DIGITAL SKILLING

SITUATIONAL ANALYSIS

NEW ZEALAND

GAN NEW ZEALAND | skills CONSULTING GROUP | GAN GLOBAL

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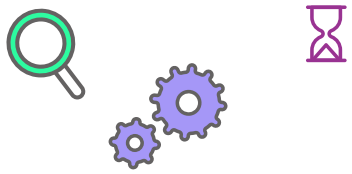

BACKGROUND

The Global Apprenticeship Network (GAN Global) is an international network of companies, employer organisations, associations, and stakeholders headquartered in Switzerland. GAN Global primarily exists in order to promote work-based learning (WBL), quality apprenticeships, and to create job opportunities for youth. This advocacy provides an important voice and input for industry. It also ensures that demand side of the labour force equation can be involved with initiatives that increase the confluence between what the labour force can do, and what is required by employers. Along with the promotion of WBL strategies, GAN Global also recognises and embeds the importance of Sustainable Development Goals.

GAN Global has sixteen official networks. The newest of these is **GAN New Zealand**, launched in November 2020. Like all networks part of GAN Global, GAN New Zealand shares the overarching aims of GAN Global in the promotion of work-based learning and apprenticeships. GAN New Zealand provides the local expertise and context that will help GAN initiatives be successful in New Zealand Aotearoa. In terms of Sustainable Development Goals, GAN New Zealand has a particular focus on Reduced Inequalities, Gender Equity, and Decent Work and Economic Growth (Goals five, eight, and ten respectively).

The GAN Global network is supported by member companies including the Microsoft Corporation which has Board representation in GAN Global. GAN Global has been engaged by Microsoft Philanthropies to support the Microsoft Global Skilling Initiative (GSI). This project is funded by Microsoft and has a focus on digital upskilling with disadvantaged youth.

As part of the GSI, three GAN Networks, in New Zealand, Australia, and Colombia, have been engaged in turn to develop digital skilling situational analyses in their respective countries.

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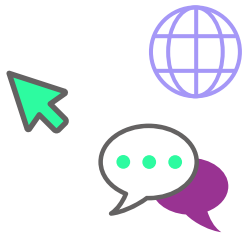
EXECUTIVE SUMMARY



This situational analysis is intended to support both GAN Global and Microsoft to identify opportunities and challenges in addressing digital skilling and related workforce issues. As well as being responsive to the COVID-19 situation and related employment disruption, Microsoft's Global Skills Initiative seeks inclusive growth, and to explore issues in attracting non-traditional recruits into high demand tech careers: in the New Zealand context this includes (but is not limited to) women, Māori, and Pasifika peoples.

The analysis has been developed primarily through desk-based research, supported by personal interviews to confirm and expand on themes and stakeholder perspectives, particularly in terms of digital inclusion. Through the efforts of government, industry, and not-for-profit research and policy initiatives, New Zealand has several high quality and recent publications delving into aspects of the digital skills picture in New Zealand. Most notably, these include the 2017 and 2021 Digital Skills for Our Digital Future reports, developed by the New Zealand Digital Skills Forum, a government and industry alliance. The 2021 update shows females make up 27 percent, Māori 4 percent, and Pasifika peoples 2.8 percent of the technology industry, confirming significant underrepresentation compared with the overall New Zealand workforce and the population in general.[1]

This situational analysis is primarily concerned with the education and training system, and the extent to which it provides possibilities, pathways, and scaffolding for learners in these groups. It provides observations and analysis of the evidence around what works for these learner groups, and the extent to which various parts of its education and skills systems are supporting pathways and possibilities in the IT industry for these learner groups. This will be used by GAN New Zealand to inform out outreach and advocacy in 2021 to support underserved and underrepresented groups to access digital skills learning opportunities, including the currently free Microsoft offer.

1 Digital Skills Aotearoa_*Digital Skills for Our Digital Future*, NZ Digital Skills Forum, January 2021.

Our analysis spends less time describing labour market supply and demand issues in the technology industry in New Zealand, which are well-canvassed in these reports: a list of further reading is appendicised to this analysis.

As well as underrepresentation of women, Māori and Pasifika, there is a historical disconnect between industry and education providers as a result of structural quirks of the New Zealand vocational education system. However, current reforms of the vocational sector may present opportunities and impetus to develop new training options and pathways, including partnerships between Microsoft and GAN New Zealand to provide both workplace and school-based learning solutions.

From our initial examination of workforce participation figures and education participation and achievement figures, it would appear that New Zealand should not have a digital skills shortage. New Zealand has close to a 2:1 ratio of technology graduates to technology jobs[2]. Where the 'shortage' lies is in senior roles which have in recent years been increasingly filled by immigration. In particular, employers have recruited overseas for roles such as Enterprise Architects, Senior Developers, and Software Engineers especially in areas such as JavaScript and Amazon Web Services. With recruitment from abroad being the norm for senior roles, development opportunities for junior staff have been stymied. This has contributed to relatively high staff turnover in the IT industry as workers search for opportunities elsewhere. Due to the long-term nature of increasing supply of workers, reliance on immigration to fill senior roles is likely to recommence in the medium to longer term, once COVID-19 restrictions in immigration are eased. While the use of skilled migration is a necessary source of talent for many industries, we must also ensure that young New Zealanders are able not just to gain entry-level work in the industry, but that well integrated and well understood pathways are available to support their upskilling and career progression. New Zealand requires greater investment in their IT workforce to build their capability.

Ultimately, we find evidence that the domestic supply of talent into the IT sector in New Zealand is significantly dominated by young people undertaking degree-level pathways directly from school, which is introducing a demographic skew. We strongly support the recommendation in the 2021 *Digital Skills* report, that the system – and workplace diversity and inclusion – would be improved through the development of digital apprenticeship models. We would add that the apprenticeship schemes lead to formally recognised credentials, including globally recognised industry certifications.

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2 Digital Skills Aotearoa_*Digital Skills for Our Digital Future*, NZ Digital Skills Forum, January 2021.

THE DIGITISATION MEGATREND

Economies across the world are coming to grips with how they will incorporate digitisation, automation, and digital transfer into their ecosystems. In the decade leading up to COVID-19, debates raged about the extent of the coming workforce disruption, and the coming employment displacement as the result of changing technologies, automation, and changing employment structures.

One year into the pandemic, it is already a truism that these forces of disruption are here, accelerating existing trends and exacerbating existing labour market inequities. To point to just one example, through its 2021 cycle, The Business 20 (B20) dialogue is focussing on Digital Transformation as "more and more a key engine of sustainable global economic growth, with over 60% of GDP expected to be enabled by digital by 2022"[3]. It also noted that COVID-19 pandemic has thrown a spotlight on the already pivotal role of Digital for a sustainable and inclusive economic development.

Which brings us straight back to digital skills: At all levels of technological adaption and adoption, digital skills are a 'must have'. This encompasses the significant cadre of occupations readily identifiable as part of the technology industry; but also increasingly cross-cutting the economy as a result of the growing ubiquity of digital technology across industries. To participate in the economy – anywhere – requires increasing digital competency, as a form of essential literacy. Traditionally digitally centred occupations such as programmers, continue to be in high-demand in New Zealand. However, generic, core and foundational digital skills are an increasing focus of technical training and general education alike, as recent developments in the New Zealand school Curriculum show, and that we describe later in this report.

It is important however, to keep matters in perspective. The acceleration of

3 https://www.b20italy2021.org/taskforce/digital-transformation/

digital adoption by businesses to support the likes of remote working is a visible adaptation due to COVID, and in response to such forces, education and skills systems will respond.

According to the World Economic Forum, technological adoption is expected to be a key driver of labour market evolution over the next five years, and must therefore be a focus of our education and skills systems. However, it's well worth noting – as the Forum did - that the same report identifies technology design and technology use as just two of the top 10 job skills of 2025.[4]

In New Zealand therefore, whether considering our school leavers, displaced workers, or career changers, if digital skills are lacking then this must be addressed as a core way to build employability and adaptability. When economies like ours notice significant increases in remote working and video-calling, our education and skills systems will gravitate to that. However, we also ought to notice that workers readily identifiable as 'essential' in various states of lockdown are those whose work cannot be digitised, done online, or performed remotely. Our education and skills systems must pay attention to that as well.

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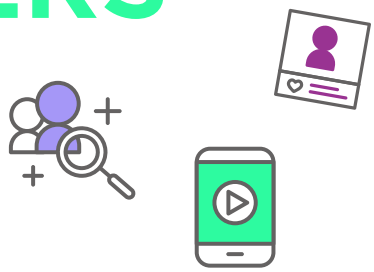
4 Future of Jobs Report 2020, World Economic Forum

DIGITAL SKILLING STAKEHOLDERS



> GOVERNMENT AND THE POLICY ENVIRONMENT

The New Zealand Government's Ministry includes a communication and digital economy portfolio, which has Ministerial responsibility for the development of the digital economy, led by a Digital Economy unit within the Ministry of Business, Innovation and Employment. The Executive Ministry also includes a government digital services portfolio, which spans the provision of Government digital services, led by the Department of Internal Affairs, through a formal Chief Government Digital Officer role held by its Chief Executive.

Within a broader suite of digital economy and industry transformation work, the New Zealand Government has issued a digital inclusion blueprint, and developed associated action plans in 2019. This was revised in May 2020, during the early months of the COVID crisis. It defines a digitally included person, whanau, or community "having convenient, reliable access to affordable, accessible digital devices and an internet connection, and can confidently use them in their day-to-day life".[5] It is set out using a framework of four elements: access; skills; motivation; and trust. This Framework was developed based on earlier work carried out by a Digital Inclusion Research Group in 2017.

> INDUSTRY AND BUSINESS

The ubiquity of digital skills across the economy means that industry's voice on digital skills issues comes through many channels, though there is collaboration work and alliances have been formed to attempt to provide a united technology industry voice to Government. There are a range of established industry and professional organisations, contributing and influencing policy and representing industry at a national level, including:

5 https://www.mbie.govt.nz/dmsdocument/3228-digital-new-zealanders-the-pulse-of-our-nation-pdf

> IT Professionals New Zealand

A membership-based professional body, representing the voice of the industry to Government. Along with core advocacy work, membership services, and industry awards, it has strong links to the education sector, though offering training programmes itself, and working with Government on the digital technologies curriculum for schools, reforms of sub-degree qualifications, degree accreditation and recognition processes.

> New Zealand Technology Industry Association (NZTech)

A membership based not-for-profit operating as the peak body for the 'tech ecosystem'. NZ Tech co-ordinates the NZ Tech Alliance group of associations to provide a united industry voice, and is leading work with The Ministry of Business, Innovation and Employment on a digital technology industry transformation plan (ITP). As part of the Government's industry policy, ITPs are being developed for a number of key industry sectors, and several, including digital technology, are being further developed and/or rescoped in response to COVID-19.

> NZRise

Part of the NZ Tech Alliance, NZ Rise is a membership body representing and furthering the interests of New Zealand-owned Technology companies.

> Internet NZ

A membership-based not-for-profit, Internet NZ is the designated manager of the top-level ".nz" domain name. It provides advocacy to government on internet policies, particularly on issues of cyber security and online safety, and provides a range of support for online business and industry events (Nethui).

> TUANZ

The Technology (formerly Telecommunications) Users Association of New Zealand is established as an independent voice for technology users, traditional focussed on digital connectivity and infrastructure, and encouraging use of digital technologies for business success and social outcomes.

> COMMUNITY AND IWI

Along with the government-driven digital inclusion blueprint, there are a great many community driven initiatives and organisations supporting aspects of digital inclusion. It is a broad and multifaceted effort, ranging from initiatives to support senior New Zealanders to access an increasing range of online services, including government services. Several other groups and organisations offer digital skills offerings as part of work to people with disabilities, neurodiversity, youth services, or support people from lower socio-economic backgrounds to access devices, connectivity, or both.

The 20/20 Trust, a longstanding community organisation involved in supporting ICT access and training, partnered with industry group Internet NZ to produce a regional map of over 1,000 digital literacy and digital inclusion initiatives, available at digitalinclusion.nz.

Very recently, several industry organisations and a diverse range of not-for-profits have discussed a proposal to form a new Digital Equity Alliance for advocating to government and others, and to provide a collective voice for what some see as fragmented or disconnected effort.

There are also community initiatives aimed at improving the participation of Māori and Pasifika in ICT industries. The TupuToa internships and cadetships schemes provide work-based learning opportunities to Māori and Pasifika students through partnering with a number of corporates, including in the technology sector, to support career success and improve diversity and inclusion in these workplaces. Another organisation, Elevating Aotearoa's Future, is also working with employers and career aspirants to foster and grow careers with Māori and Pacific Islanders, in the data and analytics fields, including developing and delivering industry ready training programmes.

Tech Women, part of the New Zealand Tech Alliance, is an organisation run by and for women in the ICT sector, with a mission to promote careers and address the shortage of women in the industry, through networking and support, promotion, professional learning, and events.

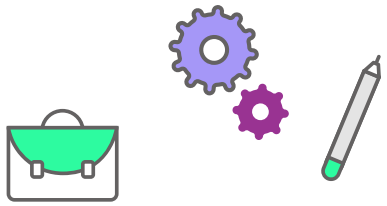
> Iwi-led initiatives

Several of New Zealand's major iwi[6] operate education and skills entities, in line with iwi development strategies. Recent policy shifts in post-school education and training support increasingly iwi-led and iwi-driven approaches to determine education and skills solutions. Major iwi, such as Tainui (seat of the Māori Kingitanga movement) and Ngai Tahu (which spans the South Island of New Zealand), operate specific organisations to develop skills and career pathways for their iwi members and in the interests of Māori success and equity more broadly.

These iwi, in partnership with a South Auckland local Government organisation and economic research company BERL have led a recent four-part study into the future Māori workforce. Several iwi and Māori Community Trusts have established digital hubs as part of training skills initiatives for their members, including in partnership with other regional authorities. Interest in scaling and accelerating such options has increased markedly during the COVID period.

6 'iwi' are the larget social units in Māori society, often translated as a 'tribe' or a confederation of tribes.

EDUCATION AND SKILLS



> NZ CURRICULUM / TE MARAUTANGA O AOTEAROA

The New Zealand education system is designed to be learner centred and offer continuous pathways. Education begins with Early Childhood Education (ECE) from 0-5 years of age. Although ECE is not compulsory, it is estimated that close to 97% of children attend[7].

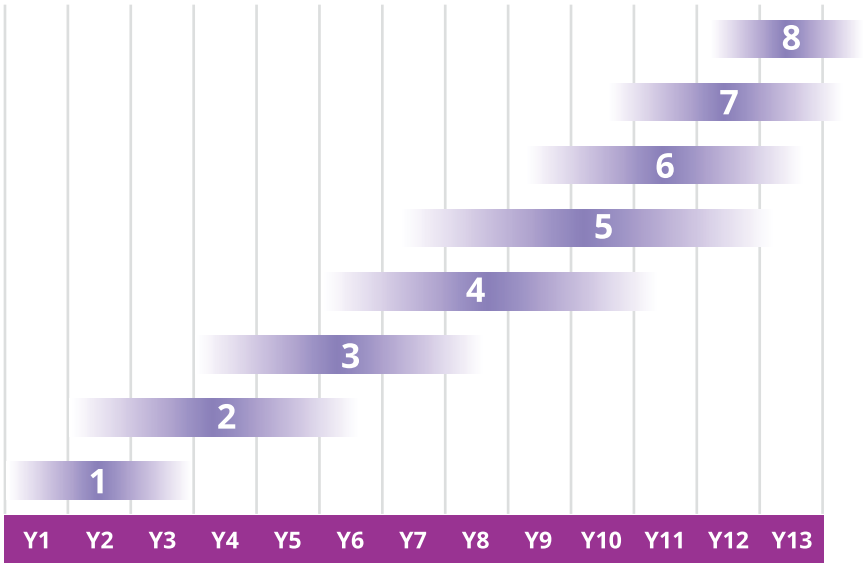
Schooling in New Zealand is compulsory between the ages of 6 and 16, though almost all New Zealand children start primary school aged 5. Secondary education is typically offered for five years, (Years 9 to 13). Pathways to further vocational, technical or tertiary options open up in the post-compulsory phase, include secondary-tertiary interface programmes, or workplace experience programmes, typically offered from Year 11, the same year that formal assessment for secondary school (and other) qualifications commences.

State schools are government funded and available to all citizens and permanent residents. There are also private, religious and Māori-medium schools that receive varying levels of government funding.

The core New Zealand Curriculum (2007) is a high level framework for Years 1 to 13. It's "first half" outlines a vision for New Zealand's learners (connected, confident, and capable learners); attitudes and values; and key competencies – heavily influenced by international benchmarking work conducted by the OECD. The "second half" sets out more detailed achievement objectives across eight levels and in respect of eight learning areas, including Technology.

7 https://www.education.govt.nz/our-work/our-role-and-our-people/education-in-nz/#:~:text=Most%20children%20stay%20at%20school,%2D17%20years%20of%20age).

Figure 1
Years and Curriculum Levels



Source: tki.org.nz

New Zealand schools are highly devolved and governed by individual school governors. While required to set achievement targets for learners and assure the Government that the community is adequately consulted, the actual curriculum delivery is a matter for the school to decide, in the interests of the school's own community. The New Zealand Curriculum does not attempt to be proscriptive, nor are any elements of the curriculum mandatory beyond Year 10, though in practice minimum literacy and numeracy standards are required to be awarded during the main secondary school qualifications (NCEA), and there has been a recent government decision to make the teaching of New Zealand History compulsory from 2022.

Te Marautanga o Aotearoa is a parallel Māori-medium Curriculum, used predominately by New Zealand's network of Māori Kura (immersion schools). While there are overlaps in terms of learning areas and objectives, it is certainly not a straightforward translation of the English-medium Curriculum, but rather employs Te Ao Māori (Māori world) concepts to deliver learning in and through Te Reo Māori (Māori language).

Both the English- and Māori-medium reflect high level and capability-based Curriculum Frameworks. This means they were futureproofed by design to an extent. In 2007 the growing importance of digital literacies and skills was clearly known, as the Curriculum developers observed the rise of social media and video streaming websites, and increasingly widespread access to high speed internet connectivity. However, clearly over the last 13 years, the accelerated development of digital tools, technologies, and techniques since has increased both the priority and the ubiquity and application of digital skills across the Curriculum Learning Areas, and with respect to overarching capabilities and competencies (transversal skills).

In 2017, the then Government revised the Technology Curriculum, to make two of its five areas specific to digital technologies, including linking these to other learning areas. This covers Years 1 to 13, and has been available for use by schools since 2018, with schools required to make it available to students by 2020.

This is seen by most as a key step forward. As a simple accident of history, the rise in computing and ICT over the last few decades has been tacked on to older "technologies" – hard materials; design; graphics; engineering. There is clearly crossover – and perhaps increasing convergence, as these crafts are increasingly digitalised - but the bundling of these disciplines has not always been comfortable and at various stages, unhelpful to both. The move also acknowledged the extent to which digital skills and literacies are playing out in other learning areas, including the use of ICTs as learning tools in their own right.

> THE NATIONAL CERTIFICATES OF EDUCATIONAL ACHIEVEMENT (NCEA)

The culmination of 11-13 years of schooling in New Zealand is the NCEA, which since 2002 has been the main secondary school qualification. The NCEAs are competency-based qualifications registered at Levels 1 to 3 on the New Zealand Qualifications Framework. With the exception of a core literacy and numeracy requirement, the NCEAs are entirely open-field. Any combination of registered assessment standards on the NZQF (including those drawn from the New Zealand Curriculum, NZQA 'generic' standards, or foundation level industry standards) may be accumulated to achieve NCEA.

This extraordinary flexibility has turned out to be NCEA's greatest strength and its greatest weakness, all at once: it offers the opportunity to reflect each students' strengths and weaknesses, and support their future pathways, but it can equally be achieved in a way that lacks coherence, or articulate well into post school study or employment pathways.

Since NCEA's inception, universities have negotiated a common entrance standard for higher education, which - with respect to university as a key post-school destination - mitigates against NCEA incoherence by requiring that a certain number of credits be drawn from the Curriculum-derived subjects. This one well-defined pathway, and the history and structure of secondary schooling dominates much of what and how education is delivered in NZ secondary schools.

> DIGITAL TECHNOLOGY CURRICULUM AND ACHIEVEMENT STANDARDS

Between 2011 and 2013, a new suite of assessment standards for Digital Technologies was adopted for NCEA that have received strong uptake. The later development of the revised Digital Technologies Curriculum was in a sense 'reverse engineered' from these assessment standards, and the Curriculum developed to extend right through to Level 1. Again, this was substantive progress, though it should be added that there remains continued advocacy for Digital Technology to gain its own learning area, rather than as a part of the wider Technology Curriculum. As with any new Curriculum, there is also a period of time needed for the secondary education workforce to gain confidence in delivering and assessing against it. New Zealand's Education Review Office has reported low levels of confidence to implement the curriculum and significant professional learning and development has been committed to addressing this.

Following a recent review of the NCEA qualifications, a multi-year review of assessment standards has commenced, driven in part by a need to identify core learning outcomes from end users' perspective, such as employers. While the Digital Technology standards themselves are relatively recently developed, assessment resources are also to be developed, and the Ministry of Education is seeking to hear from industry and the private sector to ensure that standards are assessed in ways that are relevant and applicable to real-world contexts, such as the workplace. This provides a key opportunity to encourage - or even to directly provide - learning and assessment resources to schools based on industry requirements.

Noting the Digital Technologies assessment standards matrix reproduced below, it would be highly surprising if foundational elements of the suite of Microsoft training products did not develop assessment evidence that could be used in respect of the award of these Curriculum-based assessment standards. If indeed this were the case, it would infer that the *standards* were missing the mark, rather than the industry failing to understand its own desired learning outcomes. As such, it is an important area to explore to ensure that the NCEA standards were not contributing to skills mismatch issues that play out beyond school.

Table 1

NCEA Achievement Standards
Digital Technologies & Hangarau Matahiko

Digital Technologies & Hangarau Matahiko
Computational Thinking (CT)
Designing and Developing Digital Outcomes (DDDO)

3	**AS91900 // 3.1** Conduct a critical enquiry to propose a digital technologies outcome (6)	**AS91904 // 3.5** Use complex techniques to develop an electronics outcome (6)	**AS91908 // 3.9** Analyse an area of computer science (3)
	AS91901 // 3.2 Apply user experience methodologies to develop a design for a digital technologies outcome (3)	**AS91905 // 3.6** Use complex techniques to develop a network (4)	**AS91908 // 3.10** Present a reflective analysis of developing a digital outcome (3)
	AS91902 // 3.3 Use complex techniques to develop a database. (4)	**AS91906 // 3.7** Use complex programming techniques to develop a computer program (6)	
	AS91903 // 3.4 Use complex techniques to develop a digital media outcome (4)	**AS91907 // 3.8** Use complex processes to develop a digital technologies outcome.(6)	
2	**AS91890 // 2.1** Conduct an inquiry to propose a digital technologies outcome (6)	**AS91894 // 2.5** Use advanced techniques to develop an electronics outcome (6)	**AS91898 // 2.9** Demonstrate understanding of a key aspect of a computer science concept (3)
	AS91891 // 2.2 Apply conventions to develop a design for a digital technologies outcome (3)	**AS91895 // 2.6** Use advanced techniques to develop a network (4)	**AS91899 // 2.10** Present a summary of developing a digital outcome (3)
	AS91892 // 2.3 Use advanced techniques to develop a database (4)	**AS91896 // 2.7** Use advanced programming techniques to develop a computer program (6)	
	AS91893 // 2.4 Use advanced techniques to develop a digital media outcome (4)	**AS91897 // 2.8** Use advanced processes to develop a digital technologies outcome (6)	
1	**AS91877 // 1.1** Develop a proposal for a digital outcome (3)	**AS91881 // 1.5** Develop an electronics outcome (6)	**AS91885 // 1.9** Demonstrate understanding of searching and sorting algorithms (3)
	AS91878 // 1.2 Develop a design for a digital outcome (3)	**AS91882 // 1.6** Develop a computer system (4)	**AS91886 // 1.10** Demonstrate understanding of human computer interaction (3)
	AS91879 // 1.3 Develop an outcome to manage data (4)	**AS91883 // 1.7** Develop a computer program (4)	**AS91887 // 1.11** Demonstrate understanding of compression coding for a chosen media type (3)
	AS91880 // 1.4 Develop a digital media outcome (4)	**AS91884 // 1.8** Use basic iterative processes to plan and develop a digital outcome (6)	

Potential development work could include mapping appropriate level Microsoft training products to these standards, to develop a package of assessment resources that are then pre-moderated by NZQA for use in NCEA. This pre-moderation step is important, since the majority of secondary school teachers in New Zealand use "off the shelf" resources that have the pre-moderation "tick" from NZQA, as opposed to creating their own. Such assessment resources could then be delivered in-class as a "subject" within the timetable, or through workplace interface programmes such as Gateway.

> VOCATIONAL PATHWAYS

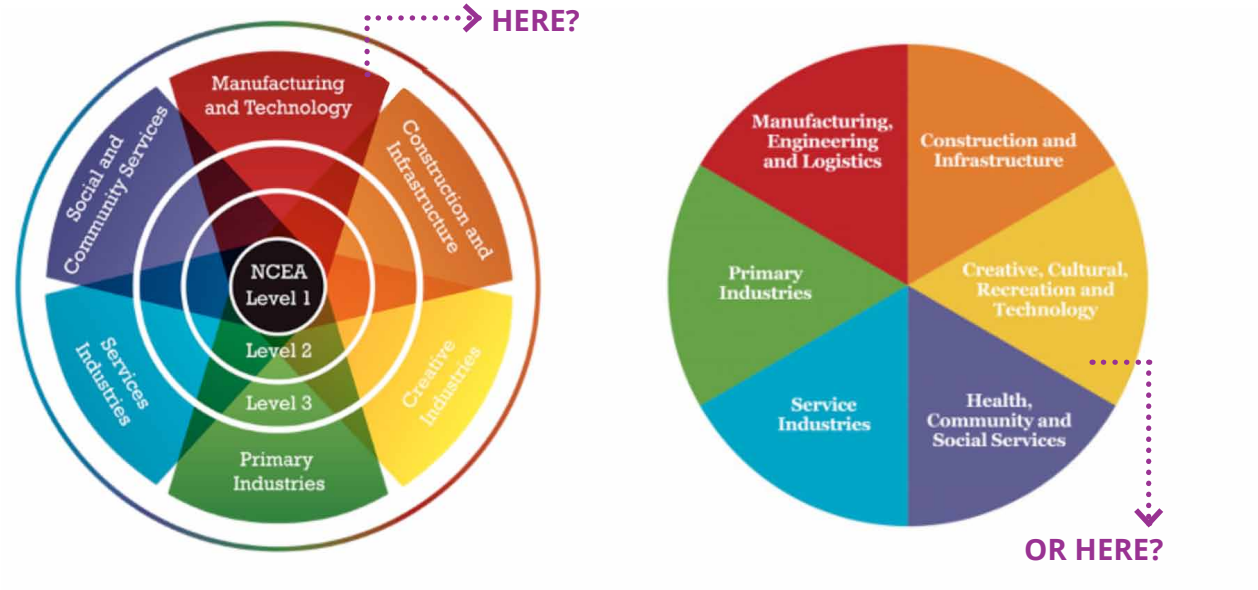
Commencing in 2010, and launched in 2013, a Vocational Pathways (VPs) framework was developed to link NCEA assessment outcomes with study and employment possibilities, with respect to six broad sectors of the economy. This was an attempt to provide a navigation system for learners and educators to assemble coherent NCEA qualifications with a better sense of direction with respect to the world of work. Young people are able to assemble an NCEA qualification with a profile and/or endorsement in respect of these sectors, based on industry-led definitions of learning outcomes that are recommended by sectors and specific learning outcomes that relates to sectors. In short, the VPs 'colour code' the credits and colour code the jobs.

For the IT sector, "Technology", including digital and ICT, is part of "Manufacturing and Technology" – red – and the occupations identified within the pathway sit alongside several unrelated occupations, in the same uncomfortable marriage as the New Zealand Curriculum. There was lobbying from subject associations at the time that ICT ought to define its own pathway, since from a labour market perspective some of the outcomes recommended for Manufacturing and Technology were more strongly related to skills associated with mechanical engineering or trades, which meant a student might easily achieve an endorsement for their NCEA qualification that implied a level of strength or skill in digital technologies that was not there.

As described in more detail below, current reforms of vocational education will develop post-school training, assessment, and qualifications through six Workforce Development Councils, based on a similar framework to the vocational pathways, albeit one of the key differences is the "placement" of IT related skills and occupations.

Figure 2
Technology - pathway mismatch?

NCEA vocational pathways **Proposed Workforce Development Councils**



The VPs have become an increasingly important framework for organising programmes in the education sector and to improve the ease with which employers can recognise talent. The VP framework is now underpinning key changes in post-school vocational education as part of the present reforms of vocational education, and job classifications.

The VPs key challenge is a persistent perception that "vocational" is defined as "non-academic", rather than "relating to the world of work". This is a deeply felt cultural phenomenon, by no means confined to New Zealand. However, it needs to be recognised that the barrier to achieving the potential of VPs or any education to employment framework is if they are seen by educators as the 'alternative' to an academic pathway, in a pejorative sense.

> TRANSITION PROGRAMMES: GATEWAY, TRADES ACADEMIES

As a standards-based qualification, the NCEAs can be completed via credits achieved outside of school, typically through tertiary providers or workplaces. A number of interface schemes have been developed over the years to support such opportunities, such as Secondary-Tertiary Alignment Resource (STAR), Gateway (15,000 students in 2019), and Trade Academies (8,200 students in 2019).

A key way to link private sector training opportunities could be relatively achieved through mapping the learning outcomes in Microsoft's learning paths with NZQA credits, especially the Digital Technologies Achievement Standards. These could then be packaged up as either the workplace assessment package for a workplace experience programme

(Gateway), or offered in-class as the learning and assessment material associated with Digital Technologies, offered as a timetabled subject. A third option, which would provide some flexibility around delivery, would be to work with a standards setting body or provider to register a micro-credential for Digital Technologies, so it could standalone as a credential, as well as form part of a larger programme, as appropriate.

Of the above, Gateway programmes would appear to be a very fruitful avenue to explore, because as well as delivering credits for NCEA and other qualifications, it would develop workplace and employability skills though exposure to real workplaces. Gateway programmes are typically arranged around six-week blocks (which schools can manage around their timetables, and some employers prefer as it provides a more immersive internship-style arrangement). One-day-per-week models have also been employed.

In early 2021, the New Zealand Qualifications Authority amended its policy on microcredentials, to allow these to stack with full qualifications, including the NCEA. This creates a real new opportunity to incorporate industry endorsed credentials as part of an NCEA qualification, that could be delivered in-class or through workplace experiences and that provide a genuine taster and head start on a career pathway.

> SCHOOL LEAVERS

Approximately 60,000 school leavers leave New Zealand schools each year. Around two-thirds enter further or higher tertiary education, while one-third enters the workforce immediately. That workforce currently numbers 2.8 million.

Notwithstanding global pandemics, New Zealand's skilled workforce is highly mobile, and its local labour force is strongly supported by migration: one in four New Zealanders were not born here. New Zealand's birth rate, as in many developed countries, is declining and in November 2020 it was announced to be at a record low of 1.63 per woman, well below replacement rate of 2.1.

This context is set out for the sake of perspective: debates in education - including in the family home - are often focussed around teenagers, their choices, and their transitions from education to employment. Industry-led discussions about skills and training also quickly gravitate to schools and the quality of careers advice being accessed by the young.

It absolutely matters what opportunities young people are able to access and the quality of their preparation for "the real world". But the hard numbers suggest our attention is at least partially misplaced. If we know anything about the fourth industrial revolution, it is that the workforce is aging, that technology change is accelerating, and that people will have long and precarious and dynamic careers, characterised by multiple job changes, and probably career changes. That means that lifelong learning – an idea that

has underpinned New Zealand 's education and qualifications system for over 30 years – needs to be properly supported, particularly by tertiary funding policies.

Again we support the findings and recommendations of the Digital Skills Forum that upskilling and reskilling through the workplace is significantly underdone in New Zealand's technology sector, and as well as developing fit for purpose training products and pathways, employers' habits will need to change to meet ongoing skill requirements, and match the upskilling to genuine industry needs.

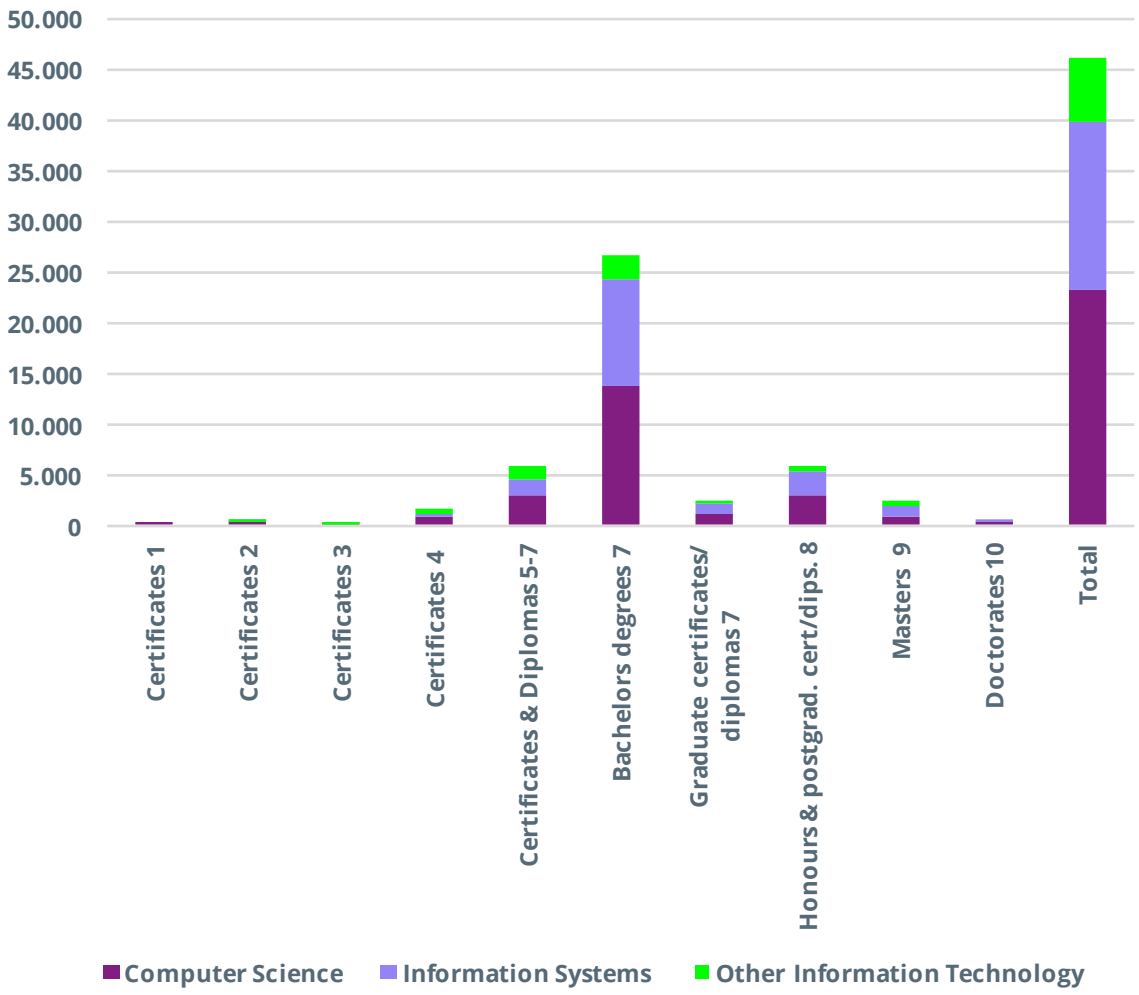
> WORK-BASED LEARNING

The joint industry and government developed *Digital Skills for a Digital Nation* reported in 2017 that 88% of surveyed employers identified on-job learning as the preferred and most effective model for skills development in the digital industry. This is a very comprehensive result, especially given that the industry and its employers are populated by people with a range of education and training backgrounds – many proudly self-taught, many others degree-qualified, but members of both groups readily claiming that they learned "the real stuff" once they got into the industry.

The Digital Skills update report, updated in January 2021, notes that just 42 percent of surveyed employers had taken on an intern, and just 352 of the 3,000 internship applications in the Summer of Tech programme found a placement, despite an employment success rate of 83 percent following these internships. The pathway clearly works, but is seriously underutilised. Employer behaviour is clearly preferring to hire skilled and experienced candidates, including importing skilled workers via an immigration pathway that is likely to be severely curtailed for some time as a result of the COVID crisis.

> TERTIARY EDUCATION PATHWAYS

Figure 3
Information Tehnology : Tertiary Enrolments 2019

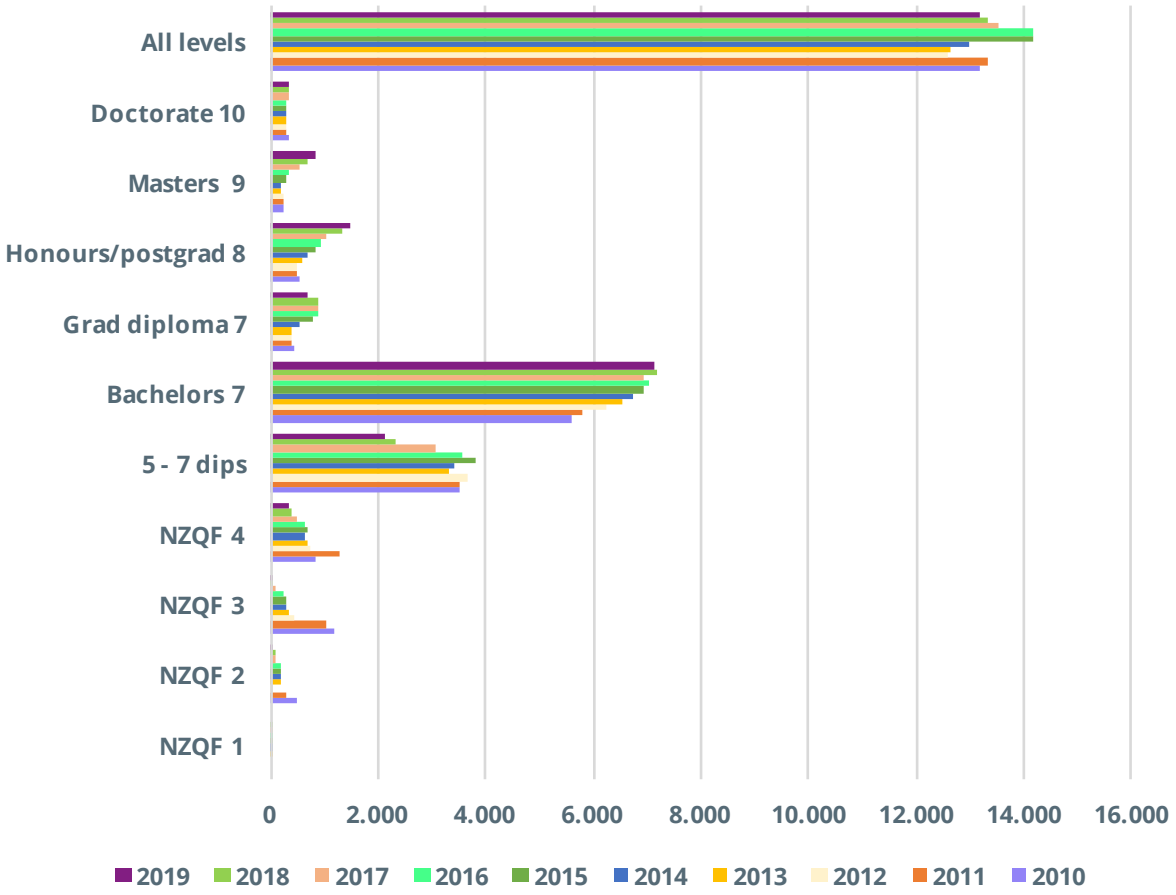


Source: educationcounts.govt.nz

In terms of the domestic supply of talent, a breakdown of domestic enrolments in information technology training in New Zealand shows a vast dominance at level 7 of the New Zealand Qualifications Framework, undergraduate or bachelors degrees.

Over half of all IT students in the country in 2019 were studying towards an undergraduate (Bachelors) degree. Of those 14,455 bachelors-level students, 11,555, or 80 percent, are aged between 18 and 24. That means that the local training of the tech workforce is predominately that of school leavers who went straight to university. This introduces an immediate demographic skew into the pipeline of talent into the industry, since only 28 percent of school leavers go to university, and Māori and Pasifika are underrepresented in the numbers that undertake higher education, and that ultimately complete degrees.

Figure 4
Information Technology Equivalent Full-Time Students 2010-2019



Source: Educationcounts.govt.nz

Added to this, the trend over the last decade reveals decreasing numbers studying or training at lower levels. While overall numbers of IT students has remained relatively stable, proportionally there has been growth at degree and post-graduate level, and declining numbers at certificate and sub-degree diploma level. This would fit a general pattern of 'qualification inflation' observed in many industries, but is quite marked, occurring here within the space of ten years. Our stakeholder discussions suggest a range of dynamics that have exacerbated the trend, including competitive funding pressures for lower level qualifications, specific policies to target higher level qualifications, such as ICT graduate schools; and generally an employer recruitment behaviour favouring degrees (and above), even as the industry skills demand did not objectively require that.

Ultimately, this pattern of study participation, set against the age profile of the learners, suggests that the domestic industry is populating itself through a very narrow segment in terms of education. It needs to consider the diversity of its skills supply, particularly if it has a labour supply problem, or if skilled migration remains problematic following the COVID crisis, and certainly if it is seeking a more diverse workforce.

It suggests to us a need to develop well-scaffolded post-school pathways that either lead to degree qualifications, and especially, to develop more "entry ramps" into the industry through work-based learning pathways.

> "We take the graduates, then we start again with them"

The employer lament "we take the graduates but then we start again with them" is by no means unique to technology industry employers, but it is a common refrain.

Typically, it's an expression of frustration aimed at an apparent disconnect between the industry and higher education institutions, however, its equally acknowledged that the pace of change in the industry is such that tools and techniques (both in terms of hardware and software) make it difficult for educational institutions to maintain pace with the industry, with the best will in the world. Acknowledging this, employers will invite education providers to focus on theoretical underpinnings or "basics", figuring correctly that they can and will need to train on company or technical specifics.

But both halves of the refrain are worth further unpacking:

> "We take the graduates..."

Despite the reality or perception of skills mismatch, predominately degree-level computer science and related technology discipline qualifications are used as the primary filter into the labour market. For a certain cadre of occupations, it is a first filter for recruitment and shortlisting processes and a necessary pre-requisite for an interview, if not necessarily denoting a good match with respect to technical capability, or work readiness, or industry "fit".

It is also somewhat habitual and can be self-fulfilling – the industry requires people with degrees because it takes people with the degrees, whether that is a reflection of the actual range of skill demands in the industry or not. Overtly, or subliminally, the message that "you need a degree to get into IT" filters back into the schools, and the cycle continues.

> "...then we start again with them- the challenge of work readiness"

All employers train: they have to, and it is an ongoing process. The day is not arriving when a school leaver - or a masters graduate for that matter – will walk into a company, "plug and play", fully productive on day one, particularly in fast moving industries like technology. There is an unavoidable lag between the skills taught in pre-employment situations and the requirements of the world of work, exacerbated in high tech fields due to the pace of change, and the emergence of new tools, techniques, and technologies.

The choice employers face is if they train for their own firm, or as part of the formal training system. That former is often easier or perceived as less costly, but on the other hand in an SME-dominated economy, working with a training organisation or vocational

provider can provide quality training infrastructure and recognised credentials where the firm lacks the infrastructure to offer either on its own.

Across many industries, we can also observe differences between actual industry skills demand, and employer recruitment practices. For example, the ICT Graduate Schools initiative included workplace internship placements for Masters' level ICT Graduates. Following the placements, when employers were surveyed what the students lacked, their answers referred sometimes to technical competencies or skills currency, but much more often more to transversal employability and work-readiness skills which employers in all industries cite: attitude; teamwork; client communication; and self-management skills such as "turning up on time".

These are skills that educators do not necessarily associate with degrees or Masters-level qualifications, but are nonetheless a necessary foundation for success in the industry, and the workforce overall. Recent NZ research also highlighted the extent to which transversal or "soft" skills really reflect the situational behaviours of workplaces, which are culturally located, difficult to develop in classrooms, and impossible to demonstrate except in the context of real workplaces.

This is not to defend the sometimes non-inclusive cultures that have develop around industries – where to "fit" in a workplace means accepting unwelcome behaviours, or bullying, or it being unusual that you present as a certain gender or ethnicity.

It is very challenging to train people outside the workforce, for a workforce that has moved on by the time they get there. So another option – and necessity - is to upskill and reskill people within the workforce. This strongly suggests further development of work-based learning options as a core solution to skills gaps and to improve the match between the skills that are developed with industry needs – which very likely underpins the strong preference for on-job learning reflected in the 2017 *Digital Skills* survey results, and the strong support for the development of digital apprenticeships in the 2021 update report.

> Current post-school provision

Table 2
Information Technology courses offered by level – November 2020
Source: studyspy.ac.nz

535 information technology courses are currently offered by education providers nationally (this includes computer science, information systems and other information technology).

Level	Qualification	Courses?
1	Certificate Courses	11
2	Certificate Courses	25
3	Certificate Courses	73
4	Certificate Courses	52
5	Certificate/Diploma Courses	87
6	Certificate/Diploma Courses	56
7	Diploma/Graduate Diploma/Bachelor/Undergraduate Degrees	101
8	Honours Degree/Postgraduate Certificate/Diploma	31

Table 3
Information technology courses offered by provider – November 2020
Source: studyspy.ac.nz

Provider	Courses
Nelson Marlborough Institute of Technology (NMIT)	48
Ara Institute of Canterbury	43
Manukau Institute of Technology (MIT)	34
The Cut Above Academy	24
Auckland University of Technology (AUT)	18
Southern Institute of Technology	18
Universal College of Learning (UCOL)	14
Aspire2	13
Eastern Institute of Technology (EIT)	13
Waikato Institute of Technology (Wintec)	13
Wellington Institute of Technology (WelTec)	13
Toi Ohomai Institute of Technology	12
New Zealand School of Education (NZSE)	11
Whitireia New Zealand	11
Information Technology Training Institute	10

Avonmore Tertiary Institute	8
Cornell Institute of Business and Technology	8
Massey University	8
NorthTec (Tai Tokerau Wānanga)	8
Otago Polytechnic	8
The Open Polytechnic of New Zealand	7
Unitec Institute of Technology	7
AMES - The Institute of IT	6
The University of Waikato	6
University of Canterbury	6
Yoobee Colleges	6
AGI Education	5
Animation College New Zealand	5
Learning Post	5
Mission Ready	5
People Potential	5
Regent International Education Group	5
Tasman International Academies	5
The Skills Organisation	5
University of Otago	5
Western Institute of Technology at Taranaki (WITT)	5
AWI International Education Group	4
BEST Pacific Institute of Education Limited	4
KIWA	4
National Technology Institute	4
New Zealand Management Academies (NZMA)	4
Techtorium NZIIT	4
University of Auckland	4
Vision College	4
Wellington ICT Graduate School	4
Alphacrucis International College	3
Auckland Institute of Studies	3
EmployNZ Tertiary Institute	3
Future Skills Academy	3
ICL Graduate Business School	3
Newton College of Business and Technology	3
Te Whare Wananga o Awanuiarangi	3
UUNZ Institute of Business	3
Victoria University of Wellington	3

Abacus Institute of Studies	2
Anamata	2
Front-line Training Consultancy	2
HLC	2
International College of Auckland	2
MSL Training	2
Martin-Hautus The Pacific Peoples Learning Institute	2
Media Design School	2
New Zealand Institute of Sport	2
Royal Business College	2
Sewtec Fashion Academy	2
Active Institute	1
Arai te Uru Kokiri Training Centre	1
Crown Institute of Studies	1
Education Action Limited	1
Enspiral Dev Academy	1
Framework Solutions Limited	1
Kingston Institute of Business & Technology	1
Lincoln University	1
Matapuna Training Centre	1
National Institute of Education (Ntec)	1
New Zealand Institute of Science and Technology	1
New Zealand Institute of Studies	1
North Shore International Academy	1
Pacific Training Institute	1
Pasifika Education Centre	1
Quality Education Services Trust Limited	1
Serco New Zealand Training Limited	1
Skills Update Training Institute	1
Success Maker Education Centre	1
Sues Computer Training Company	1
TAFE College (NZ) Limited	1
Te Kohanga Reo National Trust Board	1
Te Wānanga o Aotearoa	1
The Salvation Army Education & Employment	1
Turanga Ararau	1
Valley Education and Training Enterprises Limited	1
the Learning People	1

> NEW ZEALAND HAS NEVER HAD AN IT INDUSTRY TRAINING ORGANISATION

However, despite such a strong employer preference for on-job training, formal traineeships and apprenticeships have not been offered in the IT industry in New Zealand for a number of systemic reasons.

In 1992, New Zealand implemented an industry-led system for industry training and apprenticeships, whereby enterprises would apply to be recognised by government to set occupational standards for an industry and make arrangements with employers in those industries for workers to achieve those standards and gain industry qualifications.

The system was an outgrowth of traditional apprenticeship schemes that operated primarily in traditional trades areas, but has progressively expanded to include a much wider range of industries. Over the course of two decades, stakeholders within the IT industry made attempts to establish an "IT ITO", usually as an offshoot of technological developments in other industries – one example was driven via the outgrowth of online publishing and media, which from a skills perspective was increasingly distinct from the print industry, but these efforts foundered for a range of reasons:

I. Industry definability: While today, there are definable IT occupations, the extent to which digital skills are crosscutting, play out in all sectors of the economy, and the extent to which digital skills and literacies underpin an increasing range of occupations, means that delimiting the IT industry, and where its occupational standards might apply, is and was difficult.

II. International credentials: the borderless nature of digital skills, in terms of both the internet and the international use of core IT products has meant that international technology credentials, such as Microsoft certification, is of much greater labour market cachet than an NZQA qualification, meaning the business case for developing New Zealand occupational standards and credentials was fairly weak, even when it meant the training in respect of those credentials would be subsidised.

III. Finally, and perhaps decisively, ITOs (in any industry) were only ever able to access training subsidies for training up to Level 4 (and a capped amount of Level 5) of the New Zealand Qualifications Framework. As described above, the formal qualifications and traditional pathways associated with several key technology careers were identified with degree level and above qualifications (Level 7). This meant that developing work-based (or even blended on-job and off-job) pathways to achieve recognised or respected qualifications by NZ industry employers were not available.

These factors combined meant that industry consensus was difficult to achieve and the business case for an IT ITO was difficult to make because of operational policy constraints. The New Zealand qualifications system and associated funding policies have maintained a hierarchical separation between learning for skilled trades and professions, and degree-level learning. From the learner's perspective too, the international credentials have tended to carry far more industry and labour market cachet than NZQA-branded certificates.

Looking forward, from a career pathways perspective, it could be better for the technology industry, and suit a diversity of learners better, to make available on-job certificates and diplomas through subsidised on-job pathways, leading to national recognised credentials, especially if these could bridge to degrees where appropriate, and mapped to international certifications where possible. This would immediately develop a new talent supply through developing credentialed pathways to existing workers, and increasingly, such learning can be offered online to fit around a person's working circumstances.

Looking ahead, we are optimistic, as some of the present delivery and qualifications level strictures around the former ITO system are removed, and the tech sector explicitly catered for through the more comprehensive coverage of the proposed Workforce Development Councils.

In our assessment, the development of respected work-based pathways to tech qualifications, including higher level qualifications, looks both possible and worthwhile, over the next three to five years. In that regard, we note the strong employer support (74 percent) for the development of a digital apprenticeship recommended by the Digital Forum.

> (REFORM OF) VOCATIONAL EDUCATION

The current Reforms of Vocational Education (and consequential developments on the New Zealand Qualifications Framework) provide important and encouraging opportunities to influence and address several elements of the situation described above. Taking these in turn:

Firstly, as seen above, the Technology industry will be covered under the new framework of six Workforce Development Councils (WDCs), expected to be operational in the second half of 2021. However, to date their establishment is not proving smooth or uncontroversial.

WDCs are intended to be comprehensive with respect to industries across the economy, and defined according to Australian and New Zealand Standard Industry Classifications (ANZSIC 2006). The IT industry was initially assigned under manufacturing, engineering,

logistics and technology. This was in part to align with the school-based Vocational Pathways that underpin the WDC framework, which in turn paralleled the not-always-comfortable marriage of Technology-related disciplines in the New Zealand Curriculum. However, in an interim establishment phase, tech industry stakeholders have successfully convinced the government to move key technology industry classifications from the Manufacturing and Engineering WDC to the Creative, Cultural and Recreation (and Technology) WDC.

This may well prove to be a better fit for the predominance of occupations within the industry, or how the industry wishes to present itself, presuming there is consensus about that. But, like the NZ Curriculum, and like the Vocational Pathways, once again the Technology industry finds itself tacked-on to something else, as opposed to defining its own pathways or its own WDC.

In that context it is worth noting that in the consultation stage of the reform, the collective of industry training organisations – which did not themselves cover the IT industry, proposed that the reform develop a system of seven WDCs, rather than six, the seventh being "Professional and ICT Services".

Looking optimistically, the framework for the WDCs matters less than the industry voice being genuinely heard and heeded by the skills system, and that the courses delivered on or off the job are giving the learners and industries alike what they need.

Irrespective of whether the IT industry is attached to "Red" or "Yellow" or gets its own colour, it does not resolve the reality that while there is an identifiable cadre of occupations that are associated with the IT "industry", the skills needed in all industries is increasingly digital and increasingly sophisticated: Dairy farmers need increasing digital skills in their workers, and therefore reflected in their industry credentials, as will the carpenters, the manufacturers, the social workers, and all the rest. That means there will be a strong need for connected and co-ordinated effort between the Workforce Development Councils to ensure such cross-cutting skills are well embedded in their skills and training products and credentials.

> COVID-19 RESPONSE

The Government has shown strong support for vocational education and apprenticeship training in the wake of the COVID crisis. A $1.6 Billion (NZD) skills and training package was announced, which has been used to make vocational education courses in priority industries fees-free, and all apprenticeships in all industries fees-free for the next two years.

A further scheme, Apprenticeship Boost, is directly supporting employers of first and

second year apprentices. Effectively a wage subsidy, the funding offsets some of the costs to employers for training less skilled workers, and stimulates more employers to engage in on-job and apprenticeship training. While there is a significant amount of polytechnic and private training in technology-related areas, the lack of formal apprenticeships means that the industry is not currently able to take full advantage of this additional support.

> ICT GRADUATE SCHOOLS

In response to industry advocacy, a number of pilot ICT graduate schools were developed in the 2010s. The concept behind these schools was faster access to more relevant ICT skills, through hosted internships – students could be fast-tracked to post-graduate ICT qualifications via work integrated learning. While the policy driver was a faster route to a qualification, by pitching at post-graduate level, the learner needed to have already completed the full and multi-year undergraduate qualification. With the change of Government in 2017, the funding for these schools has been reallocated and while some intend to continue their offerings, their specific funding will not proceed beyond 2020.

> INTERNSHIPS

While there is an increasing move towards work-integrated and co-operative learning between universities and high-tech employers, this is not systemic: overall, New Zealand is underdeveloped in the delivery of advanced and graduate level apprenticeships. However several technology employers have also partnered with university-based initiatives to support internship placements for students, the most well-known of which is the "Summer of Tech" programme, a paid summer internship programme for students studying at all levels (though mainly from universities) to kick start their careers, meet employers and gain work-readiness skills. These have operated for a number of years, but there is not necessarily a high level of integration between the programmes of study and the internships: again, an unfortunate combination of funding and qualifications policies that has impeded the systematic development of higher level work-integrated learning, including advanced and degree-level apprenticeships.

> DIGITAL APPRENTICESHIPS

Like apprenticeships in many other vocational and professional services areas, Digital Apprenticeships could provide a key solution to bolstering work readiness and improvement of employees. Skills are deployed in the industry as they are developed. In an apprenticeship model, a labour market match is not the hoped-for outcome of institutionalised training: it is the starting point. The ability to earn while learn would also go a long way to reducing economic barriers to learning as well as bridging the gap with what industry wants and what graduates can do. It would also support and encourage the

participation of underrepresented groups.

Their development will require a co-ordinated effort involving willing employers, industry representatives and training providers. It will also require behaviour change in terms of employers' recruitment patterns. The New Zealand technology industry itself believes that on-job learning is the most effective way to training for technology roles, and examples of internships and cadetships are currently happening show excellent results, but they are underutilised, and not systematic.

In short, we agree with the Digital Skills Forum recommendation that it is time – beyond time – to develop digital apprenticeships as a formal skills pathway in New Zealand. While conceptual at this point, we believe that all the necessary policy ingredients are in place to develop co-ordinated and resourced apprenticeships in the IT sector, that could lead to the achievement of industry and/or NZQF credentials, including microcredentials. Developing the pathway would require resources to support the learners and the employers to undertake the skills development and provide the pastoral care. We also suggest that digital apprenticeships be offered through both direct employer and group training schemes.

We suspect that through the evolving reforms in the vocational system, and the level of industry support, these apprenticeships may emerge through the new system structure, and the voice of the technology sector as part of workforce development councils. The question for the industry is how it can influence the education and skills system now to prioritise these developments. As above, we see no insurmountable barriers to developing a pilot.

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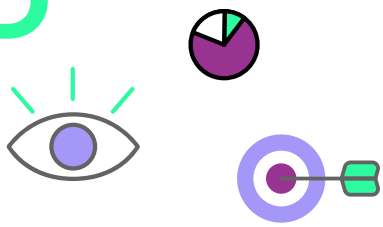
UNDERSERVED LEARNERS AND INEQUALITY



If one single thing can be drawn from the history of education and training initiatives aimed at underserved groups, or associated research and evaluation efforts, it is that 'wraparound' and pastoral support to learners is essential. This support needs to extend beyond the learning programme itself, and support background factors which are barriers to learning. Learners with less track record of formal educational success tend not to be successful through online-only or self-directed learning. Someone – a real person – must care about the learning and walk the learning journey with them. Conversely, it is absolutely the case that educational success breeds success when the right combination of support is provided, and the learning is purposeful and relevant.

Our conversations with a number of stakeholders in the digital inclusion and digital equity field confirm that a number of the issues noted in the digital inclusion literature are at play here – access to devices, connectivity, and training in ways that allow these learners to access learning around their lives and in their homes, is a given. Given existing inequalities and associated levels of deprivation, barrier-free access to training materials will be a necessary pre-condition to their engagement, including meeting any financial barriers.

In the current context, New Zealand's experience with a nationwide COVID-19 induced lockdown further laid bare some of the inequalities that exist in regards to access to technology. Research has indicated that lower socio-economic learners faced disadvantage with the sudden shift to online learning[8] including lack of access to online learning devices. Further to this, devices are likely to be shared amongst a high number of siblings, with capped internet access and houses that are more likely than average to have a large number of people domiciled. None of these factors are conducive to successful online learning. The downstream effects of this include reduced achievement and income earning potential. Any continued shift towards digitisation of learning will

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require sustained effort to enable equitable access to required devices. If not, inequalities will continue to be entrenched.

> NEETS

Seasonally adjusted, New Zealand has 80,000 "NEETS" – young people Not in Employment, Education, or Training. New Zealand has adopted the term from the OECD, and Statistics New Zealand has reported data and trends in New Zealand for several years now. Other countries employ more strengths-based terms, notably "opportunity youth", to define these young people by what they are rather than what they are not doing.

In some respects, NEETS are a statistical artefact – they are young people not in the education system and not in the tax system – and because they are not in these databases, it can be risky to generalise about them. Just to provide one example, from New Zealand's school enrolment databases, we know we seem to lose approximately 1,000 learners a year between intermediate and high school. Data matching across government through integrated data is making it easier to track the life and work pathways of individuals, but clearly this group is one source of NEETs, and they perhaps remain that way for some time.

However, they represent a group with economic potential – to themselves and their communities. They are low income, strongly correlated with low socio-economic groups, and tend not to have had a lot of previous success in formal education.

The single largest NEET group is care-giving Polynesian females. This is worth some reflection, since young women taking care of children does not necessarily fit the typical public or political characterisation of NEETs, and it also highlights how traditional statistical measures of economic activity can do a poor job of catering for the critically important work of caregiving for the young (or the old).

Having said that, these groups are among the more vulnerable in society, and investing in them will improve social inclusion and reduce economic and social costs longer term. Key stakeholders suggest that those Pasifika females are seeking out employment in administrative fields that they are able to perform at home while caregiving.

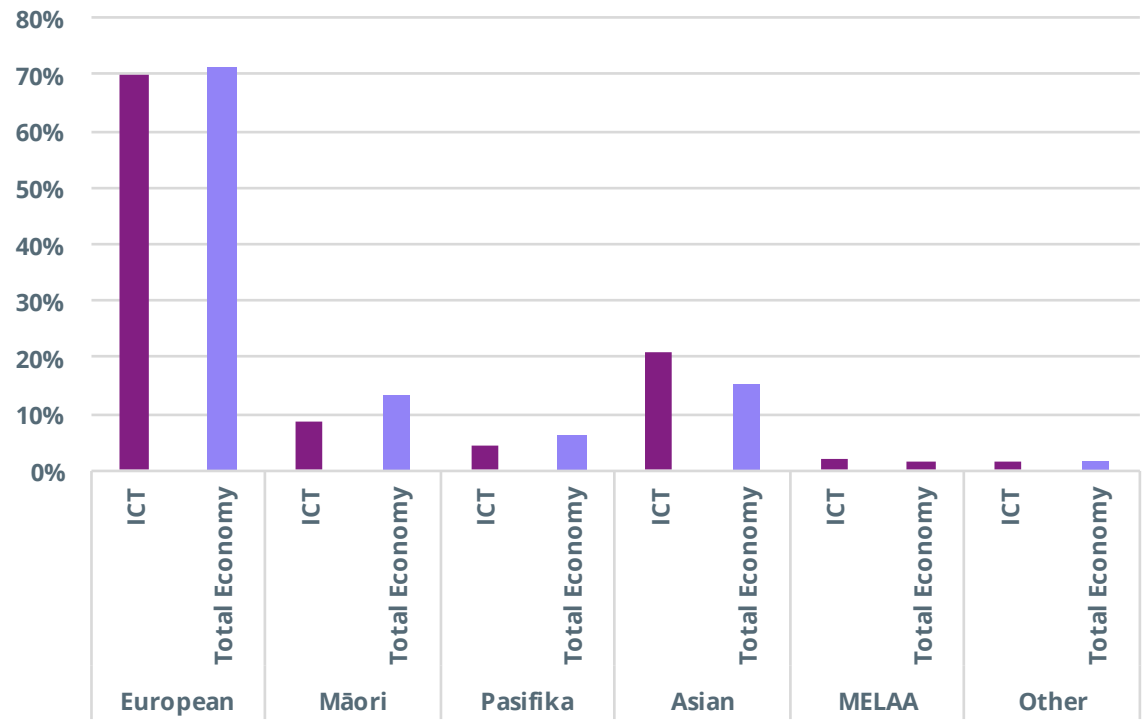
As shown in digital inclusion work by 2020 Trust and others, many NEETs will have poor access to digital technologies and low levels of digital literacy. A frontline youth services provider in New Zealand confirms that while most of these young people will have an internet capable mobile device, these tend to be cheaper phones with limited internet browsing capability, not a full smart device, and therefore not suitable as a learning device. Data connectivity also tends to be prepaid and capped, meaning easy access to high quality learning materials is also constrained.

> MĀORI AND PASIFIKA

Across the New Zealand education system, persistent achievement gaps are observed between Māori and Pasifika students, relative to European and Asian students, across the education system. Interestingly, these gaps are observed least in the work-based training and apprenticeship system, where, in 2019, Average credit achievement was the same for European and Pasifika trainees (65 credits per year), and Māori close to this, averaging 63 credits. Among the Apprenticeship cohort, European Apprentices averaged 45 credits, Māori 38 credits, and Pasifika 36 credits.

By contrast, just eight percent of computer science and information technology students in 2016 were Māori, around half the proportion of Māori in the general population, though Māori also do not participate in diploma and degree level education generally in line with the population overall, so this finding is not necessarily attributable to the attractiveness or otherwise of Technology fields. According to Elevating Aotearoa's Future, just three percent of 'Summer of Tech' interns identified as Māori or Pasifika in 2020. As described already, since the pool of interns consists of learners well advanced on a university pathway, the ethnic inequity of that population is already built in.

Figure 5
ICT Sector Ethnicity 2018



Source: Infometrics

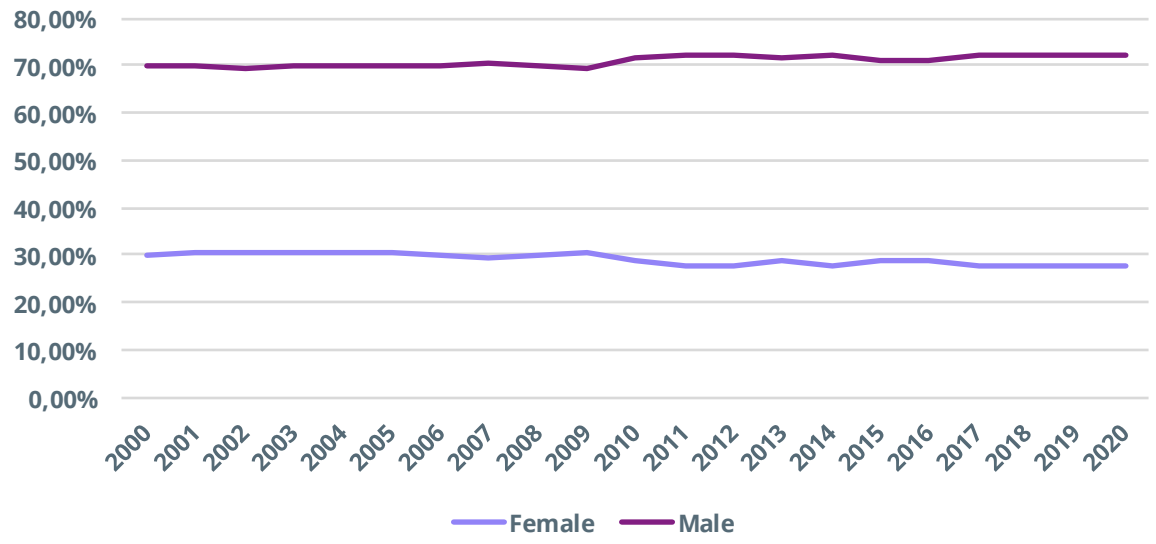
> WOMEN

Across the education system, men studying in ICT fields generally outnumber women by a ratio of 2:1. According to the 2017 digital skills report, just 36% of information students technology students were women. According to New Zealand economic intelligence company Infometrics, 27.8 percent of the of the current digital workforce was female in 2019, and the gender disparity has actually widened since the year 2000.

More evidence would be required to identify if this represents more diverse post-study pathways from women than men who study information technology, or, if it represents an encouraging sign that the proportion of early career females is higher than in the overall workforce, which may be early evidence of a positive longitudinal trend.

As is observed in many other male-dominated industries and occupations, the net result is a combination of gendered messaging throughout primary school and even in early childhood around the kinds of roles girls and women can and should aspire to. On the flipside, habitual and traditional recruitment behaviours by employers to "fish in the same pond", reinforces these workforce patterns. To take advantage of the diversity opportunity, energy and effort must go in to changing both employer attitudes, and to encourage young women's aspirations.

Figure 6
ICT Sector : Gender of Workforce



Source: Infometrics

IN-DEMAND LEARNING PATHWAYS

Microsoft's global skills initiative is focusing on 10 in-demand technology roles, and it has made the entirety of its own training products free of charge for a limited time, as a contribution to COVID recovery skilling and reskilling efforts. Across the world, the initiative aims to upskill 25 million people, and in the interests of inclusive growth, is seeking to attract and recruit people from non-traditional backgrounds to these roles.

The following breakdown provides employment and labour market trends associated with these occupations, noting that in some cases these do not align well with Australian and New Zealand Standard Classification of Occupations (ANZSCO). These classifications also struggle to maintain pace with industry changes, but assist to provide longer term trends and forecasts.

In the course of our work, we also found that there is no standardised mapping of occupations to qualifications – we believe more generally as part of the reforms of vocational education this exercise should be undertaken as an enhancement to the qualifications framework, since such a map would both assist the system to identify which qualifications were most effectively leading to good labour market outcomes, but also for learners to connect their lifelong learning journey with their job and career aspirations. A more targeted mapping could be undertaken for the Technology Industries as part of the early work of new Workforce Development Councils.

Sources: Infometrics; Careers New Zealand.

> SOFTWARE DEVELOPER (ANZSCO equivalent – Developer Programmer)

Table 4

Current employment: 12,680 FTE (Rank in New Zealand ICT industry: 2)

Year	Developer Programmer	New Jobs	Replacement Jobs	Total Jobs
2000	6.004			
2001	6.418	415	123	538
2002	6.688	270	130	400
2003	6.807	119	135	254
2004	7.027	220	149	369
2005	7.308	280	165	445
2006	7.687	380	185	565
2007	8.078	391	205	596
2008	8.513	435	228	663
2009	8.844	331	250	581
2010	8.726	-117	259	142
2011	9.081	355	270	625
2012	9.625	544	288	832
2013	10.126	501	304	805
2014	10.552	426	319	745
2015	11.073	521	336	857
2016	11.533	460	352	812
2017	12.014	481	368	849
2018	12.399	385	382	767
2019	12.779	380	395	775

> PAY

Software developers usually earn **$72K-$100K per year**

Source: Absolute IT, Tech Remuneration Report, 2018.

> JOB OPPORTUNITIES

Chances of getting a job as a sales software developer are **good** due to a shortage for workers.

> LENGTH OF TRAINING

1-3 years of training usually required.

> SALES REPRESENTATIVE

Table 5

Employment: 2,082 FTE (Rank in New Zealand ICT industry 10)

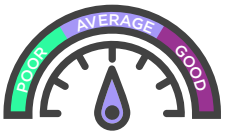
Year	Sales Representative	New Jobs	Replacement Jobs	Total Jobs
2000	1.626			
2001	1.679	53	56	109
2002	1.735	57	52	109
2003	1.664	-71	45	-26
2004	1.718	53	52	105
2005	1.830	113	61	174
2006	1.861	31	68	99
2007	1.995	133	79	212
2008	2.064	70	88	158
2009	2.138	74	98	172
2010	2.043	-96	100	4
2011	2.048	5	101	106
2012	2.089	42	103	145
2013	2.218	129	109	238
2014	2.151	-67	106	39
2015	2.106	-46	104	58
2016	2.075	-30	102	72
2017	2.160	85	106	191
2018	2.157	-3	106	103
2019	2.082	-75	103	28

> PAY

Sales representatives working for small to medium-sized companies usually earn **$39K-$100K per year**

Sales representative working for large companies usually earn **$50K-$120K per year**

Source: Hays, Michael Page, Robert Walters, Trade Me, 2018.



> JOB OPPORTUNITIES

Chances of getting a job as a sales representative are **average** for those wanting to enter the role, but **good** for those with experience.

> LENGTH OF TRAINING

There are no specific training requirements.

> PROJECT MANAGER (ANZSCO = ICT Project Manager)

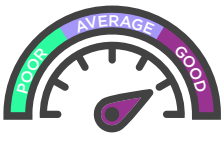
Table 6
Employment: 8,629 FTE (Rank in NZ ICT industry 4)

Year	Project Manager	New Jobs	Replacement Jobs	Total Jobs
2000	3.341			
2001	3.461	120	63	183
2002	3.747	286	66	352
2003	4.034	287	69	356
2004	4.375	341	78	419
2005	4.778	403	88	491
2006	5.233	455	101	556
2007	5.505	272	110	382
2008	5.808	303	121	424
2009	6.082	274	131	405
2010	6.099	16	136	152
2011	6.338	239	142	381
2012	6.698	360	150	510
2013	7.067	369	159	528
2014	7.301	234	166	400
2015	7.602	301	173	474
2016	7.846	244	180	424
2017	8.149	303	187	490
2018	8.444	295	195	490
2019	8.673	229	201	430

> PAY

Project managers usually earn **$55K-$135K per year**

Source: Absolute IT, 2017 and Trade Me Jobs, 2016.



> JOB OPPORTUNITIES

Chances of getting a job as a project manager are **good** because constant change means organisations often have projects needing management.

> LENGTH OF TRAINING

2-3 years of training usually required.

> IT ADMINISTRATOR (ANZSCO = Systems Administrator)

Table 7

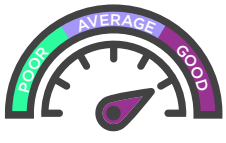
Employment: 4,275 FTE (Rank 6th)

Year	IT Administrator	New Jobs	Replacement Jobs	Total Jobs
2000	2.616			
2001	2.686	69	60	129
2002	2.750	65	66	131
2003	2.803	53	71	124
2004	2.906	103	78	181
2005	3.023	116	87	203
2006	3.116	94	95	189
2007	3.186	70	102	172
2008	3.272	86	110	196
2009	3.339	67	118	185
2010	3.279	-60	122	62
2011	3.315	36	124	160
2012	3.397	82	128	210
2013	3.486	89	132	221
2014	3.586	100	136	236
2015	3.727	141	143	284
2016	3.853	126	148	274
2017	4.003	150	155	305
2018	4.161	157	162	319
2019	4.295	134	168	302

> PAY

Systems administrators usually earn **$66K-$90K per year**

Source: Source: Absolute IT, Tech Remuneration Report, 2018.



> JOB OPPORTUNITIES

Chances of getting a job as a Systems administrator are **good** due to a shortage of workers.

> LENGTH OF TRAINING

2-4 years of training usually required.

> CUSTOMER SERVICE SPECIALIST (ANZSCO = ICT Customer Service Manager)

Table 8

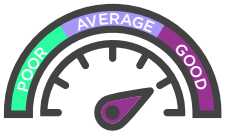
Employment: 316 FTE (Rank in NZ ICT sector 46[9])

Year	Customer Service Specialist	New Jobs	Replacement Jobs	Total Jobs
2000	227			
2001	240	13	4	17
2002	259	19	4	23
2003	259	0	3	3
2004	273	15	4	19
2005	297	23	5	28
2006	308	12	6	18
2007	320	12	7	19
2008	328	8	7	15
2009	333	4	8	12
2010	307	-26	8	-18
2011	303	-4	8	4
2012	303	0	8	8
2013	310	8	8	16
2014	306	-5	8	3
2015	304	-1	9	8
2016	305	1	9	10
2017	314	9	9	18
2018	318	4	9	13
2019	316	-2	9	7

> PAY

IT managers usually earn **$107K-$150K per year**

Source: Absolute IT, Tech Remuneration Report, 2018.



> JOB OPPORTUNITIES

Chances of getting a job as a IT manager are **good** due to a shortage of workers.

> LENGTH OF TRAINING

2-3 years of training usually required.

9 We suspect this job title may be variously captured under several additional ANZSCO classifications.

> DIGITAL MARKETER (ANZSCO = Marketing Specialist)

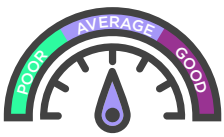
Table 9
Employment 765 FTE (Rank 27th)

Year	Digital Marketer	New Jobs	Replacement Jobs	Total Jobs
2000	280			
2001	293	13	7	20
2002	335	42	8	50
2003	359	24	7	31
2004	403	44	9	53
2005	457	54	11	65
2006	510	53	13	66
2007	548	38	14	52
2008	576	28	16	44
2009	601	25	17	42
2010	586	-15	18	3
2011	601	15	18	33
2012	635	34	19	53
2013	677	41	21	62
2014	690	13	21	34
2015	717	27	22	49
2016	732	15	23	38
2017	756	24	24	48
2018	768	12	24	36
2019	776	8	25	33

> PAY

Marketing specialists usually earn
$40K-$75K per year
Marketing executives usually earn
$60K-$85K per year

Source: Hays, Michael Page, Robert Walters, 2018.



> JOB OPPORTUNITIES

Chances of getting a job as a marketing specialist are **average** for those wanting to enter the role, but **good** for those with experience.

> LENGTH OF TRAINING

3 years
of training usually required.

> IT SUPPORT/HELPDESK (ANZSCO = ICT Customer Support Officer)

Table 10

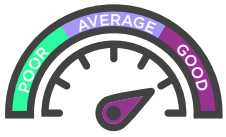
Employment: 8,102 FTE (Rank in ICT Sector: 5)

Year	IT support/ helpdesk	New Jobs	Replacement Jobs	Total Jobs
2000	5.680			
2001	5.881	201	110	311
2002	6.025	144	124	268
2003	6.140	115	138	253
2004	6.336	195	157	352
2005	6.562	226	179	405
2006	6.727	165	200	365
2007	6.812	85	219	304
2008	6.979	167	241	408
2009	7.061	82	261	343
2010	6.835	-226	269	43
2011	6.878	43	269	312
2012	7.043	165	274	439
2013	7.194	151	279	430
2014	7.326	133	282	415
2015	7.515	189	288	477
2016	7.675	160	293	453
2017	7.917	242	300	542
2018	8.049	131	304	435
2019	8.121	73	305	378

> PAY

Information technology helpdesk/support technicians usually earn **$46K-$65K per year**

Source: Absolute IT, Tech Remuneration Report, 2018.



> JOB OPPORTUNITIES

Chances of getting a job as a IT helpdesk/support technician are **good** due to a shortage of workers.

> LENGTH OF TRAINING

1-3 years of training usually required.

> DATA ANALYST (ANZSCO = Database Administrator)[10]

Table 11
Employment: 3,826 FTE (Rank in ICT industry: 7)

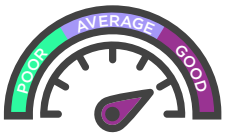
Year	Data Analyst	New Jobs	Replacement Jobs	Total Jobs
2000	1.496			
2001	1.545	50	35	85
2002	1.593	47	38	85
2003	1.630	37	42	79
2004	1.693	62	42	104
2005	1.772	79	42	121
2006	1.846	75	42	117
2007	2.019	173	45	218
2008	2.181	162	46	208
2009	2.349	168	48	216
2010	2.436	86	47	133
2011	2.596	160	51	211
2012	2.783	187	56	243
2013	2.969	186	60	246
2014	3.079	110	63	173
2015	3.225	146	67	213
2016	3.364	139	71	210
2017	3.522	158	76	234
2018	3.697	176	80	256
2019	3.845	148	85	233

> PAY

Data analysts usually earn **$64K-$110K per year**

Data scientists usually earn **$105K-$133K per year**

Source: Absolute IT and Hays, 2020.



> JOB OPPORTUNITIES

Chances of getting a job as a data analyst are **good** due to a shortage of workers.

> LENGTH OF TRAINING

2-3 years of training usually required.

10 Similarly, this role descriptor is not neatly catered for or out of date in the ANSZCO framework)

> FINANCIAL ANALYST (ANZSCO Accountant and Finance Manager)

Table 12

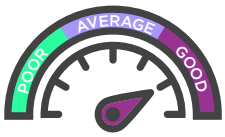
Employment: 1410 FTE (Accountant 782 FTE Rank 24; Finance Manager FTE 628 Rank 32)

Year	Accountant (ICT sector)	New Jobs	Replacement Jobs	Total Jobs	Finance Manager (ICT sector)	New Jobs	Replacement Jobs	Total Jobs
2000	378				415			
2001	406	28	8	36	434	19	6	25
2002	441	34	8	42	471	37	6	43
2003	447	6	9	15	477	6	7	13
2004	472	26	10	36	509	33	8	41
2005	514	41	11	52	561	51	9	60
2006	565	51	13	64	614	53	11	64
2007	590	25	14	39	632	18	12	30
2008	612	22	16	38	633	1	13	14
2009	639	27	17	44	634	1	13	14
2010	625	-13	18	5	596	-38	13	-25
2011	644	19	19	38	589	-7	13	6
2012	682	38	20	58	597	9	14	23
2013	724	42	21	63	605	8	14	22
2014	732	8	21	29	608	2	15	17
2015	749	17	22	39	615	7	15	22
2016	758	10	23	33	620	6	15	21
2017	782	24	23	47	635	15	16	31
2018	798	16	24	40	634	-1	16	15
2019	788	-10	24	14	633	-1	17	16

> PAY

Finance managers usually earn **$82K-$163K per year**

Source: Source: Hays, 2020.



> JOB OPPORTUNITIES

Chances of getting a job as a finance manager are **good** due to high demand of their services.

> LENGTH OF TRAINING

3 years of training usually required.

> GRAPHIC DESIGNER

Table 13
Employment : 520 FTE, rank 37. (Note web designer 710 FTE)

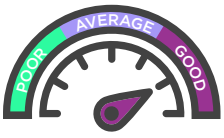
Year	Graphic Designer	New Jobs	Replacement Jobs	Total Jobs
2000	205			
2001	224	20	6	26
2002	239	15	6	21
2003	245	6	7	13
2004	259	14	7	21
2005	276	17	8	25
2006	300	24	9	33
2007	321	21	10	31
2008	344	23	12	35
2009	361	17	13	30
2010	355	-6	13	7
2011	373	17	14	31
2012	401	29	15	44
2013	427	25	16	41
2014	442	16	16	32
2015	469	26	17	43
2016	487	19	18	37
2017	503	16	19	35
2018	512	9	19	28
2019	526	14	20	34

> PAY

Graphic designers with 1 to 5 years´ experience usually earn **$40K-$65K per year**

Senior graphic designers with more than 5 years´ experience usually earn **$65K-$90K per year**

Source: Hays, 2018.



> JOB OPPORTUNITIES

Chances of getting a job as a Graphic designer are **average** for those wanting to enter the role, but **good** for those with experience.

> LENGTH OF TRAINING

3 years of training usually required.

CONCLUSIONS

Ultimately, our situational assessment identifies a “missing middle” for digital skilling in New Zealand:

> The domestic skills supply into the technology industry is dominated by bachelor level graduates straight from school, which immediately develops a demographic skew in the recruits, especially in terms of ethnicity.

> Employers in the sector have expressed a strong preference for internship, apprenticeship, and on-job training, but their recruitment preference has been to hire skills and experienced workers (including from overseas) rather than offering training themselves.

> The lack of formal or systematic ‘earn and learn’ options in the sector has been exacerbated by system barriers in the education system that may be resolved through the present vocational education reforms, but will equally critically rely on employer engagement and behaviour change.

> There are significant and achievable opportunities to develop, including:

> Digital apprenticeship packages and programmes, including towards Microsoft credentials, and using Microsoft’s training offer. We strongly concur with - and note the strong industry support for - the development of Digital Apprenticehsips recommended in the 2021 *Digital Skills* update report.

> Well-designed “interface” programmes to be offered in secondary schools, including through workplace experience arrangements. This could lead to industry micro-credentials that contribute to New Zealand secondary school qualifications, while providing employability skills and genuine head starts into pathways in the industry.

The good news is there are immediate and strong opportunities to progress both of these opportunities, through work to engage enterprises and through present reforms of the vocational education sector.

New Zealand has a well-developed and regarded vocational apprenticeship system, but it is currently undergoing significant structural reform. Through this change process, there is a need to embed initiatives that bring supply and demand factors of the labour force closer together. Due to the multi-year nature of most post-secondary qualifications, there will always be a time lag between what is learned and what is applied in industry.

Therefore, to support lifelong learning and improve skills matching, we need enterprise partners to help with the work readiness of our graduates and reskills those already in the workforce or have been excluded in the past for whatever reason. The lack of mapping of qualifications to occupations as well as the flexibility of NCEA and the recent development of new standards provide an opportunity to use programmes and resources developed by partners such as Microsoft as way to gain qualifications that are simultaneously internationally recognised and valued by industry.

Before introducing any new initiatives, we need to be aware of existing demographic skews in the IT sector in New Zealand. While New Zealand aims to make educational opportunities available to all, inequalities still exist - due to a variety of historical, sociocultural, and behavioural factors. These inequalities manifest in a situation where Māori, Pasifika, and women are underrepresented in the technology sector. With multiple causative factors, a wraparound approach will be needed to address these inequalities.

Learners from lower socio-economic backgrounds which disproportionately includes Māori and Pasifika tend to have less access to required technology for online and distance learning. They can often have other barriers such as caregiving to navigate. Solutions that can alleviate these factors such as provision of equipment and learning on-demand will be required. In terms of gender disparity, encouraging more women to enter to technology fields and working with industry gatekeepers to ensure that they are widening the recruitment net will go some way towards establishing a more equitable gender ratio in technology.

Employers complain of graduates that are not work-ready and further upskilling in order to operate in the workplace. We have a disconnect between what is taught, and what is needed. This suggests two things: Firstly, industry needs more say in what is taught; and learners in technology fields need earlier access to the workplace via apprenticeships, internships or other initiatives that will increase pre-graduation exposure to the workplace.

At a surface level, it would appear that there are numerous job opportunities for IT graduates in New Zealand. However, New Zealand produces enough IT graduates for the size of industry - we are just not producing them in the right areas. Industry has previously relied on immigration to fill senior IT roles. This does fill skill gaps, however industry needs to be encouraged to begin developing their own staff, invest in training and provide opportunities ‘in-house’.

Training providers will also need to contribute with closer links to industry and ensuring that course offerings are matching not only what industry wants, but also forecasted needs and international trends. This has been recognised with various initiatives that provide paid internships and work placements. These initiatives have not been carried out in a centralised way and are only ever a budget-cut away from being mothballed.

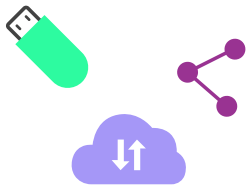
The IT industry has a voice through industry groups that liaise with Government agencies such as the Ministry of Business, Innovation, and Employment. What the industry has lacked in the past is a systematic way to influence learning and in particular on-job learning. For a number of reasons, there has never been an IT Industry Training Organisation and even if there was, its resourcing would have constrained it to the lower levels of the New Zealand Qualifications Framework. As a result, no national on-job cadetship or apprenticeship system has yet emerged.

The current vocational educational reforms address this in part through including the technology sector in the emerging Workforce Development Councils, but initially placed responsibility for its occupational standard setting and skills leadership with the broader manufacturing and engineering sectors, and subsequently with the creative and recreation sectors. Given the sizable and increasing influence that technology will have on the economy, it is disappointing that there is not a separate Workforce Development Council for ICT, and time will tell if the sector has been given an adequate voice in the restructured skills and training system.

In undertaking this analysis, we have enjoyed access to high quality employer survey information. However we note significant fragmentation and gaps, and lack of currency, in official information. These gaps are not unique to the IT industry, however there is no good match, or readily available mapping, between industry and occupational classifications (which are themselves increasingly outdated), and education and training courses and qualifications, despite the good efforts of many to create tools to help learners and industries navigate the system.

This consequently makes analysis of skills supply and demand issues in the sector necessarily inferential. More detailed analysis – or work to develop such a mapping – would support the industry, develop clearer education and training pathways, and associated careers and training advice. We recommend that work along these lines is undertaken, in particular to support the efforts of new regional skills leadership groups and the emerging Workforce Development Councils.

REFERENCES



> Australian Bureau of Statistics. (2006).*Australian and New Zealand Industry Classification (ANZSIC)*. https://www.abs.gov.au/ausstats/abs@.nsf/39433889d406eeb9ca2570610019e9a5/a77d93484dc49d63ca25712300056842!OpenDocument

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> Department of Internal Affairs Te Tari Taiwhenua.(2019). *The Digital Inclusion Blueprint Te Mahere mō te Whakaurunga Matihiko.* https://www.digital.govt.nz/assets/Documents/113Digital-Inclusion-BlueprintTe-Mahere-mo-te-Whakaurunga-Matihiko.pdf

> Digital Inclusion Research Group. (2017). *Digital New Zealanders: The Pulse of our Nation. A report to MBIE and DIA.* https://www.mbie.govt.nz/dmsdocument/3228-digital-new-zealanders-the-pulse-of-our-nation-pdf

> Whātua Ōrākei and Koi Tū: The Centre for Informed Futures. (July 2020). *Addressing Rangatahi Education : Challenges after Covid-19.* https://informedfutures.org/wp-content/uploads/Addressing-rangatahi-education.pdf

> FURTHER READING

The suggested reading below are all items that informed but were not directly quoted or referenced within this Situational Analysis. None of the items included in the References section are included below. This list below provides valuable insights into the New Zealand context and support the case for GAN type projects in New Zealand.

> Ministry of Education (March 2021): Digital Inclusion in New Zealand: 2014 Survey of Adult Skills (PIAAC).
https://www.educationcounts.govt.nz/__data/assets/pdf_file/0010/206767/Digital-Inclusion-in-New-Zealand.pdf
This recently released report analyses the PIAAC results for New Zealand in terms of a number of digital literacy and inclusion metrics, finding strong correlations between digital literacy and general literacy, strong ethnic disparities in digital inclusion, and an association between strong digital skills and higher earnings.

> NZTECH (2017). *Manifesto – New Zealand's Digital Future.*
https://nztech.org.nz/wp-content/uploads/sites/8/2019/02/tech-manifesto.pdf
This document gives insight into the views of industry and gives an overview of the areas in which industry lobby in order to influence Government policy.

> NZ TECH (2021 February 16).
https://nztech.org.nz/wp-content/uploads/sites/8/2021/02/202102-WDC-response-from-tech-industry.pdf
This paper provides the official tech industry response to the Government Review of Vocational Education (ROVE). This paper clearly outlines the industry concern with how ROVE has been implemented in relation to the needs of the tech sector. This clearly makes the case for why industry partnership such as the likes of the Microsoft initiative is needed in New Zealand.

> New Zealand Qualifications Authority. (2021, February 16).
https://www.nzqa.govt.nz/providers-partners/approval-accreditation-and-registration/micro-credentials/
This website gives official advice on the development of microcredentials and how they can provide pathways to larger qualifications. This could be one of the ways forward with digital apprenticeships and future partnerships involving GAN New Zealand.

> Light, Dr Rowan. (2020). *Catching the tide. New directions for youth NEET policy after covid-19.*
https://www.maxim.org.nz/wp-content/uploads/2020/09/CTT.pdf
This discussion paper was developed by the Maxim Institute which is a conservative leaning policy think tank in New Zealand. This paper makes some interesting points around the potential effectiveness of smaller wrap around initiatives for NEETs. This provides possible direction for potential GAN New Zealand interventions.

> MYOB. (2021, February 16).
https://nzentrepreneur.co.nz/wp-content/uploads/2019/05/MYOB-Women-in-Tech-Report-2019.pdf
This report gives specific New Zealand centric survey results of women in tech and identifies areas that are problematic in terms of supplying a level playing field.

> Tertiary Education Commission (2021, February 16*).*
https://www.tec.govt.nz/rove/reform-of-vocational-education/
The Tertiary Education Commission is a New Zealand Crown Agency that is responsible for the funding of the tertiary education sector in New Zealand. This webpage gives an overview of the Review of Vocational Education in New Zealand and is the source of official updates.

> ACKNOWLEDGEMENTS

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Norie Ape, Digital Product Lead, Building and Construction Industry Training Organisation

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Brad Olsen, Infometrics

Anne Taylor, Education Manager, Microsoft New Zealand

Patrick Dowling, Managing Director, Techtorium

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Ciaran Jack and **Jarrod Mosen**, StudySpy

Natalie Elia and **Holly Simpson**, Youthline New Zealand

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