DIGITISATION: ECONOMIC AND SOCIAL IMPACTS IN RURAL AREAS

NATIONAL POLICY ANALYSIS

FINLAND

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National Policy Analysis | Finland

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Content

Executive Summary

In European comparison, Finland is sparsely populated. There are some exceptions. Over one million citizens (from a little over 5 million population) live near the capital, Helsinki (officially Uusimaa Region). So, there is a dynamic metropolitan area which has good connections globally. There are some other cities with over 200 000 inhabitants (Tampere, Turku, Oulu) but otherwise the bigger population centres can be described as university cities. Smaller cities can be described as industrial centres or sometimes market towns. Around these cities there are rural areas that consist of forests and agricultural lands. Policies for digital transformation must be successful in very diverse areas. One measure or mindset is not enough to fulfil everyone's wishes.

Finland is one of the leading countries in EU in digitalisation (see DESI 2020). Still two latest governments (lead by Juha Sipilä and Sanna Marin) have not written down a comprehensive digital strategy for Finland. Is this a paradox?

Policy analysis is much easier if there is a single document that you can analyse and quote. In a very dynamic environment, rigid strategies may not age well. If the digital technologies change quickly, making strategies may not be best way to enter the future.

Finland still makes special strategies for some digital technologies (Strategy for Artificial Intelligence was made in year 2021). So, Finland has not lost trust in strategic management tools. Making strategies is not a question of principle and we can approach the question from a pragmatic view.

If there is any doubt if digitalisation is a global megatrend or if there is disagreement about the significance of digitalisation, a government needs a Digital Strategy to show direction for other actors and its commitment to advancing digitalisation in all sectors. In Finland we already have many successful companies (Nokia in network building, Supercell in games) in digital business. EU programmes (and other funding schemes) always have an implementation strategy which discusses digitalisation. Consensus has been found. New Grand Challenges like mitigating climate change always have digitalisation as a part of their toolbox. If all agree on the basics of the policy, it is enough that the administration implements the policy effectively (and firms invest in digital technologies).

Ministry of Agriculture, Forestry and Rural Areas can govern digitalisation in the sectors that are under its jurisdiction. Natural Resources Finland (Luke) is a big research and development institute that has ongoing projects in agriculture, forestry, and rural areas. Luke plays a key role in developing the conditions of the industrial internet for the needs of the Finnish agricultural and forestry machinery industry. Diversity is an advantage as sectors can learn from each other.

Primary industries still have a lot of development potential which can be reached using digital technologies. Digitalisation can promote the management of seasonal variations in agriculture. In forestry digitalisation helps the minimisation of harvesting traces and damage. By increasing the use of spatial data, the choice of the right equipment and harvesting time can be made more efficient. Common physical and virtual research platforms offer a unique environment for testing system

compatibility. Similar farm scale research and testing environments are rare. Legislation can also be included in the systems, thus reducing the bureaucracy of support control.

Forestry sector in Finland is big in comparison to EU average. In Finland, forestry is more important in Eastern and Northern Finland as the West Finland has more agriculture. In Finland, the digitalisation of forestry machinery is one step further than that of agricultural machinery – in fact, it represents the top of the world. Digitally, the management of timber cutting, the utilisation of spatial data and map systems, and the fault diagnostics of machines are handled. In forestry, digitalisation largely means that silent, existing data is analysed, combined, and effectively shared with everyone. By utilising and combining open data, new, valuable forecasts can be made.

Luke develops cost-effective and environmentally friendly methods for forest management and harvesting. Another development area is the development of wood cutting, so that the quality of wood and the needs of down-to-further processers can be considered. The third big theme is precision forestry. In the past, extensive forest patterns were treated homogeneously, now unique growth environments can be utilised and treatment and editing methods can be targeted. (https://www.luke.fi/tietoa-luonnonvaroista/digitalisaatio/metsatalous-ja-digitalisaatio/)

Because of EU and national subsidy policy, dairy farming is concentrated in Northern Finland. Also, climate dictates that cereal growing in the northern parts of Finland is not possible. In Southern Finland, there are pigs, chicken and cereal growing. So, markets for automated milking system are in the North and investing in precision agriculture should be most profitable in the big farms of the South.

Even if Finland does not have a written strategy, we can gather many small decisions and recommendations from various sources and conclude ex-post what has the Finnish digitalisation policy been. What we miss is a forward-looking plan that anticipates coming changes and analyses weak signals to find out coming disruptions. Education, capacity building and skill development takes time so they cannot be easy solutions during coming crisis. Leverage can be gained if all actors have parallel strategies and outcomes are not fragmented. On the other hand, in dynamic markets, where technologies compete, inflexible strategies can lead to disasters.

1. Introduction

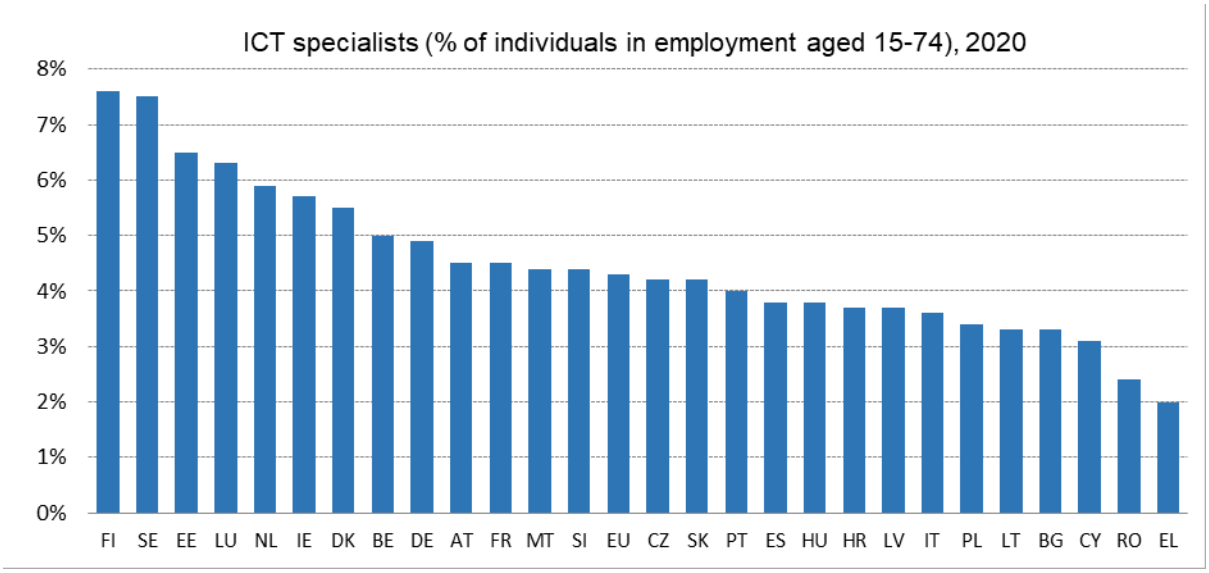
1.1 Context

Digitalisation has led to the emergence of the data economy. In the data economy, the availability and portability of data are key components of value creation. A few years ago, the European Commission estimated that the value of the EU data economy could rise to EUR 739 billion by 2020. The number of data enterprises would increase by 100,000 to top 350,000, and the number of data workers would rise from six to ten million. The European cloud services market, meanwhile, would be valued at just under EUR 45 billion. It has been suggested that data is no longer a commodity but a form of capital that no longer accumulates as a by-product of other activities but instead is actively collected and acquired from everyone and everywhere to be sold onward and used to enhance the efficiency of organisations' own activities. Digitalisation and the ensuing data economy interact with other ongoing global trends and are therefore linked also to key global challenges such as climate change and the deterioration of natural environments. (Ojala et al 2020, 23–24)

Earlier on, the company sector has been Finland's leading digital sector. Now the position of the Finnish companies is slightly waning in the international comparison. The ICT sector, i.e. the manufacture of computers, electronics and optical products (1,5 % of GDP), telecommunications (1 % of GDP) and data processing services (2,8 %), accounted for around 5.3 % of Finland's GDP in 2019. This is 0,5 %-points less than in year 2018. (https://www.ficom.fi/ict-ala/tietopankki/ict-toimialan-tunnuslukuja/ict-toimialan-merkitys/ict-toimiala-ja-bruttokansantuote/)

Furthermore, studies show that on some dimensions the digital skills of Finns are the best in the EU. At EU level, 4.3% of its workforce are ICT specialists. Figures per Member States range from 2% in Greece to 7.6% in Finland. This proves that the prerequisites for success in digitalisation are excellent. (https://vm.fi/en/digitalisation)

Figure 1. ICT specialists (% of individuals in employment aged 15-74) by Member State, 2020



Source: Eurostat, Labour force survey, SWD (2021)

Finland ranks second in Digibarometer 2021, which compares 22 countries with a composite index consisting of 36 variables. Digibarometer is a Finnish study which evaluates how well individual countries utilise digital capabilities. General factors such as educational levels or a country's role as a producer of ICT do not affect the scoring. The measurement is done on three levels (capabilities, utilisation, and implications) and across three sectors (company, civic, and public). (Mattila et al 2021)

Finland has been among the three best countries in the Digibarometer during the eight years it has been carried out. Finland's high placement is explained by its even performance across various indicators. Finland's capabilities to utilise digitalisation are among the best in the world as well as the actual utilisation (3th place). Regarding implications, however, Finland scores lower (6th). In the impact of ICT capital on GDP growth, we remain among the most underperforming countries in the group of similar countries. Finnish online stores sell abroad less often than others. Earlier on, the company sector has been Finland's leading digital sector. Now the position of the Finnish companies is slightly waning in the international comparison (4th this year). Simultaneously, the public sector (1st) rises its ranking, thus assuming the role of the new cornerstone of Finland's placement. In the civic sector, Finland ranks also well and is now in the fourth place. (Mattila et al 2021)

AFR policy context

There is a relatively good level policy integration and coordination in agricultural and rural policy in Finland. Rural Development Programmes are delivered through the Ministry of Agriculture and Forestry (Managing Authority) and the Finnish Food Authority (Paying Agency). However, certain

Managing Authority functions for both the EAFRD and ERDF and Paying Agency for the EAFRD have been delegated to network of provincial government offices (Centres for Economic Development Transport and the Environment – ELY Centres). The Regional Councils take care of distributing the EARD development funds. This organisation model may seem complex but in practice it enables complementarity between different funding instruments and strategies (for example, the strategy for digitisation, investments in basic services under the EAFRD, ERDF investments, LEADER, Municipal investments). The closeness of the actors to rural areas also increases the speed of project approvals and payments. The partly EU-funded Finnish National Rural Network plays an important role in transferring good practice between different initiatives.

Rural policy programme 2021–2027 (Countryside renewing with the times) is an action programme of the Rural Policy Council. It is implemented in broad cooperation with different stakeholders and the commitment of actors in the rural policy network to promoting common objectives is important. The current seventh programme sets out objectives and measures for rural development. The overall programme's period is longer than the government term and is in line with the EU programme period. Rural policy programmes give concrete light and refine the national regional development decision. Rural programmes aim to influence the state budget in different sectors, but they are not funding programmes (cf. ERDF and ESF). The overall programme will be implemented within the framework of central government framework decisions and resources in accordance with state budgets. Some of the objectives can be met by the EU programmes.

Rural development article of the state budget finances the operational expenditure of the Rural Policy Council and national rural research and development projects. The projects are also partly financed by the Agricultural Development Fund. The most important resources for rural development are under the EU's co-funded rural programme and the Structural Funds programme (ERDF and ESF).

Rural policy programme 2021–2027 wants to ensure comprehensive telecommunications in rural areas. High-speed and consistent telecommunications connections significantly reduce the disadvantages of geographical distances for business and training and the organisation of services. They enable independent work, entrepreneurship, and studies, as well as the production of services. Optical fibre connections affect the positive demographic development of the place and the development of business activities. High-speed and consistent broadband connections are a vitality investment in rural areas.

In Finland, fibre optic construction has progressed more slowly than expected, which is why the national or EU policy objectives for construction have not been achieved. The availability of fibre optic is still poor in much of the country and the construction of fibre optic networks has been fragmented. The Finnish difference in the connectivity of high-speed fixed broadband between rural and urban areas is one of the largest in the EU. Improving access to high-speed broadband in areas where connections are not built on market terms still requires public support.

Rural policy measures:

- Ensure that the EU Commission's objective of the gigabit society is achieved.
- Support the nationwide coordination of the construction of high-speed broadband networks.

- Assess the socio-economic and regional economic impact of available broadband connections from the perspective of municipalities and rural enterprises. The targets of the review are social and health care services, education, cultural services, as well as economic development, as well as public costs vs. investment/productivity.

2. Context for (rural) digitalisation

2.1. Current context for digitalisation

2.1.1. Introduction

Public sector in Finland wants to be technology-neutral in its actions. So, it says it wants to have good connections to Internet in rural areas, but it does not say that connections need to be fixed or mobile. Finnish government wants that market forces decide which technology is best. This is not a policy for transformative change or mission led innovation. Targeted invest would channel resources to the new digital technologies. Targeting could work well if it strengthened the reinforcing feedbacks of innovation and diffusion. Of course, targeting is risky and sometimes bad things happen.

In democracies, the outcomes of political processes are usually different from market solutions in other respects. Market solutions rarely worry about inclusion and weak groups in society. Finland has good connections if you count how many households have access to certain technology (like 5G or broadband). At the same time Finland can be one of worst countries in EU when focus is on rural connections. One reason for weak situation in rural areas is that it is nor economically profitable for network operators to offer broadband for rural households. Cooperatives, associations, and municipalities have tries to solve market hole by offering broadband regionally. Third sector and civil society actors have more challenges in financing the building of the network as banks do not value the build network to either its full value or at all (since broadband is sunk, irreversible investment).

Research and public debate on digital gaps used to focused on who has or does not have access to computers and mobile devices. It was thought that providing a network connection or terminal device for everyone will eliminate the problems of participation in the future. There are many other dimensions in the digital divide. The level of digital skills is important factor on the demand. In the supply side, the amount of digital public and private (banking and shopping online) services available effect the usage.

As public services develop towards the primacy of digital services, we must ask many questions (https://vm.fi/miten-digitaalisuus-vaikuttaa-arkeen-).

1. Who benefits from digitally provided services and who is left on the margins?

2. How does society take care of citizens' involvement and the continuous development of knowledge?

3. How will digital use and increasing technology-mediated interaction change our culture?

4. What kind of functionality does digital use increase? As users, are we passive media content targets and consumers, or are we able to use digitalisation as an extension of our creativity and as a tool for new production?

2.1.2. Broadband coverage and adoption

Fixed connections are needed above all for services that require high and predictable connection speed. At present, the fastest and most reliable fixed connections are provided using optical fibre and they also serve as the foundation for the high-speed wireless connection transmission network. The deployment of new fibre-optic connections continues to be built and existing copper connections are being replaced with optical fibre.

At year-end 2019, fixed-network broadband subscriptions in Finnish homes numbered around 1.53 million and the number of business subscriptions was around 210,000. While there was only a slight increase in the numbers from previous years, the speeds of fixed-network broadband connections are clearly rising. This is partly due to slower technologies being replaced with newer and faster ones. Over 40% of all fixed-network broadband connections had a speed in the range of 100–300 Mbit/s. (LMM 2020)

At year-end 2019, mobile broadband subscriptions in Finland numbered well over 2 million. Nearly 80% of these were used by households and almost all included unlimited data. The volume of data transmitted over the mobile communication network has rapidly increased in Finland between 2007 and 2019. As result, in Finland, the take up of fixed broadband in rural areas is much lower than the EU average (see DESI 2020).

The Digital Agenda for Europe (2010) called for broadband coverage of at least 30 Mbps for all Europeans in 2020. In practise this next-generation network infrastructure reached 85.8 percent of European households in 2019. Over the last year and a half internet speeds in Europe have increased by more than fifty percent. Unfortunately, the gap between urban and more rural areas, and between north European countries and those in the south-east, has also grown.

Internet performance in Europe has improved dramatically over the past year and a half. Average fixed line download speeds have increased by more than half (+51.9 percent), from 68 Megabits per second (Mbps) in March 2020 to 103.3 Mbps in June 2021. Over the same period, upload speeds increased by 44 percent, from 32 to 46.2 Mbps.

According to a Eurobarometer survey published at the beginning of the year, 9 out of 10 Europeans have not changed their internet subscription type during 2020. This is even though restrictive measures linked to the pandemic have led many people to work and study from home, where they may have to share the same connection with other family members. It is therefore likely that the increase in speeds is due to a general improvement in the services offered to users under unchanged economic conditions.

Average internet speed in Europe's regions (NUTS 3) tell us that (see https://datavis.europeandatajournalism.eu/obct/connectivity/#third) in the fourth quarter of 2020

Central Ostrobothnia had average download speed of 55.02. The measured average download speed of Central Ostrobothnia is one among the worst of all regions in Finland.

The availability of optical fibre in Finland at the beginning of 2020 was as follows: (https://www.ruralpolicy.fi/paatoksenteon-tueksi/tietoa-ja-tyokaluja/laajakaista)

At the end of 2019, 64 per cent of households had fast fixed broadband reaching 100 Bit/s or more. That's nearly 1.8 million households. Optical fibre, on the other hand, was available for 38 per cent of households. The total number of fibre subscriptions in Finland was 977,000, including those used by companies. Most fibre connections were used in households.

Optical fibre connection was available for 26 per cent of all Finnish buildings. Availability was unevenly distributed: only 25 per cent of terraced houses and detached houses had been fibred, compared with 43 per cent of blocks of flats.

In urban municipalities, only 17 per cent of detached houses had optical fibre access available. By contrast, the situation was much better in rural municipalities, with fibre-optic detached houses accounting for up to 38%. The availability of optical fibre in blocks of flats in these two types of dwellings were almost the same.

Optical fibre investments have been good EUR 170 million per year for the past two years. Over the past two years, fibre cable investments in the access and local area network have accounted for nearly 70 per cent of all fibre investments. The remaining 30 % of fibre investments will be used for backbone and base station connections.

According to EU policies, fixed broadband availability with a download speed of at least 100 megabytes must be 100% of households by 2025, both in cities and rural areas. This target has not been achieved in any region of Finland by the end of 2019.

The availability of optical fibre in the whole of Finland is 38 per cent, in urban areas 39 per cent and outside urban areas 25 per cent. The availability of a fixed network in households is 64 per cent in the whole of Finland, 70 per cent in urban areas and 25 per cent outside urban areas.

The availability of fixed broadband will not be more than 43 per cent in single-family houses and leisure buildings completed in 2018-2019. In rural areas, the availability of fixed broadband in new buildings is less than 24%.

Leisure buildings are often located in rural areas, while single-family houses are in urban frame areas. In rural areas, the availability of fixed broadband appears to be significantly worse than in cities. In sparsely populated rural areas, only 12 per cent of completed buildings were in fixed broadband.

Impact and importance: a functional infrastructure as a platform for vitality

Effectiveness in fibre optic construction arises according to the need – input – output – outcome – impact chain as follows:

1. Need: fibre optic is an investment in the future. Operational and fast telecommunications networks are basic infrastructure comparable to road and electricity networks.
2. Input:

    1. Public support: political decision-making and the guidelines of the municipal strategy are a prerequisite for public support.
    2. Private funding: private funding is also needed to build a fibre network. To ensure this, there must be sufficient demand for broadband connections.
3. Output: there are also operational and fast telecommunications networks in the area.
4. Outcome: fast connections will enable new services to strengthen traction power of rural areas.
5. Impact: the vitality and competitiveness of rural areas will increase, leading to opportunities for work and entrepreneurship, as well as positive demographic trends.

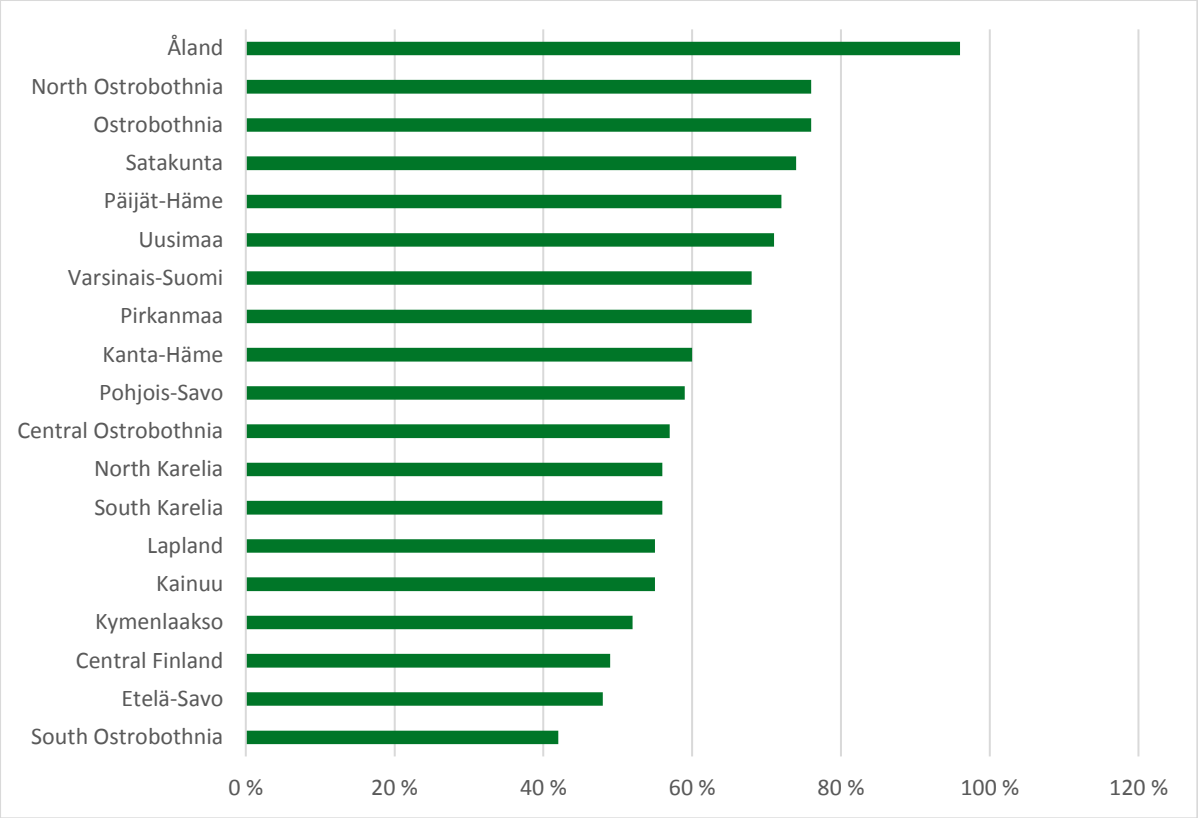
Infrastructure is one of the determinants of regional development. Fibre optic construction can trigger a circle of positive development.

Fibre optic investment as a threshold investment creates a spiral of positive effects on these themes:

1. Digital services are made available.
2. Services in everyday life and working life are improving.
3. Business impacts, location independence, favourable operating environment, accessibility will be improved.
4. Housing and leisure.
5. The transformation of work and the use of new technologies.
6. Teleworking, multi-location, soft attraction factors in rural areas.
7. Vibrant and competitive countryside.

Average internet speed in Europe's regions (NUTS 3) tell us that (see https://datavis.europeandatajournalism.eu/obct/connectivity/#third) in the fourth quarter of 2020 Central Ostrobothnia had average download speed of 55.02. The measured average download speed of Central Ostrobothnia is one among the worst of all regions in Finland. Traficom's statistics show the coverage of fast broadband in regions where Central Ostrobothnia is in the middle of the group.

Figure 2. Download speed > 100 MB (percentages in Regions).



Source: Traficom, https://www.traficom.fi/fi/tilastot/kiintean-verkon-laajakaistasaatavuus

2.1.3. Digital divide

Existing digital divide

The services provided by the ICT sector are changing the ways people interact as well as processes in a wide range of industries. A few decades ago, few could imagine the extent of the changes in the way we work and play brought about by mobile communication and digital services. Similarly, we cannot yet know how virtual and augmented reality, voice and gesture controls, the Internet of Things (IoT), blockchains, quantum computing and technologies that are now only emerging will change the ways we do things, or what their externalities might be.

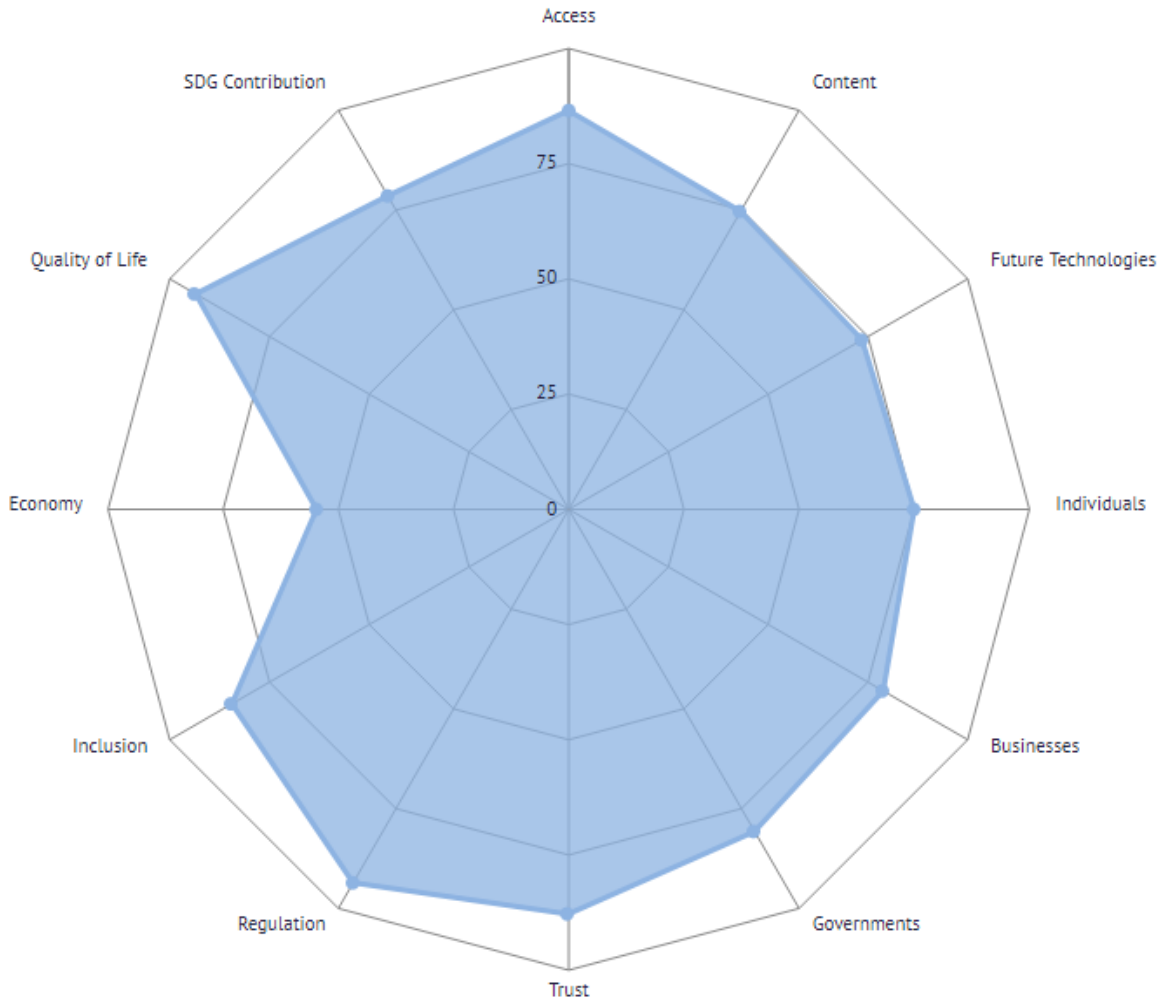
As devices, services and all of society are going online to an increasing extent, huge volumes of data are being accumulated on services, devices, users, businesses, and all other elements of society alike. The term used for this is global datafication. Vast investment is made in the storage, processing and

analysis of data, and some of the success of current major corporations is based on their ability to collect and capitalise on data and to use it to predict the behaviour of the individual.

Network Readiness Index (NRI) has been developed by World Economic Forum. NRI is one of the leading global indices on the application and impact of ICT. In 2020, the NRI Report maps the network-based readiness landscape of 134 economies based on their performances in four different pillars: Technology, People, Governance, and Impact. Each of these pillars is itself comprised of three sub-pillars that have been populated by a total of 60 variables.

In 2020 Finland is ranked as 6. with a NRI score 80,16. Finland is strongest on people (3.) and governance (5.) pillars, but technology and impact (both rank 9.) are not as successful. In people pillar all sub-pillars perform in the same way. In impact performance is very different in sub-pillars: quality-of-life is 3., but economy 17. and SDG contribution 28.

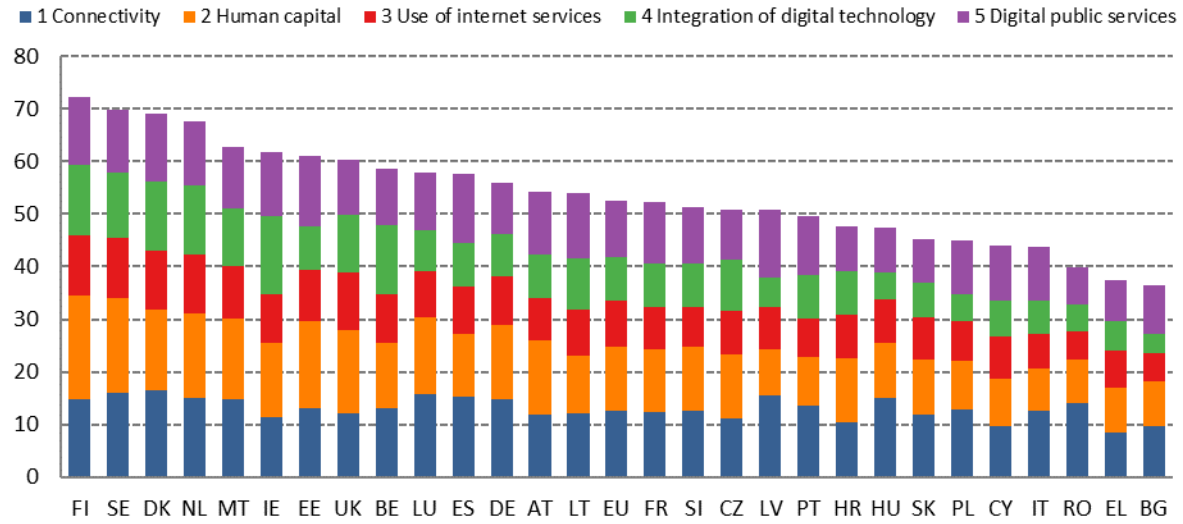
Figure 3. Finland: Network Readiness Index Sub-Pillars (2020 Score, 0 = Worst 100 = Best)



(https://knoema.com/infographics/ljisicg/network-readiness-index-2020-digital-transformation-at-a-glance)

Digital Economy and Society Index (DESI). This is a composite index elaborated by the European Commission that summarises relevant indicators on Europe's digital performance and tracks the evolution of EU Member States in digital competitiveness. The EU uses the DESI to measure the availability of fast broadband internet access, the population's digital skills and internet use, the integration of digital technology by businesses and digital public services, and ICT research and development. Along with Sweden, Denmark and the Netherlands, Finland consistently scores high on the index and was ranked as number one both in 2019 and 2020.

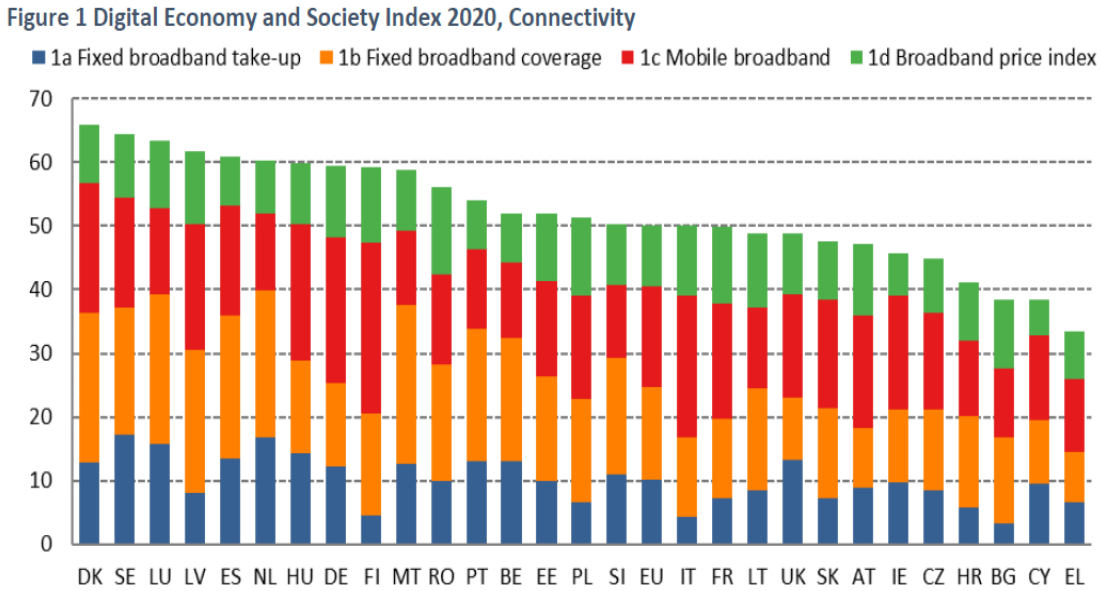
Figure 4. Digital Economy and Society Index 2020 components by counties.



Source: DESI 2020, European Commission.

DESI Report also includes information on connectivity and on the so-called Next Generation Access (access to the following technologies: FTTH, FTTB, Cable Docsis 3.0, VDSL and other superfast broadband (at least 30 Mbps download)), differentiating between rural and urban areas.

Figure 5. DESI 2020 by countries and broadband characteristics.



Source: DESI 2020, European Commission.

The leading EU countries in DESI also rated very well in the International Digital Economy and Society Index (I-DESI) which includes also non-EU countries (such as South Korea, Iceland, Norway and the United States).

The **Women in Digital Scoreboard 2020** (https://digital-strategy.ec.europa.eu/en/library/women-digital-scoreboard-2020) provides an analysis of the digital divide by gender. In 2020 Finland is ranked as 1. with a score 74.7 (EU: 54.5). In Finland there are relatively more female ICT specialist than in the EU, but still the percentages are unacceptable low.

Figure 6. Women in Digital Index.

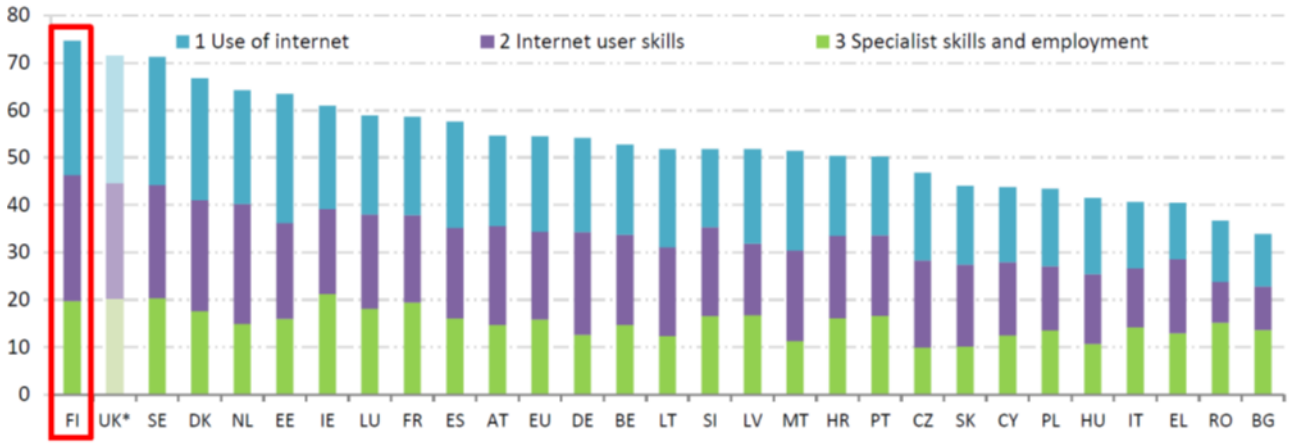


Table 1. Use of Internet by gender in Finland and EU.

	Finland Women value	Finland Women rank	Finland Men value	EU Women value	EU Men value
1 Use of internet					
1.1 Internet users % individuals, 2019	**94%**	**5**	*93%*	**84%**	86%
1.2 People who have never used the internet % individuals, 2019	**3%**	**4**	*3%*	**10%**	9%
1.3 Online banking % internet users, 2019	**96%**	**1**	*95%*	**65%**	67%
1.4 Doing an online course % internet users, 2019	**22%**	**1**	*22%*	**11%**	11%
1.5 Online consultations or voting % internet users, 2019	**17%**	**3**	*14%*	**12%**	12%
1.6 e-Government users % internet users submitting forms, 2019	**94%**	**2**	*95%*	**66%**	68%
1 Use of internet Score (0-100)	**85**	**1**		**60**	

Source: DESI/Women in Digital Scoreboard 2020.

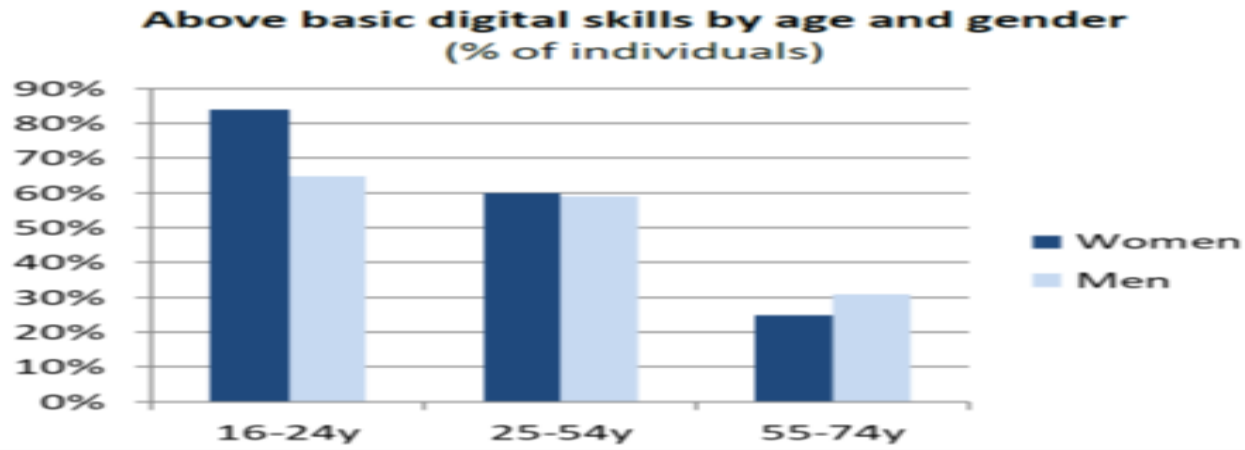
Table 2. Internet user skills by gender in Finland and EU.

2 Internet user skills					
2.1 At least basic digital skills % individuals, 2019	**78%**	**1**	*75%*	**56%**	60%
2.2 Above basic digital skills % individuals, 2019	**50%**	**1**	*50%*	**31%**	36%
2.3 At least basic software skills % individuals, 2019	**78%**	**1**	*76%*	**59%**	63%
2 Internet user skills Score (0-100)	**80**	**1**		**55**	

Table 3. Specialist skills and employment by gender in Finland and EU.

3 Specialist skills and employment					
3.1 STEM graduates Per 1000 individuals aged 20-29, 2018	**13.4**	**12**	33.7	**14.3**	26.3
3.2 ICT specialists % total employment, 2019	**2.8%**	**2**	*10.3%*	**1.6%**	6.2%
3.3 Unadjusted gender pay gap % difference in pay, 2018	**13%**	**7**		**18%**	
3 Specialist skills and employment Score (0-100)	**59**	**4**		**48**	

Figure 7. Above basic digital skills by age and gender in Finland.



In Finland, young women are more qualified in digital skills than males. Working age population has the needed digital skills. Older generations have modest skills but this time males are the more skilful gender.

In the **Digital Barometer 2021** (Mattila et al 2021) Finland retains last year's second position. Denmark is like last year, at the top of the comparison, and Sweden rises from sixth to third place. United States drops out of third place fifth, while Norway also wedges past it, finishing fourth Nordic success. Netherlands is in sixth place. (Mattila et al 2021)

Relative to similar countries, Finland has advanced legislation on information and communication technologies (ICT), competition works well in communications services, funding for technological

development is well available, public data is relatively open and the scope and quality of public online services are excellent. Finnish citizens rely on the information security of government systems. In the widespread incidence of the use of electronic services by public authorities, Finland is among the top countries in comparison.

Despite our good rank, there is room for improvement. Finland could use ICT to improve the productivity of public services. Similarly, public procurement could increasingly promote the development and use of high technology.

Finland is doing excellently in relation to the similar countries in the digital skills of our citizens, and online expertise is very available. Even in mobile broadband, we are among the best and basic services such as social and health services, education, banking, and insurance services are well available through information and communication technologies.

On the other hand, the widespread incidence of fixed broadband connections is middle-of-the-line, as well as in the activity of internet use and social participation using ICT.

Urban-Rural digital divide

Finland performs poorly in NGA and VHCN broadband coverage. This is surprising as Finland was one of the best nations in DESI measurement. Where fixed broadband take-up is comparatively low, many households rely purely on mobile technologies at home. Finland stands out in this category with 35 %. So, in Finland fixed and mobile broadband can be seen as competitors.

Figure 8. Rural NGA broadband coverage in 2020.

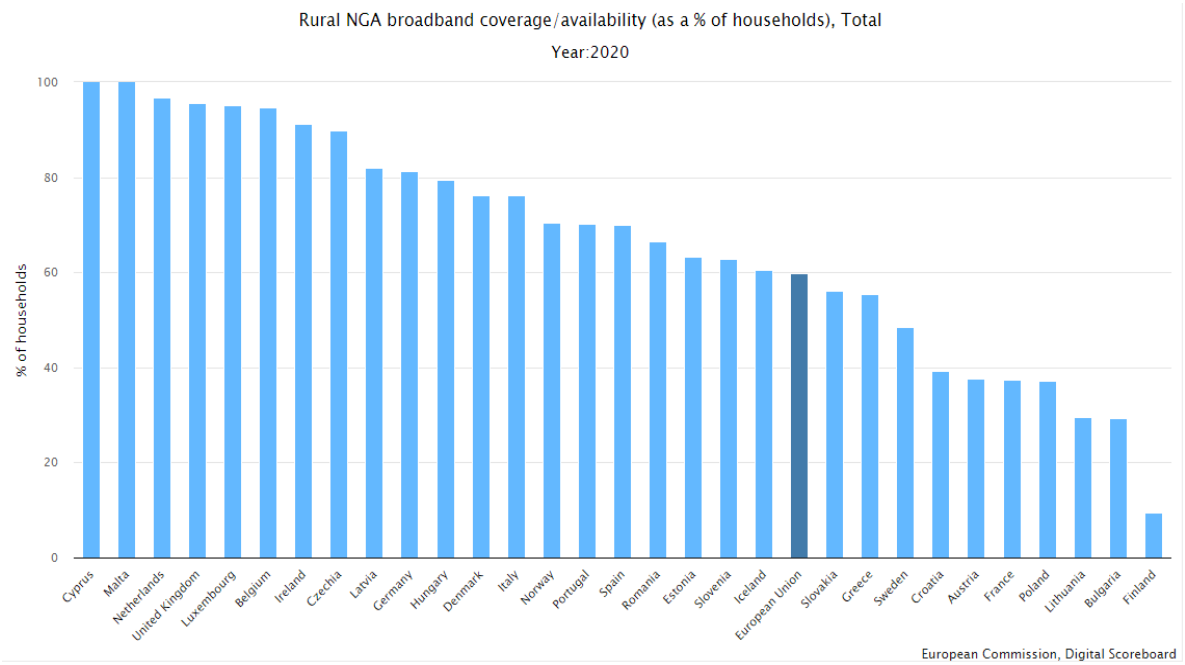
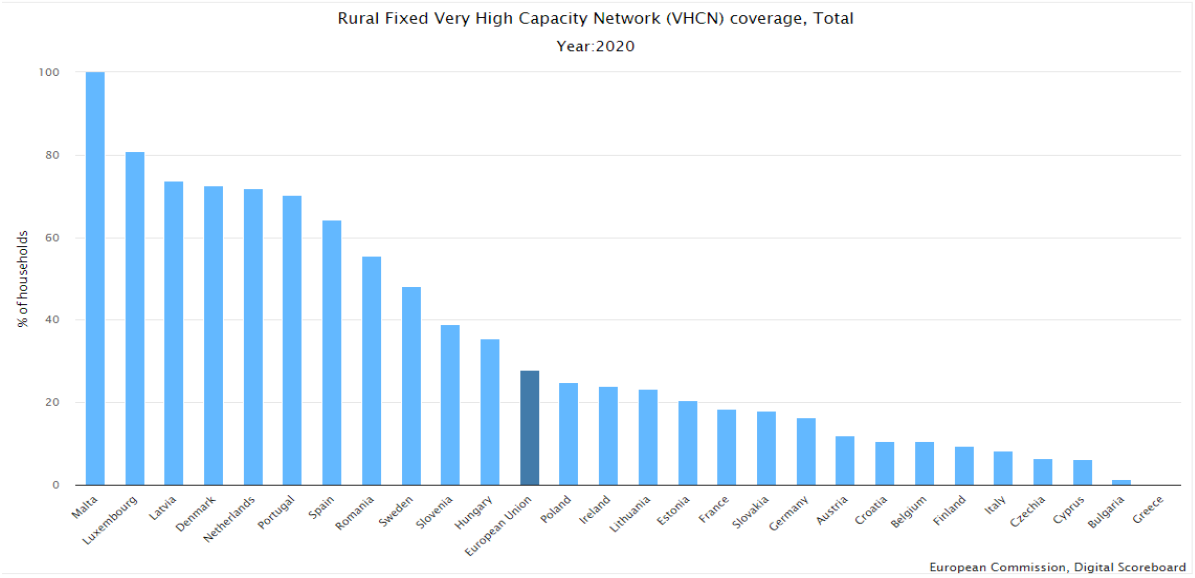


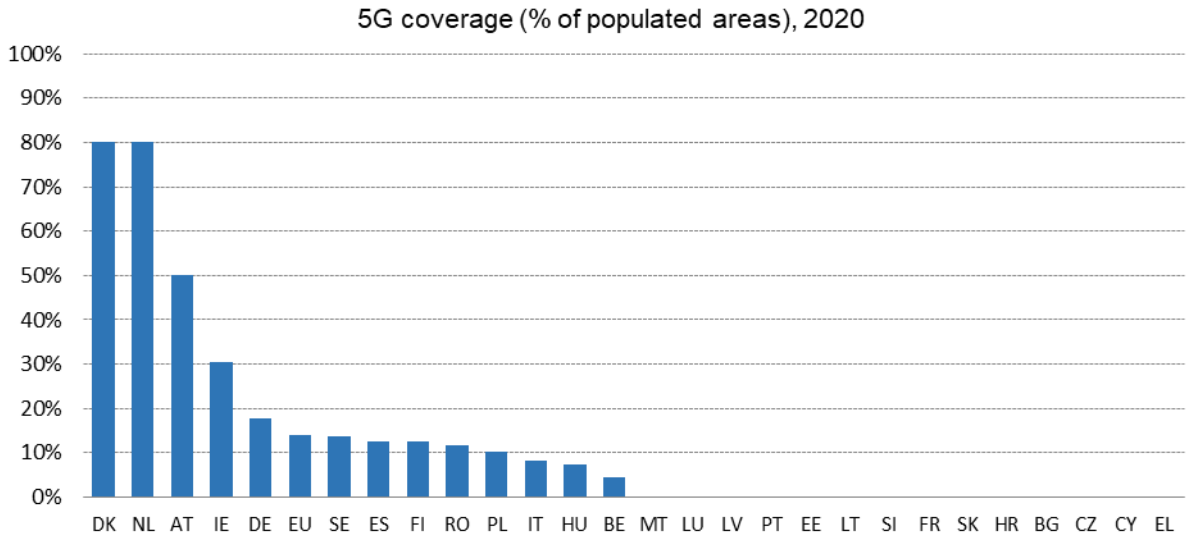
Figure 9. Rural Fixed Very High-Capacity Network coverage in 2020.



Finnish telecom operator DNA promises that fixed 5G brings a fibre-like user experience (https://oppaat.dna.fi/teknologiatrendit2021/?ircp=693407257&deliveryid=1087144367#kiintea-5g-tuo-kuitua-vastaavan-kayttokokemuksen). The 5G wall shuttles attached to the exterior wall of the house solve the connectivity problems of many homes and businesses in areas where the fibre network cannot reach. The fibre network is an unnecessary solution, especially in single-family houses. The wireless 5G network is now expanding rapidly. Telecom operators promise that in the future 5G will solve the network needs of more and more properties. This claim needs fact-checking.

Mobile coverage is usually measured by regulators using “population coverage”, i.e. the percentage of the population covered by at least a mobile network at their homes. In most cases, the availability of the mobile service at a given place is determined based on the declaration of mobile network operators. (SWD 2021, 28)

Figure 10. 5G coverage (% of populated areas) by Member State, 2020



In 2020, only 14% of populated areas in the EU were covered by a 5G network. This is also since only half of the Member States started commercial 5G network deployments by mid-2020. Highest coverage levels were recorded in the Netherlands and Denmark (80% of populated areas each), followed by Austria (50%), Ireland (30%) and Germany (18%). In Finland, rural areas will have to wait for 5G to come for a while. (SWD 2021, 28)

3. Policy framework for (rural) digitalisation

This section aims to identify how general policies boosting digitalisation, not specific for rural areas influence these areas and how rural and agricultural policies foster digital transition.

3.1. European Digital Policies

In 2015, the European Commission (EC) communicated the Digital Single Market Strategy which intend to remove virtual borders, boost digital connectivity, and make it easier for consumers to access cross-border online content. A Europe fit for the digital age is aiming to empower people with a new generation of technologies. https://eufordigital.eu/discover-eu/eu-digital-single-market/

How to make Europe greener and more digital are the twin challenges. The Digital Europe Programme (DEP) will provide strategic funding to answer these grand challenges, supporting projects in five key capacity areas: in supercomputing, artificial intelligence, cybersecurity, advanced digital skills, and ensuring a wide use of digital technologies across the economy and society, including through Digital Innovation Hubs (DIHs). With a planned overall budget of €7.5 billion, it aims to accelerate the economic recovery and shape the digital transformation of Europe's society and economy. (https://digital-strategy.ec.europa.eu/en/activities/digital-programme)

The main work programme of DEP, worth €1.38 billion, will focus on investment until the end of 2022. Alongside this main work programme, the Commission published two specific work programmes: the first one focuses on funding in cybersecurity, with a budget of €269 million until the end of 2022; and the second one focuses on the set-up and operation of the network of European Digital Innovation Hubs, with a budget of €329 million, until the end of 2023. (https://ec.europa.eu/commission/presscorner/detail/en/ip_21_5863)

Digital Innovation Hubs are part of the Finnish digital policy. They have been directly adapted from the EU policy with conditions that a candidate must pass to be eligible to join the system. Having to apply for a place in the system makes the candidates eager to build posh web sites et cetera but the program may have little effect on the regions as there is no seed money for concrete actions. Having a DIH is a certain mark of expertise and services available, but that status does not guarantee active functioning. Only after a site is chosen to be a European DIH will there be money and resources to develop the EDIH to higher operational level. Of course, being part of a European network gives participants chance to specialise, create a division of labour between experts and ask for help from other members of the network if your clients have needs that you are not able to fulfil.

The DEP will not address challenges in isolation, but rather complement the funding available through other EU programmes, such as the Horizon Europe programme and the Connecting Europe Facility for digital infrastructure, the Recovery and Resilience Facility and the Structural funds, to name a few. It is a part of the next long-term EU budget, the Multiannual Financial Framework 2021-2027. (https://digital-strategy.ec.europa.eu/en/activities/digital-programme)

DEP is not a RDI programme but aims to respond to the need for digital investment, and to make concrete use of digital capacity and digital solutions. In principle, the programme offers opportunities

for operators who can respond to its large scale, different technology focus and selected nouns. DEP is not designed for rural actors, but some advanced institutions can finance their actions (https://www.eurahoitusneuvonta.fi/ohjelmat/digitaalinen-eurooppa)

European Union has connectivity goals. According to the Broadband Europe plan, access to a network of at least 100 Mbps is expected in all European homes by 2025. The Commission's next goal, laid out in its Digital Compass, is a secure, high-performance, sustainable digital infrastructure, and connections of at least one gigabit per second (Gbps) for all by 2030.

The Strategic Foresight Report (2021) focuses on key global megatrends that will continue to affect the EU in the coming decades. Digital hyperconnectivity (the term refers to the ever-increasing number of interconnected devices that enable the development of new services, jobs, and forms of human interaction and technological transformations) is one of them. The number of connected devices globally might increase from 30.4 billion in 2020 to 200 billion in 2030. Europe's global leadership ambition in the twin transitions could position it strongly in an emerging lucrative market. (https://ec.europa.eu/info/strategy/strategic-planning/strategic-foresight/2021-strategic-foresight-report_it)

The Path to the Digital Decade (SWD 2021) is the Commission's proposal to set up a governance framework to ensure Europe reaches its 2030 Digital Decade objectives. The Commission would first develop projected EU trajectories for each target together with the Member States, which would in turn propose national strategic roadmaps to attain them.

To reach the digital targets and objectives, the European Commission will accelerate and facilitate the launch of multi-country projects, large-scale projects that no single Member State could develop on its own. The European Digital Infrastructure Consortium is a new instrument to help interested Member States speed up and simplify the implementation multi-country projects.

The EU could deploy a network of Security Operations Centres, powered by AI, to anticipate, detect and respond to cyberattacks at national and EU level.

About 20 Percentage of the Recovery and Resilience Facility each EU country should dedicate to the digital transition. Sustainable Growth Programme for Finland: Recovery and Resilience Plan (2021) operationalises the EU recovery plan into Finnish context.

3.2. National Policies boosting digitalisation

This section will gather the different existing at national policies promoted by different ministries and institutions.

3.2.1. National Digital Agenda or similar strategies

During the government period 2015–2019 (Prime minister Juha Sipilä) Finland adopted an approach whereby digitalisation policy is not written in a form of strategy. Instead, the policy is published as a

list of prioritised projects. Thus, when analysing the framing of digital divide in the Finnish policy one could study these documents.

In the Finnish administrative system, the Public Sector ICT operational unit of the Ministry of Finance is responsible for the overall development of the digital services of public administration and the integration of joint development projects. (https://vm.fi/en/digital-services)

Different tasks pertaining to the digitalisation are assigned to different agencies under the ministry's mandate, but digital support and change management functions have been centralised to Digital and Population Data Services Agency (henceforth DVV from the Finnish name). Agency's digitalisation-related responsibilities include Suomi.fi online service, developing the information architecture, portfolio management and coordination of the Government Information Security Management Board.

Hatinen (2020) concludes that during Juha Sipilä's government, the Finnish strategy is concerned with digital divide. The mitigation measures for digital divide are wrapped around digital support. The driver for digital support development is to increase usage of digital services rather than mitigate exclusion or inequality. Approach addresses the usage gap (Van Deursen & Van Dijk, 2014).

Randall and Berlina (2019) make a national policy audition for Finnish digital policy. They see that in conclusion, digitalisation is not a priority per se in Finland, but it has been identified as a key means to achieve growth in the business sector. Even though an all-encompassing digitalisation strategy does not exist, digitalisation is a priority in sectoral strategies (e.g., education). Digitalisation is seen as a great opportunity.

Randall and Berlina (2019) see that there is no push to developing regional digitalisation agendas at the national level. However, some regions have introduced their own digital agendas (e.g., Lapland) supporting aspects of digitalisation, such as broadband coverage and digital skills development. In addition, in the biggest cities digital programmes have been drawn up and implemented at the municipal level. An example of national and regional co-operation is The Six City Strategy—Open and Smart Services (2014–2020), under which the state promotes collaboration on developing smart city services among the six largest cities in Finland and contributes financially to this work.

Further, regional perspectives have been taken into consideration, for instance, in the Smart Countryside project. One of the project's key aims is to support living and entrepreneurship in rural areas through digitalisation and experimentation. The spearheads of the national work address broad global issues such as platform and data economy but with weak or no links to regions. Thus, there is not much interaction between the regions and the national level. However, the policies at the EU level may encourage closer collaboration. An example is the creation of a network of digital innovation hubs.

The goals of the next government (Prime minister Sanna Marin) for period 2019-2023 were briefly articulated in the government program (Marin 2019). No explicit digitalisation program nor any list of prioritised projects was written. So, in practise ministries operationalise the digitalisation program.

The DVV leads the efforts to mitigate digital divide in regional level. The agency has coordinated the network of projects in the Regional Councils (https://dvv.fi/-/digituen-alueellinen-kehittaminen-jatkuu-kattavasti-suomessa). Each project is responsible for developing a network of grassroot level

actors as well as promote conspicuousness and findability of digital support in their region. The regional level is not permanent but given its geography, an extra layer of coordination may be necessary to ensure country-wide support.

General guidance is provided by a variety of organisations like Public service infos. Also, municipalities (including libraries), adult educational institutions, non-governmental organisations and private companies provide digital support.

Finnish AI-program (TEM 2021) prepared an action plan for Finland to speed up the introduction of artificial intelligence and to promote the fourth industrial revolution.

Business Finland (BF) is the biggest company development and RDI funder who gives funding to projects that are on very high technology readiness levels (TRLs). Digital Finland Framework (https://www.businessfinland.fi/globalassets/julkaisut/digital-finland-framework.pdf) challenges us to question the existing methods and practices in society and to make them more effective and flexible. Digitalisation is a means to look after our wellbeing and success and can ultimately work as a kind of restructuring protection. BF see that by means of digitalisation people and businesses take centre stage in the development of public services. Welfare of senior citizens can be improved by means of intelligent health services; children can learn history and geography in a virtual environment; and the need for a private car may be removed by comprehensive public transport services.

Digital services increase the opportunities for citizens, companies, and corporations to use public services regardless of time and place. Digital services are usually the fastest and easiest way to interact with the authorities. When the use of digital services becomes more widespread, the public service production becomes more efficient, which saves public resources. The starting point is that digital services provided by the public administration must be functional, easy to use and safe.

According to the public administration's client relationship strategy, the authorities must ensure that the digital channel is an attractive option to the client. In building digital services, key issues include user-oriented design, renewal of service processes, interoperability of services, and information security and data protection.

3.2.2. Other policies and strategies influencing (rural) digitalisation

The **regional development decision** 2020–2023 establishes the priorities within the Government's remit to be observed during Prime Minister Sanna Marin's term of office, and objectives at the central government level to which the ministries have committed. The regional development decision steers the development of the different administrative branches and regions, and the coordination of these measures.

The aims and measures of regional policy, which is based on regional strengths and balanced regional development, are linked to the Government Programme. A dynamic, thriving and socially strong Finland will be built on the combined successes of the Greater Helsinki region, growing city regions, sub-regions, and rural areas alike. In this regional development decision, the themes and strategic measures are structured into six key priorities:

- Mitigating climate change and safeguarding biodiversity
- Building sustainable communities with good connections
- Innovating business life and accelerating R&D&I
- Making skills and education a resource for regional development
- Increasing inclusion and wellbeing and preventing inequality
- Creating an operating model for regional development

Cross-cutting themes in all six priorities are sustainable development and digitalisation. The regional development approach referred to in the Government Programme is a regional or theme-based framework of activities that corresponds to the specific characteristics of each region, devised through partnership and agreement.

Randall et al (2020, 54) give advice for policy makers for rural digitalisation:

1. Continue to work towards broadband infrastructure provision targets until every 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.

Randall et al (2020, 46) highlight some specific projects:

■ 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. 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 because of the decline in the sector in 2010. On the other hand, it sought to improve digital skills among SMEs.

■ 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. The project was funded by the European Agricultural Fund for Rural Development and implemented by ProAgria.

Table 4. National Policies

Ministry / Authority	Policy	Objective	Expected Impact
Ministry of Economic Affairs and Employment of Finland	Finnish AI-program (TEM 2021)	The Report prepared an action plan for Finland	to speed up the introduction of artificial intelligence and to promote the fourth industrial revolution.
Antikainen et al (2017)	Smart Countryside	Better services in rural areas by using digitalisation and experiments	The Finnish government resolution on promoting rural digitisation was developed based on the results of Antikainen et al. (2017). See Randall et al (2020).
Ministry of Economic Affairs and Employment of Finland	Promoting digitalisation in the retail sector	Strengthen the capacity for digitalisation in the retail sector in the areas of internationalisation and competition, skills and labour force as well as innovation and technology.	As rural is not mentioned in the report we must conclude that village shops and other rural trading places have no significant role in the future.
The National Funding Agency for Technology and Innovation of Finland (TEKES/Business Finland)	Digiboosti (2015-2017)	a national program aimed to encourage digital innovation in SMEs by supporting them to hire digitalisation professionals	Although there was no particular focus on rural areas in the programme, the beneficiaries were rather evenly spread throughout the country geographically.
Business Finland, 2019	Tempo	Tempo provides funding support to Finnish startups and SMEs for accelerating internationalisation.	Growing globalisation of SMEs.

ProAgria	RuralDigiServ	The aim ofthe project was improving the digital skills of farmers and promoting the utilisation of digital solutions in their daily work.	
Micropolis Ltd (+ partners like VTT)	DigiLeap	The project has created an open web-based digitalisation support service model which helps companies to evaluate their readiness for digital transformation.	When firms measure their digital maturity with well-designed tools, development companies have a easier job to see what is the next step for this particular company..Firms are more willing to take advice when they have learnt how their rank compared to other companies in the database.
Ministry of Social Affairs and Health (STM)	Information to support wellbeing and service renewal – eHealth and eSocial strategy 2020. http://urn.fi/URN:ISBN:978-952-00-3575-4 More info https://stm.fi/en/social-and-health-services/information-management	The social welfare and health care service must be client-centred. Electronic information management provides up-to-date information and modern tools for citizens and professionals as well as offering support for management in tasks related to assessment and decision-making.	Data produced by citizens social welfare and health care services will offer input for the management of services and decision-making in society in real time as well as for research, innovation and industrial and commercial activity in the sector.Clear cooperative structures will be created for the steering of social welfare and health care services both nationally and regionally.
Ministry of Social Affairs and Health (STM)	Health and social services reform	At present, the responsibility for organising health and social services in Finland rests with 310 municipalities.	From year 2023 onwards, the health and social services reform will transfer the responsibility for organising services to 22 health and social services counties whose members are chosen by an election.

3.2.3. Policies and strategies to boost digital literacy and tackle the digital divide

Svenlin (2020) presents how to understand digital literacy in social work. This example can also be applied to other professional work domains. Digital literacy is more than using applications and technology. The basis of digital literacy is an understanding of the cultural context in which digital technology is used. It is a question of navigational skills, i.e. that the worker is able to operate in different digital environments. It's one thing to write a blog post, it's another to chat on Twitter or Facebook. It is one thing to talk to a customer in a Chat service, but it is one thing to be in a video

conference with a young person who lives on the other side of Finland. It is necessary to understand for what purpose a particular app is used and why. Culturality is learning to understand the digital world and how to operate there, without forgetting its impact on customers' everyday lives.

Digital literacy also includes a cognitive element that is knowledge and understanding of how digital environments are built and what their logic of action is. This part of digital literacy is at the heart of the design of e-services. Technology is a channel and intermediary for information, but it is equally essential to understand what information is passed on, who transmits it and to whom. Digital literacy is to stop and ask how a customer can connect with an employee or consider what kind of screen, library computer or smartphone, customers read our messages or fill out applications. It is an interest in what kind of digital world customers live (or do not live in). Children and young people know Snapchat's activity logic – how young people communicate there. (Svenlin 2020)

It is likely that white collar workers will produce more and more digital content themselves in the future. Digital literacy is about the ability to produce content and network on digital platforms. It is the ability to summarise the message into an image, text or video. It is also information about who owns the copyright and how the other person's own is borrowed. This is the kind of skills actors learn when assigning a podcast, video, blog post, or newsletter to a customer. In addition, communication skills are needed, i.e. information on where content is shared and where people can meet online. Expert workers must also be able to connect people online ("connecting people"), and to establish and maintain relationships ("connect to people"). In training, such experiences can be provided by meeting experience experts online. (Svenlin 2020)

Creativity as an element of digital literacy means the ability to produce something new that has value. Trainers should also produce digital content (such as blog posts!) and prepare tasks for students in different digital environments. Learning tasks should encourage students to take risks – randomness, error and discovery are part of the process. New content is created, for example, when students familiarise themselves with the new topic and teach each other. (Svenlin 2020)

A significant part of digital literacy is critical gaze, which should focus on the perspectives and content presented on the website, what sources are referred to and who is the author. Criticism must also be focused on addressing systemic issues. What kind of activities are appropriate to transfer online and what are the reasons? When does online transactions improve services and not just degrade them? When are we going to drop people down the digital gap, when are we going to lift? (Svenlin 2020)

Criticality is combined with the civic element, which you refer to the use of digital platforms specifically for influencing and instilling civil debate. Digital literacy is one of the tools used to break the culture of silence. It is about being able to influence and participate in social debate online as well. (Svenlin 2020)

The last element of digital literacy is trust, which is to believe in one's own competence and competence. This requires a sense of control, which is strengthened when students solve problems and operate on different digital platforms. (Svenlin 2020)

The COVID-19 pandemic has concretely demonstrated the need to be able to provide services more and more online as well. This is possible when you understand what kind of skills it requires of

employees. Digital literacy is a good concept for this. The core elements provide good guidelines for how these skills can be developed during studies. They also challenge education providers to look at their own competence and relationship with the digital world. It is no longer enough to promote digital literacy and digital skills on the shoulders of a few pioneers. (Svenlin 2020)

OSIS (2021) publishes every year Media Literacy Index. The index assesses the resilience potential to fake news in 35 European countries, using indicators for media freedom, education and trust in people. As the indicators have different importance, they are assigned different weight in the model. The media freedom indicators have the highest weight (Freedom House and Reporters without Borders) along with the education indicators (PISA) with reading literacy having the highest share among them. The e-participation indicator (UN) and trust in people (Eurostat) have smaller weight relative to the other indicators.

Finland (1st), Denmark (2nd), Estonia (3rd), Sweden (4th) and Ireland (5th) are at the top of the ranking of the Media Literacy Index 2021. These countries have the highest potential to withstand the negative impact of fake news and misinformation due to the quality of education, free media, and high trust among people. As in previous years, Finland remains No1 among the 35 European countries included in the index. (https://osis.bg/?p=3750&lang=en)

The index cluster analysis shows certain geographic patterns as the best performing counties are located in clusters in Northwestern Europe and the worst performing countries are located in the Southeaster part of the continent. The changes in clusters when the indexes of 2021 and 2019 are compared seems to point to a deterioration in the situation as a number of countries backslided to lower-tier clusters. (https://osis.bg/?p=3750&lang=en)

Finland's success rests on the teaching of media literacy skills in schools. The Finnish national media education policy is implemented by the National Audio-visual Institute and the Ministry of Education and Culture in collaboration with media education professionals (https://medialukutaitosuomessa.fi/mediaeducationpolicy.pdf). The Department for Media Education and Audiovisual Media (MEKU) is legally tasked with promoting media education, youth media skills and fostering a safe media environment for children (https://kavi.fi/en/about-kavi/). The NGO-run fact-checking service, Faktabaari (https://faktabaari.fi/in-english/) provides fact-checking and media literacy materials for schools. (https://www.nordicpolicycentre.org.au/media_literacy_education_in_finland)

Media and information literacy (MIL) is seen as civic competence; important to every citizen from an early age. The term media education refers to the educational actions promoting MIL and the skills related to it. Finnish Media Education publication (https://kavi.fi/sites/default/files/documents/mil_in_finland.pdf) gives guidance how Finnish media education is promoted through national policies and in various organisations and projects.

Digital divide

Current research on digital divide classifies the phenomenon in three types or levels (Van Deursen & Van Dijk, 2019, Wei et al. 2011):

1. Physical access to computers and internet (access divide)
2. user skills (capability divide)
3. outcome divide

The first level or access divide refers to the original digital divide i.e., the differences in access to computers and internet augmented with the e.g., notion of importance of peripheral devices, maintenance costs and quality of connections. The second level or capability divide is concerned with user's skills in the widest sense as well as the differences in usage. Third level or outcome divide is only emerging as an area of research inquiry but is gaining traction as other divides seem to narrow. (Hatinen 2020)

The original point of interest, namely the material/physical access to computers, has paled in significance in comparison to other gaps (Van Dijk, 2005, 223). However, the conclusion is not that the digital divide is bridged but rather that the divide has shifted from access to other areas (Van Deursen & Van Dijk, 2014), where gaps seem to widen (Van Deursen & Van Dijk 2010, 894). Similarly, the research task has thus shifted to that of capturing the range and quality of use and tracking shifting 'degrees of marginality' in digital inclusion and exclusion (Livingstone & Helsper, 2007, 22).

Schools are not the only or even the first actor in the field. An ESF-funded project that was managed by labour administration in Structural Fund period 2000-2006, provided jobseekers and other citizens with access to free of charge electronic services for job search, studying and other through personal guidance. Technological advances have made government services more accessible. Mastering the basics of the information system should be civic skills comparable to swimming skills, because nowadays job search is also very closely linked to it. However, there are still groups in Finland that have never sent an email, filled out a job search form online or used electronic data sources. These are the people the project wanted to encourage. (http://www.rakennerahastot.fi/vanhat_sivut/rakennerahastot/tiedostot/hyvat_kaytannot_esr_hankkeissa/Digitaalinen_lukutaito_ei_ole_kaikille_itsestaeaenselvyys.pdf)

Heponiemi et al (2021) see that in developed countries digital health care and social welfare services have been spreading rapidly and partly replacing face-to-face services. They see a threat in the process as the development may lead to a pronounced digital inequality. Their population-based study of Finnish adults (N = 4495) examined the associations of offline resources with perceived benefits from online services and the mediating effects of access, skills, and attitudes in these associations. The results indicated that those with lower personal, economic, and social offline resources perceived

online services as less beneficial. This was largely explained by poor access to the services, poor digital skills, and negative attitudes towards online services. It would be important to improve Internet access and digital skills and implement means to address negative attitudes, especially among vulnerable groups. Moreover, online health and social welfare services should be designed to be more inclusive.

Tuikka et al (2018) provide empirical evidence how disabled people are not on the same playing field with others in Finland even if digital technologies can help some disabled persons. This gap is referred as digital disability divide. Their study employs a quantitative approach in technologically advanced society. Their data is retrieved from a nationwide survey, which was conducted in Finland during years 2012–2015 by National Institute for Health and Welfare. The data was analysed regarding two main aspects: access to internet and use of internet. The analyses focused on people with disabilities and their family members. The results indicate that both access rate and usage of internet are lower among them than the rest of the population.

Rural digital divide is a fact of life also in Finland but the details about the severity of the situation are published in other parts of this report. Main conclusion is that the fixed broadband access is not good in rural Finland, but usually good mobile connections can partly compensate for this gap. New 5G network is still a mystery as operators promise wide coverage but these plans do not take into account remote rural areas.

Table 5. Programmes and initiatives addressing digital literacy and digital divide. (*) International, National, Regional or Local

Initiative	Objective	Key words	Period	Area of impact	Link	Public / Private	Scale of action *	Rural / General
Faktabaari	provides fact-checking and media literacy materials for schools. An awarded Finnish factchecking service bringing accuracy especially to the public election debates.	fact-checking, more fact-based public debate, pedagogical help	2014-	Election, schools, social media	(https://faktabaari.fi/in-english/)	NGO	National	General
Mediakasvatus **The Finnish Society on Media Education**	promoting media literacy and media education. Organise events, publish material, implement development projects, contribute to the public debate and provide opportunities to share media education experiences online and offline nationwide.	media literacy, media education	2005-	raise awareness and spread information and best practices of media literacy.	https://mediakasvatus.fi/english/	NGO	National	General
The Council for Mass Media (CMM)	CMM is a self-regulating committee established by publishers and journalists in the field of mass communication for the purpose of interpreting good professional practice and defending the freedom of speech and publication. The Council also addresses the methods by which journalists acquire their information.	self-regulation, journalism	1968-	CMM regulates almost all Finnish media: in addition to news media, it regulates women's magazines, radio stations, children's magazines and most political parties' newspapers.	https://www.jsn.fi/en/	Private	National	General
The Department for Media Education and Audiovisual Media (MEKU)	MEKU publishes educational and informative materials related to media education and classification of audiovisual programmes.	Regulation	2014-	media education, censorship (from the interest of children, K-12, 14,16,18)	https://kavi.fi/en/	Public	National	General

3.2.4. Policies and strategies that incentivise digital innovations

Seven regions from Eastern and Northern Finland (ENF) have started to co-operate in development questions. ENF (2020) report *Challenges of disseminating innovations and digitalisation in Eastern and Northern Finland* bring forward barriers and drivers of innovation. Thematic clusters, that are not based on physical proximity, are one way to foster digital co-operation between regions in the ENF area. One does not need to create critical mass in one region to be able to take advantage of common knowledge or RDI investments. Value chains can be created so that one SME is Kainuu Region gets advice from a higher education institution in South Savo. With the help of EUinMyRegion project funded vouchers these kind of knowledge values can be created between un-usual subjects that would not normally meet in the development of a novel idea.

Digital practices took a big leap in 2020. Distance learning, distance counselling, webinars, video meetings and other online cooperation became a normal way of working and forced all actors to make digital leap. The administration quickly adapted to remote operations and its ability to function remained good. More new tools for remote service and teaching were developed in training and counselling. In fact, teleworking also increased the opportunities for farmers to participate in workshops and webinars, as well as in distance training, and skills developed rapidly.

Virtual learning environments make it easier to work with students from vocational or higher education institutes to follow teaching coming from other educational institutes. Rural areas are winner in digital age as they can directly access information coming from global sources. The hierarchy between areas does not affect rural areas so much as it used to do.

The overall objective of P-IRIS (https://www.interregeurope.eu/p-iris/) is to improve policies related to 3H / 4H cooperation in rural innovation systems. P-IRIS wants to increase the number of SMEs in innovative networks and the number of innovation projects including R&D. As a Nordic co-operation P-IRIS can inspire the cluster program of Norway by bringing rural innovations to the front.

EU action for smart villages is an initiative launched by the European Commission in April 2017 to invest in the villages of the future and to consider support for investment, accessibility and skills that promote digitalisation. Finnish Smart Villages network (see https://www.maaseutu.fi/maaseutuverkosto/teemat/alykkaat-kylat) exchanges information regularly in their meetings. Distance education applications and pilots are one common development issue in all rural regions in Finland.

Finland's smartest village competition was launched in summer 2018 and the Smart Villages working group worked as a working group for the Finnish rural network during 2019-2020. During 2014-2020, the Rural Development Programme has financed about 350 projects promoting the use of digitalisation. The projects have improved rural services and increased cooperation. In the coming period, smart villages will receive their own development tool in the CAP plan as part of both investments and cooperation intervention.

EIP-Agri initiatives have made promising experiments with digitalised cowsheds and smart bales. Monitoring (general) animal health is something that smart vision equipment can learn. This coding something that used to be silent expertise of farmers. Sensors that are inside the animals can detect changes in the metabolism of cows – this is something new as no farmer could follow the welfare of his production animals at this level of breadth and deepness at the same time.

The digital revolution in the bioeconomy has at least three different dimensions in the innovation context. 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 use of forest ecosystem services. (Randall et al 2020, 32)

The second dimension pertains to the bioeconomy as part of the circular economy, where data may aid the improvement of circular value chains. 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. (Randall et al 2020, 33)

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. 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. (Randall et al 2020, 33)

Table 6. Policies influencing digitalisation in rural areas

Initiative	Brief Description	Objectives	Area of impact	Period of implementation	Budget (if any)	Public / Private	Are rural areas specifically mentioned or addressed? Y/N	Link
What is the role of NGOs in the digitalisation of rural areas?	Information Society Development Centre (Tietoyhteiskunnan kehittämiskeskus ry, TIEKE) and its partners have launched a project, NGOs Imparting Knowledge Economy in Rural Areas, to survey third sector organisations as users and promoters of digitalisation locally and regionally.	The aim of this project is to investigate and develop rural area NGOs as promoters of the digital capabilities of individuals. With over 100,000 registered NGOs in Finland, the third sector has vast significance and potential in advancing the readiness of citizens to operate in a digital society.	Rural areas. NGOs are also valuable service providers, likely even more so in rural areas with less commercial interests at large.	The project runs from April 2021 to June 2022.		Funding is provided by the Rural Development unit of Finnish Ministry of Agriculture and Forestry. So the funding is mainly public.	Y	https://tieke.fi/en/ngosrural/ https://tieke.fi/en/projects/digingosrural/

3.3. Contributions from the Structural and Investment Funds and the Cohesion Policy

The Renewing and Competent Finland 2021-2027 (Uudistuva ja osaava Suomi 2021−2027) programme in mainland Finland includes the ERDF, ESF+ and JTF funds and has EU funding of approximately EUR 1.9 billion. The programme is being prepared in a partnership in the Cohesion 2021+ working group under the leadership of the Ministry of Economic Affairs and Employment. http://www.rakennerahastot.fi/ohjelmakausi2021_2027

The preparation of the programme will continue in cooperation with the European Commission during autumn 2021. The Government approves the National Regional and Structural Policy Programme "Renewing and Competent Finland 2021–2027 – EU Regional and Structural Policy Programme", after which the programme will be formally submitted to the Commission.

The main content for support from the European Regional Development Fund and the European Social Fund for the period 2021-2027 would be directed around five themes:

1. **A smarter** Europe (growth and competitiveness of SMEs, digital transformation, entrepreneurship, innovation, industrial transformation challenges in the context of globalisation, the circular economy and climate change)
2. **A greener low-carbon Europe (clean energy solutions, energy efficiency, transition to a low-carbon** economy, renewable energy, innovative low-carbon technologies, support for green and blue investments, sustainable resource management, circular economy, adaptation to climate change)
3. **A more interconnected** Europe (mobility, energy and regional ICT connections, sustainable transport, smart energy networks, high-speed digital connections)
4. **A more social** Europe (ESF+ support for actions under the Pillar of Social Rights, in particular the promotion of employment, education and lifelong learning, social inclusion and health and social innovation)
5. **A Citizens'** Europe (local development of urban-rural and coastal areas).

For the ERDF, the Programme shall support research and innovation capacities, including the uptake of advanced technologies, digitalisation and the improvement of the growth and competitiveness of SMEs. Finland's carbon neutrality target will also be promoted, especially from the perspective of energy efficiency, adaptation to climate change and the transition to a circular economy.

Local infrastructure investments to improve accessibility in Eastern and Northern Finland are also included in the draft programme presented to the Commission. The ESF+ action programme will also contribute to the objective of a more social Europe, including through improved access to

employment, continuous learning and support for active inclusion. The programme also includes food aid for the most deprived and social innovations for the development of child protection.

The actions of the JTF are aimed at mitigating the adverse effects of the climate transition by supporting the regions and workers most affected by the transition. Actions supported by the JTF would facilitate the impact of the transition by financing the diversification and modernisation of the local economy and mitigating the negative impact on employment.

Digitalisation is a cross cutting theme in the Structural Funds and Cohesion Policy programme so it reflected in all specific objectives

The Northern Periphery and Arctic Programme is part of the European Territorial Cooperation Objective, also known as Interreg, in the framework of the cohesion policy, supported by the European Regional Development Fund.

3.3.1. Broadband infrastructure

Because of the immense distances and very low population density, Finland was very quick to recognise the strategic importance of broadband connectivity. Telecommunications connections improve employment and quality of life, for example through health services and education. Connections reduce the costs of distances, make companies' business more efficient and enable them to study and work remotely. (https://www.maaseutu.fi/maaseutuverkosto/teemat/laajakaista)

The transfer of large amounts of farm data online has accelerated and high-quality real-time camera footage shows that everything is fine in the barn. The farmer receives notifications of changes to the mobile phone and information that improves the efficiency of the holding can be collected. Technology is constantly increasing on farms. People can chat and rehabilitate with a doctor or nurse via video, which has saved journeys to the health centre or days spent in hospital.

Schoolchildren and students in sparsely populated areas have received equal opportunities for studying, and the teaching offering has diversified through e-learning. The teacher can live far from school, too.

For their own amusement and benefit, students have completed online courses and teleworking has become increasingly smooth as video rotates and attachments open quickly.

The first national strategy for fast broadband was developed in 2008. This was complemented by a national study for a ‘smart countryside in 2016 (MDI, Antikainen et al 2017) and a new government initiative for rural digitisation in 2017. Even if Finland started determinedly, fast connections of at least 100 megabits are only in about half of Finnish households. Market solutions are rare in rural areas as operators are not interested in building broadband networks.

Public funding for broadband construction is available from the rural programme to where connections are not built on a market-based basis.

Funding for the rural programme can be applied for broadband construction in a village or in several villages. In EAFRD the village network refers to the construction of a local area network with the necessary connection networks to the village or village groups. The village network project cannot build long backbone networks and therefore requires a ready-made backbone network with sufficient capacity or cooperation with projects or operators building the backbone network.

The municipality, association, cooperative and SME can apply for support. The aid amounts to 50 % or 70 % of the total cost. Private funding can come from the volunteers of the villagers. The combined length of the networks built in Finland by 114 broadband projects financed by the EU EAFRD in 2014-2020 is 5200 km.

Also, Leader groups have funded village networks as they have seen some great examples where building broadband together has blown new driving to the village, attracted new residents, and created new opportunities for entrepreneurship.

The EAFRD received an additional €16 million from EU recovery funds for broadband projects. Now there is access to funding for the construction of broadband connections in a municipality or village. EAFRD support of up to 70% for broadband construction. For example, village associations or other associations, cooperatives, municipalities, and local operators can apply for support. https://www.maaseutu.fi/laajakaistainfo/maaseuturahastosta-jopa-70-n-tuki-(laajakaistarakentamiseen)

The Finnish Broadband Competence Office (BCO, https://www.maaseutu.fi/en/bco) plays a key rural in improving cooperation between the national administration and other actors. The BCO is a collaborative effort by different authorities; it is not a public authority, and it does not have governmental functions. The national BCOs form a European-wide network which exchanges information and best practices.

The Finnish BCO website shares information about broadband deployment and availability and the progress of digitalisation. The website provides information about funding options and the rules governing aid and broadband network construction. Information sharing is technology-neutral across technologies.

The Finnish BCO is a virtual organisation (https://www.maaseutu.fi/en/bco/what-is-laajakaistainfo-and-what-does-bco-stand-for). It comprises the following public authorities:

Ministry of Agriculture and Forestry is the Finnish administrative authority for the Rural Development Programme for Mainland Finland 2021–2027. The Development Programme finances broadband investments and digitalisation in rural areas.

Ministry of Transport and Communications is responsible for broadband related legislation and the preparation of the broadband strategy.

Finnish Transport and Communications Agency (TRAFICOM) is the aid-granting authority for broadband project funding as laid down in the Broadband Subsidies Act. In addition, TRAFICOM's broadband promotion related duties include user guidance, technical regulations, and market surveillance.

Finnish Food Authority, whose responsibilities include instructing on the implementation of the aid from the Rural Development Programme for Mainland Finland, electronic transactions and data systems, and aid payments.

3.3.2. Digital Public Services

Open Government (https://opengov.fi/) promotes transparency in government activities, access to government information and services, and receptiveness of government to new ideas, requirements and needs. Much emphasis is placed on vertical negotiation between municipalities and state administration.

Finnish schools had tried rural distant schooling (e.g. in Eskola the village school was under a different municipality) before Covid-19. So, there was first-hand experience from the challenges that lied ahead. But the real problems in Eskola pilot where related to the school legislation which forced the inspectors to make frequent (and expensive) physical trips to the school. The development of Zoom and other videoconferencing software package made the technical side much easier. At the same time people are also more informed what it is like to follow distant courses. Many parents prefer live learning. Municipalities prefer cheap schooling, but they also listen to parents' wishes.

Socially sustainable Finland (2020) is social and health policy strategy that discusses the possibilities to use e-health and to take care of aging population with the help of digital technologies.

Lundgren et al (2020) studied the impact of digitalisation in health care and social care on regional development and they found impacts in relation to all three dimensions of sustainability – economic, social and environmental. Important obstacles to implementing digital solutions in health care and social care were found to be in the areas of leadership, management, and legislation. When using digital distance-spanning technologies, it is often said that laws accommodating them change too slowly, and that current laws are not applicable to the latest technology anymore. But important technical, economic, and cultural barriers were also discovered, and these clearly need to be addressed. The accessibility of health care facilities across the regions studied varies, depending both upon the spatial distribution of the populations and on the organisation of health care and social care services in the individual regions.

Lundgren et al (2020) found many examples of the way digital solutions can increase flexibility and improve quality in the provision of health care and social care services. This is especially beneficial for the development of welfare services in rural and remote areas. However, the case studies also illustrate the difficulties involved in disentangling observed and realised results and effects from potential future opportunities and risks. This points to the need for more comprehensive and systematic studies on the economic effects of digitalisation in health care and social care, as well as

its other regional development impacts. Digitalisation in health care and social care has significant potential not only for enhancing health and wellbeing, but also for boosting regional development and contributing to economic, social, and environmental sustainability.

Valokivi et al (2021) notice that reducing or curbing health-care costs is a cross-cutting priority. With the ageing population, elder-care will become one of the largest social service costs. Most documents of the role of eHealth are connected to economic efficiency. The development of digital services allows both the reduction of costs related to the management and communication of information between hospitals, doctors and patients and the reduction of costs of care through self-care, self-service, self-help and self-monitoring.

Digitalisation saves resources that are otherwise destined, on the one hand, to the development of 'physical' structures for the management of health information (offices, counters, telephones, employees) and, on the other, to the provision of medical assistance. When patients can self-monitor their state of health at home, such monitoring does not have to be done by a doctor in an expensive care facility. (Valokivi et al 2021)

The use of technological innovations in patient management is seen as an opportunity to improve the sustainability of 'continuity of care' by being able to treat a patient for longer at home, thus reducing the costs of hospitalisation. Finally, eHealth is included in the broader opportunities represented by the health industry (technologies, pharmaceuticals, digital services, biotechnologies). eHealth could be part of the economic strategy of a country. The health industry can represent a strategic sector for the economic development of some of the regions. (Valokivi et al 2021)

A primary target of health technologies is and will be older people. This is true for reasons of efficiency and efficacy. In terms of efficiency, older citizens are the largest target of the national health systems. In terms of efficacy, older people are more likely to have chronic diseases, and health technologies are particularly effective in the care of the chronically ill and those in need of continuous assistance. Technology supports older people's independent living and helps avoid hospital stays for chronically ill people. One way to increase ageing citizens' utilisation of eHealth is to engage them in the design and testing of technologies. (Valokivi et al 2021)

Not all of the Finnish reports speak equally of the possible limits and risks associated with the implementation and use of eHealth. In general, the approach to technology is positive, optimistic and deterministic, and not all documents leave room for the possible negative implications of the use of health technologies or for possible limitations in general. In some documents, limitations and possible risks associated with the development of eHealth services aiming towards older users are articulated, including issues related to integrity, trust, limited economic resources among older people, and digital competence and confidence. Ethical concerns are addressed in some policy texts, and eHealth and welfare technology is advised to be used with caution and ethical issues kept in mind. (Valokivi et al 2021)

Eheä yhteiskunta ja kestävä hyvinvointi (2018, 16–17) [An intact society and sustainable welfare] states that confidence in digital services is enhanced by engaging in an active social debate on data protection, digital exclusion, self-determination and ethics. Other ethical issues in eHealth and

elderly users are related to the potential replacing of offline service. Digital services risk being perceived as services that 'replace' the opportunities for offline and personal face-to-face contact. (Valokivi et al 2021)

In Finland, the most rural areas are in the northern parts of the country, where the population density is much lower than in other parts of the country. In Lapland, there are huge distances and travel times from sparsely populated residential areas to municipal centres and services. In addition, sparsely populated areas are ageing more rapidly than other parts of the countries and care needs are higher. eHealth is considered to be one solution to overcoming the distance gap. However, ageing and declining rural areas are contradictory to the optimistic expectations on ICT and eHealth. (Valokivi et al 2021)

The idea of equality and equal services for all people, despite where they live, is emphasised highly in documents. eHealth is seen as a tool to promote equity of access to health care for all citizens, even in more remote areas. However, the population cannot expect all health and social services to be performed in the same way, particularly in sparsely populated areas. (Valokivi et al 2021)

The technological solutions are seen as an answer to guarantee that everyone in the population has an opportunity to have their care needs met – citizens have the opportunity to communicate electronically with service providers regardless of their place of residence, and electronic solutions ensure equal access to services in sparsely populated areas. Universal access to care means offering the same standard of care to patients living in cities or in isolated communities. (Valokivi et al 2021)

But there is a price to pay. The current rather one-sided focus on the traditional mediation logic of physical meeting must be shifted to include other forms of interaction with the patient. The patient's needs and opportunities need to be better met by health care. The technical possibilities are great today to meet needs without physical meetings, but the technology needs to be spread so that everyone has the opportunity to have their needs met in this way. (Valokivi et al 2021)

As local services are being closed, there is an increased risk of inequalities in access to adequate health care, particularly in areas with large ageing populations. Digitalisation creates opportunities for primary care to develop services that create greater accessibility for patients, enable remote monitoring and monitoring in the home, and streamline work methods and processes for sharing information between care-givers. To some extent, geographical distance is compensated for through technical solutions. (Valokivi et al 2021)

There are regional differences and regional diversification in service supply, and municipalities and regions have different starting points and resources to guarantee services. Inequality and segregation of residential areas involve security risks, and rural areas are widely seen as a place for the diffusion of digital solutions. In addition, different areas have their own strengths, which can be emphasised by strengthening regional and local decision-making and co-operation. eHealth is one solution to strengthening rural areas with a strong dispersion of population density. The virtual communications network between citizens and primary care services can use ICT in many ways, and the eHealth services should mainly be provided in areas defined as 'internal or rural areas' that are disadvantaged from a geographic point of view. (Valokivi et al 2021)

Rural areas are not interesting for private and commercial service producers. The size of the municipality affects the number of ICT solutions that are available and the number of ICT-skilled professionals, including both health-care providers and ICT support personnel. Rural areas need public intervention for the diffusion of technologies. Rural hospitals and service centres can use broadband to provide care and medical skills identical to those available in units in urban centres. eHealth services can offer new opportunities because the service can be provided without the patient having to travel to obtain care. However, remote areas can be challenging. Sparsely populated and remote areas in general face obstacles of low diffusion of ICT, digital divide, interoperability, lack of ICT devices, and lack of digital skills among older adults and health and social care workers. (Valokivi et al 2021)

Table 7. Digital Public Services usage

		Extremely common	Very common	Fairly common	Not common for most of the population	It is not a possibility nowadays
e-Administration procedures	In general in the country	X				
	In rural areas		X			
e-Health	In general in the country		X			
	In rural areas		X			
e-Education	In general in the country	X				
	In rural areas		X			
Digital identity	In general in the country				X	
	In rural areas				X	
Digital signature	In general in the country				X	
	In rural areas				X	
	In general in the country	X				

On-line banking (account management, payments)	In rural areas	X				
Bills (council taxes, water, electricity)	In general in the country	X				
	In rural areas	X				

3.3.3. Research and Innovation Strategies for Smart Specialisation (RIS3)

In the Region of Central Ostrobothnia regional development was old school regional planning even if there were named sectors and domains in the RIS3 for the 2014-2020 programming period. No entrepreneurial discovery process (EDP) was tried. That is not uncommon as most of the Regional Councils in the East and North Finland have done in the same way. They see that there is enough participation even if the firms and entrepreneurs are generally missing from the meetings. Laranja (2021) reports the difficulties that European Regions had in translating the concepts of RIS3 and EDP into policy practices. Seeing Smart Specialisation as plan is not a good way to proceed as S3 is more about experimenting, self-discovery and emergent processes happening during the working.

Current version of RIS3 in Central Ostrobothnia has digitalisation as an item of its own. Also, traffic and tourism sectors have lots of measures that can only be implemented properly by using digital technologies.

Smart Specialisation Strategies (S3) can serve as a tool to integrate resilience perspectives and systems thinking, including the actions to address skills development. However, these should consider region's co-dependency with neighbouring regions and countries. (Teräs & Giacometti 2020, 11)

Even if the Recovery and Resilience Plan (RRP) is a national instrument with a top-down governance structure, the implementation of actions can only be effective with a strong involvement of Regional Councils in the design of calls for applications and in the selection of RDI investment projects to be funded. Green and digital transformation go hand in hand to meet the Grand challenges of the humankind. To effectively contribute to Smart Specialisation, a certain space for experimentation under a process of entrepreneurial discovery should also exist. Furthermore, the effects will also depend on the absorption capacity of companies in Central Ostrobothnia. (Marques Santos 2021).

3.3.4. Digital Innovation Centres (DIH)

In a planning report, Virkkunen et al (2019) state that Finland should create a Digital Innovation Hub network based on a Finnish digitisation vision and strategy that rests upon national strongholds (application domains and digital technology spearheads). The selection criteria should stress the

ability and readiness of the parties involved to accelerate the digital transformation and build international networks. So rural areas were not a priority in the beginning.

Digital-innovation-hubs-catalogue (https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool) recognises 20 DIHs in Finland. Only one, Rural Industry DIH (https://ruralindustries.eu/), has countryside in its name. We focus on this DIH even if there is a huge problem with objectivity as our institute is one of partners.

Centria University of Applied Sciences together with Kokkola University Consortium Chydenius and the Kerttu Saalasti Institute of the University of Oulu are the founding members of the Rural Industry DIH. DIH focuses on the development of smaller rural towns and the areas around them. There is a lot of business activity in regional centers, but this activity leaves under radar. Many companies' growth is limited by a lack of capital and resources and there can also be recruitment challenges (see (Kalpaka, Sörvik, & Tasigiorgou 2020). Digitalisation can help companies on a growth path, by improving the quality of operations and products.

The aim is to lower the threshold for utilising new digital solutions, to provide new services for product development and testing of new solutions and for business development in a digitalising operating environment. Rural Industry DIH is the only digital innovation hub of its kind in sparsely populated areas in Finland. Through the activity drivers, it already has good international networks that enable the knowledge of the corresponding DIH actors to be utilised through cooperation.

Some other DIHs may also serve rural areas as part of their affordances. **The Arctic Development Environments cluster** provides businesses in Lapland a one-stop-shop access point to the digital technology expertise and services of its member organisations: universities and research organisations in the region. Natural Resources Finland (Luke) has a DIH page, but there is no content. In principle, Luke serves agriculture, forestry, and rural areas but without concrete plans it is impossible to say what is going on. Smart Bio-based Solutions (SBBS) is led by VTT (applied research institute) in the metropolitan area, but some services are directed to agricultural actors and forest companies.

Eight consortia apply for EDIHs.

Smart AgriHubs Horizon-project coordinates and helps rural DIHs. One of its sub-projects, The Scandinavian Regional Cluster (RC), is led by a Natural Resources Finland (Luke) and by Seges (a company specialised in agricultural research and innovation). RC works to strengthen the Nordic network of agricultural DIHs by assisting relevant stakeholders in defining efficient roles in the region, and by developing a tailor-made set of services to promote the digitalisation of farms. (https://www.smartagrihubs.eu/regional-cluster/scandinavia)

RC supports regional DIHs in linking up with relevant actors in the Scandinavian ecosystem as well as with other DIHs across regions and sectors. This network of DIHs serves the Competence Centres (CCs) and Flagship Innovation Experiments (FIEs) in the region to effectively address digitalisation challenges of farms.

It also raises common awareness and interest towards the digitalisation of the agri-food sector in general and the services provided through the SmartAgriHubs (SAH) ecosystem. The goal of this RC is to establish and expand the Scandinavian ecosystem, help develop digital solutions and adapt these to the regional environmental circumstances, and ultimately to share this know-how with other regions all over Europe.

3.4. CAP National Strategic Plans

Smart agriculture is based on the use of data and data in production, decision-making and the operations of the entire value chain. The starting point is the utilisation of data from production and the operating environment. Finnish National Strategic Plans for the next CAP Program recognise the importance of digitalisation as the text in below proves.

Finnish Plans admit that we need both an upgrade of old technology, small improvements, and an overhaul of the entire ecosystem. In arable farming, machines such as tractors, drones and sensors become self-driving and connected in real time. Renting modern machinery chains eases investment pressures on arable farms. Intelligent farming saves soil, as it helps to take local conditions into account. It facilitates the use of various sustainable farming methods. Smart agriculture is resource-wise and therefore environmentally wise. Digitalisation increases the competitiveness of all types of Finnish farms, but at the same time small farmers may find it hard to invest enough into digital technologies. More precise monitoring, the smaller use of fertilisers and pesticides, as well as avoiding duplication and unnecessary measures, reduce greenhouse gas emissions, improve carbon sequestration, and help diversity. In livestock production the physical load decreases and the farmer's working conditions improve, for example, through remote monitoring.

Finland has good potential to utilise digitalisation. Digital technologies are, in principle, viewed positively. Digitalisation is generally seen as creating conditions for protecting the environment, helping to improve the welfare of farm animals, and supporting producers' economies. A lot of data is produced and generated on farms, but its analysis and use on farms is still poor. The most advanced sector in Finland is milk production. Already about half of Finnish milk is milked by robots, which at the same time produce a huge amount of data on both production and farm animals.

Social benefits from automated milking systems are enormous as the family farm is no longer tied to the milking times in cowshed. Family members can have normal social life, go to the hobbies, and take part in local politics. Before milking robots, the whole rural municipalities used to take account the milking times in its social life as otherwise the dairy farmers could not take part in activities. Digitalisation is significantly changing arable farming. In addition to the actual cultivation work, data work related to data analytics has risen strongly. The producer already has essential measuring instruments, cultivation software that discusses with machines and equipment, and GPS positioning has created the conditions for self-driving of the devices.

Information management supports the farm's finances. More detailed information increases cost-effectiveness, up-to-date production control, relevancy of decisions and uniform quality. At the same time, new production methods can be developed. The food industry and chain are also seen as beneficiaries of digitalisation development. However, there are also farmers who are not eager to tackle new technologies and operating policies. On the other hand, the ability to utilise information and communication technologies or digital platforms is also variable. The most efficient use of the new technology is trained and business-oriented farm entrepreneurs.

Smart agriculture is the basis for an increasingly traceable food chain. The food chain offers consumers CO2 tracking solutions that are beneficial to the environment and the climate. Consumer interest in following carbon footprint of their grocery shopping is tightening up producers' sustainability efforts. On the other hand, the development of platform technologies enables different stakeholders to collaborate in utilising data to produce financially and environmentally sustainable solutions.

When different actors in the chain give access to real-time data to authorities, industry, business networks and researchers, a new level of productivity, sustainability, predictability, and transparency can be achieved throughout the chain. The data can be used to gain legitimacy for farmers activities and, on the other hand, to develop new value-creating products and services. Trusted and secure data transfer continues to be a significant drag on the development of data mobility. Standards and aggregators are missing. Finland's smart agriculture operators are involved in developing their own and Europe-wide data space (European Agri Food Data Space). Its aim is to operate easily, reliably and in accordance with fair rules, benefiting all actors to exchange information between operators.

The Industrial Internet is one of the most important transformations of the moment. The importance of the industrial internet is explained, firstly, by the maturation of the technology required for the intelligence of products and by the calculation of the costs of deployment. Industrial internet offers opportunities for improving or reforming the services provided by the public sector (in the management of energy, roads, railways, water, and sewerage networks). Due to the long distances, remotely managed solutions have greater benefits in rural areas than in cities. In rural areas, opportunities for the industrial internet arise from the virtualisation of trade and services (e.g. online shops and local service points), remote control of tools and equipment, individualisation of learning (distance learning), self-service health care (e.g. carrying out some measurements yourself, after which a healthcare expert is consulted) and the virtualisation of identities and social structures (e.g. through social media).

How has this vision changed from previous ones? On-going CAP Program is not so different in its ambitions, but new digital technologies offer opportunities that could not be thought coming. Building infrastructure for digital transformation (broadband et cetera) is still important but maybe the view is now more on applications.

Holistic digital view has substituted the more sectoral visions. Traceability of value chain was nor understood before – even now the program may overlook the digital surveillance system that can pinpoint any producer 24/7. It may be mentally harder to be a farmer in the future as you just cannot

sell your meat and milk to the producers' co-operative and after that escape from the radar completely. If almost every product on the consumers table offers the information from the value chain, the producer is individually responsible for all the decisions made. Anonymity is history.

3.4.1. CAP Integrated Administration and Control System (IACS)

The aid application IACS deals with most EU and national subsidies paid to farmers in Finland. The scheme also collects a large proportion of basic agricultural statistics and non-indicator reporting data to the Commission. The IACS consists of the registers and systems required by the Horizontal Regulation (phased area monitoring from 2023) including a calculation application, a reporting system and a payment collection system connected to a centralised database, the IACS Central Register. The scope of the support application containing spatial data will be extended as required by performance reporting. The data used for the area monitoring system shall be stored on an external server.

Mandatory storage fields are used in data management, for the information needs of the performance report, (e.g. In the Vipu service during the recording phase of the electronic support application 4). A comprehensive automatic logic check for the data to be stored and its accepted values is in place (built-in monitoring system). Monitoring of the planned and actual unit support levels, financial alloy and planned variation will also be in place, as well as the indication of deviations (% overswing and the need to give reasons for deviations).

Compatibility with the European Commission's information system has been implemented. The aid application can be reported, inter alia, on the amounts of commitments and contracts applied for, area data, animal data, control data and payment data. Similarly, the results can be reported based on output data. The support application performs the storage of application data, data validation, recording of surveillance data, coordination of conditionality and making payment decisions. The calculation application is used to calculate subsidies, from which a lot of information is generated in the database, for example, in reporting. The aid application's payment collection system provides the data required for the processing of centralised aid payments to pay the aid. The farm register has also been maintained using the Support Application. The data in the IACS Central Register shall also be subject to cross-checking runs prior to payments and to ensure the correctness of outputs and to retrieve the necessary information for risk analyses related to sampling. To support the planning, monitoring and control of operations and other information needs, ready-made reports have been implemented to run either directly from the system interface or with separate reporting software. The data is retrieved for reports either directly from operational system data or from a repository implemented for reporting purposes.

3.5. Data management

Open Data

Digital and Population Data Services Agency (DVV) provides "all Finnish open data in one place". Don't know if this possible in practise but at least DVV tries. Opendata.fi is a service for publishing and utilising open data for everyone (https://www.avoindata.fi/en). The official portal for European Open data is data.europa.eu (https://data.europa.eu/en).

The President of the Republic has adopted laws implementing Open Data Directive (EU) 2019/1024. The acts entered into force on 17 July 2021. The new legislation concerns the way and form of disclosure of information in the case of public information held by public authorities or certain undertakings providing services of general interest or in the case of publicly funded research data. As a result of implementation, information held by public authorities and certain other organisations must be more easily utilised in certain respects. The European Commission is expected to adopt further implementing acts defining so-called valuable datasets. (https://vm.fi/-/julkisen-tiedon-luovuttaminen-muuttuu-avoimen-datan-direktiivi-pannaan-taytantoon).

The DVV has coordinated the network of projects in the Regional Councils (https://dvv.fi/-/digituen-alueellinen-kehittaminen-jatkuu-kattavasti-suomessa). Each project is responsible for developing a network of grassroot level actors as well as promote conspicuousness and findability of digital support in their region. The regional level is not permanent but given its geography, an extra layer of coordination may be necessary to ensure country-wide support.

The YKR Urban-rural classification is a GIS based regional classification system produced by the Finnish Environment Institute (SYKE). It structures Finland using seven regional classes. The Urban-rural classification and its criteria reform the prior urban-rural regional classification and trisection of rural areas based on municipal boundaries. The regional classification based on GIS data enables the utilisation of Finland's extensive and comprehensive GIS materials identifying various regions regardless of municipal boundaries. The urban-rural classification makes it possible to gather nationwide information on regional development in Finland.

The Urban-rural classification system has been implemented using nationwide source material. The material is based on accurate high-resolution geographical information. The calculations are made primarily in a statistical grid of 250 x 250 meters, which is also the resolution at which the material is classified on the map. The source material consists of data concerning population, workforce, commuting and buildings, as well as road network (Digiroad) and land-cover (CORINE). Based on the data, variables describing the amount, density, efficiency, accessibility, intensity, versatility and orientation of the areas have been calculated. The areas have been divided into seven classes based on a variety of analyses using these variables and the classification criteria.

The urban-rural classification primarily depicts differences between areas at the level of a regional structure, thus it does not describe in detail characteristics of smaller scale locations. The borders of

the spatial categories have been generalised in a way that the classification is suitable for examining broader areas. The classification system makes it possible to identify different developments at the regional and national level.

The geographical information-based area classification system has been created by the Finnish Environment Institute and the Department of Geography of the University of Oulu in cooperation with the Ministry of Employment and the Economy, the Ministry of Agriculture and Forestry and Statistics Finland.

The Finnish title of this dataset is Kaupunki-maaseutuluokitus (YKR). This dataset belongs to SYKE's open data collection (CC BY 4.0). The YKR Urban-rural classification is available from SYKE's open information service and represents year 2010. More information: http://www.ymparisto.fi/en-US/Living_environment_and_planning/Community_structure/Information_about_the_community_structure/Urbanrural_classification http://www.ymparisto.fi/download/noname/%7BAB032DBB-E09B-48C6-A385-42201BBCB32B%7D/135290

Cybersecurity and data safety

Finland´s Cyber security Strategy (2013) was an early effort to govern the new situation. Later it has been renewed many times (like year 2019 https://turvallisuuskomitea.fi/suomen-kyberturvallisuusstrategia-2019/). On 13 January 2021, the Ministry of Transport and Communications sent out for comments a draft Government Resolution on Cyber Security Development Programme. The aim of the Programme is to provide guidance for the cyber security development extending across sectoral borders and government terms. The Development Programme that was now sent out for comments includes both a concrete implementation plan and an impact analysis. The Programme covers the period from 2021 to 2030. (https://valtioneuvosto.fi/en/-/development-programme-to-improve-the-overall-state-of-cyber-security)

Themes of the new Programme are cyber expertise, cooperation, functional capacity, and cyber security industry. The aim is to bring citizens' cyber security skills to a good level as well as to provide Finnish top cyber security experts. This requires the inclusion of cyber security in different levels of education from comprehensive school to workplace training.

In addition to improving the skills, the Programme would intensify cooperation between the public sector and business and industry. The proposed measures include strengthening collaboration between cyber security operations and research and development activities in the sector. The Programme would also promote the active participation of Finns in international forums as well as closer cooperation with international cyber security actors.

The Programme pays particular attention to the authorities' capacity to provide appropriate measures for ensuring cyber security. It proposes that the authorities' preparedness and their observation capacity for cyber security should be further developed. In key sectors, the cyber security

requirements should be harmonised, and the information security of critical data resources and digital services should be increased.

Measures are also presented to support the domestic cyber security industry. For the branch of industry to emerge, the other elements in the Programme must function properly. At the same time, the aim is to promote the digital information society and the skills it requires. From the perspective of economic growth, the increasing cyber security market is an important opportunity for Finland.

For the Development Programme to be implemented, annual funding of EUR 5.9 million for 2022-2025 will be needed as well as an additional allocation of EUR 3.2 million for 2021. The Government Resolution on the Cyber Security Development Programme is based on the Programme of Prime Minister Sanna Marin's Government that aims to increase national cyber security to improve national coordination and enhance international cooperation.

National Cyber Security Centre (NCSC-FI) was established (see https://www.kyberturvallisuuskeskus.fi/en/). NCSC-FI develops and monitors the operational reliability and security of communications networks and services. NCSC-FI also provides situational awareness of cyber security.

The EU Network and Information Security Directive ('NIS Directive') contains provisions on security obligations and incident reports in multiple sectors. In Finland, such obligations are laid down in legislation within each sector, and the supervisory authorities in these sectors monitor their compliance. NCSC-FI supervise digital services and infrastructure while coordinating national and international cooperation. Usually, the provisions do not apply to micro and small enterprises. (See more https://www.kyberturvallisuuskeskus.fi/en/our-activities/regulation-and-supervision/digital-services-and-infrastructure)

Now many universities in Finland (also University of Jyväskylä) have professors who are specialised in cyber security. Government has encouraged universities to expand teaching and research in cyber security.

Kivivirta et al (2020) see that without functional cyberinfrastructure, access to many public services is almost impossible in remote rural areas of North Finland. At the same time citizens in remote and sparsely populated areas are accustomed to dysfunctional infrastructure, such as slower internet connections and even occasional power cuts. In terms of contemporary security practices, disconnectedness is now said to define danger. In dairy farms many alarm systems in cow sheds are not operational if Internet is down. Big economic losses can happen while farmers are sleeping in their house and not knowing that something is wrong.

Interoperability of data within EU information systems for security

The national implementation project is part of the ongoing development work within the EU to streamline data and information in its information systems related to internal security, border management and migration management. The Finnish project also covers a national legislative package. The legislative project was set up in April 2020 to prepare the necessary amendments to

national legislation. (https://intermin.fi/en/projects-and-legislation/interoperability-of-data-within-eu-information-systems-for-security)

Finnish authorities use EU information systems in their daily work. The purpose of the project is to coordinate the measures to be taken by different authorities in the context of the implementation of the EU-level reform in Finland. Similar projects are underway in other EU countries, too.

The aim of the EU-wide coordination effort is to strengthen security in parallel with a smooth flow of border traffic. In future, national authorities will be better able to detect security threats, intensify controls at external borders, and combat identity fraud and illegal migration.

Large-scale interoperable IT systems

Information systems interoperable across Europe will enable competent authorities to gain more rapid access to increasingly reliable and comprehensive data and information on third-country nationals present in the EU territory. This allows for improved identification of persons suspected of an offence, among others.

Apart from the Schengen Information System, the data and information entered in the said EU information systems only covers third-country nationals. For the individual citizen, the most noticeable new development is that the passports of third-country nationals will no longer be stamped at external borders, as border-crossing data will soon be stored digitally across the EU.

The Ministry of the Interior has during the summer circulated for comments a draft government proposal (https://intermin.fi/en/-/the-act-on-the-interoperability-of-the-european-union-s-information-systems-circulated-for-comments). The legislative proposal submitted to Parliament on Thursday 23 September allows the police, Customs and the Border Guard to make queries in the common identity repository of the European Union's information systems for the purpose of identifying a person. The EU regulations concerning the framework for interoperability were adopted in 2019. (https://valtioneuvosto.fi/en/-/1410869/interoperability-of-eu-information-systems-will-be-enhanced)

The interoperability platform maintained by the Digital and Population Data Services Agency provides tools for defining interoperable data content. The platform consists of the glossaries, code sets and data models needed for data flows and in other areas of information management. (https://dvv.fi/en/interoperability-platform)

The interoperability platform is intended for both public administration and the private sector. The platform tools are available free of charge for terminology work, the management of code sets and data modelling. Data content producers are responsible for their own data specifications and their quality, and for keeping them up to date. One can use the data specifications that exist on the interoperability platform. Using existing code sets and data models in your organisation's system development is cost-effective and improves interoperability between the systems of different actors. The consistent use of concepts makes services easier to plan and understand.

4. Challenges and Opportunities

4.1. Barriers to digitalisation

Jussila et al (2019) present the barriers of digitalisation in Finnish rural areas:digital technologies are advancing the walk of life and no one can follow there

1. Data is expensive and the incentives for its distribution are inadequate
2. Data standards and aggregators are missing, experts scattered
3. Security risks
4. The profitability and uncertainty of agriculture do not allow sufficient investment
5. Shortcomings in farmers' data expertise
6. Farmers are not interested in education or training is too demanding
7. The positive effects of digitalisation are not understood
8. Legislation and its shortcomings
9. Shortcomings in telecommunications infrastructure and advice for farmers.

Jussila et al (2019) provide valid points. Unfortunately, the barriers have stood the time better that no-one would have wished. Farmers have been offered courses where they can learn the basic digital skills. This has not been wasting of time and money because must know the basics to know when you must ask help from the experts. At the same, we must acknowledge that digital technologies are expanding to all walks of life, and no one can follow their advancement properly.

In the table 8 the barriers to digitalisation in Finland are updated to the COVID-19 times.

Table 8: Barriers to digitalisation in Finnish rural areas

Barriers to digitalisation		Influence of COVID-19
Technical	Mobile connections are not stable enough for farmers.	People move between places (second homes, domestic tourism) a lot so anticipating demand is not easy. Shared mobile connections are vulnerable.

	Low connectivity in rural areas	Networks are now faster and safer than before COVID-19.
Legal	Conflict over data ownership	No change.
	Work laws must be updated to allow distance working arrangements to be a genuine rural development policy tool.	Videoconferencing programs (like Zoom, Teams) are more popular than ever. Their quality has risen fast. Complicated workshops can be organised online with the help of new applications (like Miro).
Training / Education	Farmers are not interested in virtual education	Positive change. Rural inhabitants have found the benefits of digital communication tools. Physical travel will decrease as better equipment and software allow almost as good experience as face-to-face meeting.
	Training is too demanding	Better skills make learning easier. New ways to study include watching videos afterwards when there is a convenient time.
Economic	Lack of evidence of return on investment. Pilot projects and firms are needed to set a standard.	Specialised producers have encountered economic losses as their supply channels have been cut. Still niche producers are the biggest winners as they can get distant customers for their original or responsible products.
	Limited development of infrastructure (drain tiles are missing from many fields, land consolidation scheme and reallocation of pieces of land is needed) does not allow farmers to take advantage of productivity gains of digital technologies.	Farmers are building up drain tiles but that may have more to do with mitigating climate change damage. Digital sensors in drain tiles help keeping the land in agricultural use (not wet nor dry).
Others	Lack of public data to enable the development of digital business models.	More data will be available as society wants to help innovating and teleworking from home.

4.2. Actions to boost sustainable digitalisation

Jussila et al (2019) present the drivers of digitalisation in Finnish rural areas.

1. Development of standards and compatibility and common rules of the game
2. General digitalisation rate and service development
3. Cooperation between farms and service providers and machine suppliers
4. Digital leap and user-driven development of agricultural support organisations

5. Generational changes and other structural changes such as farm size growth
6. Team spirit and open cooperation between farmers, e.g. risk management
7. Cooperation with foreign actors
8. Training and investment aid
9. Media and local debate
10. Control by means of regulations
11. Investments in telecommunications infrastructure
12. Research funding

Jussila et al (2019) again provide valid points. I just comment some of them with the help of hindsight.

In dairy farming the dominating (80 % of raw-milk markets) producer co-operative Valio does not want to acquire more milk. The demand for milk is going down in Finland. People do not drink as much milk as before and there are also many substitutes for milk in the downstream markets (oat products, soya products et cetera). Exporting milk to western countries is not profitable, and Russia has closed its markets from the Finnish dairy products that used to be the leading foreign trademark in may niches. Cheeses, ice creams and yoghurts are imported to Finnish customers who want to taste something different.

Valio has now a milk quota system for areal co-operatives that gather the milk from farms, and the regional milk fetching co-operatives have a quota for every farm. This quota gives good prices for "normal" production, but the price goes down the more, the more the farm produces over its quota. So, in effect, bigger farm size does not increase your income as much as before. Increasing the farms size (that used to be the leading strategy for decades) is no longer as profitable as it used to be.

Bigger dairy farms gain more from the use of digital technologies as the unit cost of digitalisation per litre of milk is lower. In effect the milk quota system is slowing down the digitalisation in dairy farms as it is taking away part of the benefits. Of course, land consolidation, lean production, biogas production and other means to cut costs on the farm become more important as the output-based route to profitability is closed for the moments.

Table 9. Actions to boost sustainable digitalisation

	Key rural development domains			
	Human capital	**Innovation**	**Investments**	**Governance**
Creating the basic conditions for digitalisation	Firm can outsource digital work to a contractor if owner's digital	Prices for new technology items will come down quickly.	The pace of digitalisation will come from the growth in farm size. Large farms	Government wants to be technology neutral, so it won't back

	skills are not UpToDate.	Learning curve is steep, but also growing volumes lead to decreasing unit costs.	have not only more benefit (scaling) but also resources to invest in new technology.	down any single manufacturer's solution to a problem.
Anchoring digitalisation to sustainable development	Precision farming can save natural resources if energy use and fertilizer use can be downscaled.	Added value (security, animal welfare, working conditions) is created through traceability.	accelerated plant processing with data masses and machine learning	Government must show direction so that rural actors dare to invest in sustainable methods. Investment cycle is decades.
Adapting digitalisation to different context	The outcomes and risks of digitalisation projects are likely to vary by sector, geography and even between persons/ individual businesses.	General purpose technologies (like Industry 4.0) are easily applied to different contexts.	Farms with bad infrastructure in the fields must take part in land consolidation programmes. Drain tiles could also help. After upgrading the infrastructure, using digital technologies can be profitable.	Sustainable public procurement can help new solutions to gain ground by securing basic demand.
Favouring digital inclusion	providing digital competences for all	providing new ways of organising education and training by digital tools and platforms	bridge the digitalisation gap within and between population groups and regions	Providing a (virtual) place for rural actors in a cross-border dialogue is vital to ensuring an inclusive approach.
Developing digital ecosystems	Systematically consider how digitalisation and other	Development of EDIHs open new ways of doing things.	increased collaboration between regional actors to follow	Our Region's Rural Industry DIH needs SMEs as customers, otherwise it is

	disruptive technologies reshape the economies and societies.		trends in the market, assess the needs and develop new job opportunities.	just a certificate.
Developing adaptative governance models	Skills governance needs to be understood beyond education. Securing skills requires active work in attracting labour, promoting labour mobility across borders and across municipalities.			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.
Designing policy tools for sustainable digitalisation	Digital maturity tests tell the business developers what is the smart next step to take.			The ICT sector, climate and the environment must be looked together (see Ojala et 2020)

5. Conclusions

Finland is very successful in digitalisation - DESI and other measurement criteria give us a ranking near the medallists. Broadband connections are not fastest, but mobile connections serve many people with sufficient service level. Finland is a large and sparsely populated country so offering everyone optical fibre connection or 5G is neither easy nor cheap. Finland has not succeeded in mitigating digital divide even if much money has been spent in various support services.

EU members follow common rules. Still EU guidelines just create the framework and level playing field for all actors. Good rules are only the necessary requirement, not sufficient condition for a successful digitalisation. The way that policies are implemented, is important.

Finland has not had a digital strategy for a long time. Has Finland lost its long-term vision? Latest Finnish Governments have had a little different solution to the problem. Juha Sipilä's government wanted to name high priority projects that should be implemented fast. Sanna Marin's government has neither national digital strategy nor project priority lists in digitalisation. Interpreting politicians' mindset is always difficult but one can speculate that digital solutions are

- so mundane that you just live with them (cross-section policy is good as digitalisation is present in every sector)
- so difficult to foresight that best policy is to be technologically neutral (not to pick winners)
- so urgent that there is no time for long term planning (digital strategy unfolds itself ex-post from the actions that different stakeholder have enforced).

Ministries promote digitalisation in their sectors. Ministry of Finance coordinates digital actions but its efforts have mainly focused on building different kinds of support mechanism for special situations (cyber security, guidelines, promoting digitalisation in all sectors via budget negotiations). Ministry of Finance is maybe not so interested in digitalisation as a goal, but it wants to use digital technologies to increase productivity in industries and in the public sector.

Many sparsely populated and aging regions in Europe have lost especially public and some private services. The easy fix that different sectors offer is the digitalisation of public services or offering mobile services on some day during the week. Innovations are a good thing, no one wants to stop the progress of society. The use of new technologies can be a means to provide similar services in rural as in urban areas even if the service providers just want to reduce costs. However, one must ask if heterogonous regions need all similar or each different, tailor-made context sensitive services to be in equal situation with others. (Löfving et al 2021)

Rural researchers (see Salemink, Strijker, and Bosworth 2017) have emphasised the role of place-based or community-based approaches to ensure that rural digitalisation policies do not reproduce existing socio-economic divides or intensify territorial inequalities. Löfving et al (2021) receipt for achieving greater impact is the mainstreaming of digital solutions into administrative routines and the involvement of civic actors in the development of digital services according to local needs.

Rules versus discretion is an old discussion. In economics, clear rules are favoured when there is consensus on the advantages and disadvantages of the phenomenon (cartel ban). Case-by-case

consideration leads to a better outcome, but the increase in administrative and review costs may more than reverse the benefits of full account at society level.

Precision agriculture promises environmental (less fertilizer use, less pesticides) and economic benefits (raising profit when less inputs are needed and more and better output are produced). In many Finnish regions precision agriculture applications are still rare. There can be problems with absorption capacity of farmers. Infrastructure in the fields is not good enough (land consolidation programs are needed, drain tiles are missing) to reap the economies of scale. Also, the benefits of precision agriculture are less clear, but costs are easy to see. Access to cloud services is not reliable enough. Advanced digital technologies are not familiar to farmers even if most farmers have the basic skills that are needed to manage the administrative task connected to EU regulations and monitoring schemes. Many farmers in crop cultivation work part-time and the profitability of the businesses is low, so they are not interested to invest time to learn new ways of doing things.

Automated milking systems are very popular. They offer many benefits. Milking robots and manure robots reduce the need to use manual labor force, but the effect on working conditions is also big. Social effects still dominate as farmers are not tied to milking times and can have normal social life.

So far new digital systems make tacit knowledge codified. Milking robot does the same that human worker did before, so the real benefit comes from increased productivity. The real game changer is going to be a product or system that uses the inner strengths of digitalised world and does something that humans are not doing now.

The downside of digitalisation is the dependence of stable electricity network. Dairy farms using robot milking and other digital technologies must have a backup system for energy because there may also be power cuts in harsh weather conditions (heavy snowing, wind, storms). Long open-air electricity cables are vulnerable to falling trees when distances to electricity transformers are long. It may a long time to get electricity back if there have been large damages in the nearby forests.

Policy analysis is difficult when you don't have a leading document that you can interpret. Hatinen (2020) saw that previous Finnish government published only a list of most important projects and otherwise focused on support services. That interpretation may be correct or not. Current government has been struggling with Covid-19 and policy proposals concerning digitalisation have been even more rare. EU programmes have led the development in Finland.

One can say that transformation myth in Finland has been busted (Kane et al 2021). Current digitalisation is not a great transformation in Finland as we already experienced greater disruption when Nokia was making cellular phones. Digitalisation in Finland is a process where small incremental shocks come again and again. Leaders in ICT companies have met many challenges during their careers, and more are coming. Firms adjust their operations to changing circumstances. Resilient ICT firms have flexible job contracts with their employees who can also change jobs to another similar firms if the current business model proves to be a failure.

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