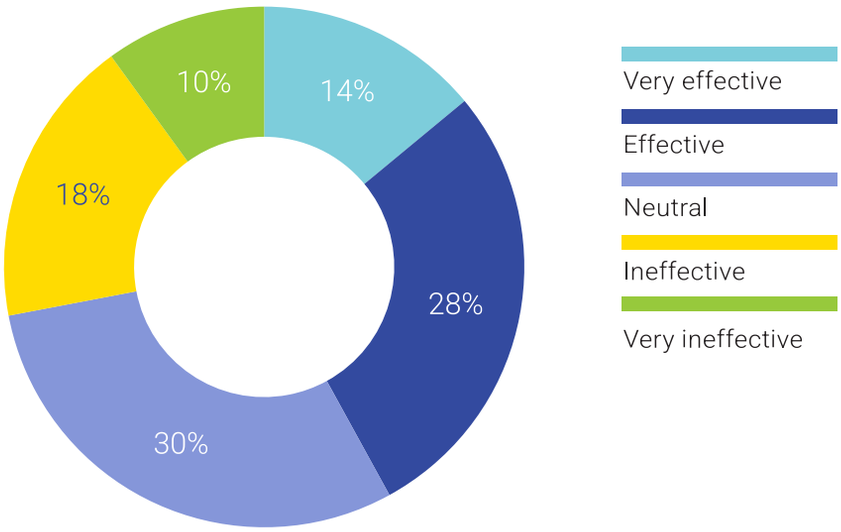
- Smaller firms often focus on sharing information and ICT trends, reflecting resource constraints and a preference for lighter engagement.
- Mid-sized organisations increasingly combine knowledge exchange with structured internship programmes, signalling a shift toward more formal collaboration as they seek to strengthen talent pipelines.
- Large enterprises stand out for their reliance on dedicated trainee and internship schemes, embedding collaboration into their workforce strategy and using these partnerships as a lever for long-term talent development.

A similar pattern emerges in relationships with higher education institutions. Smaller organisations lean toward knowledge sharing, while mid-sized firms begin to integrate internships alongside research collaboration and larger companies again lead with formalised trainee programmes and co-developed initiatives, often blending academic input with practical experience to secure specialised skills.

Across both types of partnerships, effectiveness grows with scale: as organisations expand, collaboration shifts from informal exchanges to structured, strategic programmes that combine talent attraction with capability building. This convergence highlights that size drives not only the depth of engagement but also the expectation for measurable outcomes and integrated pipelines.

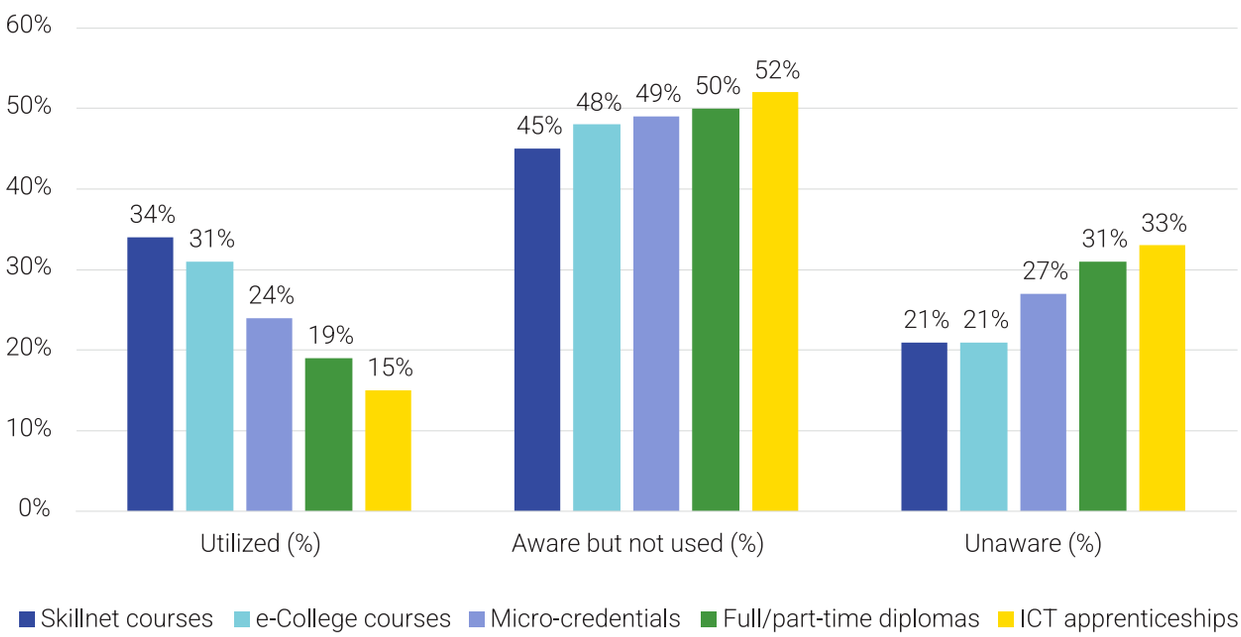
Survey responses also show mixed perceptions of how well apprenticeships and traineeships develop digital/IT skills. Only 42% consider these programmes “very effective” or “effective”, while slightly less than one third consider them “neutral” (Figure 48). This finding reinforces earlier commentary on collaboration gaps between industry and academia. While internships and traineeships are among the most cited mechanisms for preparing graduates, their perceived effectiveness remains modest.

Figure 48: **Effectiveness of Apprenticeships and Traineeships**



Source: ICT Skills in Ireland Survey, August 2025

Figure 49: **Awareness and Utilisation of Free Training Opportunities**



Source: ICT Skills in Ireland Survey, August 2025

However, previous gaps and challenges highlighted by respondents also pair with a significant **awareness gap regarding free or low-cost ICT training opportunities in Ireland** (Figure 49). While many respondents know these programmes exist, actual utilisation remains low. For example, only 34% have benefited from courses provided by the Skillnet network, 31% from e-college courses, 24% from micro-credentials, and 19% from full- or part-time diplomas, with ICT apprenticeships trailing at 15%. In contrast, around half of respondents acknowledge awareness without usage across most categories.

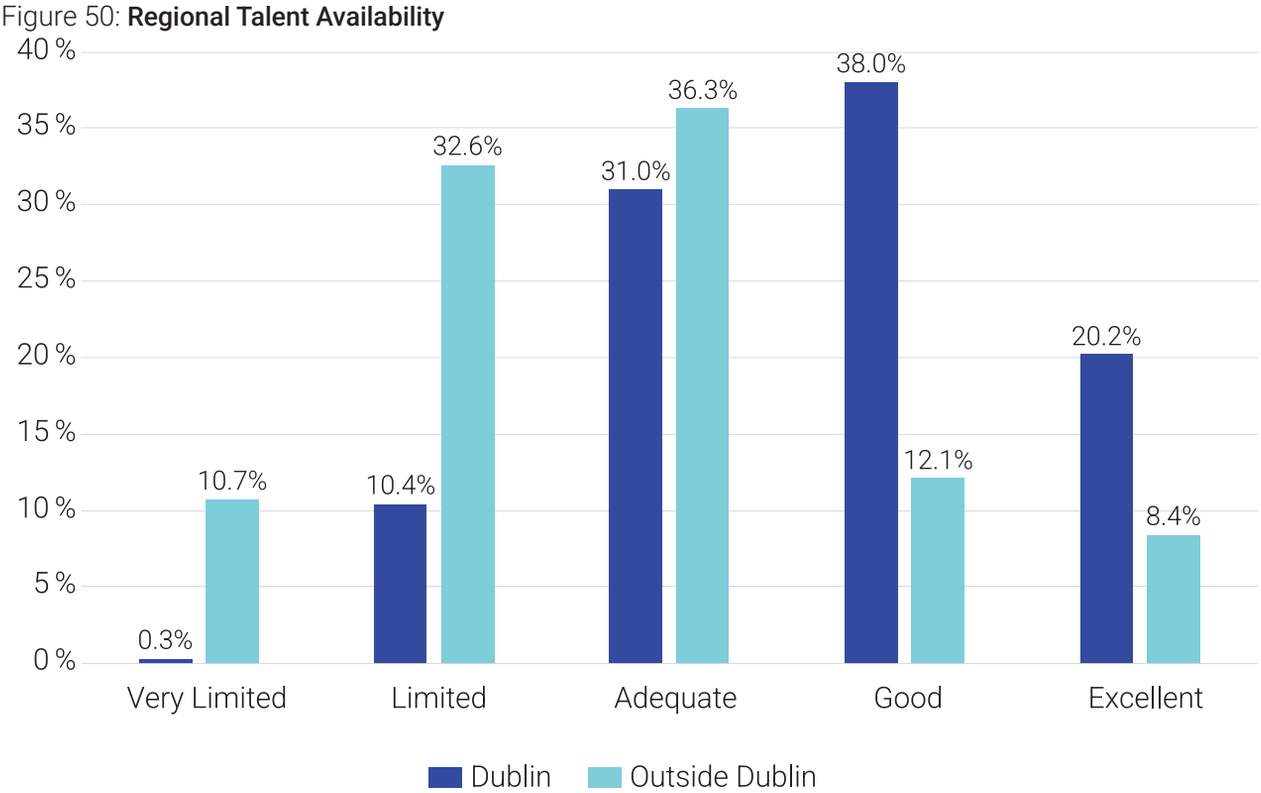
Alarmingly, 33% are completely unaware of ICT apprenticeships, and 31% are unaware of full-time diplomas, suggesting that communication and outreach remain major barriers. While these figures reflect respondents' perceptions and may not fully represent the actual accessibility or quality of these programmes, they highlight a disconnect between availability and uptake.

This finding reinforces earlier insights on the perceived limited effectiveness of apprenticeships and the preference for company-to-company partnerships over academic collaboration. Even when structured training options exist, surveyed organisations either do not leverage them or lack awareness.

5.5 Talent Availability and Regional Disparities

Survey results highlight a **sharp Dublin–rest-of-country divide** in perceived access to digital specialist skills. In Dublin, 58% of respondents rate talent availability as "good" or "excellent," compared with just 21% outside Dublin; conversely, "limited" or "very limited" availability is reported by 43% outside Dublin, versus 11% in Dublin. Put differently, employers outside of Dublin are 4X more likely to face constrained availability than those in Dublin. Taken together, these patterns suggest that Ireland's digital demand is over-reliant on a single hub for skilled digital specialist labour.

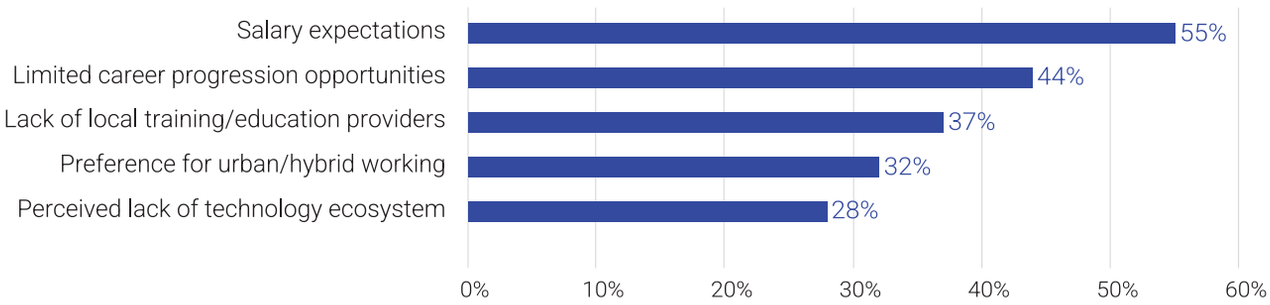
Figure 50: **Regional Talent Availability**



Source: ICT Skills in Ireland Survey, August 2025

Figure 51 highlights a clear hierarchy of **obstacles to attracting or retaining digital specialists** outside major urban centres, according to respondents. Salary expectations (55%) dominate, reflecting intense competition for experienced digital specialist talent and the anchoring effect of global wage benchmarks. Even when cost of living is lower outside metropolitan areas, candidates often calibrate expectations against multinational packages or Dublin-based roles with hybrid flexibility. For employers beyond urban hubs, this translates into persistent pay-pressure, counter-offers, and longer time-to-hire. From a talent-market perspective, the finding is consistent with broader signals of limited local supply and high competition: when scarcity and bidding wars intersect, salary becomes the first-order constraint.

Figure 51: **Talent Attraction Challenges Outside of Dublin and Major Urban Areas**



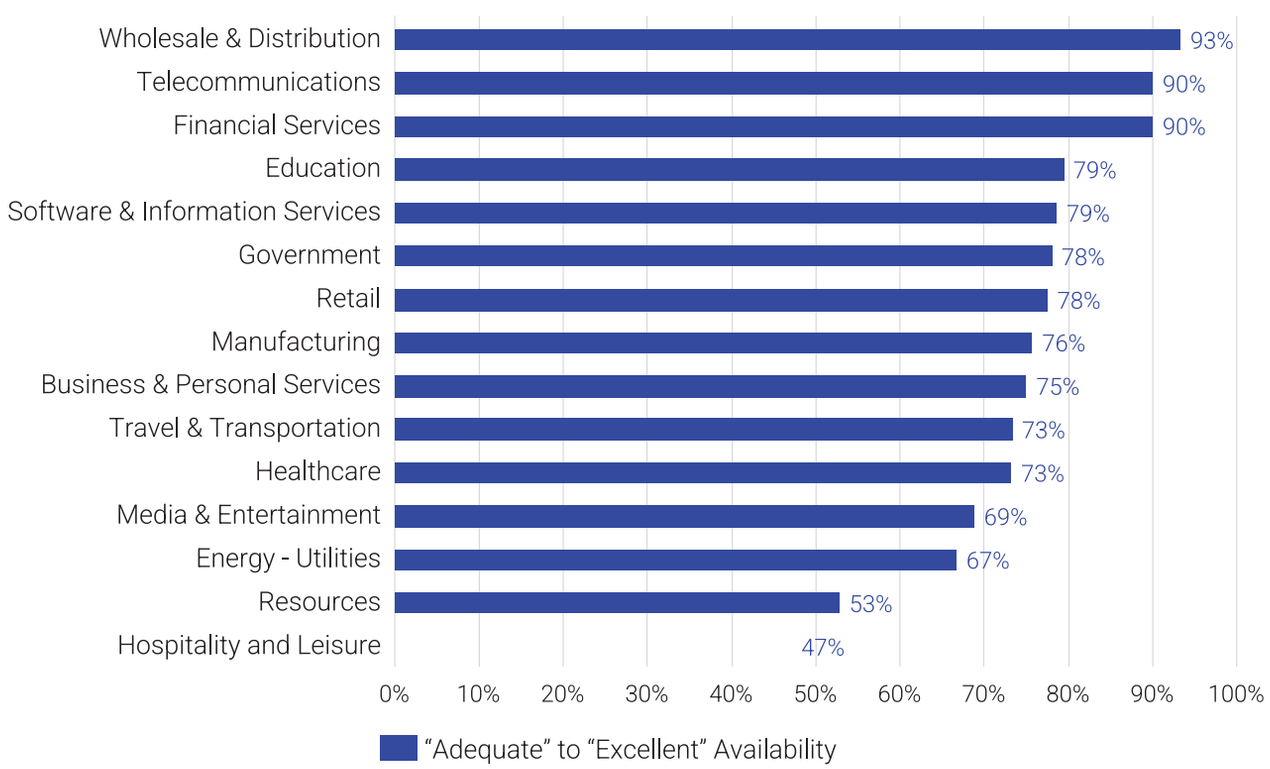
Source: ICT Skills in Ireland Survey, August 2025

Limited career progression opportunities (44%) emerge as the second most cited barrier, signalling that professionals weight not only initial compensation but also multi-year advancement paths. Outside large centres, teams are often smaller, role ladders shallower, and exposure to complex programmes or leadership tracks more constrained.

A reported lack of local training and education providers (37%) suggests that some regions may face ecosystem-level challenges. In areas where nearby institutions offer fewer – or where there is a perceived lack of - opportunities for dedicated education, upskilling, or reskilling, both employers and professionals can experience additional friction in accessing learning pathways. Increased distance to education programmes may raise the time and cost associated with continuous learning.

Looking at **industry breakdown** instead, talent availability is tightest in the Hospitality and Leisure and Resources sectors, and most available in the Wholesale & Distribution, Telecommunications and Financial Services sectors.

Figure 52: **Digital/IT Talent Availability by Sector**



Source: ICT Skills in Ireland Survey, August 2025

Two structural drivers explain these differences:

- First, regulatory intensity: sectors with heavier compliance (financial services, healthcare) demand deeper, more specialised digital specialist skillsets, raising bars on qualifications and experience.
- Second, regional footprint: industries with substantial operations outside Dublin feel the regional availability gap more acutely, amplifying time-to-hire and salary pressure for experienced roles.

5.6 Key Findings from the Survey

The survey highlights **a persistent structural gap in how Irish organisations prepare for digital transformation.** Fewer than half (42%) report a strong understanding of the digital skills required to deliver their strategies, while many rely on reactive, ad-hoc approaches to workforce planning. This **limited forward visibility risks misalignment between business needs and talent investments**, undermining long-term competitiveness. Governance of digital skills remains heavily concentrated within IT functions, with relatively limited involvement from executive leadership and HR, reinforcing a siloed approach to what is inherently an enterprise-wide challenge.

Encouragingly, **investment in digital skills is increasing**, with L&D budgets allocated to advanced ICT capabilities expected to rise significantly. Participation in upskilling is becoming more mainstream, though it remains uneven across firm sizes and rarely reaches full workforce coverage. High costs, time constraints, and difficulties in identifying relevant skills reduce the effectiveness of training programmes, indicating the need for more targeted, role-specific learning pathways.

The digital specialist talent ecosystem is characterised by **weak collaboration between industry and education providers**. Most organisations perceive partnerships as ineffective, and structured engagement—particularly with higher education—remains inconsistent. While businesses emphasise the need for curriculum alignment and expanded internships, reduced entry-level opportunities and limited feedback loops are weakening the talent pipeline. At the same time, awareness and utilisation of existing public training supports are low, suggesting that **access is not the primary issue—rather, coordination and communication gaps persist**.

Finally, **significant regional disparities** shape talent availability. Dublin remains the dominant hub, while organisations outside the capital are far more likely to experience skills shortages, compounded by salary pressures, limited career progression opportunities, and weaker local training ecosystems. Sectoral differences further intensify demand in highly regulated industries. Overall, addressing Ireland's digital specialist skills challenge will require more strategic workforce planning, stronger cross-sector collaboration, and targeted regional interventions to broaden the talent base.

6

Expert Workshops

6.1 Introduction

In November 2025, six stakeholder workshops (three online and three in-person) were organised to assess digital specialist skills needs with particular emphasis on AI, cybersecurity, and emerging technologies. These workshops brought together diverse perspectives from almost 100 participants across multinational corporations, SMEs, higher education institutions, skills development organisations, and government agencies (Table 10).

Table 10: **Expert Workshop Details**

Date	Location	Topics	Attendee Sector
03-Nov 2025	Online	Public Sector: AI, Cybersecurity, Emerging Technologies	Academia and Public Sector
05-Nov 2025	Online	Private Sector: AI & Cybersecurity	Academia and Private Sector
07-Nov 2025	Online	Private Sector: Emerging Technologies	Academia and Private Sector
17-Nov 2025	Griffith College, Dublin	AI and Emerging Technologies (Private Sector, Public Sector, Academia)	Academia, Private Sector, Public Sector and Other
18-Nov 2025	Eurofound, Dublin	Cybersecurity (Private Sector, Public Sector, Academia)	Academia, Private Sector, Public Sector and Other
20-Nov 2025	University College Cork	AI, Cybersecurity and Emerging Technologies (Private Sector, Public Sector, Academia)	Academia, Private Sector, Public Sector and Other

The discussions at the workshops revealed not isolated technical challenges but interconnected systemic issues requiring comprehensive responses. Across all six workshops, common themes emerged:

- the gap between technological possibility and organisational capacity to leverage new tools;
- the mismatch between academic output and industry requirements;
- the shortage of bridging professionals who translate between business and technical domains; and,
- the urgent need for more agile, responsive training mechanisms.

These challenges transcend individual sectors or technologies, pointing to fundamental structural issues in how Ireland develops and deploys digital specialist talent.

The following sections of this chapter summarise the views expressed by workshop participants under five themes:

1. Infrastructure and human capital for teaching and learning;
2. Skills for the Future: AI and Cybersecurity;
3. The Work-Ready Digital Workforce: From Business Requirements to Change Management Complexities;
4. Talent-Related Challenges for Organisations; and,
5. Collaboration for a sustainable talent pipeline.

6.2 Expert Opinions from the Workshops

6.2.1 Infrastructure and Human Capital for Teaching and Learning

The Infrastructure and Human Capital Deficit

Academic institutions face significant constraints that limit their ability to prepare work-ready graduates. Some of the academic participants described inadequate computing infrastructure, limited access to industry-standard tools and platforms, insufficient or unavailable practitioner engagement in curriculum development, and challenges within institutions to ensure that their educators can keep up with the evolving technologies, which may create difficulties when they transition to the workplace.

Infrastructure challenges are not limited to physical assets. Universities can lack agile procurement processes to rapidly adopt emerging tools, they struggle with licensing costs for enterprise platforms and operate on planning cycles misaligned with the industry's digital transformation pace. Faculty recruitment and retention suffer from compensation gaps between academia and industry, creating a knowledge transfer bottleneck where cutting-edge practices can remain trapped in industry rather than flowing to students.

Challenges for Academia - Curriculum Lag and Relevance

Educational institutions face a fundamental challenge: curriculum development cycles are measured in years while technology evolves in months. By the time new programmes gain approval, undergo accreditation review, hire faculty, and enrol students, the technological landscape has shifted. Graduates emerge with skills already obsolescent, requiring immediate upskilling upon workforce entry.

This lag particularly affects emerging technologies where best practices remain unsettled and tools evolve rapidly. Universities teaching two-year-old AI frameworks graduate students into workplaces using current-generation tools. Cybersecurity curricula emphasize traditional network security while industry grapples with cloud architecture, zero trust models, and supply chain attacks. The gap undermines graduate confidence and employer satisfaction, putting pressure on the trust in formal education's value.

Infrastructure and Resource Constraints

Academic participants described acute infrastructure limitations constraining student preparation. Inadequate computing resources force rationing of access to Graphic Processing Units (GPUs) necessary for AI/ML coursework. Licensing costs prohibit adoption of industry-standard platforms, requiring substitution with open-source alternatives that don't reflect workplace realities. Laboratory equipment becomes obsolete before replacement budgets allow updates. Internet bandwidth constrains cloud-based learning activities.

Resource limitations extend to human capital. Faculty salaries cannot compete with industry compensation, creating recruitment difficulties and retention challenges. The most current expertise remains in industry rather than academia, yet adjunct and visiting practitioner programmes face administrative barriers. Teaching loads in some institutions leave insufficient time for faculty to maintain cutting-edge skills through research, professional development, or industry engagement.

Measurement and Accountability

Educational institutions face challenges measuring outcomes and demonstrating value. Graduate employment rates provide crude metrics but don't capture preparation quality, skill relevance, or long-term career success. Employer satisfaction surveys yield limited insights. Skills assessments remain subjective and difficult to standardize across diverse roles and industries.

The accountability challenge extends to curriculum reform. Universities can struggle to identify which changes drive improvement, and which investments yield highest returns. Without clear feedback loops, resource allocation decisions rely on intuition rather than evidence. This perpetuates misalignment between educational offerings and workforce needs.

6.2.2 Skills for the Future: AI and Cybersecurity

The Adoption Paradox

Organisations simultaneously recognize AI's transformative potential while struggling to implement it effectively. Workshop participants identified a four-dimensional barrier framework (see also section 7.1) encompassing:

1. people (resistance to change, insufficient literacy)
2. process (unclear governance, legacy workflows)
3. technology (data quality issues, integration complexity), and
4. policy (regulatory uncertainty, ethical concerns).

This adoption paradox manifests differently across organisational sizes, with SMEs facing resource constraints while larger enterprises confront change management complexity at scale.

The cybersecurity domain exhibits a parallel pattern. Organisations understand threat severity but struggle to operationalise robust defences due to budget constraints, competing priorities, and the technical debt accumulated in legacy systems. The result is reactive rather than proactive security postures, with investments spiking after incidents rather than preventing them.

The Security Imperative

Cybersecurity emerged as both a specialised domain requiring dedicated expertise and a fundamental competency required across all digital specialist roles. Participants emphasized that security cannot remain siloed within specialised teams but must permeate organisational culture and individual skillsets. The "security by design" principle demands that developers, system administrators, data analysts, and business analysts all possess baseline security awareness and incorporate protective thinking into their work.

Yet current educational models treat security as an elective specialisation rather than a core competency. Graduates enter roles with insufficient understanding of threat vectors, secure coding practices, or data protection principles. The skills gap manifests not only in shortages of dedicated security professionals but in the broader digital specialist workforce's inability to implement security-conscious practices in daily work.

6.2.3 The Work-Ready Digital Workforce: From Business Requirements to Change Management Complexities

The Foundational Skills Imperative

Amidst rapid technological change, workshop participants consistently emphasised that foundational human skills remain paramount. Foundational (transversal) skills including critical thinking, communication, collaboration, problem-solving, and adaptability emerged as more durable and valuable than any specific technical competency. The ability to learn, question assumptions, synthesise information, and work effectively in teams transcends particular tools or platforms.

This finding carries significant implications for curriculum design and training prioritization. Rather than chasing every technological trend, educational institutions should focus on developing strong fundamentals that enable continuous learning. Technical skills layer atop this foundation, with the expectation that specific tools will change but the capacity to master new tools persists throughout careers.

The Bridging Professional Shortage

A critical skills gap does not exist in technical specialisation, but in professionals who bridge business and technology domains. These "T-shaped" individuals possess deep expertise in one area while maintaining sufficient breadth to translate between technical and business stakeholders. They understand both what technologies can do and what business problems need solving, serving as essential connectors in digital transformation initiatives.

Current educational pathways produce specialists but not integrators. Computer science programmes emphasise technical depth without business context. Business programmes cover technology at surface level without meaningful technical capability. The result is a shortage of professionals who can identify where AI creates business value, translate security requirements into business terms, or help non-technical leaders make informed technology decisions.

Change Management Complexity

AI adoption and digital transformation initiatives fail not due to technical inadequacy, but organisational resistance. Workshop participants described challenges in building AI literacy across all organisational levels, overcoming scepticism and fear, aligning stakeholders around transformation priorities, and managing the cultural shift from established practices to experimental mindsets.

Change management requires dedicated effort, clear communication, leadership commitment, and patience that many organisations lack. The pressure for rapid results clashes with the reality that meaningful transformation unfolds over years, not months. Companies struggle to maintain momentum through inevitable setbacks, pilot failures, and the grinding work of process redesign.

Theory-Practice Balance

Academic programmes traditionally emphasise theoretical foundations and computer science fundamentals. This approach develops rigorous thinking and creates adaptable graduates capable of learning new specifics. However, employers increasingly demand practical skills and immediate productivity, creating tension between educational philosophy and market requirements. Workshop participants debated the appropriate balance. Industry representatives want graduates with hands-on experience in current tools, understanding of professional practices, and exposure to real-world problem complexity. Academic representatives defend theoretical grounding as essential for long-term career success and adaptability. The challenge lies in achieving both within constrained credit hours and programme lengths, particularly when infrastructure limitations impede practical learning.

The Experience Paradox

Firms' express frustration that graduates lack practical skills and work-readiness despite possessing relevant degrees. They cite insufficient exposure to real-world problem complexity, limited experience with enterprise-scale systems, poor understanding of professional practices (version control, documentation, testing), and weak foundational skills (communication, time management, collaboration).

At the same time, there is a perceived mismatch between employers' expectations and workforce development practices. Firms simultaneously eliminate entry-level positions where graduates historically gained experience. Automation absorbs routine tasks, budget pressures reduce junior headcount, and the pace of work leaves insufficient time for comprehensive onboarding. Companies want experienced hires but don't create environments where experience is built, externalising training costs to other organisations or expecting academia to produce workforce-ready graduates beyond universities' practical capacity.

Legacy System Burden

During the cybersecurity session in Dublin, participants emphasised the persistent challenge of legacy systems creating cybersecurity vulnerabilities and limiting innovation capacity. Organisations operate mission-critical systems built on outdated technologies, running unsupported software, lacking adequate documentation, and depending on scarce specialists with relevant expertise. These systems resist integration with modern platforms, create attack surfaces difficult to defend, and consume resources that could otherwise drive innovation.

The legacy burden extends beyond technical debt to encompass organisational inertia and risk aversion. Companies avoid modernisation due to migration costs, business continuity concerns, and insufficient confidence in transformation success. The longer the modernisation delays, the more technical debt accumulates, and the more expensive eventual transformation becomes. This creates a vicious cycle where

legacy systems increasingly constrain organisational agility precisely when competitive pressures demand greater responsiveness.

6.2.4 Talent-Related Challenges for Organisations

Talent Acquisition Challenges

Irish organisations face intense competition for digital specialist talent, particularly given the global market where remote work can reduce geographical advantage. Workshop participants described "talent wars" as being particularly acute in cybersecurity, where the public sector is not always able to compete on equal footing with private sector compensation packages. The shortage of qualified candidates drives salary inflation, increases time-to-hire, and forces organisations to lower standards or leave positions unfilled.

Talent Retention Challenges

Professionals receive constant recruitment overtures, creating churn that disrupts teams and erodes institutional knowledge. Organisations invest in training only to see newly skilled employees depart for higher compensation elsewhere. The lack of career progression pathways (particularly for non-management technical tracks) drives experienced professionals toward opportunities offering growth without necessarily moving into management.

6.2.5 Collaboration for a Sustainable Talent Pipeline

The Pipeline Challenges

Perhaps the most concerning finding spans all six workshops: traditional entry-level pathways into digital specialist careers appear to be eroding. Participants noted that entry-level positions increasingly require experience levels historically associated with mid-career roles. Junior positions disappear as automation handles routine tasks previously used to train newcomers. Graduates possess theoretical knowledge but lack practical skills, creating a potential Catch-22 where they cannot gain employment without experience and cannot gain experience without employment.

This pipeline disruption creates multiple downstream effects. Companies may lose the talent pipeline they historically relied upon to develop senior professionals. Universities struggle to place graduates despite high demand for digital specialist skills at senior levels. The profession can become less accessible to diverse entrants who might excel given proper onboarding. Mid-career professionals face pressure to rapidly upskill while simultaneously mentoring junior staff who no longer exist in sufficient numbers.

The Collaboration Friction

Despite strong appetite for industry-academia partnership, structural barriers can impede effective collaboration. Workshop participants identified protracted contracting processes (often 6-9 months for simple engagements), intellectual property friction, misaligned incentive structures (academic publication metrics versus industry delivery timelines), and administrative complexity that discourages informal knowledge exchange.

These barriers can prevent the fluid interaction necessary for responsive curriculum development, effective internship programmes, collaborative research projects, and practitioner involvement in teaching. Companies express willingness to engage but find bureaucratic overhead prohibitive. Academics want industry input but cannot always navigate institutional constraints. Students may miss opportunities for authentic learning experiences that would smooth their workforce transition.

Engagement and Collaboration Barriers

Universities want industry engagement for curriculum input, guest lectures, internship placements, collaborative research, and employment pipelines. Companies want to participate but encounter bureaucratic

friction that discourages involvement. Workshop participants identified contracting delays, intellectual property concerns (particularly around student work and collaborative research), administrative complexity, and misaligned incentives as major barriers – though participants did not specify whether these issues differ between undergraduate and master's level collaborations.

These structural impediments can prevent the fluid collaboration necessary for responsive education. By the time legal reviews complete and contracts execute, the industry partners may have moved on or circumstances have changed. The effort required to establish formal relationships exceeds many companies' capacity, particularly SMEs lacking dedicated partnership teams. Informal engagement carries risks (liability, IP exposure) that institutional policies discourage.

6.3 Key Findings

Chapter 6 summarises expert insights from six stakeholder workshops involving almost 100 participants across industry, academia and government. These discussions highlight **system-wide challenges in Ireland's digital specialist talent ecosystem**, rather than isolated skills shortages. Core themes include gaps between technology and organisational capacity, misalignment between education and industry needs, and the absence of agile training systems.

A central finding is that **academic systems find it challenging to keep pace with technological change**. Curriculum development cycles are too slow relative to rapidly evolving fields like AI and cybersecurity, resulting in graduates whose skills may already be outdated. This is compounded by **infrastructure and resource constraints**, including limited access to advanced computing (e.g. GPUs), outdated tools, and difficulty attracting industry-experienced faculty due to pay disparities.

Organisations face an "**adoption paradox**": they recognise AI's importance but struggle to implement it due to gaps in skills, governance, data quality, and organisational readiness. Cybersecurity presents similar issues, with firms often adopting **reactive rather than proactive approaches**. Importantly, security is no longer a niche function but a **core competency across all ICT roles**, yet current education systems do not adequately reflect this.

Participants emphasised the importance of **foundational human skills**—such as critical thinking, adaptability and communication—as essential complements to technical expertise. A key gap exists in **"bridging professionals"** who can connect business needs with technical solutions. Additionally, organisations face challenges in **change management**, with cultural resistance often hindering digital transformation more than technical barriers.

There is intense competition for digital specialist talent, particularly in AI and cybersecurity, leading to **recruitment challenges, high turnover and skills shortages**. At the same time, traditional entry-level pathways are eroding, as automation reduces junior roles. This creates an **"experience paradox"**, where employers seek experienced candidates but provide limited opportunities for graduates to gain experience.

The workshops highlighted a **fragile talent pipeline**, with declining entry-level opportunities and insufficient practical experience for graduates. While there is strong willingness for **industry-academia collaboration**, structural barriers—such as lengthy contracting processes, misaligned incentives, and administrative complexity—limit effective partnerships. This constrains curriculum responsiveness, internship availability, and knowledge exchange.

The chapter concludes that Ireland's digital specialist skills challenges are systemic, requiring coordinated action across education, industry and policy. Addressing these issues will require more agile training systems, stronger collaboration mechanisms, and a rebalancing of both technical and foundational skill development.

7

AI Skills Outlook

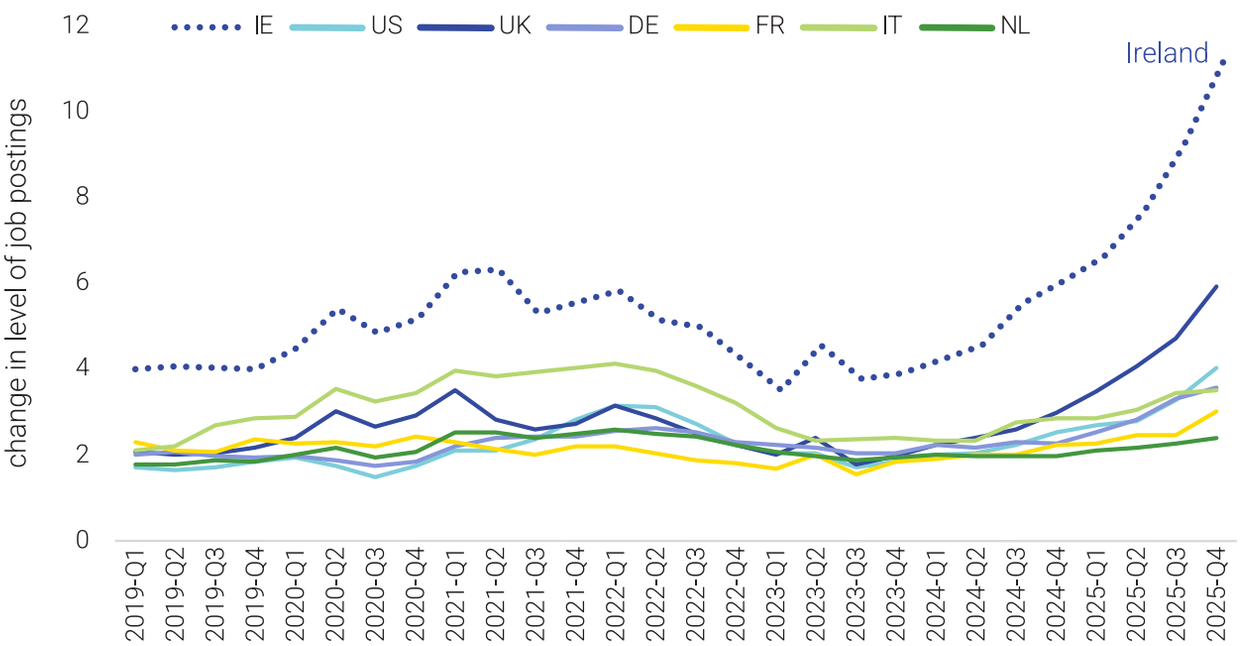
This chapter examines how AI adoption is evolving across Irish organisations, highlighting the gap between growing demand for AI capabilities and the current availability of skills, talent, and organisational readiness. It explores the workforce, skills, and leadership changes required for organisations to successfully scale and govern AI adoption.

7.1 AI Exposure and Emerging Skills Demand

The report Artificial Intelligence: Friend or Foe, developed by the Department of Finance and DETE, highlights how 63% of jobs in Ireland were found to have some level of exposure to AI. Of these roles, roughly one-third (33%) involved tasks where AI could enhance or support the work, while the remaining 30% were considered vulnerable to being replaced by AI.[134]

A recently published EGFSN Skills Insights Note, *The Irish Labour Market and AI in 2026*, highlights the rapid pace of AI development in Ireland. It finds that demand for AI-related skills continues to grow strongly, with Ireland's trajectory diverging from peer countries based on Indeed data.[135] The share of job postings referencing AI has risen sharply: after fluctuating between 4–6% from 2019 to 2023, it has since doubled, with particularly strong growth in the past year. Overall, this indicates that Ireland is generating AI-related jobs at roughly two to three times the rate of neighbouring countries. (see Figure 53).

Figure 53: **AI Job Postings - a Cross-Country Comparison**



Source: Indeed

7.2 Expected Impact of AI on Digital Skills: Evidence from the ICT Skills In Ireland Survey

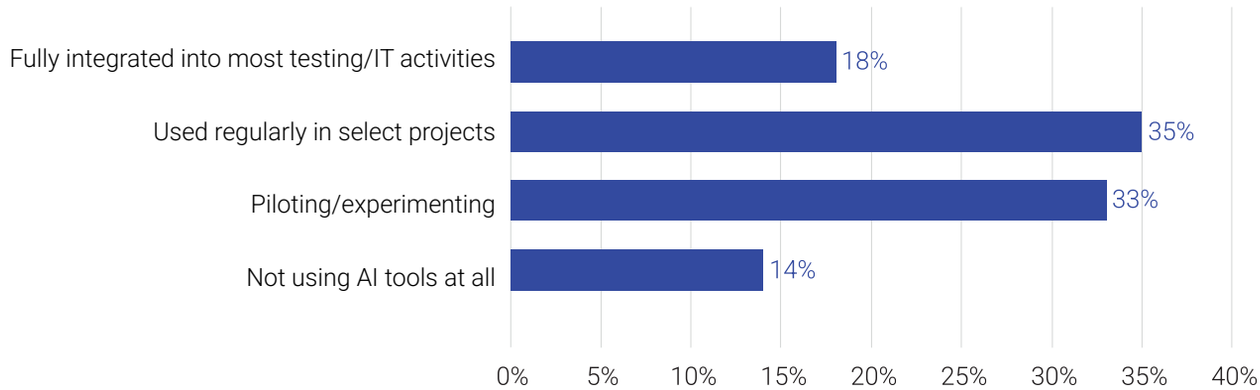
Survey findings confirm that Irish organisations are actively engaging with AI tools, but adoption remains uneven.

134 Williamson, H., Gannon, N., Daly, K., Fitzgerald, K., & Coates, D. (2024). Artificial Intelligence: Friend or Foe? An Analysis of How AI Could Impact Ireland's Labour Market. Department of Finance & Department of Enterprise, Trade and Employment

135 Indeed report on the share of job postings referencing AI terms for a selection of countries including Ireland. For more, see: Hiring Lab | Data Portal | Indeed.com

A total of 68% of organisations report either piloting AI (33%) or using AI regularly in selected projects (35%) in IT departments, while only 18% have fully integrated AI-powered tools into testing activities (Figure 54). This indicates that most organisations are still transitioning from experimentation to operational use. A further 14% report no use of AI tools, reflecting either limited awareness or differing strategic priorities.

Figure 54: **AI-Powered Tools Adoption in IT Departments of Irish Organisations (%)**



Source: ICT Skills in Ireland Survey, August 2025

Overall, the data suggests a transitional phase; organisations recognise AI's value but face barriers to scaling it across processes. Supporting evidence from the CSO shows that 15% of Irish enterprises were using AI in 2024, with adoption highly uneven by firm size: 51.2% of large enterprises compared to 25.1% of medium firms and 12% of small firms.[136] This aligns with EU trends, where deployment remains concentrated in early stage use despite broader digital maturity.

This scenario is also aligned with the current situation in the European Union: the 2024 edition of the Digital Economy and Society Index (DESI), European Commission's benchmark for tracking digital performance across EU member states, shows that while Ireland ranks among the top performers in overall digitalisation, AI adoption in businesses is still limited and uneven across Europe, with most organisations in the pilot or early deployment phase.[137]

Workshop findings reinforce these patterns. As highlighted in the previous chapter (section 6.2.2), organisations encounter four main barriers:

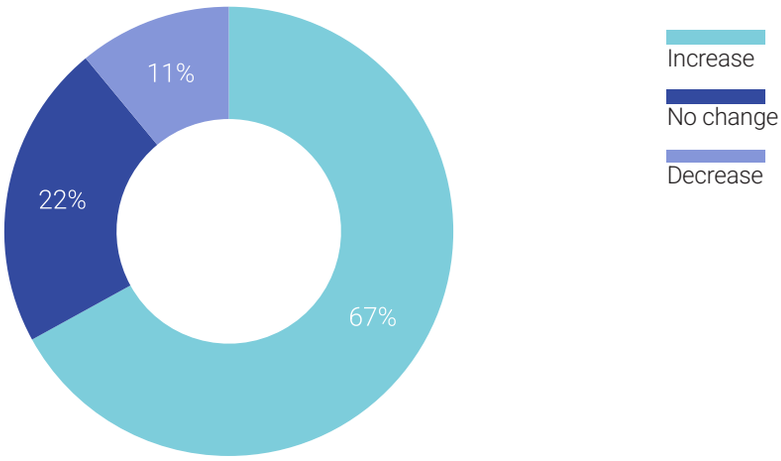
1. **People:** limited AI literacy and resistance to change
2. **Process:** weak governance and incompatible legacy workflows
3. **Technology:** issues with data quality and system integration
4. **Policy:** regulatory uncertainty and ethical concerns

These challenges differ by firm size. While SMEs face resource constraints, larger firms struggle with organisational complexity and change management.

Despite these constraints, AI is expected to transform rather than reduce workforce demand across digital specialist occupations. The ICT Skills in Ireland Survey found that 67% of organisations expect an increase in demand for advanced digital skills overall (Figure 55). Only 11% expect a reduction, while 22% anticipate no change, pointing to a clear trend of upskilling rather than job loss.

136 Artificial Intelligence Information Society Statistics - Enterprises 2024 - Central Statistics Office
137 European Commission, DESI 2024 report

Figure 55: **Overall Expected Impact of AI and Automation Solutions on Demand for Advanced Digital Skills**



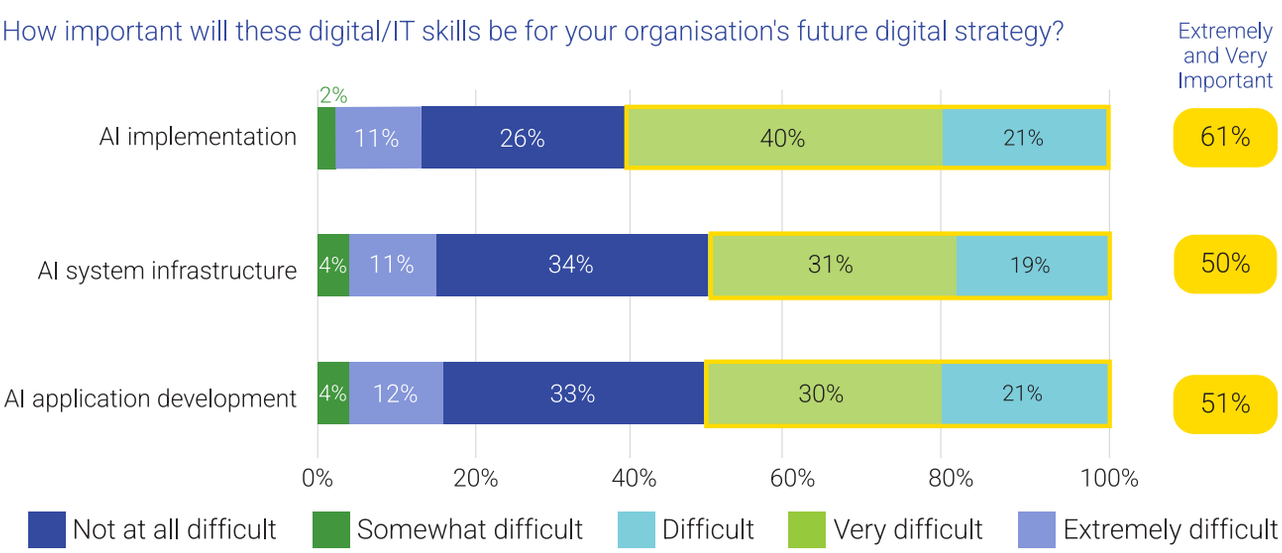
Source: ICT Skills in Ireland Survey, August 2025

At the same time, organisations predict a significant decline in demand for certain skill areas. Basic digital skills, such as word processing and data entry, are expected to see the sharpest reduction (55%), followed closely by programming and coding (53%). This reflects the growing ability of AI tools to automate routine tasks and even generate code, reducing reliance on traditional programming roles. Systems administration and IT operations and data analytics are also projected to decline, suggesting that automation will increasingly handle repetitive technical tasks.

As highlighted in Chapter 4 of this report, evidence shows machine learning roles are among the fastest-growing digital specialist occupations; data engineering is foundational to AI deployment; and demand is shifting from experimentation to operationalisation. Survey data confirms that AI implementation skills are now the top priority, with 61% of organisations rating them as "very" or "extremely important" (Figure 56). This reflects the shift from building AI systems to deploying and integrating them into business workflows.

Closely related skills include AI application development (51%); and AI system infrastructure (50%). This indicates that organisations increasingly prioritise practical integration and business alignment over purely technical development. Overall, the evidence points to a clear structural shift: AI is reducing demand for routine tasks; it is increasing demand for higher-level technical and strategic capabilities; and organisations must move from experimentation to scaled deployment.

Figure 56: **Relevance of Core AI Skills for Future Digital Strategies**

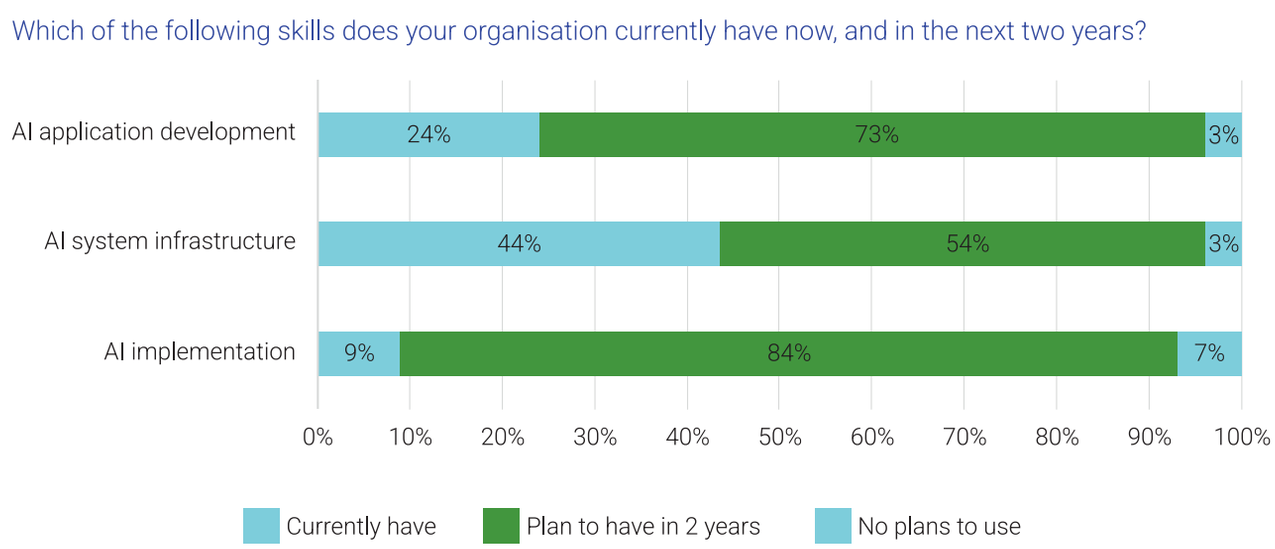


Source: ICT Skills in Ireland Survey, August 2025

7.3 Supply-Demand Gaps

Despite strong demand, there is a significant gap between the importance of AI skills and their current availability. The most critical skill area—AI implementation—is currently present in only 9% of organisations (Figure 57), while 84% plan to develop this capability within the next two years. Similar patterns apply across other areas: AI application development: 24% current availability, 73% planned growth; and AI system infrastructure: 44% current availability, 54% planned growth.

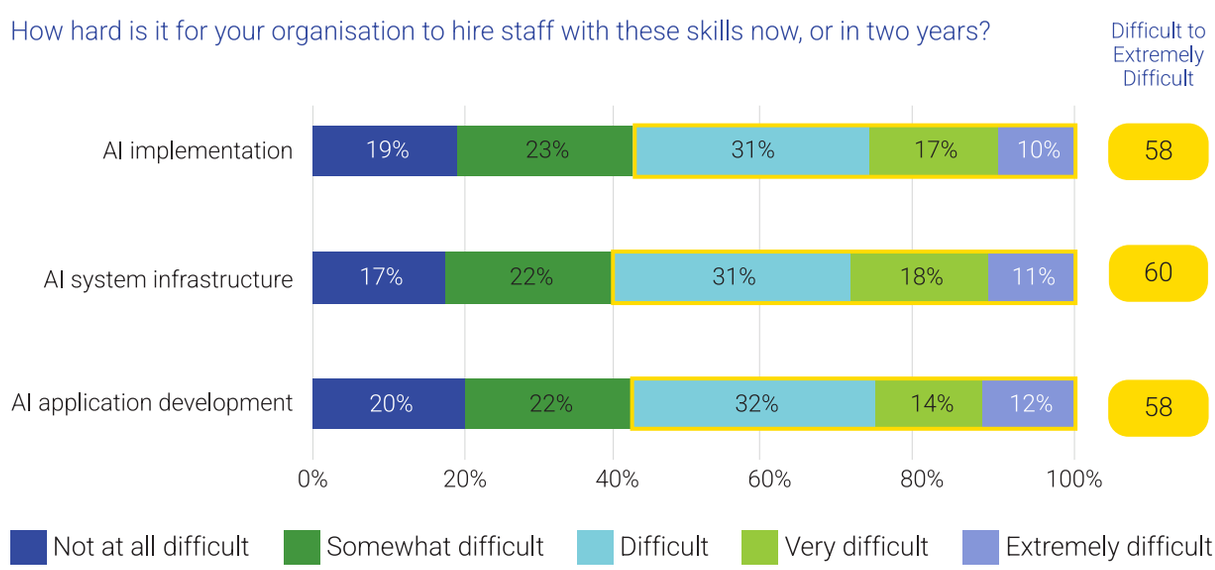
Figure 57: **Current and Future Availability of AI Skills**



Source: ICT Skills in Ireland Survey, August 2025

Recruitment challenges are also acute. For AI implementation skills—the most critical category—58% of organisations expect hiring to be difficult or very difficult (Figure 58). Comparable challenges exist for infrastructure (60%) and application development (58%).

Figure 58: **Difficulty to Hire Staff with AI Skills - Now and in Next Two Years**

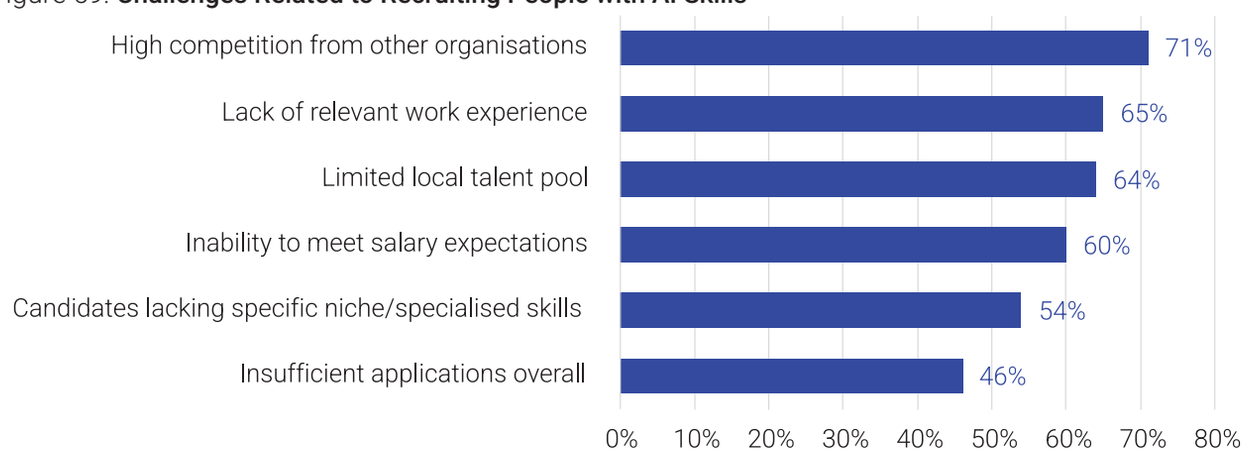


Source: ICT Skills in Ireland Survey, August 2025,

In summary, this confirms that organisations are in early-stage capability building, with the next two years expected to be pivotal, and underscores both urgency of addressing the skills gap. The combination of high strategic importance, low current availability, and anticipated hiring difficulty suggests a looming skills bottleneck that could slow down Ireland's progress in operationalising AI.

The reasons Irish organisations anticipate these difficulties hiring AI-related talent are multifaceted, with the most cited challenge being high competition from other organisations, reported by 71% of respondents (Figure 59). This is followed by: lack of relevant work experience (65%); limited local talent pool (64%); inability to meet salary expectations (60%); shortage of niche skills (54%); and insufficient applicant numbers (46%). Together, these factors indicate a structural skills bottleneck, with demand significantly outpacing supply.

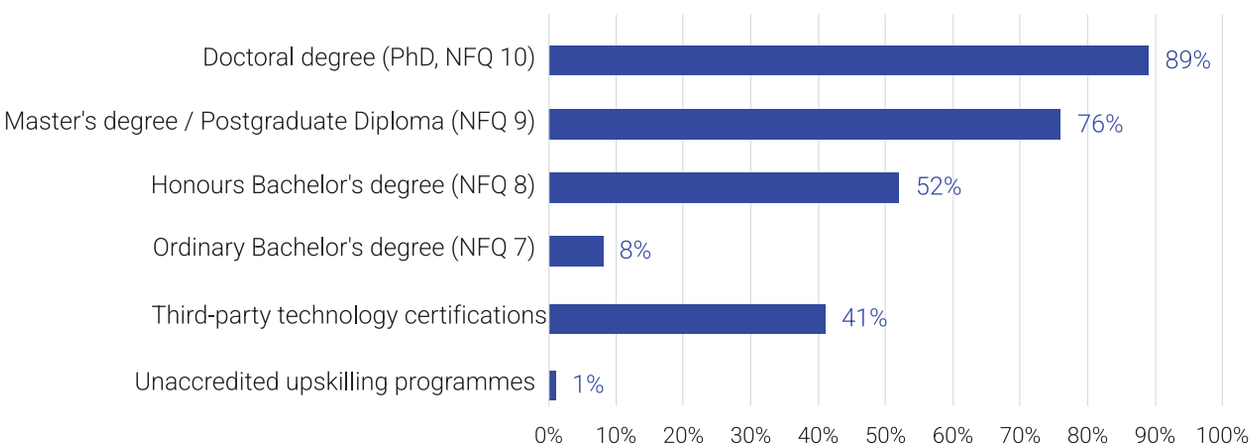
Figure 59: **Challenges Related to Recruiting People with AI Skills**



Source: ICT Skills in Ireland Survey, August 2025

These recruitment challenges are further exacerbated by high educational expectations of firms. Irish organisations strongly associate AI capability with advanced qualifications. Doctoral degrees (PhD) are considered the most relevant, cited by 89% of respondents, followed by master's degrees or postgraduate diplomas (76%) (Figure 60). By contrast, short-form or lower-level qualifications are seen as insufficient.

Figure 60: **Expected Qualifications/Certifications to Obtain AI Skills**



Source: ICT Skills in Ireland Survey, August 2025

While this emphasis on education ensures depth of expertise, it also limits the available talent pool, as the most sought-after candidates often hold advanced degrees, a segment of the workforce that is inherently limited in size. This exacerbates talent shortages unless complemented by alternative upskilling routes.

In summary, the combination of high demand, limited supply, and high qualification expectations creates a significant constraint on scaling AI adoption.

7.4 High-Demand AI Roles in Ireland

The next phase of digital transformation in Ireland will depend on the ability to embed AI into core business processes. This requires a workforce equipped with advanced, specialised skills across multiple domains. The core AI roles emerging in Ireland are shown in Table 11 below (see Appendix 4 for more detail).

Table 11: **Core AI Roles Emerging in Ireland**

AI Application Developer	AI Product Manager
AI Systems and Infrastructure Engineer	Prompt Engineer
AI Implementation Engineer	AI Security Engineer
Machine Learning Engineer	AI Governance and Risk Specialist
Data Scientist / AI Analyst	Chief AI Officer / Strategy Lead

Source: IDC and Huawei, ICT Job Roles and Skills in the Intelligent World

The emerging AI workforce landscape in Ireland reflects the following trends:

1. a strong demand for technical infrastructure and operational roles (e.g. implementation engineers);
2. growth in governance and compliance roles, driven by EU AI regulation;
3. the rising importance of leadership and strategy roles as organisations scale AI adoption; and
4. a decline in entry-level roles, with demand shifting toward mid- and senior-level expertise.

Overall, the AI workforce is becoming more specialised, more interdisciplinary, and more focused on operational execution rather than experimentation.

7.5 Beyond Technical AI Skills

Developing AI capabilities within organisations requires navigating a complex skills landscape that spans technical, analytical, and governance dimensions. Together, these three skill domains illustrate the multidimensional nature of AI readiness and the need for balanced workforce development strategies other than pure AI technical skills.

- **Technical and Engineering Skills:** These form the foundation for AI deployment, including: AI implementation; application development; and systems infrastructure. These skills underpin current and future AI adoption.
- **AI Literacy Skills:** AI literacy refers to the ability to: understand AI systems; use AI tools effectively; and integrate AI into everyday work. OECD data (Table 12) shows that AI literacy is evolving rapidly. Key trends include: the shift from model-specific knowledge (e.g. ChatGPT) to multi-platform literacy; the growth of AI-enabled productivity tools (e.g. Copilot); the expansion of prompting skills beyond specialists to general workers; and a movement toward enterprise-level AI platforms. This reflects a broader transition from isolated tool use to workflow-level AI integration.

- **AI Governance and Ethics Skills:** As AI adoption increases, governance becomes critical. Key areas include regulatory compliance (e.g. EU AI Act); ethical risk assessment, transparency and accountability; and public trust and engagement. An analysis of Irish policy literature reveals key governance skill clusters, including regulatory and compliance skills, ethical AI design and oversight, public sector governance and procurement; organisational risk management; public engagement and trust-building; and standards and certification.[138] These skills are increasingly essential across sectors, particularly given Ireland's regulatory environment and commitment to trustworthy AI.

Table 12: **Fastest Growing AI Literacy Skills in OECD Countries, 2023-2024**

Rank	2023	2024
1	GPT-4	Generative AI Tools
2	ChatGPT	Anthropic Claude
3	Prompt Engineering	Microsoft Copilot Studio
4	Google Bard	Microsoft Copilot
5	GitHub Copilot	AI Prompting
6	Midjourney	LLaMA
7	Stable Diffusion	Google Gemini
8	DALL-E	Generative AI Studio
9	GPT-3	GitHub Copilot
10	Generative Art	AI Builder

Source: OECD.AI, data from LinkedIn Economic Graph

The evolution of AI adoption and use is also visible across four main skill clusters.

- First, **foundation model literacy** is expanding beyond single providers toward diverse model ecosystems.
- Second, **platform and productivity tool literacy** is growing, with workplace-integrated tools such as Microsoft Copilot and AI Builder becoming central to productivity.
- Third, **prompting and orchestration skills** are broadening from specialised "prompt engineering" to more accessible "AI prompting," indicating wider adoption among general workers.
- Finally, **creative and generative media skills** are shifting from experimental tools to enterprise-level platforms, signalling a move toward professional, business-oriented use cases.

These trends are particularly relevant for Ireland, where organisations are expected to move beyond basic familiarity with tools like ChatGPT toward more advanced capabilities, including workflow automation, cross-platform integration, and sophisticated prompting techniques.

138 See Appendix 4 for a table showing more detail on the roles and skills involved.

7.6 Key Findings

This chapter highlights that AI is playing an increasingly significant role in Ireland's labour market, with most jobs exposed to AI and demand for AI-related skills growing rapidly. Ireland's workforce is entering a **transitional phase of AI adoption**, where awareness and experimentation are high, but full-scale integration remains limited. Survey evidence shows that 68% of organisations are either piloting AI (33%) or regularly using AI in select projects (35%), while only 18% have fully integrated AI tools into core processes. This indicates that although AI is widely recognised as transformative, organisations face barriers in scaling its use.

A key finding is that **AI is reshaping rather than reducing labour demand for digital specialists**. Around 67% of organisations expect increased demand for advanced digital skills, particularly in areas such as AI implementation, data science, and automation. At the same time, demand for routine or basic digital skills is expected to decline sharply (e.g. 55% for basic tasks and over 50% for traditional coding), reflecting automation of repetitive functions.

However, there is **a significant gap between demand and available skills**. For example, only 9% of organisations currently have AI implementation capabilities, despite it being the most critical skill area, with 84% planning to develop it within two years. Similar gaps exist in AI application development and infrastructure. This mismatch is compounded by recruitment challenges, with approximately 59% of firms expecting difficulty hiring AI talent, driven by strong competition from other organisations (71%), lack of relevant work experience (65%) and a limited talent pool (64%).

The chapter also highlights a **shift in the types of roles required**. Future demand will centre on specialised and operational AI roles, such as AI implementation engineers, machine learning specialists, and AI governance experts, alongside increasing demand for senior leadership and strategy roles to guide AI adoption.

Finally, AI **capability is presented as multi-dimensional**, extending beyond technical skills to include AI literacy across the workforce and governance, ethics, and regulatory skills. As AI becomes embedded in decision-making, organisations will require balanced capabilities spanning technical deployment, everyday use, and responsible oversight. Overall, the findings point to a rapidly evolving skills environment where upskilling, talent pipeline development, and organisational readiness will be critical to realising AI's benefits.

8

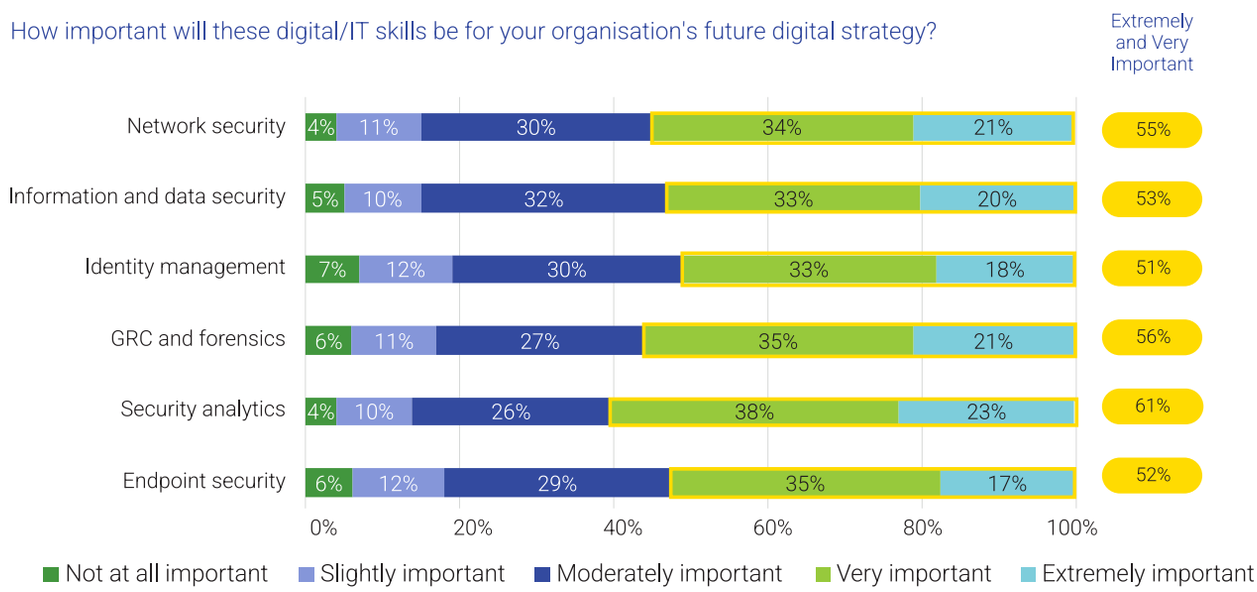
Cybersecurity Skills Outlook

8.1 Key Cybersecurity Skills and Challenges to Recruit

Cybersecurity is Ireland's fastest-growing digital domain, with demand projected to grow at 11% annually through 2030 (see Chapter 4). Survey results confirm that cybersecurity skills are central to organisations' future digital strategies.

Security analytics ranks as the most critical domain, with 61% of respondents rating it "very" or "extremely important", reflecting rising demand for advanced monitoring and threat detection in cloud and AI-driven environments (Figure 61). GRC (Governance, Risk, Compliance) and forensics follow at 56%, highlighting regulatory pressures and the need for structured incident management. Foundational areas—network security, data security, endpoint security, and identity management—also remain essential.

Figure 61: **Relevance of Core Cybersecurity Skills for Future Digital Strategies**

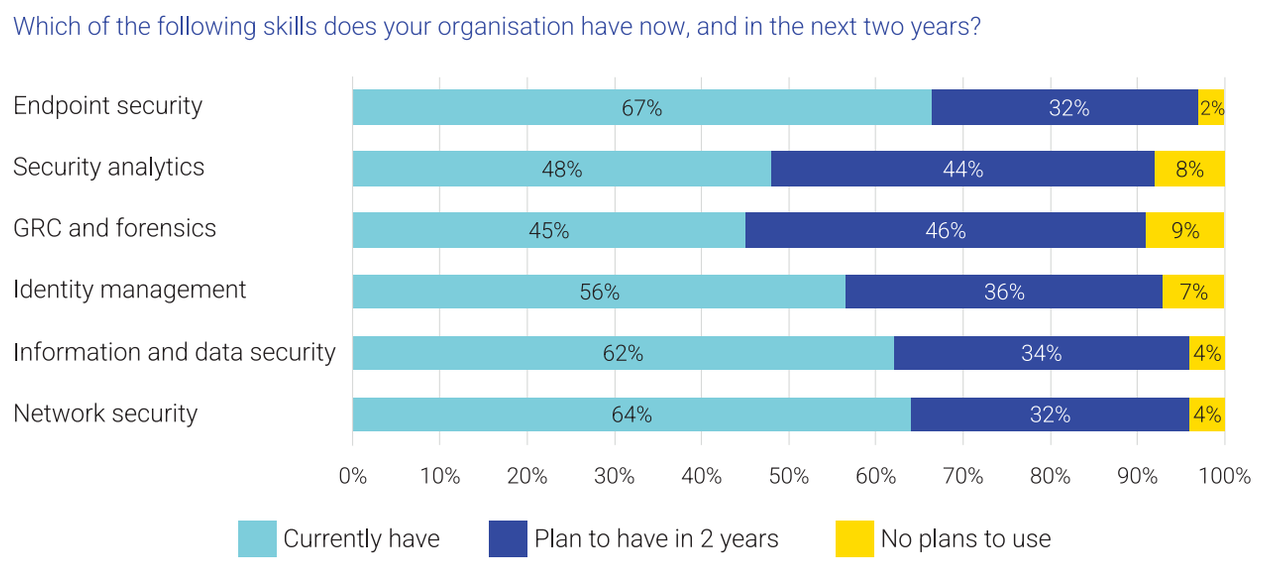


Source: ICT Skills in Ireland Survey, August 2025

As organisations expand cloud and data infrastructure, the attack surface —the number of potential entry points that can be exploited by cyber attackers - increases, requiring integrated and proactive security approaches. The prominence of analytics and GRC reflects a shift from reactive defence toward risk-based governance aligned with EU frameworks such as the Cybersecurity Act and NIS2 Directive. In relation to current vs future capability – Irish organisations report strong capability in traditional areas: endpoint security, 67%; network security, 64%; and data security, 62% (Figure 62).

However, gaps exist in advanced domains. In particular: security analytics, available in less than 50% of firms, with 44% planning to acquire within two years; GRC/forensics, with 45% available and 46% planning to build; and identity management: 56% available, 36% planning growth. These figures highlight a transition toward proactive, intelligence-driven security capabilities.

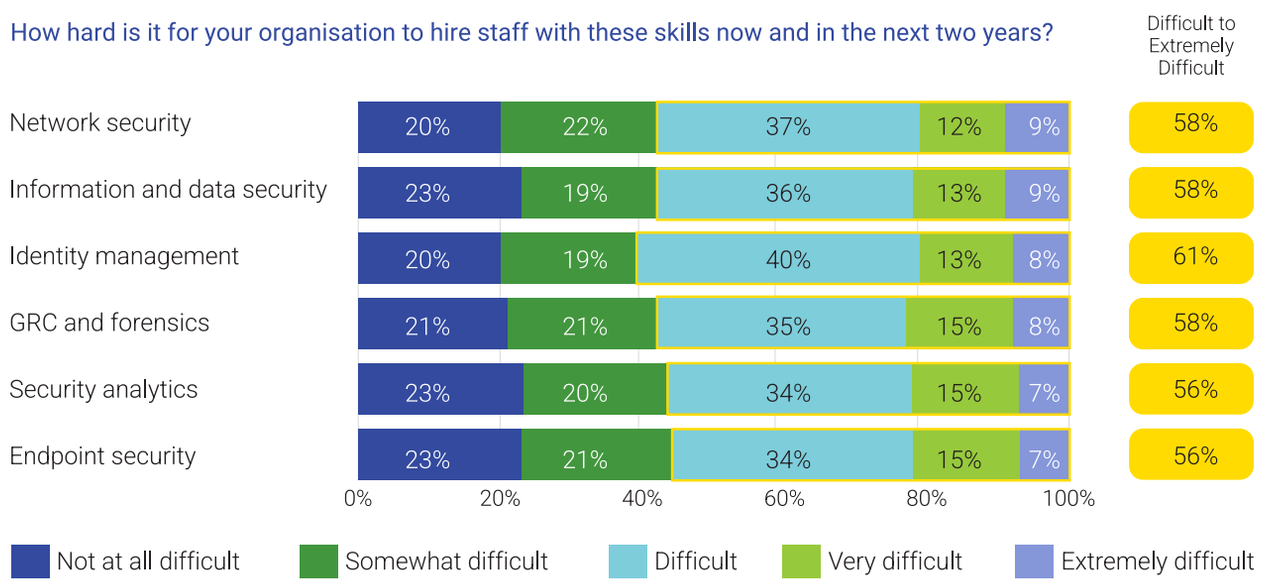
Figure 62: **Current and Future Availability of Cybersecurity Skills**



Source: ICT Skills in Ireland Survey, August 2025

Recruitment challenges are being felt quite strongly, with all of the listed skills showing more than 56% of respondents reporting from difficult to extremely difficult to hire (Figure 63). This is particularly true for identity management, with 61% of survey respondents reporting difficulty hiring; and 58% report difficulties hiring for network security, information and data security and GRC/forensics.

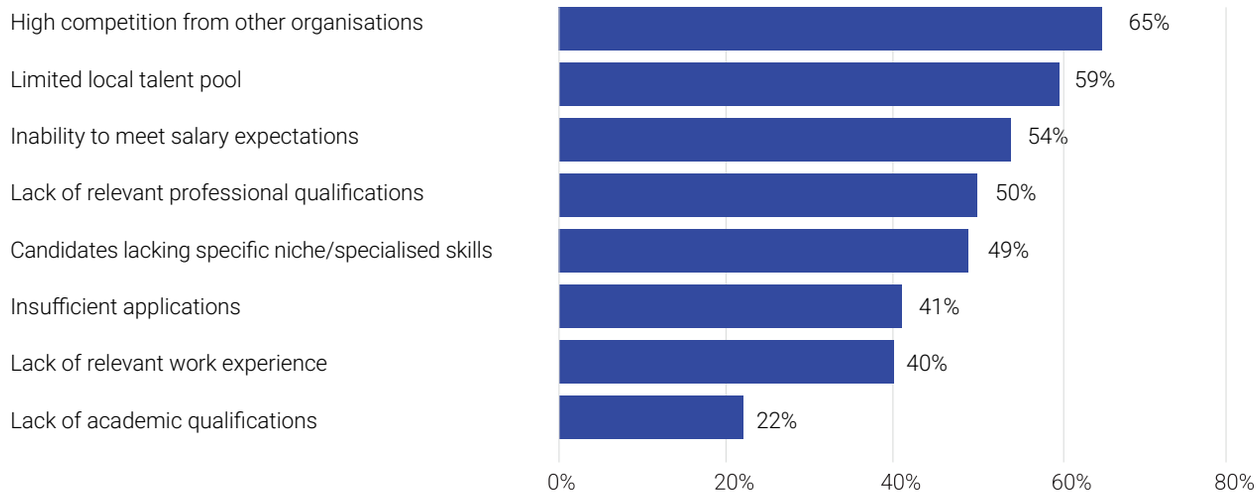
Figure 63: **Difficulty to Hire Staff with Cybersecurity Skills**



Source: ICT Skills in Ireland Survey, August 2025

The main difficulties experienced by recruiters are shown in Figure 64, with key recruitment barriers including: competition for talent, 65%; limited local talent pool, 59%; and salary expectations reported by 54% of respondents. Additional issues include lack of relevant qualifications, 50%; missing specialised skills, 49%; insufficient applications, 41%; and lack of experience, 40%. Only 22% cite lack of academic qualifications, indicating that employers prioritise hands-on experience and certifications.

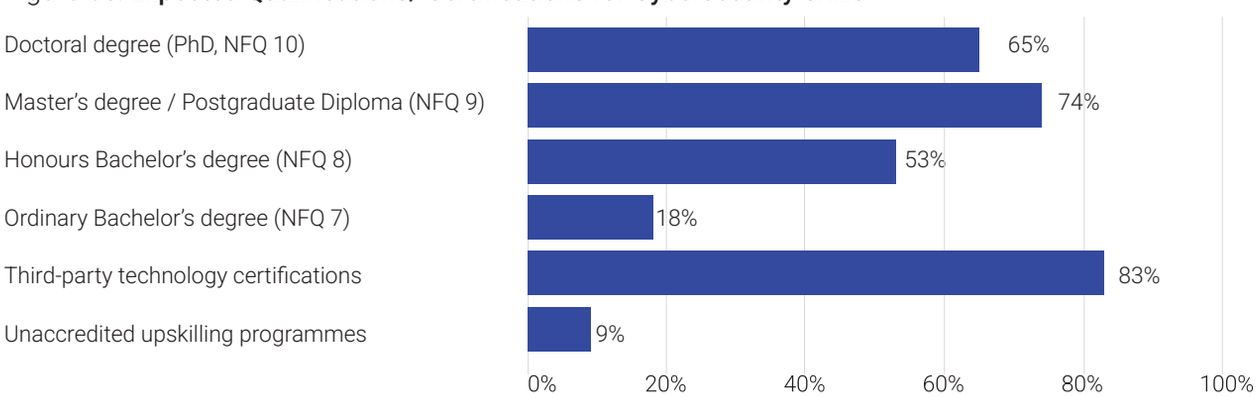
Figure 64: **Challenges Related to Recruiting People with Cybersecurity Skills**



Source: ICT Skills in Ireland Survey, August 2025

Cybersecurity differs from AI in that third-party certifications are most valued (83%), reflecting the importance of practical vendor-specific expertise (Figure 65). Academic pathways remain important: with 74% of respondents stating that cybersecurity skills can be earned via master's/postgraduate (NFQ 9) programmes; PhD (NFQ 10) qualifications are valued by 65% of respondents; and honours degrees (NFQ 8) by 53%. Entry-level or short programmes are seen as insufficient for advanced roles.

Figure 65: **Expected Qualifications/ Certifications for Cybersecurity Skills**



Source: ICT Skills in Ireland Survey, August 2025

8.2 High-Demand Security Roles

Cybersecurity roles in Ireland span three broad categories: operations, governance (GRC), and leadership, with the labour market characterised by increasing specialisation and persistent hiring difficulty. The following list briefly describes the top ten roles (Including emerging specialist roles), with additional detail on core mission, competencies, tools and relevance for Ireland available in Appendix 5.

- **Security Management Specialists** translate regulatory requirements into policies and controls, operationalising frameworks such as GDPR, NIS2, and DORA. Their importance reflects the under-provision of GRC capabilities.
- **Cybersecurity/Information Security Engineers and Analysts** represent the operational backbone, implementing and managing controls such as SIEM, EDR, and cloud security platforms. They are critical in translating the priority of security analytics into 24/7 capabilities.

- **SOC Analysts** provide continuous monitoring and incident triage, supporting the scaling of security analytics maturity across organisations.
- **Incident Responders (IR)** handle containment, recovery, and forensic investigation, addressing the increasing complexity and potential impact of cloud and AI environments.
- **Penetration Testers / Ethical Hackers** simulate adversaries, supporting proactive security and zero-trust architecture adoption.
- **Threat Hunters and Intelligence Analysts** directly address the analytics skills gap, requiring advanced expertise in hypothesis-driven detection and MITRE ATT&CK mapping.
- **GRC and Risk Consultants** manage compliance and regulatory alignment, reflecting increased demand driven by EU legislation.
- **Cybersecurity Managers and CISOs** provide strategic direction, governance, and investment leadership, with particularly acute competition at senior levels.

Emerging specialist roles include:

- **Cloud Security Architects**, who design secure multi-cloud infrastructures
- **AI Security Engineers**, who secure AI pipelines and models

These roles reflect the convergence of cybersecurity with cloud, AI, and data disciplines, as well as rising demand for mid-senior expertise, particularly in analytics, cloud, and regulatory compliance, where hiring difficulty is highest.

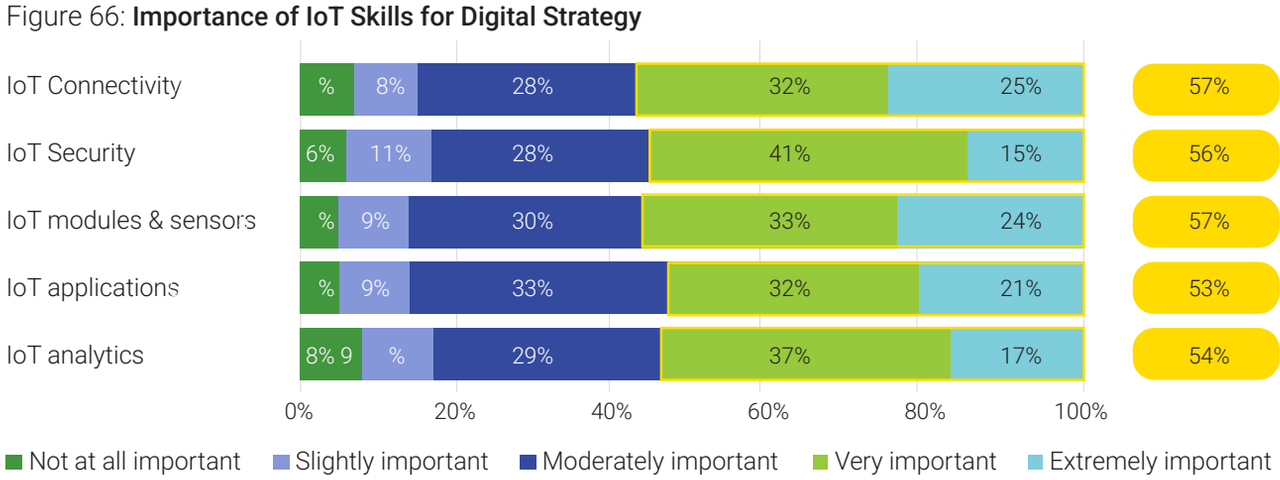
8.3 Emerging Threat Landscapes

The cybersecurity landscape is evolving rapidly as organisations adopt interconnected technologies. Threats are becoming more distributed, automated, and sophisticated, requiring new skill sets beyond traditional security domains.

8.3.1 IoT Security

IoT security is one of the highest-priority IoT-related skill domains for Irish organisations, with 56% of respondents rating it as “Very” or “Extremely important” to their future digital strategy. The data suggests that Irish organisations increasingly see IoT deployments not as isolated technical projects but as part of broader digital transformation programmes where security maturity directly influences scalability and compliance.

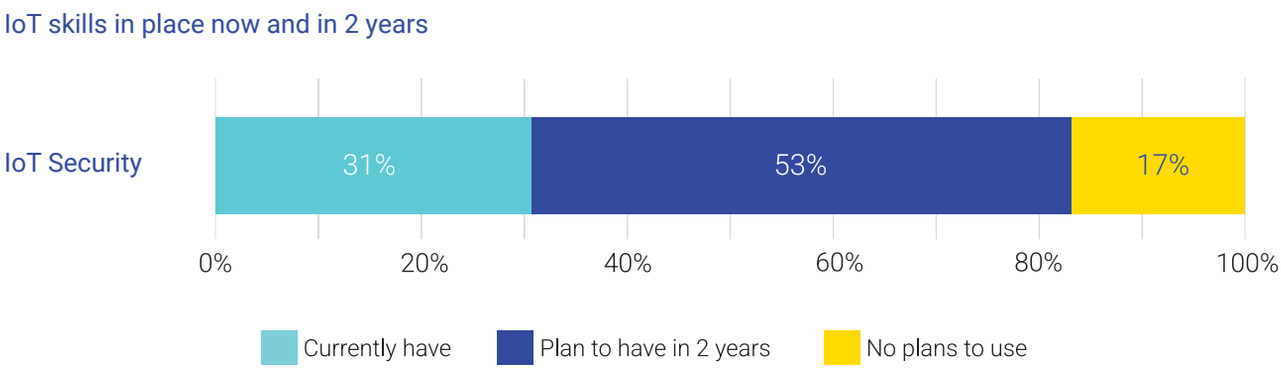
Figure 66: **Importance of IoT Skills for Digital Strategy**



Source: ICT Skills in Ireland Survey, August 2025

Demand drivers include integration into critical infrastructure (energy, transport, utilities); regulatory obligations under NIS2; and the shift from pilot to large-scale deployments. Despite this importance, only 31% of respondent organisations currently have IoT security capability, but 53% plan to develop it, signalling a substantial planned expansion in demand for these skills (Figure 67).

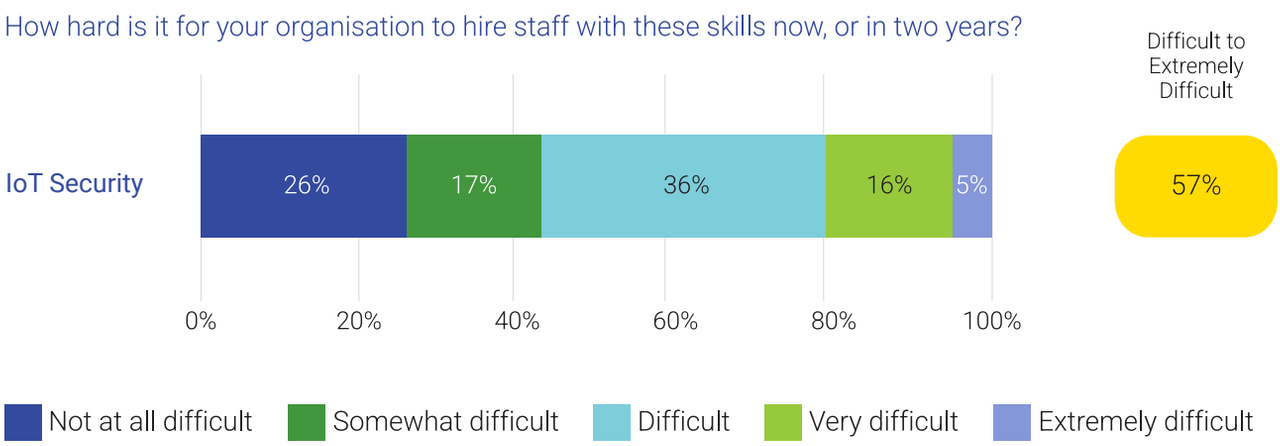
Figure 67: **Current and Future Availability of IoT Skills**



Source: ICT Skills in Ireland Survey, August 2025

This gap is compounded by hiring challenges, with 57% reporting recruitment difficulty (Figure 68). The scarcity of talent is driven by the interdisciplinary nature of IoT security, which requires expertise in embedded systems; cloud architecture; OT–IT integration; and threat modelling across heterogeneous environments. Overall, IoT security represents a critical and rapidly expanding skills gap within Ireland's cybersecurity workforce.

Figure 68: **Difficulty to Hire Staff with IoT Skills**



Source: ICT Skills in Ireland Survey, August 2025

8.3.2 Cloud Infrastructure Protection

Ireland's role as a European cloud hub significantly elevates the importance of cloud security. With over 80 data centres and major hyperscale providers (AWS, Microsoft Azure, Google Cloud), cloud infrastructure is central to national economic resilience. Regulatory developments further reinforce this importance: NIS2 introduces stricter risk management and reporting requirements; and DORA (effective January 2025) imposes ICT risk obligations on financial-sector technology providers.

At a national level, the National Cyber Security Centre (NCSC) 2025 National Cyber Risk Assessment highlights

cloud infrastructure as critical to the resilience of essential services, including healthcare, energy, and finance.[139] Demand for cloud security skills focuses on: identity-first architectures; secure multi-cloud design and segmentation; platform-native controls (e.g., CSPM, CNAPP); and threat-led resilience testing and compliance engineering. These skills are difficult to source because they sit at the intersection of security engineering, DevOps/SRE, and regulatory compliance. As a result, talent shortages create systemic risks, including over-reliance on third-party providers and increased exposure to supply-chain attacks.

8.3.3 AI-Driven Attacks

AI is fundamentally reshaping the threat landscape. It enables large-scale social engineering and deepfake generation; faster, automated attack cycles; and improved adversarial decision-making. The NCSC 2025 National Cyber Risk Assessment highlights increasing systemic risks driven by AI, geopolitics, and supply-chain vulnerabilities. At the same time, AI offers defensive advantages, including real-time anomaly detection; automated threat response; and predictive security analytics. Key emerging AI-driven skills include AI-assisted threat detection; adversarial AI and deepfake analysis; automated incident orchestration; and secure AI system design.

These changes amplify skills shortages in cybersecurity and increase the urgency for Irish organisations to develop AI-ready capabilities, ensuring that both enterprise teams and SMEs can keep pace with rapidly evolving threat environments.

Expectations on AI-driven tooling becoming embedded across security operations, from threat detection and adversary simulation to incident response and forensic analysis, means that each role is experiencing or will experience a shift from manual, reactive tasks toward AI-augmented analytics, automation, and orchestration.

The key roles currently evolving under AI influence are:

- Security Management Specialist
- Penetration Tester/Ethical Hacker
- Threat Hunter/ Threat Intelligence Analyst
- Security Architect /Engineer
- Incident Responder (IR)
- SOC Analyst

Appendix 5 provides additional detail about the key tasks and skills needed for these roles. Across all roles—from SOC Analysts to Incident Responders—tasks are shifting from manual processes to AI-augmented analytics and automation. This transformation increases the urgency for organisations to develop AI-ready cybersecurity capabilities.

8.3.4 Quantum Computing Implications for Cybersecurity

Quantum computing represents a longer-term but highly significant challenge. While large-scale cryptographically relevant quantum computers (CRQCs) are not yet operational, projections suggest they could emerge within 10 years, potentially breaking current encryption standards. The EU has recognised this risk through its PostQuantum Cryptography (PQC) roadmap (June 2025), which requires both migration initiation by 2026 and completion for high-risk systems by 2030.[140]

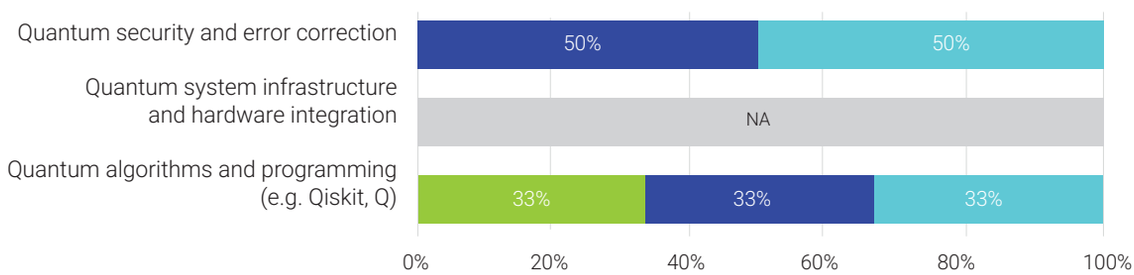
139 National Cybersecurity Centre, 2025 National Cyber Risk Assessment

140 A Coordinated Implementation Roadmap for the Transition to Post-Quantum Cryptography | Shaping Europe's digital future

For Ireland, the implications are amplified by its position as a European data-centre hub. A failure to transition could expose systems to "harvest now, decrypt later" attacks, where encrypted data is stored today for future decryption. Results (Figure 69) show that organisations primarily view quantum technologies through a cybersecurity lens, particularly cryptographic resilience. However, capability development remains limited: quantum skills are largely absent today; and only a minority organisations plan to develop them in the near term. This reflects uncertainty around use cases and return on investment. Nevertheless, given the long lead times required for migration, quantum security must become a strategic priority for the period to 2030.

Figure 69: **Relevance of Quantum Computing Skills for Future Digital Strategies**

How important will these digital/IT skills be for your organisation's future digital strategy?



Source: ICT Skills in Ireland Survey, August 2025

8.4 Key Findings

This chapter highlights a rapidly expanding and increasingly complex cybersecurity skills landscape in Ireland, driven by digital transformation, regulatory pressures, and emerging technologies.

A central finding is that **cybersecurity is Ireland's fastest-growing ICT domain**, with projected demand growth of 11% annually to 2030. Organisations consider cybersecurity a critical pillar of their future digital strategies, with **security analytics emerging as the top priority skill area** (61% rating it highly important). This reflects a shift toward proactive, intelligence-led security approaches in response to increasingly sophisticated and data-driven threats. Governance, Risk, and Compliance (GRC), as well as forensics, are also highly valued, underlining the importance of regulatory compliance and structured incident response.

Despite strong capabilities in traditional areas such as endpoint, network, and data security, **significant skills gaps persist in advanced domains**. Notably, less than half of organisations currently possess security analytics capabilities, while substantial proportions plan to build these skills within the next two years. This indicates an ongoing transition from reactive defence to integrated, risk-based cybersecurity models aligned with EU regulations such as NIS2.

A major challenge identified is **persistent recruitment difficulty across all cybersecurity skill areas**. More than half of organisations report difficulties hiring for every core skill, particularly identity management and GRC roles. The main constraints include strong competition for talent (65%), a limited local talent pool (59%), and high salary expectations (54%). Employers prioritise practical experience and certifications over purely academic qualifications, with third-party certifications (83%) seen as the most important credential.

The chapter also emphasises increasing **role specialisation within cybersecurity**, spanning operations, governance, and leadership. Key roles include security management specialists, security engineers, SOC analysts, incident responders, and GRC specialists, alongside emerging roles such as cloud security architects

and AI security engineers. These emerging roles reflect the convergence of cybersecurity with cloud computing, AI, and data systems, and are associated with particularly acute skills shortages.

In terms of the **evolving threat landscape**, three areas stand out. First, IoT security is identified as a rapidly growing priority, with low current capability (31%) but strong planned investment, highlighting a major skills gap. Second, cloud infrastructure protection is critical due to Ireland's role as a major European cloud hub, with security requirements driven by both economic importance and regulatory obligations. Third, **AI is transforming cyber threats**, enabling automated attacks, deepfakes, and large-scale social engineering, while also offering defensive capabilities such as real-time analytics and automation.

Finally, **quantum computing presents a medium-term but strategic cybersecurity challenge,** with the potential to undermine current encryption within the next decade. Although current capability is limited, early preparation is essential due to long transition timelines and EU policy requirements.

Overall, the chapter concludes that Ireland faces **strong demand** but a widening cybersecurity skills gap, particularly in advanced and emerging areas, requiring urgent investment in talent development, certifications, and AI-ready security capabilities.

9

Findings & Conclusions

9.1 Key Findings

The analysis undertaken for this study highlights a digital skills ecosystem that remains fundamentally strong but faces increasing pressures arising from technological change, evolving employer requirements and sustained growth in demand for advanced digital specialist skills in advanced and specialised areas rather than traditional ICT occupations.

Finding 1: Demand for digital specialists will continue to grow strongly to 2030

Demand forecasting indicates continued expansion of Ireland's digital specialist workforce under all scenarios. Employment is projected to increase from approximately 168,800 digital specialists in 2025 to between 192,900 and 222,700 by 2030, representing net growth of between 24,100 and 53,900 additional roles. **Growth is being driven by digital transformation, AI adoption, cloud technologies, cybersecurity requirements and increasing data-intensive business activity.**

Finding 2: A quantitative skills shortfall is emerging, but with high uncertainty

The demand-supply analysis indicates that Ireland is likely to experience a persistent shortfall in digital specialist supply under most growth scenarios. Under the baseline scenario, annual shortages are projected to rise to approximately 5,500 specialists per annum by 2030, increasing to approximately 7,700 annually under the high-growth scenario. However, under the low-growth scenario, a small excess is projected. If either of the growth scenarios are realised, current education, training and migration channels are unlikely to fully meet future demand without intervention.

Finding 3: Growth is concentrated in high-skill specialist domains

Demand growth is increasingly concentrated in advanced and specialised areas rather than traditional ICT occupations. Cybersecurity is projected to be the fastest-growing domain, expanding at approximately 11% CAGR to 2030, while strong growth is also expected in software engineering, machine learning, AI implementation, cloud architecture, data engineering and advanced analytics. By contrast, routine support and operational roles are expected to experience slower growth or decline as automation increases.

Finding 4: Supply needs to adapt to change

Supply needs to continue adapting to technology change and employer needs, in particular for technicians and areas in which demand is declining. Ireland's education and training system has expanded significantly. **Total ICT awards increased by 40% between 2019 and 2024,** reaching 10,358 awards, while an estimated 7,981 graduates entered employment in 2024. **Employers consistently report shortages in practical experience, specialised technical skills, business understanding and job readiness.** It is essential that employers themselves become more proactive in providing job placements and internships for graduates and work experience for undergraduates. Equally, the supply of skills, and the curricula of courses, need to evolve along with technology in order to remain relevant.

Finding 5: AI is transforming skills requirements across the economy

AI is reshaping both the volume and nature of digital skills demand. While 67% of organisations expect demand for advanced digital skills to increase, employers anticipate declining demand for routine digital tasks and traditional coding activities and entry-level roles more generally posing risks to future talent pipelines and the ability to meet future demand for advanced digital skills. Significant capability gaps remain: **only 9% of organisations currently report having AI implementation capability, despite 84% intending to develop it within two years.** Demand is shifting towards AI implementation, machine learning, AI governance, AI risk management and AI-enabled business transformation roles.

Finding 6: Transversal skills gaps becoming as important as technical skills gaps

Evidence from surveys and workshops highlights growing demand for multidisciplinary "T-shaped" professionals combining technical expertise with communication, critical thinking, business understanding,

adaptability and leadership skills. Employers report significant gaps among graduates in critical thinking (49%), communication (40%) and adaptability (30%). Emerging technologies are also increasing demand for governance, ethics, compliance, risk management and change-management capabilities.

Finding 7: Weakening entry-level pathways and gender imbalances

AI-driven automation is altering traditional entry-level career pathways. Many organisations report reducing junior recruitment while increasing expectations for graduate readiness and AI capability. This creates risks for future talent pipelines, knowledge transfer and workforce succession and the risk that projected rising demand for highly advanced digital skills may not be met without intervention to address. This is potentially quite a significant threat to future pipelines. At the same time, women remain underrepresented, accounting for only 28.1% of ICT awards and approximately 21.6% of honours degree graduates, further limiting the potential talent pool.

9.2 Recommended Actions

To address the issues that have been highlighted above, a number of actions are recommended. Delivery of these actions will require a combination of activities including increased collaboration between employers and education and training providers, work across Government and State agencies and further policies directly targeting these areas of action.

Action 1: Expand capacity in high-growth priority domains

Increase higher education, FET, apprenticeship and conversion programme capacity in areas where future shortages are expected to be most acute, particularly: Artificial Intelligence and Machine Learning; Cybersecurity; Data Engineering and Data Science; Cloud and Platform Engineering; and Semiconductor and Quantum-related technologies. This expansion should be aligned with forecast demand and reviewed regularly.

Action 2: Review curricula of digital courses

Regularly review curricula to ensure that digital specialist courses, including courses for ICT technicians, are keeping pace with technology developments and enable pathways into digital specialist careers. This is needed to respond to the automation of some of the technician roles, rapid technology development and the need to support digital transformation.

Action 3: Strengthen work-based learning and industry engagement

Expand structured work placements, internships, apprenticeships, project-based learning and industry partnerships to improve graduate readiness. Particular emphasis should be placed on ensuring learners gain practical experience with enterprise-scale technologies and real-world digital transformation projects. To ensure that every graduate entering the workforce has had an opportunity for work-based learning, employers need to offer 1 work-based opportunity for every 10 employees.

Action 4: Enable upskilling at scale in AI, cybersecurity and data

Reflecting the fact that close to 200,000 digital specialists will need to upskill on a regular basis, expand modular, stackable and employer-informed provision in high-pressure specialisms. Expand and strengthen specialist FET Centres of Excellence, supporting regional and national capability. Priority areas should include AI implementation, AI governance, machine learning engineering, data engineering, cloud security, security analytics, GRC, incident response, IoT security and post-quantum cryptography readiness. Provision should be accessible to both new entrants and experienced professionals, with clear pathways from short courses and micro-credentials into recognised qualifications where appropriate.

Action 5: Build stronger multidisciplinary and business-oriented skills

Education and training programmes should place greater emphasis on communication and collaboration; critical thinking and problem-solving; business and organisational understanding; leadership and change

management; and ethics, regulation and sustainability. These capabilities should be embedded alongside technical content rather than treated as separate subjects.

Action 6: Review collaboration processes between academia and industry

Review the HE and FET institutions' approaches to partnerships between Education and Training providers and enterprises in relation to programme and course content, skills development and work-based learning. This is to identify good practices, streamline processes, and enable greater participation from SMEs.

Action 7: Strengthen talent retention and diversity measures

Policy measures should continue to support expanding participation among underrepresented groups. Particular attention should be given to increasing female participation in digital specialist education and careers; supporting career changers and conversion pathways; expanding regional access to digital opportunities; and retaining international graduates educated in Ireland.

Action 8: Use international talent strategically and strengthen domestic capacity

International recruitment should remain a strategic part of the skills response, particularly for highly specialised and experienced roles where domestic supply cannot scale quickly enough. This should be aligned with domestic talent development, retention of international graduates, clear permit pathways for priority roles, and knowledge transfer into Irish teams. International talent should complement, not substitute for, sustained investment in domestic education, training and career progression.

Action 9: Improve strategic skills intelligence and forecasting

Establish a continuous digital skills monitoring framework that combines labour-market intelligence, employer feedback, education data and technology trend analysis. This would enable more agile responses to rapidly changing skill requirements, particularly in AI, cybersecurity and emerging technology domains.

9.3 Overall Conclusions

Ireland enters the second half of the decade from a position of considerable strength. The country possesses a large and internationally competitive digital workforce, a strong higher education sector, growing training infrastructure, and a globally significant technology ecosystem. Digital specialists already account for approximately **6.3% of total employment**, placing Ireland among the leading performers in Europe.

However, the evidence presented throughout this study demonstrates that future challenges will be increasingly characterised by the complexity and speed of technological change rather than by workforce expansion alone. **Demand for digital specialists is expected to continue growing** strongly to 2030, particularly in AI, cybersecurity, software engineering, cloud computing and advanced data roles. At the same time, automation and AI are reshaping traditional career pathways and changing the skills required across virtually all digital occupations.

The central conclusion of the study is that Ireland's future digital skills challenge is **not simply a shortage of people.** It is a challenge of **ensuring that the right skills are available, at the right level, in the right locations, and at the right time**. Quantitative shortages are likely to emerge in specialised domains, but qualitative skills mismatches are already evident across much of the labour market.

Addressing these challenges will require a **coordinated response** involving government, education providers, employers and skills agencies. **Continued investment** in advanced specialist provision, lifelong learning, work-based learning, AI capability, cybersecurity skills and talent diversity will be essential.

If these actions are implemented successfully, Ireland will be well positioned to maintain its status as a leading digital economy, to support innovation and enterprise growth, and to develop a resilient, adaptable and future-ready digital workforce through to 2030 and beyond.

Appendices

Appendix 1 - European Digital Skills Policy Context

A1 Overview of Recent Key Policy Actions

The European Union has developed an ambitious digital transformation agenda to strengthen competitiveness, wellbeing and strategic sovereignty. The Draghi Report links Europe's competitiveness gap to underinvestment in advanced technologies and skills, while the Letta Report calls for a "fifth freedom" for research, innovation, education and digital skills, reinforcing the need to expand the supply of digital specialists. [141]

A1.1 The European Digital Innovation Hubs Network: Capacity Building and Implementation in Ireland

The European Commission established the European Digital Innovation Hubs (EDIH) Network as a practical implementation mechanism. It comprises 151 EDIHs funded through the Digital Europe Programme and 76 additional hubs with Seal of Excellence designation, covering EU Member States and candidate countries.[142]

EDIHs act as regional access points for SMEs and public bodies, offering digital maturity assessment, "Test Before Invest" facilities, technical advice, training, networking and access-to-finance support in areas such as AI, high-performance computing, cybersecurity and advanced digital skills.

In Ireland, the EDIH Network is delivered through four designated hubs, selected by DETE and implemented through Enterprise Ireland:[143] CeADAR (Artificial Intelligence & Data Analytics), FactoryXChange (advanced/ industrial digitalisation and manufacturing), ENTIRE (IoT, sensors, cybersecurity and data), and Data2Sustain (digitalisation for sustainability and the circular economy).[144]

A1.2 Comprehensive EU Funding Architecture for Digital Skills Development

EU investment in digital skills is delivered through several instruments, with the Recovery and Resilience Facility (RRF) constituting the largest source of EU funding for the Digital Decade. Recent European Commission analysis estimates that €120.4 billion of RRF investment contributes directly to Digital Decade targets, while 23% of the RRF envelope is allocated to measures supporting the digital transition.[145] Ireland's National Recovery and Resilience Plan totals €1.153 billion, with 34.2% allocated to digital transition measures including the Digital Strategy for Schools, Adult Literacy, Numeracy and Digital Literacy Strategy, higher-level ICT graduate expansion and digital equipment for further and higher education learners.[146]

The Digital Europe Programme funds advanced digital skills training in AI, cybersecurity, high-performance computing and related technologies, including support for Ireland's EDIH participation and specialised EU-level

141 European Commission (2024), The future of European competitiveness – Report by Mario Draghi; Letta, E. (2024), Much More Than a Market: Speed, Security, Solidarity

142 https://european-digital-innovation-hubs.ec.europa.eu/home

143 https://www.enterprise-ireland.com/en/supports/become-more-innovative/european-digital-innovation-hubs

144 Harnessing Digital, The Digital Ireland Framework, 2023 Progress Report

145 https://joint-research-centre.ec.europa.eu/jrc-news-and-updates/digital-investments-eus-recovery-plan-estimated-generate-eur-2192-billion-2026-06-17_en

146 Ireland's National Recovery and Resilience Plan. Europe's contribution to Ireland's recovery

training. [147,148] ESF+ provides over €2 billion for digital skills reforms across 2021–2027; Ireland's Employment, Inclusion, Skills and Training (EIST) Programme totals €1.081 billion, with around €281 million for skills, upskilling, reskilling and lifelong learning through Springboard+, the Human Capital Initiative, Skillnet Ireland and related supports.[149,150]

Erasmus+ supports ICT use in teaching and learning and Centres of Vocational Excellence,[151] while the European Regional Development Fund, Cohesion Fund, Just Transition Mechanism and European Investment Fund complement digital infrastructure, SME digitalisation and workforce upskilling in Ireland.[152]

A1.3 Specialised Initiatives for Critical Skill Domains

The EU has also created targeted initiatives for critical domains. The Cybersecurity Skills Academy, launched in 2023, addresses the cybersecurity talent gap through industry-education partnerships, quality standards and certification, diversity measures and career awareness.[153] In Ireland, this agenda is supported by the National Cyber Security Centre (NCSC) and the National Cybersecurity Coordination and Development Centre, Ireland (NCC-IE), Ireland's national coordination centre within the European Cybersecurity Competence Centre network.[154]

NCC-IE complements delivery mechanisms including Cyber Skills, Cyber Ireland, Technology Ireland ICT Skillnet and IMI's Leading in Cybersecurity,[155] linking EU priorities with Irish training, SME participation and cross-border collaboration.[156] The Digital Skills and Jobs Platform[157] and the Irish Digital Skills and Jobs Coalition[158] support coordination among government, education providers, Skillnet Ireland, industry bodies and enterprise agencies.

Finally, the Leading European Advanced Digital Skills (LeADS) project mapped emerging needs in artificial intelligence, cybersecurity, cloud computing, Internet of Things, data science and quantum computing, giving education and workforce systems evidence to anticipate next-generation skills requirements.[159]

147 https://digital-strategy.ec.europa.eu/en/activities/digital-programme
148 Digital Decade Policy Programme: Ireland's National Strategic Roadmap
149 European Social Fund Plus
150 https://european-social-fund-plus.ec.europa.eu/en/support-your-country/esf-ireland; Launch of Employment, Inclusion, Skills and Training Programme 21-27
151 2024-Erasmus+Programme-Guide_EN.pdf
152 EU Cohesion Policy: €1.4 billion for Ireland's economic and social development and green transition in 2021-2027 - EU Funds
153 Cyber Skills Academy | Digital Skills and Jobs Platform
154 https://www.ncsc.gov.ie/ncc-ie/
155 https://www.imi.ie/product/leading-in-cyber-security/
156 https://digital-skills-jobs.europa.eu/en
157 https://digital-skills-jobs.europa.eu/en
158 https://digital-skills-jobs.europa.eu/en/about/national-coalitions/ireland-digital-skills-and-jobs-coalition
159 https://advancedskills.eu/

Appendix 2 – Europe's Digital Decade Programme

As a first step, it is essential to anchor Ireland's digital skills strategy within the broader European policy framework, recognising that Ireland does not operate in isolation. The Digital Decade Policy Programme (DDPP) provides the EU-wide structure and targets that guide national approaches to digital skills development and workforce readiness. For Ireland, aligning with the DDPP is crucial to ensure competitiveness, coherence with EU standards, and the long-term sustainability of its digital talent pipeline.

The DDPP represents the first-ever digital strategy commonly agreed across all EU institutions, embodying a shared vision for Europe's digital transformation through the remainder of the decade. The DDPP requires each country to develop a National Strategic Roadmap detailing how it will contribute to EU-wide targets, track progress through measurable indicators, and implement corrective measures where gaps persist. This governance model reflects the EU's recognition that digital skills development, while guided by common goals, must be executed through country-specific education systems, labour markets, and industrial structures. A formal review of the Digital Decade Policy Programme is planned for 2026, marking the mid-point towards the 2030 targets.

Ireland's response to the EU Digital Decade framework is articulated in its Digital Decade Policy Programme – National Strategic Roadmap[160]. Ireland's current Digital Decade strategic roadmap was adjusted in November 2024. It expanded the total number of measures to 81, including 22 new initiatives, with a total budget of €9.2 billion, of which €4.8 billion is from the public budget (equivalent to 0.9% of GDP).

The roadmap aligns explicitly with the four pillars of the EU DDPP, while tailoring implementation to Ireland's economic profile as a small, open, innovation- and FDI-driven economy. Under the skills dimension, Ireland commits to increasing the share of adults with at least basic digital skills toward the EU-wide 80% target by 2030, while simultaneously expanding the pipeline of digital specialists through higher education, apprenticeships, reskilling pathways, and international talent attraction.

Importantly, the roadmap embeds digital skills policy within a wider ecosystem of lifelong learning, enterprise digital adoption, and labour-market responsiveness, reflecting the EU's view that skills shortages cannot be addressed through education policy alone.

Ireland will be adjusting its strategic roadmap in 2026, with a cross-government exercise which commenced in July 2026. A key focus of the 2026 adjustment will be on reflecting the objectives and deliverables of *Digital Ireland – Connecting our People, Securing our Future*, Ireland's new National Digital and AI Strategy, launched in February 2026.

The 2026 State of the Digital Decade Report, published in June 2026 and incorporating 2025 DESI data, shows real progress since 2022 in addressing remaining structural weaknesses in terms of basic and specialist digital skills. The EU average basic digital skills stood at 60.4% in 2025, still short of 80% target, which is only expected to be met in 2037. The report also notes that the total of 10.5 million digital specialists across the EU, and a growth rate of only 4% year on year, the EU remains some distance from achieving the target 20 million digital specialists in 2030.

Within this European framework, Ireland emerges as a strong performer. Ireland's 2026 Digital Decade Country

160 https://www.gov.ie/en/department-of-enterprise-tourism-and-employment/publications/irelands-national-strategic-roadmap-for-the-eu-digital-decade-policy-programme/

Report underlines that Ireland performs strongly ranking second in the EU on basic digital skills, with 82.8% of adults meeting at least basic skills levels (up from 72.91% in 2023). Ireland has met and surpassed the target of 80% of the population with basic digital skills.

Ireland also maintains its leadership position at 6th place in the provision of digital specialists who are 6.2% of total employment compared to an EU average of 5%.[161]

Table 13: **EU Digital Decade Targets vs Ireland Commitment**

EU Digital Decade Target (2030)	EU Target Definition	Ireland Commitment / National Trajectory	Current Performance
Basic digital skills (population)	At least 80% of people aged 16–74 with at least basic digital skills	Converge to the 80% benchmark by 2030 via lifelong learning, adult upskilling and education reform	Ireland: 82.8% (2026, Digital Decade Country Report); EU: 60.40% (2026, State of the Digital Decade)
ICT specialists in employment	20 million ICT specialists employed across the EU by 2030	Scale domestic ICT graduates, apprenticeships and conversion courses; sustain talent via reskilling and international attraction	Ireland: 6.20% of workforce as ICT specialists (2025 DESI); EU: 5.0% (2025 DESI)
Gender balance in ICT	Significantly increase female participation among ICT specialists (qualitative target)	Targeted measures to increase female participation across STEM/ ICT pathways and careers	Women in ICT: Ireland 22% (2025 DESI); EU
Digital transformation of businesses	75% of EU enterprises use cloud, AI or big data	Support SME adoption through Digital Transition funding, Skillnet programmes and enterprise transformation initiatives	SME adoption of AI/Cloud/Data Analytics: Ireland: 70.95% (2025 DESI, 9th in EU); Ireland SME Cloud adoption: 62.71% (7th, EU: 45.74%) (2025 DESI)
Digital public services & digital identity	100% online availability of key public services and EU-wide digital identity access	Digital-by-default services, life-event portals, interoperability; progress on eID and cross-border services	Ireland: full availability of digital public services for businesses since 2020 (2nd in EU), 91.42% for citizens (7th in EU); e-Health online access score 44% vs EU 86.51 (2025 DESI) – which is rising fastest

Source: Digital Decade Policy Programme: Ireland's National Strategic Roadmap; Ireland 2026 Digital Decade country report; CSO Information Society Statistics, 2024[162]

However, Ireland's 2024 roadmap acknowledges that sustaining this advantage and contributing meaningfully to the EU target of 20 million digital specialists by 2030 will require continued structural intervention. These include scaling advanced digital and AI-related skills, improving participation from under-represented groups, and mitigating intense international competition for digital talent that disproportionately affects smaller Member States. In this sense, Ireland's Digital Decade roadmap exemplifies the EU's broader challenge: translating collective ambition into nationally grounded, execution-focused strategies capable of closing the growing gap between digital demand and skills supply across Europe.

161 Ireland's 2026 Digital Decade Country Report | Shaping Europe's digital future

162 Artificial Intelligence Information Society Statistics - Enterprises 2024 - Central Statistics Office

Appendix 3 – Methodology

This appendix outlines the methodology: desk research and policy analysis, a national ICT Skills in Ireland Survey, expert workshops, quantitative demand forecasting and supply-demand gap analysis. It captures projected demand for digital specialists in Ireland and evolving skills needs in AI, cybersecurity, data, cloud, infrastructure and digital transformation.

A3.1 Desk Research and Policy Analysis

The desk research reviewed Irish, European and international evidence on digital specialist skills, labour-market trends and technology adoption. Irish sources included, the Central Statistics Office (CSO), Digital Ireland, the National Digital and AI Strategy, Quantum 2030, the National Semiconductor Strategy, the National Cyber Security Strategy, Industry 4.0, Impact 2030, enterprise and public service transformation strategies, and earlier ICT skills action plans. EU Digital Decade targets and evidence from Eurostat, the OECD, Cedefop and European Commission were also considered.

The review shaped the study scope, definition of digital specialists, occupational classifications and technology domains. SOC and ISCO mappings aligned with earlier EGFSN work. CSO Labour Force Survey data profiled specialists by occupation, region, sector, age, gender and education. The review also identified trends including AI, cybersecurity, cloud, data analytics, automation, quantum-related skills and T-shaped professionals.

A3.2 ICT Skills in Ireland Survey

The ICT Skills in Ireland Survey was conducted August 2025 using Computer-Assisted Telephone Interviewing. It covered 512 Irish organisations, including multinationals headquartered in Ireland. Respondents were selected for knowledge of ICT and digital skills needs over the next two years and were mainly digital specialists, with HR representatives included where relevant.

The sample spanned twelve industries and firm sizes from micro firms to large enterprises. Topics included digital readiness, future skills mapping, governance, upskilling and reskilling, barriers to training, collaboration with providers, public supports, regional talent availability, and AI and cybersecurity needs. Findings were analysed overall and by region, size and sector. Results reflect perceptions but provide directional evidence on employer experience, gaps and priorities.

A3.2.1 Survey Sample Structure

Table 14: **Survey Sample, by Industry**

IDC Sector Detail	Frequency	Percent
Financial services	40	8
Healthcare	41	8
Telecommunications	40	8
Energy	36	7
Manufacturing	52	10
Resources	36	7
Retail	40	8

IDC Sector Detail	Frequency	Percent
Software and information services	56	11
Transportation and leisure	48	9
Business and personal services	48	9
Education	34	7
Government	41	8
Total	**512**	**100**

Table 15: **Survey Sample, by Company Size**

Company Size	Frequency	Percent
2 to 19 employees	53	10
20 to 49 employees	130	25
50 to 99 employees	108	21
100 to 249 employees	93	18
250 to 499 employees	55	11
500+ employees	73	14
Total	**512**	**100**

Table 16: **Survey Sample, by Respondent Role**

Respondent Role	Frequency	Percent
IT/Digital	460	90
HR	52	10
Total	**512**	**100**

Table 17: **Survey Sample, by Respondent Seniority Level**

Respondent Seniority Level	Frequency	Percent
Mid and Entry-level	245	48
Senior (Director/Professional)	217	42
Executive (C-Level/VP)	50	10
Total	**512**	**100**

Table 18: **Survey Sample, by Region**

Region	Frequency	Percent
Dublin	297	58
Border	27	5
Mid-East	41	8
Midland	21	4
Mid-West	21	4
South-East	23	5
South-West	49	10
West	33	6
Total	**512**	**100**

A3.3 Expert Workshops

Six stakeholder workshops were held in November 2025: three online and three in person. The in-person workshops took place at Griffith College and Eurofound in Dublin and at UCC in Cork. Workshops 1, 2 and 3 were held online. Workshop 1 focussed on AI, Cybersecurity and Emerging Technologies, with participants from the public sector and academia. Workshop 2 focussed on AI and Cybersecurity, with industry participants. Workshop 3 focussed on Emerging Technologies, also with industry. Workshop 4, held in Griffith College, focussed on AI, with both academic and industry participants. Workshop 5, held in Eurofound, focussed on Cybersecurity, also with a combination of industry and academic contributors. Workshop 6, held in UCC, focussed on Emerging Technologies with a combination of academia, industry and public sector in attendance.

In total, almost 100 participants from multinationals, SMEs, higher education, skills bodies and government agencies tested and deepened findings from the desk research, survey and quantitative analysis. Workshops identified recurring constraints: curriculum lag, limited access to industry tools, difficulty attracting practitioners into teaching, weaker entry-level pathways, need for bridging professionals, foundational human skills, organisational challenges in AI adoption, and barriers to collaboration. Evidence was treated as expert opinion to complement quantitative and survey findings.

A3.4 Approach to Demand Forecasting

Methodological Foundation: Hybrid Bottom-Up and Top-Down Approach

The forecasting model combines role-level bottom-up analysis with macroeconomic top-down validation. Bottom-up estimates cover 41 digital specialist roles using technology adoption, spending trajectories and industry requirements. Top-down checks use labour force statistics, digital specialist employment trends and wider macroeconomic indicators.

This captures technology-specific and emerging role dynamics while keeping aggregate forecasts within plausible labour market constraints.

Methodological Strengths and Differentiation

The model triangulates IDC's Worldwide ICT Job Role Taxonomy (Table 19 below), IDC Technology Spending Guides, occupational statistics, the Irish digital specialists survey, macroeconomic indicators and expert input, reducing reliance on any single source.

The 41-role taxonomy supports actionable education and training planning by identifying shortage domains such as ML Engineers and Security Operations Analysts. Scenario modelling presents plausible ranges rather than a single forecast.

IDC Taxonomy and Irish Specific Data Sources

IDC's proprietary Worldwide ICT Job Role Taxonomy disaggregates the digital specialist workforce into seven technology seven domains: Applications, Cybersecurity, Data Management/Analytics, IT Infrastructure, IT Leadership, Other IT/Technical and Technical Support. These cover 41 distinct roles and link labour market data to technology spending patterns.

The model was adapted to Ireland using CSO occupational statistics, SOLAS's National Skills Bulletin October 2025,[163] ILO ISCO-08 mappings, and inputs from DETE and other departments. It accounts for multinationals, indigenous software firms and data centre infrastructure, with SOC codes mapped to the nearest IDC job role (Table 19).

Table 19: **IDC ICT Job Role Taxonomy and Best SOC Code Match**

Best match to related SOC codes	IDC ICT Job Roles by Technology Domain
	Applications
2136	Applications Maintenance Manager
2136	Machine Learning Designer/Developer/Engineer
2136	Mobile Applications Developer
2136	Software Developer/Engineer
2136	Software QA Engineer/Tester
2136	Systems Analyst
2137	UI/UX Designer/Developer
2137	Web Developer
	Cybersecurity
2139	Security Management Specialist
2139	Cybersecurity/Info Sec Engineer/Analyst
	Data Management/Analytics
2135	Business Intelligence Analyst
2135	BI Architect/Developer
2133	Data Analyst
2133	Data Engineer
2133	Data Scientist
2133	Data Warehousing Specialist
2133	Database Administrator

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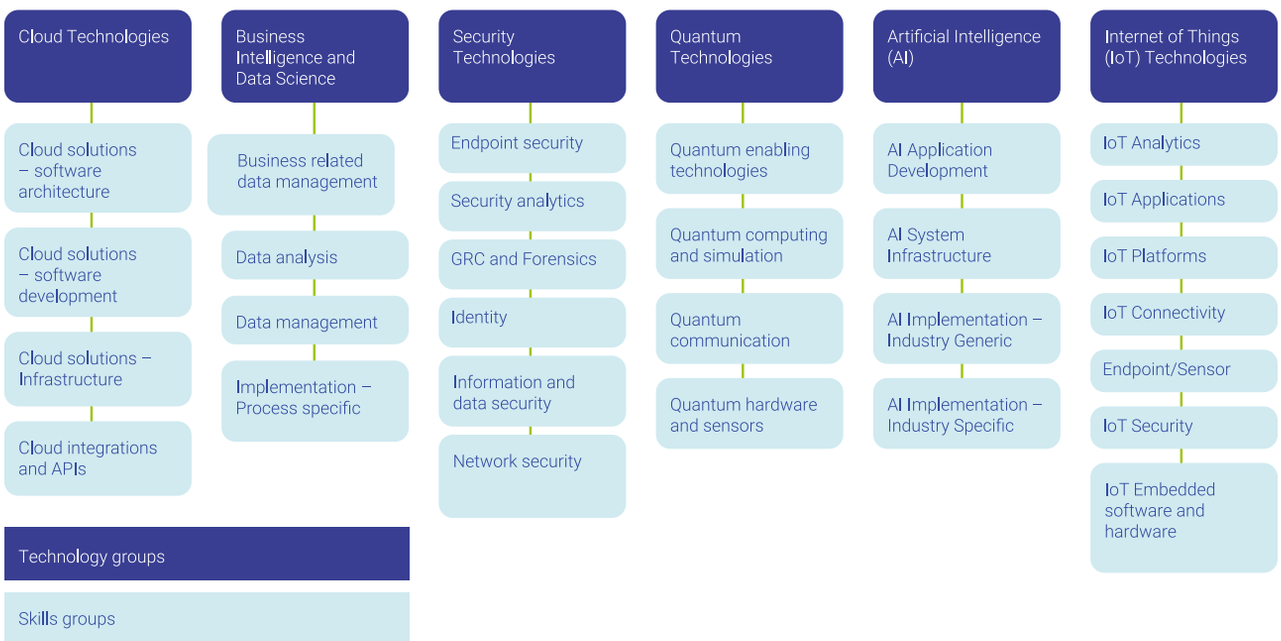
Best match to related SOC codes	IDC ICT Job Roles by Technology Domain
2133	Database Architect
	IT Infrastructure
2136, 2123, 2124, 2126, 2139	IoT Designer/Developer/Engineer
5245, 2123, 2124, 2134	Network Engineer/Architect
5245, 2123, 2124, 2134, 3112	Operations Engineer/Technician
2134	Social Media Manager/Administrator
5242, 2123, 2124, 2134	Telecommunications Engineering Specialist
2123, 2124	Infrastructure & Systems Architect/Analyst
2139	Network/Systems Administrator
	IT Leadership
2135	Business Partner/Business Analyst
1136	Change Management
1136	CIO/Director of IT
1136	Chief Technology Officer
1136, 2133,2134, 2135	Enterprise Architect
1136	IT Sourcing, Procurement & Governance
	Other IT/Technical
2137	Graphic Designer/Desktop Publisher
2137	Multimedia Designer/Animator
2136, 2133, 2135, 2139	Uncategorised IT
2137	Web Designer
2135	Webmaster/Administrator
	Technical Support
2134	IT Project Manager
2133, 3112	Network/Systems Support Specialist
2136	Support Specialist/Developer
2133,2134, 2135	Technology/Integration Consultant
2135	User Support Specialist

Source: IDC, 2025[164]

164 LEADS_D1.1-Demand-Assessment-Framework_v1.0-FINAL-5.pdf (p.39)

Skills mapping used the European Commission-funded LeADS approach, in which IDC was a partner. LeADS defined six advanced skills groups- AI, Cybersecurity, Cloud, IoT, Data Science and quantum computing—plus detailed skills pockets (Figure 70). LeADS provided the skills baseline;[165] IDC's ICT Job Role Taxonomy provided the role baseline.

Figure 70: **LeADS Advanced Technology Skills Framework**



Source: IDC, 2025

Technology Spending as a Demand Proxy

Technology spending is used as a leading demand indicator. IDC's Worldwide ICT Spending Guides provide five-year forecasts across about 120 technology categories, 15 sectors, company-size segments and more than 50 geographies, including Ireland.

Historical spending-workforce relationships calibrate demand. Cloud growth informs demand for cloud architects, DevOps engineers and platform specialists, cybersecurity investment, including NIS2 and DORA drivers, informs demand for SOC analysts, governance specialists and cloud security architects. Spending patterns add forward-looking signals beyond employment trends.

Role-Specific Drivers and Technology Adoption Proxies

Each digital specialist role is linked to drivers from technology trends, regulation and transformation. ML Engineer demand reflects AI/ML adoption, generative AI and AI infrastructure. Cybersecurity Engineer demand reflects cloud, IoT, AI-enabled threats, compliance and threat intelligence.

Data Engineer and Data Scientist forecasts reflect cloud data platforms, real-time analytics and data governance. Software roles reflect cloud-native development, AI-assisted coding and micro-services. Systems Administrators and Network Engineers reflect automation and cloud migration. This differentiates high-growth roles such as ML Engineers (26.88% CAGR in the Baseline), from declining roles such as User Support Specialists (at -2.57% CAGR).

Macroeconomic Calibration and Validation

Total digital specialist employment projections are tested against labour force participation, sectoral

165 Full definitions for each of these skillsets can be found here.

employment and GDP assumptions, including forecasts from other agencies. The model checks digital specialist workforce growth relative to general employment growth while remaining consistent with population, education output and migration capacity.

Eurostat places Ireland's digital specialist share at 6.3% of employment in 2024, sixth in the EU and above the 5.2% EU average. The model's 2030 projection of 192,900–222,700 digital specialists imply a 6.8%–7.8% workforce share, comparable with Sweden at 8.6%, Luxembourg at 8.0% and Finland at 7.8%.

Data Limitations and Modelling Assumptions

The model assumes technology spending remains broadly predictive of workforce requirements and that historical spending-headcount elasticities persist. AI productivity effects are partly reflected through role-specific growth differentials, with slower growth for routine roles more exposed to automation.

Scenario parameters are calibrated using expert consultation, IDC surveys, historical analogues and the Irish survey, rather than purely quantitative optimisation. Retirements are applied uniformly at 1.9% annually. International recruitment assumes 2025 work permit levels continue to 2030; immigration, skills recognition or authorisation changes could materially affect shortage roles such as cybersecurity specialists and data engineers.

A3.5 IDC Digital Specialist Demand Forecasts by Job Role and Technology Domain to 2030

Table 20 below details the estimated number of people employed for each technology domain and underlying job role in 2025, the forecast number employed in 2030, and the annual growth rate (CAGR) from 2025 to 2030 in the low, baseline and high growth scenarios.

Table 20: **Digital Specialist Employment Forecast 2025-2030 by Job Role and Technology Domain in Three Growth Scenarios**

Digital Specialist Job Role and Technology Domain	2025 (000s)	LOW GROWTH 2030		BASELINE 2030		HIGH GROWTH 2030	
		CAGR (%)	Change (000s)	CAGR (%)	Change (000s)	CAGR (%)	Change (000s)
Domain Subtotal: Applications	**49.38**	**5.16%**	**63.51**	**8.62%**	**74.66**	**9.63%**	**78.21**
Applications Maintenance Manager	1.64	2.08%	1.82	3.36%	1.93	4.09%	2
Machine Learning Designer/Dev./Engineer	2.1	18.40%	4.89	26.88%	6.91	30.15%	7.84
Mobile Applications Developer	6.3	4.18%	7.73	6.55%	8.65	7.60%	9.09
Software Developer/Engineer	24.62	5.88%	32.76	10.02%	39.68	10.91%	41.31
Software QA Engineer/Tester	1.17	9.80%	1.87	14.46%	2.3	17.08%	2.57
Systems Analyst	8.87	1.20%	9.42	2.27%	9.92	2.46%	10.02
UI/UX Designer/Developer	2.81	1.40%	3.01	2.41%	3.17	2.83%	3.23
Web Developer	1.87	1.45%	2.01	2.40%	2.1	2.82%	2.15
Domain Subtotal: Cybersecurity	**9.45**	**8.91%**	**14.48**	**13.67%**	**17.93**	**15.42%**	**19.36**
Security Management Specialist	6.07	9.20%	9.42	14.16%	11.77	15.91%	12.7
Cybersecurity/Info Sec Engineer/Analyst	3.38	8.42%	5.06	12.74%	6.16	14.52%	6.66
Domain Subtotal: Data Management/Analytics	**18.47**	**3.66%**	**22.11**	**5.83%**	**24.52**	**6.87%**	**25.75**
Business Intelligence Analyst	6.07	2.81%	6.97	4.66%	7.62	5.40%	7.9
BI Architect/Developer	1.29	4.72%	1.62	7.19%	1.83	8.52%	1.94

Digital Specialist Job Role and Technology Domain	2025 (000s)	LOW GROWTH 2030		BASELINE 2030		HIGH GROWTH 2030	
		CAGR (%)	Change (000s)	CAGR (%)	Change (000s)	CAGR (%)	Change (000s)
Data Analyst	1.75	2.20%	1.95	3.60%	2.09	4.34%	2.16
Data Engineer	2.34	6.33%	3.18	9.61%	3.7	11.34%	4
Data Scientist	1.52	6.08%	2.04	9.16%	2.36	10.89%	2.55
Data Warehousing Specialist	0.47	2.68%	0.54	4.16%	0.58	4.98%	0.6
Database Administrator	2.22	0.80%	2.31	1.53%	2.39	1.75%	2.42
Database Architect	2.81	4.51%	3.5	7.03%	3.95	8.25%	4.18
Domain Subtotal: IT Infrastructure	**16.11**	**0.43%**	**16.46**	**1.22%**	**17.12**	**1.47%**	**17.33**
IoT Designer/Developer/Engineer	3.5	1.56%	3.78	2.75%	4.01	3.16%	4.09
Network Engineer/Architect	3.15	0.60%	3.25	1.25%	3.35	1.36%	3.37
Operations Engineer/Technician	3.26	0.49%	3.34	1.13%	3.45	1.25%	3.47
Social Media Manager/Administrator	1.05	-2.49%	0.93	-2.17%	0.94	-2.14%	0.94
Telecommunications Engineering Spec.	1.17	0.65%	1.21	1.33%	1.25	1.55%	1.26
Infrastructure & Systems Arch./Analyst	1.99	2.01%	2.2	3.32%	2.34	3.94%	2.41
Network/Systems Administrator	1.99	-2.49%	1.75	-2.17%	1.78	-2.14%	1.79
Domain Subtotal: IT Leadership	**7.82**	**3.48%**	**9.28**	**5.48%**	**10.21**	**6.39%**	**10.66**
Business Partner/Business Analyst	3.5	4.54%	4.37	7.05%	4.92	8.17%	5.18
Change Management	1.52	3.91%	1.84	5.97%	2.03	6.99%	2.13
CIO/Director of IT	1.4	1.41%	1.5	2.44%	1.58	2.86%	1.61
Chief Technology Officer	0.7	0.84%	0.73	1.60%	0.76	1.83%	0.77
Enterprise Architect	0.23	3.66%	0.28	5.62%	0.3	6.64%	0.32
IT Sourcing, Procurement & Governance	0.47	3.70%	0.56	5.70%	0.62	6.73%	0.65
Domain Subtotal: Other IT/Technical	**38.63**	**0.61%**	**39.83**	**2.10%**	**42.85**	**2.14%**	**42.95**
Graphic Designer/Desktop Publisher	5.25	-2.49%	4.63	-2.07%	4.73	-1.94%	4.76
Multimedia Designer/Animator	0.94	0.85%	0.98	1.52%	1.01	1.74%	1.02
Uncategorized IT	30.68	1.10%	32.41	2.81%	35.24	2.83%	35.27
Web Designer	0.47	-1.99%	0.43	-1.67%	0.43	-1.64%	0.43
Webmaster/Administrator	1.29	1.30%	1.38	2.21%	1.44	2.63%	1.47
Domain Subtotal: Technical Support	**28.94**	**-1.24%**	**27.19**	**-0.56%**	**28.14**	**-0.34%**	**28.45**
IT Project Manager	4.43	1.88%	4.86	3.27%	5.2	3.80%	5.34
Network/Systems Support Specialist	4.9	0.14%	4.94	0.71%	5.08	0.71%	5.08
Support Specialist/Developer	2.81	-1.59%	2.59	-1.37%	2.62	-1.44%	2.61
Technology/Integration Consultant	0.94	4.53%	1.17	6.94%	1.31	8.26%	1.4
User Support Specialist	15.86	-2.99%	13.63	-2.57%	13.93	-2.44%	14.02
GRAND TOTAL: ALL Digital Specialist Roles	**168.8**	**2.70%**	**192.9**	**5.00%**	**215.4**	**5.70%**	**222.7**

Source: IDC, May 2026

A3.6 Approach Used for Gap Analysis

The gap analysis compared projected digital specialist demand with supply from domestic education and training and international recruitment. Demand combined net employment growth with replacement demand, using a 1.9% retirement rate to estimate exits.

Supply estimates included higher education and FET graduates by NFQ level, employment outcome rates, nationality and retention adjustments, engineering graduates entering digital specialist roles, other adjacent entrants and net new international entrants through work permits. Non-aligned industry certifications were treated mainly as upskilling; lower-level qualifications were excluded where these are not direct digital specialist pathways.

Supply was normalised to demand for year-by-year scenario comparison, identifying potential surplus or shortfall, especially under Baseline and High Growth conditions. Qualitative mismatch was assessed using survey and workshop evidence on work-readiness, applied technical capability, AI, cybersecurity, data engineering, cloud architecture, business understanding, communication, critical thinking and adaptability.

Appendix 4 - Detailed AI Roles

Table 21: **Core Upcoming Roles in AI**

AI Role	Core mission & responsibilities	Key skills & competencies	Typical tools / tech stack	Where it sits (Ops / Data / Leadership)	Relevance for Ireland
AI Implementation Engineer/ Specialist	Deploy models, integrate AI tools, automate workflows, ensure model stability and performance.	MLOps, API integration, testing, orchestration, pipelines.	Azure ML, AWS Sagemaker, Kubernetes, CI/CD, LangChain, vector databases.	Ops / Engineering	AI implementation is a key priority for the future, but with current scarce supply and high relevance for the future.
AI Application Developer	Build AI-enabled applications, copilots, agents, and LLM-driven features.	Prompt engineering, retrieval design, Python/JS, LLM orchestration.	OpenAI APIs, Azure OpenAI, LangChain, RAG stacks.	Engineering	High importance but scarce supply. Demand driven by shift from pilots to scaled adoption.
AI Systems & Infrastructure Engineer	Manage compute environments, optimize model performance, handle data and distributed systems.	GPUs, distributed compute, storage optimization, data engineering.	Databricks, Ray, Airflow, cloud GPU infrastructure.	Data/Ops	Difficult to hire role. Essential for scaling beyond experimentation.
Machine Learning Engineer (MLE)	Train/optimize models, manage ML lifecycle, feature engineering.	ML frameworks, model optimization, experiment tracking, statistics.	PyTorch, TensorFlow, MLFlow, Sagemaker, HuggingFace.	Data Science / Ops	Advanced academic expectations. High hiring difficulty for niche skills.
Data Scientist / ML-AI Analyst	Build predictive models, analyse data patterns, support decisions.	Statistical modelling, experimentation, data storytelling.	Python, R, SQL, ML libraries.	Data Science	Traditional analytics shrinking, but advanced AI analytics rising, aligned with need for advanced skills.
AI Product Manager	Define AI roadmap, coordinate cross-functional teams, ensure ROI & responsible development.	Product strategy, stakeholder mgmt., ethical AI, evaluation.	PM tools, analytics dashboards, governance reports.	Leadership / Product	Needed as orgs move from pilots to integration. Strong demand for mid-senior talent, limited supply.
Prompt Engineer / Conversational AI Designer	Design, optimize, evaluate prompts; define agent behaviour.	Prompt optimization, evaluation metrics, persona design.	Prompt IDEs, LLM sandboxes, evaluation frameworks.	Engineering / UX	Represents growing specialization trend; aligns with AI-driven job fragmentation.
AI Security Engineer	Secure AI systems, test for adversarial attacks, enforce governance.	Red-teaming AI, secure MLOps, data governance.	AI scanning tools, policy gateways, monitoring dashboards.	Security / Architecture	Critical due to convergence of cloud, AI & cyber. Matches high difficulty and niche skill shortages.
AI Governance, Ethics & Risk Specialist	Ensure responsible AI, compliance with EU AI Act, transparency & auditability.	Policy design, fairness testing, risk assessment.	Governance platforms, monitoring tools.	GRC / Leadership	High governance demand; low supply. Ireland faces strong EU regulatory pressure. Critical need.
Chief AI Officer / AI Strategy Lead	Guide AI strategy, investment, organisational change.	Strategic leadership, regulation, transformation.	C-suite dashboards, KPI frameworks.	Executive Leadership	Needed for enterprise-wide AI adoption; aligns with shift toward senior specialization and fewer entry roles.

Source: IDC for DETE, 2025; IDC/Huawei, ICT Job Roles and Skills in the Intelligent World

Table 22: **Relevant AI Governance and Ethical Skills for Ireland**

Skill Cluster	Definition	Example Skills / Competencies	Why is relevant for Ireland
Regulatory & Compliance Skills (EU AI Act / Standards)	Skills needed to interpret, implement, and monitor compliance with AI regulations and standards frameworks, including the EU AI Act.	AI risk classification Conformity assessment; Documentation & transparency obligations; Data governance & GDPR alignment	National AI Strategy Refresh 2024 emphasises EU AI Act implementation and standards rollout.
Ethical & Trustworthy AI Skills	Skills to ensure AI systems are developed, deployed, and used in ways that uphold fairness, transparency, accountability, and human oversight.	Ethical impact assessments; Bias detection & mitigation; Explainability techniques; Human-in-the-loop design	National strategy identifies trustworthy AI as core principle. Oireachtas Committee stresses rights protection & transparency.
Governance for AI in Education	Skills enabling safe, ethical, and policy-aligned adoption of AI tools in schools and higher education, ensuring integrity and accountability.	Academic integrity guidance for AI; Assessment transparency; Privacy governance; Educator AI literacy	HEA National Policy Framework on Generative AI mandates governance principles (integrity, transparency, oversight, privacy).
Public-Sector Governance & Procurement Skills	Skills required to govern, procure, and supervise AI systems within public services, ensuring responsible use and compliance.	Ethical procurement standards; Public-sector AI oversight; Regulatory sandboxes; Safe experimentation protocols	National AI Strategy Refresh 2024 calls for AI sandbox and public-sector experimentation in safe frameworks.
Organisational AI Governance & Management Skills	Skills that enable organisations to design and manage internal governance structures that ensure responsible AI adoption at scale.	Responsible AI governance models; Change management; Organisational risk oversight; Leadership for AI adoption	Organisational & management skills needed for users, policymakers & regulators identified by the EGFSN.
Societal, Public Engagement & Democratic Governance Skills	Skills supporting transparent public communication, active citizen involvement, and democratic oversight of AI decisions.	Public trust-building; Citizen engagement forums; Awareness campaigns; Transparency communication	National Strategy focuses on AI & Society strand prioritising public trust and engagement. Oireachtas recommends Citizens' Assembly on AI ethics.
Standards, Certification & Technical Governance Skills	Skills for applying technical standards and ensuring systems meet quality, safety, and audit requirements.	Standards implementation; Technical auditing; Model documentation; Certification readiness	National AI Strategy aims to build workforce expertise in AI standards, certification, governance and assurance to support responsible deployment and regulatory compliance.

Source: IDC Elaboration on Irish Institutional Papers[166]

166 Ireland's AI Advisory Council Recommendations - Helping to Shape Ireland's AI Future; Guidance on Artificial Intelligence in Schools; AI - Here for Good A National Artificial Intelligence Strategy for Ireland; Joint Committee on Artificial Intelligence, First Interim Report; HEA's Generative AI in Higher Education Teaching & Learning, Principles for Ethical AI Adoption

Appendix 5 - Detailed Cybersecurity Roles

Table 23: **Core Upcoming Roles in Cybersecurity**

Role	Core mission & responsibilities	Key skills & competencies	Typical tools / tech stack	Where it sits (Ops / GRC / Leadership)	Relevance for Ireland
Security Management Specialist	Translate risk into controls and policy; design and run the security program; coordinate audits and vendor risk.	Risk assessment, control mapping, policy design, vendor risk, audit readiness, reporting.	ISO 27001/2, NIST CSF/800-53, DORA/NIS2 mappings, GRC platforms.	GRC / Program	GRC & forensics rated highly for future strategy but under provisioned today. Role operationalises regulations such as GDPR/DORA/NIS2 and helps close governance gaps driving hiring difficulty.
Cybersecurity / Information Security Engineer / Analyst	Build and operate preventative/ detective controls; tune detections; triage alerts; harden systems.	SecOps, detection engineering, log parsing, scripting, identity/endpoint controls, cloud security basics.	EDR/XDR (Defender, CrowdStrike), SIEM/SOAR, FW/WAF, CSPM/CNAPP.	Operations	Security analytics is top importance yet underprovided. Engineers/ analysts convert analytics priority into 24/7 capability.
SOC Analyst	24/7 monitoring, alert triage, escalation, playbook execution, SOC metrics.	Log analysis, threat triage, incident documentation, SOAR runbooks.	SIEM/SOAR, EDR, threat intel feeds, ticketing.	Operations (SOC)	Front-line operations that scale endpoint/network controls into operational analytics maturity. Demand reinforced by anticipated hiring difficulty and expansion of analytics capacity.
Incident Responder (IR)	Containment, eradication, recovery; forensic triage; lessons learned and playbook improvements.	IR methodologies, containment strategies, malware analysis, crisis communication.	Forensic suites, EDR, memory analysis, sandboxing.	Operations / IR	With Cloud & AI adoption, potential blast radius increases. IR fulfils forensics expectations and addresses experience gaps cited as a hiring barrier.
Penetration Tester / Ethical Hacker	Simulate adversaries; validate controls; provide remediation guidance; red teaming.	Offensive security, exploit development, cloud/app/API testing, red team tactics.	Burp, Nmap, Metasploit, Kali, Cobalt Strike (red team), cloud pen toolchains.	Assurance / Operations	Supports shift to zero-trust and architectural hardening; growing need to proactively validate cloud and API layers tied relevance of cloud skills.
Threat Hunter / Threat Intelligence Analyst	Hypothesis-driven hunts, ATT&CK mapping, intel fusion, detection content creation.	Hypothesis development, KQL/Python, intel analysis, TTP tracking.	SIEM, EDR telemetry, TI platforms, sandboxes, MITRE ATT&CK.	Operations / Intelligence	Directly addresses the security analytics capability gap. Typically, mid–senior specialisation with high hiring difficulty.
Security GRC & Risk Consultant	Map regulations to controls, maintain risk registers, 3LoD, audits, supplier risk.	Regulatory literacy (GDPR, NIS2, DORA), control testing, stakeholder management.	GRC suites, compliance scanners, vendor-risk tools.	GRC	High importance and planned growth in GRC; hiring difficulty driven by niche regulatory experience as EU mandates take effect across finance, health, energy, public sector.
Cybersecurity Manager/ Information Security Manager	Own roadmap, budget, KPIs; embed security in projects and architecture; lead teams.	Program & people leadership, budgeting, metrics, risk communication, change management.	Portfolio/ GRC tools, dashboards, OKRs/KPIs.	Program / Leadership	As organisations scale AI and cloud, need mid-senior leaders to translate plans into staffed programs, consistently with shift away from entry-level roles.

Role	Core mission & responsibilities	Key skills & competencies	Typical tools / tech stack	Where it sits (Ops / GRC / Leadership)	Relevance for Ireland
Chief Information Security Officer (CISO)	Set enterprise risk posture; board reporting; investment cases; regulatory engagement; crisis leadership.	Strategy, governance, regulation, vendor/budget stewardship, executive influence.	Board reporting suites, ERM, GRC.	Executive Leadership	Pivotal for governance, investment, and resilience as firms move from pilots to scaled AI/cloud. Competition and salary pressure are acute at this level.
Cloud Security Architect (specialisation)	Design secure cloud landing zones; identity models; segmentation; KMS; IaC policy as code.	CSP-native controls, zero-trust, identity-first design, IaC, CSPM/ CNAPP.	Azure/AWS/ GCP security, Terraform, Defender for Cloud, Prisma/ Wiz.	Architecture / Ops	Cloud infrastructure & integrations are top priorities for Irish organisations and hard to hire. Architects close the gap between importance and scarce expertise.
AI Security Engineer (specialisation)	Secure AI pipelines/models; data lineage and governance; prompt/attack surface controls; monitoring.	Model security, data governance, AI red-teaming, MLOps, policy enforcement.	Model scanning, policy gateways, data loss controls, AI red team kits.	Architecture / Ops	Bridges AI implementation priority with security analytics/GRC. Ensures safe AI adoption as firms scale. Niche skill with high hiring difficulty and current low availability.

Source: IDC for DETE, 2025

Table 24: **Core Cybersecurity Roles Impacted by AI – Shifts in Key Tasks and Skills**

Cybersecurity Role	Key Tasks	Key Skills
Security Management Specialist	• Monitor and analyse threats using AI-enhanced SIEM/EDR/NDR systems • Validate alerts, investigate anomalies, coordinate triage • Support incident response and threat-hunting workflows	• AI-driven analytics and behavioural analysis • Ability to tune/interpret AI-driven detections • Incident response, threat-hunting, cross-team collaboration
Penetration Tester/ Ethical Hacker	• Conduct attack simulations and defence testing • Use AI-augmented adversary emulation and scenario generation • Analyse TTPs and strengthen defensive controls	• AI-supported attack simulation and defence automation • Adversarial AI knowledge and detection engineering • Multi-team coordination and continuous learning
Threat Hunter/ Threat Intelligence Analyst	• Collect, preserve, and analyse digital evidence • Use AI tools to automate evidence extraction and correlate patterns • Produce forensic reports and support attribution	• Automated forensic analysis and malware/ deepfake detection • Pattern recognition, anomaly analysis, chain-of-custody integrity • Technical writing and legal/ethical awareness
Security Architect / Engineer	• Design secure systems integrating AI-enabled controls • Implement automated policies and compliance monitoring • Build adaptive, resilient security architectures	• Security automation and architectural design for AI systems • Threat modelling, adversarial defence, compliance automation • Collaboration with data/AI teams
Incident Responder (IR)	• Detect, triage, and contain AI-enabled threats • Execute automated playbooks and coordinate response • Conduct post-incident analysis and recovery facilitation	• Automated detection & containment orchestration • Root-cause analysis, alert prioritisation, remediation workflows • Crisis coordination and communication
SOC Analyst	• Monitor network/system activity using AI-powered tools • Triage alerts, escalate incidents, tune detections • Conduct continuous threat monitoring and investigation	• Behavioural analytics, AI-assisted detection tuning • Automated investigation and escalation workflows • Continuous monitoring expertise

Source: IDC/Huawei, ICT Job Roles and Skills in the Intelligent World

Appendix 6 - Glossary of Terms

This glossary provides definitions for acronyms, abbreviations, and technical terms used throughout the report.

A

AI (Artificial Intelligence) - The simulation of human intelligence processes by computer systems, including learning, reasoning, and self-correction. AI encompasses technologies such as machine learning, natural language processing, and computer vision.

API (Application Programming Interface) - A set of protocols and tools that allows different software applications to communicate with each other, enabling integration and data exchange between systems.

AR/VR (Augmented Reality/Virtual Reality) - Technologies that create immersive digital experiences. AR overlays digital content onto the real world, while VR creates entirely virtual.

B

BDA (Big Data/Analytics) - The practice of examining large and varied data sets to uncover patterns, correlations, and insights that inform business decisions.

BI (Business Intelligence) - Technologies and strategies used by organisations to analyse business information, including data mining, process analysis, performance benchmarking, and descriptive analytics.

C

CAGR (Compound Annual Growth Rate) - A measure of growth over multiple time periods, calculated as the rate of return that would be required for an investment to grow from its beginning balance to its ending balance.

CATI (Computer-Assisted Telephone Interviewing) - A research methodology where interviewers use computer systems to conduct telephone surveys, ensuring consistency and data quality.

CISO (Chief Information Security Officer) - A senior executive responsible for establishing and maintaining an organisation's information security strategy, policies, and programs.

CompTIA - A professional association for the IT industry offering vendor-neutral certifications including A+, Network+, and Security+.

CRUD (Create, Read, Update, Delete) - The four basic operations of persistent storage, fundamental to database management and application development.

CS (Computer Science) - The study of computation, information processing, and the design of computer systems.

CSEP (Critical Skills Employment Permit) - An Irish work permit for occupations on the Critical Skills list, offering streamlined access and retention pathways.

CSO (Central Statistics Office) - Ireland's national statistical office responsible for collecting and publishing official statistics.

CSP (Cloud Service Provider) - Companies that offer cloud computing services, including infrastructure, platforms, and software.

CSPM/CNAPP (Cloud Security Posture Management/Cloud-Native Application Protection Platform) - Security tools for managing cloud infrastructure security and protecting cloud-native applications.

D

DataOps - A collaborative data management practice focused on improving communication, integration, and automation of data flows between data managers and consumers.

DDPP (Digital Decade Policy Programme 2030) - The EU's comprehensive digital transformation strategy establishing targets for digital skills, infrastructure, business transformation, and public services by 2030.

DevOps - A set of practices combining software development and IT operations to shorten development lifecycles and provide continuous delivery.

DevSecOps - An approach integrating security practices within the DevOps process, embedding security into CI/CD pipelines.

DigComp (Digital Competence Framework) - A European framework defining key components of digital competence for citizens.

DORA (Digital Operational Resilience Act) - EU regulation establishing requirements for financial entities to manage ICT risks and ensure operational resilience.

E

e-CF (e-Competence Framework) - A European framework for ICT competencies used across industry and education sectors.

ECCC (European Cybersecurity Competence Centre) - An EU body coordinating cybersecurity research, innovation, and industrial capacity.

EDIH (European Digital Innovation Hub) - Regional access points offering digital transformation services, technical expertise, and infrastructure to businesses, particularly SMEs.

EDR (Endpoint Detection and Response) - Security technology monitoring endpoint and network events, recording information for threat detection and investigation.

EIST (Employment, Inclusion, Skills and Training) - Ireland's ESF+ programme representing €1.081 billion investment in skills and workforce development (2021-2027).

EPOS (Employment Permits Online System) - Ireland's digital platform for processing employment permit applications, launched in April 2025.

Erasmus+ - The EU's flagship education, training, youth, and sport program supporting mobility and cooperation projects.

ERM (Enterprise Risk Management) - A framework for managing organisational risks across all departments and functions.

ESF+ (European Social Fund Plus) - EU funding program supporting employment, social inclusion, education, and skills development (2021-2027).

ETB (Education and Training Board) - Local education authorities in Ireland responsible for delivering further education and training programs.

ETL (Extract, Transform, Load) - The process of extracting data from sources, transforming it to fit operational needs, and loading it into target databases.

F

FDI (Foreign Direct Investment) - Investment by entities from one country into business interests in another country.

FIT (Fast Track into Information Technology) - Irish initiative offering Tech Apprenticeships combining paid workplace learning with structured training.

FTE (Full-Time Equivalent) - A unit measuring employee workload, with one FTE representing a full-time worker's annual workload.

G

GCP (Google Cloud Platform) - Google's cloud computing services offering infrastructure, platforms, and applications.

GDPR (General Data Protection Regulation) - EU regulation governing data protection and privacy for individuals within the European Union.

GenAI (Generative AI) - AI systems capable of generating new content, including text, images, code, and other media.

GIS (Geographic Information System) - Systems for capturing, storing, analysing, and managing spatial and geographic data.

GRC (Governance, Risk, and Compliance) - An integrated approach to managing organisational governance, risk management, and regulatory compliance.

H

HEA (Higher Education Authority) - The statutory body responsible for higher education policy, planning, and regulation in Ireland.

I

IaC (Infrastructure as Code) - Managing and provisioning infrastructure through machine-readable definition files rather than manual configuration.

ICT (Information and Communications Technology) - Technology involving computers, networks, and telecommunications for storing, retrieving, and transmitting information (includes IT)

IoT (Internet of Things) - Network of physical devices embedded with sensors, software, and connectivity enabling data collection and exchange.

ISCED (International Standard Classification of Education) - UNESCO framework classifying education programs by level and field of study.

IT (Information Technology) - Use of computers, storage and devices to create, process, store, and exchange data.

IUA (Irish Universities Association) - Representative body for Irish universities, including the MicroCreds initiative for accredited modular learning.

K

Kafka (Apache Kafka) - Open-source distributed event streaming platform for high-performance data pipelines and streaming applications.

KMS (Key Management Service) - Cloud service for creating and controlling encryption keys used to encrypt data.

KPI (Key Performance Indicator) - Measurable value demonstrating organisational effectiveness in achieving business objectives.

KQL (Kusto Query Language) - Query language used for analysing large datasets in Azure services and security operations.

L

LeADS (Leading European Advanced Digital Skills) - Digital Europe project developing advanced digital skills intelligence frameworks for six core technology areas.

M

ML (Machine Learning) - Subset of AI enabling systems to learn and improve from experience without explicit programming.

MLOps (Machine Learning Operations) - Practices for deploying and maintaining machine learning models in production environments reliably and efficiently.

MSc (Master of Science) - Postgraduate academic degree typically requiring 1-2 years of study beyond bachelor's level.

N

NACE (Nomenclature of Economic Activities) - European statistical classification system for economic activities used for organising economic data.

NCC-IE (National Cybersecurity Coordination and Development Centre, Ireland) - Ireland's coordination centre within the EU cybersecurity network, facilitating access to EU funding and building national competence.

NCSC (National Cyber Security Centre) - Irish national authority for cybersecurity, housing the NCC-IE coordination centre.

n.e.c. (not elsewhere classified) - Statistical term indicating items not fitting into other specific categories.

NFQ (National Framework of Qualifications) - Irish framework defining education and training qualification levels from 1 (basic) to 10 (doctoral).

NIS2 (Network and Information Security Directive 2) - EU directive establishing cybersecurity requirements for critical infrastructure and digital service providers.

NIST (National Institute of Standards and Technology) - U.S. agency developing technology standards, including the Cybersecurity Framework.

O

OKR (Objectives and Key Results) - Goal-setting framework for defining and tracking objectives and measurable outcomes.

P

PhD (Doctor of Philosophy) - Highest academic degree awarded by universities, requiring original research contribution.

PLC (Post Leaving Certificate) - Irish further education programs at NFQ Level 5 providing vocational skills and progression pathways.

PQC (Post-Quantum Cryptography) - Cryptographic algorithms designed to be secure against attacks by quantum computers.

Q

QQI (Quality and Qualifications Ireland) - Irish state agency responsible for qualifications and quality assurance in further and higher education.

R

R&D (Research and Development) - Activities undertaken to innovate and introduce new products, services, or processes.

RRF (Recovery and Resilience Facility) - EU funding instrument supporting recovery from COVID-19 pandemic, including €23 billion for digital skills across member states.

S

SASE (Secure Access Service Edge) - Network architecture combining WAN capabilities with security functions including secure web gateways and firewall as a service.

SD-WAN (Software-Defined Wide Area Network) - Technology simplifying management and operation of WAN by decoupling networking hardware from control mechanisms.

SIEM (Security Information and Event Management) - Technology providing real-time analysis of security alerts generated by applications and network hardware.

SOC (Security Operations Centre) - Centralized unit dealing with security issues on organisational and technical levels.

SOC (Standard Occupational Classification) - System classifying workers into occupational categories for statistical purposes.

SOLAS - Ireland's Further Education and Training Authority responsible for coordinating and funding apprenticeships and training programs.

STEM (Science, Technology, Engineering, and Mathematics) - Educational and professional fields emphasizing these disciplines.

T

TEL (Technology Enhanced Learning) - Strategy for modernizing FET program delivery using digital technologies.

TI (Threat Intelligence) - Evidence-based knowledge about existing or emerging threats to assets, informing security decisions.

TTP (Tactics, Techniques, and Procedures) - Patterns of activities or methods associated with specific threat actors or cyberattacks.

U

UX/UI (User Experience/User Interface) - Design disciplines focusing on how users interact with products (UX) and the visual elements of those interactions (UI).

W

WAN (Wide Area Network) - Telecommunications network extending over large geographic areas to connect multiple local networks.

WiD (Women in Digital Index) - Index measuring women's participation in digital economy across EU member states.

X

XR (Extended Reality) - Umbrella term encompassing augmented reality (AR), virtual reality (VR), and mixed reality (MR) technologies.

Appendix 7 – Members of the Project Steering Group

Name	Organisation
Philip Maguire	Chair; CEO, Auxilion
Anne Ribault-O'Reilly	Department of Further Education and Training and Higher Education, Research, Innovation and Science
Orla Mulready	AI and Digital Programmes Unit; Department of Enterprise, Tourism and Employment
Amanda Ward	Enterprise Ireland
Helen Burke	IDA Ireland
Eoin Morton	Skillnet Ireland
Joan McNaboe	Skills and Labour Market Research Unit, SOLAS
David Bermingham	AIM Centre
Jean Kennedy	Advanced Manufacturing Training Centre of Excellence
Don O'Connor	EGFSN Secretariat; Department Of Enterprise, Tourism and Employment
Rhodri Lloyd	EGFSN Secretariat; Department Of Enterprise, Tourism and Employment

Appendix 8 – Members of the Expert Group on Future Skills Needs

Name	Organisation
Colm Kelly	Chair
Diarmaid Smyth	Head of EGFSN Secretariat and Principal Officer; Labour market and Skills Unit, Department of Enterprise, Tourism and Employment
Gary Tobin	Assistant Secretary: Economy and Climate Division, Department of Enterprise, Tourism and Employment
Fiona O'Byrne	Assistant Secretary: Department of Further Education and Training and Higher Education, Research, Innovation and Science
Sarah Miley	Principal Officer: Department of Further Education and Training and Higher Education, Research, Innovation and Science
Dr Vivienne Patterson	Higher Education Authority
Shauna Dunlop	SOLAS
Joan McNaboe	Skills and Labour Market Research Unit, SOLAS
Breda O'Toole	IDA Ireland
Helen McMahon	Enterprise Ireland
Dr Helen Murphy	South East Technological University
Liam Berney	Irish Congress of Trade Unions
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