

Can cities outsmart the robots?

The future of skills in UK cities

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00.

Executive summary

Technology is transforming the world of work. As debates on the ‘rise of the robots’ continue at the national level, our research has shown that some cities will be more vulnerable to automation and artificial intelligence than others.¹

Without concerted action, socio-economic divides across the country are likely to widen. It is critical that we understand what these changes mean, and that the skills system adapts accordingly to ensure every city is equipped to respond to these changes.

Key findings

Analytical and interpersonal skills are becoming increasingly important in all UK cities. In recent years, technological change has meant that interpersonal and analytical skills, such as negotiation, coordination and critical thinking – skills that complement machines – have become more important, whereas physical skills have decreased in demand.

These changes are explained by two main factors: the changing composition of the labour market and changes in the skills sets required within existing occupations. Employment in the UK has continued to polarise with a decline in routine manual occupations and a stronger bias towards high-skilled occupations. This has resulted in a significant increase in the demand for analytical and interpersonal skills. The importance of analytical and interpersonal skills is also increasing within existing occupations. Tasks requiring analytical and interpersonal skills are less easily replicated by machines compared to those requiring physical skills, meaning that they are likely to be increasingly important in the future.

However, variation in attainment and participation suggests that some cities, particularly in the North and Midlands, are less well equipped to adapt to these changes. Educational attainment, participation in extra-curricular activities and work experience all help to prepare young people for the future world of work. Lifelong learning, meanwhile, can help adults adapt and

1 Centre for Cities (2018) Cities Outlook 2018, London: Centre for Cities

progress in response to these changes. Yet there are huge disparities between places at all education stages. In general, there are lower levels of attainment and participation in activities that support the development of these skills in cities outside the Greater South East – with the system failing to endow individuals with the skills they need.

Recommendations

While a broader set of economic development interventions are needed to support economic growth and to increase demand for analytical and interpersonal skills, urgent action is needed to ensure individuals have access to opportunities to develop these skills at every stage of their lives.

Given the scale of the challenge, this will require a concerted effort and action on several fronts to improve take-up and quality of provision at every stage. In particular:

- 1. Cities should establish Skills Compacts to promote collective responsibility and action for improving education and training.** City leaders and metro mayors should bring local stakeholders together – including schools, FE colleges, training providers, universities, businesses and the third sector – to commit to increasing learning and improving outcomes in their city. The Compact should aim to ensure better coordination among organisations, share knowledge and best practice, and raise awareness of existing initiatives to improve the quality of opportunities and access to them. To measure progress, partners should set measurable targets that reflect the goals set by the Compact.
- 2. The Department for Education and the devolved administrations must match local efforts with increased flexibility for cities to experiment and tailor provision.** Different places face different challenges related to education and what works in one place might not work in another. The Department for Education (DfE) should acknowledge these differences and work more closely with the Compact's stakeholders to increase flexibility in provision, pilot new initiatives and allocate resources in a way that is reflective of local needs.
- 3. The Department for Education should lead on creating a common framework to define interpersonal and analytical skills.** The language and definitions used to describe these skills often varies, with references to 'employability', 'soft', 'vital' and 'transferrable' skills, among others. This results in a lack of clear understanding of what skills individuals need to succeed in the labour market. DfE should work with employers and skills experts to establish a clear definition of the interpersonal and analytical skills that are needed for current and future jobs, and review how they can be embedded in each educational stage. This would help ensure these skills are better valued, improve learning opportunities, and support the identification of good practice.

4. The Government should take a cross-departmental approach to raising investment and participation in lifelong learning, supported by a new What Works Centre for Adult Education.

As the nature of jobs continues to evolve and people work for longer, it is crucial to ensure that individuals that have already left compulsory education can up-skill and retrain. Government departments need to work together to raise awareness of opportunities and remove barriers to them, including financial ones. To be effective it is essential that this builds on lessons from the past and is supported by evidence on what works.

01.

Introduction

History shows that major changes in the economy, resulting from the introduction of new technologies and the evolution of global supply chains, for example, play out differently across the country. Cities Outlook 2018² highlighted that some cities are more vulnerable in the face of these changes, whereas others are better placed to attract high-skilled jobs. The ability of cities to adapt to change is reflected in their economic performance: while the employment rate is at its highest level nationally, there is significant variation across cities.

Most of the public debate on the future of work has focused on the impact of automation and globalisation on jobs: which roles are likely to be lost and which ones might be created. Less emphasis has been put on the skills required for the jobs of the future. These skills have a fundamental impact on the ability of individuals – and cities – to adapt in the changing economy.

In recent years, the Government has introduced a number of reforms in the education sector, spanning from early years, through to schools and GCSE reform, T-levels, apprenticeships and Further Education. Similarly, skills are a key priority for the metro mayors and for Combined Authorities and Local Enterprise Partnerships (LEPs) in the development of their local industrial strategies. The Department for Education has promised to devolve the Adult Education Budget to Combined Authorities, Skills Advisory Panels are being set up across the country and area-based reviews for Further Education have been carried out.

Given the number of reforms underway at the moment, it is crucial to ensure they reflect the skills changes taking place in the labour market. As people become less and less likely to stay in the same job for their entire careers, this means ensuring training is as relevant for current roles as for future ones, endowing individuals with transferable skills.

Yet to date there has been limited research on how skills demand and supply is changing across the country. This report aims to fill this gap. It looks at the types of skills that are going to be needed in the future labour market, how cities are responding, and what more they need to do to ensure individuals have the skills to succeed. It first sets out how demand for skills is changing in cities. It secondly

2 Centre for Cities (2018) Cities Outlook 2018, London: Centre for Cities

explores the factors behind these changes. Thirdly, it explores the extent to which the supply of skills in different cities reflects these changes and the implications for national and local policy-makers.

Box 1: Mapping changing demand for skills

Data from the labour market analytics company, Emsi, was used to build a detailed picture of change in city labour markets between 2006 and 2016.

Changing demand for skills is measured using skills data from the O*NET database from the United States. O*NET is a comprehensive system for collecting and disseminating information on occupational and worker requirements and includes data on the importance of 35 different skills for almost 1,000 occupations covering the entire US economy.

Data from the O*NET is then mapped on to UK city labour markets in several steps:

- O*NET data is converted between the US Standard Occupational Classification (SOC) system and UK SOC at the 4-digit level.
- Detailed occupational data (4-digit level) was constructed by combining job data within industries from the Business Register for Employment Survey with occupational data from the Annual Population Survey using a staffing pattern constructed using the Labour Force Survey.
- A vector for each of the 35 skills was created by aggregating the value of the skills importance of that skill in each occupation, weighted by the relative share of that occupation in the city labour market (following the methodology used by Dickerson and Morris).³ This provided an overall measure of the demand for each skill in each city.

Due to changes in the way skills were measured in O*NET over the time period for the analysis, adjustments were made to the 2006 version of the survey to ensure it was comparable to the 2016 version. While skills measures for all occupations in the 2016 survey were provided by job analysts, some were provided by people doing particular jobs (job incumbents) in the 2006 survey. The ‘incumbent-effect’ was then calculated and subtracted from the skills measure to produce consistent measures across the time period.

For the purpose of this research, the 35 skills were then aggregated into three indices: analytical (or cognitive), interpersonal and physical (or manual) skills. See Appendix 1 for a complete list of skills for each index.

³ Dickerson A. and Morris D. (2017) “The changing demand for skills in the UK” Department for Economics and CVER University of Sheffield.

02.

How is demand for skills changing in cities?

Demand for skills varies across the country

In 2016, interpersonal and analytical skills were in greater demand than physical skills in every city in Britain. Within these broad groups, some of the most important interpersonal skills are active listening, speaking and social perceptiveness, while the most important analytical skills include critical thinking, reading comprehension and monitoring. These skills play a significant role in almost every occupation and were the most in demand in every city. In contrast, installation, repairing and other physical skills were among those least in demand in 2016.

However, the magnitude of the demand for the different skills groups varies across the country. Demand for analytical skills in 2016 tended to be higher in cities in the Greater South East, including Cambridge, Oxford and Reading; whereas physical skills were in higher demand in cities in the North and Midlands, such as Derby, Mansfield and Middlesbrough (see Figure 1).

These differences reflect broader variations between these urban labour markets and the types of occupations most prevalent. For example, physical skills are more important in manufacturing and trade occupations, such as plant and machine operatives and metal workers. These occupations are in higher demand in some cities, particularly those in the North and Midlands.

Demand for interpersonal skills is more evenly spread out across the country but is particularly high in cities such as Cambridge, Edinburgh, London and Oxford. This can be explained by the significance of higher education and other knowledge-intensive service sectors in these cities and the importance that social skills play in these jobs.

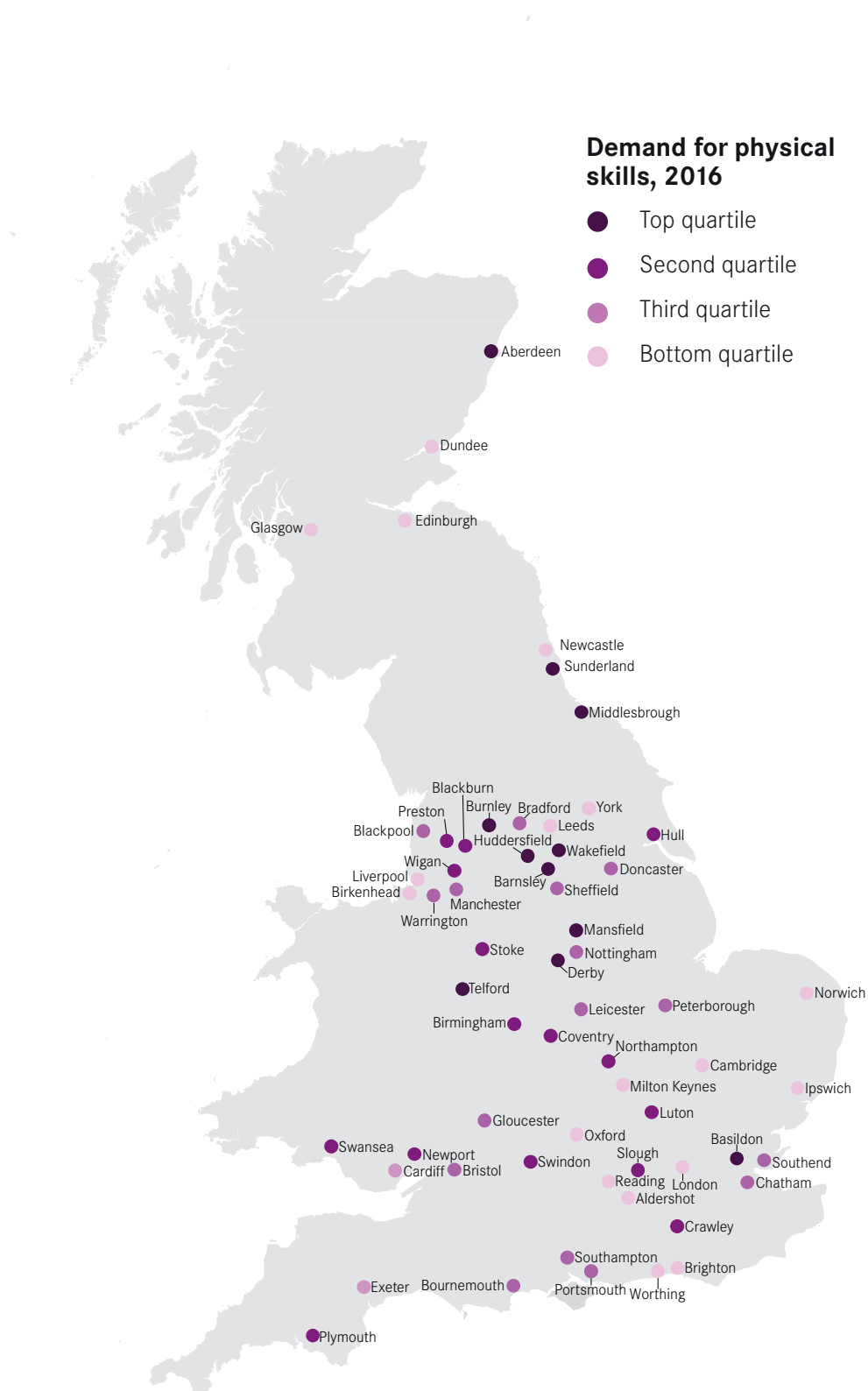
Figure 1: Demand for analytical, interpersonal and physical skills in Great Britain's cities, 2016



Source: Emsi, 2018



Source: Emsi, 2018



Source: Emsi, 2018

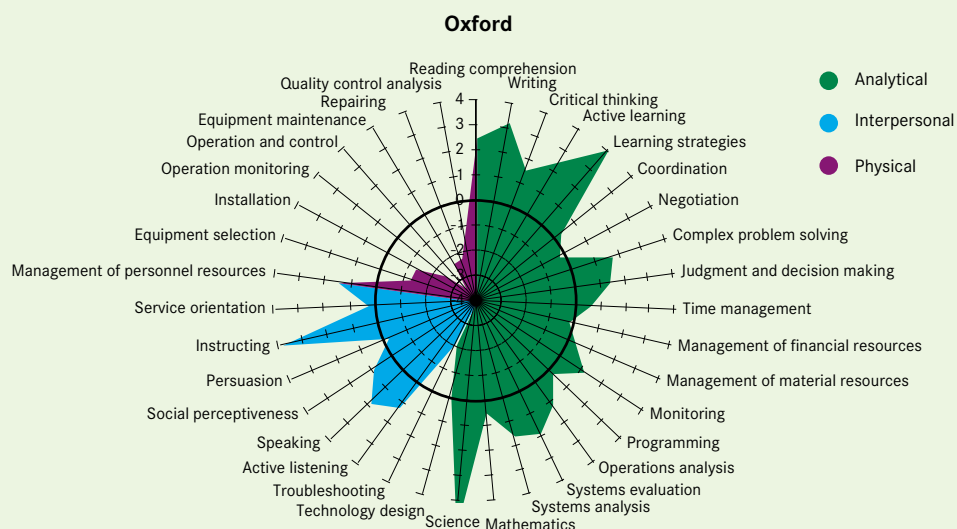
Box 2: Demand for skills in Oxford and Stoke

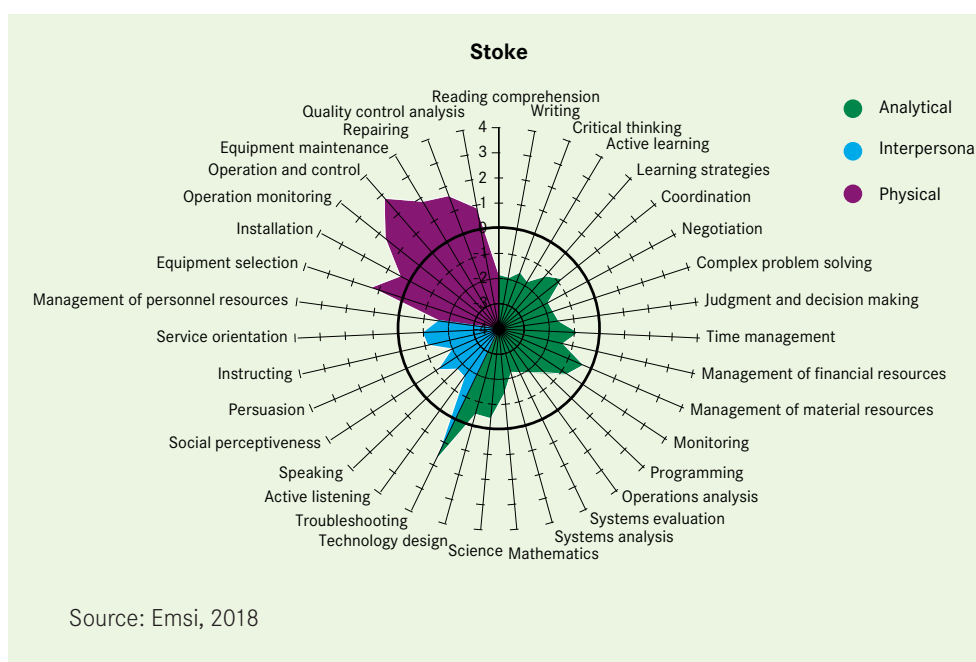
Oxford and Stoke have very different labour markets and these differences are reflected in the demand for skills (see Figure 2).

Among UK cities, demand for interpersonal and analytical skills is highest in Oxford. This in part reflects the importance of the education sector in the city. Higher education and further education professionals are among the top five most popular occupations in Oxford, relying heavily on interpersonal and analytical skills. On the other hand, Oxford has the lowest demand for physical skills, reflecting the relatively small proportion of routine, manual jobs in the city.

In contrast, demand for physical skills is higher in Stoke, where skilled trade occupations and process, plant and machines occupations – relying heavily on physical skills – are more prevalent than the urban average. In contrast, occupations requiring interpersonal and analytical skills, such as professional and managerial occupations, make up a smaller share of jobs in Stoke, and this is reflected in the lower demand for these skills in the city.

Figure 2: Difference in demand for skills in Oxford and Stoke compared to the urban average, 2016



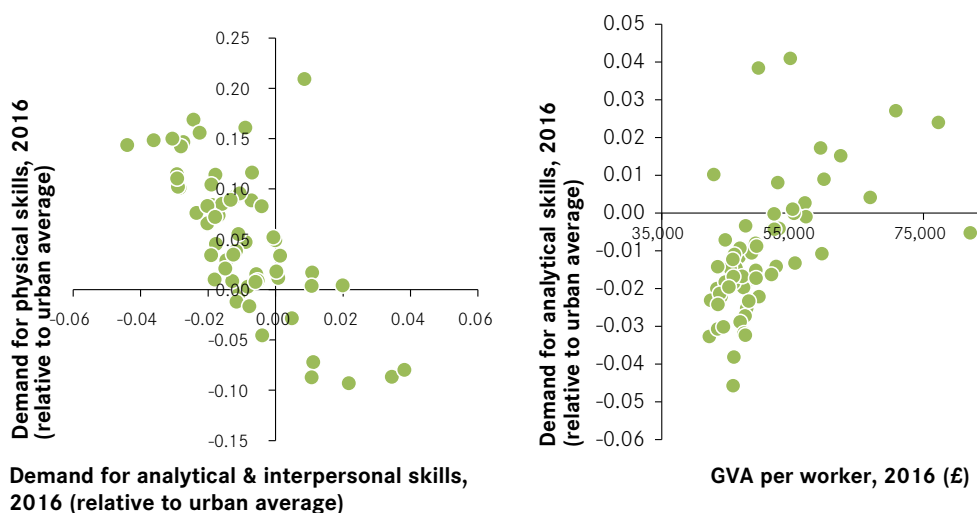


Differences in demand for skills across the country reflect differences in economic performance

Cities with higher demand for analytical and interpersonal skills tend to have a lower demand for physical skills (see Figure 3, left). Oxford, Cambridge and London are among the cities with the highest demand for analytical and interpersonal skills and have the lowest demand for physical skills. Conversely, demand for physical skills is higher in Wakefield, Mansfield and Sunderland while demand for analytical and interpersonal skills is lower. Aberdeen stands out with higher than average demand for all three skills groups, which may relate to the specific skills requirements of the oil and gas industry.

More significantly, cities with higher demand for analytical skills tend to be more productive (see Figure 3, right). For example, London and Reading are among the cities with the highest demand for analytical skills and are also among the most productive cities in the UK. In contrast, in Wakefield and Barnsley demand for analytical skills is low and so is productivity. This is because analytical skills tend to play a big part in many knowledge-intensive services jobs, and these jobs tend to be more productive, as the next section will illustrate.

Figure 3. The relationship between demand for analytical and interpersonal skills and demand for physical skills (left) and GVA per worker (right), 2016



Source : Emsi, 2018 and ONS, Regional Gross Value Added (Income Approach) NUTS3 Tables; NOMIS, Business Register and Employment Survey, 2017 data; NOMIS, Mid-year population estimates, Centre for Cities' calculations

Demand for skills is continuing to shift towards interpersonal and analytical skills

A decade ago, demand for analytical and interpersonal skills was already higher than demand for physical skills and over the last ten years, interpersonal and analytical skills have become even more important relative to physical skills in urban Britain.

Overall, demand for interpersonal skills in cities grew by 52 per cent between 2006 and 2016, and demand for analytical skills grew by 18 per cent. In contrast, overall demand for physical skills in cities declined by 40 per cent over the same period.

There is variation between more specific types of skills, however. All interpersonal skills increased in demand over the 10 years, with demand in persuasion, service orientation and negotiation skills increasing by more than 70 per cent. In contrast, only operation monitoring increased in demand among physical skills. These changes are reflective of the way technology is transforming the world of work. Automation has meant that tasks requiring physical skills are now more easily carried out by machines, but robots cannot easily replicate interpersonal skills.

Growth in analytical skills has been more varied. Analytical skills related to 'technology creation', such as technology design and troubleshooting, have become relatively less important, whereas those related to the use of and interaction with technology, such as programming and complex problem solving, have become more important (see Figure 4). This is likely to reflect the increasingly widespread use of technology in work and the increased importance of skills that complement this.

Figure 4: Growth in demand for skills in cities, 2006-2016 (%)



Source: Emsi, 2018

Box 3: Change in demand for programming skills

Programming was least in demand of the 35 skills in 2006, but has seen one of the largest increases in demand over the decade as part of the shift towards skills needed to interact with and oversee technology.

Jobs in occupations most likely to require programming skills saw a big increase between 2006 and 2016. The number of web designers and IT analysts increased by a third, while the number of programmers increased by almost 40 per cent. These occupations tend to be highly-paid, with average salaries around £40,000 and over.

Demand for these occupations continues to increase. Job postings data from Emsi shows that more than 33,500 software engineering jobs were advertised in cities in the last two years. The majority of these were jobs in cities in the South, with over a third in London (see Figure 5).

Skills demanded in these roles tend to be similar across the country: software engineering and programming language are the most frequently referenced. Demand for sector-specific knowledge in these roles does vary, however, reflecting variation in the sectoral profile of cities. For example, knowledge of the oil and gas industry is among the skills most frequently required of software engineers in Aberdeen. In contrast, more emphasis is put on knowledge of testing and engineering in Coventry.

This serves as a reminder that while analytical and interpersonal skills are increasing in importance across the economy, sector or job-specific knowledge remains important. These variations highlight the need for skills systems that respond to local demand.

Figure 5: Job postings for software engineers, 2016-2018

Top 10 cities for job postings in 2016-18			Bottom 10 cities for job postings in 2016-18		
1.	London	11,815	53.	Doncaster	46
2.	Cambridge	3,288	54.	Wakefield	45
3.	Manchester	1,967	55.	Blackpool	43
4.	Bristol	1,928	55.	Mansfield	43
5.	Edinburgh	1,333	57.	Barnsley	23
6.	Birmingham	1,275	57.	Blackburn	23
7.	Leeds	836	59.	Southend	21
8.	Oxford	755	60.	Birkenhead	16
9.	Southampton	610	61.	Wigan	14
10.	Coventry	548	62.	Burnley	11

Source: Emsi, 2018

These trends play out across all cities. Demand for physical skills declined in importance in every city, while analytical and interpersonal skills grew in importance everywhere.

As might be expected when looking at percentage change, increases in the demand for interpersonal and analytical skills have been largest in cities that started from a low base in 2006. Stoke and Burnley saw the largest growth in interpersonal and analytical skills, but initial scores were relatively low in these cities. In contrast, Oxford and Cambridge have seen below average percentage change in demand for interpersonal and analytical skills, but these skills already played a big role in their economy in 2006. This suggests that places with the lowest demand in 2006 are catching up with other places, confirming the overall shift of the UK economy towards analytical and interpersonal skills.

03.

What drives changes in demand for skills?

Major changes in the economy – technological change, globalisation and demographic change among others – are affecting demand for skills in two ways. Firstly, they have changed the type of jobs people are doing, both in terms of job titles and the tasks they involve. Secondly, they have changed the type of skills required within existing occupations, meaning that for some occupations the job title has stayed the same but the job description has changed.

Changes in the composition of jobs have varied across the country and impacted on demand for skills

One factor that has changed demand for skills is the changing profile of jobs in the UK economy. In a manufacturing-based economy with lots of manual routine jobs in factories, demand for physical skills will be high. As the UK economy becomes increasingly service-orientated with an increase in non-manual, less routine jobs, demand for analytical and interpersonal skills will increase.

These changes in part explain changes in demand for skills in UK cities. **Demand for skills has changed as the share of high-skilled, non-routine jobs has grown in the economy** (see Figure 6). Between 2006 and 2016, the share of jobs in high-skilled, non-routine occupations has increased by 2 percentage points, while there has been a slight increase in the share of low-skilled non-routine occupations. In contrast, growth in more routine occupations, such as process, plant and machines operatives and skilled trade occupations, has declined by two percentage points.

Figure 6: Job composition 2016 and change over time (2006/16)

	Share of total jobs, 2016 (%)	Percentage point change, 2006-16
High-skilled occupations	44.6	2.1
Lower skilled non-routine occupations	30.3	0.1
Lower skilled routine occupations	25.0	-2.2

Source: Emsi, 2018. See Appendix 2 for a detailed definition of the three categories

These trends have been more accentuated in the Greater South East. Professional occupations have seen the biggest growth nationally but this growth has not been evenly spread out. Between 2006 and 2016, professional occupations grew by 59 per cent in Milton Keynes and by more than 30 per cent in Reading and London. As a result, these cities are now among the cities with the highest share of professional occupations and the highest demand for analytical and interpersonal skills.

These trends are expected to continue in the future, meaning that analytical and interpersonal skills will become even more important. The shift towards a service economy will continue, with creative and media related occupations, health, education and local services occupations (such as food and hospitality and sport and fitness occupations) all likely to grow in demand in the future.⁴

Demand for skills is also affected by changes in skills required within occupations

Technological innovation has meant that many routine tasks are now done by machines and that some occupations, particularly those related to manufacturing, are now more orientated to overseeing and interacting with those machines.

These changes serve as an important reminder that changing occupational and sectoral profiles will only provide a partial picture of the way in which demand for skills is changing.

⁴ Bakhshi et al. 2017, Future of Skills: Employment in 2030, London: Nesta and Pearson.

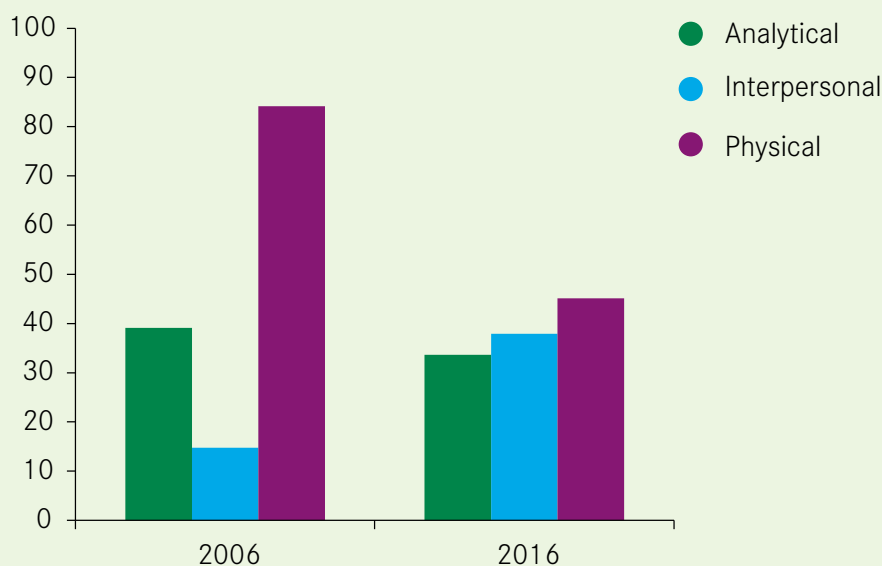
Box 4: The change in skills demanded by assemblers (vehicles and metal goods)

Assembler jobs are among the ones most at risk of displacement.⁵ Overall, the total number of assemblers declined by almost 20 per cent between 2006 and 2016. Yet the nature of the skills required by assemblers has also changed across the decade.

In line with broader shifts, the requirement for assemblers to have interpersonal skills almost doubled between 2006 and 2016, while their need for physical skills declined by 46 per cent (see Figure 7). In particular, persuasion and social perceptiveness – skills that were only marginally important for assemblers in 2006 – have grown the most in importance. While operation monitoring and quality control analysis continue to be the most important skills for assemblers, they have decreased in importance over time by respectively 25 and 35 per cent.

These changes have taken place as the role of assemblers has become less about putting things together, and more focused on maintaining and interacting with machines that are assembling items.

Figure 7: Skills importance for assemblers, 2006 and 2016



Source: Emsi, 2018

5 Bakhshi et al. 2017, Future of Skills: Employment in 2030, London: Nesta and Pearson

In fact, changes in the skills required within occupations are the main drivers of changes in demand for skills overall. Estimates suggest they account for between 80 to 90 per cent of the change in demand for analytical skills and for 90 per cent of the change in demand for interpersonal and physical skills.⁶

This has two important implications for policy-makers. Firstly, jobs that are considered at high risk of disappearing might not in reality disappear; rather, the skills required by these jobs will change. This suggests that jobs might be less vulnerable to automation than one would think and therefore policy should not overly focus on job losses. Secondly, it underlines the importance of analytical and interpersonal skills even in those economies where there are fewer jobs that would typically use these types of skills. Hence, interpersonal and analytical skills should sit at the core of education from the early years through to adult education.

6 Dickerson A. and Morris D. (2017) “The changing demand for skills in the UK” Department for Economics and CVER University of Sheffield.

04.

Does the education system develop interpersonal and analytical skills ?

To ensure people and businesses are able to adapt to the changing economy, it is crucial that people are equipped with analytical and interpersonal skills through education and training.

Yet there is no common framework for interpersonal and analytical skills. The language and definitions used to describe these skills often varies, with references to ‘employability’, ‘soft’, ‘vital’ and ‘transferable’ skills, among others. This results in a lack of clear understanding of what skills individuals need to succeed in the labour market and poses three challenges. Firstly, interpersonal and analytical skills are likely to be undervalued. Secondly, it makes developing these skills harder. And thirdly, it is difficult to measure progress on the development of analytical and interpersonal skills.

With these challenges in mind, this section looks at how the supply of interpersonal and analytical skills varies across cities at different stages, from early years to lifelong learning.⁷ It also sets out a number of recommendations on how policy makers might help improve outcomes at each stage.

Preparing younger generations for the labour market – the early years

The development of analytical and interpersonal skills begins very early in life, and early years education has an impact on the ability to learn and achieve over the longer term.⁸ For this reason, intervention at this point is crucial in ensuring every child can develop the skills needed to fulfill their potential.

Reflecting the importance of early years, the Government has put greater emphasis on this policy area. Early years interventions played a central role in the Government’s social mobility strategy,⁹ and interpersonal and analytical

7 Compulsory education is a devolved matter and data across the four different countries is not comparable. Hence, this section only focuses on England.

8 Government Office for Science (2017) “Future of skills and lifelong learning” <https://www.gov.uk/government/publications/future-of-skills-and-lifelong-learning>

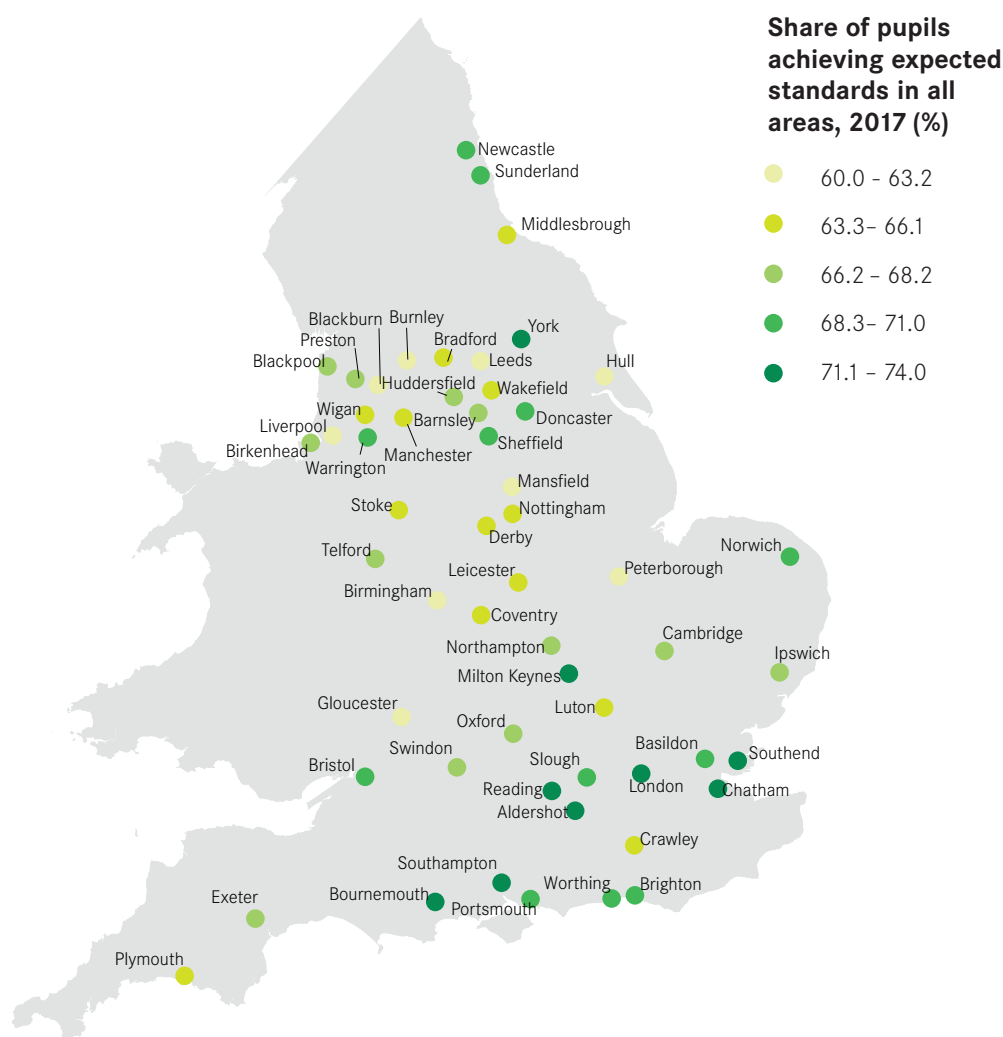
9 Department for Education (2017) “Unlocking talent, fulfilling potential”

skills sit at the core of the new Early Years Foundation Stage (EYFS) framework. The EYFS came into effect in 2017. It outlines standards for learning and development for children from birth to five years old and has a strong emphasis on communication and language, physical development and personal, social and emotional development.¹⁰

However, **achievement in early years varies across the country and is lower in cities in the North and Midlands.** On average, 69 per cent of children in England achieved or exceeded the expected standards in the early years, but there is significant variation between cities (see Figure 8). York has the highest share of children achieving expected standards in all areas. Yet, York is an exception among cities in the North, as the other cities in the top ten are in the Greater South East. Indeed, in cities such as Aldershot, Bournemouth, Milton Keynes and Reading, more than 70 per cent of children achieved expected standards. In contrast, only 60 per cent of children in Peterborough, Hull and Burnley met all of the 17 learning goals.

¹⁰ More information on the framework is available at: <https://www.gov.uk/government/publications/early-years-foundation-stage-framework--2>

Figure 8. Pupils' performance at the Early Years Foundation Stage, 2018



Source: Department for Education 2018, Early years foundation stage profile (EYFSP) results by pupil characteristics: 2017

Past experience suggests that gaps in the early years are likely to persist, if not widen, in school and into adulthood. To prevent this, national and local policy makers should work together to ensure every pupil receives excellent early years education, where children can start developing interpersonal and analytical skills. In particular, cities should focus on two actions:

1. Improve uptake of early years education

Given how important the early years are for outcomes later in life, it is essential that every child receives high-quality early years education. It is vital that the Government raises the quality of early years education through workforce development, and ensures that the current set of entitlements supports equal access to this provision. As part of this, cities can play a role in improving the take-up of early years provision.

The Government currently offers free early years education to all two-year-olds from disadvantaged backgrounds, alongside other entitlements and benefits, yet take-up is patchy and families are not always aware of this support. Local authorities should use the data they hold and the connections they have with organisations involved in the early years to identify children that could benefit from the scheme and drive take-up up of early years provision in their cities. For example, the London Borough of Islington is working with local stakeholders to identify children with special needs in order to provide additional support in the early years (see case study 1).

Case study 1: Islington council - using data to identify the needs of children

To identify children in need of additional support in the early years, the London Borough of Islington established an Early Years and Disability Funding Panel.¹¹

The panel helps to build capacity by using data from education, health and social care services to identify children who have special needs. This, in turn, improves the timeliness and quality of support. The council holds meetings every term with education providers, social care services and other stakeholders and, prior to the meeting, organises the data from different organisations in a single data sheet for discussion. This enables the council to track individual children and families over time.

With the new system, early years providers have been able to build profiles on the children they are working with. This has led to increased utilisation of data across providers, which in turn has improved decision-making, integrated working, and enabled collaboration and coordination of staff working in different professional disciplines, with consequent benefits for children.

2. Work closely with organisations focused on the early years and families to promote and share best practice

Organisations such as the Early Intervention Foundation (EIF) and the Education Endowment Foundation (EEF) have established a growing body of evidence on what works to improve outcomes in the early years.¹² In their research, they found

11 Council for disabled children “Islington: joint working”

12 Education Endowment Foundation, “Early Years Toolkit” available at: <https://educationendowmentfoundation.org.uk/evidence-summaries/early-years-toolkit/>
Early Intervention Foundation, “Early Intervention into action: innovation and evaluation” available at: <http://www.eif.org.uk/early-intervention-into-action/>

that improving communication and language in the early years, as well as self-regulation skills, improve educational attainment later in life. Furthermore, as this research shows, these skills are among the most in demand from employers and will likely become even more important in the future.

Cities should help facilitate the sharing of best practice and testing of new approaches. This work should focus on interventions that have already been found to have a positive impact on the early years, such as family skills interventions and vocabulary learning. While cities are taking an active role in this space (see case study 2, for example), more can be done.

Case study 2: EasyPeasy Bournemouth – finding ways to experiment with new ideas and act as a test bed

To improve children's skills through family learning, Bournemouth Borough Council has been working in partnership with the Sutton Trust and the Esmée Fairbairn Foundation to introduce EasyPeasy, a smartphone app for parents of pre-school aged children.¹³

The app, which sends game ideas to parents combined with information on child development, was first prototyped in 2014 and then piloted in Bournemouth in partnership with the Council. It is designed to encourage positive habits within families both in terms of play and interaction and games were developed in consultation with experts to ensure its efficacy. The app covers all of the EYFS areas of learning and development, sending tailored prompts, encouragement and reminders to parents.

The Bournemouth trial was rigorously evaluated by researchers at the University of Oxford and was found to have a positive effect on families after 18 weeks. Children made progress in terms of social and emotional development. Furthermore, the app had positive effects on parents' engagement and confidence in setting rules and sticking to boundaries. Given its success, the app is now used in a number of other local authorities, including Newham and Camden in London, Doncaster and Coventry.¹⁴

Preparing younger generations for the labour market – schools and colleges

If policy interventions in the early years are tailored to the development of soft skills together with literacy and numeracy, the focus starts to shift towards curriculum and subject/cognitive knowledge development when pupils enter school. Analytical and interpersonal skills are not necessarily skills that can be taught directly but developed through exposure to a rich curriculum, particular ways of teaching and extra-curricular activities.

Good literacy and numeracy skills (as measured through attainment in Maths and English at GCSE level) are intrinsically important to progression in education and are positively correlated with the broader development of analytical and interpersonal skills.

13 University of Oxford (2016) "EasyPeasy parenting app" London: Sutton Trust

14 EasyPeasy <https://easypeasyapp.com/>

The development of analytical and interpersonal skills also occurs outside the classroom. Extra-curricular activities are thought to be a good complement for what happens in the classroom and activities, such as debating or team sports, offer an opportunity to young people to apply skills, such as negotiation and team working, in real life situations.¹⁵ Schools recognise the importance of extra-curricular activities and 97 per cent of them indicated extra-curricular activities as their preferred way to develop soft skills. In particular, these activities included arts clubs (91 per cent), outward bound activities (72 per cent), hobby clubs (71 per cent) and subject learning clubs (60 per cent).¹⁶

For these reasons, GCSE attainment and take-up of extra-curricular activities reveal important insights into the development of analytical and interpersonal skills among children.

Firstly, attainment in Maths and English at GCSE level¹⁷ is lower in northern and midlands cities compared to cities in the Greater South East. In 2017, over 70 per cent of pupils in Cambridge, Reading and Aldershot achieved 9-4 grades in Maths and English against a national average of 64.2 per cent. These cities also had a higher share of pupils achieving a ‘strong pass’ (9-5 grades) compared to the national average of 42.9 per cent. In contrast, Hull, Stoke and Blackpool had among the lowest share of pupils achieving 9-4 pass, and only one in three achieving a ‘strong pass’ in Maths and English (see Figure 9).

Figure 9: GCSEs 9-4 achievements in Maths and English across English cities, 2016 (%)

Top 10 cities for Maths and English GCSEs results			Bottom 10 cities for Maths and English GCSEs results		
1.	Cambridge	73.3	46.	Bradford	57.2
2.	Reading	71.1	47.	Stoke	57.1
3.	Aldershot	71.0	48.	Luton	57.0
4.	Warrington	69.2	49.	Mansfield	56.8
5.	York	68.9	50.	Plymouth	56.7
6.	London	68.9	51.	Blackpool	56.2
7.	Bournemouth	68.7	52.	Crawley	56.0
8.	Preston	67.4	53.	Liverpool	55.7
9.	Slough	66.6	54.	Peterborough	54.3
10.	Southend	66.3	55.	Hull	52.2

Source: Department for Education 2018, GCSEs Results in England, 2016/17 data

15 Cullinane, C & Montacute, R (2017) Life lessons: improving essential life skills for young people. London: Sutton Trust

16 Marshall L., Rooney K., Dunatchik A. and Smith N. (2017) “Developing character skills in schools” Department for Education and NatCen Social Research

17 In 2013 the Government introduced reforms in the GCSEs grading system. The new system assigns pupils a 9-1 grade where 9 is the top grade. Achieving a grade from 9-4 is equivalent to achieving a GCSEs A*-C in the old system. Furthermore, 9-5 grades are considered ‘strong pass’. More information available at: <https://www.gov.uk/government/publications/gcse-changes-a-summary>

In terms of extra-curricular activities and work experience, the picture looks similar with pupils in the Greater South East more likely to participate than those in cities in the North and Midlands.

Research by the Sutton Trust found that 37 per cent of young people do not take part in any extra-curricular activities, while this rises to more than half (54 per cent) among pupils from disadvantaged backgrounds.¹⁸ While there is a lack of data on participation in extra-curricular activities at the local level, the geography of pupils from disadvantaged backgrounds provides some indication of how participation is likely to vary.

Liverpool, Hull and Birmingham are the cities with the highest share (more than 20 per cent) of pupils from disadvantaged backgrounds (as measured by the number of pupils eligible for free school meals). In contrast, in Aldershot, Bournemouth and York less than 10 per cent of pupils are eligible for free school meals. Given the lower likelihood of pupils from disadvantaged backgrounds participating in extra-curricular activities, it is likely that overall levels of participation are lower in the former group of cities compared to the latter.

Work experience also has the potential to endow children with the interpersonal and analytical skills employers need. Although no longer compulsory, a recent survey by the Government found that the majority of schools and colleges offer work-related experience to all students (in year 10-11 or in year 12-13) and that schools and colleges perceived work-experience as a way to improve children's employability skills such as communication and interpersonal skills.

Despite this positive evidence, however, take-up varies from school to school. From the little data available, it appears that the majority of employers offering these opportunities are predominantly found in the South East.¹⁹

Taken together, this data suggests that pupils in less economically successful cities have fewer opportunities to develop strong analytical and interpersonal skills. As face-to-face interaction, negotiation and complex problem solving become more important in work, young people in these city economies are likely to be less well equipped to access opportunities in the future labour market. This means that existing divides between cities are likely to widen.

National and local policy-makers should work together to improve take-up and quality of education in schools and colleges. In particular:

1. The Government should continue to improve numeracy and literacy

While there have been significant improvements in the attainment of GCSE Maths and English at the national level, there are still large gaps in attainment between cities and too many young people are leaving school without having developed good literacy and numeracy skills.

Maths and English are the foundation for the broader development of interpersonal and analytical skills and as such, more needs to be done to improve

18 Cullinane, C & Montacute, R (2017) Life lessons: improving essential life skills for young people. London: Sutton Trust

19 Government Office for Science (2017) Future of skills and lifelong learning

attainment in these subjects. Given that the quality of teaching is one of the most important determinants of pupil attainment, the Government should focus on improving teacher retention and development, particularly in cities with the lowest attainment rates.

2. The Government should ensure that all young people have access to extra-curricular activities

Up until 2017, schools used to receive funds from the Government to ‘build character’ through the Character Grant Scheme. However, the scheme was scrapped and the grant has been substituted by the Essential Life Skills initiative which aims to increase take-up of extra-curricular activities but is restricted to Opportunities Areas only.²⁰ This is good news for Opportunities Areas, as they are the most in need of intervention, but developing these skills is essential for every pupil across the country and the Government should ensure that every child has access to activities that help support their development.

3. Cities should establish Skills Compacts to promote collective responsibility and action for improving education and training.

Local authorities and local skills bodies should play a convening role and encourage stakeholders to sign up to a Skills Compact. Similar to the Boston model in the US (see case study 3), local authorities should coordinate activity in their cities, facilitating collaboration between schools and other stakeholders. To measure progress, every Compact should set measurable targets based on the specific goals of the compact.

Through the Skills Compact, cities should act on two fronts. Firstly, the Skills Compact should focus on promoting the use and sharing of best practice. As part of this, local authorities should support schools and local organisations to pilot different initiatives to improve analytical and interpersonal skills, monitor and evaluate their outcomes and promote the dissemination of the learning experience from these pilots.

Secondly, the Skills Compact should target children from disadvantaged backgrounds to ensure they can develop interpersonal and analytical skills. Practically this would firstly require the identification of barriers to participation and attainment. There may be a series of relatively cost-effective interventions that help to address these barriers: the creation of an easy-to-access platform, with all the information with regard to extra-curricular activities and other skills development activities that families and children can access, may help to raise awareness of existing provision, for example.

This work is already underway in some cities, such as Liverpool (see case study 4). Yet, given the scale and urgency of the challenge, it is imperative for every local authority to take concerted action.

20 <https://www.gov.uk/government/news/plans-launched-to-drive-social-mobility-in-opportunity-areas>

Case study 3: The Boston Compact – using local leadership to make provision of skills more efficient

In 2011, the Boston mayor, Boston School Committee Chair, the Boston Public Schools attendant and leaders from the Boston Alliance of Charters Schools signed a formal ‘Compact’ to improve the quality of education in the city.²¹

Under the leadership of the mayor, the Compact set out cross-sectoral professional strategies, a common accountability system with a common framework, and better use of city facilities. Through better coordination, learning and sharing of best practice, the Compact has introduced a Boston Schools Hub website to highlight options available for families in the city. It is also focusing on practice related to effective teaching and learning, especially for individuals with special needs and English learners.

The Compact has expanded over the years and now covers more than 93 per cent of all students in the city. In the English Language Learner Initiative, participants reported benefiting from practical strategies and professional development, and changes in classrooms which included increased linguistic focus and student’s interactions.²²

Case study 4: School improvement Liverpool – creating a common framework to improve education

School Improvement Liverpool was established in 2014 to offer support to nurseries and schools to ensure children and young people have the opportunity to develop, learn and excel in life.²³ Its services and its structure resemble the Boston Compact.

School Improvement Liverpool offers a range of support services such as training, consultancy, qualifications and in-school support. The main partners include Liverpool City Council, Liverpool Learning Partnership and the Liverpool School Business Managers Association. Through coordination and sharing of best practice, it offers services for the early years, primary and secondary schools. For example, School Improvement Liverpool provides support and training for the Philosophy for Children project, which aims to help children become more willing and able to question, reason, construct arguments and collaborate with others. The project, which already runs in 25 schools in Liverpool, is highlighted as one of the most promising by the Education Endowment Foundation.²⁴

To date, School Improvement Liverpool has worked with over 900 schools and businesses offering services to over 170,000 children and young people and supporting over 18,000 professionals.

21 School & Main Institute (2015) “City-Wide collaboration between District, Charter and Catholic Schools. The Boston Compact start up years 2010-2014” Massachusetts Charter Public Schools Association

22 <https://www.wested.org/project/boston-compact-english-learner-initiative/>

23 <https://www.schoolimprovementliverpool.co.uk/About-Us>

24 <https://educationendowmentfoundation.org.uk/projects-and-evaluation/projects/philosophy-for-children>

Ensuring the existing workforce is able to adapt to changes in skills demand – adult learning

Early intervention is crucial in order to close the attainment gap among pupils across the country, but this does not preclude the necessity of lifelong learning and adult education.²⁵ With two-thirds of the 2030 workforce having already been through compulsory education, it is vital that adults also have the opportunity to develop their skills.²⁶ Yet as people get older, the emphasis on the development of analytical and interpersonal skills tends to fade away. As a consequence, not enough is done to improve the skills of the current workforce.

Too many adults lack basic literacy and numeracy skills, particularly in parts of the North.²⁷ In 2011, 15 per cent of the workforce lacked basic literacy skills, while 24 per cent lacked basic numeracy skills. In the North East, numbers were even higher with 17 per cent of the workforce lacking literacy skills and 31 per cent lacking numeracy skills. London also had a high share of individuals with poor literacy and numeracy, due to the polarised nature of its labour market, but its situation is improving compared to 2003 thanks to interventions in schools.²⁸ Levels of poor literacy and numeracy are far lower in parts of the South: the South East and South West are the best performing regions with less than 10 per cent of the workforce lacking basic literacy skills and less than 20 per cent lacking numeracy skills.

According to the Employer Skills Survey (2017), **the main reason employers find vacancies hard to fill is lack of skills, particularly complex analytical skills.** While two-thirds of employers with skills shortages stated that applicants lack the specialist skills or knowledge for the role, among more transferable skills one in every two employers in the UK found complex analytical skills to be the most difficult skills to obtain from applicants alongside managerial and customer handling skills.

Within analytical skills, employers are most likely to cite problem-solving (42 per cent) and numerical skills (27 per cent) as the hardest to find among applicants (see Figure 10). The survey suggests that finding applicants with complex analytical skills is a challenge for businesses across the country, in particular in the North and Midlands. In these regions, the share of employers struggling to find applicants with complex analytical skills is higher than the national average.

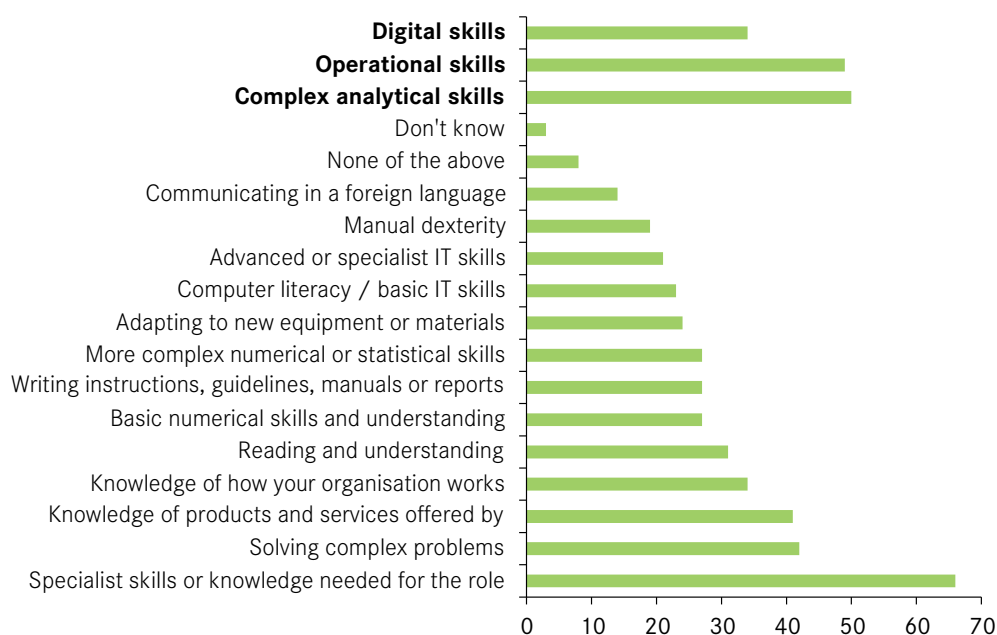
25 Government Office for Science (2017) “Future of skills and lifelong learning” <https://www.gov.uk/government/publications/future-of-skills-and-lifelong-learning>

26 Dromey J. and McNeil C. (2017) “Another lost decade? Building a skills system for the economy of the 2030s” London: Institute of Public Policy Research (IPPR)

27 Department for Business, Innovation and Skills (2012) “The 2011 Skills for Life Survey: A Survey of Literacy, Numeracy and ICT Levels in England” London: Department for Business, Innovation and Skills.

28 Litster J. (2013) “The impact of poor numeracy skills on adults”. London: NIACE (now Learning & Work Institute).

Figure 10: Technical and practical skills found hard to obtain among applicants, 2017



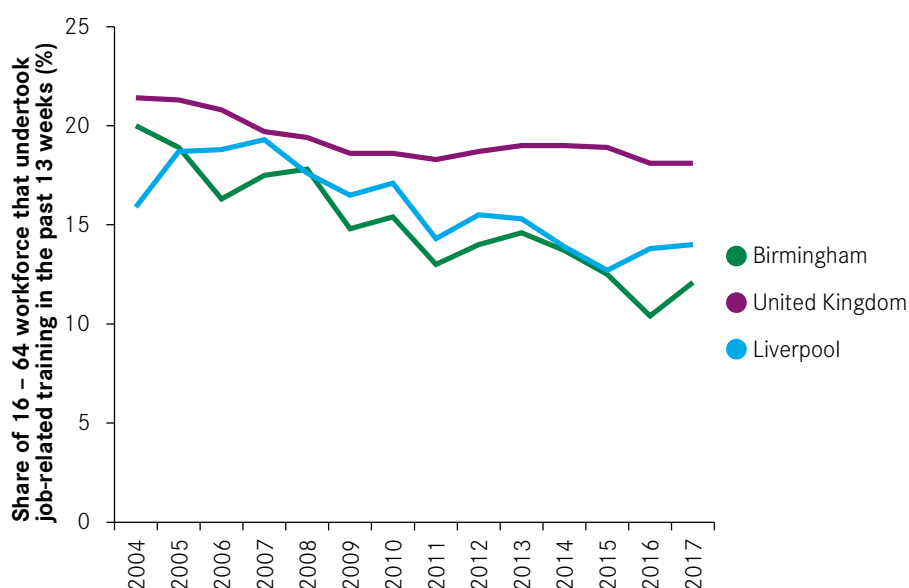
Source: Department of Education, Employers Skills Survey, 2017

Despite the clear need for lifelong learning, **numbers undertaking job-related training are down, particularly in cities where the likelihood of workers undertaking training was already lower than average.** These falls are mirrored in other forms of lifelong learning, including apprenticeships and participation in further education. Furthermore, not only has the number of individuals undertaking training been declining, but it has become increasingly skewed towards individuals from more affluent socio-economic backgrounds who tend to already have higher skills.

Between 2004 and 2017, the share of workers undertaking job-related training in England fell by 14.5 per cent. This trend holds among the majority of cities, with 42 of them having seen a decline in job-related training and only 13 having seen an increase.

In addition, the decline in job-related training has been sharpest in those places that stand to benefit the most from up-skilling and re-training. For example, the share of workers in Liverpool and Birmingham undertaking on the job training was already relatively lower in 2004 (19 per cent in both compared to national average of 21 per cent) and it declined more sharply compared to other areas. The share of workers undertaking on-the-job training has declined by 25 per cent in Liverpool and by 35 per cent in Birmingham (see Figure 11).

Figure 11: Share of 16 – 64 workforce undertaking job-related training in the past 13 weeks, 2004 – 2017



Source: ONS 2018, Annual Population Survey 2004-2017

National policy-makers should work towards reversing this trend. In particular:

- 1. Government should take a cross-departmental approach to raising investment and participation in lifelong learning, supported by a new What Works Centre for Adult Education.**

As the nature of jobs continues to evolve and people work for longer, it is crucial to ensure that individuals that have already left compulsory education can up-skill and retrain. Government departments need to work together to raise awareness of opportunities and remove barriers to them, including financial ones. To be effective it is essential that this builds on lessons from the past and is supported by evidence on what works. However, there is currently a much richer understanding of what works to improve educational attainment among children and young people. It is now time to raise the profile of adult education and create a similar organisation that focuses on lifelong learning.

- 2. Local authorities should pilot new flexible methods of provision in adult education**

From 2019/20, combined authorities will have control over the Adult Education Budget. This is an opportunity for cities to ensure that provision is tailored to the needs of local communities and businesses and to pilot new approaches.

One of the challenges related to the take-up of adult education is the necessity to juggle training between work and other personal commitments, such as family and care. Local authorities should first work to identify barriers to take-up of adult education in their local areas. Secondly, local authorities should use their powers to experiment with different forms of provision, such as evening classes or online courses, to widen access and participation in training. Properly evaluated, this would help to identify the most effective ways to improve adult education.

3. Improve take-up of adult education through better coordination with local stakeholders

Local authorities should also use the Skills Compact model outlined in the schools section to improve take-up and quality of provision for adult education. Building on work already underway, this means working collaboratively with further education colleges and other local stakeholders, learning and sharing from experimentation with different pilots, and raising awareness among individuals about the opportunities available in the city. (See case study 5).

Case study 5: Step Up – supporting low-paid workers to progress their careers

Building on collaboration between the Learning and Work Institute, Trust for London and the Walcot Foundation, the Step Up initiative was launched in 2015 to help low-paid workers progress in their careers and move into better work.²⁹

Key features in the delivery of the programme involved a personalised approach, one-to-one support, and coaching to boost participants' motivation and confidence. The initiative also involved partnerships with training providers and organisations connected to employers. Businesses were crucial for the initiative and were engaged in a number of ways. For instance, they provided job opportunities and a source of training and mentoring. To recruit businesses, the initiative made use of existing contacts with the business community such as through networking events and employer-led employability workshops. Subsequently, the initiative provided a tailored business solution by offering a high-quality recruitment service with screened and prepared candidates.

The project was evaluated after two years. It showed that there were clear benefits to career progression and wage increases, as well as a range of soft outcomes. These included greater confidence, work/life balance, technical skills and qualifications, and labour market knowledge. These skills can, in turn, generate further employment benefits in the future. Other programmes with similar features include the Skills Escalator pilots in West London.³⁰

29 <https://www.trustforlondon.org.uk/publications/step-evaluation/>

30 <https://www.wlc.ac.uk/newsstories/skills-escalator>

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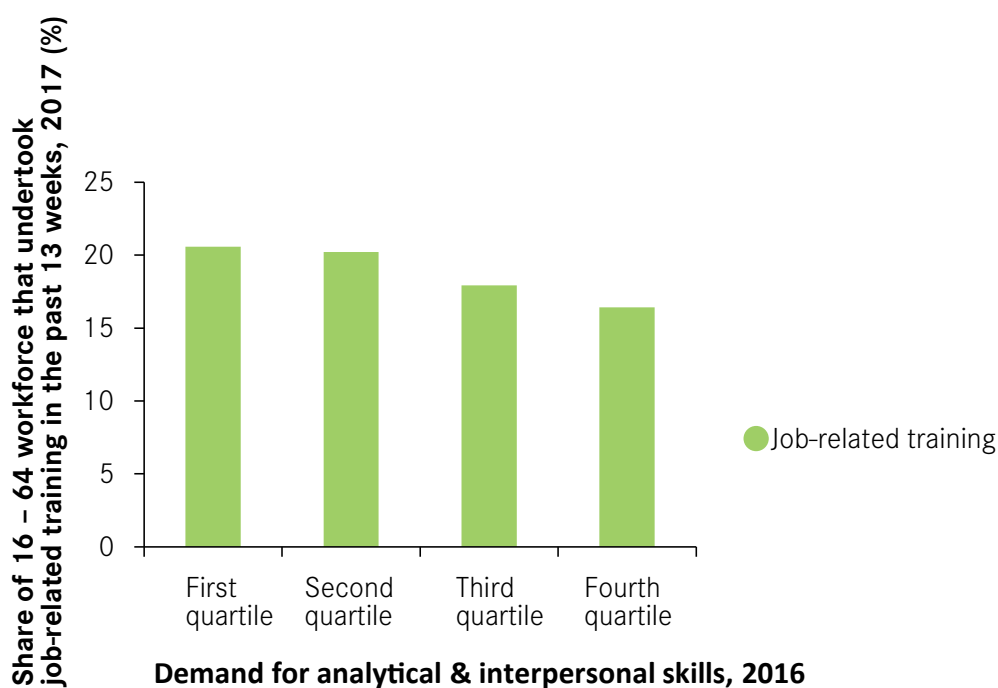
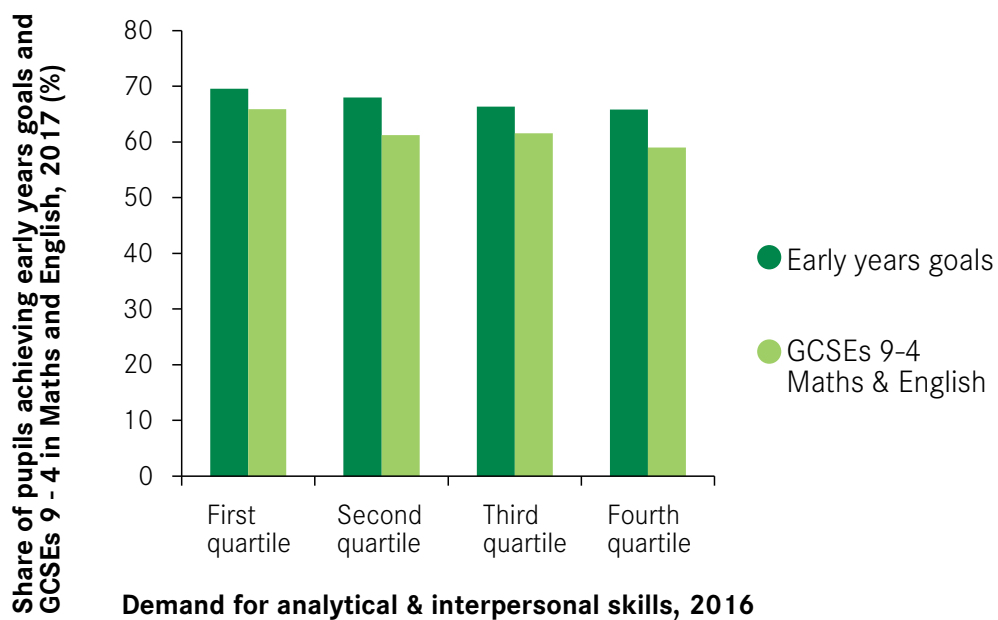
Summary

The world of work is changing and so are the skills required to succeed in the labour market. Interpersonal and analytical skills are in greater demand than ever, and these trends are expected to continue in the future.

Yet both the demand for skills across the country and the availability of these skills are lower in cities outside the Greater South East.

Early years attainment in cities with the lowest levels of demand for analytical and interpersonal skills (which are all in the North and Midlands) is 4 percentage points below that of places with the highest demand (which are all in the Greater South East). The gap widens in schools, with cities with the lowest levels of demand falling 7 percentage points behind ones where demand is highest. Furthermore, the share of adults undertaking job-related training is smaller in cities with the lowest demand for analytical and interpersonal skills (see Figure 12).

Figure 12: Pupils achieving early years goals and GCSEs in Maths and English 2017 and job-related training in England cities, 2016



Source: Emsi, 2018, Department for Education 2018, Early years foundation stage profile (EYFSP) results by pupil characteristics: 2017 and GCSE Results in England, 2016/17 data.

06.

Policy recommendations

The education and training system is not equipping individuals with the skills they need for the future labour market. Too many young people are leaving education without the foundations needed or without having accessed additional opportunities to develop these skills, and too few adults are participating in the lifelong learning that will help them adapt.

Interventions should aim at improving opportunities to develop interpersonal and analytical skills, in and out of the classroom, especially in weaker city economies. This means acting on several fronts at every stage in the education and training system to ensure that national reforms result in better outcomes across the country.

Given the scale of the challenge, this will require a concerted effort and action on several fronts to improve take-up and quality of provision at every stage. In particular:

- 1. Cities should establish Skills Compacts to promote collective responsibility and action for improving education and training.** City leaders and metro mayors should bring local stakeholders, including schools, FE colleges and training providers, universities, businesses and the third sector, together to sign up to a shared commitment to increase learning and improve outcomes in their city. The Compact should aim to ensure better coordination among organisations, share knowledge and best practice, and raise awareness of existing initiatives to improve the quality of opportunities and access to them. To measure progress, every Compact should set a measurable target for participation and outcomes.
- 2. The Department for Education and the devolved administrations must match local efforts with increased flexibility for cities to experiment and tailor provision.** Different places face different challenges related to education and what works in one place might not work in another. The Department for Education (DfE) should acknowledge these differences and work more closely with the Compact's stakeholders to increase flexibility in provision, pilot new initiatives and allocate resources in a way that is reflective of local needs.

- 3. The Department for Education should lead on creating a common framework to define interpersonal and analytical skills.** The language and definitions used to describe these skills often varies, with references to ‘employability’, ‘soft’, ‘vital’ and ‘transferrable’ skills, among others. This results in a lack of clear understanding of what skills individuals need to succeed in the labour market. DfE should work with employers and skills experts to establish a clear definition of the interpersonal and analytical skills that are needed for current and future jobs, and review how they can be embedded in each educational stage. This would help ensure these skills are better valued, improve learning opportunities, and support the identification of good practice.
- 4. The Government should take a cross-departmental approach to raising awareness across the existing workforce of and participation in lifelong learning, supported by a new What Works Centre for Adult Education.** As the nature of jobs continues to evolve and people work for longer, it is crucial to ensure that individuals that have already left compulsory education can up-skill and retrain. Government departments need to work together to raise awareness of opportunities and remove barriers to them, including financial ones. To be effective it is essential that this builds on lessons from the past and is supported by evidence on what works.

Appendix 1: Detailed breakdown of analytical, interpersonal and physical skills

Analytical skills include: reading comprehension, writing, mathematics, science, critical thinking, active learning, learning strategies, monitoring, coordination, negotiation, complex problem solving, operation analysis, technology, design, programming, troubleshooting, judgement and decision making, systems analysis, systems evaluation, time management, management of financial resources, management of material resources.

Interpersonal skills include: active listening, speaking, social perceptiveness, persuasion, instructing, service orientation, management of personnel resources.

Physical skills include: equipment selection, installation, operation monitoring, operation and control, equipment maintenance, repairing, quality control analysis.

Appendix 2: Detailed breakdown of occupational groups

Occupations are classified using the broad 1-9 Standard Occupational Classification (SOC) groups.

High-skilled occupations include: SOC1, Managers, directors and senior officials; SOC2, Professional occupations; and SOC3, Associate professional and technical occupations.

Lower skilled non-routine occupations include: SOC6, Caring, leisure and other services occupations; SOC7, Sales and customer services occupations; and SOC9 Elementary occupations.

Lower skilled routine occupations include: SOC4, Administrative and secretarial occupations; SOC5, Skilled trade occupations; and SOC8, Process, plants and machine operatives.



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