SOFTWARE SKILLS FOR A 10X ECONOMY

DIGITAL SKILLS NI NETWORK

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Forward

The Northern Ireland Executive and the Department for the Economy have made a commitment to develop the Northern Ireland economy by ten-fold over the next ten years through the adoption of innovation and smart specialisation on the industry sectors where Northern Ireland has a world leading competitive advantage.

To achieve this goal, it is likely that this innovation will be based on digital technologies and so there will be an increasing demand for a digitally competent workforce and an even greater demand for the software engineering skills that develop the technologies that enable digital technologies to function. There are concerns in the software sector that there will not be sufficient people with the software skills to support the growth of the 10X Economy.

The demand for software development and engineering jobs in Northern Ireland has remained strong throughout the Pandemic. This demand is across all sectors of the economy as organisations moved to remote working and digitising their supply chains. International evidence indicates that this demand trend will continue well into the future as the nature of work continues to change.

The software sector in Northern Ireland relies heavily on the education system to provide the majority of its new entrants each year but there are worrying signs that this supply of skills could be disrupted. The number of applications to university courses in computer science and software engineering has declined. The number of post-primary schools offering 'A' Level and GCSE courses in the subjects valued by industry is too small resulting in fewer people seeking places in tertiary education in these subject areas. There are alternative pathways into the sector but issues remain with these programmes resulting in numbers from these interventions remaining small.

Like other industry sectors the software sector works hard to make itself an attractive career choice for young people. There are multiple sector attractiveness initiatives organised by industry, government and the third sector. These initiatives are well meaning, generate a lot of activity and are staffed by highly motivated people but given the decline in university applications and the low numbers of post-primary pupils undertaking the courses valued by the software sector there must be a doubt over the effectiveness and impact of these sector attractiveness programmes.

Finally, the software sector needs a voice. The software sector in Northern Ireland employs 30,000 people, in jobs paying above the national average, in over 2,200 companies and generates £1.5bn annually yet there is no one single organisation that represents the sector either in Northern Ireland internally, nationally or internationally. There are multiple groups established to take the views of employers in the software sector but these are for the purposes of the organisations that have established these groups, not to represent the views of the sector as a whole. Companies in the software sector should come together to form a single representative body to raise issues of concern to the sector, develop a strategy for the sector and to represent the software sector to government, academia and the general public.

Introduction

The Digital, Information, Communications and Technology sector or Software Sector plays an important part of the Northern Ireland economy with almost 2,200 companies registered[1] and employing approximately 30,000 people[2]. This figure takes account of the number of technology related jobs in other sectors.

The sector was worth £1.5billion[3] in 2019 and is dominated by activities relating to 'computer programming, consultancy and related activities'.

In the context of this report digital skills are considered to be the skills required to operate digital devices whereas the focus of this report is on the engineering skills required to develop the software that enables digital devices to function.

Since the "dot.com crash" just over twenty years ago the software sector in Northern Ireland has experienced problems in matching its demand for skilled labour with the supply of skilled labour from educational institutions and elsewhere. There have been intermittent interventions by government that have provided short term assistance but the establishment of the Digital Skills NI Network affords a real opportunity to address the skills imbalance in a more sustainable manner by bringing together the industry, academia and the relevant government agencies to address the skills issues. Changes in company processes through the adoption of digital technologies as a result of the Coronavirus pandemic and the introduction of Industry 4.0 place greater demands on the need for digitally competent workers.

Whilst the full impact of the Covid-19 pandemic will not be known for several years there is evidence to suggest that it has had a positive commercial benefit for software companies as other businesses adjust their business models and processes to accommodate remote working, the digitisation of work processes and the advancement of automation in Industry 4.0.

A recent report by the University of Liverpool showed that 76% of businesses surveyed in the North West of England had introduced new technologies into their workplace, 83% were using more technology than pre-pandemic with 67% believing that they were more efficient through the use of digital technology. However, the demand for more digital technology has led to an increased demand for digital skills. A Tech Nation survey found that advertised roles in the digital technology sector rose by 36% between June and August 2020; it also found that Belfast (and Cambridge) had the highest proportion of advertised roles in digital technology at 26% of all advertised posts. The University of Liverpool study found that 29% of businesses reported that skills shortages would be a barrier to digital innovation.

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1 Inter-Departmental Business Register, NISRA – includes all companies in the Information and Communication sector

2 Labour Force Survey, NISRA. Defined as the following occupations: SOC 5245 (IT Engineers), SOC 213 (Information Technology and Telecommunications), SOC 1136 (Information technology and telecommunication directors) and SOC 313 (Information Technology Technicians).

3 Regional GVA (current price estimates), Office for National Statistics

Introduction

In July 2020 McKinsey Global Institute commissioned a survey amongst 800 business executives across nine countries: Australia, Canada, China, France, Germany, India, Spain, the United Kingdom and the United States. The results showed that 68% of the 800 surveyed (544) indicated they have plans to increase adoption of automation and AI. A similar number indicated that they expect more deployment of digital working tools, e-commerce platforms and digital supply chain platforms. The same report 'The Future of Work after Covid-19' also predicts a sustained rise in the use of e-commerce with 56% of consumers in eight countries stating that they planned to continue using online grocery shopping after the pandemic.

The pandemic has also seen consumers increase their use of telemedicine.

For businesses the increase in e-commerce may cause a shift in occupations away from customer facing roles e.g. traditional retail to roles that require digital skills. McKinsey also predicts the increase use of digital platforms will change pre-pandemic working practices such as a decrease in business travel as home working remains and areas such as manufacturing where automation maybe used to reduce workspace proximity of workers.

The scoping study exists to provide clear, logical and evidence-based recommendations aimed at addressing the ever-increasing need for digital skills. The purpose of the Digital Skills NI Network is to collectively assess how best to address the software skills (computing science, software engineering) issues in the short, medium and long term.

The purpose of this Scoping Study, funded by Invest NI Collaborative Growth Programme, was to assess the impact of the Covid-19 Pandemic and EU Exit on the CBI NI report 'Opportunities Available' from February 2020 by Dr Owen Sims and to explore other issues relating to the supply and demand for software skills. The research was undertaken between April – July 2021. 41 individuals assessed and commented on the policy recommendations and 36 face-to-face interviews and structured conversations were held with stakeholder organisations. The findings and recommendations are collated under the headings:

- The Software Skills Supply Chain
- Alternative Pathways
- Sector Attractiveness Activities
- Employer Advisory Group Landscape
- New Software Skills Action Plan

Purpose

The Digital Skills NI network first came to together informally in 2018 when a group of CBI members from the software sector raised issues that they were struggling to find individuals with the appropriate digital skills to service their collective company requirements and future growth.

The CBI subsequently facilitated several well attended roundtable discussions with CEOs and other stakeholders to understand the issues and how to address them. This core group of companies attending the discussions have traditionally competed with each other for talent, but it was perceived that wage inflation and general skills availability was having a negative impact on the overall competitiveness of the sector and there was agreement to work together to try and resolve these issues.

This early engagement work identified the following concerns:

- A lack of skills availability – a deficit of adequately qualified individuals in the local market at entry and mid-tier level for current and anticipated future demand;

- A decreasing pipeline – of individuals thereby storing up future problems for growth;

- A need to ensure the relevance of the curriculum at all levels of education;

- The perceived siloed approach between industry and educators;

- The challenges in continuing to attract FDI in a region with a severe skills deficit;

- The challenge of growing the indigenous economy for the same reasons;

- The impact of the Covid-19 pandemic and the increased potential of poaching NI skills by globally remote firms;

- The impact of EU Exit on the ability to attract international talent given the UK Government's migration policy and the weakness of Sterling.

There followed a more detailed body of research and this culminated in the publication of the report '**Opportunities Available** Towards a Digital Action Plan for Northern Ireland' authored by Dr Owen Sims.

Building on this spirit of collaboration the purpose of this Scoping Study is to identify how best to leverage communication and engagement between stakeholders in industry, government and academia with the aim of ensuring the gap between skills demand from industry and skills supply from education and training is narrowed (it is unlikely to ever be closed).

By ensuring a better skills match it is anticipated that local companies will be better placed to grow and compete in the wider market. It is also anticipated that addressing this skills match will have benefits in addressing the deficit of digital skills across the whole Northern Ireland economy. As evidenced earlier, there is increasing demand for digital skills in all sectors of the economy accelerated by the impact of Covid-19 and EU Exit as companies digitise their processes in order to remain competitive.

The results of this report are based on research with key stakeholders from the software sector, academia and government in Northern Ireland between May and July 2021. In total there were 36 face to face interviews and structured conversations and a further 11 responses to prioritise the policy recommendations in the original report from 2020.

Executive Summary

Executive Summary

The 10x Economy

The Executive/ Department for the Economy is committed to create a "10x Economy for Northern Ireland" over the next decade. Heralding a decade of innovation that will encourage greater collaboration and innovation to deliver a ten times better economy with benefits for all citizens in Northern Ireland.

The high-level strategy will realise this ambition by focussing on innovation in areas where the economy has real strengths and making sure these gains mean something to all businesses, people and places in Northern Ireland. Overall, the aim is to see a positive impact on economic, societal and environmental wellbeing. This level of ambition to build a '10x Economy' reflects the scale of the challenges ahead, and the opportunity to make a generational change.

The ambition in this vision is to drive economic growth through a focus on innovation, whilst also achieving a fairer distribution of opportunities for all people to participate in, and benefit from, this growth. Innovation is at the centre of this vision as it will unlock a higher number of better jobs. Innovation can mean different things to different people. Some may view it as the outcome of research, others as new technology. In its most basic form, innovation simply means the development of creative ideas and methods into new products or services.

Innovation can be harnessed to keep Northern Ireland relevant to the generational challenges we face today. The scale of ambition we are setting is a tenfold increase in innovation.

In education and the workplace this means giving people the necessary training, reskilling and upskilling in order to maximise their potential, both within existing and future growth sectors. There is a need to inspire future generations to work in and create their own businesses and provide opportunities for talented young people, with the ultimate goal of developing and retaining the entrepreneurs and innovators of tomorrow.

Key Cluster

The development of key strategic clusters is acknowledged as an important driver of competitiveness in economies around the world. Internationally orientated firms are frequently embedded in deep clusters with highly integrated supply chains. Other small, advanced economies with successful clusters include Switzerland (finance, pharma, precision engineering), the Netherlands (logistics, food), Denmark (shipping, renewable energy, pharma), Israel (high tech) and Hong Kong (finance, logistics).

There are five priority clusters identified to deliver this ambitious growth; they relate to areas where the emergence of significant capability and capacity with the potential to drive the economy forward has been identified. A number of local businesses within these specialisms, both Small and Medium Enterprises (SMEs) and large companies, have already demonstrated an appetite for collaborative working and have come together with academic partners and other key stakeholders to develop new products, services and ways of working.

These technologies and clusters will evolve and change and these clusters may change over time too. However, the commitment to 'tightening an economic strategy from broad sectors to strong or emerging specialisations will remain.

The priority Clusters are:

- Digital, ICT and Creative Industries (e.g. cybersecurity)
- Agri-Tech
- FinTech/ Financial Services
- Advanced Manufacturing and Engineering
- Life and Health Sciences

The Digital, ICT and Creative Industries include processing and communication of information by electronic means, including transmission and display, and incorporates Cyber Security; AI & Data Analytics; Telecom, Mobile & Data, Networks; Healthcare IT; Smart Cities; and Sports Tech. Digital and Entertainment Media.

Skills Needed to Meet the Opportunities of 10x Economy

Delivering on the ambitions of the 10x Economy will require step change in the skills of the workforce in these priority sectors. 'Skills for a 10x Economy', the new skills strategy for Northern Ireland recognises this and proposes three themes to deliver these skills – Addressing Skills Imbalances, creating a Culture of Life Long Learning and Enhancing Digital Skills, Developing a Digital Spine. Developing the future software skills will be critical to deliver the engineering and enabling technologies that will support the Digital, ICT and Creative Technologies, and the other Priority Clusters in the 10x Economy.

The Software Skills Supply Chain

Computer Science is very different to Information Communication Technology and needs to be treated differently. The main entry path into the software sector is through undergraduate programmes at university. The number of applications to universities in Northern Ireland has declined. Only 1.1% of 'A' Level students study either Computer Science or Software Systems Development qualifications and these are only available in 27% of post-primary schools and 7% of schools at GCSE level. The low availability of software courses at both GSCE and 'A' level in Northern Ireland is not as a direct result of the current policy of the Department of Education. Both the Curriculum and Entitlement Framework are designed to provide a wide range of subject availability and pupil choice that should support the pupil's interests and progression. That said, in relation to the teaching of computer science and to a lesser extent ICT there remains a gap between the policy intent and what is actually delivered in post-primary schools.

Information Communication Technology is a cross-curricular skill and should remain so but to meet the future demands of the economy and to meet the strategic ambitions of the "10x Economy" and the new skills strategy "Digital Spine" there needs to be an in-depth knowledge of the barriers preventing all post-primary schools from offering computer science qualifications either as an individual institution or as part of an Area Learning Community (ALC). Understanding fully these barriers to offering computer science subjects would be the first step in trying to change individual school's policies on subject choice and so increase availability.

- A group of educators from along the education "supply chain" should be formed to examine all the barriers resulting in the low availability of computer science teaching in the school's system and to ensure that the appropriate qualifications are available in all 27 ALCs. This group should have members representing the Initial Teacher Education establishments, school leadership and subject teachers, further education, higher education, CCEA, EA and policy makers from the Department of Education and the Department for the Economy. There must be representation from the software sector on this group..

- The industry will actively support the schools' system in developing actions that will address the low availability of Computer Science and Software qualifications. This could include improving low teacher confidence in teaching computing through Professional Teacher Learning, supporting school leadership to increase the capability to teach these qualifications and assist in developing positive messaging for pupils and parents to encourage the demand of these subjects and co-creation of curriculum content.

Alternative Pathways

Whilst the main pathway into a job in the software sector is through the university there are alternative pathways. These include Assured Skills Academies, Higher Level Apprenticeships and other apprenticeships and individuals undertaking training to up-skill or re-skills themselves through the DfE funded short term, on-line courses. The under-representation of HLAs and apprenticeships in the software sector is not through a lack of motivation or effort on behalf of the companies, the Department for the Economy or the training providers. Rather it is likely more structural and a consequence of both demand and supply factors. The research has identified positive and negative aspects of the current alternative pathways and recommends:

- Given that the Assured Skills programme has been given increased funding as part of the Economic Recovery Action Plan more software companies should explore the use of Assured Skills Academies on a collaborative basis to meet their recruitment needs. Consideration should also be given to extending the Academy model to a part-time, on-line delivery model.

- Industry should engage more deeply with the Belfast Metropolitan College IT Hub to explore opportunities for student placements for Foundation Degree students on software courses and to assess whether there may be job opportunities in companies at the NQF Level 5 competence.

- Industry, the Department for the Economy and Belfast Metropolitan College should explore the possibilities of changing the training delivery balance for the first year of the IT Apprenticeships from four days per week in on-the-job training and one day per week in off-the-job training to four days per week in off-the-job training and one day per week on-the-job training.

- Industry should engage with the Department and organisations such as Work Plus to understand the changes made to the apprenticeship system as a result of the Pandemic and other changes and to reassess the value of the apprenticeship system to their businesses.

- Government, education and industry should establish a mechanism to monitor the destinations of those who have undertaken the short term, on-line courses to assess if the training has led to new employment outcomes for individuals.

Sector Attractiveness Activities

There are seven main sector attractiveness programmes operating in Northern Ireland and one education programme that could have a long-term impact on young people choosing a career in the software sector. The current sector attractiveness programmes are:

- **Bring IT On** – BMC funded by Department for the Economy

- **IT's Your Choice** – Sentinus funded by DfE, Invest NI and DE

- **Time to Code** – BITC NI funded by DE

- **Homeground** – Derry Strabane District Council Education and Skills Group funded by DSDC

- **STEM Works** – CCEA

- **Digital Youth** – Young Enterprise funded by ABC Council

- **CoderDoJo** – various.

And the education programme –

- **Digital School House** – funded by Ukie

Whilst these programmes are well intentioned and delivered by well-motivated organisations there must be a question of their overall effectiveness and impact, especially if applications to universities are in decline. There must also be questions regarding the consistency of messaging and effectiveness of approach. It is recommended that:

- A meeting of the delivery organisations is held to raise awareness of each other's work and to explore the possibility of establishing a group of employers and delivery organisations to plan and deliver a new sector attractiveness programme.

- In parallel with this there should be a small group of the government funders established to review all of the sector attractiveness activities under their direction. This review should examine the objectives of each programme, the target audiences for each programme, the consistency of messaging between each programme the outcomes and impact each is making on the number of young people entering the software sector by which ever career pathway. The need to rationalise government funded programmes should also be examined along with the possibility of consolidating funding into fewer programmes for greater impact.

Employer Advisory Landscape

In the skills arena, Northern Ireland government departments have a long history of establishing advisory groups with employers to articulate their current and future skills needs. The concept of the "triple helix" approach consisting of industry, academia and government working together to deliver economic development through interventions in skills and employment has won Northern Ireland international acclaim.

However, there are or soon will be, ten different advisory groups involving employers with the software sector. Each of the advisory groups has been established by multiple organisations to understand employers needs regarding different aspects of the skills agenda.

The groups are "owned" by the organisations that established them and not by the software sector itself. So, despite the large number of employer groups there is no one representative voice for the software sector. This is a gap as there is no overall representative body for the sector, no organisation to be a lead for the sector in talking to government and others and no organisation to develop an over-arching strategy as to how the sector should develop in the future. It is recommended that:

- A single organisation should be established that can represent fully the interests of the software sector in Northern Ireland. Consultation with the sector should take place to understand the purpose and full remit of this organisation and how it should be constituted.

- Irrespective of the eventual structure and remit of the Software Alliance/ Software Council a meeting of the Chairs of the existing employer advisory groups should be convened twice per year to improve coordination and communications between the various groups.

New Software Skills Action Plan

A table of challenges and suggested actions derived from the main policy recommendations from the 2020 report are attached below.

This has been compiled following the interview process and reflects the post-pandemic, post EU Exit environment.

Recognising that many of the recommendations are still valid and involve multiple delivery organisations there is a need for a group to be established to oversee the delivery and governance of the recommendations and actions. The group should be industry led and work closely with the stakeholders in government and the education system to ensure the delivery of the recommendations.

INNOVATION

Key Stakeholders Who Contributed to this Scoping Study

Professor David Jones, *Pro-Vice Chancellor*, Queens University Belfast

Professor Liam Maguire, *Pro-Vice Chancellor*, Ulster University

Professor Peter Finn, *Principal*, St Mary's University College Belfast

Dr. Irene Bell, *Head of Science, Technology and Mathematics*, Stranmillis University College

Michael Bower, *Director of Strategy*, Open University

Professor Philip Hanna, *Dean of Education*, Queens University Belfast

Professor Johnny Wallace, *Professor of Innovation*, Ulster University

Dr Jonathan Hegarty, *Deputy Director*, Belfast Metropolitan College

Eamonn Brankin, *ICT Hub Manager*, Belfast Metropolitan College

David Mawhinney, *CEO*, Equiniti

Tara Simpson, *CEO*, Instil

Peter Shields, *Managing Director*, Etain

Mark Owens, *CEO*, Civica

Andrew Gough, *Managing Director*, GCD

John Healy, *Managing Director*, Allstate NI

Tom Gray, *Chief Technology Officer*, Kainos

William Hamilton, *Managing Director*, Liberty-IT

Angela McGowan, *Regional Director*, Confederation of British Industries NI

Columb Duffy, Allstate NI

Brian Douglas, *CEO*, Codingfury

Mark McCormack, *Chief Technology Officer*, Aflac

Andrew Cuthbert, *Technical Director*, GCD

Steve Orr, *CEO*, Catalyst Inc.

Joanne Best, *Personnel Director*, Catalyst Inc.

Anne O'Neill, *HR Director*, Alchemy

Frank O'Grady, Bottle Top Media

Graeme Wilkinson, *Director of Skills and Policy*, Department for the Economy

Niall Casey, *Director of Skills and Competitiveness*, Invest NI

Jim Wilkinson, *Director*, Apprenticeships, Careers and Vocational Education, Department for the Economy

Frances O'Hara, *Head of the Careers Service*, Department for the Economy

Julianne Kieran, *Deputy Principal Economist*, Department for the Economy

Karen McCullough, *Director of Curriculum and Qualifications*, Department of Education

Deirdre Ward, *Director or Work and Wellbeing*, Department of the Communities

Gareth Heatherington, *Director*, Ulster University Economic Policy Centre

Mark Magill, *Senior Economist*, Ulster University Economic Policy Centre

Ruth Ray, *Skills Manager*, Belfast Region City Deal

Jayne Brady, *Northern Ireland Digital Commissioner*

Tina Gillespie, *Skills Manager*, Derry Strabane District Council

Claudine McGuigan, Mid-South West Region Team, Armagh, Banbridge and Craigavon Council

Helen Gormley, Mid-South West Region Team, Armagh, Banbridge and Craigavon Council

Carol Fitzsimons MBE, *Chief Executive*, Young Enterprise Northern Ireland

Ciara Mulgrew, *Manager*, "Time to Code", Business in the Community

Margaret Farragher, *Acting Chief Executive*, Council for Curriculum, Examinations and Assessment

Michael McEnry, Programme Manager, Education Team (Digital and Assessment), CCEA

Rory Clifford, *Interactive Manager*, Northern Ireland Screen

In addition, 11 members of the Ulster University Computing, Engineering and Built Environment Faculty Computing Employer Advisory Board (CEAB) and Invest NI ICT Forum submitted their scores on the Policy Recommendations anonymously through a Survey Monkey questionnaire prepared by Professor Johnny Wallace.

This report was prepared for the Digital Skills NI Collaborative Network as part of the Collaborative Growth Programme funded by Invest NI.

Policy Recommendations Table

No.	CHALLENGE	ACTIONS	LEAD RESPONSIBILITY
1	There are 10 separate employer advisory groups within the software sector, yet the sector does not have a single representative body to represent the views of the sector as a whole.	A single organisation should be established that can represent fully the interests of the software sector in Northern Ireland. Consultation with the sector should take place to understand the purpose and full remit of this organisation and how it should be constituted.	Industry, Invest NI
2	Undergraduate applications in Computer Scence have fallen between 17%-43% and 'A' Level and GCSE Awards have also reduced by 13% and 30% respectively. If this decline continues it will reduce the number of young people available to work in this sector.	A group of educators from along the education "supply chain" should be formed to examine all the barriers to teaching computer science in the school's system. This group should have members representing the Initial Teacher Education establishments, school leadership and subject teachers, further education, higher education, CCEA, EA and policy makers from the Department of Education and the Department for the Economy. Representation from the software sector should also be part of this group.	Industry, St Mary's University College, Stranmillis College, school leadership, subject teachers, colleges, universities, CCEA, EA, DE, DfE
3	There is low availability of Computer Science and Software Systems Development 'A' Levels (27% of schools) and GCSEs (7% of schools) in the 193 Post-Primary Schools. This limits pupil choice, inclusive economic growth and is contrary to the Entitlement Framework policy.	The industry will actively support the schools' system in developing actions that will address the low availability of Computer Science and Software qualifications. This could include improving low teacher confidence in teaching computing through Professional Teacher Learning, supporting school leadership to increase the capability to teach these qualifications and assist in developing positive messaging for pupils and parents to encourage the demand of these subjects.	Industry, EA, universities, FE Colleges, CCEA, DE, DfE
4	Small and Medium size companies are keen to have access to the Assured Skills programme.	Software companies should work with the Department's Assured Skills team to develop Assured Skills Academies on a collaborative basis. Consideration should also be given to extending the Academy model to a part-time, on-line delivery model.	Industry, DfE Assured Skills
5	There may be an over-reliance by companies on the graduate entry route into the software sector. This is limiting the growth opportunities for the sector.	Industry should engage more deeply with the Belfast Met IT Hub to explore opportunities for student placements for Foundation Degree students on software courses and to assess whether there may be job opportunities in companies at the NQF Level 5 competence.	Industry, Belfast Met IT Curriculum Hub

No.	CHALLENGE	ACTIONS	LEAD RESPONSIBILITY
6	Industry is keen to utilise Higher Level Apprenticeships but the current training delivery model does not suit the software sector.	Industry, the Department for the Economy and Belfast Metropolitan College should explore the possibilities of changing the training delivery balance for the first year of the IT Apprenticeships from four days per week in on-the-job training and one day per week in off-the-job training to four days per week in off-the-job training and one day per week on-the-job training.	Industry, DfE, Belfast Met
7	Apprenticeships and Higher-Level Apprenticeships are under-represented in the Software Sector compared with other engineering sectors. This is limiting the growth of the sector.	Industry should engage with the Department and organisations such as Work Plus to understand the changes made to the apprenticeship system to reassess the value of the apprenticeship system to their businesses.	Industry, DfE Apprenticeships, Work Plus.
8	There has been a major investment in funding for re-skilling and up-skilling through short term, on-line courses and this may create future job opportunities for individuals.	Government, education and industry should establish a mechanism to monitor the destinations of those who have undertaken the short term, on-line courses to assess if the training has led to new employment outcomes for individuals.	DfE, QUB, Ulster University, industry
9	There are seven different Sector Attractiveness programmes for the software sector in Northern Ireland. There is a risk of fragmentation and duplication of effort and inconsistency of messaging.	A meeting of the delivery organisations is to be held to raise awareness of each other's work and to explore the possibility of establishing a group of employers and delivery organisations to plan and deliver a new sector attractiveness programme.	DfE, DE, Industry, Delivery organisations.
10	Government funds many of these sector attractiveness programmes either directly or indirectly. Evaluations are provided by each programme but there needs to be a comprehensive review of them all to ensure they are effective and are having an impact on numbers applying for software courses.	There should be a small group of the government funders established to review all of the sector attractiveness activities under their direction. This review should examine the objectives of each programme, the target audiences for each programme, the consistency of messaging between each programme the outcomes and impact each is making on the number of young people entering the software sector by whichever career pathway. The need to rationalise government funded programmes should also be examined along with the possibility of consolidating funding into fewer programmes for greater impact.	DfE, DE, Invest NI

No..	CHALLENGE	ACTIONS	LEAD RESPONSIBILITY
11	There are ten separate employer advisory groups with no communications between them. This places undue demand on businesses' time, creates duplication and wasted effort.	Irrespective of the eventual structure and remit of the Software Alliance/ Software Council a meeting of the Chairs of the existing employer advisory groups should be convened twice per year to improve coordination and communications between the various groups.	Advisory body Chairs
12	Improve alignment between skills provided by education system and those required by industry.	Education institutions (schools, FE Colleges and HEIs) and industry to work with each other to better understand the skill sets that are required by industry and what is taught at primary, post-primary and NQF Levels 5 & 6.	Industry, IT Employers and Educators Forum, EA, CCEA
13	There may be an over-reliance on Computer Science Graduates, when graduates for other disciplines may be suited to work in the sector.	Industry to work with universities and FE Colleges to investigate and better understand other pathways to employment from subject areas such as mathematics, statistics, natural sciences, finance etc. and the role that pre-employment training may play.	IT Educators and Employers Forum
14	There is a general lack of understanding in the general public as to the variety and range of job roles in the software sector. This is limiting career choices for young people and reducing numbers of potential entrants to the sector.	There needs to be a public awareness campaign to raise awareness of the range and variety of job roles in the software sector. Information on career pathways, including subject choices, courses and qualifications needs to be created in formats used by the general public and young people (social media, apps etc.).	Industry, IT Educators and Employers Forum, Careers Service
15	Assisting successful learner transition from school to college to university creates a positive student experience and prevents student drop out from courses.	FE IT Curriculum Hub, universities and schools will work collaboratively to better align qualifications to facilitate better integration for progression through the education system.	Industry, IT Employers and Educators Forum, CCEA
16	Better communications channels between industry and public sector regarding areas of current and future investment projects could assist in reducing labour market disruptions and workforce displacements.	Invest NI, Department for the Economy and industry representatives to meet twice per year regarding FDI strategy, targets and levels of interest from external technology companies.	Invest NI, DfE, Software Alliance

No.	CHALLENGE	ACTIONS	LEAD RESPONSIBILITY
17	There is a limited understanding of future skills needs and this can delay development of suitable education and training curriculum and development and provision.	Use of current "real-time" information sources to develop an "Iceberg Watch" report forecasting likely demand for skills over next 12-18 months. Develop a 'horizon scanning' mechanism for future skills needs with industry input on future technical innovations.	Invest NI, DfE, industry
18	Careers information, advice and guidance is a critical communications channel to advise young people but it is a challenge to keep up to date and relevant to young people and their parents. This may limit the attractiveness of the sector and uptake in appropriate courses etc.	Industry to assist with developing and delivering a new NI wide sector attractiveness campaign for the software sector. New portal being developed by the Careers Service to better serve the all-age careers offering. Specific testimonials on new job roles to be created with industry help.	DfE, DE, industry
19	A better understanding of future skills demand and supply bottlenecks will assist in improved labour force planning.	A model will be developed to better understand the relationship on the future workforce when availability of appropriate 'A' Levels and GCSEs is limited – impact on application to HEIs.	IT Employers and Educators Forum, DE, DfE, CCEA, EA
20	Poor work shadowing opportunities and placements have reportedly put young people off the industry.	DfE, Invest NI and industry to explore the establishment of a professionally managed work placement service for schools and colleges.	DfE, Invest NI, industry
21	Perceptions of inflexible working conditions may be putting off potential recruits to the sector.	The pandemic has changed work conditions dramatically (e.g. remote/home working) and there is a need to map out current working practices across the sector and to benchmark best practices. This information can be used in recruitment campaigns especially with prospective "returners". Assess the impact of the "Press Return" programme delivered during the pandemic. Work with BRCD Employability & Skills Group to assess the impact of their Task & Finish Group on diversity in the software sector.	DfE, DfC, BRCD Employability and Skills Group
22	There are limitations to attracting migrant labour to work in Northern Ireland. More needs to be done to attract qualified professions into the NI industry.	Establish a software sector specific "Attract Back/ Attract In" campaign targeting software professionals working in Great Britain and Ireland. Explore the possibilities of recruitment of international remote workers for key "difficult to fill" roles in the software sector.	Invest NI