

Rural perspectives on digital innovation:

Experiences from small enterprises
in the Nordic countries and Latvia

Linda Randall, Louise Ormstrup Vestergård & Mari Wøien Meijer

NORDREGIO REPORT 2020:4



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1. Introduction and background

In April of 2017, the Ministers responsible for digital development in Norway, Sweden, Denmark, Finland, Iceland, Faroe Islands, Greenland, Åland, Estonia, Latvia, and Lithuania met in Oslo and set an ambitious agenda for digitalisation across the Nordic-Baltic Region. Their vision is to make the Nordic-Baltic Region a digital frontrunner by pursuing the following policy goals (The Norwegian Ministry of Local Government and Modernisation & Nordic Council of Ministers, 2017):

- 1. Strengthening the ability for digital transformation of our governments and societies, especially by creating a common area for cross-border digital services in the public sector.
- 2. Strengthening the competitiveness of our enterprises through digitalisation.
- 3. Enhancing the digital single market in the Nordic-Baltic Region.

In fact, the Nordic countries are already at the forefront of digitalisation in Europe (see Figure 1). The Baltic States show a more mixed performance, but still score around or above average on the European Commission's annual measure of digital progress, the Digital Economy and Society Index (DESI).

Despite this positive development overall, disparities remain with respect to digital development within countries; with rural and sparsely populated areas often lagging behind on the

availability of digital infrastructure and the adoption of digital technologies. As such, this project sought to provide a rural perspective on the second goal: *Strengthening the competitiveness of our enterprises through digitalisation*. Specifically, it aimed to demonstrate how smart, sustainable and inclusive approaches to digitalisation can be used as a tool to increase the competitiveness and attractiveness of rural areas by exploring the challenges and opportunities for small enterprises in rural and sparsely populated areas. The project was funded by the Nordic Council of Ministers for Digitalisation (MR-Digital), the Nordic Thematic Group for Innovative and Resilient Regions 2017-2020 and the North Atlantic Cooperation (NORA) and included a baseline study, local workshops and a webinar series. Its primary focus was the Nordic countries and Latvia; however, data is also provided for Estonia and Lithuania where possible.

The **baseline study** explored the nature of digital transformation in rural areas and reflected on opportunities and challenges for small and medium sized enterprises (SMEs) in rural areas in each of the Nordic countries and in Latvia. The study was developed through desk-based research conducted by Nordregio and a report prepared by Vidzeme Planning Region which detailed the Latvian context. It provided an overall context for the digitalisation of SMEs in rural areas including sector-specific information on the bioeconomy,

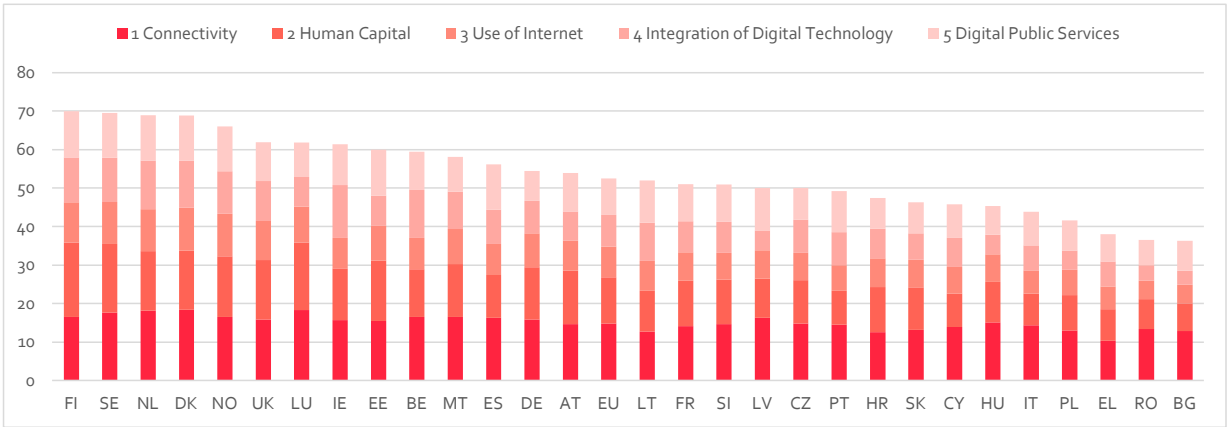


Figure 1: Digital Economy and Society Index, 2019. Data source: European Commission, 2019f.

manufacturing and tourism sectors. It also provided an overview of the policy context in each of the Nordic countries and independent territories and in Latvia. The baseline study was designed to inform the local workshops and was circulated to all participants in advance.

Local workshops were held in rural locations throughout the Nordic-Baltic Region, including the five Nordic countries, Latvia and the Faroe Islands.¹ The workshops were developed and promoted in partnership with local stakeholders and aimed to provide an opportunity for local capacity building and networking as well as a source of data. Each workshop was organised in partnership with a local stakeholder and contained several presentations deemed to be of relevance to the audience. This was followed by a discussion guided by a series of questions:

- How do you currently use digital solutions in your company?
- What opportunities do digital solutions present in your company / sector?
- What are the main challenges for implementing digital solutions and tools in your company (e.g. skills, knowledge, access to finance, poor connectivity, regulations, lack of time)?
- What kind of support do you need for increasing digitisation within your company / industry?

The tailored approach in each location resulted in a unique constellation of stakeholders attending each event. As such, we are cautious in our interpretation of the data and have avoided making cross-country comparisons or drawing strong overall conclusions about digitalisation practice in each region. Instead the workshop data provides a rich series of practical examples and personal experiences from Nordic-Baltic rural areas that illustrate (and at times challenge) the findings of the desk-based research. This provides a strong basis for future research and is an important first step in highlighting the need to include rural areas in the conversation about digital innovation. The locations, themes and participant numbers from the workshops are shown in Table 1.

The **webinar series** brought together participants from the local workshops to present their perspective to practitioners and policy makers. Episodes were presented weekly during March 2020 and were based on the following topics:

- Webinar 1: The digital divide
- Webinar 2: Digitalisation in the manufacturing industry
- Webinar 3: The digital revolution in the bio-economy
- Webinar 4: Digitalisation and sustainable tourism

This Nordregio Report presents the results of these activities. It builds on the original baseline study by including practical examples and insights from the local workshops and webinar series to provide a genuine rural perspective on digital innovation. The report is presented in four sections. The first section provides an introduction to digitalisation in the Nordic-Baltic rural context. It is structured around the two aspects of the urban-rural digital divide: digital infrastructure and digital knowledge and skills. The section includes a series of maps illustrating the current situation with respect to broadband connectivity. It also presents a broad introduction into the challenges and opportunities that rural enterprises face in the context of digitalisation. The second section discusses the effect of digitalisation on small rural enterprises, shining a spotlight on three sectors deemed to be particularly relevant in the rural context: bioeconomy, sustainable tourism and manufacturing. The third section addresses the support structures that are expected to facilitate the digital transition for rural enterprises. It presents the ideas for support raised by workshop participants before describing the support structures available in each country and independent territory. The fourth and final section provides the overall conclusions from the project, along with advice for policy makers about how to best support rural and sparsely populated areas to make the most of the opportunities digitalisation offers.

¹ The workshop in the Faroe Islands was made possible through additional funding from NORA (Nordic Atlantic Cooperation). This funding was also intended to allow for a workshop in Greenland but unfortunately this workshop was cancelled due to the outbreak of Covid-19. As such it was not possible to include results from Greenland in this Report. Nordregio hopes that this workshop may still be conducted at some point in the future.

Workshop location and theme ²	Regional characteristics ³	Number of participants
Ii Municipality, Finland "Digital transformation in rural enterprises"	Northern Ostrobothnia - predominantly rural	6
Trøndelag County, Norway "Digitalisation of rural SMEs"	Nord Trøndelag - predominantly rural; Sør-Trøndelag - intermediate region	5
Ísafjörður, Iceland "Digitalisation: From threat to opportunity"	Westfjords - predominantly rural, remote	13
Vesthimmerland Municipality, Denmark "Digitalisation of rural SMEs"	Region Nordjylland - predominantly rural	10
Vingåker Municipality, Sweden "Meet the challenge of rural farming with simple digital tools"	Södermanland - intermediate region	10
Tórshavn, The Faroe Islands "Digitalisation: what are the great opportunities for Faroese businesses?"	The Faroe Islands - predominantly rural, remote	11
Līgatne, Latvia "Improving bioeconomy value chains through digitalisation"	Vidzeme Region, predominantly rural, remote	18

Table 1: Nordic-Baltic workshop locations, themes and attendance.

² The workshop titles listed here are translations. All workshops were promoted in the local language. With the exception of Iceland and Latvia, the quotes provided throughout the report are also translations as the workshops were held in the local languages. In Latvia the workshop event was held using a combination of Latvian and English, with simultaneous translation provided for both languages.

³ Based on the Eurostat urban-rural typology.

⁴ Due to limited registrations, study visits to three local companies were conducted in place of the workshop. The same questions were addressed in the study visit in the form of an informal interview.

2. Digitalisation in the Nordic-Baltic rural context

Digitalisation holds considerable potential for rural areas. It allows us to overcome the challenges associated with geographical distance, ensuring equal opportunities regardless of where people live (Gillespie et al., 1994). This includes new modes of service provision through the emergence of eHealth, distance learning and eGovernment solutions. It also relates to new ways of organising work, for example, new business models that allow a single entrepreneur to start a business with limited capital, opportunities for self-employment through the platform economy (e.g. renting out rooms through Airbnb), and remote working arrangements (OECD, 2017; Vironen & Kah, 2019). Together, these developments are expected to play a role in addressing many of the challenges rural areas face, including population ageing, out-migration of young people, skills shortages, accessibility challenges, and lack of labour-market diversity (Interreg Europe, 2019a; Roberts et al., 2017; Vironen & Kah, 2019).

Nordic rural communities are well placed to realise these potentials, as the region is generally considered to be at the forefront of digitalisation in a European and even global context (Alm et al, 2016; Chakravorti & Chaturvedi, 2017; European Commission, 2019c; 2019d). The Baltic States show a more mixed performance, with Estonia generally considered a frontrunner – particularly in the context of eGovernance (European Commission, 2019c; 2019d) – and Lithuania and Latvia performing around the European average (European Commission, 2019b). Despite this positive picture overall, digital development within

countries is unequal; with rural and sparsely populated areas often lagging behind with respect to the availability of digital infrastructure and the adoption of digital technologies. These urban/rural disparities are often referred to as the digital divide and are caused by shortcomings with respect to supply (e.g. infrastructure) and demand (e.g. lack of knowledge or skills to unlock the opportunities associated with digitalisation) (Labrianidis & Kalogeressis, 2006). This section will address both sides of the digital divide, beginning with digital infrastructure before moving on to discuss digital knowledge and skills.

2.1 The digital divide: Infrastructure

Access to modern digital infrastructure and the services it facilitates is crucial for rural communities. This infrastructure is the foundation for competitiveness, attractiveness, innovation, and economic growth (Interreg Europe, 2019a). At the national level, the Nordic-Baltic countries mostly perform well on measures of digital connectivity. Taking, for example, Next Generation Access (NGA) coverage, which is generally considered fast broadband (see Box 1), almost all countries had coverage that is better or equivalent to the EU average in 2019 (83%). Iceland (97%), Denmark (95%) and Latvia (93%) have the highest percentage of overall household access followed by Sweden (86%), Norway (84%) and Estonia (84%). Finland (75%) and Lithuania (63%) are the only Nordic-Baltic countries in which NGA coverage levels are below the EU average (European Commission, 2019f).

Box 1. Understanding digital infrastructure – how fast is fast?

The European Commission defines three categories of download speed (European Court of Auditors, 2018):

- Basic broadband - speeds between 144 Kbit/s and 30 Mbps;
- Fast broadband - speeds between 30 Mbps and 100 Mbps;
- Ultra-fast broadband - speeds above 100 Mbps

The upper limit of the connection speed is generally determined by the type of infrastructure used (see Figure 2). Fixed-line infrastructure delivers the highest speeds (up to 2.5 Gbps/1.2 Gbps (down/up) in the best case (fibre to the premises)) and wireless links deliver the lowest speeds (up to 60 Mbps/10 Mbps (down/up) for terrestrial wireless and 20 Mbps/8 Mbps (down/up) for satellite technology) (European Court of Auditors, 2018, p. 11). Within the European Union, Next Generation Access (NGA) is a commonly used indicator of progress and is defined as including the following technologies: FTTH (Fibre to the Home), FTTB (Fibre to the Building), Cable

DOCSIS 3.0, VDSL (Very high-speed Digital Subscriber Line) and other types of fast broadband (at least 30 Mbps download) (European Commission, 2015). The aim was that all Europeans should have access to 30 Mbps by 2020, however it is unlikely that this target will be reached (European Court of Auditors, 2018). In the Nordic countries, governments are increasingly striving for 100 Mbps coverage for all households and businesses (see Box 2).

But what does all this mean from a practical perspective? Think of an internet connection as being like a pipe. Just as the diameter of the pipe determines how much liquid can pass through at any given moment, the speed of the internet infrastructure determines how much data can pass through in any given second. More complex activities require more data and thus a faster connection. For example, activities like general browsing of the internet or checking emails only require about 1 Mbps, while a high-definition video conference call requires at least 6 Mbps (Federal Communications Commission, 2020). If multiple people are using the same connection at the same time, the capacity of the infrastructure is divided across the users (Woodall, 2018).

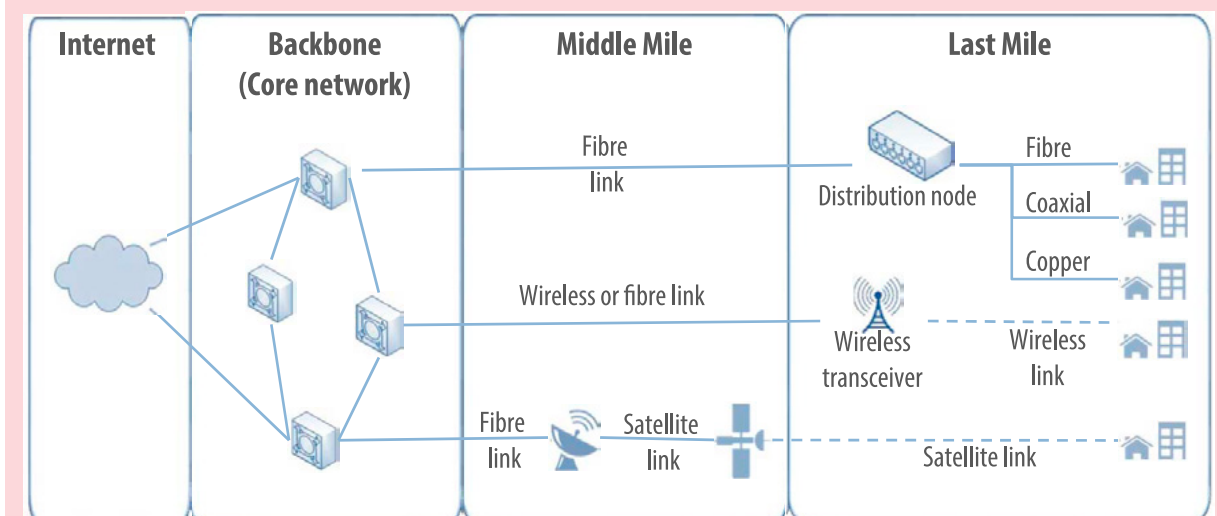


Figure 2: Broadband network segments.
Source: European Court of Auditors, 2018.



Photo: Andreas Dress / unsplash.com

A regional perspective on broadband coverage

The infrastructure accessibility figures cited above go some way to explaining the Nordic countries' reputation as digital frontrunners. It is important to note however that these figures are based on coverage for the population as a whole and, as such, hide the urban-rural divide. Once urban-rural differences are taken into account, we see that the Nordic countries actually perform fairly poorly in a European context. Using the same measure of NGA coverage (as a % of households) in 2018, for example, Finland and Sweden were the European countries where the gap in access between rural and urban households was the largest (see Figure 3). Lithuania and Norway also performed below the European average on this indicator. Iceland and Latvia stand out as regional frontrunners in this regard, both with high levels of coverage overall and relatively small gaps between urban and rural households.

The maps that follow show the same two indicators from a regional perspective. Map 1 shows NGA household coverage for all households at the NUTS 3 level for the Nordic-Baltic Region. Map 2 shows the same indicator but includes only rural households. Here, rural households are defined as 'households in square kilometres with a population of less than one hundred' (Point Topic, 2013, p. 17). This means that the map showing rural household coverage only includes households in areas with a density of less than one hundred houses per square kilometre. In some regions this is a very small proportion of households (e.g. Byen København, Denmark = 0.1%), while in others it includes a substantial proportion of households (e.g. Utenos apskritis, Lithuania = 62.4%). This is quite different to the approach that is often taken to urban rural comparisons, which involves classifying a whole region or municipality as "urban", "rural" or "intermediate" (see for example Grunfelder et al., 2020).

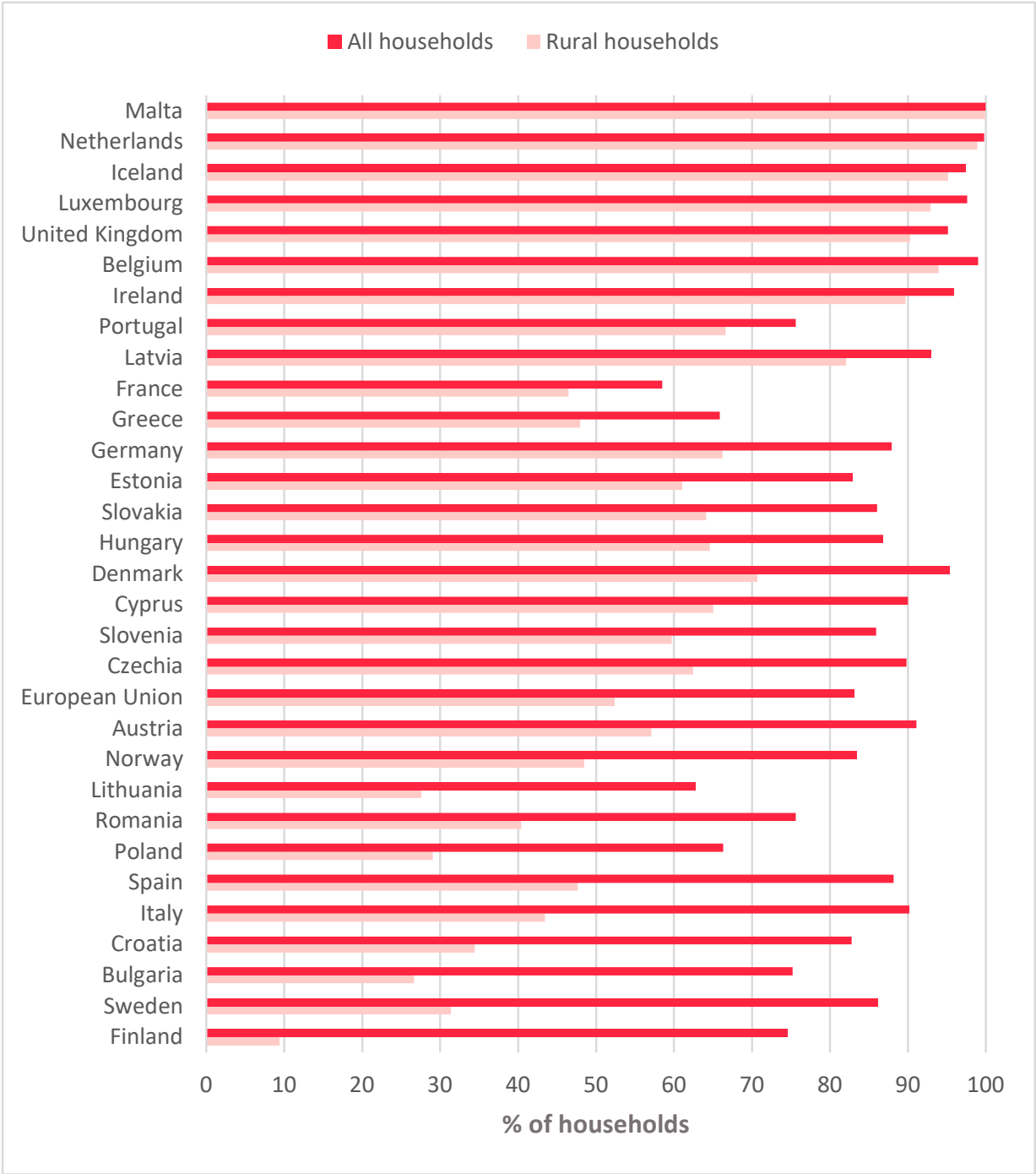
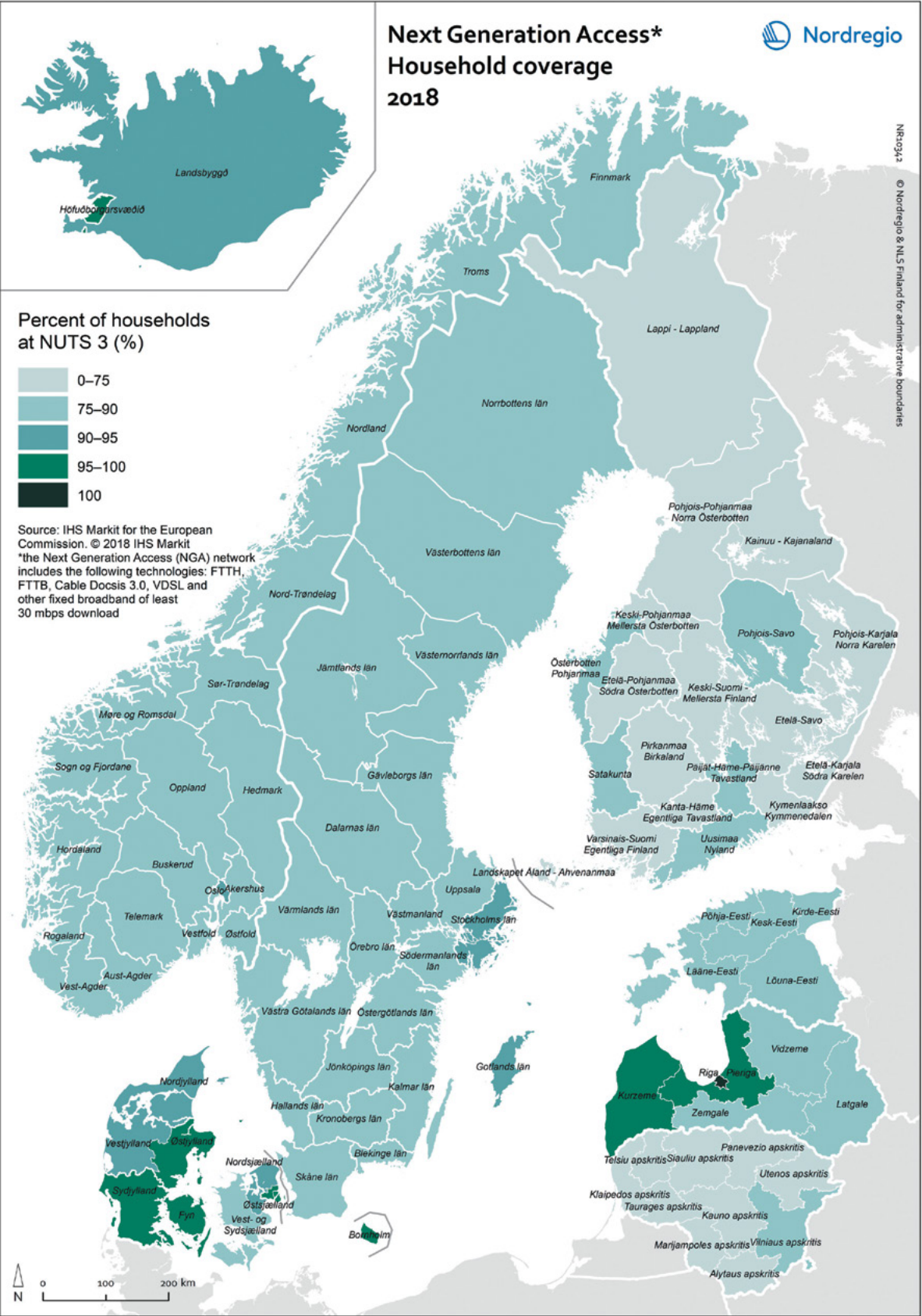
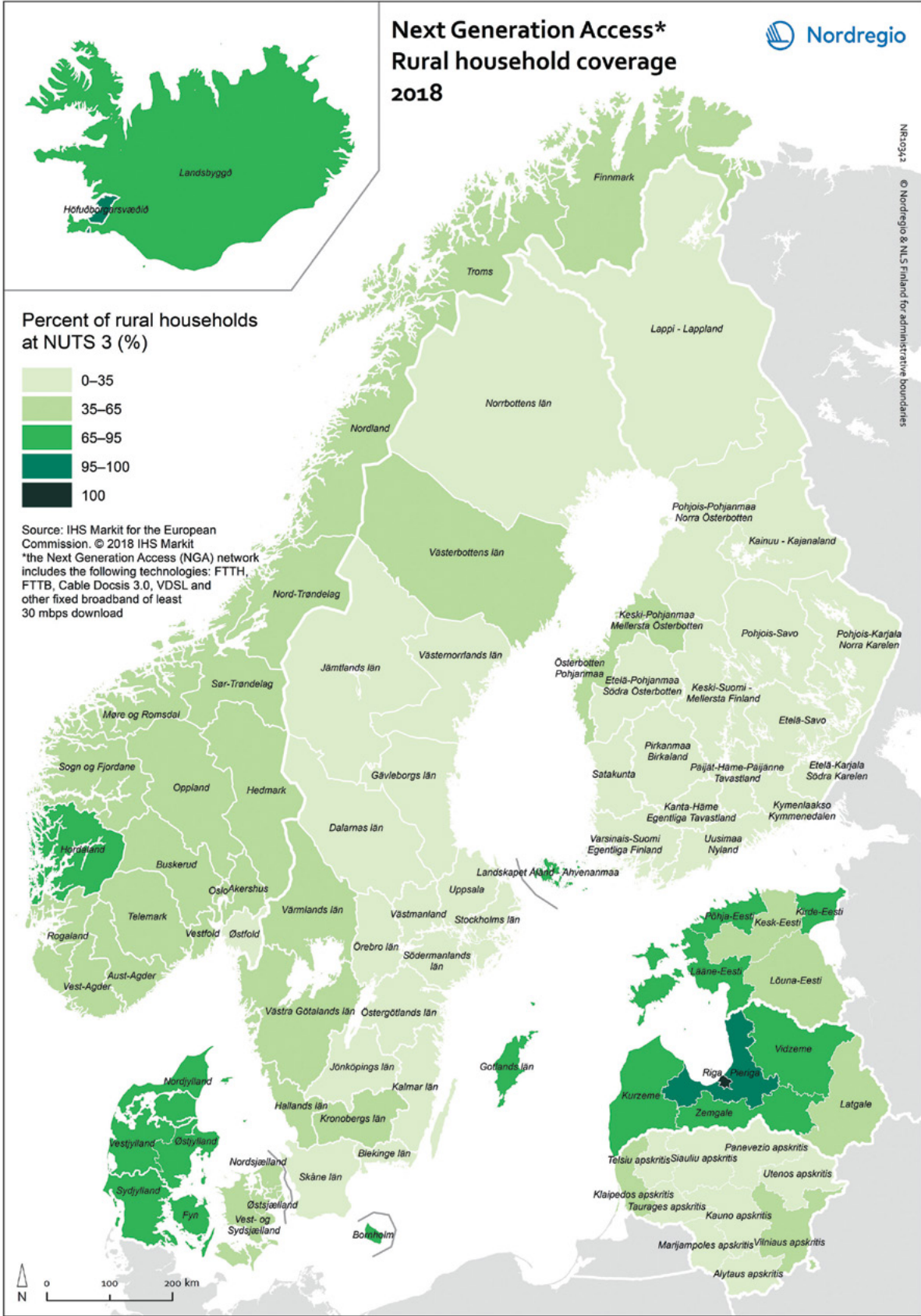


Figure 3: Next Generation Access broadband coverage in 2018 (as a % of households).
Data source: European Commission.



Map 1: Next Generation Access Household coverage, 2018.



Map 2: Next Generation Access Rural household coverage, 2018.

Considered together, Map 1 and Map 2 provide a clear demonstration of the digital divide from the infrastructure perspective. Map 1 shows NGA coverage for all households and presents a regional picture largely consistent with the national averages. Over 75% of households have access to NGA coverage in most regions for most countries, with the exception of Finland and Lithuania where overall household coverage is below 75% in several regions. Map 2 shows the same indicator but only includes rural households and reveals a picture that is in stark contrast to the national averages. In most of Finland and Lithuania, as well as many regions in Sweden, less than 35% of rural households have access to NGA coverage. Norway performs somewhat better, with NGA access for 35-65% of rural households in most regions. Perhaps unsurprisingly, the countries with the highest level of connectivity overall – Iceland, Latvia and Denmark – are also the countries with the smallest urban-rural divides.

A municipal perspective on broadband coverage

The urban-rural disparities described above can largely be explained by the market driven nature of broadband development. Long distances and low population density mean that, in many rural and sparsely populated areas, the demand is insufficient to recoup the cost of the infrastructure investment and thus broadband providers struggle to make a business case for rural expansion (Houzet, 2007; OECD, 2017). The 'last mile' of coverage is generally the most challenging (see Box 1), but it often affects those remote areas for whom digital access could be most transformative.

The implications of this are best revealed by zooming in to the municipal level. Map 3 shows the significant variation in the percentage of households with access to a broadband connection of at least 100 Mbps. This speed has been chosen as it is the national target in all Nordic countries (see Box 2). Unfortunately, municipal level data is not available for the Baltic States, so the map only shows the Nordic countries.

As Map 3 demonstrates, a substantial proportion of households (>75%) have access to 100 Mbps in most Danish municipalities. Sweden also has relatively good fixed broadband coverage across most of the country, though there are

Box 2. National broadband targets in the Nordic-Baltic countries

Denmark: 100 Mbps download and 30 Mbps upload accessible to all households and businesses by 2020 (Agency for Digitisation, 2016).

Finland: 100 Mbps providing 100 % coverage by 2025 (The Ministry for Transport and Communications of Finland, 2018).

Iceland: 99,9 % coverage of 100 Mbps for households and businesses by 2023 (Icelandic Parliament, 2019).

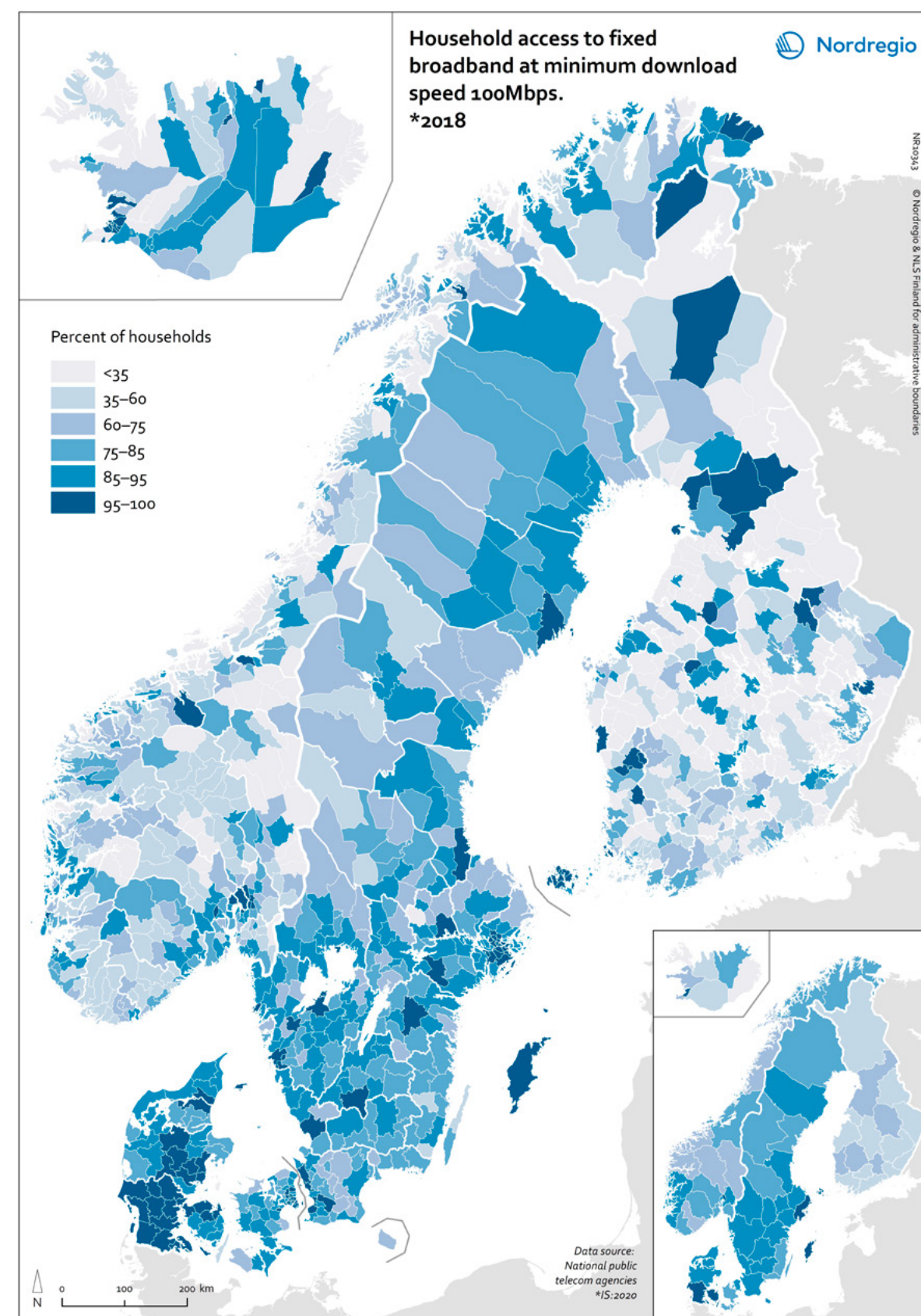
Norway: 90 % accessibility by 2020, with access to at least 100 Mbps (The Norwegian Ministry of Local Government and Modernisation, 2016)

Sweden: 100 Mbps covering 95 % of households and businesses by 2020 and a completely connected Sweden by 2025 (The Swedish Ministry of Enterprise and Innovation, 2017).

Latvia & Lithuania: 50 % coverage of 100 Mbps by 2020 and 100 % coverage of at least 30 Mbps by 2020 (European Commission, 2019b).

Estonia: 60% coverage of 100 Mbps & 100% coverage of 30 Mbps by 2020 (The Estonian Ministry of Economic Affairs and Communications).

several municipalities where coverage drops below 60% of households (Skinnskatteberg, Berg, Strömsund, Torsås, Vansbro, Borgholm, Älvdalen, Högsby & Nordanstig). The poorest coverage can be found in Finland and parts of Norway. It should be noted that in some Norwegian regions, satellite technology is used, as opposed to fixed broadband. As noted in Box 1, satellite technology is not currently capable of reaching this speed so including this technology in the map would not affect the results. In Iceland, the poorest coverage can be found in the eastern part of the country and in the Westfjords. Outside of these areas the coverage is relatively good, with at least 60% of households having access to minimum download speeds of 100 Mbps in many municipalities. It should be noted that, due to the limited availability of municipal level data, figures for Iceland are from 2020.



Map 3: Household access to fixed broadband at download speeds >100 Mbps, 2018.

Åland has the highest percentage of high-speed broadband availability among households in Finland, with 97% of all households having access to fixed broadband with a minimum speed of 100 Mbps. More remote municipalities fare worse, with only 9% of the households in Föglö having access to 100 Mbps and only 1% at Kökar. In the Faroe Islands the majority of the population (92%) have access to the internet from home and, even in the outlying islands, the connection is generally good (Ministry of Foreign Affairs, Trade, and Industry and Ministry of Finance, 2018). In Greenland, 83% of the population have access to the internet from home (Epinion, 2018).⁵

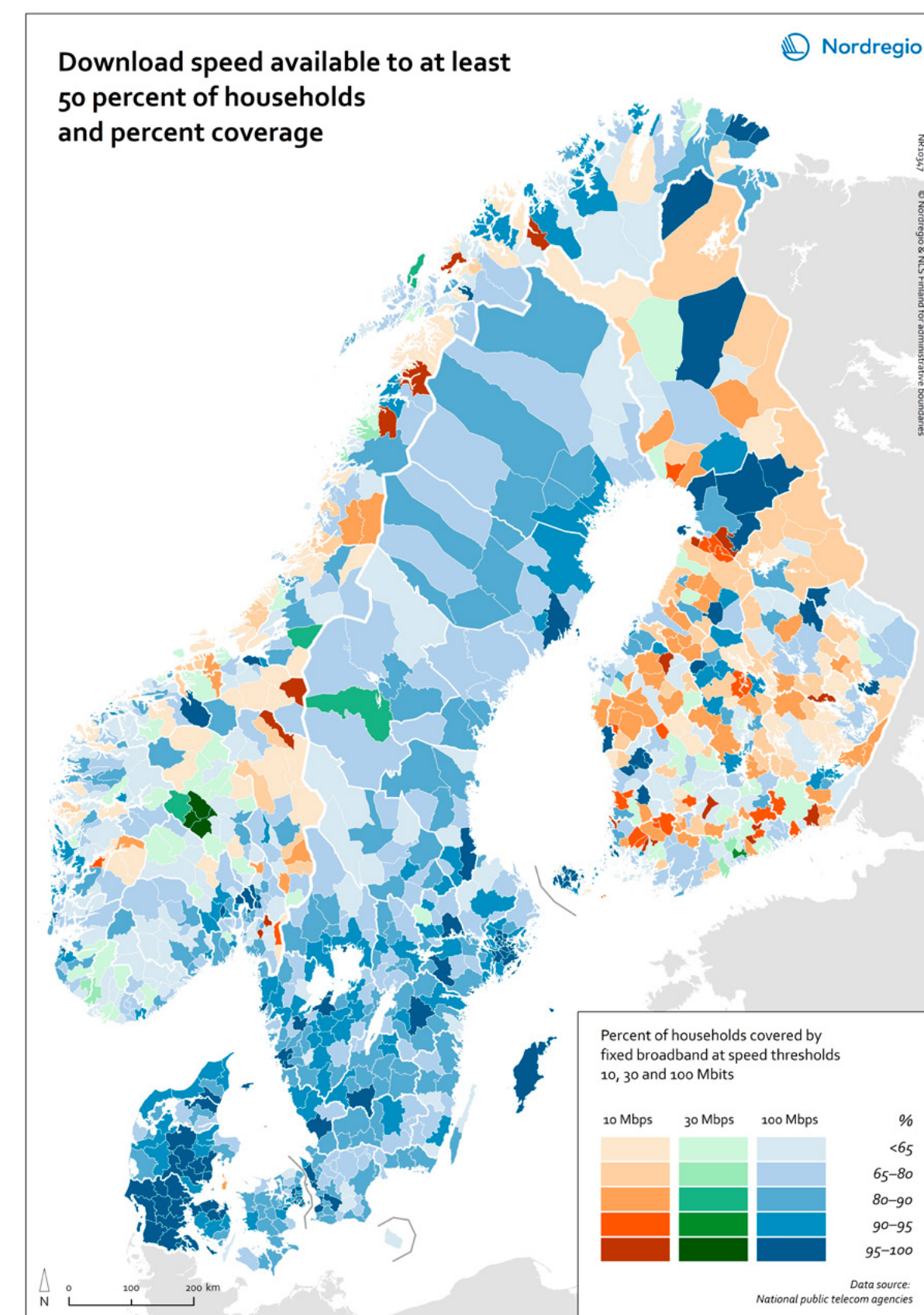
It is important to acknowledge that fixed line broadband of at least 100 Mbps is an ambitious measure and that larger proportions of the population in each municipality have access to some form of internet. To explore this, Map 4 integrates speeds of 30 Mbps (for municipalities where less than 50% of the population has access to speeds of 100 Mbps) and 10 Mbps (for municipalities where less than 50% of the population has access to speeds of 30 Mbps).

Map 4 shows different speeds for municipalities based on the coverage accessible to the majority of households (>50%). In municipalities where over 50% of households have access to fixed broadband with minimum speeds of 100 Mbps (blue shading), Map 4 presents much the same picture as Map 3. In municipalities where less than 50% of households have access to fixed broadband with minimum speeds of 100 Mbps, Map 4 instead shows the percentage of households who have access to fixed broadband with minimum speeds of 30 Mbps (green shading). Finally, for municipalities where less than 50% of households have access to fixed

broadband with minimum speeds of 30 Mbps, Map 4 shows the percentage of households who have access to fixed broadband with minimum speeds of 10 Mbps (orange shading).

The most striking finding in Map 4 is the small but significant portion of households in the Nordic Region who do not have access to fixed broadband coverage with a minimum speed of even 10 Mbps. This suggests that there is substantial work to be done if the Nordic countries are to reach the broadband provision targets set out in Box 2. With the exception of Samsø (Denmark, 82%), these municipalities are all in Finland and Norway. In Norway, the most problematic regions appear to be Trøndelag (an intermediate region), and the predominantly rural regions of Hedmark and Oppland⁶ and Møre og Romsdal. In Finland, municipalities with comparatively poor levels of coverage are scattered around the country.

We compared the figures for “all technologies” in the Norwegian context to allow for the possibility that coverage in these municipalities improves substantially once satellite technology is taken into account. Using this method, there remains 86 municipalities where less than 50% of households have access to minimum speeds of 30 Mbps. However, in all but one of these municipalities 100% of the population has access to 10 Mbps.⁷ Notably, these figures are similar even once satellite technology is removed from consideration, suggesting that the majority of these households access these speeds using mobile technology. In Finland, mobile coverage is comparable to that provided in Norway, with almost all households having access to 4G (European Commission, 2019a), suggesting that a similar result may be obtained for Finland if the data was available.



⁵ Neither Greenland nor the Faroe Islands are included on the map due to difficulties in obtaining municipal level data.

⁶ Due to a regional reform which took effect on 1st January 2020, the regions of Hedmark and Oppland are now one region: Innlandet.

⁷ The only exception was Masfjorden where 99% of the population have access to minimum speeds of 10 Mbps.

Map 4: Household access to fixed broadband based on download speed available to >50% of households, 2018.

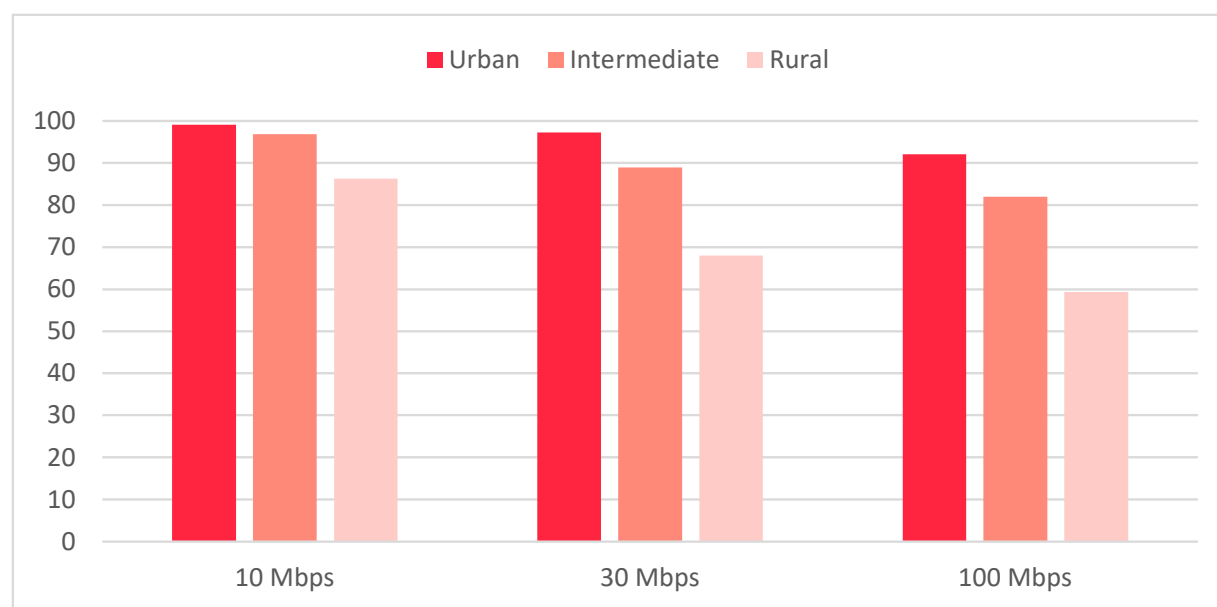


Figure 4: Average municipal household coverage of fixed broadband by speed and municipality type for Denmark, Finland, Norway and Sweden, 2018.

Data source: National Public Telecom Agencies.

In order to more clearly understand the distribution of speeds between urban and rural municipalities, we looked at the average municipal household coverage by municipality type for three speeds: 100, 30, and 10 Mbps (see Figure 4). Average household coverage was substantially lower for rural municipalities than either intermediate or urban municipalities at all three speeds. Perhaps unsurprisingly, the largest gaps were found at the higher speeds. Intermediate municipalities fell behind urban regions with respect to the two faster speeds, but a comparable proportion of households have access to at least 10 Mbps. This suggests that, regardless of the method of classification⁸, there is substantial evidence to support the existence of an urban-rural divide when it comes to digital infrastructure in the Nordic Region.

A policy perspective on broadband coverage

The relatively high levels of coverage in Iceland are largely a result of the Rural Fibre Project (*Ísland ljóstengt*), a Government program launched in 2016 which aims to provide ≥100 Mb/s internet to 99.9% of households and businesses (Government Offices of Iceland, 2019). The original goal was to provide this coverage by 2020, however the

timeframe has now been revised to 2023 (Icelandic Parliament, 2019). Through the program, local governments can apply for state aid from the Telecommunications Fund. Around 5500 households and businesses had been connected in 2019, with approximately 1500 buildings in sparsely populated areas still to be connected in order to reach the targets. The project has a strong emphasis on cost effectiveness, seeking synergies with other utilities development projects wherever possible (Government Offices of Iceland, 2019). Connectivity was not raised as issue in the Nordic-Baltic workshop held in Iceland.

Government policy has also played an important role in Denmark. In particular, the broadband fund which was a part of the strategy “Growth and development in all of Denmark” (2016-2019) (Regeringen, 2015). Though development of digital infrastructure is principally market-driven in Denmark, this state fund sought to improve opportunities for development and growth for businesses and citizens everywhere in Denmark with an explicit focus on access in rural and sparsely populated areas where the telecommunication companies were not planning to expand (Erhvervsministeriet, 2018a). This has significantly improved access to the internet in

rural areas in recent years. While 63% of houses and companies in rural municipalities had access to a fast connection in 2015, 81% had access in 2018 (Energistyrelsen, 2018). This is compared with 91% at the national level (Energistyrelsen, 2018). Generally speaking, the companies we visited in Denmark did not consider connectivity a problem. One exception was companies which produce machinery for farms that are reliant on access to store data in a cloud solution. Here, poor connectivity was raised as an issue.

In Finland, state funded, targeted support mechanisms aim to support rural municipalities to implement the optical fibre network. Through this funding, the Municipality of Ii has implemented an optical fibre network to secure broadband access across the town, including in remote localities. Just because such a network exists however, does not guarantee its use, and, according to participants in the Nordic-Baltic workshop, uptake has been slow, particularly among older residents. Participants also mentioned challenges for businesses when it comes to the reliability of the network.

In Norway, the Norwegian Communications Authority provides needs-based government grants for the development of high-speed broadband. Counties and municipalities are the only ones eligible for funding and must go through a public tendering process. Other public and private actors may participate in the planning processes.

Applications are evaluated on the basis of the following criteria: 1) Areas with no basic need; 2) Areas with basic need, but without the need for a high-capacity broadband; 3) Cost-efficient network development; 4) Local co-funding; 5) Plan for sustainable operation after development, and 6) Significance for local community development and value creation (Oslo Economics et al, 2017). The total annual grants may differ and was in 2019 close to 250 MNOK following the increase of 50 MNOK in the revised national budget in May 2019 (Norwegian Communications Authority, 2019). The upper limit of state aid for broadband development purposes are set in concordance with the GBER (general block regulations) set out by the European Commission and applies to the Norwegian case through the European Economic Area and the EFTA Surveillance Authority (The Norwegian Ministry of Transport and Communication, 2019).

In Sweden, broadband development is largely characterised by a bottom-up approach with local fibre networks operating in almost 200 municipalities and accounting for 60% of the total network (Svenska stadsnätstföreningen, 2014). The Swedish Local Fibre Alliance (*Svenska stadsnätstföreningen*) supports local communities to develop these networks, which are, in most cases, municipally owned and managed (see Box 3).

Box 3. Vingåker Municipality – One of Sweden’s smartest rural areas

Vingåker Municipality is proactively working towards the goal of access to fibre for all households and businesses in the municipality by 2020. It employs a standard cost rate, ensuring affordable access to infrastructure regardless of where in the municipality someone is located. Associations that own houses can apply for monetary compensation to connect to the fibre without any extra cost. Over 300 persons have participated in workshops about how to choose operators and to connect to the fibre infrastructure. WiFi-zones in the centre of Vingåker have also been installed. To ensure good mobile-phone connectivity, the municipality measure speeds using devices attached to the garbage trucks. Through this activity the municipality is able to make

a reliable, independent assessment of the reception that they then use in dialogue with the operators to advocate for a more stable connection across the municipality.

Vingåker is among few municipalities in Sweden that have installed a sensor network. This LoRa-WAN network covers the whole municipality and enables a vast range of applications using the Internet of Things. For example, the municipality can monitor the moisture in the soil to ensure that plants are only watered when necessary. The investment in LoRa-WAN is expected to cut costs and transport needs both within the public and private sectors. Vingåker participates in two regional networks related to digitalisation. The first is focused on municipal cooperation on digital infrastructure (*bredbandssamordnade nätverk*) and the second focused on coordinating digitalisation work across Region Södermanland.

⁸ Figure 3 determines rurality by classifying whole municipalities as urban, intermediate or rural while Map 2 classifies individual households as rural based on the density of the surrounding area.

Alongside these municipally owned networks, there are also over 1 000 associations representing community owned networks. In these cases, a lack of interest from both the market and the state has resulted in communities installing their own broadband infrastructure, either by investing their own funds, seeking grant funding, or a combination of the two. These associations can get support from the Village Internet Forum (*Byanätsforum*), a national network consisting of over 400 community owned internet associations.

The Swedish case is often used to illustrate how the challenge of broadband expansion to rural areas can be addressed through grass-roots action. While the work happening in these communities is of course impressive, it is important that the existence of such networks does not shift the focus from the responsibility of the state to provide an equal level of service and infrastructure to all residents, regardless of where they live. Not all communities have the resources and capacity to develop such networks or make such investment, yet all have a right to be connected. This is particularly relevant to farmers, foresters and companies alike who may want to use sensor networks or cloud services. A study by the Swedish Board of Agriculture (2017) found that unequal access to financing for new digital solutions has the potential to further exacerbate the unbalanced power relations between small

and large-scale producers in the bioeconomy. Availability of Internet of things applications that are suitable for small-scale application is vital to ensuring the benefits of digitalisation are shared equally between large-scale and capital-intensive agriculture and small-scale farms (The Swedish Board of Agriculture, 2017).

A final consideration with respect to connectivity is that not all internet access is from a fixed line. In fact, mobile access is increasingly as important as household coverage and accelerating the deployment of fifth-generation mobile systems (5G) in the Nordic countries is among the prioritised items on the Nordic Cooperation agenda. The Letter of Intent from the Nordic Prime Ministers on development of 5G in the Nordic Region promotes the deployment of 5G technology in several sectors, including transport and energy, environment, agriculture and aquaculture. 5G is expected to provide considerably higher speeds than 4G, and has a theoretical maximum capacity for download speeds of up to 10 Gbps (European 5G Observatory, n.d.). Thus, 5G deployment has the potential to enable the development of new industries and services beyond communications and provide better and faster connections for rural areas. At the same time, a lack of critical mass and high costs of a 5G system may limit its deployment to rural areas, further widening the digital divide.

Photo: Nicholas Doherty / unsplash.com



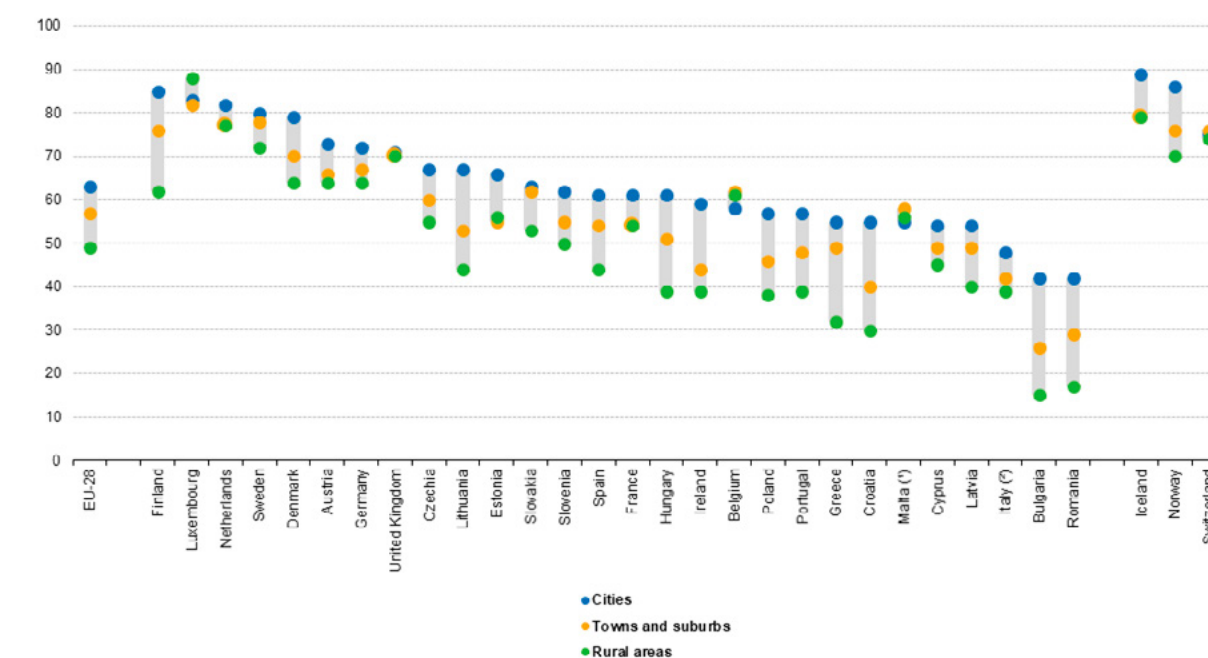
2.2 The digital divide: Knowledge and skills

Alongside the infrastructure shortcomings described above, rural and sparsely populated areas also experience barriers when it comes to the knowledge and skills required to unlock the opportunities associated with digitalisation (ENRD, 2017; Labrianidis & Kalogeressis, 2006). Digital competence is often found to be concentrated in the capital regions and other larger urban areas (Danmarks Erhvervsfremmebestyrelse, 2019).

Figure 5 is based on regional data collected as part of the European Commission's Digital Economy and Society Index and shows the percentage of people aged 16-74 years with basic or above basic digital skills, based on where they live. With the exceptions of Luxembourg, the

United Kingdom, Belgium, Malta and Switzerland, people in cities were significantly more likely to report having at least basic digital skills than people in rural areas or in towns and suburbs. This relationship was evident across countries regardless of the overall level of digital skill. Perhaps unsurprisingly, the largest gaps among the Nordic-Baltic countries were evident in Finland and Lithuania, the countries found to have the poorest infrastructure coverage in the previous section. The smallest gap among the Nordic-Baltic countries was found in Sweden. The remainder of this section will consider the implications of this dimension of the digital divide in the context of small rural enterprises in the Nordic-Baltic Region, using the notion of "digital capital" to frame the discussion (see Box 4).

People with basic or above basic digital skills, 2017
(%, share of people aged 16-74, during the 12 months preceding the survey, by degree of urbanisation)



Note: ranked on cities. Basic and above basic digital skills are the two highest levels of skills (compared with low skills or no skills). The indicator presented is a composite indicator covering four different skills domains: information, communication, problem solving and software skills. Individuals with basic and above basic digital skills have at least a basic level of skills for one of these four domains and do not have no skills across all four domains.
(*) Rural areas: low reliability.
(*) 2016
Source: Eurostat (online data code: isoc_sk_dskl_i)

eurostat

Figure 5: People with basic or above basic digital skills, 2017.
Source: Eurostat.

Box 4. What is digital capital?

One way of understanding digital knowledge and skills is through the concept of digital capital (Ragnedda, 2018). Digital capital is defined by Ragnedda (2018) as ‘the accumulation of digital competencies (information, communication, safety, content-creation, and problem solving), and technology’ (p. 2367).

Digital capital is a useful concept, as it infers the potential for exponential growth. As with other types of capital (e.g. social, cultural, political), the more a person or group has, the more likely they are to have opportunities to accumulate more (Putnam, 2000). Put another way, those with higher levels of digital capital to begin with are more likely to interact with digital tools in a way that further increases their digital capital. Thus, investments in digital capital development may have benefits that go well beyond the initial support provided. To take a simple example, a municipality may engage with elderly residents for the purposes of teaching them to use eGovernment services. The skills acquired may in turn enable further digital interactions (e.g. skype with grandchildren), providing an additional boost to the person's digital skills as well as generating other indirect benefits (e.g. decreasing social isolation) (Forsman & Nordmyr, 2017).

Digital capital and small and medium sized enterprises

In 2017, about 93% of all EU enterprises were micro-enterprises with less than 10 employees and 5.8% were small enterprises with 10-49 employees (European Commission, 2017a; Tillväxtverket, 2018). In Sweden, the corresponding figure was 94.7% and 4.4% respectively (European Commission, 2017a), while in Denmark micro enterprises accounted for 88.7% and small enterprises for 9.2% (European Commission, 2017b). Over 99% of all enterprises in Norway are considered small and medium sized enterprises (SMEs), with only 0.1% of all enterprises having

more than 250 employees (The Norwegian Ministry of Local Government and Modernisation, 2019; Statistics Norway, 2020). Ensuring that these enterprises have the capacity to embrace digitalisation is vital to ensuring the continued competitiveness of the Nordic-Baltic Region in European and global markets.

According to the Digital Economy and Society Index (European Commission, 2019f), SMEs fall behind large companies on all key indicators used to track digital performance (see Figure 6). Several explanations for this have been suggested in the literature, including: lack of knowledge about digital opportunities and their benefits, low level of ICT skills, limited ability to adapt to rapidly developing technologies and know-how, limited access to capital and finance, lack of appropriately tailored support structures, lack of engagement with support structures and limited capacity to employ ICT specialists or professionals to direct digital strategy or drive organisational change (European Commission, 2018, 2017d; European Investment Bank, 2019; OECD, 2017; Interreg Europe, 2018).

Although these findings are not specific to rural areas, the tendency for digital competence to be concentrated in urban areas may result in SMEs in rural areas experiencing a double digital divide. Challenges that have been highlighted in the literature as particularly relevant to SMEs in rural areas include: lack of access to information about support instruments and funding possibilities, brain drain, and insufficient innovation potential of SMEs (Interreg Europe, 2018).

Several tools have been developed that aim to support SMEs to engage successfully with digitalisation. Figure 7, for example, provides a useful framework for assessing a company's digital maturity. It contains six levels, ranging from no digital engagement to a situation where technology transforms the entire business model. According to research by the Latvian IT cluster, approximately half of Latvian SMEs sit at level 2 on the pyramid (Irmeja, 2020). The next largest groups are at level 3 (25%), followed by level 0 (15%) and level 1 (10%). Only 5% of Latvian SMEs can be considered digitally transformed based on this model (Irmeja, 2020).

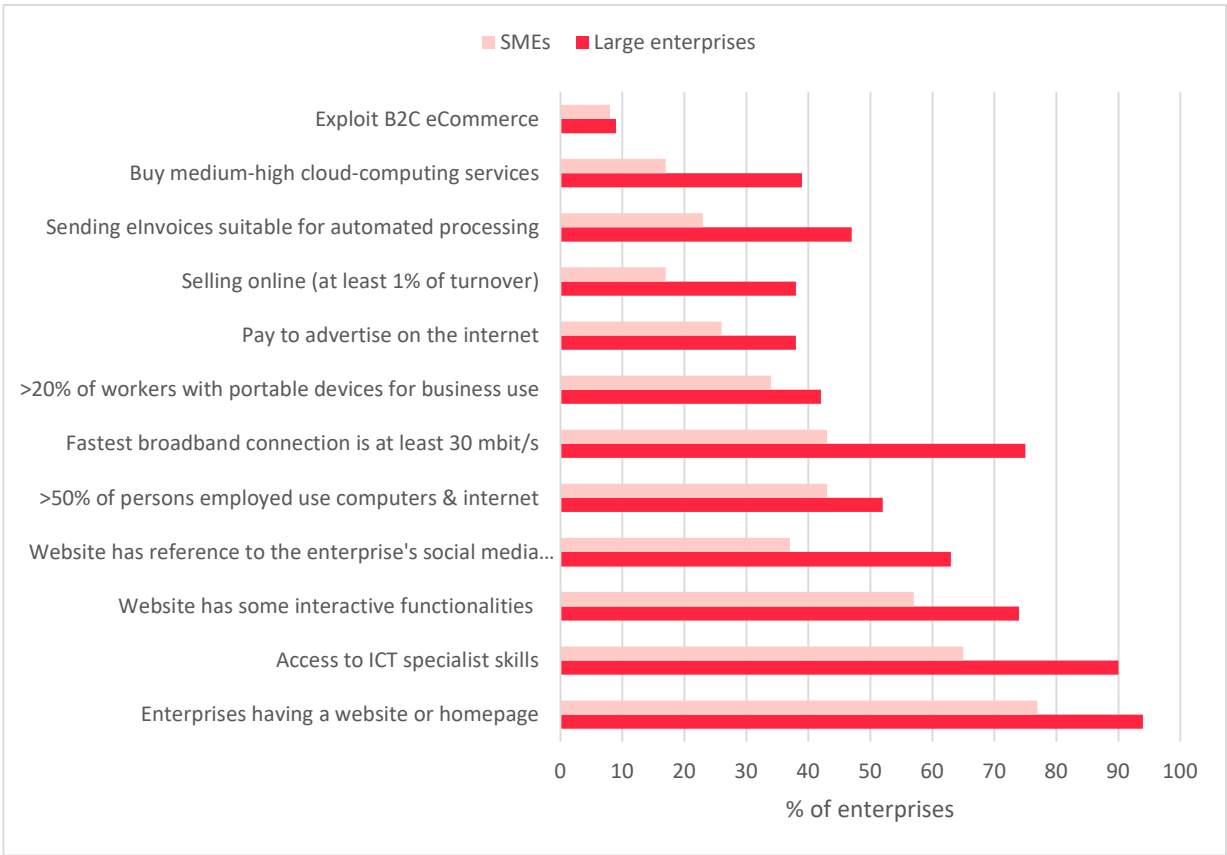


Figure 6: Key indicators tracking digital progress, EU, 2018 (% enterprises). Data source: European Commission.

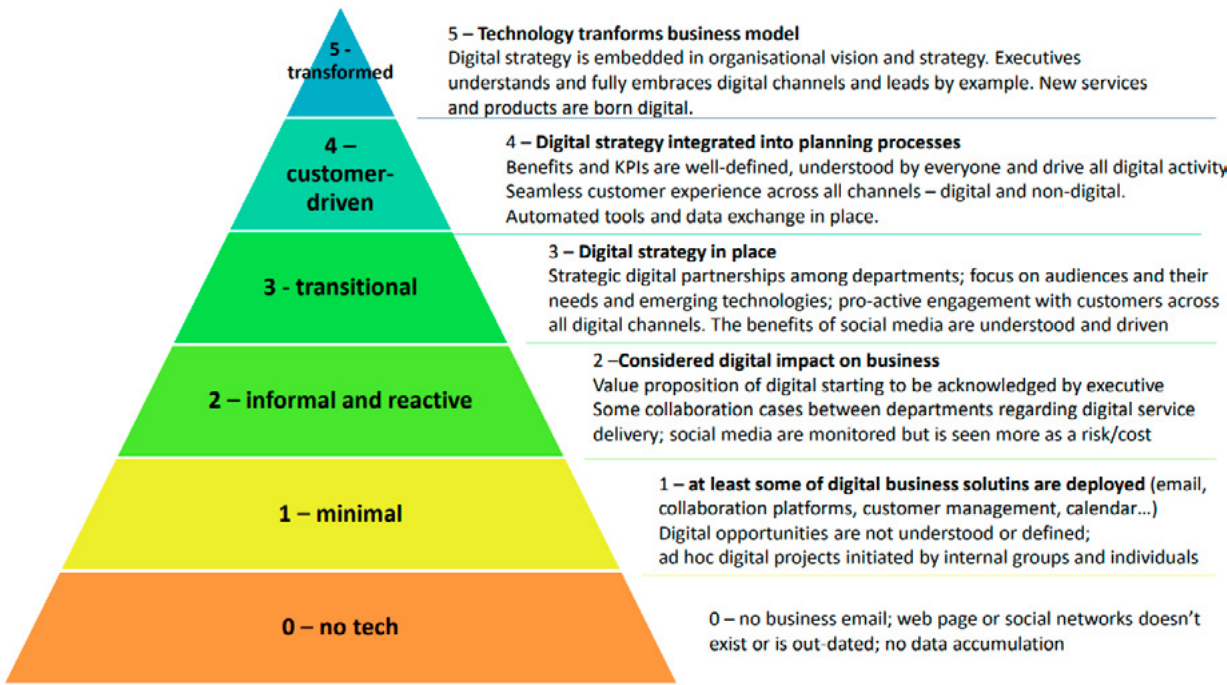


Figure 7: Pyramid of digital maturity. Source: Irmeja, 2020

A similar model has been developed by REG LAB, in this case using the staircase as a metaphor (see Figure 8). This model is based on research with Danish SMEs who have successfully undertaken a digital transformation process and aims to provide a deeper and more nuanced understanding of the key steps and drivers along the digital journey (REG LAB, 2018). Here the steps are grouped into high and low categories based on the level of complexity.

A key distinction between the complexity levels is the degree to which the business is transformed through the implementation of digital tools. The steps within the low complexity group mostly involve the implementation of digital tools within the constructs of existing work practices while the steps in the high complexity group are more likely to require or enable some form of organisational transformation (REG LAB, 2018).

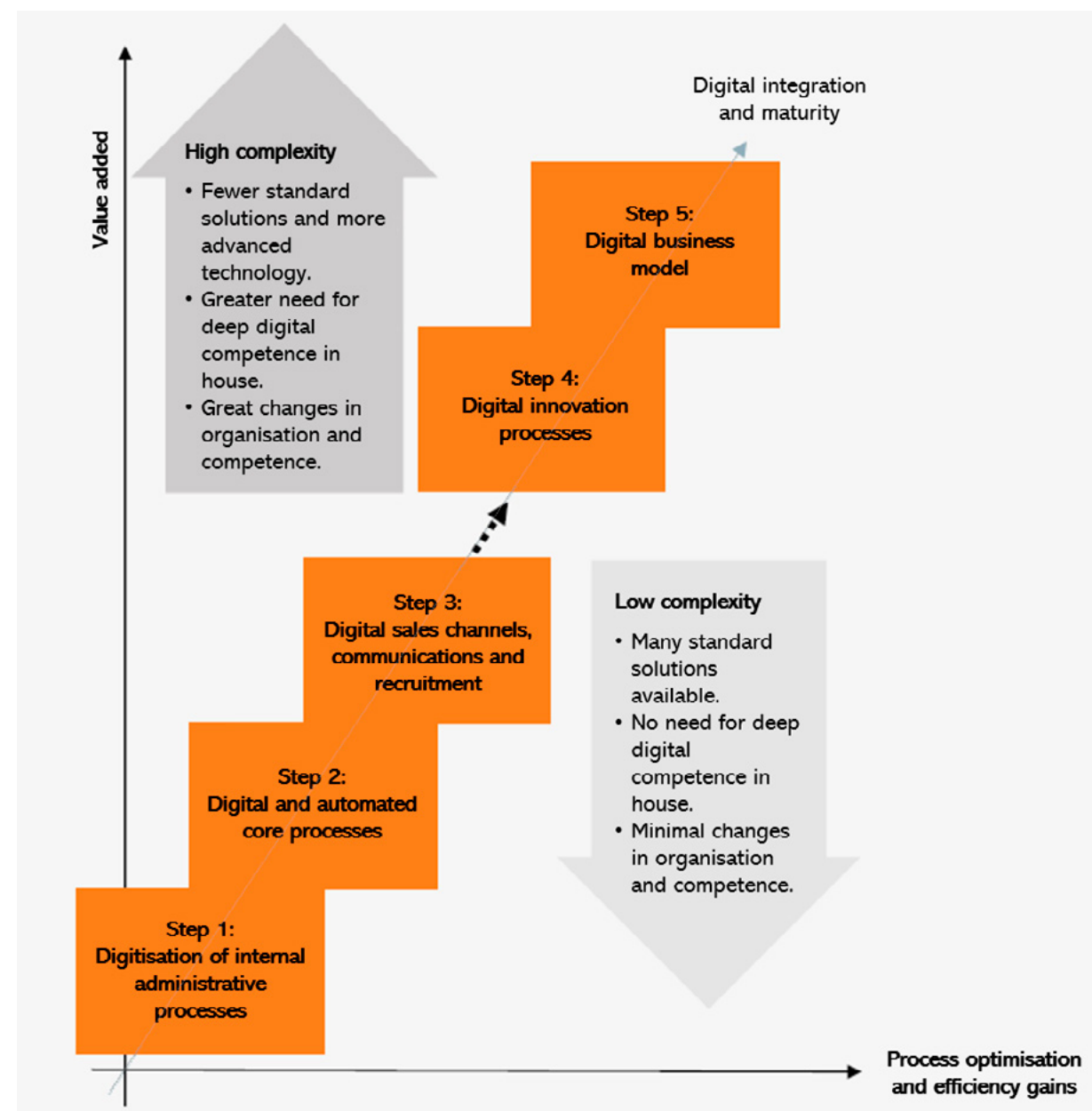


Figure 8: Digital transformation and maturity of companies step by step. Source: REG LAB, 2018 (translated to English by the authors).

These models demonstrate that, much like other forms of capital, the accumulation of digital capital is a gradual process. A business may need to spend some time working at the lower levels to generate the capital necessary to make the next step in their digital journey. Further, companies may return to the lower levels with a new perspective further down the track (REG LAB, 2018). Such models can be useful for companies who are not sure where to start and may also help authorities to determine the level at which to pitch capacity building activities (Irmeja, 2020). Although neither model is specific to rural areas, the notion of a step-by-step approach is quite relevant, as small rural enterprises may have limited time and financial capital to invest in rapid digital development.

Digital capital in Nordic-Baltic rural areas

The example of digital capital accumulation given in Box 4 is, in many ways, indicative of the discourse surrounding digitalisation in rural areas. Throughout the Nordic-Baltic Region, rural populations are experiencing considerable challenges with respect to both the outmigration of young people and population ageing (Kull et al, 2020; Stjernberg, 2020). In this context, rural communities are often positioned as receivers of technological solutions designed to improve access to services for citizens while at the same time resulting in increased efficiency for providers (Johnsen et al., 2018; Mergel, Edelmann & Haug, 2019). Where capacity building comes into focus, it is generally in the context of programs designed for those whose skills are most limited (e.g. the elderly, people with limited education), so that they can access these digital services (Löfving, Norlén & Heleniak, 2019).

Ensuring everybody has the skills required to access basic digital services is, of course, important. Equally important, however, is the need for a broader focus that works to build the

capacity for digital innovation in rural areas. This includes building the digital capital of individuals but can also be achieved by building digital capital in companies, organisations and even at a whole-of-community level (see Box 5).

For companies who took part in the Nordic-Baltic workshops, a lack of knowledge about digitalisation was a common challenge (see Figure 9). Participants discussed feeling confused about which solutions were best suited to their company, as well as uncertainty about how to get the best out of the solutions they already had access to. Interestingly, some participants also spoke about a lack of knowledge in a much more fundamental way, struggling to relate to what this concept of digitalisation actually means in the context of their company. Others talked about a need to change the mindsets of others as a first step to truly embracing digitalisation. For example, the perception that a digital meeting is a (less-favourable) substitute for a physical meeting rather than a genuine communication tool in its own right (see Box 6).

“ I think when you say digital, you often think about a smartphone, and then some people might think, then digitalisation is not for me. But digitalisation is much more than that: it is about optimizing production. And that is something everybody wants. So I also think it is about being better at articulating what digitalisation actually is.

Workshop participant, Vesthimmerland Municipality

Box 5. Country #196 (Valsts #196, in Latvian)

In the world today, there are currently 195 officially registered Nation States. Country #196 is thus a metaphor for the digital state, a country to which we all belong. This social movement was founded a year ago and is an initiative from international data technology company "Squalio". The initiative brings together researchers, national and local government representatives, entrepreneurs and opinion leaders to develop knowledge and tools that can be put into practice so that change can take place now. The Latvian IT cluster actively participates in and supports this movement with its knowledge, experience and resources. Cēsis, which is home to just 18,300 people, was the first place in Latvia to get involved in the movement "Country#196" as pilot city. Through the movement, Cēsis Municipality hopes to discover ways in which technology can be used to develop a sustainable city. While this "smart city" concept is by no means new, it does look quite different in a rural context. Here, sustainability goals are primarily related to addressing outmigration, particularly among young people.

The idea is that, by increasing digital literacy, people can have the opportunity to stay in rural areas while at the same time taking advantage of global opportunities and markets.

To achieve this goal, the initiative "Country#196" is engaging with Cēsis city in two ways. First, they have worked with the municipality on their data strategy, setting up working groups with the view to opening up data on the city and using it in new and innovative ways.

Second, they are working with local business and society to improve their capacity to work with digital tools and data management. This work began with a large conference about digital awareness which raised questions like: What is data? What is digital identity? How can I survive and know this digital world? How can I benefit from this? Following on from this, they held a series of workshops and meet-ups with local entrepreneurs about how they can make the most of digital tools within their business.

Finally, Riga Technical University is running the first vocational education course on data analytics for beginners in Cēsis. The intention was to start with one group of 14 students, however, after receiving 135 applications, the program received additional funding from the city and instead started with two groups (28 students). The ambition is that, within 2 years, 1% of Cēsis residents will have undertaken this course. The overarching idea is that, in this data driven world, understanding data flows can be a powerful tool to support citizens of "Country #196" to identify new opportunities in their businesses, organisations and society (Irmeja, 2020).

Importantly, there was no evidence of a lack of curiosity or competence as a barrier to engagement with digitalisation. Instead, limited time and lack of financial resources were emphasised as the main barriers. When it came to time, participants clearly appreciated the long-term efficiency benefits of digital technologies but were often simply too busy to invest in their initial adoption. From a financial perspective, investments in technology were perceived as high risk, particularly if there was a long pay-back time. Development of tailored solutions was found to be expensive and existing solutions were

not always well suited to the specific needs of enterprises. In the Latvian workshop, lack of trust also appeared to be a substantial barrier when considering a new investment. Opportunities to participate in the provision of public services is one avenue through which to support the long-term sustainability and financial security SMEs need to prioritise investments in digital development. This requires more equitable access to public procurement processes which, according to workshop participants in Norway, tend to favour larger companies.

Box 6. Rural actors lead the way on eLearning and remote working

The Westfjords (Iceland) covers 22,271 km² and has a population of just 6 994, almost one third of whom live in Isafjordur, the region's largest town (Statistics Iceland, 2018). The remainder of the population is dispersed in a number of very small towns and the region is characterised by limited accessibility, particularly during the winter months. As a result, the people of the Westfjords are no strangers to eLearning and remote working.

In fact, distance learning first started in the Westfjords in 1998 when a trial program for training nurses was introduced by the University of Akureyri (Peer Review Group, 2001). Today, communications technology is used in the region in a range of ways. One third of the students in Isafjordur's secondary school are distance learners from around the country and the Center for Lifelong Learning offers online courses in Icelandic for immigrants as well as working to increase digital competence among the population. The University of the Westfjords offers on-campus master programs (in cooperation with the University of Akureyri) as well as eLearning. The online courses benefit local students but can also be attractive to international students who might come to the Westfjords for only some parts of their course. Here, digitalisation has the potential to be a driver of population growth by both supporting young people to stay in the region and attracting newcomers.

Actors in the Westfjords are also challenging traditional models of work. The Blue Bank, offers accommodation and access to a coworking space to people from all around the world. It describes itself as "a community of ideas, at the service of the village and the world" (Blue Bank CoWorking, 2020). The centre is part of Arctic Digital Nomads, a project funded by the North Atlantic Cooperation that aims to inspire micro-innovation by offering

entrepreneurs the chance to spend some time working from the unique environment of the Arctic. In this respect, participants in the Isafjordur workshops discussed the opportunity to "sell" the simpler, cleaner lifestyle of the Westfjords, in a context where choosing this lifestyle does not necessarily mean being shut off from the world or turning ones back on outside opportunities. The Westfjords Development Centre has staff located all over the region meaning that digital meetings between staff are commonplace. The team have developed several strategies to ensure the effectiveness of online collaboration and make sure that those outside of the main office in Isafjordur feel included. For example, if one meeting participant needs to join via digital means, everyone joins individually via their computers – even if they are sitting in the same building. This helps to even out the power dynamic and avoids marginalising the person who is not physically present.

The diverse ways in which the communities of the Westfjords are using information and communications technology highlights the need for a critical perspective when discussing the knowledge and skills dimension of the digital divide. While there may be an overall tendency for people in rural areas to have lower levels of digital competence than those in urban areas, the very experience of remoteness may also necessitate digital skill development. Here, the concept of "digital skills" is less about the technology itself, and instead relates more to the ability to derive value from online interactions that is equivalent to that which can be achieved face-to-face.

According to participants in the Isafjordur workshop, the limited value attributed to these skills outside of rural areas means that they are currently most useful in connecting actors within the region. Participants suggested that a fairly dramatic mind-set shift is required if digital tools are to have the same degree of success in facilitating urban-rural connections (e.g. through "placeless jobs").

A further challenge highlighted by participants in the Finnish workshop was the older age of many local entrepreneurs. The assumption here was that younger entrepreneurs are more curious and capable when it comes to engaging with technology. This challenge is likely to be more prominent in rural areas, particularly in countries that, like Finland, have a more acute experience of rural population ageing (Stjernberg, 2020). Similarly, in the Westfjords having many older workers meant that implementing even simple digital solutions could be a long process.

In the Faroe Islands workshop, companies whose central products had a digital character (e.g. a tech-care company and IT companies) described challenges related to data management, out-of-date legislation, and the lack of tools like digital signatures and online business registration. These were seen as hindering factors when trying to enter the global market.

Alongside the challenges, digital technologies also present substantial opportunities for small

“ We have many young entrepreneurs, but the share of older entrepreneurs is still higher than in fast growing cities like Oulu... Entrepreneurs below 50 years old are more capable of utilising digital tools.

Workshop participant, Ii, Finland

rural enterprises and for rural areas in general. They can provide access to new markets, contribute to business growth, reduce the need for investment in fixed assets (e.g. through cloud-based services), and generate increased interaction with customers that enhances the quality of products and services (Interreg Europe, 2018). In the Nordic-Baltic workshops, the opportunities of digitalisation that participants identified were more diffuse and less concrete than the challenges (see Figure 9).

They included: increased ability to brand and market local products and places, job creation and economic gain, improved efficiency, increased transparency in work processes, development of new and better products and services, and access to global markets. Interestingly, improvements in efficiency were not always associated with job losses, as improved ability to generate and work with data also created new roles within some companies.

A final point related to knowledge and skills that has received little attention up until now is the need to build the capacity of ICT professionals to collaborate with other sectors. Several workshop participants expressed frustration that barriers to digitalisation were framed only in light of the digital competence of those who work

in traditional industries. For them, having ICT professionals understand the precise nature of their work was equally important. The hope was that this could lead to a collaborative approach where the starting point was a problem to be solved, rather than the technology itself. In one case, this approach was reported to have resulted in the development of a tailor-made solution right there in the region.

“ I’m not interested in talking to you about GPS technology but I do like driving without a map.

Workshop participant, Vidzeme Region, Latvia

Photo: Dan Magatti / unsplash.com

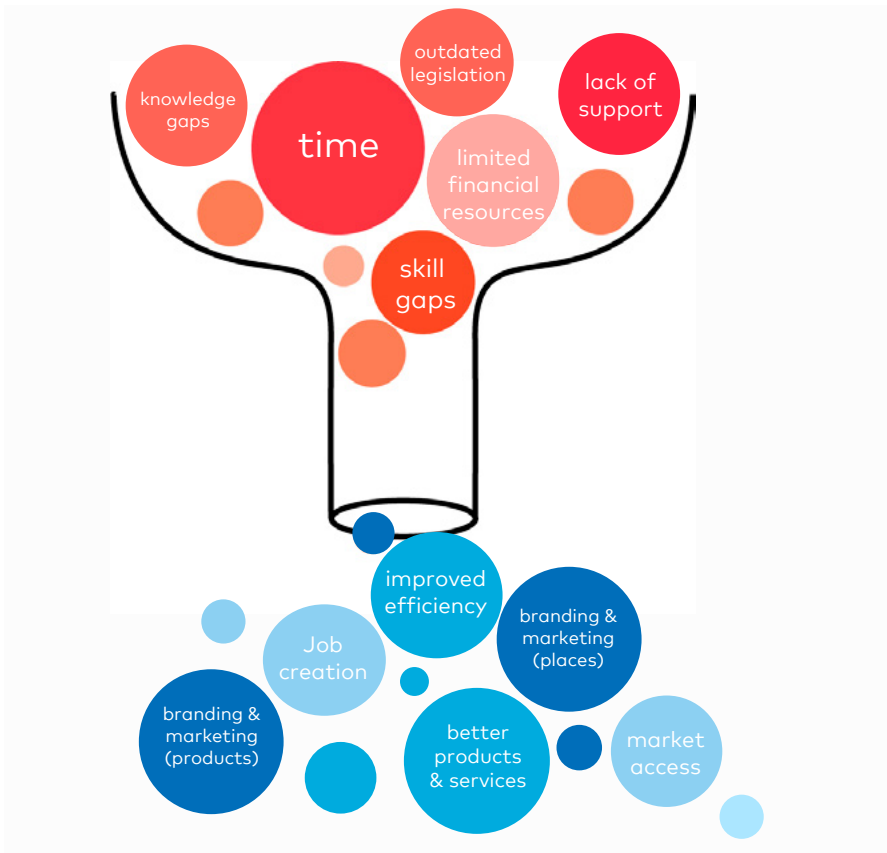


Figure 9: Challenges and opportunities associated with digitalisation for small rural enterprises. Data source: Literature and Nordic-Baltic workshops.



3. Digitalisation in key rural sectors

The previous section provided a general overview of the challenges and opportunities for rural areas in the context of digitalisation. While the elements described above have broad relevance for all small and medium sized enterprises (SMEs) in rural areas, the way that different challenges and opportunities play out varies significantly between sectors. For example, the challenge of identifying the right solution looks quite different for a farmer as compared to a tourism operator. For the farmer, considerable up-front financial investment may result in pressure to select the right solution. For the tourism operator, the upfront investment is more likely to be time, getting to know the different platforms and determining which provides the best service with the lowest commissions. This section of the report is dedicated to exploring this diversity, taking an in-depth look at digitalisation in the context of three key rural sectors: the bioeconomy, sustainable tourism, and the manufacturing industry.

3.1 The digital revolution in the bioeconomy

The bioeconomy can be described as the use of 'biological resources from the land and water for the mutual benefit of business, society and nature' (Refsgaard et al., 2020). Refsgaard et al. point out that the Nordic Region at large has an abundance of bioresources, and that the conscious use and development of these hold great potential for regional and local development. In 2017, approximately 17% of the Nordic working population held employment within the bio-based industries (Refsgaard et al., 2020). The majority of the bio-based jobs are in areas outside the traditional bio-based sectors (agriculture, forestry and fisheries) and includes sectors such as services, textiles, bioenergy and nature-based tourism (Refsgaard et al., 2020).

According to the OECD 'the whole bioeconomy business cycle is ripe for digitalisation' (OECD,

2020, p. 144). This may have disruptive effects, but it may also contribute to the sustainability of bioeconomy industries (Klitkou, et al., 2017). Research into the effects of digitalisation on the bioeconomy suggests that digitalisation is fostering transparency across value chains and helps to monitor the compliance with given rules and standards (Klitkou et al., 2017). From a rural development perspective, increased use of digital technologies is expected to play a role in attracting a younger generation to farming and rural business start-ups (European Commission, 2019e). The relevance of this theme to the agriculture sector was raised in the Swedish workshop as well as among forestry workers in the Latvian workshop. Digitalisation charges the path for diversifying traditional bioeconomy sectors and is transforming the bioeconomy into an increasingly multi- and interdisciplinary skilled sector (OECD, 2020). Digitalisation is changing the bioeconomy as we know it.

The digital revolution in the bioeconomy has at least three different dimensions. The **first dimension** sees the use of digital tools as a vehicle for precision-use and monitoring. For example, real-time monitoring of farming practices such as crops and livestock brings added value through saved time and costs. Similarly, in the forestry sector, monitoring can bring added value by generating data, optimising the preservation and

“New technology demands intellect and curiosity. [Being a farmer] is not only about driving a tractor and sweeping floors in the stables any longer. To be employed in a farm you need education.

Workshop participant, Vingåker, Sweden

use of forest ecosystem services (Klitkou, et al., 2017; European Commission, 2019e). The **second dimension** pertains to the bioeconomy as part of the circular economy, where data may aid the improvement of value chains; to reuse, recycle and repair. Data analysis generated from digitalisation in, for example, biorefineries or bio-based manufacturing may help identify new products emerging from what was previously defined as waste (OECD, 2020).

The **third dimension** is where we see advancements in biotechnology. Data-driven at its core, biotechnology is developing rapidly due to the growing repository of information related to biology (Investopedia, 2020a). Its application can be seen across a variety of products and services such as the use of genomes for therapeutics, personalised medicine and biopharmaceuticals.

It may also be seen in the development of biochemicals as replacements for petrochemicals and other harmful substances (OECD, 2020). The remainder of this section provides a more detailed description of each level, drawing on the literature as well as practical examples from the Nordic-Baltic workshops.

Dimension 1: The adoption and use of digital tools

In the agricultural sector, various measures have been introduced to accelerate the digital transformation in the EU farming sector and in rural areas. In 2019, 24 European Member States signed a declaration of cooperation: 'A smart and sustainable digital future for European agriculture and rural areas' (European Commission, 2019e, p.1). The declaration recognises the potential of

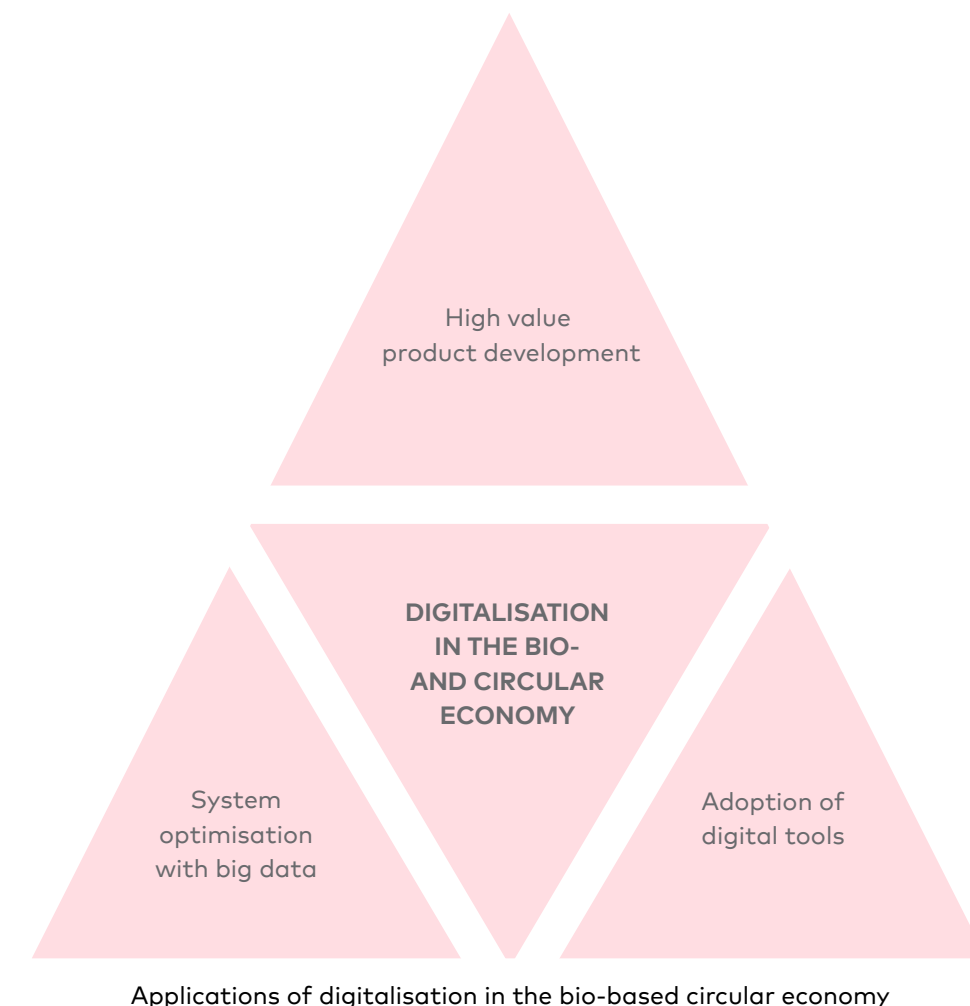


Figure 10: Applications of digitalisation in the bio-based circular economy.

digital technologies to support the development of the EU's agri-food sector and rural areas in general (European Commission, 2019e).

Research on smart farming and food traceability is among the areas for cooperation outlined in the declaration, but it also mentions the promise of Internet of things and sensor technology for optimising planting and yields (European Commission, 2019e). According to Indesmatech, a technology company who took part in the project⁹, monitoring and tracking livestock and crops optimises everyday operation through more precise planning and 'remote control' farming. It also allows for increased transparency, as data is shared more readily across the value chain from fodder to dairies, abattoirs, product development and retail (Togsverd, 2020).

Digitalisation has also provided opportunities for small-scale farmers to diversify their sales channels and to obtain a better price for their products through development of 'alternative' and 'local' food supply chains in rural areas (see Box 7). The use of digital tools helps to reconnect producers and consumers, to increase transparency, to re-localize agricultural and food production and to build trust among food system actors.

In the Nordic-Baltic workshops precision farming, diversified sales channels, reduced waste and increased efficiency were some of the main digital opportunities highlighted. Expectations connected to the increased use of sensors for activities like monitoring soil and water quality, were high, especially as the parameters for quality assurance are, at least for the most part, in place. Findings also show that improved animal welfare is considered an added value, but participants were cautious not to omit the importance of the farmer's presence in animal husbandry.

Participants in the Vingåker workshop stressed the need for data security and interoperable systems. Data security concerns were related to privacy as well as anxiety about the loss of data through cyberattacks or malfunctioning technology. Interoperability of systems (e.g. a tractor that is compatible with soil-based sensors) was seen as an important way of ensuring data was well-utilised without requiring substantial input from farmers themselves. While this interoperability was desirable, it was thought to be difficult to achieve with so many companies

Box 7. Reducing the distance from farm to fork

Bygdens Saluhall is a member-driven digital platform in Southern Sweden that connects small-scale local farmers with consumers. The platform was first piloted in Röstånga Village in 2016. It was initiated in response to increasing consumer demand and as an incentive to support local farmers by shortening the food supply chain and excluding intermediaries. Information about producers and their products, convenient delivery dates and product prices are uploaded to the platform. Food can be ordered online and picked up once a week at a local food node. Transactions are organised between the producer and the consumer (Berlina et al., 2017).

competing for business. Limiting oneself to a single technology provider was not necessarily seen as cost effective, however companies may lack the financial incentive to make their products compatible with those of their competitors.

Digitalisation also holds great potential for forest-based industries. Digital tools are impacting the management of forests across Nordic and Baltic regions, enabling more control over forest resources and their value chains (OECD, 2020). Apps, websites and digital platforms are furthermore bringing the consumer demands closer to the value chain (OECD, 2020). For the individual forester, management apps have been developed to support their control and monitoring. One example is the forestry management app 'Din Skog' developed and provided by the Norwegian forestry cooperative Viken Skog SA (Viken Skog SA, 2020). This mobile phone app enables the forest owner to plan tree planting and harvests, provides an overview of which trees are ready for felling, and creates thematic maps of the forest area. Mapping may also help promote young and healthier forest areas, and prepare hunting areas for recreational use (Viken Skog SA, 2020).

Forest-management structures across the Nordic-Baltic Region are diverse. In the Nordic-Baltic workshops we observed that fragmented

forest ownership may be a barrier to the adoption of new tools due to both the size and number of players. For small players, individual investments may be perceived as risky or beyond their financial means. At the same time, the large number of smaller players may hamper a collective approach to investments.

Dimension 2: Data for systems innovation in the bio-based circular economy

Digitalisation in the bioeconomy also has the potential to disrupt future bio-based production and manufacturing, moving towards a bio-based circular economy (OECD, 2020). In this space, digitalisation relates to the optimisation of the supply chain, the mitigation of hazardous and non-harmful waste products, and data-driven opportunities for new products development. As such, digitalisation can act as an enabler of circular-economy practices through the application of systems thinking, digital tools, industrial symbiosis and enhanced production control through Internet of things (see Box 8).

Digitalisation can also facilitate distributed manufacturing in bio-based industries (Srai et al., 2016), positively impacting the availability of different types of bioeconomy jobs in rural areas. One example is advances in 3D-printing using wood-based raw materials. Such advances are expected to decentralise production and result in the establishment of small modular manufacturing companies (Klitkou et al., 2017). This is evident in

Box 8. GreenLab Skive: Digitalisation as part of the circular bio-based economy

GreenLab in Skive, Denmark, is an industrial energy park focusing on circular economy principles that extend the lifecycle of raw biomass waste products by reusing them as input for energy creation. Digitalisation and smart algorithms ensure resource optimisation in the industrial park, increase the green production value, and play a role in energy trading. GreenLab is also home to a knowledge centre that focuses on green and intelligent energy. It is an open innovation platform providing data access which is open for R&D and other commercial actors to draw on (Thomsen, 2020).

the Bioinno-project lead by the Paper Province-cluster in the Swedish region of Värmland, which focuses on supporting forestry-based entrepreneurs to realise their innovative ideas through open testbeds (Paper Province, 2020).

Digitalisation also makes it possible to track products, allowing consumers to learn more about the origin of the food they eat. This idea was tested by one of the participants in the Nordic-Baltic workshops, who placed QR-codes on their packaging that traced the lifecycle of the meat from its origin all the way to the store. The intention was that this feature would make the product more appealing and result in increased sales. In practice, this was not the case, however the initiative was successful in creating increased transparency in the supply and value chains. This highlights the importance of experimentation in generating unintended positive outcomes.

Support structures are important for enabling SMEs in the bioeconomy to take the digital leap. The strong presence of cluster networks, cooperatives and local development companies in the Nordic-Baltic Region can act as a springboard for SMEs looking to use digital tools to create higher value products in the bioeconomy and circular economy. These companies support local start-ups to advance their business models, often basing this on digitalisation as a tool for creating added value. One such company is the Finnish development company Micropolis Ltd. Aiming to boost green growth in Northern Finland, they support the piloting of new solutions that draw on circular economy practices, resource and energy efficiency, climate action and intelligent solutions (Micropolis Ltd, 2020). Combining digital technologies with the advancement of circular bio-based solutions is considered key to staying competitive on the market and is the basis for future strategies and plans for growth in northern Finland (Vuotovesi, 2020).

Dimension 3: High value extraction and novel applications

Biotechnology is the result of the convergence of chemistry and biology, and first emerged in the 1950s (Rhodes, 2010). More specifically, it is defined as 'the use of biology to solve problems and make useful products' (Encyclopædia Britannica, 2019). With the bioeconomy conceptualised as part of the circular economy, biotechnology acts as a natural extension of the traditional sectors by

⁹ Indesmatech presented at the workshop in Vingåker (Sweden) and in the bioeconomy webinar.

diversifying additional value creation (Refsgaard et al., 2020). With high levels of digitalisation, including blockchain and artificial intelligence and its role in, for example, aquaculture, agriculture and forestry, new products and use of by-products are expected to emerge (Refsgaard, et al., 2020). Biotechnology is also resulting in companies developing genetically modified seeds and contributing to advancements in synthetic biology. The overlapping role of data for research, development and innovation in circular bio-based economy can also be seen in modern waste management (e.g. use of bacteria in degradation etc.) (Rhodes, 2010).

Digitalisation in the bioeconomy can also act as a driver for innovation and product development through the use of big data. In the health sector, for example, big data is facilitating promising results in biomedical research. Here, the fast pace of data-driven analysis is expected to lead to a greater degree of personalised medicine, therapeutics and pharmaceuticals (Rhodes, 2010). According to Investopedia (2020a), there has been an upsurge of biotech companies in Silicon Valley, USA, in recent years due to the emerging field of bioinformatics: the combination and use of 'computational technology to handle the rapidly growing repository of information related to molecular biology' (Investopedia, 2020b).

Data-driven analysis also has the potential to result in advances in biochemistry, the sector which is expected to replace petrochemicals. Several biorefineries work on applications using forest by-products and components of wood, such as lignin, for applications in pharmaceuticals, adhesives, fragrance, food, and additives for batteries (e.g. the Norwegian forestry company Borregaard).

In Sweden, regional actors are using organic (inedible) feedstock to produce liquid bio-oils through the process of pyrolysis (the thermal cracking of organic material in absence of oxygen) (Matisons, 2019). The liquid bio-oil produced from this process is compatible with the existing fossil fuel infrastructure, such as gas turbines and boilers, and thus fills one of the gaps the bio-based economy and the petroleum-based economy (Matisons, 2019). Pyrolyzed liquid bio-oil is currently not used as a transportation fuel, but companies such as the Swedish Piteå-based SME Sunpine AB, are developing advanced biofuels based on forest-resources (Sunpine, 2017).

3.2 A potential blessing, a possible curse: Digitalisation and sustainable tourism

On a global scale, the fast-paced and large-scale development of information and communications technologies have revolutionised and reshaped the tourism sector (Árnadóttir, 2019; Munar, 2012; Scott and Gössling, 2015; Wiggen and Lexhagen, 2014). Due to rising living standards, low-cost airlines and the development of travel planning platforms that allow individuals to compare and book flights, accommodation and tourism activities, travel has become increasingly accessible to a global audience (Scott and Gössling, 2015). At the same time, the instant global exposure made possible through social media and other digital platforms has made tourists themselves important co-producers of tourism content.

As a result, digital platforms such as Instagram, YouTube and Facebook have become important sources for inspiration and travel planning. An analysis by Visit Denmark, the Danish national destination management organisation, showed that within three years the use of social media as source of inspiration prior to a vacation in Denmark has increased from 4% to 18% among Danish tourists and from 9% to 19% among international tourists (VisitDenmark, 2019a). The same study mapped the decision making of Swedish and Norwegian tourists and found that three quarters chose Denmark as a travel destination based on information found online (VisitDenmark, 2019b). Digital platforms that make it possible for tourists to publicly review their experiences is another way that digitalisation has made tourists more powerful actors. These visitor reviews can have a significant effect on businesses in the tourism sector, either attracting or scaring away potential customers.

Promoting sustainable tourism?

While exposure on social media provides valuable opportunities for tourism destinations and businesses, the exposure also presents challenges of environmental, social and economic character (Elmahdy et al., 2017). Unexpected or surprising amounts of attention can be overwhelming for a tourist destination, putting pressure on the local community as well as on the natural environment. In Iceland, for example, the Environmental Agency decided to temporarily close the canyon of Fjaðrárgljúfur to visitors due

to concern about the large numbers of people who were visiting the site (Umhverfisstofnun, 2019). The canyon attracted extra attention after a music video by the singer Justin Bieber was filmed at the location (Marcus, 2019).

Tensions between locals and tourists can also emerge. Farmers in the Netherlands have experienced problems with tourists who walk into tulip fields to take photos of themselves amongst the flowers. As a result of the damage done to the tulips, frustrated field owners have put up fences to keep the tourists out (Boffey, 2019). In Norway, local authorities find that tourists visiting iconic natural sites such as Preikestolen and Trolltunga are not prepared for the demanding trek and changeable weather. Consequently, the need for rescue operations has increased, putting pressure on both the police and local search and rescue volunteers (Elmahdy et al., 2017).

Nature-based tourism holds vast potential for rural areas. At the same time, increasing tourism activity can threaten the natural and cultural values that attracted the tourists in the first place. This paradox, and the question of how to secure a sustainable approach to tourism is a growing concern (Øian et al. 2018) and was a central question for tourism actors who participated in the Nordic-Baltic workshops. While companies saw multiple benefits of going digital for marketing purposes and business development, they also expressed concerns about the pressure increased inflows of tourists place on the local community and the natural environment. A disconnect was identified between promoting a place to attract tourists on the one hand and securing a sustainable and manageable flow of tourists on the other. This paradox between the unlimited boundaries of the digital world and the physical limitations of the real world is perhaps most neatly illustrated in the case of the Faroe Islands (see Box 9).

Box 9. Closed for maintenance, Open for voluntourism

Perhaps the most interesting illustration of the tension between digitalisation and sustainability can be found in 'Closed for maintenance, Open for voluntourism', a pilot project launched in 2019 by Visit Faroe Islands. The project aimed to highlight the importance of sustainable tourism by closing off 10 popular tourist sites for the weekend and instead inviting 100 volunteers to visit the islands and work alongside locals to preserve and improve the sites. In return, the visitors were provided with food and accommodation for the weekend. Despite having a media budget of zero, the project was hugely successful, attracting 3528

applications from 25 countries in just four days. Online media was a vital factor in this success with 511 news articles and 34 million social media actions related to the initiative (Visit Faroe Islands, 2019). Herein lies the tension. On one hand, the campaign was successful in promoting a powerful message about the importance of sustainable tourism, both locally and abroad. On the other hand, there is a risk that the interest the campaign generated in the Faroe Islands will increase the number of tourists to unsustainable levels. Importantly, the campaign is part of a broader strategy that seeks to develop tourism as an important industry for the Faroe Islands while at the same time respecting the local community, economy and environment (Højgaard, 2019).

Challenges and opportunities for rural actors

Alongside the broader question of whether tourism can truly be sustainable in a digital world, tourism actors in rural areas also face practical day-to-day challenges. As the number of trips that are inspired and planned online grows, tourism companies are becoming increasingly aware of the importance of an online presence. Despite this, small tourism operators in rural areas tend to lag behind with their digital development (Styvén & Wallström, 2019). Use of digital platforms and tools is limited, and many of these companies can still be characterised as 'Digital Beginners' despite demonstrating an awareness of both the many possibilities digital tools offer and the necessity to digitalise in order to not fall behind (Kvistgaard & Hird, 2019; Tillväxtverket, 2018).

Previous studies have identified several opportunities associated with digitalisation for SMEs within the tourism sector, including better means to attract visitors, increased competitiveness, improved customer service, and increasing communication with potential and previous customers (Kvistgaard & Hird, 2019; Styvén & Wallström, 2019). Similar findings were evident in the Nordic-Baltic workshops, with participants using digital tools for marketing purposes, as a way to modernise their business and provide better services, and to attract visitors. Beside opportunities for the individual company, digitalisation may also enable development of the tourist destination as a whole through closer collaboration between local tourism actors, both private and public.

Previous research has also identified barriers for SMEs within the tourism sector embarking on their digital journey, including: lack of time, lack of competences, lack of interest or energy, and difficulties navigating in the jungle of possibilities and identifying the right match for their business (Kvistgaard & Hird, 2019; Styvén & Wallström, 2019). Workshop participants emphasised similar challenges, citing limited time and resources to implement digital solutions and lack of skills and knowledge about how to make the most out of the available tools as major barriers to embrace the digital world. The companies that had managed to develop a business model incorporating digital tools, found that they could be time-consuming. One participant described the way that the direct links to potential customers created by online channels had increased the amount of time he

spent on administrative tasks as he often needed to respond to questions that were not relevant to his business. The financial side of digitalisation was also raised. For example, developing tailor-made applications was considered prohibitively expensive. While the available online booking platforms charge high commissions that transfer money away from the local area.

Promoting digital skill development at the regional level

To increase the digital skills of SMEs within the tourism sector, national and regional tourism organisations throughout the Nordic Region have launched different projects. Visit Sweden, for example, has developed a guide for nature-based tourism companies to increase their digital presence. The guide was developed through the project "Swedish nature experiences on digital export" which aims to enhance Sweden's competitiveness within nature-based tourism and increase possibilities for tourism in rural areas. The guide depicts the traveller's journey using a travel cycle (see Figure 11) which is designed to support companies to direct their actions in line with tourists' online trajectories.

The Travel Cycle consists of five steps performed by the traveller: 1) Dream, becomes inspired, 2) Plan, explores different opportunities, 3) Book, searches for the services that fits their needs, 4) Experience, conducts the actual travel, 5) Remember, shares pictures and other content from the journey online (Visit Sweden, 2019).

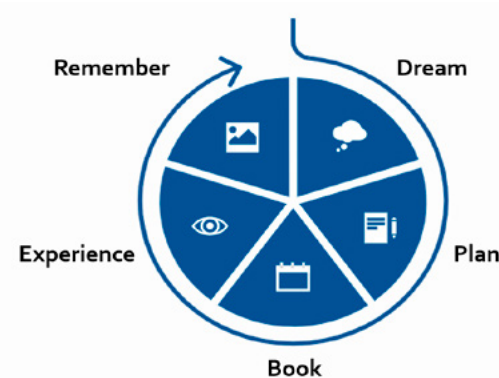


Figure 11: The travel cycle.

Source: Visit Sweden, 2019 (Translated to English by the authors).

Innovation Norway offers similar support through a course titled (Become skilled on the internet) which aims to give companies within the tourism industry the skills, knowledge and inspiration to develop their digital marketing (Innovation Norway, 2019). The course explores themes such as social media for marketing, search engine optimization, and how to make use of pictures and videos in company operations. Prior to the course, the companies receive a digital check, and are presented with an assessment of the strengths of their current webpage and areas for improvement.

Similar programs can also be found at the regional level. For example, "The Digital Step" a project launched by the Swedish Region of Västerbotten in 2019. The project aims to help SMEs within the region's tourism sector to embark on their digital journey, and provides digital strategists and consultations to help develop digital action plans, offers digital coaching, and facilitates presentations and workshops. The objectives for the companies are increased visibility, stronger relations to new and former customers, and increased sales. According to the project leader, interest from the SMEs has been overwhelming and more courses need to be added to meet the demand (Persson, 2020).

3.3 Getting started on the digital journey: Digital transformation in the manufacturing sector

Digitalisation of the manufacturing sector is often discussed in the context of what is commonly termed the fourth industrial revolution – or Industry 4.0. The fourth industrial revolution is predicated on the inventions of the third industrial revolution, and is expected to be characterised by innovations that increasingly blur the lines between the physical and virtual world (Schwab, 2018; see Figure 12). Here, developments in information and communication technology are combined with robotisation and artificial intelligence to allow more complex and integrated processes to be undertaken by machines (Degryse, 2016).

This is having a substantial impact in many sectors, particularly manufacturing which has historically included a high share of medium-skilled routine jobs (Berglund et al., 2019). These types of jobs are particularly susceptible to automation due to the relative ease with which human labour can be substituted by machines, a process referred

to in the literature as routine-biased technological change (Berger & Frey, 2016; Degryse, 2016; McKinsey & Company, 2017; Goos, Manning & Salomons, 2014).

Broadly speaking, these changes have affected the manufacturing sector in two ways. First, the manufacturing sector now makes up a much smaller portion of the overall workforce, with employment falling by 30% in OECD countries since 1980 (OECD, 2016). The Nordic countries have witnessed a similar decline and, while manufacturing jobs made up almost one third of Nordic employment in 1970, they comprise just 8% of jobs today (Berglund et al., 2019). Second, the jobs that remain are more complex and require higher level of skill than was previously the case (Autor, 2015; Berger & Frey, 2016; Berglund et al., 2019).

These changes are relevant to manufacturing SMEs in rural areas in several ways. Despite the deindustrialisation described above, the manufacturing sector remains a crucial component of the Nordic economies. Though it makes up a smaller share of GDP than in the past, manufacturing output has declined comparatively less than manufacturing employment (Iris Group, 2015). While manufacturing jobs are geographically dispersed across the Nordic countries, the highest shares of total employment are found outside

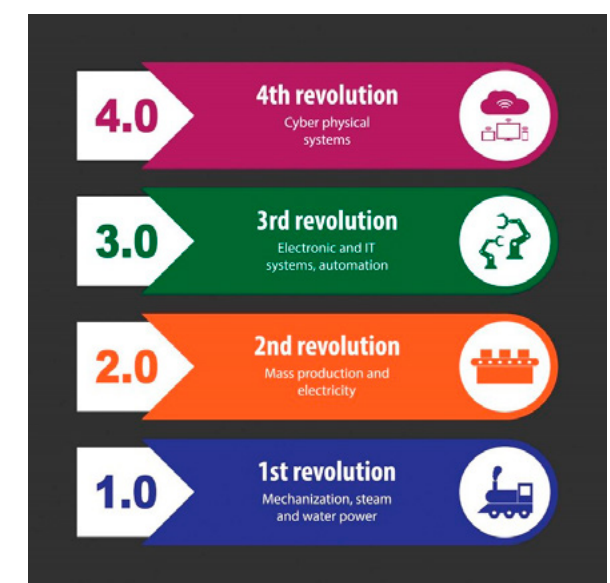


Figure 12: Industrial Revolution.

Source: Encyclopædia Britannica, 2018.

the capital regions (Iris Group, 2015). In addition, 90% of all manufacturing companies in the Nordic Region have less than 20 employees (Iris Group, 2015). As such, competitiveness in manufacturing relies, at least in part, on the ability of small rural enterprises to respond to technological change. In the context of routine-biased technological change, the upskilling of those who remain in the rural manufacturing sector is vital to ensuring competitiveness, both at home and abroad. As one webinar presenter put it: digitise or die (Sokolovs, 2020). Two angles appear to be particularly relevant here. First, the task of getting SMEs on board with the concept of digitalisation. Second, how to create an environment that promotes innovation among small and medium sized manufacturing companies.

How does digitalisation relate to me?

Given the broad and all-encompassing nature of the changes described above, it is perhaps unsurprising that some participants in the Nordic-Baltic workshops struggled to relate to the concept of digitalisation. Digitalisation was found to be a buzzword – used in many contexts, but without ever being accurately described. For example, one company reported thinking that digitalisation was irrelevant to his business, as their products are custom-made and individually adjusted to each customer. As such, the production process cannot be automated, and the business owner had not considered that digitalisation may be relevant in other ways. Once this business did engage with the concept, they found that digital tools could in fact be used to increase transparency in the production process. This in turn had a motivating effect for employees as they knew how much work was

ahead of them and could more easily conceptualise their tasks within the full working chain.

Breaking down this intangible concept and making it understandable and relatable for small production companies was found to be a vital step in getting SMEs on board with the fourth industrial revolution (see Box 10). For participants in the Nordic-Baltic workshops, this meant ensuring that support measures were tailored to the unique needs of companies. For example, access to neutral and free business counselling to help them understand what digital technologies exist and how they can beneficially be implemented in their production. Participants also stressed the need for funding that would allow them to conduct initial market analysis. As noted in the first section of this report, investments at this stage can be seen as risky for companies, particularly if they are not yet fully aware of the potential benefits digitalisation may bring to their company in the long-term. It was also noted that the process for accessing such funding and support structures should be as straight forward as possible to ensure accessibility for companies of all sizes.

“ I couldn’t really see the relevance [of digitalisation]. It was actually about understanding what we can use this for. (...) These big and grand ideas that are shown, they need to be boiled down to something that is easy to understand.

Workshop participant, Vesthimmerland municipality

Box 10. Promoting peer support through cluster organisations

Digital competence for SMEs - Clusters as partners for innovation and change (*Omstillingsmotor for short*) is a program from Innovation Norway which aims to build the digital competence of SMEs. The project model involves pairing SMEs with relevant cluster organisations who support them by providing expertise and knowledge on digital transformation. The program provides a unique peer-to-peer learning opportunity by supporting cluster organisations to share their expertise with SMEs from outside of the cluster. Through this approach, SMEs anywhere in Norway can get access to the expertise of whichever of the selected clusters is most relevant to them.

The model (Figure 13), includes four steps and begins with the mobilisation of SMEs. The importance of this first step should not be underestimated. The CEOs of SMEs are extremely busy people and it can take a substantial amount of encouragement to get them to invest their time and that of their company in a program like this. Once an SME is engaged, a match is made with the

relevant cluster and together they develop a program proposal. The proposal is then presented to Innovation Norway along with a request for funding. The funding usually goes towards paying the cluster for their time and SMEs are expected to contribute the equivalent level of resourcing in the form of employee hours.

One example of a success story from the program is Flisa Printing AS, a printing company that was established in 1913 in the small village of Flisa (Hedmark Region). This company has recently used digital tools to transform its operations from a simple printing press into the largest communication agency in the region. Interestingly, *Omstillingsmotor* now also includes a simpler component in the form of a business model innovation workshop, focusing on how to increase competitiveness and growth by using digital technologies to meet the needs of you customers. This component was developed following the finding that many SMEs were not sufficiently aware of the implications of digitalisation for their business and thus, did not yet have the motivation to invest resources in the more in-depth program.

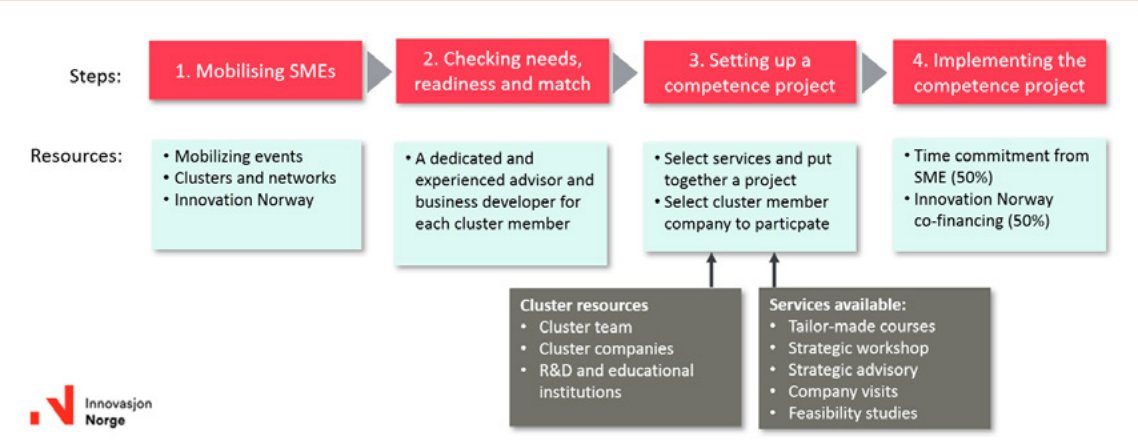


Figure 13. Omstillingsmotor - Project model. Source: Gjester, 2020.

Innovation through collaboration

Digitalisation in the manufacturing sector is not only about automating tasks and renewing processes. As in the bioeconomy, there is also substantial potential for innovation, added value and the creation of new products. As such, opportunities to collaborate with other actors to find inspiration and explore new ideas are vital. This may occur through existing networks but can also involve joining or developing new ones. Collaborations between manufacturing companies and universities can be particularly valuable in bringing know-how to SMEs. While these collaborations will at times develop organically (see Box 11), a more formal “match-making” approach has also been found to be effective (see Box 12).

“ There is a difference between digital competencies and competencies to innovate. Innovation skills and the desire to try something new and think something new, versus the fact that you are good [with technology].

Workshop participant, Vesthimmerland Municipality

Regardless of the approach, it is important to acknowledge that SMEs will not necessarily seek out these types of collaborations for themselves. In the example of North-West Smart Production (see Box 12), a key factor driving the success of the project was that SMEs were approached directly by the business associations. These associations often had existing relationships with the SME representatives and were able to explain the value of the program in a way that the companies could relate to (Ringgaard Jensen, 2020). According to the companies we met on our field trips, without this personalised approach the SMEs would not have sought out such an opportunity themselves and, in turn, would not have thought about the relevance of digitalisation for their company.

One potential barrier to innovation that was identified in the Nordic-Baltic workshops was narrow and restrictive funding frameworks that require a concrete goal to be defined in the application stage. More flexibility in the programmes directed towards SMEs was recommended, to allow companies to make adjustments or change path during a project when new knowledge is acquired or new possibilities appear. New technologies and features are constantly being developed; a more flexible framework would make it possible to adapt projects to the fast pace of technological developments.

Box 11. SIA BALTMA

SIA BALTMA is a small metalworking company located in Valmiera, Latvia, that has recently embarked on a project to digitise elements of its production process. The project was a collaboration between BALTMA, Marcus Kompononter (BALTMA's partner company in Sweden), KTH Royal University of Technology (Sweden), and Vidzeme University of Applied Sciences (Latvia) and was funded through an innovation grant provided by Valmiera Municipality. The companies worked in partnership with students at the two universities to develop a prototype for machinery which allows the company to save data from the manufacturing process and to do real time analysis (see Figure 14).

The first step was to digitise the logistics and planning processes by introducing the enterprise resource planning (ERP) system. Next, industrial controllers were connected to production machines to gather actual data from the processes. In the future, there are plans to connect these systems, further reducing the need for human-human and human-machine interactions. These digital innovations have made the manufacturing process more efficient. They have also increased effectiveness by making a clear overview of the production process available at all times. This allows decisions to be made much more quickly than before. The grant and the university collaboration were key enablers, making it possible to develop a tailored solution as opposed to implementing one that was already out there.

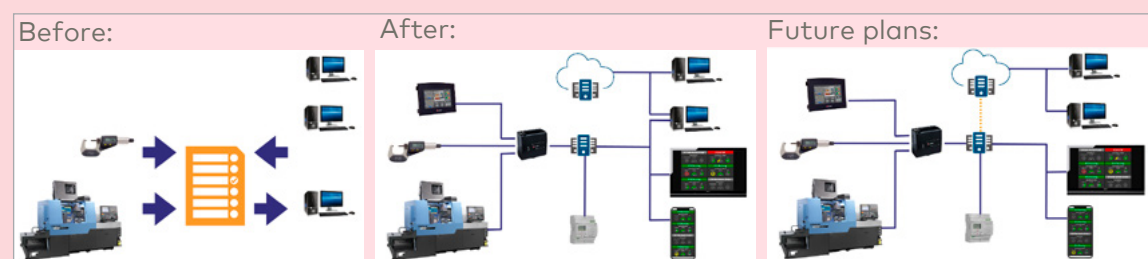


Figure 14. SIA BALTMA - Digitisation process.

Box 12. North-West Smart Production

North-West Smart Production aims to support the digital transformation of manufacturing SMEs and is a collaboration between Vesthimmerland Municipality, Jammerbugt Municipality, Aalborg University, Foundation Autonomous, and two local business associations (one from each municipality). The overall aim of the project is to maintain and create jobs through a targeted innovation approach that takes into account the concrete technological needs and competencies of the participating companies. Companies are guided through the entire innovation process with the help of technological consultants who help to identify the companies' innovation potential and make plan for the implementation or development process. The innovation is realised through a close partnership between the companies and the knowledge institutes with the purpose to develop new innovative solutions and products.

To date, 32 companies have participated in the project, together identifying and implementing over 100 innovation activities and creating 10 jobs (Ringgaard Jensen, 2020). The project has also developed a new methodology for engaging SMEs that has been successful in attracting two further municipalities to join the partnership (Mariagerfjord and Thisted Municipalities). The partnership approach is vital to the success of the project, in particular the small number of partners with clearly defined roles. The local business associations facilitate the initial contact with SMEs, the university and Foundation Autonomous provide the technical knowledge and the municipalities take care of the administration. Another key success factor is the bottom-up approach. Innovation actions are identified and defined by the SMEs themselves and all activities take place on the company's premises.

4. Supporting digitalisation of small rural enterprises in the Nordic countries and Latvia

State-funded mechanisms and support structures play an important role in facilitating the up-take of digital technologies among existing companies as well as providing optimal conditions for new, digitally enabled, start-ups to emerge and thrive. Examples of effective measures include policies that facilitate access to finance, bridge knowledge gaps, increase competence and skills, and support networking and peer-peer learning opportunities (European Investment Bank, 2019; OECD, 2017; Interreg Europe, 2018). Access to finance is important in overcoming the challenges related to resources discussed in the previous section. A small investment in an ICT application or support for organisational change may be all that is needed for a small enterprise to develop a product or service that brings significant value to a rural community.

Previous research has highlighted a range of actions that have proved particularly effective in bridging knowledge gaps and increasing skills and competences of small and medium sized enterprise (SMEs). These include educational measures aimed at raising awareness of the benefits of digitalisation (e.g. training, learning platforms, guidebooks and online digital assessment tools), and dedicated coaching programmes that support the integration of digitalisation into company development strategies (European Investment Bank, 2019). Clusters and networks involving smaller rural companies, new business support organisations, digitalisation help desks, incubators, networks and technological and science parks can also be an effective way of promoting peer-peer mentoring and support (Interreg Europe, 2018).

Importantly, businesses must understand that digital transformation requires a wide change and integration of digital processes into every aspect of the company. It is important that this transformation is supported both at company level by changes in culture, leadership, skills and processes, as well as at the regional and

national level by introducing supporting policies and programmes (European Investment Bank, 2019). The Interreg Europe SKILLS+ project also identified different factors beyond the companies themselves that are important for the digital development of SMEs. These include the presence of regional level digitalisation strategies, as well as strong coordination and integration among different regional policy actors and instruments (Interreg Europe, 2018).

In the Nordic-Baltic workshops, several ideas for support mechanisms were raised. The most common was access to support to navigate the digital landscape. This included a desire for knowledge of the solutions that are out there but also that this support is provided in a tailored and individual way. That is, participants were less interested in attending a generic workshop where various digital solutions were presented and more interested in one-on-one conversations with experts who understood (or at least took an interest in) the unique nature of their work. Workshop participants were also enthusiastic about the concept of peer-peer learning opportunities. With respect to financing, several workshop participants suggested that the often time-consuming requirements of funding applications made it hard for SMEs to apply, let alone compete. They suggested that information about programs and funding opportunities should be provided in an accessible way, with clear guidelines on how to participate.

Digitalisation is high on the agenda across the Nordic Region, however specific approaches vary from country to country. The following section will highlight the specific national approaches to supporting the digitalisation of rural SMEs in each of the Nordic countries and independent territories, as well as in Latvia. It gives a general overview of the context and support structures and highlights several relevant projects in each country.

4.1 Denmark

The rhetoric on Danish businesses' uptake of digitalisation follows what can be termed a 'jump or lose' logic. If businesses do not jump on board now, they risk being left behind by their national or international competitors who took the jump and made the digital transformation (Danske Regioner, 2017). Though most Danish firms expect that digital development will affect their business model, only a minority of firms have actually made the jump. According to the Business Promotion Board only one out of three Danish SMEs with 10-49 employees could be described as highly digitalised (Erhvervsministeriet, 2018a).

In 2017, the government decided to strengthen Danish industry and entrepreneurship through the agreement Together on the businesses of the future (*Sammen om fremtidens virksomheder*) (Erhvervsministeriet, 2017). The agreement includes a Strategy for Denmark's digital growth (*Strategi for Danmarks digitale vækst*), which allocates 1 billion DKK to support digital development in Denmark up to 2025 (Erhvervsministeriet, 2018b, p. 3; 2018a). The strategy specifically focuses on enhancing and supporting the uptake of digital solutions in SMEs, a task that will be supported by the national program SMV:Digital (SMV:Digital, 2020). SMV:Digital does not have a specific focus on rural or sparsely populated areas, but targets all Danish SMEs.

The following are examples of programs within Denmark that aim to support SMEs through the digital transition:

■ **Strengthened business at street level (*Styrket erhverv i gadeplan*)** (2018-2020) aims to increase growth in retail businesses at street level through digitalisation and is a collaboration between four municipalities: Svendborg, Faaborg-Midtfyn, Ærø and Langeland. It is funded by the European Social Fond and the Southern Denmark Growth Forum (*Syddansk Vækstforum*)¹⁰ and includes 170 local businesses who participate in networking opportunities and have access to SME-consultants to support strategy development. An evaluation of the project found that participants retrieve the most useful knowledge on digitalisation when inputs are concrete and practice-oriented (Grøn & Rasmussen, 2019). An example of this is the short videos that have been produced featuring participants explaining how their businesses successfully have developed through the uptake and use of different digital solutions (Fremtidsfabrikken, 2020).

■ **Digital paths to growth** – SME growth plan (*Digitale veje til vækst – SMV vækstplan*) 2018-2021 is a region-wide attempt to increase growth in SMEs through automation and digitalisation in Region Zealand. Funded by the Danish Government and the European Regional Development Fund, the project targets SMEs with significant growth

Box 13. Manufacturing Academy of Denmark

In Denmark, a non-profit organisation called MADE (Manufacturing Academy of Denmark) was established in 2014 through a collaborative effort by the industry, funds, associations and research institutions (MADE, n.d. a). The purpose of MADE is to create a platform for applied research, development, and innovation in Danish manufacturing companies. In 2017 the research program 'MADE Digital' was launched with the purpose to accelerate the digital transformation of Danish manufacturing companies. The project is

divided into nine working packages focusing on different aspects of digitalisation, for example, digital manufacturing processes, digital assistance tools, and organising digital production. MADE also has a specific section for SMEs, where they run projects aiming at SMEs uptake of digital solutions (MADE, n.d. b). For example, SMEs can participate in a cluster project, where four to eight manufacturing companies follow a course together where they concentrate on a specific manufacturing technology. Previous cluster projects have focused on 3D-printing in manufacturing, flexible automation solutions, and advanced surface technology.

¹⁰ From 1st of January 2019, Syddansk Vækstforum and the five other regional growth fora have been replaced by Denmark's Business Promotion Board (Danmarks Erhvervsfremmebestyrelse)

potential in regional strongholds: local food, transport, bioeconomy and, in particular, the construction sector (Zealand, n.d.).

■ **Digital Management Culture (*Digital Ledelseskultur*)** is a development course which aims to provide business leaders with the necessary competencies to conduct a digital transformation of their company. The project is financed by the European Social Fund and the Danish Business Authority and is delivered through the national program SMV:Digital. It targets all Danish SMEs, with local partners in each region (SMV:Digital, 2018).

4.2 Finland

In Finland, the government resolution on promoting rural digitisation was developed based on the results of a 'Smart Countryside' study in 2017 (Antikainen et al., 2017). One of the four priority areas in the resolution is digitisation of rural employment and entrepreneurship. Business Finland is the main authority fostering digitalisation of businesses in Finland, supported by the Technical Research Centre of Finland (VTT). Meanwhile the Ministry of Agriculture and Forestry promotes the sustainable growth of rural enterprises and rural entrepreneurship under the Rural Development Programme for Mainland Finland (The Ministry of Agriculture and Forestry of Finland, 2019).

The following are examples of programs within Finland that aim to support SMEs through the digital transition:

■ **Digiboosti** (2015-2017) was a national program run by the National Funding Agency for Technology and Innovation of Finland (TEKES/Business Finland) which aimed to encourage digital innovation in SMEs by supporting them to hire digitalisation professionals. Approximately 390 companies benefited from the program and ca 450 digitalisation experts were engaged in the activities. Around two thirds of the experts' contracts were prolonged beyond the life of the project. Although there was no particular focus on rural areas in the programme, the beneficiaries were rather evenly spread throughout the country geographically (Interreg Europe, 2019b). An interesting aspect of this good practice example

is its dual objective. On the one hand, it aimed at facilitating recruitment of engineers from the ICT sector that lost their jobs as a result of the decline in the sector in 2010. On the other hand, it sought to improve digital skills among SMEs (Interreg Europe, 2019b).

■ **Tempo growth programme** is designed to be a follow-up to Digiboosti. It is run by Business Finland and provides funding support to Finnish startups and SMEs for accelerating internationalisation (Business Finland, 2019).

■ **RuralDigiServ** (2015-2018) worked with approximately 90 farms in Kainuu Region with the aim of improving the digital skills of farmers and promoting the utilisation of digital solutions in their daily work. Lack of skills and knowledge among farmers was identified among the barriers for the uptake of digital solutions. To address this challenge, the project activities included trainings, workshops and providing experiences on using the online digital services, advisory services through video conference tools and consultancy on the use of sensors, tracking devices and cloud platforms in farm management. The project also supported piloting, for example, pH and moisture sensors for animal feed and use of drones in farm environment planning (Interreg Europe, 2019c). The project was funded by the European Agricultural Fund for Rural Development and implemented by ProAgria.

Box 14. Micropolis Ltd

Micropolis is a local development company which supports municipalities and companies to create value out of climate action, circular economy, resource and energy efficiency, intelligent solutions and low-carbon services. Digital solutions are one support mechanism for carbon neutrality and, as such, Micropolis has been a partner organisation for the local project DigiLeap, which aims to support companies in Northern Ostrobothnia to be well prepared for digital structural change. The project has created an open web-based digitalisation support service model which helps companies to evaluate their readiness for digital transformation.

4.3 Iceland

The Icelandic regional development policy 2018-2024, aims to promote digital development in rural areas. Several projects in the current policy aim to promote digital development in different ways. One is to increase the number of remote workplaces/stations in governmental agencies to distribute state-based employment opportunities more equally across the country. Other projects are aimed more directly towards SMEs in the countryside such as Digital Advantage and The Radar (The Icelandic Parliament, 2018). This policy is expected to be revised in 2020, with digitalisation as one focus point of the revision. Clearer, simpler and faster public services are among the government's priorities during this election period (2017-2021). Digital Iceland leads the work on digital development where the focus is developing strong digital infrastructure and joint ventures in the public sector. One of the main projects underway is the development of a centralised digital service portal under the brand Ísland.is. This development is expected to facilitate improved communication with government agencies for both citizens and companies (The Icelandic Government, 2020).

The following are examples of programs within Iceland that aim to support SMEs through the digital transition in Iceland:

■ **Digital Advantage (*Stafrant forskot*)**, is run by Innovation Center Iceland and designed to support companies in rural areas to take advantage of digital technology for growth. The program offers consultancy support to SMEs in digital development and marketing, including designing a digital strategy, advanced use of social media, managing content for web and social media, and using Google Analytics. The Digital Advantage offers both online teaching material and workshops across the country. The first workshops were held in February 2019 and from the beginning it was obvious that such an initiative was needed. To date, 140 companies and institutions have participated,

and many still receive ongoing guidance from Innovation Center Iceland. The project runs outside the capital area and is funded through the Parliamentary Resolution on a strategic regional plan for the period 2018-2024. The initiative is based on the Scottish program Digital Boost (Business Gateway, 2018) and has been translated and localized into Icelandic circumstances (Stafrænt forskot, n.d.; Fréttablaðið, 2020).

■ **The Radar (*Ratsjain*)** is a six-week regional development and innovation project for tourism operators that want to expand their reach. Under the guidance of experts, participants are introduced to tools that strengthen their managerial capacity, hear about the experiences of other companies, and learn how to better utilise digital media.

Box 15. Digi2Market

Digi2Market will use digital tools to address the various challenges that companies in peripheral areas face, such as small size of market, distance from the market and isolation. The project seeks to support the international growth of companies which have business models based on the biological resources of their local areas; Agri Enterprises (Food & Biomass), Marine Enterprises (Food & Health Products), Engineering Enterprises (Fabrication & Agri/Marine). Activities are expected to include development of a marketing ToolKit and creation of digital pathways for SMEs to enter new markets including digital hubs and the use of immersive technologies (e.g. virtual reality). The project is funded by the Northern Periphery and Arctic programme (NPA) and includes partners from Iceland, Finland, Ireland, and Northern Ireland (Digi2Market, n.d.).



Photo: Warren Wong / unsplash.com

4.4 Norway

Digitalisation was lifted as a horizontal policy objective to overcome impeding challenges and generate new opportunities for Norwegian industry and business in the Report to the Parliament – White paper 27 (2016-2017) The industry – greener, smarter and more creative (Meld. St. 27 (2016-2017) *Industrien - grønnere, smartere og mer nyskapende*). The objective includes skills and competence development for the future labour force and digitalisation as an enabler of the green transition (The Norwegian Ministry of Trade and Fisheries, 2017). The White Paper additionally established the Digital21-project, aiming to provide insights and recommendations for the government's digitalisation work (The Norwegian Ministry of Trade and Fisheries, 2017). Digital21 has given recommendations with regards to industrial and business development and emphasises the role of the government in contributing towards the development of broadband infrastructure for securing value creation across the country. Digital21 also places weight on the role of access to data, especially for research and innovation efforts in SMEs (Digital21, 2018).

The following are examples of programs within Norway that aim to support SMEs through the digital transition:

■ **Engine for Change (Omstillingsmotor)** is run by Innovation Norway and described in detail in the manufacturing section of this report.

■ **SkatteFUNN** is a tax deduction scheme supporting businesses by taking the edge off the investment costs (Research Council of Norway, 2019). The projects eligible for tax deductions need to

be concerned with the improvements of services, production processes or goods. SkatteFUNN is coordinated by the Research Council of Norway and is specifically geared towards SMEs (ibid).

■ **Norsk Katapult** is a nationally coordinated effort to support SMEs through test-beds. By providing SMEs with innovation infrastructure (e.g. competencies, networks, equipment and facilities) to aid the development and testing of novel ideas, these test-beds aim to accelerate the development of new products and services. The Katapult-centres are funded by the Research Council of Norway, the Industrial Development Corporation of Norway (Siva) and Innovation Norway to support SMEs across Norway as a response to the rapid increase of technology on the global market as well as the green transition (Norsk Katapult, n.d.).

■ **Digital Norway** is another national level programme to support and guide digitalisation of businesses in Norway (DigitalNorway n.d.). It is part a network and platform for sharing experiences and knowledge through the platform DigitalNorway Community, part guide to understand how technology might enable business and project ideas, and part tutoring service for digital leadership.

■ **Smart Innovation Norway AS** provides support for start-ups and SMEs with networks and clusters, encourages open innovation, and help businesses navigate the regulatory system and support frameworks where a business' competence might be lacking. Digitalisation figures as integral to the development of business models by placing the customer and the customer experience at the

centre. Smart Innovation Norway AS is a strategic collaborative regional partner in Digital Norway, alongside the innovation companies Kongsberg Innovation AS and Proneo AS, and iKuben – a Norwegian Centre of Excellence focused on facilitating business development with a special focus on digitalisation and sustainability.

The following are examples of Norwegian projects with a regional focus:

■ **The Digital Visibility** project aims at building competencies in online/digital visibility and strategies among small rural businesses. The project was initiated in Sør-Trøndelag County in 2016 and was based on a series of workshops / courses within digital visibility for SMEs in rural areas (6 seminars x 4 hours workshops). The project was coordinated by the 'business gardens'; and a local bank and Google were involved in the implementation. Among the concrete examples of themes addressed were strategy development, Google AdWords, how to trigger online traffic and social media. Also, businesses gardens tried to connect SMEs with regional service partners and local bureaus (offices), so that the local bureaus could become service partners in the future. Based on the evaluation of the pilot project, the initiative was prolonged in 2016/2017 and renamed to Kompetanseforum-Digital Visibility. Until now, approximately 140 SMEs have attended training. In 2019 the project includes the whole of Trøndelag County, after Nord- and Sør-Trøndelag merged in 2018.

■ **Industry 4.0 Trøndelag** is a spin-off of the Kompetanseforum-Digital Visibility project that runs from 2018 (Nasjonalparken Næringsshage, 2020b). The project was developed responding to the needs of micro- and small companies in the region which had problems utilising national programs due to lack of digital competence and high costs. Prior to the implementation of the project, the digital maturity of 60 SMEs was measured in order to get a better understanding of the level of digital skills, maturity and needs in the SMEs in the region. Also, the training programme itself has been further developed in cooperation with business gardens, the NTNU University, SINTEF and some specialised tech companies. Industry 4.0 Trøndelag aims to provide basic training within the digital field to 400 SMEs. It is a 3-year project with 14 million NOK funding provided by the County Authority and Innovation Norway.

4.5 Sweden

When it comes to promoting digitalisation among Swedish businesses, the Swedish Agency for Economic and Regional Growth (*Tillväxtverket*) is a major player. The agency describes digitalisation as a unique opportunity for SMEs (Swedish Agency for Economic and Regional Growth, 2018). It offers business development checks for digitalisation of SMEs and organises Startup-Sweden for digital start-ups. Together with other authorities, the Swedish Agency for Economic and Regional Growth runs a website, verksam.se, that offers a number of digital services to companies, with the aim to simplify and improve the conditions for digitalisation of businesses.

The Swedish Association of Local Authorities and Regions (SKR) is also a major player on a regional and local level. However, their focus is mainly directed to digitalisation of public management and the provision of welfare services. Another noteworthy organisation is SmåKom (2020), a network of 69 smaller and mostly rural municipalities that have been quite active when it comes to digitalisation and have especially focused on broadband provision. *Bynätforum* has a similar focus on infrastructure and connects over 400 local broadband providers in rural parts of Sweden (Nilsson, 2020). Vinnova (the Swedish Innovation agency) has also published several reports on the digitalisation of Swedish industry in general (See e.g. Björkdahl, J., Wallin, M.W. & Kronblad, C., 2018).

The following are examples of programs within Sweden that aim to support SMEs through the digital transition:

■ **Develop businesses in rural areas (*Utveckla företag på landsbygden*)** was the headline of an open call by the Swedish Agency for Economic and Regional Growth in autumn 2019 which provided funding for actions focusing on digitalisation in rural SMEs. Thirteen projects received funding: eight projects on developing or applying digital models and tools and five projects on increasing knowledge about challenges faced by rural companies. The projects do not target specific sectors but have a special focus on micro businesses with less than 10 employees.

■ **DigiLift (*Digitaliseringslyftet*)** is another project run by the Swedish Agency for Economic and Regional Growth which aims to increase knowledge about the possibilities of digitalisation and increase use of digital technologies, particularly in the industrial sector (Tillväxtverket, 2020).

■ **Kickstart Digitalisation** (*Kickstart Digitalisering*) provides a free program of lectures and workshops for industrial SMEs aimed at supporting them to kickstart the process of digital transformation in their company. The project is run by a collaboration between a number of industrial interest organisations (e.g. the workers union IF Metall) and financed by the Swedish Agency for Economic and Regional Growth.

■ **Production2030** aims to increase competitiveness amongst Swedish manufacturing companies. Digitalisation and sustainability are considered key areas in this endeavour and the programme has a special focus on developing SMEs' abilities through research projects and technical workshops (e.g. on the use of collaborative robots in production).

■ **INDIGO** aims to help SMEs to improve business opportunities with the help of digital solutions. The project is run by IUC (*Industriella Utvecklingscentra* or Industrial Development Centers, in English) and financed by the Swedish Agency for Economic and Regional Growth.

■ **Digitalakademien** is run by Almi (the Swedish state-owned investment company that invests in startups and Google) has also a similar objective as other projects. It is focused on basic uses of the internet such as social media etc.

4.6 The Faroe Islands

In 2015, the first national digital strategy for the Faroe Islands was developed through a collaboration between the Ministry of Foreign Affairs, Trade, and Industry and the Ministry of Finance. The aim of the national digitalisation program is to develop the digital infrastructure and digitise public services during the period from 2015 to 2020 (Ministry of Foreign Affairs, Trade, and Industry and Ministry of Finance, 2018). Of special importance for the Faroese enterprises is the development of a national e-ID including a digital signature and of an online business register. The e-ID is to be public in 2020, whilst the business register is currently on hold, but expected to be developed in the near future.

The central business sector on the Faroe Islands is the maritime industry which includes, among others, fisheries, aquaculture, and biotechnology. However, there is a focus on diversifying the industry in order to create a more robust Faroese society. Special focus is on the IT sector which has expanded in recent years, especially due to the national digital strategy where a key focus has been to use local companies. Other sectors that are expanding are financial services, tourism and the creative industries (Føroya landsstýri, 2019).

4.7 Greenland

With generally good internet access and the majority of people owning a smartphone or other tablet device, the current national digital strategy focus on citizens and businesses' use of technology (Digitaliseringsstyrelsen, 2018). Digital competence development is considered key to bringing both the Greenlandic labour force and the labour market into the future and emphasises the way digitalisation is becoming part of everyday life. As such, the strategy also positions digitalisation as an opportunity for business development and seeks to create an attractive environment for digital entrepreneurship. Fisheries is the central industry in Greenland, but there is a political focus on creating a more diversified business sector within, for example, tourism (Government of Greenland, n.d.).

E-learning through the project 'the digital elementary school' is an important step towards integrating digitalisation in society. Two Greenlandic elementary schools were provided iPads in 2014, which in the aftermath of the pilot proved to be important both for practical reasons and for the pedagogic nature of the tool. The main challenges connected to the pilot were seen in the poor quality of internet coverage and the inability to share and exchange experiences with a wider pool of schools. In 2018, the Greenlandic Government decided to extend and expand the project to include all schools in Greenland, including a broadband upgrade. The project is a response to the challenging geographic nature and settlement structure in Greenland. It is also seen as an opportunity to elevate the quality standard of education in Greenland, as the pupil's activity and development takes centre stage (Avaanaata Kommunia; Kommune Qeqertalik; Qeqqata Kommunia; Kommuneqarfik Sermersooq; Kommune Kujalleq, 2018).

4.8 Åland

Digitalisation has been present on the Government of Åland's policy platform for years. Digitalisation is considered crucial to both the public and the private sector. Digitalisation provides an opportunity to modernise through e-administration and welfare services, but it also encourages socio-economic opportunities for the individual through digital technology (Randall & Berlina, 2019). The Government of Åland adopted a Digital Agenda in 2012 and furthermore established a Digital Council in 2016. The Digital Council launched *Vision Åland 2.0 Enklare&Tryggare* in 2016, focusing on the ways in which digitalisation enables Ålandic society – by building relations and enabling a broad dialogue with citizens (Ålands Landskapsregering, 2017). In 2017, the Government of Åland established a Digital Commission. The Åland Chamber of Commerce has previously worked on digitalisation and SMEs and hosted a series of lectures on digitalisation called #digitalimera during 2014-2015 (Åland Chamber of Commerce, 2015).

Åland's agricultural sector is also seeing constant changes in light of digitalisation, as they adapt and modernise to meet modern production needs, and the use of digital platforms and social media is expected to bring about a change in consumer behaviour (Teräs & Slätmo, 2018). Tourism, which plays an important part in Åland's economic profile, placed digitalisation, collaboration and branding at the centre of Visit Åland's action plan for 2019 (Visit Åland, 2019). In this plan, digital marketing is considered particularly important, but even projects such as the use of Apps for cultural heritage experiences, such as the Defence Arch-project in Bormarsund, and digital maps are highlighted (Visit Åland, 2019).



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4.9 Latvia

Digitalisation of SMEs and ICT development has been one of the hot topics in Latvia in recent years. More and more companies are becoming aware of the importance of digitalisation in terms of increasing competitiveness. National policies and regional development plans are being taken into consideration and concrete support instruments and activities to support digitalisation are being developed, but still research shows that Latvia is lagging behind the EU average.

Latvia has good IT infrastructure and broadband internet, which provides a good base for digital development. There are also good innovation support instruments for digital technology development and implementation within SMEs, including educational programs to improve the digital skills of employees. Despite this, SMEs, and especially SMEs in rural areas, lack the understanding of the possibilities of digitalisation and lack informative support. As such, it is important to organise educational campaigns and inspirational events in the region to encourage SMEs to digitalise. In addition, there is lack of information about the actual situation of SMEs in terms of digitalisation, especially in rural areas.

The most important document for digitalisation is the **Information Society Development Guidelines 2014 – 2020** which aims to provide an opportunity for anyone to use ICT, to create a knowledge-based economy and to improve the overall quality of life by contributing to the national competitiveness, and increasing economic growth and job creation. Special attention in the Guidelines is devoted to the implementation of an open data principle in the public administration and simplifying delivery of public services, by means of efficient and effective eServices and interoperable information systems. By reducing the administrative burden, it is expected to increase the number of those entrepreneurs (especially SMEs), which until now have been deterred from commencing their businesses or official registration due to the complexity and unwieldiness of bureaucratic procedures.

Other relevant Government strategies include:

■ **National Development Plan for 2014 - 2020.** A national comprehensive medium-term planning document to facilitate balanced and sustainable development. The aspects relating to digital entrepreneurship include an increase in R&D efforts in the defined priority scientific areas, reduction of obstacles for entrepreneurs, ensuring a high-speed connectivity throughout Latvia, as well as the development of digital content, product and e-services to expand the use of digital technologies in the economy and in the population.

■ **Operational Programme “Growth and Employment 2014 - 2020”.** Its aim is to promote a business-enhancing environment that is based on available information (data), integrated ICT solutions for both the public and private sector and full inclusion of Latvia in the single European digital market. The policy promotes eSkills among both the public sector and the private economy and shall contribute to provide anyone with the opportunity to make the best use possible of modern ICT solutions. The policy is therefore aligned to Latvia's goal to improve the quality of life by contributing to national competitiveness, increasing economic growth and accelerating job creation. The implementation of the policy instrument therefore needs to be optimised to make sure that SMEs in rural areas make full use of the available opportunities and that financed interventions lead to durable impacts to the benefit of Latvia's overall economic competitiveness.

■ **National industrial policy guidelines for 2014 - 2020.** Aims to promote economic structural changes, increase the production of goods and services with high added value, including strengthening the role of industry, allowing modernisation of industry and services, as well as expanding exports. As the key directions we can mention – availability of financing; increase of capacity of innovation; promotion of exports. In 2017, a review of the guidelines is planned, including assessing the need for the guidelines to include the policy objectives and provide business action for digitisation.

■ **Science, Technology Development, and Innovation Framework 2014-2020.** The Guidelines implement a new horizontal approach to the science and innovation policy, linking research and industrial sectors into a single system. The main components for a successful development of Latvian innovation system are the following: 1) the development of the potential of scientific activity; 2) the development of the platform for long-term cooperation between researchers and enterprises; 3) the support of the development of innovative enterprises. The aim of the STI Guidelines is to raise the global competitiveness of Latvian science, technology and innovation, satisfying the development needs of Latvian society and economy. One of Latvia's “Regional innovation strategy for smart specialisation” (RIS3) policy priorities is “Modern ICT” and specialisation area is “Information and communication technologies”.

■ **The Policy Guidelines for the Electronic Communications Sector of the Republic of Latvia 2011-2016.** Provide for a task for the Ministry of Transport to draw up a concept for the development of the next generation broadband electronic communications network in order to achieve the objective laid down in the strategy Europe 2020 – to improve access to fast and ultra-fast internet for European citizens.

Support instruments in Latvia are planned and carried out at national level. As such, there is no special digitalisation support instrument available only for SMEs in rural areas. It is the task of public organisations and stakeholders of the industry to support SMEs in rural areas to understand the importance of digitalisation and digital skills development for future growth. Events and informative campaigns are organised in regions to encourage SMEs to take up digital solutions.

ICT and digitalisation is one of the smart specialisation areas in Vidzeme Region and it is stated that special focus will be devoted to digitalisation in the bioeconomy field. Wood product manufacturing and food product manufacturing are one of the key industries of VPR and these are also part of bioeconomy, so more and more informative events will be set up to reach these SMEs. The overall tendencies within SMEs in terms of digitalisation in rural areas is that the main focus is still on digitising the business, but more and more companies are also interested in digitalising their businesses and find new business models. Digital transformation often happens in SMEs which are located in larger towns.

5. Conclusions and advice for policy makers

This project aimed to provide a rural perspective on digital innovation, with a focus on the challenges and opportunities faced by small and medium sized enterprises (SMEs) in rural and sparsely populated areas. It did so in the context of one of the goals set by the Ministers responsible for digital development in the Nordic-Baltic countries and autonomous territories: **Strengthening the competitiveness of our enterprises through digitalisation**. The project included a baseline study, workshops held in rural locations around the Nordic-Baltic Region, and a webinar series.

This report has brought together the results from this work. It explored the urban-rural digital divide from the perspective of both digital infrastructure and digital competence, highlighted the key challenges and opportunities for small enterprises in three key rural sectors, and provided an overview of support structures in the different countries. This final section reflects upon the key themes of the report to provide some conclusions and advice for policy makers. These conclusions may also be relevant for practitioners working with business development at the national, regional and local levels. The advice is summarised in Box 16 and described in detail below.

Digital infrastructure is the foundation for digital innovation and, as such, ambitious broadband connectivity targets have been set by all countries in the Nordic-Baltic Region. Progress towards these targets has been good overall. Disparities remain however, with households in rural and intermediate areas less likely than their urban counterparts to have access to a high-speed broadband connection. Ensuring equal access to infrastructure for all is a crucial step towards bridging the urban-rural digital divide. Thus, it is vital that all countries **continue to work towards broadband infrastructure provision targets until every last household is connected**.

With respect to digital knowledge and skills, small and medium sized enterprises in rural areas face a double digital divide. Their size means

Box 16. Summary of recommendations

1. Continue to work towards broadband infrastructure provision targets until every last household is connected.
2. Acknowledge the stage companies are at in their digital journey.
3. Frame digitalisation in a way that small enterprises in rural areas can relate to.
4. Take an individualised approach that generates a dialogue between technical experts and experts in traditional industries.
5. Develop locally-anchored initiatives to support SMEs in rural areas to engage with digitalisation.
6. Focus on the development potential digitalisation presents.
7. Work collaboratively with the local community to address the implications of increased digital media attention for tourism sites.
8. Take a company-centred approach and promote mutually beneficial collaboration.
9. Create opportunities for cross-border collaboration between participants in successful locally-driven digitalisation initiatives.

that they are less likely to have implemented digital tools than larger companies and their geographic location means that they are less likely to have access to people with high levels of digital competence than SMEs in urban areas. Addressing this is complex, and begins with the need to **acknowledge the stage companies are at in their digital journey**. For example, a workshop on how to digitally transform your business model is unlikely to appeal to a company that is yet to employ digital tools beyond basic internal administrative processes.

At the same time, it should not be assumed that all companies are immediately aware of the relevance of digitalisation to their business. For many, digitalisation has become a buzz word which conveys little meaning. As such, it is important to **frame digitalisation in a way that small enterprises in rural areas can relate to**. One potentially useful approach is to put less focus on the digital tools themselves and more focus on the outcomes that may be achieved or the risks associated with inaction. Importantly, these outcomes and risks are likely to vary by sector, geography and even between individual businesses.

Given this diversity, it is necessary to **take an individualised approach that generates a dialogue between technical experts and experts in traditional industries**. This may mean rethinking the challenge at hand. Perhaps it is not only about traditional industries getting on board with digitalisation, but also about people with digital expertise getting better at working within a diverse range of sectors. This may involve visiting farms and production sites and getting to know the people behind the processes. These interactions are vital in developing trust, which may be an important step in getting companies to take the leap into unknown digital ground. These interactions can also help to breakdown communication barriers, providing an opportunity to develop a common language through which to collaboratively explore the potential for digital innovation in different sectors.

Alongside the need for tailor-made approaches within different sectors, it is crucial to **develop locally-anchored initiatives to support SMEs in rural areas to engage with digitalisation**. While the overall goals may be set at the regional, national or even supranational level, the strategies to get there should be developed through a dialogue with the relevant local actors (e.g. local business associations). These actors play a vital role in getting local businesses on board with the need for change. For example, the biggest challenge that most workshop participants reported facing was unequivocally a lack of time. This meant that they were unlikely to seek out support related to digitalisation unless they had a specific reason to do so. On the other hand, when approached by a trusted local actor, these same companies were much more open to collaborating with public actors, universities and other experts to explore the opportunities that digitalisation might hold.

These recommendations are relevant in all sectors in different ways. Within the bioeconomy, the re-framing of the conversation was the most central point. Here, it is important to recognise that the adoption of digital tools is not an end in itself and instead **focus on the development potential digitalisation presents**. This potential is multifaceted and includes the creation of new products, services and even industries. Though based on rural resources, these opportunities may require new types of collaboration that strengthen urban-rural linkages. The digital transformation of the bioeconomy also has the potential to make jobs in traditional bioeconomy sectors appealing to a broader cross-section of people. This could result in job opportunities in rural areas for young people with high levels of education and may also make these sectors more appealing and accessible to women.

In the tourism sector, digital media has become increasingly powerful in shaping tourist choices while at the same time creating a range of new business opportunities. Small enterprises generally found it easy to relate to the concept of digitalisation but required guidance on how to use digital tools and determine which ones were best for their purposes. At the same time, tourism actors recognised an inherent tension between the infinite potential of digital reach and the finite capacity of the natural environment and the local communities. Thus, while growing the tourism sector may promote economic development in rural areas, it is important that this development is consistent with the capacity of the local area to receive tourists.

To address this, those responsible for promoting tourism at the different levels should **work collaboratively with the local community to address the implications of increased digital media attention at tourism sites**. This may include developing an understanding of what improvements might be necessary to protect a natural site in the event of larger visitor numbers (e.g. designated paths, signage, toilet facilities). It may also include working with local residents to explore potential business opportunities that may emerge in light of increased tourist numbers.

For small manufacturing companies, a central challenge was understanding how abstract concepts like digitalisation and industry 4.0 relate to their business. Getting over this hurdle requires initiatives that **take a company-centred approach**

and promote mutually beneficial collaboration.

Partnerships between companies or between companies and universities can be a particularly important driver of innovation, providing small companies with access to knowledge and expertise that may otherwise be out of reach (e.g. if they had to employ a consultant). It is important however, that those providing the expertise are prepared to meet the company where they are, both physically (by visiting their production site) and metaphorically (by acknowledging where they are at on their digital journey).

Finally, it is important to highlight the opportunities for Nordic-Baltic cooperation that exist within this space. Though the data collected does not allow for robust cross-country comparisons, it is interesting to note that similar challenges were raised in the different countries. At the same time, support structures appear to be nationally driven and do not tend to incorporate cross-border learning opportunities. The one example that we came across of cross-border collaboration came about through a personal

connection between the business and a university abroad. This suggests an untapped potential for collaboration and knowledge sharing that could boost digital progress in the region. Importantly, such collaboration should still respect the principals described above and be anchored at the local level.

Given this, a good first step could be to **create opportunities for cross-border collaboration between participants in successful locally-driven digitalisation initiatives**. These opportunities could be a valuable source of knowledge sharing and inspiration. They would also provide the space for cultural exchange, initiating a dialogue that may in time inform a shared understanding of what exactly constitutes digital progress in the Nordic-Baltic Region. Providing a place for rural actors in such a dialogue is vital to ensuring an inclusive approach to digitalisation in which no one is left behind. When the benefits of digitalisation are evident across all segments of society, the Nordic-Baltic Region can truly lay claim to the title of digital front runner.

Box 17. Reflections in the context of COVID-19

As we were putting this report together, the COVID-19 pandemic was unfolding across Europe and around the world. The long-term implications of this event are as yet far from clear and, as such, we made a deliberate choice not to speculate on the situation in presenting our results. Nevertheless, it is worth reflecting briefly here on several relevant aspects. First, the social distancing measures put in place have brought digital communication tools sharply into focus. To take just one example, the videoconferencing program Zoom, which had 10 million users in December 2019, had over 200 million registered users in March 2020 (Evans, 2020). This event will undoubtedly result in a collective boost to our digital skills – In particular, our ability to derive value from online interactions that is equivalent or at least comparable to that which can be achieved face to face. Continued development of these new skills once social-distancing measures are lifted

has the potential to be extremely powerful in making distance-working arrangements a genuine rural-development policy tool.

Second, the economic consequences of the pandemic will no doubt have an impact on small rural enterprises. The most immediately obvious is perhaps the impact of limited mobility on the tourism sector. Global supply chain issues and changes in consumer behaviour are also likely to affect companies in manufacturing and bioeconomy industries. Interestingly, there are already some signs of digital innovation in the responses of these industries. For example, Visit Faroe Islands is experimenting with the concept of "remote tourism"¹¹ and Airbnb is giving hosts the opportunity to offer "online experiences" such as classes for cooking up local treats and performances or lectures that share elements of local culture¹². In Norway, *Bord til Jord* (From table to field) is responding to shortages in foreign seasonal workers in the Norwegian agricultural sector by providing a platform to connect farmers with recently unemployed people¹³.

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