



diversITy Series

Promoting e-skills training for a diverse tech workforce

Country report for Ireland

February 2019

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The *diversITY series* of reports presents information collected and compiled by empirica, supported by J.P. Morgan, on the technology skills training landscape in seven target countries: Spain, Germany, the United Kingdom, Ireland, Poland, France and South Africa. External sources of information and data have been credited accordingly where applicable.

The term *Information and Communications Technology (ICT) sector* used in this report refers to the technology or digital sector in all target countries.

The term *ICT skills* used in this report comprises two main categories:

ICT user skills: the capabilities required for effective application of ICT systems and devices by the individual. ICT users apply systems as tools in support of their own work, which is, in most cases, not ICT. At the general level, they cover “digital literacy”: the skills required for the confident and critical use of ICT for work, leisure, learning and communication.

ICT practitioner skills: The capabilities required for researching, developing and designing, managing, producing, consulting, marketing and selling, integrating, installing and administrating, maintaining, supporting and servicing ICT systems.

The term *ICT specialists* refers to the European Commission’s definition of ICT specialists as workers whose main job involves ICT and who can deal with a wide range of tasks concerning corporate ICT systems. The terms *ICT specialists* and *ICT workers* are used interchangeably in this report.

The term *ICT skills training* refers to programmes and initiatives aimed at improving or upgrading peoples’ skills and knowledge in ICT user and practitioner skills.

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Preface

The diversITy project carried out an evaluation and assessment of ICT skills and training programmes to support diverse populations to enter the labour market.

It identified and analysed ICT training programmes that aim to prepare and place jobseekers into meaningful tech jobs, with a focus on diverse target groups, including women, youth at risk of social exclusion or from difficult socio-economic backgrounds, people with migrant background or unemployed adults changing careers.

In the context of this study, the term ICT skills includes both, ICT user and ICT practitioner skills. However, more importance is given to ICT practitioner skills, which the European ICT skills Forum defines as, “The capabilities required for researching, developing and designing, managing, producing, consulting, marketing and selling, integrating, installing and administrating, maintaining, supporting and servicing ICT systems”.¹

The target countries are Germany, France, the United Kingdom, Ireland, Spain, Poland and South Africa.

The work product of the diversITy project informs policy development on the European and national level and provides practical recommendations to non-profit organisations and training providers. An initial assessment and evaluation of identified ICT skills training programmes in the target countries produced a repository of 96 inclusive programmes. Brief descriptions of these 96 cases are available on the diversITy online repository, which can be accessed at www.eskills4diversity.com. In addition to the online repository of case studies, we produced seven country reports for each target country, analysing in-depth each country’s ICT skills gap and unique training landscape. In each report we showcase a set of good practice show cases, setting a benchmark to foster exchange.

The diversITy project is part of the J.P. Morgan New Skills at Work initiative that aims to identify strategies and support solutions that help improve labour market infrastructure and develop the skilled workforce globally. This \$250 million five-year global initiative, first launched in December 2013, brings

together leading policymakers, academics, business leaders, educators, training providers and nonprofits with the goal of connecting labour market policy with practice, supply with demand and employers with the workforce.

We greatly acknowledge the support and collaboration of J.P. Morgan to produce this report.

We would like to thank **Eriona Dashja** and **Aleksandra Szczodrowski** from the empirica team for research support for this report.

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¹ See European Commission (2004), *e-skills for Europe*.

Executive summary

- In spite of significant progress achieved in terms of growing numbers of students graduating from ICT courses in higher education, there is evidence of persistent shortages in ICT specialists in Ireland including the current vacancy backlog, which is estimated to be about 5,000. Many recruiters face extreme difficulties in attracting ICT talent. Effective action is required to mitigate the situation if Ireland's economy is to prosper in the coming years.
- Ireland's labour market has recovered from the latest recession, but several groups still face serious challenges in finding employment. Of particular concern is the high share of young individuals not in employment, education or training (NEET). 16.1 % of the 20-34 olds in the Ireland in 2017 were neither in employment nor in education and training ('NEETs'). Female NEETs aged 20-34 are rather economically inactive while their male counterparts tend to be unemployed.
- Ireland's digital workforce suffers from structural under-representation of women. Meanwhile, the recent inflow of high-skilled people with migrant background from within and outside of the EU has boosted the share of non-natives in the ICT workforce.
- Ireland's government puts strong emphasis on skills development, with a particular focus on ICT specialist skills. In Ireland, 82% of ICT specialists have an academic degree. This figure is the highest in the EU, for which the average is only 62%.
- Recent years have seen a renewed emphasis on further education and training, in particular apprenticeships and traineeships. Newly launched apprenticeships in ICT are seen as an important step towards opening up ICT careers to people.

Current developments in the ICT labour market in Ireland

The Irish ICT workforce accounts for about 80,000 workers, or 4.1% of the total workforce – which is above the European average. The number of ICT workers has increased over recent years, with most of the growth coming from the categories “ICT operations” and “user support technicians”. These occupational profiles typically do not require an academic qualification, which contrasts with the widespread perception in Ireland that a career in ICT requires a university degree in computer sciences or a similar subject.

The number of hard-to-fill vacancies is currently estimated to be around 5,000. 35% of all difficult to fill vacancies in October 2016 were for the ICT sector, primarily for professional roles in software development, followed by engineers, systems/solutions architects; business intelligence; tech support and sales; and digital commerce managers.

There is sizeable demand for ICT skills at entry and medium level. A 2018 study by FIT found that 21% of current vacancies require the exercise of skills at “entry level”, 37% at “competent level”, and 42% at “expert level”. This suggests a sizeable demand for

skills for which non-academic, alternative pathways to ICT skills training and jobs should be fully sufficient, in particular if they equip learners with transversal, soft and business skills as well.

Ireland makes heavy use of foreign-born talent for helping address ICT skills shortages. Foreign-born workers made up 16.4% of the total ICT sector workforce in 2016. Their contribution to employment growth tends to be much larger still. More than two out of three of these workers came from EU countries. More than one in two ICT jobs in the Dublin area are being filled by talent from abroad.

Forecasts indicate that the potential for new jobs is likely to be 30,800 and the ICT skills gap will be 6,800 in 2025, respectively. This presents an opportunity for both employers and policy makers to provide new avenues for ICT education and training.

The share of women working in ICT is low. Only 31% of those working in Ireland's ICT industries were women in 2016, against a figure of 46% across all sectors. Only 21% of all third-level ICT graduates were women in 2016, against 52% across all fields of study.

In 2017, the share of female ICT specialists in Ireland was at 20.8%, 1.3 percentage points less than in 2017. This compares to a European average of 17.2 % female ICT specialists. In some of the other European countries analysed, the share of women in ICT occupations is below the European average (Poland 14.8%, Germany and Spain 16.6% women), in others it is slightly above (UK 17.6% and France 19.6%).²

The causes for under-representation of women in ICT are complex and often reflected in unconscious bias, for example on the part of young persons (and their parents) at stages when they take decisions about future career options.

Ireland's government has taken important steps to achieve a more inclusive ICT training offer. These include the National Plan for Equity of Access to Higher Education 2015-2019 and the Further Education and Training Strategy 2014-2019, which seeks to “provide more training programmes and supports for those experiencing socioeconomic disadvantage”. A key component is modernisation of Ireland's apprenticeship and traineeship systems.

Expectations are high that ICT apprenticeships will appeal to a wider range of young people. The 2016 Action Plan to Expand Apprenticeship and Traineeship in Ireland 2016-2020 has resulted in two ICT apprenticeships, developed in response to industry demand for software development skills: ICT Associate Professional Network Engineer and ICT Associate Professional Software Developer. More are under development. In Ireland apprenticeships used to be almost exclusively taken by men, there is a strong need to promote these novel programmes to young women and their influencers, including the career guidance system.

Ireland has comprehensive experience in targeting ICT training at groups at risk of exclusion. The country benefits from the significant experience of Fast Track into Information Technology (FIT), a social enterprise, and Skillnet, a national agency dedicated to the promotion and facilitation of workforce learning, in offering ICT training programmes to groups at risk of exclusion from quality employment, such as young people not in employment, education or training (NEET), long-term unemployed and persons with disability.

Ireland has well-developed structures for channelling jobseekers and career changers to the ICT sector. The country quite successfully manages to create an ICT workforce not solely relying on IT graduates from universities but also training individuals graduating from other subjects to become ICT specialists and find a job in IT as ‘lateral entries’. There is evidence that most current female ICT specialists (75%) in Ireland had not set out for a career in ICT, and only 39% have a degree in computer science. This indicates that non-traditional paths into the ICT profession can be of particular relevance for women, and possibly also other groups of persons currently underrepresented in the ICT workforce. Here, Ireland benefits from established structures for upskilling and conversion training that allow persons who do not have an ICT degree to enter the ICT workforce, such as the ICT Skills Conversion programme and Springboard. An evaluation of Springboard+ 2011-2016 showed that 80% of Springboard+ participants 2011-2015 are no longer on the live register; employment rates 3-6 months after graduation have increased from 37% in 2011 to 61% in 2014, and that ‘ICT Conversion Graduates’ has the highest employment rates 3-6 months after graduation at 73% in 2014.³

² Eurostat: ICT specialists in employment, July 2018: https://ec.europa.eu/eurostat/statistics-explained/index.php/ICT_specialists_in_employment#ICT_specialists_by_sex

³ Department of Education and Skills: 04 June, 2018 - Government launch Springboard+ 2018: <https://www.education.ie/en/Press-Events/Press-Releases/2018-press-releases/PR18-06-04.html>

Key Recommendations to Stakeholders

Continue the Higher Education Access Route (HEAR) to support school leavers from socio-economically disadvantaged backgrounds⁴

- The HEAR scheme should clearly identify the alternative pathways to higher education for their target groups. This is important, given that not all students with disabilities and students from socio-economically disadvantaged backgrounds who apply to the schemes make the transition to higher education through the schemes.
- HEAR should provide a maximum large degree of flexibility in the transition to higher education, and advocate transparency and accessibility in pathways for young adults to access higher education.
- Evaluation reports revealed that further investigation of the impact of a reduced points offer on the nature of the course accepted is needed to ascertain what impact a reduced points offer has on chosen area of study.

Promote non-academic training pathways

- Much effort is required to promote alternative pathways to ICT careers in the country, especially in terms of more effective career guidance.
- The role of career guidance must be to improve the attractiveness of apprenticeships and other non-academic ICT training by reducing the stereotypes and prejudices among young people and their main influencers such as parents and teachers.

Promote apprenticeship system towards women and ICT education requirements

- Ireland's apprenticeship system needs active promotion towards women and full diversity. Moreover changes are necessary to better adapt to the requirements of ICT education.
- The recent announcement of the Irish Government (February 2019) formally announcing their adoption of the FIT ICT Apprenticeships as a new talent pipeline for governments departments (the Civil Service) appears to be a good step in this direction. There also seems to be a demand for apprenticeships since applications for the government apprenticeships had more than 1000 applicants for 40 places. It is recommended that future application rounds more intensively address the issue of inclusiveness and diversity thereby making diversity an integral part of the apprenticeship reform in Ireland.

Improve the capacity of SMEs and training providers to engage in inclusive ICT training

- Most SMEs find it difficult to divert resources to offering work placements, traineeships or apprenticeships. Barriers are even bigger when offering work placements for persons from groups currently underrepresented in the ICT workforce, many of whom need special support in one way or another.
- SMEs, as well as professional training providers, would benefit from effective, hands-on support to deal with any hurdles that might keep them from offering ICT training to members of minority groups to whom they had little exposure so far. Equalities help lines should be established to support SMEs and training providers in their equality policy.

Leverage the power and creativity of existing communities of engaged citizens

- Ireland has a very strong community of engaged citizens who are working, in particular, to promote equality of chances for women in ICT training and the digital workforce. Many activities are led by women working in ICT who are keen to reach out to girls and young women at a time when they make career choices.
- The experience made by these engaged groups of people should be used to promote other groups currently underrepresented in the ICT workforce and give them a stronger voice as well. For this purpose, innovative models may need to be developed, such as shared mentorship schemes and online mentoring including mentors from private and public sector companies which allow workers to take

⁴ See also: Nic Fhlannchadha, S. (2018). DARE HEAR Facts and Figures Report 2017-2018 Summary. Report prepared by the Irish Universities Association, on behalf of the participating HEIs; Byrne, D. et al., An Evaluation of the HEAR and DARE Supplementary Admission Routes to Higher Education, November 2013

limited paid time off for doing a mentorship job.

- Government funding could help increase the reach of NGOs that provide effective, short-term ICT training such as coding clubs to groups currently underrepresented in the ICT workforce.

Use mentorship, especially for supporting young women considering a career in ICT

- Our analysis of existing inclusive ICT training programmes suggests that the mentorship model is particularly well suited to encourage girls and women to consider ICT careers for two reasons: first, because female role models have been found to play a key role in young women's attitude to working in the digital sectors; second, because it tends to be comparatively easy to recruit volunteer mentors among women working in the digital sectors.

Trainings that offer participants strong flexibility are of particular importance for attracting women

- The contribution of ICT training to address the lack of inclusiveness of Ireland's labour market needs to be strengthened
- There are doubts whether the numbers of persons participating in existing trainings are big enough to tackle the overall size of the challenge in terms of, on the one hand, shortage of ICT specialists and, lack of employment opportunities for at-risk groups on the other. Macro-level data on Ireland shows that the country still performs poorly when it comes to the very high rate of NEET youth as well as low employment among people with disability. While valuable work has been done in the area, ways must be found to widen and upscale the reach of ICT training programmes to help contribute to addressing these challenges.

Need for strong connection between employers and guidance counsellors

- Guidance counsellors advise students and young people so that they can make informed choices about their future in relation to employment, education and training. Guidance and counselling in Ireland is made up of three separate yet interlinked areas. These are: Personal and Social Guidance and Counselling, Educational Guidance and Counselling and Vocational Guidance and Counselling.
- In order to improve the chances of students for training followed by a professional career in industry close links not only to relevant agencies and institutions but also employers need to be established to keep up to date with the labour market needs, motivate employers for diversity and thereby create training and apprenticeship opportunities and improve the chances for diversity and inclusiveness in the labour market. At the same time career guidance should see its role also improving the attractiveness of apprenticeships and other non-academic ICT training towards their target groups.

Introduction

Ireland is home to a large, vibrant digital sector which requires access to growing numbers of well-qualified ICT specialists. Most other industry sectors are also depending increasingly on ICT expertise. Although the number of students graduating from ICT courses in higher education has greatly increased in recent years, there is evidence of persistent shortages in ICT specialists. One possible way to mitigate the problem, is to open up careers in ICT to groups of people currently underrepresented in the digital workforce, such as women, persons from a challenging socio-economic background, and people with disabilities. We conducted a comprehensive survey to determine the impact and challenges of inclusive ICT-skills training programmes for diverse groups to enter the digital labour market in Ireland. In this report, we provide an analysis of our main findings.



Introduction

Ireland's ICT workforce is growing fast. An analysis carried out by Frontier Economics, a consultancy, found that employment in what the authors define as "digital sectors" grew by 9% from 2009 to 2016, in contrast to a mere 3% employment growth for the economy as a whole.⁵ This reflects the key role of the ICT industry for the country's economic performance, as well as the fact that specialist ICT skills have increasingly been in demand across all other economic sectors in Ireland, too.

Against this background, perceptions of a critical shortage of specialist ICT skills have become widespread in the country. According to an employer survey conducted in 2017 on behalf of Hays Ireland, "74% of technology employers said that a shortage of suitable applicants is their top recruitment challenge for the coming year. [...] 70% of employers stated that over the past year they have experienced moderate to extreme skills shortages and of these, 20% of them labelled them as extreme"⁶. The available data suggests that the share of companies reporting difficulties with trying to recruit ICT specialists has remained at a high level over many years. With growing numbers of students graduating from ICT courses in higher education, the country is quite different to other European countries such as the UK, where graduate numbers have remained flat.

The persistency of skills shortages in the ICT specialist labour market goes together with significant evidence of a lack of diversity in the current ICT workforce. This refers most of all to the low share of women working in ICT. According to data from CSO Ireland, the national statistical institute, only 31% of those working in Ireland's ICT industries were women in 2016, against a figure of 46% across all sectors.⁷ Only 21% of all third-level ICT graduates were women in 2016, against 52% across all fields of study.

In 2017, the majority of ICT specialists were men; the share of female ICT specialists in Ireland was at 20.8%, 1.3 percentage points less than in 2017. This compares to a European average of 17.2 %, 5.3

percentage points less than a decade earlier. In the other European countries analysed their share is even lower than the average in most cases with Germany and Spain both at 16.6%, the UK at 17.6%, France at 19.6%, Poland at 14.8%.⁸

The causes for under-representation of women in ICT are complex and often reflected in unconscious bias, for example on the part of young persons (and their parents) at stages when they take decisions about future career options.

Survey research commissioned by Hays found that most current female ICT specialists (75%) in Ireland had not set out for a career in ICT, and only 39% have a degree in computer science.⁹ This indicates that non-traditional paths into the ICT profession can be of particular relevance for women, and possibly also other groups of persons currently underrepresented in the ICT workforce, e.g. persons with disabilities, refugees and youth from disadvantaged socio-economic backgrounds. Many of these pathways do not have access routes for all. But, Ireland benefits specifically from established structures for upskilling and conversion training that allow persons who do not have an ICT degree to enter the ICT workforce.

⁵ See Technology Ireland & Frontier Economics (2017), Brexit and the Irish Technology Sector.

⁶ Hays Ireland (2017), Salary and Recruiting Trends 2018 Guide.

⁷ See Central Statistics Office (2016), Women and Men in Ireland 2016.

⁸ Eurostat: ICT specialists in employment, July 2018:

https://ec.europa.eu/eurostat/statistics-explained/index.php/ICT_specialists_in_employment#ICT_specialists_by_sex

⁹ See Hays Ireland (2014), Women In IT – Untapped Answer To The Skills Shortage.



1

ICT Skills Forecast

The Irish ICT workforce accounts for about 80,000 workers, or 4.1% of the total workforce – which is above the European average. Since 2011, the number of ICT workers has slightly increased in the country, with most of the growth coming from the categories “ICT operations” and “user support technicians”. This is all the more remarkable because this occupational profile does typically not require an academic qualification, which contrasts with the widespread perception in Ireland that a career in ICT requires a university degree in computer sciences or a similar subject. The average annual need for new ICT specialists according to our model is about 3,200, the sum of expansion (600) and replacement demand (2,600). This is roughly in line with the 3,000 ICT graduates produced each year by the country’s education system, but it does not yet take account of the current vacancy backlog, which is estimated to be about 5,000.



Baseline figures and forecast for Ireland

The ICT skills challenge for Ireland

Irish workforce data for years 2011 to 2015 is only available at a coarse breakdown. The number of employed ICT specialists has grown slightly over these years, from 77,500 in 2011 to 79,900 in 2015. ICT managers show the largest relative growth over the period 2011-2015, but their total number is small. The occupations showing strongest growth in terms of number of jobs added over this period are in the major group 35 “ICT operations and user support technicians”. This is an occupation which typically does not require an academic degree.

Vacancy data is available from the Further Education and Training Authority (SOLAS), but unfortunately only at sector level rather than occupational level. According to the latest available data (for 2016), the ICT sector has the highest vacancy rate of all sectors with an average of 2.5% despite a drop to 1.7% in quarter 4 of 2016, from a peak of 2.9% in the third quarter of 2015.¹⁰ In comparison, the job vacancy rate for IT jobs in the UK is at 9.2%.¹¹ However, due to the underlying definitions and methods used, these data might not be comparable.

Reliable data on the total number of vacancies for ICT specialists are scarce. The estimate shared by most stakeholders, as reported by Collins McNicholas, a recruitment firm, indicate that there are currently about 5,000 ICT vacancies in Ireland, which corresponds to a job vacancy rate of 6.25%. It is not specified whether these vacancies are hard to fill or not.

The shortages are currently most pronounced for software developers with Java, .NET, Python, Ruby on Rails and Scala, while data analytics is the fastest-growing skill in demand. A Recruitment Agency Survey of Difficult to Fill Vacancies (DTF) conducted for SOLAS found that 35% of all difficult to fill vacancies in October 2016 were for the ICT sector, primarily for professional roles in software development, followed by engineers, systems/solutions architects; business intelligence; tech support and sales; and digital commerce managers. In terms of share of companies experiencing a particular shortage, the areas most often mentioned are Cloud Computing, Platform

Administration and Programming/ Development Methodologies (by 85 %, 75% and 74% of all companies surveyed by the 2018 FIT ICT Skills Audit, respectively). The required skills to fill shortages range from entry level to expert level. The FIT audit specifically mentions educational equivalents to the Irish National Framework of Qualifications (NQF) levels 5 and 6 and ICT vendor certificates. Levels 5 and 6 include the Irish secondary education leaving certificate, advanced and higher certificates based of vocational and occupational training.¹²

The areas in which employers are affected by shortages are bound to change in response to developments in the technological and economic sphere. For the design of training programmes, however, the possibly more relevant finding from the latest ICT Skills Audit is that companies perceive, in addition to the need for technical expertise, “an increasing requirement for broad transversal skills to enable wider applications of emerging technologies”¹³.

The investigation by FIT was keen to hear from employers what level of skills they require from new recruits. For this purpose, FIT distinguishes between three levels. “The specific skills and disciplines are not exhaustive but adopted in the light of the European e-competency framework”¹⁴:

- Expert level: “A set of advanced ICT practitioner skills and where the employee works as a technology expert or leads teams and projects.”
- Competent level: “A set of well-established ICT practitioner skills and where the employee works independently on individual tasks or as a fully-fledged team member with occasional supervision.”
- Entry level: “A set of useable ICT practitioner skills and where the employee works in a highly structured environment or is supported by regular supervision or mentoring.”

The study found that 21% of current vacancies require the exercise of skills at the entry level, 37% at the competent level, and 42% at the expert level. This suggests a sizeable demand for skills for which non-

¹⁰ See SOLAS (2016 and 2018)

¹¹ See TechPartnership (2016)

¹² <http://www.nfq-qqi.com/>

¹³ FIT (2018) p. 6

¹⁴ FIT (2018) p.14

academic, alternative pathways to ICT skills training and jobs should be fully sufficient, in particular if they equip learners with transversal, soft and business skills as well.

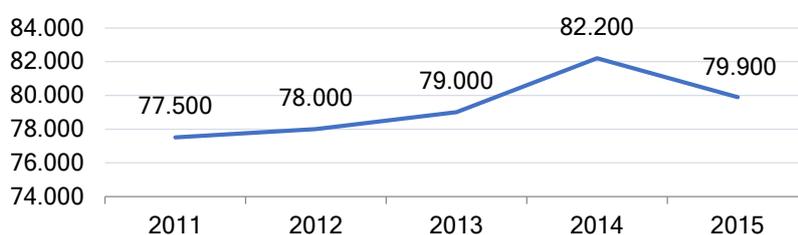
Trends in education and training of ICT specialists

In Ireland, 82% of ICT specialists have an academic degree. This figure is the highest in the EU, for which the average is only 62%. No statistics have been published as to the field of education, such as whether it is ICT or not. The available evidence suggests, however, that most of these degrees are in ICT.

The number of ICT graduates entering the labour market is a major determinant of the development of skills supply in Ireland. There were no vocational education graduates in 2015 (latest). Ireland counted about 3,000 tertiary education ICT graduates in 2015 (first degrees). For Higher Education graduates, data is available for longer periods, indicating a steady increase in graduate figures, apart from a dip in 2011 caused by the latest economic crisis.

The approximate yearly labour market inflow of graduates with an ICT degree (from vocational and tertiary education) is therefore about 3,000. For our forecast model (see box below) we assume that the annual need for 3,200 new entrants to the ICT labour market is well covered by these ICT graduates who enter the ICT labour market per year; the remaining shortfall in terms of workforce inflow is about 200 per year. We estimate that workforce expansion will continue along the same lines as it has since 2011, i.e. that the number of employed ICT specialists will grow by 600 jobs per year (see above), to which we need to add a replacement demand of 2,600 per year [see Appendix A]) The size of this shortage is modest when compared to some other EU countries including the UK – a success which is mainly caused by the ability of the Irish education system to attract growing numbers of students to ICT programmes. Ireland also has some successful conversion programmes, such as Springboard+, which help workers originally from other professions to become ICT practitioners – see the Good Practice Showcase in the Annex.

Figure 1 Employed ICT specialists in Ireland 2011-2015 (in 1'000s)



Source: Eurostat, "Employed ICT specialists"

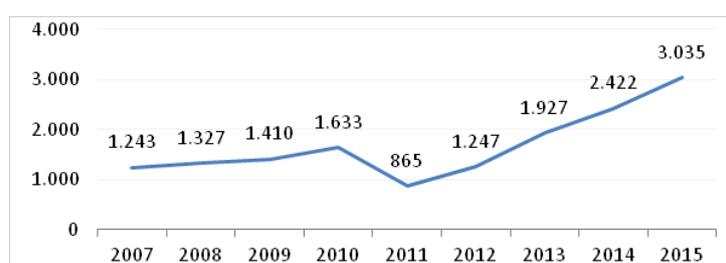
Table 1 ICT workforce per ISCO classification in Ireland, 2011-15	ISCO code	Usually requires academic degree	Absolute growth p.a. (5 year avg.)	2011	2015	%-Growth (5 year CAGR)
ICT operations and user support technicians	35	N	882	11,639	15,165	6.8%
ICT Professionals	25	Y	564	40,413	42,669	1.4%
ICT managers	133	Y	117	313	782	25.8%
Graphics and Multimedia Designers	2166	Y	24	3,784	3,880	0.6%
Electronics mechanics and servicers	7421	N	-160	6,911	6,270	-2.4%
Information and communications technology installers and servicers	7422	N	-312	7,731	6,484	-4.3%
Telecommunications engineers	2153	Y	-460	6,369	4,530	-8.2%

Source: Eurostat

Table 2 ICT graduates in Ireland, 2015	Total 2015 or latest available	% ICT graduates/ all graduates	Percent female ICT graduates
[1] Short-cycle tertiary education	448	5.3%	24.1%
[2] Bachelor's or equivalent level	2,587	6.3%	18.6%
[3] Master's or equivalent level	1,235	7.7%	22.0%
[4] Doctoral or equivalent level	85	4.9%	24.7%
Approximate maximum labour market inflow with ICT degree (1+2)	3,035		

Source: Eurostat [uoe_grad02]. Rounding applies

Figure 2 Ireland - Tertiary ICT graduates, first degrees (1,000s)



Source: Eurostat [educ_grad5 and uoe_grad02]

Box 1 Snapshot: Ireland's ICT Workforce

Ireland's ICT specialist workforce accounts for almost 80,000 workers, or 4.1% of the workforce. While small in absolute terms, in relative terms the ICT workforce is larger than the European average: Ireland ranks ninth in a list led by Finland, Sweden and the UK; it is ahead of the larger continental countries Germany (rank 11), France (16), Spain (17), Italy (18) and Poland (24). In terms of female representation in the ICT workforce, Ireland ranks 7th in the EU, behind countries like Bulgaria (27.7%), Latvia (24.7%) or Finland (22.4%) but ahead of big countries like Spain (17.4%), Germany (16.3%) and the UK (16.2%). Of the very core category of ICT professionals, i.e. software, database and network professionals, more than one in four (26%) of Europe's workforce are in Ireland, which reflects the country's key role as an EU location for ICT multinationals from the United States and other countries.

Table 3 Key figures at a glance	IE	Rank in EU28
ICT workforce	79,900	18
As % of domestic workforce	4.1%	9
% female	19.8%	7
Estimated annual replacement need	2,600	
Latest vacancy figures (including contractor vacancies)	5,000	
Vocational graduates	0	
Tertiary graduates (only first degrees)	3,000	
Projected jobs potential until 2025 (8 years)	30,800	
of which expansion	9,300	
% of enterprises that employ ICT specialists	35%	1
% of enterprises providing training for ICT specialists	13%	6
% of ICT specialists with tertiary education	82%	1

Source: Eurostat (2015).

Migration as a factor in ICT skills supply

Ireland makes heavy use of foreign-born talent for addressing digital skills shortages, as evidenced for example by the number of work permits (required for most non-EEA nationals) issued by the Irish Government. Their number has increased from 7,253 in 2015 to 11,361 in 2017.¹⁵ A large share of work permits are issued for ICT jobs (in 2016, over 40%), primarily for:

- professional occupations (e.g. software engineers/developers, data analysts/scientists, business analysts (including IT, systems), test/process/network engineers);
- associate professional roles (e.g. a number of sales roles such as account managers/strategists and market specialists, many with language skills required such as Arabic, Turkish, Russian and Hebrew).

Most new employment permit holders had a degree or masters qualification.

Analysis undertaken by Frontiers Economics on behalf of industry association Technology Ireland found that foreign-born workers made up 16.4% of the total ICT sector workforce in 2016.¹⁶ Their contribution to employment growth (2013-2016) was much larger (38.6%). More than two out of three of these workers came from EU countries. The analysis also found that foreign-born workers represent a larger proportion of the workforce in the ICT sector than in the economy as a whole; this applies in particular to persons born outside of the EU: non-EU born workers made up (at least) 9.6% of the ICT sector workforce, against a share of 4.9% of total employment.

The general picture is confirmed by data on regional labour markets, which found that “more than half of the ICT jobs in Dublin are being filled by talent from abroad”¹⁷.

In the current political environment of the Republic of Ireland – which is influenced by the UK’s decision to leave the EU as well as EU migration policy – it is difficult to provide a robust forecast for the development of cross-border migration into and from

Ireland’s ICT workforce over the coming years.¹⁸ The Frontiers Economics report comes to the conclusion that “access to [digital] talent is unlikely to be significantly impacted by Brexit as the sector is not overly reliant on UK workers. Also, Ireland will retain access to UK talent if the free travel area between Ireland and the UK is maintained”¹⁹. Some observers argue that there is even the possibility of positive effects in case the UK “becomes a less accessible and/or less desirable location for future EU and non-EU migrants in the tech sector. This opens up opportunities for the Irish tech sector to attract these future migrants to work here”²⁰.

In any case, the current impact of Brexit related developments appears to be predominantly in increasing the level of uncertainty, as voiced by majority of businesses involved in inclusive training in the context of the Skillnets programme.²¹

ICT skills forecast model for Ireland

When looking at the development of jobs in terms of workers, the first apparent finding for Ireland is that the number of ICT workers has increased steadily but at modest speed since 2011, while the number of graduates from university ICT programmes has radically increased over the same period.

Secondly, some of the fastest growing ICT occupations in the country do not typically require an academic education. There appears to be significant potential for training programmes at vocational level which could help meet the demand for entry and competent level ICT skills while opening new pathways for a career in ICT, especially for people to whom university education is not an attractive or feasible option. Additional discussion on this follows in Sections 3 to 5.

Despite these favourable numbers, Irish recruitment firms have reported that job vacancies for ICT specialists are some of the most difficult to fill in the country. This is confirmed by survey data according to which the share of employers facing difficulties in finding suitable candidates for open ICT positions has grown steadily over recent years. The existing shortages are related not only to a lack of candidates with appropriate formal qualification, but also with

¹⁵ See Department of Business, Enterprise and Innovation (2017), Permits issued by Sector.

¹⁶ See McNaboe et al. (2017)

¹⁷ Corcoran (2015), Supplying the skills required to meet the needs of the Irish ICT Sector.

¹⁸ See Rooney (2017), Brexit and global mobility

¹⁹ Ibid., p. 29.

²⁰ McNaboe et al. (2017), p. 31.

²¹ See Indecon (2017), Evaluation of Skillnets TNP, Finuas and ManagementWorks in 2016.

transversal and cross-sectoral skills, which are increasingly being sought by employers. The latter

include “people skills, critical/analytical thinking skills, management skills and creativity, design and innovation, entrepreneurialism, team working, communications and business acumen, [...] and foreign languages/ cultural awareness”²². Training approaches discussed in Section 4 address this challenge in more detail.

Available data, including anecdotal evidence from industry insiders, suggest that Ireland has so far relied heavily on skilled people with migrant background labour to fill any shortage in ICT specialists. Against this background, the impact of the UK’s Brexit vote is giving reason to concern; the impact in terms of access to talent could be negative as well as positive. In any case Ireland is well-advised to further develop its capacity for producing skilled labour for those parts of the economy that depend of ICT specialist, which includes the most growth-intensive ones.

Box 2 Baseline projection for Ireland’s ICT Skills Gap

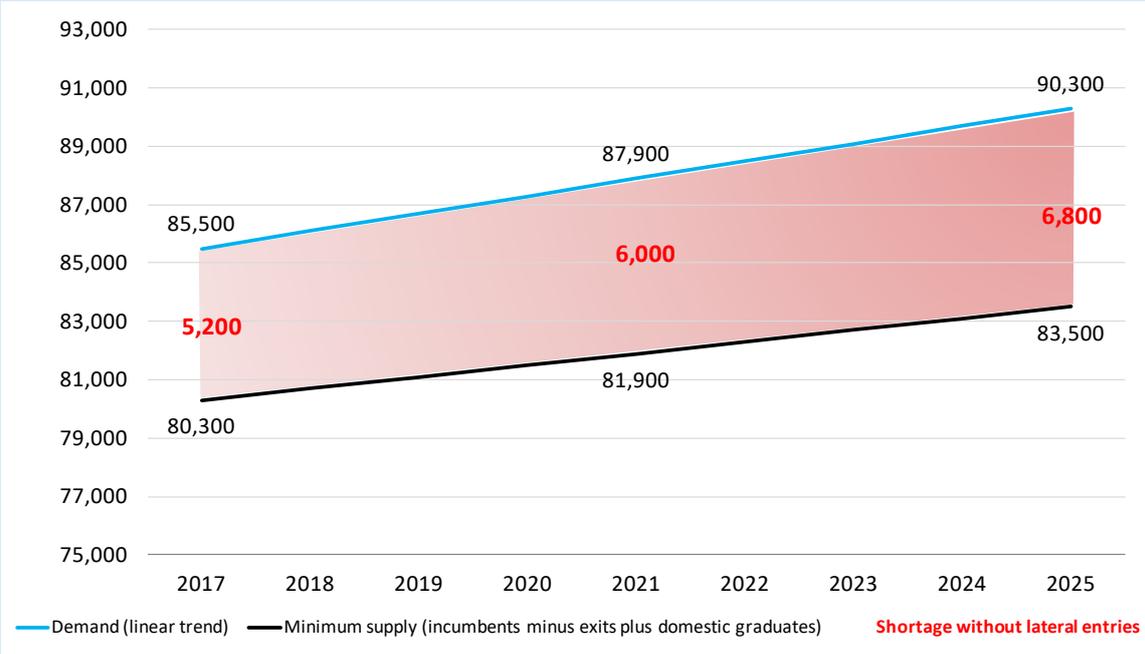
For analysing current and projecting future ICT skills gaps, we need to look at **demand** in terms of changes to the underlying demand exerted by employers (workforce expansion) as well as replacement demand – the need to replace workers who leave the workforce for good or temporarily, typically because of retirement. In terms of **supply**, the most important determinant is the number of ICT graduates who enter the labour market. Net migration of ICT workers and “lateral entries” of non-ICT graduates into IT occupations are excluded from this calculation.

For our model we estimate that workforce expansion will continue along the same lines as it has since 2011, i.e. that the number of employed ICT specialists will grow by 600 jobs per year (see above), to which we need to add a replacement demand of 2,600 per year*). The average annual need for new ICT specialists is thus 3,200. To assess total demand, one has to also account for the current vacancy backlog (the figure most often cited is 5,000, see above). One could also split the demand into met and unmet demand, with the current vacancies being (in a simplistic model) “unmet demand” and actual expansion and actual replacement being “met demand”. New supply is set by the average supply of domestic ICT graduates over the last years.

A simple projection is calculated that basically rests on assuming a baseline scenario of a steady state of flows. It should be noted that this is a “Things stay the same”-scenario. It simply shows the number of jobs to be filled in coming years if the demand keeps growing in a linear fashion, with annual supply of new labour remaining the same as in the last five years. This is a projection based on a baseline scenario, and not necessarily the one empirica would deem most likely if expected technological, socio-economic and political trends are considered. These are not allowed for in this model.

²² Mooney (2018), ICT and business skills in high demand.

Figure 3 Baseline projection scenario for Ireland’s ICT labour market from 2017 – 2025*



The shortage of skills of 6,780 in 2025 is highlighted in red in the figure above. It does not take account of lateral entries, i.e. people without a domestic degree in ICT. It is the cumulative minimum scope for outsider entries to the ICT labour market. The model is constructed such that the actual projected shortage is exactly as “today”, meaning at starting point of the model, i.e. 5,000. The total potential for new jobs from 2017 until 2025 is 30,800 according to this model (19,800 expansion and 21,000 replacement demand).

Source: empirica (2017)

(*) See yearly breakdown in Appendix A.

(**) Replacement demand is based on Cedefop’s baseline scenario for demand and supply of skills in Europe. Cedefop, the EU agency responsible for the development of vocational training, publishes estimates of future replacement demand by occupation at ISCO-08 two-digit level. For the by far largest relevant groups of ICT professionals (ISCO-08 group 25) and the smaller group of ICT technicians (group 35) this is on average 3.3%/year and 3.1% respectively in Ireland. We apply a weighted average of 3.2% and assume that this figure remains stable over the next few years.

2

Trends in Diversity

Although Ireland's labour market has well recovered from the latest recession, several groups still face serious challenges in finding employment. Long-term unemployment still affects more than 10,000 persons aged below 25. Of particular concern is the high share of young individuals not in employment, education or training (NEET). Ireland's gender gap in employment is 10.7 p.p., roughly the same than the EU average, but the country finds it much harder than most other EU countries to provide people with disabilities with employment. Ireland's digital workforce suffers from structural under-representation of women. Meanwhile, the recent inflow of high-skilled migrants from within and outside of the EU has boosted the share of non-natives in the ICT workforce.



Employment and diversity in Ireland's labour force

Table 4 Employment and unemployment indicators for diverse groups	IE	EU28	IE Rank
Long-term unemployment rate	4.3	4.0	19 th
Young people not in employment, education or training (15-24 years) – NEET	13.0	11.6	21 st
Youth unemployment	16.8	18.7	12 th
Employment rate of older workers (55-64 years)	57.2	55.3	11 th
Age employment rate gap (15-64 vs. 55-64 years) in p.p.	9.3	11.4	10 th
Gender employment rate gap (15-64 years) in p.p.	10.7	10.5	24 th
Non-natives born outside the EU, as share of total population	5.3	6.9	20 th
Non-native employment rate gap, in p.p.	6.0	8.3	17 th
Disability employment gap, 2011, in p.p.	31.1	19.6	24 th
Disability unemployment gap, 2011 in p.p.	3.1	2.5	17 th
Source: empirica calculations based on latest available Eurostat data (2016)			

Ireland's **long-term unemployment** rate stands at 4.3%, slightly above the EU28 average. The rate has been falling steadily since a peak in 2012, when it reached 9.8%. Nevertheless, there are concerns that still more than 10,000 persons aged below 25 are long-term unemployed, a figure which has been particularly slow to reduce.²³

Youth unemployment peaked in 2012 as well, when it hit 32%; the rate has been decreasing since then and now stands at 16.8%, somewhat better than the EU average, but still more than twice than in Europe's best-performing country, Germany (6.7%). The size of the challenge facing Ireland becomes clearer when looking at the number of **young people not in employment, education or training (NEET)**, for which the Ireland figure in 2017 (16.1%) is around the EU28 average (17.2%). On this indicator Ireland ranks 15th among the EU28.

It raises particular concern that disparities between the employment rates of low-, medium- and highly skilled workers are currently among the highest in the EU. The European Commission has warned that "these discrepancies have decreased only marginally in Ireland since 2010, compared to faster falls in some other Member States. This suggests that the labour market recovery has not yet been able to reverse the relative deterioration of labour market prospects that low-skilled workers have experienced since 2008"²⁴.

Ireland's **gender** employment rate gap is 10.7 percentage points, roughly at EU28 average. The female employment rate has increased by 4.4 p.p. over the period 2012-2016 but has not yet regained the level before the onset of the latest economic crisis in 2008.

As an indicator for the labour market situation of ethnic minorities in Ireland, we use the share of **non-natives born outside of the EU** in both total population and in employment. At 5.3%, Ireland has one of the lower shares of non-EU immigrants in the EU. The country's employment rate of non-natives is 6 p.p. below the value for natives, a figure somewhat below the EU average (8.3 p.p.). Closer analysis of the data shows that Ireland has the fifth highest share of people with migrant background in employment with tertiary education (57% in 2014)²⁵. In 2016, net inward migration overtook net outward migration for the first time since 2009.

Ireland's **disability** employment gap is huge. The employment rate is over 30 p.p. lower for people with disability compared to people without, which leaves Ireland on rank 24 among EU28 countries. This is caused both by lower labour force participation and higher unemployment rates for people with disabilities. As the European Commission analysis highlighted, "addressing this issue is particularly relevant due to the high prevalence of disability in jobless households"²⁶.

²³ See National Youth Council of Ireland (2017), CSO Live Register: Youth Council reaction to latest figures.

²⁴ European Commission (2017), Country Report Ireland, p. 36.

²⁵ See Redmond & Whelan (2017), Educational Attainment and Skill Utilisation in the Irish Labour Market: An EU Comparison.

²⁶ European Commission (2017), p. 37.

Diversity in Ireland's ICT Workforce

The available data suggest that Ireland's ICT workforce is marked by significant under-representation of **women**. According to data from the national statistical institute CSO, only 31% of those working in Ireland's ICT industries were women in 2016, against a figure of 46% across all sectors.²⁷ Only 21% of all third-level ICT graduates were women in 2016, against 52% across all fields of study. In comparison, the share of women in ICT in Europe is about 17% on average.

Several stakeholders have collected data on reasons and attitudes related to women and employment in the ICT domain. The Irish chapter of 30% Club, an international network of Chairs and CEOs committed to "gender balance on boards", and Dublin City University regularly conduct an analysis of women in business leadership and management positions in Ireland. According to their investigation, women comprise only 30% of junior management positions in Ireland's technology sector, and even fewer (24%) are CEOs.²⁸ 26% of junior management positions in ICT functions are women, but only 13% of executive director level ICT positions are taken by women. This translates into a lack of role models at management level – although some Irish women who have successfully reached top management positions in ICT have become very active in promoting ICT careers to young woman in the country, as discussed further below.

Industry sources have indicated that retaining women in ICT jobs poses a challenge. Analysis by Software Skillnet, the National Training Network for the Software Technology sector in Ireland, found that "after 10 years of experience, 41% of women have left the technology sector"²⁹. While this specific challenge is outside of the scope of the present study, it is indicative of underlying problems that act as deterrents to young females who are considering a career in ICT for themselves.

Those **neither in employment nor in education and training ('NEETs')** are a further target group of the project. 16.1 % of the 20-34 olds in the Ireland in 2017 were NEETs. This is slightly less than the European average (17.2%) Female NEETs aged 20-34

are rather economically inactive while their male counterparts tend rather to be unemployed. In 2017 the proportion of young people neither in employment nor in education and training ranged from 7.8 % in Sweden to 29.5 % in Italy.³⁰

In their report 'Society at a Glance 2016 - A Spotlight on Youth' the OECD provides data on the NEET rates for women and people with migrant background in Ireland. "Across the OECD NEET rates for women are 38% higher than for men – in Ireland this gap was only 12% in 2015. But this smaller gap is due to the fact that the recession had a stronger impact on male employment, driven by a collapse in the construction sector. (...) Ireland is one of the few countries in which youth born outside the country do not have higher NEET rates than Irish born youth while across the OECD NEET rates tend to nearly 50% higher for youths with migrant background. This can, in part, be attributed to the fact that the bulk of recent inflows into Ireland have been EU nationals moving to take up employment in the booming pre-recession Ireland".³¹ Ireland had the highest proportion of **Mathematics, Science and Technology (STEM) graduates** in the EU in 2015. The proportion of graduates in these disciplines was 31.5 per 1,000 of the population aged 20-29 in Ireland, while the EU average was 19.1.³² However, the proportion of female graduates in Ireland, at 12.9, was the seventh highest in the EU.³³

According to the Accenture report titled 'Powering Economic Growth: Attracting more young women into science and technology' and quoted by the ICS women are vastly under-represented in science and technology-based careers. According to ICS "in Ireland, there are roughly 117,800 people working in jobs that utilise STEM skills. The proportion of women employed in such roles hovers at less than 25%, according to the Central Statistics Office. (...) Irish companies collectively will have an estimated 44,500

²⁷ See CSO (2016), Women and Men in Ireland 2016.

²⁸ See DCU and 30% Club (2017), Women in Management – the Leadership Pipeline 2016.

²⁹ Tech Central (2017), Women Reboot programme goes national.

³⁰ Eurostat: Statistics on young people neither in employment nor in education or training, July 2018:

https://ec.europa.eu/eurostat/statistics-explained/index.php/Statistics_on_young_people_neither_in_employment_nor_in_education_or_training

³¹ Society at a Glance 2016 - A Spotlight on Youth: <https://www.oecd.org/ireland/sag2016-ireland.pdf>

³² CSO: Measuring Ireland's Progress 2016: <https://www.cso.ie/en/csolatestnews/pressreleases/2018pressreleases/pressstatementmeasuringirelandsprogress2016/>

³³ CSO – Central Statistics Office: <https://www.cso.ie/en/releasesandpublications/ep/p-mip/mip2015/edu/ed/>

job openings for people with high-level information and communications technology (ICT) skills over the next six years”.³⁴

There are very little data available about other groups currently underrepresented in the country’s ICT workforce. In line with the low labour force participation rates of **people with disability** in Ireland in general, the group appears to be strongly underrepresented among ICT specialists. Among Irish residents with an **ethnic minority** background, there is a strong polarity between highly skilled workers, who are over-represented in the ICT workforce, and persons with low educational attainment, who are underrepresented. Foreign-born workers from outside of the EU made up 9.6% of the total ICT sector workforce in 2016, against a share of 4.9% of total employment.³⁵

In Ireland more than 800 schools currently qualify for the **DEIS (Delivering Equality in Schools)** scheme and benefit from vital additional resources such as extra teachers and grant-aid. Despite this support there is still a significant gap in achievement and attainment between students attending DEIS and non-DEIS schools across Ireland, according to an analysis of the education programme. “The latest report into the DEIS programme, which was introduced to primary and post-primary schools in Ireland in 2006, showed that achievement levels among Junior Cert students in DEIS schools has “improved significantly” while the gap between DEIS and non-DEIS schools continues to narrow. However, it warned there is still a significant difference in educational achievements between students in DEIS and non-DEIS schools.”³⁶ In the DEIS evaluation published as part of the DEIS 2017 plan the Department of Education and Skills states that “the Leaving Certificate retention rate for the 2008 entry cohort in DEIS schools is 82.1%, which is around 8.5% lower than the national average rate.”³⁷ No data could be identified on the number and share of students from these schools starting education and training and later on a career in ICT fields.

³⁴ ICS: Vast under-representation of women in tech careers, according to new report: <https://www.ics.ie/news/view/1147>

³⁵ See McNaboe et al. (2017)

³⁶ The Irish Times (7 January 2019): Significant achievement gap between DEIS and non-DEIS schools: <https://www.irishtimes.com/news/education/significant-achievement-gap-between-deis-and-non-deis-schools-1.3750444>

³⁷ Department of Education and Skills: DEIS: Delivering Equality of Opportunity in Schools: DEIS Plan 2017: <https://www.education.ie/en/Schools-Colleges/Services/DEIS-Delivering-Equality-of-Opportunity-in-Schools/>



3

Policy Overview

Ireland's government puts strong emphasis on skills development, with a particular focus on ICT specialist skills. The Action Plan for Jobs features the goal of making Ireland the most attractive location in the world for ICT skills, as also reflected in National Skills Strategy 2025. Targets have been introduced, for instance, for the number of ICT graduates from undergraduate programmes. Progress so far has been in line with expectations. Traditionally, the main area of activity has been higher education, for which the National Plan for Equity of Access to Higher Education 2015-2019 has stepped up efforts to support groups currently underrepresented in university education. Recent years have seen a renewed emphasis on further education and training, in particular apprenticeships and traineeships. Newly launched apprenticeships in ICT are seen as an important step towards opening up ICT careers to people for whom university education is, for one reason or another, not a feasible or attractive enough proposition, including women and members of other groups currently underrepresented in the ICT workforce.



Policy initiatives to address ICT skills challenges in Ireland

The overall policy aim of the Irish government is to meet the country's ICT skills needs in the future primarily through education, including re-skilling and up-skilling, plus attracting of talent from abroad. Two ministries in Ireland share responsibility for policies regarding professional ICT skills and employment of diverse target groups: the Department of Education and Skills (DES) and the Department of Jobs, Enterprise and Innovation (DJEI). On topics such as women in ICT strategies are also being formulated by the Department of Justice and Equality (DJE) and other ministries.

Policy on Jobs, Skills and Education

The basis for most of the following policies is provided by the **Action Plan for Jobs** launched in 2012, a major government initiative for job creation. ICT is an important part of the action plan: the document features the goal of making Ireland the most attractive location in the world for ICT skills. The action plan is generally regarded a success, as unemployment has dropped from 15% in 2012 to 7% in 2017, the lowest figure since the onset of the last economic crisis in 2008. The 2017 Action Plan foresees further increases in total employment; it places growing emphasis on activities for the development and attraction of "high quality talent". The recent editions of the action plan have also put stronger focus on inclusiveness and equality. One current focus is on reskilling and upskilling jobseekers for ICT jobs and on offering ICT training for the long term unemployed.

Acknowledgement of the need to coordinate and design policy action in the employment domain on the local and regional levels have lead to launch of eight **Regional Action Plans for Jobs** in 2015-2016. A new **Regional Enterprise Development Fund** has been set up to support the development and implementation of collaborative and innovative projects, many of which have a focus on persons at risk of exclusion from quality employment. In this regard, a key component of the Action Plan for Jobs is Ireland's **National Skills Strategy 2025**, which is implemented by the Department of Education and Skills. Its objectives include a specific focus on active inclusion to support the participation of underrepresented groups in education and training and the labour market.

The **Enterprise 2025** strategy, launched in 2015, also highlights the importance of training in relevant skills, especially for the unemployed, and the ICT sector.

The 2012 **ICT Action Plan** was launched that year by the Department of Education and Skills. It features key targets including doubling the number of ICT graduates from undergraduate programmes from about 1,000 in 2011 to 2,000 in 2018. The Action Plan features short term "Up-skilling and Conversion Actions" in order to increase domestic supply of high-level ICT skills over the period 2012-2014, for which purpose already existing programmes such as Springboard and Skillnets were revised. Medium-term plans include measures to ensure a sustained increase in the output of appropriately skilled graduates, for instance by attracting more students (especially women) to ICT.

In 2014, an updated document was published, the **ICT Skills Action Plan 2014-2018**. It features a target for 2018 to produce 74% of the forecast industry demand for high-level ICT skills from the domestic education system, up from 45% in 2012. In parallel, the document places emphasis on making the Irish labour market even more attractive – in fact, "the global leader" – for skilled ICT professionals. The Action Plan is currently being evaluated, with a review expected for later in 2018.

Further education and training (FET) are the topic of a separate strategy, the **Further Education and Training Strategy 2014-2019**, for which responsibility lies with DES and SOLAS, the Further Education and Training Authority. The strategy features a strong emphasis on the FET system's capability to produce the skills demanded by the economy, as well as active inclusion and quality provision. Its Active Inclusion pillar "seeks to provide more training programmes and supports for those experiencing socioeconomic disadvantage".

In preparation of the Strategy, a review of Ireland's apprenticeship system was carried out in 2013/2014, which concluded that "there is significant scope to expand employer-led apprenticeships at FET level (and also in higher education) into a wide range of occupations in business sectors" including the ICT sector.

The FET Strategy's Strategic Objective of implementing a new apprenticeship system was further specified in the 2016 **Action Plan to Expand**

Apprenticeship and Traineeship in Ireland 2016-2020.

So far, two ICT apprenticeships were newly developed in response to industry demand for software development skills: ICT Associate Professional Network Engineer and ICT Associate Professional Software Developer. ICT traineeships currently on offer are: IT Support Specialist; Software Developer; Digital Sales and Marketing [since 2017]; IT Network Security; Animation Studio Assistant.

Policy initiatives for supporting diversity in ICT training for jobs

In terms of policy strategies dealing with women and training for ICT jobs, the **National Strategy for Women and Girls 2017-2020**, launched by the Department of Justice and Equality, is the most relevant. Better integration of girls and women into STEM education and employment is singled out as a key objective. In this respect, the strategy takes a view encompassing the full skills pipeline, starting from early and primary education and reaching out to female representation in management positions in the ICT and other STEM domains.

The policy framework for measures for supporting employment of people with disabilities is presented in the **National Disability Inclusion Strategy 2017-2021** and the **Comprehensive Employment Strategy for People with Disabilities 2015-2024**, which are both whole of government initiatives.

The Disability Inclusion Strategy features eight themes, including education and employment: The objective is to empower people with disabilities to enrol in third level education and participate in employment. The Employment Strategy for People with Disabilities, related to the Action Plan for Jobs, aims to: build skills, capacity, and independence; provide bridges and supports into work; make work pay; promote job retention and re-entry to work; provide co-ordinate and seamless support; and engage employers. The strategy does explicitly refer to STEM-related in the context of a Strategic Objective to “develop a programme of work to include people with Autism Spectrum Disorder (ASD) within the SFI Discover programme” as a means to “engage young people with ASD with Science Technology, Education and Maths education and career paths”.

The Irish government recognises that access to higher education need to be made much easier for people with a socio-economically disadvantaged background or a disability. Under the National Plan for Equity of Access to Higher Education 2015-2019, the **HEAR and DARE schemes**,³⁸ operated by several higher education providers that offer places on reduced points for school-leavers from groups currently underrepresented in higher education, have been made available to further education graduates as well.

Box 3 Snapshot: National Plan for Equity of Access to Higher Education 2015-2019

Higher education is covered in depth by the **National Strategy for Higher Education to 2030** which was established by the DES in 2011. Measures aimed at making higher education more inclusive have been specified in more detail in the **National Plan for Equity of Access to Higher Education 2015-2019**, published by DES and the Higher Education Authority. The plan’s aim is to ensure that the student body entering, participating and completing higher education “reflects the diversity of Ireland’s population at all levels”.

A major objective is to ensure that there are “coherent pathways from further education and to foster other entry routes to higher education”. The plan stresses the key role to be played by “regional and communal partnership strategies” with a special focus on mentoring. The main target groups of the National Plan are socio-economic groups who have low participation rates in higher education, as well as people with disabilities, part-time/flexible learners, further education award holders and the Traveller community.

Preparatory work for the Action Plan by the Working Group on Student Success identified non-completion of programmes, particularly for those in underrepresented target groups, as of special importance (Objective 1.4). The document also foresees action to “support a more coherent and systematic approach by institutions (working within their regional clusters) providing different pathways and supporting the transition to higher education”.

Source: Working Group on Student Success (2016): National Plan for Equity of Access to Higher Education 2015-2019. Discussion Paper

³⁸ See www.accesscollege.ie

4

Findings

Out of 92 programmes identified in Ireland, 63 were found to be directly relevant to inclusive ICT skills training as defined in the scope of our study. In this section we analyse the results of our survey of stakeholder approaches towards inclusive ICT skills training programmes. We provide a brief look into the pathways available to gain an entry into the digital labour market in Ireland and suggest a taxonomy to classify the programmes surveyed. We conclude this section with a summary of lessons learnt from our selected programmes.



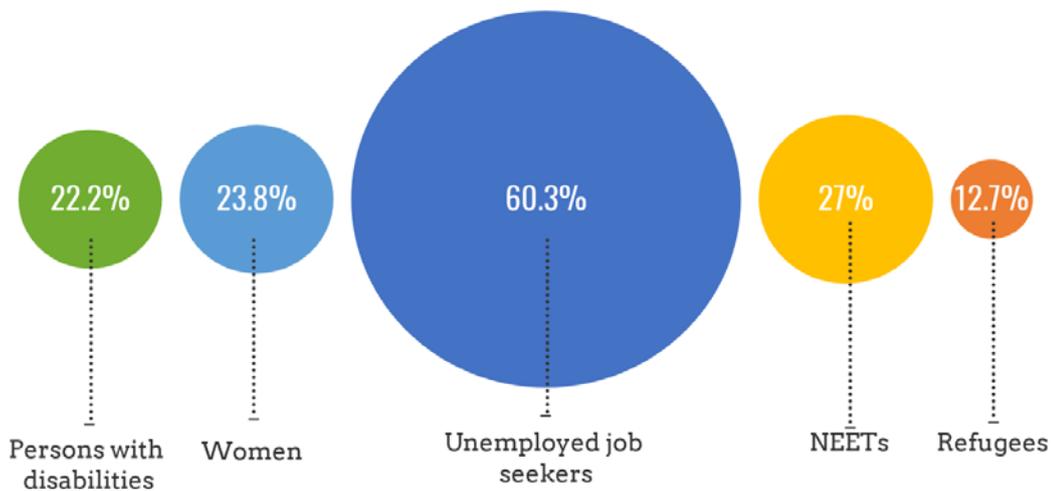
Methodology and research

We conducted a comprehensive survey to determine the impact and challenges of inclusive ICT skills training programmes for diverse groups to enter the digital labour market. Our research combined both qualitative and quantitative methods, including surveys, individual interviews with training providers, and in-depth interviews with the selected best cases and employers.

Out of the 92 programmes identified in Ireland, 63 were found to directly relevant to inclusive ICT skills

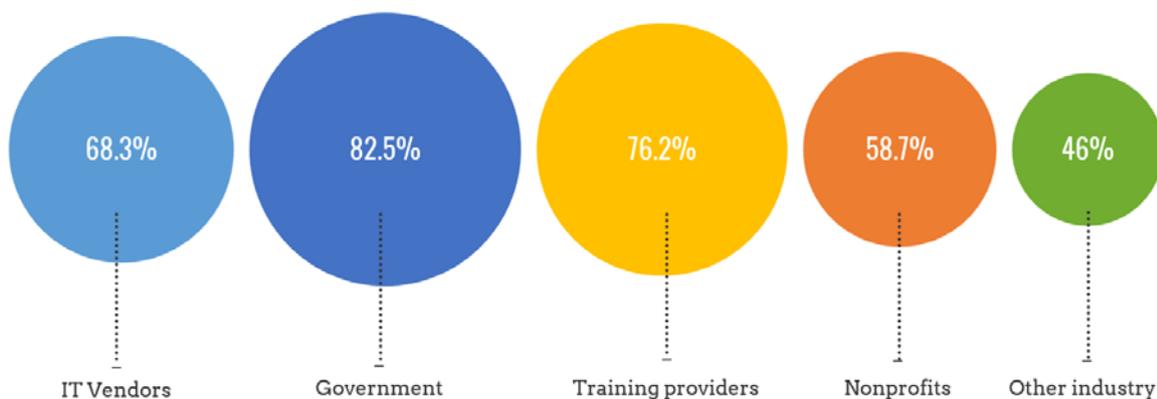
training as defined in the scope of our study. These programmes were specifically targeted towards underrepresented groups such as women and disadvantaged socio-economic groups such as NEET youth, students attending DEIS schools (DEIS Delivering Equality of Opportunity in Schools), and job seekers at risk of long-term unemployment. Figure 4 and Figure 5 show a further breakdown of these programmes in terms of target groups addressed and stakeholders involved in inclusive ICT training in Ireland.

Figure 4 Ireland - Share of target groups in inclusive ICT training in Ireland, % of programmes surveyed



Source: diversITy Survey, empirica (2017)

Figure 5 Ireland - Share of stakeholders in inclusive ICT training in Ireland, % of total programmes surveyed



Source: diversITy Survey, empirica (2017)

Pathways to ICT skills training and jobs

There are multiple pathways for individuals to gain an entry into the digital labour market; in Ireland, traditional education in the form of university degrees is still the most common, but recent reforms of the systems for apprenticeships and traineeships have increased the number of training options available for entering the ICT workforce. The favourable conditions on the Irish labour market for ICT specialists have

resulted in a strong demand for possibilities to add digital skills training to educational attainments from another area, such as a degree in the humanities. In response, new pathways have emerged for young people seeking to transition from other sectors into the ICT sector. The four main pathways in Ireland are discussed below.

Pathways

University education

In Ireland, the by far most common traditional pathway for ICT careers is a university degree in Computer Science or a related subject. This is a typically a 3-4 year undergraduate degree (BA), optionally complemented by a 1-2 year master's degree (e.g. Master of Computer Science). Most of the graduates working in the ICT sector have a university degree. While all universities charge tuition fees and a student contribution, almost all students are eligible for the "Free Fees Initiative". With this initiative the government covers the tuition fees and leaves the contribution fees to the students. Ireland also offers the Higher Education Access Route (HEAR). HEAR is a college and university scheme that offers places on reduced points and extra college support to school leavers from socio-economically disadvantaged backgrounds who are resident in the Republic of Ireland. HEAR applicants must meet a range of financial, social and cultural indicators (criteria) to be considered for a reduced points place and extra college support. An evaluation report came to the conclusion that "there is evidence that the HEAR scheme targets a more diverse profile of applicant than the typical CAO (Central Applications Office) applicant, particularly in terms of country of birth or nationality, but also in the type of school that applicants have attended. More females than males apply to HEAR, and a greater share of applicants who were not born in Ireland or who do not have Irish nationality are attracted to the scheme, compared to the typical profile of CAO applicant. HEAR applicants are more likely to have attended vocational schools compared to applicants who use other admission routes, schools which typically have a greater composition of students from working class and unemployed households."³⁹

Conversion programmes and ICT vendor certificates

Many students who enrol in ICT skills training in Ireland have an educational background in subjects other than Computer Science, such as Humanities or Social Sciences. They may choose to switch to ICT for better career prospects or stable and higher-paying jobs. To cater for this group, Ireland has for many years seen several programmes targeting non-ICT Higher Education graduates who may be interested in a career in ICT. This includes the ICT Skills Conversion Programme targeted at jobseekers who already hold a level 8 or equivalent qualification. The programme is now run under the banner brand Springboard+ (see Good Practice "Springboard"). Employers consider Industry-led / ICT vendor trainings as useful further training certificates. The certificates enjoy a high reputation and are accepted as valuable also for career transitioning youth and adults and specifically if obtained from reputable international ICT vendors.

³⁹ Byrne, D. et al., An Evaluation of the HEAR and DARE Supplementary Admission Routes to Higher Education, November 2013

Apprenticeships

An apprenticeship is an occupational “earn-and-learn” programme, with 50-80% of the time spent on the job. Apprenticeships take 2-4 years and apprentices receive a contract of employment as well as a salary. Both available ICT apprenticeships are two-year programmes consisting of a 6-month block off-the-job initially followed by 3 or 4 days per week on-the-job training, and 1 or 2 days per week classroom training. All training costs are state-funded through the National Training Fund, and employers pay a salary to apprentices for the duration of the programme. For example, the “ICT Associate Professional Software Development” apprenticeships leads to an Irish National Framework of Qualification (NFQ) level 6 advanced certificate.

Traineeships

Traineeships are targeted at unemployed people and provide work-based learning in partnership with employers. Traineeships are generally 40 weeks in duration, beginning in an education and training environment, with work placement (generally 30% minimum of total duration) following either during or after the on-campus learning. Successful trainee participants receive an award or industry certification at Levels 4-to-6 on the NFQ. The work-based component is supported by an in-company mentor/supervisor who oversees completion of each trainee’s skills checklist on-the-job.

Regarding the **higher education** pathway, the main issue is the low share of women and those from socially challenged background (e.g. DEIS students) choosing ICT subjects as well as what has been called the “leaky pipeline”⁴⁰, i.e. the higher percentage of women dropping out of higher education ICT programmes and – for those who graduate – their lower progress in comparison to their male colleagues.

Specifically DEIS students suffer from the economic burden of higher education. The student contribution can still act as a deterrent to members from at-risk groups such as persons from challenging socio-economic backgrounds. However, under the National Plan for Equity of Access to Higher Education 2015-2019, the HEAR and DARE schemes, access to higher education is made much easier for people with a socio-economically disadvantaged background or a disability. The universities under this programme offer places on reduced points for school-leavers from groups currently underrepresented in higher education

Experts agree that systematic efforts are required to mitigate the situation for underrepresented students, specifically women, which would need to address all main stages of the talent pipeline. The Irish government is engaged in a whole range of policy activity in the area, but there is consensus that real change will require an extended, concerted effort involving all key stakeholders. In the meantime, valuable work is done by NGO programmes driven by

intrinsic interest in boosting diversity, exemplified by Women in Technology and Science (WITS), Coding Grace and WomenWhoCode Dublin,⁴¹ all of which are voluntary membership organisations focusing on networking, organisation of workshops and other events, as well as promotional campaigns.

Ireland has been early in realising the potential of combining action to combat unemployment with measures to help meet employer demand for entry and competent level ICT skill. A popular means to do so are **conversion courses**. Skillnets - Ireland’s enterprise-led and sector-specific training networks - are responsible for the design, management and delivery of specific training programmes targeting job seekers (such as the Skillnet ICT Conversion Programme) through the Jobseekers Support Programme (JSSP), which is funded by the government through the National Training Fund. Eligible, unemployed learners are provided with free training in the form of industry-specific course offerings integrated training with those in employment. In recognition of the strong demand for ICT specialists in Ireland, any unemployed person wishing to enter the ICT sector is eligible for free training. These programmes all include work placements within ICT companies. They have been found to result in high employment progression rates (up to 85%).

For individuals who already hold a primary degree in another discipline (e.g., Arts, Business) and who seek

⁴⁰ See Daly et al. (2017), Fixing the leaky pipeline and retaining our talent.

⁴¹ See <http://witsireland.com/>, www.codinggrace.com/chapters/dublin/, www.womenwhocode.com/wwcode-dublin

Good Practice Showcase: Skillnets' Women ReBoot

Enterprise-led training networks which use government funding for providing ICT training to job seekers, including women who have taken a family break

Skillnets are enterprise-led training networks comprising a group of private sector companies from the same sector and/or region of Ireland. 5 of the 63 learning networks currently funded by Skillnets exclusively support firms in the technology sector; many other networks, however, also include ICT training as part of their offering. Any unemployed person wishing to enter the ICT sector is eligible for free training. These programmes all include work placements within ICT companies and have been found to result in high employment progression rates (up to 85%). One of such programmes is the **Women ReBOOT** programme. It targets women with existing ICT skills who have taken a career break and now seek “structured and supported routes back to work [...] with a view to filling current or future open roles”. The programme consists of group seminars, one-to-one professional coaching, online training and mentored company work placements.

Why a good practice showcase?

- Very high rate of progression to employment from ICT programmes, as found by independent economic consultants who undertake annual evaluations of programmes funded by Skillnets.
- The Women ReBOOT programme is free to jobseekers and offers opportunities to upgrade and enhance professional development and prepare for re-entry into the workforce.
- It offers a combination of opportunities in updating knowledge and skills, work preparation and experience, one-to-one coaching and mentoring.
- Extended paid work placements of 3-6 months in duration, which are project-based in design and are particularly effective in allowing valuable support for re-entry to the workplace in an encouraging environment.
- Women ReBOOT shows how individuals who require flexible modes of training, tailored to their specific requirements, can be motivated to participate in ICT training.

For full details of the case, see Appendix E.

to enter a career in ICT, the Irish government allocated €1 million in the 2017 Budget to support the provision of Level 9 MSc Computer Science conversion programmes, which commenced in the 2017/18 academic year. The maximum grant per student was €5,000, from which participants were able to pay the fee charged by the provider.

With regard to programmes that have a particular focus on **women who want to re-start their career** in ICT after a family break, the recently launched Women ReBOOT programme targets women with existing ICT skills who have taken a career break and now seek “structured and supported routes back to work [...] with a view to filling current or future open roles”. The programme consists of group seminars, one-to-one professional coaching, online training and mentored company work placements. A pilot involving 28 jobseekers proved highly successful; the programme is currently being rolled out across the country. Please see the Good Practice Showcase “Skillnets” in the Annex.

Ireland was rather late in assigning more emphasis on **apprenticeships** outside of their traditional role in the craft-based sectors. In 2011, the proportion of school

leavers entering an apprenticeship was only 2.0%⁴², one of the lowest shares in Europe. Moreover, the number of young women embarking on an apprenticeship has traditionally been all but negligible: in 2016, there were only 33 female participants in apprenticeship programmes out of an apprenticeship population of 10,315. The inclusion rate of people with a disability was also very low, with just 1.7% of total apprentices.⁴³ Recent years have now witnessed renewed emphasis on apprenticeships as an important route into the digital workforce.⁴⁴ Already the second call for apprenticeships features ICT degrees. So far it has led to the development of the ICT Associate Professional Network Engineer and ICT Associate Professional Software Developer apprenticeships. They result in a NFQ Level 6 qualification (Advanced Certificate in Computer Networking and Advanced Certificate in Computer

⁴² See Education and Training Boards Ireland (ETBI)(2013), Submission to Department of Education and Skills on The Future of Apprenticeship in Ireland.

⁴³ See O'Brien (2017), Just 33 out of 10,000 apprenticeships taken by women.

⁴⁴ See Eustace (2017), Generation Apprenticeship.

Industry-led initiative focusing on ICT training for marginalised job seekers

Fast Track to IT (FIT) works in close collaboration with industry partners and the Irish government to provide training courses and work placement services to the unemployed, with a particular focus on the long-term unemployed. FIT courses are tailor-made for the technology sector and are provided at different levels; elementary, middle-skills, expert level. Since 2015 FIT has launched two ICT apprenticeship programmes, with more in the pipeline. These present novel opportunities for marginalised job seekers and disadvantaged communities to embark on a career in ICT. FIT follows the “Training for Employment” model, which means that industry partners define the curriculum development and the government allocates training provision, funding assistance and regulation. FIT’s strength is its curriculum, which is continually evolved according to industry needs and emerging technologies, in mobile, cloud computing, fintech, big data, medical device maintenance and renewable energy.

Why a good practice showcase?

- FIT support for diverse population groups has resulted in around 4,000 marginalised job seekers completing FIT courses every year. Since 1999, 18,000 individuals completed the programmes and 72% of FIT graduates have proceeded to employment, self-employment or further education or training.
- FIT provides wrap-around support to participants, covering the areas of training, hands-on support and recruitment.
- To assess employer needs in a timely and effective fashion, FIT has developed a skills needs analysis methodology which has resulted in publication of the FIT ICT Skills Audit series. This has become a key source of data for all stakeholders in the domain.
- Since 2010, the activities of FIT have become a key component of the Irish Government’s Further Education and Training (FET) Strategy in terms of addressing disadvantage, modernisation/innovation and bringing stronger industry links to the FET sector. FIT strategies are complementary to and in support of various national policies in the areas of national development, social policies, skills development and enterprise.

For full details of the case, see Appendix E.

Programming, respectively). Apprenticeships in development include ‘Fintech Associate Professional’, ‘ICT Associate Professional in Cybersecurity’ (both Level 6) as well as ‘Software System Designer’ and ‘CGI Technical Artist’ (both Level 9).

Ireland’s **traineeship** model was reviewed earlier this decade (2014)⁴⁵. As a result, a new type of traineeships was developed, so-called Career Traineeships. They combine transversal and technical skills development and are typically delivered in flexible ways, including online learning. Traineeships are open to all potential participants, of all ages and backgrounds, and are free of charge to participants. To broaden their appeal to vulnerable socio-economic groups, individuals currently receiving state support (e.g. Jobseekers Benefit, Jobseekers Payment, One Parent Family payment, Jobseeker’s Transitional Payment, Disability Allowance) can participate in a traineeship while retaining their welfare payment,

and also receive a training allowance for the duration of their training. This makes traineeships very suitable for individuals who fail in securing a (salaried) apprenticeship. Employment outcomes from traineeships have been found to be strong and the approach very cost-effective.⁴⁶ 47% of “IT, Web dev, Media” and 30% of “Core ICT” trainees are in employment. Job profiles include IT, Web development, Media; Transport, Distribution & Logistics; Sales & Marketing; Business, Administration & Management; Engineering & Manufacturing. Based on this, SOLAS – the institution funding this activity - concluded that traineeship provided a good alternative option to apprenticeship in having on-the-job learning for specialist skills but over a shorter period of time.

⁴⁵ <https://www.education.ie/en/Press-Events/Press-Releases/2014-Press-Releases/PR14-01-21.html>

⁴⁶ See Perceptive Insight (2017), 2016 Follow up survey of FET programme participants.

Training taxonomy targeting training needs

We classified the ICT skills training programmes identified in Ireland in six categories based on the programmes' approaches to learning. The most promising programmes use multiple methods that are a combination of two or more approaches. The advantage of using integrated approaches is that it

allows for the development of both technical and cognitive skills. These approaches are discussed in more detail below.

 <h3>Bootcamps</h3> <p>Intensive training programmes generally lasting for a few days to several months. Training can be full- or part-time depending on the programme and consists of lessons, individual and team projects, 1:1 tutoring and tests.</p>	 <h3>Workshops</h3> <p>These typically take one to three days. Training is on specialised topics and consists of presentations and interactive peer-to-peer sessions.</p>
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A variety of training providers use both bootcamps and workshops (the terms are used interchangeably in the Irish digital training landscape). Coding bootcamps for example have a skill-intensive focus that cover areas such as intermediate to advanced programming languages, supplemented by smaller sessions or workshops on soft skills training.

Success factors

- **Affordability:** Bootcamps are an affordable alternative to a four-year university degree as they require less time to complete and tend to cost less.
- **Flexibility:** Compared to university programmes, bootcamps are more flexible in terms of curricula and can respond faster to changing market demands.
- **Prior Experience:** Bootcamps are less selective than universities in terms of prior qualifications. Individuals who are interested and do not necessarily have an ICT background can enrol in training bootcamps.

Challenges

- **Certifications:** Bootcamps tend to not offer standardised certifications but rather follow a variety of teaching and training techniques.
- **Employability:** In terms of employability, bootcamp qualifications are not sufficient and employers tend to require more traditional technology qualifications or longer work experience in the ICT sector.

 <h3>Classroom</h3> <p>Traditional, instructor-led training in a classroom setting, in most cases using tailored e-learning platforms. Training usually leads to a certificate and can last for several months.</p>	 <h3>Online</h3> <p>Training includes but is not limited to massive open online courses (MOOCs). Courses are available on online platforms, are mostly free to join and may or may not have instructors. Assessments are sometimes self-administered or based on peer-to-peer feedback, while others offer the possibility to take a final exam and earn a certificate.</p>
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Classroom training with online learning elements is by far the more popular approach towards ICT skills training used by most training programmes in Ireland.

Success factors

- **Flexibility:** Learning through online platforms can be more flexible as trainees can access courses and

schedule tests based on their own availability. However, this may not be possible with classroom training if programmes follow a strict in-house schedule.

- **Learner engagement:** Classroom training tends to be much more suitable for ensuring engagement of persons who lack self-efficacy, such as often found among NEET youth and the long-term unemployed.
- **Certifications:** Courses include but are not limited to content provided by IT vendors, such as Microsoft, SAP, Cisco and Oracle. Vendor-specific trainings follow a partner-centric approach in which companies create the curriculum which is then delivered by partners.
- **Employability:** Such trainings have the advantage of providing certifications that are valued by employers.

Challenges

- **Affordability:** Classroom training following a vendor-specified curriculum resulting in a certification tends to cost more, both for trainees and training providers. These programmes, unless funded through sponsors and other mechanisms, are unable to reach low income segments of the population, i.e. large parts of at-risk-groups covered by this study.
- **Accessibility:** Training programmes which require the presence of the learner at the location of the training provider tend to be available most of all in the major urban centres of the country, as our assessment of the training landscape shows. Other parts of the country tend to be underserved. Classroom based training is also less suited for persons requiring flexibility about when to learn, such as parents of young children – in particular single mothers.
- **Prior Experience:** These programmes, especially if offered for free, tend to be more selective when choosing prospective participants. Stricter selection criteria have the risk of excluding those who may have the most to gain from such employability skills.

Experiential



A mix of technical and experiential learning including classroom-oriented learning and company placements. Both digital apprenticeships and, to a lesser degree, traineeships are designed around experiential learning.



Mentorships

Not a stand-alone training type and is integrated with other types. A trainee can choose or is appointed a mentor who is an experienced instructor or employee. The mentor is responsible for providing 1:1 guidance. In inclusive training programmes, mentors are typically volunteers with an interest in helping young persons succeed in the ICT sector.

Experiential programmes such as an internships or compulsory work placement are a more recent approach towards ICT skills training. Depending on the programme, training can last from a few weeks to more than a year. The latter type is typical for the new ICT apprenticeships which results in a certification or degree. Such ICT trainings in Ireland are developed in a process of business-education partnership, where the training curriculum is designed to reflect the demands of employers, often at regional level.

Success factors

- **Certifications:** Depending on the programme, a trainee may or may not receive a certification. However, the number of hours worked are recognised as formal work experience.
- **Employability:** Internships and workplace learning programmes have high added value for trainees as they learn both technical skills and soft skills, and get in touch with employers who may want to offer them a job after completion.
- **Employer Engagement:** As training is structured to reflect the demands of employers, employers can benefit from being involved in the training by getting relevant skills in return. This is a major success factor of experiential training programs, especially those developed with the help of business-education partnerships.
- **Mentorships:** In many such programmes, technical training is accompanied by mentorships. Mentors are a valuable source of learning for new trainees or employees at the beginning of their careers. Mentorships work well if mentors are selected based on an intrinsic interest in supporting others during

their career.

Challenges

- **Affordability:** It is challenging for training providers to find employers who are willing to train and hire interns because of the resource burden on employers. Usually, experiential training is offered by well-reputed training programmes with a vast network of partners.
- **Accessibility:** Many socio-economically disadvantaged youth live in parts of town quite distant from places of work

Good Practice Showcase: Springboard

Multi-stakeholder partnership for providing skills required by employers, with a strong focus on training for ICT specialist positions

The Springboard programme targets both unemployed individuals and those who are considering a track or transition towards careers in ICT. The programme includes mandatory job placement during the studies. It caters to a higher-than-average age of participants – of 25 years – when compared to the range of 18-20 year olds in other ICT courses across the country. Springboard is funded by the Irish government (National Training Fund) and co-funded by the European Social Fund (ESF). The funding from the Irish government gets revised annually. In 2017, the programme received funding of around €27 million from the government. Between 2011 and 2016, 35,000 individuals took part in the Springboard programme of which almost 10,000 participated in ICT related programmes. 2,200 people participated in the ICT skills conversion programme. Overall, 53% of participants reported employment 3-6 months following graduation in an ICT sector. In comparison, 73% of graduates from the ICT conversion programme are employed in the ICT sector. An additional 19% of participants went into further education.

Why a good practice showcase?

- Springboard's training offers are designed and delivered with the help of well-established, effective partnerships with employers and industry players, who collaborate on course content and design. The Higher Education Authority is the key stakeholder, ensuring a well-represented curriculum across industries and skills.
- Course content is geared towards those problem sectors which indicate a high skills gap. Springboard undertakes detailed labour market analysis to ensure an accurate identification of required skills, followed by constantly updated programmes. Based on an annual cycle of evaluation of performance indicators, decisions about continuation of courses are taken. In addition, there are annual calls for proposals through which new training offers are being selected, reflecting current skills demand.
- Major national marketing campaigns ensure that the target groups most in need of the programme are reached effectively.
- The programme has a high rate of female participation, which at 27% is significantly higher than the average of female participation in mainstream ICT courses in Ireland. In 2017 the programme expanded its target group to include home-working women, without professional experience.

For full details of the case, see Appendix E.

Lessons learnt

IT vendor certifications, such as those mentioned above, provide an added value for both trainees and employers. An IT vendor certification is the most widely accepted form of certification because it is recognizable and uses benchmarks for skills assessment of trainees. Moreover, these certifications are designed based on a variety of specific skill sets, which can be adapted and updated to match the changing needs of the ICT sector. For this reason, vendor certified programmes generally require individuals to retake assessments at regular intervals.

The added advantage of skill-specific certifications is that many of them do not require an extensive educational background. Training providers can utilise this advantage by focusing on training content that specifically addresses low-skilled ICT occupations that do not require an educational background and for which certifications are sufficient for finding employment in the ICT sector. Examples from Ireland include the Learning Networks funded by Skillnets.

Traditionally, employers in Ireland have been reluctant to hire candidates who do not have an academic background in ICT or related fields,

regardless of certifications. While this general picture is confirmed by the interviews conducted for FIT's ICT Skills Audits, the research also found that the perceived shortage of ICT specialists has started to force employers to reconsider attitudes. The recent introduction of ICT apprenticeships has contributed to this shift. This is opening new opportunities for many individuals belonging to diverse socio-economic groups, for whom an academic background is a difficult criterion to meet due to considerable investment of time and finances.

Our analysis shows that the mentorship model is particularly well suited to encourage girls and women to consider ICT careers for two reasons: first, because female role models have been found to play a key role in young women's attitude to working in the digital sectors; second, because it tends to be comparatively easy to recruit volunteer mentors among women working in the digital sectors. This is because, as surveys have repeatedly shown, they have typically perceived a range of gender related obstacles themselves during their career, which they are often keen to help remove for future generations of women working in the sector.

Box 4 Key lessons learnt from ICT training in Ireland



Outreach

- Programmes target a variety of socio-economic groups (see Figure 2.A). A high proportion is geared towards unemployed job seekers in general, with a focus on groups currently underrepresented in the ICT workforce.
- Outreach to highly vulnerable groups is well coordinated by means of close cooperation between public sector agencies and business-led networks such as FIT. Key stakeholders are SOLAS, the national agency for guiding and funding FET, and the sixteen Education & Training Boards (ETBs) operating at regional level.
- Employers play a key role as providers of work-based learning, which forms a core element of most programmes targeting groups at risk of exclusion from the labour market. The limited capacity of private sector companies, especially SMEs, to approach, recruit and work with persons from groups currently underrepresented in the ICT workforce remains a challenge.
- Some programmes seek to cater for individuals who do not meet requirements in terms of formal qualification, but who gained relevant skills and knowledge through life outside of formal education and training. The government has in recent years established principles and operational guidelines for 'Recognition of Prior Learning' (RPL), which is increasingly becoming available to learners. For example, the Digital Skills Academy offers RPL to qualify for a place on the WebElevate programme⁴⁷.



⁴⁷ See <http://www.webelevate.ie/>



Training

- Successful trainings combine a variety of training methods. The most important aspect of multi-level training is the development of both technical and cognitive skills, such as the ability to work in teams, effective communication and problem-solving. In addition, many successful programmes equip participants with skills in self-marketing.
- Mentoring using (mostly) volunteer, seasoned ICT specialists as mentors and role models has been tried and tested and proven to be able to effectively address challenges in attracting and supporting underrepresented groups, in particular women. The as yet low number of potential role models in the ICT apprenticeship sector, however, presents a challenge to use of mentoring for this particular pathway into the ICT careers.



Employability

- Irish employers frequently state that both the level of technical skills and prior experience in the work environment are important. Both the new ICT apprenticeships and traineeships, therefore, offer a highly promising route into employment and could be of special value to underrepresented groups – if employers, including SMEs, are empowered to accept candidates from these groups and properly support them during the programme. Experts describe the successful implementation of this overhaul of the apprenticeship system as a mammoth task. Should the serious image problem of apprenticeship not be rectified it appears unlikely they will reach the necessary scale to make a difference. It is not unlikely that young people from more affluent areas will continue to progress to college than to an apprenticeship, regardless of whether or not they are suited to third-level education. In work-based learning, employers have a strong role in candidate identification and selection. This bears the risk that unconscious bias resulting from deeply entrenched attitudes towards employment of women and persons from minority groups in ICT roles act as a barrier to greater inclusiveness of ICT traineeships in Ireland.
- Programmes that are designed with strong input from employers in the digital sectors and also offer periods of work placement often lead to direct employment of participants after completion of the training. The main challenge in this case is ensuring that the selection process for admitting candidates to the training does not work to keep out members of groups currently underrepresented in the ICT workforce.
- Certifications have a high added value for job seekers. Employers prefer hiring those candidates who have successfully completed high quality training from reputable training institutions. If programmes do not equip successful participants with well established, third-party certifications, they risk being of limited impact in terms of improving employability.

Source: *diversITY Survey, empirica (2017)*

5

Conclusion

Ireland has developed a system of provision of ICT training to persons from groups currently underrepresented in the ICT workforce, including women and people at risk of exclusion from the labour market. The overall high rate of young people not in employment, education or training (NEET), the low share of women in the ICT workforce, and the country's low performance in getting people with disability in employment signal, however, that further efforts are needed. Our analysis has shown that stakeholders in Ireland are aware of this need, and important steps have been taken for making the ICT training landscape more inclusive. This section discusses a number of recommendations on what needs to be done so that these activities make as big an impact as possible.



Ireland has a well-developed system of provision of ICT training to persons from groups currently underrepresented in the ICT workforce, including women and people at risk of exclusion from the labour market. The extensive, successful experience of Fast Track into Information Technology (FIT) in offering novel pathways into ICT careers is acknowledged by experts all over Europe and beyond. Yet, it remains a challenge to industry partners and policy makers to further address the challenge; FIT alone cannot solve Ireland's inclusive ICT issues.

FIT has actively been promoting inclusive ICT training approaches for many years, which is even more relevant due to the organisation's more recent role in designing and delivering the new ICT apprenticeships. FIT claims, based on the interviews conducted for its 2018 ICT Skills Audit, that "more employers now appreciate that tech-savvy candidates can, and should, come from diverse backgrounds"⁴⁸. The question remains, however, whether changes in expressed attitudes are translating into real change in terms of recruitment behaviour and employer willingness to cater for the specific requirements of groups currently underrepresented in the ICT workforce. As of today, most existing programmes still struggle to place most of their trainees.

There is, moreover, the question whether numbers of persons participating in existing programmes are big enough to tackle the overall size of the challenge in terms of, on the one hand, shortage of ICT specialists and, on the other hand, lack of employment opportunities for at-risk groups. The macro-level data on Ireland show that the country still performs poorly when it comes to the very high rate of NEET youth as well as low employment among people with disability. While valuable work has been done in the area, ways must be found to widen and upscale the reach of ICT training programmes to help contribute to addressing these challenges.

From our analysis of the inclusive ICT training landscape in Ireland, a number of recommendations can be derived.

Recommendations

Promote ICT careers to women

Our analysis has shown that stakeholders in Ireland are aware of the need of a well functioning system of provision of ICT training to persons from groups currently underrepresented in the ICT workforce, including women and people at risk of exclusion from the labour market. Effort have been undertaken to further develop it in a way to reduce the overall high rate of young people not in employment, education or training (NEET), increase the low share of women in the ICT workforce, and improve the country's low performance in getting people with disability in employment thereby making the ICT training landscape more inclusive. However, further efforts are needed.

Stakeholders tend to agree that young women need to be attracted to embark on a career in ICT. Amongst others, also cultural norms and value systems, including stereotypical views among key influencers (e.g. parents, teachers, peers) need to be addressed. Survey evidence confirms that this is the case not only in Ireland.⁴⁹ The study also found that both teachers and parents complain about a lack of female role models in the sector.

Interventions in the form of awareness-raising campaigns and taster programmes are already being utilised by Irish programmes to encourage young women to contemplate careers in ICT. These activities should be continued and extended to reach many more young women and their main influencers.

In the higher education domain, the ICT Skills Action Plan 2014-2018 tasked the Higher Education Authority (HEA) to provide support to higher education institutions in delivering Summer Computing Camps to encourage more diverse groups of second level students to consider ICT careers. Additional funds have been made available for this purpose.⁵⁰ Positive experience has been made with the STEM Teacher Internship programme, which supplies student teachers with first-hand experience of working in the technology sector.⁵¹ Once qualified, these teachers are expected to influence many

⁴⁸ FIT (2018), p.8

⁴⁹ See Accenture Ireland (2014), Powering economic growth; Attracting more young women into science and technology.

⁵⁰ See <http://hea.ie/skills-engagement/ict-skills/>

⁵¹ See Irish Tech News (2017), Ireland's Top Tech CEOs meet to improve gender diversity in technology sector in Ireland.

thousands of students, again with a particular focus on groups currently underrepresented in the ICT workforce.

Looking beyond the higher education domain, much could be achieved by a high profile, multi-channel marketing campaign on opportunities outside of third-level education, i.e. in ICT apprenticeships, traineeships and other further education programmes, with a particular focus on young women, ethnic minorities, and young disabled people (see below). The campaign needs to challenge traditional perceptions around apprenticeships and include clear messages also to parents, teachers and the wider public. Promotional activities should focus on the attractiveness of career paths in ICT rather than merely the national economy's need for more ICT specialists.

Continue the Higher Education Access Route (HEAR) to support school leavers from socio-economically disadvantaged backgrounds

The HEAR scheme should clearly identify the alternative pathways to higher education for their target groups. This is important, given that not all students with disabilities and students from socio-economically disadvantaged backgrounds who apply to the schemes make the transition to higher education through the schemes.

HEAR should provide a maximum large degree of flexibility in the transition to higher education, and advocate transparency and accessibility in pathways for young adults to access higher education.

Evaluation reports revealed that further investigation of the impact of a reduced points offer on the nature of the course accepted is needed to ascertain what impact a reduced points offer has on chosen area of study.

Promote non-academic training pathways

Non-academic education pathways in Ireland have suffered, especially since the financial crisis 2008, from the widely held belief that only third-level education can ensure a prosperous career in the Irish labour market. Much effort is therefore required to promote alternative pathways to ICT careers in the country, especially in terms of more effective career guidance. The role of career guidance must be to improve the attractiveness of apprenticeships and other non-academic ICT training by reducing the stereotypes and prejudices among young people and their main influencers such as parents and teachers.

Open up ICT training to people who require flexibility

Many individuals need flexible arrangements and additional support that indirectly help and motivate them to complete their ICT training. This is an area where effective improvements could have a significant effect on take-up. Support services that can help overcome practical obstacles may include after-school childcare, eldercare, coaching, networking, and time off from work.

The new national scheme of financial support for parents towards the cost of quality childcare currently discussed by stakeholders and mentioned in the National Strategy for Women and Girls 2017-2020, would no doubt ease the burden for parents of young children to enrol in training measures such as an apprenticeship. The same applies to family leave and other work-life balance measures operating at workplace level.

Technology can help meet the need for flexibility as well. Existing programmes such as Women ReBOOT (see the Good Practice Showcase in the Annex) make extensive use of online provision of training, while the need for attendance is limited to workshops (1-2 days per month) and a face-to-face meeting with an executive coach (once a month). The WebElevate programme, targeted at homemakers, delivers all learning content online; only the project-based work placement, which is a compulsory part of the course, requires participants to leave their home.

Promote ICT careers to members of communities with migrant background

The unemployment rate for all recent immigrants was 20% though there were large variations by nationality. Among Brazilians 30 per cent of those in the labour force were unemployed, while only 4.5 per cent of German national immigrants were in this category.⁵²

Recent research based on representative surveys of the Irish population revealed the persistence of negative attitudes to people with migrant background from non-European countries, especially towards people from the Muslim and Roma communities.⁵³ The research also found "social contact with those of a different race/ethnic group [...] to be associated

⁵² CSO: Census of Population 2016 – Profile 11 Employment, Occupations and Industry: <https://www.cso.ie/en/releasesandpublications/ep/p-cp11eoi/cp11eoi/lfmfmfl/>

⁵³ See McGinnity et al. (2018), Attitudes to Diversity in Ireland, p. ix.

with more favourable attitudes to the impact of immigration regardless of the frequency of contact”, suggesting that “enhancing opportunities for meaningful and positive interactions between the Irish-born population and immigrants will reduce anti-migrant sentiment. Such interaction would also have positive implications for the social integration of people with migrant background and their children”⁵⁴.

Against this background, actions which can increase social interaction with diverse ethnic groups during education, training and work appear well-suited to mitigate negative attitudes. The ICT domain is likely to be very appropriate for this purpose due to the public perception of a skills shortage in the area, which means views that people with migrant background compete against natives on the job market are less marked here in comparisons to other sectors.

Activities could include university summer schools, subject enrichment programmes, master classes and targeted information and guidance. Extensive use should be made of diverse role models, wherever available. Hands-on support through the application process and development of new forms of marketing and communication could also help tackle under-representation. Regarding apprenticeships and traineeships, insiders recommend target group specific ‘in apprenticeship/ traineeship’ support for those who may find it harder to adjust to the workplace or complete their training. Some form of prior training might also help applicants from underrepresented groups including people with migrant background to compete successfully for apprenticeships and traineeships. Solutions need to involve career guidance counsellors, Home School Community Liaison Coordinators, ETB education officers, as well as partners outside of the education system such as national bodies representing minority groups in Ireland.

Exploit the full potential of ICT training for people with disabilities

The recent introduction of new apprenticeships and traineeships in the ICT domain opens up opportunities for people with disabilities who seek a career in ICT. This is because work-based learning has generally been found to be an effective learning and training environment for people with disabilities, in particular for learners with intellectual disabilities and those

with mental health issues. The ICT domain also offers a large range of jobs that are suitable to persons with disabilities, as international experience has demonstrated – partly a result of the ready availability of “assistive technology” that can easily be integrated into ICT workplaces.

The data available suggest, however, that people with disabilities are significantly underrepresented among apprentices and trainees in Ireland, including in ICT trainings. Existing programmes such as the National Learning Network (NLN), which offers flexible training courses for people who need support in gaining access to employment and is funded by the State through the Health Service Executive and the 16 ETBs, should be reviewed to explore the potential for upscaling and increasing outreach to many more members of the target audience. Such a review needs to make full use of international best practice about effective ICT training programmes targeting people with disabilities.

In order to attract more individuals with disabilities, ICT training programmes need to create awareness amongst people with disabilities that their individual support needs will be met. Dublin’s Trinity University has made good experience with a so-called “ambassador programme”, under which students with disabilities volunteer to represent and showcase the college’s disability service to prospective students.⁵⁵

More needs to be done to provide education and training providers with the capacity to cater for learners with disabilities. Many public sector institutions provide disability awareness training for teaching staff, but this tends to be on a voluntary basis.⁵⁶ Such training should be made mandatory also for private sector training providers on contract by State agencies.

Changing employer attitudes around disability will also require considerable additional effort. As recommended by the National Disability Authority,⁵⁷ a central focal point of advice for employers should be implemented for dealing with any issues around employing people with disabilities, including as apprentices or trainees, which could offer guidance

⁵⁴ Ibid.

⁵⁵ See Cradden (2017), Overcoming disability as a barrier to college education.

⁵⁶ See Murphy et al. (2016), Mental Health Matters.

⁵⁷ See National Disability Authority (2014), Review of Apprenticeship.

around issues such as reasonable accommodation or other issues that arise on the job.

Towards inclusive apprenticeships

Most of the current vacancies for ICT specialists are still for graduates from third-level programmes, ICT employers' feedback shows that they are "increasingly valuing the currency and credentials of the NFQ Level 5 and Level 6 programmes"⁵⁸.

Experience from other countries suggests that apprenticeships in ICT can be attractive alternative to a university degree for all everyone. In this respect one challenge is the fact that the Ireland's apprenticeship system has traditionally been almost exclusively geared towards male learners. The National Strategy for Women and Girls 2017-2020 foresees that diverse groups' participation in apprenticeships will be closely monitored and action taken to boost the system's appeal to women and other groups currently underrepresented in the ICT workforce. This will include a review of guidance services, tools and careers information for school students and adults. While findings from the review will not become public before later in 2018, there can be little doubt that concerted effort is required to achieve progress.

In order to cater for early school-leavers or students at risk of dropping-out of the education system and acquired skills through their work, the possibilities for recognition of skills obtained outside of formal education and training (RPL) need to be further developed.

Improve the capacity of SMEs to provide inclusive ICT training

Most SMEs find it difficult to divert resources to offering work placements, traineeships or apprenticeships. This is all the more true if they are asked to consider taking on persons from groups currently underrepresented in the ICT workforce, many of whom need special support in one way or the other.

Both SMEs and third-party training providers require effective, hands-on support to deal with any hurdles that might keep them from offering ICT training to members of minority groups with which they have made little experience so far. Equalities help lines should be established to support SMEs and training

providers in their equality policy. In larger companies, networks of current employees from underrepresented groups plus HRM experts and third-party providers of support measures can go a long way towards establishing "wrap around" support to trainees, line managers and others whose day-to-day commitment is needed.

Increase use of mentorship

Mentoring programmes have been discussed previously as a training approach in experiential learning. There is, in addition, the possibility of mentorship programmes for students and trainees during their education, specifically for women and people from minority groups. Mentors can play an important role as role models who help question traditional gender roles; they can demonstrate career opportunities for groups currently underrepresented in the ICT workforce; and they can provide practical, tried-and-tested ways how to address obstacles in day-to-day training. Moreover, mentors provide network contacts which can make all the difference once the time has come to apply for a job.

Many mentorship programmes make use of seasoned employees who volunteer for the role based on an intrinsic interest in advancing progress in the diversity area. However, the small number of people from many underrepresented groups in the workplace means that findings mentors in-house – for example, successful employees with a disability – can pose a challenge. For this purpose, innovative models may need to be developed, such as shared mentorship schemes and online mentoring.

Career guidance

Non-academic education pathways in Ireland have traditionally suffered from the widely held belief (some observers call it an "obsession"⁵⁹) that only third-level education can ensure a prosperous career in the Irish labour market. Much effort is therefore required to promote alternative pathways to ICT careers in the country, especially in terms of more effective career guidance. Given the current bias towards third-level education, the role of career guidance must be to improve the attractiveness of apprenticeships and other non-academic ICT training. For this, it needs to reduce the stereotypes and prejudices among young people and their main

⁵⁸ See FIT (2018), p. 6.

⁵⁹ O'Brien (2018), Surge in numbers of young people taking apprenticeships.

influencers such as parents and teachers. Many young persons from groups at risk of social exclusion are ill-advised to embark university education. These people need support to make well-informed and sustainable educational choices that match their capabilities and preferences.⁶⁰

Mainstream diversity in regional level cooperation between the education system and employers

Most of the recommendations discussed above require coordination and tailoring to the specific local/regional context of training provision. In this respect, recent developments to give a stronger role to the local/regional level in skill needs identification and training programme design, via establishment of Regional Skills Fore, opens up opportunities for mainstreaming of diversity in ICT training provision.

The main objective of the Regional Skills Fore currently being established is to “provide a cohesive structure for employers and the further and higher education system to work together in building the skills needs of their Regions, help employers better understand and access the full range of services available across the education and training system, [and to] enhance links between education and training providers in planning and delivering programmes, reduce duplication and inform national funding decisions”⁶¹. Emphasis is placed on providing “more robust labour market information and analysis of employer needs to inform programme development”⁶².

National and regional bodies representing groups currently underrepresented in the ICT workforce should mobilise their resources to lobby for a strong emphasis on diversity and inclusiveness in the work of the Fora. This may take the form of campaigns to raise awareness about how best to approach, attract and recruit women as well as candidates from at-risk groups; effective advice about supports that are available to employers who are interested in taking on, for example, apprentices or trainees with disabilities; and making sure that the labour market data to be collected and reported include appropriate indicators on diversity and inclusiveness.

An example worth consulting for the purpose of mainstreaming diversity and inclusiveness in ICT

training is Skills Development Scotland’s ‘Equalities Action Plan for Modern Apprenticeships in Scotland’⁶³.

Leverage the power and creativity of existing communities of engaged citizens

Our analysis has revealed that Ireland has a very strong community of engaged citizens who are working, in particular, to promote equality of chances for women in ICT education and workforce. They are carrying out a large range of activities, many of which by women working in ICT and keen to reach out to girls and young women at a time when they make career choices. Examples of NGOs working in the area include Women in Technology and Science (WITS), Coding Grace and WomenWhoCode Dublin. Their experience should be made best use of for giving other groups currently underrepresented in the ICT workforce a stronger voice as well. Government funding could also help increase the reach of NGOs that provide effective, short-term ICT training such as coding clubs to groups currently underrepresented in the ICT workforce. Along these lines, some experts have suggested that government develops a framework through which such NGOs can be funded and accredited.⁶⁴

⁶⁰ See Eustace (2017), Generation Apprenticeship.

⁶¹ <http://www.regionalskills.ie/About-Us/>

⁶² Ibid.

⁶³ See Skills Development Scotland (SDS)(2015). See also Skills Development Scotland (SDS)(2017), *Equalities action plan For Modern Apprenticeships in Scotland – Year 1 Update*.

⁶⁴ See Corcoran (2015).

Summary of Recommendations

Recommendation 1:

Continue the Higher Education Access Route (HEAR) to support school leavers from socio-economically disadvantaged backgrounds

The HEAR scheme should clearly identify the alternative pathways to higher education for their target groups. This is important, given that not all students with disabilities and students from socio-economically disadvantaged backgrounds who apply to the schemes make the transition to higher education through the schemes.

HEAR should provide a maximum large degree of flexibility in the transition to higher education, and advocate transparency and accessibility in pathways for young adults to access higher education.

Evaluation reports revealed that further investigation of the impact of a reduced points offer on the nature of the course accepted is needed to ascertain what impact a reduced points offer has on chosen area of study.

Recommendation 2:

Improve the capacity of SMEs and training providers to engage in inclusive ICT training

Most SMEs find it difficult to divert resources to offering work placements, traineeships or apprenticeships.

Barriers are even bigger when offering work placements for persons from groups currently underrepresented in the ICT workforce, many of whom need special support in one way or another.

SMEs, as well as professional training providers would benefit from effective, hands-on support to deal with any hurdles that might keep them from offering ICT training to members of minority groups to whom they had little exposure so far. Equalities help lines should be established to support SMEs and training providers in their equality policy.

Recommendation 3:

Promote non-academic training pathways

Non-academic education pathways in Ireland have suffered, especially since the financial crisis 2008, from the widely held belief that only third-level education can ensure a prosperous career in the Irish labour market.

Much effort is therefore required to promote alternative pathways to ICT careers in the country, especially in terms of more effective career guidance. The role of career guidance must be to improve the attractiveness of apprenticeships and other non-academic ICT training by reducing the stereotypes and prejudices among young people and their main influencers such as parents and teachers.

Recommendation 4:

Promote apprenticeship system towards women and ICT education requirements

Ireland's apprenticeship system needs active promotion in general and specifically towards women and other underrepresented groups. Further changes are necessary to better adapt to the requirements of ICT education.

The recent announcement of the Irish Government (February 2019) formally announcing their adoption of the FIT ICT Apprenticeships as a new talent pipeline for governments departments (the Civil Service) appears to be a good step in this direction. There also seems to be a demand for apprenticeships since applications for the government apprenticeships had more than 1000 applicants for 40 places. It is recommended that future application rounds more intensively address the issue of inclusiveness and diversity thereby making diversity an integral part of the apprenticeship reform in Ireland.

Recommendation 5:

Leverage the power and creativity of existing communities of engaged citizens

Ireland has a very strong community of engaged citizen groups who are working, in particular, to promote equality of chances for women in ICT training and the digital workforce. They are carrying out a large range of activities, many of which by women working in ICT and keen to reach out to girls and young women at a time when they make career choices. Their experience should used best to give other groups currently

underrepresented in the ICT workforce a stronger voice as well. Government funding could help increase the reach of NGOs that provide effective, short-term ICT training such as coding clubs to groups currently underrepresented in the ICT workforce. While use should be made of mentorship wherever possible, the small number of people from many underrepresented groups in the ICT workforce means that findings mentors in-house – for example, successful employees with a disability – can pose a challenge. For this purpose, innovative models may need to be developed, such as shared mentorship schemes and online mentoring.

Recommendation 6:

Need for strong connection between employers and guidance counsellors

Guidance counsellors advise students and young people so that they can make informed choices about their future in relation to employment, education and training. Guidance and counselling in Ireland is made up of three separate yet interlinked areas. These are: Personal and Social Guidance and Counselling, Educational Guidance and Counselling and Vocational Guidance and Counselling.

In order to improve the chances of students for training followed by a professional career in industry close links not only to relevant agencies and institutions but also employers need to be established to keep up to date with the labour market needs, motivate employers for diversity and thereby create training and apprenticeship opportunities and improve the chances for diversity and inclusiveness in the labour market.

At the same time career guidance should see its role also improving the attractiveness of apprenticeships and other non-academic ICT training towards their target groups.

Source: empirica (2018)

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Appendices

Appendix A: Definitions and methodology

Appendix A.1: Methodology for baseline projection of ICT skills gap

Demand is following a linear trend, i.e. the average absolute growth of the last few years with plausible data is extrapolated.

Minimum supply is calculated as incumbents' workforce in a previous year minus exits plus domestic graduates. Exits are calculated using a percentage derived from Cedefop applied to the last year where data for the incumbent workforce available (it is fixed, i.e. static, to avoid repercussions from the model itself). Domestic graduates are assumed to be constant and equal to the latest available plausible official statistics. Graduates counted are VET graduates, short cycle programme and bachelor level graduates. Masters and PhD level graduates are not counted because they usually have previously earned a bachelor's degree and would hence be double counted.

Supply in a scenario with constant lateral entries adds also the "Minimum lateral entry inflow" to minimum supply

Minimum lateral entry inflow is the calculatory structural gap that remains when the number of

domestic graduates (as defined in minimum supply) is subtracted from the need for new labour market entries (expansion and replacement).

Shortage without lateral entries is the gap that remains when the need for new labour market entries were only covered from domestic graduates.

Shortage with constant lateral entries ("everything stays the same") is the gap the remains when a constant number of lateral entries flows into the labour market.

The total potential for new jobs until 2025 is calculated as:

Demand 2025	90,300
Minus incumbent jobs 2016	80,500
Plus cumulative replacement 2017-2025	21,000
Jobs potential	30,800

Appendix A.2: Yearly breakdown for baseline projection of ICT skills gap

	2017	2018	2019	2020	2021	2022	2023	2024	2025
Demand (linear trend)	85,500	86,100	86,700	87,300	87,900	88,500	89,100	89,700	90,300
Minimum supply (incumbents minus exits plus domestic graduates)	80,300	80,700	81,100	81,500	81,900	82,300	82,700	83,100	83,500
Supply in a scenario with constant lateral entries	80,500	81,100	81,700	82,300	82,900	83,500	84,100	84,700	85,300
Shortage without lateral entries	5,200	5,400	5,600	5,800	6,000	6,200	6,400	6,600	6,800
Shortage with constant lateral entries ("everything stays the same")	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000

Source: empirica (2017)

Appendix B: Definition of ICT occupations according to ISCO

ICT Specialists by skill level according to ISCO (International standard classification of occupations)

Level	ISCO (International standard classification of occupations)
High	Management, architecture & analysis
Mid	Core ICT practitioners – professional level
Mid	Other ICT practitioners – professional level
Lower	Core ICT practitioners – associate / technician level
Lower	Other ICT practitioners – associate / technician level

Eurostat: ICT specialists according to ISCO

Management, architecture & analysis 133 ICT Service managers 2511 Systems analysts
Core ICT practitioners – professional level 2512 Software developers 2513 Web and multimedia developers 2514 Application programmers 2519 Software and multimedia developers and analysts not elsewhere classified 2521 Database designers and administrators 2522 Systems administrators 2523 Computer network professionals 2529 Database and network professionals n.e.c.
Other ICT practitioners – professional level 2152 Electronic engineers 2153 Telecommunication engineers 2166 Graphic and multimedia designers 2356 Information technology trainers 2434 ICT sales professionals
Core ICT practitioners – associate / technician level 3511 ICT operations technicians 3512 ICT user support technicians 3513 Computer network and systems technicians 3514 Web technicians
Other ICT practitioners – associate / technician level 3114 Electronics engineering technicians 3521 Broadcasting and audio-visual technicians 3522 Telecommunications engineering technicians 7421 Electronics mechanics and servicers

Appendix C: Workforce Diversity Indicators

Indicator	Definition/Source
Long-term unemployment rate	Share of persons unemployed for 12 months or more in the total number of active persons in the labour market. Source: Eurostat [une_ltu_a], data from 2016.
Young people not in employment, education or training (15-24 years) – NEET	Percentage of the population in age group 15-24 years who is not employed and not involved in further education or training. Source: Eurostat [edat_lfse_20], data from 2016.
Youth unemployment	Number of persons under 25 years who are unemployed, as share of the total number of young people in the labour market. Source: Eurostat [une_rt_a], data from 2016.
Employment rate of older workers (55-64 years)	Number of persons in age group 55-64 years who worked at least one hour for pay or profit during the reference week or were temporarily absent from such work, as share of the labour force in that age group. Source: Eurostat [lfsi_emp_a], data from 2016.
Age employment rate gap (15-64 vs. 55-64 years) in p.p.	Difference in percentage points between the employment rates of persons in age group 15-64 to age group 55-64 years. A positive figure denotes that the employment rate for older persons is lower than for the entire workforce. Source: Own calculation from Eurostat [lfsi_emp_a], data from 2016.
Gender employment rate gap (15-64 years) in p.p.	Difference in percentage points between the employment rate (15 to 64 years) for women and the rate for men. A positive figure denotes that the employment rate for women is lower than for women. Source: Own calculation from Eurostat [lfsa_ergaed], data from 2016.
Non-natives born outside the EU, as share of total population	Total population born outside of the EU (borders as of 2016) on January 1. Source: Eurostat [migr_pop3ctb], data from 2016.
Non-native employment rate gap, in p.p.	Difference in percentage points between the employment rate (15 to 64 years) for population born outside of the EU (borders as of 2016) and the rate for the population born in the reporting country. A positive figure denotes that the employment rate for persons born outside of the EU is lower than for those born in the reporting country. Source: Own calculation from Eurostat [lfsa_ergaed], data from 2016.
Disability employment gap, 2011, in p.p.	Difference in percentage points between the employment rate (15 to 64 years) of persons reporting difficulties in performing basic activities, and the rate for persons reporting no such difficulties. Difficulties can relate to seeing, hearing, walking, and communicating, and must have lasted or be expected to last for six months or more. A positive gap figure denotes that the employment rate for persons facing difficulties in basic activities is lower than for those without. Source: Own calculation from Eurostat [hlth_dlm010], data from 2011 (latest available).
Disability unemployment gap, 2011 in p.p.	Difference in percentage points between the unemployment rate of persons reporting difficulties in performing basic activities, and the rate for persons reporting no such difficulties. Difficulties can relate to seeing, hearing, walking, and communicating, and must have lasted or be expected to last for six months or more. A positive gap figure denotes that the unemployment rate for persons facing difficulties in basic activities is higher than for those without. Source: Own calculation from Eurostat [hlth_dlm030], data from 2011 (latest available).

Appendix D: Survey methodology

Research framework and survey design

The analysis and findings of this report are a result of extensive desk research and two surveys carried out with ICT skills training providers and employers across the target countries. The approach to select and benchmark good practice showcases of ICT training programmes was based on a four-step process

illustrated below. The research findings were further analysed and strengthened expert workshops. Three expert workshops were held in Spain (Madrid), Germany (Berlin) and United Kingdom (London) and attended by a panel of experts from academia, policy, the nonprofit sector and businesses.

Step 1: Collection of 300 initiatives	Step 2: Selection of 96 initiatives for the online repository
<p>The first phase of the project, using comprehensive desk research we identified more than 300 initiatives based on the following criteria:</p> <ol style="list-style-type: none"> Type of program: Any type of ICT training programme activity, project, initiative and multi-stakeholder partnership of different levels of government, PPPs (public private partnerships), MSPs (multi-stakeholder partnerships), nonprofit organisations, IT vendors, addressed to: Target group: diverse target groups, including women, vulnerable youth with low educational achievement or from difficult socio-economic backgrounds, people with migrant background, unemployed adults changing careers, etc., Scope: to enable them to obtain and develop in-demand ICT skills and support their entry into the labour market. The process started with the: Analysis of around 300 e-skills programs and initiatives identified in desk research throughout selected countries, followed by: Identification of further programmes not covered by the initial list by national correspondents from the empirica Global Network for Innovation Research (ENIR) (www.enir.org) and other national experts where appropriate. 	<p>In the second phase, 96 inclusive programmes were shortlisted from the 300+ collected cases. Each case was given a score on a scale from 0 (low) to 2 (high) based on the following evaluation scheme:</p> <ol style="list-style-type: none"> Outcome: To what extent is the programme effective in enabling diverse populations access employment opportunities through the acquisition of demand-driven e-skills? Target Fit: To what extent does the program or initiative target diverse populations to support to enter the labour market? Scalability and Continuity: What is the potential for the initiative or programme to replicate, expand or continue to reach more beneficiaries and contribute to the skills development at regional and national level? Maturity: Has the programme been in operation for long enough to make it possible to assess performance and to learn from its experience? Policy Fit: To what extent is the program or initiative embedded in a broader policy context? <p>Textual descriptions of the relevant inclusive ICT skills training programmes were developed based on a common format to get an overview of training measures and how these were addressed and implemented. The selected training programmes are part of an online repository of an estimated 96 programmes, which were selected for further analysis.</p>

Step 3: Identification of Good Practice Showcases	Step 4: Evaluation of Good Practice Showcases
<p>The selection of good practice showcases from the shortlisted programmes was based on the following framework, with each case given a score from 1 (low) to 3 (high):</p> <ol style="list-style-type: none"> 1 Relevance: To what extent is the programme relevant in terms of creating a diverse skilled workforce responding to demands in the labour market? 2 Transparency: To what extent is it possible to have access to information about the programme? 3 Effectiveness: How effective is the programme in providing participants with the ICT knowledge and skills, in line with current demands in the labour market? 4 Efficiency: How efficiently has the programme been implemented? 5 Impact: What were the effects of the programme on the target groups involved? 6 Sustainability: To what extent are the achieved benefits from the programme sustainable? 	<p>The main objective of the final phase of analysis was to further evaluate and benchmark the 22 good practice showcases against a set of defined criteria (evaluation criteria), to identify best practice elements and lessons learnt. The evaluation and assessment of best practice ICT skills training programmes was carried out making use of a qualitative survey of key stakeholders. This consisted of in-depth interviews (with decision makers from the selected best practice programs and selected employers) and a SWOT analysis to help address and understand issues relevant and factors influencing the success of training measures from different perspectives.</p>

Employer survey

Format: in-depth telephone interviews of around 60+ minutes duration each plus completion of a questionnaire by the interviewee either prior or after the telephone interview.

Target group: 12 HR key decision makers in mainly large organisations from Spain, the United Kingdom, Germany, France, Belgium, the Netherlands, Poland and South Africa. **Objectives:** to gather **insights about experiences and expectations related to (inclusive) training programs**. The primary objective was to find out whether the current ICT training(s) are attractive and making use of these would equip participants with the in-demand ICT skill sets and **would qualify them for further consideration by employers**. The interview results served as an input for the policy recommendations developed in the course of the project to inform policy development on the European and national level, and provide practical recommendations to non-profit organisations and training providers.

Structure of interviews:

1. **General – Job profiles:** type of ICT people / professions needed in the organization; roles / competences relevant and required in the organization.
2. **(Digital) skills and competences needed:** relevant digital skills and competences required from an employee in the organisation either already working for the organisation or those applying for a job.
3. **Recruitment criteria:** recruitment process, the different steps involved and main decision makers as well as main sources of recruitment and main prerequisites; minimum entry standards / credentials (e.g. degrees and certifications) required for a potential candidate to be eligible.
4. **Employer involvement and collaborations:** organisation already involved in training schemes addressed to diverse / vulnerable groups of people including vulnerable youth with low educational achievement or from difficult socio-economic backgrounds, people with migrant background or unemployed adults changing careers; providing any offers to such training schemes (internships, apprenticeships, mentoring, training for specific subjects, other) or involved in any collaborations with the training providers (skills needs assessment / matching, curriculum reform, research & development, equipment and facilities, advisory panels, on the job placement, certification standards, other).
5. **Proposed policy interventions and programs**
6. **Recommendations:** to training providers for assuring delivery of the skills and talent needed in the labour market and the organisation through their education / training programs as well as recommendations to policy makers.

Timing: October – November 2017

Appendix E: Good practice showcases

Appendix E.1 Fast Track to IT (FIT)

FIT'S MISSION IS TO PROVIDE JOBSEEKERS WITH NEW, MARKETABLE AND PROFESSIONAL SKILLS AND OPPORTUNITIES TO COMPETE FOR JOBS IN THE EMERGING KNOWLEDGE ECONOMY OF IRELAND.

Target group

- Long-term unemployed persons
- People with disabilities
- Migrants
- Senior citizens

Main activities

FIT was founded in 2000 as an industry-led initiative. It follows the "Training for Employment" model and works in close collaboration with industry partners and the Irish government to provide training courses and work placement services to the unemployed, with a particular focus on the long-term unemployed. FIT courses are tailor-made for the technology sector and are provided at different levels; elementary, middle-skills, expert level. In May 2015, FIT launched its ICT Associate Professional programme for apprenticeships, focusing on marginalised job seekers and disadvantaged communities. The pilot programme consisted of a 6 month college-based training and 18-month work-based learning, and involved 200 applicants. FIT has also run awareness raising campaigns in high schools across Ireland and provided e-Inclusion programmes supporting around 8,000 'off-liners' annually to gain digital skills. The programmes are supported by private partnerships and the Irish government.

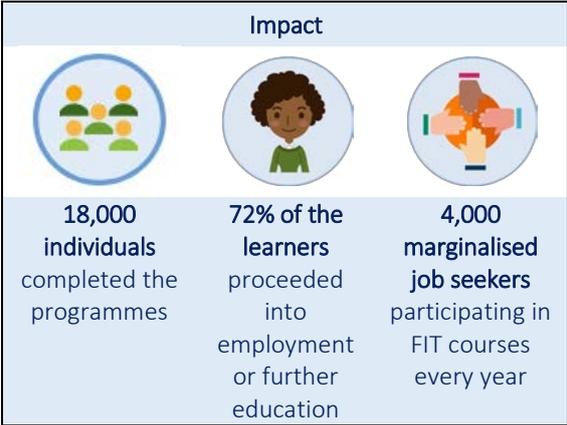
FIT support for diverse population groups has resulted in around 4,000 marginalised job seekers completing FIT courses every year. Overall, 18,000 individuals completed the programmes and 72% of FIT graduates have proceeded to employment, self-employment or further education or training.

Industry input

ICT industry stakeholders like SAP, Microsoft, Cisco and IBM, as well as partners in education and training like SOLAS and the ETBs provide a good basis to equip jobseekers with relevant skills for the labour market. Together, they develop and provide courses to gain personal and professional skills, all with an ICT focus.

Funding is derived from the following sources:

- Funding for Programmes: FIT receives industry funding for the implementation of the dual apprenticeship and industry-certificate courses. Complementary funding is variable (e.g. EU Projects, Digital Inclusion), is project-based and has related time-horizons.
- Funding for Applicants: SOLAS financial support aims at allowing youth from low-income backgrounds to participate in FIT courses.
- Additional support: J.P. PMorgan supports campaigns to increase participation of youth with diverse backgrounds, incl. women, in FIT programmes.



Lessons learnt

FIT was launched as a means to scale up past local community projects, which were launched to train and place the long-term unemployed into work. FIT's USP is the "Training for Employment" model, which involves all three areas of training, support and recruitment for diverse groups of people, with a focus on the unemployed. As a part of this model, the industry partners for FIT define the curriculum development and the government allocates training provision, funding assistance and regulation. FIT's strength is its curriculum, which is continually evolved according to industry needs and emerging technologies, in mobile, cloud computing, fintech, big data, medical device maintenance and renewable energy.

FIT also developed a unique skills needs analysis methodology which has resulted in publications that are widely welcomed by industry, the education and training system and policy makers, i.e. the FIT ICT Skills Audit series. This approach has been adapted by FIT for other locations (Malta ICT Skills Audit) and sectors, e.g. Advanced Manufacturing. Additionally, FIT needs to increase resourcing of this 'change making' research so that its full impact can be realised.

FIT is named in the Irish Government's Further Education and Training Strategy as a key contributor in terms of addressing disadvantage,

modernisation/innovation and bringing stronger industry links to the FE sector. FIT is no longer considered by government as a 'programme' but instead as an important enabler of a more effective and developing national Further Education sector.

FIT recognises that engaging and motivating groups from every aspect of Irish life will be essential in creating a functioning inclusive Smart Economy. FIT strategies are complementary to and in support of various national policies in the areas of national development, social policies, skills development and enterprise.

Appendix E.2 Skillnet

SKILLNET ACTIVELY SUPPORT AND WORK WITH BUSINESSES IN IRELAND TO ADDRESS THEIR CURRENT AND FUTURE SKILLS NEEDS. INNOVATIVE PROGRAMMES SUCH AS WOMEN REBOOT ARE DESIGNED TO ATTRACT MEMBERS OF GROUPS CURRENTLY UNDER-REPRESENTED IN THE ICT WORKFORCE

Target group

- Private sector enterprises throughout Ireland, with a particular focus on Small and Medium-sized Enterprises (SMEs)
- Unemployed individuals, with particular focus on the long-term unemployed
- Women and men with existing ICT skills who are interested in re-launching or starting a career in ICT after a family break

Main activities

Skillnet is an enterprise-led training network comprising a group of private sector companies from the same sector and/or region of Ireland. The basic principle behind Skillnet is that networks of companies engage in the design, management and delivery of specific training programmes to employees (Training Networks Programme; TNP) and jobseekers (Jobseekers Support Programme; JSSP) across a range of Irish industry and service sectors, based on the specific skill needs of the participating businesses. 5 of the 63 learning networks currently funded by Skillnet exclusively support firms in the technology sector, however many other networks also include ICT training as part of their offering. Eligible, unemployed learners are provided with free training in the form of industry-specific course offerings integrated training with those in employment. In recognition of the strong demand for ICT specialists in Ireland, any unemployed person wishing to enter the ICT sector is eligible for free training. Approx. 200 courses are delivered through the JSSP annually. Funding comes from the state through the National Training Fund (DES).

ICT Ireland Skillnet and **Software Skillnet**, both of which are coordinated by Technology Ireland, the main association representing Ireland's technology sector, are two examples of learning networks dealing with provision of specialist ICT skills. The network has access to over €1 million in funding, which is used to develop, design and/or deliver training that is required by network members with the aim of closing the skills gap that exists in the ICT Sector. Most courses are for

people in employment who seek upskilling as well as for jobseekers, for which some free places are reserved. In addition, there are some "**Skillnet ICT Conversion Programmes**" exclusively aimed at jobseekers. These programmes all include work placements within ICT companies, and have been found to result in high employment progression rates (up to 85%).

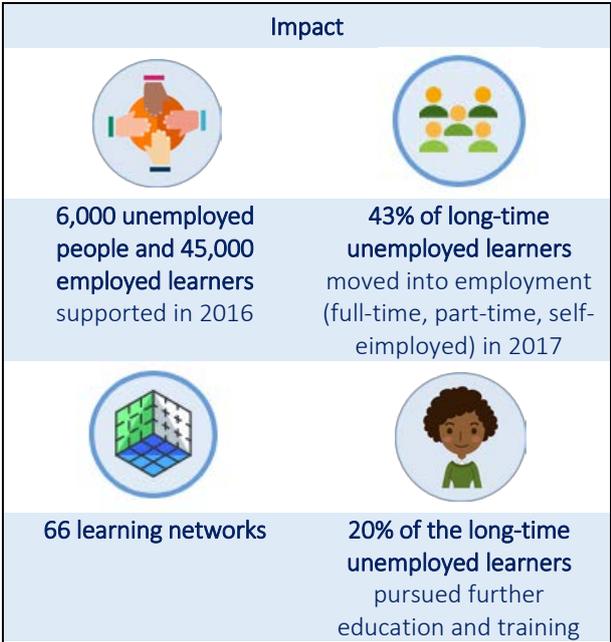
One such recently launched programme, **Women ReBOOT**, targets women with existing ICT skills who have taken a career break and now seek "structured and supported routes back to work [...] with a view to with a view to filling current or future open roles". The programme consists of group seminars, one-to-one professional coaching, online training and mentored company work placements. After a successful pilot involving 28 jobseekers, currently there are 50 free places made available to applicants. A related, earlier programme was **Back2IT**, which targeted ex-ICT professionals wishing to return to a career as an ICT specialist, such as degree holders and other people with relevant experience who have been out of the workforce for at least two years, in particular women. The programme was co-funded by VMware, an ICT multinational with large presence in Ireland. Courses were free for the participants and consisted of 12 weeks of training, including four weeks work experience in VMware. At the end the participants had access to job opportunities in VMware and other companies.

Industry input

Technology programmes that include the unemployed or are provided exclusively for the unemployed are based on the specific requirements of employers, on foot on a competency-based learning needs analysis undertaken by network managers. Technology firms are consulted on the learning outcomes, and also on the learning blend between classroom-based and applied learning (via work placements). Technology firms are encouraged to interview JSSP candidates for work placement, and these placements give companies an excellent opportunity to assess the suitability of individuals for future employment. At network-level, a manager is employed to manage each learning network, while strategic direction and governance is provided by a steering group. The steering group is comprised of representative enterprises from the network's particular sector or region. Within the ICT sector, it is the responsibility of

the network manager to work with technology firms to identify skills gaps, determine current and future skills needs, and to provide programmes that address the strategic challenges and opportunities facing the sector.

Mechanisms for the identification of future skills requirement are well established in Ireland. Skillnets actively seeks to support skills development within priority sectors that subject to special reports produced by the Expert Group on Future Skills Needs (EGFSN). Skillnets has an important role to play in placing a focus on future skills that will impact on the growth potential of Irish enterprise. This is one of three strategic goals of the organisation.



Lessons learnt

Skillnets attributes its success to the following factors:

- Very high rate of progression to employment from technology programmes, as found by independent economic consultants that undertake annual evaluations of programmes funded by Skillnets.

- High-level of enterprise investment by technology firms in programmes designed for the unemployed. This includes direct financial investment to match the grant provided by the learning network. It also provides indirect investment by firms that allocate their staff (HR and technology specialists) to interview JSSP candidates, review proposed learning outcomes and contribute to programme design, in addition to providing training facilities, hosting work placements and ensuring that designated staff supervise and mentor unemployed trainees undertaking work placements.
- Extended placements of 3-6 months in duration, which are project-based in design and are particularly effective in allowing unemployed trainees to fully understand and apply each programme’s learning outcomes.

Skillnets faces similar challenges as other training initiatives in Ireland. As the country’s economy has begun to recover, learning networks in the technology sector are finding it increasing difficult to attract suitable unemployed candidates for their programmes. Additionally, there is an intensive time investment in screening the unemployed candidates for advanced ICT programmes, as they typically include a range of aptitude assessments in addition to interviews.

Recommendations:

- It is essential that provision on behalf of the unemployed is based on market requirements and ideally follows direct consultation with employers in the technology (or other) sector.
- The policy or approach should ideally include employers at key milestones within the process from programme initiation to delivery.
- Work-based learning, provided to the unemployed via structured work placements, is highly effective and should ideally form part of the learning blend.

Appendix E.3 Springboard

SPRINGBOARD'S MAIN OBJECTIVE HAS BEEN TO TACKLE UNEMPLOYMENT IN IRELAND, WHICH WAS AT ITS PEAK AT 15% IN 2011. ITS PROGRAMMES WERE ORIGINALLY DESIGNED TO IMPROVE SKILLS SHORTAGES THROUGH LABOUR MARKET ACTIVATION AND THE UP- AND RE-SKILLING OF UNEMPLOYED INDIVIDUALS. MORE RECENTLY, SPRINGBOARD'S FOCUS HAS SHIFTED TO SOLELY UP-SKILLING THE UNEMPLOYED.

Target group

- Jobseekers and previously self-employed
- Homemakers who do not receive a social income (generally females)
- People in employment looking to upskill or reskill in the areas of advanced manufacturing or ICT

Main activities

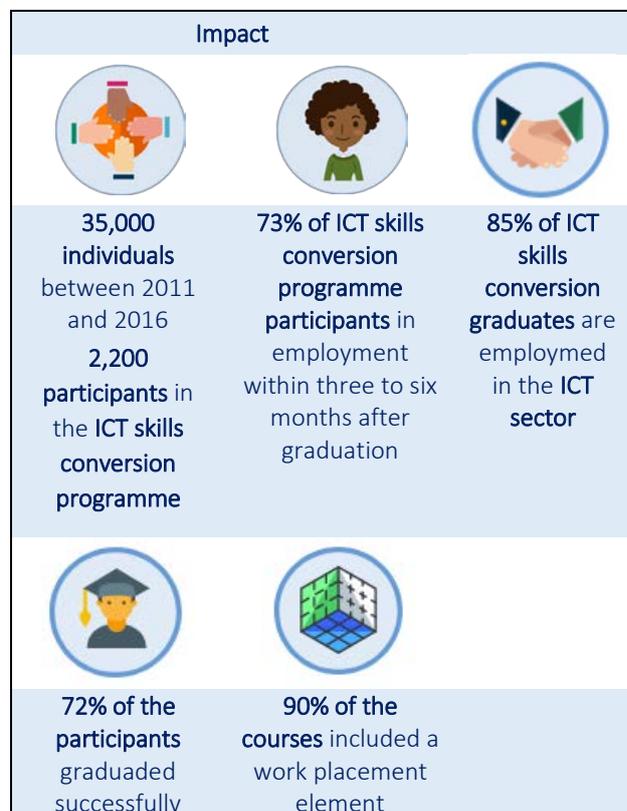
The Springboard programme began as a targeted initiative for individuals with a history of unemployment and those who were severely affected by the economic recession of 2009. Between 2011 and 2016, only citizens in the job seeker scheme and social income receivers, plus those previously self-employed were eligible to take part in the programme. The programme served both public and private educational institutions, enabling participants to choose between 181 free courses. Participants could choose between part-time and intensive conversion courses over various levels, such as higher education certificates, degrees, and post-graduate degrees. The courses provided qualification in growing enterprise sectors, particularly those with a demand for skilled personnel. These include technology, advanced manufacturing, financial services, entrepreneurship, hospitality and the construction industries. Around 90% of the courses included a work placement element.

Since 2016 however, the programme is running together with the ICT Skills Conversion programme under Springboard+. The focus is slightly different as Springboard+ targets both the employed and unemployed individuals who are considering a track or transition towards technology careers. The programme, though less abundant in terms of the variety of courses and degrees offered, includes mandatory job placement during the studies. It also caters to a higher-than-average age of participants – of 25 years – when compared to the range of 18-20 year olds in other IT courses across the country. A

standout feature is the programme's rate of female participation, which at 27% is significantly higher than the average of female participation in mainstream IT courses in Ireland. Additionally, in 2017 the programme expanded its target group to include home-working women, without professional experience.

Springboard is funded by the Irish government (National Training Fund) and co-funded by the European Social Fund (ESF). The funding from the Irish government gets revised annually. In 2017, the programme received funding of around €27 million from the government.

From 2011 to 2016, 35,000 individuals took part in the programme. In the original Springboard programme, 72% of the participants were able to successfully graduate. Among the 28% who did not complete the programme were also those who received job offers during their studies. 53% of the graduates were in employment within three to six months. In Springboard+ and the ICT Conversion programme, this number was 73-75%. Following an independent analysis of Springboard+ by the Department of Social Protection, 80% of the participants were found to be no longer on the Live Register (Ireland's register of the unemployed).



Industry input

Design and delivery with the help of effective partnerships: Employers and industry players are on board with Springboard to collaborate on course content and design. The Higher Education Authority is the key stakeholder, ensuring a well-represented curriculum across industries and skills. The HEA issues calls for proposals within set requirements each year, which reflect current skills demand. Around 500 proposals are received annually – in 2016, 180 proposals were accepted and in 2017, this number increased to 280. Support for programmes in continued in subsequent years only if performance indicators show a high rate of success, for example, in terms of employed graduates.

Response to current market demand for skills: In order to be consistent with market demand, Springboard collaborates with an expert group, which is responsible for the analysis of future skills needs in the economy. The course content is geared towards those problem sectors which indicate a high skills gap.

Lessons learnt

Springboard and Springboard+ were dedicated programmes run by the Iris government to combat unemployment. By the end of 2016, the unemployment rate in Ireland decreased to 7.2% - in

2017, it was 6.3%. When Springboard was first launched, the economic situation was drastic but has consistently improved. Springboard was a success because of its comprehensive and innovative approach – the first refers to how it collaborated with partners across industries, and the second, with regard to its course design and market analysis expertise. This detailed labour market analysis ensured an accurate identification of the required skills, followed by constantly updated programmes, equipping participants with valuable knowledge.

A successful national marketing campaign complemented good design with efficient delivery, securing the channels through which relevant information reached the target groups most in need of the programme. Springboard made good use of various social media platforms, such as Instagram, and a variety of traditional methods, such as print media and local events, to highlight individual success stories of participants. The campaigns were mostly summer-intensive as most of the courses began in September and October.

Consequently, it is expected that the number of jobseekers will decrease significantly over the next years, which introduces Springboard's biggest challenge – what the programme will look like in the future and what are its next steps.



NEW SKILLS AT WORK
J.P.Morgan