spreading the benefits of digital participation

April 2014
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Over the past two decades, the digital revolution has reached across the globe and into every part of our daily lives. For those of us who are online, the wealth of information available and the channels through which we can connect and communicate, empower us to make better informed decisions, to realise our ambitions and to exercise our right to freedom of expression. For society, digital technologies offer much-needed opportunities to make our public sector more sustainable, our civil society more cohesive and to stimulate our economy.

But Scotland – like every other nation – must manage its digital transformation. How can we ensure that everyone can participate in and benefit from the digital society? How can we design and deliver sustainable public services that are accessible for all? How can we support our businesses to make the most of digital opportunities? And what role does Government have to play in creating an environment in which the benefits of being online are not outweighed by the risks?

Digital participation has become, in recent years, a growing policy focus. There have been a number of welcome developments and initiatives in Scotland. However, this activity must be part of a bigger picture: a strategic approach that will make the most of digital technologies in all sectors, while ensuring that no-one is left behind.

The Royal Society of Edinburgh, as an independent and impartial body with access to a broad range of expertise, is well placed to take such a rounded view. This Inquiry, launched in February 2013, has gathered a wealth of evidence from across Scotland and across sectors. The Report sets out a comprehensive overview of the current use of digital technologies in Scotland, the barriers to increased participation, and the responsibilities of a digital society. It makes recommendations, to the UK and Scottish Governments and their private and third sector partners, on the steps to be taken to harness digital technologies for maximum benefit. We hope that this evidence base and these recommendations continue to inform the development of policy and activity in Scotland.

I would like to offer the RSE’s sincere thanks to Professor Michael Fourman and Professor Alan Alexander for their dedicated and dynamic leadership of the Inquiry, and to the Inquiry Committee for devoting their considerable expertise and experience, along with a huge amount of time, to such a sizeable, but important, task.

Sir John Arbuthnott MRIA PRSE
President, The Royal Society of Edinburgh
Financial Support and Thanks

The Royal Society of Edinburgh is an independent charitable organisation and the funding for this Inquiry therefore had to be raised from a variety of sources. We are most grateful to the organisations below, without their support this Inquiry could not have been undertaken.

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The Binks Trust
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Creative Scotland
City of Edinburgh Council
Pulsant
The Scottish Cities Alliance
Scottish Enterprise
Scottish Government

In addition, we would like to extend our thanks to EDINA, the University of Edinburgh, the National Library of Scotland, the Scottish Council for Voluntary Organisations, the Scottish Qualifications Authority and Scotland’s Rural College (SRUC) for allowing their members to participate in the Committee of Inquiry.

Finally, we would like to most wholeheartedly extend our thanks to all of those organisations and individuals who took the time to respond to the Inquiry, whether through attending events, submitting written evidence, commenting on the Interim Report or providing expert advice, guidance and feedback as we developed the Report. It was enormously helpful to hear about the experiences of those on the ground who are supporting people to get online in Scotland.
Executive Summary

Two key principles for digital participation

1. The Scottish Government must recognise that every individual has an undeniable right to digital inclusion and must assume overall accountability to ensure that it is available and accessible to all.

2. Governments must respect and protect our rights and freedoms online, as well as offline.

Digital technologies are not merely new forms of communication; they are transforming societies and economies around the world. Digital offers new opportunities for education, health and economic and social wellbeing for people and organisations that are online. Those who remain offline, however, risk being increasingly excluded from society and the economy.

People least likely to be online are those facing other, often multiple, forms of social isolation. In particular, levels of digital uptake are significantly lower amongst older people, people with disabilities and people living in deprivation. If barriers to digital participation are not addressed, there is a looming danger that the digital divide will further increase inequality by entrenching existing social divides.

Our first principle calls for universal digital inclusion. With the technologies currently available, Government views 100% inclusion as prohibitively expensive, and therefore ‘universal’ in practice is taken to mean 95% or 98% of the Scottish population as a whole. Evidence provided in this report (Section 1.2) emphasises the real danger that such targets leave the door open for existing inequalities to go unaddressed. If the remaining offline 2% or 5% are concentrated in low socio-economic groups or in specific isolated geographies, then ‘universal’ digital inclusion will not be conducive to a fair society.

Barriers can be broadly categorised under a lack of affordable access to the internet, a lack of motivation to go online and/or a lack of skills to do so effectively and safely. The Scottish Government has a responsibility to ensure that its digital participation strategy delivers these key elements in such a way that uptake is equitable across demographic groups and geographies. The measures we identify below must apply across all sectors of society.

Access

Key Finding: The Step Change programme of infrastructure investment will radically but still inadequately improve Scotland’s digital connectivity. Without substantial further investment, some 400,000 households in Scotland will still suffer from inferior connections in 2020. Furthermore, many vulnerable and marginalised individuals and households cannot afford the devices and connections required to make effective use of the internet.

Key Recommendation: The Scottish and UK Governments and regulators have a responsibility to ensure that every individual and organisation has access to affordable, fit-for-purpose digital infrastructure, as recommended in the RSE’s Digital Scotland 2010 report. In particular, they must ensure that there is open access to the publicly-subsidised ‘middle-mile’ fibre infrastructure in Scotland.
Executive Summary

Vision:
➢ That digital infrastructure (fixed broadband and Wi-Fi) capable of delivering symmetric, low latency connectivity to individuals and businesses now and in the future, is in place across Scotland.
➢ That wholesale access to this core infrastructure is made available to all potential providers of digital services.
➢ That new architectures and business models for affordable internet connections are widespread.
➢ That public access to publicly-held connections and devices, such as in libraries and schools, is made best use of.
➢ That online public services are fully accessible to all.

Potential measures:
➢ Percentage of premises/households/SMEs within reach of fit-for-purpose infrastructure; number of connections; speed of connections available to all in relation to the median speed enjoyed by most, as well as comparable latency and symmetry.
➢ Number of hours available for public use of publicly-held devices and connections.
➢ Number of public buildings and spaces with Wi-Fi.
➢ Percentage of transactions with government carried out online.

Motivation

Key Finding: If the majority of people with whom an individual or organisation wishes to communicate and associate are online, that individual or organisation is more likely to feel motivated to be online (the ‘network effect’). Local interventions tailored to the interests of particular communities and targeted at gaining a critical mass of participation within those communities are essential to motivating everyone to get online. Local action, however, must be coordinated at national level to avoid duplication and to ensure that efforts and resources can be strategically directed to match the scale of the problem.

Key Recommendation: The Scottish Government, local authorities, the third sector and private sector partners, led by SCVO 1, must recognise the importance of the network effect and local interests and develop initiatives for local action on digital participation aimed at community level. A large part of this will be about scaling up and accelerating initiatives that are already happening. A national framework should provide coordination, support and resources for local initiatives.

Vision:
➢ That every individual, organisation and community (geographic or of interest) understands the capabilities and relevance of digital tools. Everyone who has access to affordable, fit-for-purpose infrastructure, is enabled to connect to the internet and use it effectively as and when they need to.
➢ That all SMEs and third sector organisations have strong digital capability and can use digital tools to meet their objectives.
➢ That digital channels of service delivery are clear and easy to use.

1 The Scottish Council for Voluntary Organisations, www.scvo.org.uk
Executive Summary

Potential measures:

- Number of connections or percentage of households online (uptake as an indicator of motivation).
- Percentage of SMEs and organisations using digital.
- Percentage of public sector transactions online.

Education, Skills and Training

Key Finding: Information literacy is essential in the modern information age; literacy, numeracy and digital skills are required by everyone if they are to effectively find and use information and enjoy their right to personal expression. Provision of these skills to all adults and young people in Scotland is urgently required. A fundamental understanding of computing science is needed by a minority in a digital society; Scotland’s education system has made advances in this area in recent years, but further progress is required.

Key Recommendation: The Scottish Government must take a national lead and coordinating role in ensuring that Scotland’s young people, adults, businesses and organisations have the information and digital skills required for a thriving 21st-Century digital society through formal education, workplace learning and lifelong and community learning. The numerous organisations involved in the delivery of information and digital skills support must ensure that their staff are appropriately resourced, equipped and skilled.

Vision:

- That everyone in Scotland has the information and digital skills required to participate in the digital arena and prosper from digital opportunities.
- That sustainable online and peer support for continuing learning and development of information and digital skills throughout all stages of life is in place.
- That information and digital skills are embedded across the curriculum and from pre-school to tertiary.
- That computing science (CS) is taught and recognised on a par with other sciences.
- That small and big businesses are able to access a workforce with the skills needed to exploit digital tools and opportunities.

Potential measures:

- Percentage of people with basic online and information skills, both overall and within different demographic and geographic groups.
- Number of learning opportunities across communities in Scotland.
- Percentage of students taking CS in schools.
- Employment rates of CS graduates.
- Percentage of positions industry is able to fill.
Responsibilities of a digital society

The internet provides new opportunities for economic, political and social interaction; everyone has the opportunity to communicate and collaborate with anyone online. However, technology has so altered our capacity to acquire, store, process and communicate information that a number of issues that underpin modern society must be revisited: surveillance, anonymity, trust, copyright, privacy and freedom of speech, to name a few. This Inquiry had neither the remit nor the breadth and depth of legal and ethical expertise to explore the complex challenges that face society in countering the threats of digitisation while taking full advantage of the potential opportunities. But as concerns on privacy, data protection and cyber crime act as significant deterrents to digital participation, we call on governments to respect and protect our rights online. The Scottish Government should establish the framework necessary to ensure considered democratic oversight of the effects of the increasing digitisation of every aspect of commerce and society.

Scale and cost

Around one-quarter of Scotland’s population (some 1.3 million people\(^2\)) are either not online or lack the basic digital skills needed to participate effectively and safely in the digital arena. Yet these skills are a basic pre-requisite for a thriving 21st-Century society.

If Scotland is to achieve its aspiration to become a ‘world-class digital nation’ by 2020\(^3\), it will require a commitment to investment (on a par with that made to digital infrastructure) in accessibility, motivation and skills initiatives to increase digital participation. Latest analysis suggests an additional £875m is required to deliver basic digital skills to everyone in the UK by 2020\(^4\), over and above the capital expenditure required for infrastructure and devices. A basic calculation based on the proportion of people in the UK lacking basic online skills living in Scotland puts this at over £100m for Scotland. Further efforts to ensure that Scotland’s citizens, society and organisations are positioned to take full advantage of digital opportunities will require additional resourcing.

Timescales

Equipping everyone with the access and skills needed to participate in the digital arena must be an urgent priority for government and for society as a whole. Internationally, the digital revolution is driving innovation, growth and competitiveness. A strategic and holistic approach to the embedding of digital in our society and economy is needed if Scotland is truly to be ‘world-class’ in digital by 2020.

The necessity of immediate action is also a result of the fast-moving drive by government to digitise channels of public service delivery over the next 4–6 years. Such a fundamental shift must be matched by a corresponding push to ensure that people have the skills needed to use digital channels. The recommendations put forward in this Report should therefore be considered in this timeframe, with significant progress on levels of digital participation made by 2020.

\(^2\) Ipsos Mori for BBC, September 2013, Media Literacy: Understanding Digital Capabilities, Follow Up
http://www.bbc.co.uk/learning/overview/assets/bbcmedialiteracy_20130930.pdf

\(^3\) Scottish Government, March 2011, Scotland’s Digital Future: A Strategy for Scotland,
http://www.scotland.gov.uk/Publications/2011/03/04162416/12

\(^4\) Tinder Foundation, February 2014, A Leading Digital Nation by 2020: Calculating the cost of delivering online skills for all,
http://www.tinderfoundation.org/sites/default/files/research-publications/a_leading_digital_nation_by_2020_0.pdf
Executive Summary

This Inquiry


But having the right infrastructure in place is merely a means to an end. In February 2013, the RSE launched an Inquiry to examine how Scotland should maximise the benefit that infrastructure brings to society, individuals and organisations. This Inquiry set out to:

- understand the potential societal benefits of digital technologies and how Scotland might realise these;
- highlight the social and economic risks of a growing digital divide;
- identify the barriers preventing increased digital participation and engagement; and
- identify policies and actions that could overcome these barriers and maximise the benefits of a Digital Scotland.

Bringing together expertise from informatics, public sector management, social media, social science, education and the voluntary sector, the Inquiry Committee spent much of 2013 gathering evidence and views on these questions from across Scotland and across sectors. We examined literature and research and took expert evidence from organisations such as the Tinder Foundation, the Carnegie UK Trust and Citizens Advice Scotland. We held a series of consultation sessions, through which we consulted over 250 individuals across Scotland, from Hawick in the Borders to Lerwick in Shetland. We met with high school pupils in Glasgow and North Berwick; with individuals and representatives from local communities in 12 Scottish towns and cities; and with representatives from a broad range of sectors, including education, health, local government, housing, the creative industries, eCommerce, the third sector and people working with older people and people with disabilities. At our local area consultations, we gathered feedback on local issues affecting public, private and third-sector bodies. We also invited responses to a series of questions via online and postal forms and gathered written evidence from stakeholders and sector representatives such as BT and the Scottish Council for Voluntary Organisations.

In December 2013, we published an Interim Report of our emerging conclusions and recommendations for further consultation. That Report set out a picture of the potential benefits of the digital revolution for Scotland, and identified barriers to digital participation falling broadly under a lack of affordable access, a lack of motivation to get online and/or a lack of skills to do so confidently, creatively and safely.

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Further active debate and discussion on that Interim Report was very welcome and has allowed us to refine and strengthen our conclusions and recommendations under the headings of access, motivation and skills (Sections 2, 3 and 4). To this we add a new section (Section 5) on the responsibilities of a digital society: the difficult questions that must be acknowledged and addressed by both Government and citizens as digital transforms every aspect of society. And finally, we ask what is it that a 21st Century society might want to achieve in the foreseeable future and what role can digital technologies play (Section 6)? Focusing on a number of key sectors, we present the evidence we have received on the opportunities of digital, current developments and the challenges that remain.

For a number of years, efforts have been made, in Scotland and across the UK, to equip people with the skills they need to get online. Since the conception of this Inquiry, the need to support digital participation – over and above the delivery of digital infrastructure – has come into sharp focus amongst policy makers. We expect digital participation strategies from both the Scottish and UK Governments in April 2014. We are pleased to offer this Report as an independent and objective addition to what is now an active and dynamic movement on digital participation. As efforts are stepped up to ensure that everyone can benefit from the transformation to a digital society, we hope that the recommendations we set out continue to inform their development.

All evidence received can be found on the RSE website:
http://www.royalsoced.org.uk/1058_SpreadingtheBenefitsofDigitalParticipation.html
Introduction: a 21st Century Society

Digital technologies provide new ways to collect, process, communicate and analyse information, and information is the lifeblood of society. The Special Rapporteur to the Human Rights Council of the United Nations has recognised ‘the unique and transformative nature of the Internet, not only to enable individuals to exercise their right to freedom of opinion and expression, but also a range of other human rights, and to promote the progress of society as a whole.’

A successful digital society will have economic and social advantages. The economic arguments are well-rehearsed: operational efficiencies for organisations in all sectors; extended reach to new markets; consumer access to the best deals for goods and services; an innovative and more competitive economy. The social aspect is less well documented but equally as important: the potential for greater social cohesion; a population better-equipped to make well-informed decisions in all aspects of life; equality of opportunity; a strong national identity and fertile culture.

The digital revolution will continue to provide new opportunities for education, health and economic and social wellbeing to those who are online. Offline access to many goods and services will become increasingly rare and expensive. Any who remain offline will be increasingly excluded from society and the economy. Current trends suggest that it is already those facing some other factor[s] of exclusion who are most likely to be offline, creating a vicious circle.

Key Principle: The Scottish Government must recognise that every individual has an undeniable right to digital inclusion and must assume overall accountability to ensure that it is available and accessible to all.

‘Universal’ digital participation is in practice often taken to mean that 95% or 98% of the population will be online. With the technologies currently available, 100% inclusion is viewed by government as prohibitively expensive. Evidence provided in this report on the current picture of digital exclusion in Scotland (Section 1.2), highlights that exclusion is already concentrated in groups that face some other form of isolation, either geographic or social. If the remaining 5% or 2% of the population that aren’t covered by national digital participation strategies are concentrated in low-socioeconomic groups or in specific isolated geographies, then as a nation we have failed those whom we have the greatest obligation to support.

Our Interim Report identified that every individual and all organisations must have unfettered access to digital infrastructure and the motivation and skills to use digital tools effectively and safely. Most of the recommendations set out in this Report, structured around access, motivation and skills, were outlined in the Interim Report. We are delighted that some of them have already been included in working drafts of the Scottish Government’s forthcoming strategy for digital participation.

However, it has become increasingly clear that the Scottish Government must consider not only the opportunities that a digital society presents, but also the potential impacts on individual and organisational rights and freedoms.

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7 United Nations General Assembly, 10 August 2011, Report of the Special Rapporteur on the promotion and protection of the right to free of opinion and expression A/66/290.
8 See, for example, the Scottish Government’s target of fibre broadband provision to 95% of premises by 2017 under the Step Change programme, http://www.digitalscotland.org/superfast-broadband/the-project/
Introduction

The thrust of our additional argument is that Scotland must address a difficult task. In framing policies that enable a digital society to prosper, it is necessary to create an inhospitable environment for abuse. But it is also necessary to ensure that we protect individual and organisational rights and freedoms online, just as we strive to do offline. In Scotland, as elsewhere, we need to think about the transformation to a digital society in a much more strategic and holistic way than we have done so far.

Key Principle: Governments must respect and protect our rights and freedoms online, as well as offline.

A comment on the scale and cost of the challenge

In light of the growing body of evidence on the societal and economic benefits of a digital society, there is a clear interest at national level to ensure that everyone is online. At present, over 800,000 households are not online and around 1.3 million people in Scotland do not have the basic digital skills needed to use the internet effectively and safely. The scale of the challenge must not be underestimated.

In February 2014, a Tinder Foundation report put the cost of delivering basic digital skills to all of the UK by 2020 at £875 million, additional to existing skills and support initiatives. More work would need to be done for an accurate Scottish figure, but simply looking at the proportion of people in the UK lacking basic online skills who live in Scotland, this figure would be over £100m.

The model used by the Tinder Foundation does not take into account the costs of infrastructure (some £410m has been committed to Scotland’s digital infrastructure plan); or the costs of hardware, software or broadband connections. Nor does it explicitly consider the support needed by SMEs or not-for-profit organisations. However, it does begin to indicate the order of magnitude of the resources needed to bridge the digital divide.

Many of the actions we put forward in this Report call for a strategic approach to the transformation to a digital society and the coordination of efforts to ensure that everyone has the access, motivation and skills required to get online. This will require better coordination and more effective distribution and application of resources that already support learning and development initiatives. But beyond this, a further commitment to investment in accessibility, motivation and skills initiatives to increase digital participation will be required on a par with that made to digital infrastructure. The public sector, the private sector and the voluntary sectors will all have a role – and indeed a responsibility, where they will be direct beneficiaries of increased digital engagement – to contribute to these efforts.

A comment on timescales for addressing the challenge

Achieving full digital participation is an immediate imperative. Until everyone is online, a growing digital divide increasingly serves to exacerbate existing inequalities and deprivation. The capabilities and uses of digital technologies change and evolve rapidly. Seldom does a day go by without some reference in the media to digital issues and digital developments. International progress on digital participation and the effective use of digital technologies intensifies economic competition as nations strive to gain advantage.

9 Ipsos Mori for BBC, September 2013, Media Literacy: Understanding Digital Capabilities, Follow Up http://www.bbc.co.uk/learning/overview/assets/bbcmedialiteracy_20130930.pdf
11 For more information see Scottish Government, http://www.scotland.gov.uk/Topics/Economy/digital/action/Makingprogress
Introduction

At both UK and Scottish levels, government policy is currently a key driver in the urgency to get everyone online:

- The (UK) Government Digital Service has been tasked with digitising 25 key services by 2015\textsuperscript{12}.
- The Department of Work and Pensions has set a target of 80% of Universal Credit applications to be completed online by 2017\textsuperscript{13}.
- The Scottish Government has set out an ambition for Scotland to be a ‘world-class digital nation’ by 2020\textsuperscript{14}.
- The Scottish Government and partners aim to bring next generation broadband to 95% of premises in Scotland by 2017.

The achievement of these goals will require a significant improvement in levels of digital uptake and basic online skills. The recommendations and actions we put forward in this Report should broadly, then, be considered within these timescales.

An exception to this timeframe is considered in Section 4 ‘Education, skills and training’, where we discuss the teaching of computing science in schools. The current incremental, research-based approach to developing CS qualifications in Scotland, combined with the constant revision that will be required to reflect the new learning and understanding that comes as pupils progress through the system, means that this is a long-term issue that will span some 10–15 years.

Finally, we comment that the astonishing rapidity with which digital issues move forward in both the national and global arenas entails that Government and other bodies cannot afford to sit back and take their time if Scotland’s digital future is to be secured. As set out in Section 5, a 21st-Century digital society faces many complex challenges and responsibilities; addressing the intended and unintended consequences of the digital transformation will require a long and difficult journey, but one that must be urgently begun.

\textsuperscript{12} For more information see Government Digital Service, https://gds.blog.gov.uk
The Scottish Context

1.1 The Scottish Government’s ‘Digital Ambition’

Digital engagement is a matter of individual choice and circumstance. However, many of the benefits are felt collectively. So, just as for immunisation, where the ‘herd’ effect increases effectiveness, there is a common interest in extending participation. For this reason, there is a role for society, through its institutions – public, private and third sector – to enable and foster participation, by ensuring the adequacy of the physical infrastructure, and by stimulating effective use of the internet by individuals and organisations.

In October 2010, the Scottish Government published *A Digital Ambition for Scotland*[^15]. It recognised that, "by harnessing advances in this area we can help:"

1. give our young people the best start in life and prepare them for success in a 21st-Century marketplace;
2. boost people’s job opportunities;
3. ensure that Scottish businesses can benefit from a first-rate broadband infrastructure that allows them to thrive in markets both at home and abroad;
4. showcase and promote our country’s rich cultural assets; and
5. generate savings to the national purse by promoting the take up of public services online."

The strategy also set ambitious goals:

- That next generation broadband will be available to all by 2020 with an interim milestone to close the digital divide;
- That the rate of broadband uptake by people in Scotland should be at or above the UK average by 2013, and should be highest among the UK nations by 2015.

Scotland has already achieved a great deal, but ONS data show that we did not reach the 2013 goal[^16] and international comparators suggest that we must aim to do more.

The stated aim of both the UK Government and the Scottish Government is to eliminate the so-called ‘digital divide’ between those for whom digital participation has become an integral part of daily life and those who remain excluded. Although some of the funding comes from the UK Government, the development and implementation of strategies to address the digital divide is largely devolved.

In 2011, the Scottish Government published *Scotland’s Digital Future*[^17] and in early 2012 established a Directorate for Digital, working under the Director-General Enterprise, Environment & Digital. The Directorate set out to develop this strategy and to coordinate its implementation by “focusing on four key areas to achieve Scotland’s digital ambition: public service delivery; the digital economy; digital participation; and broadband connectivity”.

The goals set out in the strategy are laudable: world-class digital infrastructure; a public sector that makes best use of digital technologies to deliver high-quality services; a business sector in which all companies make effective use of digital technologies; and citizens who are confident and capable users of digital technologies. However, it is important to temper Scotland’s ambitions with a realistic assessment of the characteristics of the continuing digital divide. In particular, the most vulnerable and deprived sectors of society experience greatest digital exclusion. Until we address this exclusion, digital public services targeted at these customers are likely to yield neither savings nor benefits.

The Scottish Context

Until digital inclusion is universal, the public sector will not be able to realise the full efficiencies of moving its services online; many of Scotland’s businesses will struggle to compete; and people in Scotland who do not have the access, motivation or skills to participate in the digital society will face growing exclusion from an increasingly digital society.

We should not underestimate the difficulties. Ten percent of Scotland’s population is thinly spread in remote rural and island communities. This presents a particular challenge to the market-driven roll-out of suitable infrastructure. Scotland also has pockets of multiple deprivation within many of its urban areas, including Glasgow City, Edinburgh City, West Lothian and Aberdeen City. These communities have particularly low rates of digital participation.

Various initiatives across Scotland, aimed at increasing digital participation, are already addressing some of these issues, often supported by mobile or fixed-line internet service providers. These include:

- initiatives by the two enterprise agencies, Scottish Enterprise and Highlands and Islands Enterprise;
- initiatives by local authorities;
- initiatives by voluntary organisations; and
- initiatives by social housing providers, mainly housing associations.

We describe some of the best examples of these initiatives in boxes elsewhere in the Report. We also highlight the urgent need to coordinate and replicate such activity if we are to bridge the digital divide (Section 3, Section 4).

Despite this good work, Scotland continues to lag behind the UK as a whole in digital connectivity. According to Q1 2013 data from Ofcom\(^\text{18}\), home internet access in Scotland stands at 76%, as compared to a UK average of 80%.

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\(^{18}\) Ofcom, August 2013, *Communications Market Report 2013*
http://stakeholders.ofcom.org.uk/binaries/research/cmr/cmr13/2013_UK_CMR.pdf
http://stakeholders.ofcom.org.uk/binaries/research/cmr/cmr13/2013_CMR_Scotland.pdf
## International comparators

**Figure 1.1** Broadband uptake by nation

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<th>Country</th>
<th>Internet users</th>
<th>Households with internet</th>
<th>Population thousands</th>
<th>Land area km²</th>
<th>Population per km²</th>
<th>GDP per capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. Korea</td>
<td>84%</td>
<td>97%</td>
<td>49,039</td>
<td>100,000</td>
<td>490</td>
<td>$33,000</td>
</tr>
<tr>
<td>Iceland</td>
<td>96%</td>
<td>95%</td>
<td>317</td>
<td>103,000</td>
<td>3</td>
<td>$41,000</td>
</tr>
<tr>
<td>Norway</td>
<td>95%</td>
<td>93%</td>
<td>5,148</td>
<td>324,000</td>
<td>16</td>
<td>$55,000</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>92%</td>
<td>93%</td>
<td>521</td>
<td>2,600</td>
<td>200</td>
<td>$78,000</td>
</tr>
<tr>
<td>Sweden</td>
<td>94%</td>
<td>92%</td>
<td>9,724</td>
<td>450,000</td>
<td>22</td>
<td>$41,000</td>
</tr>
<tr>
<td>Denmark</td>
<td>93%</td>
<td>92%</td>
<td>5,569</td>
<td>43,000</td>
<td>130</td>
<td>$38,000</td>
</tr>
<tr>
<td>Netherlands</td>
<td>93%</td>
<td>94%</td>
<td>16,877</td>
<td>41,000</td>
<td>412</td>
<td>$41,000</td>
</tr>
<tr>
<td>UK</td>
<td>87%</td>
<td>80%</td>
<td>63,743</td>
<td>234,000</td>
<td>272</td>
<td>$37,000</td>
</tr>
<tr>
<td>Scotland</td>
<td>86%</td>
<td>76%</td>
<td>5,314</td>
<td>78,000</td>
<td>68</td>
<td>$41,000</td>
</tr>
</tbody>
</table>

**Sources:** Internet users, ITU Internet Users 2012[^19]; Home internet, ITU Households with Internet Access (HH6)[^20], Ofcom[^21][^22]; Population, Land area, GDP, CIA World Factbook[^23], General Register Office Scotland[^24], Office of National Statistics[^25], Scottish Government[^26]; Population Density, computed. The Eurostat figures, on which the figures for households with internet in other European countries are based, give uptake for households that include at least one adult under age 74, whereas the Ofcom and Scottish Government figures refer to all households.

Scotland’s current ambition for digital uptake is to catch up with the rest of the UK. If we are to compete with our international neighbours, our target must be higher. Norway, Luxembourg, Sweden and Denmark all have internet penetration above 90%. Scotland’s ambition should be to join this group.

Korea, Luxembourg, Denmark and the Netherlands have higher population densities and gentler geographies than Scotland. However, Iceland, Norway and Sweden demonstrate that low population densities and rugged geography are not insuperable barriers to near-universal access.

[^22]: We note that the ITU reports a figure of 89% for Households with Internet access in the UK. However, we take the Ofcom figures as authoritative. The Ofcom figure for Scotland coincides with results from the Scottish Household survey, and is consistent with our own estimates from the underlying data.
[^23]: For more information see [https://www.cia.gov/library/publications/the-world-factbook/ consulted April 2014](https://www.cia.gov/library/publications/the-world-factbook/)
The Scottish Context

The Scottish Government’s Digital Participation Strategy

At the time of going to print, we have seen working drafts of the Scottish Government’s Digital Participation Strategy, expected to be published in April 2014. We are pleased to see that the approach set out in the draft reflects some of the recommendations of our Interim Report. In particular, our Interim Report and this Final Report identify the need for Government to take a leadership role, but with a nationally coordinated programme that gives plenty of scope for local action and innovation (a ‘national framework for local action’, see Section 3 Motivation and Section 4 Skills). The Scottish Government, in the draft strategy, through its partnership with SCVO’s Digital Participation team and through the Digital Participation Charter\(^{27}\), recognises the need for coordination and the vital role of local intermediaries. We look forward to seeing how the approach is put into practice. We hope that the refined recommendations and actions in this Final Report will continue to inform the development and implementation of the national strategy.

We highlight two key areas of this Report that do not yet, however, appear to be reflected in current Government thinking. First, that while the Step Change programme will deliver improved digital infrastructure for many, it will not solve the barrier of a lack of access (available infrastructure) for all, and this deficit will only grow in time (Section 2.1). Second, that Government must take strategic oversight of the responsibilities of a digital society and create an environment in which individuals’ rights are respected and protected online, whilst creating conditions to minimise abuse (Section 5).

We look forward to seeing the UK Government’s digital participation strategy, which is also expected in April.

Not everyone can get online

Throughout this report we call on the Scottish Government and partners to aim high in the drive for increasing digital participation. Such ambition is required if Scotland’s citizens and organisations are to be equipped for life in the digital society and if Scotland is to be competitive on the international stage. However, we also call on both the UK and Scottish Governments, in developing and implementing the digitisation of public services, to recognise that there are a number of people who cannot get online now and will never be able to get online in the future.

At present, some of this group are people whom society deems should not have access to the internet: those currently being held in Scottish and UK prisons. A number of other inquiries have considered the current, limited, use of ICT in prisons, including the Justice Committee of the Scottish Parliament in its Inquiry into purposeful activity in prisons\(^{28}\). A 2013 UK-level report, Through the Gateway\(^{29}\), sets out in detail the potential benefits digital could offer in respect of rehabilitation, maintaining family ties and learning opportunities; the barriers around security, financial constraints and insufficient central resources; and how these might be overcome. We have identified the need for the Scottish Government to recognise that every individual has an undeniable right to digital inclusion. We therefore add our voice to those urging the Government, together with the Scottish Prison Service, to examine the issue with a view to reforming the use of digital in prisons.


Others, however, are ‘permanently’ excluded for different reasons. In the course of this Inquiry, we met with some individuals for whom the internet was a harmful addiction, and others fearful that their digital footprints might be abused by the security services in their home country, in this case Iran. We also came across instances of people with disabilities, whether physical or mental, who will never be able to use the internet. In one instance, for example, we heard the story of someone who has substantial anxiety issues around technology and who cannot use computers or have such technology in her home, despite numerous efforts and support provided by her family.

Throughout this Inquiry, we have frequently heard the question: must everyone go online? Some individuals who remain offline have no wish to change. In part, this reluctance may be overcome by actions discussed in Section 3 (Motivation) and Section 5 (on the responsibilities of a digital society to create an online environment in which risks are minimised). But a small proportion will never perceive the benefits of going online as outweighing the drawbacks.

We suggest that digital skills, in today’s society, are now as important as literacy, numeracy and information literacy. The reality is that those without digital skills will be increasingly excluded from opportunities that will be available only online, or only to those who are able to use digital technologies. Increasingly, there are no offline channels for enquiries, complaints, orders or job applications. Those who choose to remain offline can do so, but companies can choose their customers, and it is often more profitable to deal only with those who are online.

Public services are different: they must be accessible to all. Whilst recognising that digitisation has the potential to deliver sustainable, responsive public services, government at all levels must ensure that proportionate access to offline channels and support remains in place for those who will never be able to get online or choose not to. The (UK) Government approach to assisted digital policy outlines a framework through which offline individuals will be supported, in person or by telephone etc., either to put their data into the digital service themselves, or have someone else input data for them. We urge both the UK and Scottish Governments to work closely with the representatives of groups who cannot get online, to ensure that support is developed with these users’ needs at the core of design from the outset.

30 Government Digital Service, December 2013, Government approach to assisted digital
The Scottish Context

1.2 A closer look: the picture of digital exclusion in Scotland

A first measure of digital inclusion is the uptake of fixed broadband. Access via a fixed home connection is neither necessary nor sufficient for effective digital inclusion. Nevertheless, communities in which such access is rare are at significant disadvantage. For example, children without internet access at home are educationally disadvantaged. Alternative forms of access to goods and services may not be available to those with limited mobility, or those living far from urban centres. Businesses that are not online suffer a competitive disadvantage.

Whilst data on internet use is limited, there are data that give some indication of uptake, and this allows us to study in some detail the relationships between digital exclusion, geography and other aspects of deprivation across Scotland. We find that there are pockets of extreme digital deprivation, some in remote areas, but most located in the most deprived areas of urban Scotland.

The Scottish Index of Multiple Deprivation (SIMD)\(^{31}\) ranks small areas (datazones, each including around 20 postcodes) across all of Scotland from most deprived to least deprived. To study the relationships between deprivation, provision and uptake in Scotland, we combine data from three sources. Ofcom data give the number of lines and the median download speed for each household\(^{32}\). Census data give the number of households in each postcode\(^{33}\). SIMD data give the scores for each datazone, for each of the seven factors of deprivation shown in Figure 1.2.

Figure 1.2

Indicators in the SIMD 2012 domains

<table>
<thead>
<tr>
<th>Income</th>
<th>Access</th>
<th>Education</th>
<th>Housing</th>
<th>Crime</th>
<th>Employment</th>
<th>Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults receiving Income Support or Income-based Employment and Support Allowance</td>
<td>Drive time to a GP</td>
<td>Pupil performance on SQA at stage 4</td>
<td>Percentage of people living in households which are overcrowded</td>
<td>Domestic housebreaking</td>
<td>Working age unemployment claimant count averaged over 12 months</td>
<td>Standardised Mortality Ratio</td>
</tr>
<tr>
<td>Children dependent on a recipient of Income Support, or Employment and Support Allowance</td>
<td>Drive time to retail centre</td>
<td>Drive leavers aged 16-19 not in education, employment or training</td>
<td>Percentage of people living in households without central heating</td>
<td>Crimes of violence</td>
<td>Working age Incapacity Benefit recipients or Employment and Support Allowance recipients</td>
<td>Comparative illness factor</td>
</tr>
<tr>
<td>Adults receiving Jobseeker’s Allowance</td>
<td>Drive time to a primary school</td>
<td>Schoolers aged 16-19 not in education, employment or training</td>
<td></td>
<td>Common assault</td>
<td>Working age Severe Disablement Allowance recipients</td>
<td>Emergency stays in hospital</td>
</tr>
<tr>
<td>Children dependent on a recipient of Jobseeker’s Allowance</td>
<td>Drive time to a secondary school</td>
<td>Schoolers aged 17-21 year olds enrolling into full-time higher education</td>
<td>Working age adults with no qualifications</td>
<td>Sexual offences</td>
<td>Hospital stays related to alcohol misuse</td>
<td></td>
</tr>
<tr>
<td>Adults and children in Working Families</td>
<td>Drive time to a post office</td>
<td>Schoolers aged 17-21 year olds enrolling into full-time higher education</td>
<td>Working age adults with no qualifications</td>
<td>Drugs offences</td>
<td>Hospital stays related to drug misuse</td>
<td></td>
</tr>
<tr>
<td>Tax Credit households whose Income is below 60% of median (£198/week)</td>
<td>Drive time to a petrol station</td>
<td></td>
<td></td>
<td>Vandalism</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adults aged 60+ receiving Guarantee Pension Credit</td>
<td>Public transport travel time to a post office</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public transport travel time to a GP</td>
<td>Public transport travel time to a petrol station</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>October 2013, Postcode Reference File,</td>
<td>Public transport travel time to retail centre</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

31 For more information see Scottish Government, http://www.scotland.gov.uk/Topics/Statistics/SIMD
32 Available at http://d2a9983j40kwzn.cloudfront.net/downloads/ofcom-uk-fixed-broadband-postcode-level-data-2013.zip
The Scottish Context

Details of our analysis of this data are given in Appendix III. The remainder of this section summarises our main conclusions. A first step is to relate the proportion of households offline to geography, deprivation, and connection speed.

Geography

We use the SIMD access score as a measure of isolation, scaled to range from 0 (least isolated) to 100 (most isolated). The Ofcom data tell us which postcodes have superfast and super-slow lines. Figure 1.3 plots four curves, showing how the proportion of households offline varies with isolation, for each of the four possible yes/no combinations of super fast and super-slow.

Figure 1.3 Across most of Scotland, uptake increases with isolation

Key Findings:

1. In areas of moderate isolation, uptake increases with isolation, suggesting that an internet connection has more value for those who are isolated;

2. In the most isolated areas the proportion of offline households increases, suggesting this is due to poor infrastructure.
The Scottish Context

Geography and deprivation

Figure 1.4 shows how the proportion of households offline varies with deprivation, within each of six urban-rural classifications. The key gives the number of households within each of these classifications.

Figure 1.4 Households in deprived and remote areas are more likely be offline.

Key Findings:

1. In urban areas, there is a clear linear relationship between uptake and deprivation; in more deprived areas there are more households offline;
2. within the most deprived communities (the bottom 15%), uptake is generally higher in accessible communities outwith urban areas;
3. in remote rural areas, we again see evidence that poor infrastructure limits uptake.

It is tempting to conclude that deprivation leads inevitably to digital exclusion. So one might think that to promote digital inclusion we should first address the causes of deprivation. However, digital inclusion can itself help to address several important domains of deprivation: income, employment, health, education. Furthermore, as we will see below, the evidence shows that, even in some of the most deprived data zones there are pockets of high uptake; so the barriers are not insuperable. Digital inclusion should therefore be tackled along with other aspects of deprivation.

34 The Scottish Government Urban/Rural Classification defines urban and rural areas across Scotland based upon population and accessibility.
**The Scottish Context**

**Speed, distance and demand**

The Ofcom data give a median speed for connections in almost every postcode. In Figure 1.5 we show how the proportion of households offline varies with median speed, within each SIMD decile. Each curve shows how the expected proportion of households offline varies with median speed, within a given SIMD decile. For each postcode we draw a dot on the curve corresponding to its SIMD decile, placed according to its median speed, and coloured according to its urban-rural classification. The area of each dot represents the number of households in the postcode. Median speeds greater than 30 Mb/s are rounded to 31.

**Figure 1.5** The effects of deprivation outweigh those of varying provision.

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**Key Findings:**

1. There is no correlation between median download speed and deprivation, it is not generally the case that broadband provision is better in more affluent neighbourhoods;
2. Demand often falls as speeds increase: we presume that this is because slow speeds are associated with isolation;
3. Speed does matter, but deprivation has a far more significant effect on uptake: in the most deprived decile more than 40% of households are offline, whatever the speed, whilst in the least deprived decile less than 20% of households are offline, even in super-slow postcodes.
The Scottish Context

How wide is the divide?

These various factors allow us to account for some of the variation in uptake between different datazones across Scotland. However, the variation between datazones does not provide an adequate measure of the digital divide. There is often a local divide within a single datazone: substantial variation in uptake, from one postcode to another, that cannot plausibly be explained by chance.

Such local variations are what we would expect if there is a ‘network effect’ in broadband uptake – that is, if you are less likely to go online if none of your neighbours is online, and more likely to go online when more of your neighbours are online.

Figure 1.6 shows how the probability of being offline varies from postcode to postcode, across Scotland. The area under the curve represents all the households in Scotland. Some (coloured dark green) live in postcodes where the probability of being offline is less than 10%; some (coloured dark purple) live in postcodes where the probability of being offline is greater than 80%. The intervening bands represent different probabilities of being offline. The rectangle has the same area, divided similarly.

Figure 1.6 Extremes of inclusion and exclusion are common.

We have suggested that, if we are to compete with our Nordic neighbours, Scotland should aspire to have more than 90% of households online. Our Figure shows that less than 10% of Scotland’s households are in postcodes with this level of uptake, and that 18% of households live in postcodes where most of their neighbours are offline.
As we have already seen, in deprived datazones there are more households offline. **Figure 1.7** shows how the probability of being offline varies across the various degrees of deprivation. We see evidence of a digital divide at every level of deprivation. At every SIMD level there are some postcodes where less than 20% of households are offline, and others where more than half the households are offline. However, the postcodes with the highest probability of being offline are concentrated in the most deprived areas of Scotland. (In Appendix III, we give a similar figure showing how the probability of being offline varies across the various degrees of isolation).

**Figure 1.7** *Extremes of exclusion are most common in the most deprived areas.*

To avoid a damaging social or geographic divide, it is important that those who remain offline should not be concentrated in one social group or geographic location. So any strategy for increased digital participation must start by addressing these extreme cases where most households are offline.
The Scottish Context

Factors of deprivation

The SIMD includes seven ‘domains of deprivation’. Not all of these contribute to digital exclusion. Indeed, we have already seen that moderate isolation increases uptake.

Key Finding:

1 low income and low employment correlate strongly with low broadband uptake; the significance of the remaining factors is weaker (and is discussed in Appendix III).

In Appendix III we also discuss variations between local authority areas (see Figure III.3). Overall, we find that ten local authorities have broadband uptake significantly higher than one would expect, once all of the SIMD factors of deprivation have been taken into account, and thirteen where uptake is significantly low. All things considered, we find that Dumfries and Galloway, the Scottish Borders, and North, South and East Ayrshire have particularly low uptake figures that call for the most urgent attention.

The Glasgow City example

Glasgow City accounts for more than two out of five of the most deprived 15% of the population of Scotland. In Glasgow City, one quarter of the working-age population claims key benefits. Such statistics are matched by high levels of digital deprivation. Ofcom’s 2013 Communications Market Report\(^{35}\) showed that in Glasgow City, only 57% of individuals accessed the internet by any means (fixed broadband, smartphone, or public provision in a private space), and only 52% had fixed broadband, far fewer than in any other UK city. Birmingham – where 75% access the internet, 73% with fixed broadband – comes closest.

A MORI study, commissioned by the Carnegie UK Trust, focused on the low uptake of fixed broadband in Glasgow\(^ {36}\). This study conducted ‘200 in-depth, face-to-face interviews with individuals broadly matching the characteristics of the main demographic groups least likely to have access to the internet’.

For this sample, cost was important: 40% said it is too expensive; and for 20% the primary reason for not going online was financial. Lack of knowledge and skills was commonly cited: 31% said the internet is too difficult to learn; 29% found the options confusing; and for 20% one of these was the primary reason. Fear is also common, with 32% worrying about privacy, spam and viruses. This figure is higher than other evidence might lead one to expect. Across the UK, Ofcom reports since 2005 have consistently found that such concerns are cited by less than 10% of non-users.

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The study also looked at the distinction, within the offline population, between potential users, interested in going online in the future, and rejecters, those who express no such interest. For many of the rejecters, a low level of trust in technology appeared as a significant barrier to going online. Although the sampling methods and small sample size in this study make rigorous extrapolation impossible, it is interesting to note that 57% of non-internet users said they would like to go online in the future. This figure is also higher than expected. Across the UK, the vast majority, 73%, of offline adults cite lack of interest as their main reason for not being online, whereas only 19% of the Glasgow sample said that there is nothing on the internet of use or interest for them, and 22% said, “It’s not for me”.

The study also looked at the distinction, within the offline population, between potential users, interested in going online in the future, and rejecters, those who express no such interest. For many of the rejecters, a low level of trust in technology appeared as a significant barrier to going online. Although the sampling methods and small sample size in this study make rigorous extrapolation impossible, it is interesting to note that 57% of non-internet users said they would like to go online in the future. This figure is also higher than expected. Across the UK, the vast majority, 73%, of offline adults cite lack of interest as their main reason for not being online, whereas only 19% of the Glasgow sample said that there is nothing on the internet of use or interest for them, and 22% said, “It’s not for me”.

The ‘Glasgow effect’ refers to the unexplained poor health and low life expectancy of Glaswegians compared to the rest of the United Kingdom and Europe. “As currently measured, deprivation does not explain the higher levels of mortality experienced by Glasgow in relation to two very similar UK cities.”

At a 2011 Ofcom briefing in Edinburgh, it was suggested that low levels of broadband uptake in Glasgow might also result from a Glasgow effect.

Our analysis shows that, once we allow for the combined effects of the various factors discussed above, uptake in Glasgow is actually slightly higher than we would expect.

Unfortunately, there are other areas with similar depths of deprivation. For example, in Clackmannanshire, Dundee City, East Ayrshire, Inverclyde, North Ayrshire, North Lanarkshire and West Dunbartonshire, the figure for those on key benefits is more than one in five. Our analysis shows that some of these communities are faring worse than Glasgow.

The Glasgow study tells us that access is an issue, largely because of cost; and motivation is an issue, often because perceived benefits do not outweigh fears of online threats or technology in general. This is confirmed by evidence we have gathered across urban, rural and remote Scotland, which also shows that literacy is a barrier for many who lack the confidence to go online and, more generally, that lack of skills often limits the benefits that even those who are online can derive from internet use.

Exclusion, age and disability: a closer look

There is a strong link between digital exclusion, age and disability. Recent statistics identify that 54% of the seven million adults in the UK who have never used the internet are people with disabilities; and that 46% are aged 75 or over. In Scotland, 2012 figures suggested that 79% of people over 75, and 41% of those aged 65–74, don’t use the internet, compared to an average of 22% across all age groups. The same survey identified that around half (46%) of people in Scotland with a long-term illness, health problem or disability do not use the internet, compared to 14% of those who do not have any of these conditions.

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The Scottish Context

These are two key groups for whom the barriers to digital participation are likely to be many and complex. Whilst the barriers of affordable access, lack of interest or lack of skills apply to all groups, there are potentially multiple factors that will add weight to such challenges for older people and people with disabilities. The costs of getting online can be more significant if assistive technologies are required, whilst incomes may be lower. People with disabilities are less likely to be in employment than those without a disability and more likely to have low levels of education. People aged 75 and over are more likely to have retired before the internet, email etc. became common features of working life. Older people may not have experience in processing the breadth and quantity of information that is available through digital channels. We heard that, for some older people, new forms of communication, such as email or social media, are considered as ‘noisy’, i.e. traffic is less well regulated and content may be less relevant or inappropriate.

With such low numbers of their peers online, people in these groups who are offline do not see a need to get online themselves, regardless of socioeconomic background. Nor do they hear anecdotal evidence on the benefits of digital from people in similar circumstances to themselves. We heard in evidence that over-75s rarely express an interest in being online. We also heard from many that fears and concerns over breaking technology or becoming the target of online fraud are given particular weight by older people.

Websites, software and devices are often not designed with the needs of older people or people with additional needs in mind. We were told that that some older people are so put off by their initial experience online that they stop using digital technology, regardless of the advantages of its use.

Older people and people with disabilities will have a wide range of specific and complex needs and interests; interventions to close the gaps in digital participation in these groups will require significantly more time, effort and resources than for the general population. As well as the recommendations made under access, motivation and skills, we consider the needs of older people and people with disabilities in more detail in Section 6.1.

42 Dr Geoffrey Sharman, submitted written evidence to the Inquiry
43 Prof Alan Newell, submitted written evidence to the Inquiry
Access to a robust digital infrastructure capable at operating at competitive speeds is a basic requirement to enable digital participation. No matter how motivated an individual or organisation is to fully participate in the online world, they cannot do so without a connection.

**Key Finding:** The Step Change programme of infrastructure investment will radically but still inadequately improve Scotland’s digital connectivity. Without substantial further investment, some 400,000 households in Scotland will still suffer from inferior connections in 2020. Furthermore, many vulnerable and marginalised individuals and households cannot afford the devices and connections required to make effective use of the internet.

**Key Recommendation:** The Scottish and UK Governments and regulators have a responsibility to ensure that every individual and organisation has access to affordable, fit-for-purpose digital infrastructure, as recommended in the RSE’s Digital Scotland (2010) report. In particular, they must ensure that there is open access to the publicly-subsidised ‘middle mile’ fibre infrastructure in Scotland.

**Vision:**
- That digital infrastructure (fixed broadband and Wi-Fi) capable of delivering symmetric, low latency connectivity to individuals and businesses now and in the future, is in place across Scotland.
- That wholesale access to this core infrastructure is made available to all potential providers of digital services.
- That new architectures and business models for affordable internet connections are widespread.
- That public access to publicly-held connections and devices, such as in libraries and schools, is made best use of.
- That online public services are fully accessible to all.

**Potential measures:**
- Percentage of premises/households/SMEs within reach of fit-for-purpose infrastructure;
- Number of connections;
- Speed of connections available to all in relation to the median speed enjoyed by most, as well as symmetry and latency.
- Number of hours available for public use of publicly-held devices and connections.
- Number of public buildings and spaces with Wi-Fi.
- Percentage of transactions with government carried out online.

Access to the internet is determined by availability and affordability. For people with additional needs, the accessible design of websites, software and devices is also a factor.

### 2.1 Availability (infrastructure)

Wired infrastructure is at the root of our broadband connectivity. Although access is often via mobile or Wi-Fi connection, this wireless connection is normally short, and it depends on a wired connection to the mobile mast or Wi-Fi access point. Ultimately, any sizeable community must depend on its proximity to a core fibre network for the provision of affordable high-speed, symmetric, low-latency connections to the internet.

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44 A link is symmetric when it has equal bandwidth in each direction (i.e. both upload and download).

45 The round-trip time between two nodes, measured as the time for a ‘ping’ to be answered.
Access

Much of the core infrastructure will soon be in place. Thanks largely to the Step Change programme it will have the potential to reach most of Scotland. However, much will remain to be done to ensure that individuals and businesses across Scotland can connect to this infrastructure. Fixed (wired) connections will be important, but so will mobile coverage (4G and beyond) and Wi-Fi hotspots.

The RSE’s *Digital Scotland* (2010) report[^46] highlighted inadequacies in Scotland’s existing digital infrastructure, and identified this as a barrier to access and participation. Government data showed that, although broadband speeds had increased over the previous decade, maps of the ‘access divide’ in Scotland produced in 2001 and 2012 (Figure 2.1) looked broadly identical. These maps show that private sector investment was focused on larger, accessible centres of population, leaving large gaps not far from these centres, and leaving most of the Highlands, Islands, Borders and Dumfries and Galloway behind.

For many people, this is still an issue; the quality and reliability of connections are still poor. Our present Inquiry encountered examples wherever it went, not only in remote and rural areas but also in cities and suburbs.

Figure 2.1 Private sector broadband investment in Scotland 2001 and 2012[^47]

![Figure 2.1: Private sector broadband investment in Scotland 2001 and 2012](image)

**Sources:**

*Connecting Scotland: our broadband future*, Scottish Government,

*Scotland’s Digital Future – Infrastructure Action Plan*,
Scottish Government January 2012 [http://www.scotland.gov.uk/Publications/2012/01/1487/3](http://www.scotland.gov.uk/Publications/2012/01/1487/3)


[^47]: The maps in Figures 2.1 and 2.2 are reproduced, with permission and at the highest resolution available, from Scottish Government publications.
The *Digital Scotland* report identified the lack of a modern ‘middle mile’ infrastructure (linking communities to the high-speed fibre core network) as a key obstacle that condemned many communities to inferior access to the digital world. Recent public sector investments in Scotland’s broadband infrastructure (a combination of Broadband Delivery UK (BDUK), EU and local funding) are designed, in large part, to address this issue.

The Scottish Government led connectivity programme has the laudable aim of closing the digital divide by putting the right, world-class, future-proofed next-generation broadband infrastructure in place to ensure the whole of Scotland can participate in the digital world.

The Step Change programme consists of two live projects.

- The first contract, signed in March 2013 by BT and Highlands and Islands Enterprise (HIE), will deliver next-generation broadband across the Highlands and Islands.
- The second contract, signed on 9 July 2013, covers the rest of Scotland (RoS).

These contracts are intended to ‘put in place infrastructure that will have the capacity to deliver next generation broadband to 95% of premises by 2017’. The HIE project will fund 1,200 km of new fibre, thus changing the map.

**Figure 2.2 BT core fibre network – existing and planned**

This investment is certainly a huge improvement. It will bring many people within reach of optical fibre. However, many households and business premises will still not have access to the superfast speeds that will be available to most. This lack of appropriate and reliable access will continue to be a barrier to participation. Whilst the focus of this Inquiry is on the other barriers to participation in Scotland – those that prevail even where the infrastructure is in place and readily available – we believe that lack of access to fit-for-purpose infrastructure will continue to exclude many communities.
Access

Broadband speeds

Whilst superfast download speeds are neither necessary nor sufficient to ensure that a connection is adequate for current domestic use, still less to ensure that it will be ‘future proof’, current government targets are set in these terms. The EU uses a figure of 30Mb/s for its targets. In the UK, the target is ‘superfast’, for which various definitions have been given.

The BDUK website currently targets ‘at least 24Mb/s’. The FAQ section of the digital pages on the Scottish Government’s website states “Next Generation broadband usually means anything over 25 Megabits per second (Mbps). Usually it can deliver upload and download speeds between 40Mbps to 100Mbps.”

In this Report, we use ‘superfast’ to mean speeds of over 25Mb/s, anything else we call ‘still slow’; some lines in Scotland are ‘super-slow’ (less than 2Mb/s) and very few are ‘truly fast’ (more than 100Mb/s with the possibility of upgrading to much higher speeds).

For two reasons, current plans will leave Scotland with a significant access divide and deficit that it will be difficult to bridge by 2020.

First, Step Change continues to make use of copper in the ‘final mile’ connection to the premises. Therefore, broadband speeds will always be limited by the distance to fibre. Superfast speeds require short copper – about 1,200 metres is the theoretical limit for superfast – and since the copper can almost never be laid in a straight line, the practical limit is about 800 metres from the cabinet. Those premises that are three kilometres from fibre as the crow flies are unlikely to get speeds above 3 Mb/s. Beyond that, speeds will rapidly drop below 2Mb/s. The theoretical limits mean that future technology improvements will only benefit those with short copper lines. Those at the end of long copper telephone lines will continue to have slower connections, with no prospect of improvement through technology upgrades. As speeds increase elsewhere, this divide will only become more marked.

Secondly, in the absence of a universal coverage target, the gap-funding model adopted for BDUK intervention compels providers to serve the most profitable communities, leaving isolated pockets of exclusion. Market provision leads to the same patterns of investment, so we already see such pockets: small communities surrounded by exchanges that are too far away, even within Scotland’s Central Belt.

Premises at the fringes of the network, and beyond, will have poor or non-existent connections, with no plans for improvement. A vivid encapsulation of this problem came when we gathered evidence in Shetland. A resident of Unst, Britain’s most northerly inhabited isle, said:

“If the target is 80%, we’ll be in the last twenty; and if the target is 98%, we’ll be in the last two.”

Although significant improvements will be made by 2017, we conclude that Scotland’s infrastructure will still fall well short of its goals for 2020. We do not see how current plans will ensure that next generation broadband, delivering superfast speeds, will be available to 95% of Scottish households and businesses by 2017.

Alternative technologies

A report on The costs and capabilities of wireless and satellite technologies prepared by Analysys Mason for the Broadband Stakeholder group48 compares the costs of using various technologies to provide domestic broadband in rural Britain. Its key finding is that the per-household costs of both terrestrial wireless and satellite provision are heavily dependent on the peak usage supported.

To summarise the problem, both satellite and terrestrial wireless throughput is limited by the spectrum available. Wireless provision can be cheap where spectrum is shared, but if too many users are active at the same time then their performance will suffer.

The Analysys Mason report compared three scenarios for anticipated usage in 2016. A 2013 BSG report, from Communications Chambers, on the domestic demand for bandwidth \(^{49}\) tells us that domestic usage (total volume of traffic) in the UK has almost doubled over the past two years, and is already well ahead of the most conservative of these scenarios. These figures suggest that Analysys Mason’s Scenario B, ‘the most likely evolution of fixed broadband traffic’ is close to the mark for 2016. Satellite provision would be an expensive way to satisfy even this level of demand; it cannot provide low latency, and would provide no leeway for future increases (Analysys Mason figure 6.13). We note that there are examples of community-based fixed wireless provision in some of the most remote parts of Scotland with reported costs significantly below those quoted in the Analysys Mason report \(^{50}\).

We recommend that the Scottish Government should support the development of fixed wireless networks serving communities beyond the reach of its subsidised FTTC deployment, by ensuring that such networks have access to affordable backhaul connections to the subsidised ‘middle mile’ fibre. The Scottish Government should also ensure that the rural use of both licensed and unlicensed spectrum is not inhibited by regulations primarily designed to address congestion in more populated areas.

Penetration of mobile (4G) connectivity will also be important. The Scottish Government should monitor coverage to ensure that Telefónica UK Ltd meet their obligation to achieve at least 95% coverage of Scotland’s population by the end of 2017 \(^{51}\), work with communications providers to extend coverage to communities in the final 5% (for example, through use of femtocells), and ensure that geographic coverage is extended to meet the needs of NHS Scotland and other emergency services \(^{52}\).

2.2 Affordability

In Section 1.2, we observed that digital exclusion is often associated with other indicators of social and economic deprivation. The connection between digital exclusion and socioeconomic deprivation has been powerfully confirmed by this Inquiry’s consultations with organisations and individuals with experience of the causes and impacts of deprivation.

> ‘My problem is that I don’t want a fixed line. I don’t want hundreds of channels etc. But you cannot just get the internet. You have to get a package.’

> ‘I have lots of friends in the same boat with not wanting a phone line/TV... I have better stuff to do with £30 per month.’

Evidence heard at Inquiry meeting in Dundee, July 2013

The cost of internet connections to the home and devices through which to access the internet are prohibitive to many of those on low incomes. The economic cost of internet to the home is exacerbated by the fact that in most instances, an internet connection also requires a landline, with the associated costs of a monthly line rental. This means that the prices quoted by internet providers for broadband provision often do not represent the full story.

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\(^{50}\) For example, see http://www.tegola.org.uk/

\(^{51}\) For more information, see http://media.ofcom.org.uk/2013/02/20/ofcom-announces-winners-of-the-4g-mobile-auction/

\(^{52}\) For example, see http://www.ruralgp.com/wp-content/uploads/2013/04/Rural-mobile-network-coverage-is-an-issue-for-the-NHS.pdf
The use of mobile devices (smartphones, tablets, internet-enabled e-readers, for example) can provide an alternative to connection through the landline and PC model. Ofcom data suggest that 54% of adults in the UK have a smartphone. Devices and contracts that include some data allowance are becoming more affordable, and improved Wi-Fi availability in public spaces (see, for example, plans to roll out public Wi-Fi in Glasgow ahead of the 2014 Commonwealth Games) will enable increased free access through mobile devices.

However, except in the least-populated areas (probably in the final 5%), the wireless spectrum (whether mobile, microwave, satellite, or Wi-Fi) is insufficient to support the data volumes used by a typical wired community. Furthermore, because spectrum is a scarce resource, mobile data is typically orders of magnitude more expensive, per gigabyte, than fixed-line data. In Australia, whilst mobile wireless broadband accounts for 50% of all internet connections, fixed-line broadband accounts for 96% of download volume. In the UK, Ofcom reports a capacity of 650 PB for residential fixed lines and only 29 PB for mobile data, which again accounts for only 4% of total data throughput.

Nevertheless, Ofcom reports that a laptop or desktop is the most important device for only 74% of internet users. For more than a quarter of users, therefore, some other device – typically a mobile phone or a tablet, sometimes a games console or smart TV – is the primary, or only, device they use to go online. This proportion is expected to grow and it is important that this is recognised by service providers. Currently, access through mobile devices is not equal to access through PCs or laptops: potentially slower speeds and limited functionality can make it difficult or impossible to access and interact with some government sites and public services, as they are currently set up (see also Sections 3.2 and 6.2).

Evidence provided by Digital Fife, Fife Council, August 2013
The economic affordability of an internet connection and access devices is only one of the barriers faced by those experiencing multiple deprivation, however. Many disadvantaged families and individuals, particularly those without a permanent fixed address, are ineligible for the long-term contracts required by service providers. Many of those with low incomes do not have bank accounts to organise direct debit payments for phone lines and/or internet. This typically excludes consumers from the cheapest tariffs. In many cases, it is not even possible to acquire an internet connection without setting up a direct debit in advance; this presents an insurmountable barrier to many socially excluded people who do not have bank accounts. Other barriers may include poor credit rating, or irregular incomes or pay intervals (e.g. weekly) that don’t easily allow for the commitment to payment of a monthly direct debit – a significant risk if funds are not available when requested and financial penalties incurred.

2.3 **Accessibility**

Technologies can currently be disabling as well as enabling. Inaccessible and unusable devices, software and websites are a particular barrier for those with additional needs or who need to use assistive technology. This may be a website in which content is difficult to navigate with a screen reader, or devices that are difficult for an older person with arthritis to use. The Equality Act 2010 puts an onus on organisations and businesses to make websites accessible for all, but in practice this is poorly enforced, or sites may be accessible in a technical sense but unusable in any practical way.

> ‘If you are blind you perceive things serially, you can’t scan. If you have a huge page of something that is not well structured, it will take a long time to get through... it comes down to information design, how easily and quickly can you get to what you want.’

Evidence heard at roundtable on accessibility, May 2013

Older people and people with disabilities represent a high proportion of people who require public, health and social services. As these services are increasingly moved online, the public sector has a responsibility to ensure that digital channels are easily accessible for everyone.

2.4 **Access: recommendations**

**Availability**

We point to the recommendations of the RSE’s *Digital Scotland* (2010) report, which identified the actions needed to develop and deliver a future-proofed, ubiquitous digital infrastructure for Scotland. We believe that, across much of Scotland, this will only be achieved through new regulation.

> The Scottish and UK Governments must ensure, if necessary by legislation and regulation, that wholesale access to Scotland’s middle-mile communications infrastructure is open to all communities, housing associations and other providers, or potential providers, of digital services.

**Affordability**

The almost universal commercial model for broadband provision in the UK is based on delivering an individual service to each subscriber via a dedicated line to the premises. The model was a good fit for analogue telephone technology. However, modern network technologies enable other models. It is technically possible for a business park, or a housing development or a block of flats, to have its own network, connecting tens, hundreds or thousands of subscribers who, with appropriate safeguards, share a common connection, or several connections, to the internet. This can be far more cost-effective than buying tens or hundreds or thousands of individual connections from an internet service provider (ISP). This model is little used in the UK, but is common elsewhere; for example, in Sweden. In both urban and rural areas, local community networks can provide internet access by effectively sharing the cost of one or more highspeed connections between a community of users, if the right infrastructure is in place.
Access

The Scottish and UK Governments must enable and support the development of new architectures and business models, for example with social housing providers or community hubs, that allow the provision of affordable internet access. Successful pilot projects should be scaled and shared.

Affordable access:
The Wheatley Group - providing access to housing association tenants

The Wheatley Group in Glasgow recognises the barriers to access faced by many of its tenants and, in response to this, is working with the Scottish Government and BT on a 12-month pilot ‘Digital Demonstrator’ project in a high-rise building in Knightswood, offering internet access to all the flats in this block.

The purpose of this study is manifold: to prove that effective internet bandwidth can be provided to homes at a very affordable cost; to show through experiential opportunities that there are benefits to be gained by being online; to break down the digital exclusion barriers; to offer training and drop-in support to tenants; and to build collaborative partnerships to get all citizens online, helping them with education, employability and financial and health opportunities, as well as simply having fun.

The Housing Association is also developing a business case for possible roll-out to all its tenants and hopes to be able to demonstrate cost savings when tenants access services online instead of in person or over the phone.

To aid the study, the Wheatley Group has provided tablet devices to participating tenants. This builds on a very small project in the south of the city, where 12 tenants in three neighbouring buildings tested three different methods of internet connectivity and received help and support to get online.

Tenants in both locations, who have either not been able to afford internet connections or have not seen the value from being online, are enthusiastically engaging and, in fact, are rebuilding their communities as they help each other to find their way around the maze that is the world wide web.

www.wheatley-group.com

For individuals who find it difficult to access the internet at home, there is a clear need for public access points where they can use the internet in a relatively private space. Evidence from our consultations suggests that current provision is not sufficient for meeting this need.

Scotland’s libraries provide a network of over 500 community-based hubs. The People’s Network Initiative has ensured that all of Scotland’s libraries have computer equipment and connections, the use of which is constrained only by opening hours and staffing levels. Scotland’s libraries currently offer over 8.5 million hours of free internet access each year, with additional Wi-Fi availability in many places. Less than 4% of Scotland’s offline households live more than 3km from one of these hubs.

57 For more information see http://www.slainte.org.uk/SLIC/peoplesnet/peoplesnetindex.htm
However, Scotland has almost 850,000 households offline. Current provision in libraries amounts to only ten hours per offline household per year. High demand means that sessions often have to be time-limited and the variable quality of hardware, software and connectivity across the library service is a challenge to be addressed. Furthermore, demand is not evenly spread. Most libraries cater for fewer than 1,250 offline households, but many have several times this number of offline households to support. As a valuable resource in the drive to full digital inclusion, libraries must be supported to maintain and increase their capacity to provide public access to the online world.

Voluntary organisations and community groups are working, often in conditions of rising demand and falling resources, to provide access to broadband to those who need it. Citizens Advice bureaux, for example, offer support clients to apply for jobs and benefits online, but only as part of their normal service to people who seek advice. The extent to which bureaux are able to provide access to the internet varies across the country, largely due to variations in funding and other resources and depending on local need and the availability of other similar services. Community groups are similarly facing budgetary restraints and uncertainties that limit the access they can offer to clients. We heard numerous examples of situations where community centres and village halls have refused to act as hubs because of worries over costs and risk.

The under-use of publicly-funded connections and devices represents a substantial loss for the public sector. All secondary schools and many primary schools in Scotland have suites of computers and broadband connections that are currently used only during school hours and during school terms. Less than 1% of Scotland’s offline households live further than 2km from the nearest school and most schools have a natural catchment of fewer than 250 offline households.

An inherent, and in our judgement excessive, aversion to risk both at school and local authority levels appears to drive much of the restricted public access to schools. In some instances, we have heard fears around the risks of physically opening networks to public use (potentially resulting in damage to equipment, or the introduction of viruses through external devices). Such issues must be addressed, but there are numerous models that can be used (including current public access to computers in libraries; or public access to sports equipment and facilities in schools).

Wider concerns were cited on the suitability of filters in school networks, and what websites the public would be able to access. Whilst policies vary between schools and between local authorities, the approach taken to filtering is frequently risk averse in the extreme. We discuss in Section 4 why this is not the most appropriate way to protect children and help them to be safe online. A realistic assessment and the proper management of risk, including the use of filters, is urgently needed. The level of risk does not justify the level of wasted resources.

In addition to risk, the costs of supporting increased public access to the assets outlined above are a factor for consideration. But, accepting that digital participation has a price tag – and a significant one, as discussed in the introduction to this Report – the improved use of existing assets is a cost-effective way to make progress. Funding more staff and opening hours for the use of existing assets will cost considerably less than duplicating those assets, and supporting access to them, elsewhere.

The Scottish Government and local authorities must open and extend public access to the internet through publicly-held assets, for example in schools, colleges, universities and libraries. Such access must be fit-for purpose in terms of access to content and must accommodate both social and private uses.
Access

Accessibility

Designers of technology, software and websites, procurement officers and policy makers must consider the needs and requirements of people with disabilities and older people at the design and development stage. Some of this can be driven by properly enforced legislation, but it will also require a cultural change that will be more difficult to achieve. Work at the University of Dundee, with one of the largest academic groups in the world researching digital systems for older and disabled people, has found the use of interactive theatre and film to be effective in communicating the needs of these groups to designers and other stakeholders. Ultimately, as one respondent to the Inquiry commented, ‘The same consistent and concerted effort and planning that goes into making the physical world accessible to all today must go into the design, implementation, access, motivation, skills and training in technology and the internet.’

There is a particular onus on government at all levels to ensure that services, if delivered through digital channels, are easily accessible to all who need to use them and to set the highest of examples in good practice.

The UK and Scottish Governments and local public service providers must work with SCVO, other third sector representatives and the private sector to deliver online services and websites that are usable and accessible for all. This includes for older people, people with disabilities and people with limited literacy, information or digital skills.

59 Prof Alan Newell, written evidence to the Inquiry. See also University of Dundee Computing Department, www.computing.dundee.ac.uk

60 Quarriers, response to RSE Digital Participation Inquiry Interim Report
3 Motivation

As more and more people go online, so those who remain offline are increasingly likely to cite lack of interest as the main reason for not having the internet at home (2011:47%; 2012:52%; 2013:63%)[61]. This is a core challenge to increasing digital participation. If the motivation to get online is there, most barriers of access and skills can be overcome. But if an individual or organisation cannot see the relevance of the internet to their interests, they will make no attempt to access either the digital infrastructure or skills support available.

**Key Finding:** If the majority of people with whom an individual or organisation wishes to communicate and associate are online, that individual or organisation is more likely to feel motivated to be online (the ‘network effect’). Local interventions tailored to the interests of particular communities and targeted at gaining a critical mass of participation within those communities are essential to motivating everyone to get online. Local action, however, must be coordinated at national level to avoid duplication and ensure that efforts and resources can be strategically directed to match the scale of the problem.

**Key Recommendation:** The Scottish Government, local authorities, the third sector and private sector partners, led by SCVO, must recognise the importance of the network effect and local interests and develop initiatives for local action on digital participation aimed at community level. A large part of this will be about scaling up and accelerating initiatives that are already happening. A national framework should provide coordination, support and resources for local initiatives.

**Vision:**

- That every individual, organisation and community (geographic or of interest) understands the capabilities and relevance of digital tools.
- That everyone who has access to affordable, fit-for-purpose infrastructure, is enabled to connect to the internet and use it effectively as and when they need to.
- That all SMEs and third sector organisations have strong digital capability and can use digital tools to meet their objectives.
- That digital channels of service delivery are clear and easy to use.

**Potential measures:**

- Number of connections or percentage of households online (uptake as an indicator of motivation).
- Percentage of SMEs and organisations using digital.
- Percentage of public sector transactions online.

3.1 The network effect: a national framework for local action

The ‘network effect’ is a long established economic and social concept: that something becomes more valuable as more people use it. The telephone is one example: becoming useful to more people as their peers became connected. Today’s digital tools are often used to communicate with interest groups, social networks, friends, neighbours and colleagues. We would similarly expect the network effect to be an influential factor in uptake, and heard anecdotal instances of this.

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Motivation

A key motivator of digital participation is belonging to a community whose members are predominantly online. The analysis of uptake discussed in Section 1.2 and Appendix III shows that there is wide variation in digital uptake and inclusion at local level. Figure 1.6 demonstrates a pattern of uptake that would be expected if the network effect is an influential factor in digital participation. In some communities, local businesses and service providers see no reason to go online because none of their customers or suppliers are online, whilst some individuals see no reason to go online because none of their friends are online – a vicious circle.

As we travelled around Scotland, the Inquiry heard many examples of both individuals and organisations who had concluded that “the internet is not for me”. Further discussion would often reveal that these conclusions were based on a limited understanding of the capabilities of digital tools. The network effect has a two-fold impact on communities. Not only will individuals and organisations go online in order to communicate with peers, but also those who remain offline are more likely to hear about the benefits and relevance of the internet from others in similar circumstances to themselves, and whom they know and trust. The identification of individual level motivators that will encourage people to get online is needed for many in hard-to-reach groups for whom the more obvious immediate benefits [such as catch-up TV or online shopping/selling] don’t appear to be sufficient.

We encountered a wide range of initiatives, particularly within the third sector but also across local authorities, enterprise agencies, social housing providers and others, aimed at identifying and communicating the relevance of the internet to people’s lives in order to encourage them to take the first steps to participation.

Working with communities to get online: Digital Fife

Since 2001, Fife Council have been supporting people to get online by working through community groups. The ‘Digital Fife’ initiative offers support and training to help the group develop a website, using citizens’ existing involvement in community affairs as a hook to get them interested in going online. At least one person in the group is trained and they have responsibility to help others in the group develop digital skills. Groups and individuals are then asked to become digital champions, raising awareness of the benefits of digital and the support available to others with similar backgrounds and experiences as themselves.

www.digitalfife.com

Finding the hooks to get online: digiTable, South Lanarkshire Libraries

An interactive digiTable [a Samsung SUR40 digital touch table] at East Kilbride Library is being used to encourage people of all ages and backgrounds to get online by demonstrating what technology can do for different interests. Over the past six months, the digiTable has been used to support interactive story-telling sessions with younger children, group learning activities for adults with learning difficulties, a Young Explorers virtual tourism club and a digital arts workshop for older adults. Forthcoming activities include collaboration with the Department of Work and Pensions and the third sector to introduce support for job seekers, as well as a ‘Laughs and Landscapes’ heritage project involving a volunteer group of older members of the community.

These initiatives are worthwhile and often very well conceived as ways of motivating digital participation. Indeed, many provide models of good practice that could be scaled up and rolled out elsewhere. But we found that there is a lack of coordination among the agencies promoting them. With no national framework to coordinate efforts and avoid duplication, local initiatives that encourage several dozen, or even several hundred, people to get online, will make only a negligible dent in a digital gap of over one million people.
3.2 Initial experiences of digital

If people are to be motivated to take initial steps online and then to fully participate in the digital world, their experiences, and particularly their initial experiences, of the internet are vital.

Getting online must be easy. Mobile devices can have distinct advantages. Mobile devices and internet access can be set up in store at the time of purchase, with nothing to install or connect at home. Most people will find smartphones familiar and will quickly be comfortable using apps that are simple and well-designed. Even for those not used to technology, we heard of many occasions when people who were nervous of using traditional computers were willing to engage with devices that had intuitive touchscreen interfaces.

However, as we discussed in Section 2, if mobile devices are to be increasingly used as the only channel of access, then online content and services must be accessible and usable, beyond the context of the traditional desktop computer. In particular, publicly-funded online services must be made accessible to those with only mobile devices and limited data plans.

With the UK Government’s moves towards a ‘Digital by Default’ approach to service delivery, and the Scottish Government’s ‘Digital First’ agenda, the initial digital experience of many of those who have not yet identified a personal benefit to going online will be of public sector websites and processes. The Inquiry has heard concerns, particularly from within the third sector, that the ‘Digital by Default’ approach in general will only ingrain reluctance from many people to go online, as they feel that it is being forced upon them.

More specifically, however, we have also heard numerous examples of digital processes for public service delivery being lengthy, complex and unusable. People we spoke to suggested that one form (the application for Universal Credit) takes on average 90 minutes to complete and cannot be saved and returned to. For those who are not experienced users of technology, the process has been described as very daunting, difficult and overwhelming. Furthermore, for those who do not have internet access at home, the form must be completed on a public access computer, where sessions are often limited to 30 minutes and where there may be little privacy.

Websites and digital channels of service delivery must be fully accessible for people with additional needs, or who rely on assistive technology (Section 2). But further than this, where service providers aim to move transactions online, digital channels must be simple for everyone to use and must be equally accessible across multiple platforms and devices, becoming the channel of choice because people recognise the ease and convenience of use. There is currently huge variation in the usability of online services and more coordination is needed to create a common minimum standard; for example, that all forms provide a save and return facility and that there are safeguards against losing information or crashing if users press keys incorrectly. Apps may be increasingly important for the delivery of services to groups that are more likely to rely on mobile devices for internet access. They may also have advantages in enhancing usability for those with limited literacy, information or digital skills.

A positive experience will encourage people to explore further uses and benefits of technology; whereas a negative initial experience will entrench resistance to digital participation.

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64 Scottish Council for Voluntary Organisations, May 2013, A digital agenda for civil society – discussion paper
3.3 **Motivation: recommendations**

Since we began our Inquiry, the Scottish Government has stepped up its efforts through a new partnership on digital participation with the Scottish Council for Voluntary Organisations (SCVO). SCVO’s leadership role extends across the public, private and third sectors, as all of these have an important part to play in achieving the world-class rates of digital participation to which Scotland aspires.

**Government at all levels must direct funding support to local initiatives to increase digital participation. Central efforts, led by SCVO, should be targeted at ensuring that local groups have access to appropriate resources and to support networks that enable them to share and refine best practice.**

Flexibility and innovation at local level is crucial to the success of identifying and communicating the hooks that will get individuals and communities online; particularly as those who remain offline will be those who shun the widely-recognised benefits and focus on niche interests. Trusted intermediaries do and will play a central role in reaching out to some of the most disadvantaged in our society and encouraging them to get online.

‘The internet is a social tool. It exists to connect people, so it makes sense for digital participation activities to use the social connections that already exist between people and listen to the ideas and expertise of local communities.’

A national plan led by SCVO will allow the coordination of such local and niche efforts. It should also facilitate more strategic leverage and distribution of funding; provide mechanisms through which best practice can be identified, refined and rolled out elsewhere; and develop central materials that can be used and reused by local groups. This over-arching approach is required if best use is to be made of resources available to close the digital gap.

**The Tinder Foundation – supporting community initiatives for digital inclusion**

The Tinder Foundation, a not-for-profit social enterprise, supports a network of some 3,000 UK Online centres based at hyper-local community level across England. These partner centres provide free or low-cost access to computers and dedicated help and support. These centres employ products and services centrally developed by the Tinder Foundation, but work closely with communities to match their specific needs. A number of centres focus on the very specific specialist needs of some of the hardest to reach, digitally excluded groups: older people, people with disabilities and carers, for example. Some also focus on building large-scale capacity within communities to widen the network of support.

In addition, the Tinder Foundation has created the ‘Community How To’ portal which helps communities that aim to develop local initiatives to find digital tools that will help them to do more, more easily. This includes tools that will assist in communicating with communities, managing projects, fundraising and measuring outcomes and impacts.

In Scotland, as in Northern Ireland and Wales, there are currently no UK Online Centres, although there is a network of partner ‘access points’ which do provide access to computers but may not guarantee support.

[www.tinderfoundation.org](http://www.tinderfoundation.org)
4 Education, skills & training

A progressive 21st-Century society needs a skilled workforce; one that can approach complex problems and challenges in creative ways; one that can use all tools at their disposal, including digital, to drive economic growth and innovation. All citizens must be equipped with the skills they need to fully participate in society, whether this is in employment, within communities or through their own self-development.

Key Finding: Information literacy is essential in the modern information age; literacy, numeracy and digital skills are required by everyone if they are to effectively find and use information and enjoy their right to personal expression. Provision of these skills to all adults and young people in Scotland is urgently required. A fundamental understanding of computing science is required by a minority in a digital society; Scotland’s education system has made advances in this area in recent years, but further progress is required.

Key Recommendation: The Scottish Government must take a national lead and coordinating role in ensuring that Scotland’s young people, adults, businesses and organisations have the information and digital skills required for a thriving 21st-Century digital society through formal education, workplace learning and lifelong and community learning. The numerous organisations involved in the delivery of information and digital skills support must ensure that their staff are appropriately resourced, equipped and skilled.

Vision:
- That everyone in Scotland has the information and digital skills required to participate in the digital arena and prosper from digital opportunities.
- That sustainable online and peer support for continuing learning and development of information and digital skills throughout all stages of life is in place.
- That information and digital skills are embedded across the curriculum and from pre-school to tertiary.
- That computing science (CS) is taught and recognised on a par with other sciences.
- That small and big businesses are able to access a workforce with the skills needed to exploit digital tools and opportunities.

Potential measures:
- Percentage of people with basic online and information skills, both overall and within different demographic and geographic groups.
- Number of learning opportunities across communities in Scotland.
- Percentage of students taking CS in schools.
- Employment rates of CS graduates.
- Percentage of positions industry is able to fill.

If Scotland is to realise its aspirations to be a ‘world-class digital nation’, then it will require a public commitment from its education bodies to:
- ubiquitous lifelong and community learning opportunities for all to develop information and digital skills; and
- embedding information and digital skills and computational thinking across the curriculum and at all stages of education; and
- the teaching of computing science in schools on a par with other science subjects.

As progress is made on improving access to digital infrastructure, and as a growing number of people are required to go online to access services and opportunities, the challenge of equipping everyone with the basic skills they need to participate effectively and safely in the online world becomes ever-more pressing. Some people will be confident enough to get online and learn through doing, perhaps with very informal (family and friends) and online support. Others are already engaging through technologies they are comfortable with, often without realising the extent to which they are connected to the online world; for example, watching catch-up TV. However, many, and particularly those in the hardest-to-reach groups, will need dedicated learning support. For all learners, the challenge to ensure that they have the skills to be safe online, remains.
Education, skills and training

We consider below, in more detail, the skills that are required for participation and put forward high-level recommendations for both Scotland’s formal education system and lifelong and community learning. In light of the urgency of this challenge, we also suggest a number of immediate actions, based on the evidence we have received, that will underpin progress in this area.

4.1 Skills for the 21st Century

In this ‘information age’, every individual must have the tools and understanding required to access, evaluate, analyse and communicate information, confidently and effectively. Information literacy includes the understanding of information in all its forms. Literacy, numeracy and digital skills are required by everyone to make use of the tools – ranging from books to supercomputers – that we use to store, process and communicate information. The term ‘digital literacy’ is often used to encompass both an understanding of how to use digital devices and how to find, evaluate and use information online. But if initiatives are to truly equip individuals with the skills required for the 21st Century, it is necessary to consider first information literacy in all its forms, and then the digital skills required beyond this.

Information literacy

The Chartered Institute for Library and Information Professionals in Scotland (CILIPS) defines information literacy as “knowing when and why you need information, where to find it, and how to evaluate, use and communicate it in an ethical manner”66. These skills enable individuals to develop learning and make better-informed decisions in all aspects of life, including in personal life, in the workplace, in education, in health and in social settings. In the 21st Century, information literacy is a prerequisite for digital engagement.

‘With Information Literacy, digital participation will be enhanced and the potential benefits increased. However, without Information Literacy, the benefits of digital participation will be significantly diminished’.

Professor Bill Johnston, written evidence to the Inquiry

‘It is commonly accepted across FE (Further Education) and now, from our understanding, into schools, that most learners will have lower than required information literacy skills. These skills underpin employability, digital and academic literacies and subsequently must be developed to ensure learners have the skills for life, learning and work our new Curriculum for Excellence promises.’

Dundee College, written evidence to the Inquiry

There is an established body of work on the development of information skills in Scotland and further afield67. Nevertheless, evidence provided to the Inquiry suggests that there are significant concerns, particularly within the Libraries and Information sector, that information skills are not yet properly embedded in learning in Scotland.

66 CILIPS http://www.cilips.org.uk/information-literacy/
Education, skills and training

Literacy and numeracy

Basic literacy and numeracy skills remain an issue for some people in Scotland, with around one in five adults facing occasional challenges and restricted opportunities because of literacy difficulties, and one in 28 facing serious, limiting challenges. These skills are required for engaging with the digital world. The need for basic literacy for all has been recognised as fundamental to a stronger society by the Scottish Government, which published its Literacy Action Plan in 2010.

However, evidence heard by the Inquiry, particularly from those who work with people facing multiple factors of deprivation, confirms that a lack of basic literacy and numeracy continues to be a barrier to both digital participation and participation in society in a wider sense. Scottish Union Learning, in evidence to the Inquiry, highlighted that those with literacy difficulties “will remain digitally excluded until their literacy needs are addressed.” The Inquiry also heard concerns that a changing focus of support services, from dealing with literacy issues to helping people specifically to apply for benefits or search for jobs online, will mean that literacy will suffer more.

Digital skills

Digital information channels are relatively new, but the skills required to manage the information gathered through online methods remain largely the same as they were for books, newspapers etc.

People will use digital tools in many different settings and to many different ends. At the most basic level, digital skills are needed to effectively find, evaluate, use and create information (information literacy) using a range of digital technologies. Individuals need to understand the capabilities of digital tools. But further, they need to be able to safely navigate the online world and have an understanding of how to manage digital identities. The digital skills that people need will vary greatly as their use of technology changes and as technology itself evolves. There is, therefore, no end point in the development of digital literacy; rather, it is a journey of continuous learning. There are currently a number of formulations of what constitutes basic online skills. These can be helpful in the design of learning interventions. But it is important to bear in mind that such definitions are dynamic and must evolve along with technology and its use. Having the right information skills is essential for learners to have the confidence and know-how to continue to develop their digital skills.

We heard concerns that some of those who are online, and indeed may be seen as ‘digitally native’, have only a very narrow set of digital capabilities, such as using social media sites and apps. These skills will not necessarily translate into the ability to effectively find information on the internet, or, for example, to complete an online application. Further, some people may be regular internet users but have only a limited understanding of how to manage their digital identities and stay safe online; for example, with a limited understanding of privacy settings on Facebook or little ability to assess the safety of an eCommerce site. Where people use digital tools in the workplace, they may have specialist knowledge of specific packages needed for certain jobs (e.g. Word, Excel, or SAGE for book-keeping) but lack good digital skills in the wider sense of understanding and experimenting with a range of digital capabilities.

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70 Scottish Union Learning, response to RSE Digital Participation Inquiry Interim Report
71 Evidence heard at Inquiry meeting in Glenrothes, July 2013
72 See, for example, Go ON UK http://www.go-on.co.uk/opportunity/basic-online-skills/, or the GDS Digital Inclusion Scale (at 0:57 in video) https://gds.blog.gov.uk/2014/03/07/user-research-a-day-in-the-life/
Education, skills and training

In a recent study, Citizens Advice Scotland surveyed clients seeking advice or assistance with social security benefits on their access to and competence in using the internet. Of those surveyed, only 55% had a computer at home, just 54% had access to the internet at home, and almost three quarters (72%) said that they would struggle to complete an online job application unaided.\(^{73}\)

**Basic information and digital skills: lifelong learning and community learning**

Lack of skills or knowledge of the internet is more likely to be a barrier for those who have never been required to use a computer or the internet before e.g., for work or education, or who have not done so in some time and whose skills are outdated. Amongst those who have not had a formal introduction to digital technologies will be older people, many of whom will have retired before the internet, email, etc. became common features of working life; people who have left formal education without becoming computer-literate; and those who have not recently been engaged in employment/education. It may also include people whose work does not require, by necessity, the use of digital technology or the internet e.g., decorators, gardeners, hairdressers, shop assistants.

This demonstrates the significant role that providers of informal, community learning initiatives will have to play in supporting people outwith the formal education system to acquire basic information and digital skills, at least in the short to medium term. Many of the initiatives already being implemented across Scotland that are aimed at motivating people to get online (Section 3) also support specific groups and communities to develop the basic skills they need to do so. Again, these initiatives are often well-conceived and reflect the needs of the groups and individuals they are designed to reach. However, coordination and referral between organisations delivering services is patchy, and available support differs greatly from one local authority area to another. With little consistency, budgetary constraints, and few centrally-based resources, little progress has been made on identifying and scaling best practice.

For people who are in employment, digital skills may develop through on-the-job training as digital tools such as email, standard office packages or software needed for specific positions are required. Some employers do recognise the need for ongoing training and support or providing self-led learning opportunities in the use of digital tools in the workplace, but evidence provided to the Inquiry suggests that this is not always the case.\(^{74}\) Fewer employers recognise information literacy training needs among staff. In most cases, such skills are imparted at schools or through further or higher education. All Scottish university libraries provide information skills training that is transferable to the workplace, and colleges are also taking on this role in their programmes for students (e.g. Dundee College, pilot course “Skills for Learning, Life and Work”\(^{75}\)). Indeed, we heard that colleges “have the infrastructure, experience, staff and remit to implement learning initiatives to support workforce and economic development”\(^{76}\). However, many Scottish businesses continue to be impacted by gaps in good information and digital skills which are often neither identified nor addressed.

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\(^{74}\) Scottish Union Learning response to RSE Digital Participation Inquiry Interim Report.

\(^{75}\) For more information see http://www.therightinformation.org/blog/2013/10/24/dundee-colleges-skills-for-learning-life-and-work-course.html

\(^{76}\) Mr G Dougan, written evidence to the Inquiry
Basic information and digital skills: formal education

The Curriculum for Excellence\textsuperscript{77}, currently being implemented across schools in Scotland, makes clear that responsibility for the development of pupils’ literacy skills lies with all teachers across all subjects. The experiences and outcomes expected for pupils are set out in ‘Literacy across learning’\textsuperscript{78}. It is equally important that information literacy and digital skills are developed similarly and that these are seen as the responsibility of teachers across the curriculum.

The development of a Scottish Information Literacy Framework\textsuperscript{79} provides a model for information literacy training extending from early-years education through all stages of education. There is currently no such resource for the teaching of digital skills. It must be recognised that there is huge variation in teachers’ own abilities in both of these areas. Moreover, they are not included as specific components of programmes of study for teachers in training. In some schools, librarians – as experienced information professionals, and working across the curriculum – support the development of these skills for both teachers and pupils; but again, with no national approach, the role of school librarians is not consistent.

Further, as we gathered evidence from teachers and others involved in education, we heard frustrations with the filters and restrictions on access to content put in place in schools across Scotland (see also Section 2.4). These put significant limitations on teachers’ ability to use digital technologies in the classroom and subsequently to help pupils develop their information literacy skills in a digital world. It also hampers pupils’ ability to learn to assess and deal with risk in a safe but realistic environment that will support them to become responsible digital citizens in the future; and to use the internet in effective and creative ways, particularly through content creation.

\begin{quote}
“We have a bizarre situation. We protect kids in the classroom and they step outside and switch on a phone which is unfiltered.”
\end{quote}

Evidence heard at roundtable on Education, August 2013.

4.2 Computing science, ICT and skills for industry

Just as science education was recognised as an issue of strategic importance in the early part of the 20th Century, so computational thinking\textsuperscript{80} and computing science must be embedded in the core curriculum of the 21st-Century digital society. The literacy skills identified above are important functional skills that are required by everyone to participate in modern society. But for that society to be progressive, both in respect of its culture and its economy, its education system must be capable of equipping some individuals with a fundamental understanding of information and of the technologies we use to store, process and communicate information.

\textsuperscript{77} Education Scotland, http://www.educationscotland.gov.uk/thecurriculum/whatiscurriculumforexcellence/

\textsuperscript{78} Education Scotland, http://www.educationscotland.gov.uk/learningteachingandassessment/learningacrossthecurriculum/responsibilityofall/literacy/


\textsuperscript{80} I.e. understanding systems in terms of the ways they store, process and communicate information; and top-down design; designing, testing and implementing replicable solutions.
Key elements of computing science and computational thinking have been taught in Scottish schools continuously for over 25 years. The success of this teaching has been variable, as it has been over the same period in universities. With the renewed interest in developing computational thinking across a much broader spectrum of learners, significant effort is being invested in Scotland to roll out a staged, developmental programme of change, led by research specifically in computing science education. Computing science is recognised within the Curriculum for Excellence that is currently being implemented in all Scottish schools. The significantly improved national qualifications now place greater emphasis on design, development and understanding of algorithms, programmes and code than has previously been the case. However, there continues to be a gap between computing science as a science and biology, chemistry and physics. Further improvement will be required over the next change cycle in five years or so, to develop computing science qualifications that ensure uniform learning of unchanging fundamental computing concepts that matches the depth and rigour of the mandatory knowledge requirements for physics, chemistry and biology. This will require on-going collaboration between Education Scotland, the Scottish Qualifications Authority, local authorities, schools, Computing at Schools Scotland, colleges and universities through the Scottish Information and Computing Science Alliance (SICSA).

Perception is also a challenge that must be addressed. Currently there is little agreement on the purpose of computing science in schools. There is a void of understanding of computing science – as distinct from ICT – amongst policy makers, schools, teachers, pupils and parents. This impacts on the number of pupils choosing computing science as a subject, on the number of qualified computing science teachers in schools and on the consistency of teaching.

Outwith Scotland, teaching of computing science and computational thinking skills was dropped entirely from the UK curriculum for a period, in favour of developing information and computing technologies (ICT) skills in young people. This is now widely accepted to have been a failed experiment. England has now set itself the target of moving from this position of next-to-no computing science teaching in schools to a full-blown curriculum across both primary and secondary from September 2014. Thousands of teachers will have to be trained from a standing start and they will be working with an entirely new curriculum.

The distinction between ICT skills and computing science is important. Some degree of understanding of ICT – that is, the application of existing technologies and systems – is now required in every domain. Coding initiatives, both in schools and through initiatives such as CoderDojo, have proved successful in getting young people interested in computing. However, in early stages of education, some fundamental concepts of computing science should be introduced along with ICT, and practical experience of computing science technologies is required to bring the abstract concepts of computing science to life. So teaching in the early stages naturally combines the two.

Beyond the fundamental stages, however, the uses of ICT within every subject area should be integrated across our teaching. Computing science is an independent discipline devoted to the deeper study of information and computation: how we represent and process data; what patterns of computation we can apply to solve computationally difficult problems.
In March 2014, the Scottish Government and Skills Development Scotland announced a Skills Investment Plan for the ICT and Digital Sector. Actions under the SIP, backed by a commitment of £6.6 million, will aim to align courses and qualifications with industry needs; facilitate the up-skilling of current ICT professionals; support new entry routes to industry; and develop a long-term strategy to increase the uptake of computing-related subjects in schools and Further and Higher Education. This initiative is encouraging, and we would emphasise the need to address the issues outlined above around teachers’ digital skills and restrictive access in schools when implementing such strategic actions. Further initiatives linking digital skills to the workplace, including placements, apprenticeships and careers websites, are discussed further in Section 6.5 (Economy).

However, digital skills shortages in industry do not relate solely to ICT skills, but also to data scientists, designers, web developers, software engineers and digital producers. The advancement of the technologies underpinning digital progression and the role that internet-based applications play in society today – applications such as Facebook, Twitter, Amazon, Netflix and Skyscanner – are all born out of an understanding and advancement of computing science. Scotland must continue to be a leading light in advancing the technologies that will underpin progress. To achieve that we need to educate and produce leading graduates of computing science who can compete on the global stage.

4.3 Education, skills and training: recommendations

There is a compelling case for everyone in Scotland to have the basic literacy, numeracy, information literacy and digital skills needed to take a full and active part in today’s society. And this must happen quickly. In part, the urgency is driven by government policy to move public services online. But for a host of other reasons discussed within this Report – from the advertising of jobs online to online-only deals for utilities – the need to close the digital divide is an immediate imperative.

Basic information and digital skills: lifelong learning and community learning

Levels of digital exclusion are high amongst older people, people with disabilities and people facing multiple factors of deprivation, such as unemployment and low levels of education. There must, therefore, be specific provision to address the needs of adult learners who have never had the opportunity to develop information and digital literacy, or who would benefit from increasing and enhancing their skills. This is a key pre-requisite for digital inclusion.

Public and third sector initiatives providing information literacy and digital skills training should be targeted at groups and individuals with specific needs and coordinated under an overarching strategy. The Scottish Government, local public service providers, libraries, third sector organisations and other providers of lifelong and community learning must ensure that staff and volunteers are properly resourced, equipped and skilled to provide this training.

We have commented on the welcome step forward made by the Scottish Government in setting up a new partnership with SCVO to play a leadership role in encouraging people to get online and in supporting the development of basic online skills. But overcoming the information and digital skills gap will take a significant investment of time and money – many tens, if not hundreds, of millions of pounds by latest analysis. SCVO is well-placed to lead a national drive for basic online skills, but will only be able to do so with the required level of political capital and financial resources. Unlike infrastructure spending which can be kept under central control, this investment must flow out to communities, guided by a national framework for local action.


Education, skills and training

SLIC: national training programme for frontline library staff

The Scottish Library and Information Council is piloting a national training programme, that aims to enhance the digital skills of frontline library staff. The scheme covers a range of hardware to ensure that staff are equipped to support users of mobile devices. The programme, funded by the Scottish Government’s Public Library Improvement Fund, has been successfully implemented in Inverclyde and North Ayrshire libraries and will now be rolled out nationally.

As with efforts to motivate people to get online, an overarching national framework must coordinate skills initiatives to ensure the strategic use of resources, to avoid duplication, and to provide support networks for the identification and promotion of best practice. But it must also respect and enable the local innovation that will be required to address the varied and complex needs of learners in acquiring information and digital skills. A range of approaches that cater to the needs of different age groups, people with a range of disabilities, varying levels of education and from different minority groups, will be required. High-quality initiatives will include aspects of both information literacy and digital skills and cover a whole range of learning opportunities, from formal to very informal, and from groups to one-to-one interventions.

As digital skills will evolve through time, initiatives must also provide on-going access to support and advice and ad hoc peer support.

Lifelong and community learning basic online skills: suggested immediate actions

- The creation of central points of information on available training and support services to which individuals can be referred, with mechanisms for the evaluation of training and support services and the promotion of best practice.
- The development of partnerships with trusted service providers who are in regular contact with the hard-to-reach groups, such as Citizens Advice bureaux, GP surgeries, care workers, housing associations or trade unions. Partnerships may involve the provision of access and support in ‘safe spaces’ or consistent, coordinated referral to appropriate courses and opportunities.
- A strategic review of the role of libraries in providing access and skills support. Libraries have a specific role to support learning and an existing comprehensive network of expertise, experience and equipment. Service gains and improvements delivered by the national development of the People’s Network should be built upon to support digital inclusion. This may include the identification and roll out of best practice and the agreement of a minimum offer of resources and content to be available across all libraries in the current development of a National Strategy for libraries by the Scottish Library and Information Council and COSLA.
- All employers must ensure that learning and development opportunities are offered to employees in respect of the changing use of technologies in the workplace. Professional bodies in every sector should incorporate digital skills in their requirements or guidance on continued professional development for member organisations.
Basic information and digital skills: formal education

The Scottish Government, Education Scotland, local authorities, SQA, schools and Further and Higher Education Institutions must ensure that Scotland’s education system, from pre-school to tertiary, equips all students with information literacy, digital skills and computational thinking.

Basic information and digital skills in formal education: suggested immediate actions

There is a wealth of expertise, resources and models, both in Scotland and internationally, to support and inform learning of information literacy and digital skills.

- Education Scotland, SQA, schools and local authorities must take a strategic approach to the development of information and digital skills for all pupils at all stages of learning to ensure that within Curriculum for Excellence, information literacy and digital skills Experiences and Outcomes are developed and achieved by all learners.

- All teachers and support staff must have basic information and digital skills if they are to demonstrate and teach the use of these within their classes.

- Education Scotland, SQA, schools and local authorities must take a strategic approach to the development of information and digital skills for all pupils at all stages of learning to ensure that within Curriculum for Excellence, information literacy and digital skills Experiences and Outcomes are developed and achieved by all learners.

- All Education Faculties within Scottish universities should include components of information literacy, digital skills and computing science in their programmes of study for all primary and secondary teachers.

- Initial and refresher courses in information literacy and digital skills, appropriate to the level and subject of instruction, should be made available for all teachers and support staff. The recent introduction of ‘The Standard for Career-Long Professional Learning’ by the General Teaching Council of Scotland, and the impending national roll out of the associated Professional Update, are potential mechanisms to support this.

- Schools have a responsibility to ensure that pupils are safe online, but a realistic assessment of risk is needed. If pupils are to develop digital literacy skills for the real world, they need to be supported to assess, minimise and deal with risk, and to observe online etiquette.

- Local authorities must work with schools to make a realistic assessment of the risks inherent in internet access and the benefits to teachers and pupils of flexibility of access. Filters and restrictions should then be set at an appropriate level.
Education, skills and training

The Scottish Government, Education Scotland, local authorities, SQA, schools and Further and Higher Education Institutions must ensure that Scotland's education system provides the education and training in software and systems technology, informatics and computing science required by a digital society.

Computing science in formal education: suggested immediate actions

- SQA, in partnership with the Scottish Government, Education Scotland, Further and Higher Education Institutions and industry, should maintain periodic review of the specification, experiences and outcomes of computing science qualifications, to reflect current understanding of computing science and computational thinking and industry needs. Scotland should have clearly defined outcomes for computing science, both within broad general education and in the senior qualification courses.
- Organisations such as SICSA, Education Scotland, Skills Development Scotland, eSkills UK, SQA, Computing at Schools Scotland, BCS and industry, should work in partnership to implement strategic actions to raise the profile of computing science as a science at all levels within the education sector, including with government policy makers, school leaders, careers advisers, teachers, parents and learners.
- The Scottish Government, Education Scotland and local authorities should take the necessary political steps to ensure that every secondary school in Scotland has at least one qualified Computing Science teacher; and work with Education Faculties of Scottish universities to offer more opportunities for PGDE qualifications in Computing Science.
- Education Scotland, through its programme of school inspections, must ensure that all learners in S1 to S3 receive their entitlement to learning related to the Computing Science experiences and outcomes.

PLAN C: learning and development for Computing teachers

Computing at Schools Scotland is collaborating with the BCS Academy of Computing and the Scottish Government to provide a range of learning and development opportunities for Computing teachers in Scotland. The Professional Learning And Networking for Computing (PLAN C) project provides support for teaching National 3, 4, 5 Higher and Advanced Higher Computing Science and Computational Thinking in the broad general education phase.

Focusing on evidence-based methods for the teaching of computational thinking skills and computing science concepts and on-going evaluation, PLAN C uses a model of Lead Teacher Hubs and local groups, with a strong emphasis on the communication and sharing of experiences and expertise of Computing teachers, as well as learning materials.

http://www.casscotland.org.uk/plan-c/
5 Responsibilities of a Digital Society

The digitisation of society presents threats and challenges, as well as opportunities, both for individuals and for public and private sector organisations. However, in the words of Eric Schmidt, the Executive Chairman of Google, “you can’t hold back technology progress... You’re much better off organising society to take advantage of that technology.”

In this section of our Report, we argue that, to realise the potential benefits of digital inclusion, society must address new challenges. We must ask, “What must be done to counter the threats and take full advantage of the potential opportunities of digital technologies?”

We have had neither the time, nor the breadth of expertise required, to examine this question in depth. Many, but not all, of the opportunities that drive digital advantage are straightforward. The case for inclusion can rely on relatively simple examples. However, to protect our enjoyment of even the simplest benefits, we will have to address some complex challenges.

We are not even in a position to give a comprehensive account of the difficulties, let alone to determine how they should be addressed. To do so would require a great deal of further research, and a committee including deep legal and ethical expertise – particularly since many of the challenges raise global issues that cannot be addressed by local regulation.

Nevertheless, we can report on several issues that have emerged from the evidence we have gathered, and make some recommendations of principle. Some of these issues are already being addressed within the UK, but we suggest that more must be done.

This Inquiry set out to address the growing digital divide – the opportunity gap between those who benefit from the digitisation of society and those who cannot. We began with the question, “How should we spread the benefits of a digital society?”

However, we had some difficulties with the common assumption that going online was necessarily a good thing, so that everyone should or must go online. We soon found evidence that, for some people, it is dangerous to go online; for others, mental or physical disabilities may exclude them from some online services.

We cannot make the internet safe any more than we can make roads safe, or people safe. But we can minimise risk and ensure that individuals have appropriate skills (digital and information literacy largely) to navigate, to assess risk and to manage the risks on a daily basis. As recommended earlier in this Report, a digital society must also recognise that some citizens will not be able to do some things online, and it must cater appropriately for their needs.

The benefits of digital participation are also clouded by those who use and exploit the digital economy to commit illegal acts. In addition to its immediate harms, cyber-crime is a significant deterrent to digital participation. The virtual world must be policed effectively, so that it is safe to go online. The evidence suggests that society must go further.

In our first consultations, early in 2013, we heard that some individuals feared that going online would expose them to government surveillance. At that time, most of the people we met with thought such fears were paranoid – but this perception changed markedly over the course of that year. It now appears that such ‘paranoia’ may be well-founded.

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88 Reported by The Guardian, 7/3/2014
http://www.theguardian.com/technology/2014/mar/07/google-eric-schmidt-jared-cohen

89 Department for Culture, Media and Sport, July 2013, Connectivity, Content and Consumers,
Responsibilities of a Digital Society

It is also increasingly apparent that the, often unwitting, trading of personal data for ‘free’ online services may prove to be a Faustian bargain. Many people may come to rue the day that they made their youthful indiscretions public online, if prospective employers or finance companies later use them as evidence against them. One can only wonder how many people in public life would be in their posts today, had their student years been faithfully chronicled on Facebook and Twitter.

Data losses on a massive scale are frequent, so that even those who take care to limit their digital footprints are vulnerable to privacy intrusions and identity theft.

Advances in technology have changed the nature of data; they have made it both more valuable and more vulnerable.

What has changed?

The internet provides new opportunities for economic, political, and social interaction. Interactions no longer have to be face-to-face or based on proximity. Mass-communication is no longer restricted to a privileged few. Instead everyone has the opportunity communicate and collaborate with anyone online.

However, the very properties that enable such flexibility and universality also impinge on a variety of social norms, and potentially on individual or organisational rights. This hinders the acceptability, and is a threat to the social utility, of an always connected society. The evidence suggests that we must make a conscious effort to organise our society to take advantage of technology in ways that meet our own expectations of fairness, opportunity and freedom.

The issues at stake – which include surveillance, anonymity, trust, copyright, privacy and freedom of speech – are now being considered around the world. Discussion within the UK has been muted by comparison with that taking place in, for example, France, Germany and the USA.


None of these issues is new, but they must be all revisited because technology has so fundamentally altered our capacities to acquire, store, process and communicate information.

“Following the US data spying scandals, data protection is more than ever a competitive advantage.”
Viviane Reding, European Commissioner for Justice, Fundamental Rights and Citizenship, 12 March 2014

“Governments must not use cybersecurity as an excuse for censorship or to deny their people the opportunities that the Internet represents. The balance we’ve got to strike is between freedom and a free for all”
David Cameron, 1 November 2011

90 For more information see http://datalossdb.org/statistics
91 The Centre for Research into Information, Surveillance and Privacy (CRISP) is a collaborative initiative between the Universities of Edinburgh and Stirling, and the Open University, studying the many dimensions of the ‘surveillance society’ and its consequences. http://www.pol.ed.ac.uk/research/grants_and_projects/current_projects/crisp
Digital information is universal: there is no limit to the types of information we can store – not just text, but also movies, photos, sound-tracks, gene-sequences and so on. Digital information can be replicated, stored and communicated, on a massive scale, often at negligible cost. Digital information can be indexed, cross-indexed, searched and analysed in increasingly powerful and flexible ways. Digital tools can also be used to construct more or less elaborate forgeries, which can then be deployed on a massive scale. All of this can be done with freely available tools, often using only the computational resources of a consumer laptop (or a late-20th-Century supercomputer).

![Four properties of virtual social spaces that make them radically different from the embodied spaces of our offline experience:](image)

> Persistence: online expressions are automatically recorded and archived.
> Replicability: content made out of bits can be duplicated.
> Scalability: the potential visibility of content in networked publics is unlimited.
> Searchability: content in networked publics can be accessed through search.


www.danah.org

Digital technologies can liberate information – in a connected world, we all have all the world’s information at our fingertips – but information, once online, may persist forever, beyond our control. Furthermore, it now seems that nothing digitised can be securely kept offline – not even the secrets of GCHQ and the CIA.

**How does this change society?**

The internet has been regulated primarily as yet another medium of communication, where consumers access information provided by producers. However, an exclusive focus on this aspect of the internet could only result from inertia, combined with a lack of vision. We give one example of an area in which it appears that technology already outstrips regulation.

The revolutionary impact of the net stems from the fact that it allows individuals and organisations to create new spaces for communication and collaboration, in a virtual world that transcends limitations of space and, to a lesser extent, of time. The internet is a public space, a social space that should be open and accessible to all; this essential openness, which must be maintained, inevitably brings challenges in its wake.

Within it we can create more or less private spaces, for social, political and commercial interaction. These new spaces can reinforce existing communities, and create new online communities of interest. Homeworkers can be engaged in the workspace while still at home; teenagers can inhabit several social spaces simultaneously, whilst also doing their homework. Much of the business of society, from courting to commerce, is now conducted in cyber-space.

However, cyber-space differs from the embodied spaces of our offline experience. Almost by default, most spaces on the internet have a persistent, searchable history; this is often not well understood by users. This history is a valuable asset and hence open to misuse and abuse.

Moreover, now we all carry mobile phones, many of our public or semi-public embodied spaces – including shopping malls, stations, airports – are being instrumented to collect, monitor and store similar histories of all our comings and goings. The ongoing instrumentation of the physical world makes it increasingly nonsensical to try to compartmentalise cyber-space as something apart from ‘real life’. Traditional forms of surveillance, such as CCTV, are well regulated. These new forms of data gathering, however, are much less so. There are many grey areas, including what constitutes personal data and is therefore subject to data privacy.
Responsibilities of a Digital Society

Public space surveillance (CCTV)

A Public Space Surveillance (CCTV) licence is required when manned guarding activities are undertaken involving the use of closed circuit television equipment to:

a) monitor the activities of a member of the public in a public or private place; or

b) identify a particular person including the use of CCTV in these cases to record images that are viewed on non-CCTV equipment, for purposes other than identifying a trespasser or protecting property. This applies only if services are supplied for the purposes of, or in connection with, any contract to a consumer.


The result is that, in principle, and already often in practice, all the interactions of our daily lives, offline as well as online, are chronicled in minute detail, stored and available for government inspection, commercial exploitation, or wholesale plunder by intruders.

As more and more aspects of society benefit from going digital, more and more aspects of our lives are being exposed to such intrusions.

Whilst we cannot possibly recommend a comprehensive set of actions, we do suggest a number of recommendations of principle that should guide the consideration of legislation and regulation.

Governments must respect and protect our rights and freedoms online, as well as offline.

This principle encompasses a number of difficult issues, many of which will be international by nature and will require collaboration between governments on the international stage. But this complexity must not prevent the Scottish Government from taking steps to actively shape Scotland’s transformation to a digital society.

First, the Scottish Government must establish the framework necessary to ensure considered democratic oversight of the effects of the increasing digitisation of every aspect of commerce and society.

The Scottish Government already assumes a responsibility for improving the natural and built environment and protecting it for present and future generations. In order to protect rights and freedoms online, it should establish a similar responsibility for improving Scotland’s virtual environment and protecting it for present and future generations.

Second, the Scottish Government must respect and protect the enjoyment and exploitation of virtual space, just as it respects and protects the enjoyment and exploitation of embodied, natural and architectural spaces in Scotland.

The information revolution will profoundly affect every area of government, not only the most obvious ministries – Culture; Education and Lifelong Learning; Finance, Employment and Sustainable Growth; Public Health; Health and Wellbeing – but also Community Safety and Legal Affairs; Transport; Housing and Welfare; Energy, Enterprise and Tourism; Environment and Climate Change; Justice; and even Parliamentary Business.

Third, government should lead by example in respecting rights and freedoms online, by ensuring that all areas of government take a common and transparent approach to issues such as identity, privacy, surveillance, anonymity, trust.

In particular, government must monitor and restrict its potential abuses of digital opportunities, as well as abuses by commercial and criminal parties.
Responsibilities of a Digital Society

Transparency and trust

In the foregoing, we highlighted some of the abuses of the special properties of online information. We now conclude on a more optimistic note.

In the course of our Inquiry we have repeatedly heard evidence of the ability of the online world to enable communication, collaboration and cooperation, at every scale, from personal to global. Families can maintain links with scattered relatives. Even those in remote rural locations can participate in groups brought together by some niche interest. Specialist expertise can be shared globally, across boundaries of space and time.

Society can benefit from the pooling of shared knowledge, created and refined by crowds of individuals, each adding, correcting, or verifying bits of information that would be of little value on their own, but which contribute essential detail to the whole. Strangers can collaborate to produce global maps whose local details are based on local knowledge.

Effortless communication is enabled by the adoption of open standards. The creation of shared knowledge thrives on open data. The internet and the web are enabled by the transparency and trust afforded by open source tools. These are discussed further in Appendix IV.

To maximise the social value of digital inclusion, a digital nation should create an environment that enables such communication and collaboration.

We give a couple of examples that serve to highlight some of the difficulties society must address.

The increasing digitisation of content has, in some instances, reduced its accessibility. Materials that were previously available to all through the system of inter-library loans, may now be only accessible to those registered with the right specialist library. The national offer from Scotland’s public libraries should include a core range of digital information resources, including both licensed content and recommended freely available content.

As part of its duty to protect and respect rights online as well as offline, government must protect freedom of opinion and expression; and to seek, receive and impart information and ideas, online as well as offline. Recent well-intentioned attempts in the UK to protect children from accessing inappropriate materials online, by establishing wide-ranging default filters, have failed to respect or protect these rights.

A fertile environment for a digital society should also support the creation of content and knowledge that can be freely shared and reused: open content and open knowledge.

“Taxpayers have already paid for this information, the least we can do is give it back to those who want to use it in new ways that help people and create jobs and growth.”

Neelie Kroes Vice-President of the European Commission responsible for the Digital Agenda for Europe, on open data. December 2011.
6 A sector-by-sector view

Digital technologies are changing every aspect of society, and targeted action must be taken to ensure that no one is excluded from this revolution. But in light of the ever-evolving capabilities of digital technologies, a fundamental question for societies across the globe today is what they want to achieve in the 21st Century, and how digital technologies can contribute to these goals. Whilst these objectives will vary between societies and be subject to debate within each society, it is fair conjecture that Scotland may aim for stronger and more cohesive communities; an efficient and responsive public sector; robust health and social services; a dynamic and prospering economy; a thriving cultural sector; a strong civil society; and improved education and learning opportunities for everyone.

Digital technologies have the potential to play a key enabling role and to deliver benefits in all of these areas. We consider each one in more detail below. Based on the evidence received by the Inquiry, we comment on the potential benefits of digital in each sector, outline current developments and identify the barriers that are currently preventing Scotland from reaping the benefits of a digital society. In some, we identify potential actions that may overcome the barriers specific to the needs of that sector, although the recommendations made under access, motivation, skills and responsibilities will underpin the initiatives needed in all areas.

6.1 Stronger communities

Digital technologies provide new channels for communities to connect, cohere and project themselves to the wider world. These may be communities of place, within cities, towns and in rural areas, or they may be communities of interest. The internet provides a unique space for people with similar interests or social circumstances to connect directly, regardless of place. Indeed, some groups who find it difficult to be active in the physical community, for example due to mental health issues, can often engage effectively and succinctly online. For others who may be particularly vulnerable, such as victims of domestic abuse, the internet can provide access to support in a more direct and anonymous way. The online world can be de-stigmatising and offer safe, non-judgemental spaces that are enormously useful to some users.

Improved community cohesion can increase social capital and collective empowerment. It can strengthen a community’s position to influence decisions that will affect a local area, or negotiate the design of public services for groups with particular needs. The current policy spotlight on community empowerment in Scotland focuses on non-digital assets (community buildings, community councils). There are, however, numerous examples of the use of simple internet skills and tools such as blogs and social media sites to create vibrant community voices online.

Many of these existing initiatives centre around local heritage, contemporary news and the organisation and reporting of events to encourage interest and engagement in community issues.
Community websites: examples

**A Gurn from Nurn** is a well-respected local community news and events site covering the old county of Nairnshire which gets around 1000 unique visitors everyday. [www.gurnnurn.com](http://www.gurnnurn.com)

**Greener Leith** is a charity that aims to promote community engagement, better public spaces and sustainable development in Leith. The Greener Leith website covers news, planning, events and campaigns and attracts over 5000 visitors each month. [www.greenerleith.org.uk](http://www.greenerleith.org.uk)

**The Digital Sentinel** is a community news site for Wester Hailes in Edinburgh. Launched in 2013, the site is one of a number of projects that use digital technologies to preserve and promote the heritage of the local area. [www.digitalsentinel.net](http://www.digitalsentinel.net)

**Talk About Local** is an organisation that aims to give communities a powerful voice online. Having worked with UK Online centres, mainly in England and Wales, Talk About Local supports local people to create a basic online web presence for their community using freely available tools. The organisation has supported the development of numerous websites that have become dynamic hubs for local news and events, to organise campaigns or to attract tourism. [www.talkaboutlocal.org.uk](http://www.talkaboutlocal.org.uk)

6.1.1 *Increased social interaction: older people and people with disabilities*

The benefits that digital offers for stronger community cohesion can be particularly important for minority groups in Scotland; communities formed around sexuality, ethnicity, religion, language etc. People in these minority groups may be geographically widely spread across the country, so that digital channels of interaction, support and shared information are even more valuable. We heard from one student who was part of an active gay social network at university that the internet was invaluable to him on his return home to a remote part of Scotland in the holidays.

The potential benefits of digital for increased social interaction are significant for two of the groups that we have seen are least likely to be online: older people and people with disabilities. One in three people over 60 can go a whole week without speaking to anyone, and one in ten can go an entire month without any human contact. In a more cohesive society, digital technologies can be used as tools for increased social interaction, particularly for those who are, for one reason or another, socially isolated. This may include not only older people, but also people who live in remote areas, who have minority interests, for whom limited mobility makes it difficult to leave the house, or who face challenges that can make face-to-face social interactions more difficult.

The internet can facilitate online interaction; but it can also complement and facilitate social interaction in the physical world; for example, as a tool to arrange meet-ups or to assist with route-planning for people who use mobility scooters or wheelchairs or who have limited vision.

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A sector-by-sector view

At several consultation sessions, our Inquiry heard that for older people who live alone, or who do not have any family members nearby, Skype is a key motivator for being online because it facilitates regular face-to-face communication with loved ones. Sites such as Gransnet or local community forums for sharing memories and local history bring older people in contact with others who have similar interests, and also recognise the skills and experiences of older people. Evidence indicates that reducing boredom and loneliness amongst older people can significantly improve mental health and wellbeing and digital channels can play a role in achieving this end.

For people with disabilities, we heard that the internet can provide access to a range of services that are taken for granted by others, such as remote education or online shopping. There is an increasing number of websites and apps that provide assistance for people with specific needs; for example, apps that can identify colours and respond to light and dark, making it easier for people with visual impairments to identify windows, doors and exits. Technologies such as screen readers, combined with properly accessible software and websites, can make information much easier to access at a much faster pace. In the words of one respondent with a visual impairment, "the internet is priceless to me in my work, leisure and independent living.

Despite the potential benefits of technologies for older people and people with disabilities, we have seen in Section 1.2 that levels of digital uptake are low in these two groups; and that barriers may be multiple and complex. Efforts to increase digital participation amongst older people and people with disabilities will be particularly resource-intensive.

Supporting older people and people with disabilities to get online: suggested immediate actions

- Both national service providers (NHS and social work staff) and third sector support workers who provide care in people’s homes have a role in introducing clients to digital tools by incorporating them into their daily routines. Employers must ensure that these staff are properly resourced with both the skills and equipment required.

- Older people will likely respond only to informal one-to-one learning opportunities with access to mobile devices in their own homes. However, in order to reach the scale required to deal with the problem, schemes involving staff at sheltered housing facilities, care home or day centre staff, voluntary groups and intergenerational support should be developed. Staff involved in these interventions must be appropriately equipped and skilled to provide the informal support needed.

- For people with disabilities, there will be a wide variety of needs that must be accommodated by a range of learning environments. Training must be affordable and accessible for people with additional needs, and trainers will require to have knowledge of assistive and adaptive technologies. The identification of best practice and development of resources and approaches that can be used by stakeholders within and across communities of people with particular needs will be required to match the scale of the gap.

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95 For more information see www.gransnet.com


97 David Kelter written evidence to the Inquiry
Quarriers GO4IT Service

Quarriers GO4IT service provides help getting online and teaching digital skills to those with physical and/or learning disabilities. It provides both training and access to equipment for those who need it. Amongst the services it provides are computer clubs, equipment loans, one-on-one assessments to help determine each individual’s needs, as well as providing access to assistive technology and training sessions on various aspects of digital literacy.

www.quarriers.org.uk

6.1.2 Job seeking and employment

“The internet has revolutionised the way people search for employment. Because of the flexibility it offers, it can also help people keep their jobs, but only those already online can benefit from these opportunities...”

Job searches and applications are increasingly taking place online. Online job searches can make finding employment easier and more efficient; for example, through smart matching and sites for uploading CVs. Many jobs are filled through networks, offline and online. In addition to making it easier to access an enormous pool of formally-advertised job opportunities, the internet, and particularly social media, can open the door to job opportunities via less formal interactions.

However, with moves towards online-only job advertising and applications, and requirements on those claiming benefits to use online search tools such as Universal Jobmatch, it is increasingly the case that opportunities are available only to those already online. People who are not online, whether because they do not have access to the internet or do not have the information or digital skills needed to carry out effective online searches, face growing restrictions on the opportunities available to them. There is a significant risk that those who could benefit most by moving from unemployment into work, will be those who are least able to access opportunities. Further, job seekers who are claiming benefits and cannot get online or effectively search online, may face benefit sanctions.

6.1.3 Flexible and remote working

The internet can facilitate flexible and remote working: that in turn can improve employee recruitment, retention and productivity. Flexible working arrangements are increasingly required by employees with caring responsibilities. With the ageing of the Scottish and UK populations, more working-age adults have some responsibility for the care of older relatives; maintaining and increasing their workplace participation will represent a significant benefit, to those individuals and to society. An environment in which individuals can effectively balance their working and caring roles by working from home and/or outside normal office hours when necessary can increase participation in the workforce by people who might otherwise withdraw. Digital technologies lend themselves to the creation of new sorts of jobs well-suited to distance and part-time working. With remote access to a company’s computer systems and email, many more traditional jobs which once required to be undertaken in an office within certain business hours, can now be carried out on a much more flexible basis.
A sector-by-sector view

The opportunity for remote working can also yield significant benefits. Digital technologies offer flexibility for employees to work outside of the office, allowing them to be more productive when on business travel, for example. But they also have the potential to enhance the sustainability of isolated rural locations. A key theme that emerged from our consultations in remote areas and small towns (Dumfries, Hawick, Kirkwall, Lerwick, Lochaber, Tain and Thurso) was the potential benefit of people being able to remain resident and active in these communities, instead of moving to jobs in urban areas. These may be people employed by firms based elsewhere but able to work from home; residents who can set up a business with nothing more than a laptop and connection; or firms that can open offices in remote small towns, attracting people to the area.

Of course, such potential benefits can only be realised where there is infrastructure in place that provides reliable connections and sufficient speeds and capacity to deal with business demand at an affordable price.

“The once broadband is established, people can move into the area, because they can work from home etc. Two families moving into a village who work remotely have kept the local school open; all depends on whether they can use broadband.”

Evidence heard at Inquiry consultation in Thurso, July 2013

**The Scotsman, 9 October 2013 “Slow internet forces people out of rural areas”**

“Rural Scotland is seeing a new phenomenon of ‘digital refugees’ as people leave remote areas in search of faster internet speeds, the Rural Affairs Secretary has said. Evidence is emerging of broadband-led rural depopulation amid concerns that nearly a fifth of homes in the Highlands and Islands will remain stuck on slower internet speeds... Consumer groups have warned that internet access and slow connectivity speeds can affect people’s ability to connect with the outside world and access the job market.”

6.1.4 Democratic participation

The internet creates opportunities for greater engagement with, and greater transparency of, the political process. The Scottish Parliament website, for example, allows users to watch the day’s business in the Chamber online, publishes daily bulletins and provides educational resources on politics in Scotland. The opportunity for voters to access this information can contribute to a more informed population and to better-informed decision making in democratic processes. The internet is also enabling this level of transparency within local government. In Tain, we heard about the use of video streaming by Highland Council Chambers.

“Highland Council have a webcast, you can go online and see what your representative is doing or not doing. Disenchantment with politics is creating a deficit, this way people can watch what’s going on. It’s good for democracy and representation.”

Evidence heard at Inquiry meeting in Tain, July 2013
A sector-by-sector view

Although it may be the case that those likely to access these online services will probably be those who are already motivated to engage with the political process, online access has two major benefits for those wishing to engage. The most obvious is that they no longer have to travel to Edinburgh, or even to their local council headquarters, to do so. This removes a barrier to social and political participation for those living remotely. The second, less direct benefit, is that for those who are keen to engage in and observe the political process in Scotland, the ability to do so via online media may act as a ‘hook’ to motivate digital participation by these groups. Once these individuals are digitally engaged, other means of not only observing the political process, but also directly guiding and feeding into it, become available to them.

These opportunities for e-participation exist in various forms; for example, formal inquiries and consultations by the Scottish Government and by Parliamentary Committees which can be downloaded and submitted online. Alongside formal opportunities for e-participation, there is also an increasing number of informal processes through which the political and wider social environment can be influenced. Citizens can start their own petitions and campaigns about issues of relevance to them, and support campaigns already running by signing e-petitions or emailing MSPs and MPs. Online campaigns can attract widespread support, and have the potential to influence policy and decision makers in the public and also in the private sector.¹⁰²

E-participation is starting to open up the democratic process and enables individuals to collaborate with others who share their interests and concerns, regardless of physical location, in order to ensure that their views are represented. The UN E-Government Development Database defines the purpose of e-participation as being to: ‘improve the citizen’s access to information and public services; and promote participation in public decision making which impacts the wellbeing of society, in general, and the individual, in particular’.¹⁰³

6.2 An efficient and responsive public sector

Digital technologies are already being employed and changing the landscape of service delivery across the public sector, from UK Government departments, the Scottish Government and local authorities to agencies such as HM Revenue and Customs and the Driver and Vehicle Licensing Agency. Such usage will inevitably continue to grow.

The use of digital technologies and digital channels of service delivery can make the provision of public services simpler, faster and more integrated for users. Digital tools make continuous, real time evaluation of service delivery easier; and enable agile, responsive, on-going improvements to services based on this evaluation. Used effectively, this should ensure a high quality user experience of services.

Of course, for the public sector, a key driver of these developments is the reduction of costs. The Booz & Co report estimates that digitising public services can save approximately £1.5 billion annually.¹⁰⁴ The Cabinet Office places the figure at an estimated £1.7 billion per annum from 2015.¹⁰⁵

“The big thing we [the public sector] need to do is channel shift – it’s much cheaper if someone switches to online self service; it costs the public sector around 20p per internet transaction, around £1.73 per telephone transaction, and around £7 per transaction made in an office [in person].”

Evidence heard at roundtable with public and third sector representatives in Dundee, July 2013

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¹⁰² For example, see list of achievements at http://www.38degrees.org.uk/
¹⁰³ For more information see http://unpan3.un.org/egovkb/egovernment_overview/eparticipation.htm
¹⁰⁴ Booz and Co. 2012, This is for everyone: the case for universal digitisation, www.booza.com/media/uploads/BoozCo_This-Is-for-Everyone.pdf
A sector-by-sector view

The Government Digital Service (GDS), set up within the Cabinet Office in 2011, is currently driving and coordinating the use of digital across UK Government departments and agencies.

In 2012, the GDS launched GOV.UK as a single portal and shared publishing platform for central government. Under the UK Government’s ‘Digital by Default’ agenda, the GDS has also been tasked with leading the digitisation of 25 key services by 2015. These services include electoral registration, the property register, vehicle management, Universal Credit and tax self-assessment.

The Scottish Government and COSLA\textsuperscript{106} published Scotland’s Digital Future: the delivery of public services in 2012\textsuperscript{107}. The strategy takes a ‘digital first’ approach to service delivery; i.e., that public organisations deliver online everything that can be delivered online. It sets out goals to simplify and join up services across the public sector; to improve public sector use and responsible handling of data; to build on common standards and interoperability; and to ensure that the public sector workforce is motivated and skilled in the use of digital technologies. An Action Plan published in December 2013\textsuperscript{108} provides an update on progress.

The speed of developments, however, does not appear to have been matched by sufficient consideration of the varied needs of public service users. Elsewhere in this Report we have highlighted issues pertaining to the digital delivery of public services:

- That people who are most likely to be digitally excluded are often most likely to need the support of public services, including the elderly, people with disabilities or long-term health conditions and people experiencing multiple factors of deprivation. (Section 1.2)
- Variations in the accessibility of websites and digital channels of delivery for people who require assistive technologies, or who have other additional needs, e.g. due to health conditions or limited literacy. (Section 2.3).
- The lack of sufficient public access points to meet increasing demand for internet connections arising from public policy design, e.g. the requirement for jobseekers to use Universal Jobmatch. (Section 2.4).
- The poor design and complexity of processes, such as the Universal Credit application, which render digital channels unusable and entrench negative attitudes towards the internet. (Section 3.2).

To this list we would add:

- That digital channels of service delivery cannot be solely relied upon in rural areas where people cannot connect to the internet at the speeds required to use them. (For more details on connectivity see Section 2.1). In this situation, public services cannot make savings, the public cannot gain the benefits and the sustainability of rural communities is further endangered.

Until these issues are addressed, there is a risk, and by some accounts already a reality, that those who rely most heavily on service provision will become disenfranchised by the push to digital channels.

\textsuperscript{106} Confederation of Scottish Local Authorities


Finally, for those who can access public sector websites and services online, many do so through mobile devices such as tablets and smartphones. Of the six million unique visitors to GOV.UK each week, 20% access the portal through mobile devices\textsuperscript{109}. In Aberdeen, we heard that access to the Council website via mobile is growing: 25–30\% on average, and in some places over 50\%\textsuperscript{110}. Many services available online are not yet compatible with all technologies, and this presents a barrier to those whose preferred, or only, form of access to the internet is through mobile devices. Public sector websites and services must, from the outset, be designed to be equally functional across a range of devices, from traditional computers to tablets and smartphones.

However, as local authorities and government departments develop their digital services, websites and apps using today’s and future technologies, we call for the principle of ‘use and reuse’ to be at the heart of such design. Already there are a number of examples of sites – including GOV.UK\textsuperscript{111} – that use open source coding that can be replicated by others for free\textsuperscript{112}. StormID, a digital consultancy working with the City of Edinburgh Council, has launch Council Toolkit\textsuperscript{113}, a cost-free resource that allows Councils to design and build fully responsive websites that adhere to emerging best practice standards and guidance.

### 6.3 Robust health and social services

The proportion of people in Scotland aged 75 and over is predicted to rise by 80\% by 2035\textsuperscript{114}. There is widespread agreement that the current structure of health care and social services in Scotland, as elsewhere, will simply not be able to cope. The rising demands of an older population with complex health issues and more people living with long-term conditions as diagnostic techniques and treatment options improve, are immense challenges.

In February 2014, the Scottish Parliament passed The Public Bodies (Joint Working) (Scotland) Bill, which sets out a legislative framework for the integration of adult health and social care services\textsuperscript{115}. Integration is partly driven by the need to use resources more efficiently and effectively in the delivery of care services; and to support people to remain in their homes for as long as possible.

\textsuperscript{109} For more information see Government Digital Service, https://gds.blog.gov.uk/2014/01/08/when-will-more-people-visit-gov-uk-using-a-mobile-or-tablet-than-a-pc/

\textsuperscript{110} Inquiry meeting in Aberdeen, July 2013

\textsuperscript{111} GDS on GitHub https://github.com/alphagov

\textsuperscript{112} See for example, the New Zealand Government’s current beta website https://beta.gov.nz

\textsuperscript{113} www.counciltoolkit.org


\textsuperscript{115} http://www.scottish.parliament.uk/parliamentarybusiness/Bills/63845.aspx
A sector-by-sector view

Digital technologies will be an important factor in the integration of these more complex services. Digital tools can facilitate the integration of record keeping, data sharing and communication between health boards and social care service providers, which includes local authorities, the partners to which services are contracted out, and increasingly third sector organisations also. Designed and used effectively, digital tools can also act as tools to relieve pressure on frontline services and assist in independent living.

The potential benefits of increased digital capability and participation for health and social care providers and end users are well known, and have been well documented elsewhere (see, for example, Booz & Co., 2012). Some of the opportunities highlighted to this Inquiry include access to online health information that will promote self-management; access to peer support centred around shared conditions; improved channels for patient monitoring, feedback and dialogue; new channels for the promotion of public health messages; and better communication between health and social care professionals and patients, including communication with those who do not have a fixed or long-term address. Innovations in health care and assistive technology, including in telehealth and telecare, have the potential to allow people to live independently in their own homes for longer; to improve health outcomes; to reduce travel by patients and care providers; and to increase the timeliness of interventions.

The development of digital tools for use in health and care services has been recognised in Scotland as a sector of potential high growth and revenue. The Digital Health & Care Innovation Partnership, a collaboration between the public sector (Scottish Government, NHS Scotland, the enterprise agencies), academia and the third sector, is developing a national digital health and care delivery strategy for Scotland. 2013 saw the publication of the Technology Advisory Group’s *Digital Health and Care Technology Action Plan* and establishment of the Digital Health Institute. There are also examples of digital technologies being piloted and used on the ground in innovative ways in health and social care services across Scotland. A growing number of health boards are using digital tools such as social media, e-participation channels and online portals to distribute health and service information, gather patient feedback, facilitate discussions on health issues, engage staff and to digitise simple transactions such as requests for repeat prescriptions.

**NHS use of mobile technologies**

NHS boards across Scotland are trialling, evaluating and implementing the use of mobile technologies, supported by a £1 million fund from the Scottish Government. NHS Western Isles found that the use of digital pens by community-based staff allowed 50% more time to be spent with patients. Staff could access information and update records electronically, reducing time spent on admin. Similar schemes are now being rolled out in NHS Dumfries and Galloway and NHS Borders. Elsewhere, tablets and ipads are being used by NHS staff to record information, order equipment, access emails and manage calendars whilst out and about in their communities and in patients’ homes.

*Scottish Government press release, 26 January 2014*

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118 The Digital Health Institute, [http://dhi-scotland.com/](http://dhi-scotland.com/)
However, evidence gathered by this Inquiry suggests that the full potential of digital technologies in the health and social care sectors is far from being realised. Fears about data sharing and security of digital communications persist and we heard that complex and often inaccessible guidelines for data protection create a culture in which service providers decide that it is easier, and less risky, to share nothing and to avoid putting such data online. We also heard that policies on issues such as filters and the use of digital tools, while varying greatly across local NHS boards, are generally restrictive and often limit the options available to practitioners. The use of digital is not embedded within GPs’ contracts; and we came across concerns from primary care staff that the use of digital, e.g. to allow constant home monitoring, will increase workloads, with no additional resources to meet this demand.

Further, questions on the quality of health information that is available online and the ability of patients to find, evaluate and use this information to make appropriate health decisions (health literacy), were also raised. Health charities and the NHS are taking steps to promote sites which have been vetted and endorsed.

Providers of health and social care services have a duty to use, share, store and protect data responsibly. The integration of different services and more effective use of data could reduce costs and improve outcomes for service users.

However, there is little or no shared understanding of how data can, or should, be used, shared and protected. Who ‘owns’ data about individuals? Who should have access to what information? What are the risks of sharing data? How can access be controlled, without making the costs of sharing prohibitive? Can data be effectively anonymised?

Many of the challenges to progressing these goals are cultural: barriers to integration and data sharing will not be overcome until there is better understanding of these issues (which will require better information and health literacy across the population), clear leadership at all levels and good relationships and trust between professionals. A realistic assessment of the costs, benefits and risks of the use of digital technologies in health and social care services must be considered against assessment of the cost and benefits of not using such technologies, if digital is to be embedded in the culture of care across all services and across all of Scotland.

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**Case study: Living it Up**

‘Living it Up’ is a three year programme that aims to deliver integrated, personalised health, care and well-being services and information to over 50s through familiar technologies, such as televisions, mobiles, games consoles, computers and tablets. Part of the UK-wide dallas programme, this £10m initiative is being led by NHS24 in collaboration with five local partnerships across Scotland and aims to engage 55,000 people by May 2015. Living it Up will demonstrate how assisted living technologies can support wellbeing and independent living; and evaluation of the programme will allow lessons to be learned and considered elsewhere.

[www.livingitup.org.uk](http://www.livingitup.org.uk)
A sector-by-sector view

**Health and social care services: suggested immediate actions**

Digital tools can offer technological solutions to some of the concerns raised on data security and sharing, including by allowing patients to retain control over their own records.

- NHS Scotland and local authorities should work with system designers on the development of improved models of data access and control, that would help to engender trust both from professionals and individuals on data security.

There is an urgent requirement for a realistic assessment of the benefits and costs of digital channels of communication in the delivery of health and care services. Risks are inherent in any means of communication but these should be considered as an element of project management.

- NHS boards, local authorities and other providers of social care services must develop guidance on the use of digital channels of communication and work with local IT managers to implement this in a consistent and practical way across the country.

There are a number of pilot projects underway in Scotland, the UK and further afield, to explore the use of digital in care delivery.

- NHS Scotland and local authorities must ensure that there is a mechanism for lessons learned from pilot initiatives on the use of digital technologies in the delivery of care to be shared; and for best practice to be rolled out.

**Case study: MyDex**

Mydex is a community interest company that aims to give individuals control over their personal data. Using its innovative ‘personal data store’ platform, individuals can collect and store a range of their own personal data, encrypted to the highest industry security standards. The individual then decides what information they want to share, if any, and with whom. Current partner organisations include local councils, government departments, housing associations and a number of private and third sector organisations.

The Mydex model also allows the verification of a range of elements of an individual’s identity (e.g. passport, driving licence) that can be recognised by organisations. In September 2013, the company signed a contract with the Government Digital Service as one of five approved Identity Providers for the UK Government’s first live digital services.

This and similar emerging approaches to personal data storage and ownership may have advantages in building trust between individuals and organisations that data will be used appropriately. With the integration of health and social care, trust will be a key element of effective data sharing.

[www.mydex.org](http://www.mydex.org)
6.4 **Enhanced learning opportunities**

Digital technologies have been used in distance learning for a number of years. The Open University model, for example, involves students accessing course material through an online portal, taking part in online study groups and tutorials, and submitting assignments online. The Open University in Scotland has around 16,000 students, from every postal district in Scotland. Over 70% of Open University students are working full or part-time\(^{119}\).

In more recent years, the emergence of massive open online courses (MOOCs) has seen course materials and interactive forums with both peers and experts made available for free to anyone who is online. In Scotland, the University of the Highlands and Islands has been a trailblazer in the use of digital technologies in the delivery of distance learning.

Such new forms of learning can be flexible, self-paced and learner-centred, allowing people in part-time or full-time work, people with caring responsibilities, people with anxiety or mental health issues, and those with mobility challenges, to engage in formal learning and development. They also overcome geographic challenges – people can participate wherever they are based, including in rural and isolated areas, as long as they can connect to the internet.

Of course, in addition to facilitating lifelong learning and professional development through access to formal education, digital technologies can also facilitate much more informal learning and development, complementing traditional offline channels. BBC Learning has an Adult Learning section\(^{120}\) which provides mini online skills tutorials, in topics ranging from literacy and numeracy to cooking and gardening.

The internet can provide access to a wealth of information on every interest and hobby. With everything from YouTube instructional videos, to the sharing of hobbies and expertise on social networks, to self-led learning tools such as Codecademy\(^{121}\), it enables peer learning and opportunities for interaction with experts.

This type of informal online learning, that can be taken at the pace of the user and requires no formal assessment, provides opportunities for gaining new skills and knowledge which may be particularly appropriate for those who have had negative experiences of formal education. Online learning platforms provide opportunities to access learning resources, to practice new skills and to measure progress and gain confidence, without exposure to intimidating classroom environments.

However, using these platforms does require a basic level of literacy, information literacy and digital skills, as well as access to affordable broadband operating at the speeds that are needed for such learning applications. Without these fundamental pre-requisites, there is a real risk that only those who already have relatively high levels of education will discover and access these additional learning opportunities.

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\(^{119}\) For more information, see Open University, [http://www3.open.ac.uk/near-you/scotland/p3.asp#p1](http://www3.open.ac.uk/near-you/scotland/p3.asp#p1)

\(^{120}\) For more information see BBC, [http://www.bbc.co.uk/learning/adults/](http://www.bbc.co.uk/learning/adults/)

\(^{121}\) For more information see [www.codecademy.com](http://www.codecademy.com)
A sector-by-sector view

6.5 A dynamic and prospering economy

Globally, digital technologies have fundamentally transformed economies and the marketplace. They offer new ways to gather and analyse business intelligence; channels through which to offer goods and services; access to previously out of reach markets; increased mobility of both employees and customers; and business tools such as cloud computing and social media. All of Scotland’s businesses can benefit from the use of digital tools and improved information and digital skills. Potential high-growth sectors are emerging in the development and supply of technologies, a number of which Scotland is well-placed to compete in. Both consumers and businesses able to take advantage of digital technologies can realise benefits. Those who can’t or don’t, however, risk potential financial penalties.

Consumers

Access to the internet can enormously expand consumer choice by providing access to many more sellers online than on the local high street. This wealth of choice enables consumers to identify differently-priced goods and services and to locate specialist goods not available locally. Price comparison sites enable consumers to find the energy deals that are most appropriate for them, the lowest rates of interest on credit cards and the best deals on insurance and other services. Analysis by the Post Office estimates that a digitally excluded household could save around £560 per annum by buying online.

However, as the best tariffs for goods, services and utilities are increasingly those for online and paperless contracts, there is a risk that digital exclusion will exacerbate the poverty premium. A report issued by Consumer Futures and the Joseph Rowntree Foundation in 2013, estimated that consumers on low incomes pay on average 10% more for many goods and services than their wealthier counterparts. Further, those least likely to be online may be unable to realise these benefits just by going online; for example they may not be able to make online purchases, which require a credit or debit card, or to set up a direct debit to benefit from lower energy tariffs. The barriers identified to the affordability of an internet connection (Section 2.2), such as the lack of a bank account or no fixed address, apply here too. In many countries, mobile payments allow people without access to a bank or large financial resources to make secure financial transactions at low cost.

In today’s world, the internet is the dominant forum through which consumers can access product information, reviews, specialist advice, appropriate comparable prices, and advice on consumer and statutory rights. Being able to easily access this information puts the consumer in a much stronger position to make informed choices and to negotiate with organisations, even if the transaction itself is carried out offline. Those who are not aware of this wealth of information, whether because they are not online and have no proxy to access it for them, or because they do not have the information literacy or digital skills to navigate the online world effectively, have limited choices and a limited picture of what represents a fair deal.

Creative Industries and Technologies sectors

Both the creative industries and technologies sectors generate potentially cutting-edge, high-growth businesses that are vital to the Scottish economy in the 21st Century. The creative industries cover a broad range of businesses, from advertising to the performance arts to software development. Many of these industries, such as graphic design, computer game development, music and film, are in the vanguard of digital use and, indeed, drive innovation in the development and capabilities of digital technologies. There is a cross-over here with the technologies sector, those businesses which grasp opportunities to develop and harness new technologies in innovative and creative ways.

122 Oxford Economics, 2011, The New Digital Economy: how it will transform business,

123 PricewaterhouseCoopers UK LLP, October 2009, The Economic Case for Digital Inclusion,

124 Donald Hirsch for Consumer Futures, March 2013, Addressing the poverty premium – approaches to regulation,
Scotland has a number of thriving technology clusters and creative hubs, including in Glasgow, Edinburgh, Dundee and Aberdeen. The concentration of these strengths in Scotland is enabling new innovation and creative practice, valuable both for its creative and inspirational impact but also as the expertise of these sectors feeds out into the wider business and public communities (e.g. the growing open data movement in Scotland, web apps for interaction with councils).

The strategic importance of these sectors is reflected in their recognition as target industries by Scottish Enterprise and Highlands and Islands Enterprise. Creative Scotland, as the national body for the arts, screen and creative industries, distributes public funding for the development of enterprises in the CI sector. There are strong collaborative partnerships in place in Scotland between industry, academia and the public sector (e.g. through the Technology Advisory Group). Combined with the level of support provided by the enterprise and skills agencies, from broad advice to highly tailored and specialised support, this should place Scottish businesses in these sectors in a strong position to thrive and compete on a global scale.

The emerging findings of the Scottish Government’s digital economy strategy identifies some key technology sectors for Scotland, such as Digital Health and Care, Big Data and Smart Mobility, and summarises the initiatives being taken in each. There is, however, a range of hurdles that remain to be dealt with before such sectors can reach their full potential; for example, the skills of the workforce, infrastructure limitations, current data protection frameworks, copyright laws and IP infringement.

Small and micro enterprises

The SME sector is particularly important in Scotland, where it accounts for over 99% of private sector enterprises, 55% of private sector employment and around 37% of private sector turnover. SMEs are vital to the wellbeing of many parts of Scotland, but particularly to rural areas, where micro enterprises make up the majority of the business sector. In fact, some 94% of businesses in Scotland have ten or fewer employees.

Digital tools offer a wide range of opportunities to SMEs, whether for growth or for sustainability. Online sales and marketing can increase the geographic reach of a company and increase its profile and its client base. Improved communication with customers, via email, social media or through other forms of online feedback, provides opportunities for increased customer engagement and satisfaction. Online purchasing of raw materials and streamlining of supply chains can reduce costs and increase profit margins by providing access to cheaper products and reducing stock levels. Group purchasing and sales by co-operative business arrangements are also possible online. Greater knowledge of supply and market prices enables better-informed decision making by SMEs.

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125 Scottish Government, April 2013, Scotland’s Digital Future: Supporting the Transition to a World-leading Digital Economy, http://www.scotland.gov.uk/Publications/2013/05/2347


128 Scottish Government, April 2013, Scotland’s Digital Future; supporting the transition to a World-leading Digital Economy, Emerging Findings April 2013; http://www.scotland.gov.uk/Publications/2013/05/2347
A sector-by-sector view

A UK-wide survey undertaken by Lloyds Banking Group of 677 business owners from a spread of sectors found that of those who use the internet;

- 51% increased sales due to effective marketing and wider geographic reach;
- 54% cut costs through back-office automation and electronic communication;
- 54% improved levels of customer satisfaction, service and retention.

However, the same survey\(^{129}\) found that small and micro enterprises are unlikely to be using digital tools to their full potential. It reports that of small enterprises [of 2–10 employees], 9% were offline\(^{130}\) and another 57% had only an immature\(^ {131}\) web presence. For sole traders, the figures were 23% and 51% respectively.

Scotland has many examples of small and micro businesses that are fully digitally engaged, including those whose core business revolves around technologies. In this Inquiry, we wanted to understand why there are still so many enterprises that do not feel motivated or skilled to engage.

The motivation to get online is likely to differ between enterprises and across sectors. For some, the lure of online sales and access to a wider marketplace is a key motivator; but for others, whether due to the nature or ambition of the business, selling online is either impractical or undesirable. We heard that some small enterprises, in dismissing the option of online sales, dismiss the use of digital entirely. We also heard a repeated message that many small businesses have no ambition to grow, merely to sustain operations and ‘get by’. This suggests that small businesses do not have a clear understanding of the capabilities of digital tools to reduce costs or free up time by streamlining back-office services. Further, there is a risk that some small enterprises carrying on with ‘business as usual’ while competitors take advantage of digital technologies, may lose market share and become unsustainable.

For other small and micro enterprises, the decision to remain offline may be more considered. Some refer to negative experiences, by themselves, by others, or reported in the media, of online engagement. These lead them to conclude that the risks of digital participation to their organisation and its reputation are higher than the gains. Some fears are real and understandable. However, they are manageable and should not be insurmountable barriers to participation.

Many of the small businesses we consulted saw a lack of digital skills and understanding of digital tools and content as barriers. We heard that small business owners have no capacity to leave the business to attend meetings or training events, the relevance of which is not immediately apparent. The business and skills support landscape in Scotland includes a number of agencies (including SE and HIE, Business Gateway, Chambers of Commerce, the Federation of Small Businesses Scotland, ScotlandIS, eSkills UK), with a range of support mechanisms for digital aimed at different types and sizes of businesses, different sectors and different levels of digital maturity. There are many useful resources, training initiatives and placement programmes underway. As we gathered evidence across Scotland, however, we heard examples of courses that were over- and under-subscribed, courses that didn’t match needs or that were considered as being about IT rather than business sustainability or growth. An audit of the current digital training initiatives available to small and micro enterprises, and of the quality of these initiatives, would be useful. Digital skills training packages must be clearly linked to sustainable business models and opportunities for growth.


\(^{130}\) ‘Offline’ is characterised as having no online presence and where employees use the internet for only very basic online tasks.

\(^{131}\) ‘Immature’ is characterised as maintaining a website with low-level functionality and with low to moderate business tasks done online.
Finally, the Inquiry also heard examples where small enterprises had ‘bought in’ digital expertise and website development and were provided with tools that were not suitable for their needs, or with websites that were complicated to maintain. In part this was due to small businesses’ lack of ability to set out clear specifications of their requirements; but also at times due to poor service from providers for which businesses were overcharged. Word of mouth is a key channel of communication amongst small and micro enterprises, so such bad experiences can have a significant impact on motivation to get online across the sector.

The emerging findings on the Scottish Government’s digital economy strategy sets out a vision of a ‘seamless programme of action’ from Scotland’s enterprise and skills agencies to support the digital economy and a Business Excellence Partnership has recently been set up. The identification of the need for action to be taken on such a streamlined approach is welcome and we look forward to seeing that develop on the ground. Nevertheless, there are over 300,000 small and micro businesses in Scotland. Most of these will require some help in developing digital skills. Even if well-coordinated, small-scale skills training sessions will not match the size of the problem. Research undertaken by FSB Scotland and the Scottish Government in 2012 indicated that two key sources of information for small businesses in Scotland are local business networks and peer contacts. Peer-to-peer learning presents an opportunity to attain a critical mass of participation amongst SMEs. Business owners who have developed some digital competence can champion the benefits of digital, share their skills with others and address gaps in their own knowledge. Once basic skills have been established – i.e. logging into a computer and finding websites using the address bar – there is the opportunity to deliver further skills training and support at scale via online learning resources.
A sector-by-sector view

Suggested immediate actions: small and micro enterprises

These actions are directed at enterprise support agencies in Scotland: Business Gateway, Scottish Enterprise, Highlands and Islands Enterprise, eSkills UK, Skills Development Scotland; and membership organisations including Chambers of Commerce, ScotlandIS and the Federation of Small Businesses. However, there must be strategic coordination between these agencies to ensure that the activities of each complement the others, and that messages and referrals for support are clear and consistent.

- Enterprise agencies should provide well-targeted and well-packaged initiatives aimed at providing support for SMEs to make the small, entry-level steps necessary to digital participation. Support must be well sign-posted with appropriate referral points between agencies.

- Enterprise agencies must continue to develop and maintain easily accessible mechanisms to support SMEs to engage with the online world, including the maintenance of simple checklists of free online services and tools – such as business listings, appointment diaries, blogs and calendars.

- Enterprise agencies must rely primarily on peer-to-peer learning and supported online learning to match the scale of the problem. Central interventions should focus on providing appropriate online materials and support mechanisms that allow these to be refined and adapted in response to feedback from users.

- Enterprise organisations should establish and support regular local ‘Meet Ups’ for SMEs, where they can explore potential benefits of digital engagement and share skills and knowledge; and where local service providers can meet with potential clients and establish trust.

- Enterprise agencies should establish initiatives for the recognition of skilled and reputable web developers in order to support SMEs in identifying reliable and digitally-skilled providers. SMEs should be provided with guidelines on writing appropriate specifications for digital contracts.

Broadband Connection Vouchers

In December 2013, the City of Edinburgh Council announced financial assistance to SMEs in the city to help cover connection costs of accessing better broadband.

Funded by the Department for Culture, Media and Sport, the voucher scheme forms part of the Council’s ‘Connected Capital’ Programme. SMEs can apply for vouchers to cover connection costs of between £250 and £3,000, paid directly to the registered supplier, to cover either or both fixed broadband and wireless solutions. SMEs pay the VAT, any amount over the value of the voucher and the on-going subscription cost.

http://www.edinburgh.gov.uk/info/691/council_performance/1795/connected_capital/3
6.6 A strong and shared culture

“Cultural engagement impacts positively on our general wellbeing and helps to reinforce our resilience in difficult times. Cultural participation is known to bring benefits in learning and education; there is a significant association with good health and satisfaction with life. Our culture is key to our sense of identity as individuals, as communities and as a nation.” ¹³⁵

This quotation explains the importance of Scotland’s culture to its social and economic wellbeing, and why, in 2012, the Scottish Government added ‘Increase Cultural Engagement’ as a new performance indicator in the National Performance Framework.¹³⁶ Cultural heritage includes a huge array of printed material, photographs, paintings, sculpture, museum objects, historic sites, film, music, dance and theatre.

As Scotland makes progress in delivering digital infrastructure and improving levels of digital participation, consideration must be given also to the delivery and creation of high-quality, valuable digital content. The digitisation of Scotland’s culture and heritage has the potential to deliver a number of benefits. Digital channels can bring quality cultural and heritage material to a wider geo-demographic audience and enhance both national and international understanding and reputation of Scottish society. Digital channels can provide opportunities for public access to collections that are not publicly or readily available. Digital images, when accompanied with contextual and interpretative information that gives added value and enables individuals to understand the importance of the material, can be a powerful tool to facilitating equality of access to national and local collections. Digitisation can stimulate new activity in creative fields and provide opportunities for innovative collaboration.¹³⁷

Digitising Scotland’s heritage: examples

Scotland’s People is one of the largest online sources of original genealogical information, with almost 90 million searchable records (Scottish census records, birth and death certificates, wills) allowing the research of Scottish heritage and family trees. www.scotlandspeople.gov.uk

Shetland Museum & Archives has an online archive of over 60,000 images of all aspects of Shetland Heritage and culture, dating back to the 1880s. www.shetland-museum.org.uk

National Library of Scotland has digitised over 80,000 maps of Scotland which together provide a history of Scotland through map. The images can be enhanced by overlaying historic maps with contemporary ones. www.maps.nls.uk

Tobar an Dualchais/Kist o Riches is a collaborative project set up to preserve, digitise, catalogue and make available online several thousand hours of Gaelic and Scots recordings, including folklore, songs, music, history, poetry, traditions and stories. This resource is used a great deal by musicians and folklorists, thus feeding back into present day, active culture. www.tobarandualchais.co.uk

Online cultural engagement will be of interest to a broad audience. However we have also heard anecdotal evidence that cultural heritage can be of particular interest to the older population: those who have time and interest to explore their heritage but potentially limited mobility or resources to physically visit collections and sites. For some people in this digitally ‘hard to reach’ group, and indeed the population more generally, access to well-curated and presented cultural material may provide a hook for online engagement.

¹³⁵ For more information see Scottish Government www.scotland.gov.uk/About/Performance/scotPerforms/indicator/culture
¹³⁶ For more information see Scottish Government, http://www.scotland.gov.uk/About/Performance/scotPerforms
¹³⁷ For more information see evidence to the Inquiry: David Hunter, Dr Kate Byrne, Andrew Ormston, RSA Fellows
A sector-by-sector view

Crowd sourcing in the cultural and heritage sector is also an increasingly important way of engaging people with research and learning whilst gaining confidence in digital skills. RCAHMS\textsuperscript{138} is currently the largest crowd sourcing project of this kind in Scotland, urging thousands of volunteers to transcribe more than 150,000 pages of historic archives dating from 1645 to 1880 – reading old handwriting, identifying local places and pinpointing people in Scotland’s history.

There have been numerous digitisation programmes in the galleries, libraries, archives and museums sector over recent years and Scotland’s National Collections\textsuperscript{139} all provide some level of digital access to their collections online. Together with a range of online archives, material from the visual and performance art sectors and material that is created in digital format from the outset, there is a wealth of cultural resources available through digital channels.

However, Scotland does not have a coordinated, strategic national approach to the digitisation of and digital access to its culture and heritage. The National Library for Scotland included an aspiration ‘to develop a national strategy for digital access to Scottish cultural heritage’ in its 2012 Corporate Plan\textsuperscript{140} but it is not clear if any one organisation is well placed to lead such a national approach. Scotland’s National Strategy for Museums and Galleries\textsuperscript{141} headlined digital participation in engaging audiences, although the Inquiry was pointed to European research that found that whilst most museums are digitising collections, there is not always a longer term strategic approach to fully exploiting the results\textsuperscript{142}.

A number of innovative digitisation projects are underway both in Scotland and internationally; potentially providing examples of good practice that should be evaluated and could be replicated. In Scotland, the Scottish Ten project\textsuperscript{143} is an ambitious collaboration between Historic Scotland and The Glasgow School of Art’s Digital Design Studios to create exceptionally accurate digital models of Scotland’s five UNESCO world heritage sites and five international heritage sites. The project showcases cutting-edge 3D laser scanning heritage techniques that offer new opportunities for sites to be better managed and conserved and for public access through digital models and virtual tours. In Norway, the National Library of Norway is digitising its entire collection\textsuperscript{144}. However, such initiatives, whether in Scotland, other parts of the UK or internationally, use a range of business models and are funded in different ways. These would require to be evaluated in terms of their appropriateness for the Scottish cultural and heritage landscape.

The ability of National Collections and other cultural bodies to digitise and make available material is also limited by copyright and intellectual property (IP) law. Whilst copyright and IP rights are, of course, legitimate and necessary to protect the rights of creators and owners of cultural material, the Inquiry has heard, from the Royal Society of Arts amongst others, that the UK adopts a particularly stringent approach to copyright legislation, and fair use of Exceptions to copyright law, that is not fit for purpose in an increasingly digital era\textsuperscript{145}. The Intellectual Property Office has recently released draft statutory instruments updating copyright legislation to make it better suited to the digital age, due to come into force in June 2014\textsuperscript{146}.

\textsuperscript{138} Royal Commission on the Ancient and Historic Monuments of Scotland, for more information see http://www.rcahms.gov.uk/news/transcribe-scotlandplaces

\textsuperscript{139} National Museums Scotland (NMS), The National Library of Scotland (NLS), The National Galleries of Scotland (NGS), The Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) and The National Record of Scotland (NRS).

\textsuperscript{140} For more information see http://www.nls.uk/media/1024036/2012-2015-corporate-plan.pdf


\textsuperscript{143} For more information see www.scottishten.org.

\textsuperscript{144} For more information see www.nb.no/English/The-Digital-Library/What-is-being-digitized

\textsuperscript{145} For more information see evidence to the Inquiry, Andrew Ormston, RSA Fellows

\textsuperscript{146} For more information see http://www.ipo.gov.uk/types/hargreaves/hargreaves-copyright/hargreaves-copyright-techrreview.htm
6.7 A strong and active civil society

Civil society has a central role to play both in the vision of a progressive, inclusive 21st-Century Scottish society, and in the journey of transformation to that society. We have discussed elsewhere in this report the risks that some already vulnerable groups are those most likely to be falling behind as the digital divide widens. Third sector organisations often have strong relationships with those groups and can support them both to have a voice in the design of digital systems that reflect particular needs and to develop the skills needed for digital participation (Sections 2, 3 and 4).

Here, however, we discuss the potential of digital technologies to strengthen civil society itself, and how this potential can be achieved.

The ability to communicate more effectively and efficiently with service users and supporters is clearly a huge benefit to third sector organisations. In the current economic climate they are under pressure to provide support and advice to more people, with fewer resources. In consultation with representatives from third sector organisations, our Inquiry heard that digital technologies can facilitate better interaction with clients and service users. They can raise the profile and visibility of the services and support voluntary bodies can offer. They can make interactions between organisations easier and more efficient and enable the rapid exchange of information, such as through the MILO database for third sector support organisations established by SCVO. Digital channels can also provide opportunities for innovative marketing and campaigning. We heard an example of a charity which uses Facebook to advertise items for sale in its local charity shops – a successful marketing campaign through which items usually sold within the next day or two. Other examples of fundraisers engaging with donors through digital tools include crowd-sourced funding, text donations and donations via ATMs.

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147 See for example, get involved!, an SCVO-led national directory of third sector organisations that can be searched by anyone to find out what third sector organisations are out there by e.g. location, theme. www.getinvolved.org.uk

148 For more information see http://sva.scvo.org.uk/projects/milo/
Despite the potential benefits, one fifth of charities have little or no online presence and around half report needing help with websites and social media. The barriers to participation for charities are similar to those identified for small and micro enterprises. The positive motivators, or hooks, to get each charity online will vary and charities may need support to understand more about the capabilities of digital technologies. Some charities, for example, will not be able to rely on digital to communicate with their clients if a large proportion of that group is offline; but they are likely to be able to benefit from greater efficiencies in the delivery of services and back-office systems; from easier access to information from peer organisations; or more active relationships with supporters. Restraints on time, resources and human capital also apply as equally to third sector organisations as to small and micro enterprises in respect of their capacity to up-skill staff and volunteers in the use of digital.

A Lloyds Banking Group survey on use of the internet by 300 small to medium-sized charities found that of those surveyed:

- 73% stated that being online helped them to better interact with their supporters and form closer bonds with their donor base;
- 66% stated that an online presence had helped to raise awareness of their work and bring in new supporters;
- 40% of the charities that had increased their technological maturity ‘a lot’ over the previous two years experienced a growth in donations;
- 35% of charities with a social media account experienced increased donations over the previous two years, compared with 23% with no social media presence;
- 66% stated that being online helped to lower operating costs.


Despite the potential benefits, one fifth of charities have little or no online presence and around half report needing help with websites and social media. The barriers to participation for charities are similar to those identified for small and micro enterprises. The positive motivators, or hooks, to get each charity online will vary and charities may need support to understand more about the capabilities of digital technologies. Some charities, for example, will not be able to rely on digital to communicate with their clients if a large proportion of that group is offline; but they are likely to be able to benefit from greater efficiencies in the delivery of services and back-office systems; from easier access to information from peer organisations; or more active relationships with supporters. Restraints on time, resources and human capital also apply as equally to third sector organisations as to small and micro enterprises in respect of their capacity to up-skill staff and volunteers in the use of digital.

"We used to ask how we can use digital or social media to get the message out – but the real benefit of digital engagement is how we get the message in; it’s how we interact with clients, members etc. We have to let go of the idea of a digital newsletter, we are now more interactive, creating dialogue. Organisations that do this well, you can bring a mass of people and ideas together. Digital gives you scale – one of the benefits is communication with large numbers."

Evidence heard at Third Sector roundtable session, May 2013

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149 Booz and Co. 2012, This is for everyone: the case for universal digitisation, www.booz.com/media/uploads/BoozCo_This-Is-for-Everyone.pdf

150 Chris Yiu for Holyrood Connect, 8 January 2014, The Internet is for everyone, http://www.holyroodconnect.com/tag/scvo/
SCVO’s Digital Participation team, whilst tasked by the Scottish Government and SCVO to lead the roll out of joined-up initiatives to increase digital participation for individuals, will also support third sector organisations to develop their own capabilities and use of digital. Whilst still at an early stage of developing its programme of work in this area, SCVO has indicated that its activities will focus on equipping organisations with the digital skills they need to strengthen their own practices and to support their service users to get online; coordinating activity to avoid duplication of efforts; leveraging new resources where possible; and providing digital tools and materials that can be widely used by others.

“At its most straightforward, our role is to help the organisations and people that help others. So we want to support and amplify the great work on digital participation that is already going on in Scotland, ensure that new activity builds on what has already been started, and ensure that no one gets left behind. Where we can use our combined strength to attract new resources, we will fight to make this happen. And where we can deploy digital tools and platforms for other organisations to use and reuse, we will make these available as widely as possible.” 151

151 For more information see http://www.holyroodconnect.com/tag/scvo/
Conclusion

Scotland’s transformation to a digital society offers exciting opportunities for the nation’s people, communities, businesses, public bodies and civil society. But the benefits of a Digital Scotland can only spread to all parts of society when every individual and every organisation has access to the online world, is motivated to participate and has the skills to do so confidently, safely and creatively.

One quarter of the population has yet to take that step to full digital participation. Those offline are concentrated in remote areas of Scotland; and in groups that already face barriers to social inclusion. We have seen that there is a price tag attached to getting these remaining hard-to-reach citizens online. Government, the private sector and the third sector all have a responsibility to support this drive. Not only is universal digital participation necessary for Scotland’s economy to flourish in a competitive international market or for its public and third sector bodies to remain sustainable, it is also a necessary foundation of a fair and equitable 21st-Century society.

The Scottish Government and partners across Scotland have recognised the need to increase levels of digital participation in Scotland; and for strategic action to place Scotland in a strong position to exploit digital opportunities, across the digital economy, digital health and care and digital public services, amongst other sectors. Collaborative partnerships have been set up, strategies and action plans published and some specific funding commitments made. But these steps are merely the start of a journey, and one that has significant progress to make in an increasingly urgent timeframe, as Scotland’s global competitors press ahead with the digital revolution.

The recommendations we make in this Report urge the Scottish Government to set its goals high; to aim for truly universal digital participation. We call for Scotland’s publicly-funded digital assets to be used to their full potential, whether this is through open access to middle-mile fibre infrastructure, or through increased public access to devices and connections. And we urge the Government to take a leadership role in the drive to increase participation, whilst enabling local innovation and delivery that is best placed to find the hooks that will encourage people to get online, and support them to do so.

Finally, we call on governments to respect and protect our rights online. We recognise that many of the complex challenges that a digital society must face, around surveillance, cyber crime, copyright and data protection, for example, are issues that must be grappled with at an international level. But for Scotland to be a strong, fair and flourishing digital society, the Scottish Government must take the first steps in actively shaping that society. It should establish the framework necessary to ensure considered democratic oversight of the effects of the increasing digitisation of every aspect of commerce and society.
## Appendices

### Appendix I: Inquiry Committee and Review Group

#### Inquiry Committee Membership

- **Professor Michael Fourman FRSE FBCS (Chair),**
  Professor of Computer Systems and former Head of Informatics, University of Edinburgh
- **Professor Alan Alexander OBE FRSE (Co-Chair),**
  RSE General Secretary, Emeritus Professor, Strathclyde Business School
- **Professor Frank Bechofer FRSE, Honorary Research Fellow,**
  Institute of Governance and Professor Emeritus of Social Research, University of Edinburgh
- **Dr Janet Brown FRSE,** Chief Executive, Scottish Qualifications Authority
- **Norman MacAskill,** Head of Rural Policy, Scottish Council for Voluntary Organisations
- **Dr Darryl Mead (to December 2013),** Deputy National Librarian, National Library of Scotland
- **Professor Johanna Moore FRSE,**
  Professor of Artificial Intelligence and Director of the Human Communication Research Centre, University of Edinburgh
- **Nicola Osborne,** Social Media Officer, EDINA
- **Dr Sarah Skerratt,** Director, Rural Policy Centre, Scotland’s Rural College (SRUC)
- **Martyn Wade,** Chief Executive, National Library of Scotland
- **Chris Yiu (from December 2013),** Director of Digital Participation, Scottish Council for Voluntary Organisations

#### Committee secretariat

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<td>Elizabeth Hemsley</td>
<td>RSE</td>
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<td>Susan Lennox</td>
<td>RSE</td>
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<td>Thomas Hind</td>
<td>(placement)</td>
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<td>Kim Masson</td>
<td>(bibliographic assistant)</td>
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<td>Katey Tabner</td>
<td>(RSE)</td>
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<td>William Waites</td>
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#### Review Group

- **Professor Peter Buneman MBE FRS FRSE,** Professor of Database Systems, University of Edinburgh
- **Professor Anthony Cohen CBE FRSE,** Former Principal and Emeritus Professor of Social and Cultural Anthropology, Queen Margaret University and Honorary Professor, University of Edinburgh
- **Professor Peter Grant OBE FREng FRSE,** Regius Emeritus Professor of Engineering, University of Edinburgh (Final Report)
- **Professor Vicki Hanson FRSE,** Professor of Inclusive Technologies, University of Dundee (Interim Report)
- **Professor Wilson Sibbett CBE FRS FRSE,** Emeritus Professor of Physics, University of St Andrews (Interim Report)

*This Report was signed off by Ian Ritchie CBE FREng FRSE, RSE Vice-President for Business, on behalf of RSE Council.*
Appendices

Appendix II: Evidence provided to the Inquiry

The Inquiry received evidence from the following organisations and individuals. All evidence is available on the RSE website, including written submissions and event summaries.

Organisations

We thank the following organisations for their contributions to the Inquiry, through attending sector-specific roundtable discussions and local area events, providing written evidence and commenting on the Interim Report.

ABC Radio
Aberdeen City Council
Aberdeen City Council (Education Department)
Aberdeen Civic Forum
Aberdeen Community Council
Aberdeenshire Council
Aberdeenshire Council (Education Department)
Aberdeen University (dot.rural hub)
Age Scotland
Airdrie CAB
Albyn Housing (Tain)
Alliance Scotland (Health and Social Care Alliance Scotland)
Alternatives, Tain
Alzheimer Scotland
Anderston Community Council
Angus Council (Education Department)
Appie’s Tea Room & Craft Gallery
Archaeology Scotland
Ardgay and District Community Council
Argyll and Bute Council (Education Department)
Aspire Scotland
Balintore Residents Group
Bethany Christian Trust
BT Scotland
Cairn Housing Association
Caithness Renewables
Career Transition Partnership
The Carnegie UK Trust
Centre for Research into Information, Surveillance and Privacy (CRISP)
The Chartered Institute of Library and Information Professionals Scotland (CILIPS)
Citizens Advice Scotland
Citizens Online (Orkney)
City of Edinburgh Council
Clackmannanshire Council (Education Department)
College Development Network
Comhairle nan Eilean Siar (Education Department)
Community Ability Network
Community One Stop Shop
Computing at School Scotland
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Contact the Elderly
Council for Voluntary Services North (Thurso)
Cre8te Opportunities Ltd
Creative Edinburgh
Creich Community Council
The Crichton Institute
The Cross Party Group on Digital Participation
CSPP Adopt an Intern
David Hume Institute
Deer Digital
Describe Online
Digital Fife
Digital Inclusion Group
Dumfries & Galloway Council (Education Department)
University of Dundee
Dundee Carers Centre
Dundee City Council
Dundee City Council (Education Department)
Dundee College
Dundee Libraries
DWP Kirkwall Job Centre
East Dunbartonshire Council (Education Department)
University of Edinburgh
EFB Services
The Embo Trust (Tain)
Enable Scotland
Falkirk Council (Education Department)
Federation of Small Businesses Scotland
Fetlar Development Ltd
Fife CAB
Fife Community Learning and Development (CLD) Partnership
Fife Council
Fife Council (Education Department)
Fife Libraries
Footprints Connect
Forss Business and Tech Park
Georgesons
getITon (Aberdeen)
Get IT Together Sutherland
Glasgow City Council Digital Interns
Glasgow City Council (Education Department)
Glasgow Housing Association
Glasgow’s Merchant City & Trongate Community Council
Highland Council
University of the Highlands and Islands
Highlands and Islands Enterprise (Orkney)
IMaGEs, Robert Gordon University
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IMaGEs, Robert Gordon University
Impact Marketing Solutions
Inclusions Scotland
Inksters
Inspiring Scotland
Instant Neighbour
Institute for Creative Industries & Screen Academy, Edinburgh Napier University
Institute of Directors
Intowork
Invest Caithness
IPA Digital Forum
IRISS
ITP Solutions Ltd
Kirkwall Business Improvement District (BID)
KITE (Keep in Touch Edinburgh)
Lochaber CAB
Love Milton (community group/resource centre)
Muirhead Community Forum
Muirhead Senior Forum
Multi-ethnic Aberdeen
Mydex
NESTA Scotland
New Futures Sutherland
NHS24
Nigg & Shandwick Community Council
Norscot Joinery Ltd
North Ayrshire Council (Education Department)
North Berwick High School pupils
North Lanarkshire Council (Education Department)
OATS (Oldies Acquiring Technical Support)
Ofcom Advisory Committee Scotland
Open University Scotland
Orkney Housing Association Ltd
Orkney Islands Council
Orkney Islands Council (Education Department)
Orkney Soap
Ormlie Community Association
Outside the Box Development Support
Pass IT On Scotland
PC Inspire
Perth & Kinross (Education Department)
Quarriers
Recruit with Conviction
The Right Information, Information Skills for a 21st Century Scotland, Community of Practice
Rochsoles Community Resource Project
Rose’s Social Enterprises
Ross-shire Voluntary Action
The Royal Incorporation of Architects in Scotland
The Royal Society of Arts
The RSA Fellows’ Media, Creative Industries, Culture and Heritage Network
The RSE Computing in Schools Project Working Group
The RSE Young Academy of Scotland
ScotlandIS
Scottish Accessible Transport
Scottish Council for Voluntary Organisations (SCVO)
Scottish Government
Scottish Health Council (Aberdeen)
Scottish Informatics and Computer Science Alliance (SICSA)
Scottish Library and Information Council (SLIC)
Scottish Qualifications Authority
Scottish Trade Union Council
Seton Design
Shelter (Glasgow)
Shetland Amenity Trust
The Shetland Times
SHMU (Station House Media Unit) (Community multi-media project, Aberdeen)
Silver City Surfers (Aberdeen)
Skillnet Edinburgh
South Ayrshire Council (Education Department)
South Lanarkshire Council (Education Department)
Stirling Council (Education Department)
Talk About Local
The Tinder Foundation
Turning Point Scotland (Aberdeen)
Unst Partnership
Voices of Experience Forum
Voluntary Action North Lanarkshire
Voluntary Action Orkney
Voluntary Arts Scotland
Voluntary Groups East Sutherland
West Dunbartonshire Council (Education Department)
Wheatley Group
Wick Interested Tenants
The World Peace Prayer Society
Yiibu
Yorkhill & Kelvingrove Community Council
You Can Do IT Scotland
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Individuals

We thank the following people who took the time to meet with us, provide written evidence and comment on the Interim Report, in a personal capacity. We would also like to extend our thanks to those who assisted us in the organisation of meetings, to everyone who attended our public events and to all who completed the online and postal questionnaire.

Professor Stuart Anderson
John Bain
Dr Kate Byrne
Peter Cawkwell
Vint Cerf
Adrienne Chalmers
Marion Clark
Dana Cohlmeyer
Dr Colin Cooper
Dr John Crawford
Lisa Cresswell
Prof Sergio Della Sala
Councillor Lesley Dunbar
Philip Graham
Roy Hair
David Hunter
Christine Irving
Prof Bill Johnston
Cleo Jones
Dr Neil Kelly
David Kelter
Charles Kennedy MP
John Lee
Dr Karen Lorimer
Derek Loudon

Prof Frances Mair
Dr Andrew Manches
Liam McArthur MSP
Ian McCracken
Finlay McFee
Lorraine McFee
Liz McGgettigan
Prof Brian McKinstry
Freddie Moran
Tara Morrison
Prof Alan Newell
Paul O’Keeffe
Andrew Ormston
Sir Timothy O’Shea
Hilary Petrie
Prof Charles Raab
Simon Robinson
Margaret Sainte-Claire
Dr Geoffrey Sharman
Prof Chris Speed
Councillor Jamie Stone
Jenny Ure
Philip Wark
Sheena Watson
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Appendix III: Technical analysis of broadband uptake across Scotland

As discussed in the main report (Section 1.2) the likelihood of an individual having access to the internet can be affected by a complex mix of geographic, economic and social factors. This Appendix is intended to report on, and to some extent explain, our methodology, and to present some more subtle and detailed findings not included in the main report. The intended audience is those working on inclusion who may themselves want to dig into the data. (Full details of the data we have used, and the code we have used for our analysis, can be found at http://idea.ed.ac.uk/digiscot/)

The analysis reported here only deals with household uptake of a fixed broadband connection. It shows that there are many local pockets of digital exclusion across Scotland, and demonstrates some complex correlations between digital exclusion and various factors of deprivation. This may suggest areas for intervention and avenues for further research. However, it is limited by the data available, which do not include many relevant factors, such as age and disability, that are discussed in the main report. It should be supplemented by other studies to understand the factors that affect motivation, skills and trust.

Access via a fixed home connection is neither necessary nor sufficient for effective digital inclusion. Nevertheless, many of those without a home connection are at significant disadvantage. For example, children without internet access at home are educationally disadvantaged, and alternative forms of access may not be available to those with limited mobility, or those living far from urban centres.

Moreover, Ofcom data (Figure 18 Adults media use and attitudes report 2012) shows that almost all (76% out of 79%) those who use the internet have a home connection. Those in older age bands (> 55) and those in more deprived socioeconomic groups (C2/DE) are less likely to use the internet, but more than half of those in these groups who do use the internet do so only from home. Less deprived groups are more likely to use the internet elsewhere.

We use Ofcom’s UK fixed-broadband postcode-level data (2013), together with postcode-level census data (2011) giving numbers of households, to model broadband uptake at postcode level.

The Ofcom data is based on a snap shot of data provided by the largest fixed broadband providers in the UK for the period of June to July 2013. Data relating to each broadband connection operated by BT, Virgin Media, Everything Everywhere, O2, KCom, TalkTalk, or Sky were collected and aggregated. This dataset is described in detail in Ofcom’s 2013 Infrastructure Report. For each connection, the data collected included the postcode, modem sync speed, data use and package details. To protect anonymity, most of this data is not included in the published dataset unless there are at least three residential or small business premises and Ofcom hold data on at least three broadband connections in the postcode. However, the number of connections is published for each postcode with at least three premises; these postcodes cover 99.7% of the households in Scotland. The full data is published for postcodes that cover 96.7% of households in Scotland.

In their analysis of this data, for any given postcode, Ofcom take the sum of residential and small business premises as representing the market opportunity for broadband services (where they refer to ‘premises’ or ‘households’ in their Infrastructure Report they are referring to the sum of residential and small business postal delivery points). We use a different approach.

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Appendices

Data available for Scotland at postcode level includes counts for households (total 2,538,280), delivery points (total 2,630,460), and non-residential delivery points (total 115,086). In our analysis, we use household counts, rather than premises, to represent the ‘market opportunity’. We do this primarily because the household is the natural subscriber for a broadband connection. In many Scottish postcodes there are several times as many households as delivery points, and in some instances there are several tens of times more. This means that a statistical model based on counting connections and households gives a much better account of the observed numbers of connections than a model based on the number of premises.

We use the household count minus the number of connections as an estimate for the number of offline households in each postcode. (Where there are more connections than households, we assume there are no offline households.) According to this calculation, one third (33%) of Scottish households are offline. However, the 19.6 million connections (across the UK) reported by the largest ISPs account for only 90% of the total of 21.7 million broadband connections across the UK. Assuming that the same proportion applies to connections in Scotland would give a figure of 74.5% of Scottish households online (25.5% offline). This falls well within the confidence limits of the Scottish Household survey, which reports that 76% of households in Scotland have a fixed broadband connection, on the basis of a relatively small sample.

The main purpose of this analysis is not to establish an absolute figure for broadband uptake, but to study how the probability of a household being offline varies with geography and deprivation across Scotland. So, in the remainder of this Appendix we consider only the connections recorded in the Ofcom dataset, and do not apply the correction described in the previous paragraph.

Broadband uptake varies across Scotland. If we compute our statistic for each Local Authority area we find that the proportion of households offline varies from 24% to 65%. In increasing order, the figures are: East Dunbartonshire 24, East Renfrewshire 24, Edinburgh City 28, Shetland 29, West Lothian 29, Aberdeen City 30, East Lothian 30, Aberdeenshire 31, Clackmannanshire 31, Falkirk 31, South Lanarkshire 31, Angus 32, Fife 32, Moray 32, North Lanarkshire 32, Perth & Kinross 32, Stirling 32, Dundee City 33, Midlothian 33, Highland 34, Orkney 34, Renfrewshire 34, West Dunbartonshire 34, Borders 35, Inverclyde 36, South Ayrshire 36, Argyll & Bute 37, East Ayrshire 37, Glasgow City 37, North Ayrshire 38, Dumfries & Galloway 39, Eilean Siar 65. (We note that the anomalous result for Eilean Siar is probably explained by the fact that many on the Western Isles receive broadband from Connected Communities, a provider not included in Ofcom’s sample.)

In our Interim Report, we plotted uptake aggregated by SIMD decile and by median speed, within different urban-rural geographies. Here we use a more sophisticated statistical treatment that models the observed variations in uptake from one postcode to another. To quantify uptake as a factor of digital deprivation, we must model the scale and distribution of these variations.

A first step is to compute the proportion of households offline in each datazone. In Figure III.1 we plot, in black, a histogram of these numbers. The blue line shows a model of this distribution. Almost all datazones have between 10% and 60% of households offline.

However, the key finding of our analysis is that the variation in uptake from one datazone to another does not capture the breadth of the digital divide. The uptake figure for a single datazone often conceals substantial local variation. There are, on average, around twenty postcodes within each datazone, and there is often substantial variation in uptake from one of these postcodes to another; variation that cannot plausibly be explained by chance.

5 We have also considered models that compare the number of connections with numbers of premises [residential premises, with or without non-residential premises], households plus non-residential premises, or total population, rather than just households. We find that using the household count data provides a better statistical account of the observed numbers of connections than any of these alternatives.

6 http://www.hebrides.net/

7 We use Beta Distributions to model distributions of probabilities.
To account for the data, we have to suppose that the probability of being offline varies from postcode to postcode, and model not only the average, but also the variation from the mean.

Figure III.1 Probability of a neighbour being offline by Datazone and by Postcode: at postcode level, extremes of deprivation and inclusion are common.

To understand what this means, and how we might study this variation, consider two hypothetical situations. In the first, Scotland is divided: in some postcodes, covering half of Scotland, each household has a 50% chance of being offline, while those in the other half have only a 10% chance of being offline. In the second, in every postcode in Scotland, every household has a 30% chance of being offline. In the first situation, small postcodes with everyone offline would be quite common, and so would small postcodes with everyone online. In the second situation, in which everyone has an equal chance, such extremes would be less common. Given data for the numbers of households online and offline across a range of postcodes, we could distinguish between these two situations.

More generally, given such data we can infer a distribution of probabilities across postcodes. This is shown by the red line in our figure. We see that extremes of deprivation and inclusion are common. The digital divide is wider than the naïve analysis represented by the blue line would suggest.

Technically, we use maximum likelihood methods to fit a beta-binomial distribution to the observed data. The red line presents a beta distribution with parameters, $\alpha = 1.9$ and $\beta = 4.0$; the blue line has parameters, $\alpha = 5.3$ and $\beta = 11.3$. 
Distributions like this arise if there is a herd effect – if, when more of your neighbours are offline, you more likely to stay offline, and conversely, when more of your neighbours are online, you are more likely to go online. Across Scotland we see such an effect. If we choose a pair of neighbours, Sally and Tom, from the same postcode then: if Sally is offline then the probability of Tom also being offline is 42%; whereas, if Sally is online then the probability of Tom being offline is 27.5%.

**Figure III.2** Probability of a neighbour being offline: showing bands of inclusion and exclusion.

**Figure III.2** shows again the same red line. To picture the distribution, we divide the households into ten bands, ranging from those who live in postcodes where the probability of being offline is less than 10%, to those where it is greater than 90%. We again use the colouring we introduced in figures 1.6 and 1.7 of the main report; green (inclusion) is good and purple (exclusion) is problematic. The most favoured band accounts for 9% of the population. The band where the chance of being offline is between 50% and 60% also accounts for 9% of households, and so do the four most-deprived bands, where the chance of being offline is greater than 60%. So, 18%, almost a fifth of households in Scotland, live in postcodes where most households are offline.

The solid vertical line marks the median, which divides the households in two. Half of the households in Scotland live in postcodes where more than 30% of households are offline.

The distribution of inclusion and exclusion varies across local authorities. **Figure III.3** shows the distribution for each local authority in a separate column. The width of each column is proportional to the number of households it represents. The height of each band is proportional to the percentage of households it includes. The resulting areas show how the households in each inclusion/exclusion band are distributed across the 32 local authorities in Scotland.
SIMD factors

In Figure 1.7, within the main report, we showed how the households in each inclusion/exclusion band are distributed across the levels of SIMD deprivation. We can think of this as just like Figure III.3, except that in 1.7 we have around 1,600 columns, too small to distinguish individually, instead of 32. Each column represents around 1,600 households, all at a similar level of deprivation. (Imagine an aerial view of a grand gathering of the heads of each household, arranged in around 1,600 x 1,600 rows and columns. Each head of household wears an appropriately coloured hat to represent their inclusion/exclusion band, and stands in the column corresponding to their SIMD rank. Within each column they group themselves by inclusion/exclusion band and stand in the correct order.) The purple bands of increasingly extreme exclusion are predominantly associated with high levels of deprivation. The green band of > 90% inclusion is skewed to areas of low deprivation.
For example, Figure III.4 shows how inclusion and exclusion are distributed across the centiles of isolation. In general, inclusion increases with isolation. However, among some of the most isolated communities in Scotland we see extremes of both inclusion and exclusion that match or exceed those seen in our urban centres. In most of the most isolated communities, either the vast majority of households are online, or almost none of them are.

We have seen that there are strong correlations between uptake and isolation and deprivation. These relationships were derived using a general additive model that allows the parameters of the distribution to vary smoothly, and possibly non-linearly. We have highlighted several deviations from linear relationships. Non-linearities resulting from particularly poor uptake are seen where median speeds are very low, and also in the most isolated areas of Scotland, where connections may not be available. We attributed this low uptake to poor infrastructure rather than intrinsic lack of demand.
To study the factors that do affect demand across Scotland, without these confounding effects, we train a linear model using only those postcodes where isolation is moderate and median speeds are acceptable; postcodes where poor infrastructure should not be an issue.

The Scottish Index of Multiple Deprivation 2012 combines a number of indicators drawn from different domains to produce seven factors: income, employment, health, education, housing, geographic access, and crime. The indicators included in the various factors are presented in Figure 1.2 of the main report. More detail is provided in the Scottish Government’s technical notes. Where appropriate, indicators are standardised against other variables such as age and sex. The SIMD dataset gives both raw scores and ranks for each of the seven factors and for the overall index.

We find that the raw access score, which is composed of a sum of travel times, is a better linear predictor of broadband uptake than the access ranking. We transform this access score linearly to an isolation score, ranging from zero (least isolated) to 100 (most isolated). For the other factors, income, employment, education, housing, health, and crime, and for the overall index, we find that the ranking gives a better linear model of uptake than the raw score. We normalise each of these rankings to a linear scale ranging from -1 (most deprived) to +1 (most favoured), so that in each case, zero represents a median value of the factor. Our training set consists of those postcodes where isolation is less than 40 on our 0–100 scale and median speed is greater than 4 Mb/s. These parameters are chosen from inspection of the graphs presented in the body of this report, to exclude those postcodes where poor infrastructure may be an issue. Postcodes where isolation is less than 40 cover 85% of Scottish households. Our training model covers 78% of households in Scotland.

We allow for the observed effects of all the SIMD factors of deprivation, slow lines and superfast availability, and then compare the uptake (in areas where poor infrastructure should not be an issue) between different local authority areas. For each local authority, we give the probability that a (fictional) ‘median household’ is offline. This median household is in a postcode with no slow lines and no superfast broadband, it has a median score on each of the SIMD factors, except access for which it has a zero score for isolation. These figures tell us how uptake varies from one local authority to another, for households with similar levels of deprivation and isolation.

If we model uptake across all areas in the training set, the chance that a median household in the training set will be offline is 30%. It turns out that this is the same as the percentage of Scotland’s households that would be offline if our model applied across the whole of Scotland. This suggests that the training set is representative with respect to the factors included in our model. We can take the 3% difference between this hypothetical 30% and the observed value of 33% for all of Scotland as a measure of the households who are offline because of inadequate infrastructure.

9 http://simd.scotland.gov.uk/publication-2012/technical-notes/
Factors of Deprivation

We see that the high percentages of households offline in North and South Ayrshire, the Borders, and Dumfries and Galloway, are particularly significant, and that ten more local authorities also have significantly low levels of broadband uptake, given their geography and demographics. Conversely, uptake in East Renfrewshire, East and West Dunbartonshire, Glasgow City, Dundee City, Edinburgh City, North and South Lanarkshire, and West Lothian, is remarkably high, once we have allowed for the effects of isolation and deprivation.

Figure III.5 The effect of each SIMD factor on the odds of being offline: every factor except education has a significant effect.
These effects are summarised in Figure III.5. As we have seen, isolation is associated with high uptake. This is represented in the top row of our diagram by a green area showing how the odds of being offline reduce as we move through the centiles of isolation, from the least isolated at the bottom, to the most isolated at the top. The response appears non-linear because our model uses the score, rather than ranking, for the access factor.

We use the ranking for the remaining factors. So their effects change linearly with centiles of population. For these factors we represent the effect on the least deprived at the top, and on the most deprived at the bottom. For example, the purple triangle at the bottom of our diagram shows that one of Scotland’s most income-deprived households will have odds of being offline around one third (33%) higher than an otherwise comparable household in an area with a median income score. This means, for example, that if the other household had 1/2 odds of being offline (a 33% chance), then our more deprived household would have odds of 1/2 + 1/2 * 1/3 = 2/3 (one third higher) of being offline (a 40% chance). Those in more affluent areas have lower odds of being offline, roughlly 20% lower than the median household, shown by the green triangle in the upper half of the income row.

Our diagram has seven rows, each showing the effect on uptake of one of the factors, isolation, crime, education, health, housing, employment and income, for different levels of deprivation. The varying effect across the range of each factor is plotted, with a decrease in the odds of being offline coloured green and an increase coloured purple. The confidence interval ($z = 2$) for each effect is shaded, so that we are confident that the effect is at least as large as that shown by the unshaded portion. There effect for education is not significant, but every other factor has a significant effect.

We see that those in areas with low rankings on income, employment, health, housing and education have lower uptake, while those in datazones with more crime are less likely to be offline. Income and isolation have the strongest effects.

**Local effects**

Figure III.6 shows again the correlations from Figure III.5 for Scotland, followed by a diagram, for each local authority (with the exception of Eilean Siar, for which there is insufficient data to produce a model). We assume that the effects of isolation are the same across Scotland, but that the other factors may have different local effects, and find that there is substantial local variation in the way uptake depends on deprivation.

In addition to the effects of the seven SIMD factors, laid out just as in Figure III.6, the local diagrams include a flag, just below the local authority name, showing how the odds of a median household in this LA area being offline are greater (purple) or lower (green) than those for a median household across Scotland. Confidence intervals for these values are indicated by shading, just as for the seven factors.

We see that the high percentages of households offline in North and South Ayrshire, the Borders, and Dumfries and Galloway, are particularly significant, and that ten more local authorities also have significantly low levels of broadband uptake, given their geography and demographics. Conversely, uptake in East Renfrewshire, East and West Dunbartonshire, Glasgow City, Dundee City, Edinburgh City, North and South Lanarkshire, and West Lothian, is remarkably high, once we have allowed for the effects of isolation and deprivation.
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Figure III.6: Diagrams showing the local effects of SIMD factors on the odds of being online, for each Local Authority in Scotland (except Eilean Siar). These effects vary significantly from one authority to another.
According to this analysis, there is no ‘Glasgow effect’ in broadband uptake. Once demographics and geography have been taken into account, Glasgow City is not performing below the Scottish average. This result appears to be quite robust. If we look at SIMD alone as a single indicator of deprivation, we cannot explain the low uptake figure for Glasgow. However, even in a simple model that allows for the conflicting effects of just two factors, isolation and income, Glasgow’s uptake appears to be anomalously high. We have also found that Glasgow’s uptake is either high or normal, both in comparison with Scotland as a whole, and in comparison with the rest of urban Scotland, according to a variety of more complex models that include various combinations of factors and higher-order interactions.

By design, the effect of isolation is constant across all local authority areas. We now consider the variations in the effects of the various factors.

Crime has no significant effect except in Aberdeen City, Clackmannanshire, Dundee, Edinburgh City, Fife, North Ayrshire, Orkney and Shetland. In all of these, except Shetland, uptake is greater where there is more crime. This may again be a signal of isolation. The increased demand for broadband may simply be telling us that households in areas with high crime rates feel more isolated.

Education is a significant factor in eleven areas. In most of these, most strikingly in Dundee City and Inverclyde, uptake is higher where education is poor. However, in Glasgow City and in Perth and Kinross, those in areas with poor education are significantly more likely to be offline.

Where health has a significant effect, poor health is correlated with poor uptake.

Where housing, income, and employment are significant factors, deprivation is always correlated with poor uptake. However, in many areas, some or all of these factors have no significant effect.

These local variations in the patterns of exclusion, and the relatively weak local effects present in the data, suggest that the strong across-Scotland correlations shown in Figure III.5 account primarily for variations in uptake between different local authority areas, and that the local variations we highlighted in Figure III.1 have more complex roots. Local studies will be needed to understand the varying interactions of uptake with education and health. Policies to tackle exclusion will have to be tailored to address different issues in different areas.
Appendices

Appendix IV: **Open Standards, Open Source and Open Data**

**Open Standards** refers to publicly agreed standards that allow systems to be constructed by connecting components together. For example, any 13 amp (BS 1363) plug should fit in a standard (BS 1363) socket. This standard enables you to construct a system that boils water, by connecting a kettle, with a standard plug, to the mains electricity, with a standard socket. Standards for digital systems specify how they can connect, communicate and interact. For example, standards enable a web server in China to deliver content to a browser in the USA. A standard is open if its details are published, and can be used by anyone on a royalty-free basis.

The protocols of the internet have themselves been developed through a collaborative social process. These protocols allow different computer systems to communicate with each other in a consistent way, so anyone, versed in the art, can create networks and connect them to the internet. Other open standards underpin content that can be viewed on the web, software that can make a web page interactive, and so on.

**Open Data** refers to data that is freely available in bulk in a form that conforms to open standards. It may be processed and operated upon by systems that may or may not run open source software. Data is the raw material of an information society. If data can be freely exchanged, combined, and built upon then the insights can be drawn from them can be more valuable than the individual sources.

Data made public is naturally a public good: it is non-excludable and non-rivalrous. No one can be effectively excluded from its use; and use by one does not reduce availability to all. The production of public goods results in positive externalities which are not remunerated. No market forces provide incentives to produce such goods. However, governments are prodigious producers of data. The positive externalities should motivate governments to make data available using machine-readable open-standards formats, to ensure data can be effectively used and re-used.

**Open Source** refers to software whose source code is available for inspection, modification and reuse. Source code for some operating systems and programs has long been freely exchanged and many of the building blocks of the software that runs the web today can be traced to magnetic tapes that were traded in the 1970s and 80s.

To a computer, or a computer scientist, code is just a particular kind of data. Open-source code is just another kind of open data that can be checked locally and used globally. Just like maps, code can be created, verified, refined, and corrected by crowds of contributors distributed around the globe.

It is, in general, impossible to exhaustively test the behaviour of a software system. Inspection of source code is required, to allow a skilled software engineer to verify that a program is properly engineered to do the right things – things such as operate safely, protect user privacy and so on. Making a program open-source allows claims that it does no harm to be subjected to public scrutiny. Without this transparency, such claims must rely on trust. We must not only trust the provider, but also trust that their processes have not been subverted by third parties. This is why, “for increased digital security”, the Russian government has chosen use the open source Linux operating system (OS), to replace Microsoft’s proprietary Windows OS.
# Appendix V: Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADSL</td>
<td>See <em>DSL.</em></td>
</tr>
<tr>
<td>app (application)</td>
<td>A self-contained programme or piece of software designed to provide a specific function and to run on smartphones, tablet computers or other mobile devices.</td>
</tr>
<tr>
<td>backhaul</td>
<td>The intermediate links connecting small sub-networks of end-users to points-of-presence where peering agreements and transit services are available.</td>
</tr>
<tr>
<td>bandwidth</td>
<td>Originally, the width of a band of frequencies (measured in Hz) [see spectrum]. Now, more commonly the theoretical rate at which information can be communicated along a datalink (measured in bits per second b/s). Every communication channel has a limited bandwidth, often referred to colloquially as its ‘speed’.</td>
</tr>
<tr>
<td>big data</td>
<td>The Scottish Government uses the term ‘Big Data’ to refer to data science: techniques for deriving value from huge amounts of unstructured data – including data analytics, cyber-security, and data industrialisation.</td>
</tr>
<tr>
<td>bit (b)</td>
<td>The smallest unit of information – a bit can take one of two values (0 or 1). Communication bandwidth (speed) is normally measured in bits per second (b/s).</td>
</tr>
<tr>
<td>byte (B)</td>
<td>Eight bits – the unit of information normally used to measure the volume of stored data.</td>
</tr>
<tr>
<td>broadband</td>
<td>Originally a technical term for a transmission technique enabling increased bandwidth, ‘broadband’ became popularized through the 1990s as a marketing term for Internet access that was faster than dialup (which was limited to 56 Kb/s). This usage has been overtaken by improvements in technology, and policy debates in various countries have sought to redefine the minimum speed for acceptable ‘broadband’, for example, at 1Mb/s (Finland), 2Mb/s (UK), and 4Mb/s (USA).</td>
</tr>
<tr>
<td>channel</td>
<td>A communications channel. Technical usage includes both physical connections (using a combination of copper, fibre, or wireless technologies) and logical connections, many of which may share the same physical channel. Informal usage, often used in the phrase channel shift, treats modes of interaction, such as face-to-face communication, telephone calls, email and online interaction as different channels.</td>
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</tbody>
</table>
### Appendices

#### cloud computing
A general term for software, platforms and infrastructure that are sold ‘as a service’, where everything happens ‘in the cloud’, and the user does not need to know where and how data is stored nor where computations are performed. The cloud is just a metaphor for the Internet.

#### computing science (CS)
The science of communication and computation – a rigorous academic discipline. It encompasses the systematic study of methodical processes for the acquisition, representation, processing, storage, communication of information, and also the software and hardware tools required to implement these processes.

#### digital
Relating to information represented by discrete values (digits); hence, involving or relating to the use of current technologies for computation and communication, which are digital.

#### digital divide
The differences in economic and social opportunity between those who can benefit from digital technologies and those who cannot.

#### digital infrastructure
The physical, economic and organisational structures that allow individuals and organisations to access and use digital communications and computation as public utilities. These include both passive and active components of IT networks.

#### *DSL*
Digital Subscriber Line, a family of technologies that use legacy copper telephone wires to carry digital data across the ‘final mile’ to the home. Speeds are limited by the length of the copper connection.

In the UK, Asymmetric DSL (ADSL): was introduced in 2000 to deliver ‘up to 8Mb/s’ broadband. ADSL2+, launched in 2006, supports ‘up to 24 Mb/s’ for those close to the exchange, but, just like ADSL, it can deliver only 4 Mb/s over 4km of copper.

Very-high-bit-rate DSL (VDSL, VDSL2) is used for the Cabinet-to-Premises for BT’s FTTC, marketed as ‘up to 80 Mb/s’. It can only deliver speeds over 30 Mb/s over copper lines shorter than 1.2km, and beyond 1.6km it has the same download speeds as ADSL2+.

#### externalities
An externality is a cost or benefit that affects a party who did not choose to incur that cost or benefit. The externalities of digital inclusion include social benefits that do not affect the market-driven purchasing and investment decisions of consumers and providers of internet services.

#### femtocell
A small, low-power cellular base station, typically designed for use in a home or small business, and restricted to provide service to only a small number of registered devices, which is connected to the mobile provider via the customer’s Internet connection.
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>final mile</td>
<td>The communications channel linking the end-user to the communications network.</td>
</tr>
<tr>
<td>FTTC</td>
<td>Fibre to the Cabinet, or Fibre to the Copper: a fibre connection runs to a local cabinet, where it connects to copper. BT Infinity is an FTTC product each cabinet typically serves 288 subscribers; VDSL2 is used over the copper link to the subscriber.</td>
</tr>
<tr>
<td>gap-funding</td>
<td>The BDUK programme has awarded direct monetary grants to BT to build, manage and commercially exploit a broadband network. These grants are intended to cover the ‘investment gap’ between the infrastructure cost and the investment BT is willing to make on a commercial basis.</td>
</tr>
<tr>
<td>GB</td>
<td>Gigabyte = (2^{30}) bytes ((\sim 10^9))</td>
</tr>
<tr>
<td>informatics</td>
<td>The science of information, including the study of natural and artificial systems that store, process and communicate information. Also, the use in particular domains, bioinformatics, geoinformatics, etc., of data-driven techniques, such as cloud computing, machine learning, and artificial intelligence.</td>
</tr>
<tr>
<td>information technology (IT)</td>
<td>The branch of engineering that produces the systems used in industry, commerce, the arts and elsewhere, for digital communication and computation.</td>
</tr>
<tr>
<td>internet</td>
<td>An interconnected network of networks. The Internet is an internet that connects one third of the world’s population to almost a billion hosts.</td>
</tr>
<tr>
<td>internet addiction</td>
<td>Compulsive use of the internet that interferes with daily life.</td>
</tr>
<tr>
<td>KB</td>
<td>Kilobyte = (2^{10}) bytes ((\sim 10^3))</td>
</tr>
<tr>
<td>latency</td>
<td>The minimum round-trip time for a query and response, between two points, measured as the time for a ‘ping’ to be answered.</td>
</tr>
<tr>
<td>long tail</td>
<td>When the tail of a distribution includes significant volume we say there is a long tail. For example, a huge number of the niche services available online are of interest to only a small numbers of users. Nevertheless, together they account for a significant volume, and are important both economically and for motivation of digital participation.</td>
</tr>
<tr>
<td>MB</td>
<td>Megabyte = (2^{20}) bytes ((\sim 10^6))</td>
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<tr>
<td>Mb/s</td>
<td>Megabits per second, a unit of communication bandwidth.</td>
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<tr>
<td>median</td>
<td>The median value of a statistic is the number which divides population into two equal halves, one half having values less than that the median and the other having values above the median.</td>
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<tr>
<td><strong>Appendices</strong></td>
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<tr>
<td><strong>middle mile</strong></td>
<td>The segment of a telecommunications network that links communities to the high-speed core network.</td>
</tr>
<tr>
<td><strong>next generation</strong></td>
<td>Next generation broadband is the marketing term used by BT to describe broadband delivered over both advanced copper (ADSL+) and fibre-optic FTTC or FTTP.</td>
</tr>
<tr>
<td><strong>open data</strong></td>
<td>Open Data refers to data that is freely available online, for used, reuse, and redistribution by everyone, without restrictions or limitations.</td>
</tr>
<tr>
<td><strong>open source</strong></td>
<td>Open Source refers to software whose source code is available for inspection, modification and reuse.</td>
</tr>
<tr>
<td><strong>open standards</strong></td>
<td>Open Standards refers to public standards that can be used by anyone on a royalty-free basis to facilitate inter-operability and data exchange among different products or services.</td>
</tr>
<tr>
<td><strong>PB</strong></td>
<td>Petabyte = $2^{50}$ bytes (~$10^{15}$)</td>
</tr>
<tr>
<td><strong>social media</strong></td>
<td>interaction among people in which they create, share, and/or exchange information and ideas in virtual communities and networks through mobile and web technologies</td>
</tr>
<tr>
<td><strong>spectrum</strong></td>
<td>The wireless spectrum is the range of frequencies used for radio communications. Effective communication requires exclusive use of some band of frequencies: two communications cannot use the same frequencies in the same place at the same time. The rate at which data can be communicated is limited by the width of the frequency band. Use of the spectrum is regulated by national organisations (Ofcom in the UK), which determine which frequency ranges can be used by whom and for which purposes.</td>
</tr>
<tr>
<td><strong>superfast</strong></td>
<td>A term introduced by Ofcom to describe next generation broadband services originally described as services that provide a maximum download speed greater than 24 Mb/s, “the maximum speed that can be supported on current generation (copper-based) networks.”</td>
</tr>
<tr>
<td><strong>symmetric</strong></td>
<td>Internet connection with equal bandwidth for both upload and download of data</td>
</tr>
<tr>
<td><strong>TB</strong></td>
<td>Terabyte = $2^{40}$ bytes ($10^{12}$)</td>
</tr>
<tr>
<td><strong>VDSL, VDSL2</strong></td>
<td>See *DSL</td>
</tr>
<tr>
<td><strong>Wi-Fi</strong></td>
<td>A set of wireless networking standards that use unlicensed spectrum to provide wireless hotspots and sometimes point-to-point links.</td>
</tr>
<tr>
<td><strong>wired infrastructure</strong></td>
<td>Digital telecommunications infrastructure consisting of fibre and copper lines</td>
</tr>
<tr>
<td><strong>4G</strong></td>
<td>Fourth-generation wireless networks, offering download speeds up to 100 Mb/s on mobile devices.</td>
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