BARCLAYS

From Inclusion to Empowerment: The Barclays Digital Development Index

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Foreword

The digital revolution signals an era of huge opportunity for individuals, businesses and societies. Our world is changing, and at an incredible speed and scale. Not even the industrial revolution was as transformative as the coming digital age.

We can already glimpse the extent of this change in the way we order a taxi, do our shopping or book a holiday – and this is only the beginning.

For people and for society, this is both empowering and challenging. Empowering because it provides businesses with more opportunities and consumers with more choice. It also means that services can be delivered at greater speed than ever before. But it is challenging, requiring people and businesses to acquire, retain and consistently develop new skills and understanding to truly benefit.

The old ways of doing things will become obsolete, traditional skills are less relevant, and businesses grow or fail at speeds never previously thought possible.

In this new world of disruptive innovation and digital advancement, it is those individuals, businesses and societies who have the greatest level of access, ability and understanding who will continue to prosper. Those which have the least will fall behind and find it progressively harder to catch up.

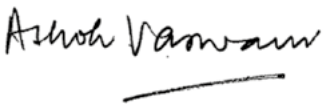
That's why Barclays is absolutely committed to using our insights, expertise and scale to ensure that everyone can realise the full benefit of the digital age.

We understand how important digital skills and confidence are because we're on a digital journey too – working to make our apps and online services accessible for everyone and using technological innovation to make lives easier. A network of thousands of trained 'Digital Eagles' now offer face-to-face help and advice to any member of the public free of charge; our online 'Digital Wings' modules offer accessible learning; and this year we will open several new 'Eagle Labs' to provide access to workspaces and tools for digital creation and innovation.

Of course, our ambition is that the UK becomes the most digitally savvy nation on earth, but we know that there will be many learnings and opportunities which cross geographical borders. This is why we have embarked on the creation of this Index.

From Inclusion to Empowerment: The Barclays Digital Development Index takes the pulse of the current situation for workers and businesses in ten markets across the globe. It aims to consider not only the outcomes of digital empowerment on an individual level, but also the wider context, attitudes and policies which can encourage and foster confidence in a digital world.

We hope that it inspires conversations and innovations around the digital skills which will be vital for our continued and further development. Together, we need to make sure we thrive in the digital era, and Barclays is dedicated to securing the strongest future for our customers, economy and society.



Ashok Vaswani
CEO, Barclays UK

Executive summary

As technology-led disruption of businesses and industries continues apace, workers in the UK and other developed nations are at risk. Their confidence in their digital skill levels is too low, despite several years of public and private sector efforts to boost them. In emerging markets, meanwhile, skills assessments and confidence levels are much higher than those in many advanced economies.

Rapid technological change means that the digital skills of most countries' workforces will not keep them competitive in tomorrow's workplace. Before long, being digitally 'competent' or 'literate' will not be enough; workers will have to learn more advanced skills that help them become creators – rather than just consumers – of digital content. They will have to become digitally 'empowered', and it is up to government, business and other stakeholders to create the conditions for this to happen.

"One organisation – whether government, business or charity – will not be able to tackle this problem alone. Nor can there be a 'one size fits all' approach. The solutions must be tailored to the needs and circumstances of the people that are going to be using these technologies."

Ellen Helsper,
Associate Professor in Media and Communications, London School of Economics

Governments must ensure that the physical infrastructure is in place to enable digital economies to prosper – super-fast broadband, for example. They must also ensure that digital learning is a core part of school curricula; that teachers have the skills and equipment to teach children what they need to know; and that they support individuals and companies by providing access to training and practical support.

Business has an important role to play too. In the UK, employers recognise that there is a skills deficit; many, for example, are convinced that productivity would increase if their employees' digital skill levels were higher[1]. Companies can address this, and improve career prospects, by investing in training and support.

The Barclays Digital Development Index is an effort to shift public debate in the UK and elsewhere from a discussion of basic digital competence towards one of digital empowerment, and to understand how ready the UK workforce is for the digital economy, compared with its rivals.

The index compares the workforce digital skills and attitudes of nations, along with the policies that are in place to improve them. It is based on a self-assessment survey that asked adult workers in 10 countries to evaluate their current digital skills, what they'll need in the future, and how their employers and governments are helping them to address the gaps.

The objective of the index is to understand how well countries are equipping their workers for the digital economy. It looks at a broad spectrum of countries, including those currently competing with the UK and those likely to be competitors in the years ahead. These countries include perceived digital pioneers such as Estonia and Sweden, major industrial and high-tech giants such as Germany, South Korea and the US, and rapidly digitalising markets such as Brazil, China, India and South Africa.

[1]Digital Skills – Workers, survey by Opinium, 2016

Digital Development Index online

To explore the findings in more detail please visit - digitalindex.barclays

The index assesses the 10 countries in two pillars of empowerment:

- The Individual Empowerment Index measures workers' self-assessment of their digital skills in six categories ranging from basic to advanced. It also includes questions about how well their businesses and employers are helping to develop their skills.

- The Digital Empowerment Policy Index assesses national efforts to create a digitally empowered workforce – from getting the infrastructure right to embedding digital skills education in schools and the workplace.

The study's major findings are as follows:

The international picture

Combined Rank		
= 01	Estonia	6.4
= 01	South Korea	6.4
03	Sweden	6.1
04	UK	6.0
= 05	China	5.9
= 05	USA	5.9
07	India	5.7
08	Germany	5.6
09	Brazil	4.5
10	South Africa	4.2

Note: Country scores are on a 1-10 scale.

- Estonia and South Korea are joint leaders in digital empowerment. Like most (though not all) developed countries in the index, their positions are based on active and well-organised government and business efforts to improve the teaching of digital skills. Even in these technology leaders, however, workforce confidence in digital skills is lower than among developing-country rivals.

- Workers in emerging markets are more confident about digital skills than those in developed markets. Worker self-assurance in emerging countries is especially high when it comes to basic skills such as web search and evaluation, communication and collaboration, and protecting data and devices. But it also comes through in the more advanced areas of coding, problem-solving and overall attitudes towards learning technology.

- When it comes to digital empowerment policy, developed countries boast stronger frameworks. These countries dominate the upper half of the table in all policy categories. One inference is that where individual confidence in digital skills is lower, stronger policy frameworks are needed to develop skills and build greater confidence.

UK performance

- The UK's digital empowerment strengths are offset by clear weaknesses. It ranks fourth overall in the Digital Development Index. This places it below Estonia, South Korea and Sweden, but above arguably its biggest rivals in the digital economy – the US, China and India. Comparative strengths in selected areas of digital skills policy and advanced skills learning are offset by relatively low confidence levels in digital skills among the workforce.

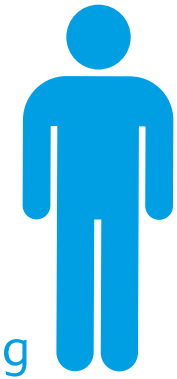
- Workforce confidence is particularly low in basic digital skills, including security. The UK places no higher than sixth out of 10 in any basic skills category. While stronger than most other developed countries in terms of online communication and collaboration, its workforce comes joint last in researching and evaluating information online, and next to last in security – protecting their data and devices.

- The UK ranks just seventh out of 10 when it comes to assessment of content-creation and coding skills. This is a key indicator of the ability to be a 'digital creator' rather than just a 'digital consumer'. India leads, producing the most school pupils with coding skills – almost 10 times as many as the US. Coding is making a comeback in the national curriculum of the UK, however, as well as in South Korea.

- Inadequate teacher training is a major drag on efforts to improve digital education. An ambitious UK computing curriculum has not been matched with adequate budget for teacher upskilling. Nor are enough new computing teachers coming into the system. As a result, there is heavy reliance on stretched volunteer networks to provide training.

- Employee awareness of digital training offered by their employers is low. Only 38% of UK workers say that their employer offers training in digital skills; this figure is considerably higher in China, the US and India. The same is true of awareness of government-sponsored training. Businesses and governments may be offering such training, but they need to do a better job of making workers aware of its existence.

Only 38% of UK employers offer their workers digital skills training



The index also throws into relief two types of digital divide for policymakers to consider. One is a gender gap: in the UK and Sweden, men exhibit higher levels of assurance in most skill categories, whether basic or advanced. Women's stated confidence in the UK is extremely low in the area of online search and information evaluation.

16-24 year olds are **less** digitally skilled than their older colleagues

The other divide is between the youngest age cohorts in the workplace. In the UK and elsewhere (but not in the US), new workplace entrants (those aged 16–24) emerge as less skilled than their older but less digitally 'native' counterparts. Many may be experts in digital communication and entertainment, but they stumble when it comes to creativity. Despite growing up in a digital world, they face the challenge of learning how to create digital content and not just consume it.

A burning platform

In most countries, digital technologies have transformed the workplace – there are few business processes today that are not driven or underpinned by technology. This digital revolution is ongoing. Businesses of all sizes face potential disruption, with knock-on effects for their employees. Whether or not such predictions come true, it is clear that, in order to thrive in the digital economy that is taking shape, the workforce will need to master more advanced digital skill sets.

In many countries, workers are failing to keep pace with change. An OECD study published in 2013 found that one-fifth of the working-age population across 33 countries could not complete an online test because they lacked experience with computers[2]. The OECD also found that 31% of working-age adults in the UK lack even basic digital problem-solving skills (the average across the OECD is 37%)[3]. According to the House of Commons Science and Technology Committee, the digital skills gap is costing the UK economy an estimated £63 billion a year in lost additional GDP[4]. The human cost is just as troubling: millions of people are not being given the chance to fulfil their potential and could fall to the bottom of the pile as the digital world continues to grow around them.

This has not gone unnoticed by commentators and politicians. In February 2015, the House of Lords Select Committee warned that the UK faces a stark choice: address its digital skills shortage or jeopardise its place as a global digital leader[5]. In November 2015, digital inclusion advocates Tinder Foundation, along with the charity Go ON UK (which promotes digital skills), called for urgent funding into digital skills training to boost productivity in the workforce[6].

The UK government has responded with initiatives to promote digital inclusion by boosting the digital abilities of groups such as older people and the unemployed. It has also taken steps to introduce or expand the teaching of computer skills in schools. But in the UK and elsewhere, much of the focus has remained on the teaching of basic skills such as completing online forms.

Competing in the digital economy will require proficiency in higher-level skills, such as searching and evaluating information online and using a variety of devices and software programs. Using technology creatively to develop content or solve problems will also be a must. And attitudes will be important: overcoming the fear of new technologies and being willing to learn new skills on an ongoing basis. In brief, workers must become digitally empowered.

> "There's been a lot of focus on the nuts and bolts of our digital world but not so much on the bigger picture and how it really will transform the way we live and work."
>
> Nick Corston,
> Co-founder, STEAM Co.

[2] OECD Skills Outlook 2013: First Results from the Survey of Adult Skills, OECD [http://skills.oecd.org/OECD_Skills_Outlook_2013.pdf] [3] Survey of Adult Skills (PIACC), OECD, completed in 2012 and published in 2013 [http://www.oecd.org/site/piaac/surveyofadultskills.htm] [4] House of Commons Science and Technology Committee, Digital skills crisis, June 2016 [http://www.publications.parliament.uk/pa/cm201617/cmselect/cmsctech/270/270.pdf] [5] Lords say digital skills will make or break the UK', www.parliament.uk, February 2015 [http://www.parliament.uk/business/committees/committees-a-z/lords-select/digital-skills-committee/news/report-published/] [6] Tinder Foundation and Go ON UK call for urgent digital skills funding to support Government 2020 "fast broadband for all" pledge', Go ON UK press release, November 2015 [https://www.go-on.co.uk/blog/2015/11/tinder-foundation-and-go-on-uk-call-for-urgent-dig/]

What is digital empowerment?

Most national and international assessments of digital skills have thus far focused on ‘competence’ or ‘literacy’. Some stress the importance of creativity and attitude, and a few consider problem-solving. The European Commission’s DIGCOMP initiative, for example, sets out to define ‘digital competency’, which alongside skills also considers people’s knowledge of and attitudes to technology. “A lot of people have skills,” explains Riina Vuorikari, a Research Fellow at the Commission. “But they don’t have the right attitude: it’s not tuned in to digital things.”

Digital empowerment is the ability and desire to use one’s digital skills to work productively and creatively, and to have the opportunity to continually upgrade them to keep pace with changing technology. It is not only about learning how to code or create content, but continually refreshing and growing such skills. It is also about confidence, which co-exists with skills in a mutually reinforcing feedback loop: the better one’s skills, the more confident and able to learn new skills one becomes. Digital empowerment also requires government, business and other stakeholders to together provide workers with the necessary digital infrastructure, training and support. For all stakeholders, it means understanding and embracing the digital future.

Pillars of digital development

The index consists of two equally weighted pillars:

Individual Empowerment Index

This is based on a self-assessment of digital skills from a survey of 1,000 working adults in each market. It numbers six categories relating to basic and more advanced skills and competencies: researching and evaluating information; communicating and collaborating; protecting data and devices; content creation and coding; solving problems; and knowledge and attitude. To create aggregate country scores, we attached a numerical score to each skills level up to a score of 10.

Digital Empowerment Policy Index

This sub-index evaluates the policies that guide the development of a digitally empowered workforce – from getting the infrastructure basics right to ensuring that the right training programmes are in place. It comprises four categories: broadband access and policy; digital skills policy; digital skills in compulsory education; and vocational and workplace skills.

Most indicators in our Digital Empowerment Policy Index are based on assessments of countries' policies, strategies and targets regarding improving digital skills and access for the broad population. Qualitative indicators were scored initially on a 1 to 5 scale (and converted to a 0 to 10 scale for aggregation purposes) using tightly defined criteria.

Several indicators are based on quantitative data – particularly those relating to internet and broadband access, as well as several relating to education, such as the percentage of students taking computer science courses. To normalise the quantitative indicators, we chose 'ideal' targets that countries should be striving to reach. For example, the target for internet access is for 100% of the population to be able to get online. Countries were then scored on a scale of 0 to 10 based on their proximity to (or distance from) these targets.

For a complete index methodology, visit digitalindex.barclays/methodology

Individual empowerment: a mixed picture

Among the more striking findings of the index is that emerging-market workforces are more confident about their digital skills than those in advanced economies, including the US and UK. Emerging-market workers are particularly self-assured in what the index classes as 'basic skills' – web search and evaluation, communication and collaboration, and protecting data and devices. But greater confidence also comes through in the more advanced skills areas of coding, problem-solving and overall attitudes towards technology learning.

Typically, younger populations, combined with higher levels of ICT training, may help to explain this impressive show of empowerment. In China, India and Brazil in particular, younger workers are more prominent in the workforce than in more developed markets; this is reflected in the survey used to build the index (the share of younger workers in the sample is lowest in the UK and Sweden). Developing countries also have generally higher levels of ICT-specific training.

Combined, these factors suggest that emerging-market workforces are at considerable ease with technology. If their policy and infrastructure environments improve (see 'Empowerment policy: playing catch-up'), workforces in China, India and other emerging markets will compete increasingly strongly with their developed-world rivals in the digital economy. How is the UK workforce equipped to respond?

The skills spectrum

In today's workplace, basic digital skills – such as the ability to search for information on the web and communicating with colleagues via email and social media – are a fundamental requirement. The same is true of knowing how to protect data and devices, at home and at work. For Emma Lindley, Founder and MD of online identity experts Innovate Identity, basic digital skills are a must: "I think it would be really hard for anyone to operate in the workforce without basic digital skills – they're just not going to be able to get a good job in future," she says. "So it is worrying that in the UK, over one-fifth of people still don't have digital skills."

UK skills weaknesses show through in the individual empowerment pillar of the index, where the country ranks no higher than sixth in any basic skills category. UK workers rate themselves particularly poorly on researching and evaluating information and protecting data and devices (ninth in both cases). The latter is especially concerning given the dangers of cyber fraud and the importance of protecting data online.

The picture is brighter when it comes to more advanced skills and abilities. They are relatively unsure about their ability to code and create content (ranking seventh), but UK workers are more assured than their developed-world peers of their ability to solve problems, such as removing unwanted apps from devices or freeing up disk space on their desktop computers (UK workers rank fourth).

UK workers rate themselves as poor on protecting data and devices

Individual empowerment index

Key: Brazil, China, Estonia, Germany, India, South Africa, South Korea, Sweden, UK, USA

= before the rank indicates a tie in rank with another geography

Overall Score		Researching and evaluating		Communicating and collaborating		Protecting data and devices		Content creation and coding		Solving problems		Knowledge and attitude	
01	5.9	01	5.5	01	6.0	01	5.7	01	6.2	01	6.6	01	6.4
02	5.8	02	5.3	02	5.6	= 02	5.6	02	6.1	02	6.5	02	6.1
03	5.7	03	5.1	03	5.3	= 02	5.6	03	5.9	03	6.4	03	5.9
04	5.4	04	4.7	04	4.9	04	5.4	04	5.1	04	6.1	= 04	5.8
05	5.2	05	4.5	05	4.7	05	5.3	05	4.7	= 05	6.0	= 04	5.8
06	4.9	= 06	4.3	06	4.0	06	5.2	06	4.4	= 05	6.0	= 06	5.7
07	4.8	= 06	4.3	= 07	3.6	07	5.1	07	4.2	07	5.8	= 06	5.7
08	4.6	08	4.1	= 07	3.6	08	5.0	08	3.6	08	5.7	08	5.6
= 09	4.4	= 09	4.0	09	3.4	09	4.9	= 09	3.0	09	5.4	09	5.5
= 09	4.4	= 09	4.0	10	3.2	10	4.4	= 09	3.0	10	4.8	10	5.3

The confidence trick

In a world of rapid technological change it is not enough for people simply to learn new skills. Workforces need confidence in their digital abilities to engage productively with technology and establish and develop those skills.

Confidence can be influenced by many different factors. Education levels, standards of general literacy, attitude and simple access to technology can shape how people approach and interact with technology. Learning new skills in order to operate and use technology is of course important, but is not enough to build empowerment. People must be interested in using technology in exciting and creative new ways, rather than feeling intimidated by it. David Hardman, CEO of Innovation Birmingham, points out that this applies to both home and workplace: "There's a basic level of training needed, but a lot of it is about confidence," he says. "Everything from how to programme a DVD player to using social media – you need to be able to continue to do that, and be able to do it in the workplace."

A lack of confidence, on the other hand, can exacerbate feelings of fear and uncertainty, preventing people from furthering their digital skills. "People say to themselves, 'Oh, I don't know how to use that, so I'm stupid'," explains Emma Lindley. "Then they just stop using it."

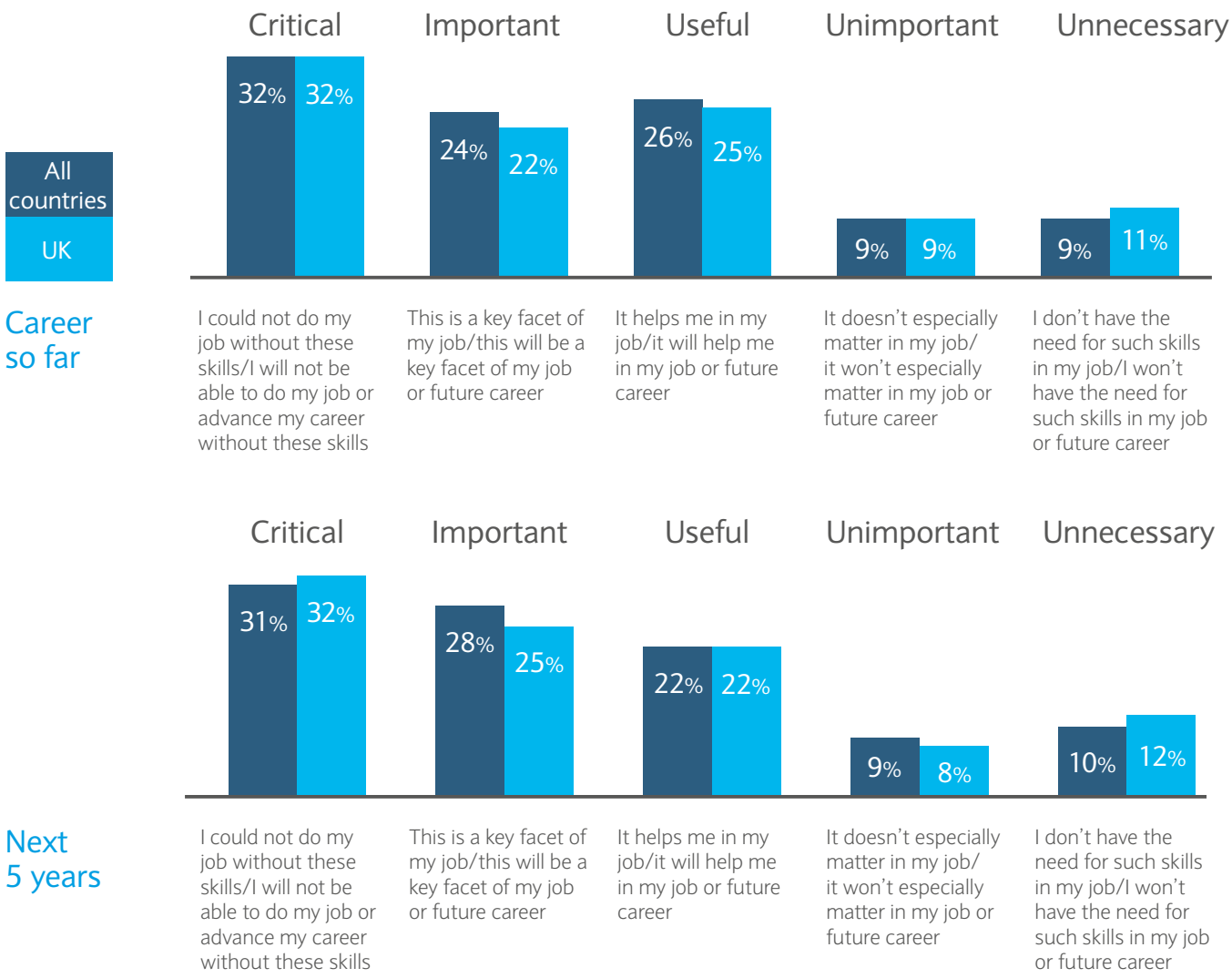
Saul Klein, Partner at venture capital fund LocalGlobe, suggests that often people can be put off or even frightened by the idea that they need to be creative when it comes to developing and applying digital skills. "In fact, you need to recognise the skills you do have and know how to apply them in the digital world." He cites the example of Uber: "Drivers use the skills they already have but instead they apply them in a new way, in a new business model which plugs into the digital age. Instead of thinking 'I can't possibly be part of this', we need to think 'what are my skills, what do I love doing, what do I excel at and how can I leverage these things?' in order to make the most of the opportunities of the digital economy."

The UK's workforce displays a comparatively positive attitude towards acquiring technology knowledge, ranking third in this category – below only China and South Africa. This is encouraging for policymakers: it means that while workers may be lacking in some digital skills, at least the majority have the confidence to attempt to change this should they want to.

More troubling, however, is the fairly noncommittal attitude of a large minority of UK workers towards improving their situation. In the survey conducted for the study, one-fifth of UK respondents (higher than the average across all countries) believe that they do not need digital skills for their jobs, while almost 30% of workers have no interest or confidence in updating their skills. Part of the problem may be a lack of exposure to technology, as Ellen Helsper, Associate Professor in Media and Communications at the London School of Economics, highlights: "If you are in an environment where nobody else uses technology, and if there's no one around to help you out if something happens or to suggest where to look for help," she says, "that quickly leads to disengagement."

Workforce attitudes towards the importance of digital skills to their jobs

How important have your digital skills been in helping you advance in your job and career thus far? And how important do you believe they will be in the next 5 years?



All countries 9760, UK:1001

Learning to learn

There is a line of thinking that digital education should be less about teaching specific skills and more about simply encouraging people to learn.

By fostering an environment in which children (and adults) can feel confident in interacting with technology, teachers can encourage them to think creatively – and even to use the technology in new and unexpected ways. What should be encouraged, the thinking goes, is learning about learning itself – the process of assimilating information and using it to improve one's knowledge and skills. So rather than devising specific lessons to teach particular skills, schools and colleges should focus on providing access to the right tools and an environment in which people can be encouraged to exploit their natural creativity.

> "Anyone can learn just about any skill – if they have the right mindset"
>
> Gi Fernando,
> Founder and CEO, Freeformers.

It is an argument supported by Tim O'Reilly, Founder and CEO of O'Reilly Media in the US. He uses a sporting analogy: "If people are sitting there saying, 'We want to produce a lot more basketball players,' you wouldn't put on basketball classes," he explains. "You would create more playgrounds with basketball hoops. It's making sure that there's access, there's inspiration and there are tools."

Gi Fernando, Founder and CEO of Freeformers, a digital transformation company, adds, "It's about skills and mindset. The biggest enabler is the democratisation of information – the fact that knowledge can be streamed like music. This means anyone can learn just about any skill – if they have the right mindset."

These views are supported by data from the index. There is a strong correlation between workers' overall confidence in their digital skills and their willingness to learn. Encouraging students and workers to continually update their digital knowledge, then, is critical to building confidence. After all, technology will continue to march on, and what are considered advanced skills today may be deemed to be basic in a few years' time.

Hasan Bakhshi, Senior Director, Creative Economy and Data Analytics at Nesta, an innovation charity, argues that formal education is important for developing digital empowerment among citizens and workers: "Digital education starts in the home and in school," he says. "We have seen a number of positive changes in recent years, in the implementation of the computing curriculum and the proliferation of coding clubs. Still, more can be done to keep the UK competitive globally, and some of these things involve thinking of the different digital skills the economy requires."

For example, adds Hasan Bakhshi, employers are increasingly demanding advanced digital skills, such as data science and machine learning. "From our analysis of on-line job ads, we see growing numbers of employers in a range of sectors seeking workers with advanced digital skills. These skills are fundamental to the vitality of the UK's most innovative and fastest growing businesses."

Old and new divides

Much policy discussion in the UK in recent years has revolved around eliminating digital divides –between urban and rural residents, for example. Internet access and connection speeds have usually been the focus of attention.

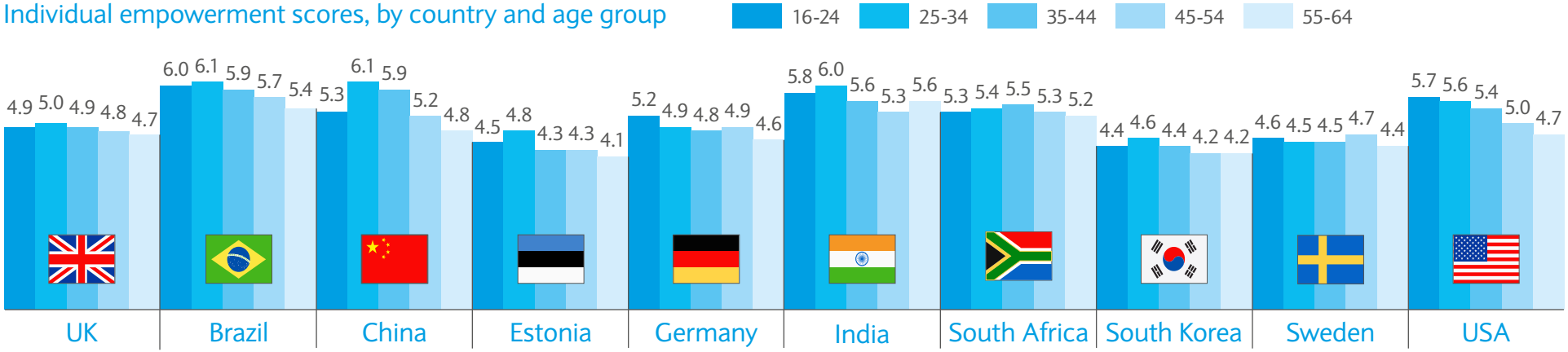
This study suggests, however, that there are digital skills gaps between different parts of the workforce that also need to be addressed – or at least taken into consideration when reviewing national digital strategy.

A gender gap is one such divide. In the UK (as well as in Sweden), men exhibit higher levels of stated assurance in most skills categories, whether basic or advanced. Womens' opinion of their confidence is extremely low in the area of online search and information evaluation. It is on a par with male confidence, however, in terms of overall attitudes towards technology learning, which suggests that minimising the gaps that do exist should not be an insurmountable challenge.

Of course, it may be that men are more likely to project confidence, whereas women are more honest about what they know. Nevertheless, gender divides such as these are familiar to Elisa Lironi, Digital Democracy and Campaigning Coordinator at the European Citizen Action Service, who sees a strong link between gender disparities in digital skills and gender gaps in wider society: "Research shows, for example, that countries which are very advanced digitally have included women into society in other ways. In other words, countries with a better gender balance tend to be more advanced in their digital skills, whereas countries that are lagging digitally are those that aren't as inclusive as they could or should be".

Age divides are also noticeable. In all countries there are broadly predictable differences in digital skills between younger and older groups of workers, with the former generally more confident than the latter. There is one interesting exception, however: within the UK and most other markets, new workplace entrants (those aged 16–24) appear less skilled than their older but less 'digitally native' counterparts (those aged 25–34). The youngest generation of workers may have learned how to consume digital content, but it might not yet have learned how to create it. This highlights the need for training and support, rather than assuming that new workforce entrants will grasp new tools by default.

Individual empowerment scores, by country and age group



Note: All scores are on a 1-10 scale.

Empowerment policy: Playing catch-up

Policy is vital to delivering digital empowerment. It shapes the framework within which people acquire and enhance their skills, and how the latter influence career development. Without training and the digital infrastructure to support it, people will not have the ability to acquire new digital skills even where they have the desire.

The policy pillar of the index considers four areas: broadband access (learning digital skills today is almost impossible without adequate infrastructure); digital skills policy formulation; compulsory education; and vocational and workplace skills. The results show broadly the reverse of the individual skills pillar: more developed markets – particularly Estonia and South Korea – are the strongest, and developing markets the weakest. One inference may be that their workforces' lack of confidence in skills is leading governments and business in developed nations to take concerted policy action to improve them.

The UK ranks fourth overall in digital empowerment policy – a better performance than in individual empowerment. It performs best in the policy category, where the government receives high marks for formulating a coherent digital skills strategy and for good coordination with the private and voluntary sectors, although there may be excessive reliance on volunteers to implement the policy.

The country receives a low score, however (and a ranking of eighth), when it comes to efforts to provide vocational and workplace training in ICT skills; adult training programmes – which could provide a vital in-road for many of the digitally excluded – receive inadequate support. In its plans for broadband roll-out, the UK is no less ambitious than many other countries, but there is still uncertainty over how good coverage will be in rural areas[7].

In most digital empowerment policy categories, the UK and other index countries cede the high ground to Estonia and South Korea. The Baltic country boasts an ambitious and well-funded broadband access policy and comprehensive training programmes, including teacher training.

Its strength in the index is no surprise to the European Commission's Riina Vuorikari: "Estonia is very advanced in applying digital in public services, for example," she says. "They don't have the burden of legacy systems, and are doing things that other countries are still talking about and wondering how to do." South Korea is a world leader in broadband provision (it also has ambitious expansion plans), while its digital skills policy – in formal education as well as adult training, including for those out of work – is well-balanced and effectively implemented.

South Korea is a world leader in broadband provision

[7] According to an Ofcom report, Making digital communications work for everyone, published in February 2016, "Rural customers have greater problems making calls, and are less satisfied with their services than anyone else."

Digital empowerment policy index

= before the rank indicates a tie in rank with another geography

Overall Score		Broadband access and policy		Digital skills policy		Digital skills in compulsory education		Vocational and workplace skills	
01	8.5	01	8.4	01	10	01	9.2	=01	7.4
02	8.4	02	8.3	=02	8.8	= 02	8.3	=01	7.4
03	7.7	03	8.1	=02	8.8	= 02	8.3	03	7.2
04	7.1	04	7.8	=02	8.8	04	7.5	04	6.7
05	6.7	05	7.6	05	7.5	05	6.7	05	6.6
06	6.4	06	7.5	=06	6.3	=06	5.8	06	6.3
07	6.0	07	5.4	=06	6.3	= 06	5.8	07	5.3
08	5.8	08	4.2	08	5.0	08	5.0	08	4.7
09	3.2	09	3.7	=09	2.5	09	3.3	09	3.7
10	3.0	10	3.5	=09	2.5	10	1.7	10	3.1

Key

- Brazil
- China
- Estonia
- Germany
- India
- South Africa
- South Korea
- Sweden
- UK
- USA

Note: All scores are on a 1-10 scale.

Start with education

Adult training programmes are important to boosting empowerment, but it is at schools that the real work begins. Yet while the will to educate may be there, there is still uncertainty in many countries over the way to go about it.

In the US, for example, there is involvement in curriculum development from third-party organisations, but courses and standards can be mixed as a result. An initiative such as code.org – widely lauded for its achievements in helping to give school pupils access to programming – is backed by the IT industry, which could limit the range of skills or learning opportunities that pupils will be exposed to, including in such areas as content creation and problem-solving. These difficulties are compounded by a shortage of qualified teachers.

> "Our staff and students are encouraged to be innovative and entrepreneurial. Digital empowerment plays a key role in both these areas and we endeavour to support staff to develop in order that they can in turn offer support and inspiration to their students."
>
> Bob Cryan,
> Vice-Chancellor, University of Huddersfield

Sherry Coutu, Chairman of Founders4schools and on the board of Raspberry Pi, says that business working hand in hand with educators to bring digital role models into classrooms and careers fairs and opening up their doors for student visits is very powerful: "The evidence demonstrate that these face-2-face interventions can triple the number of students that choose STEM subjects in just one session of four role models, which takes minutes for a teacher to organise on their mobile device." She has recommended the government help all edtech innovators by creating an API for the national pupils database so that the most successful interventions can be unearthed and amplified hundreds of times faster.

In the UK, the outlook is slightly more positive than for some of its rivals – it has a revised curriculum, for example – but here, too, the issue is teachers. According to Bill Mitchell, Director of the BCS Academy of Computing, "Most of the people responsible for teaching computing in schools haven't got much of a background in that subject and need support to understand what computing actually is." The work of volunteers is invaluable in this area, but without the teachers to implement a curriculum, the system will founder in the longer term.

Beyond coding

Ask someone what skills they think are necessary for digital empowerment, and chances are that one of the answers will be coding – essentially, learning how to write software.

Coding is finding its way into primary education in some countries, including the UK and South Korea (it is now compulsory in the latter's schools). India produces the most school pupils with coding skills – almost 10 times as many as the US (although the percentages of those graduating from high school are small).

For the experts interviewed for this report, introducing coding to school curricula is a welcome step. However, "Developing good computational skills is about much more than coding," says BCS Academy of Computing's Bill Mitchell. David Hardman of Innovation Birmingham agrees: "Basic coding helps, but we don't all need to be whizz coders to live in the digital world," he says. "We do need to understand how best to access the web and social media and the impact of that, and the responsibilities associated with all of it."

According to Nick Corston, CEO of STEAM Co., a UK not-for-profit education organisation: "Coding is only part of the software development or problem-solving process and must be taught within a wider systems-design view that encompasses understanding the challenge, defining and delivering the solution, and iterating it."

According to James Stewart, Research Fellow at the University of Edinburgh, getting children to build video games can give them not only a basic understanding of algorithms but also novel ideas about how to engage with technology. Mitchell suggests that having kids devising mini macros for Minecraft, or performing Hamlet in the video game Halo, would also serve this purpose. "They're essentially learning to write lots of little computer programs, but they do it for the social interaction it gives them and the increased status online," he says. "They're showing they can do more than just use the technology – they can master it and show they're capable of making bits of code that adapt the technology to their own use."

Schools (and governments) may baulk at the idea of allowing children to play video games in class, or use their smartphones as tools of digital expression. For Stewart, however, this would be short-sighted. "Many conventional ways of teaching digital skills in the classroom just aren't working very well," he says.

Filling the gap: the role of business

In some countries, such as India, weakness in public digital skills policy is partly counterbalanced by strong involvement of the private sector.

There is an opportunity, for example, for some businesses (and their leaders) to push for recognised qualifications and training programmes. More importantly, employers have a clear role to play in providing skills training. India's technology success suggests that business involvement in education and training can plug gaps left by government, and it can be decisive.

No one entity can meet this challenge alone, argues Sherry Coutu. "Government, businesses, volunteer organisations, schools – they must co-ordinate, and often combine, their efforts. This is not just because there's not much money to go round – it's also because each stakeholder has different strengths and perspectives to offer," she says.

Saul Klein urges a broad focus and the joining up of efforts. "Those of us in business and in the policy and educational environment need to encourage a reframing of thinking about how people use their existing skills in a digital era," he says. "And we need to support every generation – there are so many in the over 50s cohort who are not getting enough out of the digital economy. Improving engagement with digital must be a nationwide exercise for every generation."

In the US, Tim O'Reilly highlights the role of cloud services company Rackspace, which has taken a proactive approach to training. "Rackspace has its own school because it didn't have enough people who it could hire," he explains. "It trains people and hires two-thirds of them, and the other third goes to other companies. Almost all of them get jobs. People who go to the state university, however, generally don't get jobs."

> "Digital skills training in the workplace is essential. So many otherwise good employees will founder without it. With training, they could be some of your best employees."
>
> **Emma Lindley,**
> Founder and MD, Innovate Identity

Recent research shows that a majority of UK employees who have taken the time to boost their digital skills report a positive impact on their career progression[8]. In the UK, there is no shortage of digital skills training programmes offered by employers or voluntary organisations, but there is work to be done on both sides of the training desk. According to Opinium Research, British businesses are failing to invest significantly in digital skills training for their workers. Medium and large businesses plan to increase their investment in either training or recruiting digital skills by just 22% on average over the next five years. There is some variation by sector: financial services firms plan to invest most (about £12,000 in total each year for the next five years), and professional services companies the least (less than £5,000 in total each year for the next five years) – but overall there is definite room for improvement.

What's more, our survey makes clear that awareness of these programmes among employees is lacking. Only 38% of UK workers say that their employer offers training in digital skills – a figure that is considerably higher in China and the US (48% in both), and markedly higher in India (67%). The same appears to be true when it comes to awareness of government-sponsored training. This does not necessarily mean that businesses and governments are not offering such training; it does suggest, however, that government and business must do a better job of ensuring that people know about it.

> "Innovation is not about who you are or where you come from but an individual's preparedness to do something about it. The variety of people and backgrounds I have met has led me to believe that there is no monopoly on good ideas, skills or ability to create something. Some, however, are prepared to do something about it. It's the skill of iteration, change and adoption that makes the difference."
>
> **Tony Fish,**
> Co-Founder, Fab Lab London

[8]Digital Skills – Workers, survey by Opinium, 2016

Attitude and inclusion

One example in the UK of just how useful workplace training can be is e-marketing firm Smarter Digital Marketing.

The company classes itself as "wholly digital", and as such it is committed to ensuring that its staff are comfortable with digital tasks. After its inception in 2014, the company's managers started to notice that there was a dearth of suitably skilled graduates coming into the job market. Rather than despair at the lack of digitally trained personnel, the company took a different tack: it decided to hire people based not on how old they were or what degree they had, but on their willingness to engage in all things digital.

Its reasoning is sound: the core of its business – digital marketing and search-engine optimisation – involves specific skills that can only be learned through hands-on experience. So managers encourage their staff to continually learn new skills, both in their own spare time and as part of the company's mentor scheme. As the company's CEO Brian Lonsdale explains, "The specific skills needed to succeed in a digital agency are very precise, so we're happy to facilitate as much training as needed. It can be tempting to step in and take control, but if we do it that way our staff will become stagnant and not increase their skills. So now we step back and gain a real sense of pride when we watch our staff employ the online techniques they learn here."

Others agree. "Innovation is not about who you are or where you come from but an individual's preparedness to do something about it," says Tony Fish, Co-Founder of Fab Lab London, a digital fabrication workspace. "The variety of people and backgrounds I have met has led me to believe that there is no monopoly on good ideas, skills or ability to create something, but some are prepared to do something about it. And it's the skill of iteration, change and adoption that makes the difference."

Digital skills training is being used extensively in the public sector too. The UK's National Health Service is running a scheme called "Widening Digital Participation", which aims to improve the digital skills of those more likely to be excluded from the online world: older, poorer and disabled people. There is a wealth of health information and advice available online, and the goal of the scheme is to enable and encourage otherwise disadvantaged groups to access it to improve their own wellbeing, partly with the help of community networks and service provider partners. The scheme has ambitious targets – by March this year, some 400,000 people will have benefited from its work.

Another example is the BBC's 'Make It Digital' campaign, which aims to inspire people of all ages to get involved with digital technology. "We want to help people take the first step" says Jessica Cecil, Controller, BBC Make It Digital. "Amazing things happen when technology meets creativity," she adds. "It's about having the opportunity to get started on the journey which we hope will then spark further engagement with digital and lead to empowerment."

Next steps

This report makes clear that becoming digitally empowered is not just about acquiring specific skills. It is very much about building confidence in their application. New technologies can be daunting to many, but innovative educators – in schools, workplaces and vocational training environments – are helping people to overcome their fears. Importantly, they are seeking to give students the confidence to go on learning. This is critical, because the rapid pace of technological change is not likely to abate.

In the UK, some strengths in building digital empowerment are offset by clear weaknesses, and government and other stakeholders have much work to do to redress these. The workforce's lack of confidence in basic digital skills suggests, for example, that some policies are being applied in the wrong areas, or that policymakers are over-relying on volunteers to do much of the work. A shortage of teachers qualified to provide instruction in digital skills is a particular impediment to progress.

Our comparison of digital confidence and policy across countries points to five objectives that UK policymakers, businesses and other key stakeholders should jointly pursue to build digital empowerment:

Accelerate efforts

While there is much happening across the public, private and voluntary sectors to help people and organisations get online, the focus should now be on how to accelerate progress to increasing digital skills and confidence. It is not enough to maintain current momentum solely focussed on digital inclusion. Strong partnership is also required as no one organisation or institution can build digital empowerment alone.

Government is naturally well placed, but not appreciative of the need to galvanise the required collaborative behaviour and bring disparate activity together.

Widen the focus

UK efforts to date have focused on the extremes – either on encouraging advancement at the high-tech end of the spectrum or on addressing digital exclusion, with limited emphasis on those who have basic digital literacy but may be just 'getting by' online. The government has taken concrete steps to embed digital training in schools. It must also, though, help to ensure that adults receive training in advanced skills to avoid being marginalised by rapid technology change. The aim must be to move all groups – the most vulnerable, the 'forgotten middle' and those with advanced digital skills – forward towards digital empowerment.

Train more trainers

Progress in introducing rigorous digital training into school curricula will count for little without qualified professionals to provide it. From primary school teachers to university professors, educators must be properly equipped to support digital learning and growing confidence at all levels. New teachers must be trained and encouraged to find creative ways of helping students to not only use but master new technologies, and the digital skills of existing teachers must be upgraded.

Keep non-IT entities involved

The contribution of IT-focused organisations in designing skills initiatives is certainly positive, but there is also a risk of skew towards 'hard' technology skills such as coding – which are only part of the wider empowerment initiative. Input from other sectors is important to maintain a balance. While national oversight and co-ordination between public, private and third sector is essential, local and tailored delivery by partner organisations is also key.

Teach learning skills

Digital skills are not something that one acquires once. People need to be inspired to keep learning: technology will continue to change rapidly, so the key skills needed in five years' time will almost certainly be different from the ones needed today.

It must also be easy for people to learn for themselves. Not everyone learns at the same pace or responds to the same training format, so there must be flexibility and a range of learning channels.

Appendix: survey details and data sources

For a complete index methodology, visit digitalindex.barclays/methodology

Survey details

The survey that forms part of the Barclays Digital Development Index was an online survey conducted on behalf of Longitude Research for Barclays.

It was carried out in 10 countries:
Brazil (1,008 respondents),
China (1,013 respondents),
Estonia (702 respondents),
Germany (1,007 respondents),
India (1,004 respondents),
South Africa (1,005 respondents),
South Korea (1,013 respondents),
Sweden (1,006 respondents),
UK (1,001 respondents),
and the **US** (1,001 respondents).

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