The Benefits of Increased Digital Inclusion in the UK and Ireland

A report for Cisco

Authorship and acknowledgements

This report has been produced by Cebr, an independent economics and business research consultancy established in 1992. The views expressed herein are those of the authors only and are based upon independent research by them.

The report does not necessarily reflect the views of Cisco.

London, July 2022

Contents

1 Forward – David Meads, Chief Executive, Cisco UK & Ireland

The UK's national ambition to level up society and create equitable opportunities through the power of technology, brings the possibility to also drive productivity levels and boost our economy in a time when we are living with inflation and the rising costs of living.

Further digitising and transforming how we function as a society – where every UK citizen is connected, has digital skills and our public services and industries are digitised too – has the potential to add £168 billion to the UK economy by 2030. But, to fully embrace a more inclusive digital economy, with the talent and innovation to support it, requires fundamental issues to be addressed – ability, affordability, and accessibility.

It should be non-negotiable that everyone has access to digital connectivity and the skills to use technology in life and at work. Yet, in 2021, 5% of the population in the UK were without foundational level ICT skills[1] and 67% of people were concerned that access to affordable yet reliable connectivity was set to become a major issue[2]. Additionally, the urban/ rural connectivity divide is still evident with 70% of UK workers believing broadband services need to dramatically improve to enable them to work from anywhere[3].

We have a social duty to make the conversation on the digital divide one of the past and together close the gap, by enabling a sustainable digital world where everyone benefits educationally, professionally, financially, and recreationally. The UK government, industry and academia working in collaboration and investing in partnerships, projects, and initiatives would realise a more inclusive digital economy that creates opportunities, delivers outcomes, and economically empowers people, organisations, industries, and regions.

However, to live up to the UK's heritage and culture of innovation we must consider how we address not only the digital skills gap, but the varying level of digital skills required in our society. We must create programmes that move people up the skills stack, so we have a talent pool that is broad enough to secure our position as a leader in AI and Quantum Computing, as well as digitise critical public services such as healthcare, utilities, education, and our wider industry. A highly skilled workforce can not only positively impact people's earnings, but also save corporations' recruitment costs, increase government's tax revenues, and reduce Co2 emissions which would generate cost savings to society.

Connecting remote, rural communities of the UK via technologies such as 5G and open Wi-Fi has the power to achieve equitable geographic access, open digital economic opportunities, and boost productivity. Whilst influencers across government, the technology sector and wider industry must find solutions in the medium to long term to address the economics of the internet, as without it, people remain limited in their ability to gain access to free education, engage in essential services that support their welfare and quality of life, or participate in a digital economy.

Accelerating digitisation through innovation will not only help to power an inclusive future but boost our economy and transform how we live, work, and compete on a global scale.

---

1 Lloyds (2021) Lloyds consumer digital index report 2021

2 (Cisco Broadband Index).

3 (Cisco Broadband Index).

2 Introduction

This study has been commissioned by Cisco to articulate and measure the value of achieving a more digitally inclusive UK and Ireland. To this end, Cebr has undertaken a research project to quantify and describe the associated economic and social benefits up to and including 2030.

Cisco is actively encouraging the transition of the UK and the Republic of Ireland towards becoming more digitally inclusive societies. This study explores the potential benefits of overcoming the barriers that exist to individuals, businesses, and government of digital transformation. This study incorporates the underlying assumption there will be significant advances in digital inclusivity between now and 2030. As Chuck Robbins, Cisco Chairman and CEO states, Cisco want to see *'…a more connected world where everyone has access to the internet and critical services, no matter where they live.'*

This study models the effects of the majority of people who are currently without essential digital skills being able to obtain those skills between now and 2030. Incorporating consumer responses to an Ofcom survey, published in the latest Ofcom report on adults' media use and attitudes,[4] we estimate that a small proportion of the population are without the inclination to acquire digital skills and will therefore remain digitally excluded. Also factored into our research is connectivity, the quality of that connectivity and more broadly, the rate of adoption of digital technology.

Barriers and risks

Both the government and private sector can support the process of digital transformation by helping individuals and organisations to overcome the barriers that prevent higher levels of digital inclusion and technological adoption. There are at least four key barriers, and more than one may affect individuals at any one time:

- access: the ability to connect to the internet and get online
- skills: the ability to use the internet and online digital services
- confidence: a fear of cyber-crime, lack of trust or not knowing where to start online
- motivation: understanding why using the internet and digital services are relevant and helpful

It will require the private sector, government and third sector to work in concert to overcome these barriers. However, there has been much progress already, and potential shown for further progress in digital transformation.

This study is structured under four key sections: Enabling everyone with digital skills, Connecting Everyone, Digitising all industries, and Digitising public services. These four themes are key areas that Cisco sees as summarising the landscape of digital inclusion. Progress is required across all these areas to achieve the wide-ranging improvements necessary for a more digitally inclusive UK and Ireland.

4 Ofcom (2022) Adults' Media Use and Attitudes report

3 Executive Summary

The most recently published Lloyds Consumer Digital Index report states that as of 2021, 5% of the population remained digitally excluded.[5] This study on the benefits of increased digital inclusion conducted by Cebr, considers the economic benefits of achieving a digitally inclusive UK and Ireland by 2030. This study also investigates how an increase in connectivity and adoption of digital technology will induce an increase in productivity across the economy.

Using the latest Ofcom data on adults' media use and attitudes,[6] we make the assumption that a small portion of adults will never gain the Essential Digital Skills (EDS) for life, work and at the foundational level, as laid out by the Lloyds Bank EDS framework.[7] In order to minimise digital exclusion in the UK by the end of 2030, 766 thousand people must gain foundational EDS, 955 thousand must gain EDS for life, and 1.7 million must gain EDS for work, annually from 2023 to 2030. To minimise digital exclusion in the Republic of Ireland by 2030, the number of people required to learn EDS at the foundational level, for life and for work are 59 thousand, 70 thousand, and 131 thousand respectively.

- → By making the assumption that using NHS digital services requires EDS for life, we are able to calculate the monetary value of a decrease in in-person GP appointments likely to occur from achieving a digitally inclusive UK by 2030. **The NHS is expected to save £1.3 billion in aggregate from 2023 to 2030.**

- → If 1.7 million people were to gain EDS for work annually from 2023 to 2030 and be equipped to work flexibly, CO2 reduction as a result of fewer commuting journeys is expected to generate savings to society of **£622 million in aggregate over the eight-year period.**

- → **The government will save an estimated £1.7 billion in aggregate from 2023 to 2030 in efficiency savings** from those assumed to gain EDS for life, thereby increasing their usage of government transactional services online as opposed to in person, through phone calls or mail.

- → Using data from the Department for Transport, we estimate that over the 8 years from 2023 to 2030, with 955 thousand people gaining essential digital skills for life each year, this will **generate £3.8 billion in aggregate savings through increased time saved by individuals conducting banking and government transactions online.**

- → Through becoming digitally included, we estimate that those gaining essential digital skills for life will **save £6.1 billion in aggregate from 2023 to 2032 through the ability to price compare when completing online transactions.**

- → Savings to corporations filling vacant positions as a direct result of those gaining the essential digital skills for work each year from 2023 to 2030 will amount to **£23.2 billion in aggregate over the eight-year period.**

- → As digital inclusion is becoming an increasingly important factor for social inclusion, we estimate that those who become more digitally included through increased skills will spend more time

5 Lloyds (2021) Lloyds consumer digital index report 2021

6 Ofcom (2022) Adults' Media Use and Attitudes report 2022

7 Lloyds (2021) Essential Digital Skills Report

doing social recreational activities. We estimate that with 955 thousand more persons gaining life EDS per year, this adds **£960 million in aggregate through an increase in leisure and recreational spending.**

- By creating a breakdown of those receiving digital skills training each year by economic status, we estimate the number who are likely to enter the workforce as a direct result of receiving digital skills training annually from 2023 to 2030. **Over the eight-year period this will lead to additional earnings of £2.1 billion in aggregate through the increase in employment.**
- Those who are already employed and obtain digital skills training, thereby becoming digitally included, are likely to see a resulting earnings increase. **We estimate that the monetary value of this is £16.8 billion in aggregate from 2023 to 2030.**
- Through an increase in earnings of those employed gaining digital skills training and those who gain employment as a result of increased skills, we estimate the increase in government tax revenue using an in-house model. In addition, we factor in the reduction of Jobseeker's Allowance payments to those who are estimated to gain employment as a result of receiving digital skills. **We estimate the total value to be £2.5 billion over the eight years from 2023 to 2030.**
- Improved internet connectivity is part of everyone becoming better connected and improving the productivity of industry. Enhanced digital adoption is also a key driver of improved productivity. **It is estimated that industry will benefit from a boost to productivity in the region of £109 billion for the UK and £19 billion for the Republic of Ireland.**
- **The total UK benefits of increased digital connectivity and inclusion are estimated to be £168 billion.**
- **The total benefits to the Republic of Ireland of increased digital connectivity and inclusion are estimated to be £23 billion.**

4 Enabling Everyone

This section of the report covers the need to upskill those who are currently without the necessary skills they need to thrive at work and in life more generally. Whilst there have been improvements in the levels of digital skills people have in the UK and Ireland in recent years, there remains much scope for improvement. This will lead to a range of benefits for those individuals who become upskilled. These benefits include the following:

Firstly, there is a now a general discussion about the skills gap that the UK and the Republic of Ireland are currently facing.

4.2 Skills Gap – Wider Discussion

The UK has long faced a digital skills gap. There are currently around 10 million people who are not able to access the Internet themselves and cannot do the most basic digital tasks. The majority of these people are aged over 55, and many are working in sectors where digitalisation will be crucial to keep the UK competitive internationally[8]. The pace of change unleashed by digitalisation means that around two-thirds of children in primary school today will work in jobs which do not even exist yet[9]. In addition to this, the UK also has a skills mismatch with more graduates than graduate jobs, while a prevailing culture of not training sufficiently post-university leaves many underprepared for existing job roles.[10] A big part of the problem is that people are not aware that they need to continually develop their skills.

Employer Demand Side

There is significant employer demand for digital skills. A recent survey undertaken by YouGov for the educational consultancy WorldSkills UK explored the extent of the digital skills gap in the UK and uncovered a range of interesting findings.[11] Alongside literacy and numeracy, basic digital skills have become essential for the modern world of work. Over nine in ten (92%) businesses say that having a basic level of digital skills is important for employees at their organisation, and four in five (82%) job vacancies ask for digital skills. Alongside the near-universal demand for basic digital skills, many employers require advanced digital skills, with one in four employers (27%) saying that the majority of their workers require skills at this level.

Demand for advanced digital skills has increased in recent years, and it is set to go on rising; three in five employers (60%) expect their reliance on advanced digital skills to increase in the next five years. While demand for digital skills is particularly high in some sectors – such as IT and communications – it is notable that in every sector, there is a near universal demand for basic digital skills, and significant demand for advanced digital skills. Many employers already face significant digital skills gaps,

---

8 Lloyds Essential Digital Skills Report 2021 https://www.lloydsbank.com/assets/media/pdfs/banking_with_us/whats-happening/211109-lloyds-essential-digital-skills-report-2021.pdf

9 https://www.pwc.co.uk/economic-services/ukeo/pwcukeo-section-4-automation-march-2017-v2.pdf

10 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1052706/Levelling_Up_WP_HRES.pdf

11 https://www.worldskillsuk.org/wp-content/uploads/2021/03/Disconnected-Report-final.pdf

particularly relating to advanced digital skills. One in four (23%) employers say that their current workforce lacks the basic digital skills that they need, rising to over one in three (37%) in relation to advanced digital skills. Such skills gaps can have a significant impact on businesses; three in four (76%) businesses say that a lack of digital skills would affect the profitability of their business.

Worker Supply of Skills

The WorldSkills UK survey also explored factors affecting the supply of skills. It was found that nearly nine in ten (88%) of young people say that digital skills will be essential for their career. Young people are 'digital natives' who have grown up surrounded by digital technology, and the majority (62%) are confident that they have the basic digital skills that employers need. However, fewer than one in five (18%) young people are very confident they have the advanced digital skills that many employers need. Many young people are interested in pursuing a career that requires advanced digital skills, but there is a significant gender gap. Three in five (62%) young males are interested in a digital career, compared to just two in five (42%) young females, and there is a similar gender gap in young peoples' confidence in their digital skills. This reflects stark gender gaps in participation in ICT courses at school, in apprenticeships, in higher education, and in the digital tech workforce. Half (51%) of young people are interested in a career which will require advanced digital skills. Moreover, young people are keen to continue upskilling throughout their careers, with seven in ten (70%) saying they want an employer that invests in their digital skills.

Connectivity issues for children and young people

A survey conducted by Ofcom on the eve of the pandemic in early 2020 found that nearly one in ten (9%) households with children across the UK had no access to a laptop, desktop, or tablet at home.[12] Among all households with children, 2% had no access to internet, and 4% only had access through a phone's 3G, 4G or 5G network. There is a very stark 'digital divide' both in access to the internet at home and access to devices suitable for learning. Young people from the lowest socio-economic groups were six times as likely to not have access to the internet, and ten times as likely to not have access to a laptop, desktop or tablet compared to young people from the highest socioeconomic groups. Overall, more than one in five (21%) young people in lower socio-economic groups lacked access to such a device.

This digital poverty limited many young peoples' ability to learn during lockdown, contributing to educational inequalities. Moreover, the disruption from the ongoing coronavirus pandemic and the social isolation it engendered has made the heterogenous distribution of digital skills and digital provision in society starkly apparent.

Employer Investment

While many employers say they face skills gaps – including digital skills gaps – employer investment in skills in the UK is low compared to other advanced economies, and it has declined over time.[13] The latest international surveys carried out by Eurostat show that employers in the UK invest around half the EU average in continuing vocational education per employee. The Employer Skills Survey,[14] a large and long-running nationwide survey of employer skills needs and training patterns, has shown a decline in the amount invested per employee in recent years. The 2019 survey found that just two in three (61%)

12 Ofcom (2020) Connected Nations 2020

13 https://ec.europa.eu/eurostat/web/microdata/continuing-vocational-training-survey

14 https://www.gov.uk/government/collections/employer-skills-survey-2019

employers had provided training in the last year, a decline of five percentage points on the previous survey (DfE 2020).[15]

Effects on Health

The effects of digital exclusion on health are mostly the result of difficulties in obtaining information and acting on it. More than half of the people surveyed in a 2019 ONS report[16] listed "looking for health related information" as one of the key uses of the internet. Booking medical appointments, having distant medical consultations, and acquiring prescriptions electronically are just three health services that are already common, and became vital during COVID-19. Although declining, the number of "internet non-users" is still large in the UK. This matters because there is a significant overlap between digital exclusion and social exclusion, and then social exclusion and poverty, and poverty and health inequalities.

The UK Government

In 2020, the UK Government introduced a new digital skills entitlement, giving adults with low or no digital skills in England free access to new digital skills qualifications based on employer-supported national standards. The UK Government continues to work with local leaders to develop Local Digital Skills Partnerships. These collaborative partnerships are now operating in seven regions across England, with an eighth formally launching in Hull and East Yorkshire in early March. The UK Government also works with devolved administrations to consider how best to share the insights and evaluation of a programme to help build digital skills capability across the UK.

Digital exclusion in the UK and Ireland

To achieve a digitally included UK and Ireland by the end of 2030, it will be necessary for a significant number of British and Irish residents to acquire digital skills each year. Digitisation now permeates most facets of life; it influences day to day work tasks in many careers, the activities we choose to do with our leisure time, the media through which we contact friends and loved ones, and the processes we use to complete our errands such as banking and shopping. The UK is consistently one of the highest-ranking European countries in terms of digitisation, as measured by the Digital Economy and Society index (DESI).[17] In 2020, the most recent year for which this index has been released, the UK ranked 8th out of the 28 EU member states, ranking 6th and 7th in 2018 and 2019 respectively. This high level of digitisation brings with it many benefits to those who have the skills to utilise it. Evidence suggests a significant earnings differential exists for those who have digital skills, even in low skilled roles, with this differential increasing with the level of skill an employee possesses.[18]

Digitisation of government and corporate products and services means both money and time saved for consumers who are able to shop around for the best deals and complete transactions online, while saving time doing so from the comfort of their own homes. This also enables consumers to access a much larger variety of products and services. Digitisation also saves the suppliers of consumer goods and services time and money through efficiency gains. Sellers are able to increase allocative efficiency,

---

15 https://www.thelancet.com/action/showPdf?pii=S2589-7500%2820%2930169-2

16 https://www.ons.gov.uk/peoplepopulationandcommunity/householdcharacteristics/homeinternetandsocialmediausage/articles/exploringtheuksdigitaldivide/2019-03-04

17 European Commission (2020) United Kingdom in the Digital Economy and Society Index

18 Burning Glass Technologies (2019) No Longer Optional: Employer Demand for Digital Skills

reaching customers who would be unable to purchase their products if bricks and mortar shops were the only available places to make purchases from. In addition, providers, producers, and sellers able to utilise digital tools are also likely to achieve productive efficiency gains, minimising the costs associated with the production of goods and provision of services. In 2012, the UK government estimated that digitisation of its transactional services would be likely to save between £1.7 billion and £1.8 billion annually through four key areas: 1) reduced staff time involved in processing digital transactions compared to offline alternatives; 2) estates and accommodation; 3) a reduction in postage and packaging materials and; 4) the costs of supporting IT systems.[19] In addition, evidence[20] suggests that harnessing digital tools could be beneficial to reaching environmental and climate goals.

The flipside to these trends is that those who are without digital skills not only do not benefit from the advantages of digitisation, but they are in fact at a disadvantage. As the UK and Ireland become more and more digitised many aspects of our society become digital by default, and those without digital skills become excluded from fully participating in society. For example, many businesses find online sales a more cost-effective method of conducting operations and UK highstreets have suffered as a result. According to ONS data,[21] between 2015 and 2018, high street retail employment fell in more than three quarters of local authorities. COVID-19 and the associated lockdowns caused this trend to accelerate, with over 8,700 chain stores on British high streets closing in the first half of 2021.[22] If this trend continues, those who have digital skills are likely to switch to online shopping easily as their local shops disappear, however those who are digitally excluded and rely on making purchases in-person may no longer be able to acquire the goods and services that they want and need.

Both the benefits that digitisation can provide and the severity of the disadvantages of being without digital skills were enhanced further during the COVID-19 pandemic. Digital technology became essential to undergoing daily tasks without the risks that in-person interactions brought over the period. Online services acted as a central means through which people accessed information about the pandemic, the health services available to them and even as a crucial method of accessing GP appointments. Although the pandemic caused many more people to get online, the consequences for those who remained excluded are expected to have increased in severity, potentially putting their health at risk over the period.

This section of the report estimates the number of people in the UK and Ireland who are currently digitally excluded. Our first port of call for creating these estimates was the essential digital skills tables, generated by Lloyds Bank.[23] Presented in these figures are an estimation of the percentage of people in the UK who can complete all, some or no digital tasks at the foundational level, for work and for life. These percentages are further broken down by age band, region, working status and other descriptive factors.

Figure 1: Percentage of each age band who do not have foundational digital skills, 2019 – 2021

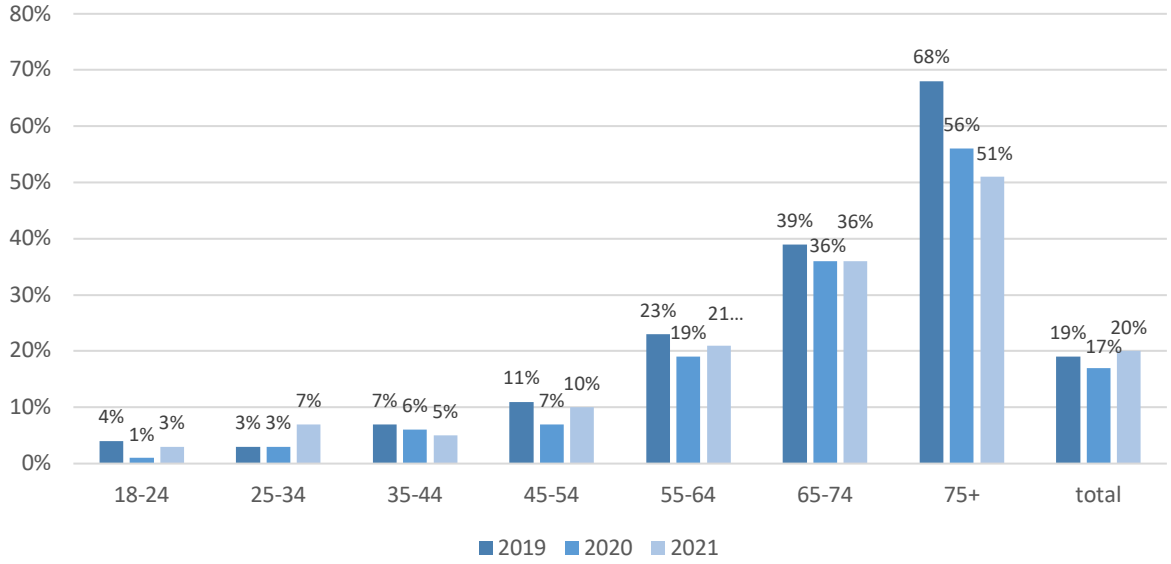
19 Cabinet Office (2012) Digital Efficiency Report

20 Europa (2020) Digitisation for the benefit of the environment: Council approves conclusions

21 ONS (2020) High Streets in Great Britain

22 BBC (2021) Almost 50 shops a day disappear from high streets

23 Lloyds Bank (2021) Essential Digital Skills Tables.



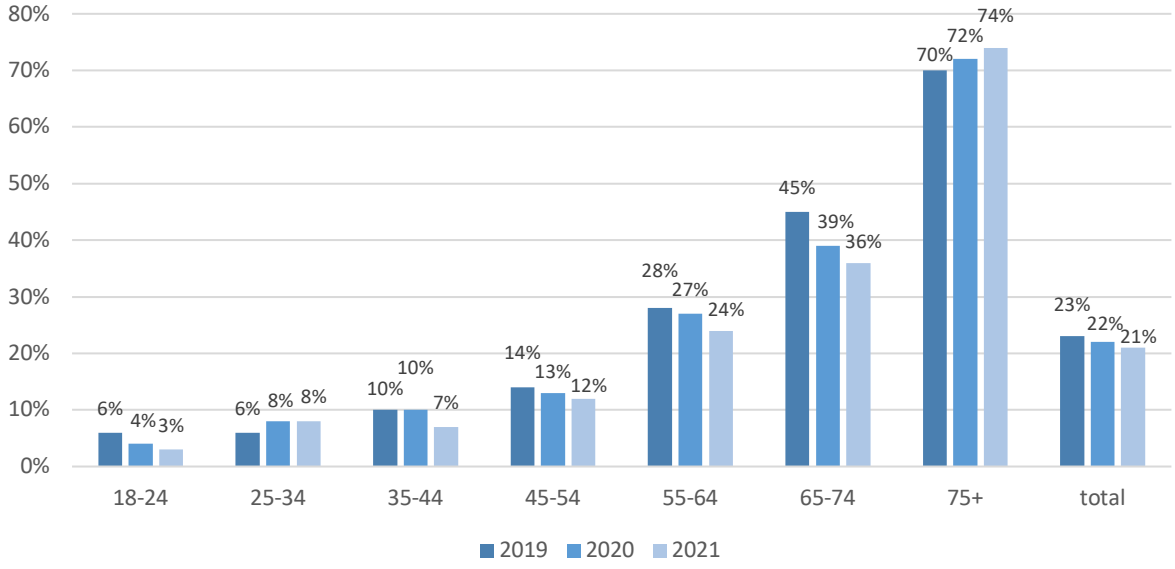
Source: Lloyds Essential Digital Skills Tables

Figure 1 above displays the percentage of people in each age category who cannot complete all seven foundational digital skills tasks, as described in the Lloyds Digital Skills Report 2021.[24] The graphed data shows that for the majority of age categories, the proportion of people without the foundational level of digitals skills decreased in the first year of the pandemic. However, from 2020 to 2021, this trend reversed, with four of the seven age categories showing a year-on-year increase in the proportion of people without foundational digital skills, and one age category remaining stationary. Only those aged 35 – 44 or 75 and over continued to see increases in the percentage who could perform all seven Essential Digital Skills (EDS) tasks. Overall, in 2021 Lloyds estimate that 20% of the UK population remain without foundational digital skills by the end of 2021 and increase from 19% in 2019 despite the drop to 17% in 2020.

Figure 2 below shows the proportion of each age category who do not have the digital skills needed for life, as specified by Lloyds.

Figure 2: Percentage of each age band who do not have EDS for life, 2019 – 2021

24 Lloyds Bank (2021) Essential Digital Skills Report 2021



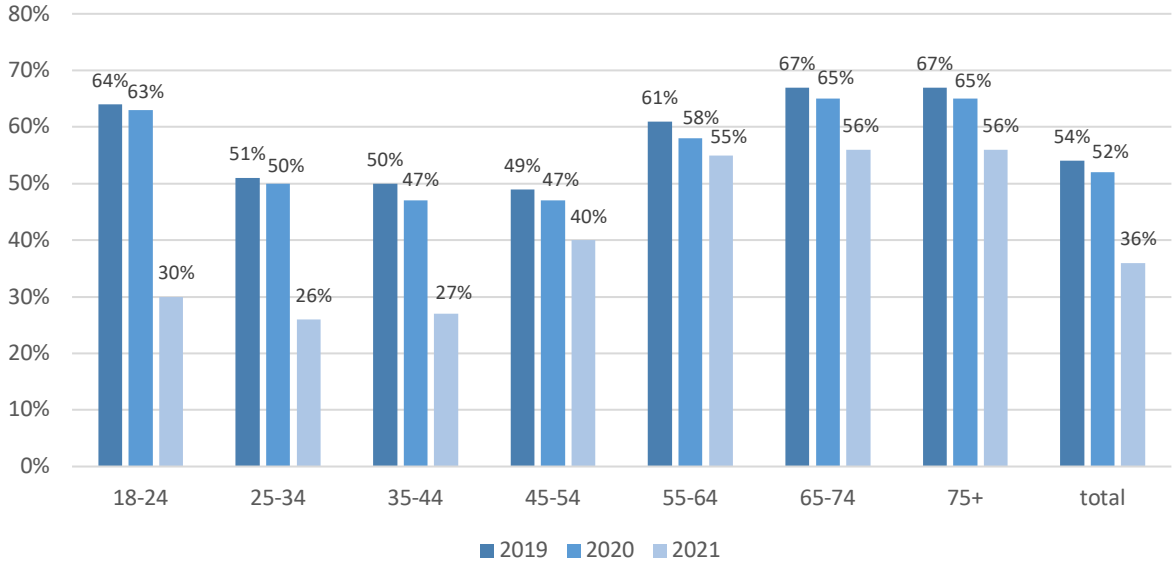
Source: Lloyds Essential Digital Skills Tables

For this level of digital skill, the trend for most age categories has been for the proportion of people without digital skills for life to decrease over the period. Those aged 18 – 24, 35 – 44, 45 – 54, 55 – 64 and 65 – 74 all gained digital skills for life from 2019 to 2021. According to the Lloyds 2021 Essential Digital Skills Report,[25] only those who have all foundational digital skills are eligible for Life EDS. There are 29 tasks associated with Life EDS split into five skill types, however within the Lloyds framework an individual is only required to have one task per skill, of all five skill types to qualify as having the EDS for life. The proportion of those aged over 75 without Life EDS is expected to have increased from 2019 to 2021 from 70% to 74%, indicating that the increase in foundational digital skills of this demographic did not accelerate past a basic level. Surprisingly, the proportion of those aged 25 – 34 without Life EDS or the foundational level of digital skills increased from 2019 to 2021, by 2% and 4% respectively.

Figure 3 below shows the percentage of each age band who do not have the digital skills required for work, according to the Lloyds bank framework. In every single age category, the proportion of people without the EDS for work fell in both 2020 and 2021. On average, the decline was greater from 2020 to 2021 than from 2019 to 2020. Only those who are classified as having EDS both for life and at the foundational level are eligible to have work EDS. If an individual can do one in each of the 5 work skill areas they are classified as having work EDS, although there are 17 work EDS tasks in total. The results indicate that those who qualify as having both life and foundational EDS have improved their digital skills required for work consistently over the period. However, this improvement may also contribute to the growing digital skill gap in the UK, as many have struggled to qualify for the foundational level of digital skills.

Figure 3: Percentage of each age band who do not have EDS for work, 2019 – 2021

25 Lloyds (2021) Lloyds Essential Digital Skills Report 2021



Source: Lloyds Essential Digital Skills Tables

The Lloyds estimates presented above, for the percentage of each age category that do not have the foundational, life and work EDS respectively were applied to ONS population projections in the UK. The results show that in the UK in 2021, there were 9.5 million people without EDS at the foundational level, 11.5 million without life EDS, and 22.2 million without work EDS.

In the Republic of Ireland, we estimate that in 2021, these figures are 666 thousand, 786 thousand and 1.5 million respectively.

4.2 Modelling the skills gap to 2030

The aim of this study is to estimate the benefits of achieving digital inclusivity by 2030 and therefore required estimating how many people would remain digitally excluded by 2030.

The first step to this process was to estimate trends in digital skills acquisition up until 2030. This involves analysing ONS data on internet usage in the UK[26] and CSO data for historical internet trends in the Republic of Ireland.[27] Using the most recently published version of this data set, as well as older versions to obtain historical data, we were able to estimate the proportion of each age category who do not use the internet regularly from 2015 through 2020. The data indicated that over time, regular internet usage increased across all age categories but at a diminishing pace. Using this as a proxy for trends in digital skills acquisition, we estimated the year-on-year change in the proportion of each age category who did not use the internet regularly. The year-on-year changes in these second order values were then calculated respectively. Excluding the year-on-year changes which occurred from 2019 through 2020, we took the average of these second order values, returning a result of 0.96 which we term the 'decay parameter'. This figure represents the pace at which the increase in internet usage diminishes by each year; the pace of growth in a given year is 96% of that of the previous year. Applying this to the existing ONS and CSO data respectively, we were able to estimate both the rate of decline each year of people who did not regularly use the internet and the percentage of people in each age band who do not use the internet regularly up to 2030.

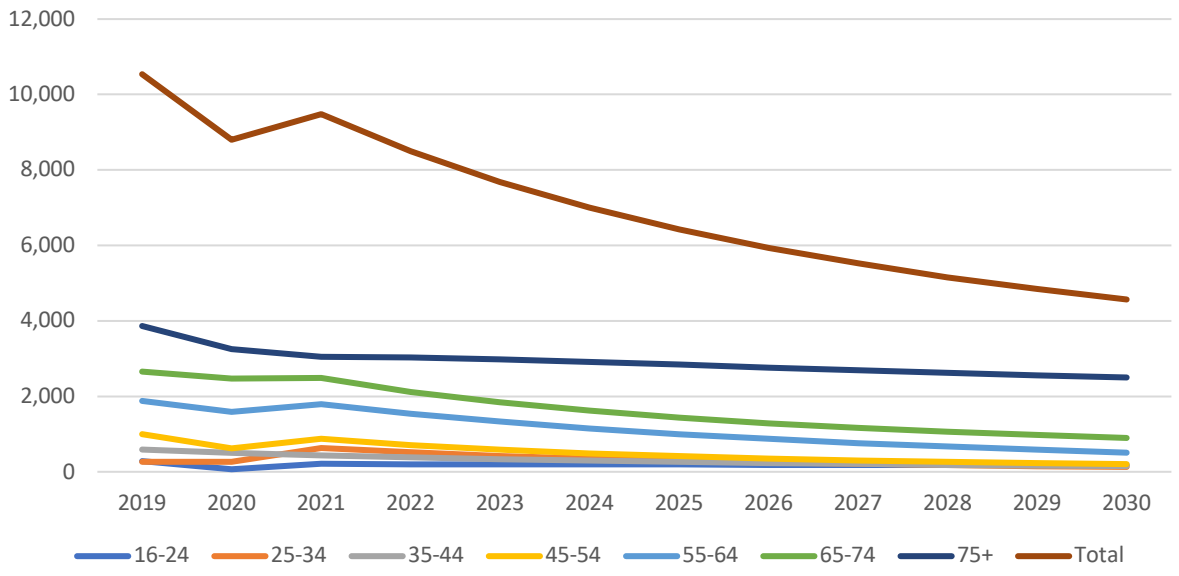
26 ONS (2021) Internet Users

27 CSO (2021) Frequency of Internet Usage

The next step involved calculating multipliers (one for each age category) which describe the relationship between those who do not use the internet regularly and those without foundational digital skills. To compute this, we took percentages of each age band that cannot complete all seven foundational tasks according to Lloyds CDI data in 2019 and divide by the percentage of people in the same age bracket who do not use the internet regularly according to ONS data. This was repeated using the Lloyds/Ipsos Mori 2018 CDI data. We did not use the most recently available data (for 2020 and 2021) because these covered years during the pandemic, which has distorted the relationship between many variables; taking the average of two non-Covid years creates multipliers that are more robust. The projections for the rate of decline in of the percentage of each age band who do not regularly use the internet, computed in the previous step, were then multiplied by the digital skills multipliers to obtain estimates for the proportion of each age band who are without the foundational level of EDS up to 2030. This step was repeated for the percentage of each age band without life and work EDS. We used these same multipliers on our models for both the UK and Republic of Ireland, making the assumption that the relationship between digital skills and internet usage remains constant in both regions.

The steps described above were applied to the estimates of people in each year without EDS for work, life or at the foundational level using the Lloyds essential digital skills tables and ONS and CSO population data. From this we were able to obtain projections for the number of people in the UK and Ireland without essential digital skills at the foundational, life and work level.

Figure 4: Projected number of people in the UK (thousands) without foundational EDS, 2019 – 2030



Source: Lloyds Essential Digital Skills Tables, Lloyds/Ipsos Mori CDI data, ONS, Cebr analyses

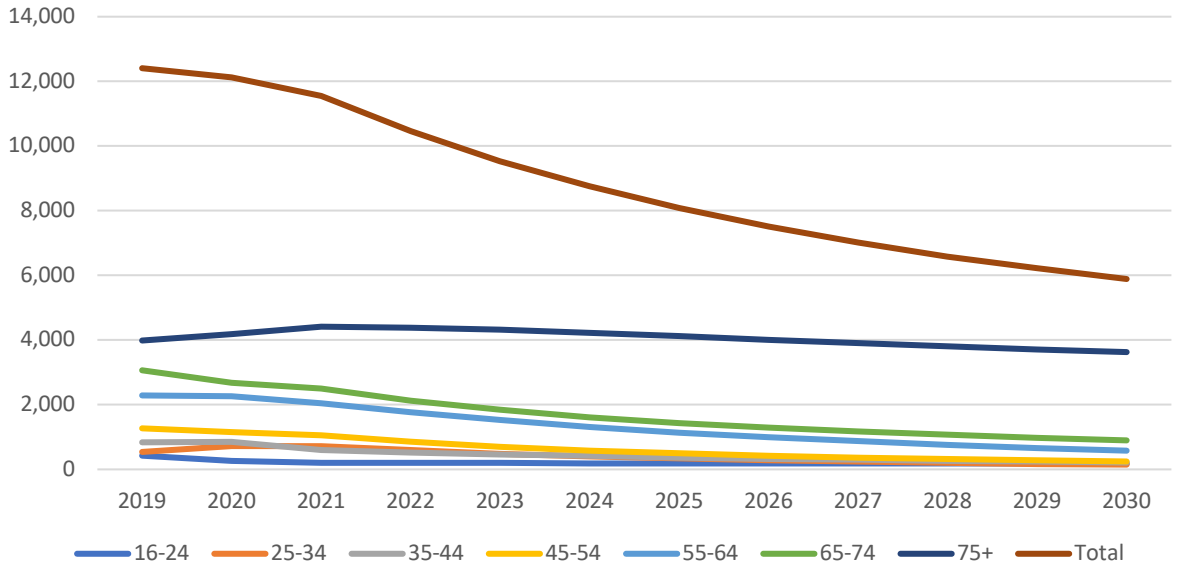
Figure 4 above shows Cebr projections for the number of people in the UK without the essential digital skills for life, in accordance with the Lloyds bank framework. Using the above-described methodology, the total number with foundational EDS fell to 8.8 million in 2020 as more people spent time at home and on their digital devices over the numerous lockdowns. However, this figure increased to 9.5 million people in 2021, falling at a steady but declining pace to reach 4.7 million people without foundational EDS in 2030.

For the Republic of Ireland, the number of people without foundational essential digital skills was 647 thousand in 2019. This fell to 573 thousand in 2020, growing again in 2021 up to 666 thousand people

without foundational EDS. From 2021 to 2030 we expect this number to fall gradually to 628 thousand without foundational EDS in Ireland.

Figure 4 below presents Cebr's projections for the number of people in the UK without the essential digital skills for life, from 2019 through 2030. Starting at 12.4 million people in 2019, this number declines marginally to 12.1 million people in 2020, a decrease of 2.2%.

Figure 4: Projected number of people in the UK (thousands) without life EDS, 2019 – 2030

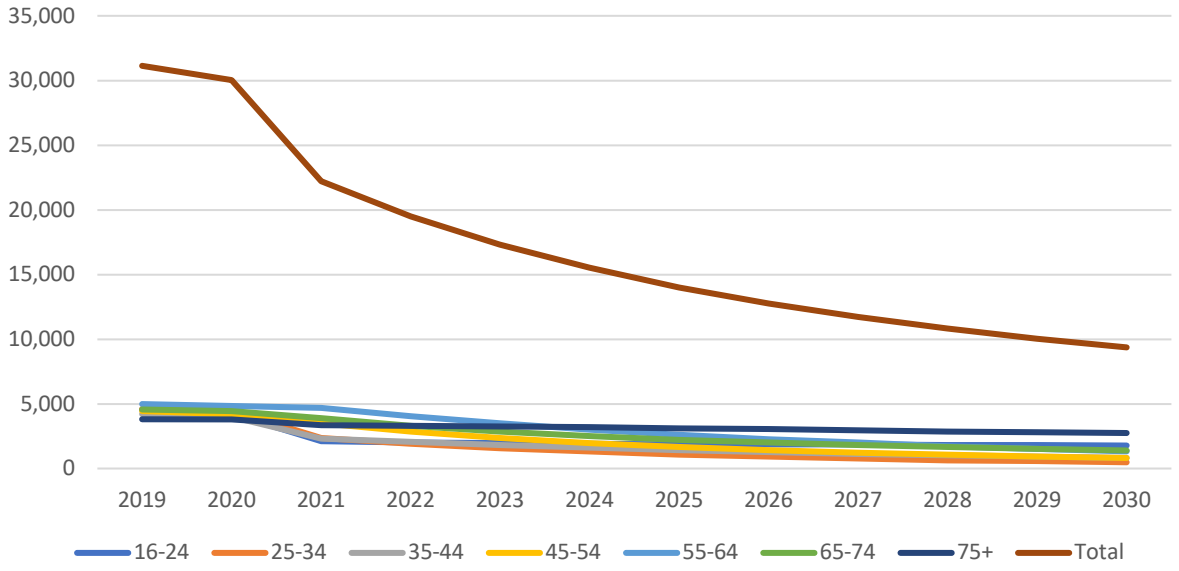


Source: Lloyds Essential Digital Skills Tables, Lloyds/Ipsos Mori CDI data, ONS, Cebr analyses

This figure declines at a faster pace the following year (4.8%) reaching 11.5 million people without EDS for life by 2021. The number of people without life EDS is projected to continue to decline each year, reaching 5.9 million without life EDS in 2030.

We estimate that in the Republic of Ireland, 778 thousand were without the digital skills for life in 2019. Using the earlier described methodology, we see this rising to 786 thousand in 2021 indicating that the pandemic had a negative effect on medium level digital skills. We expect this number to decline gradually to 774 thousand in 2030.

Figure 5: Projected number of people in the UK (thousands) without work EDS, 2019 – 2030



Source: Lloyds Essential Digital Skills Tables, Lloyds/Ipsos Mori CDI data, ONS, Cebr analyses

Figure 5 above displays Cebr projection for the number of people in the UK without the essential digital skills for work from 2019 through 2030. Using the percentages from the Lloyds essential digital skills tables applied to ONS population data, we estimate that 31.1 million people in the UK were without EDS for work in 2019. Similar to those without life EDS, this figure declined at a slow rate of 3.5% to approximately 30 million people in 2020. However, the pace of the decline sped up in the following year, falling to 22.2 million people, a decline of 26%. The number of people without work EDS is projected to fall year-on-year at a diminishing rate, reaching 9.4 million people by 2030.

For the Republic of Ireland, the number of people without digital skills for life is expected to be 2.2 million in 2019. This figure is expected to decline marginally to 2.1 million in 2020 and at a sharper rate to 1.5 million in 2021. This decline is largely expected to be the result of younger demographics who already possess the EDS for life and at the foundational level using the pandemic restrictions to digitally upskill themselves. The number without work EDS in Ireland is expected to decline at a slower pace to 1.4 million people in 2030.

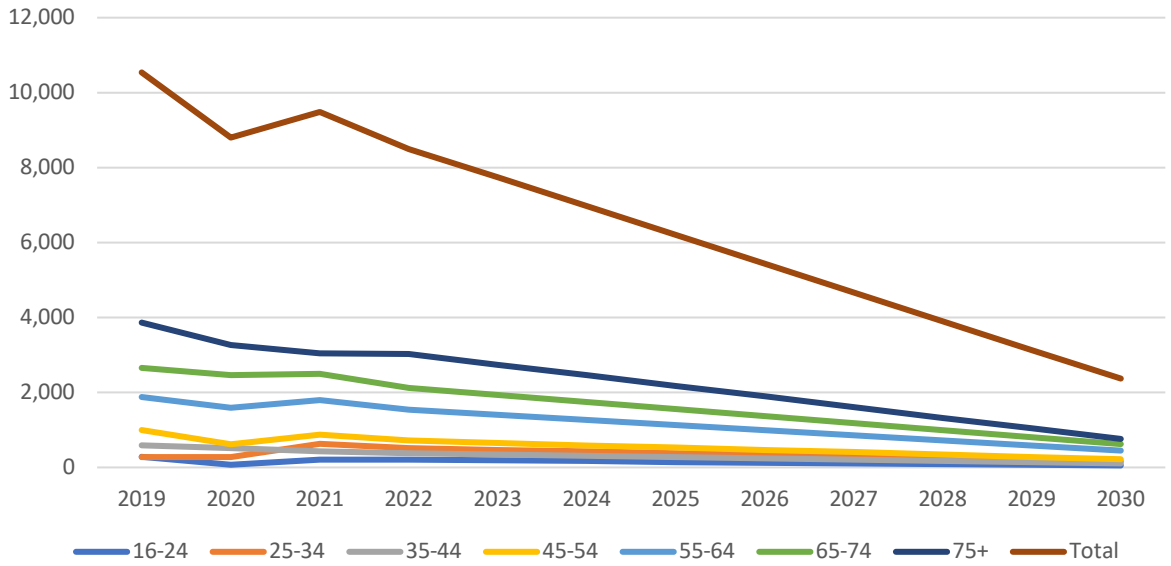
Requirements for inclusion

Full societal digital inclusivity implies that everyone possesses the digital skills required to engage fully in the society in which they live. However, responses to surveys conducted by Ofcom suggest that some people will never gain digital skills, even with initiatives and programs in place designed to aid digital skill acquisition. In their 2022 report on adults' media use and attitudes[28] Ofcom found that as of December 2021, 6% of households did not have internet at home, while 69% of this group stated that nothing would prompt them to go online within the next 12 months, with the most frequent reason given that they were not interested or felt no need to go online. Using the assumption that those who do not regularly use the internet are without the foundational level of essential digital skills, and applying this to the above statistics, Cebr estimates that in the UK approximately **2.4 million people will never gain foundational EDS.** This means that instead of reaching zero people without foundational digital skills, for the purposes of this report, reaching full digital inclusivity implies that 2.4 million will not have foundational EDS by 2030, instead of the 4.7 million people

28 Ofcom (2022) Adults' Media Use and Attitudes report, pp.8

projected to be without foundational EDS in 2030 if no digital skills intervention takes place. This assumption makes the results of our investigation more conservative but also more robust.

Figure 6: Projected number of people (thousands) in the UK without foundational EDS with an intervention to achieve digital inclusivity by 2030, 2019 – 2030

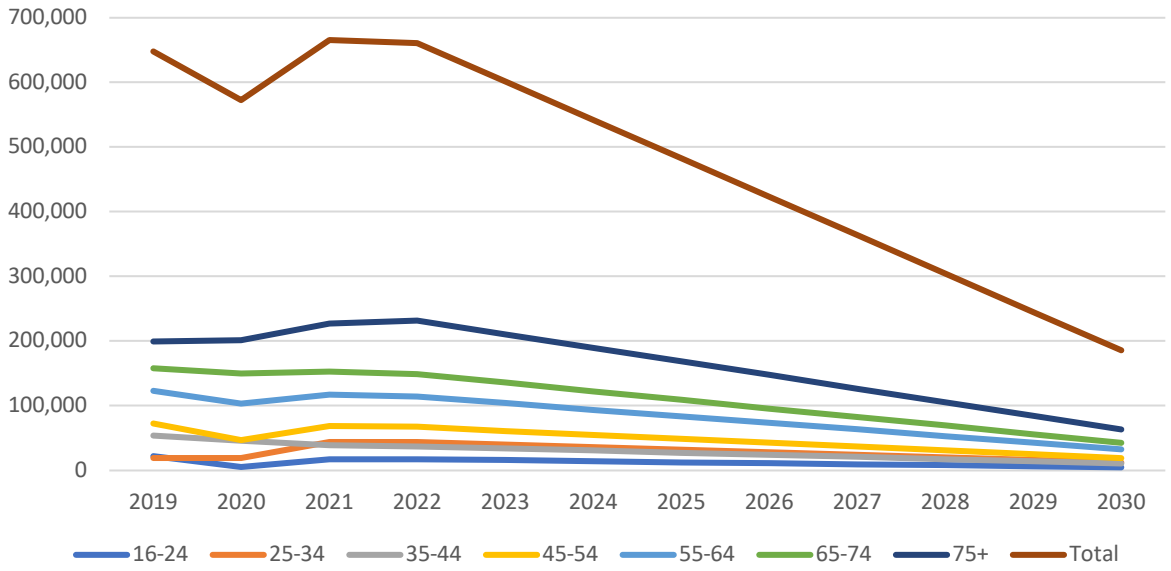


Source: Lloyds Essential Digital Skills Tables, Lloyds/Ipsos Mori CDI data, ONS, Cebr analyses

Figure 6 above presents Cebr's projections for the number of people in each age band without foundational digital skills, if an intervention to achieve digital inclusivity by 2030 was implemented in the UK from 2023 onwards. **This would require 766 thousand people to gain foundational EDS per year from 2023 to 2030 inclusive.**

Using the same methodology, **we estimate that in the Republic of Ireland, 185 thousand people will never gain essential digital skills at the foundational level.** To reach this number by 2030, 59 thousand people must gain foundational EDS each year from 2023 to 2030. Figure 7 below provides a visual representation of the number of people presented in millions without foundational EDS in Ireland with an initiative to minimise digital exclusion in Ireland by 2030.

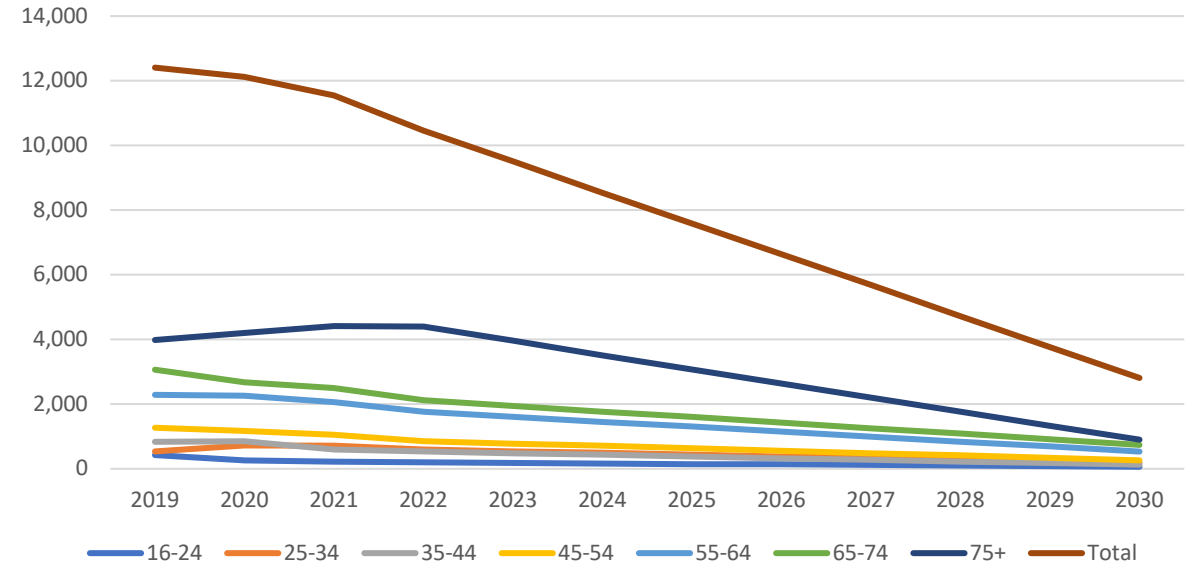
Figure 7: Projected number of people in the Republic of Ireland without foundational EDS with an intervention to achieve digital inclusivity by 2030, 2019 – 2030



Source: Lloyds Essential Digital Skills Tables, Lloyds/Ipsos Mori CDI data, CRO, Cebr analyses

For the years over which Lloyds essential digital skills tables provides data (2019, 2020 and 2021) we calculate the ratio between those who are without foundational EDS and life EDS. Taking the average across all years we are returned a figure of 1.18, indicating that, on average, the percentage of people in the UK without life EDS is 1.18 times higher than that of those without life EDS. Utilising this, we estimate that the percent of the population who will never gain life EDS will be 1.18 times higher than that of those who will never gain foundational EDS. As a result, Cebr estimates that 2.8 million people will never gain the essential digital skills for life, as specified by the Lloyds framework.

Figure 9: Projected number of people (thousands) in the UK without life EDS with an intervention to achieve digital inclusivity by 2030, 2019 – 2030

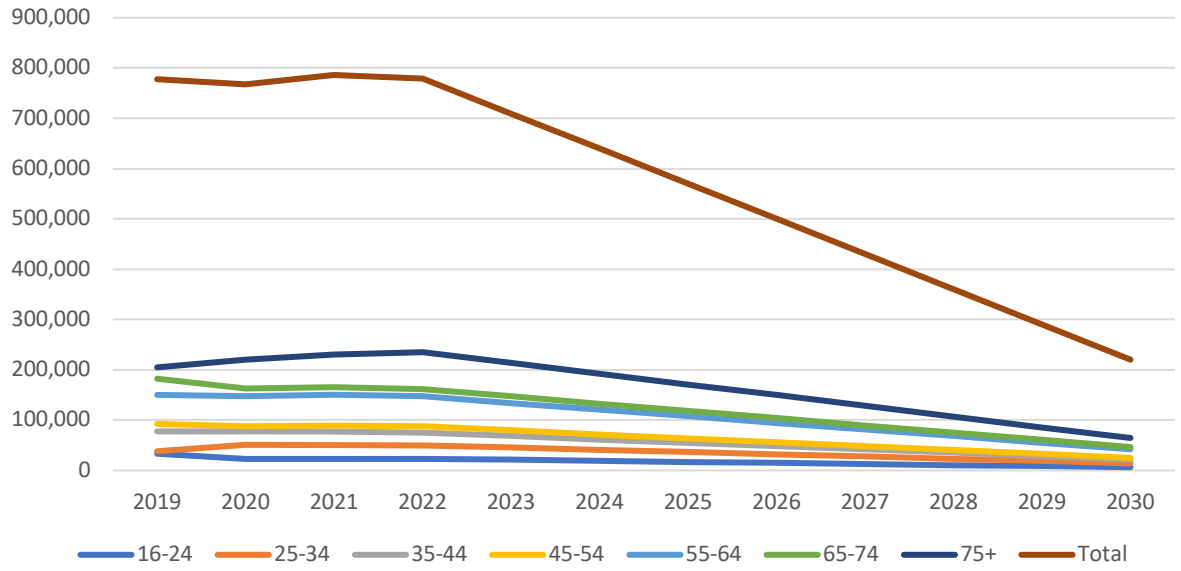


Source: Lloyds Essential Digital Skills Tables, Lloyds/Ipsos Mori CDI data, ONS, Cebr analyses

Figure above displays Cebr's projections for the number of people in each age band without the essential digital skills for life, if an intervention to achieve digital inclusivity by 2030 was implemented in

the UK from 2023 onwards. **This would require 955 thousand people to gain life EDS per year from 2023 to 2030 inclusive.**

Figure 10: Projected number of people in the Republic of Ireland without life EDS with an intervention to achieve digital inclusivity by 2030, 2019 – 2030



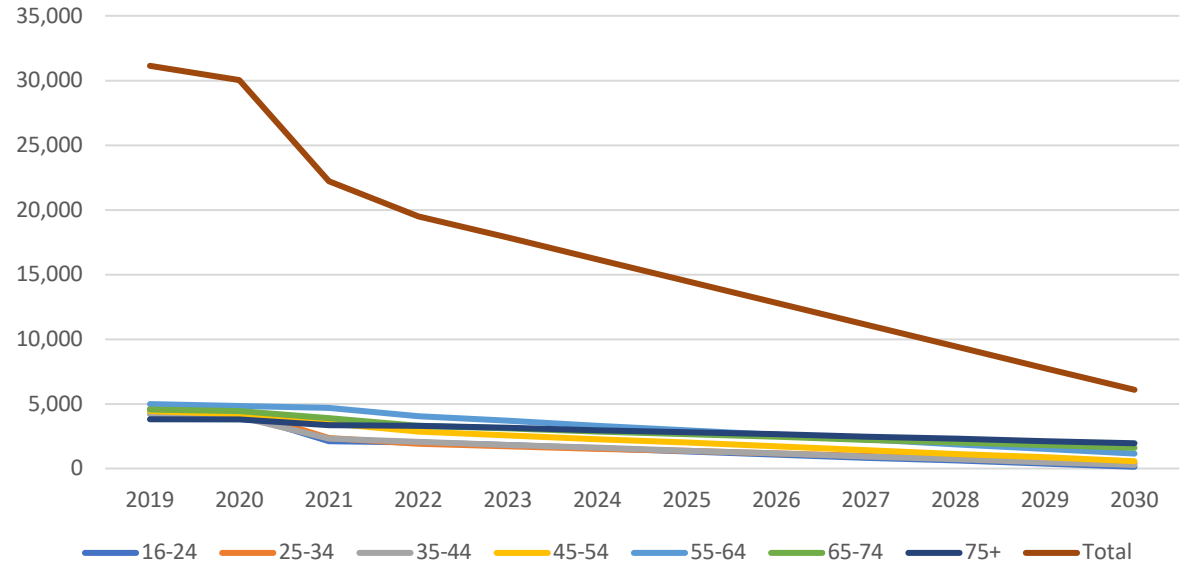
Source: Lloyds Essential Digital Skills Tables, Lloyds/Ipsos Mori CDI data, CSO, Cebr analyses

Figure 10 above shows the number of people projected to be without life EDS if an initiative to maximise digital inclusivity in Ireland was put in place. **We estimate that 220 thousand will never gain life EDS and therefore 70 thousand must acquire life EDS in Ireland each year to reach this goal.**

Using data from the Lloyds essential digital skills tables, the ratio between the percentage of people in the UK without the essential digital skills for work and the percentage of people in the UK without the foundational level of essential digital skills was calculated. Taking the average of all three years for which data was available returned a figure of 2.57. This implies that the percentage of people without work EDS is 2.57 times higher than that of those who do not have foundational EDS. After incorporating this into our analyses, we estimate that **6.1 million will never gain work EDS**, even with initiatives to increase digital inclusion in the UK.

Figure Figure 11 below displays Cebr's estimates for the number of people in each age category without the essential digital skills for work if an intervention to achieve digital inclusivity by 2030 was implemented in the UK from 2023 onwards. **This would require 1.7 million people to gain work EDS annually from 2023 through 2030 inclusive.**

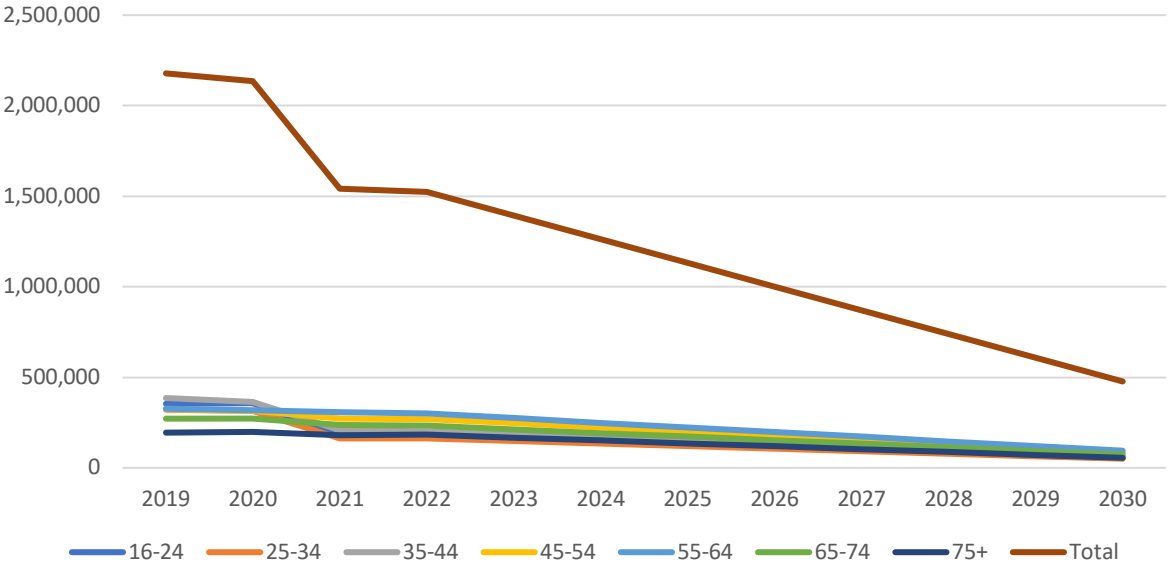
Figure 11: Projected number of people (thousands) in the UK without work EDS with an intervention to achieve digital inclusivity by 2030, 2019 – 2030



Source: Lloyds Essential Digital Skills Tables, Lloyds/Ipsos Mori CDI data, ONS, Cebr analyses

We estimate that 477 thousand people in Ireland will never gain work EDS. As a result, to achieve digital inclusivity in Ireland by 2030, 131 thousand people must gain work EDS each year.

Figure 12: Projected number of people in the Republic of Ireland without work EDS with an intervention to achieve digital inclusivity by 2030, 2019 – 2030



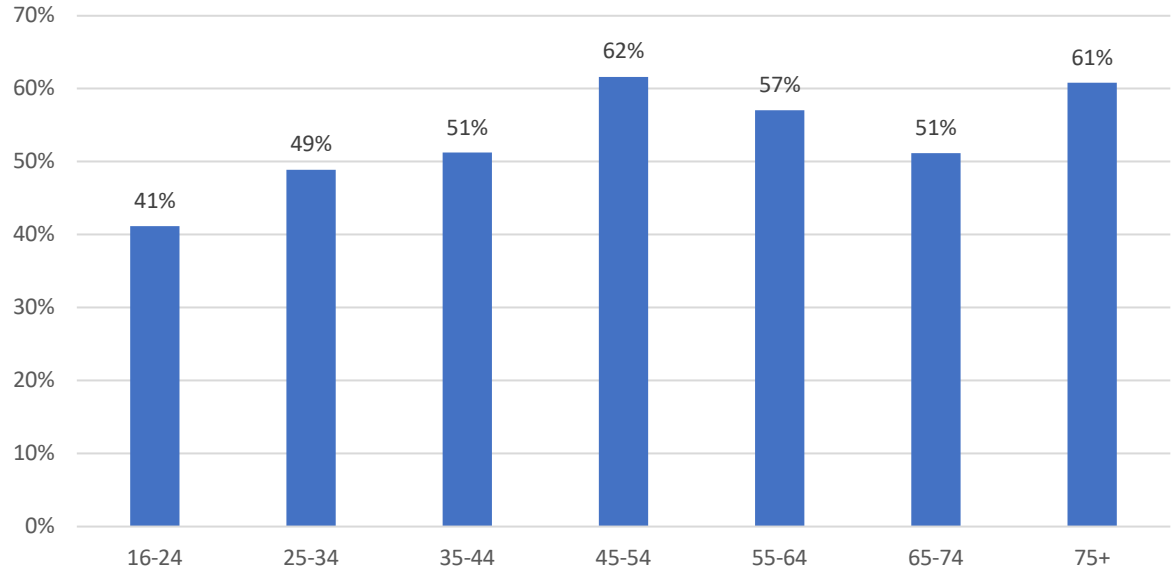
Source: Lloyds Essential Digital Skills Tables, Lloyds/Ipsos Mori CDI data, ONS, Cebr analyses

To conduct subsequent parts of this project, it is important to have a breakdown of those without essential digital skills by disability and economic status. There are two reasons underpinning our decision to split those gaining skills into those who are disabled and not disabled. Firstly, it allows us to highlight the overrepresentation of disabled individuals in the group who do not have essential digital skills. Secondly, data suggests that those who are disabled, and non-disabled have different employment and earnings outcomes; such differences are important to capture for later stages of our analyses. To split learners into disabled and non-disabled categories, we used ONS data on internet

users[29], which breaks down those who do not regularly use the internet by age group and disability levels, as a proxy for those who do not have essential digital skills and are disabled. Those who are categorised as disabled are done so in accordance with the Equality Act 2010.

Figure 13 below presents a breakdown of those without essential digital skill and are disabled by age group. The Labour Force Survey (LFS) and Annual Population Survey (APS) [30] are utilised to estimate the employment status of those who are disabled and non-disabled in the UK by age group. This data is applied to our estimates of those who are required to gain essential digital skills annually and are disabled and non-disabled respectively. From this, we are able to split those who are required to gain EDS at the foundational level, for life and for work each year, into disability and economic status. For the purpose of our analyses, the categories of economic status used are employed, unemployed, and inactive.

Figure 13: Percentage of those who do not have essential digital skills and are disabled, by age group



Source: ONS, Cebr analyses

4.3 Monetised Benefits

We now consider monetised benefits associated with digital upskilling. The monetised benefits estimated in this section are Time savings, Retail transaction benefits, Employment, and Earnings.

29 ONS (2021) Internet Users

30 ONS Nomis (2022) Annual Population Survey/Labour Force Survey; survey data on population, economic activity/inactivity, and qualifications. Broken down by sex, age, ethnicity, industry, and occupation.

Time savings

In this section of the report, we estimate the time saved to individuals in the UK and Republic of Ireland by conducting tasks digitally and monetised these savings.

The Covid-19 pandemic accelerated an existing trend towards the digitisation of transactional services. This covers individuals' interactions with private and public service providers: banking, booking haircuts, doctors' appointments, ordering food, and shopping. Increasingly, these do not require in-person or telephone contact.

Consumers save approximately 30 minutes on each digitised transaction[31] according to data published by the Security, Identity Alliance. We analyse the most recently published ONS data on government digital services to estimate that individuals make approximately 56 government transactions online per year[32]. By combining these two statistics, Cebr estimates that on average, individuals save 27.9 hours per annum by conducting government transactions online. In addition, we utilise data conducted by One Economy, which estimates that individuals save 33 hours a year through conducting banking online, completing approximately 66 transactions[33].

We make the assumption that once an individual gains the essential digital skills for life, they will be fully capable of completing both government and banking transactions online, and will choose to make half of these transactions in this way. It is our assumption that having only the foundational level of essential digital skills will be insufficient for this purpose.

By combining the above assumptions, we estimate that everyone that has life EDS saves approximately 30.4 hours of leisure time per annum as a direct result of completing government and banking transactions online. We apply this to the 955 thousand people who are required to gain life EDS per annum to achieve a digitally included society by 2030, estimating that approximately 29 million hours could be saved per annum.

The Department for Transport publishes estimates of leisure time valuations in its TAG data book.[34] Taking the most recently available dataset (November 2021), we use an in-house model to convert these into 2022 prices. Combining these estimates with the hours saved, we compute the monetary value of the time saved from those gaining life EDS using digitised services. Our UK results are presented in Figure 14 on the following page.

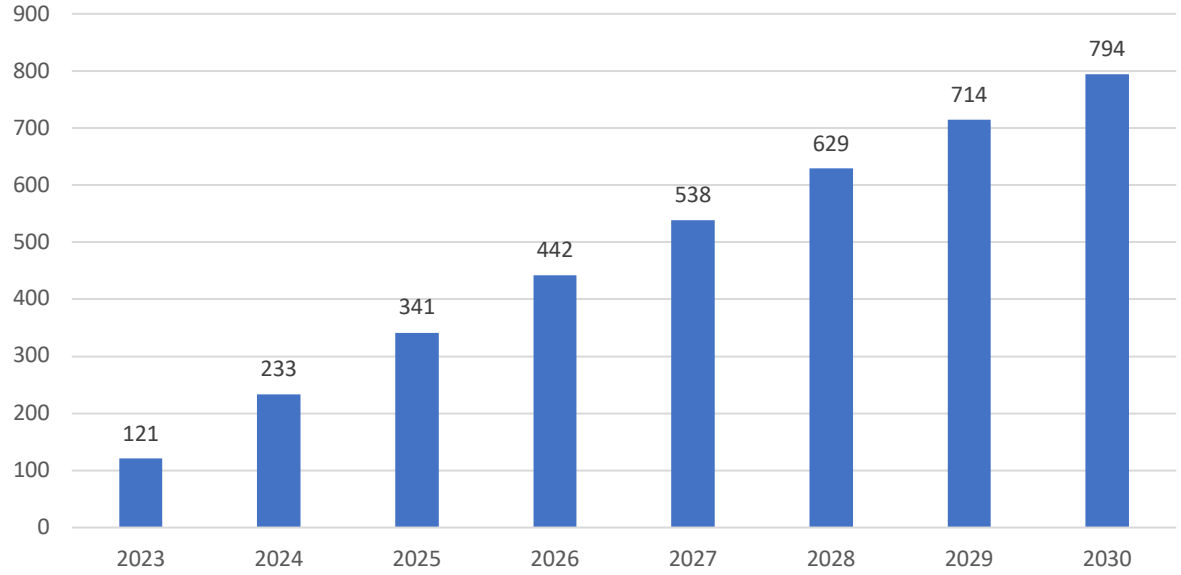
Figure 14: Monetary benefits of time saved UK, 2023 – 2030, £m

31 Security Identity Alliance (2013) eGovernment services would yield up to $50bn annual savings for governments globally by 2020

32 Government Digital Service (2021) Historical Performance Platform

33 Just Economics for BT (2014)" Valuing Digital Inclusion: Calculating the social value to individuals of going online".

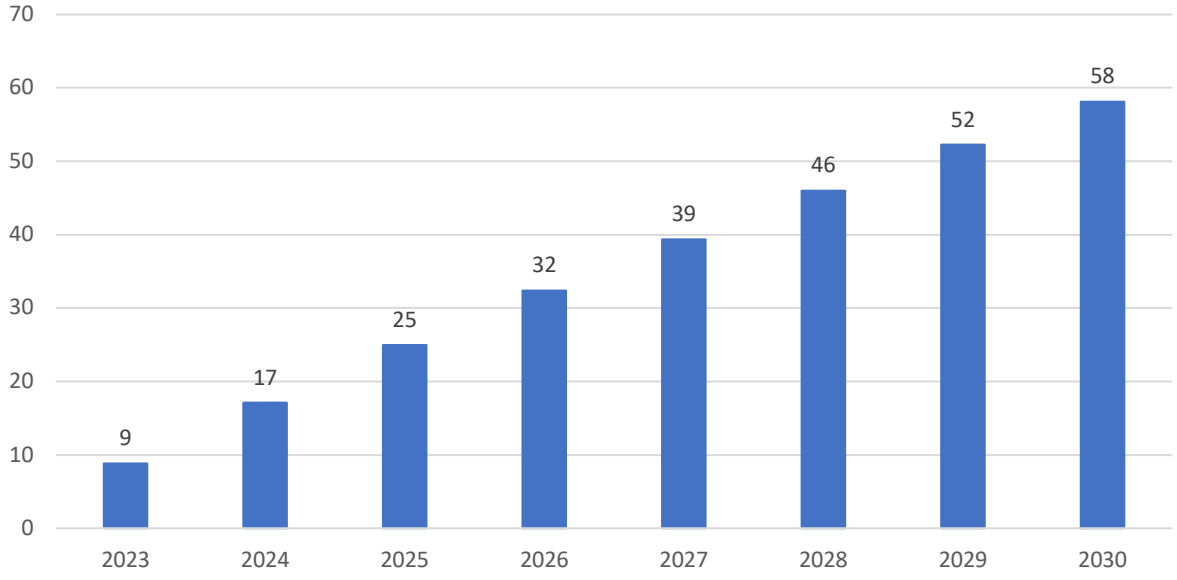
34 Department of Transport (2021) TAG data book



Source: DfT, Cebr analyses

In aggregate, over the eight years from 2023 to 2030, the value of individuals' time saved as a direct result of upskilling 955 thousand people a year with the essential digital skills for life is expected to sum to £3.8 billion.

Figure 15: Monetary benefits of time saved Ireland, £m



Source: DfT, Cebr analyses

Figure 15 above displays the annual savings made from individuals' time saved in the Republic of Ireland from 2023 to 2030. In aggregate, this sums to £279 million over the eight–year period.

Retail transaction benefits

Online shopping brings with it multiple benefits for consumers. In addition to saving time, as detailed in the previous chapter, consumers who do some of their shopping online are able to access a wider range of goods than those who are limited to shopping in person. Moreover, online shoppers' ability to rapidly compare prices from a wide range of sellers translates into real monetary savings.

The Lloyds 2017 Consumer Digital Index report shows that individuals save an average of £444 per year by shopping online using cashback and discount sites. This is despite only 50% of those who shop online taking advantage of these tools.[35] Scaling this up to 2022 prices, we were obtained estimates for the per-person savings that online shoppers can make. We do not assume that the saving is uniform across demographics, as they have different disposable income levels and purchasing habits. Therefore, we scale the per-person saving by age demographic, using ONS household spending data by demographic.[36] This dataset shows the variation in household spending made by each age group relative to the mean, and is shown below in Table 1.

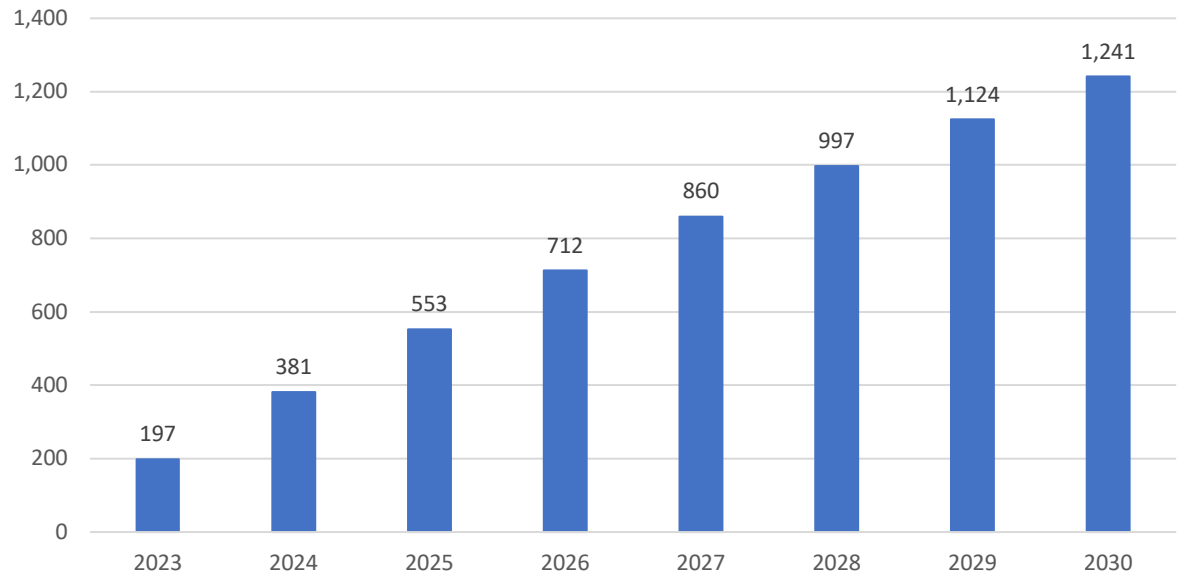
Table 1: Household spending data by age band, variation from average, 2019

Age band	< 30	30-49	50-64	65 – 74	75+
Variation from average	-1%	14%	10%	-11%	-41%

Source: ONS

We assume that essential digital skills for life are required for individuals to shop online. Therefore, we apply these savings from online shopping, varied for age demographic using the ONS household survey data, to the 955 thousand people in the UK required to gain life EDS per annum. Figure 2 below displays our results for the UK.

Figure 16: Transactional benefits UK, 2023 - 2030, £m



Source: Lloyds, ONS, Cebr analysis

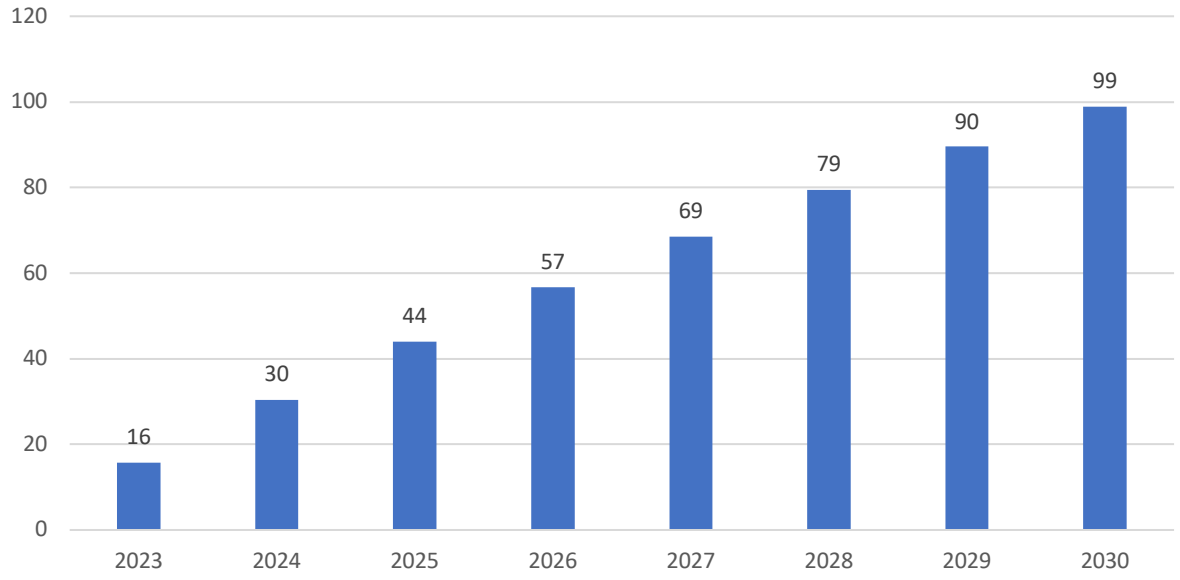
We find that cumulatively, over the period 2023 through 2030, achieving a UK society in which as many people have the essential digital skills for life as possible is likely to save individuals with these skills £6.1 billion in aggregate.

35 Lloyds (2017) Lloyds Consumer Digital Index 2017

36 ONS (2019) Detailed Household Expenditure Survey

Figure 17 below displays the likely savings made through price comparisons when individuals with essential digital skills for life in the Replublic of Ireland shop online. Over the eight year period, this sums to £483 million.

Figure 17: Transactional benefits Ireland, 2023 - 2030, £m



Source: Lloyds, ONS, Cebr analysis

Employment

An individual's digital capabilities can affect their success in the job market. On a wider scale, as mentioned previously in this report, the digital capabilities of a society or country can have drastic effects on workplace productivity, creating benefits for both employers and wider society. In this section of the report, we focus on those who are currently unemployed and are likely to gain employment as a direct result of acquiring the essential digital skills for work, calculating the increase in earnings they receive as a result.

Our first step in quantifying this increase involves estimating the number of people who are likely to gain employment as a direct result of gaining work EDS. We utilise data from the PWC study[37] to estimate the proportion of those gaining basic digital skills each year that will gain employment as a direct result. We take as a starting point a proportion 5.5%, which is based on results from the aforementioned PWC study. We then scale this up each year in line with results from the Employers Skills Survey, on the growth in vacancies related to digital skills each year. The underlying logic is that we scale up the PWC statistic in line with the growth in importance of digital skills in the labour market. We are returned percentages that increase marginally each year, from 5.7% in 2023 to 5.9% in 2030. We multiply the percentage for each respective year by the number of people who we have estimated are gaining work EDS each year and are currently unemployed. Using this process, we estimate the number of people expected to go from being unemployed to employed as a direct result of gaining work EDS.

The expected earnings of those gaining employment as a result of acquiring work EDS are then calculated, using the Annual Survey of Hours and Wages (ASHE) dataset. Utilising the ASHE dataset published for each available year included in this study, we take the lowest earnings quartile as representative of an individual's salary who gains employment because of learning basic digital skills..

37 PWC (2009) Champion for Digital Inclusion: The Economic Case for Digital Inclusion

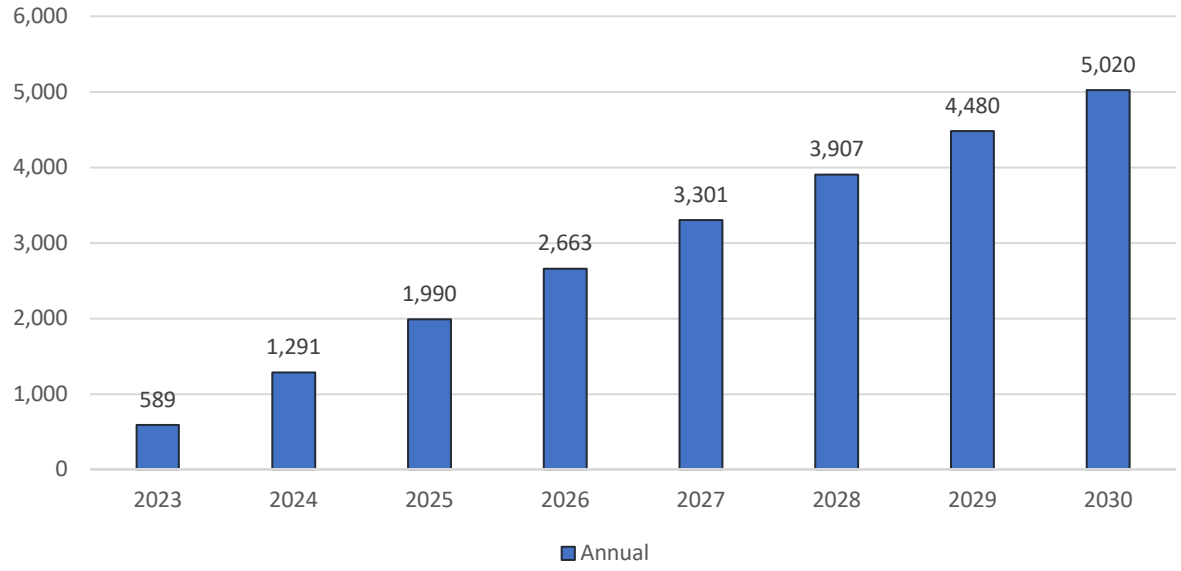
Then, these wages are scaled up in each year, using Cebr's in-house macroeconomic model. By adoptingthis method, we find that the lowest quartile of earnings is likely to range from £18,464 in 2023 to £22,296 in 2030. These figures include both full-time and part-time workers. These estimated earnings for each year are then multiplied by the number of people estimated to transition from being unemployed to employed as a result of gaining work EDS to estimate the total earnings of this group.

Using an in-house tax calculator, we calculate the estimated income tax, employee's national insurance contributions and employers' national insurance contributions expected to be generated by these earnings. We subtract from the earnings income tax and employee national insurance contributions so as not to double count these amounts. Our UK results are displayed in

Figure 18 Employment benefits UK, 2023 - 2030, £m

below. We estimate that cumulatively £2.1 billion is gained in earnings by those who become employed from gaining work EDS.

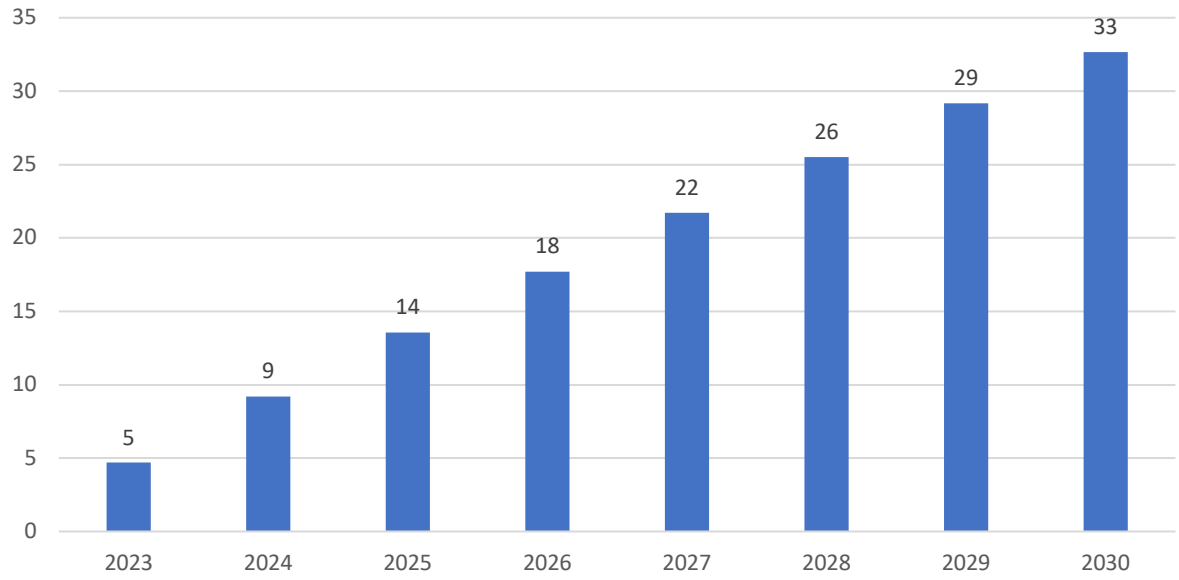
Figure 18 Employment benefits UK, 2023 - 2030, £m



Source: ONS, Cebr analysis

Figure 19 on the following page presents our results for the annual monetary benefits expected from an increase in employment likely to occur as a direct result of those required to gain work EDS in the Republic of Ireland. From 2023 to 2030, Cebr estimates this figure will amount to £154 million.

Figure 19: Employment benefits Ireland, 2023 - 2030, £m



Source: ONS, Cebr analysis

Earnings

Those who were unemployed and gain employment as a result of attaining work EDS are not the only group to benefit from additional earnings, following digital skills acquisition. Those who do not have the essential digital skills for work as specified by the Lloyds framework and are already employed are likely to see an increase in earnings. In this section of the report, we aim to quantify and monetise this increase.

We first estimate the current earnings of the 1.7 million people gaining work EDS each year who are currently in employment. We first split this group into those who are disabled and not disabled, as data suggests that those who are disabled, and non-disabled are likely to have different employment and earnings outcomes. We then use data from the LFS on employment and disability to estimate the type of employment that disabled and non-disabled persons are likely to have respectively, categorising them into nine different occupations.

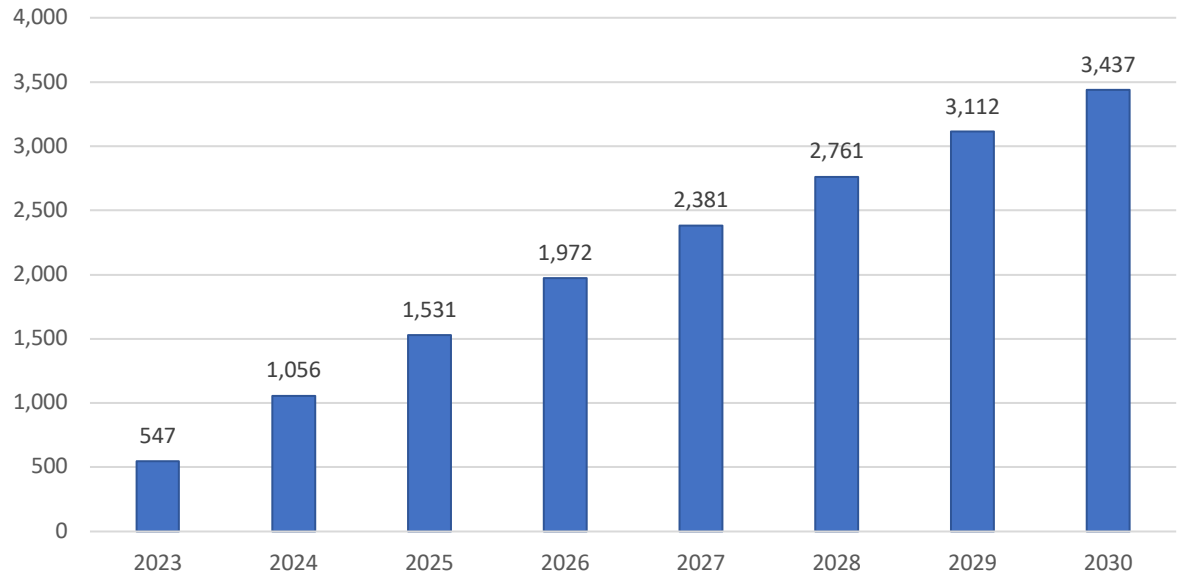
We use ASHE data to obtain the median salary for each occupation, by age demographic and to estimate the earnings of those gaining work EDS each year before they acquire digital skills for work.

Research from the Centre for Education and Economics[38] suggests that there is an earnings uplift of 2.8% for those who gain digital skills. However, more recent evidence[39] suggests an earnings uplift of 12.7%. We take the average of these to estimate an earnings uplift of 7.7% for those who acquire the essential digital skills for work. We apply this uplift to the estimated earnings of those who are set to gain work EDS each year. We subtract from this figure employee national insurance contributions and income tax. Our UK results are presented in Figure 20 bellow.

38 Centre for the Economics of Education (2007), "The Impact of Computer Use, Computer Skills and Computer Use Intensity: Evidence from WERS 2004".

39 Burning Glass Technologies (2019) No Longer Optional: Employer Demand for Digital Skills

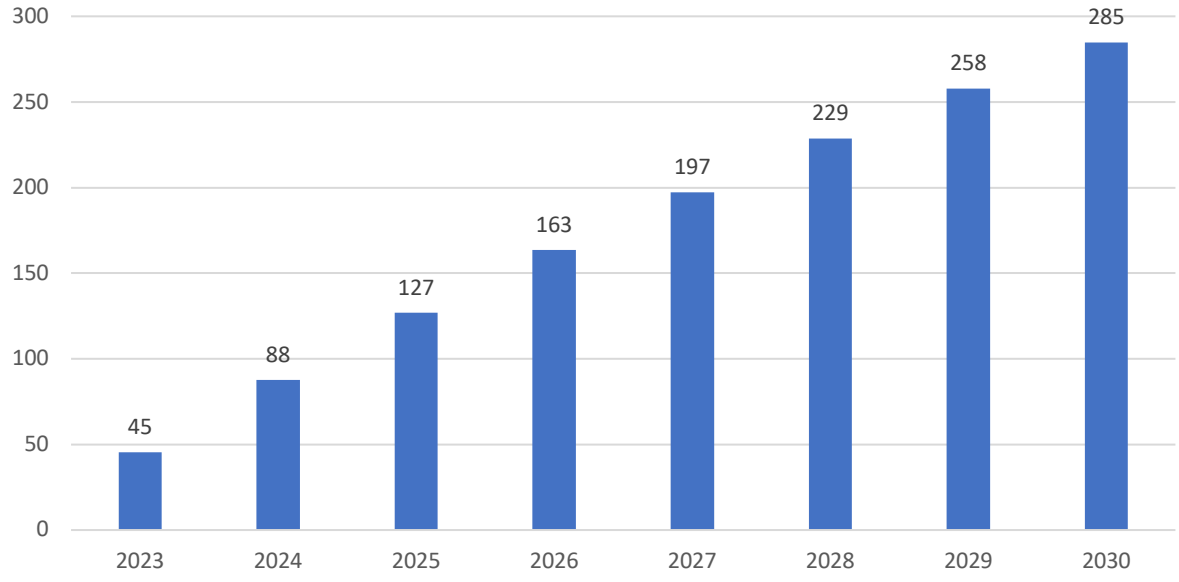
Figure 20: Earnings benefits UK, 2023 - 2030, £m



Source: ONS, Cebr analysis

Over the eight years from 2023 to 2030, £16.8 billion in aggregate is expected to be added to the UK economy through increased employment of those who require essential digital skills for work. For the Republic of Ireland, the equivalent figure is £1.4 billion, with our annualised results for Ireland presented in Figure 21 below.

Figure 21: Earnings benefits Republic of Ireland, 2023 - 2030, £m



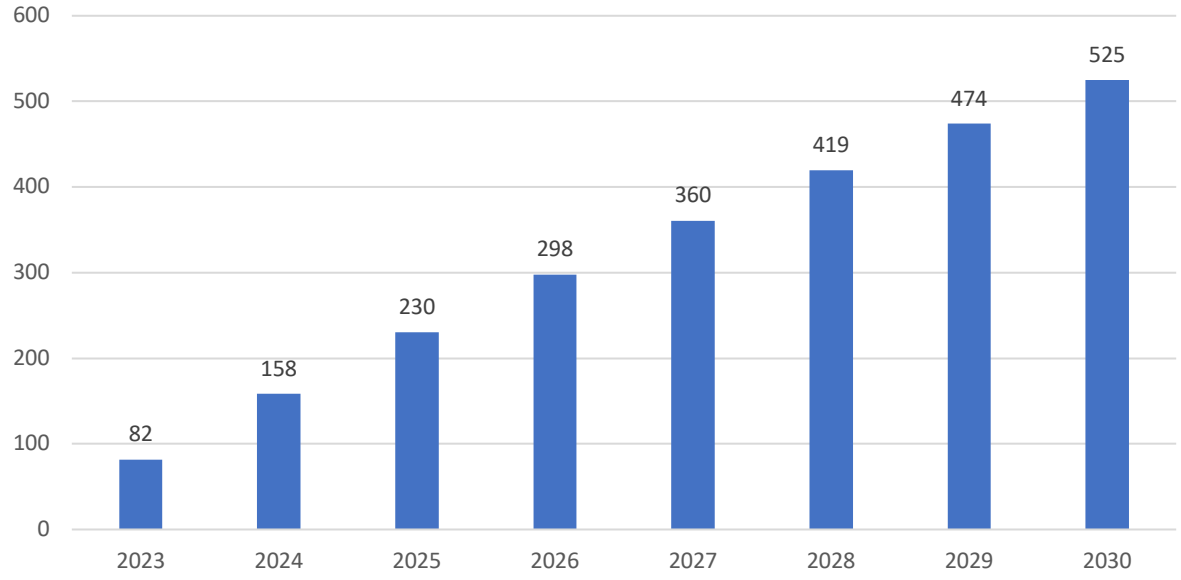
Source: ONS, Cebr analysis

Government Revenue

The government is likely to enjoy an increase in tax revenue, via the increase in earnings of those currently employed and gaining the essential digital skills for work, and the increase in earnings of those who are currently unemployed and gain employment as a direct result of acquiring work EDS.

To estimate the total increase to government revenue, the additional income tax, employee's national insurance contribution and employer's national insurance contribution from generated from both those gaining work from previously being unemployed, and those who are employed and experience and increase in earnings from gaining work EDS are summed in each year from 2023 to 2030. The output is presented below in Figure 22. Cebr estimates that the total increase in government tax revenue for the UK over the eight year period amounts to £2.5 billion.

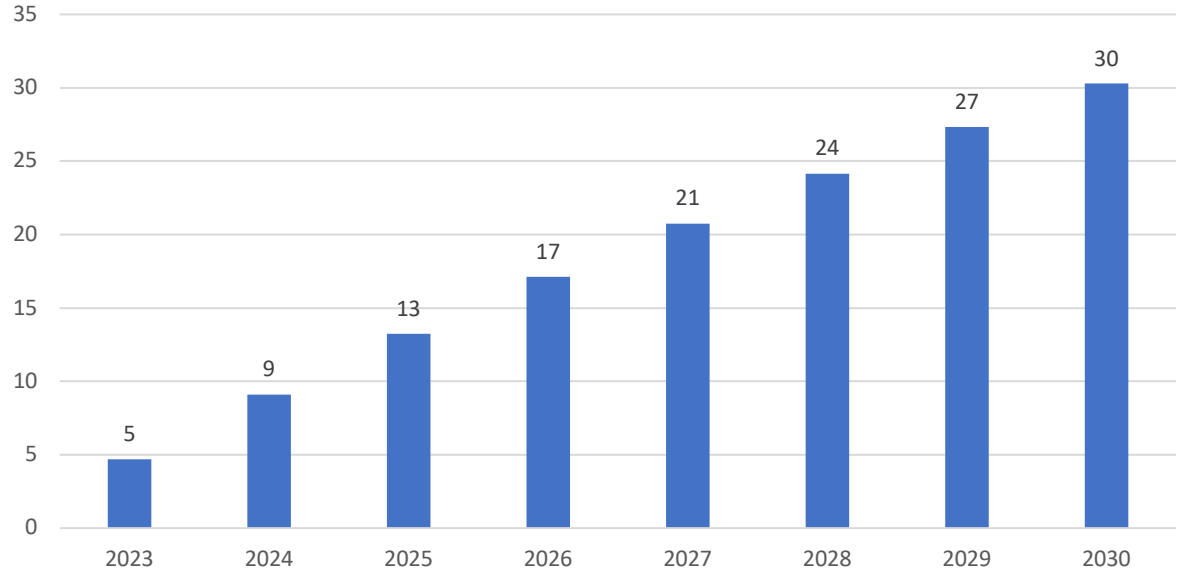
Figure 22: Increase in government revenue UK, 2023 – 2030, £m



Source: ONS, Cebr analysis

Cebr estimates that, the likely increase in government tax revenue in the Republic of Ireland generated from reaching a digitally included society by 2030 will equate to £147 million in aggregate. The annual expected increase in government tax revenue stemming from those who will now earn more as a result of gaining work EDS in the Republic of Ireland are presented on the following page in Figure 23.

Figure 23: Increase in government revenue Republic of Ireland, 2023 - 2030, £m



Source: ONS, Cebr analysis

5 Connecting Everyone

This section of the report covers the need to close the digital divide that exists within the UK and the Republic of Ireland. The quality of digital connectivity varies significantly across both countries. Ensuring people have the ability to connect with others, both in professional and social contexts, provides benefits to society. This works in tandem with the required skills to take advantage of adequate internet connections. There are two particular benefits that can be monetised: The environmental benefits from increased home-working and the benefits of improved communication.

5.1 Monetised Benefits

Communication (the more connected we are digitally, the more connected we are socially)

This section of the report quantifies the economic benefit of increased communication that derives directly from achieving a digitally included population. According to Ofcom data gathered and published in 2020[40], messaging is moving online, with an average of 68 SMS messages sent from mobile connections per month in 2019. In comparison, an average of 200 SMS and MMS were sent per month in 2011 according to the 2012 iteration of the same Ofcom report.[41] This indicates a shift in communication habits, with online mediums becoming increasingly dominant. As a consequence, those who are digitally excluded can become 'left out' as they struggle to communicate using online mediums. Depending on individual circumstance, this could engender social exclusion, which brings with it a myriad of negative consequences. We aim to capture the quantify the benefits that those with the essential digital skills for life are likely to benefit from. To do this, we focus on additional spending on leisure and well-being activities that those with life EDS are likely to make.

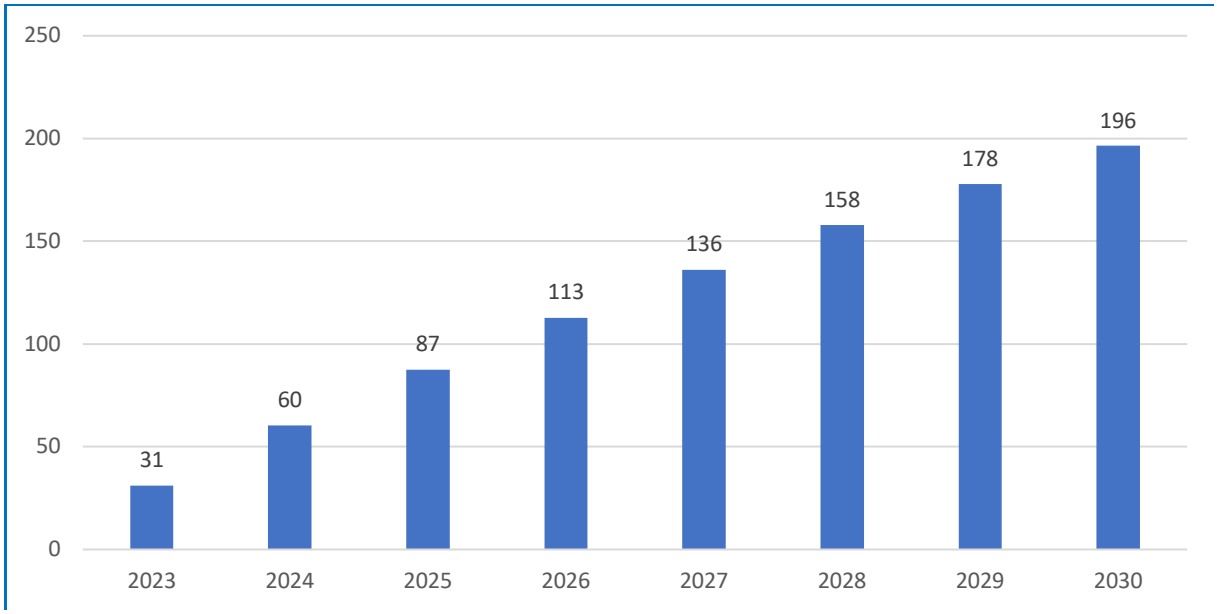
Data published in the ONS Household Expenditure survey, for expenditure by different demographics, shows that on average, individuals spend approximately £35 per week on cultural and recreational activities. Research conducted in a study by FreshMinds supports our assumption that once an individual learns basic digital skills, their spending on recreational activities will increase by 14 percentage points.[42] We scale this by demographic using the aforementioned ONS household survey, in addition to scaling according to employment status. This is because those who are employed are likely to spend a greater amount on recreational activities as a result of increased communication, than are unemployed or economically inactive individuals. We applied these quantities to the 955 thousand required to gain life EDS each year, such that the UK becomes as digitally included as possible by 2030. Our results for the UK are presented in Figure 24 below. Cumulatively, we estimate that £960 million is generated from 2023 through 2030 as a result of 955 thousand gaining life EDS annually.

40 Ofcom (2020) Communications Market Report 2020

41 Ofcom (2012) Communications Market Report 2012

42 The FreshMinds study suggests that the proportion of people who report feeling connected to their local community, friends and family following internet usage is on average 14 percentage points higher than the proportion that indicate feeling connected before using the internet.

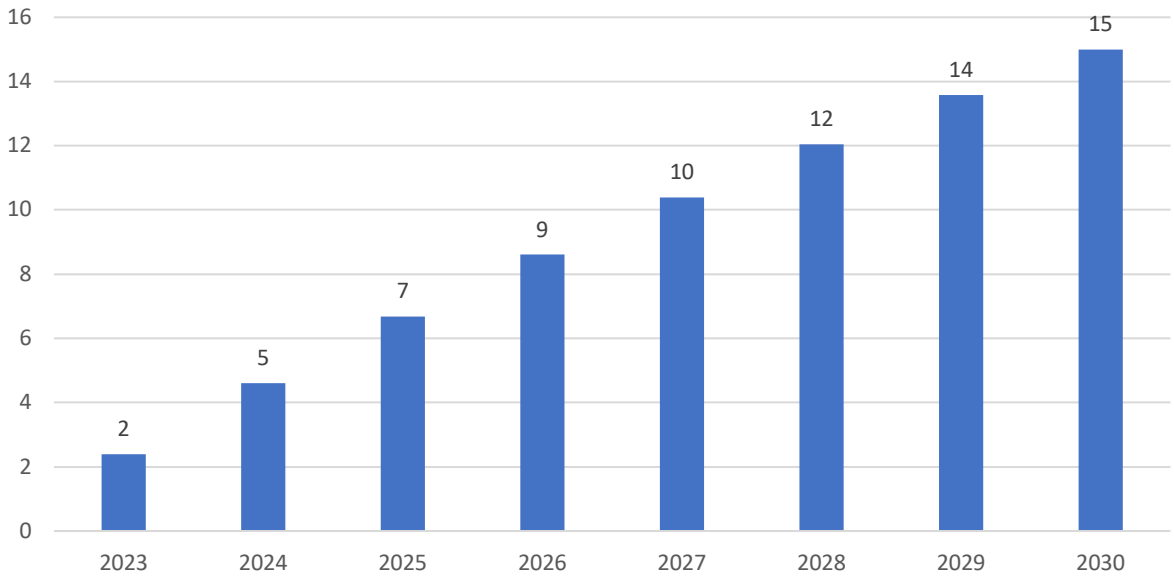
Figure 24: Communication benefits UK, 2023 - 2030, £m



Source: ONS, Cebr analysis

Figure 25 below displays our results for the Republic of Ireland. We estimate that the aggregate monetary value generated through increased communication resulting from achieving a digitally inclusive Ireland by 2030 will be £73 million.

Figure 25: Communication benefits Republic of Ireland, 2023 - 2030, £m



Source: ONS, Cebr analysis

Environmental benefits of increased home-working

In this section of the report, we analyse how a digitally included population can aid progress towards climate and environmental goals. The essential digital skills for work are a requirement for the majority of jobs that can be completed remotely; employees must be able to communicate effectively through online channels, engage in video calls, connect to VPNs and operate other remote working related

technology. By working from home, workers are able to significantly cut their commuting related CO_2 emissions. The effects of this are expected to be considerable; according to the most recently released National Travel Survey[43] in 2019, the most recent non-covid year for which data exists, 24% of journeys made in Ireland were commuting journeys. In the UK in the same year, 15% of all car journeys were commuting journeys.[44]

To compute the monetary benefits generated from achieving a digitally included society by 2030, our focus is on those with the digital capabilities along with sufficient digital connectivity, to work from home, reducing the number of commuting journeys they make. Using data published by the Department for Transport, we are then able to estimate the reduction in CO_2 emissions and associated monetary savings to the UK and Irish economies respectively that this would generate.

Cebr estimates that in 2021 there were 22.2 million people in the UK without the essential digital skills required for work and 1.5 million in Ireland. Using Ofcom data and Cebr analyses, we estimate that in the UK 6.1 million people will never gain the Essential Digital Skills (EDS) they require for work.[45] For the Republic of Ireland, this figure stands at 477 thousand. To reduce digital exclusion to this point by 2030, 1.7 million people in the UK and 131 thousand people in Ireland are required to gain work EDS per annum from 2023 through 2030. Of these 1.7 million, we estimate that approximately 409 thousand are likely to be employed (31 thousand for the Republic of Ireland). Annual Population Survey (APS) data on full-time and part-time workers in the UK is used to compute the number of employed people acquiring skills who are likely to be in full-time and part-time work respectively. Labour Force Survey (LFS) data published by the Central Statistics Office is then used to compute these same figures for Ireland. We estimate that from 2023 to 2030, approximately 77% of those employed in the UK are expected to work full-time, while the remaining 23% work part-time; in the Republic of Ireland these figures are 79% and 21% respectively.

From 2019 to 2020, the proportion of working adults who had a work from home (WFH) element in their jobs increased from 27% to 37%.[46] More recent evidence suggests that 36% of working adults reported having worked from home at least once a week.[47] It is assumed that WFH practices will continue at this rate, with 36% of workers having jobs with a WFH element. Incorporating this assumption, we obtained estimates for the number of people gaining work EDS per annum who will be employed with a WFH element in their jobs, working full time and part-time respectively. We have used the assumption that gaining basic digital skills will enable an individual to WFH, at the same rate as does the general population in the UK. Using historical EU labour Force Survey data,[48] we estimate the level of WFH jobs in Ireland relative to the UK, finding that on average across different regions of the UK and Ireland, the number of jobs with a WFH element is 4 percentage points higher in Ireland than in the UK.

43 CSO (2021) National Travel Survey 2019

44 Department for Transport (2019) National Travel Survey 2019

45 The section on Enabling Everyone below provides more detail on the framework used to assess skills

46 ONS (2021) Business and individual attitudes towards the future of homeworking, UK: April to May 2021

47 Sky News (2022) One-third of Brits still working from home despite rule changes, data show

48 Eurostat (2021) Working from home across EU regions in 2020

Using data on the average number of hours worked by full-time and part-time workers respectively from the ONS Labour Force Survey (LFS)[49] and further data[50] on the average number of WFH days per week for a worker with a flexible working job, the expected number of days worked from home by an employed learner with a WFH element in their job was computed. From this we were able to estimate the number of commuting journeys saved each by the 409 thousand estimated to gain work EDS each year and who are employed. According to data from the Department for Transport's National Travel Survey[51], in 2019, approximately 61.8% of full-time workers and 60.4% of part time workers commuted by cars. These figures increased to 73% and 64% respectively in 2020, the most recent year for which data exists at the time of analysis. Disruptions caused by the COVID-19 pandmic caused data on a wide range of variables to stray away from typical values. This is especially true for travel related data, owing to lock-down travel and transport restrictions. Consequently, we make the assumption that 2019 (as opposed to 2020) data was likely to be more indicative of long-term trends and therefore used these statistics in our analyses to estimate the number of people gaining work EDS and are employed, who commute to their jobs via car. Combining this with data from the RAC[52] on the number of kilometres travelled per commuting journey (which shows that the average commuter trip is 9.9 miles or 15.9km), we estimate that **456.4 million fewer kilometres will be travelled per annum.**

Data from the Department for Transport combined with Cebr analyses shows that approximately 165g of CO_2 is emitted on average (taking into account the average age and fuel type of cars on the road in the UK) per kilometre travelled. Using this figure, we estimate that the 456.4 million km less travelled equates to a **reduction in CO2 emissions of 75.1 tonnes per annum.** The Department for Transport provides estimates of the monetary cost of CO2 emissions in 2010 prices. We convert these into 2022 prices using an in-house model and apply this to the 75.1 tonnes of CO2 saved per annum. This generates a monetary estimate of the benefits derived from those in work obtaining the skills to allow them to work from home.

The above-described process does not, however, capture the full effects of work EDS skill acquisition on the reduction of CO2 emissions related to increased homeworking. We expect that a portion of those who are economically active and unemployed will gain employment as a direct result of gaining work EDS. This will cause an increase in individual commuting related journeys for those who transition from being unemployed to employed. Research conducted by PWC shows that between 3.5% and 7.5% of unemployed people are likely to find work because of obtaining digital skills.[53] We take the midpoint of this range and scaled it up in line with data from the Employer's Skills Survey on the average year on year change in the proportion of vacancies that are related to workers being without a basic level of IT skills between 2015 and 2021, to estimate the proportion of people likely to transition from unemployed to employed, as a direct result of acquiring work EDS each year, from 2023 to 2030. This figure ranges from 5.7% in 2023 to 5.9% in 2030. We apply these percentages to the number of people gaining work EDS each year who are expected to be unemployed (71 thousand). We then repeat the above process for this group, to estimate the additional kilometres travelled for those gaining employment as a direct result of attaining work EDS, and associated CO2 emissions created, calculating the monetary value. We subtract the figures returned for each year from the monetary savings generated from the employed

49. Duome (2021) Hybrid working calculator - how different hybrid workstyle impact office space

50. Duome (2021) Hybrid working calculator - how different hybrid workstyle impact office space

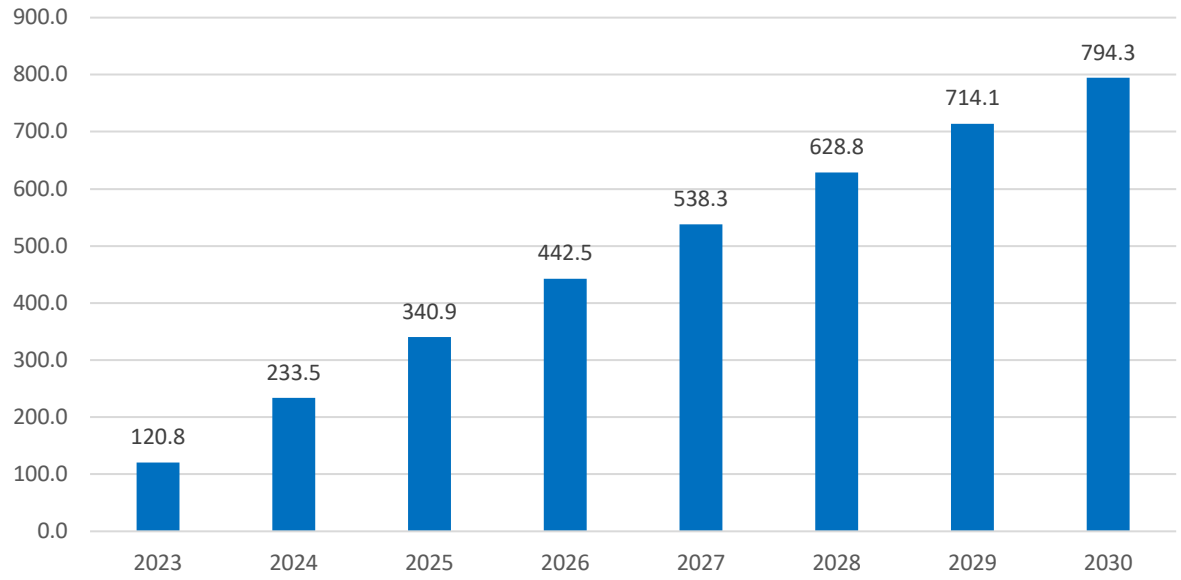
51 Department for Transport (2021) National Travel Survey

52 RAC Foundation (2013) The Car and the Commute: The journey to work in England and Wales

53 PWC (2009) Champion for Digital Inclusion: The Economic Case for Digital Inclusion pp.32

group gaining work EDS to obtain estimates for net savings each year from 2023 to 2030. Our findings are displayed in Figure 26 below. We estimate that cumulatively, from 2023 to 2030, the UK economy will save £622 million from achieving a society with as close to full work EDS as possible.

Figure 26: Monetary benefit of CO2 saved UK, 2023 - 2030, £m

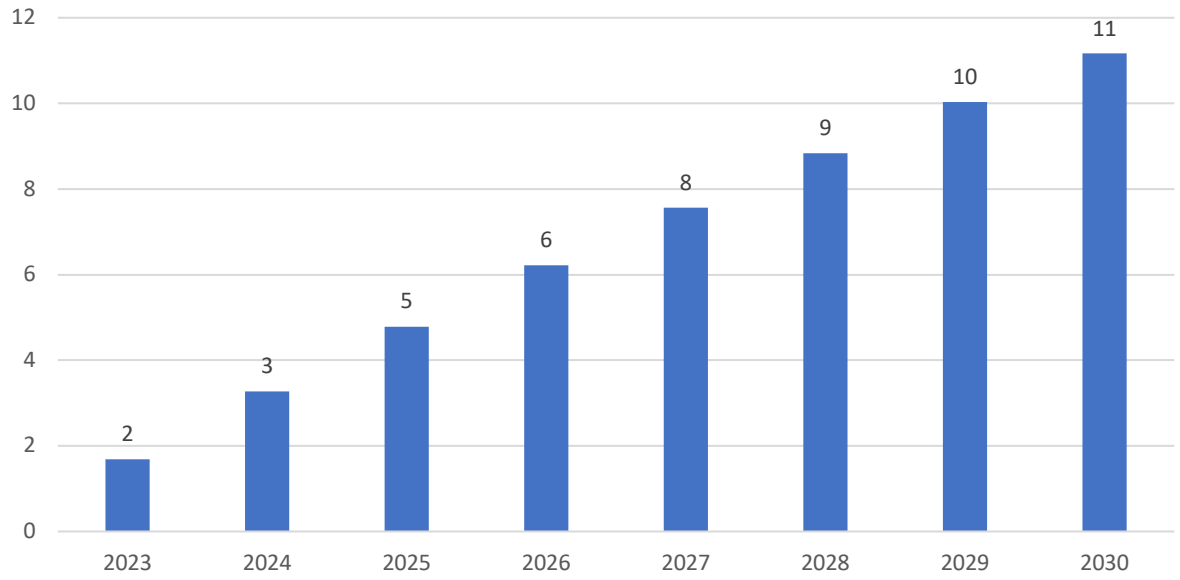


Source: ONS, APS, LFS, RAC, PWC, DfT, Duome, Sky News, Cebr analyses

Conducting a similar analysis for the Republic of Ireland health service, the associated savings are estimated to be £54 million over the period 2023 to 2030.

Our annualised results for Republic of Ireland health service, are presented below in Figure 27 on the following page.

Figure 27: Monetary benefit of CO2 saved Republic of Ireland, 2023 - 2032, £m



Source: ONS, APS, LFS, RAC, PWC, DfT, Duome, Sky News, Cebr analyses

5.2 Environmental sustainability – Wider Discussion

Digitisation is one of the most significant factors enabling progress towards addressing climate change. According to Costain, one of the UK's leading sustainable infrastructure firms, technology which developed from the fourth industrial revolution such as artificial intelligence, the Internet of things and 5G, has the potential to promote climate protection, better air quality and the preservation of biodiversity through data collection and transparency, collaboration, control, and informed decision making.[54] However, the scale to which digitisation can aid progress towards net zero and other environmental goals is dependent on its implementation. To have an impact, digitalisation must be integrated throughout organisational procedures, business models, human behaviour, and political action. To this end, having a digitally included population is critical.

In April 2021, the UK government announced a world-leading climate change target (the sixth Carbon Budget) to reduce emissions by 78% by 2035 compared to 1990 levels, on a pathway to net zero greenhouse emissions by 2050.[55] For example, in the energy sector, the government aims to deploy millions of low carbon technologies such as solar panels, heat pumps and electric vehicles.

CO_2 reduction is a key national goal. The government's current net zero plan 'Build Back Greener',[56] includes strategies, such as fully decarbonising the UK's power supply by 2035, ensuring that the primary source of the UK's energy lies in clean electricity, while upscaling the production of low carbon fuels such as hydrogen and biofuels. Another central aspect of the plan is a Zero Emissions Vehicle (ZEV)

54 Costain (2021) The role of digitisation in achieving net zero

55 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1004011/energy-digitalisation-strategy.pdf

56 HM Government (2021) Net Zero Strategy: Build Back Greener

directive designed to drastically reduce vehicle related CO2 emissions. This involves initiatives encouraging the use of electric vehicles, committing to focus on improving public transport and ending the sale of new petrol and diesel cars by 2030. The COVID-19 pandemic and associated restrictions have already demonstrated the significant contribution lowering transportation emissions can make to achieving net zero. ONS data shows that the 'sharp reduction in personal travel including commuting to work drove household greenhouse gas emissions down by 15 million tonnes of CO_2 equivalent in 2020'.[57]

The UK Government is actively using digital technology as part of their Net Zero strategy. It is currently running the £1bn Net Zero Innovation Portfolio to accelerate the commercialisation of low-carbon technologies, systems and business models in power, buildings, and industry. A central part of this is a £65m Flexibility Innovation Programme. Included as part of this is a competition to support the development of an automated secure data exchange process for registering small-scale energy assets, and collecting and accessing small-scale energy asset data.

Connectivity

A 2018 DCMS study evaluated the economic impacts of increased Internet speeds across the UK.[58] The key focus was on how firms' employment, turnover, and productivity were affected by higher speeds. For the purposes of this study, we have drawn on their findings in relation to:

- Productivity, measured by turnover per employee.
- Impacts on 'spatially stable' firms, those which were in the postcode areas studied before and after the change in speed; this avoids counting impacts driven by firm relocation (e.g. a firm which is already highly productive moving into an area which benefits from higher speeds).
- Impacts of large changes in maximum available speeds, to represent the impact of major changes, i.e. the introduction of full fibre broadband.

The relevant headline results used are thea weighted average of the increases in turnover per worker (productivity) for spatially stable firms in response to their maximum available download speeds increasing by between 200 Mbit/s or more (Table 4.12, Annex B).Industry impacts for subsidised coverage are also estimated (Table 2.7, Annex B). Statistically significant results from this analysis are used to adjust impacts by sector, whilst remaining consistent with the headline increase.

Naturally, we need to control for the fact that full fibre roll-out is already underway and has occurred to a different extent in different places; those areas which have very little full fibre coverage have a lot of scope for future productivity gains and vice-versa. Therefore, we draw on Thinkbroadband data[59] on coverage by local authority for the UK and the latest reported coverage figure for the Republic of Ireland (one third of premises).[60]

To provide a baseline economic trajectory to which impacts are applied, we use:

---

57 ONS (2021) COVID-19 restrictions cut household emissions

58 https://www.gov.uk/government/publications/evaluation-of-the-economic-impact-and-public-value-of-the-superfast-broadband-programme; impact figures from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/734857/BDUK_SF_EVAL_ANNEX_B_ECONOMIC_IMPACTS.pdf

59 https://labs.thinkbroadband.com/local/councils

60 https://www.irishtimes.com/business/technology/third-of-irish-homes-businesses-now-connectable-to-fibre-broadband-1.4279744

- ONS data on UK GVA by industry and local authority,[61]
- Eurostat data on Irish GVA by industry.[62]
- Forecasts from Cebr's in-house macroeconomic model of UK growth by industry and local authority, and of Irish growth overall.

This provides GVA by industry for each UK local authority and for the Republic of Ireland for every year up to 2030 without intervention. Impacts of 100% full fibre rollout by 2030 are then estimated based on industry impacts and current level of coverage.

Headline results in Table 2 on the following page, show total impacts for UK nations, regions, and combined authorities, and the Republic of Ireland. To put the monetary impacts into context, these are also shown as a percentage of baseline 2030 GVA. Current coverage is the biggest determinant of the impact – notably, Northern Ireland already benefits from widespread full fibre coverage, so there is limited scope for further benefits here.

61 https://www.ons.gov.uk/economy/grossvalueaddedgva/datasets/regionalgrossvalueaddedbalancedlocalauthoritiesbynuts1region, https://www.ons.gov.uk/economy/grossvalueaddedgva/datasets/grossvalueaddedindustryweightstimeseriesdataset

62 https://ec.europa.eu/eurostat/databrowser/product/page/NAMA_10_A64__custom_2714384

Table 2: Connectivity Impacts (2022 £m)

		Total impact, £m	Current full fibre %	Key industry results (£m)				
				Utilities	Construction	Retail	Transport	Hospitality
UK nations and regions	North East	2206	23.6%	0	67	100	25	39
	North West	4803	31.5%	0	157	280	63	69
	Yorkshire and Humber	3063	44.7%	0	96	157	39	45
	East Midlands	3047	31.2%	0	116	193	43	46
	West Midlands	3916	32.6%	0	134	238	52	58
	East	4296	31.9%	0	226	278	63	70
	London	7296	52.4%	0	264	335	125	137
	South East	6920	30.5%	0	292	428	96	121
	South West	3361	37.5%	0	138	184	33	77
	Wales	1859	36.9%	0	57	77	16	32
	Scotland	3922	36.2%	0	129	176	49	69
	Northern Ireland	288	84.2%	0	12	20	3	4
Combined authorities	Cambridgeshire and Peterborough	556	45.6%	0	21	29	5	7
	Greater Manchester	2110	30.8%	0	64	113	31	29
	Liverpool City Region	927	39.6%	0	28	43	13	11
	North of Tyne	552	34.5%	0	13	21	5	11
	South Yorkshire	884	39.3%	0	29	42	9	10
	Tees Valley	581	14.0%	0	17	25	6	6
	West Midlands	1854	41.7%	0	53	97	23	25
	West of England	598	44.3%	0	30	29	8	10
	West Yorkshire	1337	44.9%	0	38	69	17	16
	North East	699	24.9%	0	22	33	9	9
United Kingdom		44977	39.2%	0	1687	2466	608	767
Republic of Ireland		4904	33.3%	0	105	307	35	35

6. Digitising All Industries

In this section the productivity impacts of increased digitisation across a range of key industries are estimated along with the benefits to companies of potential employees having improved digital skills. Following this is a discussion on the existing and potential impacts of digitisation on a range of specific industries. Firstly, however, there is a general discussion of the productivity benefits of increased digitisation.

6.1 Productivity benefits of increased digitisation – Wider Discussion

Robert Solow famously asked the question 'Why is innovation everywhere except in productivity statistics?' back in 1987. More generally, economists have long been perplexed by the lack of productivity growth in advanced economies. Since 2007 the UK's productivity has been falling behind its G7 competitors and has flatlined. Moreover, productivity benefits are not evenly dispersed across any given industry. It is now estimated that it takes a UK worker five days to complete what the average G7 worker can do in four days. The Bank of England identified low levels of investment as a key cause[63]. The UK has historically invested less in capital development than other major economies. For instance, the UK level of investment between 2010 and 2014 was only 16 percent of GDP, which compared with 20 percent for other developed countries). UK businesses have very low technology adoption. Often those at the frontier are well more well-resourced, efficient and innovative. This means that the relatively poor uptake of technology by many UK businesses can compound the impact of there being too few digitally skilled persons in the workplace.

However, firms can make significant gains in productivity by adopting some basic digital technology. There are potentially many benefits provided by increased digital adoption:

- Increased gathering of data through sensors and use to optimise internal operations can achieve cash savings.
- Technologies can be used to undertake pilots that may generate a new business model.
- Digital adoption can enhance the monitoring of physical asset. Through use of 'Performance Management' applications companies can monitor and assess Digital Twins which can signal when immediate improvement is necessary.
- Technologies can also prevent unplanned downtime, when production lines require repair. This can save money as employees remain getting paid whilst machines are fixed, and companies may have to pay penalties for delayed production and delivery of goods. If companies can fix things less urgently and plan ahead, this lowers maintenance costs. Investing in software also improves safety of workers.

The role of the UK Government

The Government has been undertaking a pilot called 'Made Smarter 2017' where superfast and fast broadband is provided to urban and more rural and remote areas. This is a subsidisation which is required as it gets disproportionately more expensive to provide internet connectivity to more remote

63 Speech: The fall in productivity growth: causes and implications https://www.bankofengland.co.uk/-/media/boe/files/speech/2018/the-fall-in-productivity-growth-causes-and-implications

areas. The Made Smarter review discusses how the faster adoption of technology will result in greater investment and in more manufacturing taking place in the UK. For example:

- The automation of manufacturing processes, coupled with real-time process monitoring and re-engineering, can result in radical improvements in cost efficiency and accuracy, allowing work to move back to the UK from low-wage economies and strengthening UK supply chains;
- Technologies such as additive manufacturing can fundamentally change the supply chain and mean that competitive advantages afforded by high volumes and low labour costs are replaced by advantages like proximity to market and the opportunities to make products unique to each customer.
- These technologies will deliver multiplier effects, creating new businesses and jobs throughout the UK economy.

The effects include:

- The potential for new industries and services to be created by harnessing the data and insights flowing from digital technologies, including real-time management of assets such as trains, jet engines or wind turbines;
- The opportunity for the UK to be a leader in the development of digital technologies themselves, in areas of strength such as artificial intelligence, blockchain and virtual reality;
- The need for support for this new economy from new and improved services and infrastructure in areas like cybersecurity, fibre networks, 5G, and remote monitoring.

However, the Made Smarter pilot has found evidence that the adoption and application of technology is not consistent across all industrial sectors.

Productivity benefits for the employed

The use of digital technologies such as the internet has been found to be positively correlated with higher productivity and, hence, earnings. For instance, only 38% of those in the lowest income category used the internet, compared to more than 97% in the top income category. Those who are digitally excluded fair worse than others in several ways. They are more likely to be in low-income jobs and more likely to be unemployed. The acquisition of digital skills can lead to additional earnings for employees. A study by the Centre for Education and Economics estimated an average ICT wage premium of 3-10%.[64] This wage premium crucially depends both on the presence of skills as well as the amount of digital adoption of complementary technologies.

Automation

PWC[65] have previously reported that up to 30% of UK jobs could potentially be at high risk of automation by the early 2030s – lower than the US (38%) or Germany (35%) but higher than Japan (21%). They found that there are key risks in sectors such as transportation and storage (56%), manufacturing (46%) and wholesale and retail (44%) but lower in sectors like health and social work (17%). What is important in relation to this study is that the key differentiating factor is education. For those with just GCSE-level

64 Dolton and P. Pelkonen, (2007), 'The Impact of Computer Use, Computer Skills and Computer Use Intensity: Evidence from WERS 2004', Centre for the Economics of Education

65 https://www.pwc.co.uk/economic-services/ukeo/pwcukeo-section-4-automation-march-2017-v2.pdf

education or lower, the estimated potential risk of automation is as high as 46% in the UK, but this falls to only around 12% for those with undergraduate degrees or higher. New automation technologies in areas like AI and robotics will both create some totally new jobs in the digital technology area and, through productivity gains, generate additional wealth and spending that will support additional jobs of existing kinds, primarily in services sectors that are less easy to automate.

However, short term disruption may be offset by long term economic gains. PWC determine the magnitude of potential job losses by sector based on two factors: the proportion of jobs in a sector and the potential risk of automation, and the employment share of that sector. The industry sector forecast to have the most automation is the transportation and storage sector, with around 56% of jobs at potential high risk of automation. However, this sector only accounts for around 5% of total UK jobs.

Digital Adoption

Several firm- and industry-level studies provide evidence that digital adoption drives productivity (Dedrick et al.,2003; Draca et al., 2009; Syverson, 2011; Munch et al., 2018). An OECD paper assesses how the adoption of a range of digital technologies affects firm productivity.[66] It combines cross-country firm-level data on productivity and -industry-level data on digital technology adoption in an empirical framework that accounts for firm heterogeneity. The results provide robust evidence that digital adoption in an industry is associated to productivity gains at the firm level. Effects are relatively stronger in manufacturing and routine-intensive activities. They also tend to be stronger for more productive firms and weaker in the presence of skill shortages, which may relate to the complementarities between digital technologies and other forms of capital (e.g. skills, organisation, or intangibles).

The relationship between digitisation and productivity has been explored at length in the relevant literature. In general, investment in digital technologies is expected to have strong positive effects on productivity (Syverson, 2011; Brynjolfsson and McAfee, 2014). However, at the industry level, there is uncertainty about the strength of this link. (DeStefano, Kneller and Timmis, 2018; Cette, Lopez and Mairesse, 2017).

Digitalisation and Firm productivity

Although there are several studies suggesting a positive correlation between the adoption of digital technologies and firm and industrial level productivity, a causal relationship can be harder to establish. This is because of endogeneity bias where more productive firms are more likely to adopt new technologies. However, this challenge has potentially been addressed by several studies that have used exogenous drivers of digital adoption such as changes in the availability or quality of network infrastructure, and the results do indicate that digital adoption can support productivity.

A study by Gal et al. (2019)[67] finds that adoption of digital technologies at the average annual rate observed among EU firms over recent years (between 1 and 3 percentage points per year depending on the technology) may have increased multifactor productivity (MFP) by about 1% every year in the average firm if the gains from the various technologies considered are added up. However, these estimates probably represent an upper bound of actual gains since they assume that the estimated effects are fully causal.

---

66 FRONTIER FIRMS, TECHNOLOGY DIFFUSION AND PUBLIC POLICY: MICRO EVIDENCE FROM OECD COUNTRIES https://www.oecd.org/economy/growth/Frontier-Firms-Technology-Diffusion-and-Public-Policy-Micro-Evidence-from-OECD-Countries.pdf

67 https://doi.org/10.1787/5080f4b6-en

Furthermore, adoption of digital technologies in the form of online platforms can further aid firm productivity. There is evidence that user ratings and reviews can address information asymmetries between the end user and service providers, thereby augmenting competitive pressures by shifting demand towards better-rated providers and in turn incentivising them to offer better value for money. Other aspects such as managing bookings, processing payments and capacity utilisations (for instance, hotel occupancy rates) can also be improved by matching efficiency and making services availability visible to end consumers easily online.

Platform development has enhanced the productivity of existing service firms over the past decade in an order of magnitude that is roughly similar to the one found for the effect of increased access to high-speed internet - about 0.4% every year over 2011-17 (i.e. about 2.5% in total) for the average service firm in these industries in the countries experiencing relatively fast platform development.

Regression Results from Gal et al (2019)

The Gal et al. (2019) paper forms the basis for much of the monetised impacts estimation below. The baseline results of estimating the MFP model by OLS yields expected results, with the main takeaway being that an industry environment characterised by high digital adoption rates is associated with higher MFP growth in the average firm. The results from this specification are robust to using (i) lagged values of digital adoption rates and (ii) adoption rates at the beginning of the sample period.

A causal interpretation of the results would be that a 10% increase in adoption of high-speed broadband would translate into an instantaneous increase in MFP growth by 1.4%. After 5 years, this would imply a 5.8% higher MFP level for the average firm. Furthermore, the take-up of digital technologies exhibits significant cross-sectoral variation and overall is generally higher in services than in manufacturing. However, the association of digital adoption with higher firm-level productivity is much stronger in manufacturing than services for most technologies, with the notable exception of high-speed broadband.

In addition, the authors also test the conjecture that complementarity between digital technologies and other intangible investments, suggesting that skill shortages in a sector could impede digital adoption from yielding its full productivity benefits. This is done by further extending the baseline model to include the interaction between digital adoption and skill shortages based on data from OECD Skills for Jobs database, which includes a large number of occupations and skills. Consistent with the idea that digital technologies are complementary to organisational and human capital, results suggest that general occupational shortages in an industry curb the linkage between adoption rates and productivity performance, although for specific technologies (such as high-speed broadband, CRM and cloud computing) and for all technologies combined.

6.2 Monetised Benefits

The baseline view of economic activity was based on the same sources as the connectivity analysis:

- Eurostat data on Irish GVA by industry[68].
- Cebr's forecasts of UK growth by industry and local authority, and of Irish growth overall.

68 https://ec.europa.eu/eurostat/databrowser/product/page/NAMA_10_A64__custom_2714384

This provides GVA by industry for each UK local authority and for the Republic of Ireland for every year up to 2030 without intervention. Impacts of 100% full fibre rollout by 2030 are then estimated based on industry impacts and current level of coverage.

Headline results in Table 3 n the following page, show total impacts for UK nations, regions, and combined authorities, and the Republic of Ireland. To put the monetary impacts into context, these are also shown as a percentage of baseline 2030 GVA. Generally speaking, current coverage is the biggest determinant of the impact – notably, Northern Ireland already benefits from widespread full fibre coverage, so there is limited scope for further benefits here.

Digital Adoption

Gal et al. (2019) estimate gains in multifactor productivity associated with adoption of High speed Internet, Enterprise resource planning, Customer relationship management, and Cloud computing for the average EU firm. We draw on these to estimate overall adoption impacts:

- We assume a uniform maximum rate of adoption which feeds through to overall productivity increases. The impact is applied equally to all sectors.
- The largest estimated impact from Gal et al is for high speed Internet. While for our purposes these impacts have already been estimated in the 'Connectivity' section above, they provide a useful means of ensuring consistency in estimation of overall impacts:
    - The elasticity with respect to % adoption of high speed Internet in the paper is 0.434.
    - We calculate a rate of adoption required to achieve an overall productivity increase consistent with the impact of large increases in broadband speed from the DCMS paper used in the connectivity analysis.
    - This rate is then used as the basis for further technology adoption calculations.
- Elasticities with respect to adoption of Enterprise resource planning, Customer relationship management, and Cloud computing (respectively: 0.198, 0.193, 0.202) are applied using the annual adoption rate calculated above.
- As with the connectivity analysis, it is important to scale impacts according to existing levels of adoption. There is no data for these technologies specifically, so full fibre adoption is used as a proxy, with maximum impacts scaled down accordingly.

The same baseline economic trajectory as the connectivity analysis is used.

Headline results are shown in Table 3. Where current adoption is lowest (as proxied by full fibre), relative impacts are biggest.

Table 3: Technology adoption impacts (2022 £m)

		Total impact, £m	Current full fibre %	Key industry results (£m)				
				Utilities	Construction	Retail	Transport	Hospitality
UK nations	North East	2798	23.6%	75	143	131	53	99
	North West	6488	31.5%	96	336	368	136	176
	Yorkshire and Humber	3751	44.7%	95	205	206	85	114
	East Midlands	4095	31.2%	133	249	253	92	116

	West Midlands	5230	32.6%	123	287	313	111	148
	East	6168	31.9%	113	484	365	136	179
	London	12145	52.4%	66	567	440	268	350
	South East	10770	30.5%	208	626	563	206	307
	South West	4794	37.5%	124	295	242	71	195
	Wales	2249	36.9%	65	122	102	33	82
	Scotland	4958	36.2%	199	276	231	105	176
	Northern Ireland	358	84.2%	11	26	26	7	10
Combined authorities	Cambridgeshire and Peterborough	810	45.6%	23	44	38	10	18
	Greater Manchester	2723	30.8%	39	138	148	67	73
	Liverpool City Region	1127	39.6%	11	60	56	29	29
	North of Tyne	685	34.5%	9	28	27	11	27
	South Yorkshire	925	39.3%	23	61	55	19	25
	Tees Valley	651	14.0%	16	36	32	12	15
	West Midlands	2225	41.7%	34	113	127	50	63
	West of England	943	44.3%	14	64	38	17	25
	West Yorkshire	1675	44.9%	33	82	91	37	40
	North East	909	24.9%	34	47	44	19	24
United Kingdom		63805	39.2%	1308	3616	3239	1302	1953
Republic of Ireland		13805	33.3%	178	255	435	84	105

Industry Savings

In this section we estimate the benefits that increased digital skills provide to industry. Individuals and government bodies are not the only economic agents expected to benefit from a digitally included population. Employers are also more likely to be able to hire the workforce they require, filling vacancies related to digital skills shortages. This increases their productivity and translates into real monetary savings for corporations. Data from the latest Employers Skills Survey (ESS) published in 2020 for the 2019 calendar year,[69] shows that 25% of all vacancies are skills shortage vacancies, increasing from 23% in 2015 and 16% in 2011 according to the same source. Consequently, the efficiency gains to corporations of having a digitally capable population is likely to be significant and increasing. As technology becomes more and more engrained in working patterns, those who can attract a workforce capable of utilising such technology are likely to benefit.

To compute the monetary savings to corporations, we first estimate the number of vacancies related to digital skills that are expected to exist in the UK each year from 2023 through 2030. For this, we use ONS labour market data on vacancies by industry, released in April 2022[70] and incorporated it with historical vacancy by industry data to establish a time trend and forecast digital skills vacancies up to 2030.

We use the results of a PWC study which estimates that between 3.5% and 7.5% of people who gain digital skills will attain employment as a direct result. Scaling this up in line with data from the ESS, we estimate that this percentage will increase marginally year on year, from 5.7% in 2023 reaching 5.9% by 2030.

69 UK Commission for Employment and Skills (2020) Employers Skills Survey 2019

70 ONS (2022) Vacancies by Industry

We make the assumption that only those with the essential digital skills for work are likely to gain jobs as a result of acquiring digital skills. Consequently, out of the 1.7 million who are required to gain work EDS each year to achieve the most people with work EDS possible by 2030, we sum those who we expect to be both employed and unemployed to estimate the number who are economically active. The percentage figure of those who gain employment as a result of digital skills acquisition each respective year described in the previous paragraph is applied to this group to estimate the number who are likely to gain a job each year, from efforts to achieve a digitally included society by 2030. Combining this with our vacancy projections, we are able to estimate the number of people likely to fill digital skills vacancies in the UK through 2030.

Evidence[71] suggests that in the UK labour market, 75% of individuals actively seeking a job will find one within the same year. As a result, we estimate that 75% of those able to fill digital skills vacancies each year will do so in that year, with the remainder split out among subsequent years. This process is known as labour market friction, and exists because of disparities between the time periods, locations, specific needs and other factors that prevent both employers and employees finding and filling vacancies in a perfectly smooth fashion.

From the above-described process, we are able to obtain estimates of the number of people who fill digital skills vacancies each year as a direct result of gaining work EDS. To compute this into a monetary value for corporations, we estimate GVA per worker filling a digital skills vacancy. We make the conservative assumption that those who gain work EDS each year will be on the low end of UK pay scales, as these roles require only a 'basic' level of digital skills. Using the latest three years of data from the Annual Survey of Hours and Earnings (ASHE), we calculated the wage differential between workers on the 50th and 25th weekly earnings percentiles, for both part-time and full-time workers respectively. We use this differential to scale down the average labour productivity per worker, calculated from ONS ITL data on Gross Value Added (GVA)[72] and ONS data on the UK labour market by age group.[73] From this, we obtained estimates for GVA per person filling a digital skills vacancy as a direct result of attaining work EDS.

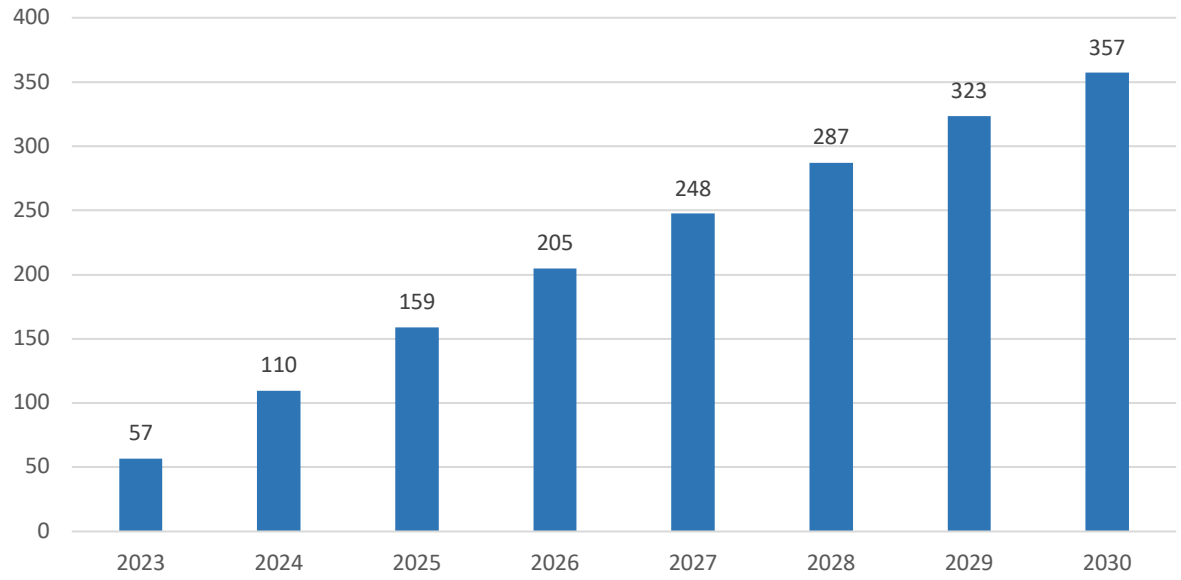
Applying GVA per person to those filling digital skills vacancies each year, we were able to compute the monetary value to corporation of achieving as close to a fully digitally included population by 2030. Our UK results are presented below in Figure 28. We estimate that cumulatively, £23 billion is gained by employers through increased productivity in this way, from 2023 through 2030.

71 Gorry, A. and Munro, D., 2013. Experience, skill composition, and the persistence of unemployment fluctuations. Manuscript, Utah State University.

72 ONS (2021) Regional Gross Value Added

73 ONS (2022) Labour Market by Age Group

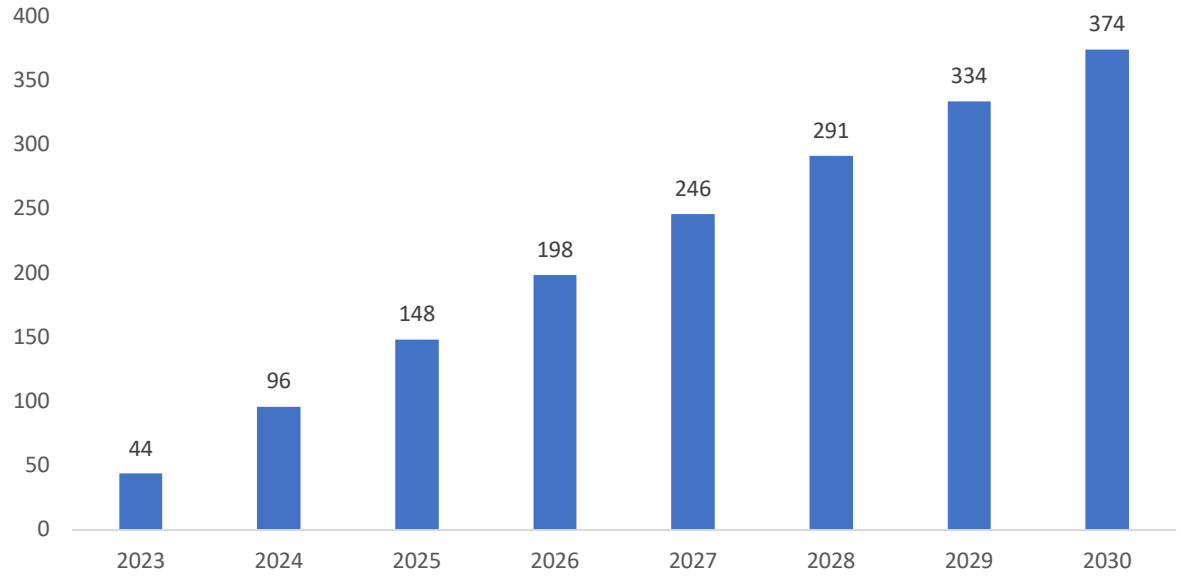
Figure 28: Benefits to corporations UK, 2023 – 2030, £m



Source: ONS, ESS, Cebr analysis

Conducting these analyses for the Republic of Ireland, we find that £1.7 billion is expected to be generated by corporations filling positions, directly as a result of achieving a digitally included Ireland by 2030. Our annualised results for the savings made to corporations in the Republic of Ireland are presented below in Figure 29.

Figure 29: Benefits to corporations Republic of Ireland, 2023 - 2030, £m



Source: ONS, ESS, Cebr analysis

7. Digitising Public Services

In this section we consider the benefits that derive from increased digital transformation in the public sector. The focus of this chapter of the report is on government productivity gains, specifically those related to the provision of government transactional services, from the uptake in digital services that a digitally included population could achieve.

In its 2012 published document, the UK government estimated that between £1.7 billion and £1.8 billion could be saved annually through greater digitisation of government services[74]. It estimated that these savings would be the result of efficiency gains that allow the government to achieve its objectives with fewer resources. In particular there are significant potential increases in productivity in the delivery of health services.

The UK government has introduced wholesale reform to the UK's procurement legislation and this has enabled the NHS to be more innovative in its approach to procuring technology solutions. Moreover, there is scope for the NHS to use digital technology to achieve innovation that is driven by data. This can ensure cost-effective approaches are adopted rapidly and widely across the country. Enhanced data security has facilitated the provision of access to data that is safe and secure.

AI is also starting to play a role as it is increasingly adopted. The Government has committed over £100 million to accelerate testing and evaluation of over 80 AI technologies. Further, a funding package of up to £200 million will soon support the NHS data infrastructure to deliver data-driven research and innovation.

7.1 Monetised Benefits

Government Productivity benefits

There are benefits in four key areas: 1) reduced staff time involved in processing digital transactions compared to offline alternatives 2) estates and accommodation 3) a reduction in postage and packaging materials and 4) the costs of supporting IT systems. These benefits, however, are only realisable if the UK population make use of online government transactional services. Proficiency in the essential digital skills for life enables use of government transactional services online as opposed to through other methods such as postage or via telephone. As such, having a population with as close to full proficiency in life EDS as possible by 2030 will increase the government's operational efficiency, and in turn accrue monetary savings.

Using the top-down approach, the 2012 digital efficiency report finds that at the 80% uptake level, the government will save £1.6 billion, while the bottom-up approach estimates these savings at £1.7 billion. In the same year, public uptake of government online transactional services stood at approximately 57% according to a Cabinet Office report.[75] Combining this statistic with ONS population data we were able to estimate the number of people using online government transactional services in 2012, and the estimated savings per person that this would generate with an 80% uptake achieving savings of between

74 Cabinet Office, Central Digital & Data Office (2012) Digital Efficiency Report.

75 Cabinet Office (2012) Government Digital Strategy

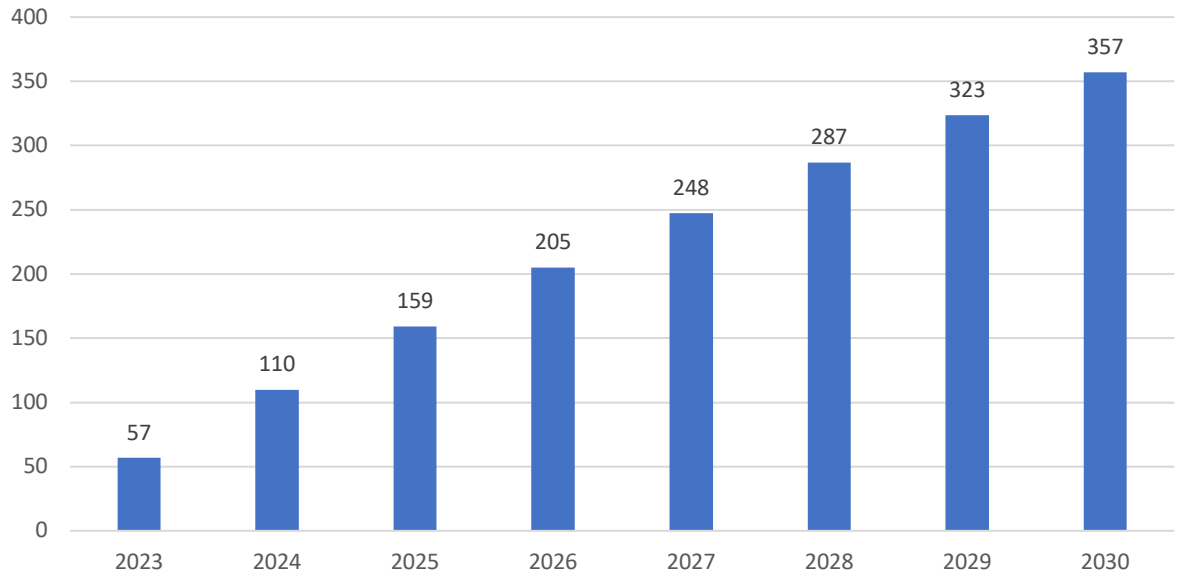
£1.7 and £1.8 billion. Savings per person were then calculated as £41.13 using the top-down method and £42.07 using the bottom-up method.

We then calculated the ratio between uptake of government online transactional services and internet usage, using ONS internet users' data, finding that approximately 70% of internet users also used online government transactional services.

Making the assumption that an individual with the digital skills for life will be a regular internet user, we conclude that 70% of those gaining basic digital skills each year will be likely to use government online transactional services. Applying this to the 955 thousand who are required to gain life EDS per annum to achieve a digitally included UK by 2030, we are able to estimate the number of additional people who will switch to using government online transactional services each year from other means, thus making the government more efficient and productive.

We took an average of the top-down and bottom-up approaches to estimating savings per person that an individual switching to online transactional services will accrue to the government in the form of efficiency savings and applied it to the additional number of people switching to online services from other alternatives. Our results are presented in Figure 30 below. The total productivity benefits to government are estimated to be £1.7 billion over the period 2023 to 2030.

Figure 30: Government Productivity Benefits, 2023 – 2030, £m

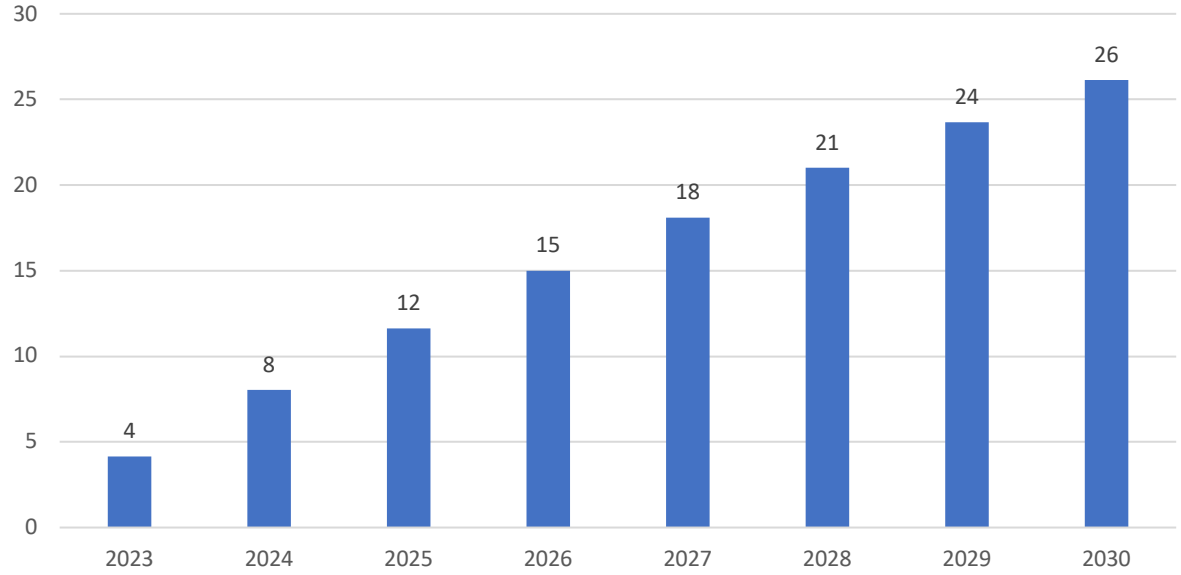


Source: ONS, Cabinet Office, Cebr analyses

Conducting these analyses for the Republic of Ireland, the total productivity benefits to government are estimated to be £140 million over the period 2023 to 2030.

Our annualised results for government productivity benefits in the Republic of Ireland are presented in Figure 30 below.

Figure 30: Government Productivity Benefits, Republic of Ireland, 2023 - 2030, £m



Benefits to the National Health Service (NHS)

We now assess the monetised benefits to the UK's National Health Service likely to be achieved from having a digitally equipped population. We focus exclusively on the reduction in the number of in-person GP appointments likely to be made with a digitally included society in comparison to current base levels. This decline is expected to make the NHS more efficient, as with a digitally capable society, in person GP appointments are more likely to be made only when other types of consultations would be insufficient.

Because of the potential for increasing efficiency and service whilst minimising costs, digitisation of services has become a goal of the NHS. To capitalise on these advantages, several initiatives have been instituted to drive technological adoption and transformation across the NHS, with goals including a 60% registration level of the NHS app and NHS.UK by March 2023, ensuring providers of community health services are able to access local shared care records, and many more.[76] The UK government has pledged significant resources to achieving a more digitised NHS, including £150 million of funding for digital adoptionin adult social care, and £2 billion to support the provision of electrontic patient records in all NHS trusts.[77]

Overthe pandemic, restriction on in-person contact led to the acceleration of the digitisation process, with guidance issued by NHS England advising GP practices to adopt a 'total triage' model, such that every patient is triaged remotely and given a follow up in-person appointment if absolutely necessary. As a consequence, the number of remote appointments escalated rapidly, with the proportion of appointments taking place via telephone or online reaching 48% in April 2020, according to data from the Nuffield Trust.[78] Although this rapid pace of digitisation has the potential to increase efficiency within the NHS, and service for those who can access it, this trend is also likely to exclude those who are not digitally capable from primary healthcare.

76 Healthcare IT News, (2022) NHS England pledges to level up digital maturity in 2022/23.

77 Department of Health and Social Care (2022) A plan for digital health and social care

78 Nuffield Trust (2020) The remote care revolution during Covid-19

To estimate the monetary benefits to the NHS of achieving a digitally included society we relied on data from Hobbs et al. (2016)[79] who produce estimates of the number of GP appointments attended per person per annum from 2007/08 through 2013/14. We then utilised data from Kontopantelis et al. (2021)[80] who investigate the distribution of consultations at the practice level from 2000 through 2019, to scale GP consultations by demographic from Hobbes et al. (2016) to the most recent pre COVID-19 pandemic financial year (2018/19).

The Widening Digital Inclusion (WDI) programme was a project conducted by NHS Digital in partnership with the GoodThings Foundation designed to test different ways of using digital technology to improve the health of the most excluded people in society.[81] The WDI programme running from 2017 to 2020 found that 33% of digital skills learners reduced the number of GP appointments by an average of 4.8 appointments each.[82] We make the assumption that because the programme was directed towards those without essential digital skills, and this group is more likely to be in older age demographics who attend a greater number of GP appointments per person than younger individuals, our estimates would be more accurate if scaled by age demographic. To do this, we used ONS data on internet usage by demographic[83] to scale estimated appointment reductions from digital skills acquisition by the internet uptake of each demographic in comparison to the average for all demographics. From undertaking these steps, we obtained estimates for the number of appointments fewer that an individual with digital skills for life will attend for each age category. Applying this to the 955 thousand people required to gain the essential digital skills for life per annum to achieve digital inclusivity in 2022, we are able to estimate the reduction in appointments made per year if the UK achieves digital inclusivity by 2030.

The King's Fund, an independent charity which works to improve health and care in England, finds that in 2020, an average nine minute GP appointment incurred a cost to the NHS of £39.23.[84] This figure was converted to 2022 prices and multiplied by the reduction in appointments made per year. Results are displayed in Figure 11 below. We estimate that in 2023, £53 million will be saved by the NHS from the additional 955 thousand people required to gain essential digital skills for life in this year. From achieving as close to a fully digital society as possible, incorporating the 2.8 million who will never gain life EDS, the NHS will save approximately £1.3 billion over the period 2023 to 2030.

79 Hobbes et al (2016) 'Clinical workload in UK primary care: a retrospective analysis of 100 million consultations in England, 2007-14' The Lancet, Vol 387, No. 10035, pp. 2323-2330

80 Kontopantelis, E., et al. (2021) 'Consultation patterns and frequent attenders in UK primary care from 2000 to 2019: a retrospective cohort analysis of consultation events across 845 general practices' BMJ Open, Vol 11, Issue 12, pp.5466

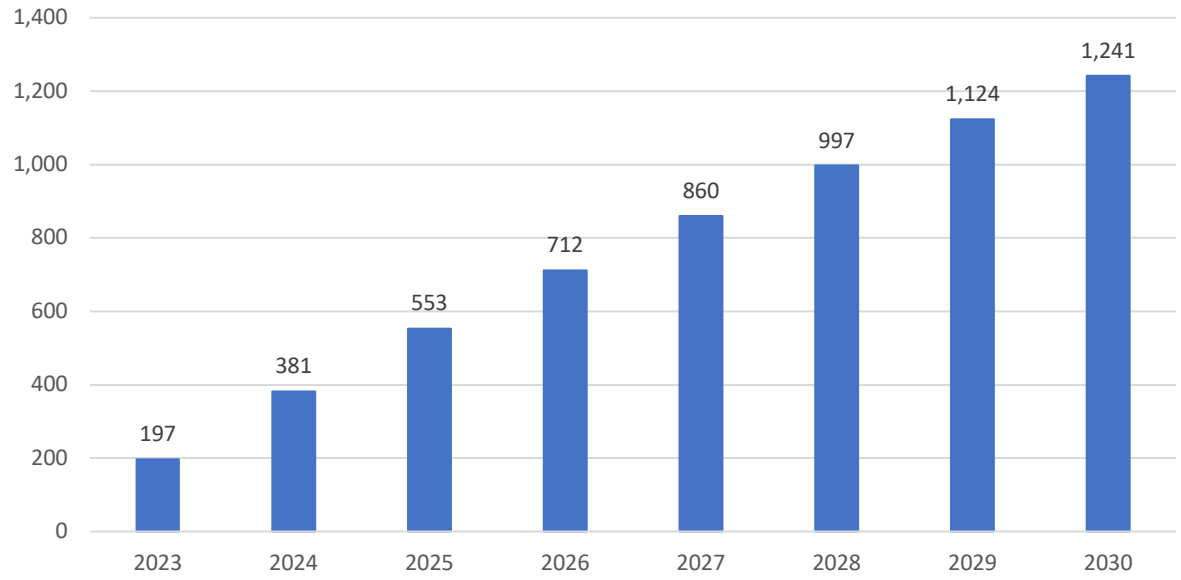
81 NHS Digital (2020) National project shows digital inclusion is key to tackling health inequalities

82 Good Things Foundation (2020) Digital Inclusion in Health Care

83 ONS (2021) Internet Users 2020

84 King's Fund (2022) Key facts and figures about the NHS

Figure 31: Benefits to the NHS, 2023 – 2030, £m

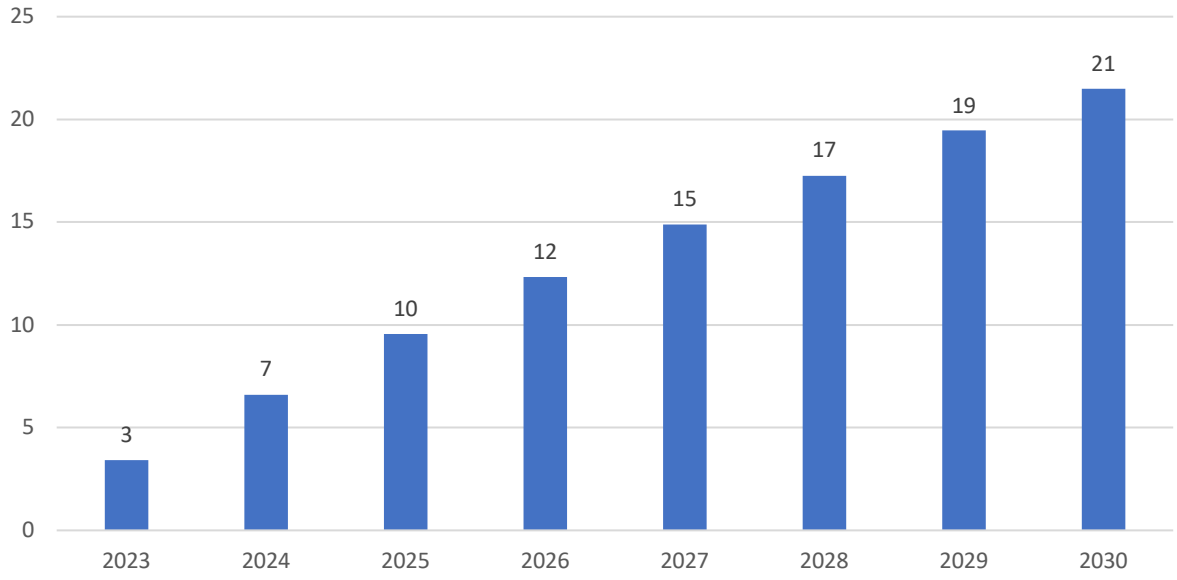


Source: ONS, Kings Fund, Hobbes et al., Kontopantelis et al., NHS Digital/GoodThings Foundation, Cebr analyses

Conducting a similar analysis for the Republic of Ireland health service, the associated savings are estimated to be £105 million over the period 2023 to 2030.

Our annualised results for Republic of Ireland health service, are presented below in Figure 32 below.

Figure 32: Benefits to the Irish health service, 2023 – 2030, £m



8. UK Regional Analysis & Ireland

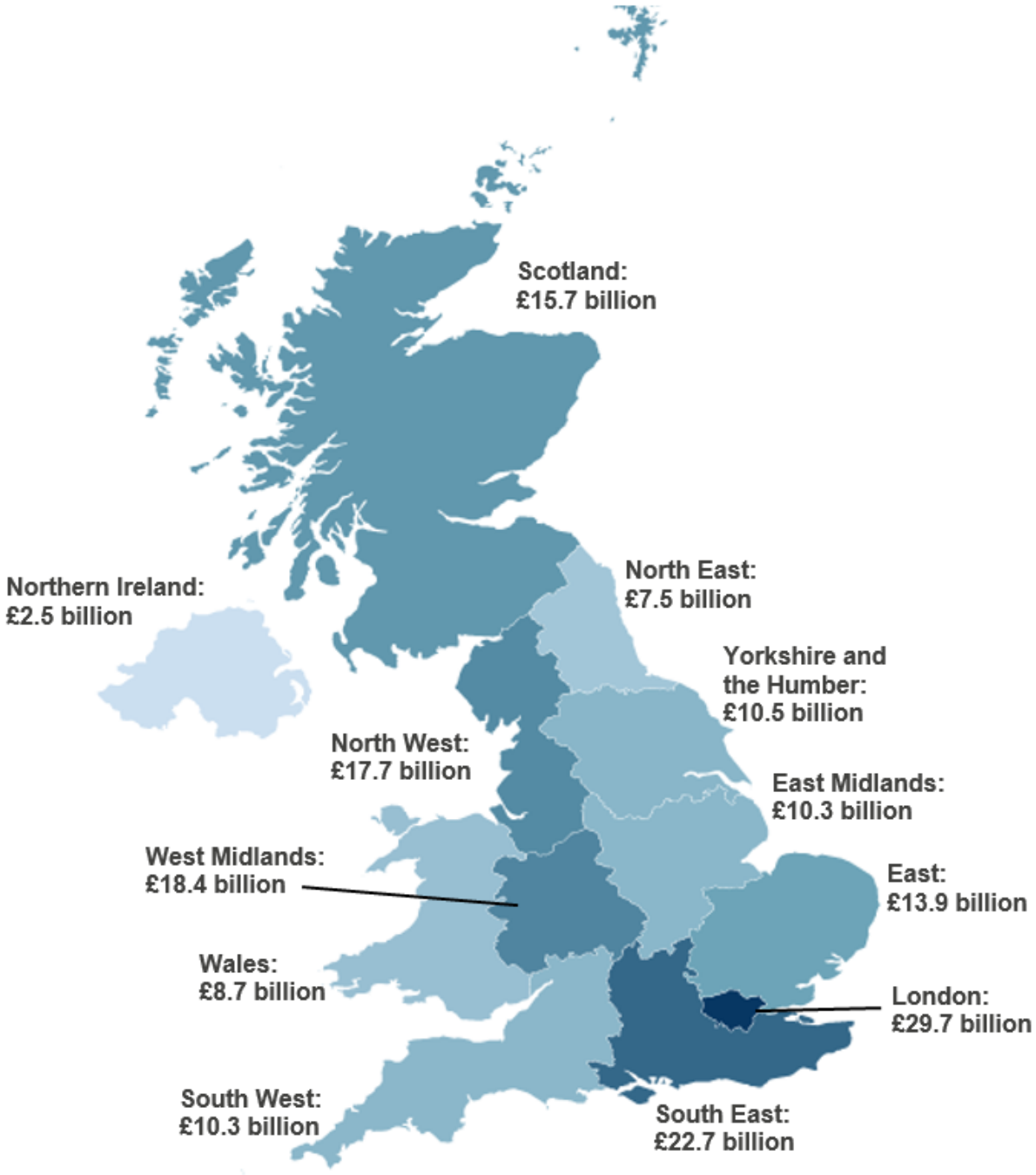
There are significant regional variations in the levels of digital skills and therefore the potential to gain benefits through the acquisition of skills.

Table 4 below depicts the economic impacts of greater digital inclusivity across the different regions of the UK and in the Republic of Ireland. Whilst the monetary benefits of achieving a digitally included UK and Ireland will be felt across all regions, Cebr expects that they will be unevenly spatially distributed.

Table 4: Sum of annual benefits from different skills related benefit streams for UK and Ireland Regions from greater digital inclusivity

Region	Environmental	Corporate	Comms	Employment	Earnings	Gov Rev	Gov Efficiency	NHS	Time Savings	Transactions	Total
East Mids	33.5	1245.8	51.8	115.1	905.7	137.2	94.1	68.7	205.3	327.1	3184.2
East England	36.4	1352.5	56.3	125.1	985.3	149.3	102.4	74.7	223.3	355.9	3461.1
London	107.6	4033.4	165.8	370.5	2901.6	440.1	301.6	220.0	659.4	1048.0	10248.1
North East	26.1	976.6	40.3	89.9	705.2	106.9	73.3	53.5	160.1	254.7	2486.7
North West	67.0	2498.5	103.3	230.2	1807.3	274.0	187.8	137.0	410.2	652.8	6368.1
South East	52.7	1957.7	81.4	180.9	1423.7	215.7	148.0	107.9	322.7	514.2	5004.8
South West	22.3	818.0	34.5	76.2	603.8	91.4	62.8	45.8	136.4	218.1	2109.1
West Mids	97.5	3660.7	150.0	335.7	2624.9	398.3	272.8	199.0	597.1	948.1	9284.0
Yorkshire & the Humber	38.6	1433.6	59.7	132.6	1045.0	158.3	108.6	79.2	236.7	377.4	3669.8
Scotland	72.4	2711.7	111.6	249.2	1952.3	296.1	202.9	148.0	443.6	705.1	6892.9
Wales	48.4	1809.0	74.6	166.4	1304.8	197.9	135.6	98.9	296.4	471.3	4603.2
Northern Ireland	19.9	743.1	30.7	68.4	536.9	81.4	55.8	40.7	121.9	193.9	1892.7
Republic of Ireland	46.7	1731.9	73.3	154.2	1391.8	146.6	127.7	105.0	279.0	483.3	4539.5

Map 1: Regional Breakdown of Total Benefits



Midlands and Wales

The estimated impact of digital inclusion varies across regions in the Midlands and Wales. The estimated sum of annual benefits from 2022-2030 from greater digital inclusivity, according to Cebr's findings, in the West Midlands was **£18.4 billion.** The estimated sum of annual benefits was less in the East Midlands, at **£10.3 billion.** Greater digital inclusion in Wales would lead to an additional **£8.7 billion** in total benefits. Compared to the rest of the UK and Ireland, when taking into consideration population sizes, the estimated benefits from greater digital inclusivity in these regions are significant.

Northern England and Scotland

Similarly, annual benefits from greater digital inclusion in Northern England and Scotland are also substantial. According to Cebr's findings, the estimated sum of total benefits between 2022 to 2030 for the North West and North East were **£17.7 billion** and **£7.5 billion** respectively. Cebr results also find that the estimated increase in total revenue from all benefit streams for Scotland from greater digital inclusivity was **£15.7 billion.** Although the estimated sum of benefits for Yorkshire and the Humber was less than other regions in Northern England and Scotland, Cebr's results suggest that greater digital inclusion would increase total revenue by **£10.5 billion.**

Southern England and London

According to Cebr's findings, the estimated sum of annual benefits from 2022-2030 from greater digital inclusion in London was **£29.7 billion**, which was the largest of any UK region. Although Cebr estimates that greater digital inclusivity would benefit other Southern regions of the UK, the magnitude of these total benefits is arguably less substantial than their northern counterparts, when taking into consideration population sizes. Nonetheless, greater digital inclusivity is estimated to deliver benefits of **£22.7 billion** in the South East, **£10.3 billion** in the South West and **£13.9 billion** in the East of England.

Northern Ireland

Cebr's results reveal the advantageous impacts on total revenue from greater digital inclusivity, the estimated increase in total revenue for Northern Ireland is **£2.5 billion.** Although this is smaller than any other region in UK and Ireland – both because of Northern Ireland's small size and the significant digitalisation (proxied by full fibre rollout) that has already occurred – the estimated benefit is still significant.

The Republic of Ireland

The Republic of Ireland would stand to experience an estimated **£24.2 billion** gain from greater digital inclusion.

8.1 Levelling Up – Wider Discussion

Inequality within the UK has a distinct geographical aspect to it. There is a need for higher productivity that is not concentrated only in specific areas, particularly London and the South East of England, as shown in the previous section. Spreading high productivity throughout the country could be an effective way of tackling the UK's relatively low productivity growth when compared to competing nations.

The government sees 'Levelling up [as] a mission to challenge, and change, that unfairness. Levelling up means giving everyone the opportunity to flourish. It means people everywhere living longer and more fulfilling lives, and benefitting from sustained rises in living standards and well-being.' The Government's Levelling Up agenda has been designed to tackle the uneven spread of opportunity across the UK. Digitisation has significant potential to address this. It has the potential to create opportunities and tackle social and economic barriers by providing people with the right tools.

By 2030, its aim is for the UK to have nationwide gigabit-capable broadband and 4G coverage, with 5G coverage for the majority of the population. One of the obstacles to digitally levelling up is that it can be prohibitively expensive for households in rural areas to upgrade internet connections. This needs to be tackled to ensure no part of the country is left behind.

Levelling up is a way to extend opportunity to all parts of the country. Increased remote working, enabled by digitisation can facilitate this. The aim is to increase economic performance so that there is less of a gap between average performance and the performance of those below the average: truncating the distribution of performance whilst keeping the average consistent or improving it.

As the last section outlines, the UK has larger geographical divergences in economic outcomes than many other developed countries. This is in relation to a range of metrics, such as productivity, pay, educational attainment and health.[85] Over the past century, changes to the structure of industries have determined the spatial distributions of opportunity that we are currently faced with. Much of the divergence in economic outcomes has a long history as those parts of the country dependent on the old staple industries have suffered worse as those industries declined over the 20th century. But we are now in a fourth industrial revolution, where geography need not play such a dominant role in determining outcomes. We can connect and work with people in any part of the country at the click of a few buttons.

The government is seeking to enhance digital connectivity through Project Gigabit and the Shared Rural Network so that by 2030 high speed fixed and mobile Internet is available across the country, not just in urban areas. However, the government understands that it must work with the private sector to deliver nationwide gigabit-capable broadband.

The Government is also directly supporting firms. The Government's Help to Grow initiative seeks to enable over 30,000 SME leaders to enhance their management capabilities and support 100,000 SMEs to adopt productivity-boosting digital technologies.[86]

Those in rural areas are more likely to have worse digital connectivity than those in urban areas. With better digital infrastructure, labour markets can be improved in rural areas by expanding and deepening the local labour markets through enabling remote working.

---

85 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1052046/Executive_Summary.pdf

86 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1052046/Executive_Summary.pdf

This is an active aim of the government. In 2020, the UK Government published the National Infrastructure Strategy. This commits to providing £5bn towards rolling out gigabit broadband to at least 85% of the country by 2025 and then to aim for 100%. A key aspect of this is that public investment is crucial for targeting premises that are much more expensive to reach. These are the types of premises that the private sector does not find it profitable to service. Real progress has been made already, with Gigabit coverage having increased from 10% to more than 60% over the last two years.

Another initiated is that the UK Government has agreed a £1bn deal with mobile operators to deliver the Shared Rural Network programme to increase 4G coverage to 95% by 2025. Moreover, the UK Government's hopes to is for the majority of the population to have access to a 5G signal by 2027.

In 2021 DCMS highlighted the West Midlands as having the country's fastest-growing tech sector. The region has attracted firms harnessing cutting edge digital technology, such as Goldman Sachs and Advanced, and the region's thriving digital industries are expected to create thousands of new jobs by the end of 2025. The region has attracted firms harnessing cutting edge digital technology, such as Goldman Sachs and Advanced, and the region's thriving digital industries are expected to create thousands of new jobs by the end of 2025. The West Midlands also has amongst the highest levels of 5G coverage in the UK as a result of the success of the WM5G Testbed programme. However, it also has the lowest digital sector share of enterprise births at 4.8% and significant digital skills challenges, which suggests that more needs to be done to foster the next generation of tech start-ups, build on innovation opportunities and level up digital opportunities for everyone to benefit. The West Midlands Smart City Region Programme will scale-up digital opportunities across the region in health tech, future mobility and smart energy. It will drive new digital start-ups through practical business support and a supply of patient venture capital to attract global innovators. And it will deliver digital catch-up programmes so that everyone in the region can gain the skills and confidence to access the opportunities this will bring.

London's Challenges

Demand is higher in the capital both for basic digital skills and advanced digital skills. Three in four (76%) employers in London said that basic digital skills were very important for their workforce, compared to just over half of employers in the Midlands (56%) and the North (55%). Similarly, a third (34%) of employers in London said that the majority of their workers required advanced digital skills, compared to one in five (22%) in the North and the Midlands.

Nearly nine in ten (87%) advertised jobs in London required digital skills, with demand spread across all sectors (DCMS and Burning Glass 2019).

Businesses in London seem to have the greatest challenge both with skills gaps, and in recruiting workers with the digital skills that they need. Nearly half (44%) of employers say they face skills gaps in relation to advanced digital skills, compared to just one in three (34%) across the rest of Great Britain. Similarly, over half (53%) of employers in London say that they have struggled to recruit employers with the advanced digital skills that they need compared to just over one in three (37%) across the rest of Great Britain. Nonetheless, 34% of ICT apprenticeship starts in 2019/20 were concentrated in London and the South East of England.

9. Actions required to deliver benefits

Much will need to be done by the private sector, government and the third sector if these benefits are to be realised. One way forward is to educate children and young people to ensure they have the digital skills they need and also provide them with sufficient technology and internet connectivity to make the most of those skills. However, this cannot be the only answer. It is important to not leave out adults and also to instil greater capacity to deliver and increase the facilities for adults to increase their digital learning. However, digital skills are not sufficient. To make the necessary changes, people need access to digital connectivity along with adequate skills to make the most of the digitised world. For increased connectivity to generate enhanced inclusivity, it will be necessary to overcome the urban/rural divide. The UK government has a goal of connecting remote, rural communities of the UK via technologies such as 5G and open Wi-Fi therefore has the potential to massively benefit both UK firms and individuals. Indeed, digitisation also has an important role in driving the productivity of firms upwards across the UK and the Republic of Ireland.

The UK government can play a key role by supporting the development of digital skills to ensure that the workforce is prepared for the rapid development of technologies and the advent of digitisation. This will be critical as the increasing number of daily tasks that require digital skills mean those that have not learnt basic digital skills end up being socially marginalised. These costs are ones that the private sector does not readily take into account, meaning that there is scope for the government to fill the gap. The government is actively supporting many individuals who lack digital skills throughout their learning process to mitigate these the potential for marginalisation, more can be done.

A good example of ongoing activity is the work of the Institute of Coding (IoC), which is an initiative by the UK Government to 'transform the digital skills profile of the country'. This provides a practical attempt to addresses the need to fill the gaps in digital skills in a variety of sectors.

Another related concern is that the UK's education system, whilst producing computing graduates in large numbers often has them ending up unemployed or underemployed.

The Made Smarter programme is another key initiative of the UK Government. The report identified key hurdles related to digital skills acquisition and that prevent industrial digitisation in the UK:

- There are poor levels of adoption, particularly among SMEs
- The UK is behind other advanced nations in overall productivity (output per worker), which is in part due to lower levels of adoption of digital and automation technology. This is particularly acute among SMEs.
- SMEs, in particular, perceive significant barriers to adoption, such as risks around cybersecurity, and a lack of common standards allowing different technologies to connect.
- Businesses also face a skills shortage, particularly in digital engineering capabilities, and are hindered by a fragmented skills system and a lack of systematic engagement between education and industry.

The Made Smarter report finds that a lack of digital skills has been identified is the most significant barrier preventing the UK achieving its goal of being a world leader in the field of information technology. The government highlighted the need for industry and government to work together to increase the level of digital skills in the workforce.

The report makes some useful recommendation about ways forward:

- Increasing investment and uptake in skills acquisition.
- Better identifying future skills requirements.
- Improving the provision of and access to quality training to support those future skills.
- Creating an agile skills development system able to respond to rapidly changing market needs.
- Creating a culture of lifelong learning and more visible career pathways for adults.

The UK government recently released an updated Digital Strategy. It is also working towards ensuring that there is better connectivity across the country. A key priority is to upgrade the internet connections of households in rural areas. Super-fast internet access is important across the UK as well as cyber security practices being established. Much has already been done with superfast broadband coverage now at 97% and gigabit-capable broadband covering 67% of UK premises. Moreover, 4G is accessible to 92% of the UK landmass.

Cyber skills are of particular importance. The Government has supported industry by providing ways for adults to reskills for roles in the cyber sector. There is also support in areas such as quantum computing and advanced semi-conductors, which are fields in which the UK has the potential to be a world leader over time.

The private and third sectors also have vital roles to play in developing the digital skills capabilities of the workforce. There are a range of activities in the private sector such as bootcamps, apprenticeships and specific help for job seekers such as the provision of accredited qualifications. For instance, the third sector also has initiatives to support digital upskilling of individuals. There are courses provided to those from disadvantaged backgrounds.

It will be important that more high-quality employee training is provided and that support through tax incentives are provided such as the Apprenticeship Levy, to encourage investment in training. Employee lead digital upskilling will continue to have an important role, especially for older employees. The Government can continue to support the UK economy by ensuring that UK technology businesses can easily have their employees access skills. This includes providing funding where necessary. There is also a need to support schools and universities and other further education providers to ensure future workers have the necessary digital skills to thrive. The government has made a start by providing funding 1,000 PhDs in artificial intelligence and 1,000 scholarships for master's degree conversion courses in AI and data science.

Digital infrastructure plays a vital role in our daily lives and is the foundation of a thriving digital economy. Continued support of adult learners will be particularly important as digital skills generally decline as one considers those in higher age profiles. There is already a lot of work to support those who are claiming benefits to develop digital skills. This can help them in the job search process. The provision of qualifications is important for providing evidence that skills have indeed been gained.

A key example is that the Government has launched Skills Bootcamps in England. These offer free, flexible courses to support in skills acquisition in areas such software development, digital marketing, and data analytics. The provision of courses also covers subjects such as digital, computer science, and cyber skills. These can provide attendees with a wage premium. The Institute for Apprenticeships and Technical Education is continuing to explore the need for new standards with employers. Government is working closely with stakeholders in the digital sector to identify opportunities for improvements that support digital growth and are delivering sector campaigns via trusted sector voices, including TechUK and BCS (British Computer Society, The Chartered Institute for IT), to inspire and inform SMEs to recruit

apprentices. There is also Government support for schools to deliver computing alongside other subjects to that younger pupils have the necessary skills to succeed in an increasingly digital world.

10. Conclusion

This report provides evidence to show that all parts of society can gain significantly from greater digital inclusivity. As people are trained and connectivity improves, people, industry and Government are able to communicate better with one another and to achieve better outcomes. It has been shown that digital inclusion has the potential to add £168 billion to the UK economy and £23 billion to the economy of the Republic of Ireland by 2030. The channels for improvement relate primarily to the enhancement of skills acquisition, along with enhanced digital connectivity for organisations. Thus, there are substantial gains to be had for individuals and for society as a whole from ensuring that all adults learn essential digital skills.

Full digital inclusion across the UK and Ireland by 2030 would yield massive benefits to individuals, industry and the Government. At the same time, to bring about these benefits requires effective collaboration and joined-up thinking and investment from across the different sections of our society. By doing this, there is a potential to use digital inclusion as a means to help solve some of the most pressing issues facing the economy and society more generally. For instance, it has been shown that the benefits would be spread across the different regions of the UK. This has the potential to support the Government's Levelling Up agenda to provide increased opportunities for those who are geographically disadvantaged. There is also a potential for digital inclusion to play a key role in closing the digital divide that exists within the UK. This would benefit people not only by enhancing their prospects of getting better jobs with higher pay but also the industries that hire more productive and effective employees. Industry can also benefit as levels of internet connectivity are driven up towards the highest existing standards and firms adopt technologies that enable them to be more productive.

Underlying the move towards capturing these benefits is a need to ensure people and industry feel confident about their security online and enabled to take an active role in ensuring they can withstand the potential of cyber-attacks. This is an essential counterpart to enabling everyone to take advantage of increased connectivity. By ensuring that the UK has a protective canopy of digital security, Government, industry and the third sector can provide the required backdrop for digital inclusion to increase rapidly between now and 2030.

Overall, there remains an opportunity to make the UK fully digital inclusive. All parts of society can gain significantly from a concentrated effort to obtain these benefits through increased training, more widespread enhanced internet connectivity and stronger digital security.

11. Appendix: Summary Results

The annual and cumulative benefits generated from achieving as close to a digitally included UK as possible by 2030 are detailed through previous chapters along with associated methodology used. This section of the report sums these benefits both annually and cumulatively, with results presented below in Table 4 below. We estimate that cumulatively, from 2023 through 2030, achieving a digitally included society will generate £59.2 billion for the UK economy arising from digital upskilling and £4.5 billion of the Republic of Ireland.

The table below shows the results of our analysis when a discount factor of 3.5% is applied to net present value calculations, as per HMRC Green Book 2022 guidelines.

Table 4 UK and Ireland benefits across aggregated across all benefit types, 2023 - 2030, £m

	2023	2024	2025	2026	2027	2028	2029	2030	Total
UK	1,749	3,536	5,251	6,872	8,395	9,824	11,163	12,414	59,205
Ireland	135	272	404	528	645	754	857	953	4,546

Source: ONS, Lloyds, Cebr analysis

Table 5 below shows the total benefits associated with improved connectivity and technological adoption between 2023 and 2030.

Table 5: Summary results, connectivity and technology adoption impacts (2022 £m)

	Total impact (£m)	Current full fibre %
United Kingdom	108782	39.2%
Republic of Ireland	18709	33.3%


Cebr