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# **State of Digitisation in UK Business**

Research Support for Business Leadership on  
Productivity

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## **Foreword**

The UK Commission for Employment and Skills (UKCES) is a publicly funded, industry-led organisation providing leadership on skills and employment issues across the UK. Together, our Commissioners comprise a social partnership of senior leaders of large and small employers from across industry, trade unions, the third sector, further and higher education and all four UK nations.

Our vision is to create, with industry, the best opportunities for the talents and skills of people to drive competitiveness, enterprise and growth in a global economy.

Over the next three years our ambition is to see industry in the UK create “ladders of opportunity” for everyone to get in and on in work. This means employers improving entry routes into the labour market for young people, ensuring the existing workforce has the skills businesses need to compete and individuals need to progress, and deploying those skills in a way that drives productivity and growth. This is a collective agenda for employers working in partnership with government, trade unions, education providers, industry bodies and local organisations.

### **Our Research**

Our research mobilises impartial and robust national and international business and labour market research to inform choice, practice and policy. We aim to lead the debate with industry to drive better outcomes for skills, jobs and growth.

Our ambition is to cement the UK Commission’s reputation as the ‘go-to’ organisation for distinct high quality business intelligence, and communicate compelling research insights that shape policy development and influence behaviour change.

In order to achieve this, we produce and promote robust business intelligence and insights to ensure that skills development supports choice, competitiveness and growth for local and industrial strategies.

Our programme of research includes:

- producing and updating robust **labour market intelligence**, including though our core products (the Employer Skills Survey (ESS), Employer Perspectives Survey (EPS) and Working Futures Series)

- developing an understanding of what works in policy and practice through **evaluative research**
- providing research **insight** by undertaking targeted thematic reviews which pool and synthesise a range of existing intelligence.

Our research programme is underpinned by a number of core principles, including:

- providing **business intelligence**: through our employer surveys and Commissioner leadership we provide insight on employers' most pressing priorities
- using evaluative insights to identify **what works** to improve policy and practice, which ensures that our advice and investments are **evidence based**.
- adopting a **longer term, UK-wide, holistic perspective**, which allows us focus on big issues and cross cutting policy areas, as well as assessing the relative merits of differing approaches to employer engagement in skills
- providing **high quality, authoritative and robust data**, and developing a consistent core baseline which allows comparison over time and between countries and sectors.
- being **objective, impartial, transparent and user-friendly**. We are free of any vested interest, and make our LMI as accessible as possible.

We work in strategic partnership with national and international bodies to ensure a co-ordinated approach to research, and combine robust business intelligence with Commissioner leadership and insight.

Sharing the findings of our research and engaging with our audience is important to further develop the evidence on which we base our work. Evidence Reports are our chief means of reporting our detailed analytical work. All of our outputs can be accessed at [www.gov.uk/government/organisations/uk-commission-for-employment-and-skills](http://www.gov.uk/government/organisations/uk-commission-for-employment-and-skills)

We hope you find this report useful and informative. If you would like to provide any feedback or comments, or have any queries please e-mail [info@ukces.org.uk](mailto:info@ukces.org.uk), quoting the report title or series number. We also welcome feedback on Twitter.

**Lesley Giles**

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*Research Support for Business Leadership on Productivity*

**UK Commission for Employment and Skills**

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# 1 Introduction

There are few areas of modern business life which are not affected to some extent by the use of digital technology, and there is substantial evidence that the exploitation of Information & Communications Technology (ICT) has been one of the most important drivers of productivity growth in developed economies over the last several years.

This report contributes to the debate on how to improve the UK's productivity performance, by providing an assessment of the current state of digitisation of UK business.

Our report is structured as follows:

- Section 2 sets out key information on the current state of digitisation of UK business, including statistics on adoption levels, the enablers and barriers facing businesses in digitisation, and an overview of the economic benefits and impacts.
- Section 3 highlights five key digital developments which we consider to be particularly important for the vast majority of UK businesses over the next three to five years.
- Section 4 discusses six inter-related areas which we suggest should be priorities for action over the next two to three years.
- Section 5 presents some information on 'what works?', drawing from various international surveys on what makes for effective digital business strategies, and a brief discussion on the role of publicly-funded support for digitisation.

There are four annexes: Annex A lists the papers/sources referenced in this report; Annex B provides further information on the UK's relative position in business digitisation versus other European countries; Annex C is a brief discussion on the implications for measured productivity of a particularly important recent development in ICT - cloud computing; and Annex D summarises various publicly-funded schemes supporting business digitisation in a selection of other countries.

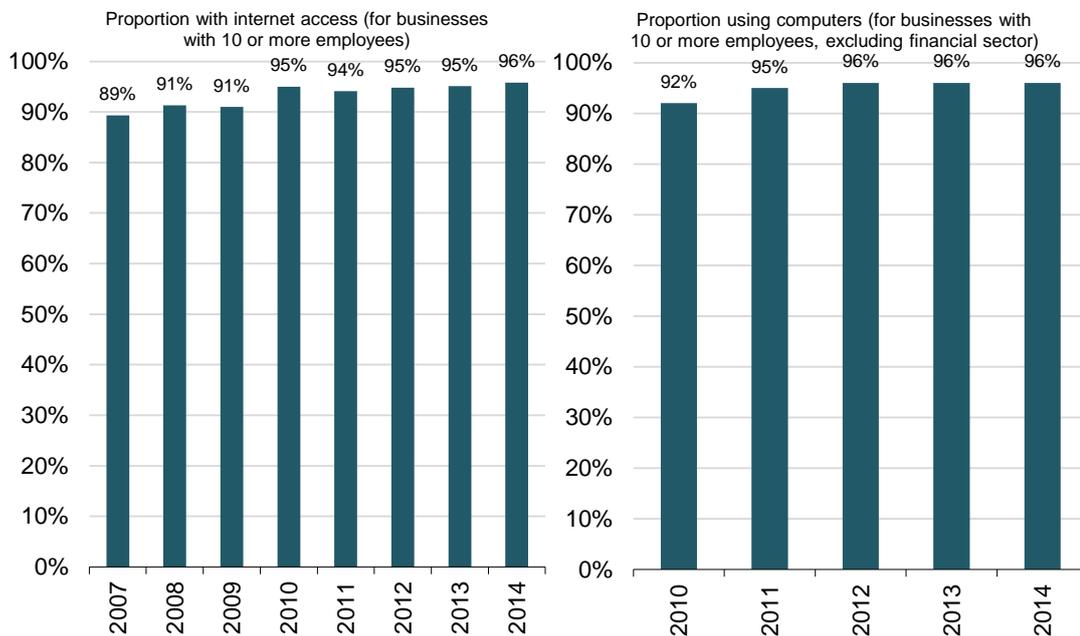
## 2 Current state of business digitisation

### 2.1 Adoption of digital

#### 2.1.1 Use of basic digital technology in now nearly ubiquitous amongst UK businesses...

Fifteen years on from the launch of broadband services in the UK, computers and the internet are now used by the vast majority of UK businesses. Of firms with 10 or more employees, about 96% have internet access and computers (Figure 2-1).

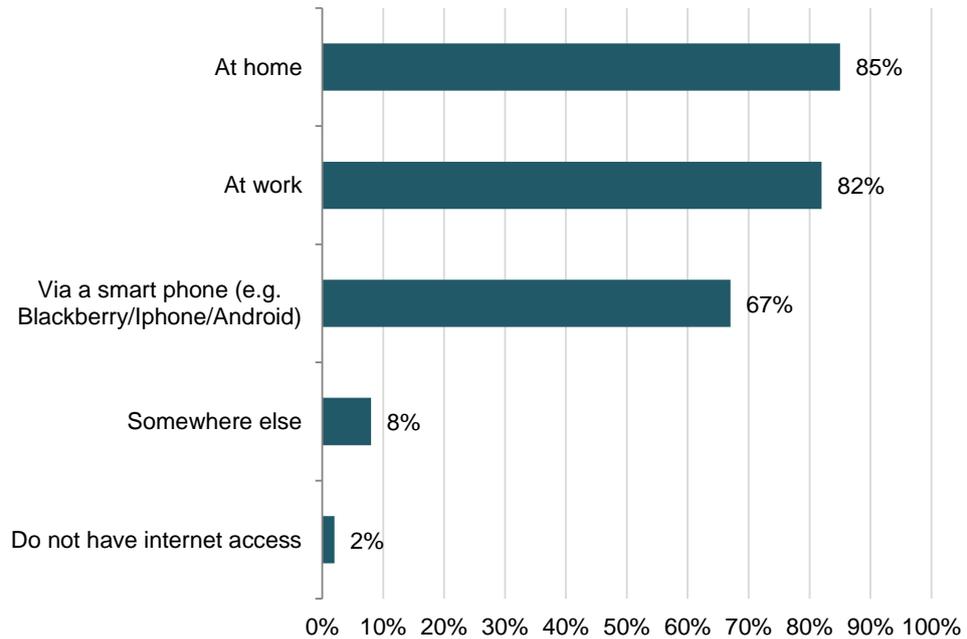
**Figure 2-1: Proportion of UK businesses with internet access and using computers**



Source: ONS, *E-Commerce and ICT Activity of UK Businesses, 2014*; Eurostat, *Information Society Statistics, 2015*

The smallest businesses – with fewer than 10 employees – are also using the internet extensively: the ONS E-commerce Survey found that 81% of firms with 0 to 9 employees had internet access in 2014. Workplace-based internet access may understate the extent to which such firms use the internet though: when 803 SMEs in England were asked ‘Where do you have access to the internet?’ in the BIS Digital Capabilities Survey 2015, 85% said ‘at home’ and ‘67% said ‘via a smartphone’ - alongside the 82% who said ‘at work’; only 2% said that they had no internet access (Figure 2-2). The FSB Member Survey 2013/14 also found that only 2% of over 8,700 respondents said ‘my business is not connected to the internet’. Broadly similar findings come from the Digital Economy Business Survey 2014 in Scotland, which found that 6% had no internet access from over 4,000 businesses interviewed.

**Figure 2-2: Where businesses access the internet (for businesses with 0 to 249 employees) 2015**

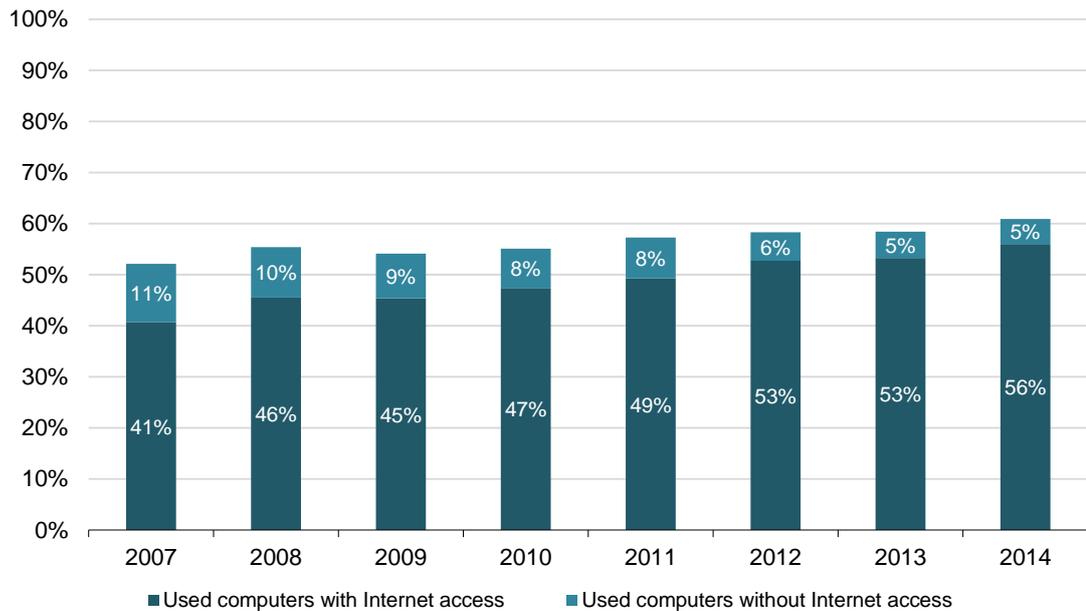


Source: BMG/Durham University, *Digital Capabilities in SMEs, 2015*

### 2.1.2 ...and most employees now use computers and the internet

Not all workers need access to computers or the internet, but Figure 2-3 illustrates that these tools have gradually been diffusing throughout the workforce: by 2014, 61% of employees (in firms with 10+ employees) used computers – up from 52% in 2007.

**Figure 2-3: Proportion of employees using computers (for firms with 10+ employees)**

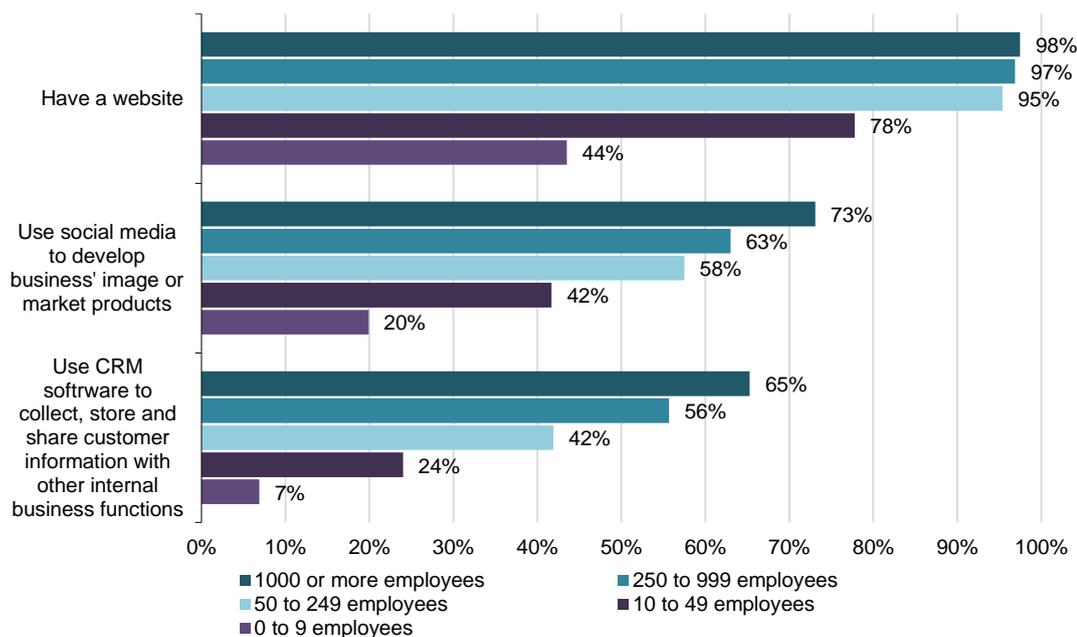


Source: ONS, *E-Commerce and ICT Activity of UK Businesses, 2014*

### 2.1.3 But the size of business is a fundamental determinant of wider digital adoption...

Larger firms are consistently more likely to adopt many forms of digital technology (Figure 2-4). For example, almost all businesses with 50 or more employees had a company website in 2014, compared to 78% of firms with 10-49 employees and 44% for the smallest firms (less than 10 employees).

**Figure 2-4: Proportion of businesses using digital technologies (by business size) 2014**



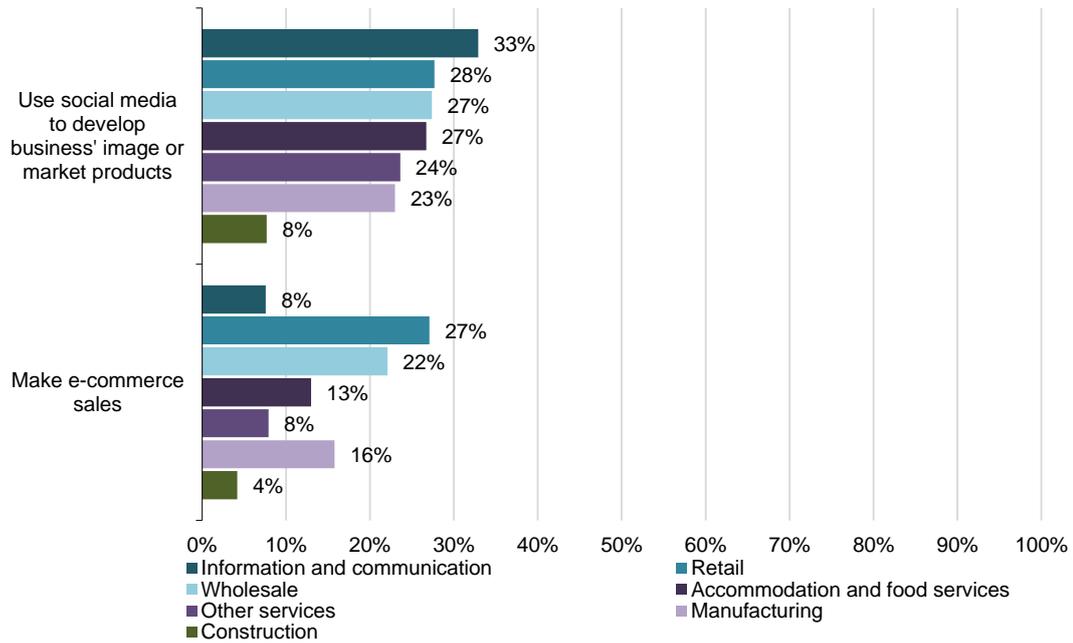
Source: ONS, *E-Commerce and ICT Activity of UK Businesses, 2014*

Similarly, use of social media and Customer Relationship Management (CRM) systems is now widespread amongst the largest firms (with 73% of firms with 1,000+ employees using social media to develop their business' image or market products, and 65% using CRM systems to collect, store and share customer information), but still very low for the smallest businesses (with only 20% of businesses with 0-9 employees using social media and 7% using CRM systems).

### 2.1.4 ...and sector is also a very important factor...

In many areas, the Information and Communications sector is itself at the leading edge of ICT usage. For example, this sector is the most prevalent user of social media, with one third (33%) using social media to develop their business' image or market products (Figure 2-5). In contrast, only 8% of Construction firms use social media in this way.

**Figure 2-5: Proportion of businesses (including micro-businesses) using various digital technologies (by sector) 2014**



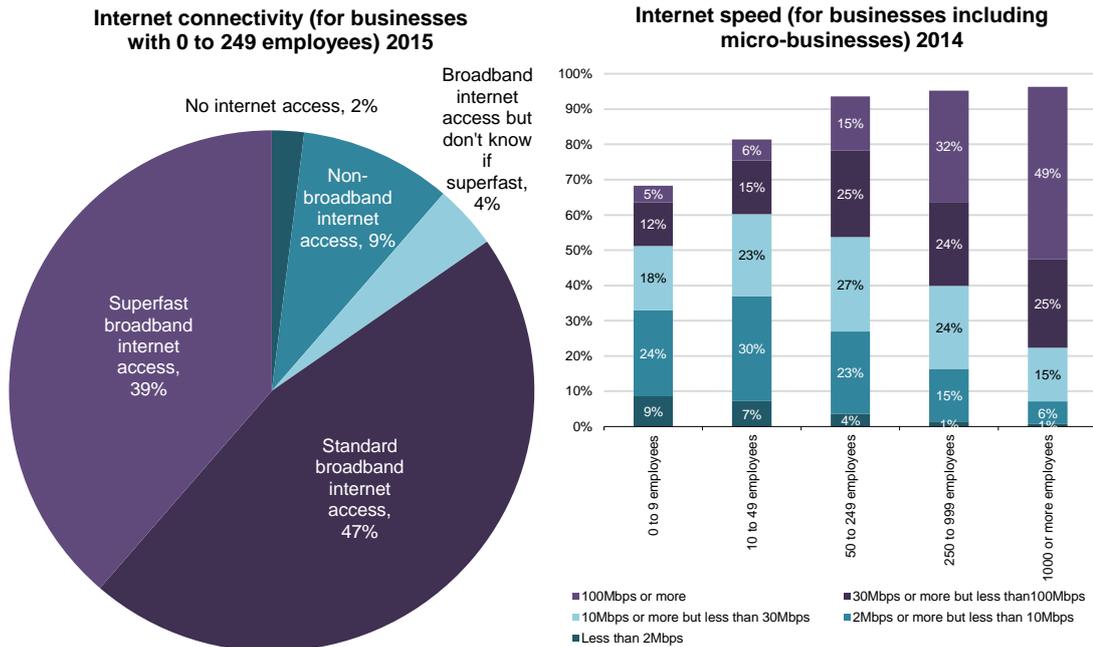
Source: ONS, *E-Commerce and ICT Activity of UK Businesses, 2014*

For certain digital applications, though, other sectors have taken the lead – because of their relevance to business operations. In particular, it is perhaps to be expected that e-commerce is most common for Retail and Wholesale businesses, with 27% and 22% of businesses in these sectors respectively making e-commerce sales in 2014. Whilst 16% of Manufacturing businesses and 13% of Accommodation and Food Service businesses made e-commerce sales in 2014, e-commerce is clearly less applicable in the Information and Communication (7.6%), Other Services (7.9%), and Construction (4.2%) sectors.

### 2.1.5 About 30% to 40% of businesses now use superfast broadband...

According to the 2015 Digital Capabilities Survey for BIS, the use of broadband is near ubiquitous amongst SMEs – 91% of businesses with 0 to 249 employees now have broadband access (Figure 2-6) and 39% of SMEs use superfast broadband (24Mbps or higher).

**Figure 2-6: Internet connectivity and speed**



Source: BMG/Durham University, *Digital Capabilities in SMEs, 2015*; ONS, *E-Commerce and ICT Activity of UK Businesses, 2014*

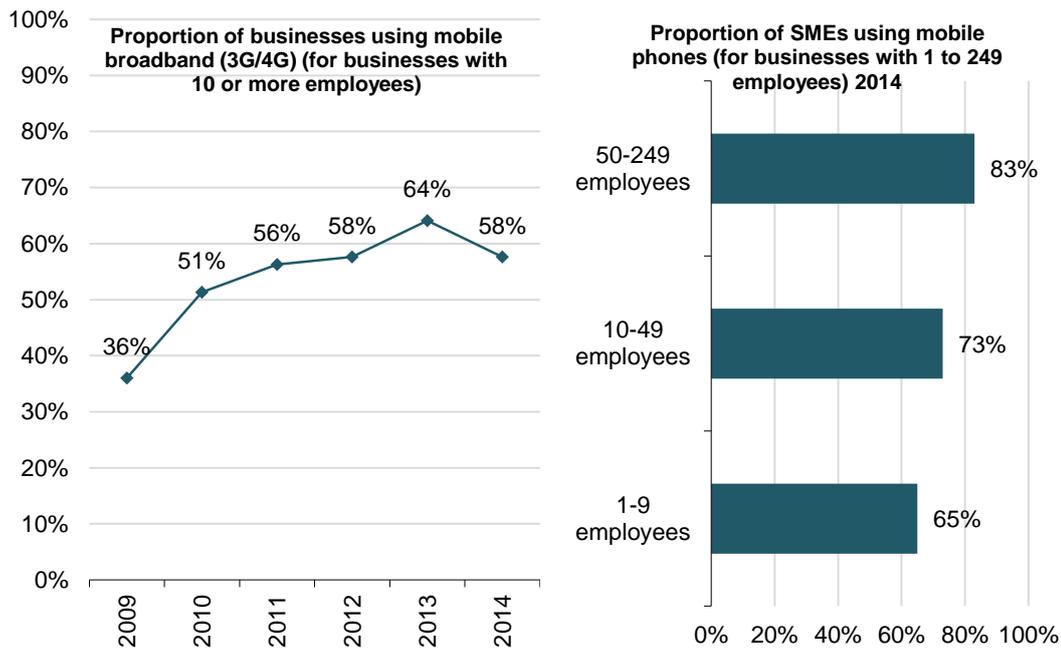
This is supported by other sources – E-Commerce and ICT Activity statistics published by ONS state that 95% of businesses with 10 to 49 employees and 99.5% of those with 50 to 249 employees had a broadband internet connection in 2014. Businesses with less than 10 employees were less likely to have a broadband connection (80%).

ONS does not use the same break-point for superfast speed, but their findings that 37% of businesses had a connection speed of 10Mbps+ and 18% had a connection of 30Mbps+ in 2014 would be consistent with business take-up of superfast (24Mbps+) now being in the order of 30% to 40%.

### 2.1.6 ...and most businesses use mobile communications

According to ONS, 58% of businesses with 10 or more employees used mobile broadband in 2014, a level that has been broadly flat over the last few years (Figure 2-7).

**Figure 2-7: Mobile broadband and mobile phone usage**



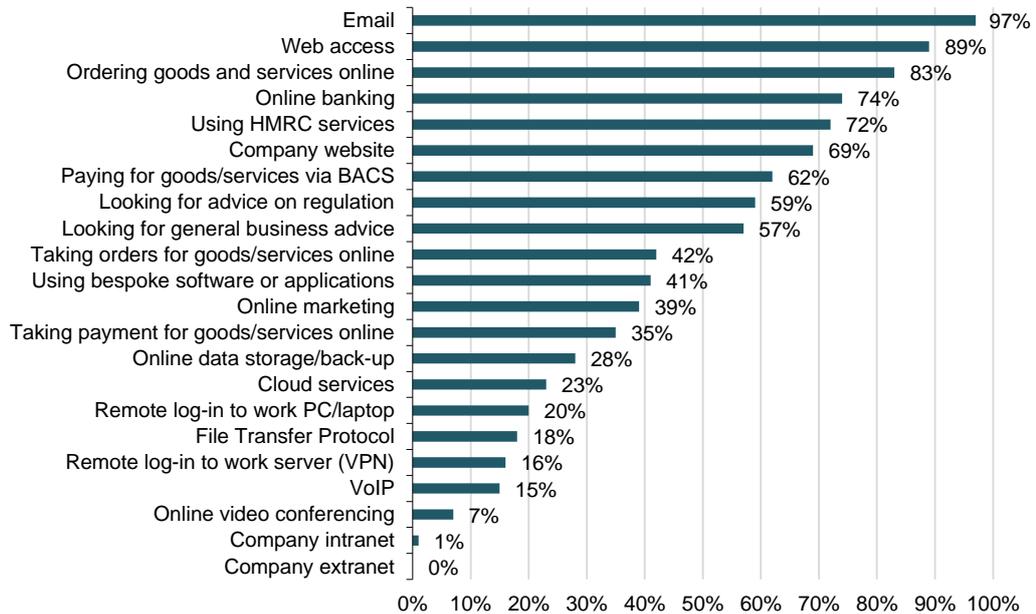
Source: ONS, *E-Commerce and ICT Activity of UK Businesses, 2014*; Jigsaw/Ofcom, *SME Experience of Communications Services, 2014*

More widely, Ofcom research into SME Experience of Communications Services finds usage of mobile phones amongst SMEs to be high, but varying by business size. Whilst 83% of those businesses with 50 to 249 employees use mobile phones, this figure is lower amongst those with 10 to 49 (73%) and 0 to 9 employees (65%).

### **2.1.7 The adoption of some applications has been fairly static over the last several years**

According to a survey conducted for Ofcom (Figure 2-8) the use of more basic digital technologies is widespread amongst SMEs. Almost all businesses with 1 to 249 employees used email in 2014 (97%), with 89% having web access and 83% ordering goods and services online. The use of digital technologies for financial tasks was also common, with 74% of using online banking, and 72% using HMRC's online services.

**Figure 2-8: Proportion of SMEs using internet applications (for business with 1 to 249 employees) 2014**

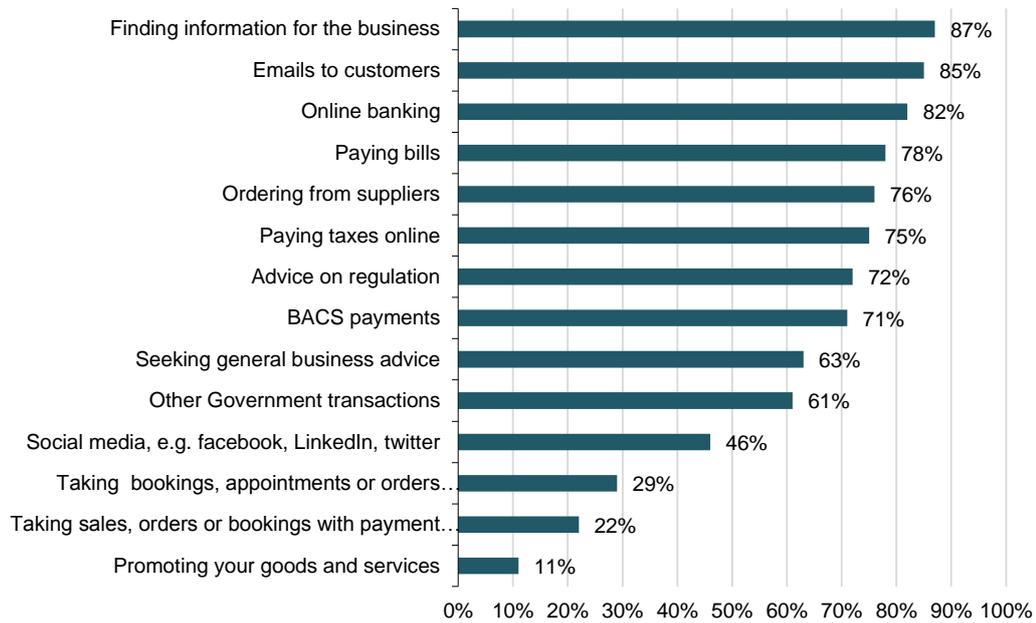


Source: Jigsaw/Ofcom, *SME Experience of Communications Services, 2014*

In contrast, adoption of other digital technologies was less widespread. In particular, relatively few respondents to that survey were using Voice over IP (15%), online video conferencing (7%) and intranets (1%), despite these technologies having been available for many years.

While the findings regarding the more common applications such as email and online banking were broadly confirmed by later research for BIS (Figure 2-9), the tracking of specific applications such as VoIP, video, intranets etc. is an area where the UK currently lacks robust time series data. Differences in question wording and sampling make it impossible to determine trends from different surveys, and the annual E-commerce Survey only covers relatively few applications.

**Figure 2-9: Proportion of SMEs using internet applications (for business with 0 to 249 employees) 2015**

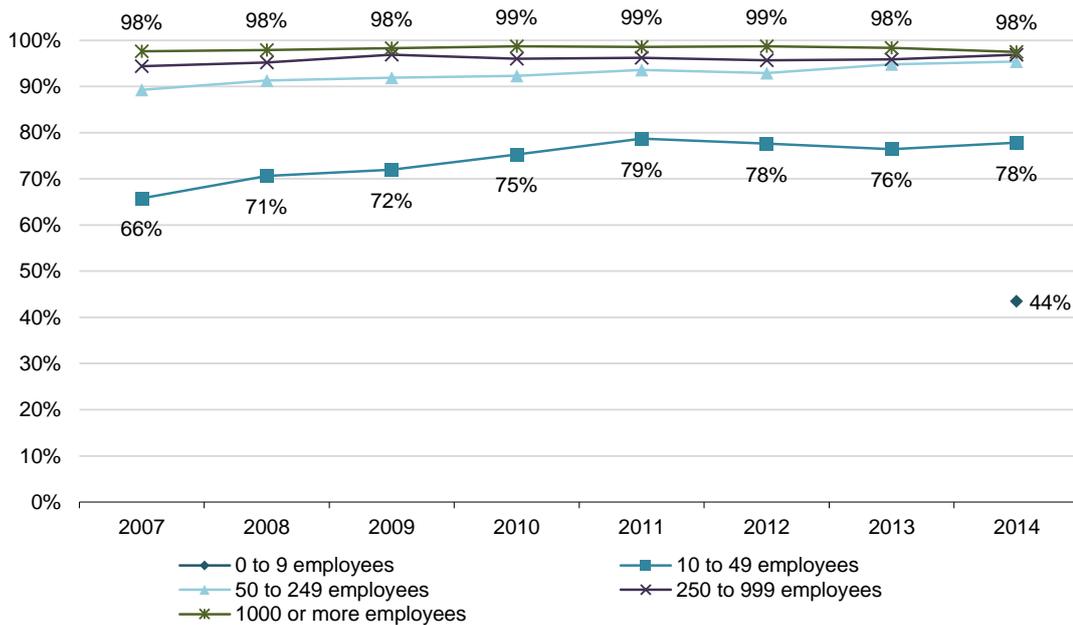


Source: BMG/Durham University, *Digital Capabilities in SMEs, 2015*

### 2.1.8 The growth in the proportion of businesses with a website has flattened out in recent years...

In 2014, 81% of businesses with 10 or more employees had a website (Figure 2-10). Whilst this has grown from 70% in 2007, the level has remained broadly unchanged since 2011.

**Figure 2-10: Proportion of businesses with websites**



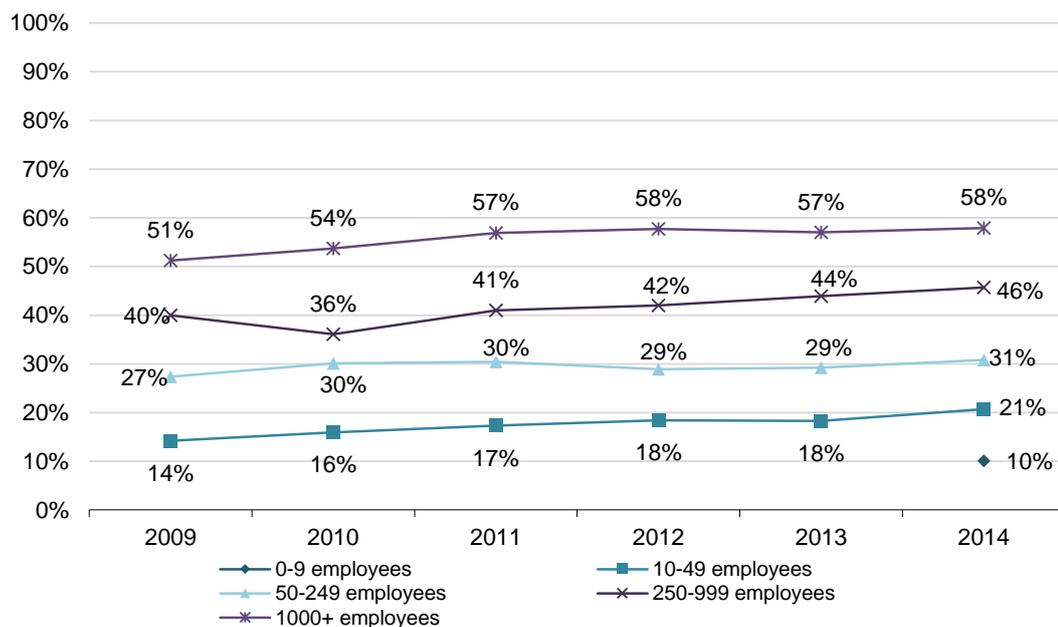
Source: ONS, *E-Commerce and ICT Activity of UK Businesses, 2014*

Analysis across different business sizes shows that almost all businesses with 50 or more employees had a website in 2014 – 95% of those with 50 to 249 employees, 97% of those with 250 to 999 employees and 98% of those with 1000 or more employees. With website penetration currently at much lower levels for 10-49 employee firms (78%) and 0-9 employee firms (44%), it remains to be seen whether these smaller businesses will eventually reach the very high levels of website usage currently found amongst larger firms.

### 2.1.9 ...and the proportion of smaller businesses making e-commerce sales remains low

Business size is also a key determinant of e-commerce activity, with a higher proportion of businesses with 1000 or more employees making e-commerce sales in 2014 (58%) than other business sizes – only 10% of the smallest businesses (less than 10 employees) did so in 2014.

**Figure 2-11: Proportion of businesses making e-commerce sales by size**



Source: ONS, *E-Commerce and ICT Activity of UK Businesses, 2014*

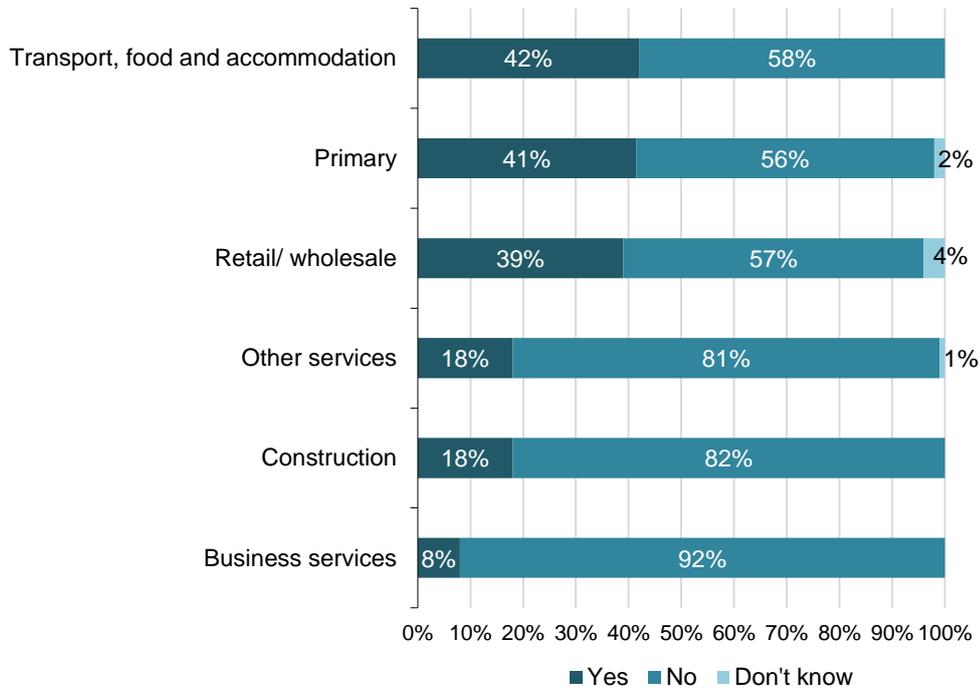
Overall, the proportion of businesses with 10 or more employees making e-commerce sales has grown from 17% in 2009 to 23% in 2014, but this growth has slowed in recent years. Whilst the proportion of businesses making e-commerce sales is lower for smaller firms, many of the non-adopters do not see a need to do so. Indeed, the BIS Digital Capabilities Survey 2015 showed that only 10% of SMEs (0 to 249 employees) not using a website for e-commerce sales planned to introduce an e-commerce website or system in the future.

### 2.1.10 E-commerce is clearly more relevant to some sectors than others...

As noted in section 2.1.4, the proportions of businesses (including micro-businesses) in the Retail (27%) and Wholesale (22%) sectors making e-commerce sales were higher than for other sectors in 2014. In contrast, e-commerce sales within the Construction industry were much lower (4.2%)

However this is driven by many products/services not lending themselves to e-commerce: 79% of non-adopters said that they did not have goods or services that were appropriate for being ordered/booked through a website in the BIS Digital Capabilities Survey (Figure 2-12).

**Figure 2-12: Whether businesses not currently making e-commerce sales have goods or services which could be ordered directly from a website, or whether bookings could be made through a website (for businesses with 0 to 249 employees) 2015**

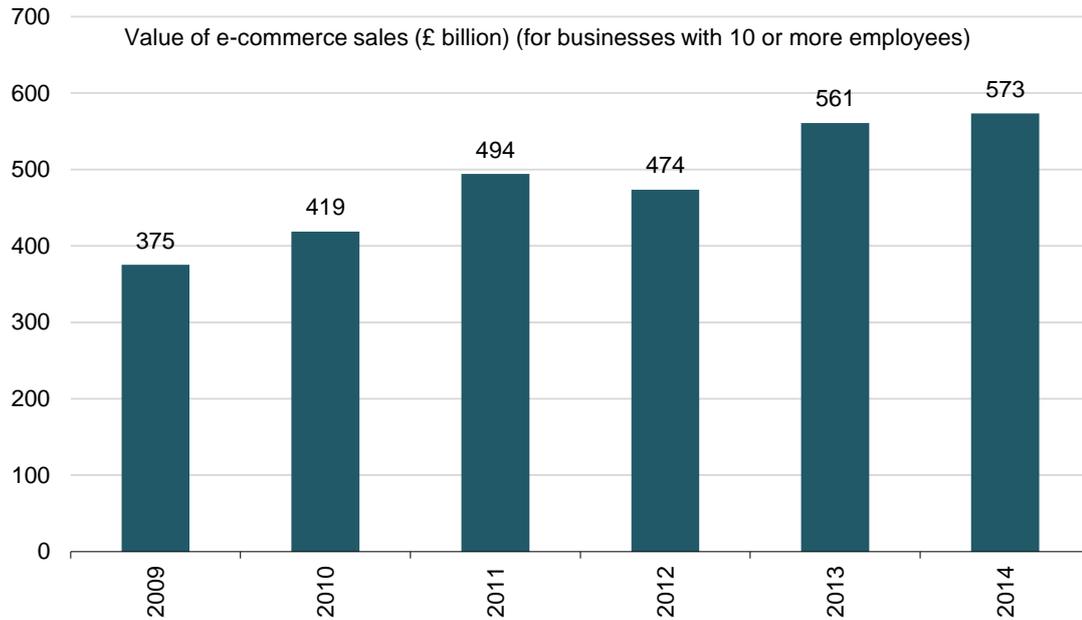


Source: BMG/Durham University, Digital Capabilities in SMEs, 2015

### 2.1.11 ...but now accounts for almost £600 billion p.a. in sales

In 2014, the total value of e-commerce sales made by businesses with 10 or more employees was £573 billion (Figure 2-13).

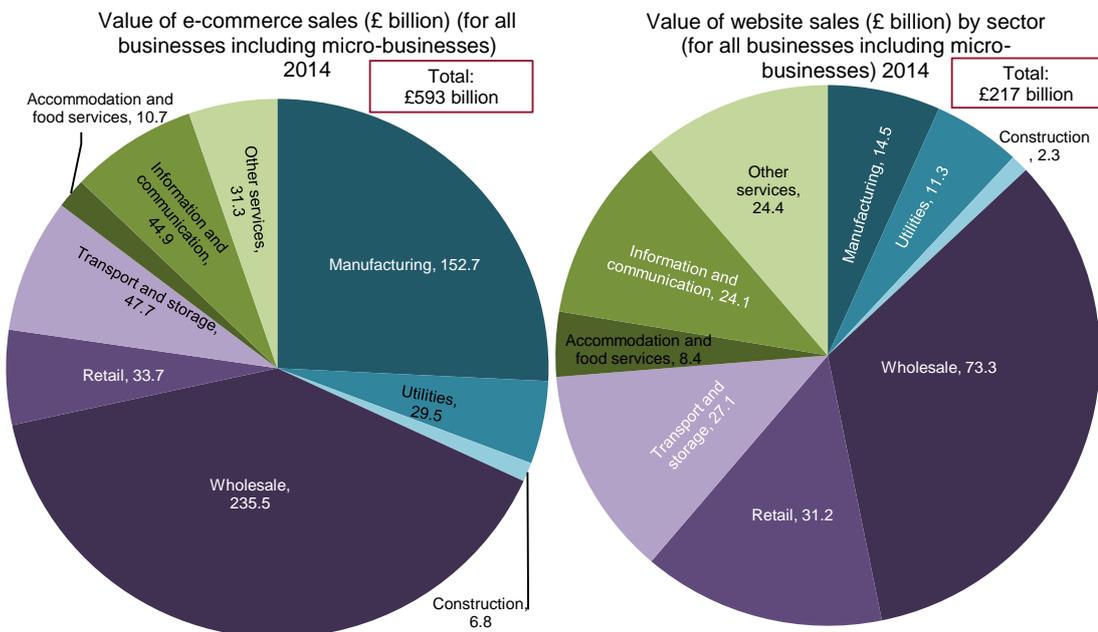
**Figure 2-13: Value of e-commerce sales for businesses with 10 or more employees**



Source: ONS, *E-Commerce and ICT Activity of UK Businesses, 2014*

Adding in a further £20 billion from micro-businesses, the total value of e-commerce sales is estimated at £593 billion in 2014 (Figure 2-14) – with Wholesale (£236 billion) and Manufacturing (£153 billion) accounting for the majority of sales between them.

**Figure 2-14: Value of e-commerce sales, and value of website sales by sector (£ billion)**



Source: ONS, *E-Commerce and ICT Activity of UK Businesses, 2014*

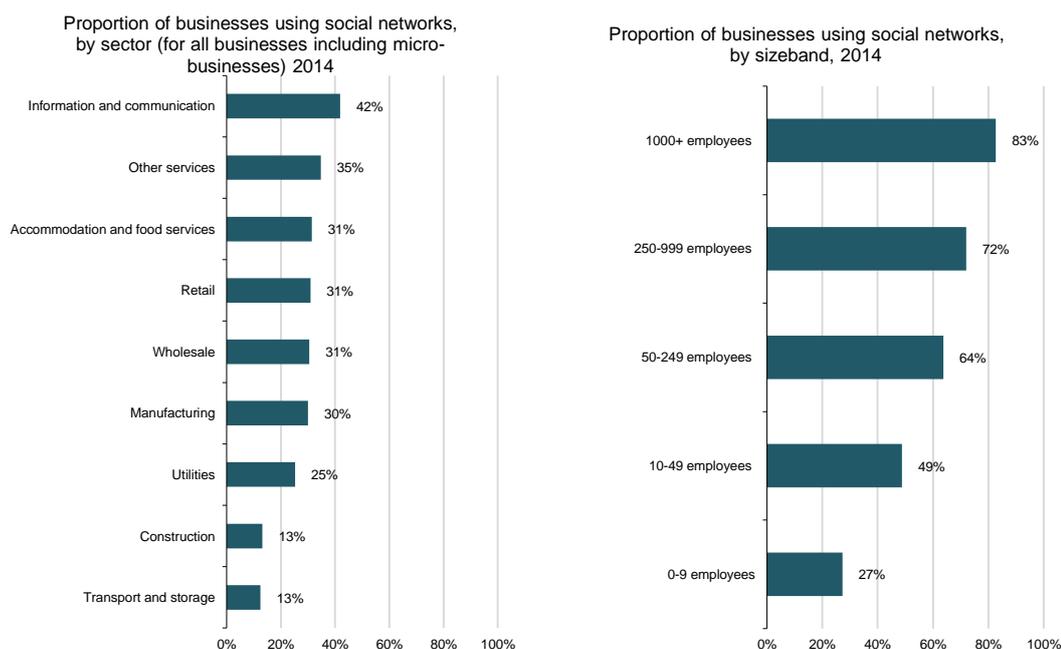
This largely reflects the role of Electronic Data Interchange (EDI) in automating supply chains in some parts of the economy: of the £593 billion total, £376 billion was via EDI and £217 billion via website sales.

However, only 1.5% of UK businesses made EDI sales, compared to 11% making website sales. Website sales are thus more relevant for UK businesses more generally, and for some sectors in particular. The value of Wholesale website sales remains highest at £73 billion (Figure 2-14), accounting for 31% of total sector e-commerce value. In contrast, the Retail sector had the second highest value of website sales (£31 billion), but this represented almost 93% of total sector e-commerce sales value.

### 2.1.12 Larger businesses and the Information & Communications sector are leading the way in exploiting social networks...

In 2014, 30% of UK businesses used social networks, and the usage was highest within the Information and Communication sector (used by 42% of businesses) (Figure 2-15).

**Figure 2-15: Proportion of businesses using social networks 2014**



Source: ONS, *E-Commerce and ICT Activity of UK Businesses, 2014*

Above average usage was reported for businesses providing Other Services (35%), with Accommodation and Food Services (31%), Retail (31%), Wholesale (31%) and Manufacturing (30%) businesses' usage in line with the UK average. The proportion of businesses in the Construction and Transport and Storage sectors using social networks (both 13%) was substantially below the UK average.

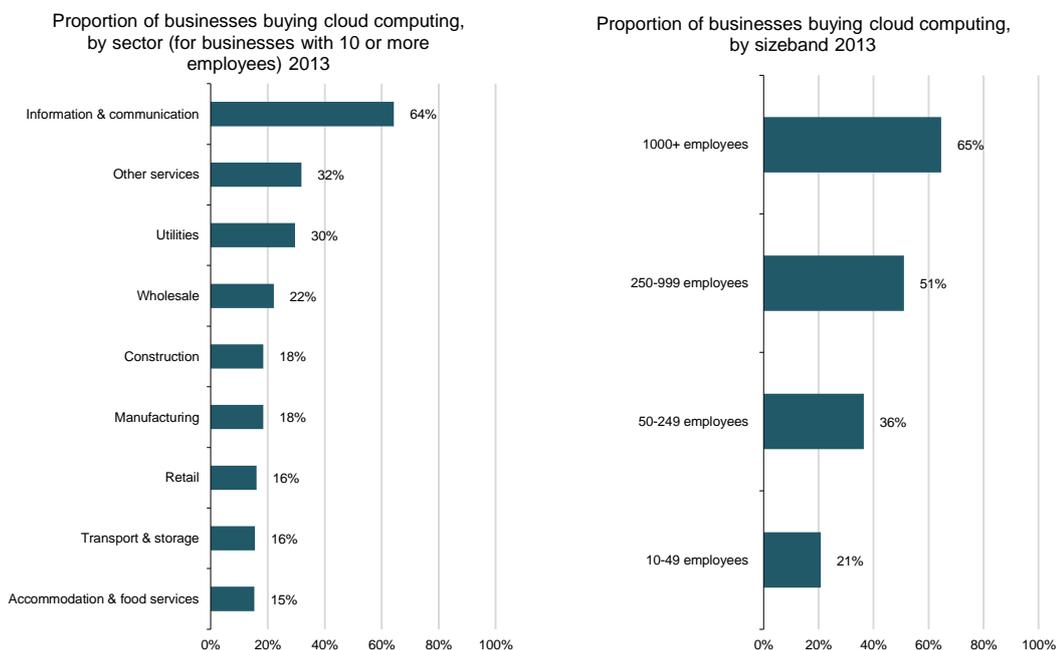
As seen for other digital technologies, business size is a strong determinant of adoption. Whilst the UK average for social network usage by businesses is 30%, this

is dominated by lower usage amongst micro-businesses (the vast majority of UK businesses) with 27% of businesses with less than 10 employees using social networks in 2014. This figure rises for larger businesses, reaching 83% amongst the largest firms (1000 or more employees).

### 2.1.13 ...and in the adoption of cloud computing

The tendency for early adoption in the Information and Communication sector and amongst larger businesses is particularly apparent when it comes to cloud computing (Figure 2-16).

**Figure 2-16: Proportion of businesses buying cloud computing 2013**



Source: ONS, E-Commerce and ICT Activity of UK Businesses, 2013

Almost two-thirds of businesses in the Information and Communication sector (64%) bought cloud computing software in 2013, double the level of usage of the second largest users of cloud computing, businesses providing Other Services (32%). Whilst the proportion of businesses using cloud computing was above average in the Utilities sector (30%), usage was below average for the other sectors covered in the ONS E-Commerce and ICT Activity statistics, falling as low as 15% for Accommodation and Food Services firms.

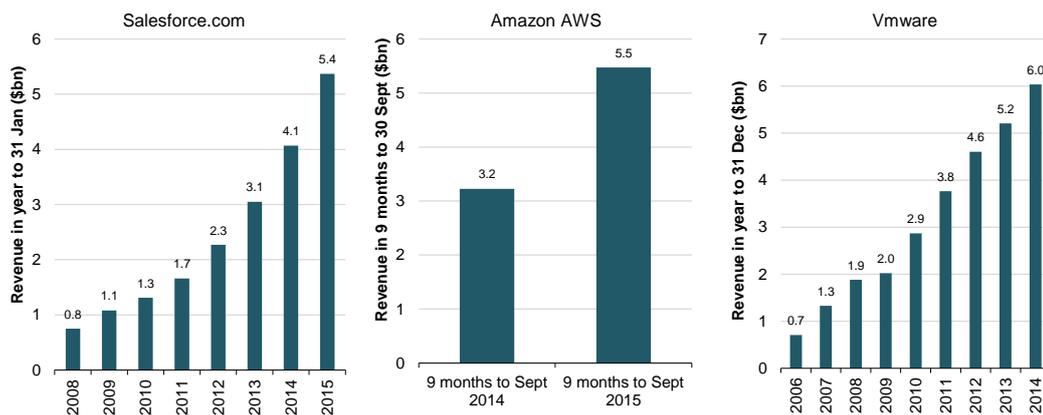
The largest businesses were again seen to drive adoption of this digital technology, with 65% of businesses with 1000 or more employees buying cloud computing technology in 2013, falling to 21% amongst businesses with 10-49 employees. In terms of the obstacles to adopting cloud computing, the ONS E-Commerce and ICT Activity

statistics found that 33% were wary of the risk of a security breach or disclosure (rising to 63% amongst the largest firms), with 37% feeling they have insufficient knowledge or expertise to implement this technology.

### 2.1.14 Virtualisation and cloud computing have both increased very rapidly in recent years...

Two technology trends have had particularly important impacts for enterprise ICT implementations over recent years: virtualisation and cloud computing. There is no robust official time series data on either of these at present, but their development is illustrated in the charts below which show the global revenues of Salesforce.com (a leading provider of cloud-based CRM), Amazon AWS (a leading provider of cloud-based infrastructure), and VMware (a leading provider of visualisation software) (Figure 2-17).

**Figure 2-17: Three key global suppliers' revenues**



Source: Company websites

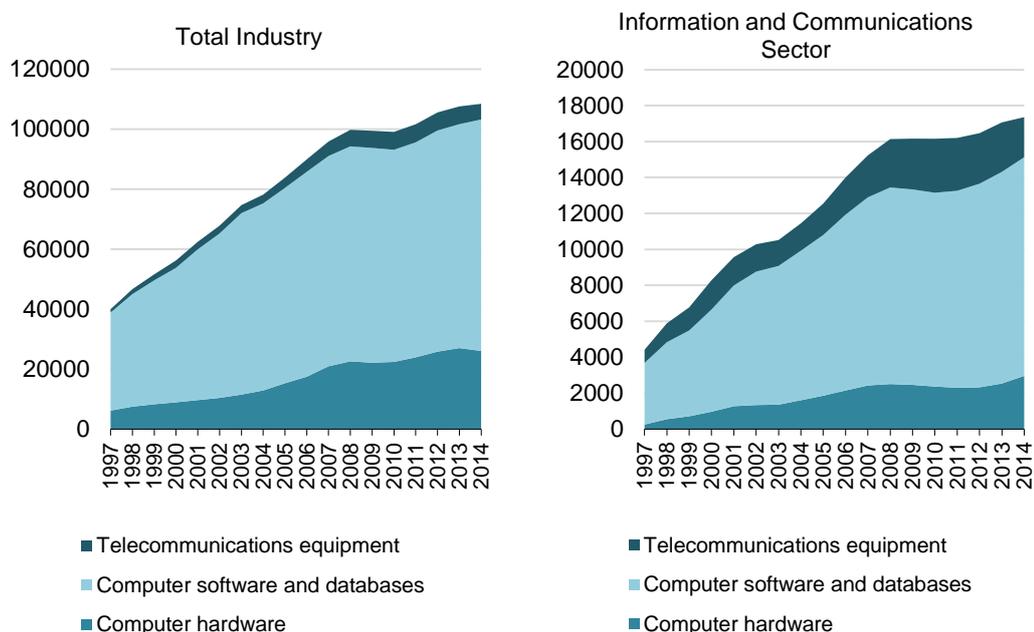
The rapid development of each of these into multi-billion dollar operations illustrates the importance that virtualisation and cloud computing have assumed over recent years.

### 2.1.15 ...and this may well explain a sustained marked slowdown in the growth of ICT capital stocks

Both of these technologies lead to much more efficient use of ICT capital: virtualisation enables a physical server to host multiple virtual machines, for example, giving more efficient use of enterprises' own hardware; and cloud computing shares hardware and software across many different user organisations, giving much higher utilisation of storage and processing capacity than can be realised by individual enterprises.

We suggest that these trends – combined with the cost-saving stimulus triggered by the 2007-08 financial crisis – are likely to have played a key part in the slowdown in the growth of the UK’s net stocks of fixed ICT capital since 2008 (see Figure 2-18).

**Figure 2-18: Net stocks of fixed ICT capital (£million, 2012 prices)**



Source: ONS, *Gross and Net Capital Stocks for total economy, by industry and asset, December 2015*

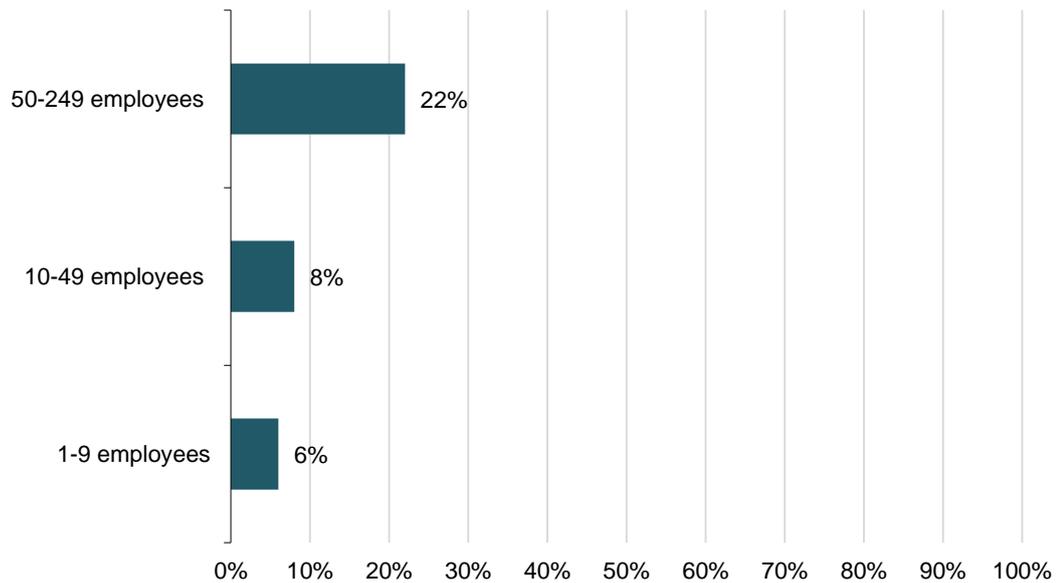
Between 1997 and 2008 net stocks of computer hardware grew year-on-year by an average of 12.5%, and net stocks of computer software and databases grew by an average of 7.4% over this period. However, between 2008 and 2014 average annual growth rates fell to 2.4% for computer hardware and 1.2% for computer software and databases.

Looking at the Information and Communications sector in particular (which is an early and enthusiastic adopter of ICT technology) we see that this change is even more pronounced: with growth of computer hardware net stocks falling from 23.3% p.a. to just 2.8% p.a., and the growth of computer software and databases net stocks falling from 11.1% p.a. to just 1.8% p.a.

### 2.1.16 The use of video conferencing is still at an early stage for SMEs...

In line with Figure 2-8, where 7% of SMEs were shown to use online video-conferencing, Ofcom’s Broadband Services for SMEs Assessment and Action Plan finds low usage amongst SMEs (Figure 2-19). Whilst one-in-five (22%) of businesses with 50 to 249 employees currently use videoconferencing, this falls to 8% amongst businesses with 10 to 49 employees and 6% amongst those with 1-9 employees.

**Figure 2-19: Proportion of businesses using videoconferencing (for businesses with 1-249 employees) 2015**



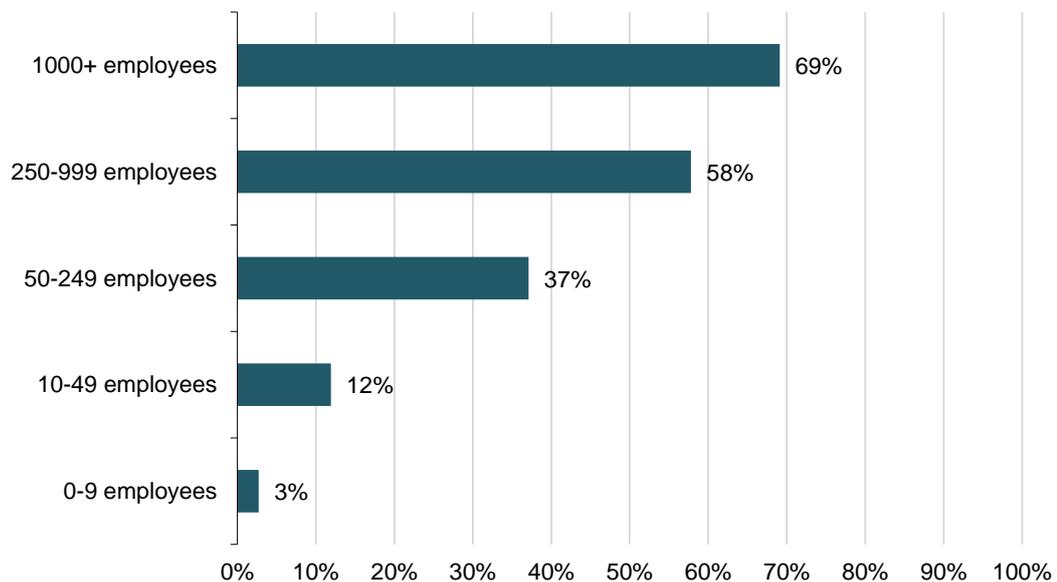
Source: Ofcom, *Broadband services for SMEs: assessment and action plan, 2015*

### **2.1.17 ...as is the use of Enterprise Resource Planning systems**

According to ONS E-Commerce and ICT Activity statistics, only 4% of UK businesses used Enterprise Resource Planning (ERP) systems in 2014. Figure 2-20 indicates business size was a determinant of adoption, however, with 69% of the largest businesses (1000 or more employees) and 58% of employees with 250 to 999 employees using ERP systems.

As seen with other digital technologies, ERP usage was lower for small and medium-sized enterprises. Whilst a substantial proportion of businesses with 50-249 employees used ERP systems (37%), this was much lower for businesses with 10-49 employees (12%) and in particular for those with less than 10 employees (2.7%).

**Figure 2-20: Proportion of businesses using ERP systems (for businesses with 10 or more employees) 2014**



Source: ONS, *E-Commerce and ICT Activity of UK Businesses, 2014*

Whilst usage remains relatively low for smaller businesses, trend data for businesses with 10 or more employees indicates the gradual diffusion of ERP software. Between 2011 and 2014 the proportion of these businesses using ERP software grew from 9.4% to 17%. Whilst it is to be expected that growth would be highest amongst the largest businesses (growing from 58% to 69% over this period) substantial growth occurred across small and medium-sized businesses. The proportion of businesses with 50 to 249 employees using ERP software grew from 23% to 37%, with the proportion of those with 10-49 employees growing from 5.6% to 12% over this period.

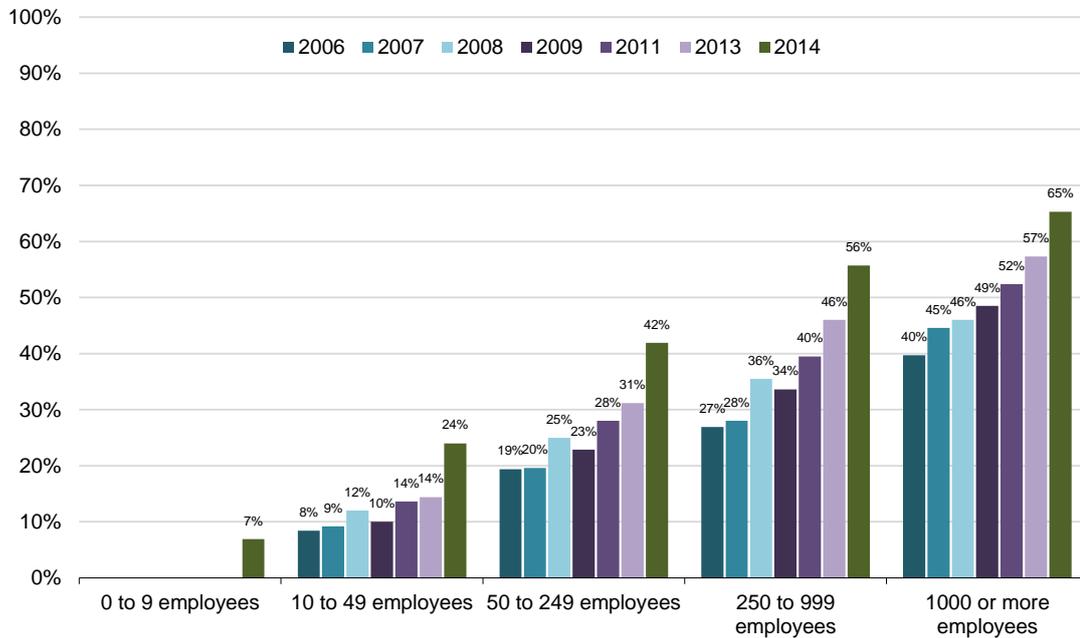
Nonetheless, the overall proportion of UK businesses using ERP is the indicator where the UK is currently weakest against international comparators (see Annex B) and this would benefit from further investigation into the underlying reasons.

### **2.1.18 The adoption of Customer Relationship Management software has grown rapidly recently amongst larger businesses, but remains very low amongst micro businesses**

In 2014, 9% of UK businesses used CRM software to collect, store and share customer information. Whilst adoption was highest amongst the largest companies (65% of businesses with 1000 or more employees, up from 40% in 2006), there has been rapid growth in usage across all businesses with 10 or more employees, rising from 11% to 27% between 2006 and 2014. In particular, there appears to have been a marked

acceleration in take-up between 2013 and 2014 – perhaps reflecting the increased popularity of cloud-based CRM such as Salesforce.com.

**Figure 2-21: Proportion of businesses of each size using CRM software to collect, store and share information about customers with other internal business functions**



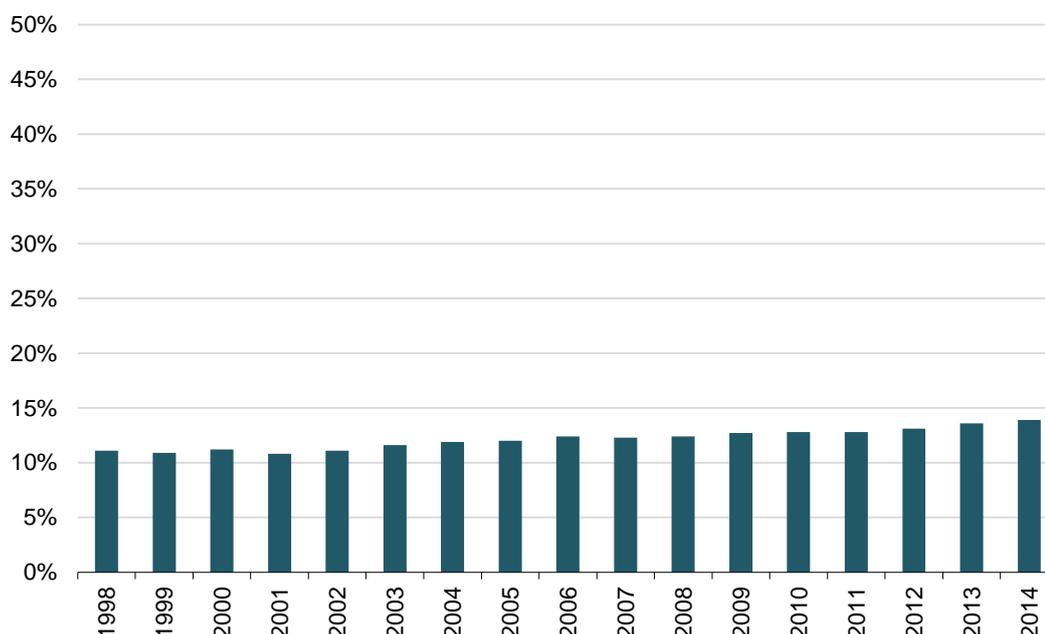
Source: Source: ONS, *E-Commerce and ICT Activity of UK Businesses, 2014*

It is the low adoption amongst the smallest businesses which drives the low overall adoption figures, with only 6.9% of businesses with less than 10 employees using CRM software in this way in 2014.

### 2.1.19 The proportion of workers who work mainly at or from home has gradually increased to c. 14%...

The ONS Characteristics of Home Workers statistics define ‘home workers’ as those employed individuals who usually spend at least of their work time using their home, either within their grounds or in different places and using it as a base. The proportion of employed people who are defined as ‘home workers’ has grown fairly slowly since 1998, growing from 11% to 14% in 2014 (Figure 2-22).

**Figure 2-22: Proportion of employed people who are ‘home workers’ (usually spend at least half of their work time using their home, either within their grounds or in different places and using it as a base)**



Source: ONS, *Characteristics of Home Workers, 2014*

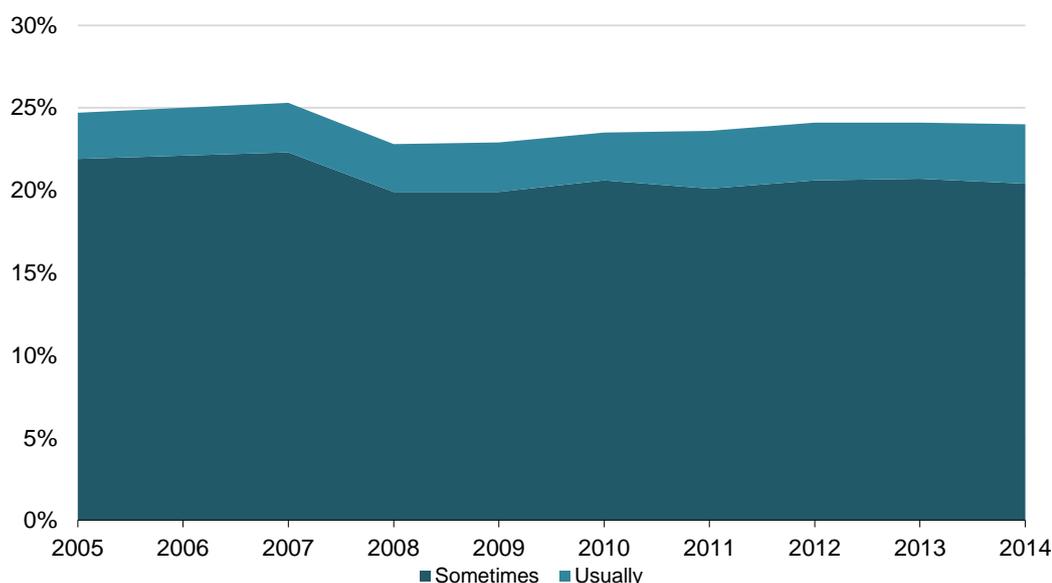
### **2.1.20 ...but this considerably understates the true extent of home-working: 24% of employed people work from home either usually or sometimes**

Whilst the proportion of employed people usually working from home is still relatively low, this does not take account of those individuals who only *occasionally* work at home.

Figure 2-23 indicates that this group accounts for a greater proportion of the workforce: Eurostat statistics show that 20% of employed people aged 15-64 in the UK worked at home ‘sometimes’, with 3.6% ‘usually’ working at home. Thus, in total, 24% of employed people in the UK worked at home at least ‘sometimes’ in 2014 – considerably above the European Union average of 14%.

The frequency of working from home is another area where the UK currently lacks robust official data. Given the importance of home-working for travel patterns (see later on in this section), this appears to be an important data gap.

**Figure 2-23: Proportion of employed people aged 15-64 working at home 'usually' or 'sometimes'**



Source: Eurostat, Labour market statistics, 2015

### **2.1.21 Some (qualitative) findings suggest that the UK is towards the fore, globally, in business exploitation of ICT**

The World Economic Forum's Executive Opinion Survey asks executives around the world to qualitatively evaluate businesses within their own country on a series of metrics<sup>1</sup>. Three metrics are of particular interest to this study:

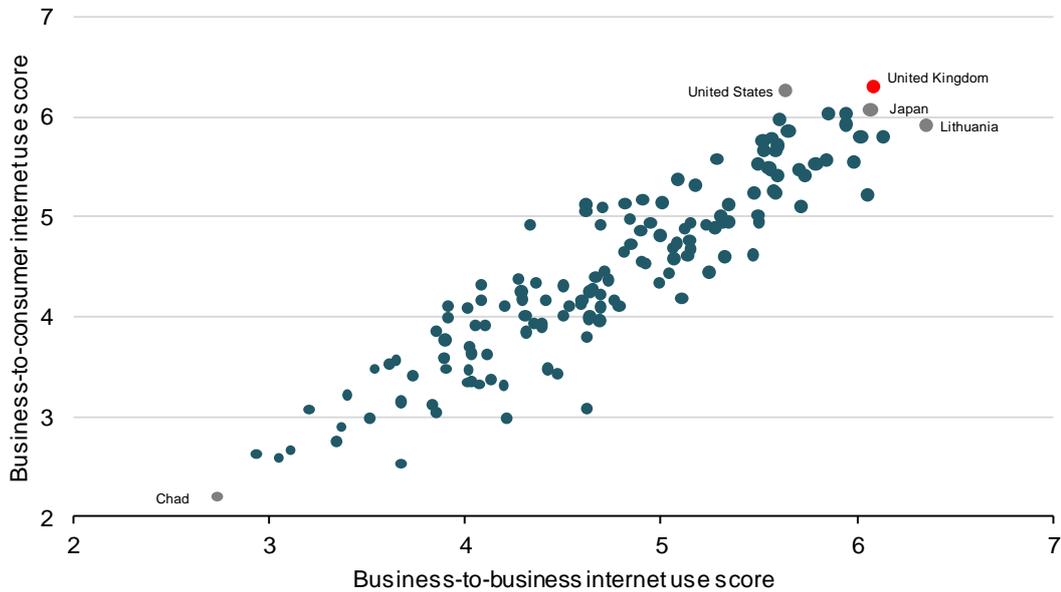
- Firm-level technology adoption (evaluated using the question: 'In your country, to what extent do businesses adopt new technology? [1 = not at all; 7 = adopt extensively]')
- Business-to-business internet use (evaluated using the question: 'In your country, to what extent do businesses use ICTs for transactions with other businesses? [1 = not at all; 7 = to a great extent]')
- Business-to-consumer internet use (evaluated using the question: 'In your country, to what extent do businesses use the Internet for selling their goods and services to consumers? [1 = not at all; 7 = to a great extent]').

Analysis of weighted average responses from 2013 and 2014 to these questions, as reported in the World Economic Forum's Networked Readiness Index, suggests that

<sup>1</sup>In 2013 there were 118 respondents from the UK, with 79 respondents from the UK in 2014 (Browne, C., A. Di Battista, T. Geiger, and T. Gutknecht. 2014. "The Executive Opinion Survey: The Voice of the Business Community." In The Global Competitiveness Report 2014–2015. K. Schwab, editor. Geneva: World Economic Forum)

UK executives consider the UK to be adept at exploiting digital technology (Figure 2-24).

**Figure 2-24: National scores for technology adoption: business-to-business internet use vs business-to-consumer internet use, and firm-level technology absorption (on a scale of 1 to 7)**



Source: Source: World Economic Forum, Networked Readiness Index, 2015

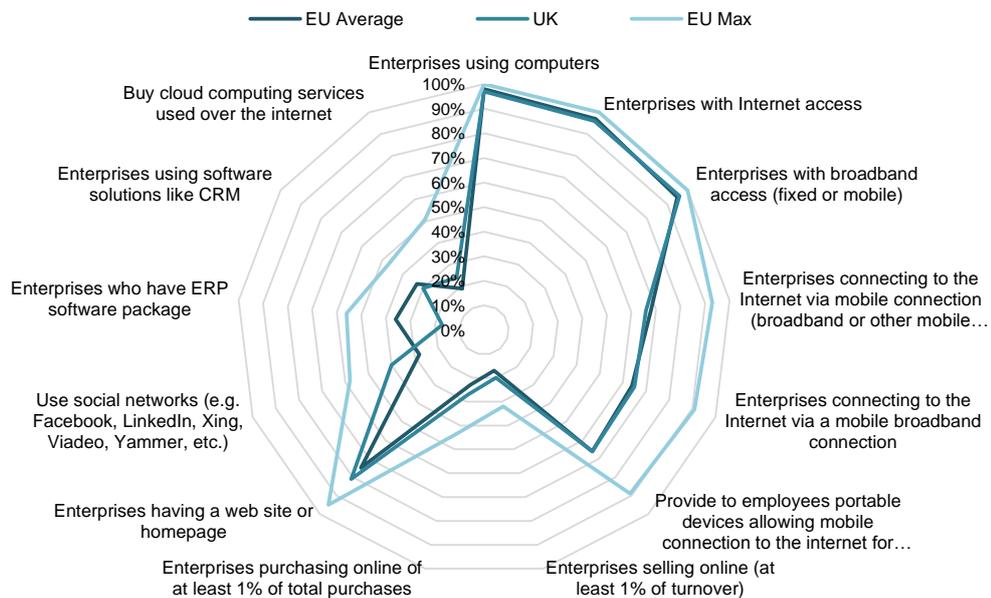
Note: Size of bubble corresponds to national score for firm-level technology absorption (1-7)

In 2013/14 the UK's average score for business-to-consumer internet usage was the highest globally at 6.3. Similarly high was the score for business-to-business internet usage (6.1), ranked third across the countries surveyed (behind only Lithuania and Estonia). On the third metric, firm-level technology absorption, the UK still performed strongly (5.7), yet was ranked lower globally (14<sup>th</sup>).

### **2.1.22 However, more objective (quantitative) data indicate that the digitisation of UK business is reasonably high (but not outstanding) in European terms**

Whilst qualitative perceptions are that UK businesses' adoption of digital technology are higher than many countries, *quantitative* information from Eurostat covering businesses with at least 10 employees finds that digitisation across UK businesses is reasonably high, but not far from the average for European countries (Figure 2-25).

**Figure 2-25: Percentage of enterprises adopting different technologies (for businesses with 10 or more employees, excluding financial sector)**



Source: Eurostat, Information Society Statistics, 2015

Note: All figures shown are for 2015 with the exception of social networks (2013); mobile internet connection (2014); mobile broadband connection (2014); portable devices (2014) and cloud computing (2014) (latest available data)

According to Eurostat Information Society Statistics, some digital technologies are near ubiquitous amongst UK businesses in 2015 – 97% of enterprises using computers and 96% having internet access (100% of which had broadband access, either fixed or mobile). However, this is not unique across Europe, with UK levels of adoption in line with the European Union average for these technologies. Across other technologies, the UK remains in line with the EU-wide average, the only exceptions being the use of ERP systems, where UK adoption is lower than average (17% versus 36% across the EU) and the use of social networks, where UK adoption was higher than average in 2013 (40% versus 28% across the EU).

Whilst digitisation amongst UK businesses is generally in-line with the EU average, to-date some European countries have embraced certain technologies more fully, with Finland leading the way in the adoption of many technologies. By 2014, 93% of Finnish businesses were connecting to the internet via a mobile connection (versus 66% in the UK), with 91% using a mobile broadband connection (65% in the UK). The adoption of cloud computing was also high in Finland (51% of businesses), while being at an early stage in the UK (24%). Similarly, whilst the adoption of ERP systems by UK businesses was still low in 2015 (17%), more than half of German businesses are now using such solutions (56%).

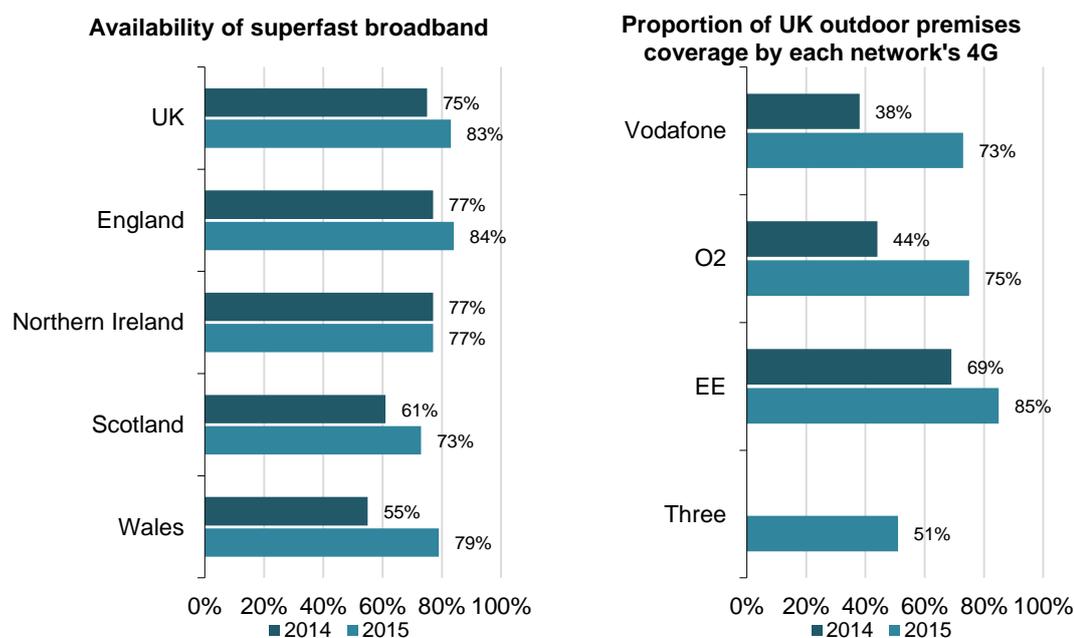
## 2.2 Enablers and barriers

### 2.2.1 Substantial progress is being made in the availability of high quality connectivity...

High quality communications infrastructure is seen as a critical enabler for wider adoption of digital technology, as it provides the medium through which firms communicate with employees, suppliers and customers. Substantial progress is being made in both the fixed and mobile arenas.

Superfast broadband is now available in 83% of the UK, up from 75% in 2014 (Figure 2-26). The most substantial progress has occurred in Wales, with coverage rising from 55% to 79% over the course of the year. Coverage in Scotland, whilst lower than the rest of the UK, has still improved rapidly, from 61% in 2014 to 73% in 2015.

**Figure 2-26: Superfast broadband and 4G coverage of the UK in 2014 and 2015**



Source: Ofcom, *Connected Nations 2015* (Note: 2014 data for Three is unavailable)

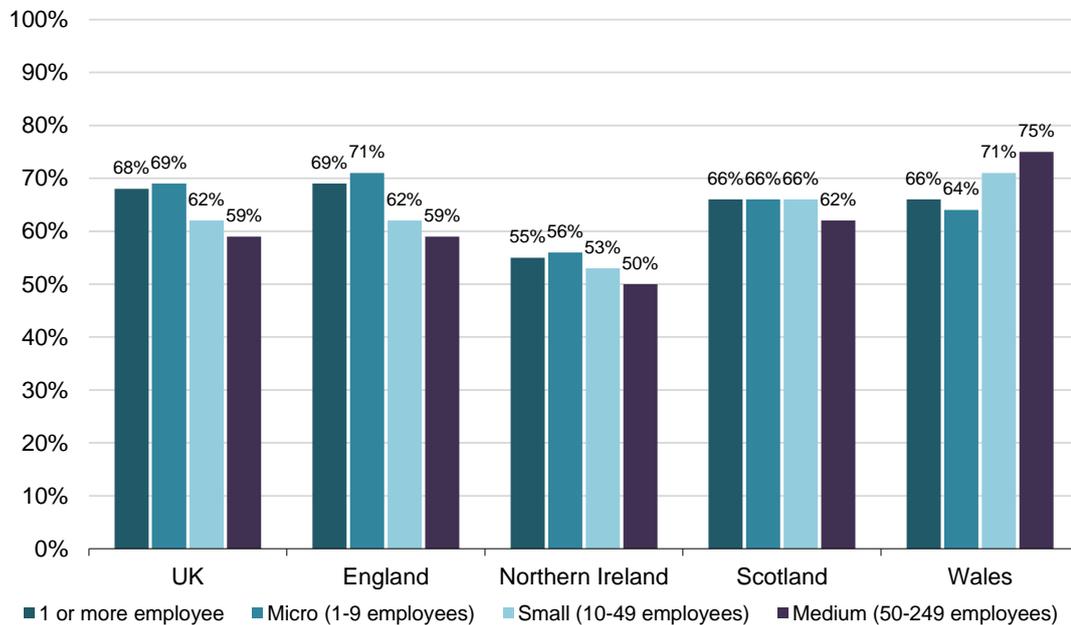
The availability of 4G has also increased rapidly, with Vodafone, O2 and EE each now covering more than 70% of UK premises with 4G service.

### 2.2.2 ...but superfast broadband may still be unavailable to 18% of SMEs by the end of 2017

Whilst the overall availability of superfast broadband has rapidly increased, coverage for SMEs is lower, and only currently extends to 68% of SMEs (businesses with 1 to

249 employees) premises – leaving superfast broadband currently unavailable to 32% of SMEs (Figure 2-27).

**Figure 2-27: Total superfast broadband coverage of SME premises 2015**



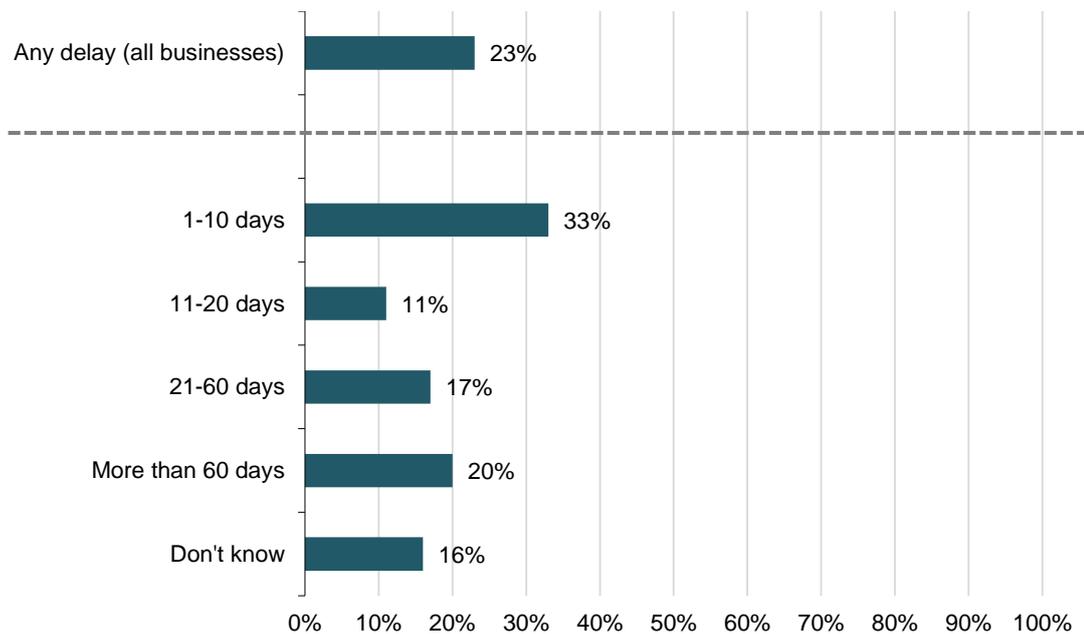
Source: Ofcom, *Connected Nations 2015*

Moreover, Ofcom’s analysis suggests that by 2017 – when 95% of all UK premises are likely to have superfast broadband – around 18% of SMEs will still not have access to superfast connections. Given the importance of superfast in enabling productivity growth, this represents a key issue for the UK’s broadband plans.

### 2.2.3 For higher-end connectivity requirements, there can be lengthy delays on fibre circuit installations (Ethernet)

Mass market superfast broadband services are not appropriate for all businesses, however. Pure fibre Ethernet lines have become increasingly affordable over recent years, and provide a higher quality of service. However, these circuits can be subject to lengthy delays in installation: a 2014 Ofcom report found that 23% of businesses with an Ethernet leased line experienced a delay in fibre circuit installations (Figure 2-28).

**Figure 2-28: Length of delays on fibre circuit installations (for businesses with at least one employee and an Ethernet leased line experiencing a delay) 2014**



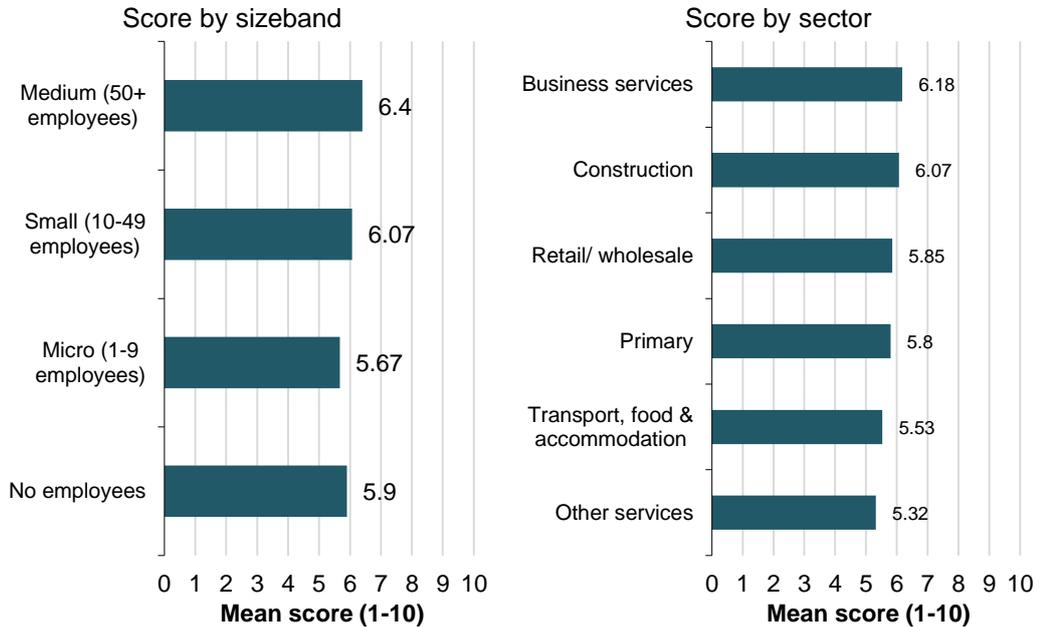
Source: Ofcom, *Quality of Service: Ethernet Leased Lines, 2014*

The length of delay varied significantly. Whilst one-third (33%) of delays lasted less than 10 working days, a significant proportion lasted longer – one-in-five delays (20%) were even seen to last more than 60 working days. There are various causes for these delays – including difficulties agreeing wayleaves with landlords, and premises lacking the necessary asbestos registers.

#### **2.2.4 SMEs give themselves about 6 out of 10 for their current exploitation of digital technology....**

When asked to rank how well they were utilising digital technology on a scale of one to 10 (with 10 meaning 'to its maximum extent'), on average businesses with 0 to 249 employees rated their exploitation of digital technology at 5.86 (Figure 2-29). Thus, whilst businesses of this size are generally more positive than negative, there is a realisation they could utilise digital technologies more effectively – only 9% of businesses rated themselves a 9 or a 10.

**Figure 2-29: How well businesses feel they are using digital technology (for businesses with 0 to 249 employees) 2015**



Source: BMG/Durham University, *Digital Capabilities in SMEs, 2015*

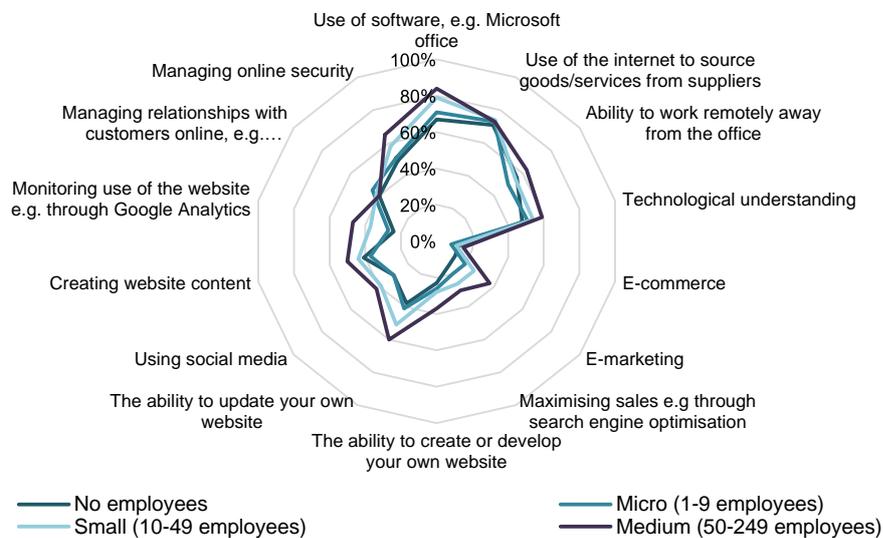
Those businesses with 10 or more employees rated their exploitation of technology more favourably. Medium-sized enterprises (those with 50-249 employees) gave themselves a rating of 6.4, with firms employing 10 to 49 people giving a rating of 6.07. Businesses with 1-9 (5.67) and no employees (5.90) still rated their exploitation of digital technology around 6 out of 10, but were not as positive as larger businesses.

Some sectors were also more positive than others – with Business Service (6.18) and Construction (6.07) businesses rating their exploitation of digital technology most favourably. Thus, whilst wider adoption of digital technology has been found to be lower in the Construction industry (Figure 2-5), businesses in this sector still consider themselves to utilising digital technology effectively. In contrast businesses providing Other Services only rated their use of digital technologies around 5 out of 10 (5.32).

### 2.2.5 ...and they reckon that their least strong areas are: e-marketing, e-commerce and SEO

Seven-in-ten businesses with 0-249 employees consider themselves to have a strong proficiency in using the internet to source goods and services from suppliers (71%) and the use of software such as Microsoft Office (68%, rising to 84% amongst those with 50-249 employees) (Figure 2-30).

**Figure 2-30: Self-reported digital capabilities by sizeband 2015. Proportion of firms rating their capabilities strong or very strong**



Source: BMG/Durham University, *Digital Capabilities in SMEs, 2015*

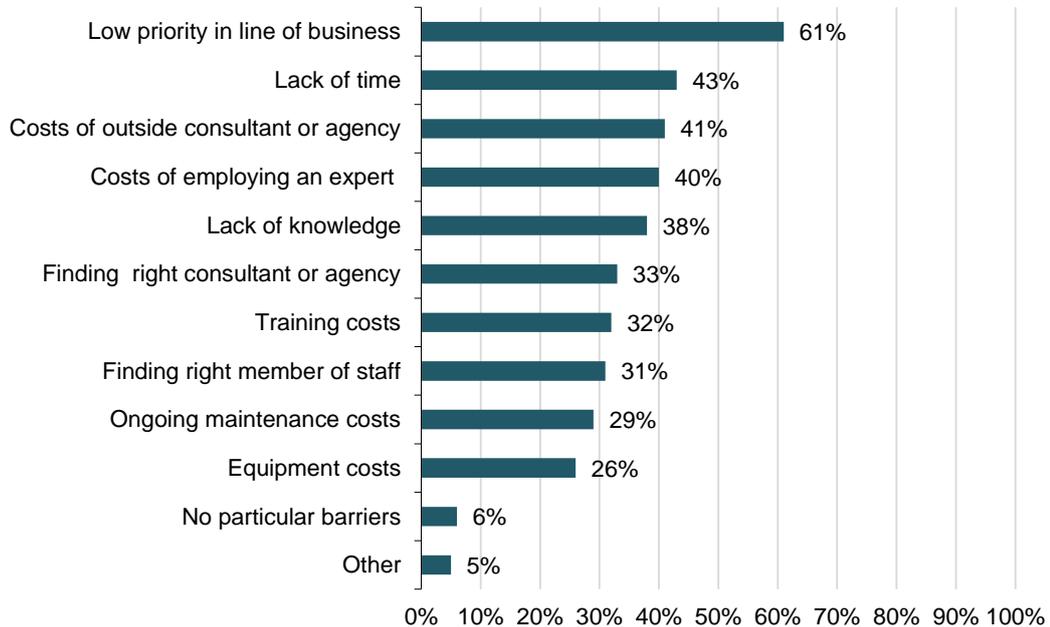
However, when asked about a range of different digital capabilities it is clear that businesses are less comfortable with some technologies. Only 11% consider themselves to have a strong proficiency in e-commerce, although this is in part driven by the fact that the vast majority (79%) do not consider e-commerce applicable to them. Only 15% consider their e-marketing capabilities to be strong (although this rises to 37% of businesses with 50-249 employees), with 39% considering them poor. Similarly limited capabilities are also reported in search engine optimisation (17% saying strong), and using social media (30% strong).

In general, the larger the business the more confident they are about their digital capabilities.

### 2.2.6 But a lack of priority and a lack of time are the most important barriers to using digital technology better...

The low priority given to digitisation by some businesses is considered a barrier to the effective utilisation of digital technology by 61% those firms who feel they are not exploiting this technology to the fullest extent (Figure 2-31). This is a particular problem in the Construction sector, where 98% consider this to be a barrier. A significant proportion also identify a lack of time (43%), the high costs of hiring an external consultant or agency (41%) or of employing an expert (40%) and a lack of knowledge (38%) as barriers to the full exploitation of digital technology.

**Figure 2-31: Perceived barriers (for businesses with 0 to 249 employees who rated their use of digital technology 1-7)**



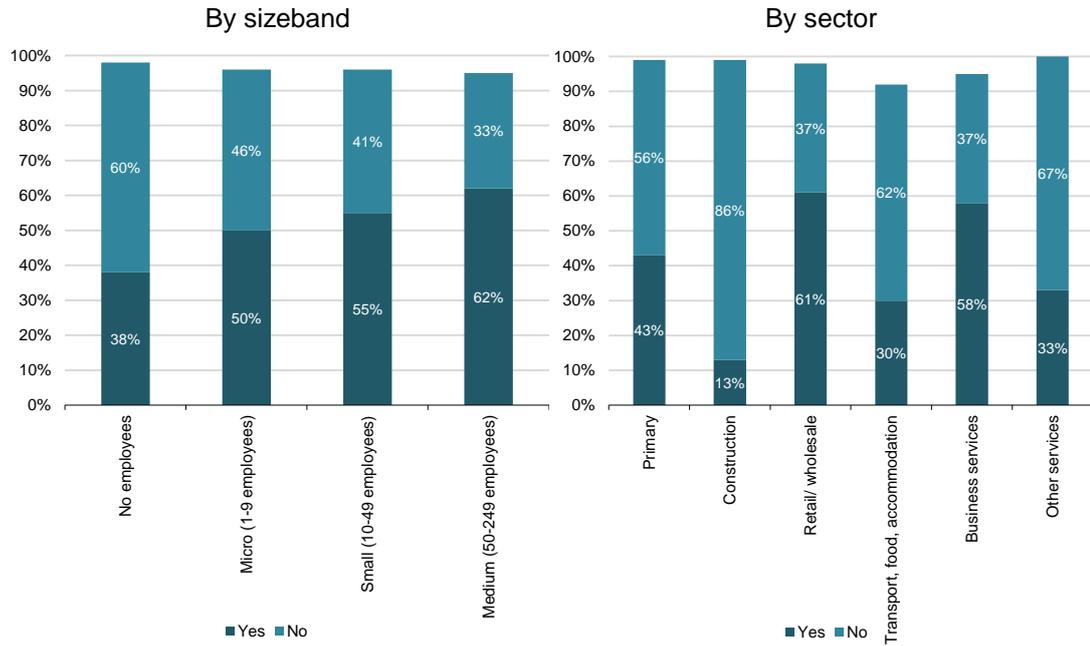
Source: BMG/Durham University, *Digital Capabilities in SMEs*, 2015

### **2.2.7 ... and most SMEs wouldn't consider using external support to improve their digital capabilities**

Over half of businesses with 0 to 249 employees (56%) would not consider using external support to improve their digital capabilities (Figure 2-32).

Larger SMEs (those with 50-249 employees) and SMEs operating in the retail/wholesale sector were more receptive to the possibility of using external support with 62% and 61% respectively considering this an option. However, the proportion of businesses who would not consider using external support is clearly higher amongst businesses with no employees (60%), businesses in the Other Services sector (67%), the Transport, Food and Accommodation sector (62%), and particularly the Construction sector, where 86% of businesses would not consider using external help.

**Figure 2-32: Whether would consider using external support to improve business capabilities (for businesses with 0-249 employees) 2015**



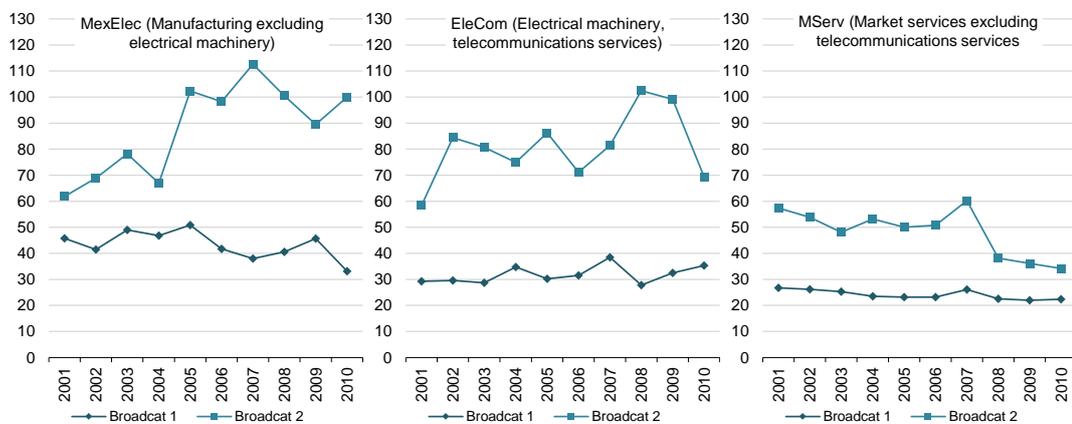
Source: Source: BMG/Durham University, Digital Capabilities in SMEs, 2015

## 2.3 Benefits and impacts

### 2.3.1 ICT-intensive firms tend to have higher productivity

According to analysis conducted by the Office of National Statistics, labour productivity (measured by real value added per person employed) was consistently higher between 2001 and 2010 for more ICT-intensive businesses in three broad industry groups analysed: manufacturing (excluding electrical machinery); electrical machinery and telecommunications services; and market services excluding telecoms (Figure 2-33).

**Figure 2-33: Labour productivity by ICT maturity status (indexed real value added per person employed)**



Source: ONS, *Micro-data Perspectives on the UK Productivity Conundrum - An Update, 2013*

The level of real value added for each person employed across these sectors was consistently higher for those businesses where between 40% and 90% of employees had access to the internet over a high speed connection ('Broadcat 1') compared to those businesses where this proportion was between 10% and 40% ('Broadcat 2'). This trend was most pronounced for manufacturing businesses where productivity amongst Broadcat 1 firms rose between 2001 and 2010 whilst Broadcat 2 productivity was simultaneously falling.

### 2.3.2 Additional ICT investments lead to changes in management practices and organisational structures...

In the UK there was a significant temporary tax incentive on ICT investment available to small firms (50 or less employees) between April 2000 and March 2004. This policy represented a particularly large investment incentive, as it allowed businesses to write off the full cost of ICT investments against their taxable profits. Gaggi and Wright (2015) evaluated the impact of this measure by linking various data sources including

confidential HMRC tax return data, quarterly expenditure survey data and information from the Community Innovation Survey.

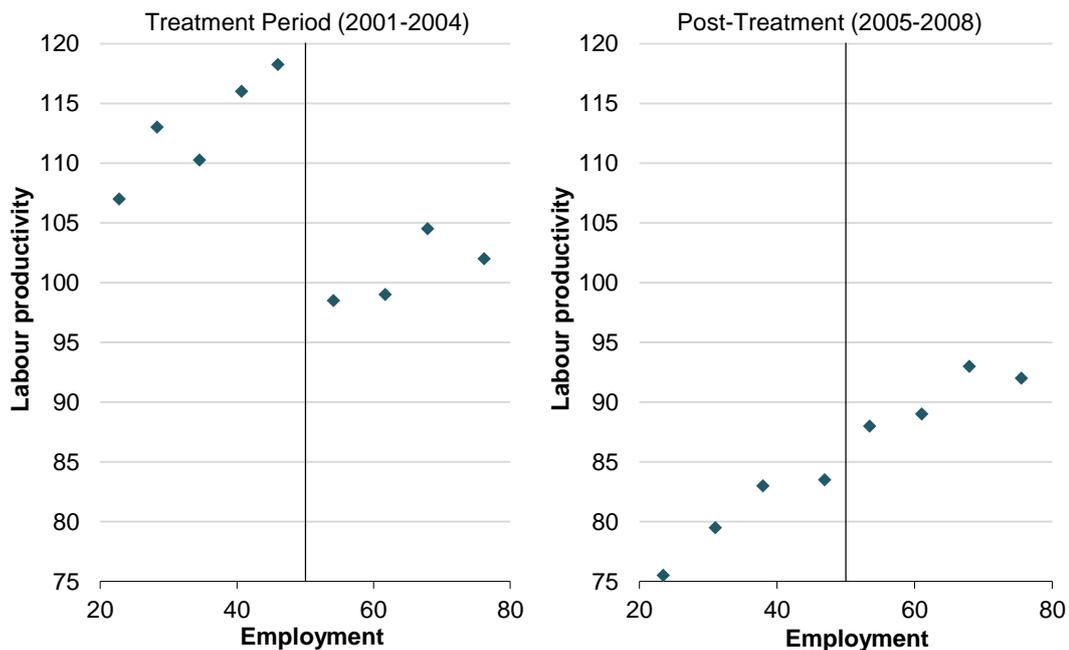
Given the eligibility threshold (firm size of 50 employees) their study used a regression discontinuity design, and found a sharp discontinuity in the incentive to invest in ICT at the eligibility threshold during the treatment period (comparing firms with employment just below the eligibility threshold and firms with employment just above the eligibility threshold). Small firms were found to be more likely to invest in ICT software and hardware between 2001 and 2004, and this was considered by the authors to be a direct result of the tax incentive.

This increased likelihood to invest in ICT led to changes in management practices and organisational structures amongst small firms, with a sharp discontinuity in likelihood to implement advanced management practices and a changed organizational structure during the treatment period around the eligibility threshold of 50 employees.

### **2.3.3 ...which in turn lead to increased average earnings and labour productivity**

The same study found a marked discontinuity in average earnings and labour productivity around the eligibility threshold during the treatment period (Figure 2-34), with both found to be higher below the eligibility threshold. The 'contemporaneous and complementary adoption' of ICT investment and organizational change amongst smaller firms can thus be seen to drive increased earnings and labour productivity.

**Figure 2-34: Impact of ICT tax incentive on labour productivity**



Source: Gaggl, P. and Wright, G., *A Short-Run View of What Computers Do: Evidence from a U.K. Tax Incentive, 2015* (Approximate figures have been read from charts in the paper)

### 2.3.4 US-owned firms appear to be better at exploiting digital technology

There can be large differences between firms, in terms of their abilities to exploit digital technology effectively.

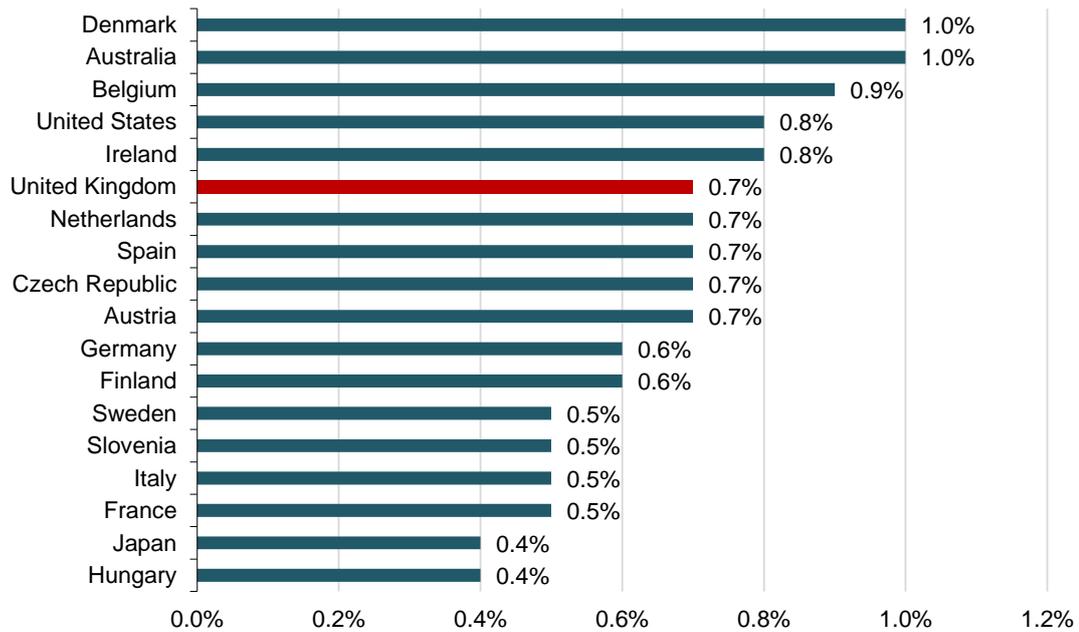
Analysis of multinationals operating in Europe over the period 1999-2006 (Bloom, Sadun, and Van Reenen 2012) found US-owned firms achieving significantly greater productivity gains through ICT than non-US multinationals. Establishments taken over by US firms were also found to achieve significantly greater productivity gains through ICT than statistically similar establishments taken over by non-US multinationals.

The authors suggest this to be driven by superior people management in US-owned firms compared to their non-US counterparts. They argue that *“part of the IT-related productivity gains underlying the post-1995 period is related to the management practices of US firms rather than simple natural advantage (geographical, institutional, or otherwise) of being located in the US environment. US firms appear to have transplanted these management practices abroad, so that their overseas subsidiaries also enjoyed a productivity miracle.”* They estimate this superior use of IT accounts for about half of the US-Europe difference in productivity growth between 1995 and 2005.

### 2.3.5 ICT capital may previously have accounted for about 0.7 percentage points of annual GDP growth in the UK

According to Spiezia (2013) average yearly growth in value added in the UK business sector was 2.7% between 1995 and 2007 - with growth in ICT capital, on average, accounting for 0.7% annual growth in value added over this period (Figure 2-35).

**Figure 2-35: Contribution of ICT capital to annual value-added growth in the business sector 1995-2007**



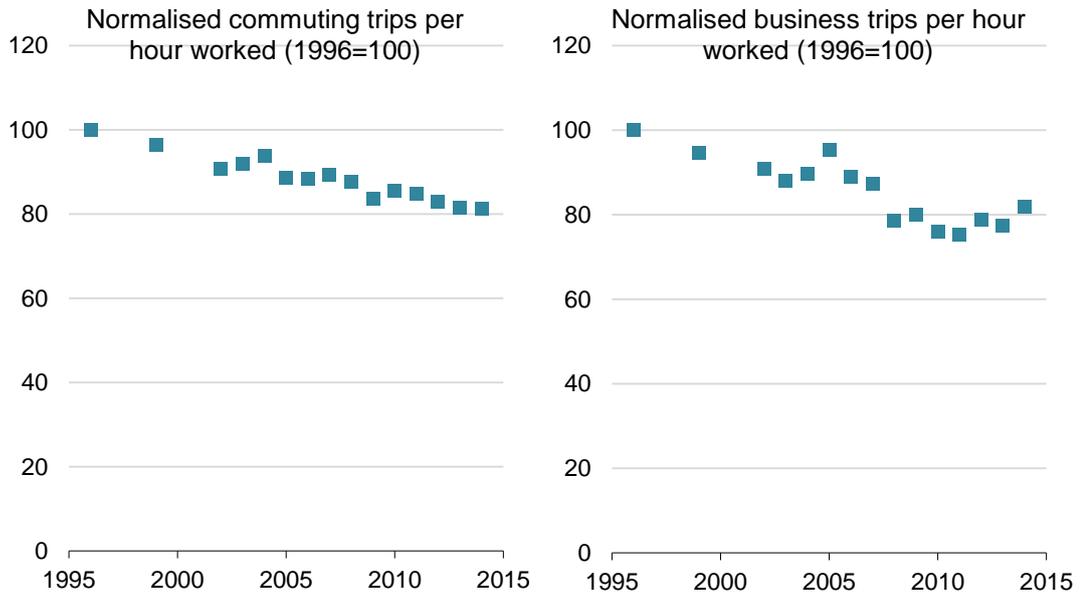
Source: Spiezia, V., *ICT investments and productivity: Measuring the contribution of ICTs to growth*, *OECD Journal: Economic Studies*, Vol. 2012/1, 2013

Figures from the Conference Board Total Economy Database are broadly in line with Spiezia's findings; the average annual contribution to UK GDP growth of capital services provided by ICT assets was 0.8% between 1995 and 2007 according to this dataset.

### 2.3.6 The impacts of ICT on UK commuting and business travel are currently unclear, but may be very substantial

The UK's National Travel Survey has recorded a marked reduction in the numbers of commuting trips per person and business trips per person over the last 20 years. Some of this may be due to compositional effects (e.g. with higher proportions of retired people in the population). However, when we account for this by dividing annual trips per person by annual hours worked per person we can clearly see (Figure 2-36) significant reductions in workers' travel intensity over the period.

**Figure 2-36: Commuting and business trips per hour worked**



Source: SQW analysis of data from ONS (hours worked and population), and the National Travel Survey, 2014 (trips per person, by purpose)

The extent to which this is attributable to digital technology is not well understood at present. However, there is considerable anecdotal evidence on employees' increasing propensity to work from home occasionally thanks to better home broadband connections and remote connectivity into company systems, and on large companies making concerted efforts to reduce business travel costs following the 2007-08 financial crisis through increased use of video-conferencing and online collaboration tools.

## **3 Future developments**

In this section we highlight five key digital developments which we consider will be particularly important for the vast majority of UK businesses over the next three to five years:

- cloud computing
- mobility
- unified communications
- data exploitation
- cyber security.

None of these are 'new' as such, but each is rapidly developing and is likely to have far-reaching impacts on the way UK businesses operate, and on productivity.

### **3.1 Cloud computing**

As previously highlighted, enterprise adoption of cloud computing is rapidly increasing, and this is set to continue over the next few years. Major efforts are being made by traditional software vendors to migrate users onto their cloud-based offering, and by newer cloud-only service providers to capture market share quickly.

For example, Microsoft is strongly promoting a shift from on-premises software licences towards *Office 365* – the subscription-based cloud version of their suite of productivity applications (including Outlook, Word, Excel, Skype for Business etc.), and claims that Office 365 is its fastest-selling commercial product ever. In response, Google has recently offered *Google Apps for Work* free until customers' current Enterprise Agreements (e.g. for Microsoft licences) expire.

Cloud services can be thought of in terms of three different models, which are briefly described in the figure below: Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS).

**Figure 3-1: Different types of cloud service offerings**

#### Software as a Service

- The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure. The applications are accessible from various client devices through either a thin-client interface, such as a web browser (for example, web-based email) or a program interface. The consumer neither manages nor controls the underlying cloud infrastructure, including networks, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings.
- Examples: Google Apps for Work; Microsoft Office 365; Salesforce.com

#### Platform as a Service

- The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or -acquired applications created using programming languages, libraries, services, and tools supported by the provider. The consumer neither manages nor controls the underlying cloud infrastructure, including network, servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment.
- Examples: Google App Engine; Amazon AWS Elastic Beanstalk; Force.com

#### Infrastructure as a Service

- The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer neither manages nor controls the underlying cloud infrastructure but has control over operating systems, storage, and deployed applications; and possibly limited control of select networking components (for example, host firewalls).
- Examples: Amazon AWS; Rackspace; Microsoft Azure; Google Compute Engine; Joyent

*Source: Cisco Global Cloud Index for descriptions; various sources for examples*

In all of these types of cloud service, intense levels of supplier innovation and competition are making cloud-based services increasingly attractive for businesses, looking to reduce their costs, simplify their IT infrastructure and scale-up flexibly and quickly. The pace of the change has been dramatic, and IDC predicts that at least **half of all IT spending will be cloud-based by 2018**. Another analyst, Wikibon, forecasts that public cloud vendors' global revenues will increase from \$80 billion p.a. in 2015 to almost \$500 billion p.a. by 2026 – suggesting that we are still in the early stages of the migration to cloud-based services.

This represents a profound shift in the nature of investments for ICT-using organisations: away from capital expenditure towards bought-in services (or 'intermediate consumption'). We include a discussion of the implications of this for the productivity statistics in Annex C.

Cloud also entails **changes in the geographic distribution of capital** investment in ICT hardware and software: away from a highly dispersed model (in ICT-using enterprises' own premises) towards a much more concentrated pattern in which the capital investments are predominantly in the data centres used by the cloud service providers. These data centres may or may not be in the UK; and in practice many of the leading cloud providers have been serving UK customers from data centres based overseas. For example, the European data centres for Microsoft Azure are currently

located in Ireland and the Netherlands, and the primary European datacentres for Amazon AWS are currently in Ireland and Germany – though note that both Amazon AWS and Microsoft Azure have recently announced plans to establish UK-based data centres in 2016. These moves were possibly accelerated by the recent European Court of Justice ruling which invalidated the ‘Safe Harbour’ agreement on transfers of personal data between the European Union and the United States, and which has highlighted issues of ‘data sovereignty’.

## **3.2 Mobility**

More and more content is being consumed over mobile devices such as smartphones and tablets. This has important implications for businesses in two respects:

- Their employees will increasingly be accessing IT systems and applications via mobile devices.
- Their interactions with customers will increasingly be via mobile devices.

We discuss each of these further below.

### **3.2.1 Enterprise mobility**

The UK e-commerce survey found that 47% of firms were using mobile broadband to some extent, and that 24% of employees had a portable device for accessing the internet in 2014. While the proportions of firms and employees using mobile devices may now be rising only slowly, the extent of usage of these devices is likely to increase substantially: Cisco, for example, estimates that the UK’s business mobile traffic will increase by 52% p.a. over the period 2014 to 2019.

Enterprises are increasingly integrating mobile apps into their day-to-day processes – enabled by the now widespread coverage of 4G mobile services in the UK, the availability of higher quality/larger screen smartphones and the increased use of tablet computers by business users. Suppliers are competing hard to position themselves for success in capturing the growth in this area. For example:

- Microsoft is seeking to provide a consistent user experience across different types of devices with its new Windows 10 operating system, and is introducing Windows Store for Business which lets firms create a directory inside Microsoft’s app store such that employees can browse and download approved enterprise apps to Windows 10 mobile devices.

- Apple and IBM are collaborating in developing *IBM MobileFirst for iOS* which is a suite of enterprise apps targeting a wide range of industries – with offerings ranging from an asset inspection app for utilities to a case management app for healthcare workers.

Enterprises are also seeking to create their own customised mobile apps: a recent Red Hat survey<sup>2</sup> (of 200 IT decision makers in the US and Western Europe, in organisations with 2.5k+ employees) found that respondents' firms plan to develop an average of 21 custom apps each over the next two years, a 40% increase over the volume developed in the last two years. The survey also highlighted the productivity benefits for these enterprises: 35% said that mobile apps change the way they do business by reinventing business processes while an additional 37% said that apps are primarily used to automate existing processes.

This is leading to a mismatch between supply and demand, however, as good mobile developers are difficult and expensive to recruit and retain: Gartner has recently predicted<sup>3</sup> that market demand for mobile app development services will grow at least five times faster than internal IT organisations' capacity to deliver them, by 2017.

While enhancing employee productivity, increased mobility also brings new security-related challenges for businesses, and new risks to be addressed. For example:

- smaller devices such as smartphones tend to be more easily lost or stolen, and many devices are not encrypted
- while setting a passcode is becoming more common, many users rely on four-digit PINs which can be observed, guessed or cracked through readily-available tools
- users downloading unapproved apps to mobile devices (whether company-provided or phones/tablets used under the firm's Bring Your Own Device policy) can introduce malware which could provide a point of entry for hackers into company systems and data
- users connecting mobile devices to public WiFi hotspots in cafes etc. can expose firms to risk, as hackers can set up fake hotspots in order to get access to devices.

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<sup>2</sup> <https://www.redhat.com/en/about/press-releases/90-percent-respondents-red-hat-survey-plan-increase-mobile-app-development-investments-2016>

<sup>3</sup> <http://www.gartner.com/newsroom/id/3076817>

### **3.2.2 Consumer mobility**

Ofcom's Communication Market Report 2015 found that 61% of UK adults now go online via their mobile phone, and the average amount of time spent online by users on smartphones (58.6 hours per month) considerably exceeds that spent browsing on desktops and laptops (31.3 hours per month).

This shift towards mobile devices is changing the way in which consumers interact with businesses. For example, the latest IMRG Capgemini Quarterly Benchmarking report found that smartphones and tablets accounted for 63% of visits to retail websites during the third quarter of 2015; and mobile devices' share of online sales increased to 45% during the third quarter this year, up from 42% in the first half of 2015. E-marketer estimates that retail sales via mobile devices (excluding travel and event ticket sales) will increase from £20 billion in 2015 to £38 billion in 2019.

All businesses with websites should therefore be ensuring that these sites use Responsive Web Design (i.e. providing easy reading and navigation with a minimum of resizing, panning, and scrolling across a wide range of devices), as an increasing proportion of website visits will be via mobile devices.

Because consumers have become used to mobile-specific apps from social media networks and leading online retailers, they will also increasingly expect any businesses they frequently interact with to provide apps specifically designed for mobile devices.

### **3.3 Unified communications**

Unified communications services integrate real-time communications such as instant messaging, presence information, voice calls, video calls, conferencing and screen sharing with non-real-time communication services such voicemail and e-mail. Examples include Microsoft Skype for Business (previously known as Lync), Google Hangouts, and Cisco Jabber/Webex.

Benefits of unified communications include easier team collaboration, more efficient call handling (informed by presence information), more seamless communications with colleagues when they are out-and-about or working from home, and cost reductions associated with 'free' IP-based calls and with removing legacy PBX systems.

Only relatively few SMEs currently use unified communications – as indicated by 2014 research for Ofcom which found that 15% used Voice over IP, and 7% used online video conferencing. However, this area is likely to grow very rapidly over the next few

years. For example, PwC anticipates<sup>4</sup> that there will be nearly 100% adoption of unified communications amongst businesses by 2020 (up from 2015 levels of 10% of firms with 10 to 49 employees and 26% of firms with 50+ employees). Telephone handsets on desks may well start to disappear, as employees will increasingly use headsets or their smartphones for keeping in touch, with the user interface presented via their computer or a smartphone app.

An important recent development in this area is that Microsoft is effectively entering the telephony market, with the introduction of PBX and PSTN calling features into its Office 365 offering<sup>5</sup>. This means that users will be able to use cloud-based Skype for Business for calls to and from ordinary telephone numbers – not just for calls with colleagues also with that application. With the strong uptake of Office 365, we suspect that this will be a key driver of accelerated adoption of unified communications over the next few years.

### **3.4 Data exploitation**

The quantity of data generated and captured by UK businesses each year is increasing rapidly, and the ability to analyse and act on that data effectively is likely to become an important driver of productivity growth over the next few years.

The 'Internet of Things' (IoT) refers to networks of physical objects or "things" embedded with electronics, software, sensors and network connectivity, which enable these objects to collect and exchange data. Its scope is vast, with examples including: the tracking of deliveries using RFID tags/readers; smart energy metering systems; smart building management; sensor networks for bridge condition monitoring; remotely managed printers/photocopiers; telehealth monitoring devices; connected cars; and plant monitoring applications in manufacturing. The extent to which IoT will be relevant to a business will depend on the nature of that specific firm's activities – and it is difficult to generalise the implications for UK business. However, overall, we are likely to see a very rapid increase in the volumes of devices connected. Gartner estimates<sup>6</sup> that there will be 6.4 billion connected 'things' worldwide in 2016 (up 30% from 2015), and that volumes will reach more than 20 billion by 2020.

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<sup>4</sup> <https://www.pwc.co.uk/communications/assets/unified-communications-report-march-2015.pdf>

<sup>5</sup> Cloud PBX and PSTN conferencing were launched in the UK at the start of December 2015, as part of a new Enterprise E5 plan for Office 365. The option to call PSTN numbers from Skype for Business Online is currently only available in the US, but is expected to be launched in the UK soon.

<sup>6</sup> <http://www.gartner.com/newsroom/id/3165317>

'Big Data' generally refers to datasets so large or complex that traditional data processing applications are inadequate – with data storage requirements extending to terabytes, petabytes and exabytes<sup>7</sup>. This could include, for example, real-time data generated by IoT networks of devices, or multi-language translations of international texts, or point-of-sales data on millions of transactions, or unstructured data gathered through social network feeds. According to IBM<sup>8</sup>, 90% of the world's data was created in the last two years. New tools and techniques have been developed in order to be able to store and analyse such datasets – such as the *NoSQL* distributed database infrastructure, and the *Apache Hadoop* open-source software framework for storing data and running applications on clusters of commodity hardware.

While 'Big Data' and 'Internet of Things' have been the topics that capture most headlines here (as they involve a massive scaling-up in the amount of data analysed and the volumes of devices connected), the exploitation of data is not restricted to these areas: the intelligent analysis of data will be of universal importance to UK businesses - whether that data is 'big' or 'small' and whether it is sensor/device-generated or not. Every business generates data to some extent – on its customers, suppliers, employees and products.

Many vendors have developed offerings to help businesses analyse their data more effectively, with leading players including IBM, Oracle, Microsoft, SAP, SAS, Qlik Technologies and Tableau Software. The market is currently seeing strong growth: MarketsandMarkets forecasts<sup>9</sup> that global spending on Business Intelligence and Analytics software will increase from \$18 billion in 2015 to \$27 billion in 2020, and highlights that the increased availability of this type of software from cloud-based providers has made it affordable to SMEs. The recent expansion of this area is also reflected in a growth in demand for technical staff with relevant experience: ITjobswatch reports<sup>10</sup> that 6.7% of all adverts for permanent IT jobs located in the UK cited Business Intelligence in 2015 (up from less than 3% in 2005), and that the average salary was £50k p.a.

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<sup>7</sup> 1 terabyte=1,000 gigabytes; 1 petabyte=1,000 terabytes; 1 exabyte=1,000 petabytes

<sup>8</sup> <https://www-01.ibm.com/software/data/bigdata/what-is-big-data.html>

<sup>9</sup> <http://www.marketsandmarkets.com/Market-Reports/business-intelligence-analytics-software-market-247431917.html>

<sup>10</sup> <http://www.itjobswatch.co.uk/jobs/uk/business%20intelligence.do>

### **3.5 Cyber security**

Cybercrime is an ever-growing concern for businesses across the world. High profile recent data breaches such as the hacking of the Talk Talk and Ashley Madison websites have emphasised how vulnerable businesses can be to attackers.

A 2015 report from EMC/RSA Research<sup>11</sup> highlights some key trends in cybercrime:

- The cybercrime-as-a-service marketplace continues to mature
  - The cybercrime marketplace has evolved tremendously over recent years and that evolution looks set to continue. Innovation among cybercrime-as-a-service providers will continue to be driven by a competitive marketplace, leading to a generalized increase in the quality of malware produced, and enabling a much larger pool of bad actors with no technical knowledge to profit from cybercrime.
- Mobile provides a larger attack surface
  - Cybercriminals will increasingly look to exploit changes in user device preference by switching an expanding proportion of their attacks to mobiles. In 2014, Symantec found<sup>12</sup> that 17% of all Android apps (nearly one million total) were actually malware in disguise.
- Cybercriminals seek more bang for their buck and increase large-scale retail and financial attacks
  - RSA has observed a number of developments in attack tactics as cybercriminals looked for new ways to steal credit cards and gain fraudulent access to money. Banking botnets have become more resilient, but there has been a move away from attacks on individuals to mass attacks on retailers and financial institutions.
- Threats continue to grow more targeted and more advanced.
  - RSA reports seeing a migration towards 'watering-hole' attacks, in which the criminal compromises an organisation that's of business interest to the primary target organisation. This makes individual phishing attempts more convincing and increases the likelihood of introducing malware into the target organisation's systems.

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<sup>11</sup> <https://www.emc.com/collateral/white-paper/rsa-white-paper-cybercrime-trends-2015.pdf>

<sup>12</sup> [https://www4.symantec.com/mktginfo/whitepaper/ISTR/21347932\\_GA-internet-security-threat-report-volume-20-2015-social\\_v2.pdf](https://www4.symantec.com/mktginfo/whitepaper/ISTR/21347932_GA-internet-security-threat-report-volume-20-2015-social_v2.pdf)

One particularly concerning development is the rise in ‘ransomware’ attacks, in which malware restricts access to a computer system that it infects in some way (sometimes encrypting user’s files), and demands that the user pay a ransom via bitcoin or pre-paid cards to the operators of the malware to remove the restriction. In August 2015, McAfee reported<sup>13</sup> that there had been a rise of 127% in the total number of ransomware samples over the previous year.

With businesses becoming more and more reliant on digital systems and processes (for example through increased use of cloud applications, mobility and IoT) their potential exposure to attack – or accidental loss of data – increases. SMEs are particularly vulnerable, as they have fewer resources available to ensure that they are properly protected: Symantec’s latest internet security threat report states that 60% of all targeted attacks struck SMEs in 2014 - putting not only these firms, but also their business partners, at higher risk.

As well as the chance of financial or reputational loss to businesses through cybercrime, the increased awareness of the dangers of security breaches is a significant inhibitor of UK firms seeking to do more in terms of digitising their organisations – acting as a drag on productivity growth. It will become ever more important for firms to develop a clear understanding of the risks around their current and planned digital technology implementations, and to put in place effective systems and processes for mitigating these.

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<sup>13</sup> <http://www.mcafee.com/us/resources/reports/rp-quarterly-threats-aug-2015.pdf>

## **4 Priorities for action**

In the light of our research, we suggest six inter-related areas which we consider are particularly important priorities for action over the next two or three years for UK business:

- raising the levels of digital leadership
- getting up to speed on cloud options and cyber security
- implementing and exploiting CRM solutions
- professionalising digital marketing activities
- migrating off end-of-life systems
- optimising e-commerce implementations and addressing international opportunities.

We discuss each of these below.

### **4.1 Raising the levels of digital leadership**

Arguably the most important enabler for improved exploitation of technology is for the levels of digital leadership to be raised within firms' top management teams. This means: recognising the importance of digitisation for the firm's future success; ensuring that the firm has people with the right attitudes and skills to lead digital-enabled change; assigning annual budgets for ICT which are proportionate to its level of importance for the business; and thinking through and agreeing explicit plans for what ICT-related changes should be implemented over the forthcoming period.

There is currently something of a mismatch between the importance that businesses say they attach to ICT and their willingness to invest. An FSB survey of 2,200 members in January 2013 found that 85% thought it important or very important for their businesses' future growth to invest in new technology; yet 69% of SMEs are not thinking of making any significant improvements to their digital capabilities over the next 12 months, according to the recent BMG research for BIS.

More widely, the Small Business Survey 2014 found that 55% of SME employers do not have any formal written business plan (and a further 11% have a business plan that is not kept up to date). Without this basic management tool for assessing challenges, opportunities, priorities and budgets, it is difficult to see how firms would

be able to take a truly strategic perspective on digitisation (nor indeed on other ways of improving business performance).

A potential approach, therefore, may be to encourage more widespread adoption of good practice in the formalisation of business planning – within which digitisation considerations should be integrated. We note, in passing, that the current [www.gov.uk](http://www.gov.uk) guidance on [writing a business plan](#) rather unhelpfully positions this under ‘setting up a business’ and links to business plan templates that would be inappropriate for established businesses.

## **4.2 Getting up to speed on cloud options and cyber security**

As discussed in section 3, cloud computing and cyber security are two areas which are developing rapidly and are likely to have very important implications for the vast majority of UK businesses over the next few years.

However, these are also areas in which businesses are currently lacking awareness and confidence. For example, 28% of 398 SME respondents in a BT/BCC survey<sup>14</sup> in 2014 said that they were aware of cloud-based applications but not sure how they are relevant to their business; and unpublished recent research by SQW also found cloud computing to be the area of ICT in which SMEs’ management teams were least informed. Regarding security, a PwC survey for the Government found<sup>15</sup> that only 60% of small organisations have a documented information security policy (vs 98% of large organisations); and KPMG found<sup>16</sup> that 70% of procurement managers in large UK businesses felt that SMEs should be doing more to prevent cyber attacks and protect valuable client data.

Given the opportunities for cloud computing to lead to more efficient business use of ICT and to provide a more flexible platform for growth, and given the increasing risks associated with cyber security (including the risk of it acting as a brake on digitisation initiatives), we think it will be particularly important to raise business awareness and confidence in these areas – especially amongst SMEs.

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<sup>14</sup> <http://www.insight.bt.com/en/features/bccresearch>

<sup>15</sup> <http://www.pwc.co.uk/assets/pdf/2015-isbs-technical-report-blue-03.pdf>

<sup>16</sup> <https://home.kpmg.com/uk/en/home/media/press-releases/2015/11/smes-need-to-take-cyber-security-seriously-or-face-being-frozen-out-of-the-procurement-process-finds-kpmg-survey.html>

### **4.3 Implementing and exploiting CRM solutions**

Although there has recently been rapid growth in the take-up of CRM systems amongst larger businesses, the level of adoption remains very low as yet for micro-businesses (as discussed in section 2).

This is also an area in which the UK is significantly lagging EU best practice at present: 30% of firms with 10+ employees using CRM in the UK versus the 37% EU average, and 47% in the Netherlands (see Annex B).

Whereas many ICT systems will not be applicable to all businesses, we consider it likely that CRM will reach very high levels of penetration over time even amongst the smallest firms: all trading businesses have customers, have information on those customers, and communicate with those customers.

With affordable CRM solutions now available for SMEs – including cloud-based options – we suggest that it will be important to accelerate the widespread adoption of CRM over the next couple of years, to act as a foundation for improved workflow automation, more sophisticated analysis of customer data, and more effective digital marketing.

### **4.4 Professionalising digital marketing activities**

Of the various areas tested by the BMG research for BIS, SMEs rated themselves least capable at e-marketing (mean of 2.53 out of 5), using social media (2.76) and maximising sales through SEO (2.86). These were also the areas most frequently cited as those where advice and support would be useful in the future – with 41% agreeing that advice/support on SEO would be useful and 39% agreeing that advice/support on digital marketing would be useful.

This suggests that there is significant current demand for support in helping SMEs to professionalise their digital marketing efforts, and SQW's recent evaluation for BIS<sup>17</sup> confirms that this is also an area where appropriately targeted support is both popular and effective in quickly leading to material business benefits.

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<sup>17</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/458122/BIS-15-510-evaluation-of-the-small-business-digital-capability-programme-challenge-fund.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/458122/BIS-15-510-evaluation-of-the-small-business-digital-capability-programme-challenge-fund.pdf)

## **4.5 Migrating off end-of-life systems**

From time to time vendors of ICT hardware and software stop supporting older versions of their products. Critically, for software, this means that no new security patches will be provided for any vulnerabilities if and when they emerge. Any customers continuing to use products past their end-of-life date will therefore face increasing risks of security breaches from hackers seeking to exploit vulnerabilities in older software.

A particularly notable and important example of this is Windows Server 2003, which reached its end of life in July 2015, but which still has a very large installed base around the world (and is therefore attractive to cyber criminals seeking vulnerabilities). A Cloud Industry Forum survey of 250 UK businesses in February 2015 found that 58% still had Windows Server 2003 active within their operations at that point. In May 2015, IDC<sup>18</sup> estimated that 1.5 million licensed installations of Windows Server 2003 still existed around the world. This is just as much an issue for large businesses as for smaller businesses: indeed, the CIF survey found a higher proportion of large businesses reporting legacy Windows Server 2003 installations than was the case for smaller businesses.

With the ever-increasing threat from cybercrime, we suggest that the need to move off end-of-life systems (e.g. Windows Server 2003, and also SQL Server 2005 which reaches its end of life in April 2016) should be considered a very high priority for UK business. On the positive side, the need to move away from end-of-life products can act as a powerful stimulus for change – a catalyst for assessing the latest options, including cloud-based alternatives, and for upgrading to newer and better systems.

## **4.6 Optimising e-commerce implementations and addressing international opportunities**

Not all businesses have products/services that are appropriate for e-commerce, and Figure 2-11 suggests that the proportions of businesses adopting e-commerce have flattened out over recent years.

For those firms which do have e-commerce implementations, however, many are rather ineffective as yet – for example, the BMG research for BIS found that (of those that were using e-commerce and who provided an indication of the value of e-commerce sales) 69% earned less than £50,000 from e-commerce in the previous 12

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<sup>18</sup> <http://www.intel.co.uk/content/dam/www/public/emea/uk/en/30-day-migration-plan/windows-2003-countdown.pdf>

months. There is a large gulf between the ‘excellence of the few’ and the ‘mediocrity of the many’ in e-commerce, which suggests that more could be done to diffuse better e-commerce practice among businesses – through search engine optimisation and the ‘tricks of the trade’ that maximise click through rates and conversion rates on e-commerce websites.

Furthermore, most UK e-commerce websites are only currently targeting customers in the UK: in the BMG research for BIS only 37% of SMEs with e-commerce operations had exported in the previous 12 months. Although one of the most frequently cited benefits of e-commerce is that it opens up world markets to businesses, it appears that most UK SMEs are not actually taking advantage of this – even amongst those who do offer e-commerce via their websites.

With very rapid ongoing growth in the numbers of e-commerce consumers around the world (in particular, China now has more than 460 million consumers who purchase online according to the Wall Street Journal<sup>19</sup>), and with UK being one of the most mature e-commerce markets in the world, we suggest that expanding the horizons of UK businesses to address international e-commerce opportunities should be an important priority, and should make an important contribution to raising the UK’s productivity performance through increased exports.

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<sup>19</sup> <http://www.wsj.com/articles/western-firms-caught-off-guard-as-chinese-shoppers-flock-to-web-1434274202>

## 5 What works?

There cannot be a single answer to ‘what works?’ in terms of business digitisation. There are so many influencing factors, including: national culture; company culture; the skills, previous experience, attitudes and interests of leadership/management and of staff; selection of suppliers and advisors; chance; influence of peers; competitive pressure; the availability of and pricing of new technology; the size and sector of the business; and the availability of resources.

For the purposes of this report, however, we focus on two areas:

- evidence on the business-level critical success factors for digital transformation, emerging from international surveys of businesses
- a brief discussion on the role of publicly-funded support for digitisation, drawing on observations of support offered in other countries and on evaluations of UK interventions.

### 5.1 Evidence on the business-level critical success factors for digital transformation

#### 5.1.1 Accenture/Forrester

Forrester was commissioned by Accenture to undertake a study<sup>20</sup> evaluating the digital strategies of large businesses around the world. This involved a survey in June 2015 with business decision-makers from 396 organisations with 1k+ employees across the US, Canada, the UK, Germany, France, China, India, Japan, Brazil and Mexico.

The recommendations emerging from the study are summarised below:

- ***Advocate digital transformation and the customer experience at an executive level.*** Forrester stresses that digital transformation can only succeed as a firm-wide initiative, which requires strong collaboration and evangelism from company leaders. Their study found that the company culture and organisation tend to lag behind process and technology when it comes to digital readiness, so the cultural change and educational aspects need to be prominent in digital transformation plans.

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<sup>20</sup> [https://www.accenture.com/\\_acnmedia/Accenture/Conversion-Assets/DotCom/Documents/Global/PDF/Digital\\_2/Accenture-Digital-Transformation-In-The-Age-Of-The-Customer.pdf](https://www.accenture.com/_acnmedia/Accenture/Conversion-Assets/DotCom/Documents/Global/PDF/Digital_2/Accenture-Digital-Transformation-In-The-Age-Of-The-Customer.pdf)

- **Execute change within the context of an end vision.** The study suggests that a clear vision for the end state is critical to make sure that everyone in the organisation is moving in the same direction, and to ensure that leaders are not making changes in isolation.
- **Be willing to take risks and learn from mistakes.** As digital technology continues to evolve, Forrester finds that companies will need to take risks and develop Agile processes in order to keep up. Not every change should require traditional approvals and a detailed business case: if new functionality is in line with the company's strategy for digital transformation, firms should give it a try, solicit feedback, and then iterate on it.
- **Find partners whose capabilities complement your own.** Forrester notes that even digitally mature companies will have new gaps in capabilities as technology continues to evolve, and that enlisting third-party providers with complementary skills is often cheaper and faster than building those capabilities internally.

### 5.1.2 Deloitte/MIT

The 2015 Digital Business Global Executive Study and Research Project<sup>21</sup> by MIT Sloan Management Review and Deloitte draws on a survey in Autumn 2014 of more than 4.8k business executives, managers and analysts across 128 countries. We summarise their headline findings as follows:

- **Digital strategy drives digital maturity.** The vast majority (80%) of the 'digitally maturing' respondents have a clear and coherent digital strategy, versus only 15% of respondents from companies at the early stages of digital maturity.
- **The power of a digital transformation strategy lies in its scope and objectives.** Less mature companies tend to focus on particular technologies and have a very operational focus for their digital strategies. More digitally mature companies see their digital strategies as a means to transforming the business.
- **Maturing digital organisations build skills to realise the strategy.** More mature organisations are less tolerant of skills gaps: 75% of respondents from these firms agreed that they were able to build the necessary skills to capitalise on digital trends, versus 19% in low maturity firms. The ability to conceptualise how digital technology can impact the business is a key skills gap amongst lower maturity organisations.

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<sup>21</sup> <http://sloanreview.mit.edu/projects/strategy-drives-digital-transformation/>

- **Employees want to work for digital leaders.** Nearly 80% of respondents said that they want to work for a digitally enabled company or a digital leader. A firm's attitude to digital will therefore influence the extent to which it can attract and retain talent.
- **Taking risks becomes a cultural norm.** More than half of respondents in less digitally mature firms saw their organisation's fear of risk as a major shortcoming, versus 36% in more digitally mature firms.
- **The digital agenda is led from the top.** Employees in digitally maturing organisations are highly confident in their leaders' digital fluency: the ability to articulate the value of digital technologies to the organisation's future. The more mature businesses are nearly twice as likely as less mature organisations to have their digital efforts led by a single person or group.

### 5.1.3 PwC

PwC's Digital IQ research<sup>22</sup> involved 1,988 business and IT executive respondents from 51 countries in mid 2015. Their analysis of this research identified ten attributes for effective digital growth:

- **CEO champion.** PwC sees the CEO as the natural champion for digital change, as the discussions have shifted from operational efficiency to business growth.
- **Digital leaders set the strategy.** The senior executives with direct responsibility for delivery of digital change should be instrumental in helping to set high-level business strategy.
- **Executive team engaged.** Beyond the leaders of the firm's digital efforts, the rest of the firm's top team need to be engaged in the digital strategy. The collaboration between the leaders of digital/IT and marketing is particularly vital.
- **Strategy-sharing across the organisation.** The research has found that businesses are increasingly sharing business and digital strategies enterprise-wide, in order to engage staff: 69% of firms now, versus 50% two years ago.
- **Outside-in approach.** PwC finds that top-performing companies leverage the knowledge base of other innovators, such as vendors or customers, to uncover and apply new ideas for using technology.

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<sup>22</sup> <http://www.pwc.com/gx/en/advisory-services/digital-iq-survey-2015/campaign-site/digital-iq-survey-2015.pdf>

- **Driven by competitive advantage.** With many potential digital activity ideas, firms must filter and prioritise those that hold most promise for market differentiation.
- **Effective use of business data.** Top-performing companies see more potential in making use of their data than lower-performing ones.
- **Proactive cybersecurity.** The most successful companies tend to be more likely to proactively evaluate and plan for security and privacy in digital enterprise projects.
- **Digital roadmap.** PwC suggests that it is crucial for firms to have a single multi-year 'roadmap' for digital, to help balance the more tactical year-on-year priorities arising in the annual planning and budgeting process.
- **Consistent measurement.** Finally, PwC advocates a combination of traditional and newer cyber metrics for tracking the value added by digital initiatives.

#### 5.1.4 McKinsey

A global McKinsey survey<sup>23</sup> of 987 business executives in April 2015 offers some further lessons from high performing firms, which could assist in developing a successful digital programme:

- **Build a risk-taking culture.** McKinsey's research finds a close link between strong digital performance and an organisational culture that encourages risk-taking.
- **Put your money (and resources) where your mouth is.** Higher performing firms do not necessarily invest more in digital, but are significantly more open to change in their investment strategies: they are more likely to review their portfolios more frequently for digital-related opportunities, to make significant changes to their portfolio's risk profile and time horizon, and to reallocate resources between businesses in the portfolio.
- **Dedicate the best people to digital – and then keep them engaged.** The high performers were more than twice as likely as others to say that they have dedicated their best people and resources to their company's digital initiatives; and 47% of high performers said that cutting-edge digital work helped them attract and retain digital talent, versus 27% in other firms.

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<sup>23</sup> [http://www.mckinsey.com/insights/business\\_technology/cracking\\_the\\_digital\\_code](http://www.mckinsey.com/insights/business_technology/cracking_the_digital_code)

- **Move quickly.** Speed is of the essence: 43% of high performers say that their firms take digital initiatives from idea to implementation in less than six months, versus 17% of respondents in other firms.
- **Lead from the top.** As with the other research cited above, McKinsey finds that top-level leadership is vital for successful digital strategies: companies with CEO sponsors are twice as likely to be high performers as firms whose CEOs are not directly involved in digital.

## 5.2 The role of publicly-funded support for digitisation

While businesses themselves must, of course, take the lead in addressing their specific digital challenges and opportunities, research in the UK and elsewhere has consistently highlighted information-related market failures – especially for SMEs – which would justify targeted publicly-funded support in order to achieve more efficient economic outcomes. For example, a recent SQW evaluation for BIS noted that:

*It is clear from the feedback from beneficiaries and the LEPs that the digital arena is particularly fast-moving, and that SMEs can struggle to keep up-to-speed with the latest developments.*

The same evaluation highlighted the effectiveness of workshops (with an optimum size of about 15 people) in helping SMEs to increase their digital confidence and capabilities – especially in digital marketing, which has previously been highlighted in this report as an area of current weakness for SMEs. Relatively light touch intervention here can lead to rapid and material benefits for the businesses involved.

It is beyond the scope of this study to undertake a comprehensive assessment of digitisation support provided to businesses in other countries, but Annex D provides a brief overview of some schemes in place in the USA, Canada, Australia, New Zealand, and Ireland – including online information and tools, subsidised/free workshops, free mentoring/coaching, grants and loans.

In the UK, the broadband infrastructure aspects of digitisation have benefited from a coordinated and coherent programme in recent years (led by Broadband Delivery UK), but publicly-funded support for UK businesses in developing digital capabilities has tended to be rather ad hoc, relatively short-lived due to the time-limited availability of specific funding streams, and often subject to sector eligibility conditions which may be neither logical nor helpful. Few areas of the UK have managed to sustain consistent and coherent programmes of business support for digitisation over the last several

years; elsewhere, the brand awareness of any support that is offered from time to time (e.g. through ERDF funded initiatives) tends to be rather low as schemes come and go.

Given the importance of digital in driving the UK's productivity growth, and the extent of the persistent market failure facing SMEs in this fast-moving arena, a more sustained and coherent approach to publicly-funded support for digitisation would appear to be an opportunity missed.

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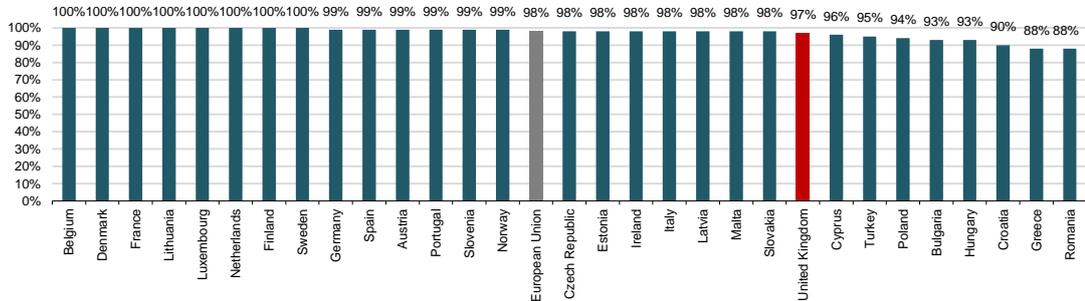
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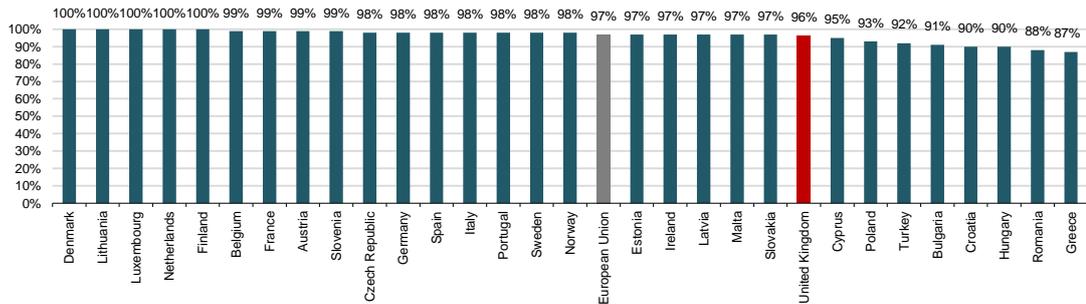
## Annex B. International comparisons

**Figure B-1: Proportion of enterprises using computers (for all businesses with 10 or more employees, excluding financial sector) 2015**



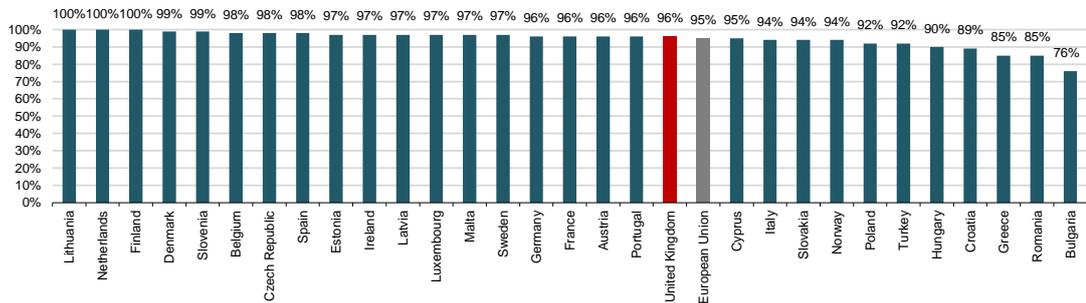
Source: Eurostat, Information Society Statistics, 2015

**Figure B-2: Proportion of enterprises with internet access (for all businesses with 10 or more employees, excluding financial sector) 2015**



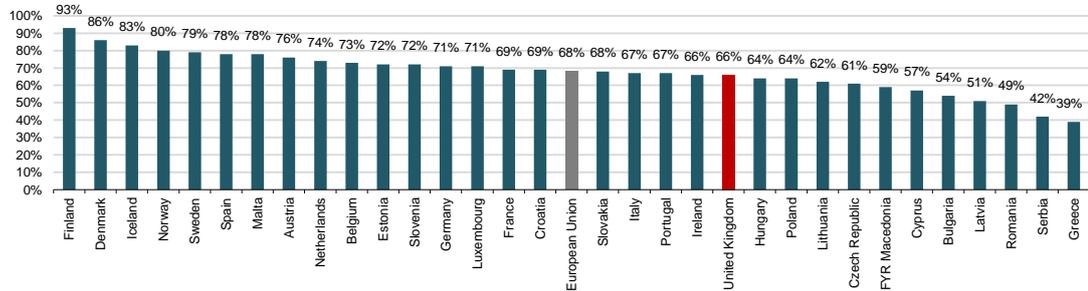
Source: Eurostat, Information Society Statistics, 2015

**Figure B-3: Proportion of enterprises with broadband access (fixed or mobile) (for all businesses with 10 or more employees, excluding financial sector) 2015**



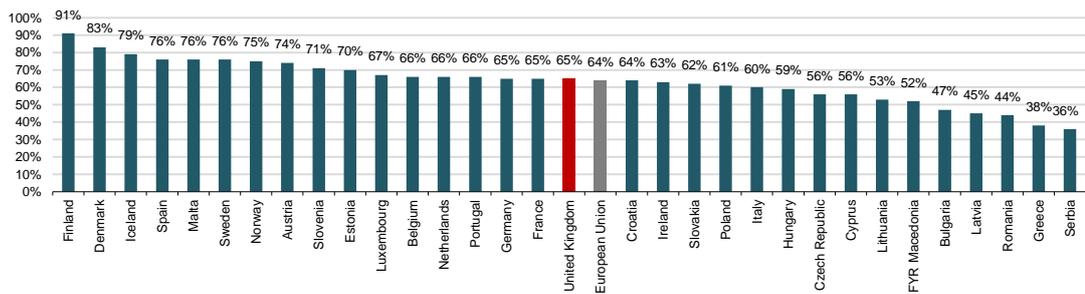
Source: Eurostat, Information Society Statistics, 2015

**Figure B-4: Proportion of enterprises connecting to the Internet via mobile connection (broadband or other mobile connection) (for all businesses with 10 or more employees, excluding financial sector) 2014**



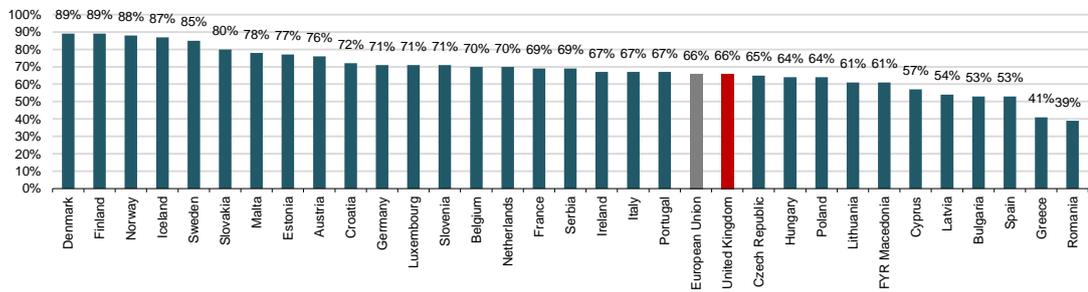
Source: Eurostat, Information Society Statistics, 2015

**Figure B-5: Proportion of enterprises connecting to the Internet via a mobile broadband connection (3G modem or 3G handset) (for all businesses with 10 or more employees, excluding financial sector) 2014**



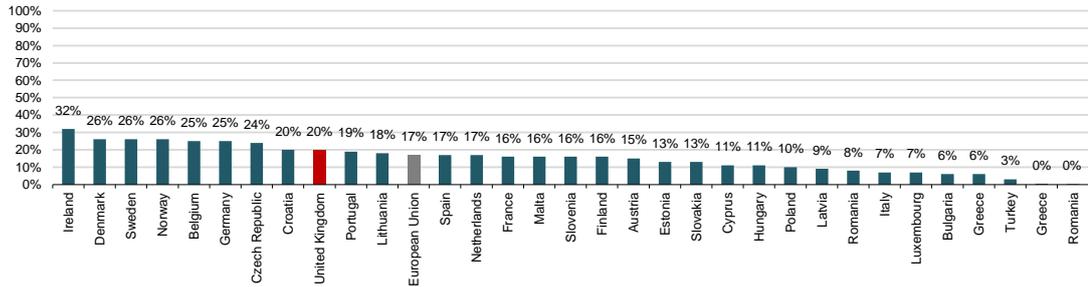
Source: Eurostat, Information Society Statistics, 2015

**Figure B-6: Proportion of enterprises providing portable devices that allow a mobile connection to the internet for business use (for all businesses with 10 or more employees, excluding financial sector) 2014**



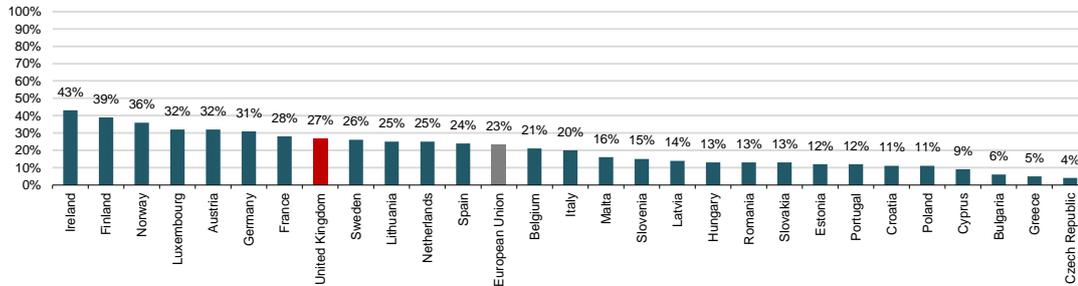
Source: Eurostat, Information Society Statistics, 2015

**Figure B-7: Proportion of enterprises selling online (at least 1% of turnover) (for all businesses with 10 or more employees, excluding financial sector) 2015**



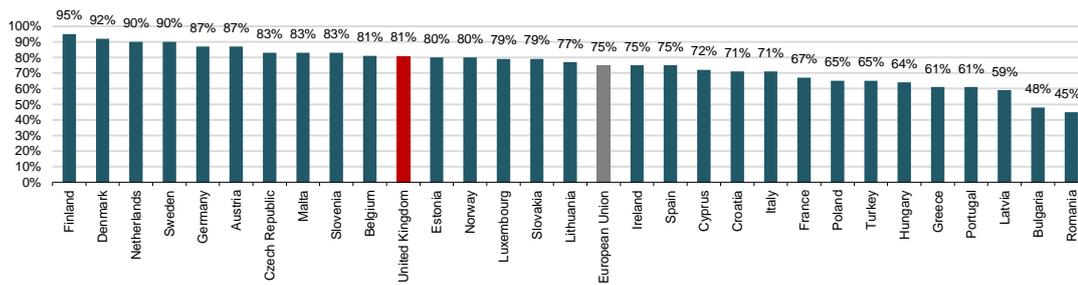
Source: Eurostat, Information Society Statistics, 2015

**Figure B-8: Proportion of enterprises purchasing online of at least 1% of total purchases (for all businesses with 10 or more employees, excluding financial sector) 2015**



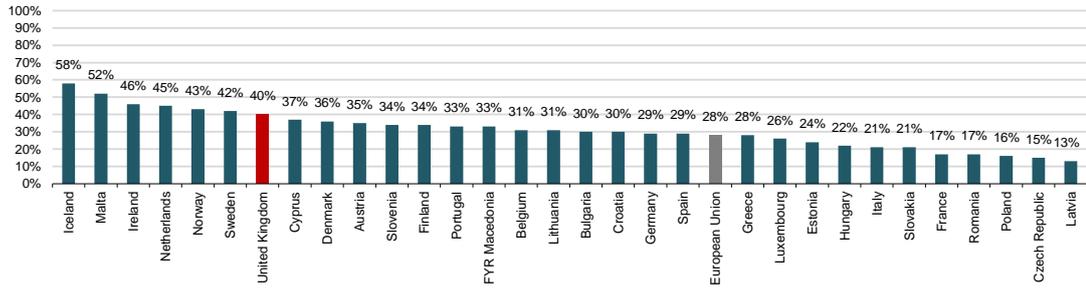
Source: Eurostat, Information Society Statistics, 2015

**Figure B-9: Proportion of enterprises with a website or homepage (for all businesses with 10 or more employees, excluding financial sector) 2015**



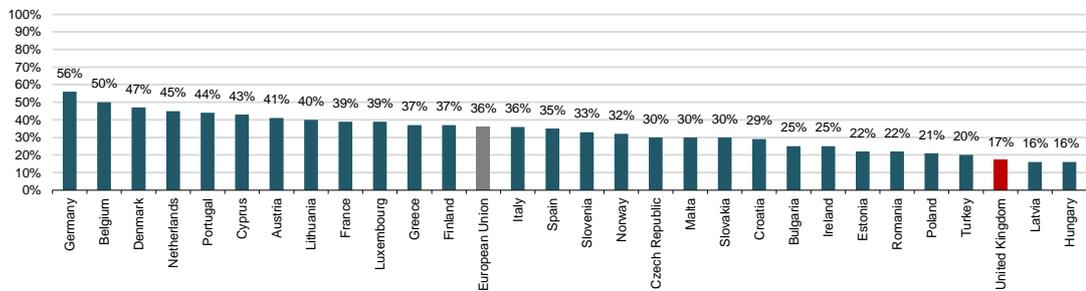
Source: Eurostat, Information Society Statistics, 2015

**Figure B-10: Proportion of enterprises using social networks (for all businesses with 10 or more employees, excluding financial sector) 2013**



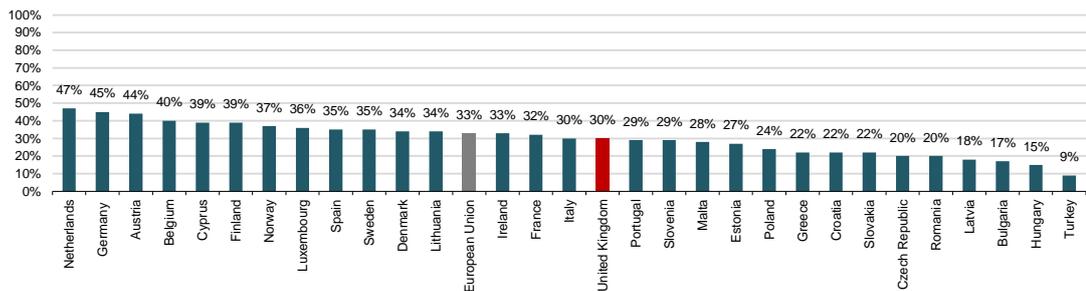
Source: Eurostat, Information Society Statistics, 2015

**Figure B-11: Proportion of enterprises with ERP software (for all businesses with 10 or more employees, excluding financial sector) 2015**



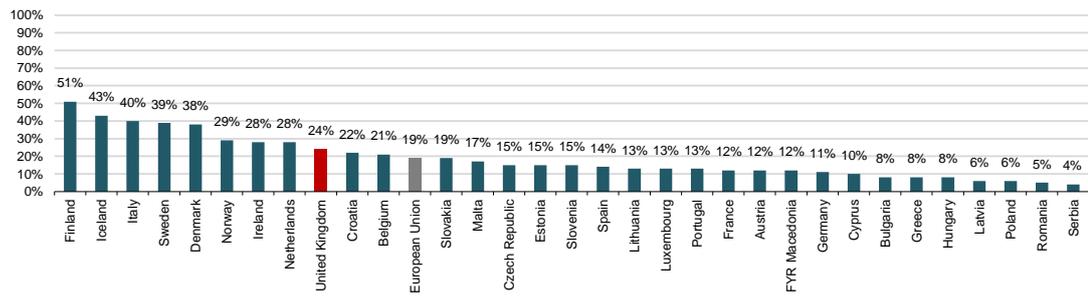
Source: Eurostat, Information Society Statistics, 2015

**Figure B-12: Proportion of enterprises using CRM systems (for all businesses with 10 or more employees, excluding financial sector) 2015**



Source: Eurostat, Information Society Statistics, 2015

**Figure B-13: Proportion of enterprises buying cloud computing services (for all businesses with 10 or more employees, excluding financial sector) 2014**



Source: Eurostat, Information Society Statistics, 2015

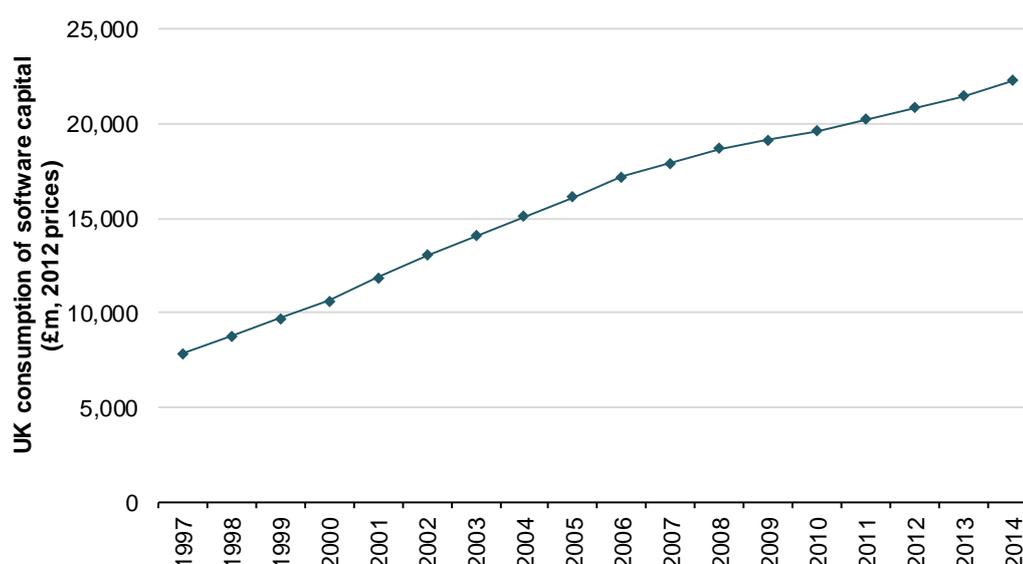
## Annex C. Discussion on cloud computing and productivity metrics

As highlighted in section 3, the increased adoption of cloud computing represents a profound shift in the nature of investments for ICT-using organisations: away from capital expenditure towards bought-in services (or ‘intermediate consumption’).

This increased intermediate consumption by cloud-using organisations represents additional turnover (which leads to additional GVA) for cloud providers – but that is not necessarily captured in the UK economy, as the bulk of the assets and employees of many cloud providers are based elsewhere. For example, the European data centres for Microsoft Azure are currently located in Ireland and the Netherlands, and the primary European datacentres for Amazon AWS are currently in Ireland and Germany (though both companies have recently announced plans to establish UK data centres in 2016).

The trend towards buying in services from cloud providers may well be behind much of the marked slowdown in the UK’s growth of net ICT capital stocks discussed in section 2, and the associated reduced rate of growth in the consumption of ICT capital since 2007 – for example, in the consumption of software capital illustrated in Figure C-1.

**Figure C-1: UK consumption of software capital (£ million, 2012 prices)**



Source: *ONS Capital Stocks, Consumption of Fixed Capital, 2015*

Businesses choose cloud-based offerings for sound commercial reasons – maximising their discounted cashflows by minimising the amount of up-front investment and ongoing maintenance required for new ICT capabilities. Paradoxically, however, this may explain some of the recent weakness in measured labour productivity, due to the way in which investments are treated in the productivity statistics.

For a given level of turnover and labour input (hours worked), a company could earn the same profit by choosing to incur cloud service charges rather than an equivalent amount of depreciation in their profit & loss account – but their measured Gross Value Added (GVA) would be lower, and so their measured labour productivity would be lower. In the hypothetical example illustrated in the table below, a shift of £100,000 from depreciation to intermediate consumption leads to Company B’s labour productivity being 1.3% lower than that of Company A – despite having the same levels of turnover, profit and labour input.

**Table C-1: Illustrative example of the business-level GVA effects of a shift from capital expenditure to bought-in cloud services**

£	Company A (no cloud)	Company B (with cloud)
Turnover p.a.	10,000,000	10,000,000
Employment costs p.a.	6,000,000	6,000,000
Bought-in goods and services (intermediate consumption) p.a.	2,000,000	2,100,000
Depreciation p.a.	300,000	200,000
<b>Net profit before tax p.a.</b>	<b>1,700,000</b>	<b>1,700,000</b>
GVA (turnover less intermediate consumption) p.a.	8,000,000	7,900,000
Hours worked p.a.	150,000	150,000
<b>Labour productivity (GVA per hour worked)</b>	<b>53.33</b>	<b>52.67</b>

Source: SQW

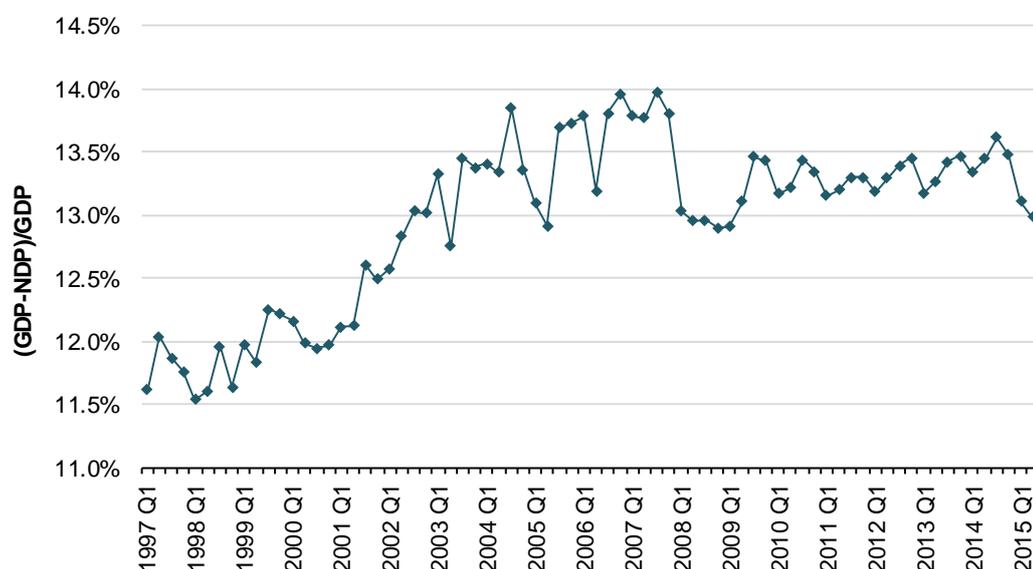
For such reasons, it has been argued<sup>24</sup> that *Net Domestic Product* (NDP) is a better measure of economic activity than *Gross Domestic Product* (GDP) – as NDP is obtained by subtracting estimates of the capital used up in the production process from GDP, and therefore better reflects the wealth created in a period<sup>25</sup>. Figure C-2 illustrates that the gap between GDP and NDP increased substantially over the period 1997 to 2006 (from 11.6% in Q1 1997 to 14.0% in Q4 2006) – reflecting an increasing importance of depreciation in the national accounts, largely as a result of the rapid

<sup>24</sup> See [http://www.ons.gov.uk/ons/dcp171766\\_358832.pdf](http://www.ons.gov.uk/ons/dcp171766_358832.pdf) for example

<sup>25</sup> In our hypothetical example, the *Net Value Added* is exactly the same for Company A and Company B, as depreciation is subtracted from GVA

growth in ICT capital over that period. In contrast, the gap has been broadly constant since mid 2009 – at between 13.0% and 13.5%.

**Figure C-2: Difference between UK Gross Domestic Product and Net Domestic Product, as a proportion of Gross Domestic Product**



Source: SQW analysis of ONS Economic Wellbeing statistics, September 2015

The implications of this for the productivity puzzle are as follows:

- The reported pre-crisis levels of productivity over the period 1997 to 2007 arguably over-stated the ‘true’ rate of growth, as the headline productivity figures (based on GDP or GVA) do not take account of the surge in ICT depreciation over that period.
- The recent shift to cloud computing is fundamentally changing the ways in which businesses ‘invest’ in ICT, and leading to *much* more efficient use of ICT capital. As a result, it may well be that the gap between GDP and NDP will continue to narrow in the future (it fell from 13.6% in Q3 2014 to 13.0% in Q2 2015).
- When framing the productivity puzzle question, we should avoid simply extrapolating the trend from the annual GDP/GVA growth measured over the 1997 to 2007 period (which is the approach typically taken – for example in the relevant [ONS paper](#) from 2012, and the [Bank of England paper](#) from 2014).
- With ICT accounting for a major share of the UK’s capital investments (e.g. software is now 9.4% of the UK’s total capital consumption), we suggest that the implications for the productivity statistics of the ongoing shift to cloud computing to warrant further investigation.

## Annex D. International examples of support for business digitisation

Country	Strategy / Activity	Description
Australia	<a href="#">National Digital Economic Strategy</a>  <a href="#">Digital Enterprise</a>  <a href="#">Digital Business On-line</a>	<p>The Australian Government's aim is that, by 2020, Australia will be among the world's leading digital economies.</p> <p>To achieve this, the government has set out eight 'Digital Economy Goals' which includes increasing the online engagement of Australian businesses and not-for-profit organisations.</p> <p>This has led to the introduction of various government initiatives such as 'Digital Enterprise' and 'Digital Business Online'.</p> <p>The Digital Enterprise initiative is designed to assist SMEs and not-for profit organisations in understanding how they can take advantage of the National Broadband Network (NBN).</p> <p>The Digital Enterprise program enables SMEs to understand how they can use the NBN to diversify their operations through improving their online presence and competitiveness, offering new products and services, expanding their market and increasing the ways in which they communicate with customers and suppliers.</p> <p>With government support of \$12.4m spread over three years, training is run by local providers in group sessions, followed by four hours of one-to-one assistance available to each participant in their place of business. The scheme has funded support in 69 communities throughout Australia.</p> <p>The 'Digital Business' on-line website provides practical guidance for small businesses and community organisations looking to establish or enhance their online presence.</p> <p>Various areas are covered including; 'Getting Online', 'Creating a Website', 'Marketing', and 'E-commerce'.</p>
New Zealand	<a href="#">Business Growth Agenda 2015</a>	<p>The Business Growth Agenda 2015 focuses on the six key areas considered crucial to business growth; export markets, investment, innovation, skills, natural resources and infrastructure.</p>

Country	Strategy / Activity	Description
	<a href="#">Digital Economy Work Programme</a>	<p>Within the area of innovation, the following objective is set; make the most of the digital economy by encouraging more effective use and uptake of ICT.</p> <p>This covers the use of ICT by business and has led to the introduction of a number of different initiatives, including the Digital Economy Work Programme.</p> <p>The Digital Economy Work Programme aims to ensure that government is focused on the right initiatives to support the growth of NZ's digital sector and the uptake/smart use of ICT across the economy.</p> <p>The work programme covers a range of interconnected areas that are deemed critical to fostering innovation, including the ICT sector, skills, use of ICT by business, broadband connectivity, security and privacy, regulation, and the use of ICT by government.</p> <p>The 'digital business' strand is concerned with supporting NZ businesses to raise their productivity and drive innovation across all sectors of the economy.</p> <p>This, in itself, is made up of separate initiatives; Digital Enablement Workshops, Digital Journey, Ultrafast Broadband for Business, and NZTE's Digital Service.</p>
	<a href="#">Digital Enablement Workshops</a>	<p>The NZ government is helping to build the ICT capability of businesses through NTZE-run Digital Enablement workshops.</p> <p>These workshops cover a range of topics (e.g. cloud computing, social media) and are designed to demonstrate online tools in action and highlight how ICT can help business operation.</p> <p>Allows participants to construct a personalised action plan to help make their business more effective.</p>
	<a href="#">Digital Journey</a>	<p>Funded by Internet NZ and Google, Digital Journey provides an interactive online assessment for businesses to determine their current use of online technology, and build a customised action plan.</p> <p>This action plan provides recommendations for improving the online presence of the business as well as offering advice on the advantages and opportunities that digital technologies have to offer.</p>

Country	Strategy / Activity	Description
	<a href="#">Ultrafast Broadband for Business</a>	<p>Crown Fibre Holdings is responsible for managing the Ultrafast BB programme and as part of this run various events to provide information on the benefits of superfast BB for small business.</p> <p>Case studies are also available which outline what superfast broadband can do for a business.</p>
	<a href="#">NZTE's Digital Service</a>	<p>NZTE's new Digital service is being developed to inspire and help internationally focused New Zealand companies use digital technologies to increase international sales and profitability.</p> <p>Its goals are to improve productivity, reduce costs and grow businesses through areas such as digital enablement, e-commerce and digital marketing.</p>
Ireland	<a href="#">National Digital Strategy for Ireland</a>	<p>The National Digital Strategy (NDS) is aimed at helping Ireland reap the full rewards of a digitally enabled society and is made up of three strands; 'Trading Online and Entrepreneurship for Indigenous Businesses', 'More Citizen-Engagement', and 'Education and E-Learning'.</p> <p>As part of strand one, the strategy aims to get 10,000 Irish businesses online for the first time and to achieve a further 2,000 small Irish businesses trading online over a period of two years.</p> <p>Actions to achieve this include an on-line voucher scheme and on-line web support.</p>
	<a href="#">Online Trading Voucher Scheme</a>	<p>The Online Trading Voucher scheme provides vouchers valued at up to €2,500 which can be redeemed against the cost of establishing an online trading presence.</p> <p>To qualify, small businesses must demonstrate what they want to achieve for their business with digital and actively commence trading online.</p> <p>Business owners and managers with little knowledge or exposure to the internet can use a portion of the voucher to access suitable expertise, technical or training support to achieve their online objectives.</p>
	<a href="#">Getting Irish Business On-line</a>	<p>'Getting Irish Business On-line' is a joint programme from Google, Blacknight, An Post and the National Network of County and City Enterprise Boards which aims to help Irish businesses benefit from the opportunities of the internet.</p>

Country	Strategy / Activity	Description
Canada	<a href="#">Digital Canada 150</a>	<p>This programme offers Irish businesses a free website/domain for one year and provides ongoing hints/tips via email and free expert Google AdWords phone support.</p> <p>'Digital Canada 150' is a national strategy aimed at ensuring Canada is able to take full advantage of the opportunities of the digital age.</p> <p>Aiming to improve digital connectivity by 2017, this strategy is built on five key pillars; 'Connecting Canadians', 'Protecting Canadians', 'Economic Opportunities', 'Digital Government', and 'Canadian Content'.</p> <p>As part of the 'Economic Opportunities' pillar, the Canadian government has allocated substantial funds to the Business Development Bank of Canada to help SMEs adopt digital technology.</p>
	<a href="#">Business Development Bank of Canada</a>	<p>The Business Development Bank of Canada (BDC) is a financial institution owned by the Government of Canada who supports over 30,000 small and medium-sized enterprises across the country.</p> <p>In 2014, the BDC provided \$200m in financing to SMEs pursuing the adoption of digital technologies.</p>
US	<a href="#">US Small Business Administration</a>	<p>The U.S. Small Business Administration (SBA) provides loans, loan guarantees, contracts, counselling sessions and other forms of assistance to small businesses.</p> <p>As well as offering useful hints and tips to help businesses get online, the SBA also provides short videos where experts and entrepreneurs discuss how taking advantage of the latest technology can help business operation.</p>
	<a href="#">Small Business Development Centres</a>	<p>Funded in part by the United States Congress through a partnership with the U.S. Small Business Administration, Small Business Development Centres provide free or low-cost up-to-date training.</p> <p>Topics of support include; writing business plans, accessing capital, marketing, regulatory compliance, <b>technology development</b>, international trade.</p>