Accelerating sustainable growth

The economic and social impacts of enhanced Information and Communications Technology in the Nordics and Baltics

September 2016
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The world is currently on the brink of a revolution, the like of which has never been seen before. Digitalization changes the playing field in every aspect of our lives, and this time there is an opportunity for its effects to include the whole world. The world’s political leaders have signed up to achieve extraordinary things in the next 15 years: to end all forms of poverty, fight inequalities and tackle climate change. Issues of this magnitude can be resolved when we all work together, and I would argue that digitalization will form an integral part of the solutions.

At Telia Company, we aspire to create one seamless, borderless, and roaming free network that delivers one Gigabit per second across the entire Nordic and Baltic region. Moreover, in parts of our geographies, the major urban areas, we aspire to create Terabit territories, with speeds a thousand times faster than a Gigabit.

By 2025, we aim to have close to as full coverage as possible with a bandwidth of at least one Gigabit per second, for all our customers, across our footprint. The Gigabit society, and the level of digitalization it enables, is re-organizing, re-prioritizing, re-shaping the way we live. With Terabit speeds, we can completely reimagine the digitalization paradigm we are just seeing the first steps of today. Driverless cars, E-health technology and customer demands know no boundaries or borders, so neither should our networks.

In our vision and aspiration digitalization triggers innovation and competitiveness, and it paves the way for a more sustainable future. It will be a key part in delivering on many of the UN Sustainable Development Goals (SDGs), something which we support through our own sustainability work, ‘All-In’. As an industry, we have committed to being the leading sector in supporting the delivery of the UN SDGs. As one of the leaders in the work to commit the global mobile industry to the goals, I am very proud that this is something we have collectively been able to come together on.

In this report by Deloitte commissioned by Telia, Deloitte have taken a closer look at the services made possible by digitalization can accelerate sustainable growth in our markets. Increasing digitalization in the Nordics and Baltics will, according to our estimates, contribute to all dimensions of development covered by the United Nations. For example:

- Improving people’s lives: Up to 23,000 untimely deaths could be avoided through e-healthcare, while connected smart transportation could save up to 1,000 lives annually on our roads in 2021.
- Boosting sustainable growth: Enhanced use of digital solutions among governments, businesses and consumers can add nearly €100bn to the economies in the region in 2021, stimulating both productivity and job creation.
- Protecting the environment: Increased digitalization of the Nordic and Baltic economies could enable a reduction of greenhouse gas emissions by up to 20 percent. That equates to taking nearly 9 million cars off the roads for a year.

Connected digital solutions will enable better access to quality education, innovative jobs for our youths, improved healthcare for an aging population, more efficient use of natural resources, as well as safer and cleaner transportation. We invite customers, competitors, policy makers, regulators, and anyone who is interested to join us in making the most of the opportunities of the new services that lie ahead.

Together we can increase the speed and impact of the positive change that will come through digital solutions. History has shown us that when we embrace new ideas, make use of new technologies and adapt our behavior, great things happen. Our journey is about more than ourselves, it is about what we can do together to deliver sustainable growth.

Johan Dennelind
President and CEO, Telia Company
Executive summary

New sources of growth are needed to overcome the economic challenges in the Nordics and Baltics

The Nordic economies (Norway, Sweden, Denmark and Finland) have historically performed well but are now facing a number of economic challenges. These include low economic and productivity growth, and historically high unemployment, especially amongst young people. The Baltics (Estonia, Latvia and Lithuania) face similar economic challenges to the Nordics and are still behind other EU countries’ income and productivity.

The Nordic and Baltic countries also face an upcoming public spending challenge, in part due to increased demand for health services and state pensions. The European Commission estimates that Finland, for example, may need to increase its tax rates by 7% to ensure fiscal sustainability.

Emerging Information, Communications and Technology (ICT) services could be a catalyst for greater economic growth

Digital services are already having a transformational impact on economies, societies and ways of life. Continuous technology innovations drive new commercial propositions that improve productivity, reduce barriers to market entry and contribute to economic growth.

As well as improving economic prospects, digital technologies become more prevalent in ways of life and can support social inclusion and empowerment of all groups; facilitate public services, e.g. in healthcare, education and e-government; and encourage innovation and new services. The wide reach of digital technologies means they can affect many aspects of the UN’s Sustainable Development Goals (SDGs), supporting developed economies to decouple economic growth from environmental degradation, and to make their production and consumption more sustainable.
Enhanced use of ICT could add €96bn to the Nordic and Baltic economies by 2021

Increased use of Cloud services, development of Internet of Things (IoT) applications, and increasing those connected to the internet, could be a new driver of growth for the Nordic and Baltics:

*Using cloud computing for access to ICT services can reduce the capital requirements for businesses and reduce barriers to entry*

- Cloud computing consists of on-demand remote access to servers, data storage, software and applications. Accessing platforms and software through the cloud can support increased innovation and improved management. The on-demand nature of cloud services also increases the flexibility of business operations.
- Cloud technology also offers the opportunity of significant resource and energy savings due to greater asset utilisation, for example through the sharing of IT infrastructure.

*IoT can reduce costs through optimising processes and driving new business models*

- IoT connects objects and machines to the internet, allowing for connected things to send reports, receive information and be controlled remotely, transforming the way they work.
- IoT applications facilitate predictive maintenance of machines and goods through remote monitoring and have the potential to increase sales through improved data about customer behaviour and stock levels.
- The information collected can also be an enabler in the way businesses operate and the services they offer. For example, data from connected cars could be used to personalise insurance quotes. IoT applications may also enable more sustainable production and consumption.

*Further connecting marginalised social groups to the internet can allow them to enjoy the benefits of greater digital inclusion, including access to greater information and services*

- Digital inclusion may lead to greater integration of people into the labour market. For example, through being able to take advantage of remote working and e-commerce.

**Figure 2: Enhanced use of ICT in the Nordics and Baltics could unlock growth in the region**

- **GDP**
  - +€82.7bn (5.7%) in the Nordics by 2021
  - +€13.5bn (12.7%) in the Baltics by 2021

- **Employment**
  - +330k (2.5%) in the Nordics by 2021
  - +140k (4.4%) in the Baltics by 2021

- **Productivity**
  - +3.1% in the Nordics by 2021
  - +7.8% in the Baltics by 2021

- **Wages**
  - +€2.6k (3.8%) per employee in the Nordics by 2021
  - +€1.8k (9.6%) per employee in the Baltics by 2021

Source: Deloitte analysis

Greater use of enhanced ICT services can drive innovation, reduce costs for businesses and consumers, increase productivity, increase access and choice for consumers and generate efficiency improvements that reduce negative impacts on the environment from economic growth.
Assuming a scenario in which 99% of people use the internet, 75% businesses use cloud computing and IoT is widely used, the available literature indicates that enhanced ICT use has the potential to:

- Add €7.7bn to the Nordic and Baltic economies through connecting marginalised groups that currently remain unconnected.
- Increase GDP by €51.2bn across the region through increased business use of cloud computing, and increase regional GDP by a further €37.3bn through the widespread adoption of IoT. Enable up to 23,000 new firms through reduced ICT start-up costs thanks to cloud computing.
- Reduce CO₂ emissions by up to 20%, through process efficiencies that may also reduce natural resource usage.

**Figure 3: Up to 20% Greenhouse Gas Emissions savings through enhanced ICT use**

*Estimation based on 2013 values across all sectors, K ton GHG

Source: Eurostat/EEA, GeSI #SystemTransformation

In addition to providing a new source of economic growth, cloud computing and IoT represent a significant market opportunity for those businesses providing these services and devices.

- If 75% of businesses in the region used cloud computing, this could represent a market worth over €19bn in the Nordics and €1.5bn in the Baltics.
- The IoT market in the Nordics could be worth €11.6bn as found in previous studies, and applying this finding to the Baltics and assuming the same usage levels as the Nordics, the Baltic IoT market could be worth over €1.1bn.
Enhanced usage of emerging ICT technologies could generate significant social impacts

Beyond economic impacts, increased use of enhanced ICT technologies could also have potentially large social impacts through:

**Increased social cohesion and civic participation**

Using the internet allows access to more information, online government services, and citizen portals. Specific examples include e-Estonia, which allows Estonian citizens to access public services, perform administrative tasks, pay taxes and vote online.

**Improved access to education resources and quality of delivery**

With enhanced ICT use countries in the Nordics and Baltics may improve levels of basic skills and address the worsening trends in tertiary education. ICT can be used to improve communication between teachers and parents, allow greater access to learning resources and offer new ways of delivery through personalising education to the needs and requirements of the individual. Through greater parental involvement and better monitoring of the needs of the pupil, quality of learning could be improved.

**Increased public sector operational efficiency and reduced costs of providing public services**

ICT could generate cost savings in running the public sector, through cloud offering higher utilisation of ICT hardware, and e-government services reducing the costs of the services by up to 96% compared to providing them face-to-face. Smart City applications offer new options for the provision and efficiency of public services, through greater knowledge and data about when and where services need to be provided, for example, using sensors in public waste bins to know when the need emptying.

**Support increased safety for the population**

Smart transportation services could reduce the number of fatalities from car accidents by up to 60%, through sensors on vehicles that reduce the probability of human error resulting in crashes.

**Improved access to and quality of health services while maintaining affordability**

E-health is the use of ICT in the provision of healthcare services, and there are a number of different ICT-supported applications that could have large impacts on the cost and quality of healthcare services.

Telehealth devices enable patients that do not need full time care to be monitored remotely, through being able to do simple tests, and helping them to live safely at home, such as through monitoring for falls and medication use. This can further reduce hospital admissions and potentially the length of stay by supporting earlier discharges. It is estimated these devices alone, excluding the impact of increased health literacy and other ICT related health outcomes, could save €4.9bn and may potentially help reduce untimely deaths by 6,000 a year across the Nordics and Baltics in 2021.

ICT can be used to transfer all patient and administrative records onto electronic databases and patient management software. Electronic patient management systems and clinical decision support tools have the potential to save time, reduce errors by physicians and help to improve the service, thus reducing costs and may potentially help save lives.

Online pre-assessment and virtual clinics in primary and secondary care can save time and money through avoiding unnecessary appointments. Using online pre-assessment, such as a video call with a clinician before booking an appointment can lead to more efficient use of a general practitioner’s (GP) time, enabling them to see more patients with health problems. Studies in the UK have shown this could save 5 hours of GP time per week. A study into the effects of a virtual clinic found that 75% of appointments could be held remotely. Holding virtual clinics with patients for follow-up and post-surgical discharge allows patients to avoid travelling to hospital and incurring the associated costs.
Action is required to address barriers to the potential economic and social gains available from enhanced ICT services. This could be an important driver in supporting the Nordic and Baltic countries to address their current low levels of productivity and economic growth, improving the welfare of the population and global competitiveness of the region.

While ICT could unlock economic growth and promote social benefits, a number of barriers would still need to be addressed to realise the significant opportunities of enhanced ICT services.

Figure 5: Overcoming regulatory and connectivity barriers is needed to achieve growth across the region

Policy makers, regulators, businesses and other stakeholders in the Nordics and Baltics have an important role to play in further partnering to address the barriers to enhanced ICT use, and capture the benefits that digitalisation has to offer.
1. Introduction: societal challenges and digital solutions

Information and Communications Technology (ICT) services have a transformational impact on economies, societies and ways of life. Continuous innovations in technology drive new commercial propositions that improve productivity, reduce barriers to market entry and contribute to economic growth. Digital technologies are increasingly becoming more prevalent in ways of life and can support social inclusion, the empowerment of all groups and facilitation of public services, e.g. in healthcare, education and e-government.

Digital technologies can support the achievement of the United Nation’s Sustainable Development Goals (SDGs). These are a set of 17 goals that are intended to catalyse action with the aspiration to end poverty, abolish hunger, achieve gender equality, boost equitable economic growth, reduce inequality and tackle climate change – all by 2030 or earlier. These goals apply to countries in all stages of economic growth; for developed economies, it will be particularly important to prioritise action to decouple economic growth from environmental degradation, and make production and consumption more sustainable.

In the context of the transformational power of digital technologies and the SDGs, it is important for countries to consider the opportunities available to better utilise technologies and the potential economic and social impacts these may have. This can be particularly significant for the Nordic (Sweden, Norway, Denmark and Finland) and Baltic (Lithuania, Latvia and Estonia) countries where productivity and economic growth has stalled, risking global competitiveness, and ICT can play an important role in revitalising sustainable economic growth.

Telia has commissioned this report to describe and estimate the economic and societal benefits that can be delivered by increased connectivity and ICT services in the Nordic and Baltic markets, through economic analysis based on academic and business literature and a series of illustrative case studies.

The Nordics and Baltics have above average coverage of superfast networks so are in a good position to take advantage of increased connectivity and ICT services.

Figure 6: The Nordics and Baltics are in a good position to take advantage of increased usage of ICT
Given the already high levels of internet penetration in these countries, the opportunities are primarily around enhancing the penetration and usage levels of new technologies:

- **Cloud computing.** Using cloud computing for access to ICT services can reduce the capital requirements for businesses and reduce barriers to entry. Accessing platforms and software through the cloud can support increased innovation and improved management. The on-demand nature of cloud services also increases the flexibility of business operations.

- **IoT.** The use of IoT devices and applications can:
  - Facilitate predictive maintenance of machines and goods through remote monitoring.
  - Reduce costs through optimising processes and collection routes.
  - Increase sales through improved data about customer behaviour and stock levels.

  The information collected can also be an enabler in the way businesses operate and the services they offer. For example, data from connected cars could be used to personalise insurance quotes.

- **Connecting the unconnected.** Further connecting marginalised social groups to the internet can allow them to enjoy the benefits of greater digital inclusion, including access to greater information and services.

Enhancing the penetration and usage levels of new technologies has the potential to offer new sources of economic growth, whilst supporting the decoupling of economic growth and environmental degradation through increased process efficiency.
2. Economic growth challenges in the Nordics and Baltics

The economies of the Nordic countries have historically performed well, and are some of the more advanced economies in Europe and the World. The Baltics are not as developed economically, but are catching up with other EU countries, and until the financial crisis were experiencing high growth. However, both areas are currently facing a number of challenges that impact on the competitiveness of the region.

1. Economic growth suffered after the global financial crisis

The region is still recovering from the impacts of the global financial crisis, in particular:

- In Finland, while Gross Domestic Product (GDP) started to grow again after the global recession and a recession between 2012 and 2014, real GDP remains lower than 2008 levels.

- Denmark also faced a mild recession in 2012 and 2013, and GDP only reached 2008 levels at the end of 2015.

**Figure 7: Growth in recent years has been low and many countries have only just reached pre-recession levels**

<table>
<thead>
<tr>
<th>Development of real GDP</th>
<th>2009=100</th>
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<tbody>
<tr>
<td>EU</td>
<td>105</td>
</tr>
<tr>
<td>Estonia</td>
<td>90</td>
</tr>
<tr>
<td>Latvia</td>
<td>85</td>
</tr>
<tr>
<td>Norway</td>
<td>110</td>
</tr>
<tr>
<td>Denmark</td>
<td>95</td>
</tr>
<tr>
<td>Finland</td>
<td>90</td>
</tr>
<tr>
<td>Estonia</td>
<td>85</td>
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<tr>
<td>Latvia</td>
<td>110</td>
</tr>
<tr>
<td>Lithuania</td>
<td>105</td>
</tr>
<tr>
<td>Sweden</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Eurostat

2. Youth unemployment is high across the region

The slowdown in economic growth has impacted on unemployment in general, with greater effects on youth unemployment:

- Unemployment in Finland and Sweden is historically high, at over 9% and 7% of the workforce at the end of 2015, respectively. A key driver of this is youth unemployment. Sweden had the highest youth unemployment in the Nordics and Baltics at the end of 2014 at over 20%.

- Despite falling unemployment rates in Latvia and Lithuania, they were still above 9% in 2015. This has coincided with youth unemployment rates falling from 28% in 2012 to 18% in 2014. Some of this may be due to the high levels of emigration these countries have experienced.
The effects of unemployment can have long run impacts on society:

- High levels of youth unemployment impede the development of a skilled workforce and risk increasing inequality in society.
- High levels of unemployment can result in negative personal and wider social impacts, e.g. increased depression and crime rates.
- Long term unemployment can erode the skill base in the country through the loss of skills over time, reducing the potential for future economic growth.

3. Productivity growth has stalled in the Nordics

Productivity growth has slowed in the Nordic countries:

- For Norway, Denmark and Finland, there has effectively been no productivity growth since 2010.
- Sweden has only achieved 3% productivity growth between 2010 and 2015.

Productivity in the Baltics is significantly below the EU average despite catching up in recent years:

- In Estonia and Lithuania labour productivity\(^{iv}\) was 25% lower than average in 2012. Despite productivity growing by at least 12% in Lithuania and Latvia between 2010 and 2015, the overall levels of productivity remain below average.

Productivity growth is an important driver of long run economic and income growth. Higher levels of productivity mean each worker produces more output, increasing GDP and competitiveness. This can then translate into higher incomes for the employees.
4. The ageing population is placing increasing pressure on public spending

The proportion of those aged over 64 in the Nordic and Baltics has been growing at a faster pace than the EU average. The proportion of the population that is over 80 could increase by over 50% by 2030, with 25% of the population in Finland being over 65.\textsuperscript{iv}

The ageing population impacts on the growth potential as well as placing increasing pressures on public services. There is a smaller workforce to provide services and raise tax revenue; pressures on public finances from pension pay-outs; and increased demand for certain services. For example, those aged over 64 years have higher levels of demand for more costly health services.

Healthcare expenditure already accounts for a significant amount of GDP, with the Nordic countries spending approximately 9% on healthcare in 2012 and the Baltics spending 6%, compared to 8.5% in the EU on average. This is expected to increase as the population ages, affecting overall sustainability for public finances. In 2014, Finland had a budget deficit of over 3%, above EU limits, whereas the other countries in the Nordics and Baltics had only small deficits or surpluses.

The European Commission’s (EC) S2 indicator measures how much tax would need to rise permanently as a percentage of GDP in order for governments to remain solvent, and indicates the scale of existing pressures on public finances. For example, Finland may require one of the highest tax increases in the EU at over 6% of GDP, while Lithuania is over 5% of GDP.\textsuperscript{v} More efficient provision of healthcare and other government services is needed to avoid debt further rising or increases in taxes.

Figure 10: The ageing population poses a risk to public finances in the region

<table>
<thead>
<tr>
<th>Share of population aged over 64</th>
<th>S2 fiscal sustainability indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>% increase between 2004 and 2014</td>
<td>% change in taxes required from current levels to achieve a balanced budget.</td>
</tr>
<tr>
<td>Finland</td>
<td>24</td>
</tr>
<tr>
<td>Denmark</td>
<td>22</td>
</tr>
<tr>
<td>Lithuania</td>
<td>19</td>
</tr>
<tr>
<td>Latvia</td>
<td>19</td>
</tr>
<tr>
<td>Estonia</td>
<td>14</td>
</tr>
<tr>
<td>EU 28</td>
<td>13</td>
</tr>
<tr>
<td>Sweden</td>
<td>13</td>
</tr>
<tr>
<td>Norway</td>
<td>8</td>
</tr>
</tbody>
</table>

Source: Eurostat, European Commission (figures rounded). Norway was excluded from the fiscal sustainability bar chart due to missing data.

Given these challenges, new sources of delivering increasing and sustainable economic growth are needed. The next section sets out how ICT could potentially transform the way services are delivered, information and knowledge is shared across the economy and the ways of doing business.
3. ICT represents a new source of sustainable growth

A. The economic opportunities of ICT

Most of the future economic and social benefits from ICT for the Nordic and Baltic countries will relate to increasing the use of enhanced digital technologies and the development of new applications, as well as connecting marginalised social groups to the internet.

1. Cloud computing

Cloud computing refers to access of digital services and applications virtually, including data storage. The capacities and services used can be adjusted on-demand. This can include pooling IT resources with others.

Cloud computing allows remote access to servers, data storage, software and applications in the cloud, which can increase innovation and reduce costs. This can be realised by both private sector businesses and public sector organisations:

- **Reduced need for capital.** Organisations can access IT services without investment in their own IT servers and data storage. This can reduce upfront cost requirements, which can then be used for other investment, and reduce the barriers to entry, particularly for smaller organisations.
- **Increased innovation.** Cloud computing can enable new business models, such as e-commerce, that allow businesses to connect with their customers in new ways and offer new services.
- **Increased flexibility.** Organisations can increase or decrease their IT capabilities in line with business requirements in a more flexible manner as they can more easily and quickly access such services without having to set up their own capabilities, or reduce their use of such services without having to consider investments already made in IT capital.
- **Improved management.** Cloud computing can enable improved management of businesses through access to more information and management software.

**Figure 11: Cloud computing can decrease costs, improve operations and increase employee flexibility**

Cloud computing – selected impacts

- **Servers and data storage (IaaS):**
  - Reduce the IT CAPEX required by businesses, lowering barriers to entry
  - Allow firms to easily change the required usage patterns, reducing costs and increasing flexibility

- **Platforms and software applications (PaaS & SaaS):**
  - Allow firms to access a wide range of software to help improve the operations of their business.

- **Remote desktop (Cloud clients):**
  - Allows employees to access the systems anywhere facilitating more flexible working patterns
  - Allows employees to access information from across the firm when making decisions

*Source: Deloitte analysis.*

Specific examples of the uses of cloud computing are set out below.
Cloud computing can offer a significant opportunity across the Baltics, and particularly for small and medium enterprises across the Nordics

The benefits of cloud computing are already being realised by larger businesses across the Nordics. In Finland, over 50% of businesses use cloud computing, which is the highest rate in Europe, with larger businesses utilising cloud computing at a higher rate of 80%. Larger firms also employ more of the range of different services and software available on the cloud. In Denmark, 33% of large firms use cloud computing services, such as customer relationship management (CRM) software, compared to only 23% of small and medium enterprises (SMEs). The barriers restricting the take-up of cloud computing services by SMEs include the fear of risks of security breaches, as well as insufficient knowledge and understanding of cloud computing. Surveys suggest that a lack of knowledge of cloud computing prevents their use for 60% of SMEs in Lithuania compared to 21% of large firms.

The market opportunity for cloud computing providers is estimated to be €21bn

The majority of the 1.7 million businesses in the Nordic and Baltic countries do not currently make much of use of cloud services other than email. Even in Finland, the country where businesses make the most use of cloud computing, only 30% of businesses purchased “high cloud” services, defined as making use of accounting software applications, CRM software and computing power. However, the uptake of cloud services is expected to increase in the coming years as companies reach the end of their current IT capabilities’ useable life and companies make increasing usage of the services available. Applying a study for the EC on public and private cloud spending in the EU in 2020 to cloud usage levels of 75% and greater use of the cloud services suggests that the market for the provision of cloud services could be as high as €21bn.

2. IoT devices and applications

IoT connects objects and machines to the internet, allowing for connected things to send reports, receive information and to be controlled remotely, transforming the way they work. This can:

- Facilitate predictive maintenance of machines and goods through remote monitoring;
- Reduce costs through optimising processes and collection routes; and
- Increase sales through improved data about customer behaviour and stock levels.

Through devices communicating with each other through platforms IoT has the potential to have everyday impacts on people’s lives. For example, connected cars could communicate that the user is stuck in traffic prompting the heating and other devices at home to turn on later, thus increasing resource use efficiency such as energy savings.

The information collected can also be an enabler in the way businesses operate and the services they offer. For example, the information collected by a connected car could be used by insurance companies to overcome the uncertainty about the quality of the driver. Insurance companies could then offer more personalised insurance at fairer premiums. Given that the IoT market is still in its infancy, some of the benefits of IoT remain to be fully explored.

Specific examples of IoT applications are set out below.
Figure 13: IoT applications can lead to cost savings and efficiency gains for businesses in the region

IoT – selected impacts

- **Smart Grids**: Improve the efficiency of the electricity network by better matching supply and demand. This could occur through e.g. restricting consumption by unused devices at peak times. It could result in lower prices and cost savings. 2-4% reduction in demand peaks
- **Agriculture**: Sensors can measure nutrition in soil to better inform fertiliser use and can increase the climate control in greenhouses. This can increase agricultural output. 5-10% saving in operating costs
- **Industrial process**: Connecting machinery can improve the efficiency of the production process, while predictive maintenance reduces outages. 2.5-5% saving in operating costs
- **Retail**: Applications including supply chain management, understanding customer behaviour, real time personalised communication / promotions can increase sales. 1.5-2% increase in sales
- **Smart Homes**: Users have control over appliances in their home while they are out. This allows them to optimise the climate and energy use. 2% saving in households’ energy bill from smart meters

Source: McKinsey Global Institute, Ofgem (2011), Deloitte Analysis

Figure 14: Connecting things can have impacts on markets and products

**Usage Based Car Insurance**

**Description**: Insurance companies are developing telematics solutions around connected cars, to calibrate premiums with individual data on drivers’ risks and behaviours. This technology would enable insurance companies to reward good driving behaviour. For example, car sensors could record individuals’ state of fatigue and stress while driving, as well as their driving speed and other metrics of their driving behaviour. Modulating premiums based on behaviour would give to the insured parties’ a financial incentive to become safer and more respectful drivers. The Center for Insurance Policy and Research (CIPR) further suggests that pay as you drive insurance could reduce carbon emissions through lower vehicle use and more efficient driving behaviour.

**Impact**: A study from Cisco suggests that such technology could decrease premiums by 10 to 30% worldwide, which could represent a large benefit to consumers. Vehicle greenhouse gas emissions could be lowered by up to 8%. Other impacts, according to the same study, include faster accident response, lower car crash investigation costs and more effective road laws enforcement.

Source: CISCO connected vehicles insurance, Center for Insurance Policy and Research

**IoT application use is still at early stages across the Nordic and Baltic region**

The Nordic countries are performing well in adopting IoT technologies relative to the EU average. In 2014, there were 45 million IoT devices in the Nordics, representing approximately 1.5 devices per person, which amounts to nearly four times as many connected devices per person than the rest of the world. However, there are opportunities to connect further devices including vehicles, wearables such as smartwatches, homes, smart metres and other electronic equipment. There is a larger opportunity in the Baltics, where the usage per person is estimated to be lower.
The market opportunity for IoT is estimated to be €12.7bn

There is the potential for a large number of connected devices to be sold in the Nordics and Baltics. For example, the number of passenger cars in the region is approximately 16 million\textsuperscript{xi} and assuming a car lifespan of 12.5 years\textsuperscript{xiv} there is the potential for over 1 million connected cars to be sold in the region each year. Connecting devices in the 15 million homes and selling hubs for the devices represents further opportunities for sales. In the Nordic countries, the IoT market could be approximately €11.6bn in 2020.\textsuperscript{xv} Applying this to the Baltic markets could result in a market size of €1.1bn with the primary uses being connected consumer goods, connected buildings and vehicles.

3. Connecting marginalised groups to the internet

Generally, current levels of internet usage are high in the Nordics while there is room for further development in the Baltics. Consumer and business ICT usage in the Nordics is some of the most developed in Europe.\textsuperscript{xvi} Over 90% of people in these markets use the internet, with over 80% using it on a daily basis. Many consumers in these countries make more use of the internet for online shopping and online banking compared to the EU average.

Figure 15: Older and less educated people in the region are significantly less likely to be connected to the internet

<table>
<thead>
<tr>
<th>% of individuals accessing the internet every week by age group</th>
<th>% of individuals accessing the internet every week by levels of education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norway</td>
<td>Denmark</td>
</tr>
<tr>
<td>Individuals aged 16-65</td>
<td>Individuals aged 65-74</td>
</tr>
<tr>
<td>Norway</td>
<td>Denmark</td>
</tr>
<tr>
<td>78</td>
<td>76</td>
</tr>
<tr>
<td>97</td>
<td>96</td>
</tr>
</tbody>
</table>

Internet usage in the Baltic countries is not as developed as in the Nordics. While the proportion of people using the internet in Estonia is above the EU average, usage in Latvia is in line with the EU average and Lithuania is below average. Usage of online shopping is generally below average and fewer businesses make use of cloud computing than in the rest of Europe. Interestingly, internet users in the Baltics do use more online banking than those in other countries, with Estonia having the second highest usage.

The main opportunity to increase the benefits of digital technologies is through connecting marginalised groups to the internet. This also includes the increasingly large number of migrant groups in the region. Ensuring that migrants have adequate access to information and services can help them participate in society and the economy. For example, accessing the internet may allow people to find educational material to help facilitate the learning of a new language. Moreover, access to the internet could also help in the search for suitable employment and interaction with online citizen portals, which could support migrants’ integration into their new societies.
The elderly, poor and less educated, and those in rural areas are more likely to be unconnected and miss out on the benefits of connectivity

Three key factors that affect whether people use the internet include age, income and education, and geography:\textsuperscript{xvii}

- **Age:** Older people are more likely to be unconnected to the internet. This occurs across the Nordic and Baltic region, and is most pronounced in the Baltics. In particular, in Lithuania only 20% of 65-74 years olds are using the internet compared to 41% across the EU.\textsuperscript{xvii} This may be due to lower levels of digital skills affecting confidence when using new technologies.

- **Income and education:** Lower income and less educated groups are less likely to be connected to the internet across the Nordic and Baltic region. This effect is most prominent in Lithuania where only 38% of the poorest in society have access to the internet compared to 58% across the EU. This could be partly due to the high cost of handsets, which increase the cost of connectivity.\textsuperscript{xviii} As the economy becomes more digitalised, inequalities in digital access may exacerbate income inequality as the unconnected have lower levels of access to information and opportunities.

- **Geography:** Those in rural areas are more likely to not use the internet than those in densely populated areas, potentially due to high cost of network rollout reducing the network coverage in rural areas. This effect is largest in Lithuania, where there is a 15 percentage point differential in the proportion of the population using the internet in densely populated areas compared to those in rural areas. Access to services such as shopping, banking and public services online can be particularly beneficial in rural regions where there may be longer distances and travel times for access to such physical services.
B. The economic opportunities of ICT

Digitalisation has the potential to generate significant economic and social benefits through:

**Increased innovation**

Improved information flows due to ubiquitous internet access can also foster innovation and new businesses. Enhanced ICT usage could help the spreading of ideas and could make it possible for businesses and consumers to use new research and technologies.

One of the barriers to digital entrepreneurship is start-up costs for new businesses. By using hybrid or public clouds a significant amount of the cost of investing in servers and data storage can be converted into operating costs. Businesses then only need to pay for what they use rather than investing in extra capacity for expansion. Additionally, using the cloud can promote further innovation amongst existing enterprises through having access to new platforms and data.

**Figure 16: Enhanced use of ICT could unlock new growth**

While there have been concerns historically about the disruptive impact that digital technologies can have on businesses, and therefore jobs, evidence suggests that overall they have been job generating in the past. For example, a study by Deloitte found that technological change over the last 15 years might have resulted in 800,000 jobs being lost in the UK but nearly 3.5 million being created.\(^\text{18}\) However, given the dynamic nature of digital transformations, evidence on job impacts from ICT does not appear conclusive.

It is likely that the use of digital technologies, such as IoT devices and the cloud, will have further disruptive affects. Disruptions could be driven by more personalised services, such as usage based insurance using connected car data. While this could upset those firms slow to embrace new technologies, it also presents a significant opportunity for innovation and new services that will benefit consumers.

**Reduced costs and increased productivity for businesses**

The ability to send more complex information and data via mobile devices and the internet can increase organisational efficiency. This can be material for all businesses as high impact technologies, such as cloud and IoT, become more widespread.

By further increasing access to information and new customers through e-commerce, widespread use of ICT services can increase productivity and enable markets to function more efficiently through removing a barrier to entry, reducing transaction costs and increasing transparency. This suggests ICT could contribute to reducing the productivity challenges in the Nordics and Baltics.

Many sectors have already been affected by digitalisation: for example, media and retail have seen significant transformations by switching to digital operations. Companies are able to achieve significant cost reductions and more easily access customers through the internet or apps. Businesses that have not adapted to digitalisation may have found themselves at a competitive disadvantage. There have been changes across the supply chain, including for intermediates.
Increased access and choice for consumers

Being connected to the internet allows people to access a larger range of information, products and online services than before. New services and products have profound impacts on the way people interact with firms. This can reduce travel time and costs for consumers, saving time that can be used for other activities.

The internet also provides new ways of participating in society and helps to drive social inclusion. The currently unconnected could access government services, healthcare information or education services. This can save time and ensure appropriate access to information.

Figure 17: Generation of wider economic impacts through using ICT

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Mechanisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency gains</td>
<td>Use of digital technologies and new ways of working reduce costs and increase efficiency. For example, reducing energy consumption and related Greenhouse Gas Emissions.</td>
</tr>
<tr>
<td>New business opportunities</td>
<td>Reductions in business set-up costs create new business opportunities.</td>
</tr>
<tr>
<td>Enhanced competition</td>
<td>Market entry drives innovation and competition within the domestic and international market</td>
</tr>
<tr>
<td>Job creation</td>
<td>Adoption of new technologies and increased competitiveness stimulate job creation.</td>
</tr>
<tr>
<td>GDP and tax revenues</td>
<td>More efficient businesses and job growth raise GDP and exports and increase the tax base.</td>
</tr>
</tbody>
</table>

Source: Deloitte analysis

Ultimately, increased innovation and productivity leads to higher economic growth, jobs and earnings. The mechanism through which this can be achieved by increased use of new technologies is illustrated below. Through realising these opportunities, the Nordic and Baltic countries could catalyse economic growth.

ICT can also have large impacts on the environment, which are highlighted in Figure 17. IoT devices can help improve the efficiency of operations, through increased levels of information and additional control of things connected to the internet. This can include smart buildings and meters reducing energy consumption; smart grids increasing the efficiency of electricity networks; smart transport networks reducing congestion; or increased knowledge about soil nutrition reducing the amount of fertiliser used. Using cloud computing can reduce emissions through higher utilisation of IT systems and e-commerce platforms can lower the number of journeys made.
Figure 18: Increased usage of ICT can reduce the negative impacts on the environment

**Transport**
- Intelligent transport systems reduce congestion and emissions.
- E-commerce & teleworking reduce journeys and emissions.
- Increased efficiency of cargo transportation through improved logistics and fleet management may reduce emissions.

**Agriculture**
- Using ICT technology, such as IoT devices that measure soil nutrition, can allow farmers to accurately assess how much irrigation and fertiliser is necessary, saving emissions and water consumption.

**Consumer**
- ICT enables greater access to, and sharing of, assets, goods and services (e.g. Uber or Airbnb)
- This could reduce the environmental footprint of industries such as transportation.

**Energy**
- Smart grids could help to match supply and demand better by restricting the usage of some devices, such as intelligent household appliances.
- By better matching supply and demand this could reduce the reliance on expensive power stations during peak hours, thus reducing emissions.

**Domestic**
- Smart buildings can reduce lighting and heating, ventilation and air conditioning energy needs.
- Smart meters also allow consumers to better monitor and control their energy consumption.

**Industry and commercial**
- ICT improves efficiency and emissions.
- Cloud computing could result in emission savings as cloud systems benefit from scale.

*Source consumer: Cohen and Kietzmann (2014)*
*Source (others): GESI SMARTer 2030*

Quantifying these economic and environmental impacts indicates that:

**Enhanced use of ICT could increase the size of the economy by €96bn by 2021 across the region**

This represents a 6% increase in GDP relative to the baseline. Given the lower levels of digitalisation in the Baltic countries relative to the Nordic countries, the relative impact on GDP is estimated to be 13% higher in the Baltics, and could support countries such as Lithuania and Latvia to overcome their current low economic growth. Even countries in the Nordic region, such as Finland and Denmark that have had low rates of economic growth in recent years could benefit: it is estimated these two countries could gain an increase of 5.7% of GDP.

For households, the additional growth from enhanced ICT usage, on average, has the potential to deliver an extra €6,800 per household in the Nordics and over €5,200 per household in the Baltics in 2021. By the same estimate, wages in the Baltics may increase by 9% and almost 4% in the Nordics in 2021 relative to the baseline.

**Figure 19 Incremental GDP and productivity impact in 2021**

<table>
<thead>
<tr>
<th>Region</th>
<th>Incremental GDP impact % in 2021</th>
<th>Incremental impact on productivity % in 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latvia</td>
<td>14,8</td>
<td>9,7</td>
</tr>
<tr>
<td>Lithuania</td>
<td>12,1</td>
<td>7,9</td>
</tr>
<tr>
<td>Estonia</td>
<td>11,3</td>
<td>6,6</td>
</tr>
<tr>
<td>Sweden</td>
<td>5,9</td>
<td>3,6</td>
</tr>
<tr>
<td>Denmark</td>
<td>5,7</td>
<td>3,3</td>
</tr>
<tr>
<td>Norway</td>
<td>5,6</td>
<td>3,0</td>
</tr>
<tr>
<td>Finland</td>
<td>5,6</td>
<td>2,9</td>
</tr>
<tr>
<td>Region Total</td>
<td>6,2</td>
<td>3,5</td>
</tr>
</tbody>
</table>

*Source consumer: Cohen and Kietzmann (2014)*
*Source (others): GESI SMARTer 2030*
23,000 new businesses could be created through cloud services reducing a barrier to entry

Cloud services, such as IaaS and SaaS, could help create 23,000 new SMEs through reducing upfront IT CAPEX required to operate. The use of PaaS could also allow make it easier to access markets through e-commerce. 18,000 of these new businesses may be in the Nordics and 5,000 in the Baltics, representing a 1% increase across the region.

ICT could drive productivity increases of 3.5% across the region

IoT devices and increased penetration may enhance productivity in 2021 by over 3% in the Nordics and approximately 8% in the Baltics, with gains as high as 10% in Latvia. In a situation where current levels of productivity have stalled, these represent significant gains.

Figure 20: Enhanced use of ICT could unlock growth in incomes

<table>
<thead>
<tr>
<th>Incremental wage impact</th>
<th>% in 2021, average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lithuania</td>
<td>11.0</td>
</tr>
<tr>
<td>Latvia</td>
<td>8.5</td>
</tr>
<tr>
<td>Estonia</td>
<td>8.4</td>
</tr>
<tr>
<td>Sweden</td>
<td>4.4</td>
</tr>
<tr>
<td>Finland</td>
<td>3.7</td>
</tr>
<tr>
<td>Denmark</td>
<td>3.6</td>
</tr>
<tr>
<td>Norway</td>
<td>3.4</td>
</tr>
<tr>
<td>Region Total</td>
<td>4.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Additional income per household</th>
<th>€ in 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norway</td>
<td>8,700</td>
</tr>
<tr>
<td>Denmark</td>
<td>6,500</td>
</tr>
<tr>
<td>Sweden</td>
<td>6,100</td>
</tr>
<tr>
<td>Latvia</td>
<td>5,800</td>
</tr>
<tr>
<td>Estonia</td>
<td>5,200</td>
</tr>
<tr>
<td>Finland</td>
<td>5,000</td>
</tr>
<tr>
<td>Lithuania</td>
<td>4,900</td>
</tr>
<tr>
<td>Region Total</td>
<td>6,300</td>
</tr>
</tbody>
</table>

Source: Deloitte analysis

470 thousand jobs could be created in the Nordics and Baltics

Advanced use of ICT services may create an additional 470,000 jobs across the Nordic and Baltic countries after factoring in the productivity gains from using the technologies. The employment gains represent a 2.5% increase in the numbers employed for the Nordics and 4.4% for the Baltics.

These gains in employment could offset significant proportions of today’s overall unemployed and could contribute to lowering the relatively high unemployment levels in Finland, Latvia and Lithuania. For example, this increase in the number of jobs could halve the unemployment rate in Latvia and Lithuania, assuming this does not encourage more people to enter the labour market or reduce emigration. The increase in the number of jobs available may also be able to help reduce youth unemployment in Sweden, as this is a key driver behind its historically high unemployment rate.

Improving process efficiency could help to reduce emissions by 20%

Applications of ICT improve process efficiency and resource utilisation. This could reduce CO₂ emissions by 20%, equivalent to 8.8 million cars not being driven for a year.iii Across key sectors of the economy these applications could reduce emissions;iii

- Transport: Fewer journeys and more less congestion could reduce CO₂ emissions by 6%.
- Energy: Smart grids could reduce total CO₂ emissions by up to 3%.
- Agriculture: Up to 3% of CO₂ emissions could be saved.
• Domestic: Smart building and meters could reduce emissions by 3%.
• Industry and commercial: These applications could reduce emissions by up 4.5%.

**Figure 21: Enhanced ICT usage could help the Nordic and Baltics overcome economic challenges**

Additional firms
Thousands in 2021

Additional jobs
Thousands in the Nordic & Baltics

*Source: Deloitte analysis, Eurostat/EEA, GeSI #SystemTransformation*

**Promoting digital entrepreneurship and innovation**

Reducing barriers to innovation can allow entrepreneurs to make the most of new business opportunities offered by the platform nature of many ICT applications. As part of the Digital Single Market programme, the EC sees digital entrepreneurship and innovation as a key driver of economic growth for Europe. The emergence of new platforms and technologies, such as IoT, provides opportunities for innovation.

Digital innovation requires specialist ICT skills, and the proportion of ICT specialists in the labour force provides a good indication of the potential for innovation. The Nordics are well placed, with some of the highest proportions of ICT professionals in Europe, at approximately 5% of the workforce in 2012. This means that there is a relatively large skill base to take advantage of entrepreneurship opportunities. Comparatively, the Baltic countries have a shortage of ICT professionals, with share of ICT professionals in Lithuania and Latvia being below the EU average of 3% and Estonia’s share at the EU average.

The Nordic countries are also seen as having one of the best enabling environments for digital innovation in Europe, with high levels of R&D expenditure and provision of highly specialised training. While the environment in the Baltics is not seen as conducive to innovation as the Nordics, both Latvia and Lithuania have a relatively strong entrepreneurial culture. This is evidenced by that fact that these countries have some of the highest birth rates of start-ups in Europe.

Governments and private organisations in the region are already working to support this growth enabler. This has been a priority for many countries in the Nordics and Baltics. Governments have introduced a number of programmes to encourage innovation, for example the Estonian Development Fund. In addition to government programmes, there have also been schemes set up by large private companies to support entrepreneurs develop their ideas into a viable services and products. These schemes also train entrepreneurs on how to run a business and help them raise capital to develop their business ideas.
To estimate the economic impacts, a further set of assumptions on the levels of usage of these services has been employed over a five year period from 2017 to 2021:

- 75% of businesses make use of cloud computing;
- There are sufficient IoT devices in the manufacturing, retail, energy, natural resource extraction, and agriculture sectors to achieve the full benefits described above; and
- Internet usage is effectively universal at 99% of the population.

The assumptions are the same for all countries to give the potential impact if the countries were able to reach the same levels of digitalisation, rather than being a forecast. The impacts are expressed as additions to what is expected to happen to GDP and other variables, based on available forecasts from the World Bank. This approach illustrates the estimated incremental impacts that enhanced ICT usage could deliver. The detailed methodology employed in this estimation, as well as results for each country included in the analysis, is reported in the appendices to this report.

This study brings together some of the existing academic literature to estimate the potential economic benefits that could be generated through increased use of new technologies. In particular, the key studies considered include:

- **Cloud Impacts:** The Centre for Economics and Business Research (CEBR) undertook a study measuring the impacts of increasing cloud usage in five European economies. They found that increasing the proportion of businesses using cloud by approximately 15%-20% in each country would generate benefits of 1.57% of GDP over the period. *(Source: ‘The Cloud Dividend’ CEBR, 2015)*

- **IoT:** McKinsey Global Institute estimated the impacts from using IoT devices across a number of sectors. These include reducing operating costs in manufacturing and resource extraction by 3.5% and 7.5% respectively, increasing sales by 2% in retail and yields in agriculture of 15%. *(Source: ‘Disruptive technologies: advances that will transform life, business and the global economy’, McKinsey Global Institute, 2013)*

- **Internet penetration “connecting the unconnected”:** This is a well-established relationship in the literature with numerous studies over the last 15 years estimating the relationship between increases in internet penetration and GDP growth. A recent Deloitte econometric study analysing internet penetration and GDP in 38 countries over 10 years finds that increasing fixed line penetration by 10% boosts GDP growth by 0.88% and mobile penetration drives GDP growth by 0.63%. *(Source: ‘BT: Enabling the UK economy’, Deloitte, 2014)*

The estimated impacts are illustrative of the potential that could be generated, and a number of enabling supply-side and demand-side factors are required to successfully enable the opportunities to be realised. The analysis is based on the assumption that any technological and regulatory issues, such as data protection and security regulations, spectrum and standardisation for 5G services, are resolved in order for the assumed usage levels to be reached.

*Source: Cloud usage assumption is informed by discussions with Telia where it was mentioned that many firms migrate to the cloud once their current systems have reached the end of their useful life.*
Estonia has been investing in ICT in recent years and promoting the growth of ICT professionals. For example, the Estonian Government funds the ‘IT Academy Programme’ that aims to improve the quality of ICT education and promote ICT courses on offer from higher education facilities. The aim of the programme is to increase the number of ICT professionals and promote digital entrepreneurship. There are other programmes, such as SmartLabs, that focus on encouraging people in education to study ICT courses at university.

Description: Telia set up VUNK Labs and accelerator programmes in June 2015 for startups that want to partner with Telia in Estonia to find new business opportunities and create value for the startups and Telia.

The programme helps new businesses with business modelling, piloting, market insight and financing. It also makes use of the technical abilities within Telia to help the startups. So far over 180 Telia employees in Estonia have been involved with VUNK.

Impact: Within the three month trial, ten business cases were evaluated and five businesses, two of which participated in the accelerator programme, are now growing their businesses.

Source: vunk.eu

Description: As part of Nokia’s restructuring strategy in 2011, Nokia launched the Bridge programme to support employees to find other job opportunities. The options included other employment within Nokia or externally and starting up a new business.

For those starting new businesses, Nokia offered grants up to €25,000 per person as well as bank finance guarantees, entrepreneurial information, startup coaching, and collaboration with local incubators.

Impact: Out of the 18,000 people eligible for the Bridge programme globally, 60% found their next step in their career and over 1,000 businesses have been set up globally. 42% of the businesses were ICT startups and over 90% of the new businesses are still operational with the average number of employees per firm rising from 2 in 2012 to 7 in 2015.

Source: Nokia Bridge Programme- New thinking on corporate social responsibility
While there are a number of programmes in place to encourage entrepreneurship, many of these are still small in scale. Through expanding and introducing similar schemes, this can help to provide information to entrepreneurs on running a business and assist them in receiving investments at early stages. This can increase the likelihood that new services and products are successfully brought to market and drive growth in the region.
C. The social opportunities of ICT

Going beyond economic growth, the increased use of ICT also offers a number of significant social benefits for the region.

1. ICT can improve access to and quality of education resources and offer new ways of delivering education

Improved access to education resources

Access to educational resources can be improved with virtual college courses. These allow people to access online curricula, including using cloud services to watch lectures, access content and submit coursework. For people otherwise unable to access higher education, virtual education allows them to improve their skill sets and increase their employability. This could be useful for countries with high youth unemployment as it would allow young people to gain more skills and increase their likelihood of finding a job.

Sweden has seen the proportion of students in tertiary education fall in recent years, from 80% in 2006 to 70% in 2012. Latvia and Norway have also seen falls in those attending tertiary education. Encouraging students to continue on to tertiary education could be important as businesses require more skilled employees.

There has been significant immigration of asylum seekers to Sweden and Denmark in the last year. In 2015, Sweden took in around 160,000 asylum seekers and expects up to 100,000 in 2016. Ensuring that migrants have adequate access to information and services can help them participate in society and the economy. For example, accessing the internet may allow people to find educational material to help facilitate the learning of a new language. Access to the internet could also help in the search for suitable employment and help interact with online citizen portals.

Figure 26: Using Apps to improve access to information and help integration

Welcome! is a non-profit app which puts locals and refugees into contact by providing a question board, where anyone can post to ask about the customs of their new country, find a friend, learn the language or ask any number of other questions. Users can also sign up to events that are listed in the app. These are usually small every day activities that help refugees adjust to the routines of life in their new country.

The United Nations High Commissioner for Refugees (UNHCR) decided to support Welcome! and collaborate with the app to make it widely known and used. It also started providing services to refugees through Welcome!.

Although quantitative evidence is not yet available, Welcome! could facilitate interactions between locals and refugees, and support refugees’ integration process. Refugees reported that this system works well for them, getting a lot of different answers that help them get complete information.

Source: http://www.unhcr-northern europe.org/what-we-do/integration/welcomeapp/

Figure 27: Social cohesion and community

Bremen.ru illustrates how internet and ICT can support the social integration of socially disadvantaged groups such as migrants. This German website, run by a local charity, offers counselling and information on everyday activities in Russian language, targeting immigrants with a Russian background in Bremen. Concentrated in the neighbourhood of Neue Vahr Nord, this social group is affected by a large poverty burden and low educational attainment. Some local stakeholders, moreover, suggest that a significant share of this group does not speak German.

Bremen.ru has helped immigrants find continuing education and employment opportunities, thanks to their access to the information system of the job information centre. Qualitative evidence, based on interviews with different stakeholders, suggests that the website is an essential source of information for many members of Neue Vahr Nord’s Russian community.

Source: EC. ICT for Integration, Social Inclusion and economic participation of immigrants and Ethnic minorities: Case studies from Germany
**ICT can offer new ways of delivering education**

The cloud can also be used to improve education delivery, for example it can be employed to set up systems that allow teachers, parents and children to interact with teaching and learning information. This can include parents being able to see homework assignments and grades as well as allowing them to communicate with teachers. Increased parental involvement in education has been shown to be an important predictor of child attainment. This suggests that increased use of these services could improve basic skills through improving outcomes.

Based on the 2012 PISA scores, Sweden and Lithuania generally perform below average on mathematics, reading and science compared to the OECD average, with the scores for Sweden declining over the last decade. Norway and Latvia generally perform at average levels whereas Estonia and Finland perform slightly above average. This suggests that all the countries can further improve the quality of their education systems. A particular focus could be to ensure that as many students have basic skills in literacy and mathematics.

Technology can also be used for more personalised and innovative methods of education. Through making use of connected handsets for example, teachers can more easily track the progress of students and use a wider range of learning activities.

One of the barriers to enhanced ICT in schools is the knowledge of the teacher of the applications and the confidence in using the technology. To help maximise the impacts of ICT in education, teachers need to be aware of best practice in how to adequately use the technology.

**Figure 28: Using ICT to improve communication in education**

<table>
<thead>
<tr>
<th><strong>EKOOL – Online school management in Estonia</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Estonia’s online school management tool ‘eKool’ illustrates the wide potential of ICT in the field of education. Introduced in 2002, the application aims at tackling some issues of the Estonian educational system, including high drop-out rates and low parental involvement in children’s education. Accessible on mobiles and laptops, the app offers a platform for teachers and parents to exchange messages, sends automatic SMS in case of absence, and provides information about pupils’ academic performance. The app also features an e-learning feature, through which students can access selected study material.</td>
</tr>
<tr>
<td><strong>Impact:</strong> Initially started in only four schools, now 85% of Estonian secondary establishments have joined the network since its launch, representing 95% of all students. The literature suggests that the application has induced Estonian teachers to use the internet more widely, and generated a high customer satisfaction.</td>
</tr>
</tbody>
</table>

Source: Snellen and Todorovski. eKool and eVem: two example show-cases for the NISPAcee e-Government Learning Platform

**Figure 29: Using tablets and software to improve educational delivery**

<table>
<thead>
<tr>
<th><strong>MICROSOFT LATIVA &amp; LATVIAN MOBILE TELEPHONE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>“Ready for tomorrow” in Latvia</strong></td>
</tr>
<tr>
<td><strong>Description:</strong> Microsoft Latvia and Latvian Mobile Telephone (LMT) have created five pilot classes in Latvia on the use of ICT at school. The two companies equipped the pupils with tablets, software and monitoring systems, and trained teachers to help them leverage these instruments to develop new learning methods.</td>
</tr>
<tr>
<td><strong>Impact:</strong> Teachers have reported that the scheme improved student motivation and generated better learning outcomes.</td>
</tr>
</tbody>
</table>

2. ICT solutions can reduce the cost of providing health services while maintaining quality

ICT applications have the potential to transform healthcare provision and the functioning of the sector, to provide more efficient care. E-health applications can be used across the care pathway, from providing more information, supporting prevention, diagnoses, treatment and monitoring of conditions, as illustrated below. E-health can be used to improve the information for both patients and health professionals, remind individuals of treatments due and medications, monitor conditions around the clock, and provide improved connectedness between patients and doctors that can increase efficiency.

**Figure 30: Impacts of ICT on the different elements of healthcare provision**

This report considers four specific applications:

- Telehealth devices;
- Electronic patient management systems and clinical decision support tools;
- Online pre-assessment in primary care; and
- Remote follow-up in secondary care.

**Telehealth devices in homes**

Telehealth devices are connected devices that are installed in the home of the person needing care. These devices allow for people’s health to be monitored remotely, through being able to do simple tests, and helping them to live safely at home, such as through monitoring for falls, lack of movement and whether appliances are left on.

Specific opportunities from the use of telehealth devices are:

- Monitoring and caring for those with chronic illnesses and the elderly. Such population groups do not necessarily need round the clock care but could face serious health issues without any monitoring.

  The Department of Health in the UK have reported that the use of telehealth could decrease mortality from long-term conditions by 45%.\(^{32}\) Estimates using this finding suggest that using telehealth devices to care for 70% of those with long-term conditions in 2021 may potentially help save 6,000 lives in that year. This is approximately 30% of those who could otherwise have died from strokes, chronic obstructive pulmonary diseases (COPD) and diabetes.

- Reducing the number of hospital admissions and days spent in hospital, which can also reduce the cost of providing healthcare.

The NHS in the UK has found that the use of telehealth devices reduces the number of bed days for the elderly by 35% and over 20% for those with diabetes, strokes and COPD.\(^{33}\) Applying the cost of a bed day and 70% usage assumption finds that using telehealth to care for the elderly and people with long-term conditions could result in gross savings of €4.5bn in the Nordics and €350mn in the Baltics. This could mitigate some of the increasing demand and cost pressures from the ageing population.
Telehealth has the potential to be widely used throughout the population, with approximately 20% of the population being elderly and 10% of the population having long-term conditions. Assuming a 70% usage rate amongst these groups and a cost per year of €1,100 per person,xxxv adjusted for the relative price levels, the market opportunity could potentially be worth up to €5.3bn across the Nordics and Baltics.

Online pre-assessment in primary care

Using online pre-assessment, such as a video call with a clinician before booking an appointment can lead to more efficient use of a general practitioner's (GP) time, enabling them to see more patients will health problems. According to a UK report, 31% of patients attending a GP appointment do not actually need to attend,xxxvi and primary care pre-assessment saved GPs up to five hours per week and there was an overall reduction in the time needed to see a patient. This suggests substantial cost savings are available through reducing the workload within primary care. This may help to accommodate the increase in demand for primary care services as the population ages. Further, this could improve patient experience through improving access to GPs, reduced travel times for those who do not need to attend in person and potentially more timely care.

Remote follow-up in secondary care

Similar to primary care, a significant proportion of people do not need to attend follow-up appointments at hospitals. A study into the effects of a virtual clinic found that 75% of appointments could be held remotely.xxxvii This means that holding virtual clinics with patients for follow-up and post-surgical discharge allow patients to avoid travelling to hospital and incurring the associated costs. This saved approximately €38 per appointment, which combined with the large number of appointments could result in a significant cost saving to healthcare providers.

Electronic patient management systems and clinical decision support tools

ICT can be used to transfer all patient and administrative records onto electronic databases and patient management software. These have the potential to save time, reduce errors by physicians and help to improve the service, thus potentially helping countries to manage the challenge of an ageing population.

Electronic patient management systems allow patients records to be updated automatically once; for example, a test has been performed ensuring that the records are complete, up-to-date and reliable. These records can also be accessed by anyone and at any time if needed. Using electronic management systems can also improve the affordability of healthcare by reducing the amount of repeat or redundant laboratory tests, cost of time spent pulling

Figure 31: E-health could save lives and avoid care related costs

The use of Telemedicine devices in 2021 may potentially help reduce untimely deaths by 23k and generate €4.9bn in care related cost savings

Source: Eurostat/EEA, Statistics Norway, Deloitte analysis. Differences due to rounding
patient charts and by reductions in length of hospital stay through more up to date records and efficient ordering processes.

Clinical decision support tools can be used to create treatment plans. In creating the plans, the physician can be alerted to allergies the patient has, potential drug interactions in the plan and whether the test is redundant or has been done before.

These systems also have the potential to improve the health literacy of patients, by providing information and reminders about their care routine, and support their ability to obtain, understand and use information to make decisions about their health and follow treatment instructions. A study published in the British Medical Journal found that those with low health literacy were 26% more likely to die in a given year than those with high levels of health literacy.xxxviii Currently approximately 70% of people in the Nordics make some use of the internet to search for health information compared to only 40% to 55% for the Baltics.xxxix Based on these assumptions, if half of the population aged over-65 reached a high level of health literacy, this may potentially reduce untimely deaths by 17,000 per year across the Nordics and Baltics in 2021.

**Figure 32: Using telehealth devices to care for people in their homes**

**Description:** Telia HomeCare is a device connected to various sensors that wirelessly communicates between users’ homes and caregivers, entirely at caretakers’ conditions. Through Telia HomeCare, the user has more control over what happens in their home and enhanced contact with their caregiver. For example, users get help with different types of services like blood tests or ECG measurement in their home. The users may also monitor their health development and share information during illness. The system can also provide reminders when the users forget things, such as taking their medicine.

**Impact:** Telia HomeCare and other Telehealth solutions may allow resources in public and private healthcare systems to be used more efficiently. Telehealth technologies could enable the users to stay home longer which is positive from a wellbeing and cost perspective. Telehealth solutions may also reduce the need for physical travel, both for caretakers and care providers, which is beneficial for the environment.

3. E-government solutions can be widely used to increase the public sector operational efficiency and reduce the cost of providing public services

The use of ICT and the internet provides new opportunities for the provision of government services and for efficiencies in government operations.

**Figure 33: Applications of ICT that can improve the efficiency of public services and utilities**

Cloud computing can save money for governments through the flexibility of cloud services resulting in higher utilisation of data centres, thus reducing the number of servers required. While the impacts vary depending on whether the cloud used is public cloud, private cloud or a hybrid, which affects whether the business has made any investments into the IT infrastructure, a US study has estimated that cloud computing could reduce IT related expenditure by 25%-50%.[iv] While the Nordic and Baltic governments are making some use of cloud computing and have plans to use more, there is still more progress that can be made to realise these benefits.[v]

Providing more government services online allows for cheaper provision of public services, as well as easier access for many. Some estimates suggest that there could be a 96% cost saving from online enquiries compared to “face-to-face” enquiries.[vi] The Nordic and Baltic countries already have a relatively large number of e-government services from online portals such as borger.dk in Denmark and the e-citizen programme in Estonia. A future source of improving the quality and efficiency of public services could be further use of IoT devices and Smart City applications. For example, Copenhagen already has smart city projects focusing on integrating the public transport system, and modernising the sewage system and waste management.[vii]
4. ICT can support improved safety for the population.

The use of new technologies presents an opportunity to further improve road and fire safety. There are varying levels of opportunity across the region.

Road deaths per million inhabitants are over 80% above the EU average in Latvia and Lithuania. Finland and Estonia are in line with EU averages, and Norway, Denmark and Sweden are some of the best in Europe. While Sweden performs comparatively very well at 27 road deaths per million, it has embarked upon "Vision Zero", a programme aiming to get road deaths down to zero a year. This involves removing aspects of human error and designing roads with the aim of minimising accidents. Despite this, in the last three years there has only been a small reduction in road deaths in Sweden, suggesting new approaches may be necessary.

Using IoT devices presents a potential opportunity to reduce the incidents of accidents by reducing human error resulting in an accident as well as reducing the fault rate of electrical appliances. The connected car, for example, can reduce the incidents of traffic accidents. Cars are increasingly able to remove elements of human error from driving. Current examples include sensors that monitor the car’s surroundings so that the car knows whether it is about to be in a collision and needs to break, diagnostic checks so that the driver knows whether they need to get the car repaired before a problem occurs. In a world where connected cars are self-driving, they would be able to communicate with others cars around them in order to minimise the chance of accidents.

Figure 35: IoT can improve business security

The Nordic countries have some of the lowest rates of fires in Europe, particularly in Norway, whereas the Baltic countries have comparatively high rates. Evidence from the Nordics suggests that approximately a quarter of building fires are through carelessness with electrical equipment or faults in electrical equipment.\textsuperscript{xlv}

Smart home technology could reduce the number of fires due to electrical appliances, such as cookers, being left on as these could be monitored or automatically switched off, while diagnostic information could reduce the chances of an electrical fire occurring when a fault occurs in a product.

**Figure 36: Connected cars could save close to 1,000 lives lost due to road fatalities**

Up to 60\% reduction of fatalities in road accidents with full adoption of Car2X technology

- Estonia: 143
- Norway: 171
- Latvia: 193
- Denmark: 227
- Finland: 271
- Sweden: 298
- Lithuania: 344

Average annual deaths past five reported years vs. Potential

Near 1000 lives saved on the roads in 2021

Source: Eurostat/EEA, GeSI #SystemTransformation

The Nordic countries have some of the lowest rates of fires in Europe, particularly in Norway, whereas the Baltic countries have comparatively high rates. Evidence from the Nordics suggests that approximately a quarter of building fires are through carelessness with electrical equipment or faults in electrical equipment.\textsuperscript{xlv}

Smart home technology could reduce the number of fires due to electrical appliances, such as cookers, being left on as these could be monitored or automatically switched off, while diagnostic information could reduce the chances of an electrical fire occurring when a fault occurs in a product.

**Figure 37: Reducing accidents using connected cars**

Description: Until recently, advanced connectivity was limited to only the latest high-end vehicles. Telia Sense can bring connected features to the great majority of cars manufactured after 2001. Developed with partners from the automotive and insurance industries, Telia Sense is a device that connects to cars’ on board computers. It enables a combination of car control functionalities, such as remote car monitoring and diagnostics, 4G connectivity and Wi-Fi, usage based car insurance and car sharing.

Impacts: Connected cars could enable more sustainable transportation through smart route planning and parking, increased vehicle utilization, fewer traffic jams, safer driving and lower greenhouse emissions.

4. Addressing the barriers to realising the opportunities to ICT

While digitalisation could unlock economic growth and promote social benefits, a number of barriers would still need to be addressed to realise the significant opportunities of enhanced ICT services. There are some common barriers across all countries, and some specific issues in certain countries, as summarised below.

**Figure 38: Overcoming regulatory and connectivity barriers is needed to achieve growth across the region**

**Public and policy perspective – ‘Rules of the game’**

There are currently a number of regulatory and policy barriers that could limit the speed and uptake of digitalisation. Specific areas that need to be addressed include:

- Development of the regulatory environment for complex issues such as privacy, data security, taxation of shared assets and liability for machine actions needs to be clarified to unlock the full potential of digitalisation:
  - IoT sensors will result in the transfer of large amounts of data across networks and platforms, which are stored in data centres. Each party’s privacy needs to be ensured and security obligations need to be clearly defined.
  - 5G network services can be a key enabler of IoT services. However, if decisions on the liberalisation of radio spectrum happen too late, this could hold back the development of IoT services and digitalisation.
  - Defining regulations for certain applications of digitalisation, such as self-driving cars and sharing of assets, relating to damage, injury and insurance issues are also of vital importance accelerating digitalisation.

- Limited awareness about ICT’s potential in accelerating more sustainable growth needs to be addressed. If all benefits and detriments of digitalisation are not known and considered in policy decisions, that might risk not harnessing the full potential of digitalisation in societal development. It is thus important to ensure that policy makers, NGOs, interest groups and other civil society organisations have sufficient information to drive the most effective policymaking, as well as to encourage further an environment of innovation and investment through policies aimed at supporting digital entrepreneurs to make their ideas a reality.

- Lack of investment and financing incentives specifically related to connecting the remaining unconnected in rural areas where the short term business case for private companies are very weak. Connecting the remaining unconnected proportion of the population to the internet will enable the benefits of digitalisation to spread to all groups of society, supporting sustainable growth and reducing inequality. For those people who are not online it may be due to:

**Source:** Telia Company
Issues accessing the internet due to poor coverage or affordability; or
Low confidence in using the internet and being secure.

Policy makers can play a key part in overcoming these challenges and creating an enabling environment for digitalisation. For example, governments and regulators, in combination with international organisations such as the EC and ITU, can set frameworks that define responsibilities for data and security and begin the process of ensuring that regulatory network barriers to the mass adoption of IoT are resolved.

**Industry perspective – ‘Supply of digitalisation’**

Development of effective cross industry, and cross public and private, collaborative platforms will be critical in successfully addressing issues such as:

- Fostering partnerships that ensure implementation of digital solutions as responsibly as possible, concerning pressing issues such as privacy and data security.
- Integration of standards across technologies such as for 5G services. As technologies are rapidly evolving, there is concern amongst some industry stakeholders that the decisions on the may take effect too late, which could hold back the development of IoT services.
- Investment in networks to manage the increasing volume of data generated by increased digitalisation such as IoT.
- Creating a financial environment that fosters digital innovations that drive sustainable development, as these innovations cannot always compete on equal (risk)-return profiles as more entertainment related services.

**Customer perspective – ‘Demand for digitalisation’**

The demand for digitalisation is one of the most important drivers of a more sustainable growth in the Nordics and Baltics. Creating that demand includes addressing some of the following issues:

- Increasing ICT literacy and digital skills for example via more education programmes focusing on these skill-sets to increase adoption of digital services, both among consumers and businesses. This will be even more important as digitalisation will continue transform current labour markets:
  - Programmes that target the individual’s barrier to internet usage may be more likely to succeed in helping them get online, for example, by providing more accessible devices and software for those with disabilities. These could be run by public, private or the voluntary sector. Coordinating the different schemes may also be more successful as they can complement each other. For example, a programme to give those from disadvantaged areas access to affordable broadband could be complemented by programmes designed to educate people about the benefits and uses of the internet.
  - For people to be able to participate successfully in a digital world, they are likely to need at least basic digital skills. These skills allow people to make better use of new technologies at home and in the workplace, thus making new technologies a significant driver for future growth. While the Nordics perform better than the EU average with at least 70% of people having basic or above basic skills, there is still room for improvement. More progress can also be made on increasing those with above basic skills, which for example is only 35% of the population in Sweden\(^{46}\). The Baltic countries have a greater shortage of people with digital skills than the Nordic countries. According to Eurostat, Lithuania and Latvia have a shortage of digital skills, performing worse than the EU average. Estonia has seen improvements in digital skills and is not far behind Sweden in basic and above basic skills.
- Improving affordability of necessary devices, sensors and software that enable the uptake of digital solutions, may be addressed by new innovative business models to serve low-income market segments and small businesses.
- Increasing the availability of locally relevant and useful content could enable enhanced ICT and digital services usage levels even further among businesses and consumers.

Finally, just as for policy makers, lack of knowledge about the potential of digitalisation in decoupling economic growth from environmental degradation could impede wanted changes in consumption patterns, such as transitioning from owning assets to using assets. By further improving information to both businesses and consumers on the benefits of digitalisation besides savings in time and money, this challenge might be addressed.
Appendix A: Individual country impacts

A.1 Sweden

1.1 Background

Key social and economic challenges

Sweden’s economy has benefited from a sustained economic growth since 2012, and has one of the highest labour participation rates in Europe. Sweden already has one of the lowest debt to GDP ratio in Europe and the Economist Economic Intelligence Unit expects the ratio of debt to GDP to keep decreasing in the future. Sweden has become a hub for digital entrepreneurship, with Stockholm hosting some of the largest European digital start-ups such as Spotify, King (owner of Candy Crush) and the payment service firm Klarna.

A significant inflow of refugees into the country has however recently increased public focus on social inclusion. Moreover, the need for job creation remains strong, as 7.4% of Swedish workers are unemployed, including over 127,000 youths. The share of people aged 65+ in the Swedish population has significantly increased in the previous decade and is likely to increase further, which may increase the cost of providing healthcare. ICT, thanks to its potential in terms of digital inclusion and job generation (see below), can be part of the solution to these challenges.

State of Sweden’s ICT market

European data suggests that Sweden’s ICT market is relatively advanced compared to the rest of the continent, with both internet and e-commerce usage being significantly above EU average. This performance is supported by the country’s ICT infrastructure providing 99% of the population with LTE coverage, as well as advanced ICT education, Sweden having the highest proportion of formally ICT trained workers among its labour force. NGA coverage is below Denmark and Sweden.

ICT markets statistics

- Internet usage: 91%
- Made an online purchase: 71%
- Business using cloud computing: 39%
- NGA coverage: 76%
- LTE coverage: 99%

Note: for usage and categories definition, please refer to the section "State of Sweden ICT market"

<table>
<thead>
<tr>
<th>Education: Sweden has the lowest proportion of people with basic* or above digital skills in the Nordics, especially above basic skills. Sweden also performs below the OECD average in the PISA rankings for general basic skills.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inequality: The Gini index increased by 5.4% between 2010 and 2015, indicating an increase in income inequality.</td>
</tr>
<tr>
<td>Growth: Labour productivity has grown by 4.7% from 2010 to 2015, in line with EU average (4.5%).</td>
</tr>
<tr>
<td>Employment: Unemployment rate amongst 15-24 year olds in Sweden stood at 22.4% in Q4 2014, above the EU-28 average.</td>
</tr>
<tr>
<td>Public finance: General government debt rose by 33% since 2010, a higher growth than on average in the EU.</td>
</tr>
<tr>
<td>Ageing: The ratio of 65+ to working age population is expected to increase by 14% between 2015 and 2030 in Sweden.</td>
</tr>
</tbody>
</table>

Education: Sweden has the lowest proportion of people with basic* or above digital skills in the Nordics, especially above basic skills. Sweden also performs below the OECD average in the PISA rankings for general basic skills.

Source: Eurostat, Digital entrepreneurship scoreboard 2015

*Basic digital skills are defined as ‘the use of computers to retrieve, access, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet’

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1 Eurostat (2016)
2 Eurostat (2016)
4 See case study “Bremen.ru” section “Connecting the unconnected”
1.2 Economic impact of ICT

ICT’s economic impact in Sweden in 2021

The total impact of enhanced ICT usage in Sweden is estimated to be SEK 283bn, approximately 5.9% of GDP. With Sweden’s GDP growth forecast at 9.7% over 2016-2021 by the World Bank, ICT therefore has the potential to be a significant driver of Sweden’s future economic growth. Estimates suggest that ICT may as a whole generate 133,000 net jobs, although other jobs may also be displaced in other sectors of the economy. This result is consistent with the literature, which suggests an overall positive impact of ICT on employment.

In Sweden, the economic impact of cloud computing is estimated to be the largest across the three technologies studied. This result is related to the fact that Sweden still has a significant margin for improvement in terms of cloud adoption, and a relatively large amount spent on IT, which increases the potential savings. Cloud computing decreases IT related fixed costs of firm creation for entrepreneurs, converting them into operating costs, thus reducing a barrier to entry.

It is estimated that the cloud could contribute to the creation of as many as 9,000 SMEs in Sweden over the five years. Cloud market size, based on the same adoption scenario, could reach SEK 65bn by 2021. IoT, which could generate an impact equivalent to 4% of GDP, could approach SEK37bn in market size in Sweden by 2021, according to a 2021 report for Telia.

The broadband penetration increase, on the contrary, may create relatively low gains because of the current high levels of usage.

Methodology

The economic impact estimation is based on a number of adoption scenarios over a five year period. The core adoption scenarios for each of the ICT areas studied are presented below:

- Internet/broadband: Sweden is assumed to reach a 99% internet usage rate across those aged 16+ by 2021, up from 91% in 2016. Broadband penetration is assumed to increase in line with internet usage. The relationship between broadband penetration and GDP is estimated using the results of a Deloitte study for BT, while the impact of productivity is calculated based on a quantitative study on broadband.

- Cloud computing: Business usage of the cloud (i.e. paying features, excluding free e-mail services) is assumed to reach 75% in 2021, up from 39% in 2014. The impact calculations are based on a CEBR study on the impact of cloud usage in the five largest European economies.

- IoT: The impact of IoT was estimated using the ‘Disruptive technologies’ study by the McKinsey global institute. It uses its findings on the cost saving potential of the IoT to evaluate the corresponding productivity and employment impact on the economy. This research is based on IoT’s impact on four key industry sectors: manufacturing (industrial internet of things), agriculture (precision farming), mining (connected sensors), and retail (smart storage to optimise inventories). The potential estimation for IoT does not rely on a specific usage assumption, but assumes a widespread utilisation of the technology by 2021.

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5 World bank (2016)
7 Eurostat (2016)
8 ‘Connected Things’ Arthur D Little and TeliaSonera, (2016)
10 ‘BT: enabling the UK economy’, Deloitte (2014)
1.3 E-health impacts

E-health potential in Sweden

Figure 41: E-health potential in Sweden

The results suggest that these technologies have the potential to generate up to SEK 9bn of financial savings for the health system, and may potentially help save 7,200 lives in 2021. The financial savings may be higher than this due to potential decreases in appointments at hospitals and reduced need to build more capacity. Based on a 70% usage assumption, the telecare industry in Sweden could generate over SEK 16bn of revenue by 2021. Given Sweden’s expected population ageing, these technologies could contribute to the sustainability of Sweden’s current public health system.

Methodology

The health impact estimation is based on two adoption scenarios, presented below:

- **E-health literacy:** the research assumes that 50% of Swedes above 65 years old will use the internet for health related reasons once a month or more by 2021, up from approximately 10% in 2015. A BMJ published study on the mortality impact of health literacy among seniors suggests that high health literate elderly people have a 26% lower death rate than those that have low health literacy.

- **Telecare for LTC and elderly care management:** Evidence suggests that telecare could decrease mortality rates by 45%. LTCs have been shown to have positive effects on diabetes, COPD and heart strokes. The model assumes a 70% usage rate of these technologies, and calculates the related gross financial savings, through a reduction in bed days only, and impact on mortality, for those with LTCs, based on the findings of the surveyed literature.

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14 Deloitte analysis on Eurostat (2016)
A.2 Denmark

2.1 Background

Key social and economic challenges

The European Commission, in its country report, expects Denmark's growth to pick up after a slow recovery from the 2008 economic crisis. In the same report, the Commission suggests that exports could be one of the drivers of growth, thanks to the improving outlook in the Eurozone, the country's main trading partner. Denmark’s public deficit is below Maastricht limits of 3% and the country is benefiting from a below European average debt to GDP ratio.

Denmark’s output per worker is high by European standard, but productivity growth has been sluggish since 2010. The European Commission, in its 2016 country report, suggests that important barriers to entry could be one of the causes for this underperformance. The country is also facing a significant inflow of refugees from the Middle East, which has increased public focus on social inclusion. Despite the net immigration flow, the share of 65+ in the Danish population has significantly increased in the previous decade, which has been a pressure for the financial sustainability of the country’s health care system. ICT, thanks to its potential in terms of digital inclusion, productivity improvement (notably in terms of barriers to entry, see below), can be part of the solution to these challenges.

State of Denmark’s ICT market

European data suggests that Denmark ICT market is relatively advanced compared to the rest of the continent, with both internet and e-commerce usage being significantly above the EU average. This performance is supported by the country’s ICT infrastructure providing 99% of the population with LTE coverage, as well as a high NGA coverage (92% of the population). The share of business using cloud computing is almost twice the EU average of 20% of firms purchasing cloud computing services.

ICT markets statistics

- Internet usage: 96%
- Made an online purchase: 79%
- Business using cloud computing: 37%
- NGA coverage: 92%
- LTE coverage: 99%

Note: for usage and categories definition, please refer to the section “State of Denmark ICT market”

Source: Deloitte analysis, Eurostat, Telia Company

Inequality: The Gini index increased by 1.9% between 2010 and 2015, indicating an increase in income inequality. Productivity: Productivity per worker has grown by less than 1% in average since 2010 in Denmark, below the EU’s average. Growth: The GDP average growth rate since 2010 stood at 0.7%, significantly below the EU average. Ageing: The dependency ratio, i.e. the number of 65+ per working age individuals, is forecast to increase by 28% in Denmark between 2015 and 2030.

Source: Eurostat, Digital entrepreneurship scoreboard 2015

2.2 Economic impact of ICT

ICT’s economic impact in Denmark in 2021

The total impact of enhanced ICT usage in Denmark is estimated to be DKK 131bn, approximately 5.7% of GDP. Given that the Danish economic growth in 2015 stood at 1.6% of GDP, ICT therefore has the potential to be a significant driver of Denmark’s future economic growth. ICT may generate 73,000 net jobs, although other jobs may also be displaced in other sectors of the economy. This result is consistent with the literature, which suggests an overall positive impact of ICT on employment.24

In Denmark, the economic impact of cloud computing is estimated to be the largest across the three technologies studied. This result is related to the fact that Denmark still has a significant margin for improvement in terms of cloud adoption25, and a relatively large amount spent on IT, which increases the potential savings. Cloud computing decreases IT related fixed costs of firm creation for entrepreneurs, converts them into operating costs, thus reducing a barrier to entry.

It is estimated that the cloud could contribute to the creation of as many as 3,600 SMEs over the period. Cloud market size, based on the same adoption scenario, could reach DKK 28bn by 2021. IoT, which could generate an impact equivalent to 2% of GDP, could approach DKK17bn in market size in Denmark by 2021, according to a 2021 report for Telia.26 The broadband penetration increase, on the contrary, may yield relatively low gains, because of the current high levels of usage.27

Methodology

The economic impact estimation exercise is based on a number of adoption scenarios over a five year period. The core adoption scenarios for each of the technological areas studied are presented below:

- **Internet/broadband**: Denmark is assumed to reach a 99% internet usage rate across 16+ by 2021, up from 96% in 2016. Broadband penetration is assumed to increase in line with internet usage. The relationship between broadband penetration and GDP is estimated using the results of a Deloitte study for BT,28 while the impact of productivity is calculated based on a quantitative study on broadband.29

- **Cloud computing**: Business usage of the cloud (i.e. paying features, excluding free e-mail services) is assumed to reach 75% in 2021, up from 37% in 2015. The impact calculations are based on a CEBR study30 on the impact of cloud usage in the five largest European economies.

- **IoT**: The impact of IoT was estimated using the ‘Disruptive technologies’ study by the McKinsey global institute.31 It uses its findings on the cost saving potential of the IoT to evaluate the corresponding productivity and employment impact on the economy. This research is based on IoT’s impact on four key industry sectors: manufacturing (industrial internet of things); agriculture (precision farming), mining (connected sensors); and retail (smart storage to optimise inventories). The potential estimation for IoT does not rely on a specific usage assumption, but assumes a widespread utilisation of the technology by 2021.

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24 Internet matters: The Net’s sweeping impact on growth, jobs and prosperity, McKinsey Global institute (2011)
25 Eurostat business cloud usage (2016)
26 ‘Connected Things’, Arthur D Little and TeliaSonera (2016)
28 ‘BT : enabling the UK economy’, Deloitte (2014)
29 Economic impact of broadband: an empirical study, LECG (2009)
30 The Cloud Dividend (2012)
2.3 E-health impacts

E-health potential in Denmark

The results suggest that these technologies have the potential to generate up to DKK 6.7bn of financial savings for the health system, and may potentially help save 4,300 lives in 2021. The financial savings may be higher than this due to potential decreases in appointments at hospitals and reduced need to build more capacity. Based on a 70% usage assumption, the telecare industry in Denmark could generate over DKK 7.8bn of revenue by 2021. Given Denmark’s expected population ageing, these technologies could contribute to the sustainability of the country’s current public health system.

Methodology

The health impact estimation is based on two adoption scenarios, presented below:

- **E-health literacy**: The research assumes that 50% of Danes above 65 years old will use the internet for health related reasons once a month or more by 2021, up from approximately 20% in 2015. Evidence suggests that high health literate elderly people have a 26% lower death rate than those that have low health literacy.

- **Telecare for LTC and elderly care management**: Evidence suggests that telecare could decrease mortality rates by 45%. LTCs have been shown to have positive effects on diabetes, COPD and heart stokes. The model assumes a 70% usage rate of these technologies, and calculates the related gross financial savings, through a reduction in bed days only, and impact on mortality, for those with LTCs, based on the findings of the surveyed literature.

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32 Deloitte analysis on Eurostat (2016)
33 Association between low functional health literacy and mortality in older adults: longitudinal cohort study, Bostock (2012)
A.3 Norway

3.1 Background

Key social and economic challenges

Despite a recent faltering of GDP growth (1.2% in 2016), Norway still benefits from one of the lowest unemployment rates in Europe, at 4.4%. The country’s fiscal position is supported by its large current account surplus (6.5% in 2015) despite the drop in oil prices and is home to the largest sovereign wealth fund in the world. Norway’s GDP per worker is already among the highest in the world and productivity growth has been significantly higher than the EU’s since 2010.

The share of 65+ in the Norwegian population is expected to increase to 20% by 2030, which will increase the financial pressures on the healthcare system. Norway could also make further progress in improving basic skills in mathematics, reading and science as based on the 2012 PISA scores. ICTs, thanks to their potential in terms of health care savings (see 3.3), can be part of the solution to these challenges.

Summary of selected challenges

Productivity: Productivity growth has been low since 2010, due to the decline in hydrocarbon prices.

Public finance: The public debt over GDP ratio rose by 2.5 points from 2012 to 2015.

Digital entrepreneurship: Norway’s ICT start ups birth rate stood at 11.2% of total ICT firms, below the EU average.

Ageing: The dependency ratio, i.e. the rate of 65+ over working age population, is expected to increase by 22% from 2015 to 2030.

Source: Eurostat, Digital entrepreneurship scoreboard 2015

State of Norway’s ICT market

European data suggests that Norway’s ICT market is relatively advanced compared to the rest of the continent, with both internet and e-commerce usage being significantly above EU average. This performance is supported by the country’s ICT infrastructure providing 96% of the population with LTE coverage. The share of business using cloud computing is above the EU average of 20% of firms purchasing cloud computing services.

ICT markets statistics

- Internet usage: 97%
- Made an online purchase: 76%
- Business using cloud computing: 38%
- NGA coverage: 80%
- LTE coverage: 96%

Note: for usage and categories definition, please refer to the section “State of Norway ICT market”

Source: Deloitte analysis, Eurostat, Telia Company

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35 Eurostat (2016)
36 Ibid
37 World Bank (2016)
3.2 Economic impact of ICT

ICT’s economic impact in Norway in 2021

The total impact of enhanced ICT usage in Norway is estimated to be NOK 203bn, approximately 5.6% of GDP. Given that the World Bank forecasts the Norwegian economy to grow by 11% between 2015 and 2021, ICT therefore has the potential to be a significant driver of Norway’s future economic growth. ICT may generate 77,000 net jobs, although other jobs may also be displaced in other sectors of the economy. This result is consistent with the literature, which suggests an overall positive impact of ICT on employment.

In Norway, the economic impact of cloud computing is estimated to be the largest across the three technologies studied. This result is related to the fact that Norway still has a significant margin for improvement in terms of cloud adoption, and a relatively large amount spent on IT, which increases the potential savings. Cloud computing decreases of IT related fixed costs of firm creation for entrepreneurs, converts them into operating costs, thus reducing a barrier to entry.

It is estimated that the cloud could contribute to the creation of as many as 2,800 SMEs in Norway over the five year period. Cloud market size, based on the same adoption scenario, could reach NOK 52bn by 2021. IoT, which could generate an impact equivalent to 2.1% of GDP, could approach NOK 24bn in market size in Norway by 2021, according to a 2021 report for Telia. The broadband penetration increase, on the contrary, may be relatively low because of the current high levels of usage.

Methodology

The economic impact estimation exercise is based on a number of adoption scenarios over a five year period. The core adoption scenarios for each of the technological areas studied are presented below:

- **Internet/broadband**: Norway is assumed to reach a 99% internet usage rate across 16+ by 2021, up from 98% in 2016. Broadband penetration is assumed to increase in line with internet usage. The relationship between broadband penetration and GDP is estimated using the results of a Deloitte study for BT, while the impact of productivity is calculated based on a quantitative study on broadband.

- **Cloud computing**: Business usage of the cloud (i.e., paying features, excluding free e-mail services) is assumed to reach 75% in 2021, up from 38% in 2015. The impact calculations are based on a CEBR study on the impact of cloud usage in the five largest European economies.

- **IoT**: The impact of IoT was estimated using the ‘Disruptive technologies’ study by the McKinsey global institute. It uses its findings on the cost saving potential of the IoT to evaluate the corresponding productivity and employment impact on the economy. This research is based on IoT’s impact on four key industry sectors: manufacturing (industrial internet of things); agriculture (precision farming); mining (connected sensors) and retail (smart storage to optimise inventories). The potential estimation for IoT does not rely on a specific usage assumption, but assumes a widespread utilisation of the technology by 2021.

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38 World Bank (2014)
40 Eurostat (2016)
41 ‘Connected Things’, Arthur D Little and TeliaSonera (2016)
43 ‘BT : enabling the UK economy’, Deloitte (2014)
3.3 E-health impacts

E-health potential in Norway

Figure 47: E-health potential in Norway

The results suggest that these technologies have the potential to generate up to NOK 12.2bn of financial savings for the health system, and may potentially help save 3,300 lives in 2021. The financial savings may be higher than this due to potential decreases in appointments at hospitals and reduced need to build more capacity. Based on a 70% usage assumption, the telecare industry in Norway could generate over NOK 10.3bn of revenue by 2021. Given Norway’s expected ageing population, these technologies could contribute to the sustainability of the country’s current public health system.

Methodology

The health impact estimation is based on two adoption scenarios, presented below:

- **E-health literacy**: The research assumes that 50% of Norwegians above 65 years old will use the internet for health related reasons once a month or more by 2021, up from approximately 14% in 2015.\(^\text{47}\) Evidence suggests that high health literate elderly people have a 26% lower death rate than those that have low health literacy.\(^\text{48}\)

- **Telecare for LTC and elderly care management**: Evidence suggests that telecare could decrease mortality rates by 45%. LTCs have been shown to have positive effects on diabetes, COPD and heart stokes.\(^\text{49}\) The model assumes a 70% usage rate of these technologies, and calculates the related gross financial savings, through a reduction in bed days only, and impact on mortality, for those with LTCs, based on the findings of the surveyed literature.

\(^{47}\) Deloitte analysis on Eurostat (2016)

\(^{48}\) Association between low functional health literacy and mortality in older adults: longitudinal cohort study, Bostock (2012)
A.4 Finland

4.1 Background

Key social and economic challenges

Finland benefits from a labour productivity higher than the EU average. The country has been an early joiner of the technology boom, in particular thanks to the firm Nokia, and the country remains an important technological hub in Europe. However, the European commission, in its 2016 country report, suggests that the Finnish economy has been negatively affected by the decline of Nokia and its ecosystem. Productivity has grown by approximately 1% since 2010, and unemployment level, at 9.4%, is above peer Scandinavian countries. Despite a net immigration flow, the share of 65+ in the Finnish population is expected to increase by 15.8% by 2030, which could generate a pressure to the financial sustainability of its health care system. ICTs, thanks to their potential in terms of digital inclusion and health care savings (see 4.3), can be part of the solution to these challenges.

Key challenges summary

Productivity: Productivity growth (at 1.3% since 2010) is below EU average.

Employment: The unemployment rate (9.4%), although close to EU average, is higher than peer Scandinavian’s countries.

Growth: GDP has grown by only 0.2% since 2010, the lowest performance of all Nordic and Baltic countries.

Public finance: The government has recorded a deficit of 2.7% in 2015. The debt to GDP ratio, at 63%, is above the Euro convergence criterion of 60%.

Ageing: The dependency ratio, i.e. the ratio of 65+ to working age individuals, is forecast to increase by 32% from 2015 to 2030.

Digital inclusion: The proportion of individuals with little formal education using regularly the internet was 10 points lower than that of the general population.

State of Finland’s ICT market

European data suggests that Finland’s ICT market is relatively advanced compared to the rest of the continent, with both internet and e-commerce usage being significantly above EU average. This performance is supported by the country’s ICT infrastructure providing 92% of the population with LTE coverage. The share of business using cloud computing however, in particular, is significantly higher than the EU average.

ICT markets statistics

- Internet usage: 93%
- Made an online purchase: 71%
- Business using cloud computing: 53%
- NGA coverage: 75%
- LTE coverage: 92%

Note: for usage and categories definition, please refer to the section “State of Finland ICT market”

Source: Deloitte analysis, Eurostat, Telia Company

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50 Eurostat (2016)
53 See case study “Bremen.ru” section “Connecting the unconnected”
4.2 Economic impact of ICT

ICT’s economic impact in Finland in 2021

The total impact of enhanced ICT usage in Finland is estimated to be €13.6bn, approximately 4.4% of GDP. Given that the World Bank forecast that the Finnish economy will grow by 11% between 2015 and 2021\(^4\), ICT therefore has the potential to be a significant driver of the country’s future economic growth. ICT may generate 47,000 net jobs, although other jobs may also be displaced in other sectors of the economy. This result is consistent with the literature, which suggests an overall positive impact of ICT on employment.\(^5\)

In Finland, the economic impact of IoT is estimated to be the largest across the three technologies studied. This result is related to the fact that Finland still has a relatively low margin for improvement in terms of cloud adoption\(^6\), and a relatively large amount spent on IT, which lowers the potential savings. Cloud computing decreases IT related fixed costs of firm creation for entrepreneurs, converts them into operating costs, thus reducing a barrier to entry.

It is estimated that cloud could contribute to the creation of as many as 2,600 SMEs over the five year period. Cloud market size, based on the same adoption scenario, could reach €3.3bn by 2021. IoT, which could generate an impact equivalent to 1.8% of GDP, could approach 1.9bn in market size in Finland by 2021, according to a 2021 report for Telia.\(^7\) The broadband penetration increase, on the contrary, may yield relatively low gains, because of the current high levels of usage.\(^8\)

Methodology

The economic impact estimation exercise is based on a number of adoption scenarios over a five year period. The core adoption scenarios for each of the technological areas studied are presented below

- **Internet/broadband**: Finland is assumed to reach a 99% internet usage rate across 16+ by 2021, up from 93% in 2016. Broadband penetration is assumed to increase in line with internet usage. The relationship between broadband penetration and GDP is estimated using the results of a Deloitte study for BT\(^9\), while the impact of productivity is calculated based on a quantitative study on broadband.\(^10\)

- **Cloud computing**: Business usage of the cloud (i.e. paying features, excluding free e-mail services) is assumed to reach 75% in 2021, up from 53% in 2015. The impact calculations are based on a CEBR study\(^11\) on the impact of cloud usage in the five largest European economies.

- **IoT**: The impact of IoT was estimated using the ‘Disruptive technologies’ study by the McKinsey global institute.\(^12\) It uses its findings on the cost saving potential of the IoT to evaluate the corresponding productivity and employment impact on the economy. This research is based on IoT’s impact on four key industry sectors: manufacturing (industrial internet of things); agriculture (precision farming); mining (connected sensors) and retail (smart storage to optimise inventories). The potential estimation for IoT does not rely on a specific usage assumption, but assumes a widespread utilisation of the technology by 2021.

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\(^{4}\) World Bank (2014)
\(^{6}\) Eurostat business cloud usage (2016)
\(^{7}\) ‘Connected Things’, Arthur D Little and TeliaSonera (2016)
\(^{8}\) ‘Telecommunication Markets in the Nordic Countries’, Nordic and Baltic telecom regulators (2015)
\(^{9}\) ‘BT : enabling the UK economy’, Deloitte (2014)
\(^{10}\) ‘Economic impact of broadband: an empirical study’, LECG (2009)
\(^{11}\) ‘The Cloud Dividend’, CEBR (2012)
4.3 E-health impacts

E-health potential in Finland

Figure 50: E-health potential in Finland

The results suggest that these technologies have the potential to generate up to €800m of financial savings for the health system, and may potentially help save 4,100 lives in 2021. The financial savings may be higher than this due to potential decreases in appointments at hospitals and reduced need to build more capacity. Based on a 70% usage assumption, the telecare industry in Finland could generate over €1.8bn of revenue by 2021. Given Finland’s expected population ageing, these technologies could contribute to the sustainability of the country’s current public health system.

Methodology

The health impact estimation is based on two adoption scenarios, presented below:

- **E-health literacy**: The research assumes that 50% of Finns above 65 years old will use the internet for health related reasons once a month or more by 2021, up from approximately 11% in 2015. Evidence suggests that high health literate elderly people have a 26% lower death rate than those that have low health literacy.

- **Telecare for LTC and elderly care management**: Evidence suggests that telecare could decrease mortality rates by 45%. LTCs have been shown to have positive effects on diabetes, COPD and heart stokes. The model assumes a 70% usage rate of these technologies, and calculates the related gross financial savings, through a reduction in bed days only, and impact on mortality, for those with LTCs, based on the findings of the surveyed literature.

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63 Deloitte analysis on Eurostat (2016)
64 Association between low functional health literacy and mortality in older adults: longitudinal cohort study, Bostock (2012)
A.5 Estonia

5.1 Background

Key social and economic challenges

Estonia is one of the fastest growing economies in the European Union\(^66\) and benefits from a relatively low unemployment rate. Its public finances are supported by its budgetary surplus and its low level of public debt over GDP, which stands at 6.2%. Moreover, Estonia is a world leader in e-government thanks to its program e-Estonia.

However, Estonian workers’ productivity still lags behind the EU average, despite comparatively strong productivity growth.\(^67\) Estonia has moreover suffered from net population outflows\(^68\) due to the wage differential with other EU members. Emigration of young Estonian has contributed to population ageing, the World Bank forecasts a 6.7% increase in 65+ share of Estonia’s population. This population ageing puts pressures on the financial sustainability of its health care system. ICT can help to improve productivity and generate health care savings (see 5.3) so can be part of the solution to these challenges.

Key challenges summary

- **Productivity:** Estonian value added per worker is 26% below EU average.
- **Digital entrepreneurship:** Digital business climate appears to be a challenge for Estonia. The country was ranked 27\(^{th}\) out of 28 on this criterion by the Digital Entrepreneurship Scoreboard 2015.
- **Ageing:** the 65+ share of the Estonian population is expected to increase by 5.7% by 2030.
- **Digital inclusion:** The proportion of individuals with little formal education using regularly the internet was 20 points lower than that of the general population.
- **Inequality:** The Gini index increased by 13.7% between 2010 and 2015, indicating an increase in income inequality.

State of Estonia’s ICT market

European data suggests that Estonia’s ICT market is still catching up with the rest of the continent, with both internet and e-commerce usage being significantly below Scandinavian counterparts. The country’s ICT infrastructure provides 95% of the population with LTE coverage, above EU average. The share of business using cloud computing, in particular, is significantly lower than the EU average.

ICT markets statistics

- Internet usage: 88%
- Made an online purchase: 59%
- % Business using cloud computing: 15%
- NGA coverage: 86%
- LTE coverage: 95%

Note: for usage and categories definition, please refer to the section “State of Estonia ICT market”

Source: Deloitte analysis, Eurostat, Telia Company

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\(^{66}\) Eurostat (2016)
\(^{67}\) Ibid.
\(^{68}\) Eurostat (2016)
5.2 Economic impact of ICT

ICT’s economic impact in Estonia in 2021

The total impact of enhanced ICT usage in Estonia is estimated to be €2.9bn, approximately 11.3% of GDP. Given that the World Bank forecasts that the Estonian economy will grow by 21% between 2015 and 2021, ICT therefore has the potential to be a significant driver of the country’s future economic growth. ICT may generate 35,000 net jobs, although other jobs may also be displaced in other sectors of the economy. This result is consistent with the literature, which suggests an overall positive impact of ICT on employment.

In Estonia, the economic impact of cloud computing is estimated to be the largest across the three technologies studied. This result is related to the fact that Estonia still has a significant margin for improvement in terms of cloud adoption, and a relatively large amount spent on IT, which increases the potential savings. Cloud computing decreases IT related fixed costs of firm creation for entrepreneurs, converting them into operating costs, thus reducing a barrier to entry.

It is estimated that the cloud could contribute to the creation of as many as 870 SMEs in Estonia over the five year period. Cloud market size, based on the same adoption scenario, could reach €390m of total revenue by 2021. IoT, which could generate an impact equivalent to 5.2% of GDP, could approach €270m in market size in Estonia by 2021. The broadband penetration increase, on the contrary, may yield relatively low gains due to internet usage already being at 88%

Methodology

The economic impact estimation exercise is based on a number of adoption scenarios over a five year period. The core adoption scenarios for each of the technological areas studied are presented below:

- **Internet/broadband**: Estonia is assumed to reach a 99% internet usage rate across 16+ by 2021, up from 88% in 2016. Broadband penetration is assumed to increase in line with internet usage. The relationship between broadband penetration and GDP is estimated using the results of a Deloitte study for BT, while the impact of productivity is calculated based on a quantitative study on broadband.

- **Cloud computing**: Business usage of the cloud (i.e. paying features, excluding free e-mail services) is assumed to reach 75% in 2021, up from 15% in 2014. The impact calculations are based on a CEBR study on the impact of cloud usage in the five largest European economies.

- **IoT**: The impact of IoT was estimated using the ‘Disruptive technologies’ study by the McKinsey global institute. It uses its findings on the cost saving potential of the IoT to evaluate the corresponding productivity and employment impact on the economy. This research is based on IoT’s impact on four key industry sectors: manufacturing (industrial internet of things), agriculture (precision farming), mining (connected sensors) and retail (smart storage to optimise inventories). The potential estimation for IoT does not rely on a specific usage assumption, but assumes a widespread utilisation of the technology by 2021.

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69 World Bank (2014)
71 Eurostat (2016)
72 Deloitte analysis on Arthur D Little and TeliaSonera (2016)
74 ‘BT: enabling the UK economy’, Deloitte (2014)
76 Eurostat (2016)
5.3 E-health impacts

E-health potential in Estonia

Figure 53: E-health potential in Estonia

The results suggest that these technologies have the potential to generate up to €68m of financial savings for the health system, and may potentially help save 850 lives in 2021. The financial savings may be higher than this due to potential decreases in appointments at hospitals and reduced need to build more capacity. Based on a 70% usage assumption, the telecare industry in Estonia could generate over €130m of revenue by 2021. Given Estonia’s expected population ageing, these technologies could contribute to the sustainability of the country’s current public health system.

Methodology

The health impact estimation is based on two adoption scenarios, presented below:

- **E-health literacy:** The research assumes that 50% of Estonians above 65 years old will use the internet for health related reasons once a month or more by 2021, up from approximately 5% in 2015.79 Evidence suggests that high health literate elderly people have a 26% lower death rate than those that have low health literacy.80

- **Telecare for LTC and elderly care management:** Evidence suggests that telecare could decrease mortality rates by 45%. LTCs have been shown to have positive effects on diabetes, COPD and heart stokes.81 The model assumes a 70% usage rate of these technologies, and calculates the related gross financial savings, through a reduction in bed days only, and impact on mortality, for those with LTCs, based on the findings of the surveyed literature.

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79 Deloitte analysis on Eurostat (2016)
80 Association between low functional health literacy and mortality in older adults: longitudinal cohort study, Bostock (2012)
A.6 Latvia

6.1 Background

Key social and economic challenges

Latvia is one on the fastest growing economies in the European Union.\(^\text{82}\) Its public finances are supported by a low budgetary deficit and a moderate level of public debt over GDP, which stands at 36.4%.\(^\text{83}\) Latvia has a high share of workers that have received ICT training, relative to EU average, but at the same time has a shortage of ICT professionals with less than 3% of the workforce being ICT professionals.\(^\text{84}\)

However, Latvian workers’ productivity still lags behind the EU average, despite comparatively productivity growth.\(^\text{85}\) Moreover, Latvia has suffered from net population outflows\(^\text{86}\) due to the wage differential with other EU members as well as enduring high income inequality. Emigration of young Latvians has participated to population ageing, the World Bank forecasting a 4.8% increase of 65+ share of Latvia’s population. This population ageing puts pressures on the financial sustainability of its health care system. ICT, thanks to its potential in terms of digital inclusion,\(^\text{87}\) productivity gain and health care savings (see 5.3), can be part of the solution to these challenges.

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**State of Latvia’s ICT market**

European data suggests that Latvia’s ICT market is still catching up with the rest of the continent, with both internet and e-commerce usage being significantly below Scandinavian counterparts. The country’s ICT infrastructure provides 91% and 89% of the population with NGA and LTE coverage, respectively. The share of business using cloud computing (8%), in particular, is significantly lower than the EU average.

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**ICT markets statistics**

- Internet usage: 79%
- Made an online purchase: 38%
- % Business using cloud computing: 8%
- NGA coverage: 91%
- LTE coverage: 89%

Source: Deloitte analysis, Eurostat, Telia Company

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\(^\text{82}\) Eurostat (2016)
\(^\text{83}\) Ibid.
\(^\text{84}\) “Digital entrepreneurship scoreboard”, European commission (2015)
\(^\text{85}\) Eurostat (2016).
\(^\text{86}\) Ibid
\(^\text{87}\) See case study “Bremen.ru” section “Connecting the unconnected”
6.2 Economic impact of ICT

ICT’s economic impact in Latvia in 2021

The total impact of enhanced ICT usage in Latvia is estimated to be €4.7bn, approximately 14.8% of GDP. Given that the World Bank forecasts that the Latvian economy will grow by 23% between 2015 and 2021, ICT therefore has the potential to be a significant driver of the country’s future economic growth. ICT may generate 48,000 net jobs, although other jobs may also be displaced in other sectors of the economy. This result is consistent with the literature, which suggests an overall positive impact of ICT on employment.88

In Latvia, the economic impact of cloud computing is estimated to be the largest across the three technologies studied. This result is related to the fact that Latvia still has a significant margin for improvement in terms of cloud adoption90, which increases the potential savings. Cloud computing decreases IT related fixed costs of firm creation for entrepreneurs, convert them into operating costs, thus reducing a barrier to entry. It is estimated that cloud could contribute to the creation of as many as 1,900 SMEs in Latvia in 2021. Cloud market size, based on the same adoption scenario, could reach €421 m of total revenue by 2021. IoT, which could generate an impact equivalent to 6.1% of GDP, could approach €379m in market size in Latvia by 2021.91 While the impact of increased broadband penetration in Latvia is lower than that from cloud and IoT, this impact is estimated to be one of the highest in the Nordic and Baltic countries due to the lower levels of internet penetration.92

Methodology

The economic impact estimation exercise is based on a number of adoption scenarios over a five year period. The core adoption scenarios for each of the technological areas studied are presented below.

- **Internet/broadband**: Latvia is assumed to reach a 99% internet usage rate across 16+ by 2021, up from 76% in 2016. Broadband penetration is assumed to increase in line with internet usage. The relationship between broadband penetration and GDP is estimated using the results of a Deloitte study for BT,93 while the impact of productivity is calculated based on a quantitative study on broadband.94

- **Cloud computing**: Business usage of the cloud (i.e. paying features, excluding free e-mail services) is assumed to reach 75% in 2021, up from 8% in 2015.95 The impact calculations are based on a CEBR study96 on the impact of cloud usage in the five largest European economies.

- **IoT**: The impact of IoT was estimated using the ‘Disruptive technologies’ study by the McKinsey global institute.97 It uses its findings on the cost saving potential of the IoT to evaluate the corresponding productivity and employment impact on the economy. This research is based on IoT’s impact on four key industry sectors: manufacturing (industrial internet of things); agriculture (precision farming); mining (connected sensors) and retail (smart storage to optimise inventories). The potential estimation for IoT does not rely on a specific usage assumption, but assumes a widespread utilisation of the technology by 2021.

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88 World Bank (2014)
90 Eurostat (2016)
91 Deloitte analysis on Arthur D Little and TeliaSonera
93 ‘BT’: enabling the UK economy’, Deloitte (2014)
95 Eurostat (2016)
96 ‘The Cloud Dividend’ CEBR (2012)
6.3 E-health impacts

E-health potential in Latvia

Figure 56: E-health potential in Latvia

The results suggest that these technologies have the potential to generate up to €86m of financial savings for the public health system, and may potentially help save 1,300 lives in 2021. The financial savings may be higher than this due to potential decreases in appointments at hospitals and reduced need to build more capacity. Based on a 70% usage assumption, the telecare industry in Latvia could generate over €151m of revenue by 2021. Given Latvia’s expected population ageing, these technologies could contribute to the sustainability of the country’s current public health system.

Methodology

The health impact estimation is based on two adoption scenarios, presented below:

- **E-health literacy**: The research assumes that 50% of Latvians above 65 years old will use the internet for health related reasons once a month or more by 2021, up from approximately 6% in 2015.\(^98\) Evidence suggests that high health literate elderly people have a 26% lower death rate than those that have low health literacy.\(^99\)

- **Telecare for LTC and elderly care management**: Evidence suggests that telecare could decrease mortality rates by 45%. LTCs have been shown to have positive effects on diabetes, COPD and heart strokes.\(^100\) The model assumes a 70% usage rate of these technologies, and calculates the related gross financial savings, through a reduction in bed days only, and impact on mortality, for those with LTCs, based on the findings of the surveyed literature.

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\(^98\) Deloitte analysis on Eurostat (2016)  
\(^99\) Association between low functional health literacy and mortality in older adults: longitudinal cohort study, Bostock (2012)
A.7 Lithuania

7.1 Background

Key social and economic challenges

Lithuania is one of the fastest growing economies in the European Union.\(^{101}\) Its public finances are supported by small budgetary surplus and a moderate, albeit rising, level of public debt over GDP, which stands at 42.7\%.\(^{102}\) Lithuania ICT sector benefits from a high share of ICT trained workers, relatively to EU average.

However, Lithuanian workers productivity still lags against EU average, despite fairly strong productivity growth over recent years.\(^{103}\) Moreover, Lithuania has suffered from net population outflows\(^ {104}\) due to the wage differential with other EU members as well as enduring high income inequality. Emigration of young Lithuanians has contributed to population ageing, the World Bank forecasting a 6.3\% increase of 65+ share of Lithuania’s population. This population ageing puts pressures on the financial sustainability of its health care system. ICT, thanks to its potential in terms of digital inclusion\(^ {105}\), productivity gain and health care savings (see 6.3), can be part of the solution to these challenges.

State of Lithuania’s ICT market

European data suggests that Lithuania’s ICT market is still catching up with the rest of the continent, with both internet and e-commerce usage being significantly below the EU average. The country’s ICT infrastructure provides 98\% and 90\% of the population with NGA and LTE coverage, respectively. The share of business using cloud computing (16\%), in particular, is significantly lower than in the average proportion in the EU.

ICT markets statistics

- Internet usage: 71\%
- Made an online purchase: 32\%
- % Business using cloud computing: 16\%
- NGA coverage: 98\%
- LTE coverage: 90\%

Note: for usage and categories definition, please refer to the section "State of Lithuania ICT market"

Source: Deloitte analysis, Eurostat, Telia Company

Key challenges summary

- Productivity: Lithuania value added per worker is 24\% below EU average.
- Employment: The unemployment rate (9.1\%), is above EU average, with youth unemployment standing at 18.5\% in Q4 2014.
- Digital entrepreneurship: Digital business climate appears to be significant challenge for Lithuania. Lithuania’s digital business climate was ranked 19\(^{\text{th}}\) out of 28 by the Digital Entrepreneurship Scoreboard 2015.
- Ageing: the 65+ share of the Lithuanian population is expected to increase by 6.3\% by 2030.
- Digital inclusion: The proportion of individuals with little formal education using regularly the internet was 17 points lower than that of the general population.
- Education: Lithuania has a shortage of basic digital skills, performing below the EU average. Lithuania also performs below the OECD average for basic mathematics, literacy and science skills.

Source: Eurostat, Digital entrepreneurship scoreboard 2015

101 Eurostat (2016)  
102 Ibid.  
103 Ibid.  
104 Ibid.  
105 See case study "Bremen.ru" section "Connecting the unconnected"
7.2 Economic impact of ICT

ICT’s economic impact in Lithuania in 2021

The total impact of enhanced ICT usage in Lithuania is estimated to be €5.8bn, approximately 12.1% of GDP. Given that the World Bank forecasts that the Lithuanian economy will grow by 24% between 2015 and 2021\(^{106}\), ICT therefore has the potential to be a significant driver of the country’s future economic growth. ICT may generate 61,000 net jobs, although other jobs may also be displaced in other sectors of the economy. This result is consistent with the literature, which suggests an overall positive impact of ICT on employment.\(^{107}\)

In Lithuania, the economic impact of cloud computing is estimated to be the largest across the three technologies studied. This result is related to the fact that Lithuania still has a significant margin for improvement in terms of cloud adoption\(^{108}\), and a relatively large amount spent on IT, which increases the potential savings. Cloud computing decreases IT related fixed costs of firm creation for entrepreneurs, converting them into operating costs, thus reducing a barrier to entry. It is estimated that cloud could contribute to the creation of as many as 2,700 SMEs in Lithuania in 2021. Cloud market size, based on the same adoption scenario, would reach €684 m of total revenue by 2021. IoT, which could generate an impact equivalent to 4.3% of GDP, could approach €497m in market size in Lithuania by 2021.\(^{109}\) While the impact of increased broadband penetration in Lithuania is lower than that from cloud and IoT, this impact is estimated to be one of the highest in the Nordic and Baltic countries due to the lower levels of internet penetration.\(^{110}\)

Methodology

The economic impact estimation exercise is based on a number of adoption scenarios over a five year period. The core adoption scenarios for each of the technological areas studied are presented below:

- **Internet/broadband**: Lithuania is assumed to reach a 99% internet usage rate across 16+ by 2021, up from 77% in 2016. Broadband penetration is assumed to increase in line with internet usage. The relationship between broadband penetration and GDP is estimated using the results of a Deloitte study for BT.\(^{111}\) While the impact of productivity is calculated based on a quantitative study on broadband.\(^{112}\)

- **Cloud computing**: Business usage of the cloud (i.e. paying features, excluding free e-mail services) is assumed to reach 75% in 2021, up from 16% in 2015.\(^{113}\) The impact calculations are based on a CEBR study\(^{114}\) on the impact of cloud usage in the five largest European economies.

- **IoT**: The impact of IoT was estimated using the ‘Disruptive technologies’ study by the McKinsey global institute.\(^{115}\) It uses its findings on the cost saving potential of the IoT to evaluate the corresponding productivity and employment impact on the economy. This research is based on IoT’s impact on four key industry sectors: manufacturing (industrial internet of things), agriculture (precision farming), mining (connected sensors) and retail (smart storage to optimise inventories). The potential estimation for IoT does not rely on a specific usage assumption, but assumes a widespread utilisation of the technology by 2021.

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\(^{106}\) World Bank (2014)


\(^{108}\) Eurostat (2016)

\(^{109}\) Deloitte analysis on Arthur D Little and TeliaSonera


\(^{111}\) ‘BT : enabling the UK economy’, Deloitte (2014)

\(^{112}\) ‘Economic impact of broadband: an empirical study’, LECG (2009)

\(^{113}\) Eurostat (2016)

\(^{114}\) ‘The Cloud Dividend’, CEBR (2012)

\(^{115}\) Disruptive technologies: advances that will transform life, business and the global economy, McKinsey Global Institute (2013)
7.3 E-health impacts

E-health potential in Lithuania

Figure 59: E-health potential in Lithuania

The results suggest that these technologies have the potential to generate up to €189m of financial savings for the health system, and may potentially help save 1,900 lives in 2021. The financial savings may be higher than this due to potential decreases in appointments at hospitals and reduced need to build more capacity. Based on a 70% usage assumption, the telecare industry in Lithuania could generate over €189m of revenue by 2021. Given Lithuania’s expected population ageing, these technologies could contribute to the sustainability of the country’s current public health system.

Methodology

The health impact estimation is based on two adoption scenarios, presented below:

- **E-health literacy:** The research assumes that 50% of Lithuanians above 65 years old will use the internet for health related reasons once a month or more by 2021, up from approximately 6% in 2015. Evidence suggests that high health literate elderly people have a 26% lower death rate than those that have low health literacy.

- **Telecare for LTC and elderly care management:** Evidence suggests that telecare could decrease mortality rates by 45%. LTCs have been shown to have positive effects on diabetes, COPD and heart strokes. The model assumes a 70% usage rate of these technologies, and calculates the related gross financial savings, through a reduction in bed days only, and impact on mortality, for those with LTCs, based on the findings of the surveyed literature.

Source: Deloitte analysis

116 Deloitte analysis on Eurostat (2016)
117 Association between low functional health literacy and mortality in older adults: longitudinal cohort study, Bostock (2012)
A.1 Estimating the economic impact of increased ICT usage

The economic impact of increased ICT usage has been estimated by considering a set of scenarios that assume a certain level of technology is reached in 2021 in each of the countries included in the study. These technology usage levels are based on assumptions selected for illustrative purposes, and are not intended as a forecast.

This section first describes the adoption assumptions used for each of the ICT usage scenarios studied: i.e. broadband penetration, cloud computing and IoT. It then describes the methodology used to estimate the incremental impact of each scenario of ICT usage on different economic indicators.

The economic and usage assumptions for the economies of the Nordics and Baltics

The ‘counterfactual’ scenario for the Nordics and Baltics

In order to estimate the additional/incremental impacts that the enhanced ICT usage scenarios may deliver, it is first necessary to establish a view of what would happen in the market according to current economic forecast (i.e. a ‘counterfactual scenario’).

GDP data up to 2014 for the studied countries are obtained from the World Bank. All values are converted to euros based on the average yearly exchange rate and rebased to 2015 values. Values beyond 2015 are projections from the World Bank.

Population forecasts up to 2021 for the studied countries are obtained from the World Bank’s Health Nutrition and Population Statistics. Population forecasts are used to construct the GDP per capita trend in the counterfactual scenario.

Employment data up to 2014 are obtained from Eurostat. Employment for 2015 and beyond is forecast based on historical trend. Employment and GDP forecasts are used to calculate the productivity (i.e. GDP per worker) in the counterfactual scenario.

Data on the number of enterprises by size (SMEs, Large corporations) is obtained from Eurostat. The historical growth rate of enterprises is applied to obtain an estimate of the number of businesses up to 2021.

ICT usage assumptions for the Nordics and Baltics

The economic impact estimation exercise is based on certain ICT usage and adoption “what if” scenarios. The adoption scenarios, for each of the ICT areas studied are presented below:

- Internet/broadband: all countries are assumed to reach a 99% internet usage rate across people of age 16+. Broadband penetration is assumed to increase in line with internet usage.
- Cloud computing: Business usage of the cloud (i.e. paying features, excluding free e-mail services) is assumed to reach 75% by the end of the period.
- IoT: This assumes that there are sufficient devices being used in the country to generate the economic impacts reported by McKinsey (see below).

Impact of increased ICT usage on GDP

Increased ICT usage is estimated to impact economic activity through the following levers: increased internet and device penetration, and enhanced data usage brought about via new technologies such as cloud computing and IoT. The cumulative impact of increased ICT usage on Nordic and Baltics economies has been estimated by adding the impact from these three levers discussed below.

Increased fixed broadband penetration:

The relationship between increased fixed broadband penetration and GDP growth is well established in the literature, with many academic papers attempting to quantify it. This report uses the results of an econometric estimation that Deloitte conducted for BT on the impact of fixed and mobile penetration on GDP in the EU27 and
OECD countries over a ten year period up to 2012. This result is used because the study controls for mobile penetration in the regression for fixed penetration, which leads to a more robust estimate.

The econometric relationship is estimated using panel data from 38 countries. To account for potential reverse causality and country fixed effects, a difference Generalised Method of Moments technique is employed. This provides consistent estimates by instrumenting the endogenous variables with all their available lags in differences. The Hansen test of over-identifying restrictions confirms that the instruments are valid. The regression estimates that every 10% increase in fixed line penetration increases annual real GDP by 0.88%.

This result is applied to the fixed broadband penetration rates in the Nordics and Baltics to get impact on GDP up to 2021 due to fixed broadband penetration.

**Increased cloud computing usage:**

The results of a CEBR report on the economic impact of cloud computing in Europe are used: this study estimates the GDP and productivity gains that can be made by more and more businesses employing cloud computing. The study finds that, across Europe’s five largest economies (France, Germany, Italy, Spain, UK), widespread adoption of cloud computing has the potential to generate €763bn of cumulative economic benefits over the period 2010 to 2015. This is 1.57% of the approximate total cumulative GDP of the five economies over the same period.

The elasticities implied by the study are similar for all countries considered in the CEBR report. Given the similar levels of development between the German and the Scandinavian economies, the German values have been applied to the countries of this study. This implies that real annual GDP increases by 0.09% for every 1% increase in cloud computing penetration. This elasticity is applied to the cloud computing penetration rates to get the impact on GDP up to 2021 due to cloud computing.

**Increased IoT penetration:**

The results of a report by the McKinsey Global Institute on the impact of disruptive technologies are used to estimate the impact of increased IoT use across different sectors of the Baltics and Nordics’ economies. The following impacts are used: widespread use of IoT is estimated to reduce operating costs in the manufacturing sector by 3.75%, improve sales in the retail sector by 1.7%, increase yields in agriculture by 15%, cut operating costs in resource extraction industries by 7.5% and reduce energy consumption by 3%.

In this study’s estimation, these benefits are assumed to be fully realised by 2021; the IoT estimation aims at providing an illustration of the potential of these technologies for the studied economies. The GDP and employment impact of these cost savings is estimated using the results of recent macroeconomic literature on the economic impact of total factor productivity.

**Overall impacts:**

The incremental impact on GDP up to 2021 from increased fixed and mobile penetration, and increased cloud computing and IoT use is added to give the cumulative impact on GDP for each country.

**Impact of increased ICT usage on productivity**

The literature on economic impacts of ICT identifies productivity impacts attributable to broadband penetration and cloud computing. Labour productivity improvements due to these two technologies, as well as IoT, are estimated.

**Impact of increased broadband penetration (fixed and mobile) on productivity:**

This study uses the results of an economic impact assessment of broadband among 15 OECD countries, 14 European countries and the United States. The impact of broadband penetration (fixed and mobile) on productivity is estimated in a regression framework that controls for voice penetration. The impact is estimated separately for countries with high ICT penetration generally (including UK, Netherlands, USA and others) and low ICT penetration (e.g. Belgium, Greece). Every 10% increase in broadband penetration is found to increase productivity by 1% in medium and high ICT countries.

This elasticity is applied to broadband penetration rates in the Nordics and Baltics to obtain the cumulative impact on productivity up to 2021 of enhanced broadband penetration.

119 ‘BT: Enabling the UK economy’, Deloitte (2014)
122 ‘On the employment effects of productivity shocks: the role of inventories, demand elasticity and sticky prices’ Chang (2009)
Impact of cloud computing on productivity:
The study on the economic impact of cloud computing described above finds that average employee efficiency increases by approximately 0.032% for every 1% increase in cloud computing penetration. This result is applied to the usage assumption to estimate the cumulative productivity improvement due to cloud computing in the Baltics and the Nordics up to 2021.

Impact of IoT on productivity:
The McKinsey study on cost savings offers estimate of how much cost could decrease for a given level of output in some key industry sector. These efficiency improvements can be directly translated into total factor productivity increases for each of the studied economy.

A.2 Estimating the impact of increased ICT usage on the health sector

Impact of increased ICT usage on health literacy and lives saved
The impact of increased ICT usage on health literacy and mortality in the countries of interest is estimated using the results of a study published in The British Medical Journal.

Research undertaken in the UK\textsuperscript{124} indicates that health literacy can affect individuals’ mortality risk. This research identifies a sample of people aged above 52 and over with three different levels of health literacy: low, medium and high. People with low health literacy are found to have 26% higher risk of mortality after controlling for all other factors, compared to those with high health literacy over a five year period. These results are applied to the Baltics and Nordics as follows:

- The study uses Eurostat data to estimate the distribution of adults with high, medium and low literacy for every country of interest. The study here focuses on 60+ adults, so as to be consistent with this report’s definition of elderly individuals.
- The study assumes that half of 65+ will have high health literacy by 2021 in all countries of the region.
- Population and mortality rate forecasts published by Eurostat are used to estimate the number of deaths among the 60+ in the countries of interest in the counterfactual.
- Reduced mortality rates (as indicated by the study described above) are applied to adults with high health literacy. The difference in number of death from 2015 to 2021 between the projection and the counterfactual is the impact of e-health literacy increase.

Impact of increased ICT on mortality and hospitalisation of those with chronic diseases
The impact of increased use of telehealth on mortality rates among those with chronic disease is estimated. Various studies document the positive impact of telemedicine on the health outcomes of those with chronic disease. A randomised study on 238 primary care practice and 6191 patients is applied here. A systematic review of these trials finds that the scheme reduced the mortality rates by 45% for the enrolled individuals.

These results are applied to estimate the impact on mortality and hospital admissions among those with long term conditions in the countries of interest, assuming a 70% take up rate.

- Data on the number of people with diabetes, COPD and chronic heart failure is collected from the public data source ‘ICT for health’. The database also offers projections on mortality from these conditions up to 2030. The number of deaths is decreased in line with the literature and assumed usage rate.
- Historical data on the number of bed days among those with chronic disease in the countries of interest is extrapolated from WHO data on the number of beds and occupancy rates for each country.
- A reduced rate of hospitalisation is applied to people receiving telemedicine services, in line with the relevant literature.

Impact of increased ICT usage on cost savings in the health sector
The impacts of telehealth devices on hospital admissions for the elderly and those with long term conditions were estimated through a random trial study. This study found telecare for the elderly could reduce the number of bed days (the number of days patients occupy a bed) for the elderly by 35%, for those with diabetes by 20%, strokes by 26% and COPD by 21%. These reductions in the number of bed days, assuming 70% take up of telehealth devices, are applied to the cost per bed day estimated by the WHO using econometric methods.

\textsuperscript{124}‘Association between low functional health literacy and mortality in older adults: longitudinal cohort study’, Bostock (2012)
1 https://sustainabledevelopment.un.org/sdgs
2 http://bruegel.org/2013/06/where-does-the-youth-exodus-come-from/
3 Labour productivity is here defined as GDP per employee. See Eurostat.
5 Eurostat
6 http://ec.europa.eu/europe2020/pdf/themes/03_publicFinanceSustainability.pdf
7 Eurostat (2015). High cloud computing services defined as accounting software applications, customer
8 relationship management software, and computing power.
9 Eurostat
10 Eurostat
12 TeliaSonera press release, March 3 2015
13 World Bank (2016)
14 European Commission, Environmental Improvement of Passenger Cars (2008)
16 Eurostat and EU digital scorecard. Unless otherwise stated the sources in this section are from Eurostat or the
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18 Eurostat
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26 http://www.reuters.com/article/us-europe-migrants-sweden-forecast-idUSKCN0XO12V
27 Englund et al. “Children’s Achievement in Early Elementary School: Longitudinal effects of Parental Involvement,
30 Education Endowment Foundation: The Impact of Digital Technology on Learning
32 NHS England (2011)
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37 (2012)
38 Eurostat, EU e-health literacy (2015)
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41 John McClelland, Review of ICT Infrastructure in the Public Sector in Scotland (2011)
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