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SKILLS FOR JOBS THAT DON'T YET EXIST:

A new system for the fourth industrial revolution

Joe Cowen & Mark Morrin

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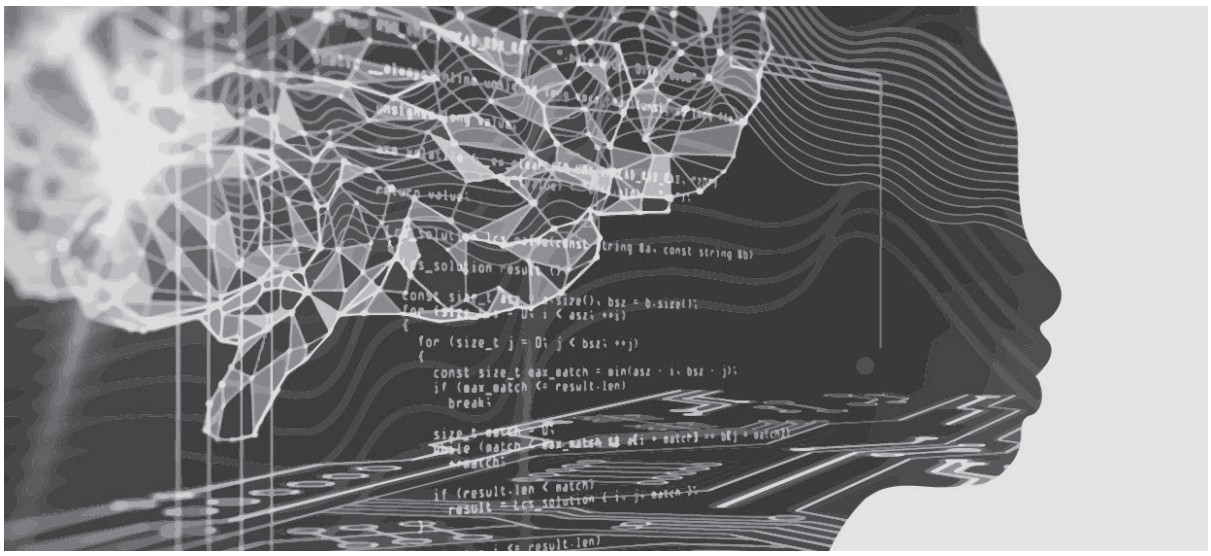


FOREWORD *by Jules Green*

A key issue for the UK's economy is how we meet the challenge of the Fourth Industrial Revolution and the future of work. Central to this challenge is the question of skills, an essential driver of productivity and growth.

Education and skills are the number one priority for employers that are struggling to find the right people with the right skills and who are increasingly concerned that they will not be able to fill positions in the future.

Our skills system is clearly not meeting the needs of business. Yet more than half of all school leavers now go to university. More than ever before. While those who don't are ill-served by an underfunded, second best, post-18 education offer. This suggests that our universities, the primary beneficiaries of our current system, are not fit for present purpose, or indeed the solution to the challenges of the future.

This raises serious questions about the logic and the cost of sending increasing numbers of young people to university; and whether there is a more effective and fairer way to provide better value for money in our current skills system. University students are currently paying up to £30,000 in fees for a three-year course which could provide as little as eight contact hours per week.

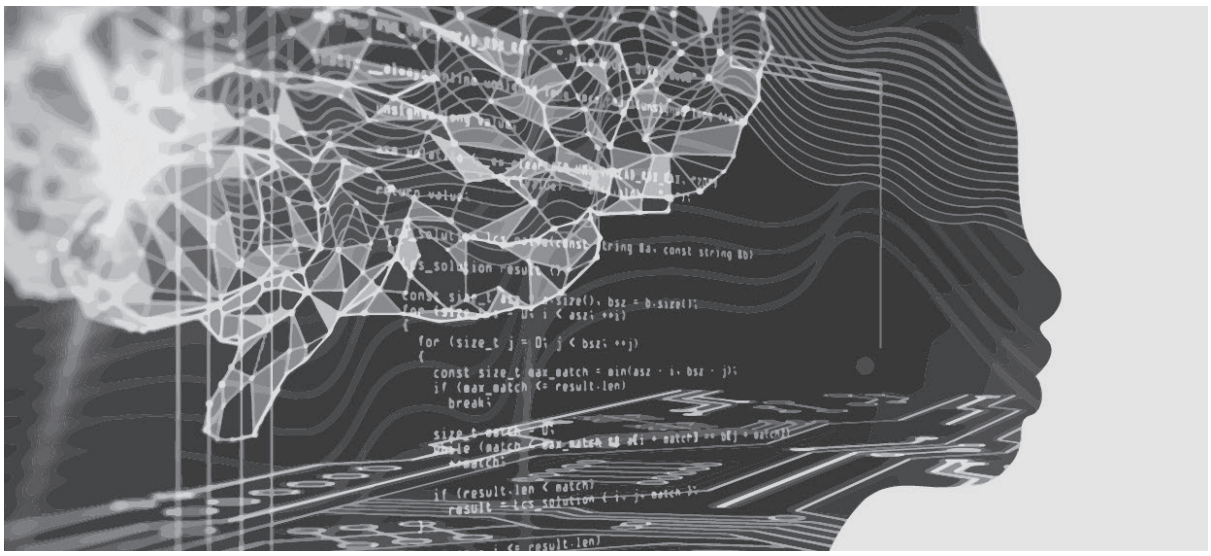
Education should be a right and not a privilege. But our current student loan system is making it more difficult for young people from poorer backgrounds to attend University, since they end up owing the most in debt. At the same time, we know that student loans – which conveniently puts the costs off the balance sheet, to remove it from the government debt – are unlikely to repaid and are therefore unsustainable.

This paper argues for a radical shake up and the need to move towards a whole education system that effectively meets the needs of industry. One which is cheaper and better; more efficient and more cost effective; and, most importantly, one which is 'free' at the point of use.

Student loans are unpopular with young people and their families. They are perceived as inherently unfair, and I believe that they are ultimately damaging to business and society. I do not think that public anger on this issue has blown over and at this time, when political parties are looking for policies that will appeal to young voters, scrapping student loans could be decisive.

We need a more flexible system that can provide wider skills choices, and not just for young people. Through life training will become increasingly necessary. This will require new ways of teaching and studying, incorporating the advantages of technology to create new platforms and applications for remote learning. The workforce of the future will require short, bespoke courses and continuous training, to adapt and remain competitive.

This approach could even lower the burden on the state, if the costs are reduced by making courses more affordable and by spreading education over time. Employees will be encouraged to invest in themselves if the burden is shared and employers would be more willing to contribute in return for a system that generates better skills and improves productivity. Personally, I see no downside in moving towards a system which is needs driven, lower cost, fairer, more efficient and is more appealing to students. I hope that this report contributes to the policy debate and helps affect change in this regard.



EXECUTIVE SUMMARY

The public discourse about post-secondary education in the UK has been dominated by the issue of funding. Specifically, how we can provide a new, more equitable, financing arrangement for student loans. The challenge for higher education is to address current inequalities in the system, while offering a good investment for both students and taxpayers. However, in thinking about the future funding for higher education it is necessary to consider the extent to which tertiary education and indeed our wider skills system are meeting the demands of a radically changing economy, and whatever scenarios this may present for the future of work.

Almost half of all school leavers in the UK go on to higher education. This is considerably higher than the US and the European average. Government policy is predicated on the theory that economic growth and productivity is dependent on a higher qualified working population. And this premise has driven university expansion over the past 20 years. Yet the UK's economy continues to endure poor productivity performance with too many workers in low-wage, low-skilled sectors compared to their counterparts in Europe. A degree is no longer a passport to higher earnings. Many graduates are faring no better than non-graduates, and earning at levels which, under the current student loan system, means they have stacked up huge debts that they cannot afford and are therefore unlikely to pay back.

At the same time those who have not gone on to university are underserved by a skill offer that has been cast as 'second best' to the more esteemed academic route, and inferior to our European counterparts. Technical and vocational training has long been a relatively low priority for UK Government, evidenced by the decline of both public and employer investment in adult skills.

This paper explores ways to reform the current tertiary education system and the funding models necessary to achieve its transformation. We offer some radical, and at the same time obvious, proposals to promote debate about the wider skills system and how it can prepare for the Fourth Industrial Revolution. It is an opportunity to entirely rethink our training and education model.

CONTEXT

Constant change to priorities, qualifications, institutions and funding has been a mainstay of UK policy over the past three decades. Yet successive governments have struggled to build a successful education and skills system to adequately address the structural problems that underpin the UK's relatively poor international position in intermediate level skills and productivity, as well as the inequality in participation.

Britain's overall skills base lags many comparator countries coming 24th out of 34 OECD countries for intermediary skills,[1] and has an overall profile that struggles "to meet the requirements of the technologically advanced sectors".[2] Research by the Confederation of British Industry (CBI) indicates that over two thirds of employers in Britain are increasingly concerned that individuals lack the necessary skills to fill positions in the future. This skills deficit is, in large part, responsible for low levels of productivity in the UK economy, which lags behind G7 competitors and is 20% less productive than the US. The UK also has some of the highest levels of structural inequalities in participation in learning, with more than 50% of those in the highest socio-economic classes (ABs) participating in learning, compared to 26% of unskilled workers and those on limited incomes (DEs).[3]

The test will be to address the current failures and provide an alternative system that can meet the challenges of the 21st century economy and the future of work. This will require a radical restructuring and rebalancing to provide through life learning, upskilling and retraining, and to meet a rapidly changing economy and the objectives of the Government's Industrial Strategy.

CURRENT SYSTEM FAILURES

The UK has expanded its higher education sector, to the detriment of other post-secondary provisions, with considerably higher participation and graduation rates than competitor nations, including the US and Europe. This emphasis on university degrees, which is both more intensive and more expensive than other forms of training and education, has seen a consequent shift towards a controversial and unpopular student loan system, as the principal means of funding.

The current **Student Finance System** is regressive. The poorest students end up owing the most in debt. After a three-year course the poorest 40% of students will graduate with a higher amount of debt (£57,000) than their classmates from the richest 30% (£43,000).[4] But there are also common misperceptions, amongst students and parents, about the loan system which has created a psychological burden of debt.[5] This is acting as an additional barrier to higher education for some poorer students, who are typically more debt averse.[6] Yet in most cases, the Government does not expect graduates to ever pay back the whole amount. Current estimates indicate that the government will have to write-off some or all of the debt of 83% of students, who will not have repaid their loans within the 30-year time limit.[7] The current system, in many ways, is more akin to a 'graduate tax' rather than a loan. It is in part clever accounting, to keep education funding off the Government's books.

It is difficult to assess the failures of tertiary education without looking at how the whole education system works, including **schools**. The UK has one of the most complex and fragmented compulsory education systems in the developed world. It also has some of the greatest disparities in educational achievement. Narrowing the attainment gap, between pupils from different social backgrounds and between different places, is one of the key challenges facing our current education system. But even where high levels of attainment are reached, this is being achieved at

great cost. Poor mental health and wellbeing among children and young people indicate that something is very wrong with our schooling system. This has been attributed in part to an educational culture based on over-testing and the attainment of qualifications, that provide access to further and higher education but are increasingly undervalued by employers.[8] New skills pathways are needed (including academic, technical and vocational) and life-long learning will be a continuous requirement. The new economy presents a significant challenge to the purpose of compulsory education and the ability to acquire new skills.

Technical and vocational skills have been a relatively low priority for UK Government, evidenced by the decline of both public and employer investment in adult skills - employers in the UK invest under half the EU average in continuous training, and investment per person has fallen 14% in real terms since 2007.[9] The post-16 vocational training sector has often been left to pick up the pieces of a failing school system that results in half of its school leavers not achieving good grades in English and maths. This has contrasted with European competitors, such as Germany and France, that have continued to invest in and value its technical and vocational routes. The challenge for the UK is to tackle a long tail of productivity and low skills, to develop a system that can raise overall levels of skills and training. This goal will become increasingly urgent with the threat of automation. Traditional learning institutions and qualifications will continue to be important, and parity of esteem with academic routes are vital, but there are also other customised training models to explore, such as **Ecole 42** in Paris (funded by a philanthropist), **Flat Iron** in London (fee based, but deferred subject to future earnings), and **Pursuit** in New York (funded through a social impact bond). These can provide shorter, faster, more direct industry specific routes for upskilling populations than most established HE/FE courses achieve.

THE FUTURE OF WORK

We are in the midst of a new industrial revolution. Technological change will radically disrupt and transform the labour market, and wider society, in a number of ways. Advancements will challenge the nature of work itself (who does it, how it is done, and where) as well the skills needed to adapt to this new future.

There are various estimates on potential job losses in the UK resulting from the widespread introduction of Artificial Intelligence, although it is also likely that new jobs will be created. Some occupations are likely to be more exposed to automation, particularly those involving repetition and computational analysis. But all jobs across the spectrum of the economy, from CEO to shop floor, are at risk.

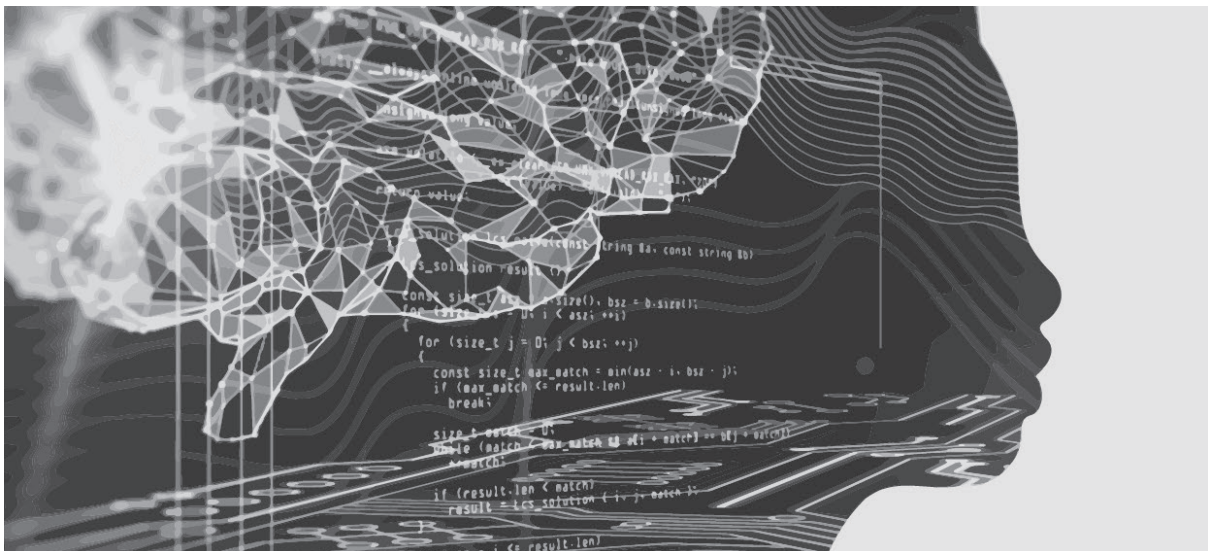
The labour market may be increasingly characterised by multiple and simultaneous short-term contracts or freelance work, as opposed to full-time permanent employment. Both high and low skilled workers may need to manage a portfolio of jobs. While the notion of a job for life, or even a career for life, may soon become redundant. Skills learnt 30-40 years ago are unlikely to remain relevant. As such, lifelong learning, to help with the continuous updating of skills will be required to replace a system which focuses on the acquisition of qualifications at the beginning of a working life.

Demographic change - longer life expectancy and longer working lives - coupled with technological advances will also create significant social and economic disruption, with increased pressures on public finances, especially health spending. This could result in less money available for the through life skills system we need, unless a new model that supports government spending with employer and employee contributions can be found.

RECOMMENDATIONS

There is a compelling case for increasing economic growth, productivity and living standards by investing in an efficient and equitable skills system. This report recommends an alternative approach that moves us away from the disagreements about student loans and how university education can be funded, towards a unified tertiary education system that can meet the needs of the Fourth Industrial Revolution.

1. **Rebalance the UK's tertiary education system**. To provide a more cost-effective means of studying and to provide better value for money, for learners, business and Government. This will allow:
   - A supply of vocational, technical and academic skills to meet the future needs of the UK's industrial strategy
   - Continuous, life-long, learning provision for all working age people
   - New ways of teaching and studying, incorporating the advantages of technology to create new platforms and applications for remote learning, and
   - New sector specific institutions for the delivery of specialised and bespoke training that can offer shorter, faster, more direct route for upskilling populations (such as Ecole 42 in Paris, Flat Iron in London, and Pursuit in New York).
2. **Restructure skills funding with a National Education Contributions (NECs) scheme**. We recommend a system akin to National Insurance Contributions (NICs), that would:
   - Reform the whole funding system for tertiary education including the abolition of the current student loan system
   - Separate the functions of Research & Development from skills acquisition and fund them appropriately
   - Auto-enrol all workers to allow employees, employers and the government to pay into a central pot that could be drawn on by individuals, to fund skills training, at any stage in their lives.
   - Provide a self-financing system that is ring-fenced from the Government's national accounts, by using a Special Purpose Vehicle to collect NECs from employees, employers, and the government.
3. **Create 'Adult Skills Accounts'**. To distribute the proceeds of national education contributions, this system would learn from previous experiments in the UK and internationally, to provide individual skills accounts that could be drawn on equally by all citizens, at any point during their working life.
4. **Introduce a 'Tech Levy' and protect 'Data Sovereignty'**. To bolster the NEC model for lifelong learning, this paper proposes a new levy on established tech firms (which will benefit disproportionately from an educated workforce) alongside legislation to introduce and protect 'data sovereignty'.
5. **Re-imagine universities as a platform for continual learning**. University subscription models should also be considered as a future role for Higher Education Institutions to support lifelong learning. This would provide students with multiple opportunities, not just between the ages of 18 and 22, but whenever necessary. To dip in and out of the curriculum throughout their lives to gain and update their knowledge and skills as needed, potentially paying lower tuition fees up front and then an annual subscription fee during their lifetime, utilising an Adult Skills Account.

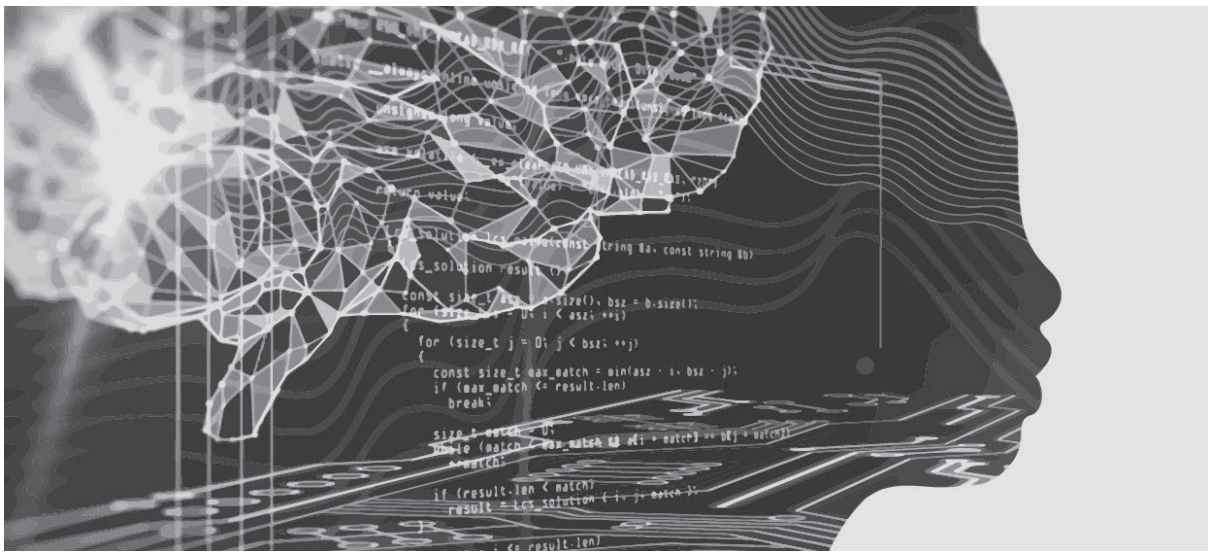


1. INTRODUCTION

Our economy and our labour market are set to experience profound, rapid and accelerating change in the coming years. The UK faces a productivity, demographic and automation challenge, and whilst there may be uncertainties about the extent and pace of technological change – and the consequences for people and society - it is certain that we will need new skills to adapt to the transformative change in the economy. If we are to turn these trends to our advantage, we will need a new education and skills system that is fit for the future.

This paper explores ways to reform the current tertiary education system and the funding models necessary to achieve its transformation. We offer some proposals to promote debate about the wider skills system and how it can prepare for the Fourth Industrial Revolution (4IR). It is an opportunity to entirely rethink our training and education model. We need a new skill offer. One that accepts that in an automated future our skills will have a short shelf life, and that we will need continual retraining and upskilling.

It is no longer effective or economic to front load tertiary education, we need to broaden it to deliver a whole life package. To achieve this, we must think beyond current silos, to develop an approach that encompasses tertiary education as part of a whole system, including schools, Further and Higher Education, as well as adult skills. This needs to build on the positive principals of the current system, which accepts cost sharing across the beneficiaries of education, to look at other forms of distribution and to create an entitlement for everyone that can be drawn on at any point through life.



2. CONTEXT

The skills system in the UK has been dealing with multiple challenges for many decades.

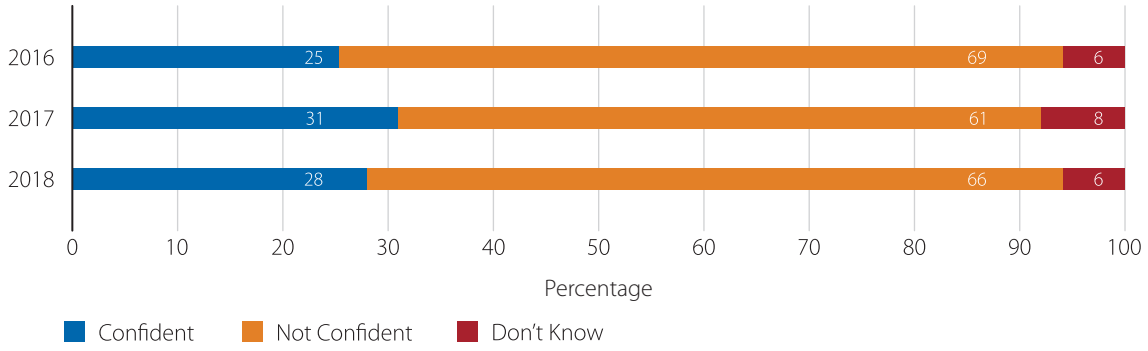
2.1 THE UK SKILLS GAP

Britain's overall skills base has long lagged well behind many comparator countries. This is particularly true of intermediate skills and basic skills such as literacy and numeracy, which more than one in five adults lack.

The Organisation for Economic Co-operation and Development (OECD) Skills Outlook 2017 found that the UK's adult skills characteristics do not support its areas of industrial specialisation, with Britain coming 24th out of 34 OECD countries for intermediary skills.[10] In particular, the OECD says the UK is among those countries whose "skills characteristics struggle to meet the requirements of the technologically advanced sectors".[11]

Research from the CBI (Figure 1) which surveys businesses across Britain, indicates that over two-thirds of employers are increasingly concerned that individuals lack the necessary skills to fill positions in the future.

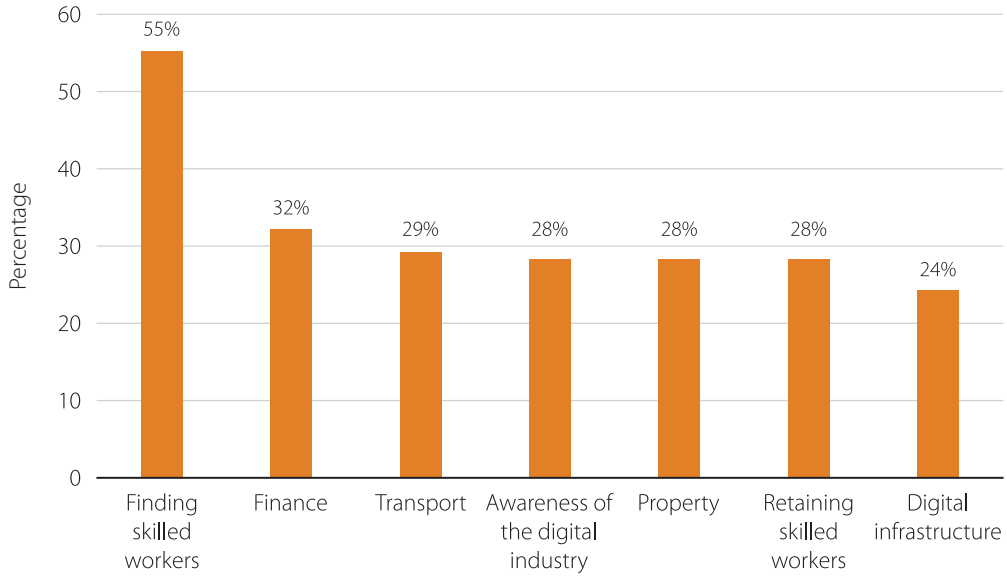
Figure 1: Employer Confidence About Accessing High-skilled Employees in Future (%)



Source: CBI/Pearson, 2018[12]

One in five job vacancies in the current market results from difficulties recruiting individuals with the appropriate skills.[13] For digital tech companies this problem is even more acute, as Figure 2 highlights, and recent estimates suggest that failing to fill such roles requiring digital skills, is costing the UK almost £2bn per annum.[14]

Figure 2: Percentage of Digital Tech Businesses Reporting Issue as a Challenge



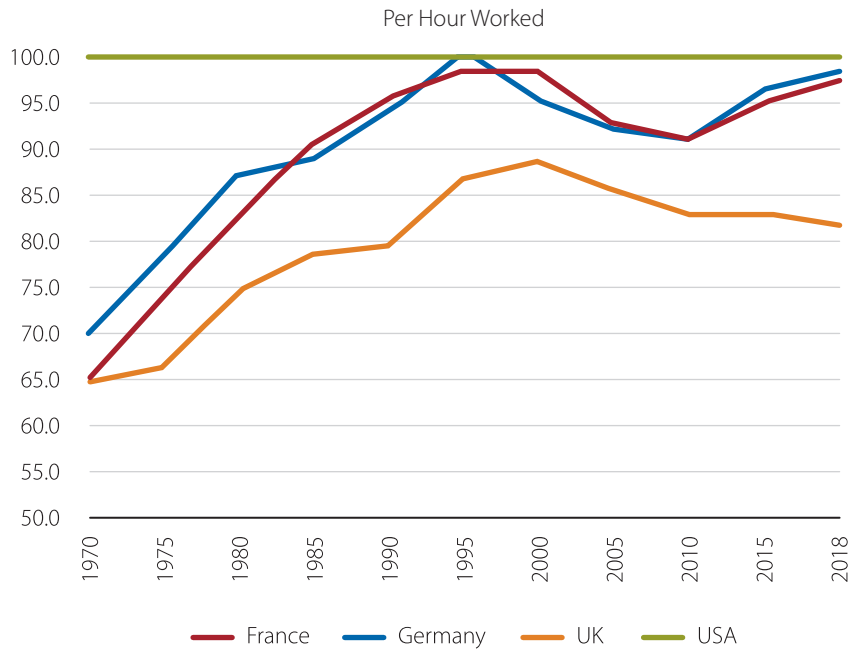
Source: Tech Nation 2017, Tech City UK

The UK desperately needs to narrow the gap between the supply and demand for skills, especially if it is to prepare individuals for a rapidly changing world and labour market. Too many are without the skills needed to be successful, and an improved skills system could provide the gateway back into employment for those that are at greatest risk of being made obsolete.

2.2 UK PRODUCTIVITY

This skills gap is, in large part, responsible for the dire lack of productivity in the UK. Productivity in Britain today has not risen since the 2008 financial crash, and it is currently around 17% lower than it would have been if it had followed its pre-downturn trend. The UK has consistently lagged behind G7 competitors – with UK workers about 20% less productive than their US counterparts (see Figure 3).

Figure 3: Productivity in the UK, France and Germany – Compared to the US



Source: OECD Dataset: Level of GDP per hour worked, as a percentage of the USA (USA = 100)

The UK's poor productivity performance is related to Britain's sectoral structure and the long tail of low productivity firms. Workers in low-wage sectors of the UK economy are less skilled than their counterparts in Europe. If their skills were increased and the productivity of low-wage firms was raised to just the EU average for those sectors, the UK could close the productivity gap with Germany and France by a third.[15] Such a move would boost UK economic growth and living standards, which are struggling to grow via increasing employment because it stands at an all-time high of 74.8%.[16]

2.3 INEQUALITY IN LEARNING

The UK also has some of the highest levels of structural inequalities in participation in learning. Other studies show, for example:[17]

- More than 50% of those in the highest socio-economic classes (ABs) had participated in learning, compared to 26% of unskilled workers and those on limited incomes (DEs)
- Half of those in work had participated in learning, compared to 28% of adults out of work but not seeking work;
- 68% of 20-24-year olds had participated in learning, compared to 20% of 65-74-year olds
- Those who left full-time education at age 21 or over are twice as likely to be participating in learning than those who left at or before age 16
- Educational attainment of young people is also strongly linked to parental income and educational attainment: 36% of children eligible for Free School Meals gain A*-C in GCSE English and Maths, compared to 63% for all other pupils
- Inequalities in learning both underpin and perpetuate inequalities in life chances. Many of those who would benefit most from learning, are least likely to participate in learning.

2.4 SKILLS POLICY IN THE UK

Constant changes to priorities, qualifications, institutions and funding has been a mainstay of UK policy since 1981. During this time Government has struggled to build a successful education and skills system to adequately address the UK's productivity and skills gap, as well as the inequality in participation. Education and skills have flipped endlessly between government departments and Secretaries of State, with a series of major strategies and reports including, for example: the Dearing, Beaumont, Cassels, Tomlinson, Leitch, Wolf and Richard policy reviews.[18]

The most recent is the wide-ranging Review of Post-18 Education and Funding led by Philip Augar. This Review was partly in response to increased debate around the cost and value of higher education. It does, however, acknowledge the wider problems of post-18 education in England and proposes that the Higher Education sector should absorb a further three year freeze on per student resources to help fund investment in other parts of the post-18 education system. The headline recommendations are to:

- Reduce higher education tuition fees (to £7,500 per year); the income threshold for student loan repayments (from £25,000 to £23,000); and the interest on loans charged while studying
- Extend the student loan repayment period from 30 years to 40 years
- Cap the overall amount of repayments on student loans to 1.2 times their loan
- Reintroduce maintenance grants of £3,000 for disadvantaged students
- Introduce maintenance support for level 4 and 5 qualifications
- Provide a first free full level 2 and 3 qualification for all learners
- Replace lost fee income by increasing teaching grants.

The proposals are expected to cost an additional £0.3 - 0.6 billion in ongoing annual costs plus a one-off £1 billion on capital for further education colleges. These costs arise from extending entitlements to maintenance and tuition support. The changes to student finance and funding are expected to reduce costs when taken on their own. They shift the balance of taxpayer funding from loan write offs to more direct funding for teaching and maintenance.

Compared to the current system the highest earning graduates will see their lifetime loan repayments fall substantially. Middle earners will see the largest increase in repayments and some of the lower earners will also repay more.

This review, alongside a review of the UK apprenticeship levy, forces policymakers to reappraise the funding of tertiary education and training, from adult basic skills to doctorates, and from Level 1 to Level 8. However, Government has yet to adopt or enact the recommendations of this review.

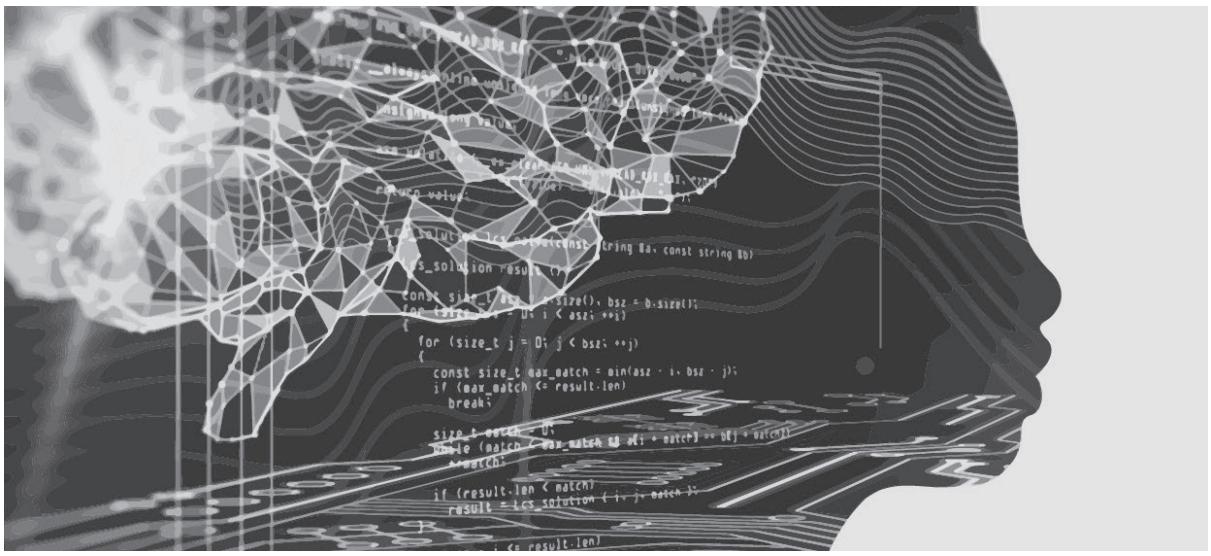
2.5 ELECTION PLEDGES, 2019

The main political parties have outlined their commitments to education and skills in their manifestos for the 2019 General Election.

The Labour Party have announced their plans to 'throw open the door' for adults to study and retrain throughout their lives and take advantage of the Green Industrial Revolution.[19] Labour is pledging to put vocational education on a par with university degrees and deliver a radical expansion of lifelong learning to make sure, 'no one is shut out of education' and to enable adults to return to study for free – ensuring automation doesn't leave people without work. This commitment to lifelong learning is part of their plans for a National Education Service, which will provide cradle-to-grave learning that is free at the point of use. The Labour Party has also pledged to scrap university tuition fees, giving every adult a free entitlement to six years of study for qualifications at level 4-6 (undergraduate degrees and equivalents such as Higher National Certificates and Diplomas, Foundation Degrees, Certificates and Diplomas of Higher Education in areas such as rail engineering technicians, nursing associates, and professional accounting technicians); and will bring back Education Maintenance Allowance for sixth form students, and university maintenance grants.

The Liberal Democrats have also made a commitment to lifelong learning by pledging £10,000 for every adult to spend on skills and training throughout their lives. The 'Skills Wallet' is intended to empower people to develop new skills so that they can thrive in the technologies and industries that are key to the UK's economic future and prosperity. The 'Plan for the Future', sets out their vision for a 'new era of lifelong learning. A Liberal Democrat government will put £4,000 into people's 'Skills Wallet' at 25, £3,000 at 40 and another £3,000 at 55. The grants have been designed to encourage saving towards the costs of education and training throughout adult life. Individuals, their employers and local government will be able to make additional payments and top up their skills wallet. However, the Liberal Democrats have ruled out scrapping university fees as, 'fantasy economics'.

The Conservative Party have announced that they will work to maintain and strengthen the UK's global position in higher education and will consider carefully the recommendations of the Augar Review, including interest rates on loan repayments with a view to reducing the burden of debt on students. There is, however, no present commitment to reduce student fees. The centrepiece of their skills plan is the new £3 billion National Skills Fund, to be invested over the course of the next parliament. This will provide matching funding for individuals and SMEs for adult education and training. Alongside other investment in skills, including £2 billion to upgrade the entire further education college estate and 20 Institutes of Technology, these measures aim to enable businesses to find and hire the workers they need.[20]



3. CURRENT SYSTEM FAILURES

The education and skills system in the UK has been the subject of continual review across all governments over the past 30 years. Yet a succession of policies has not succeeded in resolving some of the structural problems that underpin the UK's relatively poor international position in intermediate level skills and productivity.

3.1 HIGHER EDUCATION

Over this period the UK has expanded its higher education sector, to the detriment of technical and vocational training, with an emphasis on 'full' degrees, which are more time intensive (3-years) and more expensive than all other forms of training and education. The UK now has high participation and graduation rates, especially for younger cohorts, compared to competitor nations. Considerably higher than the US and 10 percentage points above the EU21 average.[21]

This emphasis on university degrees has seen a consequent shift towards a student loan system, as the principal means of funding for both tuition and maintenance. This has remained controversial, especially following the Coalition Government's decision to raise tuition fees to £9,000 per year, in 2012. The average debt owed is now double what it was in 2011, nearing £50k.

STUDENT FINANCE

For the vast majority who take out student loans, monies are provided by the taxpayer and then paid back to the exchequer through monthly or annual repayments by graduates once they earn over an agreed threshold. Four years after the start of their course, and upon earning above £25k (from April 2018), students pay back 9% of all earnings above this threshold, deducted from their pay slips.

Table 1: Current Student Loan Conditions in England

LOAN CONDITION	CURRENT PROVISION
Threshold for repayments to start	No repayments required until borrower earns £25,000 a year.
Debt written off	Any outstanding debt not repaid 30 years after completing/leaving study is written off.
Repayment rate	9% of all income over the threshold (currently £25,000) is paid to the Students Loans Company.
Interest rate	The interest charged on outstanding balances ranges from RPI to RPI + 3% (if they earn £41,000 or more).

Source: HM Government [22]

There are a number of issues with the current student finance system and how it is structured:

1. It is regressive – the poorest students end up owing the most in debt. After a three-year course the poorest 40% of students will graduate with a higher amount of debt (£57,000) than their classmates from the richest 30% (£43,000).[23] It was announced on April 18th that students will face an increase in interest rates on their loans from 6.1% to 6.3%, following an increase in the Retail Price Index (RPI). The poorest 40% of students will now have to pay almost £7k in interest over the course of their studies.

Furthermore, the National Union of Students (NUS) published a report that found that student expenditure regularly exceeds income from loans – for example fees for halls of residence often exceed the maintenance loan.[24] This has created a situation where many poorer students have to rely on part-time employment or additional borrowing to make ends-meet, whilst their parents struggle to subsidise them without forfeiting their own ability to pay for basics such as food and heating.

2. The current system is also **misunderstood and unpopular**. Because it is termed a loan, many students think they have to repay loans in excess of £50k in their entirety. For many this creates a psychological burden of debt[25] and it can act as a cultural barrier to higher education for poorer students, who are more debt averse.[26]

However, there is a common misperception that the loan must be paid back in its entirety for a lifetime. In fact, the size of the loan does not affect the amount paid back, as students only pay 9% on any income above £25k for up to 30 years. In most cases, the government does not expect graduates to ever pay back the whole amount. Current estimates indicate that the government will have to write-off some or all of the debt for 83% of students, who will not have repaid their loans within the 30-year time limit.[27]

Our research, running focus groups and surveys with current and past students, found that many do not realise this. Whilst students do have a basic understanding of the system, their parents tend to be the ones that do not – they view it through the lens of negative media, acting as a barrier to their children's attendance. So, whilst the information is out there for students and their families, the system needs to be better tailored to prepare them for

the realities of university – providing financial, budgeting, and careers advice. A good example of this is that many students and their parents think that having a student loan will impact their ability to get a bank loan/mortgage, which it won't. Even for those few that are aware of this dynamic, mistrust in the system remains. Many fear the Government could change the terms of repayment of their loans, at any time.

The current system, in many ways, is similar to a 'graduate tax'. However, it is difficult to communicate this to students because it raises a 'debt vs deficit' problem. If the system was turned into a graduate tax system, it would have to be converted into a grant rather than a loan system. This would put a huge amount of pressure on government funding upfront (abolishing fees will cost circa £10bn), which then puts education into competition with money for the NHS, the armed forces, and housing. The decision to introduce loans and raise fees, was in part clever accounting, to keep education funding off the Government's National Accounting books. When fees were tripled it reduced the deficit by £6-7bn a year over 3 years. If the system was brought back into the public accounts, there would be less money for the retraining and tertiary education programs that the UK so badly needs.

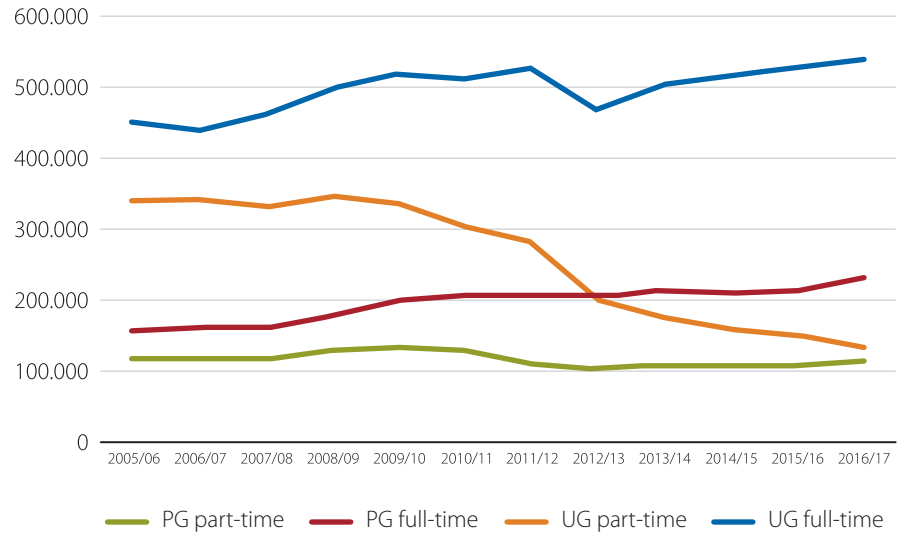
There was a proposal that the government would absorb some of the cost of higher education by cutting fees to £6,000. But a number of reports pointed out that, if fees were dropped to £6,000, the top 17% of earners would benefit the most - enabling them to clear the debt they would always have repaid, for less. Followed by the next highest 10-20% of graduate earners, who don't currently clear their debt in full but would do with lower fees.[28] A study by London Economics also found that reducing fees from £9,250 to £6,000 would take more than £3.3bn away from universities.[29]

There are other systems where tuition is free, but where attending university still incurs personal debt. In Scotland for example, removing fees has been funded by a reduction in maintenance grants, resulting in a situation where the poorest students still leave university with more debt than their wealthier classmates. Considering this, plus the impact of a four-year degree and a lower debt-repayment threshold, Scottish graduates in the bottom 20% of earnings repay more than their English counterparts, despite paying no fees. An alternative solution needs to be found.

The findings of our qualitative research identified that there is also a very strong feeling amongst students that universities are gaining too much at the expense of students, paying Vice Chancellors too much and constructing too many new buildings instead of focusing on increasing the quality of teaching. For many, the sudden hike in the interest rate broke their trust in the system. Many feel conned, contributing to the opinion that university is poor value for money. Higher education establishments need to switch from being self-serving to once again fulfilling a social and civic purpose.

3. For many of the above reasons, the current system has therefore seen a **dramatic decline in part-time students** – reducing the overall participation of those from disadvantaged groups. The number of part time undergraduates has fallen over 50% since 2010, and the trend shows no sign of slowing down (Figure 4).[30]

Figure 4: First Year Students by Level and Mode of Study Between 2005/06 and 2016/17



Source: Higher Education Student Statistics, 2018

This has been coupled with increasing pressure on the Adult Education Budget (AEB), to be discussed in more detail below, which reduces the opportunities for adults who need to reskill or for those that missed out on educational opportunities earlier in their lives. Taken together, this makes it increasingly difficult for individuals who fail to succeed the first-time round at school, college or university. As the Fourth Industrial Revolution gathers pace, the concept of a 'second chance' will become redundant as individuals need multiple 'chances' to improve their skills and knowledge. A rethink is essential. Studying part-time allows those who missed out on the opportunity to study full time at a younger age the opportunity to gain higher level qualifications. It also allows those in employment to acquire the knowledge they'll need to get better jobs or obtain the new tech skills demanded by the future world of work.

Britain is not unusual in failing to offer all of its citizens an equally good education. In fact, it shares broad trends with other developed countries. Nonetheless these are serious flaws in our education system that need addressing.

THE ONS REFORM

The Office for National Statistics (ONS) have announced how they will treat student loans in the Government accounts.[31] The ONS will split the government's student loan payments into a share that is genuine government lending and a share that is government spending. The balance, which is not expected to be repaid, will be treated as spending. This will be considered capital spending, because this can be thought of as the government effectively cancelling a portion of the loan at issuance, which is treated as capital spending under international standards.

This reform will have no impact on the overall level of government debt. This is because debt is a cash measure so is unaffected by whether the money being paid out is classified as a loan or spending. However, this change will increase the government's budget deficit, to ensure it properly reflects the true picture of government spending. Now, debt write-offs that would have taken place in 2040 and beyond, will be reflected as government spending.[32]

Even though this appears to be a sensible move from the ONS, there are some serious budget implications for the Government. It doesn't change the overall cost to government of providing student loans, but it does change the presentation of that cost, and this could wipe out the £74bn fiscal windfall given to the chancellor by the Office for Budget Responsibility (OBR) before the Autumn 2018 budget. This windfall, created by the OBR projecting that tax revenues in 2022/23 would be around £14 billion higher than they forecast back in March, delivered the promised extra spending on the NHS without increased borrowing or tax rises. Without considering these unpopular moves again, there would appear to be little extra funding for the Chancellors famed 'Brexit dividend', let alone for a new tertiary education system. A new funding model is required if we want to provide a truly revolutionary skills system for the 4IR.

3.2 COMPULSORY EDUCATION – THE SCHOOL SYSTEM

It is difficult to assess the failures of tertiary education without looking at how the whole education system works, including schools.

The UK has one of the most complex and fragmented compulsory education systems in the developed world – with a mix of private and state funded schools, including selective and comprehensive schools, schools under local authority control, and those independent of education authorities including foundations, academies, multi-academies, free schools, studio schools and faith schools.

But regardless of the type of school the current education system in the UK is built upon three foundational phases of learning - pre-school, primary and secondary. The model of learning through play is largely confined to early years before moving quickly towards more structured learning in the primary phase. Regular testing which is intensified during the secondary phase culminates in qualifications, that serve as a passport to higher education and the hope of a well-paid, high-status job.

Schooling is essentially what some critics term a 'factory model of education' with conveyor belts, assembly lines, age-based cohorts, whole class instruction, standardisation. It is a system that was designed for another economy in another era and has not fundamentally changed in 120 years. Yet parents are broadly content with this model if their children are happy and achieve their desired outcomes. While employers are similarly accepting if their recruitment needs are met.

However, there is evidence that this model is not working for everyone. Narrowing the attainment gap, between pupils from different social backgrounds and between different places, is one of the key challenges facing our current education system. Some critics have suggested it would take over 50 years to achieve this based on current levels of performance. But even when high levels of attainment are reached this is being achieved at great cost.

Rates of depression and anxiety among children and young people in the UK have been increasing steadily. Research by the Education Policy Institute identifies that 3 out of 5 parents are worried about their child's mental health at school. Referrals to child and adolescent mental health services have risen by more than a quarter over the past five years,[33] while nearly a quarter of 14-year-old girls self-harm - a 68% increase since 2011.[34]

These findings are consistent with international evidence from other developed economies, whereby the deteriorating wellbeing of children and young people is in part attributed to:

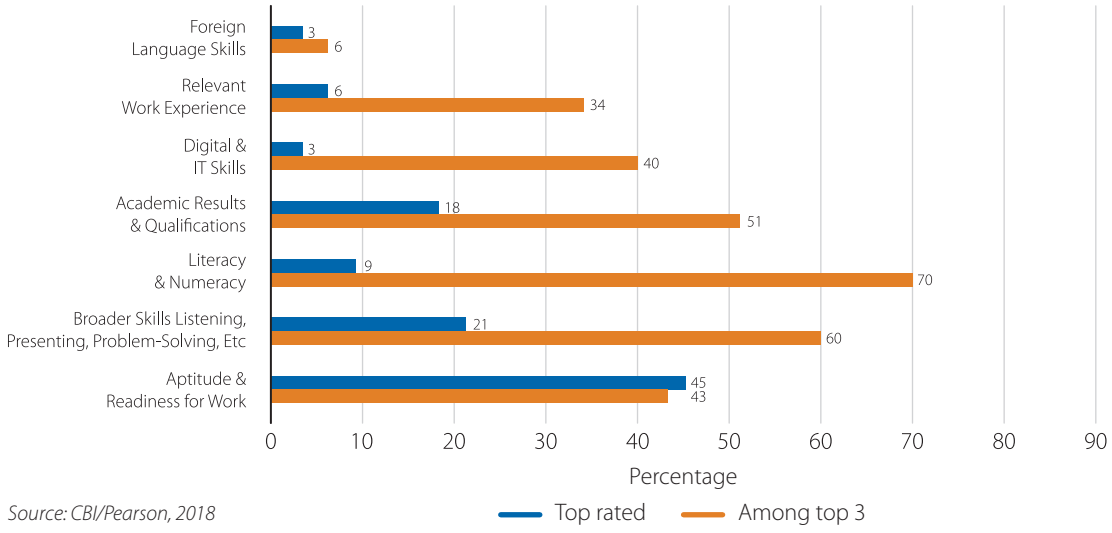
- A decline in young people's sense of personal control over their fate
- A shift toward extrinsic goals (e.g. material rewards), away from intrinsic goals (e.g. self-development)
- A decline of free play and a rise in coercive schooling that emphasises testing and grades.

Over testing has been identified as a major contributor (we currently spend £2bn per annum testing school children)[35] to the levels of stress pupils experience in trying to attain the qualifications they think they need.

Then having gained the necessary grades and achieved their ambition of attending university, many students worry about their debts and that they may not be able to secure the career they want, or that their careers may not have the longevity, or financial rewards they had hoped for due to economic restructuring and the threats of new technology. One disturbing indicator of emotional distress and deteriorating mental health is the increasing suicide rate among UK university students, which has risen by 56% in the last 10 years.[36]

Research also indicates that the current education system is not necessarily providing employers with the workforce they need. Survey data from the Confederation of British Industry (CBI) (Figure 5.) highlights that employers want employees who have broader skills (60%), such as listening and problem solving, a readiness for work (45%), and a mixture of academic and technical qualifications (74%).[37]

Figure 5: Most Important Factors in Recruiting School/College Leavers (%)



Source: CBI/Pearson, 2018

Employers also want employees who are: self-reliant and confident, who work well in teams, who are creative and innovative, and who can apply a diverse range of skills to the world of work. At present, employers complain that it is hard to find such employees. Businesses therefore want to see a focus on technical (STEM, Digital and IT) and broader skills (listening, creative teamwork etc.) that are lacking in current provision.

The new economy clearly presents a significant challenge to the purpose of compulsory education. If we accept that different skills pathways are needed (including academic, technical and vocational) and that life-long learning will be a continuous requirement, then we may conclude that the current school system premised on qualifications and access to higher education needs radical reform.

What employers' value isn't necessarily qualifications or academic results, it's attitude, character and resilience. They want agile and creative people and a curriculum better aligned to those outcomes. As the school-leaving age rises, employers are questioning the value of high-stakes exams at 16 and looking more to outcomes at 18 – both academic and vocational. Could we abolish GCSE's and end the national curriculum at 14, freeing up 14-19 for a much more tailored and fulfilling educational experience?

This presents a systemic challenge to schools and universities. As universities evolve a different offer for through life learning, schools will also need to change from a system which delivers 50% of its leavers into higher education and three-year graduate degrees to one that offers access to different opportunities at different junctures.

There will still be the requirement for an academic pathway from school to university, especially in STEM related subjects, but current levels of access to higher education, across all courses, may need to be managed down as the demand for new learning models and institutions increase.

3.3 TECHNICAL AND VOCATIONAL SKILLS

The UK has a long history of technical vocational education and training (TVET) which extends back to the 12th century. Yet in recent times technical and vocational skills have been a relatively low priority for UK Government, evidenced by the decline of both public and employer investment in adult skills, which we discuss further below.

TVET has faced repeated budget cuts and policy meddling, by successive Governments, affecting the quality and sustainability of provision. Employers in the UK are also investing less in their workforce (half the EU average),[38] at a time when automation is increasing the need for upgraded skills. The apprenticeship levy, introduced in 2017 to boost employer investment in training, has also proved difficult to implement, with a significant 24% drop-off in apprenticeships starts in 2017/18.

Vocational training has been cast as 'second best' to the more esteemed academic route, leaving the post-16 vocational training sector to pick up the pieces of a failing school system that results in half of its school leavers not achieving good grades in English and maths. While the NVQ/BTEC/HNC framework, available to those not pursuing higher education, has not been particularly valued by employers.

Some commentators attribute this demise to a longer trend dating back to the post war settlement when the

UK extended secondary education to all, but failed to deliver an adequate technical education offer, as the Butler Act (1944) had envisaged. The abolition of Polytechnics in the early 1990's is also seen as another decision which compounded the problem when the UK lost a great deal of its edge and focus on higher levels of vocational and technical education. This drift follows the pattern of the UK's industrial decline.

This has contrasted with a number of European competitors, such as Germany and France that have continued to invest in and value its technical and vocational routes.

CASE STUDY: VOCATIONAL TRAINING IN GERMANY[39]

In Germany, schools are in general selective from age 12. Vocational training is integrated as part of the education system. This dual system of training and education - is closely linked to the country's industrial base.

From ages 15/16 pupils can continue education and combine it with specialist vocational training in dedicated schools and colleges. This training can also take place part-time in industries and firms, which are themselves closely involved in the training model and include some of the main exporting industries representing a range of sectors from motor vehicles and machinery to chemicals and computer, electronic products, electrical equipment and pharmaceuticals.

The UK labour force and economy has been weakened by the proportion of low skilled workers in low skilled jobs (greater than in any other country in the Organisation for Economic Co-operation and Development (OECD), except Spain). This contrasts with the UK's leading position in several high value sectors, with a highly skilled, often highly educated work force in areas such as financial and legal services, digital, tech and scientific research.

The challenge for the UK is to tackle a long tail of productivity and low skills to develop a training and education system that can raise overall levels of skills and training. This goal will become increasingly urgent with the threat of automation.

Traditional learning institutions and qualifications will continue to be important in improving technical and vocational skills but there are also other models to explore. The growth in 'new collar' jobs which is taking place around the world presents a challenge to education and training currently delivered through schools, colleges and universities. There is growing evidence that bespoke models such as **Ecole 42** in Paris (funded by a philanthropist), **Flat Iron** in London (fee based, but deferred subject to future earnings), and **Pursuit** in New York (funded through a social impact bond) are providing very successful paths to high skilled careers in tech industries. This is a shorter, faster, more direct route for upskilling populations than most established HE/FE courses achieve.

CASE STUDY: ÉCOLE 42, PARIS

Ecole 42 is a private, non-profit and tuition-free computer programming school created and funded by French billionaire Xavier Niel (founder of the telecommunication company Illiad). The school opened in Paris in 2013.

Every year in France about 3,000 candidates (from 80,000 applicants) are selected to complete a four-week intensive computer programming bootcamp called piscine (swimming-pool). Any person between 18 and 30 can be registered for piscine after completing the logical reasoning tests on the website.

The school does not have any professors, does not issue any diploma or degree, and is open 24/7. The training is inspired by new modern ways to teach which include peer-to-peer pedagogy and project-based learning. The school has been endorsed by many high-profile people in Silicon Valley and copied there (Silicon 42[40]) and around the world.

The school is a non-profit organization and is entirely free. All the intellectual property belongs to the students.

Pursuit is another tech training organisation based in Queens, New York, which has enabled hundreds of workers from low income communities to become successful computer programmers, raising their income from $18,000 to $85,000, on average. These are customised training model's that could be scaled up to align with local industrial strategies and fast-track largely lower-skilled populations into higher paid employment in the new economy.

3.4 A FAILURE TO INVEST IN ADULT SKILLS

The imbalance in skills provision between high, intermediary and low, and the consequent gaps between supply and demand, explains the UK's productivity lag. This can be attributed to low investment in adult skills training in Britain. Funding for the current adult skills system currently comes from three key sources: individuals, employers and the government.

In 2017 total spending on adult education was between £7.5-11bn. Public funding made up approximately £2.5bn, of which £1bn was for apprenticeships and £1.5bn for the AEB. Whilst employer spend on fees to external training providers totalled £3bn (although the Employer Skills survey estimate the cost is £45bn, including the wage costs of employees being away from work to study). Individual investments reached between £2-5.5bn.[41]

However, investment from both business and the state are falling. Employers in the UK invest under half the EU average in continuous training, and investment per person has fallen 14% in real terms since 2007.[42] Given that the primary beneficiaries of a better educated workforce are businesses themselves, this is simply not good enough. Employers must start contributing more.

The decline in employer-led investment is concerning, but it is made all the more so by the drop in public investment – the adult skills budget will have been cut by 45% in real terms between 2010 and 2021.[43] The

government also recently cut entitlement to training for low-skilled workers on low pay. Those in work, who are looking to qualify in subjects equivalent to A-Level now have to fund themselves through Advanced Learner Loans instead (which work in a similar way to tuition fees described below). The year after replacing funding entitlements with the Advanced Learner Loans, participation fell by one third.[44]

Table 2 highlights the Governments further spending plans for the adult skills sector, and the priority very clearly appears to be on apprenticeships.

Table 2: Adult Skills Spending in England – Current Budget Allocations and Projections

	2015/16 (£'000S, ACTUAL)	% OF BUDGET	INDICATIVE 2019/20 (£'000S)	INCREASE 2015/16 TO 2019/20
19+ Apprenticeships	740,000	25%	1,422,999	92%
Adult Education Budget	1,494,000	51%	1,512,000	1%
Advanced Learner Loans	202,000	7%	480,000	138%
Offender Services	130,350	4%	130,350	0
Support Services	373,113	13%	239,427	-36%
Total	2,939,463	100%	3,784,776	29%

Source: Skills Funding Agency Funding Letter, Nick Boles to Peter Lauener, December 2015[45]

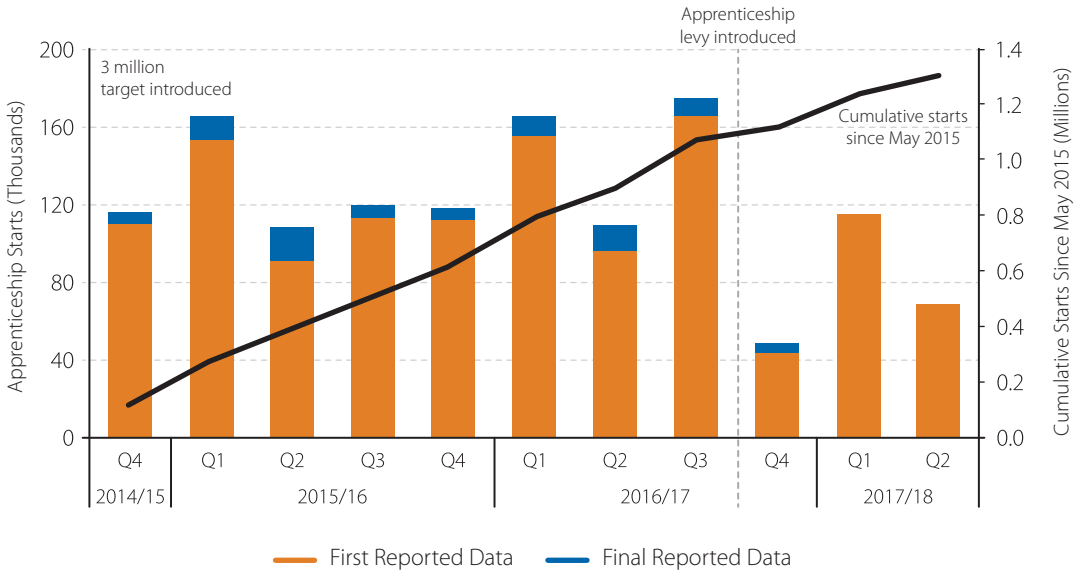
As Wolf, Dominquez-Reig and Sellen state, the obvious response to these figures is that they are implausible, 'can there really be so little provision in the current English system for intermediate tertiary skills? Can it be this unbalanced?'.[46] The short answer is yes. Adult skills have been relatively low down the list of political priorities, and this is evidenced by low and falling levels of public investment.

We need a system that reflects the wider social gains of tertiary education. Data from the OECD shows that investment in higher education in the UK has wider benefits upon the economy, yielding public rates of return of more than 10%,[47] through increased productivity and greater contribution to the public purse. If we are to make the most of these returns as well as the most from the uncertain future of work, public investment must become a priority once again.

THE APPRENTICESHIP LEVY

The apprenticeship levy is a move towards recognising that more has to be done to stimulate employer investment in skills. Since April 2017, employers whose payroll surpasses £3m have to contribute 0.5% of their bill above this threshold into an account from which £15k can be redeemed if used to pay for apprentices.[48] However, the apprenticeship levy has failed to increase investment in skills. In the first quarter after its introduction there was nearly a 60% reduction in apprenticeship uptake. This has eased, but it still faces a quarter-on-quarter decline since its inception (Figure 6).[49]

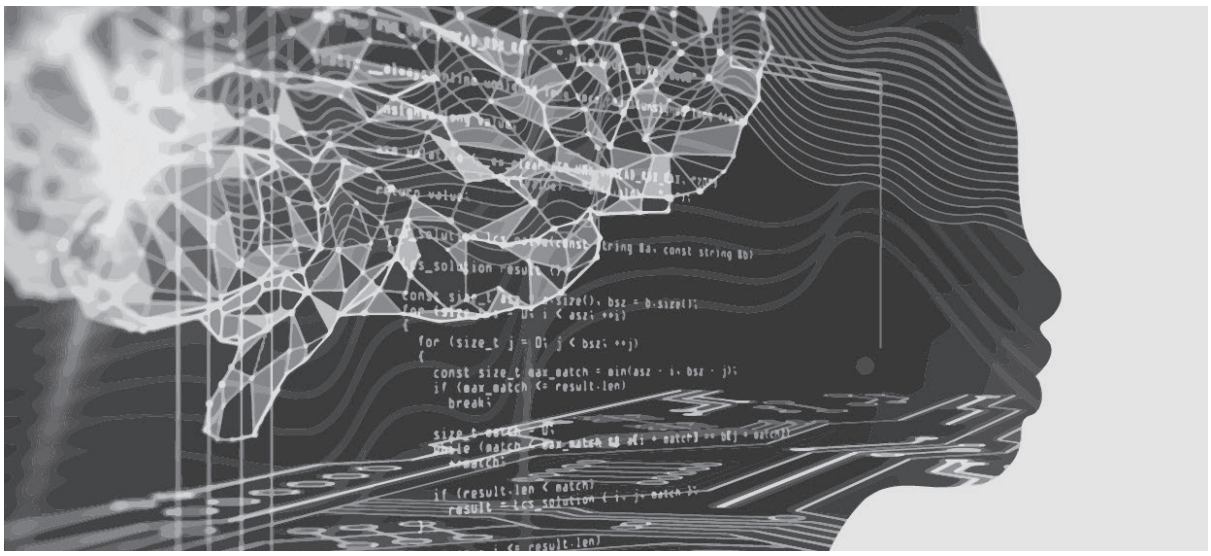
Figure 6: Quarterly Apprenticeship Starts from May 2015



Source: Department for Education, 2018[50]

The levy is considered far too inflexible and bureaucratic, putting off businesses from taking on apprentices. It is also very firm-specific, and narrowly-job focused; it does not, for example, cover the high cost of training in technical fields, making it unlikely to deliver the skills a future workforce would need. Equally, it accentuates regional inequalities. The levy raises most money in London and the south east where there are larger levy-paying firms, rather than stimulating training in the regions that need it most – where there are fewer large firms, lower levels of qualifications and lower levels of productivity.[51]

There is a compelling case for increasing economic growth, productivity and living standards by investing in an efficient and equitable adult skills system. But, whilst the adult skills budget must be protected from further cuts, a new lifelong learning system cannot be forged through greater public expenditure alone. A new funding model is required. One that is geared to provide all people, regardless of background, the opportunity to train, reskill, and prepare for the changing world of work.



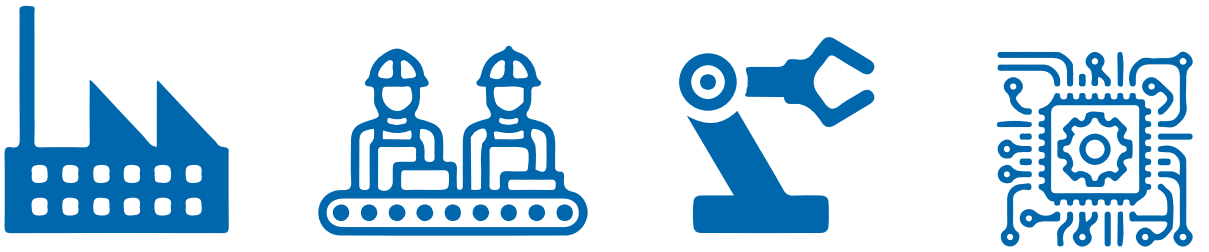
4. THE FUTURE OF WORK, EDUCATION AND SKILLS

We are in the midst of a new industrial revolution. Technological and demographic change will radically disrupt and transform the labour market, and wider society, in a number of ways. The impact of these forces is difficult to predict but they will challenge the nature of work itself (who does it, how it is done, and where) as well as the education and skills system needed to adapt to this new future.

4.1 THE FOURTH INDUSTRIAL REVOLUTION (4IR)

The fourth major industrial era since the initial Industrial Revolution of the 18th century is already underway. It is characterised by a fusion of physical, digital and biological technologies and is leading to major breakthroughs across a number of related fields including robotics, artificial intelligence, nanotechnology, quantum computing, and biotechnology.

We are at the inception of what some commentators and critics have termed the second machine age, with the proliferation of smart (phones, meters) and wireless technology (5G); mass automation (including driverless cars); additive manufacturing/3D printing; and the internet of things. Importantly, this revolution is not over, it is just starting. Yet these advances are already changing the nature of work beyond recognition and consequently the requirement for our skills system to adapt.



1st
Mechanisation, Steam & Water power

2nd
Mass Production, Assembly Lines, Electricity

3rd
Computer & Automation

4th
Cyber Physical Systems, Networks, AI

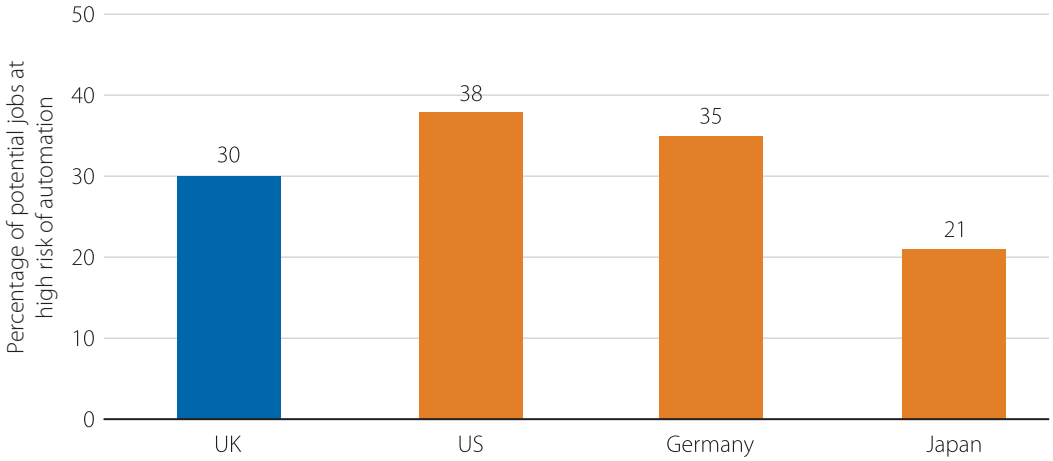
The pace of technological change is increasing at an unprecedented rate, being adopted more quickly and delivering greater impact than ever before. Fixed-line telephones were invented in 1878 and took 75 years to reach 100 million users, mobile phones created in 1979 took 16 years to reach 100 million people, the internet launched in 1990 took six years to reach 100 million, and the Apple App store unveiled in 2008 took just 3 years to reach 100 million users.[52]

But what's next? With recent developments in machine learning and artificial intelligence, technology is now able to do things that were previously only believed to be done by humans, and at levels above human performance at a fraction of the cost. These rapid advances in automation have the potential to both create millions of jobs in new industries and destroy millions of jobs in existing ones.

4.2 THE FUTURE OF WORK - TO BE REPLACED, OR AUGMENTED?

One of the most widely discussed issues related to the 4IR is the potential job losses that could follow the widespread introduction of AI. Frey and Osborne's 2014 seminal research forecasts that 35% of jobs in the UK are at risk of being fully substituted by automation,[53] whilst more recent estimates from PwC place this figure at approximately 30% (Figure 7).[54] Indeed the chief economist at the Bank of England has warned that over 15 million jobs could be lost to automation in the next 20 years.[55]

Figure 7: The Risk of Automation



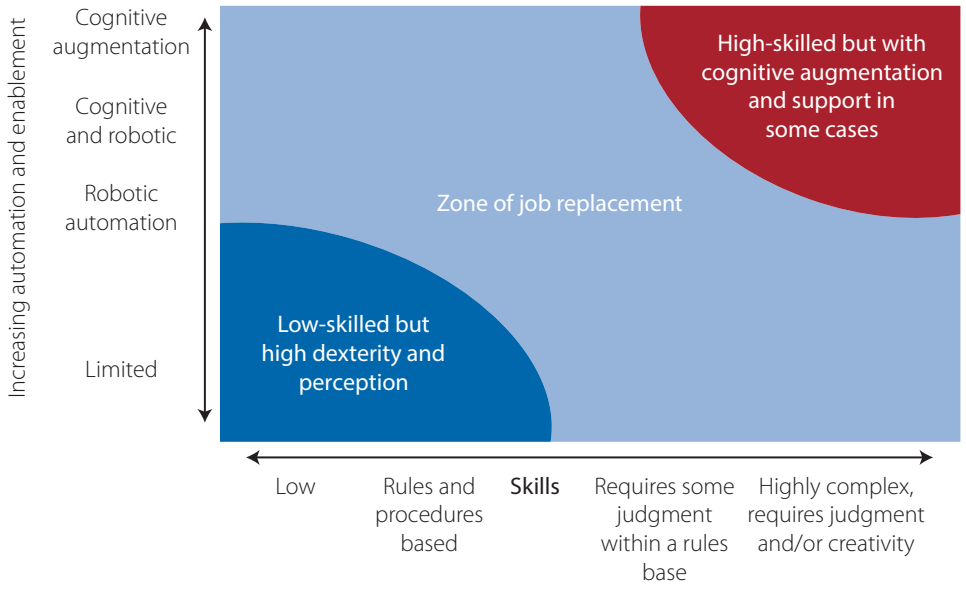
Source: ONS, PIAAC data, PWC analysis

However, not everyone agrees about AI's impact on employment. Economists such as Geoff Colvin argue that we over exaggerate the reality of job losses and under appreciate the reality of the new jobs that will be created.[56] Proponents of this position point to the fact that it's not the first time that automation has failed to live up to predicted fears. Technological anxiety is not new, from the Luddites during the first Industrial Revolution, to Keynes in the 1930s and again after WWII. With each technological leap, workers in some industries faced painful disruption, but in the long run, fears of mass-unemployment were not realised – on average, since the beginning of the 1st Industrial Revolution, one job has been created for everyone lost to a machine.[57] Furthermore, academics such as Arntz et. al argue that if you take into account 'task variation', only 9% of jobs are at risk of being completely replaced.[58]

As these opposing viewpoints fight it out, a more nuanced debate is taking place which moves beyond an aggregate assessment of good or bad, to look at which groups of people are most likely to be affected by the 4IR and how. In some occupations, comparatively few jobs are at risk of being replaced, whilst others face a harsher reality.

The 'hollowing out' thesis is now widely accepted. Middle-skilled workers, such as accountants, paralegals, sales and tradesmen are most at risk from AI. Their work requires repetitive information gathering and analysis that can be done better by a cognitive platform, and they are paid high enough to warrant investment in such automated replacements (Figure 8).[59]

Figure 8: Job Impacts of Cognitive Processing and Robotic Automation

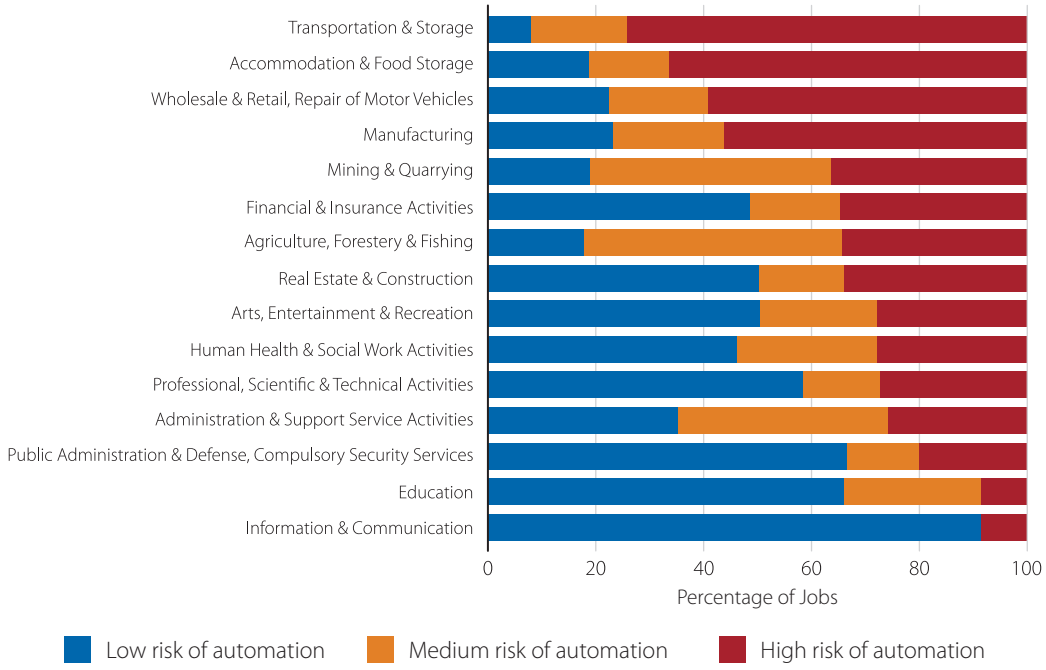


Source: KPMG International, HR COE, 2012

However, less studied is how the 4IR will impact lower skilled workers, who make up 45% of the UK workforce. New technologies are coming online which challenge the 'hollowing out' thesis. Lower skilled jobs that were once thought beyond machines, due to the dexterity and movement required, are now under threat. Advances in robotics and AI, mean machines have developed situational awareness, hand-eye coordination and the ability to grip objects in a way not previously thought possible. The world's first fully automated e-commerce warehouse came into operation in October 2018 where robots move pallets around with ease,[60] soft gripping robots can carefully pick and bag delicate fruits on farms,[61] and AI can now identify breast cancer with greater accuracy than doctors.[62] Developments in materials science, ferrofluids and air muscles are also making robots more dexterous and life-like.[63] As a result, workers with lower levels of skills or qualification, are now facing an increased risk of automation.

Given such technological advances, it is understandable that the UK's 210,000 taxi drivers and 1.3m logistics workers worry about being pushed out of business by driverless cars and automated warehouses.[64] According to research by Deloitte (Figure 9) nearly 3 out of 4 of them could lose their jobs.[65] Transportation and storage are the sectors with the highest percentage of jobs at high risk of automation within the next 20 years (74% of the current workforce; or 1,524,000 jobs). This is followed by Accommodation and Food Services sector (60%; 1,103,000 jobs), Wholesale and Retail, repair of motor vehicles (54%; 2,168,000) and Manufacturing (52%; 974,000). These findings are broadly supported by several other studies.[66]

Figure 9: Percentage of Jobs At Risk of Automation in Each Industry Sector



Source: Frey and Osborne, ONS, Deloitte analysis 2016

The result of these developments is that jobs across the spectrum of the economy, from CEO to shop floor, are at risk. In fact, as the graph below indicates, a significant proportion of highly paid work, not just low paid work, is at threat from automation.

Nevertheless, there are still many jobs that machines cannot do and industries where the likelihood of automation is comparatively low. The ability of machines to automate singular tasks versus whole jobs is often cited as the main reason that technological advances will not lead to mass unemployment. For example, ATMs in the 90s did not lead to mass unemployment in high-street banks because dispensing cash was only one task of a multi-facetted bank clerk job, including customer facing roles.[67] As Frey and Osborne also identify, social intelligence (the ability to have hunches or negotiate and respond to emotional skills), complex manipulation (the ability to deftly handle and move objects) and creativity (the ability to have novel ideas) are tasks that remain difficult for AI to master.[68]

But some experts, such as Yuval Noah Harari argue that even creative jobs and roles requiring 'hunches' or 'human intuition' are under threat. Research by behavioural economists and neuroscientists have found that humans make choices based, not on free will, but on neurons calculating millions of possibilities each second. So 'human intuition', Harari argues, is simply 'pattern recognition'.

"Good drivers, bankers and lawyers don't have magical intuitions about traffic, investment or negotiation – rather, by recognising recurring patterns, they spot and try to avoid careless pedestrian, inept borrowers and dishonest crooks".[69]

If he is right, and this is the case, AI does not need to compete against 'human intuition'. It only needs to compete against neural networks in recognising patterns and calculating probabilities, which it could feasibly beat.

Creative jobs may also be challenged by AI. Harari points to big data algorithms that can write symphonies beautiful enough to dupe listeners into believing they have been made by human musicians.[70] The past 2 years have also seen dramatic advances in machine 'deep learning', that has spawned what many consider, creative AI. In December 2017 a google software program called AlphaZero beat the world's computer chess champion Stockfish 8. Computers have been able to beat human chess champions since 1997, and Stockfish had centuries of accumulated chess knowledge written into it, able to calculate over 70 million chess moves a second. Yet AlphaZero, which had never been taught a single chess move, used the latest AI deep learning to teach itself chess. Out of 100 games with the chess champion, it never lost a game and won 28. Because it had never been taught chess, many of AlphaZero's winning moves were deemed unconventional and truly creative by the human chess champions watching. And how long did it take AlphaZero to learn chess and turn the chess world on its head? Just 4 minutes.[71]

History cannot settle whether this industrial revolution will be different to those that came before it. Are we approaching a place where the pace of technological advancement will outstrip the economy's ability to create new jobs? Earlier industrial revolution innovations were limited to manual and cognitive routine activities, and today machines are mimicking the human body and mind in revolutionary new ways, infringing on many non-routine jobs once believed only possible for humans. The pace of change has never been seen before. Indeed, in 2004 leading AI scientists Levy and Murnane predicted that driving was too dependent on human perception to be automated.[72] But, just under 15 years later, driverless cars are a genuine reality. Google's automated vehicles have driven over 2 million miles in the past six years; they have been involved in 16 minor incidents, there have been no injuries and none of the collisions were the car's fault.[73] So, it is possible that technology will destroy more jobs than it will create this time around. Research from Nesta does find that one-tenth of the UK workforce are in occupations that are likely to grow as a percentage of the workforce, but one-fifth are in occupations that are likely to shrink.[74] Indeed, research from the Organisation for Economic Co-operation and Development (OECD) estimates that 25% of jobs will see roles change considerably thanks to AI.[75]

In truth, no one can be certain about the impacts of AI. The jury is still out, and the public debate is subject to creative fiction. The RSA in their recent publication about the Future of Work suggest four different 'scenarios', including:

- The Big Tech Economy, which describes a world where rapid transformation delivers improvements in goods and services but leaves workers increasingly insecure
- The Precision Economy, where technology enables a future of hyper-surveillance
- The Exodus Economy, characterised by an economic slowdown, and
- The Empathy Economy which envisages a future of responsible stewardship.[76]

If we are to mitigate the downside and take advantage of the changes that will come, we will need the skills to adapt.

4.3 FUTURE SKILLS

While the true extent of technology's impact on employment remains unknown, one thing is certain, we will need a new system that allows us to retrain, shift careers and gain new skills to thrive in this new world.

At some stage soon we could reach an AI tipping point, 'that magic moment when an idea, trend, or social behaviour crossed a threshold, tips, and spreads like wildfire',[77] and we need to be prepared for the idea that the current trend of technology creating more jobs than it destroys, will come to an end. To realise the shared benefits of the 4IR, citizens must have a stake in the economy and be able to do productive work. The nature and pattern of work will change. The labour market may be increasingly characterised by multiple and simultaneous short-term contracts or freelance work, as opposed to full-time permanent employment. Both high and low skilled workers may need to manage a portfolio of jobs. At both ends of the spectrum the UK must have a workforce that has the right skills to take advantage of a restructured economy. High growth firms will not be able to realise the productivity gains from innovations in robotics and AI without programmers and software developers, and workers will not be able to take advantage of new jobs unless they have the appropriate skills.

But, a growing number of all workers will need more digital skills. The Brookings Institute has found that digitalisation of roles has already risen 57% between 2002-2016,[78] whilst other studies have shown that 80% of middle-skills roles are digitally intensive, and that these jobs are growing twice as fast as those not requiring digital skills.[79] As AI continues to develop, workers will increasingly need technical skills to keep pace.

Beyond IT skills, workers will also need 'soft skills' to remain employable in businesses where routine roles are increasingly automated. As research from the World Economic Forum (Figure 10) highlights, by 2020 even the skills that are important in today's economy will have changed.[80] Skills such as emotional intelligence enter the top 10 for the first time, whilst creativity moves into the top three. Negotiation and flexibility become less important as big data starts to make decisions for us.

Figure 10: Skills Requirements for the Future of Jobs

in 2020	in 2015
1. Complex problem solving	1. Complex problem solving
2. Critical thinking	2. Coordinating with others
3. Creativity	3. People management
4. People management	4. Critical thinking
5. Coordinating with others	5. Negotiation
6. Emotional intelligence	6. Quality control
7. Judgement and decision making	7. Service orientation
8. Service orientation	8. Judgement and decision making
9. Negotiation	9. Active listening
10. Cognitive flexibility	10. Creativity

Source: World Economic Forum

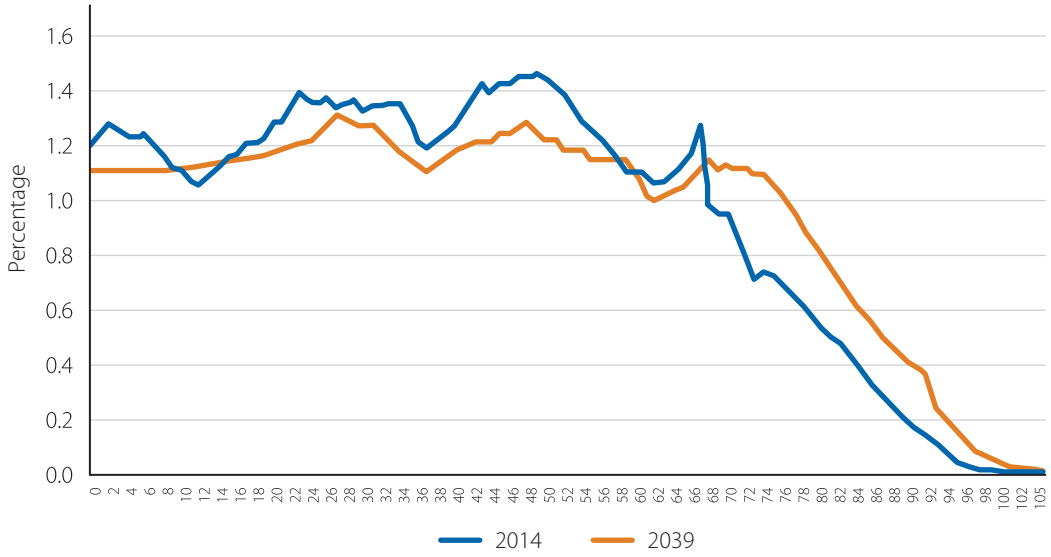
The notion of a job for life, or even a career for life, may soon become redundant. Skills learnt 30-40 years ago are unlikely to remain relevant. As such, a lifelong learning system will be required to help older individuals update their skills instead of focusing on acquiring qualifications at a young age and abandoning education upon entering the workplace. Learning at any stage in life is the best way to ensure people can make the most of the changes underway, instead of being made obsolete by them.

Fortunately, we are at a point where we can manage the potential impacts of the 4IR. We can learn from previous industrial transformation and adapt to the present and future challenge.

4.4 DEMOGRAPHIC CHANGE

An additional complication is that the UK population is ageing, and life expectancy is increasing. By 2039 30% of the population will be over 60, up from 23% in 2014 (Figure 11),[81] bringing with it a number of challenges.

Figure 11: Predicted Population Distribution of the UK by 2039



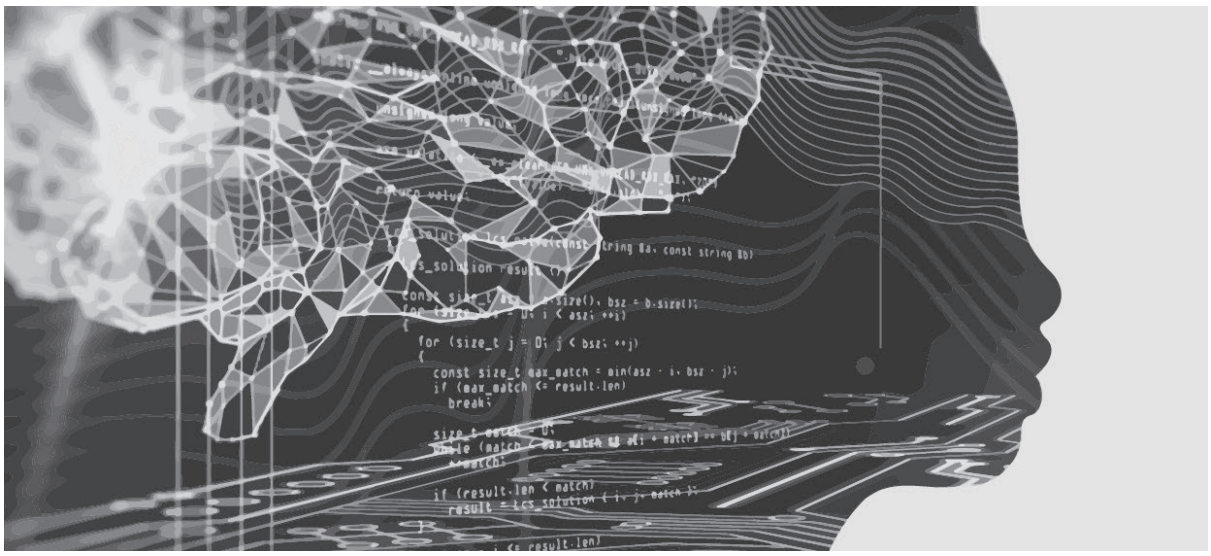
Source: ONS, 2018

Longer life expectancies lead to longer working lives. Indeed, the Government's Actuaries Department has suggested that people under 30 years old will have to work until 70 before they can claim a state pension.[82] To ensure people are able to work this length of time, we will also need an education system that allows people to update their skills or change careers at a later date.

Another consequence of an ageing population is that there will be increased pressure on public finances. The Office for Budget Responsibility predicts that demographic trends will increase public spending but fail to

provide increased tax revenues.[83] They expect health spending to rise, from 6.2% of GDP to 8%, and State pension costs to increase from 5.1% of GDP to 7.3% within the next half a century. The result is that there will be even less money available for the new tertiary education system that we so desperately need, unless a new model that supports government spending with employer and employee contributions can be found.

This demographic change, coupled with the technological advances highlighted in the previous section, will therefore create significant social and economic disruption. There needs to be some urgency and fresh impetus to address these challenges before they are realised. The answer, as we outline in the next section, is a system of through life learning, properly and radically funded.



5. THE WAY FORWARD

Meeting the challenges of the 21st century economy will require a restructuring of the UK skills system to raise the importance of vocational and technical education, and to allow the working population to acquire through-life skills, to continuously reskill at scale.

To remain competitive and productive we will need to prepare for the disruptive effects of a rapidly changing economy. Funding is clearly a major factor in charting a new way forward. However, a successful transformation will not be achieved by providing a funding solution for one part of the system, students loans, without consideration of where the future of higher education fits into the wider post-18 skills offer. The solutions will need to take in whole-system changes.

5.1 REBALANCING THE SYSTEM

The present system of student loans is unsustainable. But so too is universal free tuition, for the same volume of university students currently accessing Higher Education. Especially in the face of competing funding pressures. As part of its Industrial Strategy, the UK needs to figure out how many graduates it really needs, and in what subjects. Science, Technology, Engineering and Maths will continue to be a priority and there is an argument for incentivising the take up of these subjects with grant funding for fees and maintenance. At the same time, we will need to consider a reduction in the overall proportion of school leavers attending university.

This is not just a numbers game. The new economy will present a fundamental challenge to higher learning institutions, traditional degrees, and qualifications. This includes what people learn, how they learn, where they learn, and when they learn. The future of learning will require new ways of teaching and studying, incorporating the advantages of technology to create new platforms and applications for remote learning.

This will in turn provide a more cost-effective means of studying and provide better value for money. University students are currently paying up to £30,000 in fees for a three-year course which could provide as little as eight contact hours per week. Our present system has created a qualification arms race, where graduates now need a post-graduate degree to gain a competitive advantage in the labour market.

Universities and skilled graduates are undoubtedly important to a knowledge-based economy, but we will need to separate the functions of Research and Development from skills acquisition and fund them appropriately. Flooding universities with fee paying students to subsidise research activity is not the solution.

Rebalancing the UK's education and skills system will require proper consideration of vocational and technical needs and where this situates alongside academic courses. New models will need to be innovated, to forge new vocational and academic pathways, and to help more people participate in lifelong learning, particularly those from lower socio-economic groups.

Bespoke industry models, such as **Ecole 42**, **Flat Iron** and **Pursuit**, could be adapted and scaled up to align with local industrial strategies and fast-track largely lower-skilled populations into higher paid employment in the new economy.

To help pay for this, the government should implement a National Employment Contribution system, topped up by a tech-levy, discussed below, and reconfigure the Apprenticeship system into a wider 'skills levy', as suggested by the CIPD and the Taylor Review. In addition, the government should consider redirecting more funding to FE colleges, which are well placed to support lifelong learning efforts among low skilled groups. Business leaders would seem to support some of these ideas with 44% backing more priority to vocational education and lifelong learning.[84]

University subscription models should also be considered as a future role for Higher Education Institutions to support lifelong learning. In the not-so-distant future, one way to 'go to university' could be to periodically dip into higher education over the course of a working life – by paying an annual subscription. This model reimagines universities as a platform for continual learning that provides students with multiple opportunities to develop both soft and hard, theoretical and technical skills, not just between the ages of 18 and 22, but whenever necessary.

Under this model, students would start higher education earlier by taking dual-enrolment or early college courses while still in the school system. Thereafter, they could dip in and out of the curriculum throughout their lives to gain and update their knowledge and skills as needed, potentially paying lower tuition fees up front and then an annual subscription fee during their lifetime, utilising an Individual Learning Account.[85]

5.2 NATIONAL EDUCATION CONTRIBUTIONS

The skills of the future - a unified tertiary education system - will require a new funding model, one that individuals can draw on for education and re-skilling across a lifetime.

This could be financed through a 'National Education Contributions (NECs) system; similar to our current National Insurance Contributions (NICs). This would enable everyone who benefits from a better educated population to contribute towards it, that is, individual learners, industry, and government.

- This could be funded through auto-enrolment in a system akin to NICs and workplace pensions, with government, employees and employers paying into a pot from which anyone who needs skills training can draw from
- This would be a self-financing system that is ring-fenced from the Government's national accounts, by using a Special Vehicle to collect NECs from employees, employers, and the government
- This funding pot could then be drawn on equally by all citizens, like a state pension, at any point in their life, accessed through an online 'Adult Skills Account'. This would create a single learner-led lifetime tertiary education allowance for any approved education or reskilling courses, giving all adults the opportunity to study full or part-time, whenever they need it in their careers
- Any unspent balances could then be transferred to the pensions pot or to fund other priorities such as social care.

This system, in effect, utilises the logic behind the current apprenticeship levy and extends it beyond just apprenticeships so that everyone in society has the ability to gain an education and retrain later in life. Another key distinction is that we offer individuals the power and choice to train or reskill, to replace the regressive and unequal tertiary education system that exists at present.

We suggest a system in line with NICs, as opposed to a workplace pensions model. Unlike the pension system were individuals can choose the amount they wish to contribute a NIC style auto-enrolment for skills would apply a set contribution as a proportion of income earned. Also, with a national insurance style system, government contributions are clearer than tax relief offered in a pension system.

We accept that there may be some pushback to the idea that everyone must pay once they start work, given that different people may have different re-skilling needs and would therefore draw different amounts from the system. Indeed, some people may contribute and never use the account if they are in the position to not need any further skilling or retraining. However, we believe that we need to rethink how we view education, given the uncertainties of the Fourth Industrial Revolution (4IR). Just as we insure ourselves against ill health, with payments into a government pot for healthcare that we may never use; or pay into a welfare benefits system we may never draw on unless we fall on hard times – education must be seen in the same way. A NIC style contribution for education is necessary to protect and insure us against a future where AI may make our skills obsolete, and we will need retraining.

Research indicates that an employer/employee/state contribution system may be a popular policy idea. A survey by Pew Research highlights that 54% of people understand that 'it will be essential to develop new skills throughout their working lives', and that they are increasingly willing to contribute towards it. Illustrating this, a study by Manpower found that 93% of millennials were willing to spend more of their own money on further education and training.[86] Equally, although the Treasury may not like the idea of a NIC hypothecated tax system, it could prove popular with people because they like to know exactly what their money is going towards. Meanwhile employers are already making direct contributions (over and above wage premium contributions) to skills training, through the apprenticeship levy. The only problem being that this structure has been too narrow

and needs to be expanded beyond just apprenticeships so that employers can contribute to a wider tertiary education system that they benefit from.

5.3 AN 'ADULT SKILLS ACCOUNT'

To distribute the education contributions equally, this system would learn from, and go beyond, previous experiments with individual learning accounts (ILAs). Learning accounts provide a good, equitable model for how citizens can draw on a central fund, but proponents have struggled to articulate how they would be properly financed. They operate within and alongside the current system, relying on, for example, small loans from a central pot.

We provide an alternative funding model, which operates within the new paradigm of an automated future. ILAs (by any other name) are not new. They have been proposed and tested on many occasions. A program of 'Individual Learning Accounts' was introduced by the Labour Government in 1997, However, the implementation of this policy was flawed and suffered widespread fraud, money was being claimed by individuals who were never actually taught or even registered,[87] leading to a loss of £97m.[88] The idea was abandoned in 2001, ending the prospects for lifelong learning for a generation of policymakers.

But in the last few years, ILAs have again gained policy traction. Especially after a parliamentary inquiry found that the fraud was small scale, involving only a number of private companies, and that the failures were largely a result of being poorly designed and hastily implemented, rather than a fundamentally flawed concept.[89] In fact, the committee found the ILA program to be an overly bureaucratic, low-value voucher system.[90]

As a result, several advocates have recently proposed bringing back ILA's in various forms:

- Baroness Wolf, a long-term advocate of ILAs, has proposed a system of 'Personal Learning Accounts' to distribute a lifelong entitlement. These would simply build on the current system. Wolf states that 'because of the student loan system, we can simply adjust and build on an institution that already deals with over 3 million individual accounts: accounts which are in the name of, and responsibility of, the individual student, not of an enrolment-hungry 'provider'.'[91]

- The Learning and Work Institute, built on recommendations from the think tank Bright Blue, and provides a similar offer. They call for a 'Lifetime Loan Account' to give more flexible funding allocation across people lives. This would simply extend loan support to modules of learning as well as full qualifications, rebadged as 'Help to Learn' support.[92]

- Minouche Shafik, Director of the LSE, wants to give all 18-year olds a loan entitlement for life-long learning, which could be used across a lifetime for university or vocational training. The entitlement would be offered at the government's cost of borrowing 'as an investment in human capital that increases future tax revenues'.[93]

  However, policymakers have tended to think about ILAs, and how they are funded, within the current system. Our NEC proposal provides a radical alternative that allows everyone who benefits from the ability to reskill in an automated future (employers, employees and government), the ability to pay into a unified tertiary

education system. It will take the positive elements of ILA's to distribute the central pot of national education contributions to each citizen equally, through an 'Adult Skills Account'.

An 'Adult Skills Account' would create a single online account, which details the total amount that an employee, employer, and the government are contributing through NECs. It would also provide a statement of accreditation which could be stacked in order to gain full qualifications. The online account would also include a high-quality advice portal that allows workers to access information about prospective courses. As both experience with ILA's and the NHS' personal health budgets have shown, access to proper advice, guidance and information is essential for individuals to make the decisions that are in their best interest.[94] This 'Adult Skills Account' would learn from the failures of the ILAs in England 1997-2001 in a number of ways:

- When the ILA system was first designed there was no prior infrastructure in place. In an overly hasty attempt to attract new providers to the market, the government maintained very little control over educational skills providers, including checks on the quality of provision. In order to ensure that NEC's are spent appropriately, the 'Adult Skills Account' will only grant access to funds for courses and providers that have been approved by the government and sectoral institutions. This would ensure that account funding is spent only on high-quality training, benefiting employees, employers and the state.

- The original ILA's had a pilot scheme which identified challenges, but instead of rectifying these, a new model was developed and launched untested. To make sure that NECs and 'Adult Skills Accounts' deliver good value for money, it should be piloted in a city region, to iron out any problems, before being introduced nationally.

- ILA's failed to make sure that individuals co-invested in their own training, along with the state and employers. Our 'Adult Skills Account' gives individuals the power to invest in and choose their own training for the future.

- The government should consider piloting Adult Skills Accounts along the lines of those developed in France and Singapore. These would provide an annual credit of a few hundred pounds for workers to spend on any training course provided by accredited institutions.

CASE STUDY: SINGAPORE[95]

Singapore's SkillsFuture Credit is a universal benefit that provides every citizen aged 25 years or over who has completed full-time education with a financial contribution to lifelong learning. The credits do not expire and can be topped up to pay for work related course fees. They can be used in addition to existing government-provided course fee subsidies.

Learners are able to invest in modular provision that allows them to continuously build on and develop their skills. As part of a continuing education system Singapore has also developed a workforce skills qualification (WSQ) framework for up to 30 different industries. This is designed specifically for adult learners to support progression from entry level to graduate diploma. The content of the WSQ is shaped by employers, with oversight and quality assurance provided by the Singapore Workforce Development Agency.

5.4 A TECH LEVY AND DATA SOVEREIGNTY

To bolster the NEC model for lifelong learning, and to provide a windfall for a new skills system, this paper proposes a new levy on established Tech firms alongside legislation to introduce and protect 'data sovereignty'. The idea is for those businesses that benefit most from technological developments, and particularly the use of personal data, to contribute more to helping individuals adapt their skills for the future of work.

A TECH LEVY

Education has traditionally been the route to higher wages and social mobility. But this is now less certain. Further, asset inequality is outstripping income inequality with fewer graduates not only struggling to advance their careers but also unable to find a foot-up on the property ladder. Given the direction that the future economy is headed in, workers must be offered a stake in society by other means.

Tech firms (which will benefit disproportionately from an educated workforce) must start contributing more to help these pathways, where the money generated through the use of personal and public data could help pay into a funding pot for education and skills. The notion of a tech levy or tech 'tax' has been suggested to ameliorate a whole range of social and economic problems in the UK, for example, to:

- Subsidise mental help provision and combat the negative effects of social media
- Fund an independent watch dog to tackle fake news and protect journalism standards
- Protect the high streets from on-line markets
- Provide for a Universal Basic Income.

In the 2018 budget the Government announced a new Digital Services Tax on sales generated in the UK. This is due to be implemented from April 2020. But while this is a welcome step in the right direction, it is clear that all Governments and society as a whole are struggling to catch up and deal with the growing influence and potential threats of the data driven, digital economy. Attempts to take action and regulate are piecemeal and isolated.

Meanwhile the exploitation of big data, the raw material of the new economy, continues at pace, as personal information has become increasingly commodified and traded. By 2020 people and connected objects will generate 40 trillion gigabytes of data that will have an impact on every aspect of daily life. The sale and resale of 'third party data' has already become a mainstay of the digital economy. In Europe the value of our digital identities, the sum of all the digitally available information about us will be worth €1 trillion. And this is predicted to generate an additional value-add of $1.9 trillion globally over the next five years.[96] Personal data is already being over exploited by established players – so called tech giants – and this is further concentrating wealth and power in the hands of the few.

New models for valuing data uses are needed and Government must exert greater control and influence through the introduction of taxes on use of data assets so that the considerable profit extracted from UK residents' data, can be reclaimed for public benefit. The creation of a central pot would allow for some kind of distribution, so it can be invested in lifelong learning and other related priorities.

Clearly this agenda must be taken up by the OECD nations, the EU and other big trading blocs to prevent the flight of tech industries, who will argue that such an approach will impact on their businesses, leading to less investments in R&D and innovation. But overall this could have positive externalities that ultimately make the policy worthwhile. The future will see tech firms' profits surge. Paying a fair price for the data that allows them to be so successful, must be encouraged. [97]

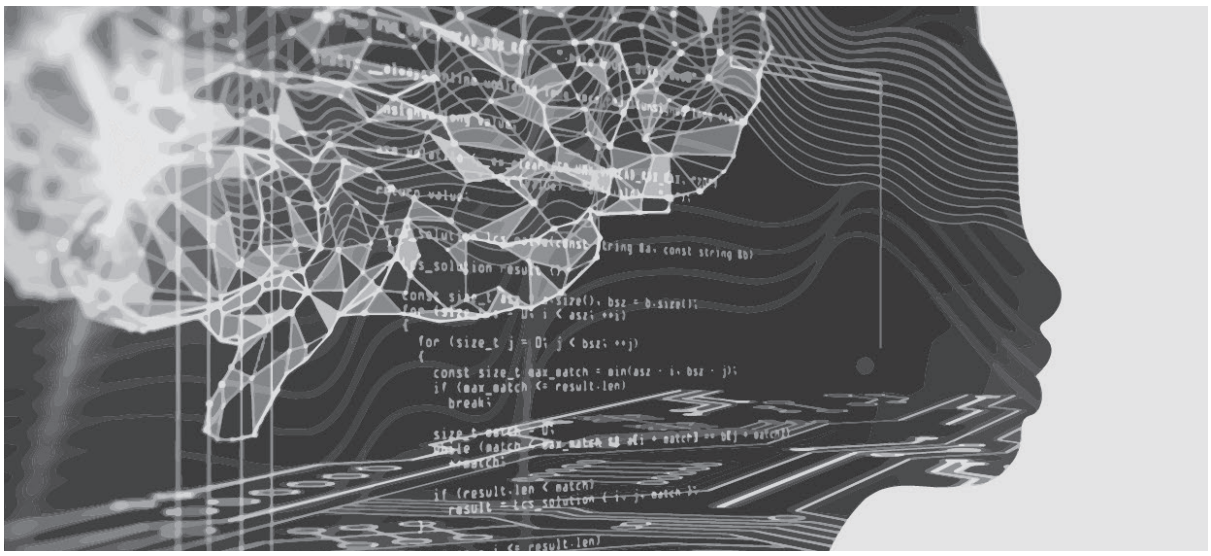
DATA SOVEREIGNTY

Retaining more ownership of personal and public data including the options to share and monetarise it will be increasingly important to enabling a fair stake in the new economy, and in achieving a tech levy to subsidise education and skills.

The removal of personally identifiable information such as names, date of birth, and addresses, do little to cover our tracks. A growing awareness that companies are benefitting disproportionately from the collection and sale of personal information, is driving the desire for greater individual control of personal data. This may be achieved by a number of means, including web-based solutions. However, it may be necessary to legislate so that individuals retain full ownership of their own data which they are able to trade in return for benefits.

Recognising that all of the data extracted within a country is the common property of everyone who lives in that country, one solution could be to 'democratise' our data reserves to create a national or 'sovereign fund' for investment in education and skills. Another related policy solution could be to democratise the ownership of 'machines' giving workers a share in the ownership of the technology that creates wealth, or a profit-share.

A publicly owned sovereign wealth fund could be set up to invest in company assets and emerging technologies, and channel dividends to every citizen in the form of a 'technological inheritance' including education and skills.



6. RECOMMENDATIONS

There is a compelling case for increasing economic growth, productivity and living standards by investing in an efficient and equitable skills system. This report recommends an alternative approach that moves us away from the disagreements about student loans and how university education can be funded, towards a unified tertiary education system that can meet the needs of the fourth industrial revolution.

1. **Rebalance the UK's tertiary education system.** To provide a more cost-effective means of studying and to provide better value for money, for learners, business, and Government. This will allow:
   - A supply of vocational, technical and academic skills to meet the future needs of the UK's industrial strategy
   - Continuous, life-long, learning provision for all working age people
   - New ways of teaching and studying, incorporating the advantages of technology to create new platforms and applications for remote learning, and
   - New sector specific institutions for the delivery of specialised and bespoke training that can offer shorter, faster, more direct route for upskilling populations (such as Ecole 42 in Paris, Flat Iron in London, and Pursuit in New York).

2. **Restructure skills funding with a National Education Contributions (NECs) scheme**. We recommend a system akin to National Insurance Contributions (NICs), that would:
   - Reform the whole funding system for tertiary education including the abolition of the current student loan system
   - Separate the functions of Research & Development from skills acquisition and fund them appropriately
   - Auto-enrol all workers to allow employees, employers and the government to pay into a central pot that could be drawn on by individuals, to fund skills training, at any stage in their lives
   - Provide a self-financing system that is ring-fenced from the Government's national accounts, by using a Special Purpose Vehicle to collect NECs from employees, employers, and the government.

3. **Create 'Adult Skills Accounts'**. To distribute the proceeds of national education contributions, this system would learn from previous experiments in the UK and internationally, to provide individual skills accounts that could be drawn on equally by all citizens and at any point during their working life.

4. **Introduce a 'Tech Levy' and protect 'Data Sovereignty'**. To bolster the NEC model for lifelong learning, this paper proposes a new levy on established tech firms, alongside legislation to introduce and protect 'data sovereignty'.

5. **Re-imagine universities as a platform for continual learning**. University subscription models should also be considered as a future role for Higher Education Institutions to support lifelong learning. This would provide students with multiple opportunities, not just between the ages of 18 and 22, but whenever necessary. To dip in and out of the curriculum throughout their lives to gain and update their knowledge and skills as needed, potentially paying lower tuition fees up front and then an annual subscription fee during their lifetime, utilising an Adult Skills Account.

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The UK has some of the highest levels of wealth concentration in the developed world. It has an economy where most mature markets are dominated by a small number of players and the barriers to entry are far too high. It is not an exaggeration to suggest that in many areas, from energy to banking to groceries, the UK has a monopolistic rentier rather than a market economy – a system in which certain individuals or small groups gain market dominance and excessive returns through anti-competitive practices. This conspires against innovation and is detrimental to the small and emergent businesses that generate growth and spread prosperity. Added to this, our education system, by specialising too early and often in the wrong areas, fails to produce students with fully rounded skill-sets. We are simply not equipping our future workforce with the means to safeguard our, and their, economic future. This is one reason why the real value of wages in proportion to growth in GDP continues to stagnate or fall. Our long-term productivity dilemma is a function of market capture and the effective de-skilling of the population.

We believe that shared prosperity cannot be achieved by simply tweaking the market. Britain needs significant demand and supply-side transformation, with new visionary institutions re-ordering our economy. We need long-term solutions that give power over wealth and assets, not simply handouts, to ordinary people. Central to this process of economic empowerment is an ethical, practical and adaptable education that gives people the skills to build their own businesses, or develop their own talents, rather than a conveyor belt to a service industry of low wage and less return.

New financial institutions to promote small business lending are required, and this involves smaller, more specialised and decentralised banks that can deliver advice as well as capital. We wish to explore ways in which all financial transactions can be linked to a wider social purpose and profit, which itself needs a transformation of the legal framework within which economic transactions take place. We believe that the future lies in the shaping of a genuinely social market which would be in consequence a genuinely free and open market. Internalising externalities and creating a level economic playing field in terms of tax paid and monopolies recognised and challenged, remains beyond the scope of contemporary governments to deliver. Such a vision requires new concepts. The viable transformative solutions lie beyond the purview of the current visions of both left and right in the UK.

Prosperity *Prosperity* *Prosperity*

A key issue for the UK's economy is how we meet the challenge of the Fourth Industrial Revolution and the future of work. Central to this challenge is the question of skills, an essential driver of productivity and growth.

Education and skills are the number one priority for employers that are struggling to find the right people with the right skills and who are increasingly concerned that they will not be able to fill positions in the future.

Yet more than half of all school leavers now go to university. More than ever before. While those who don't are ill-served by an underfunded, second best, post-18 education offer. This suggests that our skills system is not fit for present purpose, or indeed the solution to the challenges of the future.

This report sets out a range of measures, to future proof skills and transform our education, training and skills system to address Britain's productivity crisis. Skills for jobs that don't yet exist, argues that funding and competing resources is a major consideration, but the solutions will need to take in whole-system changes to rebalance UK skills and prepare for the disruptive effects of automation.

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