

FIT ICT Skills Audit 2018

Widening the ICT Talent Pipeline for Sustained and Inclusive Growth











Acknowledgements

FIT would like to thank the Board of FIT, Solas and the Irish American Partnership who cofunded the report and all of the companies and their executives who gave generously of their time in completing the Audit's survey. Thanks also to the FIT staff for their commitment and expertise in conducting and analysing the research.

About FIT

Fastrack into Information Technology (FIT CLG) is a not-for-profit, industry-led organisation. Its core mission is to promote an inclusive Smart Economy by creating routes to marketable technical skills for people at risk in Ireland's labour market. It has pioneered its own methodology for working with employers to understand their skills requirements through granular analysis of the skills, knowledge and competencies required. Working in collaboration with QQI, other awarding bodies, SOLAS, ETBI/ ETBs, Regional Skills Forums and local development agencies, it designs tech programmes that enable people to acquire the in-demand skills identified, collaborates with regional/local education and training providers in their delivery and assists those who complete them to secure employment.



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Foreword

Since 2011 a staggering 34,500 jobs have been announced by technology companies in Ireland - companies large and small, indigenous and multinational. It continues to be the case that when one company finishes a recruiting round, another has a major jobs announcement.

This is an incredibly positive story and we are still at its beginnings. The current market size of the global technology sector is over \$4trillion and is expected to grow more than 30% by 2020. Growth will happen somewhere, and should Ireland continue to bolster its competitive advantages of skills, talent and a business conducive environment, we will be well placed to capitalise on that growth.

Core to understanding how to capture this growth is the knowledge of what skills are needed by the sector now and in the medium-term. That is why the latest FIT ICT Skills Audit plays a crucial role. As the report has comprehensively achieved in the past, the third edition of the Skills Audit arms the sector and policymakers with highly valuable data on how to plan for the sector's growth in Ireland. FIT is to be commended for this.

The FIT Audit points to an array of skills needed over the coming years. There will be demand for entry, competent and expert talent and these skillsets will take many forms, from project management and business acumen, to creativity and STEM capabilities.

30%

The current market size of the global technology sector is over \$4trillion and is expected to grow more than 30% by 2020. The Audit also supports the emergence of alternative routes into the sector. The ICT Associate Professional Programme Tech Apprenticeship is now seeing real traction and is a solid example of what modern apprenticeships can achieve. The programme matches study and academic achievement with in-depth and consistent experience in the workplace. Graduates will display robust technical skills coupled with entrepreneurship and business savvy, acquired through direct and sustained work experience. It is an exciting compliment to the current availability of strong courses at third level.

As an advocate working in the sector, can I congratulate FIT in completing the third ICT Skills Audit and thank the 118 companies who gave so generously of their time in completing the Audit's survey. The future of the technology sector in Ireland will be as we make it and the FIT Skills Audit tools us up nicely.

Paul Sweetman Director Technology Ireland Board Member DIGITALEUROPE & FIT

Preface

The purpose of the FIT ICT Skills Audit is to identify those skills sets currently in demand within the tech and related sectors of the economy, to inform programme development in further and higher education and to encourage wider participation and diversity. The good news is that the audit findings indicate strong, if not unprecedented employment growth in the tech sector now and in the foreseeable future resulting in an array of exciting job opportunities at entry, competent, and expert levels. The opportunities that employers flagged are not only for graduates of STEM subjects but substantially for those undertaking further education and training programmes in a range of technical, project management and creative disciplines.

Accordingly, expanding that talent pipeline is a key priority to ensure future growth and competitiveness in Ireland's tech sector and its significant contribution to national prosperity. A coordinated skills development strategy that actively engages all stakeholders is essential to achieving this goal. In this regard the establishment of the National Skills Council and Regional Skills Fora are most welcome developments.

The introduction of modern apprentices in areas such as ICT, finance, insurance, manufacturing etc. within further education and higher education is also crucial to the expansion of the skills development ecosystem in Ireland. Such programmes have the capacity to substantially augment the tech talent pipeline in a timely fashion. The Department of Education and Skills, the Apprenticeship Council, ETBs/ETBI, HEIs, SOLAS, the HEA and QQI are all actively engaged in the successful implementation of this new policy. FIT is the national coordinator for the delivery of two new tech apprenticeships namely Software Developer and Network Engineer at NFQ Level 6. The ambition is that the Tech Apprenticeship portfolio will expand to meet skill requirements in critical aspects of the tech sector in Ireland including Cyber Security, FinTech, DevOps, IoT technologies, Advance Manufacturing, Analytics etc. with a view to engaging a minimum of 1,000 tech sector apprentices per annum by 2021.

To conclude I would like to acknowledge the valued input of the 118 tech employers who participated in this skills audit. I wish to thank the FIT Board, SOLAS and the Irish American Partnership for co-funding this report. Finally I would like to applaud FIT management and staff for the dedication, expertise and enthusiasm invested in drafting the document which I believe is a significant and valuable contribution to the sustainable development of Ireland's tech industry. A sector which is a leading and growing contributor to the economy and a provider of quality employment for fellow citizens and those of other nationalities who enrich our cultural diversity and add to our economic capacity.

Liam Ryan MD, SAP Labs Ireland Chairperson FIT

> FIT is the national coordinator for the delivery of two new tech apprenticeships namely Software Developer and Network Engineer at NFQ Level 6.

Executive Overview

The Irish economy has been one of the fastest growing in the Eurozone in recent years. The consensus of forecasts is that strong growth will continue in 2018 and beyond, despite serious global political and economic uncertainties, and that full employment is in sight. The outlook for ICT-intensive enterprises and economic sectors in particular is even brighter. These enterprises and sectors were the least affected by the Great Recession. Demand for their high-value products and services remains strong in the export markets served from Ireland.

This Audit is based on face-to-face interviews conducted by FIT staff with senior business development managers in 118 ICT-intensive companies at locations across Ireland. During interviews, lasting on average one hour, a detailed questionnaire was completed to ascertain the numbers of existing and emerging vacancies in each company, the ICT discipline in which they are arising, the specific skills required of candidates in each vacancy, and the level at which each skill should be exercised (whether entry level, competent or expert).

The overriding objective is to further inform employers, training and education providers, job seekers/learners, career guidance professionals and other interested stakeholders about the tech sector skills demands and hiring requirements. The specific approach is therefore to obtain as much practical detail as possible on existing and emerging vacancies so that training solutions can be designed and implemented within an acceptable time frame. This is challenging given the rapid pace of technological developments in the industry. The framework questionnaire must be a 'live' structure that evolves in close consultation with industry to ensure in-demand skills are captured as reliably as possible. For the 2018 Audit, the pace of change in the sector required two new disciplines and 70 new specific skills to be added to the previous 2014 framework.

Broadly speaking, these include peoples' attitudes, their openness to learning and their ability to relate to others. This suggests that there is a general upskilling taking place across the entire industry as it learns to live with accelerating change and the need for teams to adjust rapidly.

The Audit finds that there are currently 12,000 vacancies in the tech sector requiring skills at entry, competent and expert levels.

More importantly, FIT's Audit finds evidence that there is a greater emphasis than in 2014 on experience and on soft, social and transversal skills.

For example, individuals whom employers perceive as 'technology experts' in 2018 need broader accomplishments than those that earned them this classification in 2014 or 2012. 'Expert' has been consistently defined as including the ability to 'lead teams and projects'. Whereas in 2014 and before, it required a deep mastery in an area of specialisation such as Programming, Web Development, Cloud Computing. In 2018, technical fluency across a range of specialised ICT areas and the simultaneous possession of significant transversal skills (creativity, problem-solving, collaboration, etc.) are now required.

In general, tech practitioners can no longer rely primarily on honing and deepening a skill set acquired in their initial technical education. They are having to adapt and take on additional ICT skills sets as the tech-driven transformation evolves. At the same time, transversal competencies such as project management, problem solving and entrepreneurship are increasingly valued. These transversal competencies cannot be fully honed in the classroom and require nurturing through hands-on application and professional development to bring them to the levels required in today's tech workplaces. Accordingly, the potential of dual-education programmes, whether in Further Education and Training (FET) or Higher Education (HE), that combine off-thejob training with work-based learning to develop and test these skills, has become more appreciated by employers.

KEY INSIGHTS

Audit reports 12,000 vacancies and explores the breakdown by level across all ICT disciplines



The drift in demand towards higher thresholds and a requirement for greater versatility at each of the three levels explains why, to source talent on the scale required, more employers are now open to embracing FET as a complementary channel to HE. It is also one that is particularly likely to increase the diversity of their recruitment by engaging under-represented cohorts such as females, young people from different socio-economic backgrounds and the unemployed.

The increased emphasis on experience that is evidenced by the current Audit highlights the requirement for upskilling, and the increasing scope for career paths available to entry level and competent professionals. In seeking candidates for these positions the requirements have also evolved with employers preferring individuals with technical competencies and the capacity to become more autonomous ICT practitioners.

KEY INSIGHTS

Strong skills demand across all ICT disciplines



These developments in ICT enterprises and ICT roles need to be highlighted to a broad audience including prospective ICT professionals, parents, teachers, guidance counsellors and potential candidates (job seekers). The career paths available to ICT practitioners have never been so attractive. Those who enter the sector will have an increased opportunity to progress to higher levels and will be sought after as companies strive to fill the growing number of vacancies, from entry, through competent to expert levels. This report concludes that there are some key considerations and recommendations that should be borne in mind by those engaged in skills policy development in Ireland, by education and training providers undertaking programme development, and by jobseekers and job changers interested in pursuing careers in the tech sector:

- Increasing skill demands reflect the pervasiveness of ICT technologies across all sectors of the economy, requiring a redefinition of the 'tech talent' pipeline to one which is broader, deeper, and more diverse in its composition.
- The Audit finds that ICT companies continue to demand deeper technical skills, coupled with an increasing requirement for broad transversal skills to enable wider applications of emerging technologies. This is consistent with the conclusion of industry analysts that the "4th Industrial Revolution" is upon us, and that successful economies going forward will be characterised by their willingness and ability to adapt rapidly to the challenges and opportunities that this presents.
- Extremely positive feedback from interviewees to the new tech apprenticeships, which allow experience and competency to develop together. This merits the higher stature that dual education initiatives are attaining in current policy and practice.
- To exploit the opportunities presented by on-going technological advances, the adoption of ICT technologies by indigenous companies and in 'traditional' sectors needs to be more ambitious. Providing alternative sources of required skills will encourage this ambition.

- Specifically, the levels of tech employment already present in the nonurban regions should be built upon by providing new approaches to upskilling, and new strategies for attracting under-represented groups into the talent pipeline.
- Our ambition should be for Ireland's tech sector to become noted for its contribution to the inclusiveness of the Irish labour market.
- Labour Market Intelligence and training provision are essential to successfully orchestrating a learning ecosystem that keeps education and training provision aligned with high-value employment opportunities. Using this intelligence to inform career choices in a sector where change is a constant requires a continuous dialogue amongst stakeholders.
- With tech employers increasingly valuing the currency and credentials of the NFQ Level 5 and Level 6 programmes, FET deserves fuller recognition in policy and practice as a key and essential component in addressing the increasing demand forecast for ICT practitioner skills.

Maintaining Ireland's ICT success story requires deep engagement with regional employers and other regional economic stakeholders. In support of the work of the country's nine Regional Skills Fora, and in particular of the ETBs that are present on them, this Audit is accompanied by an analysis of Census 2016 data on the current status of ICT employment in the regions and its rate of growth since the 2011 Census.

On the one hand, it becomes clear that ICT activity and urban scale are closely coupled – 38,300 or 45% of all ICT practitioners in the State are in the greater Dublin region. In addition to Dublin and the Mid-East, the South West can be described as having a significant cluster of ICT practitioners (11,400 or 13.4% of all in the State).Thereafter the tech sector has a significant degree of regional spread, where lesser numbers in the national context can be significant within smaller regions. The very scale of the imbalance between Dublin and the other regions can be seen as an opportunity rather than a threat to the effective development of ICT in the regions. It is, in fact, already being leveraged to good effect in several ways.

It is important at the regional level as well as at the national level that stakeholders in economic development see how changes in ICT technologies are offering both opportunities as well as threats to their location's value proposition for hosting hightech enterprises and skilled ICT practitioners. Associated with this is the need for hightech enterprises to have access to workers with the skills, knowledge and competencies that enable them to exploit the newest technologies required to innovate, boost productivity and remain competitive from their Irish locations.

At the same time, it is important to acknowledge that major disruptive effects of new technologies on employment seem inevitable, particularly in traditional economic sectors (transport and logistics, wholesale and retail, manufacturing, etc.), and will affect lower skilled workers the most. These sectors need to be prepared in anticipation of how the labour market will change. The design and delivery of effective re-skilling and up-skilling programmes for employees in these sectors needs to be prioritised by government.

KEY INSIGHTS

Access to skills is a priority for SMEs and Corporates



Company Demand per Discipline: Corporate V SMEs (%)

KEY INSIGHTS

Strong growth in number of ICT practitioners nationally



ICT Practitioners as % of Region's Labour Force (2016)

An integral part of making the national economy and regional economies 'friendly' to high-tech will be communicating clearly the enormous potential of the new ICT technologies to achieving outcomes that are not just improving our lives as consumers but our well-being, society, and the planet as a whole; examples include speeding up the diagnosis and management of illness, protecting the environment, recycling waste, generating green energy and efficiencies, enhancing quality of life for the elderly and people with disabilities and widening access to life-long learning.

As the sector has grown and become more influential, it aspires to avail of an increasingly diverse talent pool and now provides a more expansive array of career opportunities. More employers now appreciate that tech-savvy candidates can, and should, come from diverse backgrounds and be enriched by diverse interests.

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1. Introduction

After a period of stagnation, the global economy is growing again. Yet, stability and continuity in international trade is under extreme pressure while, everywhere, digital technologies are reconfiguring how and where economic value is being created.

Individual countries must be prepared to adapt rapidly, and profoundly, to changes in the international trading climate and to the challenges and opportunities presented by the convergence of technologies such as Artificial Intelligence (AI), robotics, the Internet of Things (IoT), big data and analytics. This convergence has been labelled the "4th Industrial Revolution" and it is credited with enabling organisations to be more intelligent, more agile, more scalable, and better able to optimise supply chains and shift to new business models with unprecedented speed. As a result, we are likely to see radical transformations in how work gets done across global value chains while also having the potential to cause social disruption in societies that are unprepared.

Ireland has undergone a remarkable recovery from a deep recession with full employment now within sight. If the economy is to be resilient to future shocks, foreign and, especially, indigenous enterprises in the country must embrace the latest technologies and exploit their full potential to innovate, boost productivity and grow markets. We must also ensure that employment is of a high quality and inclusive of the population in the country's nine regions¹.

A key dependency for indigenous enterprises to realise growth opportunities, and for continuing success in attracting and retaining high quality inward investment, will be access to a pipeline of talent with the necessary competencies to work with the emerging technologies. It is critical that government, the development agencies and the regions provide the right conditions and resources, skills and capabilities that new corporate strategies demand, and that they are in a position to clearly articulate how an Irish location can support dynamic companies' (FDI and indigenous) ambitions for growth.

Taking the pulse of tech skill demand

This is the Third Edition of the national audit of ICT skills needs among tech employers in Ireland (the previous Editions were published by FIT in 2012 and 2014). These audits serve three main objectives:

- They inform and guide FIT's quantitative contribution to meeting the skills deficits of tech employers. They seek to identify quality jobs that are currently available for job seekers with the required ICT skills to 'hit the ground running';
- ii. They strengthen FIT's qualitative contribution as to how these ICT skills should be supplied. The audits are attentive to the levels at which skills are required and to which may be acquired through Further Education and Training (FET). FIT, through its Board, client contacts, and operating experience, remains convinced that FET and Higher Education (HE) should be planned as a continuum in order to increase the breadth and inclusiveness of recruitment to ICT roles;
- iii. They are a contribution by FIT to the wider **public policy formation** process and to all engaged in **career guidance**, including parents. FIT's experience is that a breadth of aptitudes and interests are compatible with attaining competence in ICT skills. It is committed to demystifying ICT careers and putting them within reach of broader sections of the population.

Developments since the 2014 Audit have strongly confirmed the importance and feasibility of these objectives. Significant ICT skills deficits continue to challenge tech employers and, the problem is growing more acute. There is a need to alert and prepare job seekers for available opportunities in a thriving tech sector.

¹ The country has eight regions for statistical purposes, which become nine for purposes of regional economic development and skills planning when the North East and North West components of the Border Region are distinguished. Thus, there are nine Regional Skills Fora – for the North East, Dublin, Mid-East, South West, Mid-West, West, North West and the Midlands.

² The CIRCA Group with Alan Nuzum (2016), An Evaluation of the Pilot Phase of the FIT ICT Associate Professional Programme.

Employers are much more open than before to recruiting ICT workers through FET channels as well as from HE. Given the scale of skills shortages, and success rates achieved with earlier initiatives, more of the most prestigious employers now **want both options**. Following its 2014 Audit, FIT worked with employers, ETBs and SOLAS on the design and operation of two pilot ICT Associate Professional Programmes. The programmes were highly successful in routing people from a variety of backgrounds through two years of dual education to ICT employment². The learning gained was instrumental in positioning FIT to then design and gain approval to coordinate Ireland's first two ICT national apprenticeships at NFQ Level 6. FIT with its partners in industry and education is now targeting the training of 2,250 tech apprentices by 2021.

Although the new national ICT tech apprenticeships are at NFQ Level 6, FET Level 5 tech programmes can still be sufficient for those seeking a first job in the ICT sector. A demonstration of the currency of Level 5/6 ICT awards is the number of 'in-demand' vendor certifications that equate with these awards. These include:

- Comptia A+
- Comptia Net+
- Comptia Security+
- Cisco CCNA
- Microsoft Technology Associate (MTA)
- Microsoft Certified Technology Specialist (MCTS)
- City and Guilds Level 3 Diploma in ICT Systems and Principles
- Oracle (On Demand) Certifications.

FIT's Audits are complementary to those undertaken by larger bodies and at higher levels of classification. FIT has developed a customised methodology and set of instruments for 'listening' closely to employers while promoting a practical focus on designing and implementing training solutions within an acceptable time frame.

2 The CIRCA Group with Alan Nuzum (2016), An Evaluation of the Pilot Phase of the FIT ICT Associate Professional Programme.

2. The context in 2018

2.1 Exceptional uncertainties but resilient ICT enterprises

The Irish economy has been one of the fastest growing economies in the EU in recent years. The consensus of forecasts is that strong growth will continue in 2018 and beyond, and that full employment is in sight despite serious global political and economic uncertainties. Brexit is the most serious single threat that, however managed, will slow Ireland's economic growth trajectory. However, even allowing for this, the Irish economy is still expected to grow strongly, particularly by EU standards. The outlook for ICT-intensive enterprises and economic sectors is even brighter. These successfully weathered the Great Recession and demand for their high-value products and services remains strong in export markets served. It is even possible that Brexit will redirect ICT businesses and ICT professionals from the UK to the Republic of Ireland.

There are uncertainties specific to the Irish operations of ICT multinationals, notably the inevitability of changes in how they will be taxed and regulated by national governments and at the international level. While this makes their spectacular rate of expansion over the last two decades challenging to sustain, Ireland has developed a 'strength in depth' in attracting high-end, inward investment in ICT that makes extreme responses by multinationals located here to regulatory and fiscal changes unlikely. It is more likely that growth in their Irish activities will be slowed by the increased quality of other countries' competition for FDI and by further rises in the relative cost of living in Ireland faced by high skilled workers.

Currently, there are approximately 97,000 ICT practitioners in Ireland³. An estimated 50 per cent of these are employed in dedicated technology product or service providers. Three other sectors (Manufacturing, Financial & Insurance, Professional and Scientific) account for approximately 15 per cent of ICT employees, while significantly 35 per cent are seeded across firms operating throughout the rest of the economy. The new ICT technologies offer exceptional opportunities to boost productivity and efficiency in areas such as Wholesale and Retail and Transport and Logistics. This suggests that a wide range of private and public sector organisations in Ireland are likely to compete increasingly vigorously for ICT practitioners as they seek to maintain competitiveness

ICT-intensive enterprises have assumed major importance in the national economy over the last two decades:

- They account for a major share of total exports. Computer services accounted for 46 per cent of total service exports in 2016 and, at €64.6bn, were almost equivalent to the value of total goods exports (€69.6bn.) that year.
- Ireland is home to some of the world's most successful ICT multinationals in the world who have generated substantial employment in the country since arriving.
- A significant indigenous software industry has developed, comprising of SMEs operating on global technological frontiers in their niche areas.
- ICT enterprises are to the fore in demonstrating the benefits to Ireland of participating fully in global supply chains and adapting in times of change.
- Indigenous industries from agriculture and food processing to retail and health services - continue to adopt ICT technologies that improve their quality, efficiency and effectiveness.
- Overall, the jobs provided in ICT-intensive sectors and enterprises are of high quality. Cities and regions that have large clusters of ICT firms are the more vibrant because of them. There is also evidence that they improve the employment prospects for many other types of worker, including the lowskilled.

by taking advantage of the efficiency benefits that new technologies provide. It is even likely that the impetus Brexit is giving to indigenous industries to diversify their export markets will also heighten their requirement to adopt enhanced ICT capabilities.

3 The Census total for April 2016 updated to April 2018 on the assumption (conservative) that their numbers grew at twice the growth rate of total employment.

2.2 Evolution and revolution in ICT technologies

The main reason demand for ICT skills is set to grow steadily, and may even accelerate, is the manner in which evolutionary and revolutionary advances in ICT technologies combine to produce quantum leaps in potential. Continuous integration of technological advances promise to radically transform how work gets done in global value chains and to unleash new opportunities for value creation. Companies that are 'first movers' seize opportunities to introduce new services, products, and business models that transform how clients and consumers engage with them.

Mapping the skills needs of enterprises and sectors where business models, roles, and sectoral boundaries are changing rapidly is, therefore, not for the faint-hearted. Each FIT Skills Audit, in fact, can be visualised as dipping into a fast moving river at a given moment in time. The river is the gathering accumulation of technological and organisational advances that began with the widespread adoption of ICT in the 1970s. Figure 2.1 sketches this flow to date and gives pointers to the future. It maps the leading tech trends over the period and aligns them with their key corporate innovators, associated technologies and the resulting in-demand skill sets. It is evident from the Figure how different were the companies driving transformation in the 1970s to those that are doing so now. The earlier set of companies (IBM, DEC, Wang) provided technological infrastructure to support sectoral evolution, whereas the current set of corporate innovators use technology as a driver to transform and dominate traditional sectors. For example, Google and Facebook (who captured 20% of global advertising spend in 2016) might be best described as media companies; Alibaba, the Chinese e-commerce giant, and Amazon could be described as global retailers; Netflix and Spotify could be described as entertainment rather than tech companies.

Associated Programming OS Server config. Virtualisation App Development Cloud design, Database Network Web Dev. Diaital Skills Sets build & config. design & build config. eCommerce Marketing Design & build CRM/SQL Dev Ops ERM **Data Analytics** C++ / Perl Transversal/multi skill COBOL/c Networks/ <u>00 &</u> Agile / Scrum Associated Touch screen Database/ Routers Scripting Search Non-relational Database Technologies Languages Virtualisation methods/tools Storage C++ / Perl Wireless Mobile Cubersecurity Datacentre design Server & operate Apple Google Facebool Companies driving the Amazon / eBay / PayPal trans-Netflix / Spotify formation Transformative **Tech Trends**

1990s

2000s

2010s

2020s

Figure 2.1: Overview of ICT Developments 1970s to Present

1970s

1980s

As the core technologies and leading corporate innovators have changed in practically every decade since the 1970s, the top section of Figure 2.1 sketches how the types of ICT skills in most demand have also changed. By comparison to earlier decades, they are now more diverse, complex and interconnected and can be described as a set of 'meta' technology skills (such as Apps, Cloud, DevOps, Data Analytics, Agile/Scrum and Cyber Security) that are built on the core underlying disciplines of programming, database and networks. Whereas previously, ICT practitioners had to continually deepen their core skills to advance in their careers, today they need to be able to apply a suite of high level tools and possess the transversal skills needed to contribute effectively in multidisciplinary team environments.

What we now bear witness to is the convergence of technologies such as Artificial Intelligence (AI), robotics, the Internet of Things (IoT), virtual and augmented reality, big data analytics, cloud computing, mobile platforms and social media. These 4th Industrial Revolution technologies are enabling organisations to be more intelligent, agile and swift in re-scaling their operations, optimising their supply chains and shifting to new business models. Many people still struggle to understand what these technologies actually are, never mind what they will entail for their own and their children's jobs and careers, and the types of skills that will strengthen lifetime employability.

Digitalisation in manufacturing, for example, is enabling companies to design, develop and test new products in virtual space before then shaping and steering their physical production through globally integrated supply chains. Factories are said to have 4.0 status when there is connectivity and instant communication between not just the different human players but the machines and tools they are using. In the 'smart factory', the Industrial Internet of Things and Advanced Manufacturing Techniques are embedded to allow systems and machines to be 'intelligent', i.e., guided by algorithms and instant data from the internet and its users to make adjustments on their own in the manufacturing process. Wholly new standards become possible – in, for example, predictive maintenance, improved decision-making in real time, the anticipation of inventory needs, the minimisation of waste, coordination between jobs, and the integration of global supply chains. A UK Commission informed by some of the country's leading manufacturers estimates that the 'digitisation' of manufacturing' – the full adoption of digital technologies in the manufacturing process - could deliver a 25% improvement in industrial productivity by 2025⁴.

'Tech culture'

The pace of change and technological evolution makes it increasingly difficult to use yesterday's labels to categorise the digital careers that are flourishing. Traditional descriptors such as coding, are now in danger of suggesting a degree of over-specialisation, reflecting an absence of flexibility where the ability to understand and appreciate developments in a range of ICT fields and to work across them as is now increasingly required. Today's tech employers also require not just a much broader array of tech skills but balanced employees with business development, entrepreneurial, creativity and interpersonal skills that may not be readily apparent on a résumé. The ability to communicate with others and an approachable demeanour now matter more than ever before for candidates seeking to pursue careers in the tech arena.

This requirement for competency across a range of technological areas and good knowledge of how business gets done means that tech practitioners can no longer primarily rely on honing and deepening a skill set acquired in their initial tech education. They are having to adapt and take on additional ICT skills sets to a greater or lesser extent as the tech-driven transformation evolves. At the same time, transversal competencies that stimulate WE'Q⁵ (as against IQ) e.g. project management, problem solving and entrepreneurship are increasingly in demand. These transversal competencies cannot be fully honed in the class-room and require effective application through hands-on learning and professional development to bring them to the levels required in today's tech workplaces. Accordingly, the potential of dual-education programmes, whether in FET or HE, that combine off-the-job training with work based learning to develop and test these skills has become more appreciated by employers.

⁵ New Skills New- Inclusion in the Digital Economy, Accenture (2017)

3. The 2018 Audit

3.1 Methodology

The Skills Audit model, first developed by FIT in 2012, is designed to gather detailed data on the skills needs of ICT companies nationwide. The aim is to ensure that education and training provision in ICT is relevant and responsive to companies' actual needs and to learners' search for quality employment. It also serves as a resource for jobseekers, career guidance specialists, parents and other stakeholders.

The granular level of detail sought is widely appreciated as shortening the sometimes lengthy cycle in identifying and meeting skills deficits. FIT's 2014 Audit yielded the best example of this to date. Its findings led to the design and implementation of two pilot FIT ICT Associate Professional Programmes whose success has informed two new ICT National Apprenticeships for which FIT is now the national coordinating provider. It has also underlined the potential for further tech apprenticeships by FIT in areas such as Fin-Tech, Cyber Security, DevOps and Advanced Manufacturing.

At the heart of FIT's Skills Audit model is a detailed questionnaire completed during face-to-face interviews conducted by FIT personnel with senior business managers. It enquires into what employers need from ICT practitioners. FIT follows the European Commission understanding of ICT practitioners as those who 'have ICT as the focus of their work [in that], for example, they *plan, build, run, enable* and *manage* ICT systems⁻⁶. (The practice followed to identify ICT practitioners for statistical purposes is explained in Section 4).

In 2018, 118 companies participated in the Audit. This is almost double the 61 of 2014, an increase reflecting in part the growing urgency and willingness of companies to look wider for solutions to rising skills shortages. In 2018, the average duration of the interviews was one hour. As in the preceding Audits, these relatively unhurried, face-to-face interviews facilitated discussion and the acquisition of invaluable qualitative inputs that have further strengthened the interpretation of the quantitative data.

Respondents/participants were asked to quantify the scale of their current need for additional employees who could carry out each of 350 specific skills categorised within 15 occupational disciplines along with their requirements regarding transversal skills at each level. As well as the potential vacancies that might arise in each discipline, they were also asked to provide their existing employee headcount in that discipline and to weigh the extent of the challenge they faced in sourcing suitable candidates. The specific skills and disciplines are not exhaustive but adopted in the light of the European e-competency framework⁷ and after extensive consultation by FIT with ICT employers. In the light of the rapid pace of technological development in an industry where change is the only constant, the framework has to be a 'live' structure that evolves between successive Audits to ensure that in-demand skills are being captured as reliably as possible. In the 2018 survey questionnaire, 70 new skills and two further disciplines were added to the 2014 framework⁸.

ICT Practitioners are classified into three levels reflective of the competencies and skills outlined by the European e-Competency Framework. As in 2012 and 2014, respondents were asked to distinguish the level at which additional employees would need to be able to conduct each skill in order to be hired as either 'entry', 'competent' or 'expert'.

In this way, the methodology captures the extent of demand in the ICT sector itself for people at three levels and, as previous Audits and the current one show, there are significant levels of demand for people at entry and competent levels as well as for 'experts'. The Audit's methodology, therefore, serves to correct a widespread and persistent misconception that the ICT skills gap is exclusively made up of roles at the apex of the skills triangle or in this report's terminology, at the 'expert' level. It has become clear from the Audits that expertise in ICT employers' eyes is more the fruit of experience than of the level of qualifications.

EXPERT LEVEL A set of advanced ICT ractitioner 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.

7 The European e-Competency Framework provides a common language for competences, skills and proficiency levels that can be understood across Europe, including for ICT workplaces.

⁶ European Commission (2012), Exploiting the potential of ICTs.

3.2 Profile of participating companies

Participating companies were of all sizes (Figure 3.1). Almost one quarter (24%) are micro-enterprises with less than 10 people at work, while 40% in total have workforces of less than 20. Approximately one fifth (19%) are SMEs with between 50 and 249 at work while a further one fifth (19%) are large enterprises with more than 250. A handful had workforces numbering in the thousands.

focussed on ICT, but using them to support their operational activities. It had significant success in doing so. As Figure 3.2 shows, 57% of participating companies were in the Information & Communication sector itself but 43% spread across another 12 sectors⁹. Therefore, the sectoral mix of the companies interviewed directly reflected the profile of companies in Ireland employing ICT professionals, as summarised earlier in this report. Interviews took place during the period July 2017 to January 2018.



Figure 3.1: Companies Interviewed by Numbers at Work

Figure 3.2: Participating Companies by Economic Sector (%)



The large majority (78%) of the companies interviewed were indigenous and 22% were controlled from overseas. The participating companies had a combined number of employees of 31,080 at the time of the Audit, with 20,477 (66%) of them working specifically in ICT. Aware that ICT business functions are becoming increasingly pivotal in practically every economic sector and enterprise today, the 2018 Skills Audit endeavoured to include companies from a broad range of economic sectors so as to gain insight into the demand for ICT skills in enterprises and sectors not primarily

FIT works closely with the Education and Training Boards (ETBs) that are deeply involved in supplying skills needs at the regional level and prominent members of the Regional Skills Fora established in 2016. Therefore we were keen to source companies for the 2018 Audit from as many of the country's nine regions as possible. The regional spread of participants is illustrated in Figure 3.3 (overleaf).

8 The two new disciplines are 'Cyber Security/Digital Forensics' and 'DevOps'. Taking advantage of the changing relative importance of some of the disciplines since 2014, and to help keep the amount of detail being presented in check, the responses related to the Game Technology discipline and the Programming/Development Methodologies discipline integrated in presenting the 2018 findings.

9 Four sectors had just one company interviewed - Electricity, Gas, etc.; Water, Sewerage & Waste Management; Construction; Transportation & Storage - and four had no representative at all - Agriculture, Forestry & Fishing; Mining & Quarrying; Accommodation & Food Services; Public Administration & Defence.



Figure 3.3: Regional Breakdown of Participant Companies



Figure 3.4: Composition by Skill Levels of Current and Anticipated Vacancies

3.3 Key findings

FIT estimates that there are approximately 12,000 current vacancies in the ICT sector. This is based on an analysis of the Audit data complemented by our separate in-depth research into the volume and categories of ICT practitioner vacancies advertised by leading recruitment agencies.

More important even than this level of demand is what the Audit reveals about its composition. Of the 12,000 current, the majority (58%) require the exercise of skills at the entry or competent level, and the remainder (42%) at the expert level.

The overall picture that emerges, therefore, is of a thriving tech sector requiring large numbers of additional ICT practitioners with substantial requirements at entry, competent and expert levels. While a larger proportion of experts are required than was the case four years previously, this finding necessitates careful interpretation. Demand

for experts is being driven in part by ICT multinationals siting more advanced technology functions in Ireland and by the growing number of indigenous tech companies exploiting enterprise opportunities driven by new technologies and digitisation.

In each of FIT's three Audits to date, employers were asked to classify as 'experts' those who 'work as a technology expert or lead teams and projects'. While this definition, and the way it is communicated, has been constant across each Audit, it appears that what is required to 'lead teams and projects' has changed. In 2014 and before, it often required a deep mastery in an area of specialisation; by 2018, it is technical fluency across a range of specialised ICT areas *and* the simultaneous possession of significant transversal skills (creativity, problem-solving, collaboration, project management, team skills, etc.) that is required. In short, the individuals whom employers perceive as 'technology experts' in 2018 need broader accomplishments than those that earned them the classification in 2014 or 2012.

As companies seek to source more employees for these expert roles we are likely to see increased poaching, along with more emphasis on in-house CPD programmes. The existing workforce is a key potential source for the expert talent increasingly needed. Recent research by LinkedIn¹⁰ reported that the number one priority for tech companies was developing transversal skills. It found that those skills that are needed to effectively communicate, problem solve, collaborate and organise are becoming more important for success as the workplace evolves socially and technologically. Some of these are most effectively developed and more clearly identified in and through the workplace where their application is practised and honed over a number of years.

It should be noted that this greater emphasis on experience than in previous Audits is an opportunity for greater upward mobility through upskilling within enterprises, and a reminder to the large number (the estimated 58%) needed for entry level and competent positions of what they can ambition by way of career paths. In seeking candidates for these positions the requirements have also evolved with employers looking for individuals with an established proficiency and the potential to become more autonomous ICT practitioners.

The drift in demand towards higher thresholds and greater versatility at each of the three levels confirms that, to source talent on the scale they require, employers are right to want to embrace FET more fully as a complementary channel to HE and as one that offers a more diverse and enhanced recruitment pipeline. This will contribute to the more effective engagement of under-represented cohorts such as females, young people from different socio-economic backgrounds and the unemployed.

It is clear that these developments need to be highlighted primarily for prospective ICT practitioners but also to a broader audience including parents, teachers and guidance counsellors. The career paths available to ICT practitioners have never been so good. Those who enter the sector will have every opportunity to progress to higher levels and they will be sought after as companies strive to fill the growing number of roles from entry to expert level.

All of the disciplines reviewed presented skill requirement across the spectrum of entry, competent and expert. The proportion of those requisite at different skills levels reported in 2018 varies by discipline as shown in Figure 3.5. Recruitment to entry and competent roles can be readily augmented through increased delivery of appropriate tech programmes at NFQ level 5 and Level 6.



Figure 3.5: Level of Skills required by Discipline (%) in 2018

10 2018 Workplace Learning Report - The Rise and Responsibility of Talent Development in the New Labour Market.

The rising demand for experts, and the broader skill-sets now expected of them, can be interpreted as being driven by two factors: the *evolutionary* journey of mature disciplines, and the *revolutionary* influence of newer technologies. Mature disciplines have grown in complexity resulting in the need for more experienced personnel with developed competencies. Furthermore, traditional and modern technologies are blending to improve the provision of services across a number of business models. An example is the networking field which now requires a growing number of practitioners with skills in both traditional networking and newer cloud technologies.

Revolutionary technologies, such as AI and the Internet of Things, require experts with deep knowledge to act as accelerators in their deployment. AI will have a transformational effect on both business and society over the coming years and will play a pivotal part in supporting the needs of Irish companies. To satisfy this demand, continuing professional development (CPD) has as big a role to play. The upskilling of current ICT practitioners not only meets the demand for experts but also frees up positions for entry and competent professionals. An example of responsiveness to such demand is the recent launch of an MSc in Artificial Intelligence which has emerged from needs expressed by industry and is seen as an opportunity to respond to the country's skills shortages¹¹.

The survey responses were analysed to determine the specific skills most in demand for each of the disciplines and the level of competency required. This information is presented in radar charts and tables that together give the reader an overview of the skills landscape requirements for each discipline. This level of detail is not for everyone and is kept to last. Further information gained through the interviews on how companies recruit for ICT positions is presented next.

3.4 Addressing skills needs

In addition to completing the questionnaire, respondents were asked about their strategies for addressing existing and emerging skills needs. Recruitment pipelines were discussed along with barriers to meeting talent shortages and developing skills within their organisations. Five issues, in particular were identified.

Recruitment Channels

Firstly, the 118 participating companies were asked about the types of educational programmes on which they currently most rely when recruiting for IT positions¹². Of those who had recruited from Third Level Institutes (n=57), **74%** were satisfied with the calibre of candidates. Respondents who had recruited from FET programmes (n=71) recorded a satisfaction rate of **80%** while, of the 45 companies who availed of the ICT Associate Professional Programme in particular, **87%** expressed satisfaction.

Secondly, companies were asked how such IT Programmes might better address their skills requirements. Typical of the needs expressed were:

IT Programme Curricula need to be constantly renewed and informed in collaboration with industry leaders

Expansion of dual-education programmes with lengthier work placements encourage successful on-the-job learning and practical application of theories learned

Candidates should possess sufficient soft skills such as communication and problem-solving along with a good work ethic

The industry-led MSc. in Artificial Intelligence is an initiative of the Technology Ireland ICT Skillnet and is being developed and delivered by the University of Limerick.
 It must be noted that companies can recruit from multiple sources, the combination of which was not disclosed in the findings.

The 2018 Skills Audit also posed a question on company receptiveness to Apprenticeship Programmes. **91% of respondents**¹³ **expressed support for apprenticeships and their willingness to hire an apprentice to address skill shortages within their organisation.** Specific areas highlighted as important in the hiring of apprentices were Software Development, FinTech, ICT Security, Digital Marketing, Systems & Networks and Advanced Manufacturing. When asked what may dissuade companies from taking on apprentices, small company size was most often cited.

These findings support the view that companies are eager to explore and use different pipelines in meeting their skills needs. With ICT moving at such a rapid pace, twoyear apprenticeships are a fast-track complement to four-year degree programmes in sourcing fresh tech talent. Moreover, access to a wider pool of candidates brings increased diversity of background and experience to a company's workforce.

Gender Diversity

The tech sector can be hampered by unconscious biases that manifest largely in a male dominated workforce. The Skills Audit took the opportunity to probe participating companies on the issue of the current male/female imbalance in the industry. What emerged was recognition of gender imbalance in the industry as a whole and that reaching an equal male to female employee ratio is an opportunity to build a more inclusive tech sector. However, delving further into company responses it was clear that sourcing candidates, irrespective of gender, remains an ongoing struggle for many smaller companies and that the need to meet demand lies not just in the recruitment of females but in sourcing the right talent.

Of the 98 respondents who voiced opinions on this element of the questionnaire, 36 % identified gender balance as an issue. The majority of these were based in Dublin with 100+ employees. This finding alone suggests that larger companies are more likely to see balance as a priority when compared with smaller companies who may be more tolerant of current status quo in pursuit to meet current demand for skills. Taken together these findings emphasise the need for greater endeavour on the part of tech companies collectively in achieving a higher representation of women in ICT practitioner roles. An outcome that can only be achieved if education and training providers also have greater success in attracting more women onto their ICT programmes.

ADDRESSING SKILLS NEEDS

Gender Diversity

50/50

Reaching an equal male to female employee ratio is an opportunity to build a more inclusive tech sector

Time and Cost

70% of companies cited time as the largest barrier

Access to Training Provision

6 71%

said access wasn't an issue

Foreign Languages



It is clear that strong and continuing collaboration between employers, the HEA and SOLAS through HE and FET initiatives will be required to bring about a more balanced representation of women in ICT roles.

Time and cost

A lack of time was cited as the largest barrier to addressing the skills needs of their existing and future employees by 83 companies (70%). In this context, it is important to note the size distribution of the companies interviewed (Figure 3.1) and that, for example, 40% had fewer than 20 people. In some instances, senior staff members themselves attend training to filter the more important learnings and then share with their staff on a needs-must basis for both time and cost-saving purposes. Cost was a significant barrier cited by 37 respondents (31%), again particularly in smaller companies with very limited training budgets.

Access to training provision

In response to whether or not access to training provision was a barrier to developing skills, the finding is largely positive with the majority (71%) stating that it was not. However, the remaining 29% indicated that limited knowledge of the range of training provision and/or limited access **was** an issue. Given the scope of companies interviewed and the regions they represent, it was important to draw attention to the concerns of those experiencing difficulty.

A challenge for smaller companies is access to relevant training, often compounded by the need to travel outside their region to avail of it. There was a general view that the delivery of in-house training by industry experts would be of value but likely to be highly determined by cost.

Foreign languages

Despite the large presence of ICT multinationals in Ireland, the need for more foreign languages was emphasised by relatively few companies. Out of the 118 respondents, 24 (20%) expressed a need for more language skills, with an emphasis on French and Spanish at an advanced level, followed closely by German. A few companies anticipated a greater need in the future for Nordic languages. These findings confirm that recruitment from abroad is the primary means through which the ICT sector sources its need for practitioners requiring fluency in a foreign language.

3.5 Detailed results by discipline

The survey responses have been analysed to determine the specific skills most in demand for each discipline and at what level of competency. Results of the Audit are summarised below in radar diagrams. This information is presented here in radar charts that provide an overview of the 'skills eco-system' for each discipline. In each radar diagram:

- The outermost ring represents the highest demand for a specific skill;
- All rings represent significant demand, even the inner ones;
- Different coloured symbols illustrate demand for entry, competent and expert levels.

Accompanying each diagram is a table that gives the same information in the form of a ranked list with the number one position occupied by the most in-demand skill. Readers are invited to explore the top ranked skills and most in-demand roles as set out in the radar diagrams and tables for disciplines that are of particular interest to them or, indeed, for all of the disciplines if a comprehensive understanding is required. For those who only need an overall understanding of skills needs, the brief summaries introducing each discipline's table may be sufficient.

What follows is a detailed representation of the specific skill sets in demand for each discipline and an analysis of the qualitative data obtained in the interview process.

Discipline 1. Programming/Development Methodologies

In the Programming/Development Methodologies discipline, the specific skill most sought at each level is SQL, with Java and Java Script also in strong demand at entry and competent level. Knowledge of .Net would also benefit those wishing to enter the sector.

Programming/Development Methodologies



Rank	Entry Level	Competent Level	Expert Level
1	SQL	SQL	SQL
2	Java	JavaScript	Project Management
3	JavaScript	Project Management	Problem Solving
4	.Net	Java	JavaScript
5	Problem Solving	Problem Solving	Java
6	Project Management	PHP	.Net
7	PHP	.Net	Professional Soft Skills
8	C++	Python	РНР

Discipline 2. Mobile Technology/Development Platform

Demand for HTML5 is strong and relatively consistent across all levels. A standout requirement is a combination of JavaScript and Java at all levels. Furthermore, CSS and UX Design were also highlighted as important skills, especially for those entering the domain.

Mobile Technology/Development Platform



Rank	Entry Level	Competent Level	Expert Level
1	HTML5	HTML5	HTML5
2	JavaScript	JavaScript	JavaScript
3	CSS	CSS	CSS
4	Java	Java	Java
5	UX Design	WordPress	Project Management
6	.Net	UX Design	UX Design
7	Objective C	.Net	.Net
8	Problem Solving	Project Management	WordPress

Discipline 3. Web Development/Technologies

While proficiency in SQL is a top requirement at expert level, there is evident demand for this skill at both entry and competent level. Furthermore, skills in JavaScript and Java combined with HTML5 would strengthen one's competency when entering the sector.

Web Development/Technologies



Rank	Entry Level	Competent Level	Expert Level
1	JavaScript	JavaScript	SQL
2	SQL	SQL	HTML5
3	Java	HTML5	JavaScript
4	HTML5	CSS	CSS
5	Angular JS/Gulp	MySQL	MySQL
6	CSS	Java Web	Java Web
7	MySQL	Angular JS/Gulp	Project Management
8	Java Web	Java	Java

Discipline 4. Software Development Tools and Methodologies

Demand at all levels is evident in Agile, Software Testing and GIT respectively. Object Orientation Design and Development Tools are prominent requirements at entry and competent level. A combination of Continuous Delivery and Standard Revision Control strengthen competency for entry level roles in the sector.

Software Development Tools and Methodologies



Rank	Entry Level	Competent Level	Expert Level
1	Agile (Crystal Methods, DSDM, Scrum)	Agile (Crystal Methods, DSDM, Scrum)	Agile (Crystal Methods, DSDM, Scrum)
2	Software Testing	Software Testing	Software Testing
3	Git	Git	Git
4	Object Orientated Design and Development Tools	Object Orientated Design and Development Tools	Problem Solving
5	Continuous Delivery	Continuous Delivery	Project Management
6	Standard Revision Control	Lean Development	Object Orientated Design and Development Tools
7	Bitbucket	Standard Revision Control	SDLC-Software Development Lifecycle
8	Project Management	Project Management	Standard Revision Control

Discipline 5. Cloud Computing

In the Cloud discipline, the skill most in demand is Microsoft Tools (Cloud, Azure and Office 365) and Amazon Web Services at all levels. Demand for Web Services SOAP & Rest, MCSA Windows Server and Microsoft SQL Server is applicable to entry level and thus a good addition to the above for those entering the sector.

Cloud Computing



Rank	Entry Level	Competent Level	Expert Level
1	Microsoft Cloud/Azure/ Office 365	Microsoft Cloud/Azure/ Office 365	Microsoft Cloud/Azure/ Office 365
2	Amazon Web Services	Amazon Web Services	Amazon Web Services
3	Web Services SOAP, REST	MySQL	Problem Solving
4	MCSA Windows Server	MCSA Windows Server	MySQL
5	Microsoft SQL Server	Web Services SOAP, REST	Project Management
6	MySQL	Microsoft SQL Server	MCSA Windows Server
7	VMWare vCloud	Project Management	Microsoft SQL Server
8	Exposure to Shell/Perl/ Python/PHP scripting	Problem Solving	Web Services SOAP, REST

Discipline 6. Platform Administration

A combination of Microsoft Cloud/Azure/Office 365 and MCSA Windows Server is the standout requirement in this discipline. Competency in MCSE Server Infrastructure is also flagged as a common requirement for those at entry and competent level.

Platform Administration

Outer rings are highest demand



Rank	Entry Level	Competent Level	Expert Level
1	Microsoft Cloud/Azure/ Office 365	Microsoft Cloud/Azure/ Office 365	MCSA Windows Server
2	MCSA Windows Server	MCSA Windows Server	Microsoft Cloud/Azure/ Office 365
3	MCSE Server Infrastructure	MCSE Server Infrastructure	Enabling Office 365 Services
4	MCSE Private Cloud	MCSE Private Cloud	MCSE Server Infrastructure
5	Enabling Office 365 Services	Enabling Office 365	Exchange Server Rollout and Administration
6	MCSE Cloud Platform	MCSE Private Cloud and Infrastructure	MCSE Cloud Platform and Infrastructure
7	Managing Microsoft SharePoint Server 2016	Exchange Server Rollout and Administration	Microsoft Hyper-V
8	Microsoft Hyper B	Managing Microsoft SharePoint Server 2016	MCSE Private Cloud

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Discipline 7. Cyber Security and Digital Forensics

Networking and Configuration (WAN/LAN/Wireless) is most in demand across all levels. Skills in Routers and Routing/Secure Transfer Topology along with Computer Systems Architecture would provide good grounding for those entering the Cyber Security and Digital Forensics arena.

Cyber Security and Digital Forensics



Rank	Entry Level	Competent Level	Expert Level
1	Networking	Networking	Networking
	& Configuration (WAN/	& Configuration (WAN/	& Configuration (WAN/
	LAN/Wireless)	LAN/Wireless)	LAN/Wireless)
2	Routers and Routing/ Secure Transfer Topology	Network Vulnerability Analysis/Security	Routers and Routing/ Secure Transfer Topology
3	Computer Systems	Routers and Routing/	Computer Systems
	Architecture	Secure Transfer Topology	Architecture
4	Virtualisation Support/	Computer Systems	Malware Investigation
	Cloud Security	Architecture	& Analysis
5	Network Vulnerability	Malware Investigation	Network Vulnerability
	Analysis/Security	& Analysis	Analysis/Security
6	Malware Investigation	Virtualisation Support/	Virtualisation Support/
	& Analysis	Cloud Security	Cloud Security
7	Software Development & Testing	Software Development & Testing	Database Design, Scripting & Data Processing
8	Database Design, Scripting & Data Processing	Database Design, Scripting & Data Processing	Business Continuity Management

Discipline 8. DevOps

In the discipline of DevOps, the specific skills most needed are JavaScript, Amazon Web Services and MCSA Windows Server and would be a good grounding for a career in the sector. Skills in Microsoft Azure would strengthen the competency set for DevOps roles.

DevOps



Rank	Entry Level	Competent Level	Expert Level
1	JavaScript	JavaScript	MCSA Windows Server
2	Amazon Web Services	MCSA Windows Server	Amazon Web Services
3	Microsoft Azure	SQL	SQL
4	Code to RESTFUL APIs	MCSE Server Infrastructure	JavaScript
5	MCSA Windows Server	Microsoft Azure	GIT
6	GIT	Amazon Web Services	Microsoft Azure
7	SQL	GIT	MCSE Server Infrastructure
8	.Net (ASP.NET/VB.Net /C#)	.Net (ASP.NET/VB.Net/ C#)	.Net (ASP.NET/VB.Net /C#)

Discipline 9. Network Technologies

Demand for IP Networking and MCSA Windows Server was evident at all levels with a notable importance for those at entry and expert levels. Certifications such as CISCO Network Administrator CCNA and Comptia A+ would be a good grounding for those entering the sector.

Network Technologies



Rank	Entry Level	Competent Level	Expert Level
1	MCSA Windows Server	Network Security	IP Networking
2	IP Networking	CISCO Certified Network Administrator - CCNA	MCSA Windows Server
3	Network Security	Wireless Networking	CISCO Certified Network Administrator - CCNA
4	Wireless Networking	IP Networking	Network Security
5	CompTIA Network+	MCSA Windows Server	Wireless Networking
6	CompTIA A+ Certification	MCSE Server Infrastructure 2012	CSE Server MInfrastructure 2012
7	CISCO Certified Network Administrator - CCNA	CompTIA Network+	Problem Solving
8	MCSE Server Infrastructure 2012	Cisco Certified Internetwork Expert (CCIE)	Project Management

Discipline 10. Big Data

Skills in particularly high demand in the Big Data category are SQL and Python. These combined with Java, JavaScript and Microsoft Azure provide a good foundation for entry and competent levels.

Big Data



Rank	Entry Level	Competent Level	Expert Level
1	JavaScript	Microsoft Azure	SQL
2	SQL	SQL	Systems Architecture
3	Python	Python	Python
4	Java	Java	Microsoft Azure
5	Systems Architecture	Oracle	Java
6	Apache Hadoop	Apache Hadoop	JavaScript
7	Microsoft Azure	Systems Architecture	Oracle
8	С	JavaScript	Linux

Discipline 11. Enterprise Applications

Three distinct skills are identified across all levels; SQL, MySQL and MS Access. Such a skillset would be a strong combination for a career in the sector, especially for those at entry level. SharePoint and Salesforce are also highlighted as important requirements.

Enterprise Applications



Rank	Entry Level	Competent Level	Expert Level
1	SQL	SQL	SQL
2	MySQL	MySQL	MySQL
3	MS Access/Excel	MS Access/Excel	MS Access/Excel
4	SharePoint	SharePoint	Problem Solving
5	Salesforce	Salesforce	Project Management
6	Dynamics CRM	Problem Solving	SharePoint
7	Problem Solving	Project Management	Professional Development (Soft Skills)
8	MCSA SQL 16/14/12	VMWare VEEAM	MCSA SQL 16/14/12

Discipline 12. eBusiness/Digital Marketing

Demand is highest and relatively evenly spread across a number of skills sets at both 'competent' and 'expert' levels for Google Analytics, Search Engine Optimisation and Social Media Marketing. A similar pattern is evident at entry level with the additional demand for CSS.

eBusiness/Digital Marketing



Rank	Entry Level	Competent Level	Expert Level
1	Google Analytics	Google Analytics	Google Analytics
2	CSS	Search Engine Optimisation (SEO)	Search Engine Optimisation (SEO)
3	Social Media Marketing /Planning	Social Media Marketing /Planning	Social Media Marketing /Planning
4	HTML5	Social Media Monitoring /Blogging (Online PR & Communications	HTML5
5	Search Engine Optimisation (SEO)	Google Keyword Planner	WordPress
6	Facebook Insights	HTML5	Adobe Photoshop
7	Twitter Analytics	Facebook Insights	CSS
8	Social Media Monitoring /Blogging (Online PR & Communications)	WordPress	Facebook Insights

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Discipline 13. Call Centre/Contact Centre Support

Proficiency in relevant Computer Applications is a priority across all levels. This combined with a Knowledge of Customer Service Principles and Practices and Customer Service Experience would equip candidates for roles at entry and competent level.

Call Centre/Contact Centre Support



Rank	Entry Level	Competent Level	Expert Level
1	Proficient in relevant Computer Applications	Proficient in relevant Computer Applications	Proficient in relevant Computer Applications
2	Knowledge of Customer Service Principles & Practices	Knowledge of Customer Service Principles &	Customer Service Experience
3	Customer Service Experience	Knowledge of Call Centre Telephony & Technology	Relevant Product Knowledge
4	Relevant Product Knowledge	Customer Service Experience	Problem Solving
5	Good Data Entry/ Keyboard Skills	Good Data Entry/ Keyboard Skills	Project Management
6	Knowledge of Call Centre Telephony & Technology	Knowledge of Administration & Clerical Processes	Knowledge of Call Centre Telephony & Technology
7	Knowledge of Administration & Clerical Processes	Relevant Product Knowledge	Appreciation of E-Commerce/Cloud Technologies
8	Contact Centre Metrics	Appreciation of E-Commerce/ Cloud Technologies	Contact Centre Metrics

Discipline 14. Digital Skills/Media

Demand for JavaScript is robust and would be a good calling card for entering the Digital Skills/Media sector. Additional skills in high demand are HTML5 and CSS. These skills combined with PHP and WordPress provide a good foundation for entry roles.

Digital Skills/Media



Rank	Entry Level	Competent Level	Expert Level
1	JavaScript	JavaScript	HTML5
2	HTML5	HTML5	CSS
3	CSS	CSS	PHP
4	MySQL	WordPress	JavaScript
5	WordPress	PHP	MySQL
6	PHP	MySQL	WordPress
7	Angular	Bootstrap	Object Orientated Design
8	Object Orientated Design	Object Orientated Design	Photoshop CC
Transversal Skill A. Project Management

In the Project Management discipline the most in demand skills are Agile/Scrum/Kanban combined with Experience in People Management and Strategic Planning. Entry level Project Management skills would be enhanced with knowledge of Slack and ITIL.

Project Management

Outer rings are highest demand



Rank	Entry Level	Competent Level	Expert Level
1	Agile/Scrum/Kanban	Agile/Scrum/Kanban	Agile/Scrum/Kanban
2	Experience in People Management	Experience in People Management	Experience in People Management
3	Experience in Strategic Planning	ITIL (Information Technology Infrastructure Library)	Experience in Strategic Planning
4	Experience in Project Management Capacity	Experience in Project Management Capacity	Experience in Project Management Capacity
5	ITIL (Information Technology	Experience in Strategic Planning	ITIL (Information Technology Infrastructure Library)
6	Slack	Prince II	Slack
7	PMI Project Management Professional	Six Sigma/Lean	Microsoft Project
8	Microsoft Project	Microsoft Project	PMI Project Management Professional

Transversal Skill B. Professional Development

Communication Skills are highlighted across all levels and are crucial with regards to Professional Development. The importance of being customer focused and a self-starter is evident at entry level with demand for Presentation Skills a priority for those at competent level.

Professional Development

Outer rings are highest demand



Rank	Entry Level	Competent Level	Expert Level
1	Customer Focus	Presentation Skills	Communication Verbal
2	Self-starter	Communication Written	Communication Written
3	Communication Verbal	Communication Verbal	Customer Focus
4	Prioritisation	Customer Focus	Leadership
5	Teamwork	Prioritisation	Self-starter
6	Multi-tasking	Self-starter	Presentation Skills
7	Communication Written	Teamwork	Teamwork
8	Presentation Skills	Leadership	Prioritisation

Transversal Skill C. Problem Solving Skills

Demand for Analytical Thinking Skills is robust at all levels followed closely by Critical Thinking Skills. This bundle of skills is crucial at entry level for a future of work in which new technologies are embraced, along Technical report writing and System Thinking Skills.

Problem Solving Skills

Outer rings are highest demand



Rank	Entry Level	Competent Level	Expert Level
1	Analytical Thinking Skills	Analytical Thinking Skills	Analytical Thinking Skills
2	Critical Thinking Skills	Technical Report Writing	Critical Thinking Skills
3	Technical report writing	Systems Thinking Skills	Technical report writing
4	Systems Thinking Skills	Critical Thinking Skills	Inventive Thinking Skills
5	Inventive Thinking Skills	Inventive Thinking Skills	Systems Thinking Skills
6	Design of Experiments	Design of Experiments	Knowledge Management Skills
7	Major Incident Management	Major Incident Management	Major Incident Management
8	Root Cause Analysis	Root Cause Analysis	Root Cause Analysis

3.6 Demand by discipline: An analysis of the breakdown

The following section looks at the breakdown of company demand per discipline for the purpose of establishing whether it differs based on location and size. Given the scale that ICT roles have assumed nationwide, significant regional growth is likely to be fuelled by SMEs. Identifying the disciplines most in demand will therefore assist FIT in its objective of planning regional initiatives that support the meeting of skills deficits.

Figure 3.6: Company Demand per Discipline in descending order (%)



Figure 3.6 presents company demand per discipline as informed by the 118 respondents. Overall demand is highest for Cloud Computing, Platform Administration and Programming/Development Methodologies (85 %, 75% and 74% respectively).



Figure 3.7: Company Demand per Discipline: Rural V Urban (%)

Companies based solely in urban locations reported a similar profile of demand (Figure 3.7). Software Development is a higher priority in rural areas, followed closely by eBusiness/Digital Marketing. The most significant difference between urban and rural locations (Figure 3.7) is the demand for Mobile Technologies.

Opportunities for SMEs in Rural Locations



Figure 3.8: Company Demand per Discipline: Corporate V SMEs (%)

A deeper understanding of the differences in demand can help inform training bodies on how to tailor curricula aimed at developing the skills per region. Figure 3.8 illustrates the difference in demand per discipline as indicated by Corporates and SMEs who participated in the Audit. Our findings indicate that a 'one-size fits all' combination of disciplines does not exist nationwide and that catering for the specific demand in the regions is required to take advantage of growth opportunities.

Results from the Audit show that the following disciplines are most in demand by SMEs in Rural Locations;

- Cloud Computing
- Platform Administration
- Programming/Development Methodologies
- Software Development
- Enterprise Applications
- Cyber Security and Digital Forensics
- Network Technologies

Therefore, offerings should be provided to develop regional skill sets within the above disciplines from entry to expert level.

4.1 Inclusiveness a general concern in advanced countries

There are strong concerns that advanced countries are neglecting the extent to which socio-economic groups and regions within their societies are being 'left behind' as technology, globalisation and migration reshape their labour markets. The OECD, for example, is now committed to assessing the labour market performance of its member states (including Ireland) on the basis of the quality and inclusiveness of the employment they provide, as well as on the extent of achieving high employment and low unemployment. Its new Jobs Strategy will track how member states protect the quality as well as the quantity of employment and increase the inclusiveness of their labour markets¹⁴.

This reflects a conviction that access to high quality employment by, for example, women, young people without higher education, older workers, people with a disability, and residents of regions distant from major urban centres, should be monitored and recorded. This is integral to satisfactory labour market performance, primarily because troubling evidence has accumulated that technologies and globalisation frequently combine to cause a deep polarisation in national labour markets. This is occurring at a level which is fuelling widespread popular and political opposition to globalisation.

A wide spread of sectors have increased both the quantity and quality of employment, with average earnings in Ireland amongst the highest in the EU and OECD. However, the labour market is far from having attained satisfactory levels of inclusiveness. An efficient and effective welfare state has to work hard to soften what is one of the most unequal underlying distributions of market income (principally earnings) of all advanced countries. The incidence of low pay in general is high and, among graduates in employment, is the highest in the EU. By international standards, the proportion of the population living in jobless households is high, as is the proportion of adult workers who have low educational attainment and poor skills. Employment prospects are bleak in many town and rural areas (what recovery?) and there has been a stubborn persistence of unemployment black sports in the cities. Such challenges are the focus of several public policies, for instance, the National Skills Strategy 2025, Enterprise 2025 and the Regional Action Plans for Jobs, which are key to ensuring the labour market is inclusive and that all sections of society have access to quality employment.

4.2 ICT employment within the Irish labour market

Given the scale that ICT enterprises and sectors have assumed in Ireland and their potential for further significant growth, it is becoming more important to understand and monitor how the direct and indirect employment they generate is affecting the country's labour market. It is FIT's experience that when skills are available the ICT sector is prepared to offer quality employment irrespective of background. Therefore the impact that ICT employment can have on the inclusiveness of the Irish labour market, is a prime opportunity for promoting labour force diversity and participation. Nevertheless, there is no easy way to study the composition of the ICT workforce, or to trace the variety of paths that individuals follow in achieving quality ICT careers.

A prominent exception is the extent to which the different counties and regions in the country benefit from the employment generated by ICT sectors and enterprises. Data that became available in late 2017 from the 2016 Census enable an authoritative and up-to-date picture of where in the country employment and workers specialised in ICT are to be found.

It is a core objective of FIT to help supply the ICT skills needs of sectors and enterprises in Ireland by increasing the share of the domestic population from which they are able to recruit. To the extent that this recruitment becomes more inclusive of everyone in the Irish labour market, the continued growth of these ICT sectors and enterprises will make a stronger contribution to labour market inclusiveness and to the achievement of social cohesion and spatial balance as well.

For this reason, in what follows, FIT provides an overview of the spatial spread of ICT activities across the catchment areas of the nine regional skills fora that are now in place. It regards this spatial analysis as a hugely relevant and contextually important to the national Audit of the specific ICT skills demand as presented in this report:

Examining the data available on the spatial spread of ICT activities helps keep to the fore the desirability of also understanding and monitoring other types of impact that ICT enterprises and sectors are having on Ireland's achievement of an inclusive labour market. Presenting the data for the catchment areas of the nine regional skills fora, draws attention to the importance of these relatively new bodies, and to the degree to which broad participation of the national population in the digital transformation of industries, enterprises and workplaces requires the vigorous engagement of regional employers and regional economic stakeholders. The fora have been established to provide a structure through which all of a region's key economic stakeholders - local authorities, higher education institutions, FET providers as well as employers and economic development agencies - can work to help bring about a balance between the demand and supply of skills in the region at as high a level as possible. There is wide support that they should develop the capabilities and be accorded the necessary resources and autonomy to be effective in pursuing this overarching objective.

The regional skills for a are particularly key bodies for aligning and maximising the respective contributions of higher education and of further education and training to supplying in-demand ICT skills and widening access to the opportunities to acquire them. In particular, they provide an important new framework through which the contribution of ETBs to ICT skills formation can be enhanced. ETBs continue the legacy of the VECs in championing those with the least formal education and the legacy of FAS in enabling people at work to reskill and upskill; they also inherit the traditional closeness of both to wide swathes of regional and local businesses. Recent strategies make clear how much of the 'heavy lifting' in bringing people from disadvantaged starting points to access decent employment must be done by the ETBs. The Regional Skills Fora, in turn, must play a key role in helping them to do so. It is for these reasons that the following analysis of Census 2016 data is included in the Audit: firstly, to sketch the economic profiles of the nine regions and illustrate the divergence in the challenges they face and, secondly, to track the current distribution of ICT employment across the catchment areas of the regional skills fora and underline the need for them to tailor strategies to increase it.

4.3 Economic profiles of the regions

The spatial distribution of economic activity and employment in Ireland is one of the most concentrated in the EU/OECD. This is because of the dominance of the Dublin City Region which now accounts for 40% of the national population and 49% of economic output (2016). By contrast, the London Metropolitan Area accounts for 22% of the UK population and 32% of GDP¹⁵. The spatial influence of the Dublin City Region extends from Louth through Meath, Westmeath and Kildare to Laois, Carlow, Wicklow and Wexford. It also partially affects Cavan, Longford and Kilkenny, and other surrounding counties. It is a degree of spatial concentration of population, economic activity and employment that makes the objective of achieving effective regional development exceptionally difficult in Ireland, an objective not served by the complete absence – apart from Cork – of other urban centres that have more than 200,000 people and capable of developing scale as to be significant in the European context (op. cit.).

The presentation of data on the catchment areas of the nine regional skills fora, therefore, must allow for the almost different meaning of the word 'region' when it is applied to Dublin as distinct from the other regions. Even among the eight, there are wide differences – in, for example, the sizes of the populations they serve, the age structure of their populations, the intra-regional distribution of their populations (population density and urban/rural mix), the mix of industries and occupations on which they currently most rely and, though its extent is hugely softened by social transfers at the national level, the relative affluence of their populations. It follows that the ambition of each regional skills forum, the measures needed to achieve its regional economy's potential, and the effectiveness of each forum's performance has to be hugely contextual. Conversely, that very little can be learned by merely pointing to differences and much less by such metrics as averages.



Figure 4.1: Proportions of Regional Labour Force Reliant on Traditional Economic Activities

Source: Census 2016, Table EB027

Fig. 4.1 provides an indication of the extent to which the regions currently rely on economic sectors that can be described as 'traditional' in that they are typically based on natural resources or long established ways of making a living. Employment in four economic sectors (Manufacturing, Agriculture, Construction and Accommodation & Food) is taken as a proxy for a region's reliance on traditional forms of economic activity. While 22% of all employment in the State is in these activities, the percentage is as low as 13% in Dublin and as high as 28% in the West. All regions outside Dublin and the Mid-East share a relatively high degree of reliance on agriculture but, perhaps of more interest, it is in their relative reliance on manufacturing that the regions diverge the most.

Figure 4.2: Proportions of Regional Labour Forces Reliant on Knowledge-Intensive Service Activities



Source: Census 2016, Table EB027

Fig. 4.2 provides an indication of the extent to which the regions currently rely on service sectors that can be described as 'knowledge-intensive' in that they are associated with employments that frequently require technical competencies or specific advanced qualifications. Employment in three economic sectors (Information & Communication, Financial & Insurance Activities, Professional, and Scientific & Technical Activities) is taken as a proxy for a region's reliance on knowledge-intensive services. While approximately 13% of all employment in the State is in these activities, the percentage is as high as 21% in Dublin and as low as 7% in the Midlands and North West. All regions have a much smaller presence of these services than Dublin, while only the Mid-East joins Dublin in having a share above the State. It is in the area of Information and Communications activities that the divergence is the widest.

4.4 The regional spread of ICT employment

Figure 4.3: ICT Practitioners as % of Region's Labour Force (2016)

The types of employment of most relevance to this report are those that specifically require ICT skills and a demonstrated competence in using them. Digital literacy is now, in effect, required of every worker and citizen today but a group in the workforce can be identified whose tasks are specifically focussed on the exercise of ICT skills. They are termed 'ICT practitioners'. They are usually the primary type of recruit sought by companies whose output is specifically made of ICT products or services but more and more enterprises and organisations of every sort in the public and community & voluntary sectors now employ one or more to monitor and improve their ICT functions. The Census enables the number of ICT practitioners in the State to be identified and their distribution across the country's nine regions to be tracked¹⁶.

Fig 4.3 shows that in 2016, 3.7% of the Irish workforce were ICT practitioners (85,500 individuals), with the proportion as high as 5.5% in Dublin and as low as 2.0% in the North East and South East.

The concentration in the Dublin Region emerges even more forcefully when the absolute numbers of ICT practitioners are presented (Fig 4.4). There are nearly as many in Dublin as in the other eight regions combined - 45% of all ICT practitioners in the State are in the Dublin region alone and 57% in either Dublin or the Mid-East. After Dublin and the Mid-East, only the South West demonstrates a significant cluster of ICT practitioners (11,400 or 13.4% of all in the State). It is clear that ICT practitioners and urban scale go closely together; being a metropolitan region with an estimated population of around 1.69m in 2011 (Ireland 2040-Our Plan), Dublin offers opportunities and advantages to specifically ICT companies and specifically ICT workers that no other city in Ireland can replicate.







Source: Census 2016, Table EB049

16 The 2016 Census (Table EB049) provides the detailed occupational groups to which everyone aged 15 years and over in the Labour Force belongs. The detail is based on the Standard Occupational Classification (SOC) 2010 developed for international statistical purposes. Approximately 320 occupations are specifically named. At this level of detail, only small percentages of the total workforce belong in any one: for example, the 104,000 in the single largest occupation, 'Sales and retail assistants', account for 4.5% of the national workforce and the country's 71,000 framers for 3%. The average share of the 320 named occupations is 0.27%. Fourteen of the 320 odd occupational groups are conventionally aggregated to identify 'ICT Practitioners'.

Source: Census 2016. Table EB049

In this context, the evidence provided in Figs 4.3 and 4.4 show that, however small the numbers are in comparison to Dublin, each of the smaller regions *has* a core of ICT practitioners present is the real starting point. The growth that each region has recorded in their numbers over the inter-census period, 2011-2016, (Fig 4.5) is, arguably, the more significant metric. For example, more of practical policy value may be learned from exploring the strong contrast between the North West (+11.9%) and the Midlands (+5.1%) than that between Dublin and Midlands.



Figure 4.5: Growth (2011-2016) in Numbers of ICT Practitioners by Region

Source: Census 2016, Table EB049

4.5 Conclusions on regional spread of ICT Employment: The regional advantage

- Most of the concentration in Dublin is not 'at the expense' of the other regions but based on the extent to which Dublin has been, and is, 'punching above its weight' in attracting multinational companies to choose Dublin over alternative locations outside of Ireland. However, the degree to which Dublin's growth is pressing against infrastructural constraints means more ICT companies and individuals may see advantages to relocating to a less congested region. Since 2015, there is evidence Dublin-based tech-workers are paying closer attention to job opportunities in Galway, Cork and Limerick¹⁷. Even small outflows by Dublin's standards can make a large impact on small regions.
- The degree of concentration of ICT practitioners and growth in their numbers observed in large city regions should not be used as templates or benchmarks for assessing the performance of smaller regions.
- Working from home for some or much of the time is a valued and significant aspect of ICT working practices. As a result, practitioners can be attracted to live in dispersed regions if they have the required broadband and transport connections that enable them to work remotely on projects. This can take the form of 'de-commuting' where ICT individuals with lengthy commutes to major urban centres leave their jobs to work for SMEs nearer where home is.
- While leveraging the exceptional success of Dublin in building up a globally significant concentration of ICT-intensive employers is important, not just nationally but to other regions, the latter's primary requirement of ICT is that its full potential should be applied to improving the performance and prospects of their existing industries and services. It is therefore important to ensure, for example, that resource-based manufacturing, farming, wholesale and retail activities, accommodation and food, health services and education, etc., adopt ICT solutions fully to improve their quality, accessibility and efficiency.

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5. Analysis and Reflections

5.1 The future: a constellation of innovation

Today, few are oblivious to how ICT technologies are impacting all aspects of our lives, transforming the way we live, learn, work, communicate and socialise as individuals. They are creating major opportunities and challenges for international peace and security, new patterns and forms of international trade, monitoring and containing planetary threats, and much more. As digital citizens, we are experiencing a transformation and new horizons comparable to what people in the early 17th century experienced when modern publishing was introduced and reading became common place.

More people and companies are using cloud-based services, to store and access information on all facets of their personal and professional lives virtually. This digitisation is rapidly redefining how business is done, transforming the once-traditional office environment, as work becomes a virtual reality accessible from anywhere, and redefining work-life balance choices and priorities. As more existing and emerging technologies are integrated into each other and developed into something greater, consumers and businesses alike can expect to see even more opportunities and benefits with future technology. Technological capacity will continue to expand providing the ability to accomplish more by getting work done, easier and faster. Al/smart devices will continue to evolve to work better together, blending the physical and virtual worlds together as smart speakers, smart homes, smart hospitals, smart cars etc. attain global application.

The analyst firm, Gartner, predicts that there will be more than 26 billion connected devices globally by 2020, fashioning a future where cars propose alternative routes to avoid traffic, goods purchased online are delivered promptly by drones, and the fridge orders the necessary groceries for delivery on one's return to the home. In other words, the future is already upon us and expectations are rapidly evolving that, in turn, will stimulate further technological advancements and solutions to opportunities not yet conceptualised.

The good news is that the demand for IT professionals continues to grow across the globe and will into the foreseeable future. Those with a passion for technologies can look forward to an exciting and rewarding career in a set of technologies that are shaping the future.

5.2 Retuning the national vision for ICT to new times

As noted, all evidence indicates that the technology sector in Ireland will enjoy strong employment growth in 2018 and into the medium term.

A large part of this growth will continue to come from expansion by existing multinationals and from the attraction of new ones. Despite how this inward investment might be affected by changes in how these firms are regulated and taxed, Ireland has sufficient domestic policy levers to ensure that the country's overall value proposition to them for accessing international markets and leveraging global supply chains from Ireland will remain attractive.

The level of tech employment provided by indigenous companies needs to grow faster. These companies include those that are most vulnerable if they do not use ICT to innovate and boost their productivity. Such companies play a particularly large and important role in the regions.

In pursuit of both objectives, maintaining inward investment and fostering faster indigenous growth, it is crucial that, at national and regional levels, tech enterprises have access to workers with the skills, knowledge and competencies that enable them to exploit the latest technology advancements to innovate, boost productivity and remain competitive in their Irish locations – for example, for manufacturers to digitise and attain 4.0 status, for wholesalers and retailers to incorporate e-commerce fully, etc.

All technology has a purpose. It is as important at the regional level as at the national level that stakeholders in economic development appreciate how changes in ICT technologies offer opportunities as well as threats to their location's value proposition. An integral part of making the national economy and regional economies receptive to advanced technologies will be communicating clearly the enormous potential of the new ICT technologies to improving our lives as consumers, our well-being, as well as the health of our society and planet e.g., speeding up the diagnosis and management of illness, protecting the environment, recycling waste, generating green energy and efficiencies, enhancing control over their lives for the elderly and people with disabilities, widening access to life-long learning, etc.

In this context, it will be particularly important to acknowledge that major disruptive effects of the new technologies on employment seem almost inevitable, particularly in domestic economic sectors (transport and logistics, wholesale and retail, manufacturing, etc.) that will affect lower skilled workers the most. These require anticipation of how the labour market will change, and the re-skilling and up-skilling programmes that should to be prioritised by policy makers.

5.3 Developing a tech skills eco-system

As Ireland's economy, at national and regional levels, is increasingly transformed by digital technologies over the coming years, it is crucial that tech skills provisioning is aligned and effective in enabling job seekers to meet the requirements of a rapidly changing labour market.

This involves schools, what is taught and how it is taught and the cognitive and noncognitive achievements that are fostered at each level of the system, but particularly during the senior cycle of secondary school and upwards. This Audit underlines the importance of fostering at these levels the aptitudes and capabilities that will enable young people pursue tech careers successfully. Since 2013, the basic architecture of Ireland's FET sector has been transformed and a new set of public bodies now work to meet the skills needs of individuals and employers across the state (see Box 1 opposite). It is important, however, to think not just in terms of formal education and training systems and publicly funded institutions, but to embrace the idea of a learning ecosystem that encompasses public, private and non-government actors. Within these ecosystems, partners collaborate and share information to achieve mutually beneficial outcomes for learners and themselves. Some consider that successfully orchestrating such learning ecosystems is the core, high-level skills policy challenge at a time of unprecedented digital disruption. The ICT sector in Ireland already has the elements of a multifaceted skills eco-system in place. It has evolved as enterprises, researchers, the economic development agencies, a variety of public bodies, and others, have become aware of the potential in the new technologies to inform new remedies to an expanding array of business, health and welfare priorities. FIT itself, in fact, is an example of a new type of intermediary, broker or 'talentdeveloper' (LinkedIn 2018) now visible in every country's ICT eco-system, seeking to link employers, job seekers, education and training providers, public policy and private plans in pursuing and spreading the benefits of ICT technologies.

Architecture of Ireland's FET sector

The state's annual spend on FET has remained fairly stable since 2008 at around €800m but the architecture of the FET system through which it is channelled was transformed in 2013. The legacy bodies of FAS and the VECs were restructured to become SOLAS, the national agency for guiding and funding FET, and sixteen Education & Training Boards (ETBs), the engines that deliver FET across Ireland. ETB Ireland (ETBI) was also established to collectively represent the 16 ETBs, promote their interests and develop a range of services in support of their work.

Other public bodies with key FET remits include: the Expert Group on Future Skills Needs (EGFSN,) established in 1997 to advise on the current and future skills needs of the economy through analysis and horizon scanning in close consultation with enterprise; Skillnets, established in 1999 to subsidise training, using the National Training Fund (NTF), that networks of private sector companies, largely SMEs, operating in the same sector or region and with similar training needs, come together to arrange; Quality and Qualifications Ireland (QQI), established in 2012, to promote and ensure quality and accountability across all education and training services; the Apprenticeship Council set up in 2014 to oversee the expansion of apprenticeship into new sectors of the economy.

All these bodies had the significance of their missions and roles significantly enhanced in 2016 with the publication by the Department of Education and Skills of its overarching *Ireland's National Skills Strategy 2025*. It led to the establishment of the National Skills Council in 2017 to oversee research and advise government on the prioritisation of identified skills needs and how they are met by FET and HE, and to the establishment of nine Regional Skills Fora to enable employers have a stronger say on the skills mix that best serve their region.

Private and not-for-profit training companies are also important contributors to the FET sector. Through being contracted as external trainers directly by SOLAS or the ETBs, or by acting independently, they increase the responsiveness of the overall FET supply to the skills training needs of employers and individuals. They often deliver specialised skills training not available in the public system. Finally, the large majority of companies (77% in 2015) provide continuing vocational training (CVT) for

their employees in one way or another, e.g., in-house, with or without the input of external trainers, as continuing professional development (CPD) or in the context of apprenticeship programmes, etc¹⁸.

In addition to FIT, all of the above are players in ensuring that the ICT skills training needs of employers and individuals are satisfied and that skills deficits and shortages in Ireland are tackled effectively. A well-orchestrated eco-system entails a high degree



of shared understanding of what is needed, mutual respect for each other's contributions and the development of a partnership approach and effective working relationships between them.

5.4 Informing career choices

The impact of digitisation is growing exponentially and employment in IT-related careers is projected to increase at a rate that outpaces most other professions. Skill gaps are already growing as the number of tech professionals entering the workforce falls behind levels of demand. While the lack of qualified talent can alter the expansion plans and locational choices of organisations with positions to fill, it simultaneously provides unprecedented career opportunities and prospects for indigenous job seekers willing to develop in-demand tech skills.

A key objective of FIT's approach to skills audits is to inform educationalists and career guidance professionals and to encourage a broader cohort of job seekers to appreciate the interesting and rewarding opportunities within their reach in the tech sector. Choosing a career in the tech sector requires passion, enthusiasm and foresight in preparation. In turn, it can deliver a career path that both stimulates and facilitates self-expression, on the one hand, and leads to strong career prospects and sustained employment, on the other. As the sector has grown and become more far reaching, it has come to require an increasingly diverse talent pool and now provides a more expansive array of career opportunities. More employers now appreciate that tech savvy candidates can and should come from diverse backgrounds and be characterised by varied interests.

While the sector displays an increasing appetite with strong careers prospects for those with in-demand tech skills, not all skills remain relevant. As in all sectors, technological obsolescence is apparent and the ICT practitioner unable or unwilling to acquire new competencies is at risk. This Audit finds that tech practitioners can no longer depend on just honing and deepening the skill set acquired in their initial tech education. Transversal competencies in such areas as project management, problem solving and entrepreneurship are also being increasingly valued. These transversal competencies cannot be gained in a classroom but require hands-on learning and professional development to bring them to the levels required in today's tech workplaces.

Accordingly, the tech sector and its representative bodies need to be more proactive in supporting education and training institutions in attaining a full appreciation of the tech eco-system and the jobs within. This should take the form of an ongoing dialogue to facilitate a forward-looking perspective on emerging techniques and resulting stateof-the-art technologies that will inform future roles and professions, yet to be defined. Similarly, students/job seekers must be assisted to understand the implications and career prospects emanating from new technologies and their application in an everchanging and dynamic workplace.

5.5 Deep educational reform

The strength of current and expected demand for ICT practitioners, and continuing shift in the actual specific skills required, underlines the enormous need for young people who desire to become ICT practitioners, and the adults who currently are, to be committed to continuing learning.

It is repeatedly emphasised that many of the jobs for which young people must prepare for over the next decade do not yet exist. At the same time, the extent to which the skills requirements of the jobs we do know about are changing and changing dramatically; in the words of a 2018 World Bank (WB) report on technological change and jobs in the EU, the 'future of work' is now¹⁹. These two factors are far from being sufficiently acknowledged and factored into how our current educational system prepares young people for their adult lives.

The WB study draws attention to what we now know about the breadth and depth of the skills that will enable people to navigate the new world of work successfully. Three types of skills, in particular, are seen to be hugely important:

- i) non-routine cognitive skills (such as critical thinking and problem-solving) built on solid competency in numeracy and literacy;
- ii) social-emotional skills (such as conscientiousness, goal orientation, and the ability to work in teams) built on sound self- and social awareness, good self-management and relationship skills;
- iii) technical skills up to date, job-specific built on sound labour market intelligence and effective, on-going collaboration between employers and education and training providers.

Similarly, a 2012 IBM CEO study (*Leading through Connections*) interviewed 1,800 CEOs in 80 countries on their priorities in running their organisations. The two top priorities identified were **adaptability** and **creativity**. How organisations respond to changes and threats in their environment was pivotal and required adaptability while, for long-term viability and relevance, creativity was deemed the top priority. While appreciating that the current education systems were originally put in place to meet the needs of the economy in a different age, corporates interviewed indicated that an alternative which stimulates creativity, collaboration and adaptability is needed in response to the challenges of the 4th Industrial Revolution and beyond.

Educational systems in every advanced country are aware of the challenge they face to articulate the blend of skills that young people will need to attain in order to have interesting careers and good jobs during their working lives. In every country, government is pursuing reforms to its educational system. Many acknowledge the inadequacy of delivering rote knowledge of a limited set of subjects in linear fashion over a set time, the dangers of building an educational system on a narrow conception of intelligence, the need to reappraise the breadth of human talent and abilities whose currency in the world of work is growing. Correspondingly, recognise the need for a more urgent pursuit of the educational formats that fashion the best in all young people and which not only accommodate but actively promote diversity, talent, creativity and imagination.

Ireland's educational system, in international comparative studies (including the 2018 WB report), is considered a high performer and its contribution to Ireland's rapid economic and social progress since EU membership is widely acknowledged. It is important to acknowledge the changes that have been made in recent years to enhance the educational experience with regard to the Junior Cert, the proposed changes to the Leaving Cert and the increased emphasis on dual education initiatives, as instanced, for example, by the expansion of the apprenticeship model into new sectors of the economy. However, there is no lack of pins to puncture complacency in the high international standing of Ireland's educational system. Even leading educational systems are encouraged to critically review how they are ensuring that all their students, particularly those from disadvantaged backgrounds, are equipped with the necessary cognitive and social-emotional skills to make them resilient to technological change.

Young people can feel defined by their Leaving Cert results and the inordinate influence of the 'points race' on the decision to proceed immediately to higher education and on what is studied – there are high non-completion rates in some programmes, while the number of graduates in elementary jobs and on low pay is high by international standards. Many of those who gain only low CAO points can enter adult life more conscious of what they do not have than of what they have. At a time of life when self-confidence should abound, some finish their schooling with little sense of achievement and low self-belief, which can lead to the dilution of their career aspirations and disregard of their potential. It is significant that some of the countries from which many EU workers come to Ireland have educational systems more equitable than Ireland's (Estonia, Poland, and Latvia²⁰).

FIT is profoundly aware of a 'waste of talent' among all too many of the 30%-40% of young people currently not transferring from school to higher education. It is also aware that making it easier for them to do so is not the answer as, for example, high non-completion rates in some HE programmes and the difficulties many graduates are having in getting jobs commensurate with their expectations attest. In FIT's experience of promoting the capacity of FET programmes as a complement to HE provision for the tech and related sectors, the number of employers who need persuading of the credentials and competencies attained on FET vocational programmes is less and less. More often than not it is the participants themselves, along with parents, who have to be convinced that there is nothing 'second-class' in choosing FET.

Overall, a more profound discussion is still needed between educationalists and the corporate sector to ensure they understand together the full breadth of competencies and skills needed to underpin working lives in the future. It is then for early, primary and secondary education in Ireland to embrace and nurture all young people with their different talents, interests and intelligences by providing the learning styles that suit them and the requisite diversity of opportunities on leaving school to make promising starts to their working lives.

6. Considerations and Recommendations

In addition to providing analysis into the skills, knowledge and competencies currently in demand in Ireland's growing tech sector, this ICT skills audit proposes to inform skills policy development, provide substantive information to education providers to assist programme development and to give some insight to educationalists, career guidance professionals and those interested in pursuing a career in the sector. The following considerations and recommendations are presented with these objectives in mind.

1. The pervasion of technologies across key sectors of the economy requires redefinition of the 'tech talent' pipeline and greater diversity in its composition

An integral part of making the national economy and regional economies amenable to high-tech will be communicating clearly the enormous potential of the new ICT technologies, across all sectors, in achieving outcomes that are not just improving our lives as consumers but our well-being, societal priorities and environmental concerns.

Accordingly the requirement for a broader participation of the population in Ireland's ICT success story as increasingly local industries, enterprises and workplaces adopt new and emerging ICT technologies necessitates vigorous engagement of regional employers and other regional economic stakeholders with the continuum of FET and HE provision.

The Regional Skills Fora on which the ETBs and third level institutions are represented have a major role in articulating the tech skill requirements of employers regionally (and collectively nationally) while facilitating the coordination of delivery of a comprehensive portfolio of tech programmes across the spectrum of tertiary education (FET + HE) through a jointly developed and comprehensive delivery plan .

2. Successful economies going forward will be characterised by the ability to adapt rapidly to the challenges and opportunities of the "4th Industrial Revolution"

The convergence of technologies, such as Artificial Intelligence (AI), robotics, the Internet of Things (IoT), big data, analytics, etc. are radically transforming how work gets done across global value chains, enabling organisations to be more intelligent, more agile, and better able to scale their operations, optimise supply chains and shift to new business models with unprecedented speed.

Ireland has undergone a remarkable recovery from a deep recession with full employment now within sight. For the economy to remain resilient to unforeseen shocks, and for future employment to be of a high quality and inclusive of the workforce nationally (across the country's nine regions), foreign investment and, especially, indigenous enterprises must embrace new technologies fully to boost productivity, innovate, grow their markets and most importantly remain competitive.

It is critical that government, the development agencies and the regions provide the right conditions, skills and capabilities that corporate strategies demand and that they are in a position to clearly articulate how an Irish location can be part of a dynamic company's ambitions for growth.

3. Successfully orchestrating learning ecosystems will be the critical skills policy challenge in an era of unprecedented digital disruption

The pace of change and technological evolution makes it in increasingly difficult to categorise the digital careers that are flourishing today with yesterday's labels. Traditional ICT specialisations are now in danger of encouraging an absence of flexibility where the ability to appreciate developments in a range of ICT fields and to work across them are now particularly highly valued. Today's tech employers require a much broader array of tech skills combined with business development, entrepreneurial, creativity and interpersonal skills. The ability to communicate with others and an approachable demeanour now matter more than before for potential candidates seeking to pursue careers in the high-tech space.

As Ireland's economy, at national and regional levels, is increasingly transformed by digital technologies over the coming years, it is crucial that skills provisioning is aligned and effective in enabling job seekers meet the requirements of a rapidly changing labour market. In the light of emerging technologies anticipation is required on how

the labour market will change, and the re-skilling and up-skilling programmes need to be prioritised by government. Ensuring that citizens have the skills to benefit from the opportunities offered by new technological developments is integral to ensuring ongoing prosperity as well as social cohesion.

This entails not just more education, but a transformation in the type of skills that are developed and how they are provided. Crucial in terms of the educational system, is not just what is taught but how it is taught and the achievements that are fostered at each level of the system, particularly during the senior cycle of secondary and upwards. This Audit's findings emphasise the importance of fostering cognitive and non-cognitive capabilities that will enable young people and job seekers pursue emerging and yet unforeseen tech impacted careers successfully. In this regard it is important to think not just in terms of formal education and training systems and their institutions, but to embrace the idea of a learning ecosystem that encompasses public, private and non-government actors who collaborate and share information to achieve mutually beneficial outcomes for learners and themselves.

4. Dual education initiatives such as the new tech apprenticeship merit the stature they are attaining in current policy and practice as key and essential contributors in addressing the strong demand forecast for ICT Skills

This requirement for proficiency across a range of technological competencies combined with a good knowledge of how business gets done necessitates effective application through hands-on learning and professional development to bring them to the levels now required in today's tech workplaces. Accordingly, the potential of dualeducation programmes (apprenticeships and traineeships), whether in FET or HE, that combine off-the-job training with work-based learning to develop and test these skills has become more appreciated, principally by employers and policy makers, and latterly by those seeking careers in tech related sectors.

5. FET deserves appropriate recognition in policy and practice as a key and essential component in addressing the increasing demand forecast for ICT practitioner skills

Consistent with the findings in this report, it has been FIT's experience and conviction for some time, that ICT employers are increasingly convinced of the technical competencies

and team working skills delivered through appropriately designed NFQ Level 5 and Level 6 programmes. It is no longer assumed that only people with a higher education are eligible to pursue careers in the technology sectors.

The findings of this skills dialogue reinforce the extent of demand in the ICT sector for people across levels of proficiency, indicating significant levels of demand for people at entry and competent as well as for expert levels. This repeated finding through the cycle of FIT ICT Skills Audits serves to correct with authority what FIT sees as a widespread and persistent misconception that the ICT skills gap is exclusively made up of roles at the apex of the skills triangle i.e. at the 'expert' level. Additionally, it has become clear from the Audits that 'the expertise' requirement articulated by tech employers' relates more to the fruit of experience rather than of the level of qualifications.

This reality requires greater resonance on the part of policy-makers particularly in the drafting of policy documents such as the ICT Action Plan. To date these would appear to undervalue the potential contribution of FET skills programmes in enhancing the tech talent pipeline which is so vital to the sustenance and future growth of related sectors within the Irish economy.

To illustrate the potential contribution of FET provision, the new ICT Associate Professional tech apprenticeship, recently approved by the national Apprenticeship Council, has the goal of delivering a minimum of 1,000 apprentices per annum into the tech sector by 2021 across a range of disciplines including Software Development, Network Engineering, Cyber Security, FinTech and Advanced Manufacturing. In this instance employers will sponsor tech apprenticeships on FET Level 6 programmes from day one.

6. Remedial actions are needed to realise the significant employment opportunities that currently exist within Ireland's tech sector

The findings of the 2018 ICT Skills Audit suggest that there are approximately 12,000 ICT practitioner vacancies currently in the tech sector in Ireland, at entry/competent levels (58%) and expert level (42%). The overall picture that emerges, therefore, is of a thriving tech sector requiring large numbers of additional ICT practitioners. This opportunity if not addressed sufficiently may quickly become a challenge to

the sectors global competitiveness as issues relating to resourcing and productivity emerge. Accordingly it is incumbent on the key stakeholders namely government/ policy-makers, tech related industry/sectors, local development agencies and education and training providers to come together and to work cohesively to deliver a coordinated response in a timely manner. Better coordination in the development, range and delivery of relevant tech training programmes across the continuum of FET and HE (both with their substantive budgets) is a critical and urgent component for success. Regional Skills Fora could facilitate the necessary dialogue between the key stakeholders on an ongoing basis with the expected outcomes clearly articulated in regional training and development plans annually – which could then be collated into national tech skills development programmes to ensure that both regional and national existing and emerging priorities are met.

7. Ensuring labour market inclusiveness in the tech sector is a shared objective

There are strong concerns that advanced countries are neglecting the extent to which groups and regions within their societies are being 'left behind' as technology, globalisation and migration reshape their labour markets. Consequently the OECD is now committing to assess the labour market performance of its member states, on the basis of the quality and inclusiveness of the employment they provide, in addition to correlation in economic performance and employment statics.

The desire is to redress the cumulative evidence emerging that technologies (principally ICT) and globalisation can, combine to cause a polarisation in national labour markets, to the point of fuelling widespread popular and political opposition to further economic internationalisation. The intent is to ensure that access to decent employment by, for example, women, young people without higher education, older workers, people with a disability, and residents of regions distant from major urban centres is prioritised and actioned to ensure satisfactory labour market performance. Ireland should aim to become the exemplar of social and economic cohesion by incorporating these concerns and necessary responses as cornerstones in future skills development policies.

Recent strategies make clear how much of the 'heavy lifting' in bringing people from disadvantaged starting points to access decent employment must be done by the ETBs, and the Regional Skills Fora, in turn, must play a key role in helping them to do so.

8. The reach and economic impact of the tech sector is significant and increasing beyond the pale

The types of employment of most relevance to this report are those that specifically require ICT skills and a demonstrated competence in using them. The spatial distribution of economic activity and employment in Ireland is one of the most concentrated in the EU/OECD due to the dominance of the Dublin City Region. However the degree of concentration of ICT practitioners and growth in their numbers observed in large city regions should not be used as templates or benchmarks for assessing the performance across the regions.

The significant growth rates in the numbers of ICT practitioners observed in the smaller regions should be built upon. The evidence suggest that the tech sector already has a degree of regional spread, and what are small numbers in comparison with large concentrated regions are not immaterial within less populated regions and are most likely of greater significance. It follows that what each regional skills forum can ambition, the measures needed to achieve its regional economy's potential and the effectiveness of each forum's performance has to be hugely contextual.

The current imbalance between Dublin and the other regions has to be seen as an opportunity rather than a threat to the effective development of ICT in the other regions. The evidence that a number of the other regions have a substantive and burgeoning ICT practitioner base should be a significant determinant in adopting appropriate policies to build on these firm foundations, providing alternatives locations for those tech sector companies coping with the costs and constraints of urban congestion as depicted in the capital. The regional growth in tech skills as recorded over the inter-census is the more significant metric in determining regional policy development. Attracting large ICT operations to small regions is possible and there are successful examples.

9. The level of tech employment provided by indigenous companies across key sectors of the economy needs to grow faster

It is important to appreciate both nationally and regionally that the full capacities of emerging technologies should be applied to improving the performance and prospects of existing industries and services. This will ensure that important industries and sectors of the economy (farming, wholesale and retail activities, accommodation and food, health services and education, etc.) are enabled and equipped to improve their quality, productivity and efficiency as key pillars of the Irish economy. Some of these companies and sectors play particularly important roles in the regions, and are most vulnerable if they do not utilise ICTs to innovate, boost their productivity, and develop new market channels.

In pursuit of the key objectives of maintaining and growing inward investment while fostering faster indigenous growth, it is crucial that, at national and regional levels, enterprises have access to workers with the skills, knowledge and competencies that enable them to exploit the newest ICT technologies.

10. Informing career choices in a sector where change is a constant requires a continuous dialogue amongst stakeholders

The ICT sector in Ireland already has some of the elements of a multifaceted skills ecosystem in place. Yet its representative bodies need to be more proactive in supporting education and training institutions in attaining a full appreciation of the tech ecosystem and the jobs within. This should facilitate a forward-looking perspective on emerging techniques and resulting state-of-the-art technologies that will inform future roles and professions yet to be defined.

Similarly, students/job seekers must be assisted to understand the implications and career prospects emanating from new technologies and their application in an everchanging and dynamic workplace. The impact of digitisation is growing exponentially and employment in IT-related careers is projected to increase at a rate that outpaces most other professions.

While the lack of qualified talent can alter the expansion plans and locational choices of organisations with positions to fill, it simultaneously provides unprecedented career opportunities and prospects for indigenous job seekers willing to develop in-demand tech skills.

Appendix 1: FIT ICT Skills Audit 2018

Company Profile				
Company Name:			Industrial Sector:	
Contact:			Number of Employees in Ireland:	
Industrial Profile:	Indigeneous	FDI	Year Established:	

Questionnaire Key:

- Use the table below to identify the additional skills you would like to have available (at a given competence level) in your organisation (e.g. figure of 2 in the "Expert" column, and 1 in the "Entry" column for Java Programming, indicates that you would like to have 2 additional "units of skill" in your organisation at expert level and one at entry level in Java Programming). Note: A "unit of skill" is not necessarily a new employee, as each employee will have more than one skill.
- 2. You are also asked to say how many staff you have already in this discipline and how many potential vacancies you may have in the next 12-18 months (e.g. a figure of 2 in the "Existing Core Programming Skills" and 1 in "Job Opportunities" indicates that you already have 2 programmers but may have a vacancy for a third.)

Discipline 1: Programming/Development Methodologies

Existing	Programming/	Dev	Staff
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Areas Requiring Upskilling Supports

No.	Skill	Expert	Competent	Entry
1	SQL			
2	Java			
3	JavaScript (Jquery)			
4	.Net (ASP.NET/VB.Net /C#)			
5	C++			
6	Objective C			
7	Python			
8	PHP			
9	Ruby on Rails			
10	Curl			
11	Delphi			
12	Eiffel			
13	IBM DB2			
14	Cobol			

No.	Skill	Expert	Competent	Entry
15	Oracle ADF			
16	Windows Server and Windows Client Editions			
17	Go			
18	Team Foundation Server (TFS)			
19	iOS/Swift			
20	Project Management			
21	Problem Solving			
22	Professional Development (Soft Skills)			
23	Other Skill (Specify)			
24	Other Skill (Specify)			
25	Other Skill (Specify)			

Discipline 2: Mobile Technology/Development Platform

Existing Mobile Technology/Dev Staff

Areas Requiring Upskilling Supports

No.	Skill	Expert	Competent	Entry
1	Java			
2	JavaScript (Jquery)			
4	.Net (ASP.NET/VB.Net /C#)			
5	CSS			
6	HTML5			
7	Objective C			
8	iOS/Swift			
9	Phone Gap			
10	NativeScript			
11	React Native			
12	Xamarin			
13	Notable			
14	Slack			
15	Wordpress			

No.	Skill	Expert	Competent	Entry
16	MailChimp			
17	Hangouts			
18	UX Design (HEART)			
19	Enterprise Mobile Management			
20	Wi-Fl Standards (802.11ac)			
21	Long Term Evolution Technology (LTE and LTE-A)			
22	Project Management			
23	Problem Solving			
24	Professional Development (Soft Skills)			
25	Other Skill (Specify)			
26	Other Skill (Specify)			

Discipline 3: Web Development/Technologies

Existing Web Development Staff

Areas Requiring Upskilling Supports

No.	Skill	Expert	Competent	Entry
1	SQL			
2	MySQL			
3	Redis			
4	.Net (ASP.NET/VB.Net /C#)			
5	PHP/JSP			
6	Python (Django/Flask)			
7	Ruby (Rails/Sinatra			
8	Java			
9	Java Web Frameworks (Spring, Hibernate, JSF/ JSP, REST, SOAP etc)			
10	Javascript (Jquery) (HTML5/CSS/JavaScript/ Jquery/Angular JS/Gulp)			
11	HTML5			
12	CSS			
13	Angular JS/Gulp			
14	Node.js (Express/Hapi)			
15	Go (Revel)			
16	Web API			
17	Wordpress			
18	Joomla			
19	Magento			
20	Motion UI			
21	Foundation for Apps (AngularJS + flexbox grid framework)			

No.	Skill	Expert	Competent	Entry
22	Docker (Containers)			
23	React			
24	CMS			
25	Polymer			
26	Bootstrap			
27	Foundation			
28	MDL			
29	SASS			
30	LESS			
31	PstCSS			
32	Atom			
33	Visual Studio Code			
34	Giy			
35	Photoshop			
36	Dreamweaver			
37	Adobe EDGE			
38	ADO.Net			
39	Trackwise			
40	Project Management			
41	Problem Solving			
42	Professional Development (Soft Skills)			
43	Other Skill (Specify)			
44	Other Skill (Specify)			
45	Other Skill (Specify)			

Discipline 4: Software Development Tools and Methodologies

Existing S/D Tools and Methodologies Staff

Areas Requiring Upskilling Supports

No.	Skill	Expert	Competent	Entry
1	Agile (Crystal Methods, DSDM, Scrum)			
2	Exteme Programme (XP)			
3	Feature Driven Development (FDD)			
4	Joint Application Development			
5	Lean Development			
6	Rapid Application Development (RAD)			
7	Standard Revision Control (SVN) & Defect Tracking Tools (JIRA)			
8	Git			
9	Continuous Delivery			
10	Object Orientated Design & Development Tools			
11	Experience with Open Source Tools			

No.	Skill	Expert	Competent	Entry
12	SDLC -Software Development Life Cycle			
13	OO Design using UML			
14	DB 2			
15	Bitbucket			
16	Bamboo			
17	Docker			
18	PROGRESS			
19	Software Testing			
20	Project Management			
21	Problem Solving			
22	Professional Development (Soft Skills)			
23	Other Skill (Specify)			
24	Other Skill (Specify)			
25	Other Skill (Specify)			

Discipline 5: Cloud Computing

Existing Cloud Staff

Areas Requiring Upskilling Supports

No.	Skill	Expert	Competent	Entry
1	Amazon Web Services			
2	Microsoft Cloud/Azure/ Office 365			
3	MCSE Private Cloud			
4	MCSA Windows Server 08/12/16			
5	VMWare vCloud			
6	EMC Cloud Architect (EMCCA)			
7	Openstack Cloud			
8	Rackspace Public Cloud			
9	Comptia Cloud+			
10	CompTIA Network +			
11	Salesforce			
12	IBM SmartCloud Enterprise			
13	HP Enterprise Services			
14	MCSA: Windows Server			
15	MCSE: Private Cloud			
16	Certified Cloud Security Professional (CCSP)			
17	Microsoft SQL Server			
18	IBM Cloud Big Data			

No.	Skill	Expert	Competent	Entry
19	Oracle Database			
20	MySQL			
21	Hadoop			
22	Mongo DB			
23	Support Engineer (Linux - Redhat, Debian, Ubuntu)			
24	Exposure to Shell/Perl/ Python/PHP scripting			
25	CloudSigma			
26	WorkXpress			
27	Google Compute Engine			
28	Sphere			
29	Web Services SOAP, REST			
30	HyperV			
31	Docker			
32	NGINX			
33	Project Management			
34	Problem Solving			
35	Professional Development (Soft Skills)			
36	Other Skill (Specify)			
37	Other Skill (Specify)			

Discipline 6: Platform Administration

Existing Platform Staff

Areas Requiring Upskilling Supports

No.	Skill	Expert	Competent	Entry
1	MCSE Cloud Platform and Infrastructure			
2	MCSE Server Infrastructure			
3	MCSE Private Cloud			
4	MCSA Windows Server 08/12/16			
5	Managing Microsoft SharePoint Server 2016			
6	Exchange Server Rollout and Administration			
7	Microsoft Hyper-V			
8	Microsoft Cloud/Azure/ Office 365			
9	Enabling Office 365 Services			
10	VMWare vCloud			
11	PowerShell - DSC			
12	Linux LPIC1/LPIC 2			
13	Linux Foundation Certified System Administrator (LFCS)			

No.	Skill	Expert	Competent	Entry
14	Support Engineer (Linux - Redhat, Debian, Ubuntu, Mint)			
15	Comptia Linux+			
16	Comptia Server +			
17	VBScript/PowerShell/C# scripting			
18	Information Technology Infrastructure Library (ITIL)			
19	OpenStack			
20	Cloudstack			
21	Analytical/Quantitative Skilss			
22	Leadership Skills			
24	Project Management			
25	Problem Solving Skills			
26	Professional Development (Soft Skills)			
27	Other Skill (Specify)			
28	Other Skill (Specify)			
29	Other Skill (Specify)			

Discipline 7: Cyber Security & Digital Forensics

Existing Cyber Security/Digital Forensics Staff

Areas Requiring Upskilling Supports

No.	Skill	Expert	Competent	Entry	No.	Skill	Expert	Competent	Entry
1	Computer Systems Architecture				13	Vulnerability Assessment Techniques/Penetration			
2	Networking &					Testing			
	Configuration (WAN/ LAN/Wireless)				14	Database Design, Scripting & Data			
3	Routers and Routing/					Processing			
	Secure Transfer Topology				15	Data Management			
4	Network Vulnerability					Systems/Protocol			
	Analysis/Security				16	Business Continuity			
5	Malware Investigation &				М	Management			
	Analysis				17	Virtualisation Support/			
6	Software Development &					Cloud Security			
	Testing				18	Digital Compliance			
7	Cryptographic Storage				19	Analytical/Quantitative			
8	Mobile Technologies					Skilss			
9	Web Development Client				20	Leadership Skills			
	Side/Server Side)				21	Project Management			
10	Web Application Security				22	Problem Solving Skills			
	- SANS 25 Errors/OS				23	Professional			
	Тор 10					Development (Soft Skills)			
11	Cyber Incident Analysis -				24	Other Skill (Specify)			
	Reporting				25	Other Skill (Specify)			
12	Forensic Investigation				26	Other Skill (Specify)			
	Methodologies								

Cyber Security Tools						
No.	Skill	Expert	Competent	Entry		
i	LetsEncrypt					
ii	Nmap					
iii	OpenVAS					
iv	OSSEC					
V	Securityonion					
vi	Metasploit framework					
vii	OpenSSH					
viii	Wireshark					
ix	Kali Linux					
х	Nessus					
xi	Aircrack					
xii	Snort					
xiii	Cain and Abel					
xiv	Netcat					
XV	Tcpdump					
xvi	Tshark					
xvii	John the ripper					
xviii	Kismet					
xix	Putty					
xx	BackTrack					
xxi	Nikto					
xxii	Truecrypt					
xxiii	Other Skill (Specify)					
xxiv	Other Skill (Specify)					
XXV	Other Skill (Specify)					

Digital Forensics Tools						
No.	Skill	Expert	Competent	Entry		
i	SANS Investigative Forensics Toolkit - SIFT					
ii	Volatility					
iii	Digital Forensics Framework					
iv	The Sleuth Kit					
V	Santoku					
vi	Open Computer Forensics Architecture					
vii	CAINE					
viii	X-Ways Forensics					
ix	EnCase					
х	Registry Recon					
xi	Llibforensics					
xii	WindowsSCOPE					
xiii	The Coroner's Toolkit					
xiv	Oxygen Forensic Suite					
XV	Bulk Extractor					
xvi	Xplico					
xvii	Mandiant RedLine					
xviii	Computer Online Forensic Evidence Extractor (COFEE)					
xix	P2 eXplorer					
xx	PlainSight					
xxi	XRY					
xxii	HELIX3					
xxii	Cellebrite UFED					
xxiii	Other Skill (Specify)					
xxiv	Other Skill (Specify)					
XXV	Other Skill (Specify)					

Discipline 8: DevOps

Existing DevOps Staff

Areas Requiring Upskilling Supports

	No.	Skill	Expert	Competent	Entry
	1	MCSE Cloud Platform & Infrastructure			
	2	MCSE Server Infrastructure			
	3	MCSA Windows Server 08/12/16			
	4	Microsoft Team Foundation Server			
	5	Microsoft Azure			
	6	Microsoft Hyper-V			
	7	Amazon Web Services			
	8	Linux Foundation Certified System Administrator (LFCS)			
	9	Vmware vCloud			
	10	Cisco CCNA Cloud (CLDFND)			
	11	Google Cloud SQL			
	12	Google Big Query			
	13	Apached Hadoop			
	14	OpenStack			
	15	Cloudstack			
	16	Chef			
	17	Docker			
	18	Powershell			
	19	Perl			
	20	Ruby			
	21	JavaScript (Jquery)			
	22	Code to RESTFUL APIs			
7	23	C++			

No.	Skill	Expert	Competent	Entry
24	.Net (ASP.NET/VB.Net /C#)			
25	SQL			
26	ASP			
27	Chef			
28	Puppet			
29	Ansible			
30	Vagrant			
31	CFEngine			
32	GIT			
34	Visual Studio Online			
35	Kernel-based Virtual Machine (KVM)			
36	CruiseControl (.NET)			
37	Jenkins			
38	Cucumber			
39	Bamboo			
40	Hudson			
41	ThoughtWorks' Go			
42	Nunin			
43	Cloudwatch			
44	Project Management			
45	Problem Solving			
46	Professional Development (Soft Skills)			
47	Other Skill (Specify)			
48	Other Skill (Specify)			
49	Other Skill (Specify)			

Discipline 9: Networking Technologies

Existing Net Tech Staff

Areas Requiring Upskilling Supports

No.	Skill	Expert	Competent	Entry
1	Cisco Certified Internetwork Expert (CCIE)			
2	CISCO Cisco Certified Network Administrator - CCNA			
3	Cisco Certified Network Professional - CCNP			
4	MCSA Windows Server 16/12/08			
5	MCSE Server Infrastructure 2012			
6	VMWare Certified Associate – Network Virtualizatio			
8	AWS Certified Solutions Architect - Associate			
9	IP Networking			
10	CompTIA Network+			
11	Comptia A+ Certification			
12	Comptia Linux+			
13	CWNP Certification (Wireless Networks)			
14	Certified Information Systems Security Professional (CISSP)			

No.	Skill	Expert	Competent	Entry
15	Juniper Networks Certified Internet Associate			
16	Citrix			
17	WCNA: Wireshark Certified Network Analyst.			
18	Network Security			
19	Wireless Networking			
20	Certified in Risk and Information Systems Control(CRISC)			
21	SNIA Certified Storage Network Expert			
22	Certified Wireless Networking Professional			
23	Digital Rights Management			
24	Project Management			
25	Problem Solving			
26	Professional Development (Soft Skills)			
27	Other Skill (Specify)			
28	Other Skill (Specify)			
29	Other Skill (Specify)			

Discipline 10: Big Data

Existing Big Data Staff

Areas Requiring Upskilling Supports

No.	Skill	Expert	Competent	Entry
1	Microsoft Azure			
2	IBM Cloud Big Data			
3	IBM DB 2			
4	Oracle			
5	SAP HANA			
6	SAP Vora			
7	Vmware			
8	Apache Hadoop			
9	Apache Spark			
10	Google Big Query			
11	IBM BlueMix			
12	Amazon Kinesis			
13	NoSQL			
14	MongoDB			
15	Couchbase			
16	SQL			
17	Java			
18	С			
19	Python			

No.	Skill	Expert	Competent	Entry
20	Scala			
21	JavaScript			
22	Linux			
23	Systems Architecture			
24	Systems Administraton			
25	Network Adminstration			
26	NiFi			
27	Phenix			
32	Machine Learning/Data Mining			
33	Stastical Analysis (SAS, SPSS, Strata, Matlab, R)			
34	Problem Solving			
35	Project Management			
36	Problem Solving			
37	Professional Development (Soft Skills)			
38	Other Skill (Specify)			
39	Other Skill (Specify)			
40	Other Skill (Specify)			

Discipline 11: Enterprise Applications

Existing Enterprise Applications Staff

Areas Requiring Upskilling Supports

No.	Skill	Expert	Competent	Entry
1	SQL			
2	MySQL			
3	MCSA SQL 16/14/12			
4	MCSE Data Platform			
5	IBM DB2			
6	IBM Enterprise Applications			
7	IBM Cognos			
8	NoSQL			
9	SAP HANA			
10	SAP Enterprise Information Management (EIM) Solutions			
11	SAP Enterprise Resource Planning (ERP)			
12	Oracle ERP			
13	Salesforce			
14	PeopleSoft			
15	Dynamics CRM			

No.	Skill	Expert	Competent	Entry
16	Sureskills			
17	WORKDAY			
18	VMware VEEAM			
19	WorkWise			
20	Knowledge of Data-base Design			
21	Sugar CRM			
22	MS Access/Excel			
23	SharePoint			
24	Hana			
25	TrackWise			
26	Project Management			
27	Problem Solving			
28	Professional Development (Soft Skills)			
30	Other Skill (Specify)			
31	Other Skill (Specify)			
32	Other Skill (Specify)			

Discipline 12: eBusiness/Digital Marketing

Existing eBus/Digital Marketing Staff

Areas Requiring Upskilling Supports

No.	Skill	Expert	Competent	Entry
1	Search Engine Optimisation (SEO)			
2	Google Keyword Planner			
3	Open Site Explorer			
4	Ahrefs			
5	Search Behaviour Tools (Moz, SEMRush etc.)			
6	SEM - Pay Per Click (Google Adwords etc)			
7	Content Management (CMS)			
8	WordPress			
9	Joomla			
10	ocPortal			
11	Drupal			
12	Customer Relationship Management (CRM)			
13	Salesforce			
14	Oracle			
15	SAP Enterprise Information Management (EIM) Solutions			

No.	Skill	Expert	Competent	Entry
16	Dynamics CRM			
17	Analytics/Performance			
18	Google Analytics			
19	Facebook Insights			
20	Twitter Analytics			
21	Teradata's Marketing Operations			
22	HootSuite			
23	Performance			
24	Email Marketing			
25	MailChimp			
26	iContact			
27	Salesforce Marketing Cloud			
28	Maketo			
29	Social Media Marketing /Planning (Facebook, Linkedin, Twitter etc)			
30	Social Media Monitoring /Blogging (Online PR & Communications)			
31	Viral Marketing			
32	Buzzfeed			
33	Upworthy			
34	ViralNova			

Discipline 12: eBusiness/Digital Marketing contd.				
Existing eBus/Digital Marketing Staff	Areas Requiring Upskilling Supports	Job Opportunities (recruitment in next 12 - 18 months)		

No.	Skill	Expert	Competent	Entry
35	E – commerce			
36	Digital Display Advertising			
37	Affiliate Marketing			
38	Planning and Implementing a Digital Marketing Strategy			
39	Lead Nurturing (B2B)			
40	UX Design			
41	Slideshare			
42	Adobe Photoshop			
43	Adobe Illustrator			
44	Coding			
45	HTML5			
46	CSS			
47	Project Management			
48	Problem Solving			
49	Professional Development (Soft Skills)			
51	Other Skill (Specify)			
52	Other Skill (Specify)			
53	Other Skill (Specify)			

Discipline 13: Call Centre/Contact Centre Support

Existing Call/Contact Centre Staff

Areas Requiring Upskilling Supports

No.	Skill	Expert	Competent	Entry
1	Proficient in relevant Computer Applications			
2	Knowledge of Customer Service Principles & Practices			
3	Knowledge of Call Centre Telephony & Technology			
4	Customer Service Experience			
5	Good Data Entry/ Keyboard Skills			
6	Knowledge of Administration & Clerical Processes			

No.	Skill	Expert	Competent	Entry
7	Relevant Product Knowledge			
8	Appreciation of E-Commerce/Cloud Technologies			
9	Contact Centre Metrics			
10	Project Management			
11	Problem Solving			
12	Professional Development (Soft Skills)			
13	Customer Facing			
14	Other Skill (Specify)			
15	Other Skill (Specify)			
16	Other Skill (Specify)			

Discipline 14: Digital Skills/Media

Existing Digital Media Staff

Areas Requiring Upskilling Supports

No.	Skill	Expert	Competent	Entry
1	Object Orientated Design			
2	Bootstrap			
3	JavaScript (Jquery)			
4	Angular			
5	Code Igniter			
6	PHP			
7	CSS			
8	HTML5			
9	MySQL			
10	Wordpress			
11	Joomla			
12	Magento			
13	Motion UI			
14	Docker			
15	Atomic			
16	Ceros			
17	Protosketch			
18	Floid			
19	Vectr			
20	Fuse			
21	Picktorial			
22	Figma			
23	Uxpin			
24	Gravit			
25	Adobe Creative Cloud			

No.	Skill	Expert	Competent	Entry
26	Photoshop CC			
27	Illustrator CC			
28	Pixelmator			
29	Skitch			
30	Coda 2			
31	InDesign CC			
32	Sublime Text			
33	Framer.js			
34	3D animation			
35	3DLive			
36	MXRToolkit			
37	ARToolkit			
38	fIARToolkit			
39	Silverlight			
40	Papervision 3D			
41	InDesign			
42	Illustrator			
43	Firework			
44	After Affects			
45	Project Management			
46	Problem Solving			
47	Professional Development (Soft Skills)			
48	Other Skill (Specify)			
49	Other Skill (Specify)			
50	Other Skill (Specify)			

Discipline 15: Games Development

Existing Games Development Staff

Areas Requiring Upskilling Supports

Skill	Expert	Competent	Entry
Unity/Unity Mobile			
Unreal Developmetn Kit			
Yebis			
Cloudant			
Marmalade			
GameSparks			
GameMaker			
GameSalad			
FMOD			
Edgelib			
CryEngine			
Coroan SDK			
ShiVa3d			
MoSysn			
OpenGame Art			
Blender			
Game State Management (GSM)			
Object Orientated Development			
	Skill Unity/Unity Mobile Unreal Developmetn Kit Yebis Cloudant Marmalade GameSparks GameSparks GameMaker GameSalad FMOD Edgelib CryEngine CryEngine Coroan SDK ShiVa3d MoSysn OpenGame Art Blender Game State Management (GSM)	SkillExpertUnity/Unity MobileUnreal Developmetn KitYebisCloudantMarmaladeGameSparksGameSaladFMODEdgelibCryEngineCoroan SDKShiVa3dMoSysnOpenGame ArtBlenderGame State Management (GSM)Object Orientated Development	SkillExpertCompetentUnity/Unity MobileUnreal Developmetn KitYebisCloudantMarmaladeGameSparksGameMakerGameSaladFMODEdgelibCoroan SDKShiVa3dMoSysnOpenGame ArtBlenderObject Orientated Development

No.	Skill	Expert	Competent	Entry
19	3D Graphics Theory			
20	Game Logic & Design			
21	HTML5/CSS/JavaScript/ Jquery			
22	Web-based Architectures & Technologies (REST, XML, JSON).			
23	.Net (ASP.NET/VB.Net /C#)			
24	C++			
25	Java			
27	MEL			
28	Unity			
29	Project Management			
30	Problem Solving			
31	Professional Development (Soft Skills)			
33	Other Skill (Specify)			
34	Other Skill (Specify)			
35	Other Skill (Specify)			
Discipline Transversal Skill A: Project Management

Existing PM Staff

Areas Requiring Upskilling Supports

Job Opportunities (recruitment in next 12 - 18 months)

No.	Skill	Expert	Competent	Entry
1	Prince II			
2	Agile/Scrum/Kanban			
3	IBM DevOps			
4	Six Sigma/Lean			
	PMI Project Management Professional			
5	ITIL (Information Technology Infrastructure Library)			
6	Experience in Project Management Capacity			
7	Experience in People Management			

			Linug
Experience in Strategic Planning			
PMP			
Comptia Project +			
Feamwork.com			
Basecamp			
Slack			
Aicrosoft Project			
Other Skill (Specify)			
Other Skill (Specify)			
Other Skill (Specify)			
	xperience in Strategic lanning MP comptia Project + eamwork.com casecamp lack licrosoft Project Other Skill (Specify) Other Skill (Specify)	xperience in Strategic lanning MP comptia Project + eamwork.com asecamp lack licrosoft Project Other Skill (Specify) Other Skill (Specify)	xperience in Strategic lanningStrategic lanningMPImage: Strategic method strategiccomptia Project + eamwork.comImage: Strategic method strategiccasecampImage: Strategic method strategiclackImage: Strategic method strategiclicrosoft ProjectImage: Strategic method strategicOther Skill (Specify)Image: Strategic method strategicOther Skill (Specify)Image: Strategic method strategicOther Skill (Specify)Image: Strategic method strategic

Discipline Transversal Skill B: Problem Solving Skills

Existing PM Staff

Areas Requiring Upskilling Supports

Job Opportunities (recruitment in next 12 - 18 months)

No.	Skill	Expert	Competent	Entry
1	Communication Verbal			
2	Communication Written			
3	Presentation Skills			
4	Leadership			
5	Customer Focus			
6	Self-starter			

No.	Skill	Expert	Competent	Entry
7	Teamwork			
8	Multi-tasking			
9	Prioritisation			
12	Customer Facing			
13	Other Skill (Specify)			
14	Other Skill (Specify)			
15	Other Skill (Specify)			

Discipline Transversal Skill C: Professional Development

Existing PM Staff

Areas Requiring Upskilling Supports

Job Opportunities (recruitment in next 12 - 18 months)

No.	Skill	Expert	Competent	Entry
1	Design of Experiments			
2	Critical Thinking Skills			
3	Analytical Thinking Skills			
4	Inventive Thinking Skills			
5	Systems Thinking Skills			
6	Models Based Problem Solving			
7	7 Step Problem Solving			
8	Technical report writing			

No.	Skill	Expert	Competent	Entry
9	Task Force Leadership			
10	Knowledge Management Skills			
11	Major Incident Management			
12	Root Cause Analysis			
13	Other Skill (Specify)			
14	Other Skill (Specify)			
15	Other Skill (Specify)			

Job Specs/Vacancies most difficult to fill?				
1	2	3		
4	5	6		

Addressing Skill Needs

No.	Question	Describe/Elaborate		
1	From what IT Programmes do you currently source candidates?			
2	Are you satisfied with the calbire of the candidates you source from such IT Programmes?			
3	Are you satisified with the quantity of candidates you can source from such programmes?			
4	Have you any recommendations on how such IT Progammes might better address your skill requirements?			
5	Do you experience any barriers to developing skills within your organisation ?		No	Yes
		Time		
		Cost		
		Skills Needs Analysis		
		Knowledge/Access to Training Provision		
		Other		
6	Does your organisation have a requirement for languages?		No	Yes
		Basic	Intermediate	Fluent
6a	What languages does your organisation require and at what level?			
6b	Do you foresee additional language requirements within the next three years?		No	Yes
		Basic	Intermediate	Fluent

Part	Participation in Apprenticeship Programmes				
No.					
			Yes	No	
1	Have you ever availed of an Apprenticeship Programme?				
2	Would you be interested in Hiring Apprentices?				
2a	If Yes – Apprentices in what specific areas?				
3	What would encourage you to conisider engaging with an Apprenticeship Programme?				
4	What would dissuade you from considering an Apprenticeship Programme for accessing skills?				

Gender Balance & Diversity

No.			
		Yes	No
1	Is Gender Balance and Diversity an issue for your company?		
2	Does the company implement any strategies to promote Gender Balance and Diversity		
2a	If Yes please outline:		

Sup	Supporting Questions				
No.					
			Yes	No	
1	Does the Company avail of Government Programmes?				
2	Key request to Government on the Skills Agenda?				
3	Key request to Government re: doing business in Ireland?				
4	Would the company support the development of dual-education initiative 'apprenticeship-style programmes as a complement to existing provision?				

Other Comments

Note:

All information is treated with the strictest confidence and no respondent (or organisation) will be individually identified but participating companies will be acknowledged in a general list of contributors.

Appendix 2: List of Participating Companies

Abcon	DCU ISS	Internet Exchange	SAP
ABP Foods	DEITG	Irish Times	Sheridans Insurance
Accenture	Dillon Productions	IT Guys	Siemens
AccuBook	DMAC	Jalmia Solutions	Sita
Altocloud	eConcepts	Liberty Insurance Dublin	Skillsoft
Aphix Software	EHA Soft	Matrix Internet	SLM Eire Teo
Applied Systems Relay Software	ElectroRoute	MeanIT Web Design	SonorPlex
AQ Metrics	Ernact	Mechatrons	Spector Information Securities
Arachas	Errigal	MTC Solutions	Strata IT
Aspire Technologies	eTelligence	Nebula	Studio Forty 9
ASTARA CREATIVE LTD.	Etsy	OAth	Sun Life Financial
ATA Group	Evo Soft	Ocuco	Taxback
AvantCard	Exigent Networks	Optum	Teamwork
Bluemetrix	Finn Media	Overstock.com	Tekenable
Bord na Mona	Forward Emphasis	P3 Hotels	Trilogy Technologies
Carl Stuart Group	Future Range	Perfect Cards IT	Three
Celestica	Gartan Technolgies	Pet Safe	Trinity Eng. Dept.
Cerebreon	Gillespie Avionics Limited	PFH	Trojan IT Solutions
CiX (Cork Internet Exchange)	GMI (Genomics Medicine Ireland)	PlanNet21	Truck Science
Coca Cola	Google	Platform Avenues	Version 1
Clan William Group	GPS Systems	Pramerica	Vesta
Codex	Horner	Profile Technology Ltd	VmWare
Compupac	Houghton Mifflin Harcourt	Qpercom	Voxpro
Compunet IT Solutions	HSE	Quick Tech	Windmill Lane Pictures
Control Soft Automation	IBM Ireland	Randox	Xilinx
Cora	ICECUBE/Intuity	Realex Payments	Zing Technologies
Data Parts	ICS	Renaissance	
Data Solutions	iNet Solutions	Retail Solutions	
DC Networks	Instillo	Riot Games	

A number of companies who responded to the survey requested not to be included in this table but agreed to have their response/data included in the analysis

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Software Developer

NFQ Level 6

