



SOLVING FUTURE SKILLS CHALLENGES IN WALES.

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EXECUTIVE SUMMARY

THE CHANGING WORKPLACE IN WALES.

Technological advancement and the automation of tasks are set to impact a large number of jobs globally, potentially shrinking employment opportunities in a number of sectors and particularly at lower skills levels. Estimates of the proportion of jobs 'at risk' vary greatly but **Wales has a high proportion of jobs in the three sectors deemed most 'at risk': manufacturing, transport and storage and public administration. These three areas alone account for a fifth of the Welsh workforce.**

Although it is expected that 'new jobs' will be created to replace jobs that are displaced, these new jobs will not necessarily be created in the same region, may require higher levels of skills than the displaced jobs, or may not offer the same income or security as displaced jobs.

Wales will also undergo large changes in its demography in the next 20 years **with the number of people aged 16-64 projected to decrease by 4.2% between 2016 and 2041, and the number of people aged 65 and over projected to increase by 36.6%.** Similarly, excluding potential immigration, **there will be a decrease in the number of new entrants to the workplace in the next ten years as a result of the current demographic dip in 18 year olds.** This presents additional challenges in ensuring that, as the pool of new entrants to the workforce shrinks, there is a sufficiently skilled population to mitigate the risks of automation.

Nonetheless, automation presents opportunities for Wales and has, historically, made a positive contribution to productivity. The extent to which Wales is able to take advantage of these opportunities will in part depend on how quickly the education system in Wales is able to respond flexibly.

SKILLS IN WALES - THE CURRENT LANDSCAPE

There is a consensus among the literature on automation that **higher level skills will be in increasingly large demand in the coming decades and that jobs held by graduates will be less exposed to the risks of automation.**

In 2017/18 there were 129,585 students enrolled on higher education courses in Wales with 66% of higher education students in Wales aged 24 or under. **There is a wide range of subject-specific skills currently being studied by students in Wales and 48% of higher education students in Wales are currently studying science subject areas.**

Higher level skills are also delivered through work-based learning including higher level apprenticeships. Currently, 19% of all apprentices in Wales are on a higher level apprenticeship. **Higher level apprenticeship delivery is largely concentrated on 'health and public services' and 'management and professional' with 87% of all higher level apprenticeships being delivered in these areas.**

Overall, the population in Wales has lower qualification levels than the populations of England or Scotland. In 2017, 37.4% of the population in Wales was qualified to level 4 or above, compared to 40.7% of the population in England and 47.2% of the population in Scotland.

This aligns with the analysis of the 2011 census which found that in Wales 26.5% of the usual resident population aged 16-64 had a degree compared to 28.7% of those in England. The increasing demand for higher level skills, the lower qualification levels in Wales and the ageing population presents a particular challenge for policymakers in Wales.

Flexible learning, including part-time provision, will be an important part of responding to that challenge. Professor Sir Ian Diamond's review of higher education funding and student finance arrangements included a focus on strengthening part-time provision in Wales. The recommendations from the Diamond review included an improved package of maintenance support for higher education students in Wales, including part-time students.

Between 2008/09 and 2017/18 the number of part-time higher education students in Wales decreased from 53,575 to 32,810. The new maintenance package for part-time students was introduced in 2018/19. **Early figures from the Students Loan Company suggest a 35% increase in the number of part-time students receiving student support in Wales in 2018/19**, bringing the number of awards for part-time student support to a five-year high.

As well as the introduction of new student support for part-time students, other new forms of higher level skills delivery have been developed including the introduction of degree apprenticeships in Wales. The first degree apprentices in Wales started their level 6 apprenticeships in digital in 2018/19 with the development of the level 6 advanced manufacturing and engineering degree apprenticeship ongoing. **Universities report significant employer demand for degree apprenticeships across a wide range of subject areas at level 6 and level 7.**

These developments demonstrate the substantial demand among people and employers in Wales for new ways to access university study at bachelor's and master's level. The lower qualification levels among the population in Wales and the need to provide for a high-skilled workforce in response to technological developments means that finding innovative and flexible ways to deliver level 6 and 7 provision will become increasingly important.

SKILLS IN WALES - FUTURE SKILLS NEEDS

A number of reports have identified increasing demand for higher level skills in the UK. The CBI's 2018 education and skills survey found that by 2024 almost half of all jobs will require workers who have completed some form of higher level education (level 4+). The survey also found that employers in Wales were less confident than employers in Scotland and England about their ability to access employees with high level skills.

Labour market projections by the UKCES Working Futures programme suggest that **between 2014 and 2024 the number of people in the workforce in Wales qualified at level 6**

or above will increase by 150,037.

As well as increasing demand for higher level skills, occupations that have a high proportion of people with higher level skills are likely to be less exposed to the risks of automation. **PricewaterhouseCoopers estimates that occupations with those with low levels of education (level 2 or lower) have a much higher risk of automation (44%) than those with a level 6 qualification or above (11%).**

A recent report on adult learning systems by the OECD concluded that the extent to which individuals, firms and economies can harness the benefits of automation was critically dependent on the readiness of countries' adult learning systems to help people develop skills throughout their working lives (OECD, 2019). **The report notes that, generally, adults with low skills levels are three times less likely to participate in training than those with high level skills.** Given the comparatively low skill levels of the population in Wales, this presents an additional challenge to upskilling and reskilling the population.

Wales continues to have the lowest productivity in the UK. Work by the CBI – 'Unlocking Regional Growth' – **found that areas with more graduates in the workforce are significantly more productive than those with fewer and that a firm was 17% more likely to export if it had graduates within its workforce.**

Although technical and subject-specific STEM skills will continue to play an important role in Wales, there will also be an increasing importance placed on the higher order cognitive, social and behaviour skills which are difficult to automate.

Similarly, the focus on being able to draw on knowledge from various fields and to think and behave across boundaries, will increase. This interdisciplinarity is an important feature of higher education in Wales. A study by King's College London, commissioned by the Learned Society for Wales, found that the impact of Welsh research showed considerable interdisciplinarity. For example, 12 different research disciplines contributed to the research topic of 'Business and Industry'. Any approach to higher level skills must recognise the importance of student choice and interdisciplinarity.

RECOMMENDATIONS TO RESPOND TO WALES' FUTURE SKILLS NEEDS

As well as being less exposed to the risks of automation, evidence suggests there is an increasing demand for graduates, and higher level skills more broadly, across Wales and the UK. This, coupled with the changing demography of Wales, means providing opportunities for people of all ages and backgrounds to gain higher skills will be vitally important if Wales is to stand to benefit from the creation of new jobs in the wake of automation. To this end, Universities Wales makes the following recommendations:

1. DELIVER DIAMOND

Positive steps have already been taken in Wales with the Welsh Government's implementation of Professor Sir Ian Diamond's recommendations around student support. It is important that Welsh Government continues to implement the new student support and higher education funding package in full. Doing so will enable a greater number of people to access higher level skills and provide for a sustainable, long-term higher education system in Wales.

2. DEGREE APPRENTICESHIPS TO RESPOND TO BUSINESS DEMAND

Demand for degree apprenticeships has risen sharply across the UK. The initial degree apprenticeship offer in Wales has been well-received by employers and individuals alike but universities report strong demand for degree apprenticeships in a broader range of areas and at bachelor's and master's level.

Enabling the post-16 education system in Wales to be responsive to skills needs and provide work-based routes to level 6 and 7 qualifications would provide opportunities for many people in Wales to go through the upskilling or reskilling necessary to prepare for the changing workplace in Wales.

This should include opportunities for those who have already completed a level 4 or 5 apprenticeship to progress onto higher learning. In doing so, it is important to recognise that 87% of higher level apprenticeships in Wales are in 'health and public services' or 'management and professional'.

To help meet Wales' future skills needs, Welsh Government should facilitate the development and delivery of degree apprenticeships at level 6 and 7, across a range of subject areas, to meet evidenced business demand and provide progression routes for those who have already completed an apprenticeship in Wales.

3. FLEXIBLE COURSE OPTIONS

Another feature of enabling more people in Wales to access higher level skills will be ensuring the availability of flexible course options and shorter courses. Government and higher education providers should work together to consider how modular or credits-based approaches to undergraduate study could increase flexibility in the long-term. This could support learners in switching between different types of learning and routes to progression as their needs change over time.

There may be opportunities to look at greater government support for higher education institutions wishing to innovate, scale-up activity or further develop systems for flexible learning in order to overcome financial barriers and future uncertainties relating to these activities. This could be through targeted funding.

4. PARTNERSHIPS AND COLLABORATIONS

Partnerships and collaborations will also play a key role in responding to skills demand across Wales. As well as facilitating progression, partnerships and collaborations will also help providers deliver skills in potentially remote or rural areas, or in ways which fit with work or caring responsibilities.

Partnerships are already commonplace across providers in Wales including franchised higher education provision in further education institutions, group structures that cover different levels and modes of delivery, progression arrangements from one provider to another, and employer partnerships which include delivery of higher education provision on site at the employer.

Building upon these partnerships and collaborations will help learners progress from levels 2 and 3 study into levels 4, 5 and beyond. Government should explore how collaborative activity could be supported potentially through funding for partnerships and collaborations and to build upon existing ones.

INTRODUCTION

Every strong, sustainable economy has its foundations in the education and skills of its population. With the current pace of technological advancement and the changes taking place in workplaces across the world, this is perhaps more important than ever before. As we enter what has been described as a fourth industrial revolution, with experts predicting a near unprecedented level of automation in the coming decades, many have considered what these changes mean for individuals and businesses, and what skills will be needed to make the most of the opportunities of the future.

Much of the discussion around automation and technological change has focused on the risks that these changes pose to jobs. Frequent headlines suggest a third of jobs across the world could be lost. While most accept that automation does risk displacing jobs in Wales and the UK, there is also a recognition that, historically, automation has brought with it increased productivity, and where jobs are displaced new jobs are also created.

But while recent studies estimate the number of jobs created in the UK by automation will balance out the jobs lost, this does not capture the social or cultural impact of job displacement, nor does it capture the potential for those new jobs to be created in areas outside Wales, exacerbating existing regional disparities between Wales and the rest of the UK.

In preparing for technological and economic change, research and innovation (R&I) and skills are two central pillars of any government's approach. This report focuses on the latter and explores Wales' skills needs specifically: what the current higher education skills landscape looks like and what changes may be required to ensure Wales stands well-placed to respond to the challenges and opportunities of the future.

In this report, we are fortunate to be able to build upon the substantial work carried out by colleagues at Universities UK including the analysis by UUK in 'Solving Future Skills Needs' and the findings of the programme of work I chaired for UUK which focused on the economic case for flexible learning. These publications provided us with a good vantage point from which to examine the specific landscape and needs of Wales.

In Wales we face a particular set of challenges. Our population is, on the whole, older than the rest of the UK and less well qualified, and our productivity continues to be the lowest in the UK. What this means is that providing the opportunity for people of all ages and background to access higher education is going to be even more important in Wales than it will be elsewhere in the UK. And, for the Welsh economy, universities are of greater economic importance than elsewhere in the UK.

But just as Wales faces unique challenges, we are in some ways also a step ahead. The implementation of the Professor Sir Ian Diamond's recommendations on student support arrangements and higher education funding is already helping improve access to flexible learning with early figures suggesting a 35% increase in those choosing to study part-time in Wales. In the face of uncertainty in higher education in other parts of the UK, the Diamond Review gives us a clear path forward in Wales and one to which we must stay the course to successfully meet Wales' future skills needs.

However, as well as delivering the Diamond package there are other things that government, providers and employers can do to prepare for the challenges of the future. Across the UK we have seen a sharp increase in demand from employers and individuals for degree apprenticeships. Tens of thousands of people across the UK are already studying on these work-based routes to a bachelor's or master's degree. In Wales, degree apprenticeship delivery is current limited to bachelor's level and only in the subject areas of engineering and advanced manufacturing, and digital. Given the ageing population in Wales and the increasing urgency of reskilling that population, it is imperative that Welsh Government supports universities in providing a broad range of work-based routes to undergraduate and postgraduate learning.

For universities, there will also be a need for us to work with government and other providers to consider how a modular or credits-based system for higher education could increase flexibility for those wishing to study flexibly. And there are also opportunities for all post-16 providers in Wales to build upon the existing collaboration that takes place which, as well as facilitating progress, could also help deliver skills in potentially remote or rural areas, or in ways which fit with work or caring responsibilities.

The workplace is changing and, for Wales, there are risks but also opportunities. This report examines one part of what must be Wales' response to these future challenges – how we provide higher level skills in ways which are flexible and accessible. Universities have an important role: in their communities working alongside colleges, as education providers, and working with businesses. And by ensuring we have a post-16 education system that is flexible and responsive to the future needs of Wales, we can provide opportunities for people of all ages and all backgrounds to gain new skills and benefit from the opportunities that automation could bring to a modern and prosperous Wales.

Professor Julie Lydon OBE,
Chair, Universities Wales



Julie Lydon

1. THE CHANGING WORKPLACE IN WALES

1.1 'INDUSTRY 4.0'

The changing workplace in Wales and the UK has been the focus of a number of recent publications which have sought to understand what impact technological advancement will have on the growth or decline of jobs across different sectors and regions. Much of this work has been prompted by what is commonly known as 'Industry 4.0'. This idea, which formed the basis of Germany's 'Plattform Industrie 4.0', refers to a future where machines, devices and people work alongside each other, with machines and devices carrying out tasks autonomously, making decisions and communicating with each other (Federal Minister for Economy Affairs and Energy, 2013).

The automation of tasks in the workplace is not a new phenomenon and has been a central feature of industrial advancement for centuries. However, the scale and complexity of automation that many expect to take place in the coming decades is believed to set this period apart from the experiences of previous periods of automation. The effects of automation are expected to reach across sectors and job types. This includes traditionally 'white collar' professions with the Institute for Public Policy and Research estimating that 30% of corporate audits will be carried out by AI by 2025 (IPPR, 2017).

A common focus for those who have examined the impact of automation is the risk that automation presents in terms of job displacement as a result of 'robots' or artificial intelligence. This issue has been explored in detail by academics, the big four accounting firms and think tanks. Amongst the literature in this area, there has been little consensus on the extent to which these changes will impact the Welsh and UK workforce and economy.

A frequently-cited study carried out in 2013 and which examined how susceptible jobs are to computerisation in the coming decades estimated around 47% of total US employment to be at risk (Frey & Osborne, 2013). Recent research by OECD presented a substantially different picture suggesting 14% of all jobs across 32 countries have a high risk of automation attributing this relatively low proportion of jobs to what they term 'engineering bottle necks' including tasks related to creative

intelligence and tasks related to social intelligence (Nedelkoska & Quintini, 2018).

Similarly, recent estimates by PricewaterhouseCoopers suggest that increased productivity and incomes will likely balance out job displacement over the next 20 years in the UK but that there will be 'winners and losers'. PwC estimate that the UK will see the largest net increase in jobs in health (+22%), professional, scientific and technical services (+16%) and education (+6%) and the largest net long-term decrease in jobs in:

- Manufacturing (-25%)
- Transport and storage (-22%)
- Public administration (-18%)

(PwC, 2018)

1.2 THE WELSH WORKFORCE

Although much of the analysis on the impact of automation has had a UK-wide focus, a number of studies have explored the specific risks to Wales. The Centre for Cities' Cities Outlook 2018 estimated that about 112,000 workers could be at risk by 2030 in Swansea, Cardiff, and Newport alone (Centre for Cities, 2018) and a report by the Wales Centre for Public Policy on the future of work in Wales noted that a third of the Welsh workforce is employed in 'the least productive, lowest paid, and most generic industries that are often considered at highest risk of automation' (Bell, Bristow, & Martin, 2018).

There is also an alignment between the sectors identified by PwC as most 'at risk' and large parts of the Welsh workforce. According to Welsh Government figures, the three most 'at risk' sectors - manufacturing, transport and storage, and public administration - account for a fifth of the Welsh workforce (StatsWales, 2018).

Looking at the risks across the range of employment sectors in Wales, we are presented with a mixed picture. Wales' largest employment sectors include:

- Human health and social work activities (14.6% of the workforce)
- Wholesale and retail trade; repair of motor vehicles and motorcycles (13% of the workforce)
- Manufacturing (10.1% of the workforce)

The largest sector in Wales, human health and social work occupations, is considered to be one of the main areas of job growth in the coming decades with PwC estimating a net 22% gain in jobs in this area.

For wholesale and retail trade, which accounts for 14.6% of the workforce in Wales, PwC estimates that there will be large levels of displacement (-28%) but that this will be mostly offset by the creation of new jobs (26%).

However, the risk with such high levels of job displacement and job creation in a single sector is that the jobs created may not in the same region as those displaced, potentially further contributing to geographic inequality in Wales and across the UK. There are also cultural and social implications for individuals from job loss which are not necessarily mitigated by the creation of alternative jobs.

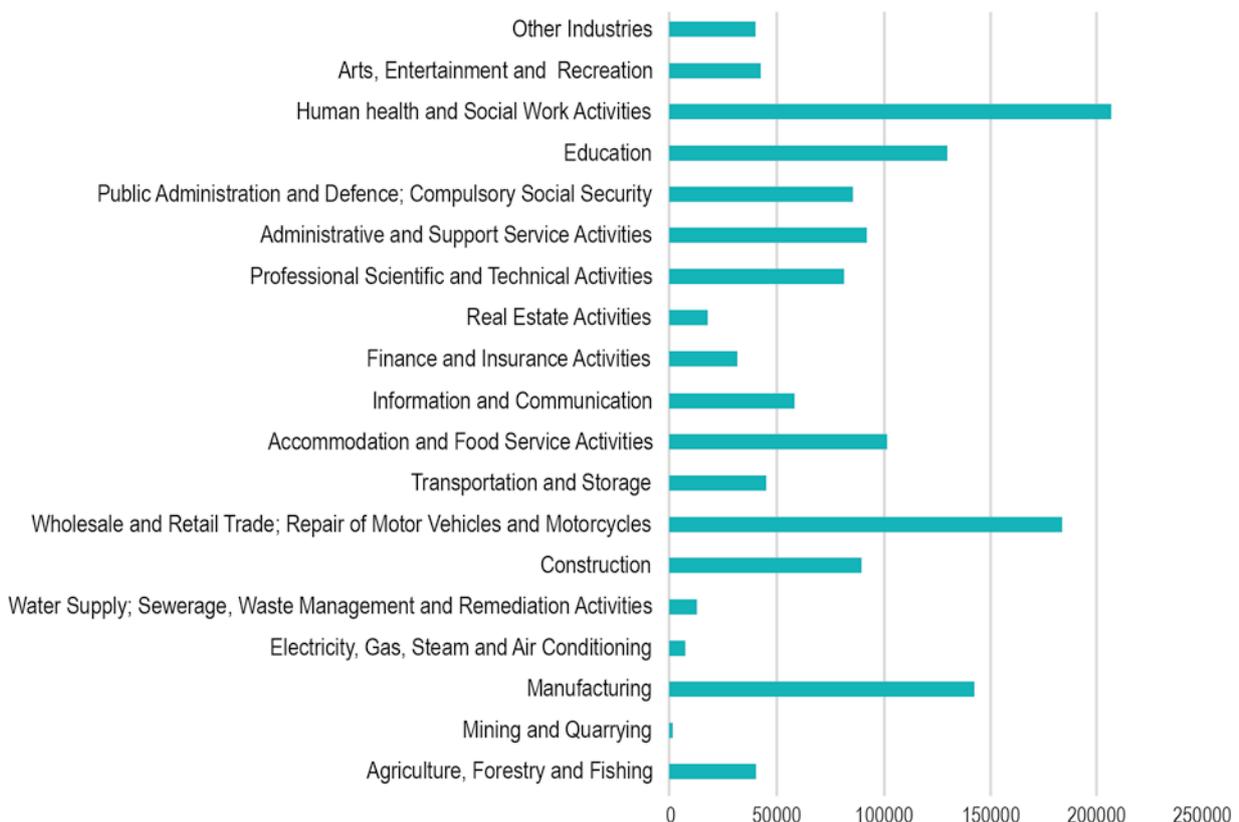
Work by Future Advocacy which used earlier PwC analysis with the sector mix of jobs in parliamentary constituencies found that the top three constituencies in Wales most at risk of automation by early 2030s are:

- Alyn and Deeside with 36% of jobs at risk of automation
- Newport East with 35% of jobs at risk
- Islwyn with 33% of jobs at risk

(Future Advocacy, 2017)

Although automation is largely discussed in terms of its impact over the next 10-20 years, the impact of automation is already being felt in the UK. The Bank of England recently reported that the focus of many companies is increasingly turning from investment in additional labour to investment in 'labour-saving plant and machinery to raise productivity and alleviate resource bottlenecks'. The Bank attributes this pivot to both the need to overcome greater labour scarcity and the availability of advances in technology (Holman & Pike, 2018).

WORKPLACE EMPLOYMENT BY INDUSTRY IN WALES 2017

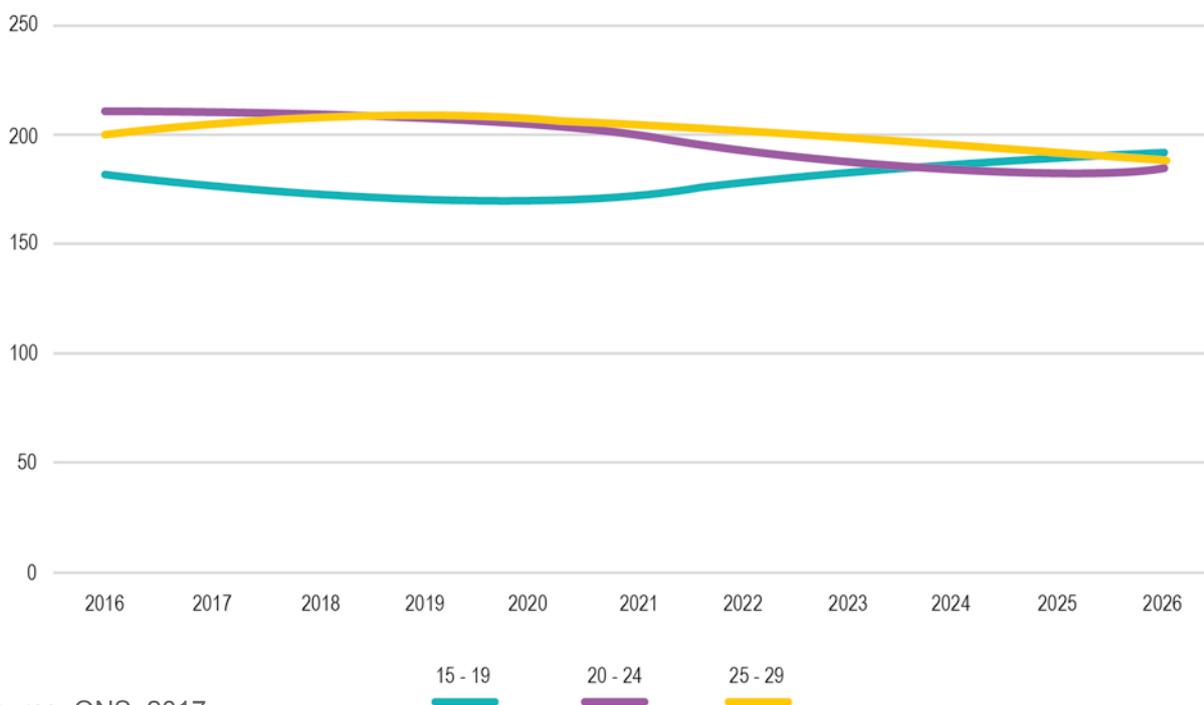


1.3 CHANGING DEMOGRAPHICS

The technological advancements described above will impact the shape and nature of employment in Wales, with different skills being required of the population and jobs of the future being comprised of different kinds of tasks. As well as the impact of automation, Wales has an ageing population which itself provides challenges for workplaces in Wales. The number of people aged 16-64 is projected to decrease by 4.2% between 2016 and 2041 while the number of people aged 65 and over is projected to increase by 36.6% in that timeframe (StatsWales, 2018).

This coincides with the ongoing demographic dip in the number of 18 year olds in Wales which, in turn, will reduce the number of people aged 20-24 entering the workforce in Wales over the next ten years. This reduction in the pool of new entrants to the workforce in Wales emphasises the need to provide people of all ages in Wales with opportunities to reskill. The figure below demonstrates how the number of 15-19 year olds in Wales will soon start to increase while the number of 20-24 year olds and 25-29 year olds will start to fall.

**PROJECTED POPULATIONS AT MID-YEARS BY AGE LAST BIRTHDAY
IN FIVE-YEAR AGE GROUPS (000s)**



Source: ONS, 2017

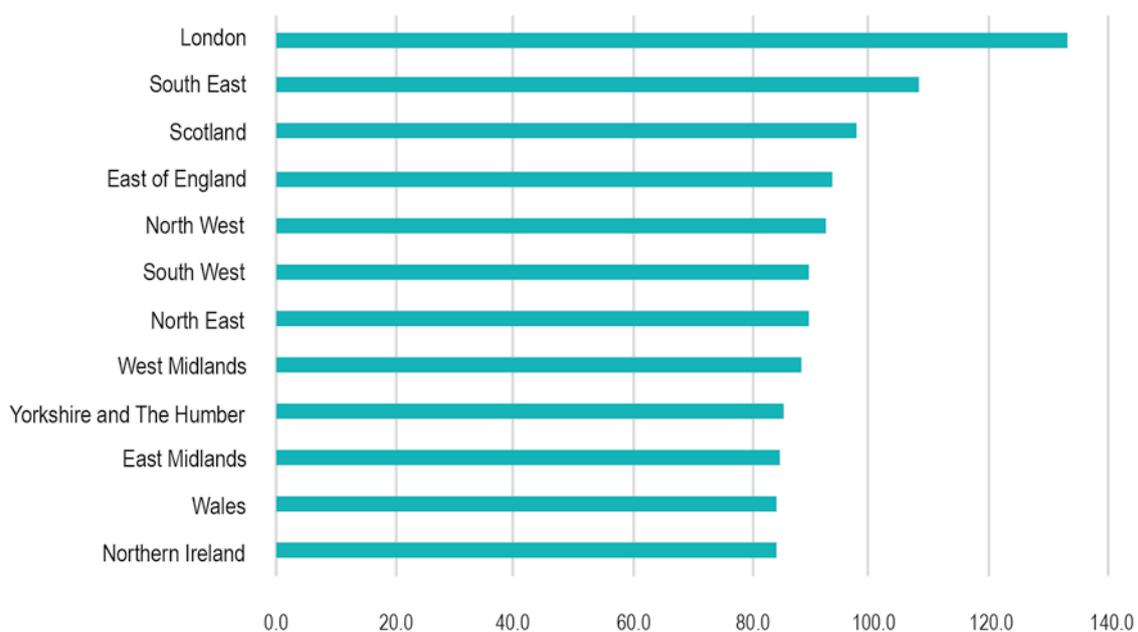
1.4 WHAT THE CHANGING WORKPLACE MEANS FOR WALES

The development of new digital technologies, coupled with the changing demographics of Wales and the UK more widely, has the potential to exacerbate existing regional disparities across the UK. According to ONS productivity figures, Wales continues to have one of the lowest labour productivity levels in the UK (ONS, 2019).

Although, as outlined above, many economists expect the number of jobs created by automation to balance out those lost, the risk for Wales is that the 'new' jobs are generated elsewhere in the UK. Analysis from the Brookings Institute on the impact of automation on regions in the US highlights the similar risks in the US of there being regional 'winners' and 'losers', finding that smaller, more rural communities will be more exposed to the risks of automation than larger ones and, among urban areas, the educational attainment of the workforce will be a decisive factor (Brookings Institute, 2019).

However, as well as the risks posed by automation exacerbating regional difficulties, there are also opportunities for Wales. Automation has historically made a positive contribution to productivity. Scenario modelling by McKinsey estimates automation could raise productivity globally by 0.8 to 1.4% annually (McKinsey, 2017). Similarly, work by PricewaterhouseCoopers suggests UK GDP could be up to 10.3% higher in 2030 as a result of artificial intelligence and automation (PwC, 2018). The benefits of this could include lower prices for consumers, and additional resource for investment in important public services such as health, education, and social care.

PRODUCTIVITY PER HOUR WORKED BY REGION, 2017



Source: ONS, 2019

2. THE FUTURE SKILLS NEEDS OF WALES

Automation risks displacing jobs across many of Wales' highest employment sectors. Many of the studies that have explored the impact of automation on the UK or Wales identify the importance of higher level skills, and flexible life-long learning in mitigating the risks of automation and preparing the workforce for the future¹.

2.1 WHAT ARE HIGHER LEVEL SKILLS?

The term higher level skills includes qualifications at:

- Levels 4 and 5 (including higher national certificates (HNCs), higher national diplomas (HNDs) and foundation degrees)
- Level 6 (bachelor's degrees)
- Levels 7 and 8 (postgraduate and research degrees).

For many students studying for a bachelor's degree, they will enter with level 3 qualifications and, throughout the course of their degree, study at level 4, 5 and 6 before attaining the level 6 qualification. The Credit and Qualifications Framework for Wales describes the knowledge and understanding, application and action, and autonomy and accountability that defines qualification levels in Wales. For example, the definition of level 6 skills includes the ability to critically analyse, interpret and evaluate complex information, concepts and ideas, and to be able to use practical, conceptual or technological understanding (Welsh Government, 2009).

For higher education, the UK Quality Code also sets out what is expected of degree-awarding bodies in setting, delivering and maintaining the academic standards of the qualifications they award. This includes descriptors for a higher education qualification at various levels on the Framework for Higher Education Qualifications (QAA, 2014).

Skills, including higher level skills, are often described as being either 'academic' or 'vocational' with academic skills being seen as more theoretical, and vocational skills being more occupation focused. Typically, academic skills have been seen as the preserve of universities and vocational skills the preserve of further education and work-based learning providers.

This binary divide is not helpful and tackling the issue of 'parity of esteem' between vocational and academic learning has been a frequent policy direction from Welsh Government. The recent Welsh Government consultation on proposals to reform post compulsory education and training in Wales - 'Public Good and a Prosperous Wales – the next steps' - refers to the aspiration for 'parity of esteem between vocational and academic routes to employment' (Welsh Government, 2018).

This divide also fails to accurately represent the breadth of post-16 provision in Wales. Universities have long delivered a range of vocational and professional provision including medicine, engineering, law and teacher training, and this now extends into areas such as digital technologies as universities respond to demand from learners and businesses. Similarly, many further education providers provide higher education typically by franchise through partner universities.

When considering future skills needs, as explored below, it is useful to consider skills in terms of subject-specific skills, professional skills and core transferable skills, which would include the higher order cognitive skills most consider to be of increasing importance in the coming decade.

¹ The importance of higher level skills in mitigating the risks of automation is highlighted as an important feature of the response to automation by PwC, Centre for Cities, the Wales Centre for Public Policy, the World Bank and Deloitte. This is explored further in section 2.4 of this report.

2.2 THE CURRENT PICTURE FOR HIGHER LEVEL SKILLS IN WALES

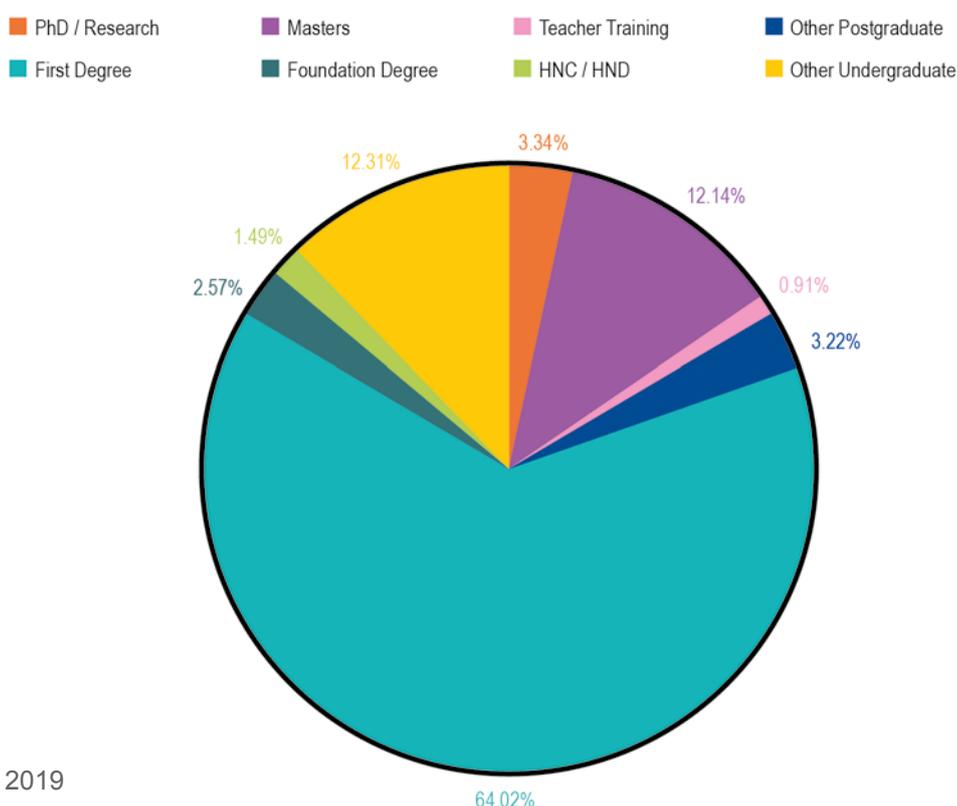
In 2017/18 there were 129,585 students enrolled on higher education courses in Wales. This is in line with previous cohorts. For example, in 2016/17 there were 129,395 students enrolled in Wales (HESA, 2019).

The majority of higher education students in Wales are studying towards a first degree with 64% of students enrolled on these courses. The second and third largest cohorts study on master's programmes which account for 12% of students, and 'other undergraduate' provision, which again accounts for 12% of students.

'Other undergraduate' provision includes, but is not limited to, diplomas in higher education, Higher National Diplomas (HNDs), Higher National Certificates (HNCs), and foundation courses at higher education level.

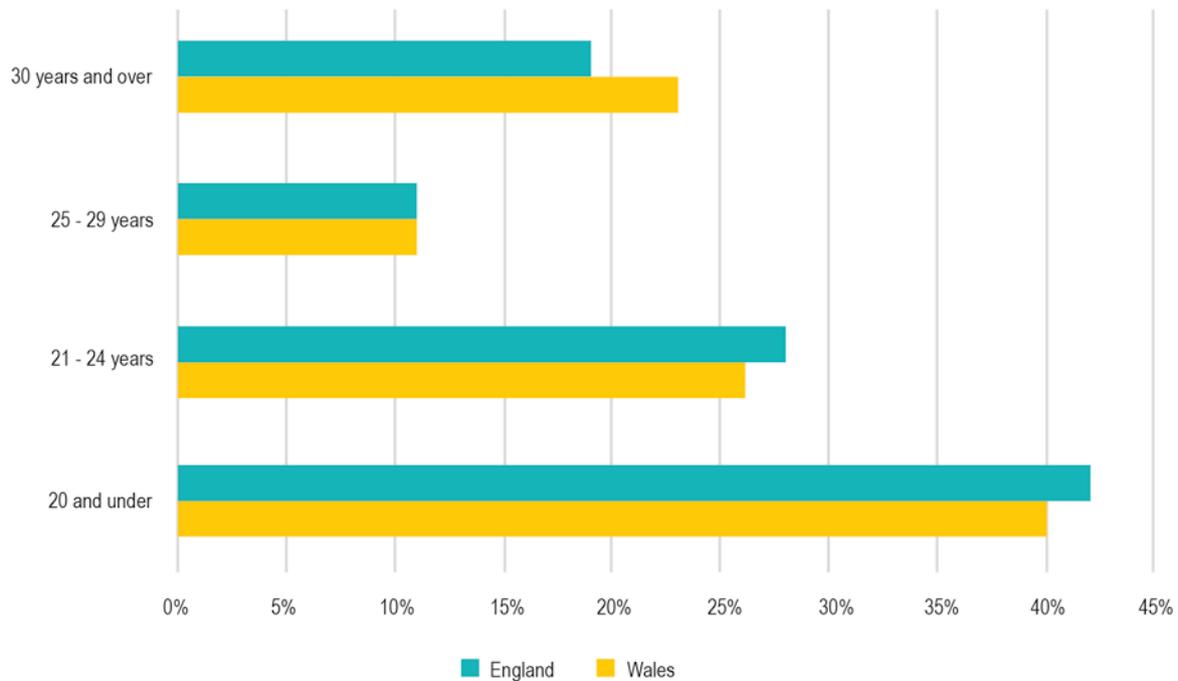
The majority of higher education courses are delivered by universities in Wales with 127,925 students enrolled on higher education courses at a university and 1,670 students enrolled on higher education courses at further education providers. However, it is important to note that these figures do not reflect franchise arrangements which exist between universities and colleges across Wales. Of the enrolments at further education providers included in HESA data, the majority (1,115) are studying part-time 'other undergraduate' provision (HESA, 2019).

STUDENTS ON HIGHER EDUCATION COURSES IN WALES BY QUALIFICATION TYPE 2017 - 2018



Source: HESA, 2019

AGE PROFILE OF HIGHER EDUCATION STUDENTS IN ENGLAND AND WALES 2017 - 2018



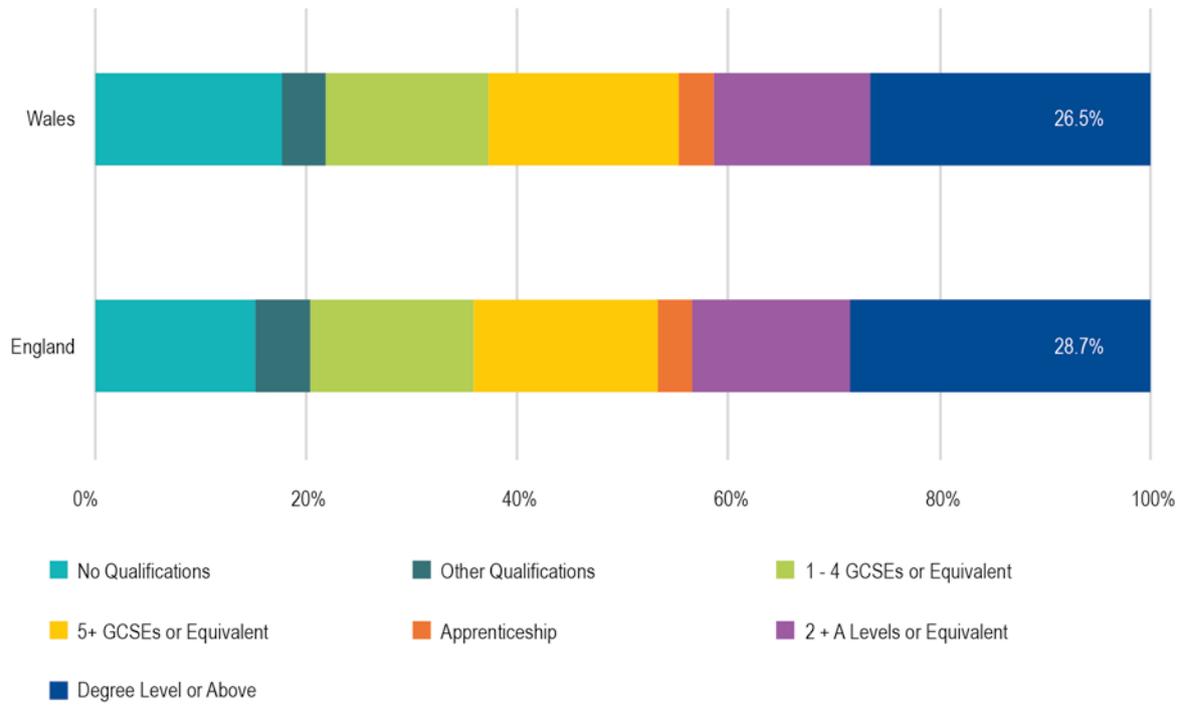
Source: HESA, 2019

As would be expected, 66% of higher education students in Wales are aged 24 or under. However, there is also a sizable cohort who are aged 30 years and over with this group representing 23% of all higher education students in Wales. The age profile of students in Wales differs slightly to that in England with a higher proportion of students in Wales are aged 30 or over, compared to England.

In Wales there are more women studying in higher education than men. Fifty five percent of students in Wales identify as female.

Analysis of the 2011 census found that in Wales, 26.5% of the usual resident population aged 16-64 had a degree, compared to 28.7% of those in England. Similarly, 17.9% of those in Wales had no qualifications compared to 15.3% of those in England (ONS, 2014).

THE DISTRIBUTION OF HIGHEST LEVEL OF QUALIFICATION AMONG
USUAL RESIDENTS AGED 16 TO 64 ACROSS ENGLISH REGIONS AND WALES, 2011



Source: ONS, 2014

Higher level skills also include work-based learning provision at level 4 and above. Currently, 11,380 apprentices in Wales are on a higher level apprenticeship, 19.4% of the apprenticeship cohort (StatsWales, 2019). Higher level apprenticeships in Wales are currently highly concentrated on the areas of 'Management' and 'Healthcare and public services' which, together, account for 87% of

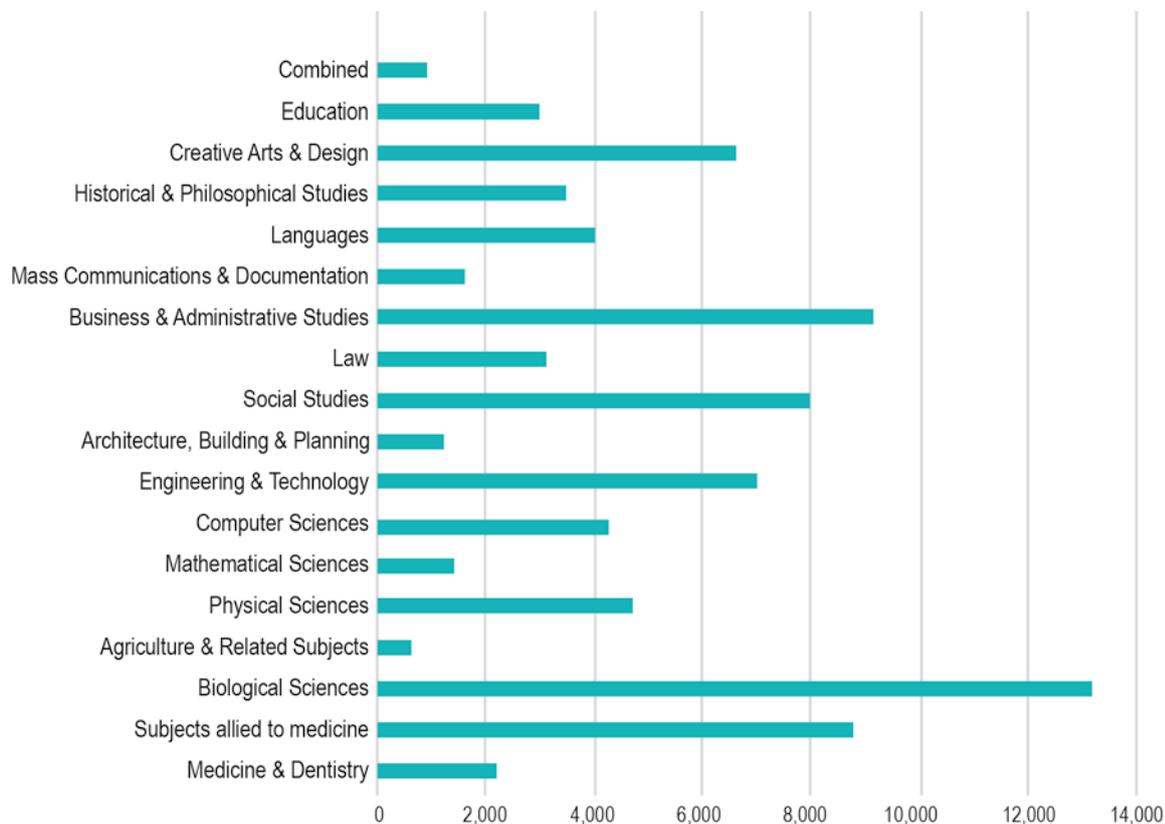
all higher apprenticeships in Wales (StatsWales, 2019). Given the need to upskill the population suggested by the changing occupation profiles in Wales outlined above, it will be necessary to consider how best to promote progression routes for those already studying a higher level apprenticeship in Wales as well as the potential role of programmes like degree apprenticeships to provide a wider spread of subject areas.

HIGHER LEVEL APPRENTICESHIPS IN WALES BY PROGRAMME AREA 2017 - 18



Source: StatsWales, 2019

UNDERGRADUATE FIRST DEGREE ENROLMENTS BY SUBJECT AREA 2017 - 2018



Source: HESA, 2019

There are a wide spread of subject-specific skills currently being studied by students in Wales. A slightly higher proportion of undergraduates in Wales study science subject areas (48%) than in England (45%).

As well as providing academic programmes, universities play a crucial role not only in the employability of their students but also in enhancing the employability prospects of the broader community. Graduates from Welsh universities historically have good employment outcomes with 93% of graduates from Welsh universities in employment or further study within six months of graduating (HESA, 2017).

Welsh universities also perform well for graduate entrepreneurship and have the highest number of graduate start-ups per capita in the UK. In the 2016/17 higher education business-community interaction survey, Wales had the highest number of graduate start-ups per capita in the UK with a 12.4% share of total active graduate start-ups. In total, there are 1,543 active graduate start-ups in Wales (HESA, 2018).

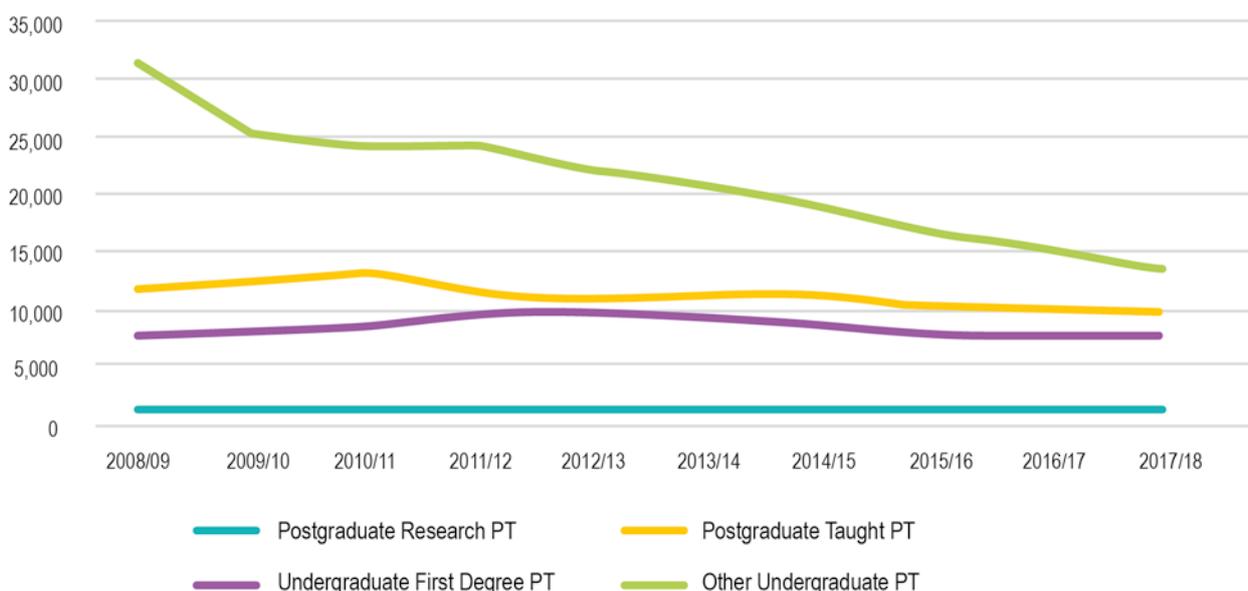
The work that universities do on employability includes partnerships with employers in Wales. In 2015-16, universities delivered nearly a quarter of a million learner days of CPD in Wales (HESA, 2018). Similarly, a third of all Welsh universities' consultancy work was with small to medium enterprises.

2.3 RECENT DEVELOPMENTS IN HIGHER LEVEL SKILLS

The delivery of higher level skills in Wales has been a focus of a number of recent reviews including Professor Sir Ian Diamond's independent review of higher education funding and student finance arrangements and Professor Ellen Hazelkorn's review of the oversight of post-compulsory education and the role of the Higher Education Funding Council for Wales (HEFCW).

The Diamond Review's terms of reference included strengthening part-time provision in Wales. Although not as steep as the decline in England, where the Sutton Trust shows there to have seen a decline in part-time student numbers of 51% between 2010 and 2015 (The Sutton Trust, 2018), there was a notable decline in part-time higher education in Wales between 2008/09 and 2017/18 from 53,575 to 32,810. Most of this decline was in 'other undergraduate provision'.

**PART-TIME HIGHER EDUCATION PROVISION
2008/09 TO 2017/18**

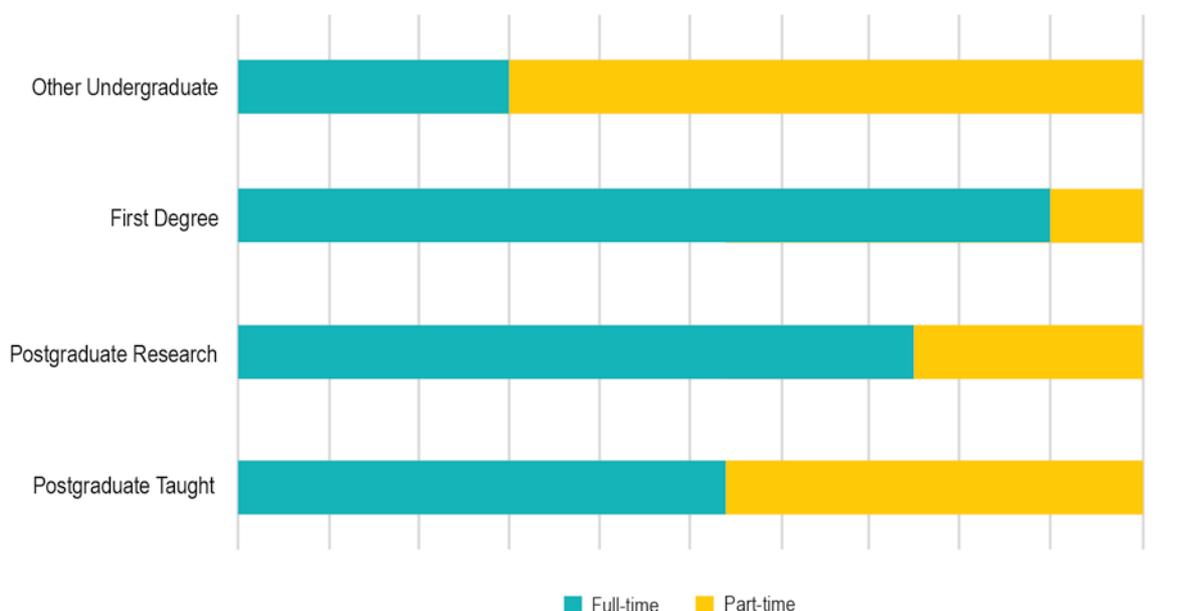


Source: HESA, 2019

The review noted the central role for providers of higher education in raising the higher level skills base in Wales and responding to forecast increase in demand. The review also recognised that support for part-time provision

had not always translated effectively into tangible financial support and that there needed to be greater parity of esteem between the two modes of delivery (Diamond, 2016).

MODE OF STUDY BY QUALIFICATION TYPE 2017/18



Source: HESA, 2019

In 2017/18, 90% of those studying a first degree were doing so full-time while the majority of those studying 'other undergraduate' courses were doing so part-time. For those on postgraduate taught courses there was closer to an even split with 54% studying full-time compared to part-time (HESA, 2019).

A study of part-time students by the Open University in Wales and the National Union of Students Wales in 2014 identified the importance of part-time provision in terms of higher skills and employment with 72% of part-time students in the study being in employment and the most commonly cited reason for pursuing part-time study being to improve future employability (Rees & Rose-Adams, 2014)

Similar motivations were cited in recent research by Universities UK (UUK) into 'lost learners' – those who had considered but not pursued part-time higher education. UUK found that 'career changers' accounted for 43% of 'lost

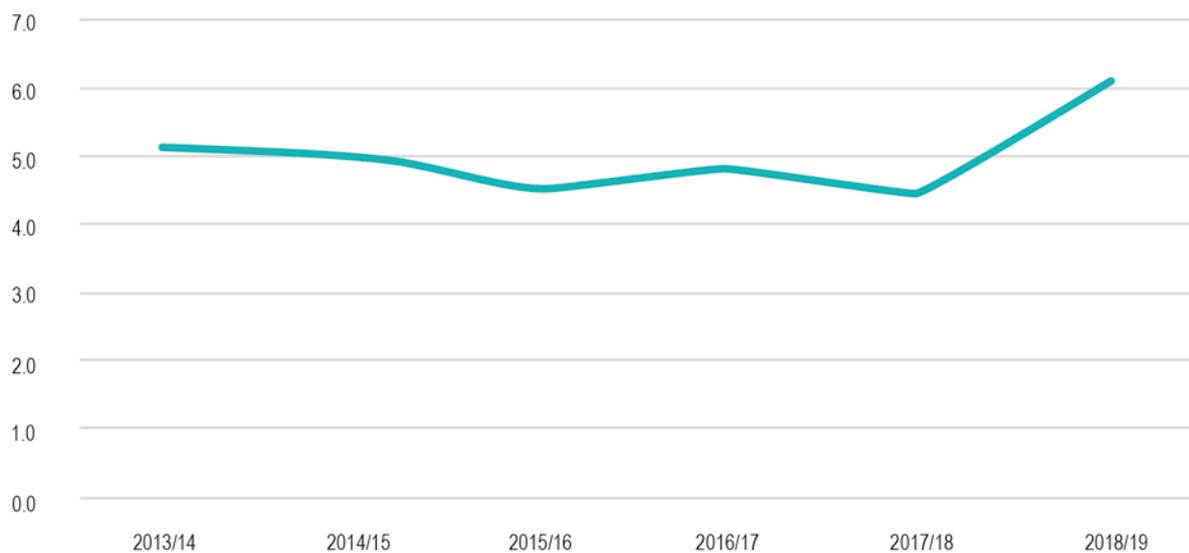
learner' respondents and 'career developers' a further 23% of the sample. Financial concerns were cited frequently as reasons why 'lost learners' chose not to take up part-time higher education. This included the cost of living being cited by 42% of respondents (Universities UK, 2018). For those who started part-time study but dropped out, a lack of flexibility was given as the main reason by lost learners (33%).

The Lost Learners sample included respondents from Wales who made up 5% of the sample. However, given the proportion of the sample from England and the differences in part-time fee arrangements in the devolved nations, some caution should be exercised in interpreting the headline findings. Nonetheless, the report's conclusions around the importance of maintenance support and course flexibility provide a helpful steer on the motivations and needs of part-time learners, and one which lines up with other studies of the motivations and experiences of part-time studies.

The flexibility cited by 'lost learners' as a key feature of part-time study is particularly important as part-time students are, on average, older than full-time students and more likely to be studying for reasons associated with career development or employment. With the aim of improving access to part-time study, the recommendations of the Diamond Review included a package of maintenance support for part-time and postgraduate students, and a long-term sustainable funding settlement for higher education.

The maintenance package for part-time students was introduced in 2018/19. Although it is still too early to make a definitive judgement on the impact that the improved maintenance support has had on the uptake of part-time students, initial figures from the Students Loans Company show a 35% increase in the award of part-time student support to students in Wales in 2018/19. This large increase means the number of part-time students being awarded student support in Wales is at a 5 year high and provides a key policy success for the Welsh Government's approach. This is contrary to the ongoing stagnation, and in some cases the steep decline, in part-time numbers seen elsewhere in the UK.

**STUDENT SUPPORT AWARDS FOR WALES
PART-TIME UNDERGRADUATES (000s)**



Source: Student Loans Company, 2019

Similarly, the recommendations from the Diamond Review included a package of student support for postgraduate students in Wales. In 2018/19, the number of Welsh-domiciled awards for postgraduate student support has increased by 59%, from 3,061 to 4,851 presenting a positive indication that the new student support package is enabling more people to access skills at level 7 and beyond, delivering on the aims of the Diamond Review's recommendations.

DEGREE APPRENTICESHIPS

In response to increasing employer demand for higher level skills and work-based learning routes to a degree, degree apprenticeships have become an increasingly desirable mode of delivery across the UK, although the systems that have developed to support degree apprenticeships vary across the devolved nations.

In England, trailblazer groups are able to develop degree apprenticeship standards in the same way that other apprenticeship standards can be developed. At the time of writing, there were over 70 degree apprenticeship standards approved for delivery in England including those at level 6 (bachelor's level) and level 7 (master's level) with a further 60 in development (Institute for Apprenticeships, 2019).

The funding of this provision operates through the same apprenticeship levy system that is used for other apprenticeship provision. A House of Commons Education Committee report highlighted a number of issues with the apprenticeship levy system but recommended that the Institute for Apprenticeships should make the growth in degree apprenticeships a strategic priority (House of Commons Education Committee, 2018).

Graduate apprenticeships in Scotland have been in place since 2017 and now cover areas including business management, financial services, construction, engineering and IT. A number of these apprenticeships are available at level 6 or level 7. In March 2019, Skills Development Scotland announced they were increasing the number of graduate apprenticeship places in Scotland from 800 in 2018/19 to 1,300 in 2019/20 (Skills Development Scotland, 2019).

Degree apprenticeships in Wales are funded through the Higher Education Funding Council for Wales (HEFCW) and the first degree apprentices in Wales started in 2018/19 on the level 6 digital degree apprenticeship framework in Wales with development ongoing on a level 6 engineering and advanced manufacturing framework. The Welsh Government's policy for degree apprenticeships supports funding for the development and delivery of degree apprenticeships to level 6 and the two areas of digital and engineering / advanced manufacturing. Welsh universities report significant demand for a wide range of degree apprenticeships at levels 6 and 7, as is explored later in this report.

2.4 WHAT SKILLS WILL WALES NEED?

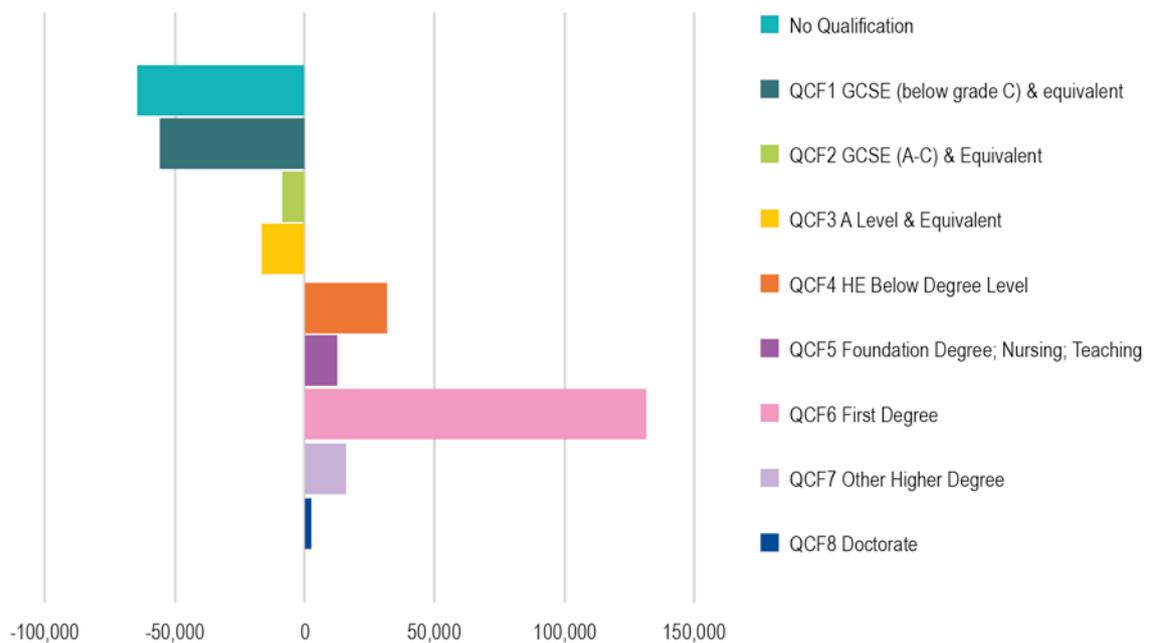
Much of the discussion about what steps countries need to take to prepare for the impact of technological change and automation has been focused around what the economy's future skills needs will be and what education and training provision should be prioritised by government policy, employers and providers.

The increasing demand for those who have completed some form of higher-level education has been evidenced through surveys of employers over a number of years. The CBI's 2018 education and skills survey found that by 2024 almost half of all jobs will require workers who have completed some form of higher-level education (level 4 and higher). The same survey

found that 81% of businesses in Wales are maintaining or increasing graduate recruitment, with one in five businesses increasing graduate recruitment (CBI, 2018). The survey also found that for the sixth consecutive year, more businesses in the UK have expanded their graduate intakes than have reduced graduate recruitment.

Labour market projections by the UKCES Working Futures Programme, published in 2016, suggest that between 2014 and 2024 the number of people in the workforce in Wales qualified at level 3 or below will reduce by 142,109 while the number of people qualified at level 6 or above will increase by 150,037.

PROJECTED CHANGE IN WELSH WORKFORCE QUALIFICATION LEVELS BETWEEN 2014 - 2024



Source: UK Commission for Employment and Skills, UKCES, 2016

The CBI employment and skills survey also found that employers in Wales were the most confident out of the UK nations in their ability to access employees with low level skills but less confident than Scotland and England in their ability to access employees with high level skills (CBI, 2018). The comparatively lower qualification levels in Wales and the lack of confidence among employers in accessing employees with higher level skills suggests a particular need in Wales to upskill our workforce, particularly in the light of the pressures expected to follow with automation and AI.

A recent report on adult learning systems by the OECD concluded that the extent to which individuals, firms and economies can harness the benefits of automation was critically dependent on the readiness of countries' adult learning systems to help people develop skills throughout their working lives (OECD, 2019). The report notes that, generally, adults with low skills levels are three times less likely to participate in training than those with high level skills. Given the comparatively low skill levels of the population in Wales, this presents an additional challenge to upskilling and reskilling the population.

The need to upskill our workforce may become more pressing and further complicated by the uncertainty around the UK's withdrawal from the European Union and what impact this will have on recruitment from EU countries. Work by CIPD identifies how 'the EU has offered employers an important safety valve for organisations that cannot find skilled labour from the UK' (CIPD, 2017). As well as impacting recruitment, the uncertainty caused by Brexit could also lead to EU nationals already in the UK leaving, exacerbating the skills challenges we face.

As well as meeting skills needs, upskilling is also important in mitigating the potential negative social and cultural impacts of the changing workplace and automation. PricewaterhouseCoopers estimate that those with low levels of education (level 2 or lower) have much higher estimated median automation rates (44%) compared to those with graduates (11%) (PwC, 2018).

REGIONS AND EQUALITY

For many sectors it is expected that the new jobs created as a result of technological change, automation or increased productivity will balance out those displaced by automation. However, those new jobs will not necessarily be in the same geographic region as the jobs which have been displaced, or available to those who had formerly been employed in routine, low-skilled positions.

We are already seeing graduates converging on urban areas to begin their careers. The most recent 'What do graduates do?' report which analyses data from the Destinations of Leavers from Higher Education 2016/17 survey found 22.4% of all graduates start their careers in London, noting also an increase in graduates starting their careers in Cardiff (HECSU, 2018).

Given Wales continues to have the lowest labour productivity in the UK, increasing the number of graduates may also contribute to improving Wales' productivity. The CBI's 'Unlocking Regional Growth' report found that areas with more professional graduates are significantly more productive than those with fewer and that a firm was 17% more likely to export if it had graduates within its workforce (CBI, 2016).

SUBJECTS AND SKILLS

Although a number of studies on future demand for skills emphasise the need for technical skills or subject-specific STEM skills, most agree that there will also be an increasing importance placed on the higher order cognitive, social and behavioural skills that enable us to problem-solve, collaborate, and form partnerships. Work such as the Wales Centre for Public Policy's report on the future of work in Wales highlighted the importance of governments focussing on 'education and skills; fostering the development of transferable skills that are difficult to automate, such as creativity and critical thinking competences, alongside skills for the digital economy, technical skills, and in STEM subjects' (Bell, Bristow, & Martin, 2018).

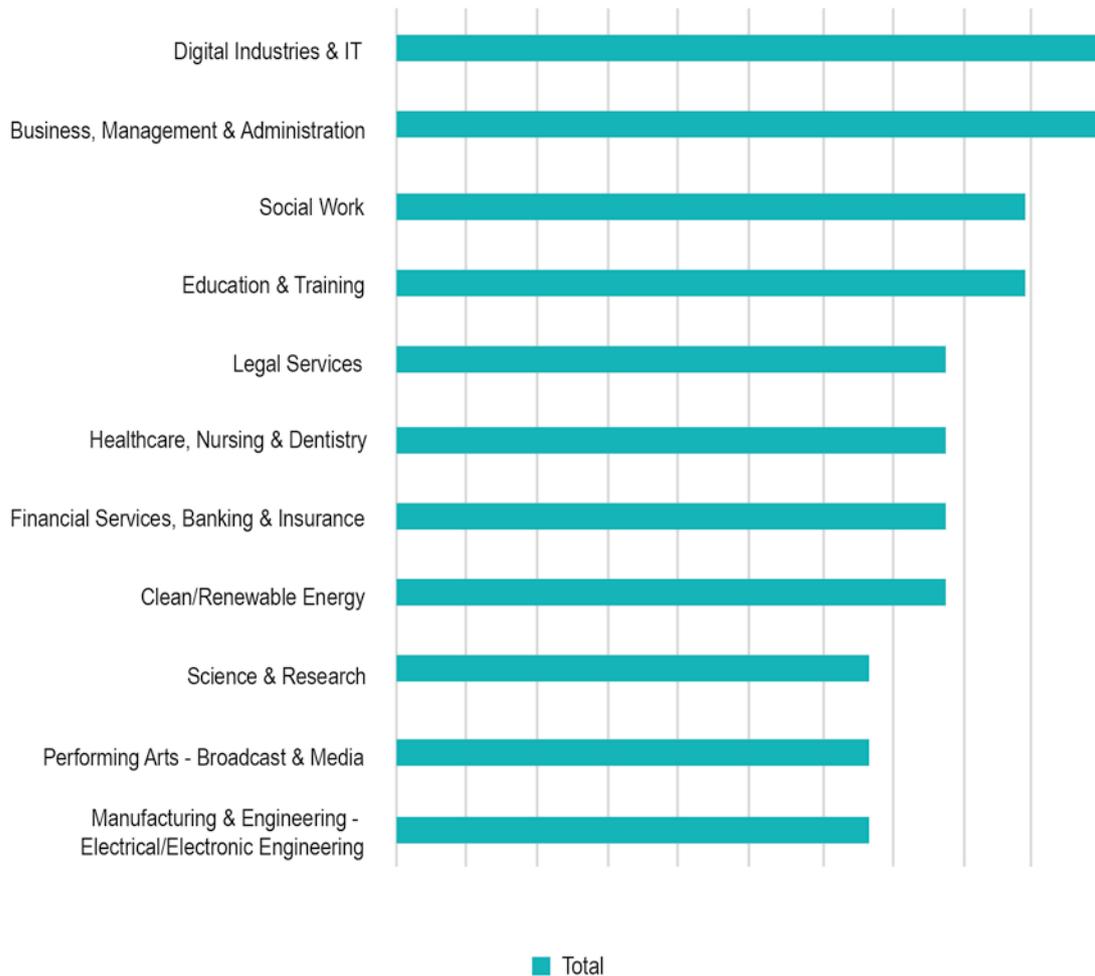
The emphasis on a broad range of skills was also a feature of recent work by the World Bank which emphasised that many more jobs in the near future 'will require specific skills – a combination of technological know-how, problem-solving, and critical thinking – as well as soft skills such as perseverance, collaboration, and empathy' and that 'automation raises the premium on high-order cognitive skills in advanced and emerging economies' (World Bank Group, 2019).

Similarly, as well as an increased need for higher order cognitive skills, the focus on being able to draw on knowledge from various fields and to think and behave across boundaries, will increase. The overview of the subject level delivery in higher education in Wales earlier in this report demonstrates a balanced range of subjects being delivered at undergraduate level with 48% of all students in Wales studying a science subject.

This breadth of delivery complements interdisciplinarity in Wales which is an important feature of Welsh higher education. A study by King's College London, commissioned by the Learned Society for Wales, found that the impact of Welsh research showed considerable interdisciplinarity. For example, 12 different research disciplines contributed to the research topic of 'Business and Industry'. Any approach to higher level skills must recognise the importance of student choice and interdisciplinarity (Hewlett & Hinrichs-Krapels, 2017).

The breadth of demand across different subjects is also reflected in the demand universities receive from employers in Wales. A survey of universities carried out by Universities Wales identified a strong demand among employers and universities for a range of degree apprenticeships across level 6 and level 7. In particular, every university in Wales reported demand for degree apprenticeship provision in 'digital industries and IT' and 'business, management and administration'. Similarly, universities reported high demand for degree apprenticeships in 'social work occupations' and 'education and training'.

SECTOR AREAS WHERE UNIVERSITIES REPORT DEMAND FOR DEGREE APPRENTICESHIPS



The identification of demand is also understood to be one of the functions of the three regional skills partnerships in Wales which are tasked with analysing economic challenges and identifying the skills needed in the workforce. These partnerships produce Regional Employment and Skills Plans to analyse and influence the provision of skills regionally. The most recent plans identified a number of areas of demand consistent across Wales and which align with areas identified by universities and other stakeholders including:

- Advanced materials and manufacturing
- Construction
- Financial and Professional
- Creative and digital

Each of the plans also included a focus on higher level skills and made specific calls for the development and introduction of degree level apprenticeships.

3. IMPLICATIONS FOR GOVERNMENT AND STAKEHOLDERS IN WALES

The literature suggests that higher level skills will be both less exposed to the risks of automation and increasingly important in ensuring that Wales is able to make the most of the opportunities afforded by technological change and automation. In particular, work by PwC suggests that those who have a first degree are significantly less exposed to the risks of automation than those whose highest qualification is at level 2.

There is already, in Wales and across the UK, an increasing demand for graduates, and higher level skills more broadly. Qualification levels in Wales remain low compared to other UK countries with a higher proportion of people with no qualifications in Wales, and a smaller proportion of people qualified at level 4 and above. This, coupled with the changing demography of Wales, where fewer people aged 20-24 will enter the workforce in the coming decades, means providing opportunities for people of all ages and backgrounds to gain higher-skills will be vitally important if Wales is to stand to benefit from the creation of new jobs in the wake of automation and in helping improving the productivity and the economy of Wales.

IMPLEMENTING DIAMOND

Positive steps have already been taken to improve access to higher level skills. Early data suggests that the implementation of Professor Sir Ian Diamond's review of student support arrangements and higher education funding is having a positive impact on the number of people choosing to study part-time and postgraduate courses in Wales.

The recommendations made by the Diamond Review continue to be the core of future success in delivering higher level skills in Wales. Continuing to implement the Diamond package as a whole will both support a greater number of people of all ages and backgrounds to access higher level skills and provide for a long-term, sustainable higher education sector to deliver those skills.

DEGREE APPRENTICESHIPS

While the new student support and higher education funding package will help support part-time study across Wales, successfully meeting future skills needs will need a broad range of interventions. Universities report a high demand for degree apprenticeships, from employers and individuals alike in a range of areas at both level 6 and level 7, that cannot be met under the current system.

Currently in Wales funding for degree apprenticeships is limited to digital, advanced manufacturing and engineering at level 6. The challenge for Wales is that the broader degree apprenticeship provision found elsewhere in the UK incentivises UK-wide employers to rotate staff out of Wales and upskill them elsewhere. This runs the risk of both increasing the disparity in qualification levels between Wales and the rest of the UK and the disparity in productivity between Wales and the rest of the UK.

Enabling the post-16 education system in Wales to be responsive to skills needs and provide work-based routes to level 6 and 7 qualifications would provide opportunities for many people in Wales to go through the upskilling or reskilling necessary to prepare for the changing workplace in Wales. Welsh Government, in partnership with HEFCW and universities, should work to facilitate the development and delivery of degree apprenticeships at level 6 and 7, across a range of subject areas, to meet evidenced business demand and provide progression routes for those who have already completed an apprenticeship in Wales.

FLEXIBLE COURSE OPTIONS

Another feature of enabling more people in Wales to access higher level skills will be ensuring the availability of flexible course options and shorter courses. Government and higher education providers should work together to consider how a modular or credits-based system for undergraduate study could increase flexibility in the long-term. This could support learners in switching between different types of learning and routes to progression as their needs change over time.

There may be opportunities to look at greater government support being given to higher education institutions wishing to innovate, scale-up activity or further develop systems for flexible learning in order to overcome financial barriers and future uncertainties relating to these activities.

When increasing the availability of flexible course options, it will be important to provide for student choice as well as employer demand as the system of university funding depends on student demand. Wales' future skills needs are wider than technical or subject-specific STEM skills, and providing for student choice will reflect this.

PARTNERSHIPS AND COLLABORATIONS

Partnerships and collaborations will also play a key role in responding to skills demand across Wales. Partnerships are already commonplace across providers in Wales including franchise higher education provision, group structures that cover different levels and modes of delivery, progression arrangements from one provider to another, and employer partnerships which include delivery of higher education provision on site at the employer. Building upon these partnerships and collaborations will help learners progress from levels 2 and 3 study into levels 4, 5 and beyond.

Supporting joint enterprise and collaborations was identified as a key aim of the Welsh Government's long-term plans to reform the regulation of post compulsory education and training in Wales. However, In the short to medium term, Government should explore how collaborative activity could be supported potentially through funding for partnerships and collaborations and to build upon existing ones.

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