

Exploring the Potential Impact of Superfast Broadband for Cambridgeshire

Benefits learned from elsewhere

Commissioned by LGSS: Research and Performance Group

7th October 2011

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Summary

Examples of the main impacts of fast broadband as found by research:

For communities

Social networking – the Digital Impact Group (2010) reported 78% of broadband users surveyed cited ‘keeping up with the news in my community’ as very or somewhat important.

Improved communication benefiting communities - recent emergence of online social networking provides users with a forum to connect with friends, colleagues and family.

Improved access in rural areas - Dickes et al. (2009), in a report about rural communities in the USA, state that “overall, it appears that access and diffusion of high quality, high speed broadband networks is a critical economic and community development tool for all communities.”

Crime and Public Safety

Contribution to the general improvement in public services - Hallahan and Peha (2009) suggest that in the USA public safety communication costs could be dramatically lowered by increasing co-ordination between agencies, deploying systems over larger regions, and by taking advantage of commercial wireless broadband technology and architecture.

Improvement in disaster and emergency response - the Digital Impact Group (2010) note that in the USA police and fire departments can now use Web-based networks to co-ordinate response efforts, disseminate safety information, and allow citizens to report problems and needs.

Improved outcomes through video communications and CCTV – requiring fast broadband, Convergence UK has recently launched a new product which overcomes the two problems that traditional CCTV faces: firstly, the length of time required to examine recorded footage and secondly the risk that CCTV data will be stolen as part of a break-in.

Improved tackling of specific incidents - Dabson and Keller (2008) note a programme applies broadband to help first responders by instantly connecting police and fire fighters to resources such as pictures of abducted children and blueprints of burning buildings.

Education and Skills

Education as investment in human capital, with economic benefits - PricewaterhouseCoopers (2009) report that access to and use of digital technologies especially computers, particularly at home, can have a positive impact on children’s educational results. Digitally excluded children of school age would have a 4.5% improvement in educational attainment.

Increased employment in education - education is a sector in the economy where broadband has been identified as increasing employment (Liebenau et al., 2009).

Increased availability of education - education can be made more widely available in rural areas through the Internet. Kelly et al. (2009) report that rural residents can also access college-level distance-learning courses and degrees that may not be offered at local institutions.

Improved education services - Education is enhanced by providing access resources such as text-based materials, photos and images, videos, animations, interactive lessons, data-manipulation tools, oral history collections, music and educational gaming (the Baller Herbst Law Group, 2008).

Employment and Economy

Increased economic output – from a panel of OECD countries in 1996–2007, Czernich et al. (2009) find that a 10 percentage-point increase in broadband penetration raised annual per-capita growth by 0.9–1.5 percentage points.

Increased productivity - a study of firms in Germany (Bertschek, Cerqueray and Kleinz, 2011) showed that while the impact of broadband Internet on firms' labour productivity is varied among firms the impact of broadband on the innovation activity of firms is positive.

Increased employment - applying the figures in Katz (2009), would indicate that an investment of £28 million (as potentially made by Cambridgeshire Councils and Broadband Delivery UK) might produce between 500 and 1,200 jobs.

Environment

Reduction in greenhouse gas emissions - enhanced adoption and use of broadband could achieve a net reduction of one billion tons of greenhouse gas over 10 years in the USA (Fuhr and Pociask, 2007).

Reduced travel - in 2007, 17% of broadband users regularly used computers to work at home for their employers (Dutz, Orszag and Willig, 2009); this compared to 8% of dial-up users.

Reduced energy use - according to Davidson, Santorelli and Kamber (2009), broadband-enabled smart-grid services and devices is expected to reduce end-user energy consumption in the USA in 2020 by roughly 23% of projected demand.

Health and Care

Reduce Costs - Access Economics (2010) expects the net benefits from widespread adoption of telehealth in Australia to be worth between £1.13 billion and £2.27 billion.

Save consumers' time and travel - telemedicine applications that enable remote screening, diagnosis, treatment and monitoring allow families to receive quality care in the communities in which they work and live, saving them time (Baller Herbst Law Group, 2008). Darkins et al. (2008) found that reductions in hospitalisations due to telehealth were greater in remote areas (with a 50% decrease in bed-days) compared to urban areas (a 29% reduction in bed-days).

Improve outcomes and treatment - A study reported for the Australia Department of Broadband, in 2010 showed that a weekly telenurse visit to patients with congestive heart failure resulted in 84% lower readmission rates and also had significantly fewer emergency visits.

Increased employment - Kolko (2010), found that 7.4% of employment growth in healthcare and social assistance is associated with an increase in broadband availability.

1. Introduction

This report reviews the potential impact of superfast broadband in terms of the following benefits:

- **Community benefits** - activities that improve how local communities get on and describes how broadband can support activities that strengthen communities and increase cohesion, tolerance and respect among neighbours and neighbourhoods.
- **Crime and public safety benefits** - about ensuring people and communities are safe and secure.
- **Education and skills benefits** - activities that improve the education and skills of adults and children and cover a range of formal and informal learning activities to which broadband and digital technology can particularly contribute.
- **Employment and economy benefits** - relates to activities that use technology to improve the local economy.
- **Environment benefits** - activities that contribute towards making an area more environmentally sustainable.
- **Health and care benefits** - activities which promote healthier communities and well-supported residents. It covers a range of activities which improve health services and adult and child social care services, as well as mental health services and services for those with disabilities.

The study has been produced with evidence from 36 references. These are cited in the last section. Of these one third have been published in 2010 or 2011.

Year of publication of the literature reviewed

Publication year	Number of reviewed studies published in this year	Percentage of studies published in this year
2011	5	14%
2010	7	19%
2009	11	31%
2008	7	19%
2007	5	14%
2006	1	3%

The findings report, as far as possible, the impact of fast broadband. As a starting point they are selected from 2006 and one third in 2010 or 2010. However it must be noted that generally the research reported may cover a three year period before the publication date. The European Union is using research like this to provide an assessment of the socio-economic impact of delivering very high-speed Internet access (defined as a download speed of at least 30Mbit/s) in the period 2011–2020 in support of the Digital Agenda.

2 Community

2.0.1 The main benefits of broadband in this category can be classed as the development of social networking, improved communication benefiting communities, and improved access in rural areas.

2.1 Social networking

2.1.1 According to the Digital Impact Group (2010), 80% of broadband users reported using the Internet to get local or community news. At the local level, a total of 78% of broadband users surveyed cited 'keeping up with the news in my community' as very important or somewhat important.

2.1.2 A Nielsen report in 2009 indicated that 17% of all online time is spent on blogging or social networking. Improved download speeds have allowed these groups to provide improved services. For instance, Facebook allows users to share photos and videos with other members of the network (Crandall and Singer, 2010). They conclude that broadband has provided tremendous value to consumers in shopping, entertainment, commuting, telephony, telemedicine, social networking, education, electricity and transportation.

2.2 Improved communication benefiting communities

2.2.1 The recent emergence of online social networking, with groups such as Facebook and Twitter, provides users with a forum to connect with friends, colleagues and family (Crandall and Singer, 2010).

2.3 Improved access in rural areas

2.3.1 Broadband benefits rural areas in two key ways. First, broadband telecoms has become a key location factor for businesses, almost as important as sewer, water, telephone and electricity service. Second, broadband does not just make it easier for rural businesses to grow; it improves the quality of life in rural communities, making it easier for smaller locales to attract and retain residents (Hedlund, 2007). Consumers in rural areas, who were previously constricted in their choices of products and services, now have access to the same variety of goods as consumers living in major metropolitan cities (Hedlund, 2007).

2.3.2 Dicks et al. (2009), in a report about rural communities in the USA, state that "overall, it appears that access and diffusion of high quality, high speed broadband networks is a critical economic and community development tool for all communities in the twenty-first century". They go on to point out that when considering rural areas as communities, then economic development from broadband can be seen as essential "without access to high-speed, high-bandwidth internet service, rural communities already suffering from the economic effects of industrial restructuring and the current economic crisis may continue to find their communities increasingly less competitive".

2.3.3 The 10th survey of multinational companies located in Ireland found that, compared to three years earlier, the strategic importance of broadband availability had moved up 12 places in the ranking, from 18th to 6th (behind wage inflation, price inflation, skills and availability of workforce) (Irish Management Institute, 2008).

3 Crime and Public Safety

- 3.0.1 Broadband can bring benefits to solving or preventing crime (for example through Close Circuit Television). However it is also the case that broadband can cause other crime issues (through the internet). Broadband can provide strong support to services which operate in disasters and emergencies (which may also be those which fight crime).
- 3.0.2 In terms of improvements from high speed broadband the importance of broadband speed is seen as significant for some aspects of public safety. The Communications Workers of America (2010) see high-speed broadband as the fundamental infrastructure of the 21st century, fuelling sustainable economic growth and job creation. It is seen as supporting innovations in public safety as well as telemedicine, education, energy conservation, and provision of public services. The Scottish Government report (2011) notes the importance of higher speeds to allow improved CCTV functions to take advantage of cloud computing.

3.1 Contribution to the general improvement in public services

- 3.1.1 General benefits from broadband may come from streamlined local government management and service provision, enhanced customer service, improved community information, increased civic participation and reduced government costs. There are also potential benefits for citizens as they spend less time dealing with government bureaucracy and feel more informed about their community. The proposition that broadband networks allow for improvements in public safety is included. Dickes, Lamie and Whitacre (2009–2010) suggest that rural communities may particularly benefit.
- 3.1.2 Improvements may reduce costs. Hallahan and Peha (2009) suggest that in the USA public safety communication costs could be dramatically lowered by increasing co-ordination between agencies, deploying systems over larger regions, and by taking advantage of commercial wireless broadband technology and architecture.
- 3.1.3 Dabson and Keller (2008) report from the USA that online activities cut costs, and they also reduce citizens' time spent in bureaucratic offices and potentially increase citizens' opinion of government efficiency.

3.2 Improvement in disaster and emergency response

- 3.2.1 The Digital Impact Group (2010) note that in the USA information technology has become a vital foundational element of disaster and emergency response at all levels of government. Local police and fire departments can now use Web-based networks to co-ordinate response efforts, disseminate safety information, and provide outlets for citizens to report problems and needs.

3.3 Improved outcomes through video communications and CCTV

3.3.1 In Scotland, Convergence UK, based near Livingston, has recently launched a new product called Fusion. Fusion overcomes the two problems that traditional CCTV faces: firstly, the length of time required to examine recorded footage and secondly the risk that CCTV data will be stolen as part of a break-in. Fusion provides an off-site storage facility for CCTV imaging. CCTV images from a business premises are uploaded automatically to an off-site server. This means that the images cannot be physically stolen during a break-in and also, once uploaded, video analytics can be used to detect alarm conditions – such as an intruder moving into a particular area. For a business with five to six CCTV cameras for example, an upload speed approaching 1Mbit/s is required for the imaging data from these cameras to be uploaded, but most businesses in Scotland currently have an upload speed of less than 0.5Mbit/s (Scottish Government, 2011).

3.4 Improved tackling of specific incidents

3.4.1 There can be a strong relationship between the tackling of specific incidents and the improved communications through picture or video transmission. The Baller Herbst Law Group (2008) give an example of the inter-relationships between the benefits for agencies that deal with crime. With a municipal broadband system, fire departments can receive building blueprints wirelessly directly to fire trucks. They quote one report which estimates that they can leave the station 90 seconds faster as a result. To the extent various city departments make data available in a usable format, fire-fighters can access and transmit other relevant data 'on the fly', including information from other jurisdictions and departments such as traffic control, transit authorities, county inspectors, the FBI and Homeland Security.

3.4.2 Dabson and Keller (2008) note that in the USA, the SAFECOM programme of the Department of Homeland Security applies broadband to help first responders by instantly connecting police and fire fighters to resources such as pictures of abducted children and blueprints of burning buildings.

4 Education and Skills

- 4.0.1 Enhancements in education and skills, whether in schools or universities, are frequently put forward as key benefits from broadband. Evidence of the perceived importance of faster broadband access in enhancing education and training is offered by the number of countries that have made special provision for high-speed broadband deployment to educational establishments. For example, in New Zealand approximately NZD200 million (UK£90 million in July 2010) is being earmarked specifically for improving schools' access. South Korea has completed a fibre to the schools (FTTS) programme, connecting all 11,414 schools with a bandwidth of at least 10Mbit/s.
- 4.0.2 In terms of improvements from high speed broadband, the Baller Herbst Law Group (2008) quotes EDUCAUSE, the association representing America's 2,500 higher-education colleges and universities. They see the benefits of broadband to include high-quality video which can provide meaningful two-way, interactive, real-time educational experiences. For example, a student at home can continue to participate in regular classes; parents can confer with a teacher using a video conference; virtual field trips can take students and teachers sitting in their class rooms to faraway places; music students can receive lessons from a master instructor hundreds of miles away, who will be able to hear, see and interact with the student; and homework can be researched using digital archives at the Library of Congress, where 3D objects can be examined from all angles.

4.1 Education as investment in human capital, with economic benefits

- 4.1.1 Education, enhanced through broadband, increases productivity. In the UK, the deployment of innovative services, applications and content enhances education and professional skills development, increases business productivity and spurs economic growth (Liebenau et al., 2009).
- 4.1.2 PricewaterhouseCoopers (2009) report on a large body of evidence that access to and use of digital technologies especially computers, particularly at home, can have a positive impact on children's educational results. Digitally excluded children of school age would have a 4.5% improvement in educational attainment, resulting in an aggregate UK£10.5 billion in lifetime earnings.
- 4.1.3 Children with Internet access have been found to have higher standardised test scores, graduation rates and earning potential (the Digital Impact Group, 2010).
- 4.1.4 Productivity within education itself can be enhanced through broadband: e-learning courses are considered to be 50% less expensive than traditional face-to-face courses; blended learning is 20% less expensive than equivalent face-to-face seminars, but is more efficient than e-learning (Fornefeld et al., 2008).

4.2 Increased employment in education

4.2.1 Education is one of the sectors in the economy where broadband has been identified as increasing employment: the effect of broadband is most significant in explaining employment growth in education, health care and financial services (Liebenau et al., 2009). In the USA, the estimated effect of a 5% increase in capital spending resulting from second-generation broadband deployment would represent an increase of USD4.3 billion (UK£2.9 billion in July 2010) in GDP and 43,871 jobs in education services (Crandall and Singer, 2010).

4.3 Increased availability of education

- 4.3.1 One advantage of broadband is that education can be made more widely available in rural areas through the Internet. Kelly et al. (2009) report that rural residents can also access college-level distance-learning courses and degrees that may not be offered at local institutions. Fuhr and Pociask (2007) quote the example of Iowa, which has many small rural schools and cannot afford the cost of an environmental programme for each school. The Internet has allowed as many as 90 schools simultaneously to participate in various environmental education programmes.
- 4.3.2 Broadband can also facilitate distance-learning opportunities through teleconferencing. This has potential benefits for rural communities that may lack access to top-flight education resources. There are several examples of distance tutoring programmes internationally (Crandall and Singer, 2010).
- 4.3.3 The Communications Workers of America (2010) note the impact of broadband on both education and health in rural areas. Broadband enables chat groups, video-conferencing and Internet-based continuing education programmes based in urban healthcare facilities to be used by rural physicians. The Telemedicine Program at Texas Tech University offers a number of distance-learning opportunities for healthcare providers throughout the state of Texas. One class, Telemedicine 101, introduces patients and doctors to the concept of remote healthcare and encourages healthcare providers to assess whether they need to implement such services in their towns.

4.4 Improved education services

- 4.4.1 Education is enhanced by providing students and teachers with access to a vast array of resources. Text-based materials, photos and images, videos, animations, interactive lessons, data-manipulation tools, oral history collections, music and educational gaming programmes are just a few of the valuable benefits (the Baller Herbst Law Group, 2008).
- 4.4.2 The development of online resources such as eBooks, Google Scholar and the Social Science Research Network (SSRN) provide academic institutions with access to fast and reliable research (Crandall and Singer, 2010).

5 Employment and Economy

- 5.0.1 There are a large number of studies which conclude that broadband has a significant and positive impact on economic growth (as measured through GDP). Some of this growth is created by investment in the infrastructure and works undertaken to deploy broadband: multiplier values have been applied to estimate the impact that this investment will have throughout an economy. Many studies comparing countries or parts of countries, as well as those looking at individual firms, conclude that broadband makes a positive contribution to growth. This is nearly always accompanied with an increase in employment.
- 5.0.2 In general, benefits are identified as increasing through the increased take-up of broadband rather than particular advantages of high-speed broadband. A survey of firms in Scotland (the UK) found that on the whole 58% of businesses perceive that reliable, high-speed broadband is very important to the operation of their business (Scottish Government, 2011).

5.1 Increased economic output

- 5.1.1 The annual average investment by broadband service providers in the USA over the next six years (2010–2015) is predicted to be USD30.4 billion (UK£20.36 billion in July 2010) in all broadband technologies, which corresponds to over 509,000 jobs created (Crandall and Singer, 2010).
- 5.1.2 Looking at a panel of OECD countries in 1996–2007, Czernich et al. (2009) find that a 10 percentage-point increase in broadband penetration raised annual per-capita growth by 0.9–1.5 percentage points
- 5.1.3 Next Big Future (2009) reports that fibre to the premises (FTTP) can boost the US economy by at least USD440 billion (UK£266 billion in July 2009). Greater use of peer-to-peer applications resulting from the availability 100Mbps/ symmetrical capability can provide a further increase. There is about a 15% productivity boost from broadband.
- 5.1.4 According to Dutz et al. (2009), consumers receive more than USD30 billion (UK£18.1 billion in July 2009) of net benefits from the use of fixed-line broadband at home. Dutz et al. (2009) also estimates, based on 2009 survey data, that the benefits of an increase in broadband speed from 100 times the typical historical speed of dial-up Internet service to 1,000 times dial-up are in the order of USD6 billion (UK£3.6 billion in July 2009) per annum for existing home broadband users.

5.1 Increased productivity

- 5.1.1 Broadband has contributed a very significant proportion – perhaps 10–20% – of productivity growth in some OECD countries (LECG Ltd, 2009).
- 5.1.2 One of the key aspects of the impact of broadband on the economy is theorised as productivity. As a variation, a study of firms in Germany (Bertschek, Cerqueray and Kleinz, 2011) showed that the impact of broadband Internet on firms' labour productivity is varied among firms while the impact of broadband on the innovation activity of firms is positive.

5.2 Increased employment

- 5.2.1 Data from 1999 to 2006 revealed that communities with new access to broadband experienced 6.4% higher employment growth on average than before they had broadband (Milano, 2010).
- 5.2.2 Crandall, Lehr and Litan (2007) found in the USA that non-farm private employment and employment in several industries was positively associated with broadband use. More specifically, for every percentage point increase in broadband penetration in a state, employment is projected to increase by 0.2–0.3% per annum.
- 5.2.3 The Internet is a catalyst for generating jobs. Among 4,800 small and medium enterprises (SMEs) surveyed, broadband access and technology created 2.6 jobs for each lost to technology-related efficiencies (McKinsey, 2011).
- 5.2.4 Kolko (2010) looked at broadband availability and economic activity throughout the USA between 1999 and 2006 and concluded that the boost to employment growth was 5.0% (statistically significant).
- 5.2.5 Katz (2009) looks at the impact on employment generation, and uses figures from five different studies. He uses figures which examine investment program, employment creation by impact (which he lists as Direct, Indirect and Induced). Direct employment relates to network construction, indirect employment is incremental employment generated by businesses selling to those that are directly involved in network construction, and induced employment is additional employment induced by household spending based on the income earned from the direct and indirect effects.

5.2.6 Cambridgeshire County Council resolved, at its Cabinet meeting on 15th August 2011, to make an investment in superfast broadband across the County, potentially in collaboration with District authorities and private businesses, with the total local authority contribution being up to £20 million. Also Broadband Delivery UK may well allocate to £8 million for Cambridgeshire. Cambridgeshire County Council suggests that private sector bodies will also make an investment. Applying the figures in the Katz (2009) research would indicate that an investment of £28 million might result in between 500 and 1,200 jobs. These jobs would be **direct**, involved in network construction and **indirect**, incremental employment generated by businesses selling to those that are directly involved in network construction.

6. Environment

- 6.0.1 Some studies identify the particular benefits for the environment of high-speed broadband. The primary benefits identified were greater use of telecommuting, smart grids and smart buildings.
- 6.0.2 Telecommuting could benefit from enhanced deployment of high-speed broadband. Enhanced deployment could enable greater use and higher-quality video-conferencing. High-speed broadband could also enable more efficient use of cloud computing and transfer of large documents and files (for example, as noted in the report by the Scottish Government, 2011).
- 6.0.3 In general, benefits are identified as increasing through the increased take-up of broadband rather than particular advantages of high-speed broadband. The Baller Herbst Law Group (2008) identifies that remote server services for telecommuting are an application for speeds between 100Mbit/s and 1Gbit/s. Improved video conferencing is seen as an advantage particularly in relation to video-conferencing with consequent reduced travel. While the development of mobile applications for domestic and commercial vehicles on existing broadband speeds has allowed them to be used more efficiently, it is possible that high-speed broadband may allow new benefits to be delivered (for example, through video transmission).

6.1 Reduction in greenhouse gas emissions

- 6.1.1 Enhanced adoption and use of broadband could achieve a net reduction of one billion tons of greenhouse gas over ten years in the USA. If converted into energy saved, this would constitute 11% of annual US oil imports (Fuhr and Pociask, 2007).
- 6.1.2 A 7% increase in adoption and use of broadband could achieve savings of USD18.2 million (UK£9.1 million in July 2008) in carbon credits associated with 3.2 billion fewer pounds of carbon dioxide emissions (Connected Nation, 2008).

6.2 Reduced travel

- 6.2.1 Crandall and Singer (2010) estimated that 28 million Americans telecommuted at least once a month in 2006; this figure was predicted to rise to nearly 100 million by 2010.
- 6.2.2 In 2007, 17% of broadband users regularly used computers to work at home for their employers (Dutz, Orszag and Willig, 2009); this compared to 8% of dial-up users.

6.2.3 Intelligent transportation systems could deliver important environmental benefits by reducing congestion, enabling traffic to flow more smoothly, coaching motorists how to drive most efficiently, reducing the need to build additional roadways by maximising the capacity of existing ones, and improving the performance and reliability of mass transit. Vehicle transportation is a major cause of greenhouse gas emissions. In England, the transport sector contributes around a quarter of the country's CO2 emissions, 93% of which is from road transport (Liebenau, Atkinson, Kärberg, Castro and Ezell, 2009).

6.3 Reduced energy use

6.3.1 Broadband-enabled smart-grid services and devices could result in over USD1.2 trillion (UK£724billion in July 2009) in gross energy savings. According to Davidson, Santorelli and Kamber (2009), this approach is expected to reduce end-user energy consumption in the USA in 2020 by roughly 23% of projected demand, potentially abating 1.1 US gigatons of greenhouse gases annually.

7. Health and Care

- 7.0.1 The impact of broadband in improving health and care is mentioned in a large number of references, including some which look at this topic by itself. The impacts can be seen in a number of ways. The Digital Impact Group (2010) looks at online health education, electronic health records, telemedicine, and chronic disease management and benefits. Fornefeld, Delaunay and Elixmann (2008) in Europe look at benefits from the electronic health insurance cards, secure messaging systems between health providers, and electronic patient records. There are significant ways in which the benefits of broadband on health and care links with benefits raised in other sections – for example, reduced travel (to receive treatment) and also increased training for healthcare professionals.
- 7.0.2 The Baller Herbst Law Group (2008) reports that a crucial part of effective telehealth services is the transmission of high-definition medical images. Under the US FCC's former definition of broadband (200kbit/s per second), it would take nearly a full day to download a ten-minute diagnostic video clip. With a symmetric 100Mbit/s broadband connection, it would only take three minutes to transmit the video clip. Healthcare and the development of telehealth and telemonitoring, particularly those elements requiring real-time uncompressed video or high-definition video connectivity, appear to require high-speed broadband. Tucker (2010) notes that a number of high-definition, and perhaps 3D, video signals in a single house, together with some on-line gaming and some telecommuting, could easily make large inroads into a high-speed 100Mbit/s broadband connection.

7.1 Reduce Costs

- 7.1.1 Litan (2008) estimates that the net total benefit from telemonitoring is in the order of USD44 billion per annum (£UK22 billion in July 2008) for an average implementation cost of USD1.75 billion per annum (£UK0.878 million in July 2008).
- 7.1.2 Connected Nation (2008) reports that if every state were to develop initiatives similar to ConnectKentucky, the USA could expect to reduce healthcare costs by USD662 million per annum (UK£332 million in July 2008).
- 7.1.3 Access Economics (2010) expects the net benefits from widespread adoption of telehealth in Australia to be worth between AUD2 billion to AUD4 billion per annum (£UK1.13 billion to (£UK2.27 billion July 2010).

7.2 Save consumers' time and travel

- 7.2.1 E-health applications have different bandwidth requirements; applications such as video conferencing, digital x-ray transmission and remote monitoring require fast broadband connection. Telemedicine applications that enable remote screening, diagnosis, treatment and monitoring allow families to receive quality care in the communities in which they work and live, saving them time (Baller Herbst Law Group, 2008).

- 7.2.2 Nooriafshar and Maraseni (2007) report that the introduction of teleconsulting in rural Queensland (Australia) saved AUD125 (£UK52.9 in July 2007) per visit avoided as opposed to sending patients to the nearest city.
- 7.2.3 Darkins et al. (2008) found that reductions in hospitalisations due to telehealth were greater in remote areas (with a 50% decrease in bed-days) compared to urban areas (a 29% reduction in bed-days).
- 7.2.4 Access Economics (2010) reports that Zanaboni et al. (2009), reporting on a trial of 927 teleconsultations in Italy, found that 600 general practitioner visits and 122 emergency department admissions were saved, yielding savings of EUR20 400 (£UK17,300 in July 2009) plus reduced travel costs to patients of EUR3,700 (£UK3,100 in July 2009), for an all up cost of EUR16,800 (£UK14,300 in July 2009).

7.3 Improve outcomes and treatment

- 7.3.1 A study published in 2001 and reported in Access Economics in Australia on behalf of Department of Broadband, Communications and the Digital Economy in 2010 showed that a weekly telenurse visit to patients with congestive heart failure resulted in 84% lower readmission rates and also had significantly fewer emergency visits.
- 7.3.2 One aspect of how broadband can improve outcomes and treatment is how it can impact on training for employees in healthcare. Johnson, Dutton, Briffa and Black (2006), writing in the British Medical Journal, note that broadband could offer learners in medicine the next generation of online learning: the prospect of high-quality interactive video and audio alongside traditional text and photographs.
- 7.3.3 Telehealth home monitoring of patients with dementia improved their medication compliance rates to 81% against 66% in the control group (Smith et al., 2007).

7.4 Increased employment

- 7.4.1 Kolko (2010), looking at whether broadband boosts local economic development, examined broadband and industry employment growth in the USA in the period 1999–2006. He found that 7.4% of employment growth in healthcare and social assistance is associated with an increase in broadband availability.

8. References

- Access Economics, 2010. Financial and externality impacts of high-speed broadband for telehealth. Available at http://www.dbcde.gov.au/data/assets/pdf_file/0019/130159/Financialandexternalityimpactsofhigh-speedbroadbandfortelehealth-311.pdf
- The Baller Herbst Law Group, 2008. Capturing the Promise of BroadBand for North Carolina and America. Available at <http://www.narucmeetings.org/Presentations/e-NC%20BB%20Report%20Jun08.pdf>
- Bertschek, I., Cerqueray, D., Klein, G. J., 2011. More bits - more bucks? Measuring the Impact of Broadband Internet on Firm Performance. Available at https://community.oecd.org/servlet/JiveServlet/previewBody/24346-102-1-46419/bertschek_cerquera_klein_2011.pdf
- Cambridgeshire County Council, 2011. Investment in Superfast Broadband. Available at <http://www2.cambridgeshire.gov.uk/db/council2.nsf/e0c624b01b2e9ade80256b14004eb73b/3cc9a7e2b8b72f6a802578e30049de06?OpenDocument> Minutes of meeting also available at same site.
- Communications Workers of America, 2010. Speed Matters. Available at http://cwa.3cdn.net/299ed94e144d5adeb1_mlblqoxe9.pdf
- Connected Nation, 2008. The Economic Impact of Stimulating Broadband Nationally. Available at http://connectednation.org/documents/Connected_Nation_EIS_Study_Full_Report_02212008.pdf
- Crandall, R. W., and Singer, H. J., 2010. The Economic Impact of Broadband Investment. Available at <http://www.ncta.com/DocumentBinary.aspx?id=880>
- Crandall, R., Lehr, W. and Litan, R., 2007. The Effects of Broadband Deployment on Output and Employment: A Cross-sectional Analysis of U.S. Data. Available at http://www.brookings.edu/~media/Files/rc/papers/2007/06labor_crandall/06labor_crandall.pdf
- Czernich, N., Falck, O., Kretschmer, T., and Woessmann, L., 2011. Broadband Infrastructure and Economic Growth. *The Economic Journal*, 121 (May 2011), pp. 505–532
- Dabson, B., Keller, J., 2008. Rural Broadband. Available at <http://www.rupri.org/Forms/RuralBroadbandFinal.pdf>
- Darkins A, Ryan P, Kobb R, et al., 2008. Care Coordination/Home Telehealth: The Systematic Implementation of Health Informatics, Home Telehealth, and Disease Management to Support the Care of Veteran Patients with Chronic Conditions. *Telemedicine and eHealth* 2008;14:1118-1126. Available at www.liebertonline.com/doi/abs/10.1089/tmj.2008.0021

Davidson, C. M., Santorelli, M. J., Kamber, T., 2009. Broadband Adoption: Why It Matters And How It Works. New York Law School's Media Law & Policy Journal, 2009, 19, pp 14-56. Available at http://www.nyls.edu/user_files/1/3/4/30/84/88/Vol%2019.1%20BROADBAND%20Adoption.pdf

Dickes, L.A, Lamie,R.D. and Brian E. Whitacre, B.E., 2009-2010. The Struggle for Broadband in Rural America. Available at <http://www.choicesmagazine.org/magazine/print.php?article=156>

Digital Impact Group, 2010. The Economic Impact Of Digital Exclusion. Referred to at: <http://www.egov.vic.gov.au/focus-on-countries/north-and-south-america-and-the-caribbean/united-states/trends-and-issues-united-states/digital-inclusion-and-digital-divide-united-states/the-economic-impact-of-digital-exclusion-in-pdf-format-330kb.html> Copy available from AnalyticsCambridge.

Dutz, M., Orszag, J., Willig, R., 2009. The Substantial Consumer Benefits Of Broadband Connectivity For U.S. Households. Available at http://internetinnovation.org/files/special-reports/CONSUMER_BENEFITS_OF_BROADBAND.pdf

Fornfeld, M., Delaunay, G., Elixmann, D., 2008. The Impact of Broadband on Growth and Productivity. Available at http://breitbandinitiative.de/wp/wp-content/uploads/2009/04/2008_micus-studie-broadbandeu_long.pdf

Fuhr J. P., Pociask, S. B., 2007. Broadband Services: Economic and Environmental Benefits. Available at http://internetinnovation.org/files/special-reports/ACI_Study.pdf

Hallahan, R. and Peha, J. M., 2009. The Business Case of a Nationwide Wireless Network that Serves both Public Safety and Commercial Subscribers. Department of Engineering and Public Policy. Paper 44. Available at <http://repository.cmu.edu/epp/44>

Hedlund, J. A., 2007. The Importance of National Policies to Connect Rural America to Broadband. Submitted to Committee on Appropriations Agriculture Subcommittee U.S. House of Representatives. Available at <http://www.itif.org/files/HedlundRuralBroadbandTestimony.pdf>

Irish Management Institute, 2008. Survey of MNCs in Ireland 2008, results of the 10th Anniversary Competitiveness Survey. ISSN: 1649-2404, p.16

Johnson, J., Dutton, S., Briffa, E., Black, C., 2006. Broadband learning for doctors. British Medical Journal. Available at <http://www.bmj.com/content/332/7555/1403.full>

Katz, R., L., 2009. Broadband demand and economic impact in Latin America. Available at <http://unpan1.un.org/intradoc/groups/public/documents/gaid/unpan036761.pdf> . Proceedings of the 3rd ACORN-REDECOM Conference Mexico City May 22-23rd 2009.

Kelly, T., Mulas, V., Raja, S., Qiang, C. Z. and Williams, M., 2009. What role should governments play in broadband development?. Available at <http://www.infodev.org/en/Document.732.pdf>

Kolko, J., 2010. Does Broadband Boost Local Economic Development? Available at http://www.ppic.org/content/pubs/report/R_110JKR.pdf

LECG Ltd, 2009. Economic Impact of Broadband: An Empirical Study. Available at http://www.connectivityscorecard.org/images/uploads/media/Report_BroadbandStudy_LECG_March6.pdf

Liebenau, J., Atkinson, R. Kärrberg, P., Castro, D. and Ezell, S. 2009. The UK's Digital Road to Recovery. LSE Enterprise Ltd. & the Information Technology and Innovation Foundation. Available at <http://www.itif.org/files/digitalrecovery.pdf>

Litan, R. E., 2008. Vital signs via broadband: remote health monitoring transmits savings, enhances lives. Kauffman Foundation and Brookings Institute www.corp.att.com/healthcare/docs/litan.pdf

McKinsey & Company, 2011. Measuring the Net's growth dividend. Available at http://www.mckinsey.com/mgi/publications/internet_matters/pdfs/MGI_internet_matters_full_report.pdf

Milano, J., 2010. Where Jobs Come From: The Role of Innovation, Investment and Infrastructure in Economic and Job Growth. Available at <http://www.dlc.org/documents/WhereJobsComeFrom.pdf>

Neilsen, 2009. Global Faces and Networked Places. Available at http://blog.nielsen.com/nielsenwire/wp-content/uploads/2009/03/nielsen_globalfaces_mar09.pdf

Next Big Future, 2009. Ultra-broadband Worldwide and GDP Boost. Available at <http://nextbigfuture.com/2009/06/ultra-broadband-worldwide-and-gdp-boost.html>

Nooriafshar, M., Maraseni T., 2007. 'Telehealth system in Queensland. In Andrew Burge (Ed.), Proceedings of the 6th Annual Hawaii International Conference on Statistics, Mathematics and Related Fields', Hawaii International Conference 956-958. Available at: <http://eprints.usq.edu.au/1866/>

PriceWaterhouseCoopers, 2009. Champion for digital inclusion: The economic case for digital inclusion. Raceonline 2010 www.raceonline2012.org/sites/default/files/resources/pwc_report.pdf

Scottish Government, 2011. Research on Broadband and Business in Scotland. Available at <http://www.scotland.gov.uk/Resource/Doc/342391/0113934.pdf>

Smith G, Angela M. Lunde, BA, Julie C. Hathaway, MA, Kristin S. Vickers, PhD 2007, 'Telehealth Home Monitoring of Solitary Persons With Mild Dementia' American Journal of Alzheimer's Disease & Other Dementias, 22(1): 20 - 26. Available at: http://www.orcotech.org/papers/home_monitoring/07_Smith_telehealth_monitor_dementia.pdf

Tucker, R., S., 2010. Broadband facts, fiction and urban myths. Telecommunications Journal of Australia, Vol 60, No 3 (2010). Available at <http://journals.sfu.ca/tja/index.php/tja/article/view/19/html>