Rialtas na hÉireann
Government of Ireland

Technology Skills 2022
Ireland's Third ICT Skills Action Plan

Background Paper

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Technology Skills 2022: Ireland's Third ICT Skills Action Plan is a collaborative effort by Government, the education and training system and industry to meet Ireland's high level ICT skills needs.

Government agencies, State-supported bodies and key industry stakeholders involved in the development of the Action Plan include:

Technology Skills 2022

Ireland's Third ICT Skills Action Plan

Government, the Higher & Further Education and Training Sector and Industry working together to meet Ireland's high-level ICT skills needs

Background Paper

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1   Context

Technology Skills 2022: Ireland's Third ICT Skills Action Plan has been developed to support the continued growth of the Irish ICT sector, the broader Irish economy, and Ireland's status as a global leader in ICT talent and skills. This structured approach to addressing Ireland's high-level ICT skills needs was established in 2012, with the publication of the *ICT Action Plan – Meeting the High Level Skills Needs of Enterprise in Ireland*[1]. This was followed two years later by the publication of the *ICT Skills Action Plan, 2014-2018 – Government, Education and Industry working together to make Ireland a global leader in ICT talent*[2].

This document provides the context and background for *Technology Skills 2022: Ireland's Third ICT Skills Action Plan*, a collaborative effort between Government, industry, and education and training providers to increase the pool of high-level ICT skills in Ireland. It sets out a comprehensive suite of actions required to boost high-level ICT skills into the future. This includes actions which will impact both now, and also those which will form the basis for long term delivery of high-level ICT skills across the economy.

Technology Skills 2022: Irelands Third ICT Skills Action Plan provides a focus on those high-impact actions required to deliver a significant increase in the level of high-level ICT skills over the four year period to 2022.

This approach is reflective of the strategic importance of high-level ICT skills to both the technology sector and the Irish economy. Ireland is a global technology hub, with 16 of the top 20 global technology firms, 9 of the top 10 US ICT companies and 4 of the top 5 IT services companies having strategic operations in Ireland. The Irish economy is also home to a dynamic pool of indigenous technology firms that are making their mark internationally.

The ICT sector is a driver of Ireland's productivity growth, a key contributor to total value added in the economy, as well as a driver of exports and high quality, highly paid employment. Computer services exports increased by 83 percent between 2012 and 2017[3], while earnings per week in the ICT sector are 50 percent higher than the general rate across all sectors[4]. The deployment of high-level ICT skills has therefore played a central role in supporting the Irish economy's export led recovery from the economic crisis of the late 2000s and early 2010s.

The application of high-level ICT skills across other sectors of the economy has also driven their productivity, competitiveness and economic resilience. In 2018, 45% of companies with over 10 employees purchased cloud computing services compared with an EU-28 average of 26%[5].

In the year in which the first high-level ICT Skills Action Plan was published, unemployment reached a post-crisis peak of 16%. By contrast, the Irish economy is now approaching full employment. As of November 2018, the monthly unemployment rate stood at 5.3 percent. This was accompanied by an increase in the numbers of those in roles most commonly associated with high-level ICT. In 2011, according to the Central Statistics Office (CSO), these numbered 65,350; by 2016 this number had risen to 81,575, an increase of 25%.

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1   https://www.education.ie/en/Publications/Policy-Reports/ICT-Skills-Action-Plan-2014-2018.pdf
2   https://www.education.ie/en/Publications/Policy-Reports/ICT-Skills-Action-Plan-2014-2018.pdf
3   https://www.cso.ie/en/releasesandpublications/er/its/internationaltradeinservices2017/
4   https://www.cso.ie/multiquicktables/quickTables.aspx?id=ehq03
5   https://www.cso.ie/en/releasesandpublications/er/iss/informationsocietystatistics-enterprises2018/

The broad ICT sector's key contribution to the Irish economy in recent years, however, as well as the contribution of ICT skills to other sectors of the economy, has created its own momentum. This is being reflected in a changed dynamic in the demand for high-level ICT skills in Ireland, one that contrasts with that planned for under the previous Action Plan, published in 2014. This dynamic is one this iteration of the ICT Skills Action Plan sets out to address.

Previous plans have supported the objective of boosting the ICT skills talent pool through targeted conversion and upskilling programmes to build short term supply, measures to incentivise and increase the number of level 8 ICT graduates, as well as targeted supports to attract highly skilled ICT professionals from abroad.

As the work outlined in this paper and undertaken in support of the development of the ICT Skills Action Plan indicates, demand for high-level ICT skillsets in the Irish economy will, in the coming years, exceed the number generated by the current output from the education and training system, as well as the numbers attracted through inward migration.

This level of demand is being driven by the rapid growth in the technology sector, and crucially, the increasingly cross-sectoral nature of high-level ICT skills needs, as digitalisation takes hold across all sectors. This rapid growth in demand is accompanied by a tightening labour market in Ireland, and intense competition for high-level ICT talent internationally. The European Commission has estimated that Europe could face an 800,000 person ICT skills shortage by 2020.

What will be required, and what *Technology Skills 2022: Ireland's Third ICT Skills Action Plan* sets out to achieve, is a step change in Ireland's supply performance, through a focussed set of impactful actions that will underpin Ireland's continuing status as a global centre for high end ICT talent. As with the previous Action Plans, this ambition will be realised by a concerted partnership approach between Government, industry, and the education and training sector.

2   The ICT Skills Action Planning Process 2012-2018

The two ICT Skills Action Plans developed and published since 2012 have been part of a collaborative industry-Government approach to building the domestic supply of high-level ICT graduates.

The first ICT Skills Action Plan, launched in 2012, contained a range of measures aimed at meeting ICT skills needs in the short-term while, in tandem, building the longer-term supply of high-level ICT graduates. Short term supply measures included the roll out of targeted conversion/upskilling programmes through Springboard+ and Skillnet Ireland (formerly Skillnets). The plan's overarching target was a doubling of the output of level 8 graduates from mainstream ICT disciplines between 2011 and 2018.

Measures to build longer-term supply included the implementation of Project Maths and introduction of higher level bonus points in Leaving Certificate Mathematics, the roll out of the Smart Futures programme, as well as undergraduate work placements and supports for increasing retention rates in higher education institutions (HEIs).

The 2014-2018 ICT Skills Action Plan was developed to take account of updated demand forecasts from the Expert Group on Future Skills Needs (EGFSN) published in late 2013[6]- which forecast that demand for high-level ICT skills would grow at an annual rate of 4.9% in the years to 2018 - as well as progress in building the skills pipeline. The 2014-2018 Action Plan included a target to meet 74% of demand for level 8+ graduates from domestic supply by 2018. Before the publication of the first plan, 45% of high-level ICT skills demand was met domestically from higher education programmes.

Key measures to increase indigenous supply included:

- The incentivisation of an additional 1,250 ICT undergraduate places in HEIs per year, with a target of 1,037 additional graduates per annum from the end of 2018;

- Continuation of ICT upskilling and NFQ Level conversion courses; and

- Collaboration with industry in the design of programmes and the provision of structured work placements

Actions directed towards enhancing ICT capacity and awareness in the education system included continued support for maths and ICT skills development through promotion and attraction measures, where possible facilitated by industry inputs e.g. the 'Adopt a School' programme, allied to curriculum reforms; an increase in HEI ICT programme retention rates from 80% to 83% over the lifetime of the plan; and the launch of the *Digital Strategy for Schools, 2015-2020[7]*, with the aim of realising the potential of technologies to enhance teaching, learning and assessment at primary and post-primary level. During the lifetime of the plan the Government also launched the *STEM Education Policy Statement, 2017-2026[8]* and *STEM Education Implementation Plan 2017-2019[9]*.

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6   Expert Group on Future Skills Needs, Addressing Future Demand for High Level ICT Skills, 2013- http://www.skillsireland.ie/media/04112013-Addressing_ICT_Skills-Publication.pdf
7   https://www.education.ie/en/Publications/Policy-Reports/Digital-Strategy-for-Schools-2015-2020.pdf
8   https://www.education.ie/en/The-Education-System/STEM-Education-Policy/stem-education-policy-statement-2017-2026-.pdf
9   https://www.education.ie/en/The-Education-System/STEM-Education-Policy/stem-education-implementation-plan-2017-2019-.pdf

A key addition was a broadening of the scope of the plan to include measures to increase the supply of highly skilled ICT professionals from abroad. This was achieved through the development and launch of the *Tech/Life Ireland* initiative in 2016 to promote Ireland internationally as a destination for high-level ICT skills, the organisation of overseas career fairs, and improved processing times and fast track facilities in the employment permit process, including through the introduction of the Trusted Partner Registration scheme.

2.1   Education and training system response

Significant progress has been made in meeting the targets under the 2012 and 2014-2018 ICT Skills Action plans:

- The number of mainstream level 8+ graduates rose by 46%, from 2,310 in 2012 to 3,378 in 2016. They are estimated to reach 3,549 by 2018.This represents a 54% increase over 2012. When graduates from ICT Conversion programmes, Springboard+ and incentivised places are taken into account, the increase is 70% with an estimated 5,310 students due to graduate this year (2018).

- Retention rates on ICT degree programmes have improved from 81% in 2010/2011 to 84% for the 2014/2015 student entry cohort. While there has been an overall increase in retention rates there remains room for further improvement.

- Initiatives targeted at increasing places in further and higher education (Springboard+, ICT Conversion programme, HEI incentivised places, Skillnet Ireland), resulted in the following:

  - An additional 480 full time level 8+ places in the Higher Education (HE) sector in 2016, under the incentivised places scheme

  - In 2017, a total of 1,186 learners graduated from HE ICT conversion programmes and ICT Springboard programmes.

  - Skillnet Ireland provided a total of 6,474 training places in 2016. 217 of these were at level 8+ and 1,104 places at level 5-7 of the QQI qualifications framework. The remainder of the qualifications gained by these graduates were unaligned with the National Framework of Qualifications (NFQ).

- The percentage of students opting for higher level Leaving Certificate Mathematics has increased from 20% in 2012 to 31.5% in 2018. This upward trend should be assisted by changes to the Leaving Certificate grading structure and the widening of higher level grade ranges counting towards CAO points accumulation which took effect in 2017.

- As part of the roll out of the Digital Strategy for Schools, Computer Science is being introduced on a phased basis as a Leaving Certificate examination subject commencing in September 2018. Coding has been available as a short course at Junior Cycle level since September 2014.

2.2   The role of inward migration in addressing Ireland's high-level skills needs

Following on from the emphasis under the 2014-2018 ICT Skills Action Plan, the attraction of experienced ICT professionals has also played a key role in helping meet Ireland's high-level skills needs in recent years. Ireland is increasingly seen as an attractive destination by international tech talent, and we are successfully luring some of the best talent to our shores.

The growing contribution of inward migration is evident in the upward trend in ICT related employment permits, for talent from outside the European Economic Area (EEA). The streamlining of the work permit application system since 2014 has been an important element in this growth. ICT related permits (new and renewal) have increased incrementally from 1,872 in 2014 to 4,021 in 2018.

In terms of their sectoral breakdown, the vast majority of permits were approved for roles in the Information and Communication Activities sector, with 2,908 or 84% of permits in 2017. Demand was highest in 2017 for Programmers and software development professionals (1,478), IT business analysts, architects and systems designers (744), and IT and telecommunications professionals (530).

- Information and Communication Activities - 2,734
- Financial & Insurance Activities - 228
- Other Service Activities - 117
- Manufacture of Computers, Electronics & Optical Equipment - 21
- Manufacture of Medical Devices - 21
- Others - 113
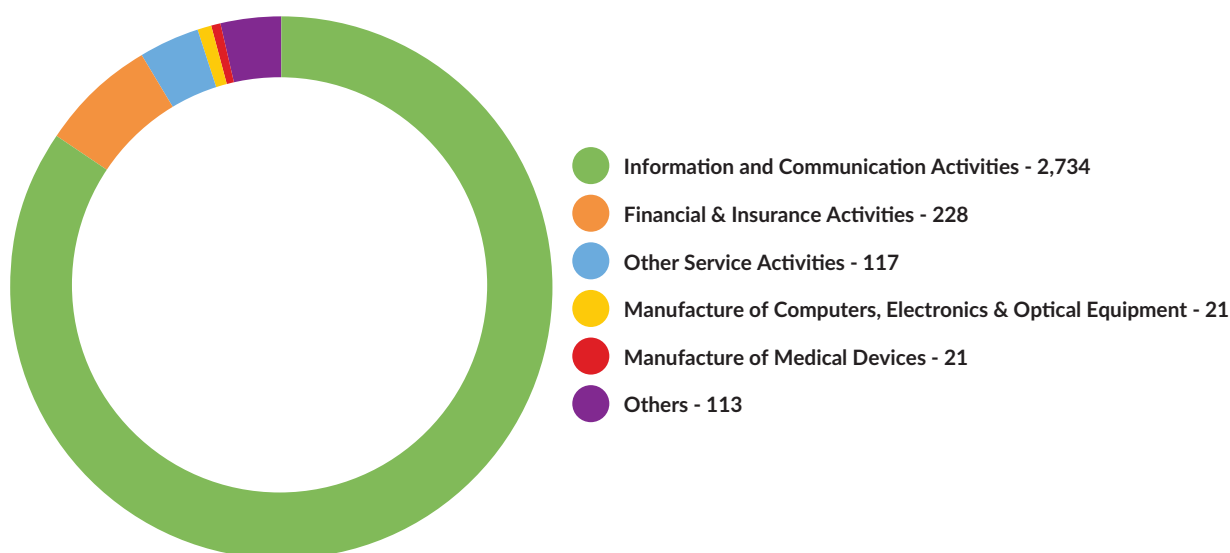
Figure 1:   Breakdown of ICT related permits per sector 2017

By contrast, inward migration of ICT talent from within the EEA or European Union is more difficult to track. A comparison of Census data for 2011 and 2016, however, reveals an increase in ICT professionals citing EEA nationality in that period. The nationality data, while not directly comparable with the Census occupational data, suggests that between 10 and 15% of ICT professionals in Ireland are from other EEA countries.

3 Expert Group on Future Skills Needs: Skills Demand Forecasting

Significant achievements can be attributed to the ICT skills action plan process to date. On the basis of the central baseline scenario set out by the EGFSN in its 2013 forecast i.e. the scenario regarded as most likely to occur (a 4.9% compound annual growth rate (CAGR) in demand), forecast supply figures, between output from the mainstream education and training system as well as inward migration, would have comfortably matched demand. According to the 2013 baseline forecast, total annual potential job openings were to increase from 5,939 in 2012 to 8,140 in 2018.
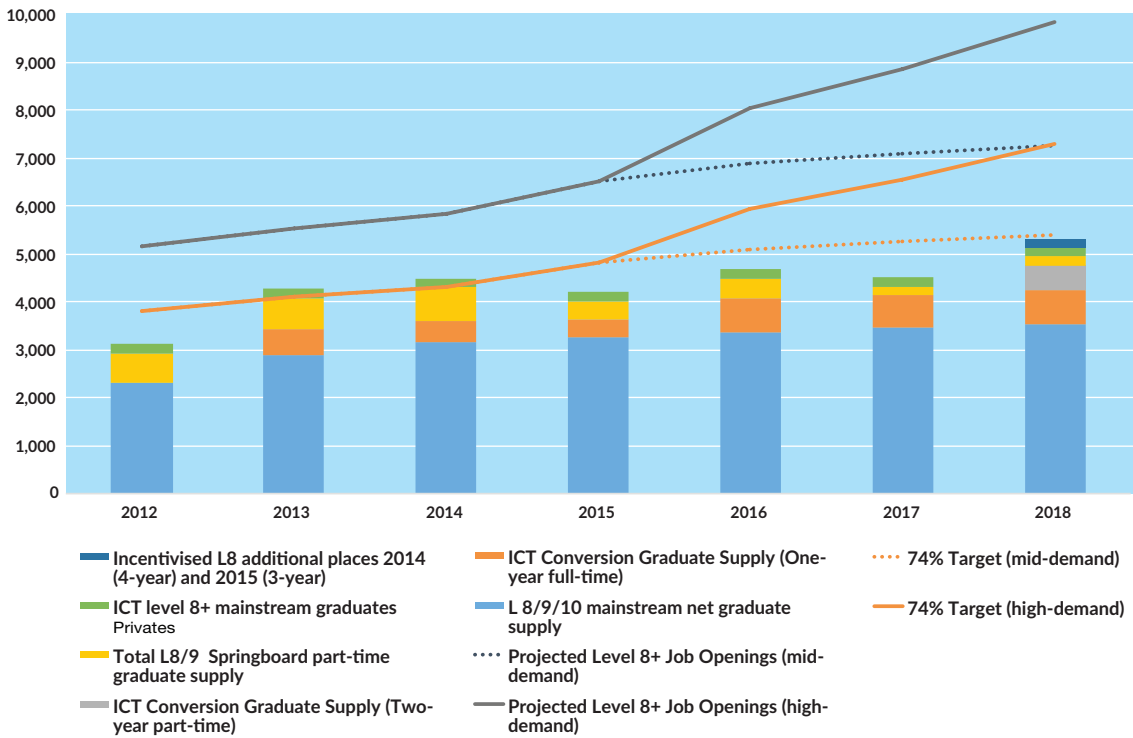
Figure 2: Skills Forecast vs Graduate supply Level 8+ (2012-2018)

Adherence to this rate of demand growth would have effectively matched the 74% target set down in the 2014-2018 plan, for meeting demand from indigenous supply. In 2013 and 2014, this target was in fact exceeded. From 2015 onwards, however, buoyed by the recovery in the economy and wider labour market, demand for high-level skills moved onto the higher growth plane set out in the 2013 EGFSN report- which forecast a CAGR rate of 7.2%. As of 2018, indigenous supply is forecast to meet 57% of demand.

Table 1: **Supply of Irish Graduates as a Percentage of Forecasted Demand (2012-2018)**

	2012	2013	2014	2015	2016	2017	2018 (projected)
Central Growth Scenario	61%	77%	77%	65%	68%	63%	73%
Higher Growth scenario	61%	77%	77%	65%	58%	51%	57%

3.1 Forecasting Future Demand for High-Level ICT Skills in Ireland, 2017-2022

The Expert Group on Future Skills Needs undertook a refresh of its 2013 skills demand forecast in late 2017. It examined the demand for high-level ICT skills in Ireland over the five year period 2017 to 2022, within both the broad ICT sector as well as other sectors of the economy. High-level ICT skills are defined as those computing and electrical and electronic engineering skillsets associated with the design, building and maintenance of high-level ICT systems at Levels 6/7 and 8+ of the National Framework of Qualifications (NFQ).

The study, which was based on comprehensive engagement with over 100 high-level ICT skills stakeholders in Ireland, as well as research and inputs on relevant domestic and international trends, resulted in the development of three skills demand scenarios for the 2017 to 2022 period. These forecasts used 2016 Census data related to the 14 occupations most closely associated with the deployment of high-level ICT skills: in total, high-level ICT professionals numbered 81,575 in 2016.[10]
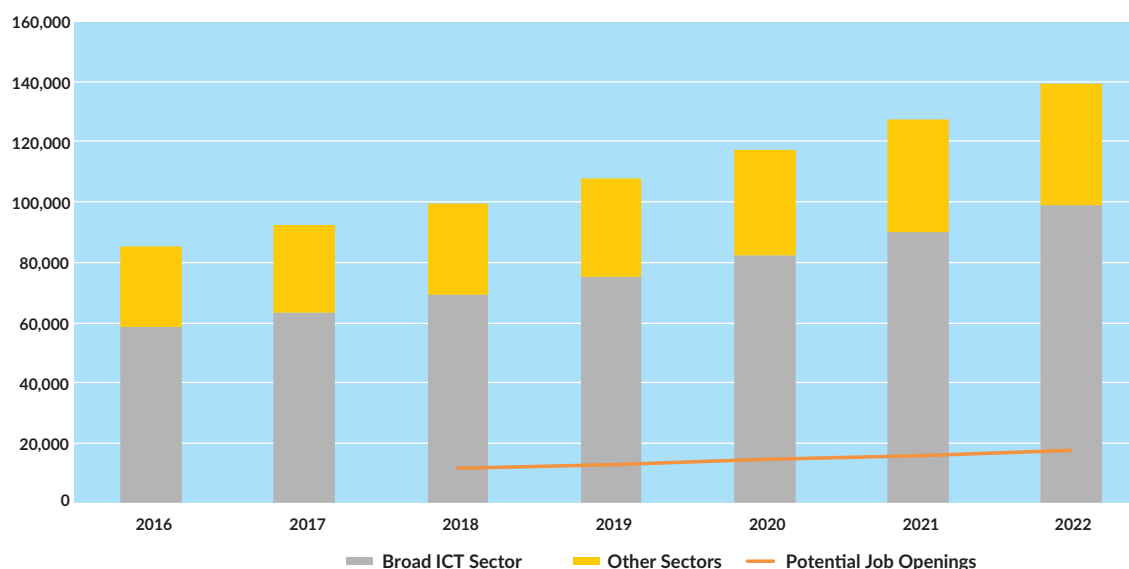
Figure 3: **Projected demand for high-level ICT skills in Ireland to 2022 under central scenario (EGFSN)**

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10   The 14 Standard Occupational Classifications codes (2010) are: Information technology and telecommunications directors — Code 1136; IT specialist managers — Code 2133; IT project and programme managers — Code 2134; IT business analysts, architects and systems designers — Code 2135; Programmers and software development professionals — Code 2136; Web design and development professionals — Code 2137; Information technology and telecommunications professionals not elsewhere included — Code 2139; IT operations technicians — Code 3131; IT user support technicians — Code 3132; IT engineers — Code 5245; Electrical and electronic engineers — Codes 2123 and 2124; Design and development engineers — Code 2126; Electrical and electronics technicians — Code 3112; and Telecommunications engineers — Code 5242

The study's central scenario suggests that the high growth scenario set out in 2013 will not just be maintained, but will accelerate in the coming years. This forecasts growth in demand of 8.5%. This will increase the demand for high-level ICT professionals to 139,000 in 2022. Demand is forecast to grow at a faster rate within the broad ICT sector over other sectors of the economy; for computing skills over electrical and electronic engineering skills; and at NFQ Level 8+ compared with NFQ levels 6/7.

Table 2:   Central Baseline Scenario: Potential Job Openings for High Level ICT Professionals by Skills Type and NFQ Level, 2018-2022

		2018	2019	2020	2021	2022	Total job openings 2018-2022
Computing	Level 6/7	1,410	1,560	1,700	1,840	1,990	8,500
	Level 8+	8,590	9,680	10,990	12,260	13,710	55,230
Electronic and Electrical Engineering	Level 6/7	324	340	369	396	415	1,844
	Level 8+	1,270	1,340	1,440	1,560	1,680	7,290
Total potential job openings		11,594	12,920	14,499	16,056	17,795	72,864

The potential total job openings arising both from replacement and expansion demand is almost 73,000 between 2018 and 2022. On an annualised basis, the annual level of job openings are projected to increase from 11,594 in 2018 to 17,795 in 2022.

3.2   Other key findings from EGFSN research

The findings of the EGFSN research also highlight key qualitative trends and issues within the market for high-level ICT skills in Ireland, which should be accounted for in the supply response. The EGFSN research highlights emerging technologies that will impact on the high-level ICT skills market in Ireland in the coming years, all of which are driving fundamental change to businesses and consumers globally.

These include diverse technologies such as artificial intelligence (AI)/ cognitive systems, robotics, the internet of things, 3D printing, augmented reality and virtual reality, and next generation security, all of which are enabled by the "Third Platform" of cloud, big data analytics, mobility and social media. These areas overlap with those set out as areas for priority funding under the *Government's refresh of Research Prioritisation, 2018-2023*[11].

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11   https://dbei.gov.ie/en/Publications/Publication-files/Research-Priority-Areas-2018-to-2023.pdf

Identified Skills Needs

Cognitive systems - Next generation security - Virtual Reality - Internet of Things - Robotics - 3D printing

Priority Research Investment

Robotics - Artificial Intelligence - Machine Learning - Augmented Reality - Virtual Reality

Potential Areas for Development

Gaming - Animation

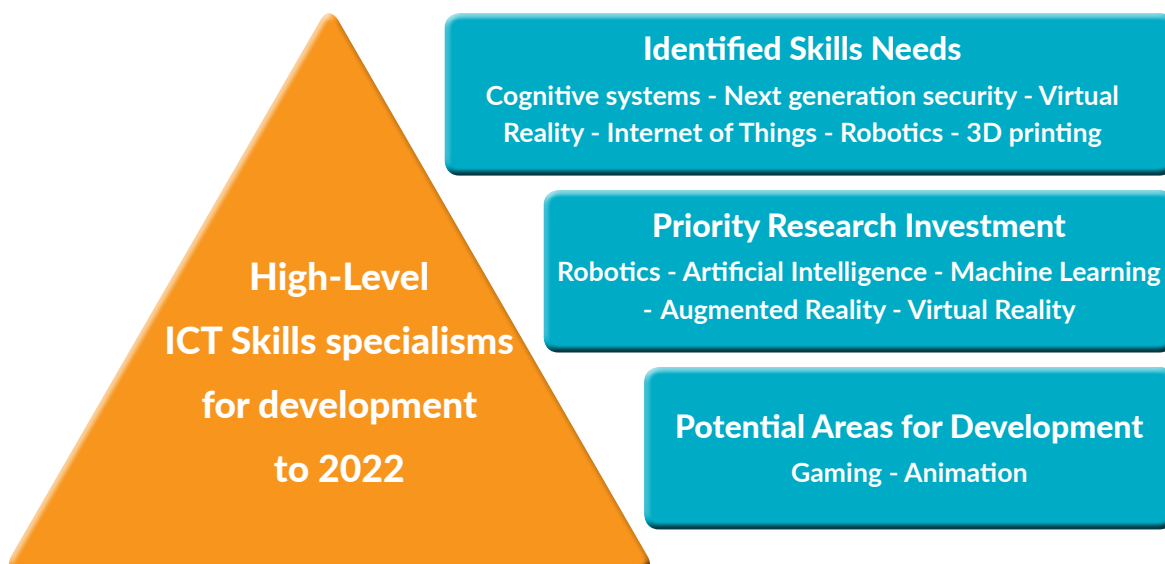**High-Level ICT Skills specialisms for development to 2022**

Figure 4: **High-Level ICT Skills: Priority Areas to 2022**

The research also confirms the success of the ICT skills action plans since their inception in boosting the supply of third level ICT graduates, as well as the reforms undertaken with respect to the employment permits system. Employers expressed satisfaction with the greater availability of high-level ICT graduates, while the challenge of recruiting talent from overseas has diminished in importance since the previous EGFSN study in 2013. The greater access to employment permits has had a major impact on facilitating the growth in the ICT sector in the intervening period.

Employers are reporting three major challenges in the acquisition of high-level ICT skills. Firstly, they are reporting difficulty in finding the right types of technical skills - this is particularly acute in new areas such as artificial intelligence, machine learning, blockchain and robotics, as well as specific software programmes in animation and gaming. The emerging nature of these skillsets means that there has been insufficient time for the education and training system to respond fully, and many of these skills are therefore being sourced from overseas.

Employers also reported difficulties, now that graduate supply has improved, in finding the right level of experience. This is partly a legacy of the previous graduate shortages as the most sought-after personnel are those with five or more years' experience. Many employers are engaging in upskilling of existing staff to address this shortfall. Finally, difficulties are being reported in finding the right mix of skills: the most commonly sought is a combination of technical with communication skills, particularly those related to business acumen, to allow for effective communication with customers.

In the main, in the coming years employers are expecting to hire a mix of graduates and personnel with more experience from other organisations. Support was also voiced for internships and the new ICT apprenticeship model, which is viewed as a welcome new entry route into the ICT profession. More recruitment of expertise in new technologies such as artificial intelligence, machine learning, data analytics and blockchain is anticipated. For a majority of companies, the essential skills in computer engineering or electronic/electrical engineering will not change other than in line with industry trends, such as trends in programming languages. A number of companies are working closely with education and training providers to increase the pipeline of graduates coming through the system, and to help ensure training is aligned with their specific needs.

4 Supply Projections and Context for Policy Response

Without intervention, projected supply from the education and training system will fall short of the potential job openings forecast under the EGFSN's baseline scenario. In the first five months of 2018, the need to meet skills needs through international recruitment and an inflow of highly skilled migrants from within the EEA and through the employment permits system is evident with the number of ICT permit approvals running 27% higher than the same period in 2017.

Targeted, impactful measures are therefore necessary to complement existing initiatives and boost the supply of high-level ICT skills in the coming years. This is critical to support the continued competitiveness and growth of the broad ICT sector and, increasingly, other sectors of the economy as digitalisation takes hold. As referenced, this also takes place in the context of near full employment in the Irish economy with a resulting tightening of the labour market; as well as intense competition for ICT professionals internationally, particularly within the EU. On this latter point, however, the European Commission's ambitions for its Digital Europe Programme, which includes targeted measures to boost the supply of advanced digital skills, could be a welcome intervention in easing the supply demand gap throughout Europe.

4.1 Reform of the tertiary education system and skills infrastructure

Development of the required supply response also takes place in the context of significant reforms that have been delivered in recent years across the Irish education and training system. These reforms and initiatives can be harnessed to the benefit of bridging the ICT skills demand-supply gap anticipated by the EGFSN forecasts, and help build upon the momentum of initiatives undertaken under the two ICT skills action plans to date.

Building upon and governing this reform of recent years is the vision set out in *Ireland's National Skills Strategy 2025*[12], which is being delivered and monitored through the *Action Plan for Education 2016-2019*[13]. These strategies aim to make Ireland's education and training system the best in Europe by 2026. This vision is being guided by a new National Skills Architecture, with the establishment of a National Skills Council (NSC) to oversee research, forecasting and prioritisation of skills needs in the economy. Supported by the work of the EGFSN and Regional Skills Fora (RSF), this architecture aims to make Ireland a leader in anticipating and responding rapidly to changing skills needs across all sectors.

Structural reform of the higher education sector is being delivered under the *National Strategy for Higher Education 2030*[14]. Under these reforms the first Technological University (TU) was established on January 1, 2019. The creation of TUs from existing Institutes of Technology (IoTs) will also provide the opportunity to drive regional development, and provide more opportunities for individuals, enterprise and the community.

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12   https://www.education.ie/en/Publications/Policy-Reports/pub_national_skills_strategy_2025.pdf
13   https://www.education.ie/en/Publications/Corporate-Reports/Strategy-Statement/Department-of-Education-and-Skills-Strategy-Statement-2016-2019.pdf
14   http://hea.ie/assets/uploads/2017/06/National-Strategy-for-Higher-Education-2030.pdf

The *Higher Education Systems Performance Framework (SPF) for 2018-2020*[15] is also setting out to ensure that HEIs provide a *'strong talent pipeline combining knowledge, skills and employability, which responds effectively to the needs of our enterprise, public service and community sectors… and maintains Irish leadership in Europe for skill availability'*. The SPF includes the achievements of targets set out in the ICT skills action planning process as key deliverables, including annual percentage growth in intake, graduates by level of qualification and programme, and retention rates.

The Higher Education Authority (HEA) has undertaken a review of the model for allocating grant funding to Universities, IoTs and colleges. The *Review of the Allocation Model for Funding Higher Education Institutions*[16] and its recommendations will shape the future direction, performance and impact of higher education, which will include an analysis of ICT courses. Their funding and infrastructure supports are essential in providing high-level ICT graduates to the sector.

The further education and training (FET) sector has significant potential to make an important contribution to Ireland's future ICT skills supply (particularly through the apprenticeship model), is developing via a process of strategic dialogue a new system of multi-annual strategic performance agreements with each Education and Training Board (ETB). This will set targets and monitor outcomes in relation to ICT skills (and associated areas like web design and development, IT engineering, etc) from FET over the period 2018-2020. The development of ICT skills will also be a central theme in the new FET strategy which will be developed during the course of 2019, for implementation from 2020.

In recent years there has been a shift within FET towards ICT specialisms. In 2016, over 50% of the 800 ICT awards at QQI levels 5 and 6 were for software development or networking courses. In 2013 the majority of awards were in general information technology. Also of note are the large number of awards which are certified by bodies other than QQI. In 2016, approximately an additional 5,000 industry certificates were awarded to learners on SOLAS-funded ICT courses[17].

The *National Skills Strategy* highlights the critical role to be played by lifelong learning in the coming years; the development of the skills of those at work, especially as the economy approaches full employment, will play a key role in the context of future growth. The Strategy has set a target to increase participation to 15% by 2025, from 9% in 2016. This ambition is being supported through the provision of greater resources to Skillnet Ireland programmes, opening up of programmes such as Springboard+ and Traineeships to people in employment, and the development of a new "Skills to Advance" framework for ETBs to support people in employment.[18] This objective will be further supported by the implementation of reforms to the National Training Fund (NTF) in the coming years.

Skillnet Ireland for its part has seen a 19% increase in funding in 2018, to €22m. The Technology Ireland ICT Skillnet, in collaboration with University of Limerick, also launched Ireland's first Masters in AI in early 2018, in response to a growing demand by industry for AI skills in Ireland. A total of 36 tech firms worked on the design of the programme. The successful development of the programme demonstrates the commitment of industry and the education and training sector to a partnership approach to meeting potential and identified skills needs.

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15   https://www.education.ie/en/Publications/Education-Reports/higher-education-system-performance-framework-2018-2020.pdf
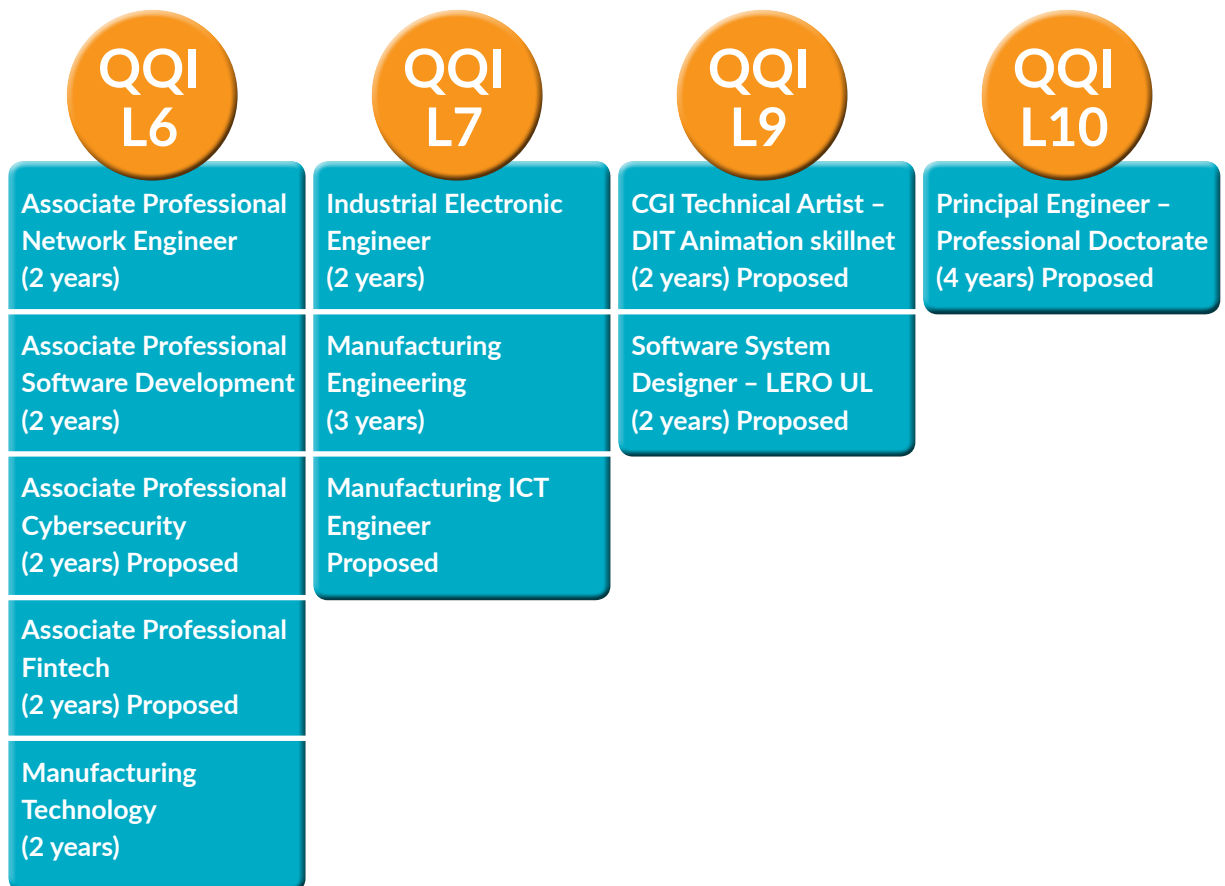16   http://hea.ie/assets/uploads/2017/06/hea_rfam_final_scoping_paper_012017.pdf
17   These include 2,800 awards recognised by ICS Skills (ECDL); 600 City & Guilds Awards; 700 Microsoft Awards; 150 Oracle Awards; almost 400 CompTIA awards.
18   Supporting Working Lives and Enterprise Growth in Ireland, 2018-2021

A review of existing career guidance tools and career information for post-primary, further education, and higher education students and adults, currently in place across the education and training system, is due to be published in early 2019. Reform of guidance was identified by employers as key to effectively promoting ICT as a career. The review is being undertaken in the context of its significant role arising from changing patterns of work and an increasing need for upskilling and reskilling, and overall more generally in the context of lifelong learning. The review's purpose is to ensure that Ireland is providing a high quality, relevant guidance support service at all stages of the career lifecycle.

Under both the Programme for Partnership Government, and *Action Plan to Expand Apprenticeships and Traineeships in Ireland, 2016-2020*[19], the Government has committed to enrolling 31,000 people on apprenticeship programmes by 2020. This ambition is being supported by significant increases in the budgetary allocation for apprenticeship training (€122m, an increase of almost 24% on 2017). This includes expansion of the apprenticeship model into non-craft areas, including ICT.

Figure 5: High-level ICT Apprenticeship programmes in place and proposed programmes as of November 2018

QQI L6	QQI L7	QQI L9	QQI L10
Associate Professional Network Engineer (2 years)	Industrial Electronic Engineer (2 years)	CGI Technical Artist – DIT Animation skillnet (2 years) Proposed	Principal Engineer – Professional Doctorate (4 years) Proposed
Associate Professional Software Development (2 years)	Manufacturing Engineering (3 years)	Software System Designer – LERO UL (2 years) Proposed	
Associate Professional Cybersecurity (2 years) Proposed	Manufacturing ICT Engineer Proposed		
Associate Professional Fintech (2 years) Proposed			
Manufacturing Technology (2 years)			

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19 https://www.education.ie/en/Publications/Policy-Reports/Action-Plan-Expand-Apprenticeship-Traineeship-in-Ireland-2016-2020.pdf

The Action Plan to Expand Apprenticeships and Traineeships in Ireland has committed to a target of 19,000 traineeship registrations between 2016 and 2020. Previously aimed at unemployed people, traineeships are now open to a wider range of participants, of all ages and backgrounds. A new five step guide was launched in November 2017 aimed at employers seeking practical information on how to develop a traineeship within their company.

The EGFSN research has highlighted the growing importance of transversal skills to ICT employers. An *Entrepreneurship Education Policy Statement* is currently under development, followed by guidance for schools to enhance enterprise in education. This will support a whole of system approach to the development of an enterprise engagement strategy for higher education. The Government is also currently implementing *Languages Connect- Ireland's Strategy for Foreign Languages in Education, 2017-2026*[20], which sets out a course of short and medium-term actions aimed at ensuring competency in at least one foreign language within the wider Irish population.

4.2 Expanding the labour force: female participation and the employment permit system

With the economy approaching full employment, Government policy is also placing an emphasis on the expansion of the labour force, partly through a reduction in the number of economically inactive, to address the growing need for skills and talent.

Increasing female labour force participation, which currently stands at 56% (compared with 68.6% for men) is a key focus, with policy seeking to address barriers to entering or re-entering the labour market. Increasing female participation in ICT was highlighted by employers as a key objective in addressing both the ICT sector's gender balance and skills needs. The Department of Justice's *'Women Returning to the Workforce'* initiative is providing support through career guidance, training programmes and work placements. Industry-led programmes such as Women ReBOOT is also seeking to connect highly skilled women returners to top technology companies.

Building on reforms to the Employment Permits system from 2014, a review of the wider economic migration policy was also delivered in 2018, to ensure the permits system remains responsive to the changing labour market as the economy approaches full employment. Recommendations made as part of this review promise to further enhance Ireland's attractiveness to international talent.

Irish Educated Globally Connected: An International Education Strategy for Ireland, 2016-2020[21] also sets out the objective of attracting high calibre international students to Ireland. The Graduate Stayback scheme is permitting the retention of these students as a means of contributing towards Ireland's skills needs. In 2016, it was found that nine months after graduation 62% of international honours bachelor degree graduates were in employment, with 37% working in Ireland. 59% of higher and postgraduate diploma international graduates were employed, with 51% working in Ireland.

20   https://www.education.ie/en/Schools-Colleges/Information/Curriculum-and-Syllabus/Foreign-Languages-Strategy/fls_languages_connect_strategy.pdf
21   https://www.education.ie/en/Publications/Policy-Reports/International-Education-Strategy-For-Ireland-2016-2020.pdf

5 Delivering Ireland's High-Level ICT Skills Needs

The education and training sector is a complex system, covering early-years to tertiary education and lifelong learning. Skills development is also a lifelong process and the ICT skills action plan process cannot be delivered in isolation from the initiatives under way in the school sector and across industry to promote and enhance background scientific and technical knowledge.

This paper sets out to identify the full suite of actions required to boost high-level ICT skills into the future. This includes actions which will impact both now, and also those which will form the basis for long term delivery of high-level ICT skills across the economy into the future.

Technology Skills 2022: Irelands Third ICT Skills Action Plan provides a focus on high-impact actions required to deliver high-level ICT skills over the four year period to 2022.

The education and training system continues to grow and develop on an ongoing basis. This includes projected growth of an additional 1,800 graduates on 2018 numbers over the next 4 years, representing a growth approaching 25% in a four year period on a "no policy change" basis.

However, without intervention, projected supply from the education and training system will still fall short of the potential job openings forecast under the EGFSN's baseline scenario.

The third ICT Skills Action Plan will maintain the momentum generated through the two previous plans, while also introducing a suite of new, impactful actions that will help meet the ambitious new level of demand, and maintain Ireland's status as a global leader for the development and attraction of high-level ICT talent and skills.

The supply of high-level ICT skills from the education and training system will be increased, so as to deliver a target of an additional 3,200 people on top of the existing planned increase in provision from across the education and training system to 2022. This represents an additional 35% on a "no policy change" – or a 68% growth in total graduate numbers within four years. This is a significant ask, and delivery requires significant commitment by Government, industry and the education and training system.

The National Training Fund (NTF) is delivering €6.3 million in extra funding to Skillnet Ireland in 2019. It is also supplying a new funding line of €11 million for the implementation of the new SOLAS/ETB framework targeted at upskilling lower skilled workers and supporting SMEs. Widening the base of individual with qualifications at level 5 of the NFQ provides a long term solution for ongoing engagement with lifelong learning and potential for progression to NFQ level 6 and above.

The Human Capital Initiative (HCI) will deliver additional investment of €300 million over the 5 year period 2020-2024, with the spend targeted towards increasing capacity in HE in skills focused programmes designed to meet priority labour market needs such as are identified in this plan and seeking to promote innovative and responsive models of programme delivery.

Supporting the above, and demonstrating continued commitment from industry, is the increased contribution by employers to the NTF levy, which began in 2018 and will continue in 2019 and 2020. Government have approved the increases as part of *Budget 2019* on the basis of reforms which are being undertaken to the NTF, including those arising from the *Independent Review of the National Training Fund*[22], carried out by Indecon and published earlier this year by the then Minister for Education and Skills. The independent review examines the existing operation of the NTF and provides recommendations to inform its future direction.

An implementation plan to deliver these recommendations was published as part of *Budget 2019* along with details of the establishment of a new advisory group to the NSC in order to strengthen governance and oversight and to secure employer input into the strategic direction of the Fund. This advisory group will be chaired by an employer representative of the Council to make recommendations to the NSC on NTF expenditure priorities will help ensure that meeting high-level ICT skills needs continue to be priorities over the period of the action plan.

Under this suite of actions, it is recognised that development in terms of infrastructure, increased capacity, and changing skills needs takes time. Partnerships between education and training providers and industry, through the new skills architecture, conversion courses, Skillnet Ireland programmes, apprenticeships and traineeships, and other measures to expand the pool of ICT professionals, will be vital in meeting our high-level ICT skills needs.

Not only does this fourth industrial revolution provide opportunities for reskilling some of the 2.4 million people who currently make up our labour force[23], it also provides an opportunity to deliver education and training in new and novel ways. Blended learning, online and distance learning allow a greater facility for learners to progress at their own rate, and in their own time.

We will deliver clear and transparent progression opportunities, encouraging those who have not previously engaged with higher education to access a clear reskilling pathway. This is in line with the Transitions Reform programme within the Department of Education and Skills, which aims to reduce barriers to progression from second level to further and higher education.

As well as measures to secure the medium term indigenous pipeline of high-level ICT talent and build towards our target, the education and training sector together with industry partners have identified measures to boost supply in the shorter-term, from both indigenous sources and inward migration.

These key actions will enhance the existing promotion of Ireland as an attractive destination for highly skilled ICT professionals from abroad. Attraction of skilled professionals will be supported by measures to reduce the administrative burden for those potential employees who require work permits and visas. These will be complemented by actions to support the development of transversal skills, as well as the longer-term development of the high-level ICT skills pipeline.

This paper sets out 13 key actions which complement the actions within the *STEM Education Policy Statement 2017-2026* and which aim to embed changes in the education and training system designed to deliver a robust and responsive high-level ICT skills pipeline.

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22   https://www.education.ie/en/Press-Events/Press-Releases/2018-press-releases/indecon-review-of-national-training-fund.pdf
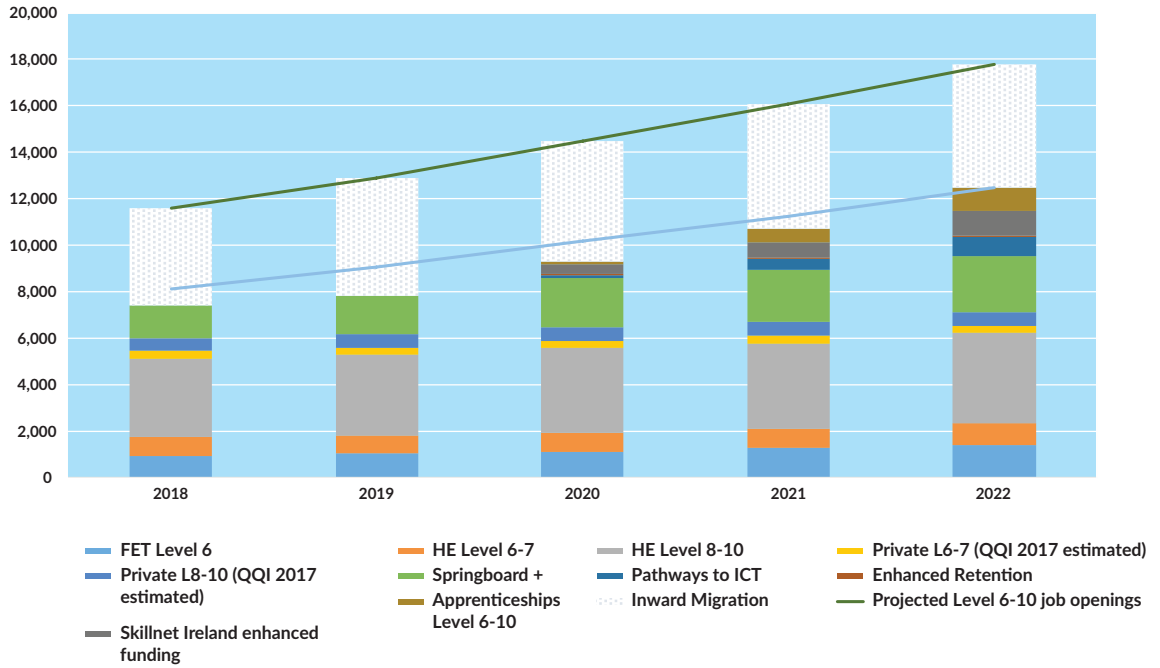23   CSO, Labour Force Survey, Quarter 2 2018

Figure 6:   High Level ICT Skills - Demand estimates and Supply response 2018-2022

6   Meeting Skills Needs: Priority Action Areas

Targeted, impactful measures are necessary to complement existing measures and boost the supply of high-level ICT skills in the coming years. This is critical to support the continued competitiveness and growth of the broad ICT sector and, increasingly, other sectors of the economy as digitalisation takes hold. As referenced, this also takes place in the context of near full employment in the Irish economy with a resulting tightening of the labour market; as well as intense competition for ICT professionals internationally, particularly within the EU.

Technology Skills 2022: Ireland's Third ICT Skills Action Plan focuses on five priority areas which will increase the domestic supply of skills to the sector, while the targeting of international talent to the sector will aid in addressing the demand gap. In addition, the expansion of provision at the higher education level will assist in the number of high-level graduates.

Priority areas for action under the plan discussed further in the section below are as follows:-

- Expansion of Provision in Higher Education
- Delivery of pathways for reskilling into ICT roles
- ICT Apprenticeships
- Skillnet Ireland
- International Talent

6.1   Expansion of provision in higher education

Increased provision of high-level ICT places in HE will contribute significantly to the supply of skilled graduates to the ICT sector.

Previous action plans have primarily focussed on increasing capacity within the higher education sector. In addition to supporting the current levels of provision, this plan now places a strategic focus on fully utilising the range of learning opportunities available across the tertiary education system to deliver a range of pathways to meet high-level ICT skill needs now and into the future.

6.2   Pathways to ICT

Technology Skills 2022 will build on existing partnerships between the further and higher education sectors to deliver a new reskilling pathway which provides an entry point at the further education level with a defined progression pathway to higher education ICT programmes at NFQ levels 6 and 7.

The Pathways to ICT programme will build on the success of the Springboard+ programme in attracting learners from diverse professional backgrounds into ICT with a particular focus on attracting females to the sector. It will aim to reskill returners and individuals who are currently employed in industries which may be at risk due to technological advancements and upskill individuals through conversion pathways to

ICT. It will formalise progression pathways between the relevant ETBs and higher education institutions (HEIs) in agreeing course content and design.

Pathways courses will be delivered in collaboration with regional employers to ensure that participants are being equipped with the skills needed for the region. The programme will be implemented at the regional level with participation from the Regional Skills Fora in identifying ICT skills needs and adapting the programme to the needs of that specific region. This is important for the development of industry regionally and to ensure that individuals are equipped with the appropriate skills for regional industry needs.

Delivering entry points at the further education level will provide a strong pipeline of potential future graduates, with an established interest in the discipline.

6.3   ICT Apprenticeships

The continued growth of ICT apprenticeships can play a major role in meeting high-level ICT skill needs. The Government has committed to expanding the apprenticeship model into non-craft areas, including ICT. Two programmes in ICT (Network Engineer and Software Developer) have been validated with their first intake of apprentices in situ as of September 2018 along with three apprenticeship programmes at level 6 and 7 in manufacturing technology, manufacturing engineering and industrial electrical engineering.

A further 6 apprenticeship programmes are in development at the current time at levels 6-10 of the NFQ. These apprenticeships will be promoted to multi-national corporations as well as indigenous companies at a regional level to ensure that skills needs nationwide are being addressed.

6.4   Skillnet Ireland

Skillnet Ireland has demonstrated a strong capacity to work closely with their business learning networks, responding flexibly and in innovative ways to meet specific ICT skill needs. Specific technology and ICT focussed Skillnets include Animation, Robotics, Green Tech, Internet of Medical Things, MedTech, Electronic Systems, ICT and Software.

Continued expansion and development of Skillnet Ireland networks through programmes aligned with the NFQ can encourage professionals to remain in the wider ICT sector. These will be supported by clear career pathways which highlight opportunities for companies and individuals in employment.

6.5   International talent

The education and training sector will increase graduate supply to the ICT sector by over 5,000 graduates over the four year period covered by *Technology Skills 2022*. There will remain a requirement to ensure that international recruitment is facilitated through the Employment Permits System and the recruitment of talent from the EU and the EEA.

The recommendations from the review of the economic migration policy will be implemented to further enhance Ireland's attractiveness to international talent. These key actions will enhance the existing promotion of Ireland as an attractive destination for highly skilled ICT professionals from abroad.

Action 1:   Provide pathways for reskilling into ICT/Technology roles

Deliverable	Industry Partners and Required Inputs	Scheduled Delivery	Responsible Body
Deliver reskilling pathway which provides entry point at level 5 and 6 of the NFQ with a defined progression pathway to HE level ICT reskilling programmes at NFQ level 6 & 7: Pathways to ICT programme	Engage with the Regional Skills Fora as necessary for determining skills needs	Q2, 2020	HEA, SOLAS, ETBs, HEIs, RSF
Continue Springboard+, ICT upskilling and NFQ Level 8 conversion courses, in collaboration with industry in the design of programmes and the provision of structured work placements	Promote career opportunities within the sector to encourage uptake of additional places	2019-2022	DES, HEA, HEIs
Issue a call for further ICT conversion/upskilling courses under Springboard+, targeting the unemployed and those wishing to return to the workforce after inactivity		Q1 per annum	DES, HEA

Action 2:   Incentivise additional places in Further Education and Higher Education in ICT/Technology Programmes

Deliverable	Industry Partners and Required Inputs	Scheduled Delivery	Responsible Body
Issue a call for expressions of interest in providing additional places in ICT disciplines in levels 6-10 through apprenticeship and traineeship models	Employer engagement in formulation and delivery of apprenticeship programmes	Q3, 2019	HEA, HEIs, SOLAS, FET
Assess the feasibility of additional ICT apprenticeship programmes for inclusion in reskilling and lifelong learning agenda		Q1, 2020	SOLAS, HEIs
Test two-year Traineeships which have 4 months intensive training in college at L6 followed by eight-months work experience in a sponsoring company (with one Day training per week) each year		2020	SOLAS
Develop a protocol for engaging with multi-national and indigenous companies to promote ICT apprenticeship scheme		Q1, 2020	SOLAS, Apprenticeship Council, DES, HEA
Conduct a review of funding allocation for ICT courses under the Revised Funding Allocation Model for HEIs		Q3, 2019	HEA, DES

Action 3:   Skillnet Ireland networks to deliver targeted ICT technical and management programmes to industry

Deliverable	Industry Partners and Required Inputs	Scheduled Delivery	Responsible Body
Deliver Skillnet Ireland ICT conversion programmes focusing specifically on software engineering	Engage with education and training providers to target ICT sector Investment in ICT programmes jointly funded by Skillnet Ireland Networks and Industry Leadership of enterprise and identification of training needs Industry experts input to the development of level 9 programmes for industry practitioners	Q1-Q4 2019	Skillnet Ireland
Delivery of Skillnet Ireland ICT conversion courses focused on hardware and infrastructure skills and job role as well as in IT service functions		Ongoing	Skillnet Ireland
Target areas for investment should be high demand areas as evidenced by the EGFSN Skills Forecasting: Data Analytics, Artificial Intelligence/Cognitive Systems, Robotics, Animation, Gaming, Blockchain, Internet of Things, 3D Printing, Augmented and Virtual Reality, Cybersecurity/Next Generation Security Conduct review of delivery against priority areas		Q4 annually	Skillnet Ireland, DES, DBEI, HEA
Continue and monitor the outcomes of the Skillnet Ireland Women ReBOOT programme		Q4, 2019	Skillnet Ireland

Action 4:   **Attract and retain talent, promoting Ireland as a destination for high-level ICT skills, and for ICT education and training**

Deliverable	Industry Partners and Required Inputs	Scheduled Delivery	Responsible Body
Enhance and promote a web portal, such as Tech/Life Ireland, to attract international talent to Ireland	Cooperation from industry in promoting the web portal and participation in careers fairs	Q1, 2019 and ongoing	DBEI, Enterprise Ireland, IDA Ireland
Implement the recommendations of the Review of the Employment Permits system		Q1, 2019	DBEI
Assess the potential to reduce the administrative burden associated with obtaining Stamp 4 visas for holders of critical skills employment permits after two years		Q1, 2019	DJE
Assess the potential of further extending the Graduate Stayback permission for highly skilled international students		Q1, 2019	DES, DJE
Promote retention of international student cohort		Q4, 2019	DES, HEA, HEIs

Action 5:   **Promote the new diversity of education and skills provision to the public and industry**

Deliverable	Industry Partners and Required Inputs	Scheduled Delivery	Responsible Body
Assess the outcomes of the Guidance review in the context of ICT Skills		Q1, 2019	DES
Deliver comprehensive skills development information to employers including the new ways employers can access funding supports and training opportunities		Q3, 2019	DES, DBEI, Skillnet Ireland

7   Meeting Skills Needs: Building the ICT Skills Pipeline

In order to develop the ICT skills pipeline, this paper will seek to support the priority actions to ensure that further and higher education institutions are appropriately resourced to cater for the increased demand in terms of resourcing for computing and electronic and electrical engineering over the lifetime of *Technology Skills 2022*.

We must attract learners to technology and ICT training through endorsement of ICT as a valid career choice for all students and learners. By promoting the range of education and training options available to learners and employers, we can ensure that the full range of education options are understood. We will seek to ensure collaboration with industry with Skillnet Ireland and Springboard+ to offer upskilling and reskilling in emerging technologies as well as in core disciplines.

It is recognised that, in order to position ICT as a career of choice for future generations, normalisation of ICT must begin at an earlier point in an individual's life. The *STEM Education Policy Statement 2017-2026* and *STEM Education Implementation Plan 2017-2020* will seek to influence students and parents from pre-school to post-primary education. In conjunction with the digital agenda we will enhance maths, problem solving and ICT skills development through promotion and attraction measures, where possible facilitated by industry inputs.

Action 6:   Increase retention rates on ICT/Technology courses in Further and Higher Education Third Level Institutions from baseline rates

Deliverable	Industry Partners and Required Inputs	Scheduled Delivery	Responsible Body
Define and baseline FET retention rates per ETB/Programme; including full and part-time programmes and apprenticeships	Contribution in the form of industry guidance; review and contribution to course design; participation in mentoring; promotion of ICT careers and work placement	Q4 2020	SOLAS
Provide ongoing support for Third Level education institutions to increase retention of ICT students through Information Technology Investment Fund funding of programmes such as support for mathematics, learning to learn and communications		Ongoing	NFETL, HEIs, HEA
Implement the recommendations from the National Forum for Enhancement of Teaching and Learning's project on co-ordinated evaluation, sharing and promotion of good practice on retention of ICT students at NFQ Levels 6-9		Q3 2019	NFETL, HEIs
Meet Higher Education targets under the Strategic performance framework i.e. a 10% increase in retention by 2020		Q4 2020	HEIs, HEA

Action 7: **Ensure sufficient infrastructure exists to facilitate the increased demand for ICT and Technology education at further and higher education**

Deliverable	Industry Partners and Required Inputs	Scheduled Delivery	Responsible Body
Undertake an audit of capacity in ICT disciplines in the Further and Higher Education Sectors	Employer engagement in formulation and delivery of apprenticeship programmes	Q2 2019	HEA, SOLAS
Provide capital funding and support development of infrastructure to (1) allow institutions increase their mainstream student intake and (2) provide appropriate lab equipment		Ongoing	DES, HEA, SOLAS
Increase capacity for online and mixed learning delivery across the system in line with the System Performance Framework target of increasing the number of higher education entrants studying on a flexible basis by 25% by 2021		2021	DES, HEA, NFETL

Action 8: **Increase levels of transfer and progression across NFQ levels and skills**

Deliverable	Industry Partners and Required Inputs	Scheduled Delivery	Responsible Body
Highlight progression pathways in college documentation and publicity materials	Promote access and work to reduce barriers to transfer and progression between FE and HE for ICT and technology courses	Q3 2019	HEA, HEIs, SOLAS
Develop links between existing further and higher education providers with a focus on ICT courses to facilitate progression and access to ICT programmes		Q1 2020	DES, HEA, SOLAS
Assess potential to utilise formal professional qualifications as access points to further and higher education		Q2 2020	DES, HEA, SOLAS

Action 9:   Target qualified individuals outside the workforce for upskilling and reskilling

Deliverable	Industry Partners and Required Inputs	Scheduled Delivery	Responsible Body
Launch new rounds of Springboard+ annually	Promotion of call by industry association, industry/education partnerships with FET and HEIs in submitting course proposals and delivery, including work placements Engagement with graduates via work placement Promote awareness and engagement with initiative by participants and employers Technology Ireland	Q2 per annum	DES, HEA
Market new rounds of Springboard+ ICT and Skillnet Ireland skills conversion/ upskilling programmes to target female participation		Q3 per annum	DES, HEA, SOLAS
Identify and market L5/L6 engagement and upskilling programmes to target the unemployed		Ongoing	SOLAS

Action 10:   Target groups underrepresented on ICT Further Education and Higher Education Courses

Deliverable	Industry Partners and Required Inputs	Scheduled Delivery	Responsible Body
Promotion of regular career posts on SmartFutures.ie highlighting female and diverse role models in ICT fields	Engagement from strong female role models from diverse areas Industry support through volunteers and mentors to the programme	Ongoing	SmartFutures
Work with Parents' Council(s) to promote ICT career opportunities, particularly for females through career talks and promotional material		Ongoing	DES
Work with organisations focussing on promoting a career in STEM to young females from disadvantaged background through Transition Year work experience and specific programs such as Technology Challenge currently being run by Teen Turn and supported by CWIT through volunteers & mentors to the programme		Q4 2019	SmartFutures

Action 11:   **Support Measures to align programmes with enterprise needs through the Regional Skills Fora**

Deliverable	Industry Partners and Required Inputs	Scheduled Delivery	Responsible Body
Provide ongoing communication and networking opportunities for Education, Training and Industry to share emerging skills needs and research developments	Engagement with education and training providers including through Regional Skills Fora, Third Level Computing Forum, and Annual Review of the ICT Skills Action Plan	Ongoing	RSF, TLCF, HEA, SOLAS

Action 12:   **Promote ICT as a valid career choice rather than a job role to students and parents**

Deliverable	Industry Partners and Required Inputs	Scheduled Delivery	Responsible Body
Analyse CAO / entrant information to identify (1) subject/course areas of low demand (2) areas of greatest gender imbalance	Engage with staff to promote volunteer opportunities; Work to overcome barriers to participation through programmes, for example, targeted role models Technology Ireland, CWIT, STEPS programme, Engineers Ireland IDSJC, ICS, Qualifax	Q3 2019	DES
Deliver comprehensive progression pathways for learners and parents through (1) career pathway matrix and (2) education pathway matrix		Q3 2019	HEA, SOLAS, Smart Futures
Publicise the availability of alternative student pathways (HEI, IRC, SFI, FIT, ETB, Skillnet Ireland, Springboard, Apprenticeships) to employers, parents, students and learners through a publicity campaign and promotional activities supported by a single ICT Skills web portal		Q1 2020	DES, HEA, HEIs, Skillnet Ireland
Assess the feasibility of a single web-based service application for matching post primary students and work placements; further and higher education students and internships		Q2 2019	DES, SmartFutures
Introduce employability statements for ICT disciplines in all HEIs		Q4 2020	HEA, HEIs

Action 13:   **Attract, retain an upskill talent nationally.**

| Deliverable	Industry Partners and Required Inputs	Scheduled Delivery	Responsible Body
Run an advanced annual ICT talent management and retention seminar to share best practice among companies in upskilling and HR talent management	Cooperation from industry in engagement and support of seminars	Q4 2019	Enterprise Ireland

8 Implementation Structures
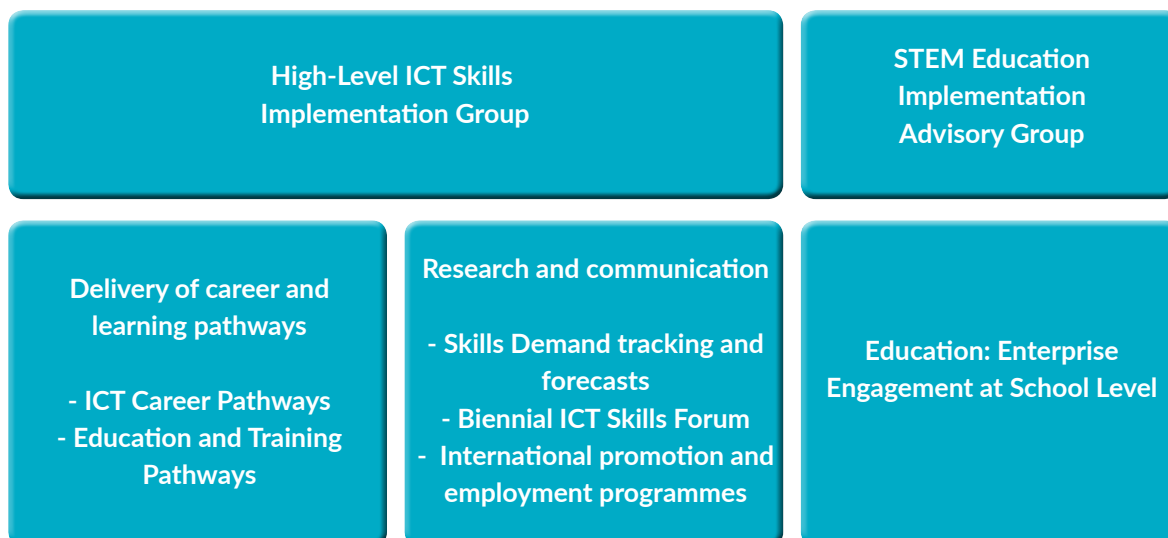
Figure 7: Technology Skills 2022: Ireland's Third ICT Skills Action Plan - Implementation Structures

These actions will be implemented through a partnership between Government, industry and the education and training system. These collaborative actions will serve to complement the ongoing work by industry itself to upskill its own talent base. Overall implementation of this Plan will be driven by a High-Level Steering Group, co-chaired by the Department of Education and Skills (DES) and Department of Business, Enterprise and Innovation (DBEI), and composed of representatives from Government Departments, Agencies, Industry and Education and Training Providers (for the membership of this Group see Appendix I).

The membership of this Group will ensure that the strategic priorities in this plan are not delivered in isolation from recent initiatives in *Ireland's National Skills Strategy 2025*, establishment of the National Skills Architecture, and a number of different strategies currently being implemented: *Action Plan to Expand Apprenticeships and Traineeships in Ireland, 2016-2020*, the *Digital Strategy for Schools 2015-2020*, *STEM Education Policy Statement 2017-2026*, and *Languages Connect: Ireland's Strategy for Foreign Languages in Education 2017-2026*.

The implementation structures take account of agreed actions under these existing initiatives. The manner in which the position on ICT skills demand is unfolding will also be monitored by the High-Level Group on an ongoing basis, and will determine the response through which the overarching objective of the third ICT Skills Action Plan - addressing the high-level ICT skills needs of the Irish economy - will continue to be met.

On an ongoing basis, there will an assessment of the applicability and effectiveness of the plan in a rapidly changing environment. Monitoring structures will include:

- An assessment of areas of low graduate supply through the Employment Permits Scheme on a 6 monthly basis

- An annual assessment of high demand skillsets

- A biennial review of the operation and impact of *Technology Skills 2022*

- Annual engagement across multiple institutions and industry representatives through a national ICT skills conference

Appendix I

Membership of the High-Level Group

Co-Chair:	William Beausang, Assistant Secretary General, Department of Education and Skills (from May 2018)
	David Hegarty, Assistant Secretary General, Department of Business, Enterprise and Innovation
Leo Clancy	Head of Technology, Consumer & Business Services, IDA Ireland
Edel Creely	Group Managing Director, Trilogy Technologies/Ibec President
Tony Donohoe	Chair, Expert Group on Future Skills Needs
Leonard Hobbs	Director – Trinity Research and Innovation, MIDAS
Alan McGrath	Director of Strategy, Research and Evaluation, SOLAS (from October 2018)
Helen McMahon	Senior Executive Client Skills, Enterprise Ireland (from April 2018)
John McNamara	Manager, ICT Department, Enterprise Ireland (from April 2018)
Margie McCarthy	Innovation and Education Directorate, Science Foundation Ireland/SmartFutures (from April 2018)
Ted Parslow	Chairperson, Third Level Computing Forum
Vivienne Patterson	Head of Skills, Engagement and Statistics, Higher Education Authority (from April 2018)
Brendan Whelan	Principal Officer, National Digital Strategy & Telecommunications Market Contracts, Department of Communications, Climate Action & Environment (from April 2018)

Secretariat
Department of Education and Skills
Philip Crosby, Principal Officer

Trudy Duffy, Assistant Principal Officer

Rebekah Maguire, Administrative Officer

Department of Business, Enterprise and Innovation
Kevin Daly, Principal Officer

Alan Power, Assistant Principal Officer

Appendix II

Bodies Consulted

American Chamber of Commerce Ireland

Connecting Women in Technology (CWIT)

Engineers Ireland

Enterprise Ireland

FastTrack to IT (FIT)

Higher Education Authority

IDA Ireland

Irish Computer Society / Irish Digital Skills and Jobs Coalition

National Forum on the Enhancement of Teaching and Learning

Science Foundation Ireland (SFI)

Skillnet Ireland

SmartFutures

SOLAS

Technology Ireland / Ibec

Technology Ireland Skillnet

Third Level Computing Forum

Appendix III
Current Courses

Computing skills:
- Information technology and telecommunications directors
- IT specialist managers
- IT project and programme managers
- IT business analysts, architects and systems designers
- Programmers and software development professionals
- Web design and development professionals
- IT and telecommunications professionals not elsewhere included
- IT operations technicians
- IT user support technicians
- IT engineers

Electronic & Electrical Engineering:
- Electrical and electronic engineers
- Design and development engineers
- Electrical and electronics technicians
- Telecommunications engineers

ISCED Coding:
ISCED 0612-Database and network design and administration

Database and network design and administration are the study of the design, maintenance and integration of software applications. Computer media applications are included.

Programmes and qualifications with the following main content are classified here:

Computer administration and management

Computer media applications

Computer network installation and maintenance

Database administrator studies

Information technology administration

Information technology security

Network administration

Network design

Web design

ISCED 0613-Software and applications development and analysis

Software and applications development and analysis is the study of the design and development of computer systems and computing environments.

Programmes and qualifications with the following main content are classified here:

Computer programming

Computer science

Computer systems analysis

Computer systems design

Informatics

Operating systems

Programming languages development

Software development

Software programming

Note: Exclusions

Computer engineering (hardware) is excluded from this detailed field and included in detailed field 0714 'Electronics and automation'.

Database and network design and administration is excluded from this detailed field and included in detailed field 0612 'Database and network design and administration'.

ISCED 0619 - Information and Communication Technologies not elsewhere classified

Information technology studies not fitting in the detailed fields are classified here:

Artificial intelligence

ISCED 0688 - Inter-disciplinary programmes and qualifications involving Information and Communication Technologies

Inter-disciplinary programmes and qualifications to which the greatest intended learning time is devoted to information and communication technologies (ICTs) are classified here.

### ISCED 0714- Electronics and Automation

Electronics and automation is the study of planning, designing, developing maintaining and monitoring electronic equipment, machinery and systems. It includes designing computers and equipment for communication.

Programmes and qualifications with the following main content are included here:

- Broadcasting electronics
- Communication systems
- Communications equipment installation
- Communications equipment maintenance
- Computer engineering
- Computer repairing
- Control engineering
- Data processing technology
- Digital technology
- Electronic engineering
- Electronic equipment servicing
- Network technology
- Robotics
- Telecommunications technology
- Television and radio repairing
- Exclusions
- Computer science (Software and applications development) is excluded from this detailed field and included under 0613 'Software and applications development and analysis'.

Appendix IV

The National Framework of Qualifications
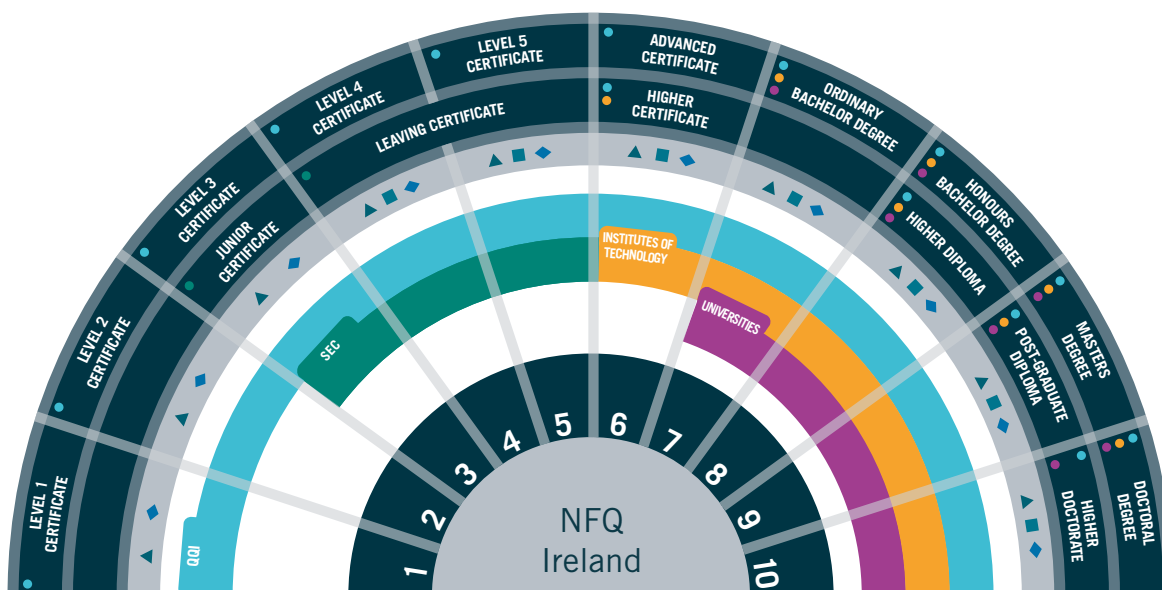
Level 6 – Advanced Certificate

An Advanced Certificate award enables learners to develop a comprehensive range of skills, which may be vocationally specific and/or of a general supervisory nature, and require detailed theoretical understanding. Modules include advanced vocational/occupational skills, enabling certificate holders to work independently or progress to higher education and training. The majority of certificate/module holders at Level 6 take up positions of employment, some of whom may be self-employed. Awarded by: Quality and Qualifications Ireland

Level 6 – Higher Certificate

The Higher Certificate is normally awarded after completion of a programme of two years duration (120 ECTS credits). Entry to these programmes is generally for school leavers and those with equivalent qualifications. A Certificate holder at this level may transfer to a programme on the next level of the framework. Awarded by: Institutes of Technology, Quality and Qualifications Ireland, and some Universities.

Level 7 - Ordinary Bachelor Degree

The Ordinary Bachelor Degree is normally awarded after completion of a programme of three years duration (180 ECTS credits). Entry to a programme leading to an Ordinary Bachelor degree is typically for school leavers and those with equivalent qualifications. In addition, there are transfer arrangements in place across higher education and a number of programmes of one year duration leading to the Ordinary Bachelor Degree for holders of the Higher Certificate. The Ordinary Bachelor Degree is compatible with the Bologna First Cycle descriptor, though holders of this award do not generally immediately access programmes leading to Second Cycle awards in Ireland. Awarded by: Institutes of Technology, Quality and Qualifications Ireland, and Universities.

Level 8 - Honours Bachelor Degree

The Honours Bachelor Degree is normally awarded following completion of a programme of three to four years duration (180-240 ECTS credits), although there are examples of longer programmes in areas such as architecture, dentistry and medicine. Entry is generally for school leavers and those with equivalent qualifications. In addition, there are transfer arrangements across higher education, and a number of programmes of one year duration leading to Honours Bachelor Degrees for holders of the Ordinary Bachelor Degree. The Honours Bachelor Degree is a Bologna First Cycle qualification.Awarded by: Institutes of Technology, Quality and Qualifications Ireland, and Universities.

Level 8 - Higher Diploma

The Higher Diploma is normally awarded following completion of a programme of one year duration (60 ECTS credits). Entry to a programme leading to a Higher Diploma is typically for holders of Honours Bachelor Degrees but can also be for holders of Ordinary Bachelor Degrees. It is of note that the Higher Diploma is typically in a different field of learning than the initial award. The Higher Diploma is a qualification at the same level as completion of the Bologna First Cycle.Awarded by: Institutes of Technology, Quality and Qualifications Ireland, and Universities.

Level 9 – Masters Degree

The taught Masters Degree is awarded following the completion of a programme of one to two years duration (60-120 ECTS credits). Entry to a programme leading to a taught Masters Degree is typically for holders of Honours Bachelor Degrees. In some cases, entry to such programmes can be permitted for those with Ordinary Bachelor Degrees or equivalent. Research Masters Degree programmes are typically of two years duration (120 ECTS credits) though not all such programmes are credit rated. The Irish Masters Degree is compatible with completion of the Bologna Second Cycle. Awarded by: Institutes of Technology, Quality and Qualifications Ireland, and Universities.

Level 9 – Post Graduate Diploma

The Postgraduate Diploma is normally awarded following completion of a programme of one year duration (60 ECTS credits). Entry to a programme leading to a Postgraduate Diploma is typically for holders of Honours Bachelor Degrees but can also be for holders of Ordinary Bachelor Degrees. The Post-graduate Diploma is an intermediate qualification within the Bologna Second Cycle. Awarded by: Institutes of Technology, Quality and Qualifications Ireland, and Universities.

Level 10 – Doctoral Degree

Normally those entering a doctoral programme with an Honours Bachelor Degree initially register for a research Masters Degree or provisional doctoral candidature. Upon successful completion of this initial stage, the candidate acquires full doctoral candidature.Doctoral programmes are between three and four years in duration. ECTS credits are used in doctoral programmes for taught elements only. Varying doctoral programmes now exist, including professional and performance/practice based doctorates.The Irish Doctoral Degree is compatible with completion of the Bologna Third Cycle. Awarded by: Institutes of Technology, Quality and Qualifications Ireland, and Universities.

Level 10 – Higher Doctorate

This award largely recognises excellent and distinguished contributions to learning. It may be used for career progression to advanced levels of academia and research. This award is never based on a provider's programme and, as such, is not subject to validation but is assessed by the awarding body for each individual provider. Normally, the learner already holds a first doctorate or equivalent for some period of time prior to becoming a candidate for the higher doctorate. The Irish Higher Doctorate is compatible with completion of the Bologna Third Cycle. Awarded by: Institutes of Technology, Quality and Qualifications Ireland, and Universities.

Appendix V

Abbreviations

AI	Artificial Intelligence
CAGR	Compound Annual Growth Rate
CSO	Central Statistics Office
CWIT	Connecting Women in Technology
DBEI	Department of Business, Enterprise and Innovation
DES	Department of Education and Skills
DJE	Department of Justice and Equality
EEA	European Economic Area
EGFSN	Expert Group on Future Skills Needs
ETB	Education and Training Board
EU	European Union
FET	Further Education and Training
FIT	FastTrack to IT
HCI	Human Capital Initative
HE	Higher Education
HEA	Higher Education Authority
HEI	Higher Education Institution
IDA	IDA Ireland
IDSJC	Irish Digital Skills and Job Coalition
IoT	Institute of Technology
NFETL	National Forum for the Enhancement of Teaching and Learning
NFQ	National Framework of Qualifications
NSC	National Skills Council
NTF	National Training Fund
QQI	Quality and Qualifications Ireland
RSF	Regional Skills Fora
SPF	Systems Performance Framework
STEM	Science, Technology, Engineering and Maths
TLCF	Third Level Computing Forum
TU	Technological University

Appendix VI

Associated publications

Forecasting the Future Demand for High-Level ICT Skills in Ireland, 2017- 2022, Expert Group on Future Skills Needs http://www.skillsireland.ie/Publications/

Technology Skills 2022: Irelands Third ICT Skills Action Plan, Government of Ireland, 2019 https://www.education.ie/en/Publications/

Rialtas na hÉireann
Government of Ireland