Government report: Finland's Digital Compass

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Abstract

For the purpose of directing and managing the development of the digital transformation in Finland, a Digital Compass was drawn up. The work was steered by the ministerial working group on developing the digital transformation, the data economy and public administration and prepared by the coordination group for digitalisation. As a background to the Digital Compass, the report describes Finland's challenges and opportunities for the development and utilisation of digitalisation and the data economy.

The Digital Compass is based on European values and the Digital Decade 2030 programme. It steers the development work and strengthens the shared understanding of the benefits, concepts and direction of digitalisation and the data economy. It also sets out priorities for Finland's advocacy work in the European Union.

The Digital Compass shows the way as we create a common roadmap for the development of digitalisation and the data economy. According to the vision, we are building a digitally capable Finland that is attractive, competitive, sustainable and prosperous. We will achieve this through competitive and innovative business activities, high-quality expertise, broad-based education, people-oriented public services and safe and high-quality infrastructure.

Achieving the objectives set for the Digital Compass calls for extensive systemic change; determined cooperation with the public and private sectors, universities, research institutes and organisations. To accelerate digitalisation and the data economy, we need investments and cross-sectoral practices.

Keywords Digitalisation, data policy, strategies, management

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Valtioneuvoston selonteko: Suomen digitaalinen kompassi

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Tiivistelmä

Suomen digitalisaatiokehityksen suuntaamiseksi ja johtamiseksi on digitalisaation, datatalouden ja julkisen hallinnon kehittämisen ministerityöryhmän ohjauksessa ja digitoimiston valmistelussa laadittu Suomen digitaalinen kompassi. Digitaalisen kompassin taustana selonteossa kuvataan Suomen haasteita ja mahdollisuuksia digitalisaation ja datatalouden kehittämisessä ja hyödyntämisessä.

Digikompassi perustuu eurooppalaiseen arvopohjaan ja digitaalinen vuosikymmen 2030 -ohjelmaan. Se ohjaa kehitystyötä ja vahvistaa yhteistä ymmärrystä digitalisaation ja datatalouden hyödyistä, käsitteistä ja suunnasta. Digikompassi määrittelee painopisteitä myös Suomen vaikuttamistyölle Euroopan unionissa.

Digikompassi näyttää suuntaa, kun luomme yhteistä etenemissuunnitelmaa digitalisaation ja datatalouden kehitykselle. Vision mukaisesti rakennamme houkuttelevaa, kilpailukykyistä, kestävää ja hyvinvoivaa digitaalisesti kyvykästä Suomea. Tämä saavutetaan kilpailukykyisellä ja uudistuvalla yritystoiminnalla, korkeatasoisella osaamisella ja laajalla sivistyksellä, ihmiskeskeisillä julkisilla palveluilla sekä turvallisella ja korkealaatuisella infrastruktuurilla.

Digikompassin tavoitteiden saavuttaminen edellyttää laajaa systeemistä muutosta; määrätietoista yhteistyötä julkisen ja yksityisen sektorin, yliopistojen, korkeakoulujen ja tutkimuslaitosten sekä järjestöjen kanssa. Digitalisaatiota ja datataloutta vauhdittamaan tarvitaan investointeja sekä toimialarajat ylittäviä käytänteitä.

Asiasanat	digitalisaatio, datapolitiikka, strategiat, johtaminen		
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Finlands digitala kompass har utarbetats under ledning av ministerarbetsgruppen för utveckling av digitaliseringen, dataekonomin och den offentliga förvaltningen och av digitaliseringsbyrån för att styra och leda utvecklingen inom digitalisering i Finland. Som bakgrund till kompassen innehåller redogörelsen en beskrivning av Finlands utmaningar och möjligheter i fråga om att utveckla och utnyttja digitaliseringen och dataekonomin.

Den digitala kompassen är baserad på en europeisk värdegrund och på programmet för det digitala decenniet 2030. Den styr utvecklingsarbetet och stärker den gemensamma förståelsen av fördelarna med, begreppen i och riktningen för digitaliseringen och dataekonomin. Den digitala kompassen fastställer också prioriterade områden för Finlands påverkansarbete i Europeiska unionen.

Den digitala kompassen är riktgivande när vi skapar en gemensam plan för hur utvecklingen av digitaliseringen och dataekonomin ska framskrida. I enlighet med visionen bygger vi ett attraktivt, konkurrenskraftigt, hållbart och välmående digitalt kompetent Finland. Det här uppnås med hjälp av konkurrenskraftig och innovativ affärsverksamhet, hög kompetens och bred bildning, offentliga tjänster som sätter människan i centrum och en trygg och högklassig infrastruktur.

En förutsättning för att målen med den digitala kompassen ska uppnås är en bred systemförändring; ett målmedvetet samarbete med offentliga och privata sektorn, universitet, högskolor och forskningsinstitut samt olika organisationer. För att påskynda digitaliseringen och dataekonomin behövs investeringar men också branschövergripande praxis.

Nyckelord	digitalisering, datapolitik, strategier, ledarskap		
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1 Introduction – digitalisation and the data economy are changing the world

The current decade of digitalisation and data economy transformation is changing Finland and the entire world. This change concerns every one of us, as digitalisation and data are part of everyday life in all sectors of society. This is reflected in new kinds of services, operating models, technologies and skill requirements. Digitalisation and the growth of the data economy open up many opportunities. However, to enter a path of strong development and stay on the cutting edge of rapid progress, Finland needs comprehensive leadership, appropriate resource allocation and investment.

The digital compass is a national strategic roadmap that extends to 2030. It includes the national vision for 2030 and the values that will underpin our development with regard to digitalisation. The digital compass objectives revolve around four cardinal points: a digitally skilled population and workforce, digital infrastructure, the digital transformation of businesses, and digital public services. The compass includes prioritised objectives for each of these points up to 2030. The digital compass also sets objectives for the management and implementation model for digitalisation. It will help establish a shared vision for the future and guide the digital transformation across administrative and sectoral boundaries, while also supporting the systemic digital green transition. The national digital compass is based on the EU's Digital Compass, introduced in 2021, and the related EU Digital Decade Programme. The national objectives are ambitious and, in some respects, set even higher than the EU's targets.

Digitalisation makes it possible to facilitate customer orientation, improve quality and increase productivity in services. It also challenges organisations to transform their operations. Investments in the development and application of new technologies and operating models yield many benefits for society. For example, solutions based on robotics and automation can free up resources for work that creates the most value for organisations and society. This makes everyday life smoother for citizens and improves productivity in both the public sector and the private sector as well as the competitiveness of businesses. For companies, the development of the data economy makes it possible to innovate solutions based on new kinds of business models and to export globally attractive solutions.

Digitalisation, new technologies and the use of data provide opportunities for moving towards a climate-neutral, resource-saving, green and resilient circular economy. At the same time, digitalisation and the data economy also consume energy and resources to an increasing extent. Furthermore, the climate impacts of the data economy and related energy production do not necessarily happen in the same place as where the data-based final product is consumed. Adopting digital technologies that promote and enhance the green transition requires competence, research and solutions for calculating and reducing the carbon footprint of the data economy. Finland should be a trailblazer in creating solutions for the green transition.

Global competition for state-of-the-art technologies, skills and professionals is accelerating, which characterises the discussion around digitalisation. By taking a coherent approach, the EU can act as a sufficiently strong counterforce to global power aspirations and large corporations, in the possession of which the majority of the data has also accumulated. The coming decade will be crucial for the development of the data economy and the EU's increasingly digital single market. The numerous pending EU legislative initiatives will set the rules for a long time to come. Coherence is needed, as EU legislation and the digital capabilities of the Member States are quite dispersed. Creating a coherent regulatory environment and standards is a key way to reap the benefits of scale offered by the single market. Finland has already been able to punch above its weight in the EU with regard to issues related to digitalisation and the data economy. The data economy is globally growing faster than traditional sectors, which makes it important for Finnish companies to get on board with this growth. Finland must continue to actively offer solutions, with which the development of the data economy can be directed, also globally, to a path that is based on democracy and European values.

The digital compass makes it possible to exercise more targeted influence on the development of digitalisation in a world where digitalisation is also intertwined with foreign policy, particularly with regard to threats against security, human rights and the global open economy. Societal objectives and competition in developing and deploying technologies change geopolitics and influence power relations between countries. Tensions are also created by the growing power of large technology companies relative to states, as well as supranational regulation where regulations targeted at a given jurisdiction's citizens and enterprises are extended to also apply beyond the borders of the jurisdiction in question. Critical infrastructure with strong cyber resilience, including not only direct ICT infrastructure but also the ICT-dependent energy, transport and water resources management networks, is one of the pillars of the operating capacity of society. The ability to develop and protect critical infrastructure plays a key role in the digital transformation. The changed geopolitical situation and the COVID-19 pandemic are concrete examples of this. The societies that were economically the least hit by the COVID-19 pandemic were the ones that had invested the most in digital capabilities.

Media literacy and the ability to tackle influence through information are, for their part, preconditions for a trust-based, open and democratic society.

Finland is in a good position to be successful in the digital transformation, thanks to the country's strong technological competence in many of the core areas of digitalisation and the data economy. We are a trust-based society, in which the public, private and third sectors cooperate closely to create new operating methods. At the same time, in our digitalising society, we also have challenges to overcome and bottlenecks to eliminate. Examples of these include the low amount of ICT investment aimed at increasing productivity, a shortage of skilled professionals, marginalisation and the changes in operating culture and paradigms required by digitalisation. The pace at which the digital capabilities of SMEs are increased needs to be accelerated in particular. It is also necessary to ensure that citizens possess the necessary skills. Skills and competences must be developed on a more multidimensional basis so that the benefits of digitalisation and the data economy can be leveraged more effectively. Finland must move from a technology-centric approach towards new operating models and business models that take advantage of globally scalable customer- and value-centric technologies. To achieve this change, additional investments in skills, research, development, innovation and attracting investment are essential.

Managing digitalisation and the data economy requires cross-sectoral governance and cooperation. In response to this need, a ministerial working group on developing the digital transformation, the data economy and public administration was established in autumn 2021. An interministerial coordination group for digitalisation was established to support the work of the ministerial working group. The task of the coordination group for digitalisation is to develop permanent and cross-sectoral coordination. The coordination group for digitalisation has also been responsible for the drafting of the national digital compass. These cross-sectoral leadership and coordination efforts need to be continued and strengthened in the implementation stage of the digital compass. The development and steering of digitalisation requires action not only from the central government but also from the municipal sector, businesses, higher education institutions, research institutions, the third sector and civil society. With this in mind, the digital compass is created and updated in close cooperation with stakeholders. The digital compass guides the actions taken by the central government, contributes to the execution of the strategy of the public administration and inspires all parties to pursue a shared vision and targets.

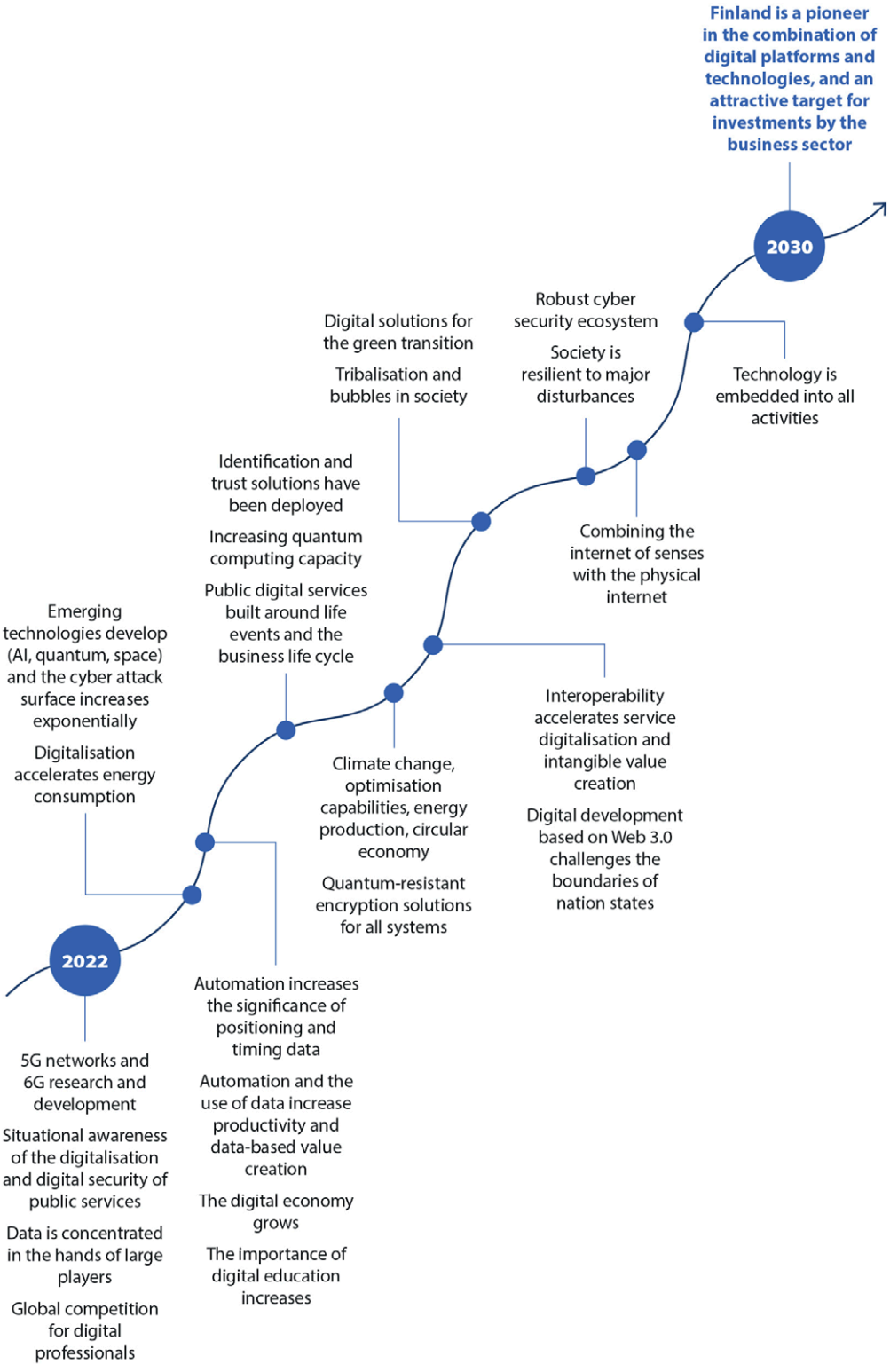
2 The benefits of digitalisation and the data economy will be realised through new operating models and leadership

2.1 Digitalisation and the data economy as challenges and opportunities for Finland

The global phenomena of digitalisation and the data economy are becoming increasingly complex and applying to a growing number of sectors and industries. In this environment, leveraging Finland's strengths requires broad-based situational awareness that cuts across the boundaries between sectors. In order to realise the benefits offered by digitalisation and the data economy, we need to anticipate and understand the phenomena that influence global and national development.

The accelerating climate crisis, an ageing and geographically concentrated population, the transformation of work resulting from digitalisation and new kinds of security threats in the digital environment are challenging governance structures and operating methods created over the last century. We also have the sustainability gap in public finances to solve as the ageing of the population increases the number of senior citizens and creates pressure on health, care and pension expenditure and the decrease in the working-age population impairs economic growth opportunities. The digitalisation and automation of public services help us tackle these challenges.

Figure 1. Global and national phenomena



Global and national phenomena affect Finland's opportunities to successfully take advantage of digitalisation and create solutions for the digital economy.

Finland is in a good position to benefit from digitalisation and solve the challenges digitalisation brings. However, strengths do not automatically turn into successes. We need to take full advantage of Finland's strengths and invest in addressing Finland's weaknesses together to ensure that we keep abreast of the global development of digitalisation and participate in the growth of the data economy.

Table 1. SWOT analysis of the current state and future of Finland's digitalisation and data economy

Strengths	Weaknesses
Strong digitalisation competence and education, digital skills	Finland is starting to lag behind the global growth of the data economy
Favourable attitude towards technology	Lack of financing and management models that enable cooperation across the boundaries between sectors and industries.
Trust-based society	Investments in the growth of the digital economy and data economy are at a lower level than those of Finland's peers
The agility needed for experimentation in cooperation between the public authorities, businesses and the third sector	The relatively low amount of ICT investment slows down the growth of productivity
International leadership in "My Data" thinking	Lack of practical solutions for the flow of data
The rate of digitalisation of public services and digital public services	Services based on the sharing of data between various parties have not been created to a significant extent
Highly functional networks	

Opportunities	Threats
The data economy creates new digital services and business	Failing to invest in digitalisation at the central government level and provide digital investment incentives to businesses would erode Finland's competitiveness
Digital green transition solutions generate exports	Failing to participate in the global growth of the data economy
Finland is profiling itself as an expert in cyber security, which creates export opportunities	Growth is slowed down by the shortage of skilled professionals. Intensifying global competition for skilled professionals
Increase the number of IT professionals through training and education as well as by attracting skilled professionals	Businesses fail to employ the international skilled professionals who are in Finland
Ensure an adequate level of matching funds for EU funding to drive growth and take advantage of European expertise	Growing digital marginalisation, leading to exclusion in society
Create practical solutions for sharing and managing data	Weakening security in digital environments, which hampers the functioning of society and erodes trust in the public authorities
Digital public services for individuals and businesses enhance daily life and increase productivity	Regulations affecting the operating environment for businesses is implemented in a form that is too detailed and restrictive (EU level and national level) or failing in the consistent implementation of regulations

The benefits of data increase through sharing

The development of the data economy, the platform economy and smooth digital services is based on the effective sharing of digital information, i.e. data, between various parties. Benefits arise from combining and analysing data in new ways; for example, to create the foundation for new digital services or develop new processes, products and business models. Agile access to data for companies of all sizes, under fair terms and conditions, as well as the courage to open data and develop new kinds of business models, generate new growth business in the data economy.

An increasing amount of data is accumulated by individuals and collected about them. For example, many applications, devices and machines generate data that could be used more effectively as the basis for services. It is vital for human-centric service development that individuals have the opportunity to control the use of their data and share their data with their chosen data ecosystem participants. As the country that created the My Data model, Finland can play a key role globally in creating smooth and easy solutions that correspond to the needs of individuals and facilitate the secure sharing of data in a manner that preserves the individual's rights[1], in both public and private services.

Consumer-driven data sharing is difficult at present. So-called data lock-ins, in which data remains in the possession of a single party, or where the consumer does not have the opportunity to influence the use of their data, constitute an obstacle to service development and the consumer's freedom of choice. For example, in the transport sector, legislation would make travel chains possible but there are hardly any consumer-oriented service combination solutions that would cover the entire travel chain.

The development of digital public services that take advantage of automation requires that more attention be paid in Finland to the production of interoperable and high-quality data, along with consistent practices (including data structure, description and standards). This ensures a technology-neutral operating environment where the solutions employed will remain interoperable in the future. It is important to create concrete cross-sectoral means to promote interoperability and avoid sector-specific solutions, which complicate the life-cycle development and management of future service packages.

1 The EU's General Data Protection Regulation provides individuals with the following digital rights to their personal data in private services: the right to access, rectify and erase their personal data, the right to object to and restrict the processing of their personal data, and the right to request the transfer of their personal data from one controller to another. Regulations that support the objectives of the GDPR are also in place in other jurisdictions, including Japan, South Korea, Canada and the United Kingdom.

The use of data is necessary throughout society

Public digital services, driven by user needs, are available from a single digital contact point.

Services are built so that they are based on an individual's life stages and the life cycle of businesses.

People can share the data they accumulate smoothly and securely in order to use digital services.

The use of digital services saves time and improves competitiveness.

Finland is a global frontrunner in the creation of concrete solutions for the use of data.

On board with the growth of the data economy

The significance of the data economy to national economies will increase considerably by 2030. According to the EU's data market study, the growth of the market is faster than in other sectors. If scalable and innovative business models based on data processing and data-based value creation are not introduced to the market, the danger is that Finland's competitiveness will deteriorate. We are at risk of falling behind our competitor countries[2].

Finland is known in the EU as a promoter of digitalisation and data economy capabilities. Our perspective has served as a basis in the drafting of the EU's data economy regulations, for example. We can further improve our opportunities to exercise influence by concentrating our influence efforts, both nationally and at the EU level, and by allocating resources to the EU's preparatory processes in areas that are high priorities for Finland.

The business potential of the data economy and its significance to Finland's competitiveness have already been recognised in industry and the business-to-business (B2B) context. However, consumer business requires investments, as Finland's growth in e-commerce solutions, for example, is clearly slower than in many other European countries.[3] The

2 Sitra's data economy report 2021: Suomen vahvuudet, haasteet ja mahdollisuudet datatalouden rakentamisessa. Sitra 2022.

3 Digibarometer 2021: Vuosikymmen verkkokauppaa ja alustataloutta. ETLA tieto 2021.

challenge for Finland is that, when compared to our peers, we generate fewer start-ups that can be scaled globally and whose business is based on the opportunities presented by digitalisation and the data economy. Our strong ICT and technology expertise is not generating high-growth start-up enterprises to the expected extent. We must invest in combining sales and export competencies with technological competencies and turn combination into a decisive success factor. At present, the majority of the added value created for customers comes from large corporations using the data they have in their possession. The SME sector is still in the early stages of tapping into the benefits of the data economy. Indeed, it is vital to strengthen these capabilities and insight in small and medium-sized enterprises.

The development of the data economy is creating new roles for technology companies that innovate and offer services for data management, transmitting and re-use (known as data operators and data intermediaries). This trend makes it possible for Finland to also export the best solutions to international arenas. For example, digital identity and MyData applications, cyber security solutions, data flow solutions that facilitate the real-time economy or seamless travel chains made possible by the Act on Transport Services could even be called techno-social innovations for which there is demand in Europe and more broadly around the world.

In Finland, strong cooperation between the public sector and the private sector lays a solid foundation for various data economy experiments. However, it is important to ensure that we are not left behind in the development of the data economy, serving only as a test bed. We must actively scale up the solutions we create in order to seize our share of value creation based on data economy service innovations and unicorns that emerge in the EU's single market. We must be on board with the growth of the data economy because, in the future, it will be increasingly common that successful enterprises are created with the aid of data economy operating models and use them in their operations. We need tax revenue from such businesses to secure the operating conditions for our welfare state.

The data economy is globally growing faster than traditional sectors

Competitiveness will be ensured by more effectively converting Finland's potential, based on technology and competence, into data economy services and products to generate profitable and sustainable data-driven business.

Small and medium-sized enterprises need to be more extensively involved in taking advantage of digitalisation and data economy services and in the role of producers in innovation and business ecosystems.

Cooperation between the public sector and the private sector provides a solid foundation for data economy experiments.

Inclusion in the digital society

As society becomes increasingly digital, it is vital to ensure that everyone has the opportunity to participate in society and its operations. This will be achieved by focusing on digital skills and the accessibility of digital services. Having the opportunity to use digital services also enhances the opportunities to participate and exercise influence in society in a broader sense.

Adequate digital skills are a precondition not only for finding employment but also for participation and inclusion in society. Indeed, digital skills can be considered a new civic skill. Digital skills are built by strengthening competence, increasing equality with regard to education and supporting continuous learning.

No-one should be left behind in the development of our increasingly digital society. This also requires strengthening trust and promoting a positive attitude towards change and digitalisation in general. In Finland, digital public services are widely available and actively used by people.[4] This provides a good starting point for the digitalisation of public services. Inclusion is strengthened by providing high-quality digital support to people in different life stages through cooperation between the public, private and third sectors. One important aspect of promoting inclusion in an increasingly digital society is ensuring the availability of services in both of Finland's official languages – and other languages – in line with the national language strategy[5]. At the same time, support and services also need to be provided to those who are unable to use digital services.

4 DESI 2022 country profile, Finland.

5 Government resolution: Strategy for the national languages of Finland.

Everyone has the right to participate in our increasingly digital society

It is important for everyone to have the opportunity to use digital services and participate in society.

Digital skills promote employment, inclusion and participation in society.

The accessibility of digital services needs to be developed.

Support for the use of digital services is needed in various life stages.

Security is challenged in new ways in a digital environment

The digital operating environment and security environment has changed dramatically. These changes have been partly driven by the COVID-19 pandemic, which has led to the development and adoption of new technologies. Russia's attack on Ukraine, in turn, has seen state-level cyber action emerge as a permanent tool for influencing the operating capacity of societies. These changes have significantly expanded the field of threats in the cyber security operating environment.

Digitalisation has created new kinds of security threats, such as cyber attacks, influencing through disinformation, data theft and identity theft. A society with a high degree of connectivity is increasingly dependent on the digital operating environment. Consequently, cyber security and information security must be integrated into all activities, processes and systems. With regard to preparedness, it is crucial to enhance society's resilience, which refers to the capacity to remain operational, tolerate disruptions and recover.

Finland is in a good position to build a safe and secure society that operates in a reliable manner. We have the technological capabilities necessary to develop cyber security and information security. There is a strong tradition of cooperation between the public and private sectors in Finland. Nevertheless, action and the development of preparedness is broadly needed in various sectors and at all levels of operations. Cyber security and information security must be seen a natural part of each organisation's and individual's social responsibility.

The development of cyber security requires a purposeful long-term effort. Risks may materialise quickly and the operating environment is constantly changing. With regard to cyber security, the challenges faced by companies and the public sector are often associated with the depth of the organisation's management's commitment to maintaining cyber security[6]. In the business sector, the level of cyber security is fairly good as a whole, although there can be major differences between enterprises. The capacity of small enterprises to maintain data protection, information security and cyber security must be given more attention. When it comes to the development of cyber security, the shortage of skilled professionals is a major challenge for both the private and the public sector. Work-related information security and cyber security skills must be strengthened and day-to-day cyber security skills need to be developed more broadly in society.

Although digitalisation brings new kinds of security threats, increasingly digital operating methods and technologies also offer the opportunity to improve the resilience of society. In addition to resilience, international needs related to strengthening cyber security provide enterprises in that sector with value creation opportunities.

Digital security is crucial throughout society

The digital environment requires preparation for new kinds of security threats, such as cyber attacks, influence through information, data theft and identity theft.

Finland has strong competence and a good opportunity to build a digitally secure society.

Digital security is a responsibility for everyone, from individuals to businesses and public sector organisations.

Digital operating methods strengthen society's resilience against exceptional circumstances. Countries with advanced digitalisation coped with the COVID-19 pandemic the best.

6 Kyberturvallisuuden nykytila eri toimialoilla – kartoituksen keskeiset havainnot. Huolto-varmuusor-ganisaation Digipooli 2020.

Competence as a bottleneck

When it comes to digital skills, Finland performs well in international comparisons. Finns have comprehensive basic digital skills and significantly more ICT specialists are trained, and graduate, in Finland than in the EU Member States on average. In spite of this fact, 59% of businesses recruiting ICT professionals reported difficulties in filling vacancies in 2021[7]. The availability of ICT professionals threatens to become a bottleneck to the development of business and public services. There is a need for not only ICT competence but also competence in various fields where digital capabilities support professional development and the application of skills.

Attracting university-educated digital professionals, researchers and specialised experts is an acute challenge for Finland. The proportion of international students among the graduates of Finnish universities is the highest in the ICT industry in relative terms, but only a small proportion of them end up working in Finland. While efforts have been made to develop services aimed at international professionals, there is still room for improvement in that respect. Residence permit processes and services that support the settling in of families and the employment of international professionals' spouses need to be developed further.

Digitalisation cuts across the various areas of business. With this in mind, small and medium-sized enterprises need to pay more attention to digitalisation-related competencies. This calls for new kinds of solutions and cooperation. There is a need for education and training leading to degrees and qualifications as well as continuous learning solutions driven by the needs of working life, in which SMEs can also participate. It is not enough that we develop new products and services: innovations must also be turned into successful business. The weak commercialisation of research hinders our success. Technological competence must be linked more closely with digital marketing, sales and service design competencies in both B2B services and data-driven consumer business development. Accelerating the growth of start-ups and boosting their internationalisation capabilities is another area that should be given more attention.

7 DESI 2021 country profile, Finland.

International skilled professionals are necessary, and the digital capabilities of SMEs need to be invested in

Compared to European countries on average, Finns have good basic digital skills.

The global competition for digital professionals will intensify in the years to come. This will also become apparent in Finland.

Finland must invest in attracting international professionals. Efforts should be made to ensure that international digital professionals graduating from Finnish educational institutions end up working in Finland.

Investments must be made in the digitalisation-related competencies of SMEs.

The green transition creates opportunities for Finland

Finnish competencies, research, development and innovation can play a key role in combating climate change and building solutions for the green economy. AI, for example, can be used to reduce energy and material consumption and emissions in various processes. The implementation of circular economy business models also requires digitalisation and the extensive use of data. Finland has significant expertise in quantum technology development, world-class AI research and leading 6G technology development, for example.

When it comes to finding locations for data centres, Finland's cool climate conditions create a natural advantage as cooling energy accounts for a significant share of a data centre's energy consumption. The ICT sector consumes significant amounts of energy and natural resources at present, which is why climate and environmental issues associated with digitalisation are the subject of growing international concern. Finland has a great deal of competence for realising energy-efficient ICT infrastructure and for developing ICT-based and digitalisation-based solutions to reduce the consumption of energy and materials. Digitalisation can help reduce energy consumption and greenhouse gas emissions of various sectors, such as the transport sector and industry.

The digital green transition requires a comprehensive change, which involves major opportunities for Finland. From the perspective of businesses, there is an inevitable trend of viewing sustainability not only from the traditional perspective focused on

risk and costs but also as a business opportunity and a tool for increasing enterprise value. Investors and financing providers are increasingly allocating capital to sustainable investees because the sustainability of activities – with regard to climate change, for example – influences an enterprise's risks and, consequently, the development of its value and revenue potential. Finland must promote the allocation of financing towards the digital green transition to support the achievement of targets related to climate change and biodiversity as well as the renewal of the structure of the economy.

2.2 Leveraging the opportunities presented by digitalisation requires investment and a new approach to governance

The benefits of digitalisation are not achieved merely by adopting new technological solutions. The renewal of society requires networked and cross-sectoral management and operating models concerning digitalisation.

Promoting digitalisation and the data economy will require significant investments in the coming years to develop services and their underlying infrastructure. Digitalisation does not consist solely of technical development but also of the development of operations and processes and their implementation under new preconditions. This requires – in both the public sector and the private sector – investing in competence and human capital as well as change management, the renewal of operating culture and a horizontal approach.

The following are the preconditions for success in Finland's digitalisation development:

- **Shared situational awareness and vision nationally**.
- **Monitoring digital development** requires measurement and reporting tools and models for impact assessment and foresight.
- **Joint governance framework between different sectors**. Managing projects that cut across the boundaries between sectors and industries, and assessing the profitability of investments, requires new models for management and resource allocation that operate on a phenomenon- and service-driven basis.
- **Comprehensive project planning and management**. Cross-sectoral and long-term planning of projects and assigning priority to projects that span across the boundaries between sectors. Interoperability between the different branches of administration must be ensured in projects.

- **Sufficient investment and new investment models**. Maintaining the quality, and making use of, data reserves, building interfaces and addressing information security and data protection requires continuous investments and working through the maintenance backlog that has already emerged. Developing investment models to support solutions and operating models that span across the boundaries between sectors and taking the full life-cycle of projects into consideration.
- **Developing the competencies of the public authorities**. In a rapidly changing operating environment, it is important to take into account technology, regulatory and sustainability competencies and knowledge management, for example.
- **Agile user-driven development**. Taking advantage of service design and agile application development, open-minded use of new technologies and operating methods. Taking user-driven development as the starting point instead of the administrative structures of the public authorities.
- **Enabling legislation and steering development**. Developing the regulatory framework in a proactive, long-term and technology-neutral basis, both at the industry-specific level and in an industry-independent context. The emergence of an operating environment that promotes digitalisation is supported by incentivising digital investments by the business sector and other ecosystem participants.
- **Cooperation**. Broad cooperation between the public, private and third sectors and universities and research institutions, and establishing a common language and understanding around digitalisation and the data economy. Engaging the commitment of all participants in the national targets.

A permanent structure for leadership: the digital ministerial working group and the coordination group for digitalisation.

To direct and lead digitalisation development as a whole, the Government set up a ministerial working group on developing the digital transformation, the data economy and public administration in September 2021. The task of the ministerial working group is to steer the development of digitalisation, information policy, technology policy, the data economy and cyber security across the boundaries between sectors and to coordinate related activities and situational awareness.

To improve interministerial cooperation, the coordination group for digitalisation was established at the same time to support the work of the ministerial working group. The coordination group includes representatives from each ministry. The coordination

group for digitalisation coordinates cooperation between ministries, maintains an overall picture and up-to-date situational awareness of Finland's digitalisation and data economy development. It serves as a contact point for correspondence on data policy, digital policy and information policy with citizens and stakeholders and engages in active cooperation with stakeholders.

Another task of the coordination group for digitalisation is to enhance Finland's influence at the EU and international level as digitalisation and data economy initiatives are spread across several administrative branches. Proactive influence in cooperation with stakeholders and creating initiatives will become increasingly important in the future.

The achievement of the digital compass targets and the overall picture of Finland's digitalisation, data economy and public administration need to be monitored and steered across terms of government, led by the ministerial working group, which, based on the lessons learned, supports the continued development of the coordination group for digitalisation, which operates in a networked and flexible manner. The performance guidance of the central government needs to be linked to the digital compass targets.

Investments in digital compass implementation and multinational projects

The development of digitalisation requires investments from both the public and private sectors, as well as the use of multiple sources of financing. Several measures related to pursuing the digital compass objectives are already under way, or funding has been allocated to them in recent decisions. Future investment needs and sources of financing will be examined in more detail as part of the preparation of the first action plan. Decisions on the use or commitment of government appropriations will be made in the budget procedure. To achieve the ambitious objectives, investments need to be reviewed and resources need to be appropriately allocated to digitalisation and the creation of the preconditions for the data economy. The more detailed data-based specification of the necessary digital investments and the prioritisation of financing needs are also necessary in the implementation of the digital compass.

Finland's target is to increase research and development expenditure to four per cent of GDP by 2030. Achieving this target would also have a significant impact on the development of technologies that promote digitalisation and the implementation of the digital compass, if RDI investments are allocated to projects that promote digitalisation.

Funding received from the EU's Recovery Facility also contributes to the achievement of the objectives of the digital compass. Finland allocates approximately 28% of the funding, or about EUR 190 million, to promoting the digital transition. Funding is allocated to

promoting the real-time economy, improving cyber security and spearhead technologies, for example.

EU funding needs to be utilised in the implementation of the digital compass through multiple funding programmes. There are several funding opportunities available for different stages of digitalisation and for different beneficiaries. Taking better advantage of EU funding can provide significant additional support for Finnish innovation, deepen the international partnership networks of businesses, and create the conditions for significant new high value-added export activities. Improving the reconciliation of EU funding with national funding is key for the smooth implementation of national matching funds. It is also important to ensure the availability of effective advisory services for organisations seeking EU funding.

RDI funding and development investments are also directly linked to the EU's preparation of data-based policy measures and the development of standardisation. Funding also needs to be utilised more broadly than before in the public sector's development efforts.

The EU's Digital Decade policy programme is supported by multi-country projects included in the programme. They are aimed at accelerating and facilitating the launch of large-scale multi-country projects that no individual Member State could implement on its own. The European Digital Infrastructure Consortium (EDIC) is a new arrangement that accelerates and simplifies the implementation of such projects. The EU-level investment areas for multi-country projects include data infrastructure, low-power processors, high-performance computing, secure quantum level infrastructure, digital public administration, blockchain technologies, digital innovation hubs (EDIH) and investments in the development of digital skills. Multi-country projects that are interesting from Finland's perspective will be assessed in more detail as part of the implementation of the digital compass. Finland must take advantage of the EU's targeted RDI investments also in the digital and green twin transition. Finland needs to take this opportunity to increase research and innovation activities and develop environmentally friendly technologies and solutions.

The private sector, innovation and consumption habits play a significant role in the digital green transition. Business opportunities related to the twin transition are a key driver of investments by enterprises. At the same time, sustainability criteria have emerged as a factor in investment and financing decisions alongside other criteria. Most of the investments required by the digital and green transition are purely market-driven. The role of public innovation funding is to complement private financing. The public sector's role is to accelerate the digital green transition and create conditions where opportunities can be taken advantage of. The impacts of the transition on the sustainability of public finances also need to be considered.

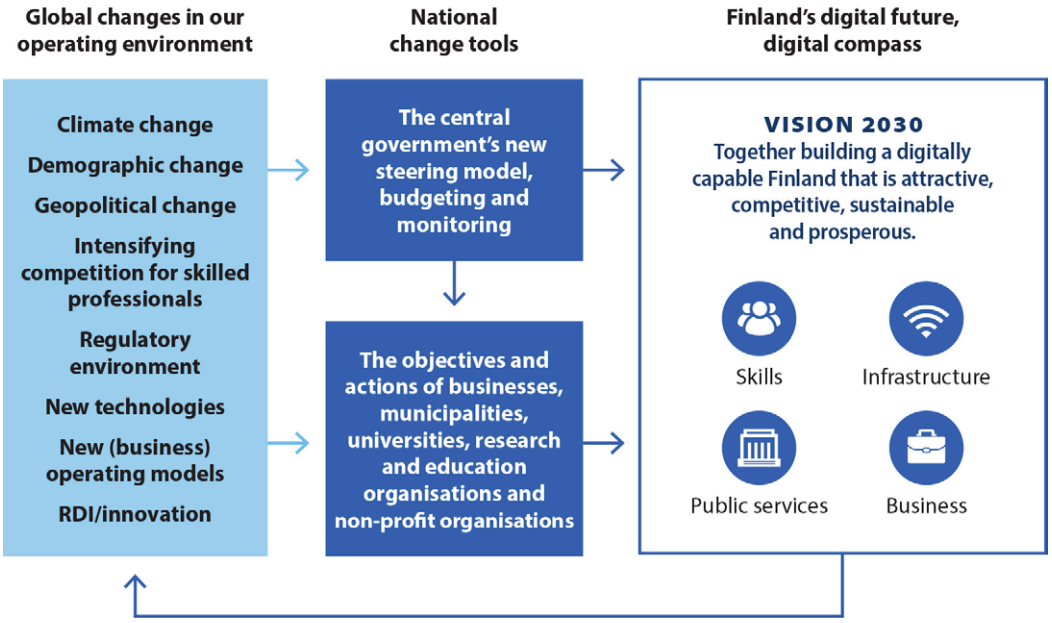
3 The digital compass points the way for Finland in global development

Finland is connected to a global operating environment. This requires the ability to monitor, and react to, international developments. The best way to ensure the necessary conditions for the business sector and public services is to provide a favourable operating environment and make efficient use of resources. It is important to be able to allocate finite resources effectively and make the necessary investments at the right time. To steer Finland's digitalisation development, Finland's digital compass has been drafted under the guidance of the Ministerial Working Group on Developing the Digital Transformation, the Data Economy and Public Administration, prepared by the coordination group for digitalisation and in cooperation with stakeholders.

The digital compass is a tool for setting national objectives and choosing appropriate policy instruments. The digital compass sets out the digitalisation and data economy vision and objectives until 2030. The digital compass supports the prioritisation of central government actions, resource allocation and the assessment of societal impact. The aim is to increase overall impact and efficiency by avoiding overlapping work in different sectors and eliminating development bottlenecks through the appropriate timing of actions. The goal is to support an operating environment that promotes digitalisation in such a way as to incentivise investments and the leveraging of digitalisation by the business sector and other stakeholders.

The digital compass and the cooperation that will emerge around it are important tools for building Finland's future. The digital compass is, first and foremost, a tool for the central government to steer the development of digitalisation, but the setting and achievement of national objectives will require the participation of society as a whole.

Figure 2. The field of activity



Global changes influence Finland's digital future, which is guided by the digital compass.

3.1 The values underpinning the digital compass

The values underpinning the digital compass guide its implementation in Finland, the European Union and globally. The values are reflected in the choices we make when creating the regulatory environment, in services and products and in all of our activities, leadership and investments. The values guide the way we leverage the opportunities created by technologies. The values of the digital compass are based on the European value base, such as democracy, equality, respect for human rights, and freedom. The digital compass, including its underpinning values, have been selected on the basis of earlier preparatory work carried out in various contexts as well as Finland's position statements and influencing efforts in the EU and internationally.

The values of the digital compass are as follows:

- **Sustainability:** Finland's digital compass promotes an economically, socially and ecologically sustainable systemic digital green transition. Economic sustainability refers to balanced growth that is based, over the long term, on securing the operating capacity of the welfare state. Sustainable economy is a prerequisite for all of the most important functions of society and lays the foundation for our wellbeing and social sustainability. Citizens, businesses and policy-makers having a growing understanding of how wellbeing is intertwined with the carrying capacity of nature creates the preconditions for promoting ecological sustainability and its social acceptability.
- **Trust**: In digitalisation, trust is maintained by ensuring the security of digital services and the transparency, responsibility and fairness of the data economy. Being a trust-based society is one of Finland's strengths and a cornerstone of the functioning of society. Value creation in the data economy must be based on fair rules and competitive open markets. A fair data economy also means access to data for businesses of all sizes, under reasonable terms and conditions, and with clear rules.
- **Human-centric approach**: Digital services and the digitalisation of society must be implemented from a perspective that starts with human needs. Planning and design decisions need to be human-centric instead of being focused on technology or administrative structures. The guiding principle in the processing of data must be the human-centric approach, the individual's right to control and share their data, and respecting the rights of the individual, particularly the right to privacy.
- **Inclusion**: Digital inclusion, equality and education are important building blocks for a trust-based society. We want to keep everyone on board and foster the freedom to learn, innovate and pursue entrepreneurial ambitions. In addition to skills, what is needed is education of the digital era. Education refers here to an individual's versatile combination of cognitive ability, discernment, ability to act and empathy. We need these skills and approaches to be able to solve the challenging problems of our era, ranging from the climate crisis to disinformation threats, and to build a trust-based society, also with the means provided by digitalisation and through encounters in the digital environment.

- **Renewal**: New skills, the adoption of new operating models and technologies, investments and focusing on innovation are essential preconditions for maintaining and increasing our entire society's productivity, added value, competitiveness and, consequently, wellbeing. The data economy is currently growing faster than other, traditional sectors and public services are becoming more data-intensive. When adopting new operating models and technologies, we need to ensure the freedom of individuals and organisations to choose the most suitable technologies and solutions and provide new operators with opportunities to innovate and introduce such technologies and solutions to the market.
- **Digital security**: Information security, the preconditions for cyber security and the realisation of data protection must be ensured at all levels of society. The digital environment requires preparation for new kinds of security threats, such as cyber attacks, influence through information, data theft and identity theft. Digital security is a responsibility for everyone, from individuals to businesses and public sector organisations.

3.2 Finland's digital vision for 2030

In 2030, Finland will be a digitally capable welfare state built on reliably operating and secure infrastructure, digital competence and entrepreneurship that utilises modern digital technology. In Finland, digitalisation and data use solutions and digital infrastructure have been built in an environmentally sustainable, ecologically efficient, secure and resilient manner. Finland is a digitally well-educated society and we support inclusion by keeping everyone on board in the digital society. Finland in 2030 will offer a competitive operating environment, attracting international professionals and companies to invest in Finland and enabling healthy growth and internationalisation for Finnish enterprises and, as a result, wellbeing for the entire society.

In the rapid digital transformation, the renewal of value creation and business activity, collaboration and ensuring inclusion in society are the keys to success and wellbeing. Everyday digital skills, availability, accessibility and plain-language services – in both of the national languages, among other language options – for both citizens and businesses are important cornerstones for an increasingly digital society. The starting point for service development must be users, not administrative structures. In 2030, diverse everyday digital skills – including skills related to information security and data protection – will be part of a well-functioning, trust-based society.

Figure 3. Digital compass vision and values.

The digital compass vision is based on shared values.

Realising the vision requires extensive systemic change in society. The objective is to take advantage of digitalisation and data to build smooth daily life and wellbeing while taking sustainability into consideration. Realising the digital compass vision requires the purposeful pursuit of the objectives in close cooperation between the public, private and third sectors, as well as universities and research institutions.

3.3 Digital compass objectives and the achievement of impacts

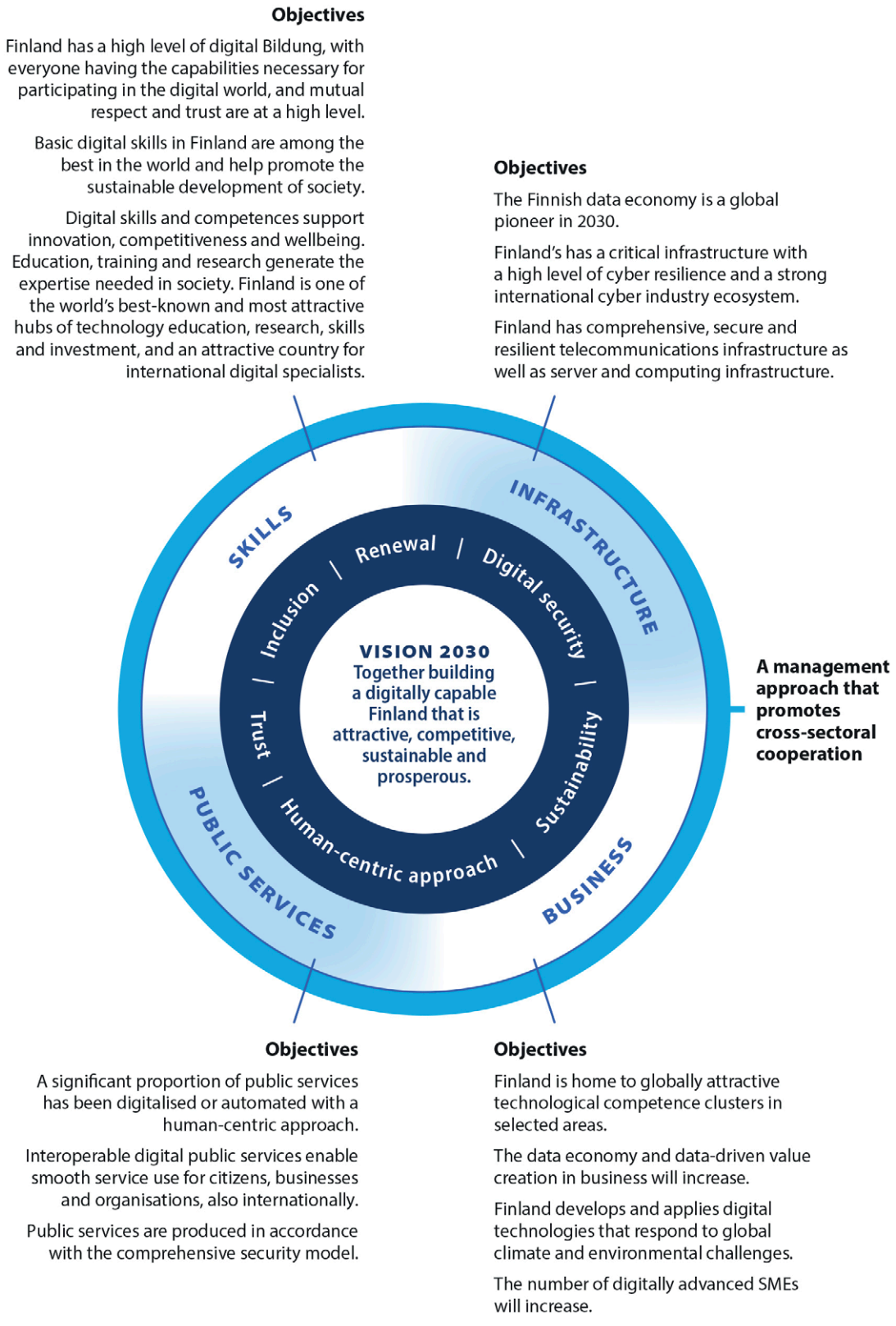
The changes in society that the digital compass aims to bring about will be achieved by pursuing the strategic objectives set out in the digital compass with a planned, comprehensive and systematic approach, while encouraging joint development efforts by the various parties involved and by making the necessary investments in a timely manner. This involves not only the central government but also all other participants in society and the development efforts and investments they make in their operations to promote digitalisation and the data economy.

The starting point for the digital compass is to create the **preconditions for realising the desired strategic changes in society, monitoring performance and enabling the appropriate allocation and scheduling of resources**. The digital compass objectives, key results and measures constitute an impact path. The objectives reflect changes at the strategic level. Under the objectives, there are quantifiable key results that support the realisation of each strategic objectives and through which performance and results are monitored.

The digital compass sets prioritised objectives that reflect strategic change under four cardinal points – skills, infrastructures, business and public services. The objectives under the four cardinal points are presented in chapter 4. The development of the digital compass has been based on previous preparatory work, the situational awareness of digitalisation established during the process of creating the digital compass, and extensive stakeholder cooperation. The targets of the EU digital compass have been taken into account in setting the digital compass objectives and key results. The planning and implementation of the objectives, key results and measures will take into account the constitutional framework pertaining to fundamental rights, such as data protection and good governance.

The key results will be achieved through the actions outlined in the digital compass. The measures and the investments required for the measures will be updated in the digital compass action plan for each government term. The purposeful promotion of digitalisation and the data economy requires a commitment to long-term development and investment. This includes both the digital maintenance backlog and the investments necessary for development. The measures and their targeting and updating will be defined in the Government Programme for each term of government and in the strategies of the administrative branches. Performance guidance will be used in the implementation of the measures. Investments in the development of digitalisation, the data economy, digital security and public services will be outlined in the general government fiscal plan.

Figure 4. Digital compass vision, values and objectives for each cardinal point of the digital compass.



The digital compass has four cardinal points, and objectives are set for each cardinal point. Furthermore, a shared cross-sectoral objective is set.

Digital portfolio

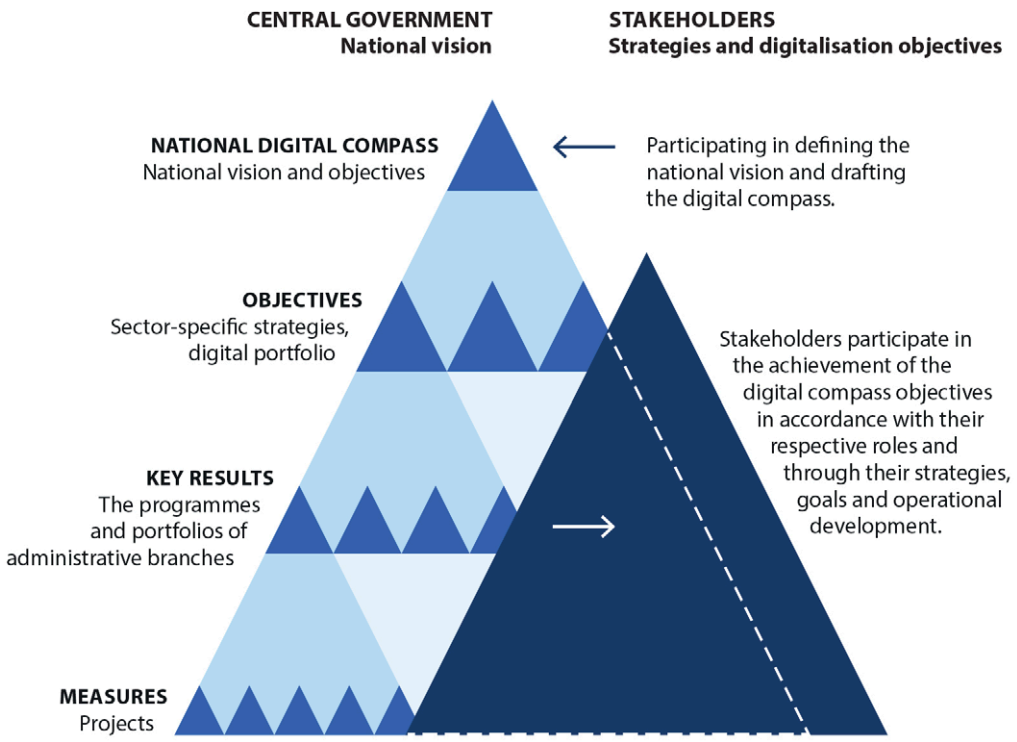
In addition to the digital compass, national digitalisation development is steered and implemented with the help of the digital portfolio. The digital portfolio is a monitoring tool that covers the most significant digitalisation projects of the central government. With the aid of the digital compass and the digital portfolio, an overall picture can be formed of national objectives and ongoing development projects and investments can be allocated and timed more effectively. It is important to be able to assess the necessity and timing of projects. Monitoring is needed for ensuring that development efforts move forward without the emergence of bottlenecks between legislative developments and technological developments, or between sectors, for example.

The role of stakeholders in putting the digital compass into action

Finland's digital future will be created together and through purposeful action. The impact of the digital compass relies on strong and close cooperation between the public administration and stakeholders, including the business sector. Cooperation built around the digital compass creates the opportunity to engage in dialogue on national needs, priorities and actions to promote digitalisation and the data economy with businesses, the municipal sector, the third sector, as well as universities and research institutions. The digital compass actions particularly involve the central government, but the goal is to engage stakeholders in promoting the national objectives and inspire stakeholders to take the national objectives into account in their strategies and the development of their operations.

Cooperation means maintaining shared situational awareness, sharpening the objectives based on that situational awareness, the allocation of public investment, and the planning and implementation of the necessary measures. The actions can be implemented together by the public and private sectors, initiated by businesses or be driven by the public administration. Private sector commitment to, and investments in, digitalisation and the data economy are important for Finland's achievement of the digital compass objectives. The business sector, the third sector, research institutions and universities must be kept involved in all stages of the digital compass effort, as is the case with public sector stakeholders.

Figure 5. The digital compass will be implemented through cooperation



Work towards the digital compass objectives involves central government measures as well as stakeholder engagement. Achieving the digital compass objectives requires contributions from all areas of society.

4 Digital compass objectives and key results

4.1 Digitally skilled population and labour force

Finland's success as a nation in global competition relies on broad-based Bildung and strong expertise. In an increasingly digital society, good basic digital skills are a new civic skill that is maintained and updated by individuals as well as organisations ranging from businesses to public and third sector entities. Research and education produce new knowledge and competencies related to the digital world, which is necessary for our operational capabilities and competitiveness. The development of knowledge, skills and competence must be continuous for both young people and the employed population so that we can address the changes brought about by the transformation of working life, technological progress and the population age structure. We also need to ensure that we are an attractive country for international digital experts.

Finland has a high level of digital Bildung

The impact of Bildung – which is a term that encompasses both education and culture – is seen in our society in the form of creativity, inclusion, global and social responsibility, an understanding of diversity, caring for others, and wellbeing. Understanding and developing our increasingly digital society and acting as a member of that society requires the strengthening of digital Bildung.

Bildung has a cognitive dimension, an ethical dimension and a social dimension. Digital Bildung requires knowledge and skills, participation opportunities and capabilities to play an active role and express oneself creatively and safely in the digital world. Digital Bildung responds to what people should know and how they should act and participate so that the digital compass vision can be achieved in a manner that ensures that people's mutual respect and trust in an increasingly digital society become stronger.

Digital Bildung also encompasses knowledge, judgment and empathy. Advanced technologies, such as AI, require that ethical questions be identified as new solutions are planned. It is also important for each of us to understand the impacts of digitalisation and the data economy on our life. With this in mind, we need to make a conscious effort to build and maintain digital Bildung in our society. At the same time, it serves as a force of renewal in society. Digital Bildung relies on a strong education system. Public libraries also

play an important role in promoting digital Bildung in all population groups. The long-term retention of cultural heritage and scientific materials and information as part of the collective memory of humankind also bolster the foundation of digital Bildung.

Basic digital skills promote the sustainable development of society

The digitalisation of society and its services can yield many benefits related to citizens' participation and inclusion. However, to develop and utilise better services, digital skills and knowledge are needed. Good digital skills are the foundation – and also a precondition – for equal inclusion in our increasingly digital society. Broadly, it is a question of possibilities and capabilities to play an active and innovative role and apply new technologies in digital environments.

As a nation that is already digitally skilled, Finland scores highly in the EU's DESI index on digital skills, according to which 79% of Finns (aged 16–74) have basic digital skills. This is a high percentage by European standards. However, the need for digital skills extends beyond the age groups included in the DESI index. The foundation for digital skills is established early on, and digital skills must be developed and maintained throughout people's lives. Good basic skills help people understand digital services and operating environments and build trust in public services. Digital skills reinforce inclusion in society as services and participation in society are becoming increasingly digital.

Digital skills need to be systematically developed throughout the education system, taking into consideration the digital skills of all age groups – including the adult population and the elderly, who may not have had the opportunity to acquire the necessary basic digital skills during their studies. Lack of digital skills may lead to digital marginalisation, dropping out of education, a disadvantaged position on the labour market and health problems. The definition, fundamental nature and indicator setting of digital skills must be reviewed from the perspective of current and future needs. We must move from basic technical skills towards a more versatile and deeper understanding of digital skills in the digital era.

Our changing and increasingly digital world also requires a more precise definition of digital literacy, in which the strengthening of national resilience is also taken into account. With extensive digitalisation, the significance of media literacy continues to increase for all age groups. Topical themes include, for example, the evaluation of information sources, the identification of different motives and recognising misinformation and disinformation and having awareness with regard to online safety and security. Media education is supported by many of the more general strengths of Finnish society, such as strong freedom of speech and trust in media. The importance of new kinds of skills, such as cyber security, is higher in increasingly digital environments.

Digital skills and competences support innovation, competitiveness and wellbeing

Innovations generate economic growth and wellbeing. Their creation and utilisation requires skilled people. The role of new digital technologies and data use will continue growing in the future. For Finland to act as a trailblazer in this field, we must continue to make significant investments in research, competences and the development of new kinds of operating models and cultures. We must ensure that the required chain of competence, from high-quality, versatile education and training all the way to research, is as it should be. The importance of new kinds of skills, such as cyber security and data competence, is also higher in increasingly digital environments.

Finland needs ICT professionals. It is important that ICT education and training is widely available and that it attracts new students, including women and international students. The goal is that the share of women among ICT professionals increases. The aim is to triple the number of new foreign degree students to 15,000 by 2030. A further aim is to increase the employment and retention rates of foreign students in Finland to 75 per cent of all graduated international degree students. To meet the growing labour needs and ensure competitiveness, we must also succeed in attracting skilled professionals from abroad. This also requires a focus on cooperation with working life and increasing diversity in working life. It is also important to ensure that tools and services related to the use of e-services are available to international students and professionals and that they enable smooth access and use of different services in Finland. For example, highly digitalised residence permit processes improve Finland's position in international competition for students and professionals.

According to the National Forum for Skills Anticipation[8], the impact of digitalisation could be seen clearly in the changes in working life skills by 2035. Among the highest-growing working life skills, there were three skills related to digitalisation: ability to use digital solutions, ability to use digital platforms and ability to manage and control digital operations. In addition to digital skills and competence, the skills that are becoming increasingly important included also competence aiming at providing people with change management skills. These included, for example, problem-solving skills, self-regulation, the ability to learn, development and management of personal competence, and information evaluation skills. Indeed, it is necessary to more broadly consider the needs related to digital skills and competences so that the potential of digital technology can be tapped in value creation, the introduction of new services and the management of platforms and functions. Taking advantage of digitalisation and data in business requires not only technical competence but also an understanding of the digital economy.

8 Competences and Skills In 2035: The first results of the National Forum for Skills Anticipation's anticipation work (abstract available in English)

Leading professionals also need to focus on the development of applied and hybrid skills, a cross-disciplinary approach and combining competencies in different fields. In the area of cyber security, for example, a growing number of experts and specialists in various fields will be needed in the near future. Digitalisation and changes in professional competence requirements brought about by technological progress require the continuous development and updating of employee competence and a new approach to management. This calls for focusing not only on studies leading to academic degrees but also continuous learning, developing education to address different needs, and cooperation between higher education institutions.

The structured dialogue to be conducted between the EU Member States and the Commission in 2022 on on digital skills and education works towards a more holistic approach to a more systemic promotion of these issues. Finland will participate in and influence this dialogue, promoting the themes that have been recognised as nationally important also at the European level.

Skills: strategic objectives and key results for 2030

Table 2. Skills: Strategic objectives and key results for 2030

Digital bildung

OBJECTIVE 1: Finland has a high level of digital Bildung, with everyone having the capabilities necessary for participating in the digital world, and mutual respect and trust are at a high level.

Key results

- Good digital Bildung contributes to building mutual respect and participating in our increasingly digital society, including knowing one's rights and obligations.
- Actions have been taken to ensure the long-term retention of key cultural heritage and research knowledge for use by society and maintain a strong foundation of Bildung, skills and competences.

Basic digital skills

OBJECTIVE 2: Basic digital skills in Finland are among the best in the world and help promote the sustainable development of society.

Key results

- Finland ranks first in the European DESI index, focusing on basic digital skills. National objective for the 16–74 age group: 87%. **(EU target: at least 80% of the population aged 16–74 has basic digital skills.)**
- The acquisition of the jointly defined basic skills necessary for participating in the digital world is possible for everyone with the help of effective support and the provision of training and education.
- Cyber security training is an integral part of the education and training offering at all levels of education, and citizens' cyber skills have improved.
- Citizens' capabilities to participate in the digital world, including media literacy and data literacy, have improved.

Digital skills and competences

OBJECTIVE 3: Digital skills and competences support innovation, competitiveness and wellbeing. Education, training and research generate the expertise needed in society. Finland is one of the world's best-known and most attractive hubs of technology education, research, skills and investment, and an attractive country for international digital specialists.

Key results

- The skills and competence requirements related to digitalisation, the data economy and the digital green transition – including cyber and data skills – have been identified and taken into account at all levels of education, with due attention paid to the national language strategy.
- A national view of the training and education offering is available, along with digital learning environments and pedagogical operating models for the flexible development of knowledge, skills, and competences, regardless of time and place where necessary.
- The share of women among ICT specialists has increased. **(EU target: 20 million ICT specialists + gender convergence and increasing the number of graduates.)**
- National resilience with regard to digital skills as well as the infrastructure of education and research has been defined and ensured.
- The digital infrastructure of scientific research is world-class.
- The availability and development of ICT specialists in Finland is world-class **(EU target: 20 million ICT specialists + gender convergence and increasing the number of graduates.)**
- The number of new foreign degree students will triple to 15,000 by 2030. The employment and retention rates of foreign students in Finland will rise to 75 per cent. **(EU target: 20 million ICT specialists + gender convergence and increasing the number of graduates.)**
- The objective is to at least double employment-based immigration by 2030 compared to the current level, and the number of employment-based immigrants annually will be at least 10,000 higher than it is now. **(EU target: 20 million ICT specialists + gender convergence and increasing the number of graduates.)**

4.2 Digital infrastructure

The objective is for Finland to have state-of-the-art, reliable and secure digital infrastructures and data economy structures. Digital infrastructure serves as the foundation for the data economy and digital services. Digital infrastructure includes telecommunications networks, data infrastructure that enables the use and sharing of data, and satellite infrastructure. Digital infrastructure lays the foundation for the operations, economy, wellbeing and development of the entire society and regions as well as the technology-related capabilities and operations of various organisations. The requirements for reliable and secure digital infrastructure permeate all sectors and industries.

Data economy

Digital data is created and processed everywhere. In the data economy, value creation is based on using data either as part of a physical or digital service or product, or in the creation of new services and innovations. The immense increase in volumes of data and the technological possibilities to process it have created an independent market for data, called the data market. A well-functioning data infrastructure enables the seamless portability of data regardless of the location of data storage or processing. Consequently, an interoperable data infrastructure that is openly available to everyone plays a key role in the use and development of digitalisation and new technologies. In accordance with the EU's data strategy and regulations, these data infrastructures based on common rules are referred to as *data spaces*.

Finland is at the EU's vanguard in developing interoperable data management solutions. The MyData model for human-centric data management has already grown into a widely used global operating model and movement. Finland is also a pioneer in the industrial use of big data and AI. Several sector-specific data space development projects to promote the sharing of data are under way in the following areas, for example: wellbeing and health, traffic and logistics, the built environment, the property sector, agriculture and food production, energy, location data, skills, cultural heritage, economic data, copyright, nature and environmental data, and industrial data. A well-functioning data infrastructure also facilitates data sharing and use between sectors. The development work requires investments that are significant on both Finland's and the entire EU's scale.

In addition, a coherent Europe-wide data market requires sufficient server capacity that is independent of the physical location (*cloud services*), computing capability that secures data processing capacity and enables new innovations (*high-performance computing and quantum computing*), and high-speed communications networks that form a channel that secures the flow of data.

Future solutions based on smart control, monitoring and automation in cities, industry, agriculture and forestry, traffic and logistics, for example, need to be supported by *a positioning and time service as well as geospatial data*. With the aid of geospatial data, physical reality is connected with digital data, such as location data on people, machinery and various objects in the environment. Geospatial data and its development may create significant opportunities to achieve climate targets, to ensure biodiversity and also to realise different public and private services, for example. A positioning and time service and geospatial data are also an integral part of the operations of security authorities.

Cyber security

Practically all of the key services of society, such as the distribution of electricity and drinking water and healthcare services, need reliable connections and information systems to work. Information security and data protection are indispensable preconditions in all industries in a digital society, considering their significance for the quality and security of services. The significant changes that have occurred in the global operating environment, constantly evolving cyber security threats and the increasing complexity of ICT environments create an increased need to improve the overall state of cyber security.

A high level of cyber security and information security and the related skills maintain the competitiveness and functional capacity of the economy and society in all sectors. With this in mind, all sectors must have the capability to respond to increasing information security and data protection challenges. This also applies to things, devices and vehicles, a growing share of which are connected to the internet and controlled through the processing of data. The key is to ensure the reliable organisation of digital connectivity, products, services and data management, as this directly impacts citizens' trust in digital services and products. Products, services and information systems must be designed, produced and maintained so that information security and data protection are an inseparable and integrated part of them. Information security and data protection must be addressed throughout the entire life cycle of operations as the starting point of product, system and service development.

In building information security and data protection, the key elements include the identification and authentication of users and the skills and qualifications required for each role. Furthermore, it must be possible to digitally validate the technical requirements and access rights of systems. This exchange of proof indicating approvals, certifications, qualifications and other requirement levels and the digital verification of their authenticity are an integral part of an interoperable digital infrastructure.

Digital infrastructure

Fast, high-quality and reliably operating communication networks and digital data that flows seamlessly through them lay the foundation for the services and innovations of the current technological transformation. In the global market, international accessibility, the speed of data flows and decentralised data management are the basis for the operational reliability and investment decisions of society and businesses. Accessibility requires, both globally and nationally, access to comprehensive telecommunications connections that are subject to open competition. Operational reliability requires that both communication connections and data management can be decentralised or replaced, if necessary. At a more general level, this can be seen in the need to ensure that solutions are based on technologically neutral, supplier-independent solutions and components and open cooperation on standardisation. To maintain our position among the leaders of technological and digital service development, Finland must carry out active and advanced development of communication connections and networks and participate in the drafting and decision-making related to regulation and standardisation.

Digital infrastructure consists of physical networks and devices needed for communications and data processing, or structures required for fixed and mobile network connections, and terminal and data centre devices and the associated components. The energy supply required by these is often included in the infrastructure. In addition, digital infrastructure encompasses non-physical structures needed for data processing, such as cloud services, software and interfaces, as well as data management structures and standards for data transfer, data processing and information security arrangements. Cooperation between the state, municipalities and businesses is necessary for the development of technical solutions, contractual models and operating models. Trust infrastructures encompass authentication solutions needed for the use of data, data use agreements and the management of intellectual property rights. These areas of digital infrastructure are sometimes called hard and soft infrastructure.

The requirements for communication network capacity are also increasing. It is estimated that the volume of data will double in two-year cycles. AI, the Internet of Things (IoT), machine-to-machine (M2M) communications and the development of automation and robotics require fast, nearly zero-delay and secure networks. The development of the Internet of Things, enabled by mobile networks, has led to a situation where not only smartphones but also everyday household appliances, cars and machines are connected to the internet. The number of sensors that are continuously observing the environment is increasing and all information that can be digitised is collected in machine-readable format. Constantly evolving virtual and augmented reality technologies, which are expanding into an interactive system referred to as a *metaverse*, also require a lot of capacity from networks.

In Finland, the main principle in the development of telecommunications networks is technological neutrality. Among other things, this involves promoting both fixed networks and wireless broadband networks in parallel. At the moment, the fastest and most reliably operating fixed connections are achieved with optical fibre. Fixed connections are needed particularly for services that require high, predictable connection speeds, in addition to which optical fibre connections serve as the basis for ultra-high speed wireless connections. Due to their different characteristics, fixed and wireless connections are not mutually replaceable; instead, both are needed, and the amount of capacity required will continue to grow in the years to come.

Finland is an undeniably a pioneering country in mobile networks and aims to be a leading player as a developer and user of next-generation mobile networks in the future. New spectrums for wireless broadband have been introduced in Finland faster than in other EU Member States. Word-class research is being conducted in 6G network technologies and other key technologies, such as quantum computing and microelectronics. We also have the competence to build transparent AI solutions. With our technological expertise, we can build the future infrastructures that serve as the foundation for digitalisation and data economy solutions.

The strategic significance of space and satellites has increased. Global navigation satellite systems produce positioning and timing data. Also significant are the increasing availability of space data, the growth of data processing power and the opportunities presented by AI solutions in the use of data. As part of the EU, Finland is also contributing to the development of global satellite broadband based on space systems. The key driver is to ensure connectivity in all situations and improve geographic coverage.

Finland is a significant hub of global, inter-continental connections. We are participating in the construction of a submarine cable system that connects three continents and passes through the Arctic region, the first of its kind.

From the climate and environmental perspective, there are two sides to digitalisation. While digital solutions offer plenty of opportunities to increase wellbeing and efficiency in society and reduce resource consumption and greenhouse gas emissions in different sectors such as traffic, communication networks, data centres and smart devices use a considerable amount of electricity and materials. With sustainable ICT solutions and expertise, we aim to become a solver of climate problems and a provider of solutions for the entire world.

Digital infrastructures: strategic objectives and key results for 2030

Table 3. Digital infrastructure: Strategic objectives and key results for 2030

Data economy

OBJECTIVE 4: The Finnish data economy is a global pioneer in 2030.

Key results

- EU-interoperable data spaces based on open standards have been created for the following industries, and they are used by a number of Finnish enterprises representing different sizes and industries: wellbeing and health data, traffic and logistics, built environment, property industry, agriculture and food production, energy sector, use of location data, competence, cultural heritage, economic data, copyright, nature and environment data, and industrial data.
- The public accessible data resources that support data spaces are available (100%) through interfaces either as open data or with access right management solutions or solutions for managing an individual's own data.
- A general, joint, secure and open-to-everyone trust infrastructure of verified data has been created for using e-services and exchanging data. **(EU target: digital identity: 80% citizens using digital ID)**

Cyber security

OBJECTIVE 5: Finland's has a critical infrastructure with a high level of cyber resilience and a strong international cyber industry ecosystem.

Key results

- 5G and 6G networks are in use with network security in mind.
- Cyber security has been taken into account in the risk management and contingency planning of critical entities, and processes are audited regularly.
- Information security in critical sectors has developed in line with the European requirement level at a minimum.
- Finland has a centre for cyber security growth and expertise that has promoted the growth, expertise and international competitiveness of cyber industry enterprises.
- Cyber security competence has improved among various parties in society.

Digital infrastructure

OBJECTIVE 6: Finland has comprehensive, secure and resilient telecommunications infrastructure as well as server and computing infrastructure.

Key results[9]

- All Finnish households and businesses have the opportunity to use a 1-gigabit telecommunications connection and the 5G network covers the entire population in 2030. **(EU target: gigabit for everyone, 5G everywhere)**
- Finland will maintain its position as a leader in 6G research and test networks will be deployed in 2027 at the latest.
- Finland's ranking in the "Connectivity" area of the DESI index has improved (ranking in 2022: 8th).
- Finland acts as a hub in the resilient and secure submarine cable system that connects the European and Asian data networks.
- A quantum computer with a minimum of 50 qubits is in use in Finland by 2025. **(EU target: first computer with quantum acceleration)**
- The pan-European LUMI supercomputer system and the related ecosystem and international cooperation networks are one of the world's main players in high-performance computing.
- Finland has a pilot production line for manufacturing semiconductor components or an industrial scale semiconductor component production plant that is connected with European and global semiconductor research. **(EU target: The EU's share of global semiconductor production will be at least 20%)**
- All new data centre investments promote the national carbon neutrality target.

4.3 Business digitalization

New technologies and the use of data facilitate the renewal of business through real-time value chains, new digital products and services and new customer-driven business models, for example. When it comes to digitalisation, the business sector is divided. Progress among SMEs in the use of digital technologies and operating models is significantly slower than among large corporations.

Finland aims to achieve carbon neutrality by 2035. Climate targets are a significant driver of industrial renewal. Robotisation and automation are key solutions for increasing the

9 Finland is not setting a direct key result for server infrastructure, but the actions in this area support the EU's target. (EU target: 10,000 climate-neutral highly secure edge nodes.)

productivity of industrial operations and improving quality, while the industrial platform economy combines services digitally with physical manufacturing capacity, thereby creating entirely new value creation opportunities for industry.

There is a significant number of technology enterprises operating in Finland that are the world's leading players in their respective market segments. Maintaining the leading position of these businesses is important from the perspective of the national economy, as they generate growth among the smaller enterprises that participate in their value chains. A further objective is to increase the size of this internationally competitive group of enterprises through strong technology expertise and a favourable operating environment.

Digital technologies as drivers of renewal

Finland has, in many respects, excellent opportunities to benefit from the development and deployment of technology. At the same time, however, international competition is intensifying and Finland must compete with other countries as a location for both businesses and highly skilled professionals. The shortage of skilled professionals that Finland is suffering from is also evident in technology-intensive industries. It is especially apparent when it comes to positions that require RDI inputs, and in production, and it constitutes a significant obstacle to growth. Success requires an international approach. What is needed is stronger competence clusters and RDI infrastructures, which attract international partners and investments and nurture cooperation between higher education institutions, research institutions and businesses. Compared to many other countries, Finland has excellent public data materials and registries, which offer exceptionally good opportunities for new kinds of data-driven value creation. Facilitating the use of data sets and the drafting and clarification of regulation are key actions in this area. In addition, businesses must have the capability to integrate into European data infrastructures, making it possible for us to connect with key value chains and networks.

Strong investment in R&D activities, the commercialisation of research results and scalable business is important for ensuring the competitiveness of enterprises. Although the Finnish public sector's total investments in R&D activities exceed the EU's average, Finland cannot be considered a leading pioneer in innovation. The proportion of corporate R&D expenditure funded by the public sector in Finland is lower than in many competing countries and substantially below the OECD average. One of Finland's strengths is that a significant proportion of publicly tendered R&D funding targeted at businesses is related to digital solutions.

In international comparisons, Finland is ranked among advanced AI countries and considered one of Europe's AI leaders among digitally advanced countries. In particular, our strengths include high-level technological research and joint development efforts,

in which public investment and pro-digitalisation innovation policy are key enabling factors. With investments in AI growing globally, maintaining Finland's position as one of the leading countries in that area requires increasing investment in new knowledge and capabilities. High-quality research and the ability quickly transfer research results to the application stage can be a success factor for Finland also in the future. It is important to increase the speed and agility of bringing the results of R&D activities to the market through businesses.

The digital green transition

Digital solutions play a significant role in responding to climate challenges. Digitalisation is also a precondition for the implementation of circular economy operating models. In the digital green transition, technologies such as data and artificial intelligence can be leveraged to produce more precise analyses and forecasts to support decision-making, produce better services and more secure environments, steer the energy system and optimise the use of resources, improve the efficiency of processes and save costs. New technologies and digital solutions allow Finnish enterprises to not only reduce their carbon footprint but also, first and foremost, offer low-carbon solutions globally to others (known as the carbon handprint). The market for low-carbon solutions is growing at an accelerating pace, and being one of the first movers will present significant opportunities for Finnish enterprises. Environmentally friendly technologies can be a significant competitive advantage for Finnish businesses in the future. The objective is for Finnish enterprises to recognise and leverage the opportunities presented by the twin transition so that our international handprint impact will increase and Finnish industry will be competitive, clean and digitalised. The digital green renewal of enterprises may be slowed by skills shortages, low investment, business challenges and inadequate growth financing.

The growing use of digital technology may increase energy consumption. However, sustainable digital transformation aims at reducing energy consumption through digitalisation; for example, through more resource-efficient digital services and software solutions, with the optimisation of data use being a focal point in this area. Promoting more resource-efficient software solutions requires skills and expertise from the designers and producers of digital software as well as from those who buy the software.

Digital competences among SMEs

The sustainable development of our economy depends to a significant degree on how SMEs can grow, boost their productivity, improve their competitiveness and reduce their environmental footprint with the help of new technologies, for example. The barriers to digital development in SMEs include, for example, being unwilling to pursue growth, having a lack of vision, having insufficient financial resources, and lacking

competence. The key is to understand the opportunities presented by digitalisation to accelerate business. Seizing these opportunities requires action by both the public sector and the business sector. The objective is to support the success of businesses through digitalisation. Supporting the digital leap of small enterprises and increasing their understanding of the potential of data are key actions in accelerating the digital transformation of business.

The success of businesses is based on continuous renewal. The number of SMEs engaged in RDI activities must be increased. It is essential to increase RDI cooperation among SMEs as well as between SMEs and large corporations, higher education institutions and research institutions. The goal of RDI cooperation is that SMEs' products, processes, functions and know-how develop, strengthening SMEs' competitiveness, and that RDI cooperation also generates new customers and business opportunities for SMEs. Furthermore, it is important for Finnish businesses to connect with international innovation and business ecosystems from the outset. The innovation capabilities of SMEs operating in various sectors must be boosted and their participation in innovation partnerships needs to be supported.

A supportive operating environment

Finland provides a supportive operating environment for businesses that seek growth. The start-up ecosystem has developed significantly over the past decade-plus, which helps create broader confidence in the renewal of the economic structure and the international growth of various industries. Finland has a growing number of successful new technology enterprises compared to many other European countries. The Finnish gaming industry's emergence as an international leader is one example of the long-term successes of innovation activities. Global distribution channels have accelerated the growth of Finnish enterprises in the gaming industry. Growth usually needs to be supported by connections to international networks. The evolution of the risk finance market is another key aspect of the operating environment. Effective venture capital markets and business angel financing are important components of the innovation ecosystem. For Europe's digital high-growth companies, the EU's well-functioning digital single market is an important reference region for scaling up operations. A lot of positive development has been seen in this area in recent years.

The EU's long-term goal of the digital single market is about to be achieved. At the EU level, harmonisation has been – or is being – carried out in regulation concerning areas such as data protection, the responsibility of platforms, the application of AI and competition in the digital market. The risk is that EU-level regulation will be implemented as excessively restrictive and detailed. In the worst case, this would increase the administrative burden, create legal uncertainty for investments and reduce businesses'

innovation and business opportunities. Although EU regulation also serves as an example around the world, there is the concern that the regulatory environments of our key competitors and trade partners will be more flexible than the EU's. The competitiveness of enterprises requires a proportionate legislative framework, which enables new innovations and the emergence of new digital business regardless of sector. At the EU level, too, the digital business environment should be regulated in a manner that secures Europe's competitiveness and innovation potential and leaves room for companies to operate.

EU aims to use regulation to accelerate the financial sector's transition to sustainable financing. The main regulatory pillars are the sustainability classification system referred to as the EU taxonomy, disclosure obligations and sustainable investment products. Sustainability criteria have already emerged as a factor in investment and financing decisions alongside other criteria. The taxonomy and reporting obligations are not directly binding on SMEs. Nevertheless, SMEs are indirectly subject to emission reduction and reporting obligations when they operate in the subcontracting networks of large corporations, and reporting is likely to become mainstream throughout the business sector in the future. The need for interoperability with regard to sustainability-related data is emphasised as part of reporting and ensuring compatibility with financial reporting.

The preparation of the "Business" cardinal point of the digital compass is mainly based on the interim report of the Artificial Intelligence 4.0 programme[10] and the report published by the Technology Advisory Board on 1 June 2021[11].

10 Finland to become a winner in a dual transition – getting goals into practice; Artificial Intelligence 4.0 programme, Second interim report.

11 Finnish technology policy in 2020s – A global leader through technology and information. Publications of the Ministry of Finance – 2021:30.

Business digitalisation: strategic objectives and key results for 2030

Table 4. Business digitalisation: Strategic objectives and key results for 2030

Digital technologies as drivers of renewal

OBJECTIVE 7: Finland is home to globally attractive technological competence clusters in selected areas.

OBJECTIVE 8: The data economy and data-driven value creation in business will increase.

Key results

- Public RDI investments in identified key technologies have increased, boosting the size of the research ecosystems/competence clusters established around key technologies significantly by 2030 (AI, quantum technology, information security, software technologies, autonomous systems, telecommunications, 6G and microelectronics).
- Increased cooperation between businesses, higher education institutions and research institutions concerning the use of digital technologies.
- The ICT investments of businesses grow annually, enhancing their international competitiveness and growth.
- Companies have annually deployed new digital technology and services based on the use of data. **(EU target: more than 90% of SMEs reach at least a basic level of digital intensity & 75% of EU companies use Cloud/AI/Big Data)**

The digital green transition

OBJECTIVE 9: Finland develops and applies digital technologies that respond to global climate and environmental challenges.

Key results

- The sustainability impact of Finnish businesses (carbon handprint) grows globally, along with growth in the export of sustainable technology.
- Public investments in technological development (including public procurement) are made annually, ensuring Finland's position of leadership in industrial climate and environmental solutions and the development of the circular economy.

The digital competences of small and medium-sized enterprises

OBJECTIVE 10: The number of digitally advanced SMEs will increase.

Key results

- Growth in ICT investments by SMEs across all industries.
- A minimum of 90% of SMEs reach at least a basic level of digital intensity and at least 75% of SMEs use cloud services, big data and AI. **(EU target: 75% of EU companies using Cloud/AI/Big Data & more than 90% of SMEs reach at least a basic level of digital intensity)**
- The share of digitally very mature SMEs has grown to at least 30% by 2030.
- The number of start-ups increases and, by 2030, more and more start-ups are growing and entering international markets. **(EU target: grow scale-ups & finance to double EU Unicorns)**
- Workplaces take advantage of the opportunities presented by digitalisation with regard to remote and multi-location work. Opportunities will be created for developing the digital skills of personnel.

4.4 Digital public services

Well-functioning public administration is vital for democracy and the welfare society. Our goal is that in 2030, Finland has the world's most efficient public sector, which enables people's wellbeing, thriving and ecologically sustainable business and flourishing civil society. The coherent and determined reform of public administration streamlines everyday services, secures legal certainty in society and creates new opportunities for companies and communities. As a result of renewal efforts, citizens' and businesses' need to use services has been reduced significantly as solutions based on data sharing, interoperability and a high level of automation have been built on the background of the services. The risks and security threats of the digital operating environment have also been taken into account in the development of public services, ensuring a high level of trust in the services.

Competent public administration is the foundation of Finnish society. Indeed, Finland's public administration and digital public services are highly ranked in numerous international comparisons, such as the EU's DESI index[12]. The COVID-19 pandemic further highlighted the role of digital capabilities as part of society's resilience. The public sector played a key role in managing the pandemic. The public administration's positive approach towards technology and preparedness to develop services cross-sectorally and

12 The Digital Economy and Society Index (DESI)

in cooperation with other players in society will remain among the keys to success in the future.

Well-functioning public services reinforce inclusion in society when digital services are available in Finnish, Swedish, English and plain language. The same is true when availability and accessibility are taken into account in service development and attention is paid to the use of clear administrative language in the national languages. Equality and the realisation of fundamental rights are the foundation for service development, and for example the obligations stipulated by the Sámi Language Act must be taken into consideration. With the help of digitalisation and automation, we can build new kinds of services that increase availability and improve accessibility of services also for those special groups that do not currently have services continuously available. Supporting the use of digital services and producing services for all groups are part of the core task of reliable public administration. This can also include the provision of services through non-digital channels where necessary Furthermore, opportunities to use non-e-services must be ensured for those who cannot use e-services. Digital services that support the use of services on behalf of others provide citizens with access to smooth service chains regardless of the service format and channel.

The rapidly changing operating environment boosts the development of digital public services. The development of the wellbeing services counties will also influence the digitalisation of municipalities. The digitalisation of public services may improve the productivity of the public sector and curb the increase of public expenditur[e13] while improving people's everyday life, the operating environment for businesses, and civil society. To achieve this, the utilisation of new technological solutions is not enough in itself; instead, the purposeful renewal of operating culture is needed. The benefits of technology cannot be tapped solely through the digitalisation of existing models. Instead, the logic and processes behind service provision must be re-examined. Efficient public administration requires targets and policy measures that transcend government terms of office, significant investments in the digitalisation of the public sector and increased cooperation and interoperability across administrative and sectoral boundaries. Current investments need to be targeted at the human-centric development of public services, and the amount of additional investment is linked to how quickly and comprehensively the objectives of human-centric public administration are sought to be achieved. The Government Programme sets out measures for each term of government to promote progress towards the set objectives.

13 Digitalisation in the public sector – productivity and measuring benefits. Publications of the Government's analysis, assessment and research activities 3/2017

The role of human-centric public services in promoting the digital green transition

Human-centric services refer to proactive and efficient services that take into account the needs and situations of different people, businesses and communities. This means that services must be built so that they are linked with people's life events and situations of the life cycle stages of businesses and communities. The objective is to define and digitalise approximately 40 of the most significant and impactful life event service packages by 2030. The selection and scheduling of these service packages should address the issues of practical feasibility, societal impact, productivity and, in particular, the extent to which the services can make the life stage in question easier.

In the future, a large share of public services will be digital and automated whenever appropriate. New technologies enable this, and citizens and businesses expect better digital public services. This will help increase the cost-efficiency and equal accessibility of services while reducing the carbon footprint of public services. For these objectives to be achieved, the starting point for investments in services must be the primacy of digital services. Accessibility requirements must be addressed starting from the planning and design stage. The availability of digital support needs to be ensured through cooperation between various parties so that all the special groups are taken into consideration. In line with the principles of good governance, everyone must have the opportunity to use public services.

Efficient government services, such as permit processes, help create a smooth operating environment for businesses and promote the smooth progress of green transition projects, for example. As users of public services, businesses and communities can be pioneers of digital services, with the aim being that the services offered to them would be solely digital and automated public services. This requires the use of data, which is why data collected from – and delivered to – businesses and communities needs to be primarily in digital and structured format and adhere to the valid European standards. This would enable, among other things, better service interoperability between organisations offering public services and the creation of a real-time economy.

Businesses and communities are customers of the public administration and also partners in the digital development of public services. The public administration also has a steering role. Public procurement, for example, can be used to support the development of more ecological digital solutions or the making of greener choices. When it comes to companies' digital services and the green transition, it must be ensured that we comply with existing European standards to ensure interoperability.

Interoperable public services

Interoperability at the legislative, administrative, technological and data levels is a precondition for new, more efficient, cross-sectoral services that can facilitate the use of services with the aid of automation, for example. Interoperability enables services linked to life events as well as the reuse and better usability of the data pools of the public administration. Cross-border activities also need to be taken into account in interoperability to enable the cross-border use of digital services. This requires the development of digital soft infrastructure[14] so that data utilisation solutions can enable the smooth exchange of data between services. Trust and identification solutions used by individuals and organisations are an important part of soft infrastructure. Their development is being driven towards models based on self-managed identity and Europe-wide usability at a minimum.

To create interoperable services, we need not only legislative reforms but also a new kind of understanding of – and competence in – the opportunities and preconditions of digitalisation. We must build broad-based technological understanding and competence in political decision-making and public administration in order to overcome the challenges associated with the efficient implementation of a cross-sectoral data and technology policy and ensure that public services are technologically up-to-date. The data economy operating environment and models must be built also in public administration and the preconditions for the interoperability of services need to be ensured. The objective of interoperability is supported by compliance with the currently valid European standards – and, where necessary, establishing national standards.

When the operating environment changes, the aim is to maintain comprehensively secure[15] public services

As the operating environment becomes increasingly digital, we encounter new security threats and trust is challenged in many different ways in society. The digital security framework includes matters related to risk management, contingency management

14 Digital soft infrastructure refers to the infrastructure related to digital services and systems, such as institutions, services, standardised specifications and agreements. Soft digital infrastructure, such as trust infrastructure and interfaces, is a prerequisite for the utilisation of data by the public administration and industrial operators as well as the progress of digitalisation and automation. Soft infrastructure creates an operating environment where all participants can build their digital activities on the same foundation instead of implementing their own foundation and having to struggle with interoperability challenges.

15 The concept of comprehensive security: Ministry of Finance, Implementation plan for digital security in the public sector

and preparedness, cyber security, information security and data protection[16] as well as threats associated with the spreading of disinformation and misinformation. The public administration must be prepared for these threats at the level of technologies and systems and at the level of processes, operating methods and operating models as well as by ensuring the necessary competence. When digital public services are developed, their comprehensive security must be taken into account. Citizens, businesses and communities must be able to trust in ethically sustainable and secure public services that support openness and transparency.

When assessing digital security and operational transparency, it is important to address the dual role played by the public sector as a user of technology and a party that steers the development and use of technology. The digital security of information systems should be assessed already at the development stage, as this helps reduce system disruptions and repair needs while also reducing the life-cycle costs of systems. At the operational stage, the constant monitoring of the digital security of the system reduces the number of disruptions and information security and data protection breaches. Automating proactive measures and monitoring activities for use by the entire public administration and establishing an underlying service description data resource would support the investigation of cyber security disturbances by enabling the identification of service dependencies and shared vulnerabilities.

The public sector must continuously assess the risks related to technological development and ethical aspects in different sectors of society and ensure a secure operating environment that protects individuals. Finland is part of the European whole and, in considerations related to the downsides of technology, Finland must be an active party, influence the drafting of regulation and engage in active cooperation at the EU level.[17]

16 Ministry of Finance, Implementation plan for digital security in the public sector

17 Finnish technology policy in 2020s – A global leader through technology and information. Publications of the Ministry of Finance – 2021:30

Digital public services: strategic objectives and key results for 2030

Table 5. Digital public services: Strategic objectives and key results for 2030

Human-centric public administration that promotes the green transition

OBJECTIVE 11: A significant proportion of public services has been digitalised or automated with a human-centric approach

Key results

- Unnecessary service use has been reduced through automation and digital services are the default service channel.
- Approximately 40 of the most significant life event service packages have been digitalised or automated. Human-centric digital services constitute a proactive, human-centric and efficient set of services. **(EU target: key public services are 100% online)**
- The key business situations in the life cycle of businesses have been identified and the related digital services constitute a proactive, human-centric and efficient set of services. **(EU target: key public services are 100% online)**
- The public services used by businesses are primarily digital or automated.
- Organisations that provide public services reduce their carbon footprint by primarily communicating with citizens via the Suomi.fi service.
- Finns have access to their digital health and social services data. Digital health services and data are used in everyday life. **(EU target: 100% of citizens having access to medical records)**
- 90% of the data collected from – or delivered to – businesses is in digital, structured format and compliant with existing European standards.
- Permit procedures, particularly concerning the green transition projects of the business sector, have been shortened across the board.
- The share of innovative public procurement will be increased to 10% of all procurement activities, and public procurement has promoted the green transition through the use of new technologies and operating models.

Public services are data-intensive and interoperational

OBJECTIVE 12: Interoperable digital public services enable smooth service use for citizens, businesses and organisations, also internationally.

Key results

- The digitalisation of the public administration is developed with an approach that spans across sectoral boundaries and administrative levels.
- Finland has shared soft infrastructure that enables digital services. **(EU target: digital identity: 80% citizens using digital ID)**
- Finland has a shared steering and funding model in use at various administrative levels to support interoperability.
- Finnish citizens and businesses can use digital services smoothly even across national borders.
- Unnecessary obstacles to the use and sharing of data have been identified and eliminated in regulations governing the data pools of the public administration.
- The comprehensive reform of healthcare and social welfare data management legislation has been carried out, and the information systems are interoperable.

Comprehensively secure public services

OBJECTIVE 13: Public services are produced in accordance with the comprehensive security model.

Key results

- A reliable and resilient communications infrastructure is available to citizens and the public authorities.
- The digital security of the central government, wellbeing services counties and municipalities has improved.
- Digital security foresight in public administration is used in the planning of operations and finances.
- The digital security solutions of digital public services contribute to the identification and management of disinformation and influencing through information.
- Risk-based digital security requirements have been established for public digital services, and their achievement is assessed and monitored on a continuous basis.

4.5 Cross-sectoral management of digitalization

The operating environment of central government is changing, driven by factors including technological progress, increased connectivity between administrative branches, a stronger focus on human-centricity and the prioritisation of sustainable development. Digitalisation, which refers to the renewal of operations and activities with the help of digital data and digital technology, extends to all administrative branches and is reshaping Finnish society and its services. In the existing system, it is impossible to set administrative boundaries for digitalisation. Consequently, digitalisation and the data economy are largely cross-sectoral themes that cut across all areas of public policy. Purposeful, ambitious and effective implementation requires comprehensive and up-to-date situational awareness as well as a management approach that spans across administrative branches.

The EU's Digital Decade policy programme involves establishing a monitoring and cooperation mechanism to support the achievement of the shared goals pertaining to Europe's digital transition. This requires cross-sectoral management from Finland, as well as the collective monitoring of the development of digitalisation. Finland's digital compass supports this by establishing a vision and strategic objectives for this decade, and by linking Finland's digital development efforts more closely to the European context. Nevertheless, achieving the objectives calls for cross-sectoral management and cooperation between different administrative branches to achieve the set objectives with regard to each of the cardinal points of the digital compass. One cross-sectoral management structure that has proved to be effective is the Ministerial Working Group on Developing the Digital Transformation, the Data Economy and Public Administration, and the Coordination Group for Digitalisation that supports it. They could be further strengthened and developed into a permanent management model. A digital portfolio that helps maintain situational awareness should also be adopted as an established tool. The Coordination Group for Digitalisation should engage in close cooperation with stakeholders and develop stakeholder engagement mechanisms to support the effective implementation of the digital compass.

Table 6. Cross-sectoral management: Strategic objectives and key results for 2030

Cross-sectoral management and development of digitalisation

OBJECTIVE 14: The opportunities presented by digitalisation and the data economy are fully taken advantage of through a management approach that promotes cross-sectoral cooperation.

Key results

- Finland has adopted an established management model for the development of digitalisation, which includes a permanent cross-sectoral coordination group for digitalisation and a ministerial working group that promotes digitalisation and the data economy.
- Progress towards the digital compass objectives is monitored in an integrated and long-term manner, using the digital portfolio and the indicators defined for the key results.

5 Performance monitoring and impact assessment

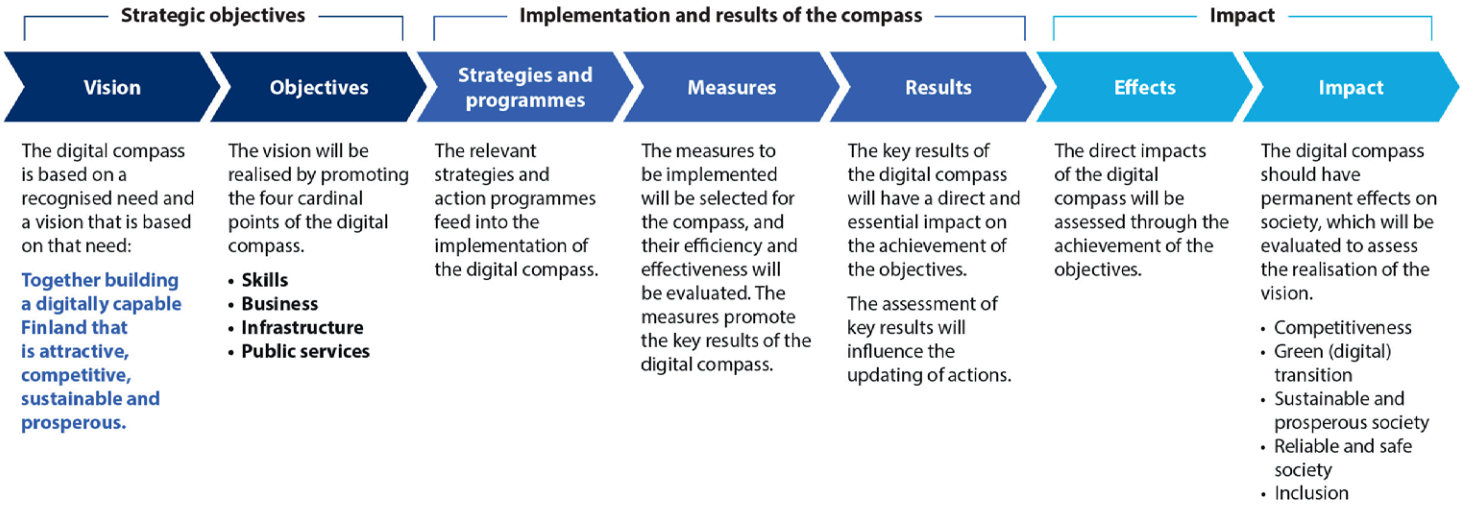
The digital compass is based on an impact path that consists of objectives, key results and measures. The impact path means that the measures produce key results, which in turn lead to the achievement of the objectives. The objectives are impact objectives that describe the desired strategic change in, or impact on, society. The key results describe milestone targets, through which the strategic objectives of each cardinal point are achieved. They are time-bound and provide a concrete description of the desired target state. The objectives and key results have been defined until 2030. The measures to be taken to put the digital compass into action, and the investments they require, will be defined for each government term and updated annually between now and 2030. The measures contribute to the achievement of the key results and are concrete, time-bound measures for which responsibility has been assigned. The resources and responsible parties for the measures will be set out in the digital compass action plan. Decisions on national funding will be made as part of budgetary processes, and opportunities for the use of EU funding will also be explored.

The objectives of the digital compass and the digital portfolio will be pursued in different administrative branches through steering efforts, reconciliation, the execution of the general government fiscal plan and performance guidance, among other things. The mechanisms of influence and steering available to the central government include, for example, reforming the regulatory environment, steering through information and the use of financial policy instruments, including project funding.

The coordination group for digitalisation coordinates and supports cross-sectoral coordination, steering, the reconciliation of measures and cross-sectoral cooperation in performance guidance. The coordination group cooperates closely with stakeholders, monitoring and supporting nationally significant digital projects that are carried out by organisations and entities outside the Government and influence digitalisation, the data economy, public administration development and operating environment development.

As part of the implementation of the digital compass, performance indicators will be defined for the digital compass objectives to illustrate the direction and rate of progress relative to the objectives. The indicators are neutral. In other words, they do not include the targeted level in themselves. The indicators may be quantitative or qualitative.

Figure 6. Impact path



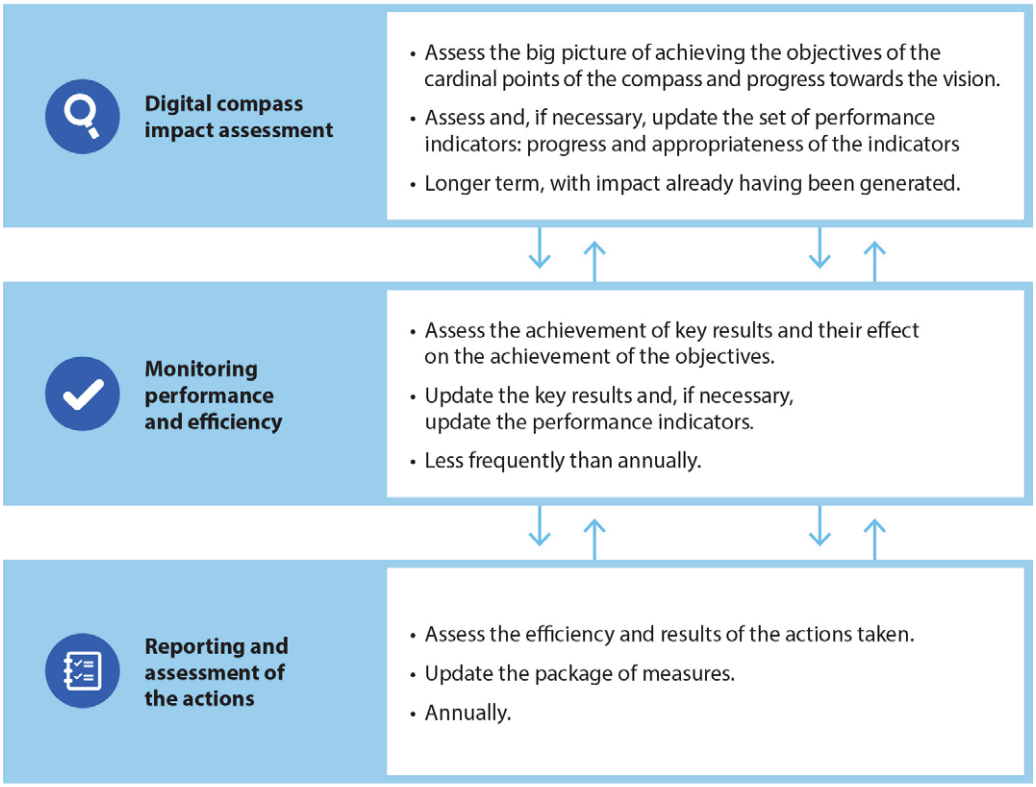
The performance monitoring and impact assessment of the digital compass are based on the impact path running from the vision to the measures.

The performance and impact of the digital compass and the digital portfolio will be monitored regularly and systematically to support the allocation of investments and the development of steering. The monitoring of the digital compass is based on short-term reporting and progress monitoring, medium-term performance monitoring and long-term impact assessment. A plan for performance monitoring and impact assessment will be established as part of the implementation of the digital compass and in accordance with the requirements of the EU's Digital Decade policy programme.

The progress of the digital compass measures will be reported annually. Reporting and the updating of the objectives and the situational picture will be linked to the Government's annual plan and processes, such as the implementation of the general government fiscal plan and annual reporting in the Government. The assessment of performance and efficiency will be carried out in the medium term. The progress made towards the digital compass objectives will be reported to the European Commission in accordance with the EU's Digital Decade programme.

The impact assessment of the digital compass will be conducted in the long term and according to a plan. The impact assessment will take into account the perspectives of effects, impact and impact sustainability. The impact assessment also needs to take into consideration the weight of changes in the operating environment and other factors in the realisation of desired or undesired effects or in the analysis of why the desired effects and impacts have not been achieved. The structure of the digital compass, which forms an impact path from the vision to the measures, constitutes the framework for assessing the societal impact of the digital compass.

Figure 7. Monitoring the progress of the digital compass



The progress of the digital compass will be monitored by means of reporting, performance monitoring and impact assessment

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