

The Skills Imperative 2035: what does the literature tell us about essential skills most needed for work?

Working Paper 1

Amanda Taylor, Julie Nelson, Sharon O'Donnell,
Elizabeth Davies and Jude Hillary



The Skills Imperative 2035: what does the literature tell us about essential skills most needed for work?

Amanda Taylor, Julie Nelson, Sharon O'Donnell, Elizabeth Davies and Jude Hillary

Published in March 2022
by the National Foundation for Educational Research,
The Mere, Upton Park, Slough, Berkshire SL1 2DQ
www.nfer.ac.uk

© 2022 National Foundation for Educational Research
Registered Charity No. 313392

ISBN: 978-1-912596-48-5

How to cite this publication:

Taylor, A., Nelson, J., O'Donnell, S., Davies, E. and Hillary, J. (2022). *The Skills Imperative 2035: what does the literature tell us about essential skills most needed for work?* Slough: NFER.



KANTAR PUBLIC

L&W LEARNING AND
WORK INSTITUTE



Contents

Acknowledgements	4
Executive Summary	5
1 Introduction	11
2 What will work look like in 2035?	16
Key findings	16
2.1 Megatrends shaping the world of work	16
2.2 Emerging and declining job opportunities	17
2.3 The impacts of automation and AI	19
2.4 The impact of Covid-19 on the changing world of work	21
2.5 What this means for skills development	24
3 Which essential employment skills will be in demand and how do we prepare?	25
Key findings	25
3.1 Essential employment skills for 2035	26
3.2 The case for essential employment skills and preparations needed	30
4 Discussion	37
4.1 The skills requirement	37
4.2 Implications for our wider research study	37
References	40
Appendix 1: Our review method	51
Appendix 2: Reports providing evidence of emerging and declining jobs (section 2.2)	53
Appendix 3: Reports providing evidence for ‘essential skills in 2035’ analysis (section 3.1)	54
Appendix 4: Rigour checks for ‘Essential Skills in 2035’ analysis (section 3.1)	57
Appendix 5: Essential skills identified outside of the ‘top 10’ (section 3.1)	58

Acknowledgements

We would like to thank the Nuffield Foundation for funding this report which forms part of the wider research study: [‘The Skills Imperative 2035: Essential skills for tomorrow’s workforce’](#).

We gratefully acknowledge the contributions of Wendy Durham, Hilary Grayson and Maureen Heron in NFER’s Knowledge Team for carrying out the extensive literature searches and coding and appraising reports. Our thanks also to NFER researchers Lydia Fletcher and Jennie Harland for their contributions to analysis and to Neal Hepworth and Tara Paxman for input to coding and to Neelam Basi for administrative support.

With thanks also to our co-investigators on the wider research study for their literature recommendations and comments on our findings: Professor Andrew Dickerson (University of Sheffield), Professor Rob Wilson (Institute for Employment Research, University of Warwick), Sam Avanzo Windett (Learning and Work Institute) and Chris Woolliscroft and Ha Bui (Cambridge Econometrics).



The Nuffield Foundation is an independent charitable trust with a mission to advance social wellbeing. It funds research that informs social policy, primarily in Education, Welfare, and Justice. It also funds student programmes that provide opportunities for young people to develop skills in quantitative and scientific methods. The Nuffield Foundation is the founder and co-founder of the Nuffield Council on Bioethics and the Ada Lovelace Institute. The Foundation has funded this project, but the views expressed are those of the authors and not necessarily the Foundation. Visit www.nuffieldfoundation.org

Executive Summary

Introduction

The world of work is in a state of transformation due to technological advancements, environmental changes, demographic shifts, and the impact of Covid-19. Calls are intensifying for workforce reskilling and a re-engineering of education and training to meet the demands of the future. Current policy in England focuses on technical, digital and green economy skills, underpinned by strong literacy and numeracy and a knowledge-rich school curriculum.

There is currently limited understanding of the combination of essential employment skills which will be needed, their relative importance, and how to develop them in England. To fill this evidence gap, our Nuffield-funded research study, [‘The Skills Imperative 2035: Essential skills for tomorrow’s workforce’](#) is investigating:

- which essential employment skills will be most needed in 2035
- what will their likely supply be and where will the gaps be
- which occupations and workers are most at risk of not having these skills
- which skills will affected workers need to develop to transition into new employment opportunities, and
- the role of educators and employers in helping to prepare young people and workers for the future labour market.

This first report, a review drawing on a wide-ranging and growing evidence base, sets the scene for our wider research study by bringing together what the literature suggests about:

- what the world of work will look like in 2035
- which essential employment skills will be in demand and how should we prepare.

This review, whilst not technically a systematic literature review, is nonetheless an extensive piece of work. We considered search results in excess of 5000 reports, systematically coding over 200 pieces before three team members independently graded the quality and relevance of reports for inclusion using agreed criteria. The literature relevant to this topic is wide-ranging and often based on surveys or forecasts. As a result, it is challenging to compare quality or methodological rigour as would happen in a review of a more homogenous evidence base. For example, the 30 studies reviewed to build a picture of the essential employment skills most expected to be in demand around 2035¹ used wide-ranging methods, each with strengths and limitations. These included large-scale surveys, job advertisement analysis, O*NET data² analysis, expert consultation and literature reviews.

¹ See section 3.1 and Appendix 3

² [The O*NET \(Occupational Information Network\) database](#) includes standardised and occupation-specific descriptors on almost 1000 occupations covering the U.S. economy

We are also aware of an element of ‘echo’ across some sources, with researchers, surveys and commentators drawing on each other’s work. With these considerations in mind, we adopted a pragmatic approach, with a balanced focus on breadth, recent timeframe (2018 onwards³), authority and methodological robustness, identifying an initial broad selection of 60+ pieces of the best available evidence across our areas of interest. Further details of our approach are available in Appendix 1.

What will work look like in 2035?

Megatrends

Work will undoubtedly look different in 2035. Universally acknowledged megatrends shaping this include: technological advancements (digitisation, automation and artificial intelligence (AI)); demographic changes (ageing populations); growing labour market inequalities; and environmental changes/the green agenda. In addition, the Covid-19 pandemic has had a profound impact on life and work globally, whilst the UK is adjusting to new economic conditions following its departure from the European Union. There is acknowledgement that the next ten years will be a ‘decisive decade’ for the UK economy in *The Economy 2030 Inquiry* – a collaboration between the Resolution Foundation and the London School of Economics, funded by the Nuffield Foundation – which is exploring the impact of Covid-19, Brexit, technology, and Net Zero transition⁴.

Growing and declining job opportunities

We identified the following key trends to provide a top-level overview of where studies suggest employment opportunities in the UK/internationally are likely to lie around 2035⁵:

- **Growing sectors:** Health, social and personal care roles are the most frequently mentioned in the literature as areas of future employment growth. Education; professional services; sales/business development; creative, digital and design; green economy; information and communication; and natural and applied sciences are also widely predicted to grow.
- **Declining sectors:** Administrative/secretarial; manufacturing/production; and retail/cashier work are the most frequently mentioned sectors in the literature for declining employment opportunities. Agricultural and business administration/finance sectors are also widely predicted to decline.

The occupational growth areas identified are grouped (clustered) around: data and AI; engineering and cloud computing; people and culture; product development; sales, marketing and content; the care economy (which includes health); and the green economy⁶. These areas suggest that growth is being driven by demand for both digital and human

³ We included some reports published in 2017 where these were very widely cited, for example Bakhshi *et al.*,

⁴ Bell *et al.*, 2021

⁵ Drawing on ten methodologically robust and authoritative recent reports, see Appendix 2. Where UK specific forecasts were available we drew on these; otherwise the forecasts are international and may mask country-specific nuances, although the UK is broadly in line with international analyses.

⁶ WEF, 2020b

factors. There are also new jobs or the adaptation of existing jobs which we cannot yet envisage or predict⁷.

The impacts of automation, digitisation and AI

It is estimated that around 1.5% of the manufacturing workforce in the EU has been displaced by technology since 2000⁸. By 2030, it is estimated that 22% of current workforce activities across the EU could be automated⁹. Workers in low-skilled routine tasks or with low education levels are at the greatest risk of being displaced by technology whilst lacking the skills to transfer into newly emerging opportunities¹⁰. However, it is not only lower-paid, lower-skilled jobs which may be affected. Analysis suggests some better-educated, higher-skilled workers/roles will also be replaced by AI, particularly those relying on intellectual abilities (e.g. comprehension and conceptualisation) rather than social abilities (e.g. social interaction and communication). Overall, however, technology is creating new – and enhancing existing – jobs, rather than diminishing employment opportunities¹¹. It is also notable that the Organisation for Economic Co-operation and Development (OECD) is exploring the human capabilities which AI and robotics are unlikely to be able to replicate in the coming decades, and considering what education and training will be needed to develop work-related capabilities beyond these¹².

Impact of Covid-19

The pandemic has accelerated the pace of digitisation, automation and AI as many businesses and organisations have turned to technology¹³. Some authors have suggested a relationship between sector vulnerability to Covid-19 and automation¹⁴, noting that sectors with high levels of furlough, or at risk from Covid-19 in the short term, tended to have greater long-term risk of automation. Covid-19 exacerbated existing labour market inequalities, with a growth in high- and a decline in low-paid jobs¹⁵. Workers educated below degree level, young people (especially those with low, or no, qualifications), and those at the bottom of the income distribution, were particularly affected in earlier stages of the pandemic¹⁶. However, more recent analysis suggests older workers (age 50+) are faring less well in the recovery¹⁷. Many lower-paid workers whose employment was interrupted or threatened by the pandemic made transitions to new roles, but these were often in declining sectors with only short-term prospects¹⁸. In addition, the divide between those who can perform their work remotely (mainly higher-paid workers), and those who cannot (mainly lower-paid workers, with some exceptions) became apparent¹⁹. At the time of writing, the literature reviewed mostly focused on the short- and medium-term effects of the pandemic. However, longer-term implications

⁷ Autor *et al.*, 2020; Lund *et al.*, 2021

⁸ Oxford Economics, 2019

⁹ Smit *et al.*, 2020

¹⁰ Smit *et al.*, 2020; WEF, 2020b

¹¹ Muro *et al.*, 2019; Smit *et al.*, 2020; Tolan *et al.*, 2020; WEF, 2020b

¹² OECD, 2021a

¹³ Cedefop, 2021; Kanders *et al.*, 2020; Lund *et al.*, 2021; OECD, 2021c; Thomas *et al.*, 2021, WEF, 2020a

¹⁴ Smit *et al.*, 2020; Wallace-Stephens and Morgante, 2020

¹⁵ Autor *et al.*, 2021; ILO, 2021b; OECD, 2021c; Thomas *et al.*, 2021; WEF, 2020a

¹⁶ Learning and Work Institute, 2021; Smit *et al.*, 2020; Williams *et al.*, 2021

¹⁷ Crossley *et al.*, 2021

¹⁸ Bateman and Ross, 2021; Lund *et al.*, 2021; OECD, 2021c; Thomas *et al.*, 2021; WEF, 2021

¹⁹ Autor *et al.*, 2021; Lund *et al.*, 2021

and the need to anticipate and adapt to future pandemics may arise during our ongoing research project.

Which essential employment skills will be in demand and how do we prepare?

This report finds there are wider skills such as creativity, critical thinking, teamwork, problem solving and resilience – which complement the new technologies and other changes taking place – which are also expected to be critical for future employment, and need to be prioritised. We refer to these as ‘essential employment skills’.

The literature we reviewed suggests there is consensus on the essential employment skills expected to be most in demand in the future labour market. In addition to literacy and numeracy, and technical and digital skills, commentators identify a range of transferable skills, which will become ever more important in the face of technology. We categorise these as: a) analytical/creative; b) interpersonal; c) self-management; and d) emotional intelligence skills. Each category contains a number of skills and attributes. Those mentioned most frequently, are listed below in order of frequency, together with the category they fall into:

- 1= Problem solving/decision making (a)
Critical thinking/analysis (a)
Communication (b)
- 4 Collaboration/cooperation (b)
- 5 Creativity/innovation (a)
- 6 Leadership/management (cross-cutting)
- 7 Self-motivation/learning orientation (c)
- 8= Flexibility/adaptability (c)
Resilience/optimism (c)
- 10 Empathy/social perceptiveness (d)

Although there is a high level of consensus, some of the most rigorous studies reviewed do not rank ‘creativity’ or ‘critical thinking’ so highly. This may be a matter of terminology. For example, the *Skills Builder* framework embeds critical thinking in ‘problem solving’²⁰. However, the fact that there are differences, and also recognised co-dependencies between skills, demonstrates that we should not over-interpret the skills ‘hierarchy’.

There is also a distinction and differing viewpoints between *skills* (which can be taught, and acquired, to varying degrees) and *attributes* (which, as inherent character traits, may need to be nurtured/experienced).

²⁰ Ravenscroft and Baker, 2020

Calls for a policy focus on essential employment skills have been made for decades²¹. A nationally representative sample of UK employers agreed these skills are equally or more important than academic qualifications²²; and various educators and partnerships also believe they should have more emphasis²³. Young people recognise the value of essential employment skills²⁴ and some would prefer to be assessed in these as well as academic subjects²⁵.

There is emerging discussion in the literature about the relationship between essential employment skills and academic attainment, career transition/progression, and income²⁶, although further research is needed to better understand this relationship. For example, self-management skills and social and emotional strengths are found to be better predictors of income at age 25 than cognitive skills²⁷, while well-developed essential employment skills have been linked to higher levels of academic performance in the primary and secondary phases²⁸.

What preparations are needed in education and training?

There are a number of strategies (in the UK and overseas) which aim to increase essential employment skills among school and further education students. These include:

- **frameworks** – such as *Skills Builder* (UK) – support development and assessment of eight essential skills through a series of steps²⁹. Similarly, a framework developed by the Centre for Curriculum Redesign (USA) matches skills to academic school subjects³⁰.
- **curriculum, pedagogic and assessment approaches** – the OECD's *Learning Compass* (n.d.) and *Fostering Students' Creativity and Critical Thinking*³¹ both support schools to develop curriculum, pedagogic and assessment approaches.
- **real-world learning and experience approaches** – such as the Edge Foundation's *Future Learning* (UK) – provide opportunities for skills development through project work, volunteering, internships, work-based learning/work-experience, and careers education³².

Recommendations made in the literature include building clarity around skills definitions and pedagogies, improving training and support for teachers, and prioritising skills within the curriculum and extra-curricular activities.

Formal vocational training and qualification routes in the UK (e.g. apprenticeships and technical education) already have some built-in essential employment skills requirements.

²¹ CBI, 1990

²² Cullinane and Montacute, 2017

²³ *inter alia* Centre for Real World Learning, 2021; Rogers and McGrath, 2021; Skills Builder Partnership, 2021

²⁴ Kashfepakdel *et al.*, 2021; Youth Employment UK, 2021

²⁵ Lloyd, 2021

²⁶ Gorea, 2021; Kashfepakdel *et al.*, 2021; Kashfepakdel and Ravenscroft, 2021; OECD, 2021b

²⁷ OECD, 2021b

²⁸ Kashfepakdel and Ravenscroft, 2021

²⁹ Ravenscroft and Baker, 2020

³⁰ Dunn *et al.*, 2021

³¹ Vincent-Lancin *et al.*, 2019

³² Rogers and McGrath, 2021

For example, in England, the new T Level in construction, design, surveying and planning includes the core skills: communication; working with others; and problem solving³³. Skills are typically developed through a combination of classroom and in-work opportunities and are considered in learners' assessments. Employers find apprentices to be the group of young people best prepared in terms of workplace skills³⁴.

What preparations are needed for the working population?

Although 80% of the people expected to be in the 2030 workforce are already in the workplace³⁵, we identified fewer examples of initiatives to develop essential employment skills in the working age population. Initiatives to reskill adults tend to focus on accessibility, flexibility, removing barriers to participation, and instilling the value of lifelong learning, rather than on developing specific essential employment skills.

Implications for our wider research study

Our review has identified a consensus on the UK's anticipated essential employment skills needs – although we are aware there is an element of 'echo' across sources, with commentators drawing on each other's work. Our review has found less evidence about the likely supply of these essential employment skills in the future. Nor did it find much evidence on where the gaps are likely to be and who will be most affected by the changes.

With this in mind, our wider study – [The Skills Imperative 2035: Essential skills for tomorrow's workforce](#) – will build on the literature review findings, raising a number of questions. For example:

- Which skills/attributes are most acquirable or malleable?
- What are the best ways of measuring these skills/attributes?
- What role should schools, post-16 training providers, third sector organisations and employers play in developing essential employment skills, and where are the barriers?
- To what extent should essential employment skills be explicitly developed; and to what extent should they be 'taught', as opposed to nurtured or experienced?

Our study will also build on the current literature by estimating the likely future supply of essential employment skills, identifying where the skills gaps fall and outlining which workers are most likely to be affected. This will allow strategies to be developed to help workers transition to other sectors or jobs.

The skills needs of the future economy present a large strategic challenge for government, employers and educators which needs to be addressed now through a joined-up strategy. Robust measures are needed to assess the growth, prevalence and take-up of skills, and shifts in patterns of acquisition. Our ongoing research study intends to contribute significantly to the achievement of this aim.

³³ DfE, 2018

³⁴ Cullinane and Montacute, 2017; DfE, 2020

³⁵ Industrial Strategy Council, 2019

1 Introduction

The world of work is in a state of profound transformation. Governments, employers and workers are adapting to technological advancements (digitisation, automation, artificial intelligence [AI]); demographic shifts (an ageing population and longer, less predictable working lives); the impetus towards greener economies; and the impact of the Covid-19 pandemic.

Commentators suggest that the Fourth Industrial Revolution is transforming the face of employment and reducing the shelf-life of employees' existing skill sets, with potentially dramatic effects on the economy, society and individuals³⁶. Covid-19 has hastened the adoption of technologies and accelerated structural changes in the nature of work. Meanwhile, the dual impact of technology and the pandemic is likely to exacerbate existing inequalities³⁷, adding to the challenges the Government is seeking to tackle in the 'Levelling Up' White Paper³⁸.

At the same time, politicians are calling for education and training to ensure a 'green skills pipeline'³⁹, and equip learners of all ages with the knowledge and skills to help employers play their part in delivering the transition to net zero by 2050⁴⁰.

Against this complex backdrop, calls are intensifying for policy measures to ensure effective transitions to a world where the jobs available, and the skills required to do them, will be different⁴¹. Employees are recognising that their job status has changed, or may change, and that they need education/training to respond⁴². Young people, teachers, employees and employers are also recognising the need for a 'new breed of digital and soft skills'⁴³, and employers are highlighting challenges in industry-specific, technical/operations, IT, and managerial skills⁴⁴.

Current skills policy focuses on technical, digital and green skills, underpinned by strong literacy and numeracy

The UK policy response has an understandably strong focus on enabling individuals to develop the technical and digital skills employers need, including through reform of apprenticeships (since 2015); the Industrial Strategy, Digital Strategy and 5G Strategy (2017); and the introduction of T Levels (since 2020) and higher technical qualifications (from 2022). This is underpinned by a more rigorous, knowledge-based National Curriculum,

³⁶ Ward, 2016; Kirschner and Stoyanov, 2018

³⁷ DfE, 2021b; WEF, 2020a; Afemikhe, 2021

³⁸ GB. Parliament, HoC. The Secretary of State for Levelling Up, Housing and Communities, 2022

³⁹ GB. Parliament. HoC. Environmental Audit Committee, 2021

⁴⁰ HM Government, 2021

⁴¹ Afemikhe, 2021; McDonald, 2021; Quigley, 2021; Agrawal *et al.*, 2020; WEF, 2020a

⁴² Hall *et al.*, 2021

⁴³ Pearson, 2020

⁴⁴ IOD/OU, 2021

with higher expectations for literacy and numeracy (introduced from 2014), and more challenging GCSEs (since 2017).

Reforms currently being taken forward in the Skills and Post-16 Education Bill⁴⁵ seek to further transform post-16 education and training; help adults gain in-demand skills and open up new job opportunities; and realign skills with employer needs. The objective is to support skills development to fill the gaps that exist now and will exist in the future, and to improve national productivity⁴⁶. Key pillars include:

- The Lifetime Skills Guarantee for adults to gain skills to improve their job prospects or retrain for sustained employment;
- Skills Bootcamps, to help people develop the skills in demand locally and transition from work in declining sectors and occupations (e.g. through digital courses, technical training and training in green skills).

There are also incentives to encourage more employers to offer more traineeships and apprenticeships, and courses to help adults to retrain or upskill in STEM (science, technology, engineering and maths) skills, including AI, digitisation of manufacturing, digital construction, agricultural robotics, and cybersecurity.

Wider essential, transferable skills are just as important for the future workplace and need to be brought under the policy spotlight

The skills prioritised in current policy are clearly vital to economic prosperity in the UK and for the life chances of individuals, but they are only part of the picture. Humans will increasingly need ‘the capacity to do the creative, empathetic and interactive’⁴⁷, meaning essential employment skills are also likely to be in high demand. The House of Lords Youth Unemployment Committee has recently raised concerns that the National Curriculum does not set out which essential employment skills should be prioritised. The committee also notes that disadvantaged young people may lack opportunities to develop these skills through extra-curricular activities, which can present barriers to them securing first employment⁴⁸. In addition, changing working practices and business models, including the rise in self-employment (see for example⁴⁹) and the need to re-skill (potentially multiple times in a working lifetime), emphasise the growing importance of resilience and flexibility.

By essential employment skills, we mean the broad range of skills, abilities and attributes needed in the workplace that underpin or complement technical, digital and cognitive skills, and enable the optimisation of technological and human contribution in the world of work. We are considering these to include analytical/creative, interpersonal, self-management and emotional intelligence skills (see chapter 3).

Calls for a focus on the development of these essential employment skills are of course not new⁵⁰. Over three decades ago, the Vocational Education and Training taskforce called for

⁴⁵ DfE, 2021a

⁴⁶ GB Parliament. HoC. HM Treasury, 2021

⁴⁷ Hancock, 2017

⁴⁸ GB. Parliament. HoL, 2021

⁴⁹ Giupponi and Xu, 2020; ILO, 2021b

⁵⁰ OECD, 2018; CBI, 2019; Kashefpakdel *et al.*, 2018

‘common learning outcomes’ in vocational training and education, including effective communication, problem solving and positive attitudes to change⁵¹.

Around the world there are numerous movements and frameworks to bridge the perceived gap between the knowledge and skills most students learn in school and what they will need in 21st century workplaces. Examples include the Framework for 21st Century Learning’s ‘4Cs’ of critical thinking, communication, collaboration and creativity⁵²; UNICEF’s transferable skills such as problem-solving, negotiation and critical thinking⁵³; and the World Economic Forum’s eight critical characteristics, including innovation and creativity skills, interpersonal skills, and problem-based and collaborative learning⁵⁴. In the UK, according to their latest impact report, the Skills Builder Partnership is gaining traction in embedding its framework for building eight essential employment skills in schools, colleges, apprenticeships and employment⁵⁵.

Although recent successive education secretaries in England have acknowledged the importance of developing some of these skills during compulsory education, we have not yet seen a comprehensive policy commitment to developing a broader range of essential employment skills throughout the education and training system. Policy responses have included Nicky Morgan’s emphasis on ‘character, resilience and grit’⁵⁶; Justine Greening’s focus on helping disadvantaged young people develop essential skills such as resilience, wellbeing, employability and leadership skills through extra-curricular activities⁵⁷; Damian Hinds’ renewed focus on character and resilience as being ‘as crucial to young people’s future as academic qualifications’⁵⁸; and Ofsted’s recognition of schools’ provision for young people to build resilience, empathy and employability skills through character education⁵⁹. It is notable that, in Wales, a specific integral skills qualification has recently been announced⁶⁰, recognising young people’s abilities in planning and organisation; critical thinking and problem solving; creativity and innovation; and personal effectiveness.

We urgently need to understand more about the essential employment skills most needed and how to prepare for them

This first report in our wider research study shines the spotlight on the essential employment skills that young people and those already in the workplace – mindful that 80% of the 2030 workforce is already in the workplace⁶¹ – need to develop in order to lead economically-active and socially-included lives in the run up to 2035 and beyond.

There is currently only limited understanding about the combination of essential employment skills needed for the workforce of the future, the relative importance of the different skills, and the extent to which they can be developed through the education system and in the

⁵¹ CBI, 1990

⁵² Partnership for 21st Century Skills, no date

⁵³ Yao *et al.*, 2021

⁵⁴ WEF, 2020c

⁵⁵ Skills Builder Partnership, 2021

⁵⁶ DfE, 2014

⁵⁷ DfE and Greening, 2017

⁵⁸ DfE and Hinds, 2019; DfE, 2019

⁵⁹ Ofsted, 2021

⁶⁰ Qualification Wales, 2021

⁶¹ Industrial Strategy Council, 2019

workplace. To fill this evidence gap, our wider Nuffield-funded research – [‘The Skills Imperative 2035: Essential skills for tomorrow’s workforce’](#) – will identify and investigate:

- the essential employment skills most needed in future employment
- the potential supply of these essential employment skills
- the main gaps in the supply of these essential employment skills
- the occupations most at risk of not having the skills needed, and the skills workers need to develop to be able to transition to another occupation
- how the education system and work-based learning can support the development of the essential employment skills needed in the future.

Our first report brings together existing research, projections and thought leadership

To set the scene for our wider research study, this first report explores the current extensive literature to understand:

- **What will work look like in 2035?:** the megatrends shaping future work opportunities, with a particular focus on the impacts of automation, digitisation and AI; the job sectors expected to emerge or decline; and the effect of Covid-19 on the already changing world of work (chapter 2).
- **Which essential employment skills will be in demand and how do we prepare?:** drawing on a range of projections and surveys to anticipate the essential employment skills which will be most needed in the 2035 labour market, and taking stock of what is happening or needs to happen to develop these (chapter 3).

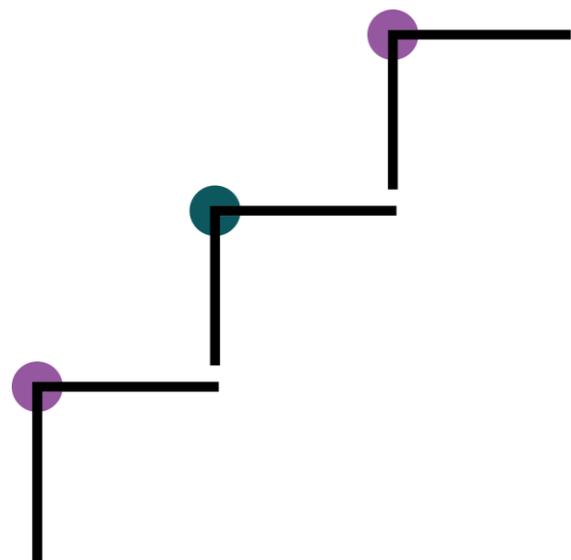
In our final chapter, we discuss the implications of the review findings for government, employers and educators, and for the next stages of our research study (chapter 4).

Given the nature and breadth of this topic with an extremely large and continually growing evidence base potentially relevant to our research questions, we have not attempted a systematic literature review. Nevertheless, it is an extensive piece of work which considered search results in excess of 5000 reports, systematic coding of over 200 pieces and independent quality and relevance grading by three team members of the 60+ reports included in the review. We found the literature to be wide-ranging and often based on surveys or projections, and as a result it is challenging to compare quality or methodological rigour as would happen in a review of a more homogenous evidence base. For example, the 30 studies reviewed to build a picture of the essential employment skills most expected to be in demand around 2035⁶² used wide-ranging methods, each with strengths and limitations. These included large-scale surveys, job advertisement analysis, O*NET data⁶³ analysis, expert consultation and literature reviews. We are also aware of an element of ‘echo’ across

⁶² See section 3.1 and Appendix 3

⁶³ [The O*NET \(Occupational Information Network\) database](#) includes standardised and occupation-specific descriptors on almost 1000 occupations covering the U.S. economy

sources, with researchers, surveys and commentators drawing on each other's work. With this in mind, we adopted a pragmatic approach to our review method with a balanced focus on breadth, a recent timeframe (2018 onwards⁶⁴), authority and methodological robustness. Further details of our approach are available in Appendix 1.



⁶⁴ We did include some published in 2017 where these were very widely cited, for example Bakhshi *et al.*

2 What will work look like in 2035?

In this chapter, we summarise the megatrends shaping the world of work, key trends in emerging and declining job opportunities, the impacts of digitisation, automation and AI and the impact of Covid-19.

Key findings

- Work will look different by 2035, shaped by universally acknowledged megatrends and the Covid-19 pandemic. For the UK, there is also the impact of Brexit.
- Growing opportunities include: health, social and personal care; education; professional services; sales/business development; creative, digital and design; green economy; information and communication; and natural and applied sciences.
- Declining opportunities include: administrative/secretarial; manufacturing/production; retail/cashier work; agricultural; business administration/finance.
- The importance of human reasoning and social interaction is clear across growth areas.
- Workers in low-skilled/routine tasks or with low levels of education are at greatest risk from automation, but AI will also impact higher skilled jobs.
- The pandemic has accelerated the pace of digitisation, automation and AI and exacerbated existing inequalities in the workforce: many low-paid workers have been displaced, making horizontal transitions, often to declining sectors.

2.1 Megatrends shaping the world of work

A number of universally acknowledged megatrends will shape the world of work in 2035 ⁽⁶⁵⁾. Collectively, these are 'creating pressure for people to develop new and higher levels of skills, as well as to continue upskilling throughout life and to use their skills more effectively'⁶⁶. They include:

- **technological advancement** (digitisation, automation, AI) – this is one of the most frequently addressed megatrends in the literature which we explore further in section 2.3

⁶⁵ *inter alia* Cedefop, 2021; PWC, 2018b; ISC, 2019; OECD, 2019b, WEF, 2020a

⁶⁶ OECD, 2019b, p.48

- **ongoing shifts** from manufacturing to service sectors and **changing business models** (e.g. greater use of contractors; shifts to digital/online services – the ‘platform economy’) and **working practices** (e.g. flexible working and self-employment)
- **demographic shifts** – in particular the ageing population and longer life expectancies impacting on the need for care for the elderly and reskilling during a longer working life as well as labour shortages in countries with ageing populations
- **growing inequalities** in the labour market and wider society playing out across demographic groups and regional geographies
- **environmental change** – the need for greening and sustainable forms of energy; the impact of extreme weather; resource scarcity, including water and other natural resources.

The **Covid-19 pandemic** has also had a profound impact on all aspects of life and work globally, although emerging thinking suggests this is accelerating or reinforcing existing megatrends rather than changing them – we explore this further in section 2.4.

In addition, the UK is in a state of flux following the **departure from the European Union**, the impact of which is likely to play out toward 2035. For example, there are estimates the UK economy will be several percentage points smaller in 2030 than it otherwise would have been⁶⁷. There is acknowledgement that the next ten years will be a ‘decisive decade’ for the UK economy in The Economy 2030 Inquiry, which is exploring the impact of Covid-19, Brexit, technology, and Net Zero transition⁶⁸. Furthermore, the pressing need to understand the combined impact of the pandemic and automation on the future of work and wellbeing is being taken forward in the Pissarides Review⁶⁹.

A recent survey of 2000 representatives from British business identifying the most pressing challenges in the next 10-20 years underlines the influence of both global megatrends and the specifics of Brexit in the UK labour market⁷⁰. These challenges include competition from emerging economies; tackling climate change; attracting and retaining talent in a global market place; increasing productivity; changes to freedom of movement; adapting to the rapid pace of change; and automation and AI.

2.2 Emerging and declining job opportunities

The Working Futures 2017-2027 study⁷¹ provides a comprehensive and detailed picture of the UK labour market, focusing on employment prospects for up to 75 industries, 369 occupations, 6 broad qualification levels, gender and employment status. This study, which will be updated as part of our wider research study, broadly projected growing employment opportunities in public administration, health, education, business and other service sectors and falling employment opportunities in the primary sector and utilities (including agriculture), manufacturing, construction, trade, accommodation and transport.

⁶⁷ Vaitilingam, 2021

⁶⁸ Bell *et al.*, 2021

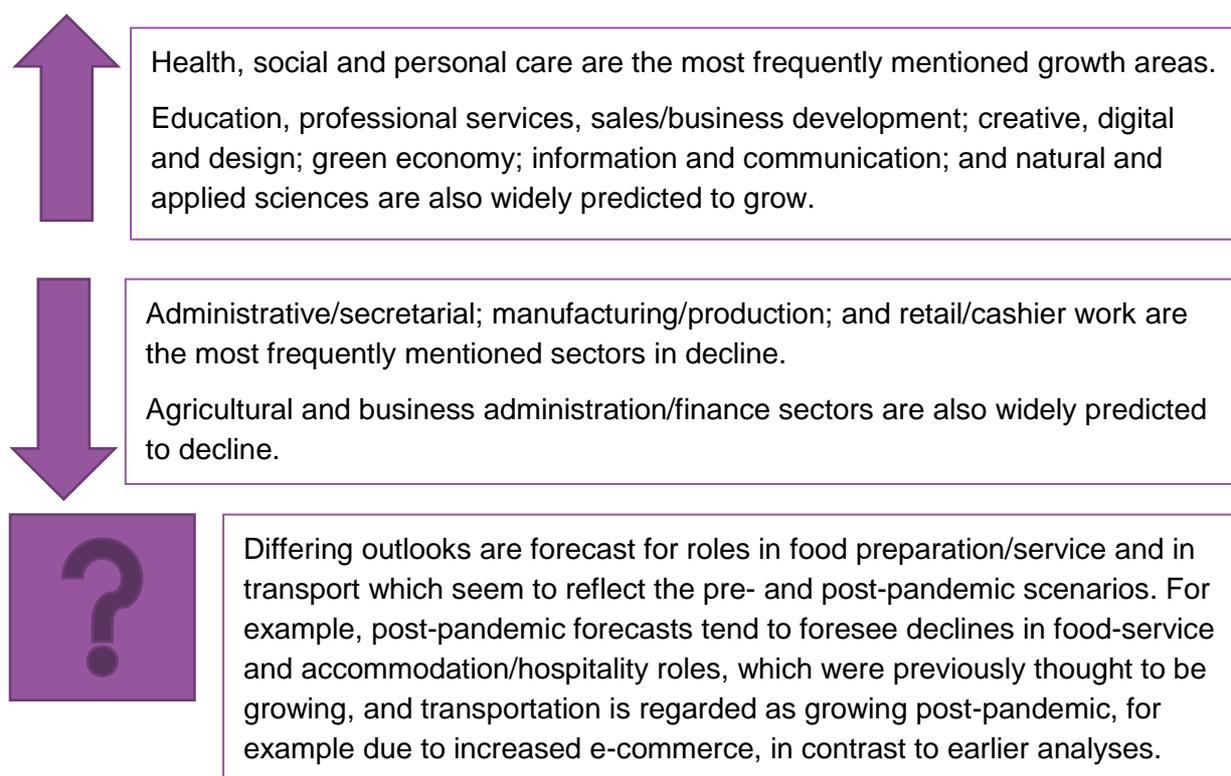
⁶⁹ IFOW, 2021

⁷⁰ Kingston University, 2021

⁷¹ Wilson *et al.*, 2020

We found these patterns were broadly consistent with those arrived at across ten additional reports published between 2017 and 2021 covering the UK, Europe and North America and employing wide-ranging forecasting and analysis techniques to 2025-2030 (see Appendix 2 for an overview of these studies). Each report presented data differently – some focusing on broad sectors and some drilling down to specific roles – and used different sector/role descriptions. To establish an overview of where there are likely to be greater or fewer employment opportunities based on these studies, we had to conflate sectors/industries with occupations/professions. Whilst this is not optimal, it allows for the identification of the degree of consensus across a range of commentators. See Figure A.

Figure A – Growing/emerging and declining job sectors



The World Economic Forum (WEF) has identified seven emerging professional clusters where they expect to see growth in the ‘jobs of tomorrow’⁷². These broadly align with the growth areas identified across the reports we consulted and are: data and AI; engineering and cloud computing; people and culture; product development; sales, marketing and content; care economy (including health); green economy.

These growth areas underline that growth is being driven by demand for both digital and human factors. Whilst ‘specialist digitally enabled’ professions are among the fastest growing roles, the continuing need for and importance of human interaction is clear in the care economy and roles in the ‘marketing, sales and content’ and ‘people and culture’ clusters. This point around demand for both technology and human factors driving growth is made in various other analyses including Lund *et al.*, (2021), who identified rapidly growing

⁷² WEF, 2020b

occupations involving new technologies, wealth work, creatives, and various roles providing socio-emotional support.

As we might expect in the context of an ageing population, **WEF predicts that growth will be largest in care economy roles**. Whilst it assesses the green economy to be likely to have the smallest growth across the clusters, this will probably change due to major government environment initiatives (as we have recently seen announced in the UK⁷³) and on the international stage (such as the recently agreed Glasgow Climate Pact⁷⁴).

There are also the jobs we cannot yet envisage or predict. Entirely new occupations will emerge in the coming decade(s)⁷⁵ and at different rates in different sectors⁷⁶.

2.3 The impacts of automation and AI

IBM (2022) defines automation as ‘a term for technological applications where human input is minimized’. It covers a broad range of capabilities from the automation of processes, integration automation where machines undertake human tasks once programmed by humans, through to artificial intelligence automation where the machines learn and make decisions based on past situations. Artificial intelligence in simplest terms is intelligent automation.

PwC (2018a) identified three ‘waves’ to the mid-2030s:

- the algorithmic wave to early 2020s (simple computational tasks and analysis of structured data)
- the augmentation wave to late 2020s (dynamic interaction with technology for clerical support and decision making and robotic tasks in semi-controlled environments)
- the autonomous wave to mid-2030s (automation of physical labour and manual dexterity, and problem solving in dynamic real-world situations).

Estimates suggest around 1.5% of the manufacturing workforce (approximately 400,000 jobs) in the EU have been displaced by technology since 2000⁷⁷. Although estimates vary across economies and sectors⁷⁸, one midpoint analysis suggests that by 2030, 22% of current workforce activities across the EU could be automated, which is estimated to equate to 53 million jobs⁷⁹. However, fully automatable occupations are in a minority. Less than 5% of jobs could be replaced entirely by technology, although around 60% are made up of around 30% of activities which could be automated⁸⁰. **Technology is also creating new, and enhancing existing, jobs rather than diminishing employment opportunities overall⁸¹**, although there are warnings that these consist of more lower-skilled support roles

⁷³ GB. Parliament, HoC. Environmental Audit Committee, 2021

⁷⁴ UKCOP26, 2021

⁷⁵ Lund *et al.*, 2021

⁷⁶ Autor *et al.*, 2020

⁷⁷ Oxford Economics, 2019

⁷⁸ Manyika *et al.*, 2017; PwC, 2018a

⁷⁹ Smit *et al.*, 2020

⁸⁰ Manyika *et al.*, 2017

⁸¹ Muro *et al.*, 2019; Smit *et al.*, 2020; Tolan *et al.*, 2020; WEF, 2020b

than more lucrative opportunities⁸². It is also notable that the OECD is exploring the human capabilities which AI and robotics are unlikely to be able to replicate in the coming decades and considering what education and training will be needed to allow most people to develop some work-related capabilities beyond these⁸³.

Automation potential varies across economies. The UK's services-dominated economy, for example, has intermediate potential for automation, whereas industrial economies will see the highest levels⁸⁴.

Automation and AI will impact all sectors and roles over time: the questions are how soon, to what extent and who is affected⁸⁵. Whilst automation is relatively slow at the macro-level, it can have rapid impacts on industries and individuals at the micro-level⁸⁶. Humans have the advantage where there is less potential for automation (for example, in literacy-, knowledge- or social interaction-based tasks, or physical activities in dynamic, unpredictable environments)⁸⁷.

The primary predictors of exposure to automation are task composition, pay levels, education levels and demographic group .

- Industries where large number of workers are engaged in relatively **routine tasks in predictable environments** (e.g. physical activities or collecting/processing data), which tend to be lower paid and require lower levels of education, are more likely to be automated⁸⁸.
- Workers with only secondary education are three times more likely to be displaced than those with higher levels⁸⁹. In the UK, it is estimated that workers with incomes in the lowest 20% face a risk of automation around three times higher than that faced by workers with incomes in the highest 20%⁹⁰. Generally **technological developments around AI are expected to disproportionately impact those in low-skill and low-wage occupations⁹¹.**
- **Better educated/skilled workers at risk of displacement may be better placed to transition to new occupations.** In contrast, workers in low-skilled routine tasks or with low education levels may lack the skills to transfer into new or emerging opportunities⁹².
- **There are mixed views on whether women are more or less exposed to automation than men.** Whilst the prevalence of females in the retail sector is argued to make them more at risk⁹³, their dominance in healthcare and service roles offers

⁸² Muro *et al.*, 2019

⁸³ OECD, 2021a

⁸⁴ PwC, 2018a

⁸⁵ Manyika *et al.*, 2017; PwC, 2018a; Thomas *et al.*, 2021

⁸⁶ Manyika *et al.*, 2017

⁸⁷ Manyika *et al.*, 2017; PwC, 2018a, WEF, 2020a

⁸⁸ Kandera *et al.*, 2020; Manyika *et al.*, 2017; PwC, 2018a

⁸⁹ Smit *et al.*, 2020

⁹⁰ Kandera *et al.*, 2020

⁹¹ Cedefop, 2021

⁹² Kandera *et al.*, 2020; Smit *et al.*, 2020; WEF, 2020b

⁹³ Kandera *et al.*, 2020

them some protection⁹⁴. It also depends on the timeframe: women are most likely to be affected in the next five to ten years whereas men – predominantly those in manual roles – will be at greater risk in the longer term⁹⁵. As the applications of AI accelerate, male and prime-age workers (that is, those aged 25 to 54, in the core stages of their working lives) are expected to be most affected⁹⁶.

- **Young workers (aged 15 to 24) are the age group most at risk of being displaced**, reflecting the potential to automate some typically early-career jobs⁹⁷.
- **Higher-skill tasks/jobs are also at risk of replacement by AI**⁹⁸. Analysis suggests that higher-skill tasks requiring intellectual abilities (e.g. comprehension and conceptualisation) are at greater exposure to AI than social abilities (e.g. social interaction and communication) given greater research intensity into the former⁹⁹.

There is a direct link between the potential to automate in a sector and the expected growth of roles within that sector. The health/care sector has the lowest percentage of jobs at risk of automation and corresponding potential for net job gains throughout the evolution, as outlined by PwC (2018a). Similarly, education has low estimated future automation rates and potential for growth (ibid.). The needs of an ageing population and the extent of reskilling and lifelong learning anticipated during working lives to the 2030s and beyond also seem likely to contribute to expected growth in these areas.

2.4 The impact of Covid-19 on the changing world of work

Although the longer term impacts of the pandemic are still to unfold and understanding of their implications still evolving, we reviewed 'Covid-era' reports to form an initial overview of the key issues.

There is **general consensus that the pandemic has accelerated the pace of digitisation, automation and AI** as businesses and organisations have turned to technology to overcome the physical challenges of the pandemic. These include the need to reduce human contact, digitise on-site customer experience and to enable/monitor home working for those roles that can be performed remotely¹⁰⁰. Commentators expect some changes made during the pandemic to be long-lasting. For example, Lund *et al.*, (2021) identify three broad trends which may re-shape work going forward: remote working/virtual meetings; faster adoption of automation and AI particularly of work requiring high physical proximity; and the continuing growth of e-commerce.

As we might expect, sectors of the economy face different levels of risk to their viability from the combined impact of Covid-19 and automation, which in turn impacts on different demographic groups. The RSA proposes four clusters of industries, according to the levels of risk they face from Covid-19 and automation¹⁰¹:

⁹⁴ Smit *et al.*, 2020

⁹⁵ PwC, 2018a

⁹⁶ Muro *et al.*, 2019

⁹⁷ Smit *et al.*, 2020

⁹⁸ Muro *et al.*, 2019; Tolan *et al.*, 2020, Webb, 2020

⁹⁹ Tolan *et al.*, 2020

¹⁰⁰ Cedefop, 2021; Gilbert *et al.*, 2021; Kandera *et al.*, 2020; Lund *et al.*, 2021; OECD, 2021c; Thomas *et al.*, 2021, WEF, 2020a

¹⁰¹ Wallace-Stephens and Morgante, 2020

1. **High Covid-19 risk, high automation risk**, e.g. hospitality, sports and recreation and parts of manufacturing and construction, typically paying lower wages and employing younger workers, slightly more men than women, and those less likely to have higher levels of education.
2. **High Covid-19 risk, low-medium automation risk**, e.g. air travel and tourism, creative arts and entertainment, architecture, film production, museums and culture. Workers in this cluster are more likely to be men, are relatively well-paid and have higher levels of education.
3. **Low-medium Covid-19 risk, high automation risk**, e.g. retail, food production, residential care and postal and courier activities which are relatively gender balanced, are lower paid and less likely to have higher levels of education.
4. **Low Covid-19 risk, low automation risk**, e.g. scientific research, healthcare and education as well as some male-dominated industries such as computer programming. Women generally predominate in this most resilient cluster and employees tend to be well paid and be highly educated.

Covid-19 is widely acknowledged to have exacerbated existing inequalities in the labour market¹⁰². Further polarisation is anticipated, with growth in high-wage jobs and a decline in the share of employment in low-paid roles¹⁰³. Analysis suggests that industries characterised by high levels of furlough or at risk from Covid-19 in the shorter term are those at greater risk of automation in the longer term¹⁰⁴. Workers educated below degree level, women, ethnic minorities, and young people were most affected in the earlier stages of the pandemic¹⁰⁵. More recent analysis suggests this effect had abated by March 2021, and older workers (aged 50+) have since fared less favourably in the recovery¹⁰⁶. However, those at the bottom of the income distribution are more likely to report a decline in net wealth over the course of the pandemic (ibid.) and there are particular concerns for young people, especially those with low or no qualifications¹⁰⁷, heightening the need to prepare them for the demands of an unknown future. In this context, the Youth Futures Foundation's *Evidence Gap Map* of what works to improve youth skills, employment and job quality is timely¹⁰⁸.

The pandemic has also brought into sharp relief the fact that **many low-paid workers are in fact key workers upon whom society has heavily relied during the pandemic**. More optimistic commentators suggest this 'has produced a collective awareness that the value of so many forms of work is not captured by the income attached to them'¹⁰⁹. This feels particularly pertinent given that some of the key areas of the labour market expected to grow to 2035 will be low-paid health and social care roles. It also reflects a polarisation which came to the fore during the pandemic: tasks/roles which can be performed remotely and those that cannot. The OECD estimates that around 30% of individuals across OECD countries can perform job-related tasks remotely¹¹⁰. Although there are notable high-paid

¹⁰² Autor *et al.*, 2021; ILO, 2021b; OECD, 2021c; Thomas *et al.*, 2021; WEF, 2020a

¹⁰³ Lund *et al.*, 2021

¹⁰⁴ Smit *et al.*, 2020; Wallace-Stephens and Morgante, 2020

¹⁰⁵ Smit *et al.*, 2020

¹⁰⁶ Crossley *et al.*, 2021

¹⁰⁷ Learning & Work Institute, 2021; Williams *et al.*, 2021

¹⁰⁸ Youth Futures Foundation, 2021

¹⁰⁹ Thomas *et al.*, 2021, p.8

¹¹⁰ OECD, 2021c

exceptions, Covid-19 has made clear that most low-paid workers cannot effectively do their jobs through computing platforms¹¹¹ and that there is greatest potential for remote or hybrid models of working post-pandemic in the finance, management, professional services and information sectors¹¹².

Covid-19 has hastened the need for workers to transition to different jobs¹¹³. One estimate suggests that workforce transitions will rise between 10% and 35% compared with pre-pandemic estimates¹¹⁴. For many affected workers – disproportionately the low-paid¹¹⁵ – these transitions are ‘horizontal moves’ to roles or sectors also in decline, meaning further moves will be needed unless these individuals get the opportunity to upskill into more secure employment longer term¹¹⁶. For example, a displaced travel industry worker could gain employment in the retail sector only for this role to be at risk in due course. However, there are also indications the pandemic has made individuals generally re-think their career path and/or caused them concern¹¹⁷.

Covid-19 has exposed inadequacies in current structures to address the mismatch between people’s current skills and those needed for future jobs¹¹⁸. This has brought into sharp focus the idea that shortages in one part of the labour market cannot rapidly be filled by surpluses elsewhere without direct policy intervention¹¹⁹. A recent example in the UK has been the need for a government response to the HGV driver shortage¹²⁰. Employers are indicating the need to prioritise learning and development within their organisations and there is widespread recognition of the need to adopt innovative approaches throughout workers’ lives¹²¹ alongside concerns about Covid-related financial constraints¹²². Individuals are also recognising the need to further their education to mitigate changes in their job or employment status¹²³. Furthermore, the pandemic is expected to have a lasting impact on how training is delivered – much of which fits with the general calls for greater flexibility for adult learning – including greater investment in digital platforms; materials, etc.; expansion of e-learning and blended learning approaches and more flexible times and locations¹²⁴.

¹¹¹ Autor *et al.*, 2021

¹¹² Lund *et al.*, 2021

¹¹³ Thomas *et al.*, 2021; WEF 2021

¹¹⁴ Lund *et al.*, 2021

¹¹⁵ Bateman and Ross, 2021

¹¹⁶ WEF and PwC, 2021

¹¹⁷ Hall *et al.*, 2021; Pearson, 2021b

¹¹⁸ WEF and PwC, 2021; OECD, 2021c

¹¹⁹ OECD, 2021c

¹²⁰ DfT *et al.*, 2021

¹²¹ *inter alia* Autor *et al.*, 2020; CBI and Birkbeck, 2021

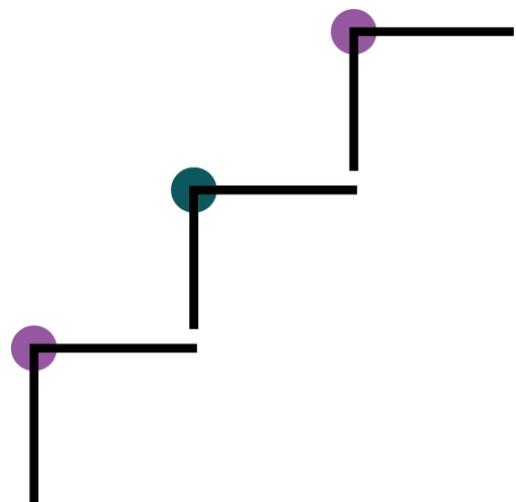
¹²² ILO, 2021a

¹²³ Hall *et al.*, 2021; Pearson, 2021

¹²⁴ *inter alia* ILO, 2021a

2.5 What this means for skills development

In summary, our exploration of the literature suggests that, whilst the world of work and the nature of employment will look different in 2035, the need for the essential employment skills humans bring to the workplace will continue to be highly prevalent in a world increasingly dominated by technology but also by the needs of an ageing population. In the next section, we drill down into what the literature suggests these skills are and the extent to which there is a consensus across analysis, forecast and commentary on which skills will be most needed. We also begin to consider what needs to happen in education and the workplace to ensure these are developed equitably.



3 Which essential employment skills will be in demand and how do we prepare?

This chapter identifies the future skills judged to be most essential in the existing literature, the reasons why they will be so important, and the preparations needed across education, training and the workplace.

Key findings

- There is a consensus about the essential employment skills – transferable skills – expected to be most in demand in the future labour market according to the 30 UK and international reports reviewed (see Appendix 3).
- We categorise these as: a) analytical/creative skills; b) interpersonal skills; c) self-management skills; and d) emotional intelligence skills.
- The top five most frequently mentioned skills across the literature are: problem solving/decision making; critical thinking/analysis; communication; collaboration/cooperation; and creativity/innovation.
- There is a distinction between skills (which may be ‘teachable’) and attributes (which, as inherent character traits, may be more difficult to ‘teach’ and may need to be nurtured or experienced to ‘learn’).
- Employers need essential employment skills from new starters and existing employees and they are key to growth areas.
- Young people recognise the value of essential employment skills and adults understand the benefits learning can have for their careers.
- There is emerging evidence about relationships between well-developed essential employment skills and higher academic attainment, career progression, income, and wider benefits (health and wellbeing).
- There are some essential employment skills requirements built in to apprenticeships and technical education and there are a number of strategies to support schools and colleges, including the Skills Builder Framework in the UK.

- Recommendations from the literature for the schools sector include building clarity around skills definitions and pedagogies, prioritising skills within the curriculum and extra-curricular activities and supporting teachers through training.
- We identified fewer examples of initiatives for essential employment skills development in the workplace or in employment support schemes, although this could reflect the absence of a systematic attempt to document these. Given that 80% of the people expected to be in the 2030 workforce are already in the workplace (Industrial Strategy Council, 2019), this is of concern.

3.1 Essential employment skills for 2035

In the previous chapter, we explored which jobs will look different in 2035 given technological advancements, social and economic changes and the impact of the pandemic. In this changing world, we consider the transferable, essential employment skills which humans bring to the workplace as crucially important for the economy, employers and individuals alike.

In this section, we now consider what the literature tells us about what these skills are likely to be and explore the extent to which there is a consensus. This work is based on 30 of the most relevant UK and international reports, selected using a systematically-informed but pragmatic approach¹²⁵. As previously noted, these studies employ a wide range of methods, each with strengths and limitations, including large scale surveys, existing job advertisement analysis, O*NET data¹²⁶ analysis, expert consultation and literature reviews.

The first task, given the wide-ranging terminology used, was to develop an essential employment skills taxonomy which we could apply across all sources. Gaining an early picture of the skills referenced in the first few sources, we developed an initial taxonomy. We used this as a coding frame for all subsequent items, continuing to modify it as we reviewed more sources. This approach enabled us to assess each source systematically, while adapting and refining the taxonomy to arrive at an accurate reflection of the most essential employment skills identified across the literature (see Figure B).

¹²⁵ See Appendix 1 for our approach to identifying and selecting reports from the extensive literature much of which by its nature is speculative and Appendix 3 for a list of reports and their method included in this analysis.

¹²⁶ [The O*NET \(Occupational Information Network\) database](#) includes standardised and occupation-specific descriptors on almost 1,000 occupations covering the U.S. economy

Figure B – Essential employment skills taxonomy

Analytical/creative skills	Interpersonal skills	Self-management skills	Emotional intelligence skills
Problem solving/ troubleshooting/ decision making	Communication	Flexibility/ adaptability	Ethics/social responsibility/ integrity/tolerance
Critical thinking/ analysis/evaluation	Collaboration/ teamwork/ cooperation	Self-motivation/ learning orientation	Empathy/social perceptiveness
Creativity/innovation/ Originality	Negotiation/ persuasion	Self-confidence/ self-belief	
Intellectual curiosity	Service orientation/ customer handling	Resilience/optimism/ persistence	
Commercial/ organisational awareness		Proactivity/planning/ organisation	
←Leadership→ ¹²⁷			

The four skill groups shown in Figure B align well with those presented in studies that themselves conducted some form of skills ordering (see, for example¹²⁸).

3.1.1 Most essential employment skills

With the taxonomy (Figure B) in place, we were able to quantify the prevalence of each identified skill, or skill group, in the literature reviewed. This enabled us to develop a ‘hierarchy’ of skills, and to identify those deemed most essential for the future labour market according to the 30 surveys, analyses and forecasts reviewed. These sources reflected the perspective of a wide range of stakeholders including employers, business, education, workers and young people – see Appendix 3. The ten most frequently identified skills, by skills group, are shown in Figure C¹²⁹.

There is a high level of consensus in the literature about which of the skills outlined in Figure B are most essential. We had to undertake some work to identify ‘equivalence’ between the terminologies and definitions used across sources in order to confirm this (see the ‘attributes’ column in Figure C) but, nevertheless, a relatively clear picture emerged.

Figure C shows the ten essential employment skills most frequently mentioned in the literature, in order of frequency. Skills from all four skills groups appear in the list. A

¹²⁷ The literature typically identifies leadership as a standalone skill, with equivalent ‘rank’ status to other essential skills. However, leadership incorporates all, or many, of the skills identified in this figure (which can also be developed independently of leadership). We therefore classify leadership as a cross-cutting skill.

¹²⁸ CBI and Birkbeck, 2021; Griggs *et al.*, 2018; Kingston University, 2021; Markow *et al.*, 2018; Pearson, 2021; Vista, 2020; Youth Employment UK, 2021

¹²⁹ See Appendix 4 for details of the rigour checks undertaken.

retrospective study by Dickerson and Morris (2019) investigated skills utilisation in the UK labour market. It found that, between 2002 and 2016, there was a strong increase in the utilisation of **analytical** and **interpersonal** skills, and a decline in the use of physical skills.

[Our] findings demonstrate the increasing importance of work-related skills and attributes for individuals' earnings, over and above their educational qualifications and, in particular, for higher levels of analytical skills and interpersonal skills in the workplace¹³⁰.

Our review findings suggest that Dickerson and Morris identified an important trend. The essential employment skills we identified in our future-focused literature review as most likely to be in high demand in 2035 are very similar to those identified in their earlier study. The five most frequently mentioned are all situated within the analytical/creative and interpersonal categories:

- Problem solving/decision making.
- Critical thinking/analysis.
- Communication.
- Collaboration/cooperation.
- Creativity/innovation.

Leadership and some self-management and emotional intelligence skills (self-motivation, flexibility/adaptability, resilience, and empathy) are also rated highly, but less frequently. The remaining skills identified in Figure B have six or fewer mentions each in the literature.

¹³⁰ Dickerson and Morris, 2019, p.24

Figure C – Essential employment skills identified – in order of frequency (as shown in brackets)

Rank	Skill	Skill group	Attributes covered
1=	Problem solving/decision making (22)	Analytical/creative	Able to find solutions to a challenge (reasoning, judgement, decision making)
	Critical thinking/analysis and evaluation (22)	Analytical/creative	Able to appraise, dissect, synthesise, interpret (information literacy)
	Communication (22)	Interpersonal	Able to speak, listen, write, present effectively
4	Collaboration/cooperation/teamwork (18)	Interpersonal	Able to work and interact effectively with others
5	Creativity/innovation/originality (17)	Analytical/creative	Able to think around a challenge or issue/come up with new ideas
6	Leadership/management (14)	Cross-cutting	Able to lead people (including social influence), systems (including project planning) and change
7	Self-motivation/learning orientation (13)	Self-management	Being a 'self-starter', open to learning new things, keen to develop, aims high
8=	Flexibility/adaptability (8)	Self-management	Able to adapt to change, change direction
	Resilience/optimism/persistence (8)	Self-management	Able to cope with adversity/uncertainty, remain positive, keep trying, manage stress
10	Empathy/social perceptiveness (7)	Emotional intelligence	Able to appreciate/understand others' perspectives and needs

3.1.2 Some reflections

Although our findings have identified a high level of consensus about the most essential employment skills, when we look specifically at the most rigorous studies (those with multiple data-collection methods, and including employer perspectives), we find that a number of these studies do not rank 'creativity' quite so highly (see, for example¹³¹). Additionally, 'critical thinking' is less commonly mentioned across a number of these studies than in our top-level findings. This may be a simple matter of terminology. The *Skills Builder* framework, which supports the development of essential employment skills for children and young people, provides a good example. The eight essential employment skills in this framework do not include critical thinking. However, deeper exploration shows that critical thinking skills are embedded in the 'problem solving' category of this framework¹³².

¹³¹ CBI and Birkbeck, 2021; Crowley and Overton, 2021; Cullinane and Montacute, 2017; Griggs *et al.*, 2018; Kingston University, 2021; Pearson, 2021

¹³² Ravenscroft and Baker, 2020

The fact that there are some differences of view about how highly creativity and critical thinking should be ‘ranked’, and the fact that there is a recognised level of co-dependency between many of the skills outlined in Figure C, demonstrates the importance of not over-interpreting the apparent skills ‘hierarchy’. Skills Development Scotland and the Centre for Work-based Learning (2018) argue that one skill often supports the development of a range of other skills, or requires another skill to be present to achieve success. For example, ‘creativity’ and ‘innovation’ skills require individuals to focus on a challenge and identify ideas or solutions, but, in order for these ideas to become reality, ‘initiative’ must come into play. It is important to remember that very few of the skills identified through our review will be useful in isolation, and that **young people and adults, in the workforce or seeking to re-enter the workforce, will need to develop a rounded package of complementary and transferable skills** to ensure their future success.

Finally, there is a distinction between skills, which can be taught, learned and acquired, and attributes, which, as inherent character and personality traits¹³³, are less straightforward to ‘teach’, although they can be nurtured or developed through experience. ‘Skills’ outlined in Figure C that it may be helpful to think of as ‘attributes’ include those in the self-management and emotional intelligence categories (self-motivation, flexibility, resilience, and empathy).

3.2 The case for essential employment skills and the preparations needed

In section 3.1, we found the most frequently mentioned essential skills or attributes in the literature regarded as important for the future workplace to 2035 to be: problem solving/decision making; critical thinking/analysis; communication; collaboration/cooperation; and creativity/innovation.

This section explores what the emerging literature suggests about the importance of essential employment skills more generally and the educational and workplace solutions needed to develop them. Given the breadth and depth of the issues, this is intended as an initial consideration taking into account some of the existing initiatives and approaches identified.

Employers highly value essential employment skills in young recruits and there are calls for those already in employment to have opportunities to develop them. Cullinane and Montacute’s (2017) survey of a nationally representative sample of UK employers found that 94% of employers think essential employment skills are equally or more important than academic qualifications in determining the success of young people, including almost one in three employers (30%) who say they are more important¹³⁴. While employers may consider that experienced employees are more likely to have these skills, opportunities for existing workers to develop these skills are called for in the literature (see section 3.2.2 below).

Essential employment skills are key to growth areas: Frizzel *et al.*, (2017) found that new, emerging and rapidly growing roles need essential employment skills such as

¹³³ OECD, 2021b

¹³⁴ For example, communication, motivation, confidence, self-control, resilience, coping with stress, teamwork

communicating effectively, thinking critically, and solving complex problems. They found that mastering academic content was the least important in these contexts.

Young people (aged 16 to 25) recognise the value of essential employment skills

across key transition points within education and on entry and progression in-work, as well as in overcoming wider life challenges¹³⁵. There is some evidence of misalignment between the skills young people rate as most important for work and the skills they have, with young people particularly valuing teamwork, problem solving and resilience skills for work, but being most confident in their listening, teamwork and literacy skills¹³⁶. Furthermore, Lloyd (2021) found young people want to be assessed in essential employment skills (e.g. teamwork and communication) rather than just academic subjects.

Adults understand the benefits learning can have for their careers: In the most recent Adult Learner Survey, Hall *et al.*, (2021) found that nearly half of adults who had undertaken learning for work or career-related reasons felt it will help them to develop or improve in their current job role. More than one in five believed it will help them to retrain into a different job or career. Although these findings relate to learning across the board rather than specifically essential employment skills, the pandemic has increased individuals' focus on learning and development given future uncertainties¹³⁷.

There is emerging evidence of relationships between well-developed essential employment skills and higher academic attainment, career progression, and income.

There are associations between students' assessment of their social and emotional strengths and their future job expectations¹³⁸. Young people with better developed essential employment skills report higher incomes, particularly those at the lower end of skill levels¹³⁹. In addition, young people with higher levels of self-reported essential skills had higher levels of literacy and numeracy in primary school, higher levels of mathematics attainment in secondary school, higher academic performance as perceived by teachers, and higher levels of careers aspiration¹⁴⁰. Recent findings that social and emotional skills development better enables workers to move within sectors¹⁴¹ are also noteworthy given the growing need to transition as labour market opportunities shift (discussed in chapter 2).

There are wider benefits for mental health and wellbeing: Essential employment skills are important for individual mental health, wellbeing, and participation in society¹⁴². Furthermore, there is evidence that interventions focused on pupils' social and emotional skills, such as teamwork, speaking, and listening, can improve children and young people's emotional and social competencies that can result in positive outcomes around wellbeing¹⁴³.

As with educational attainment in general, **there is evidence of variability in essential employment skills by gender, ethnicity and disadvantage** (using free school meals – FSM – as a measure of this) which need to be recognised in policy development and

¹³⁵ Kashefpakdel *et al.*, 2021

¹³⁶ Youth Employment UK, 2021

¹³⁷ Pearson, 2021

¹³⁸ OECD, 2021b

¹³⁹ Kashefpakdel, *et al.*, 2021

¹⁴⁰ Kashefpakdel and Ravenscroft, 2021

¹⁴¹ Gorea, 2021

¹⁴² OECD, 2021b

¹⁴³ Kashefpakdel and Ravenscroft, 2021

provision. Studies have found higher levels of social and emotional skills among young people from more advantaged backgrounds¹⁴⁴ and that gender, race and ethnicity and FSM eligibility impacted on young people's confidence in their skills for life and work¹⁴⁵.

3.2.1 Preparations needed in education and training

The importance of essential employment skills has been recognised for decades. Both employers and educationalists have called for essential employment skills to be prioritised, and there have been many concerted efforts to develop these at different stages of education.

Essential employment skills are typically built into **apprenticeship standards and technical education**, designed in partnership with employers, to ensure people have the skills they need for different professions. As illustrative examples:

- the apprenticeship standard for a level 3 Community Health and Wellbeing Worker includes the development of a range of empathy, interpersonal and communication skills¹⁴⁶
- the new T Level in construction, design, surveying and planning includes the core skills of communication; working with others; and problem solving¹⁴⁷.

Skills are typically developed through a combination of classroom and in-work opportunities and are considered part of the learner's overall assessment. Employers find apprentices to be the group of young people best prepared in terms of workplace skills¹⁴⁸ and apprentices report that they gain transferable skills for a range of jobs or industries (90%) with at least 80% reporting improved skills such as communication and team working¹⁴⁹.

In **higher education (HE)**, there has been a particular focus in recent years on enhancing graduate employability by promoting investment in work and learning partnerships that build essential employment skills, including work-based learning, internships, and job skills development¹⁵⁰. In some institutions, there is focus on ensuring that employability skills are built into different curriculum areas; Daubney (2021) notes the importance of doing this in a way that is understandable and applicable for academic staff by articulating the employability value of their existing curriculum without sacrificing rigour or integrity.

There are a number of strategies (in the UK and overseas), which aim to increase skills among **school students**. These include frameworks and curriculum, pedagogic, and assessment approaches.

Frameworks provide tools and resources to identify and highlight different skills and the approaches to gaining skills. Examples include:

¹⁴⁴ OECD, 2021b

¹⁴⁵ Youth Employment UK, 2021

¹⁴⁶ IfATE, 2021

¹⁴⁷ DfE, 2018

¹⁴⁸ Cullinane and Montacute, 2017; DfE, 2020

¹⁴⁹ DfE, 2020

¹⁵⁰ Markow *et al.*, 2018; Newton *et al.*, 2018

- **Skills Builder (UK):** This universal framework supports the development and assessment of eight essential skill areas (listening; speaking; problem solving; creativity; staying positive; aiming high; leadership; and teamwork). It was developed in collaboration with educators and industry experts from across sectors. Skills Builder breaks each essential skill down into 16 teachable and measurable steps; and includes resources for users from age four years to adult, and for staff training and strategy planning¹⁵¹.
- **Skills Development Scotland** has developed a toolkit to aid the integration of the meta-skills they propose (self-management, social intelligence and ‘create your own change’) in the education of children and young people¹⁵².
- **Centre for Curriculum Redesign (US):** Researchers developed a framework matching skills and competencies to specific subjects, ranking how they could best be delivered, for example, through the curriculum, extra-curricular activities, and classroom management¹⁵³.

Various **curriculum, pedagogic, and assessment approaches** have been developed to help teachers to deliver essential employment skills by embedding them in curriculum design, pedagogy and assessment approaches to measure learner outcomes and understand the quality of provision. In addition, there is growing recognition of the need for **‘real world’ learning and experience** to create opportunities for learners to develop their skills through the use of project work, volunteering, internships, work-based learning and work-experience, and careers education. Examples include:

- **OECD Learning Compass:** This tool serves as a guide for adjusting to the new demands for essential employment skills development using curriculum, pedagogies, assessments, governance structures, educational management, and the role of students¹⁵⁴.
- **OECD Fostering Students’ Creativity and Critical Thinking:** This portfolio of conceptual and assessment rubrics supports teachers to become more intentional and systematic in teaching creativity and critical thinking in different subjects. The rubrics set out skills attributes, and how to develop each skill and assess levels of proficiency¹⁵⁵.
- **The Centre for Real World Learning** at the University of Winchester has conducted a range of research and development work specifically on developing learning approaches for vocational and practical education in secondary schools and colleges, to encourage creativity in primary and secondary settings, and encourage creativity and critical thinking in higher education.
- **Future Learning, Edge** has developed a resource with examples of how to develop essential employment skills such as critical thinking, creativity, collaboration, and

¹⁵¹ Skills Builder Partnership, 2021

¹⁵² Skills Development Scotland, 2021

¹⁵³ Dunn, *et al.*, 2021

¹⁵⁴ OECD, n.d.

¹⁵⁵ Vincent-Lancin, S. *et al.*, 2019

communication through the use of different learning approaches including project-based learning, real world learning, and community connected learning¹⁵⁶.

Numerous reports reviewed include commentary, analysis, and recommendations calling for improvements to the current educational offer to better develop essential employment skills focused on:

- **Defining skills:** There is a need for clearer definition of essential employment skills, including taxonomies, frameworks, metrics and a common language to facilitate a more consistent, systematic and universal approach¹⁵⁷.
- **Prioritising and valuing skills:** There are concerns in the literature that the current educational offer does not place sufficient value and attention on essential employment skills due to a 'knowledge-dense' curriculum, assessment and accountability pressures (linked to academic subject performance), and a lack of parity between academic and technical routes¹⁵⁸.
- **Curriculum and extra-curricular remodelling:** There is a perceived need for more systematic access to, and development of, essential employment skills, within and beyond the curriculum. Suggestions range from teaching skills across subjects; incorporating skills into the existing personal, social and health education (PSHE) curricula; avoiding delivery in fragmented one-off sessions; and developing essential employment skills via extra-curricular activities and non-formal learning, and in careers education¹⁵⁹.
- **More pedagogical clarity and guidance for developing essential employment skills:** There is a range of pedagogical approaches for developing essential employment skills, including regular and long-term input (as opposed to one-off interventions); learning through experience and in a cross-curricular way; working with professionals, businesses and employers; volunteering and community involvement; linking learning to real-life situations; and developing skills from an early age. Further clarity and information on which approaches are most effective and in which contexts would be beneficial¹⁶⁰.
- **Teacher development:** The literature acknowledges the need for teachers to be well supported to help young people develop essential employment skills for work¹⁶¹.
- **Assessment:** Further developments are required to measure the acquisition of skills, including monitoring progress and proficiency¹⁶².

¹⁵⁶ Rogers and McGrath, 2021

¹⁵⁷ Crighton & Ravenscroft, 2021; World Economic Forum, 2020; Dondi *et al.*, 2021; Buchanan, *et al.*, 2018; Ravenscroft & Baker, 2020

¹⁵⁸ Markow *et al.*, 2018; Kashefpakdel *et al.*, 2018; Newton *et al.*, 2018; Lucas, 2019

¹⁵⁹ Crighton & Ravenscroft, 2021; Gedikoglu, 2021; Taylor *et al.*, 2020

¹⁶⁰ Taylor *et al.*, 2020; Kashefpakdel & Ravenscroft, 2021; Crighton & Ravenscroft, 2021; Vincent-Lancrin *et al.*, 2019; Angus *et al.*, 2020; Griggs *et al.*, 2018; Buchanan *et al.*, 2018; Universities UK, 2018; Kirschner & Stoyanov, 2018; AlphaBeta, 2019

¹⁶¹ Rogers & McGrath, 2021; Global Education Skills & World Skills Russia, 2020; Crighton & Ravenscroft, 2021; WEF, 2020c

¹⁶² Dondi *et al.*, 2021; Crighton & Ravenscroft, 2021; Taylor *et al.*, 2020; WEF, 2020c

3.2.2 Preparations needed in the workplace

As noted previously, although 80% of the 2030 workforce is already active in the workplace¹⁶³, we identified less evidence of initiatives to upskill and reskill those of working age in essential skills than there are initiatives to support students in education.

The literature calls for more opportunities for these workers to develop essential skills such as: communication, collaboration and teamwork (interpersonal skills); leadership and project management; judgement, decision making, problem solving, data analysis and critical thinking (analytical skills); and empathy, adaptability and resilience (self-management and emotional intelligence skills)¹⁶⁴. Pearson (2020) note that the biggest gaps in training options are around communication, persuasion, and critical and creative thinking. Teamwork, communication, and leadership skills are amongst those frequently mentioned as specific areas for improvement¹⁶⁵.

The review identified fewer sources of evidence on initiatives to upskill workers in the labour market in essential skills without a key transitional requirement for this (such as threat of redundancy, or returning to work following maternity leave), even though this was strongly recommended by a number of commentators. Where they do exist, such initiatives tend to focus on the best ways to accommodate adults' need for accessibility and flexibility, for example, through short adult learning courses, online programmes, financial support and removing barriers to participation, and the importance of instilling a culture of life-long learning¹⁶⁶.

An example of this in the UK, the LifeSkills programme (Barclays), offers free online curriculum-linked employability resources, videos, activities, tools and lesson plans. The programme teaches skills such as CV writing, interview skills, networking, problem-solving, creativity, resilience, communication and managing online reputation¹⁶⁷.

Other sources identified successful initiatives in the form of adult apprenticeships, personalised training packages, social partnership approaches, and partnerships with higher education¹⁶⁸.

The OECD (2019) observes that many countries have adult learning systems that are generally underprepared to address the skills needs of the future. Systems tend to be initiative-based and heavily dependent on individuals and employers proactively addressing skills needs through training, or through engaging with employment programmes at key transition points. As such, barriers can prevent adults from engaging with training, for example, caring responsibilities, work commitments, or the cost of training.

Particular gaps in training for further development of essential skills identified include self-motivation and interpersonal skills (particularly resilience, adaptability and communication), and also creativity¹⁶⁹.

¹⁶³ Industrial Strategy Council, 2019

¹⁶⁴ Griggs *et al.*, 2018; Bahl *et al.*, 2020; Pearson, 2021; WEF & PwC, 2021

¹⁶⁵ CBI & Birkbeck, 2021; Crowley and Overton, 2021; Pearson, 2021

¹⁶⁶ AlphaBeta, 2019; Bahl *et al.*, 2020; Dondi *et al.*, 2021; OECD, 2019a

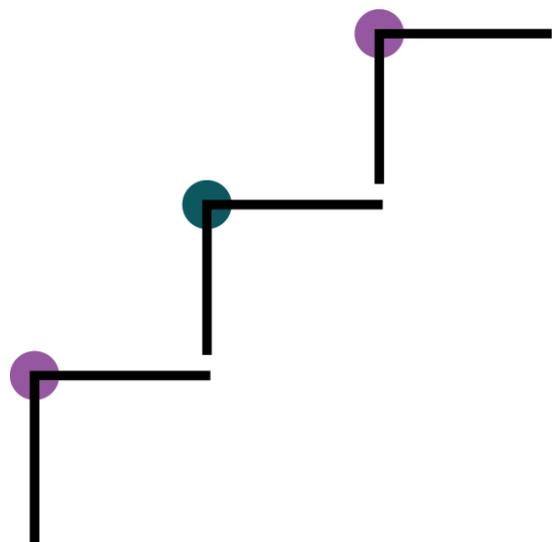
¹⁶⁷ Griggs *et al.*, 2018

¹⁶⁸ Lyons *et al.*, 2020; Bahl *et al.*, 2020

¹⁶⁹ Crowley & Overton, 2021

More widely, essential skills development for adults may similarly benefit from the additional structure and focus advocated for younger learners through a more joined-up approach to:

- understanding how best to assess skills gaps
- identifying what skills are needed
- facilitating access to training for learners
- establishing optimal approaches for delivering these
- monitoring and evaluating the effectiveness of different approaches.



4 Discussion

In this chapter, we recapitulate the key findings from this review and consider the implications for our wider research study.

4.1 The skills requirement

A number of workplace shifts are set to take place in the years to 2035 and beyond, driven by technological advancements (digitisation, automation and AI); demographic shifts (an ageing population); the transition to net zero; and the impact of the Covid-19 pandemic. There is a consensus view emerging from the literature that there is a degree of mismatch between the skills that will be required in the future and the skills/capabilities being developed in the current and upcoming workforce, and that this represents a huge strategic challenge.

As we explored in chapter 1, the current policy response is focused on addressing this mismatch by concentrating on technical, digital and green skills, and literacy, numeracy and the knowledge curricula which underpin them. Notable exceptions in England include policies related to developing school students' character, resilience and 'grit'; employability and leadership; and empathy. However, these have tended to ebb and flow with the passage of secretaries of state for education. In Wales, there are more concrete plans for the introduction of skills qualifications in schools.

Our review suggests that transferable essential employment skills are also growing in importance – especially analytical, creative and interpersonal skills. Development of these skills also requires urgent prioritisation, if future social and labour market constraints are to be avoided, and if the UK is to remain globally competitive. In addition, this review has highlighted the need to build a robust evidence base of what works in developing these skills in young people and adults of all ages and to understand more about the impact that developing or not developing these skills has on outcomes.

It is clear that government, employers and educators all have a role to play in supporting the development of essential employment skills, in different but complementary ways. Furthermore, it is critical that this issue is viewed as a shared commitment between government, education, employers, and wider society, rather than the responsibility of any one sector.

4.2 Implications for our wider research study

Our review has identified a high level of consensus between commentators about the UK's future essential employment skills needs. Inevitably, many sources refer to each other (especially those that are, themselves, literature reviews); hence there is an element of 'echo' in the findings and the risk that the level of consensus could create a false confidence about the dependability of results. In addition, while various studies have produced their own estimates of future skills needs, further work is needed to explore the potential supply side, where the skills gaps will fall and who will be affected.

This demonstrates the need for the next stage of this research study – [The Skills Imperative 2035: Essential skills for tomorrow's workforce](#) – where we will use a quantitative approach to estimate the UK's future skills needs. We will firstly update the Working Futures report¹⁷⁰ to estimate the scale and composition of jobs/occupations in the labour market in 2035. We will then use a systematic framework approach to predict future demand for the skills needed to do the jobs that will exist in the future. Using the results of this work alongside the literature review findings and through liaising with other experts, we will identify which essential employment skills are likely to be most needed in the 2035 labour market. Further, our study will build on the current literature by estimating the likely future supply of essential employment skills (including directly assessing the current levels of these skills in the workforce) and where the skills gaps fall. It will also identify which workers are most likely to be affected, so strategies can be developed to help them transition to other sectors/jobs.

Through this research study, we will build on the review findings, raising a number of questions such as those below.

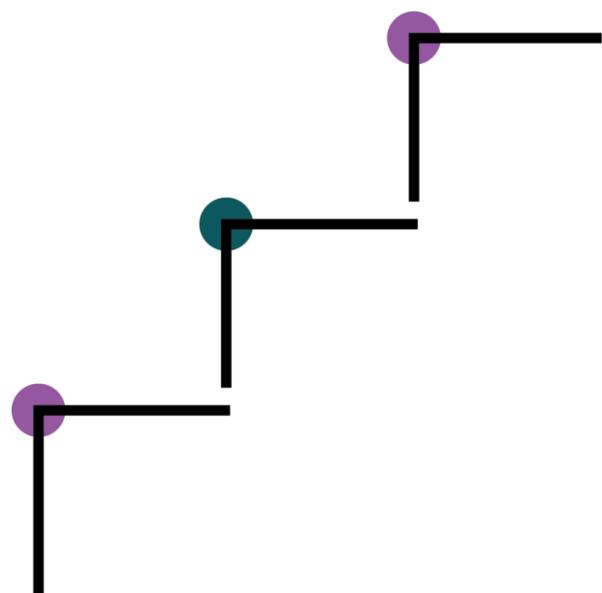
- **To what extent can future skills gaps be identified and addressed before they occur?** What employment skills will be in greatest demand in the future? What will be the likely supply of these skills, all other things being equal, and where will there be gaps in skills? Who will be affected and what do they need to do to transition to another job in the labour market? To what extent can we alleviate this situation by taking action to develop new policies and practices to address forecast skills shortages?
- **Which skills/attributes are most acquirable or malleable?** To what extent can all of the essential employment skills be formally taught? Where might alternative nurture or experiential strategies be required? What are likely to be the most effective approaches to developing personal attributes such as flexibility, resilience, self-motivation or empathy?
- **To what extent should essential employment skills be developed explicitly?** Is it preferable to develop essential employment skills explicitly or implicitly (for example, by embedding them within academic subjects, enrichment activities, or work-based projects)? How important is it that students, trainees and workers are *aware* that they are developing essential employment skills?
- **What are the best ways of measuring these skills/attributes** in order to track their prevalence, development and outcomes across the economy? To what extent can these skills/attributes be measured and how might this be reflected in qualifications?
- **What role should schools and third sector organisations play in developing essential employment skills?** To what extent can, or should, skills development be integrated into the school curriculum/wider enrichment activities and who should be responsible for these? What, if anything, might need to change in the current curriculum, or within school and community systems, to enable equitable access? How much can schools and third sector organisations contribute, given that skills typically develop through life experience and maturation?

¹⁷⁰ Wilson *et al.*, 2020

- **What role should post-16 and work-based learning providers play in developing essential employment skills?** This seems a natural ‘home’ for skills development, given its intended focus on education for employment, but it is a broad ‘sector’ encompassing further education, higher education and private training; and spanning a range of qualifications/work-based learning routes. How can essential employment skills development be built into employment support schemes for those currently outside the workforce? To what extent can a coherent approach be built into this ‘sector’?
- **What role should employers play in developing essential employment skills?** How can skills be developed within the workforce, both on a national, cross-sector level (and is this the role of employers, or government?), and within occupational sectors? What incentives might be needed for employers to invest in their employees’ continuous skills development at the levels required, especially where there is a high level of horizontal transition between occupational sectors?

The skills needs of the future economy present a large strategic challenge for government, employers and educators – a challenge that needs to be addressed now and in a coherent way. The strategy will need to be informed by a clear articulation of the ambition for the UK economy over the next 15 years and beyond. What kind of economy/society does the Government want the UK to be, and what kind of workforce will be required to meet that ambition? This will help to clarify the focus for skills development policy, both in the immediate and longer term.

We need to recognise and start to address these challenges now, so we can avoid skills shortages and widening social problems in the future. There are currently gaps in the evidence, but this research study aims to address this by producing new insights and evidence to understand and prepare for the changes afoot. We will work with government, employers, educators and others to ensure our evidence reaches the right people who can take action to develop new skills policies and deliver training to help our response to this challenge.



References

- Afemikhe, S. A. (2021). 'Accelerating to the Fourth: mapping Covid-19's impact on the nature of work and the 4th Industrial Revolution', *Medium Blog*, 8 May [online]. Available: [Accelerating To The Fourth. Mapping COVID-19's Impact on the Nature... | by Sam A. Afemikhe | Medium](#) [18 November 2021].
- Agrawal, S., De Smet, A., Lacroix, S. and Reich, A. (2020). 'To emerge stronger from the Covid-19 crisis, companies should start reskilling their workforces now', *McKinsey & Company Our Insights*, 7 May [online]. Available: [COVID-19 and reskilling the workforce | McKinsey](#) [18 November, 2021].
- AlphaBeta (2019). Future Skills: to Adapt to the Future of Work, Australians will Undertake a Third More Education and Training and Change What, When and How We Learn [online]. Available: <https://alphabeta.com/wp-content/uploads/2019/01/google-skills-report.pdf> [23 November, 2021].
- Angus, A., Millard, W., Joshua, V., Baars, S., Bowen-Viner, K. and Kashefpakdel, E. (2020). *How Do Essential Skills Influence Life Outcomes? An Evidence Review* [online]. Available: <https://cfey.org/wp-content/uploads/2020/09/How-do-essential-skills-influence-life-outcomes-3.pdf> [23 November, 2021].
- Autor, D., Mindell, D. and Reynolds, E. (2020). *The Work of the Future: Building Better Jobs in an Age of Intelligent Machines* (MIT Taskforce) [online]. Available: <https://workofthefuture.mit.edu/wp-content/uploads/2021/01/2020-Final-Report4.pdf> [18 November, 2021].
- Bahl, M., Cook, M. and Nerurkar, K. (2020). *Relearning How We Learn, From the Campus to the Workplace* [online]. Available: <https://www.cognizant.com/whitepapers/relearning-how-we-learn-from-the-campus-to-the-workplace-codex3921.pdf> [23 November, 2021].
- Bakhshi, H., Downing, J., Osborne, M. and Schneider, P. (2017). *The Future of Skills: Employment in 2030* [online]. Available: https://media.nesta.org.uk/documents/the_future_of_skills_employment_in_2030_0.pdf [18 November, 2021].
- Bateman, N. and Ross, M. (2021). 'The pandemic hurt low-wage workers the most and so far, the recovery has helped them the least', *Brookings*, 28 July [online]. Available: <https://www.brookings.edu/research/the-pandemic-hurt-low-wage-workers-the-most-and-so-far-the-recovery-has-helped-them-the-least/> [23 November, 2021].
- Bell, T., Dhingra, S., Machin, S., McCurdy, C., Overman, H., Thwaites, G., Tomlinson, D. and Valero, A. (2021). *The UK's Decisive Decade: the Launch Report for The Economy 2030 Inquiry* [online]. Available: <https://economy2030.resolutionfoundation.org/wp-content/uploads/2021/04/The-UKs-decisive-decade.pdf> [10 November, 2021].
- Buchanan, J., Ryan, R., Anderson, M., Calvo, R.A., Glozier, N. and Peter, S. (2018). *Preparing for the Best and Worst of Times* [online]. Available: [---

The Skills Imperative 2035: what does the literature tell us about essential skills most needed for work?](https://education.nsw.gov.au/content/dam/main-education/teaching-and-learning/education-</p></div><div data-bbox=)

[for-a-changing-world/media/documents/Future-Frontiers_University-of-Sydney-report.pdf](#) [23 November, 2021].

Cedefop (2021). *Digital, Greener and More Resilient: Insights from Cedefop's European Skills Forecast* [online]. Available: https://www.cedefop.europa.eu/files/4201_en.pdf [18 November, 2021].

Centre for Real-World Learning (2021). *About Us* [online]. Available: <https://www.winchester.ac.uk/research/our-impactful-research/research-in-education/centres-networks-and-institutes/centre-for-real-world-learning/> [23 November, 2021].

City and Guilds Group and Emsi (2021). *Skills Index 2021* [online]. Available: <https://www.cityandguildsgroup.com/-/media/cgg-website/documents/cg-skills-index-report-pdf.ashx?la=en&hash=B04AAEA0DBBF4F4A9203BBF024350A7C1B07257A> [23 November, 2021].

Confederation of British Industry (1990). *Towards a Skills Revolution: Report of the Vocational Education and Training Task* [online]. Available: <https://www.voced.edu.au/content/ngv%3A25975> [18 November, 2021].

Confederation of British Industry (2019). *Getting Young People 'Work Ready'* [online]. Available: https://www.cbi.org.uk/media/2960/cbi_work-readiness.pdf [18 November, 2021].

Confederation of British Industry and Birkbeck University of London (2021). *Skills for an Inclusive Economy* [online]. Available: https://www.cbi.org.uk/media/7020/12684_tess_survey_2021.pdf [18 November, 2021].

Confederation of British Industry and Pearson (2019). *Education and Learning for the Modern World: CBI/Pearson Education and Skills Survey Report 2019* [online]. Available: https://www.cbi.org.uk/media/12546_tess_2019.pdf [18 November, 2021].

Crighton, E. and Ravenscroft, T. (2021). *Essential Skills: Teachers' Perspectives on Opportunities and Barriers* [online]. Available: https://uploads-ssl.webflow.com/5ab25784c7fcbff004fa8dca/60dd7fea92a892b17953ce86_Essential%20skills%20-%20Teachers%27%20perspectives%20on%20opportunities%20and%20barriers%20-%20FINAL.pdf [23 November, 2021].

Crossley, T.F., Fisher, P., Levell, P. and Low, H. (2021). *A Year of COVID: the Evolution of Labour Market and Financial Inequalities through the Crisis* [online]. Available: <https://ifs.org.uk/uploads/WP202139-A-year-of-COVID-the-evolution-of-labour-market-and-financial-inequalities-through-the-crisis-3.pdf> [18 November, 2021].

Crowley, E. and Overton, L. (2021). *Learning and Skills at Work Survey 2021* [online]. Available: https://www.cipd.co.uk/Images/learning-skills-work-report-2021-1_tcm18-95433.pdf [18 November, 2021].

Cullinane, C. and Montacute, R. (2017). *Life Lessons: Improving Essential Life Skills for Young People* [online]. Available: https://www.suttontrust.com/wp-content/uploads/2017/10/Life-Lessons-Report_FINAL.pdf [18 November, 2021].

- Daubney, K. (2021). 'Teaching employability is not my job!': redefining embedded employability from within the higher education curriculum', *Higher Education, Skills and Work-Based Learning*. Ahead-of-print [online]. DOI 10.1108/HESWBL-07-2020-0165
- Department for Education (2014). 'England to become a global leader of teaching character', 16 December [online]. Available: [England to become a global leader of teaching character - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/news/england-to-become-a-global-leader-of-teaching-character) [18 November, 2021].
- Department for Education and Greening, J. (2017). 'Plan launched to drive social mobility in Opportunity Areas', 9 October [online]. Available: [Plans launched to drive social mobility in Opportunity Areas - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/news/plan-launched-to-drive-social-mobility-in-opportunity-areas) [18 November, 2021].
- Department for Education (2018). *Construction: Design, Surveying and Planning T Level Outline Content: Final Version for Inclusion in ITT* [online]. Available: <https://www.instituteforapprenticeships.org/media/2941/construction-design-surveying-planning-final-outline-content.pdf> [23 November, 2021].
- Department for Education and Hinds, D. (2019). 'Education Secretary sets out vision for character and resilience', 7 February [online]. Available: [Education Secretary sets out vision for character and resilience - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/news/education-secretary-sets-out-vision-for-character-and-resilience) [18 November, 2021].
- Department for Education (2019). *Character Education Framework* [online]. Available: [Character education framework - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/875561/Character_Education_Framework.pdf) [18 November, 2021].
- Department for Education (2020). *Apprenticeships Evaluation 2018-19: Employers. Technical Report* [online]. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/875561/Apprenticeships_Evaluation_-_Employer_Report.pdf [18 November, 2021].
- Department for Education (2021a). *Skills and Post-16 Education Bill: Policy Summary Notes* [online]. Available: [Skills and Post-16 Education Bill - Summary Policy Notes \(publishing.service.gov.uk\)](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/875561/Skills_and_Post-16_Education_Bill_-_Summary_Policy_Notes.pdf) [18 November, 2021].
- Department for Education (2021b). *Skills Bootcamps Process Evaluation: Research Report* [online]. Available: [Skills Bootcamps process evaluation \(publishing.service.gov.uk\)](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/875561/Skills_Bootcamps_Process_Evaluation_-_Research_Report.pdf) [18 November, 2021].
- Department for Transport, Department for Education, Home Office, Ministry of Defence and Cabinet Office (2021). *HGV Driver Shortage: UK Government Response* [online]. Available: <https://www.gov.uk/government/topical-events/hgv-driver-shortage-uk-government-response> [23 November, 2021].
- Dickerson, A. and Morris, D. (2019). *The Changing Demand for Skills in the UK* [online]. Available: <https://cver.lse.ac.uk/textonly/cver/pubs/cverdp020.pdf> [18 November, 2021].
- Djumaieva, J. and Sleeman, C. (2018). *An Open and Data-driven Taxonomy of Skills Extracted from Online Job Adverts* [online]. Available: <https://escoe-website.s3.amazonaws.com/wp-content/uploads/2020/07/13161304/ESCoE-DP-2018-13.pdf> [23 November, 2021].
- Dondi, M., Klier, J., Panier, F. and Schubert, J. (2021). 'Defining the skills citizens will need in the future world of work', *McKinsey & Company*, 25 June, [online]. Available:

<https://www.mckinsey.com/industries/public-and-social-sector/our-insights/defining-the-skills-citizens-will-need-in-the-future-world-of-work> [23 November, 2021].

Dunn, K., Fortier, E., Taylor, R., Weiss, J., Holohan, W., Bialik, M. and Fadel, C. (2021). *Embedding Competencies within Disciplines Deliberately, Explicitly & Systematically* [online]. Available: <https://curriculumredesign.org/wp-content/uploads/Embedding-Competencies-within-Disciplines-aka-Top4-CCR-June-2021.pdf> [23, November, 2021].

Easton, E, and Djumalieva, J. (2018). *Creativity and the Future of Skills* [online]. Available <https://www.nesta.org.uk/report/creativity-and-future-skills/> [23 November, 2021].

Frizzell, M., Braun, M., Ferguson, M., Stark Rentner, D. and Kober, N. (2017). *Building Competencies for Careers: Linking O*NET's Occupational Elements with Deeper Learning Competencies* [online]. Available: https://cte.careertech.org/sites/default/files/files/resources/FrizzellBraunFergusonRentnerKober_Report_BuildCompCareers_5.31.17.pdf [23 November, 2021].

Gelicolous, M. (2021). *Social and Emotional Learning: an Evidence Review and Synthesis of Key Issues* [online]. Available: <https://epi.org.uk/wp-content/uploads/2021/11/SEL-paper-Nov2021-EPI.pdf> [23 November, 2021].

Gilbert, A., Thomas, A., Atwell, S. and Simons, J. (2021). *The Impact of Automation on Labour Markets: Interactions with Covid-19* [online]. Available: <https://www.ifow.org/publications/the-impact-of-automation-on-labour-markets-interactions-with-covid-19> [18 November, 2021].

Giupponi, G. and Xu, X. (2020). *What Does the Rise in Self-Employment Tell Us about the UK Labour Market?* [online]. Available: <https://ifs.org.uk/uploads/BN-What-does-the-rise-of-self-employment-tell-us-about-the-UK-labour-market-1.pdf> [18 November, 2021].

Global Education Skills and World Skills Russia (2020). *Future Skills for the 2020s: a New Hope* [online]. Available: <https://drive.google.com/file/d/1vKV6QuK8WU2LP83U-iKIIO-M909SRHl3/view> [23 November, 2021].

Gorea, M. (2021). *Finding Value: Identifying and Assessing Social and Emotional Skills in the Tourism and Hospitality Industry* [online]. Available: <https://fsc-ccf.ca/wp-content/uploads/2021/09/Finding-value-ses.pdf> [23 November, 2021].

Great Britain. Parliament. House of Commons. Environmental Audit Committee (2021). *Green Jobs: Third Report of Session 2021-22* (HC 75) [online]. Available: <https://committees.parliament.uk/publications/7615/documents/79773/default/> [21 November, 2021].

Great Britain. Parliament. House of Commons. HM Treasury (2021). *Build Back Better: Our Plan for Growth* (CP 401) [online]. Available: [Build Back Better - our plan for growth \(publishing.service.gov.uk\)](https://publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/97444/build-back-better-our-plan-for-growth.pdf) [21 November, 2021].

Great Britain. Parliament. House of Lords. Youth Unemployment Committee (2021). *Skills for Every Young Person: Report of Session 2021-22* (HL 98) [online]. Available: <https://committees.parliament.uk/publications/7988/documents/82440/default/> [9 December, 2021].

Great Britain. Parliament. House of Commons. The Secretary of State for Levelling Up, Housing and Communities (2022). *Levelling Up the United Kingdom* (CP604) [online]. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1052706/Levelling_Up_WP_HRES.pdf [8 February, 2022].

Griggs, J., Scandone, B. and Batterham, J. (2018). *How Employable is the UK? Meeting the Future Skills Challenge* [online]. Available: https://www.barclays.co.uk/content/dam/documents/business/business-insight/Barclays_Lifefskills_report_v10.pdf [21 November, 2021].

Hall, S., Jones, E. and Evans, S. (2021). *Adult Participation in Learning Survey 2021* [online]. Available: <https://learningandwork.org.uk/resources/research-and-reports/adult-participation-in-learning-survey-2021> [23 November, 2021].

Hancock, M. (2017). 'The Fourth Industrial Revolution.' Speech at the All-Party Parliamentary Group on the Fourth Industrial Revolution's (4IR) Autumn reception, London, 16 October [online]. Available: [The Fourth Industrial Revolution - GOV.UK \(www.gov.uk\)](http://www.gov.uk) [21 November, 2021].

HM Government (2021). *Net Zero Strategy: Build Back Greener* [online]. Available: [Net Zero Strategy: Build Back Greener - October 2021 \(publishing.service.gov.uk\)](https://www.gov.uk/government/consultations/net-zero-strategy-build-back-greener) [21 November, 2021].

International Business Machines Corporation (IBM) (2022). *What is Automation?* [online]. Available: <https://www.ibm.com/topics/automation> [08 February, 2022].

Institute for the Future of Work (IFOW) (2021). 'IFOW announce the Future of Work and Wellbeing: the Pissarides Review', 24 June [online]. Available: <https://www.ifow.org/news-articles/ifow-announce-the-future-of-work-and-wellbeing-the-pissarides-review> [21 November, 2021].

Industrial Strategy Council (2019). *UK Skills Mismatch 2030* [online]. Available: <https://industrialstrategyCouncil.org/sites/default/files/UK%20Skills%20Mismatch%202030%20-%20Research%20Paper.pdf> [21 November, 2021].

Institute of Directors and Open University (2021). *The Open University Business Barometer* [online]. Available: [Business Barometer 2021 | Open University](https://www.odinstitute.org/business-barometer-2021) [21 November, 2021].

Institute for Apprenticeships and Technical Education (2021). *Community Health and Wellbeing Worker (Apprenticeship Standard)* [online]. Available: <https://www.instituteforapprenticeships.org/apprenticeship-standards/community-health-and-wellbeing-worker-v1-0> [30 November, 2021].

International Labour Organization (2021a). *Skilling, Upskilling and Reskilling of Employees, Apprentices and Interns during the COVID-19 Pandemic: Findings from a Global Survey of Enterprises* [online]. Available: https://www.ilo.org/skills/areas/work-based-learning/WCMS_794569/lang-en/index.htm [21 November, 2021].

International Labour Organization (2021b). *World Employment and Social Outlook* [online]. Available: https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_795453.pdf [23 November, 2021].

- Kanders, K., Djumalieva, J., Sleeman, C. and Orlik, J. (2020). Mapping Career Causeways: Supporting Workers at Risk. A New System for Supporting Job Transitions and Informing Skills Policy in a Changing Labour Market [online]. Available: https://media.nesta.org.uk/documents/Mapping_Career_Causeways_01_G2XA7SI.pdf [10 November, 2021].
- Kashefpakdel, E., Newton, O., Clark, J., Rehill, J., Haskins, M., Laczik, A., Emms, K. and Taylor, J. (2018). *Joint Dialogue: How are Schools Developing Real Employability Skills?* [online]. Available: <https://www.educationandemployers.org/wp-content/uploads/2018/11/Joint-Dialogue-FINAL-REPORT-2019.pdf> [23 November, 2021].
- Kashefpakdel, E. and Ravenscroft, T. (2021). *Essential Skills and their Impact on Education Outcomes: a Quantitative Analysis of the British Cohort Study* [online]. Available: <https://www.skillsbuilder.org/essential-skills-and-their-impact-on-education-outcomes> [23 November, 2021].
- Kashefpakdel, E., Ravenscroft, T. and Percy, C. (2021). *Better Prepared: Essential Skills and Employment Outcomes for Young People* [online]. Available: <https://www.skillsbuilder.org/better-prepared> [23 November, 2021].
- Kingston University (2021). *Future Skills League Table 2021* [online]. Available: <https://d68b3152cf5d08c2f050-97c828cc9502c69ac5af7576c62d48d6.ssl.cf3.rackcdn.com/documents/user-upload/kingston-university-59898d8f5e5-future-skills-report-ku.pdf> [21 November, 2021].
- Kirschner, P. A. and Stoyanov, S. (2018). 'Educating youth for nonexistent/not yet existing professions', *Educational Policy*, **34**, 3, 477-517 [online]. DOI [10.1177/0895904818802086](https://doi.org/10.1177/0895904818802086).
- Learning & Work Institute (2021). *Facing the Future: Employment Prospects for Young People after Coronavirus* [online]. Available: https://learningandwork.org.uk/wp-content/uploads/2021/04/Facing-the-future-employment-prospects-for-young-people-after-Coronavirus_update.pdf [21 November, 2021].
- Lloyd, J. (2021). 'What next for GCSEs: The past, present and future of GCSEs', *AQi*, 2 October [online]. Available: <https://www.aqi.org.uk/publications/what-next-for-gcses/> [23 November, 2021].
- Lucas, B. (2019). *Why We Need to Stop Talking about Twenty-first Century Skills* (Seminar series 283, May 2019) [online]. Available: https://www.researchgate.net/publication/332864663_Why_we_need_to_stop_talking_about_twenty-first_century_skills [23 November, 2021].
- Lund, S., Madgavkar, A., Manyika, J., Smit, S., Ellingrud, K., Meaney, M. and Robinson, O. (2021). *The Future of Work after Covid-19* [online]. Available: <https://www.mckinsey.com/featured-insights/future-of-work/the-future-of-work-after-covid-19> [21 November, 2021].
- Lyons, H., Taylor, A. and Green, A. (2020). *Rising to the UK's Skills Challenges* [online]. Available: <https://industrialstrategy council.org/sites/default/files/attachments/Rising%20to%20the%20UK%27s%20skills%20challenges.pdf> [23 November, 2021].

- Manyika, J., Chui, M., Misread, M., Bughin, J., George, K., Willmott, P. and Dewhurst, M. (2017). *A Future that Works: Automation, Employment and Productivity* [online]. Available: <https://www.mckinsey.com/featured-insights/digital-disruption/harnessing-automation-for-a-future-that-works> [10 November, 2021].
- Markow, W., Hughes, D. and Bundy, A. (2018). *The New Foundational Skills of the Digital Economy: Developing the Professionals of the Future* [online]. Available: https://www.bhef.com/sites/default/files/BHEF_2018_New_Foundational_Skills.pdf [21 November, 2021].
- McDonald, P. (2021). 'As businesses prepare for the future of work, the need to upskill and reskill workers becomes more essential', *Forbes*, 9 June [online]. Available: [As Businesses Prepare For The Future Of Work, The Need To Upskill And Reskill Workers Becomes More Essential \(forbes.com\)](https://www.forbes.com/sites/petermcdonald/2021/11/21/as-businesses-prepare-for-the-future-of-work-the-need-to-upskill-and-reskill-workers-becomes-more-essential/) [21 November, 2021].
- Muro, M., Whiton, J. and Maxi, R. (2019). *What Jobs are Affected by AI? Better Paid, Better Educated Workers Face the Most Exposure* [online]. Available: https://www.brookings.edu/wp-content/uploads/2019/11/2019.11.20_BrookingsMetro_What-jobs-are-affected-by-AI_Report_Muro-Whiton-Maxim.pdf [21 November, 2021].
- Newton, O., Laczik, A., Emms, K., Beardmore, H. and Cohen, K. (2018). *Towards a Twenty-first Century Education System* [online]. Available: https://www.edge.co.uk/documents/12/edge_future_learning_report_final.pdf [22 October, 2021].
- Ofsted (2021). *Education Inspection Framework (EIF)* [online]. Available: [Education inspection framework \(EIF\) - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/98421/education-inspection-framework-2021.pdf) [21 November, 2021].
- Organisation for Economic Co-operation and Development (no date). *In Brief: OECD Learning Compass 2030* [online]. Available: https://www.oecd.org/education/2030-project/teaching-and-learning/learning/learning-compass-2030/in_brief_Learning_Compass.pdf [21 November, 2021].
- Organisation for Economic Co-operation and Development (2018). *The Future of Education and Skills: Education 2030* [online]. Available: [https://www.oecd.org/education/2030-project/about/documents/E2030%20Position%20Paper%20\(05.04.2018\).pdf](https://www.oecd.org/education/2030-project/about/documents/E2030%20Position%20Paper%20(05.04.2018).pdf) [21 November, 2021].
- Organisation for Economic Co-operation and Development (2019a). *Getting Skills Right: Future-Ready Adult Learning Systems* [online]. Available: [DOI. 10.1787/9789264311756-en](https://www.oecd.org/education/skills-education/Getting-Skills-Right-Future-Ready-Adult-Learning-Systems.pdf) [23 November, 2021].
- Organisation for Economic Co-operation and Development (2019b). *OECD Skills Strategy 2019: Skills to Shape a Better Future* [online]. Available: [DOI 10.1787/9789264313835-en](https://www.oecd.org/education/skills-education/OECD-Skills-Strategy-2019-Skills-to-Shape-a-Better-Future.pdf) [23 November, 2021].
- Organisation for Economic Co-operation and Development (2020). *What Students Learn Matters: Towards a 21st Century Curriculum* [online]. Available: [DOI 10.1787/8cbde0df-en](https://www.oecd.org/education/skills-education/What-Students-Learn-Matters-Towards-a-21st-Century-Curriculum.pdf) [23 November, 2021].
- Organisation for Economic Co-operation and Development (2021a). *AI and the Future of Skills, Volume 1: Capabilities and Assessments* [online]. Available: [DOI 10.1787/5ee71f34-en](https://www.oecd.org/education/skills-education/AI-and-the-Future-of-Skills-Volume-1-Capabilities-and-Assessments.pdf) [09 December, 2021].

Organisation for Economic Co-operation and Development (2021b). *Beyond Academic Learning: First Results from the Survey of Social and Emotional Skills* [online]. Available: [DOI 10.1787/92a11084-en](https://doi.org/10.1787/92a11084-en) [21 November, 2021].

Organisation for Economic Co-operation and Development (2021c). *OECD Skills Outlook 2021: Learning for Life* [online]. Available: [DOI 10.1787/0ae365b4-en](https://doi.org/10.1787/0ae365b4-en) [21 November, 2021].

Oxford Economics (2019). *How Robots Change the World: What Automation Really Means for Jobs and Productivity* [online]. Available: <https://www.oxfordeconomics.com/recent-releases/how-robots-change-the-world> [23 November, 2021].

Partnership for 21st Century Skills (no date). *21st Century Skills: What Do We Do?* [online]. Available: [Partnership for 21st Century Skills – Making Thinking Visible with Technology \(mtvt.org\)](https://www.mtv.org/partnership-for-21st-century-skills-making-thinking-visible-with-technology) [21 November, 2021].

Pearson (2020). *The Global Learner Survey: August 2020* [online]. Available: <https://plc.pearson.com/sites/pearson-corp/files/footer-image/pearson-global-learners-survey-2020.pdf> [23 November, 2021].

Pearson (2021). *The Currency of Learning: 2021 Employer Research Report* [online]. Available: https://www.pearson.com/content/dam/one-dot-com/one-dot-com/global/Files/Pearson_EmployerResearch_2021_FINAL1.pdf [21 November, 2021].

PricewaterhouseCoopers (2018a). *Will Robots Really Steal our Jobs? An International Analysis of the Potential Long Term Impact of Automation* [online]. Available: <https://www.pwc.co.uk/economic-services/assets/international-impact-of-automation-feb-2018.pdf> [21 November, 2021].

PricewaterhouseCoopers (2018b). *Workforce of the Future: the Competing Forces shaping 2030* [online]. Available: <https://www.pwc.com/gx/en/services/people-organisation/workforce-of-the-future/workforce-of-the-future-the-competing-forces-shaping-2030-pwc.pdf> [21 November, 2021].

Qualifications Wales (2021). 'Qualifications for the future: reimagining qualifications in Wales', 14 October [online]. Available: [Qualifications Wales / Qualifications for the Future: Reimagining Qualifications in Wales](https://www.qualifications.wales/qualifications-for-the-future-reimagining-qualifications-in-wales) [21 November, 2021].

Quigley, L. (2021). 'How do we upskill and reskill for the future of workforce and workplace?', *The Drum*, 23 July [online]. Available: [How do we upskill and reskill for the future of workforce and workplace? | The Drum](https://www.thedrum.com/news/2021/07/23/how-do-we-upskill-and-reskill-for-the-future-of-workforce-and-workplace) [21 November, 2021].

Ravenscroft, T. and Baker, L. (2020). *Towards a Universal Framework for Essential Skills: a Review of the Skills Builder Framework* [online]. Available: [https://uploads-ssl.webflow.com/5a86b2cd68b41700017162ca/5ec2b44c1cac8f93cea68444_Essential%20Skills%20Taskforce%20Report%20-%20Final%20\(May%202020\).pdf](https://uploads-ssl.webflow.com/5a86b2cd68b41700017162ca/5ec2b44c1cac8f93cea68444_Essential%20Skills%20Taskforce%20Report%20-%20Final%20(May%202020).pdf) [21 November 2021].

Rios, J., Ling, G., Pugh, R., Becker, D. and Bacall, A. (2020). 'Identifying critical 21st – century skills for workplace success: a content analysis of job advertisements', *Educational Researcher*, **49**, 2, 80–89 [online]. DOI [10.3102/0013189X19890600](https://doi.org/10.3102/0013189X19890600)

Rivera, D., Rajabi, Y., Zachariah, J. and Willoughby, R. (2021). *Ahead by a Decade: Employment in 2030* [online]. Available: <https://brookfieldinstitute.ca/wp-content/uploads/Ahead-by-a-Decade-EN-Final.pdf> [10 November, 2021].

- Rogers, L. and McGrath, S. (2021). *Edge Future Learning: Our Evidence Base* [online]. Available: https://www.edge.co.uk/documents/155/Edge_Future_Learning_Our_Evidence_Base.pdf [23 November, 2021].
- Skills Builder Partnership (2021). *Impact Report 2021* [online]. Available: <https://www.skillsbuilder.org/file/impact-report-2021> [21 November, 2021].
- Skills Development Scotland (2021). *A Guide to Meta Skills across the Curriculum* [online]. Available: https://www.skillsdevelopmentscotland.co.uk/media/48265/1451_skills-toolkit-phase-1-guidance-paper_v4-002-final.pdf [23 November, 2021].
- Skills Development Scotland and Centre for Work-based Learning (2018). *Skills 4.0: a Skills Model to drive Scotland's future* [online]. Available: https://www.skillsdevelopmentscotland.co.uk/media/44684/skills-40_a-skills-model.pdf [21 November, 2021].
- Smit, S., Tacke, T., Lund, S., Manyika, J. and Thiel, L. (2020). *The Future of Work in Europe Automation, Workforce Transitions, and the Shifting Geography of Employment* [online]. Available: <https://www.mckinsey.com/featured-insights/future-of-work/the-future-of-work-in-europe> [21 November, 2021].
- Taylor, R., Fadel, C., Kim, H. and Care, E. (2020). 'Competencies for the 21st Century: Jurisdictional Progress', *Brookings*, 23 November [online]. Available: <https://www.brookings.edu/research/competencies-for-the-21st-century-jurisdictional-progress/> [23 November, 2021].
- Thomas, A., Gilbert, A., Atwell, S. and Simons, J. (2021). *A Better Future for Work: the World after Covid-19* [online]. Available: <https://www.ifow.org/publications/a-rapid-review-with-the-future-of-work-commission-a-better-future-for-work-the-world-after-covid-19> [10 November, 2021].
- Tolan, S., Pesole, A., Martínez-Plumed, F., Fernández-Macías, E., Hernández-Orallo, J. and Gómez, E. (2020). *Measuring the Occupational Impact of AI: Tasks, Cognitive Abilities and AI Benchmarks* [online]. Available: <https://ec.europa.eu/jrc/sites/default/files/jrc119845.pdf> [21 November, 2021].
- UKCOP26 (2021). 'COP26 keeps 1.5C alive and finalises Paris Agreement', 13 November [online]. Available: <https://ukcop26.org/cop26-keeps-1-5c-alive-and-finalises-paris-agreement/> [21 November, 2021].
- Universities UK (2018). *Solving Future Skills Challenges* [online]. Available: <https://www.educationandemployers.org/research/solving-future-skills-challenges/> [23 November, 2021].
- Vaitilingam, R. (2021). 'After Brexit; the impacts on the UK and EU economies by 2030'. *LSE Business Review Blog*, 25 January [online]. Available: <https://blogs.lse.ac.uk/businessreview/2021/01/25/after-brexit-the-impacts-on-the-uk-and-eu-economies-by-2030/> [10 November, 2021].
- Vincent-Lancin, S., González-Sancho, C., Bouckaert, M., Jacotin, G., Urgel, J. and Vidal, Q. (2019). *Fostering Students' Creativity and Critical Thinking: What it Means in School* [online].

Available: <https://www.oecd.org/education/fostering-students-creativity-and-critical-thinking-62212c37-en.htm> [23, November, 2021].

Vista, A. (2020). 'Data driven identification of skills for the future: 21st-century skills for the 21st-Century workforce', *Sage Open*. April-June. 1-10 [online]. DOI [10.1177/2158244020915904](https://doi.org/10.1177/2158244020915904)

Wallace-Stephens, F. and Morgante, E. (2020). *Who is at Risk: Work and Automation in the Time of Covid?* [online]. Available: https://www.thersa.org/globalassets/foundation/new-site-blocks-and-images/reports/2020/10/work_and_automation_in_time_of_covid_report.pdf [10 November, 2021].

Ward, M. (2016). *Fourth Industrial Revolution* (House of Commons Library Briefing CDP 2016/0153) [online]. Available: [Fourth Industrial Revolution \(parliament.uk\)](https://www.parliament.uk/resources/briefings/briefing-cdp-2016-0153) [21 November, 2021].

Webb, M. (2020). *The Impact of Artificial Intelligence on the Labor Market* [online]. Available: https://www.michaelwebb.co/webb_ai.pdf [21 November, 2021].

Williams, J., Alexander K., Wilson, T., Newton B., McNeil, C. and Jung, C. (2021). *A Better Future: Transforming Jobs and Skills for Young People Post-pandemic* [online]. Available: <https://www.employment-studies.co.uk/resource/better-future-transforming-jobs-and-skills-young-people-post-pandemic> [23 November, 2021].

Wilson, R., Barnes, S.-A., May-Gillings, M., Patel, S. and Bui, H. (2020). *Working Futures 2017-2027: Long-run Labour Market and Skills Projections for the UK* [online]. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/863506/Working_Futures_Main_Report.pdf [23 November, 2021].

World Economic Forum (2020a). *Future of Jobs 2020 Report* [online]. Available: https://www3.weforum.org/docs/WEF_Future_of_Jobs_2020.pdf [21 November, 2021].

World Economic Forum (2020b). *Jobs of Tomorrow: Mapping Opportunity in the New Economy* [online]. Available: https://www3.weforum.org/docs/WEF_Jobs_of_Tomorrow_2020.pdf [21 November, 2021].

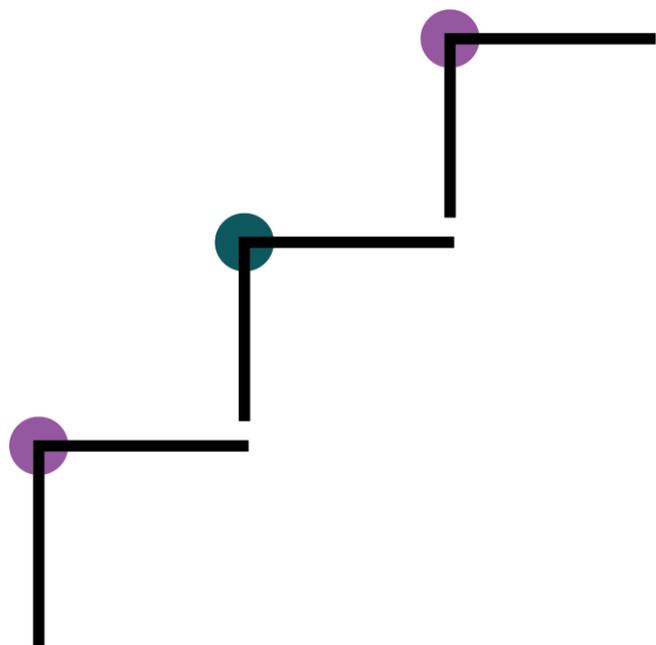
World Economic Forum (2020c). *Schools of the Future: Defining New Models of Education for the Fourth Industrial Revolution* [online]. Available: [WEF Schools of the Future Report 2019.pdf \(weforum.org\)](https://www3.weforum.org/docs/WEF_Schools_of_the_Future_Report_2019.pdf) [21 November, 2021].

World Economic Forum and PricewaterhouseCoopers (2021). *Upskilling for Shared Prosperity: Insight Report* [online]. Available: https://www3.weforum.org/docs/WEF_Upskilling_for_Shared_Prosperty_2021.pdf [23 November, 2021].

Yao, H., Alejo, A., Nasir, B. and Cooper, R. (2021). 'Mind the gap(s): are we seeing the full picture of children's skill development?', *UNICEF Evidence for Action Blog*, 27 October [online]. Available: [Mind the gap\(s\): Are we seeing the full picture of children's skill development? - Evidence for Action \(unicef.org\)](https://www.unicef.org/evidenceforaction/blog/mind-the-gap-s-are-we-seeing-the-full-picture-of-childrens-skill-development-evidence-for-action) [21 November, 2021].

Youth Futures Foundation (2021). *The Youth Employment Evidence Gap Map* [online]. Available: <https://youthfuturesfoundation.org/our-work/identify/evidence-and-gap-map/> [23 November, 2021].

Youth Employment UK (2021). *Youth Voice Census Report 2021* [online]. Available: youth-voice-census-report-2021.pdf (youthemployment.org.uk) [21 November, 2021].



Appendix 1: Our review method

From the outset, we were aware that this is a very wide-ranging review with an extremely large and growing evidence base potentially relevant to our questions. We adopted a pragmatic approach to our review method with a balanced focus on breadth, a recent timeframe (2018 onwards¹⁷¹), authority and methodological robustness.

Our search sources covered:

- **key education and skills bibliographic databases:** Education Resources Information Center (ERIC), VOCEDplus, British Education Index (BEI) and Australian Education Index (AEI). We devised an extensive search strategy combining a set of 50+ essential skills-related keywords with a set of 25+ future/labour market-related keywords (informed by consulting a number of reports, skills frameworks and database thesauri and trial searches)
- **websites and bibliographies** of 50+ UK and international organisations
- **recommendations** from our co-investigators and external strategic advisory group
- **ongoing current awareness monitoring** by NFER's Knowledge Team including an internal social media channel to share news
- **reference harvesting** of reports selected for inclusion in the review.

The main searches were carried out in July 2021. These were supplemented by the NFER Knowledge Team's ongoing current awareness monitoring and internal social media channel to share new reports throughout the study. There was also a targeted top-up search in November 2021. Inevitably, as with any literature review and particularly so here, with the very live nature of the topics under examination, there will be new evidence available by the time our report is published. In addition, given the breadth of potentially relevant reports, we acknowledge that we had to make pragmatic choices to ensure manageability and succinctness and therefore reports not featured in the review should not be considered as out of scope or lacking credibility.

We carried out an initial sift of in excess of 5000 reports (based on the title and, where needed, the abstract or executive summary) for relevance to our research questions:

- **what will work look like in 2035?:** The megatrends shaping future work opportunities, with a particular focus on the impacts of automation, digitisation and AI; the job sectors expected to emerge or decline; and the interplay of Covid-19 on the already changing world of work
- **which essential skills will be in demand and what preparations are needed?** Drawing on a range of forecasts and surveys to anticipate the essential skills which

¹⁷¹ We did include some published in 2017 where these were very widely cited, for example Bakhshi, *et al.*

will be most needed in the 2035 labour market, and taking stock of what is happening/needs to happen to prepare for these skills for those in education and those already in the workforce.

We systemically coded over 200 reports (based on abstracts, executive summaries and tables of contents) against specific aspects of our wide-ranging research questions to ascertain which reports offered focused or multiple insights as well as noting the methodologies employed. Given the wide-ranging nature of the reports covered and the forecasting or speculative nature of some, it was challenging to compare quality or methodological rigour as would happen in a review of a more homogenous evidence base. For this reason, three team members graded the 200+ pieces independently for quality using the following guidelines, before discussing variances in our grading. Within those graded medium/high, we iteratively arrived at an initial 60+ pieces which represented a balanced mix of organisations, perspectives, methods and timeframes.

Low/medium quality indicators	Medium/high indicators
<p>Single method or qualitative only</p> <p>Small scale (e.g. one or two of focus groups, one-off round table discussion)</p> <p>Current or very short range</p> <p>Agenda-led – for example pieces commissioned to underpin an existing viewpoint</p> <p>Recaps on very familiar themes, less substantial or think piece oriented</p>	<p>Mixed methods (or in some cases quantitative only)</p> <p>Medium to large scale (e.g. surveyed respondents in 1000s, reviewed 50+ pieces of literature, conducted several focus groups/round tables)</p> <p>Longer term perspective – as close to 2035 as possible</p> <p>Multiple perspectives, organisations, disciplines, or stakeholders</p> <p>Offered a post-Covid-19 perspective</p> <p>Widely cited in other reports</p> <p>* Wildcard – did not meet many of the above criteria but, based on authoring organisation’s standing, decision made not to award a lower grade (used sparingly)</p>

Appendix 2: Reports providing evidence of emerging and declining jobs (section 2.2)

Report	Method	Timeframe
A future that Works: Automation, Employment and Productivity (Manyika <i>et al.</i> , 2017)	Discussion, analysis, forecasting, modelling	2030
Ahead by a Decade: Employment in 2030 (Rivera <i>et al.</i> , 2020)	Foresight research, expert insights, and machine learning	2030
Digital, Greener and More Resilient: Insights from Cedefop's European Skills Forecast (Cedefop, 2021)	Data analysis, forecasting	2030
Skills Outlook 2021: Learning for Life (OECD, 2021c)	Machine learning	2029
The Future of Jobs Report 2020 (WEF, 2020a)	Large scale survey and O*NET mapping; LinkedIn data transition analysis	2025
The Future of Skills: Employment in 2030 (Bakhshi <i>et al.</i> , 2017)	Trends analysis, foresight workshops, machine learning, analysis	2030
The Future of work after COVID-19 (Lund <i>et al.</i> , 2021)	Modelling using O*NET data	2030
The Future of Work in Europe: Automation, Workforce Transitions and the Shifting Geography of Employment (Smit <i>et al.</i> , 2021)	Data analysis/modelling	2030
The Work of the Future: Building Better Jobs in an Age of Intelligent Machines (Autor <i>et al.</i> , 2020)	Taskforce approach	2029
Will Robots Really Steal our Jobs: an International Analysis of the Potential Long Term Impact of Automation (PWC, 2018a)	Data analysis (including PIAAC)	2030
Working Futures 2017-2027: Long-run Labour Market and Skills Projections for the UK (Wilson <i>et al.</i> , 2020)	Projections based on data analysis/modelling	2027

Appendix 3: Reports providing evidence for ‘Essential Skills in 2035’ analysis (section 3.1)

Report	Method	Timeframe
2021 Employer Research Report: the Currency of Learning (Pearson, 2021)	Survey of 1215 UK/US employers in businesses with 5000+ employees	2029
An Open and Data-driven Taxonomy of Skills Extracted from Online Job Adverts (Djumaliev and Sleeman, 2018)	Taxonomy derived from extensive job advertisement data	Current
Building Competencies for Careers: Linking O*NET's Occupational Elements with Deeper Learning Competencies (Frizell <i>et al.</i> , 2017)	Linking O*NET data to the Deeper Learning Competencies	Current
Data-Driven Identification of Skills for the Future: 21st-Century Skills for the 21st-Century Workforce (Vista, 2020)	Development of a skills metric using O*NET	21 st century
Defining the Skills Citizens will need in the Future World of Work (Dondi <i>et al.</i> , 2021)	Self-assessed skills survey (n=18,000) against developed framework	Current/future
Educating Youth for Non-existent/Not yet Existing Professions (Kirschner and Stoyanov, 2018)	Group concert mapping	2035
Follow-up report, Rising to the UK's Skills Challenges (Lyons <i>et al.</i> , 2020)	Final report of the Skills Insights project	2030
Future Skills (Alphabeta, 2019)	Data analysis	2040
Future Skills for the 2020s: A New Hope (Global Education Skills & World Skills Russia, 2020)	Expert consultation and survey analysis	2030
Global Framework on Core Skills for Life and Work in the 21st Century (ILO, 2021a)	Literature Review	21 st century
How Employable is the UK: Meeting the Future Skills Challenge (Griggs <i>et al.</i> , 2018)	Multiple methods including employer survey	2028
Identifying Critical 21st-Century Skills for Workplace Success (Rios <i>et al.</i> , 2020)	Content analysis of job advertisement data	21 st century

Joint Dialogue: How are Schools Developing Real Employability Skills? (Kashefpakdel <i>et al.</i> , 2018)	Multiple methods including employer focus groups	21 st century
Learning and Skills at Work Survey 2021 (Crowley and Overton, 2021)	Survey (n=1000+)	Current/future
Life Lessons: Improving Essential Life Skills for Young People (Cullinane and Monacute, 2017)	Literature review and surveys of employers, teachers and young people	Current/future
Mapping Career Causeways: Supporting Workers at Risk (Kanders <i>et al.</i> , 2020)	Mapping O*NET and ESCO data & European Labour Force Survey analysis	Current/future
Relearning How We Learn, From the Campus to the Workplace (Bahl <i>et al.</i> , 2020)	International survey business and HEIs	21 st century
Schools of the Future: Defining New Models of Education for the Fourth Industrial Revolution (WEF, 2020c)	Desk research/consultation	Fourth industrial revolution
Skills 4.0: a Skills Model to Drive Scotland's Future (Skills Development Scotland, 2018)	Literature review/development of framework	Fourth industrial revolution
Skills for an Inclusive Economy: CBI and Birkbeck Education and Skills Survey 2021 (CBI and Birkbeck Education, 2021)	Survey of 250+ British businesses	Next 3-5 years
Skills Index 2021 (City & Guilds Group and Emsi, 2021)	Multiple methods (job advertisement data analysis, survey of 1000+ British Chamber of Commerce member businesses and 2000+ working age adults)	2024
Skills Outlook 2021: Learning for Life (OECD, 2021c)	Various analysis	Current/future
The Future of Jobs Report 2020 (WEF, 2020a)	Future Jobs Survey 2020	2025
The Future of Skills: Employment in 2030 (Bakhshi <i>et al.</i> , 2017)	Multiple methods (trends analysis, foresight workshops, machine learning, analysis). Widely cited	2030
The Future Skills League Table (Kingston University, 2021)	Survey of British business (2000+)	2031-2041
The New Foundational Skills of the Digital Economy: Developing the Professionals of the Future (Markow <i>et al.</i> , 2018)	Analysis of job advertisement and resumes	Current/future
Towards a Twenty-first Century Education System (Newton <i>et al.</i> , 2018)	Evidence review, case studies	21 st century
Towards a Universal Framework for Essential Skills (Ravenscroft and Baker, 2020)	Framework development: review of employability frameworks, job advertisements, apprenticeship	Current/future

	standards and graduate attributes.	
UK Skills Mismatch in 2030 (Industrial Skills Council, 2019)	Analytical modelling	2030
Youth Voice Census 2021 (Youth Unemployment UK, 2021)	Survey of 3400 UK young people	Current/future

Appendix 4: Rigour checks for ‘Essential Skills in 2035’ analysis (section 3.1)

Although we adopted a systematic approach to identifying relevant sources to include in our review, we were conscious that its cross-cutting nature may have masked some nuances. To establish whether this was the case, we put in place a number of rigour checks as follows.

Check against skills frameworks

Ten of the appraised sources were recognised skills frameworks, which often included packages/approaches to support the development of skills in education settings or the workplace. Given the recognised nature of these frameworks, it was important to check the alignment of our results with these. We found that the most commonly identified skills in our review aligned very closely with the skills frameworks that we appraised. The frameworks mentioned very similar skills in line with our top ranked skills.

Check against studies that conducted their own ‘skills prioritisation’

Seven of the appraised sources undertook their own ‘ranking’ or ‘prioritisation’ exercises. We wanted to ensure that our cross-cutting quantification approach had not failed to take into account the fact that these studies had already assigned an order of importance to the identified skills. Again, we found that the main skills identified by these studies were very similar to those identified in our review. The only exception was that ‘creativity/innovation’ was ranked more highly in our findings than it was across these seven studies.

Check against studies with a similar date reference

Only seven of the appraised sources had a similar date reference to our study. These had generally projected or forecasted the skills that would be most essential by, variously, dates ranging from 2030 to 2041 (our own study date reference is 2035). Given that the other studies had different reference points (from current, through 2-3 years hence, to an unspecified timeframe), we thought it important to compare our results to these studies. This check revealed an almost identical pattern of findings to our own.

Check against studies with the most rigorous methodologies

Rigorous methodologies were considered to be those that utilised the views of employers, or which used mixed methodologies and/or a range of perspectives. Nine studies fell into this category. The top skills identified by these studies aligned reasonably well with our findings, but there were some differences. Again, ‘creativity/innovation’ did not rank so highly as in our review findings. Additionally, ‘critical thinking’ was less frequently identified. There were also a few differences in the ordering of the lower-ranked skills. These findings are discussed in more detail in section 3.1.

Appendix 5: Essential skills identified outside of the ‘top 10’ (section 3.1)

This table shows in purple other essential skills outside of the ‘top 10’ identified in our analysis.

Analytical/creative skills	Interpersonal skills	Self-management skills	Emotional intelligence skills
Problem solving/troubleshooting/decision making	Communication	Flexibility/adaptability	Empathy/social perceptiveness
Critical thinking/analysis/evaluation	Collaboration/teamwork/cooperation	Self-motivation/learning orientation	Ethics/social responsibility/integrity/tolerance
Creativity/innovation/originality	Negotiation/Persuasion*	Resilience/optimism/persistence	
Commercial/organisational awareness*	Service orientation/customer handling*	Proactivity/planning/organisation*	
Intellectual curiosity		Self-confidence/self-belief	
		Independence/autonomy/initiative	
←Leadership→			

* The most frequently mentioned of the lesser-mentioned skills.

