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Analysis and Comparison of Digital Societies in Selected Countries

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- Identification of relevant characteristics, requirements, and indicators
- Data analysis and comparison of selected countries
- Results and discussion
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I declare:

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Justice Takyi by own hand

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ANNOTATION

The thesis analyses and compares digital societies in selected countries from 2017 to 2022 year end. It highlights how these digital societies performed based on certain dimensions and indicators during the pre-covid, covid, and post covid era. The secondary data used were obtained from Digital Economy and Society Index covering a period of six years from 2017 to 2022. The results of the analysis reveal significant differences in the level of digitalization and the extent of digital infrastructure development, as well as differences in the policies and strategies employed by governments and businesses to promote the adoption of digital technologies. The thesis also highlights the importance of considering cultural, economic, and political contexts in building digital societies, and offers insights and recommendations for policymakers and stakeholders seeking to promote the growth and sustainability of digital societies.

KEYWORDS

digital society, digital economy and society index, analysis, comparison

NÁZEV

Analýza a porovnání digitálních společností ve vybraných zemích

ANOTACE

Tato práce analyzuje a porovnává digitální společnosti ve vybraných zemích mezi lety 2017 a 2022. Zaměřuje se na to, jak si vybrané digitální společnosti vedly na základě existujících dimenzí a ukazatelů během éry před covidem, v covidové době a po covidu. Použitá sekundární data byla získána z indexu digitální ekonomiky a společnosti za období šesti let od roku 2017 do roku 2022. Výsledky analýzy odhalují významné rozdíly v úrovni digitalizace a rozsahu rozvoje digitální infrastruktury a také rozdíly v politikách a strategiích používaných vládami a podniky pro podporu využívání digitálních technologií. Práce také zdůrazňuje důležitost zohlednění kulturních, ekonomických a politických souvislostí při budování digitálních společností a nabízí postřehy a doporučení pro tvůrce politik a zúčastněné strany, které se snaží podporovat růst a udržitelnost digitálních společností.

KLÍČOVÁ SLOVA

digitální společnost, index digitální ekonomiky a společnosti, analýza, porovnání

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List of abbreviations

APC	Association for Progressive Communications
DESI	Digital Economy and Society Index
DSL	Digital Subscriber Line
EIU	Economist Intelligence Unit
EU	European Union
ICT	Information and Communications Technologies
ITU	International Telecommunication Union
MGI	McKinsey Global Institute
OECD	Organisation for Economic Co-operation and Development
SMEs	Small and Medium-sized Enterprises
STEM	Science, Technology, Engineering and Math
TAM	Technology Acceptance Model
WEF	World Economic Forum

INTRODUCTION

In the current digital age, the use of digital technologies is pervasive across most countries around the world. Digital societies are rapidly emerging, and the impact of this trend is profound. It is essential to understand the differences between digital societies in order to gain insight into the varying impacts of the digital transformation. The digital society of the European Union (EU) is the most recent of several revolutions, ages, and social forms that have been promoted by academics, decision-makers, and businesses (Lengsfeld, 2019; Martin, 2008; Perriam and Carter, 2021). Critics contend that labelling society as technological or digital in origin is, at best, inaccurate and, at worst, incorrect and that it is not frequently susceptible to the quick and unexpected phase transitions inherent in revolutions (Martin, 2008). However, the way that society functions and how social actors interact are being affected and transformed by digital technology (Martin, 2008; Reis et al., 2018).

Additionally, there is a substantial body of research on the possible social advantages of digital technology (Mossberger et al., 2007; Perriam and Carter, 2021). Building smarter cities, enhancing access to e-government, e-health services, and digital skills are all part of the EU's inclusive vision for a digital society in Europe, according to the European Commission (2021). However, for many, such a digital society may appear hazy, remote, and outside the realm of their technological expertise and imagination.

The convergence of the virtual, physical, and social realms makes it more difficult to comprehend and conceptualize what a digital society is. Understanding not as it were the physical and computerized universes in and of themselves but moreover the connections between the different substances in each of these universes and between them, a space which may be a form of blended reality is vital to form sense of, exist completely in, and envision a future society saturated by advanced innovations. Additionally, from global to micro levels, various actors' points of view might differ greatly.

A digital society is a society that is characterized by the extensive use of digital technologies to facilitate communication, commerce, and other activities. These technologies include the internet, mobile devices, and various software and applications. In a digital society, many social, economic, and political aspects are mediated by digital technologies. Digital societies are marked by a high degree of interconnectivity and interdependence, as people rely on digital technologies to communicate, access information, and perform various tasks. Therefore, as

digital societies continue to evolve, it is important to analyse and compare how some countries are being digitized rapidly to benefit individuals and society.

An analysis and comparison of digital societies are to check for the various ways digital technologies are being used and integrated into different aspects of society. This might include examining the digital infrastructure (such as broadband penetration and internet coverage), digital economy (such as e-commerce and online payments), digital government (such as e-government services and digital identity systems), and digital society (such as social media usage and online privacy). The focus of the analysis and comparison performed in this thesis would be based on dimensions and indicators such as human capital, connectivity, integration of digital technology, digital public services etc. In addition, there will be a presentation on the various changes from 2017 to 2022 in selected countries.

The aim of this thesis is to analyse and compare digital societies in selected countries. The following questions were established to fulfil this aim:

1. What concepts, components, and approaches form a digital society?
2. What are the characteristics, requirements, dimensions, and indicators that are used to analyse and compare a digital society?
3. Looking at the pre, covid, and post covid seasons, did Covid-19 affect the dimensions and indicators and the development of digital societies in selected countries?

1 THEORETICAL BACKGROUND

1.1 DEFINITION OF A DIGITAL SOCIETY AND RELATED CONCEPTS

A digital society is a society that is heavily influenced by and reliant on digital technologies, particularly the internet, for communication, economic activity, and social interaction. In a digital society, many aspects of daily life, including education, entertainment, commerce, and politics, are mediated through digital platforms and devices (Dwivedi et al., 2011; Perriam and Carter, 2021). Digital society can be seen as a subset of information society, which refers to a society in which the creation, distribution, and use of information are central to its functioning and development. People living in these societies are formed by the conditions that are shaped by the digital information age (Lengsfeld, 2019; Perriam and Carter, 2021).

In a digital society, people use digital technologies to access information, communicate with others, and participate in various forms of online activity. Digital technologies also play a key role in the economy, with many businesses relying on digital platforms and tools to reach customers, sell products and services, and manage their operations (Brousseau and Penard, 2007; Dwivedi et al., 2011; Soete and Weel, 2005). Digital society also involves the integration of digital technologies into various aspects of social life, such as education, healthcare, and government services and the way people do business, work, live, influence democracy, and interact with one another (Qurbonovich, 2022). One of the key characteristics of a digital society is the way it relies on the collection, analysis, and use of data (Perriam and Carter, 2021). This is a result of the highly developed and widespread usage of information and telecommunications technology by individuals, organizations, and governmental bodies across all sectors (Qurbonovich, 2022).

Making ensuring that individuals have unrestricted free access to information is one of the most crucial jobs for industrialized nations. The expansion of value added in today's economy is based on intellectual effort, an increase in industrial technology, and the use of contemporary information and telecommunications technologies. The knowledge economy is integrating with current economic structures. The function of elements contributing to intellectual creation is greatly increased when society moves from an industrial to a postindustrial state (Hall, 1994).

Digital societies are informed societies. An informed society is one where the majority of its citizens are actively involved in the creation, storage, processing, and use of information, including knowledge, which is information's highest form. With the development of an

informed society will come the emergence of a new information processing sector based on computer and telecommunication information technologies. Economic and sociocultural developments in society are greatly impacted by the process of digitization. Additionally, the interchange of information is vital for the development of cultural norms and values that are in line with the changing demands of the period (Dufva and Dufva, 2019; Qurbonovich, 2022).

The information society determines the movement towards the knowledge society. One of the main features of this society is its global character. As the information society develops, the global economic structure is drastically changing, and the market is becoming more vibrant and competitive. Information and knowledge are becoming one of the strategic sources of the country, the scope of their use is comparable to the use of traditional resources, access to which is one of the key factors of socio-economic development. In this sense, one of every nation's most crucial duties is to establish and expand its information infrastructure while integrating it into the global information society (Dubolazova, 2020; Dwivedi et al., 2011).

Networking is becoming an integral part of a person's information culture. The term "programmable society" is associated with the accumulation of contradictions in an industrial society and the study of the peculiarities of the formation of a new stage in human development. The development of information communication systems has helped to improve access to information resources for different categories of users (Castells and Cardoso, 2005).

We can conclude that the most general characteristics of a digital society include the following (Dufva and Dufva, 2019; Dwivedi et al., 2011; Lengsfeld, 2019; Perriam and Carter, 2021): (1) globalization – people from different countries to interact, collaborate, and share ideas; (2) connectivity – people are constantly connected to the internet and each other; (3) transparency – with the right tools, it is possible to access information that was once hidden or difficult to obtain; (4) interactivity – with users able to engage with each other and share information in real time; (5) personalization – with the right tools, it is possible to tailor the experience to each user's needs, preferences, and interests; (6) data-driven – to inform decisions and develop strategies in various areas, from business decisions to public policy; (7) networked – to connect stakeholders with one another to sharing of information, resources, and communication; (8) social – allows for increased sharing, collaboration, and communication between stakeholders; (9) accessibility – people can easily access information; and (10) diversity – people can communicate with others from different cultures, backgrounds, and religions.

1.2 DIGITALIZATION AND ITS COMPONENTS

Digitalization is the key to building the digitalised society by "*transforming various previously physical or analogue actions into digital data systems*" (Dufva and Dufva, 2019). The process of turning data, procedures, or goods into a digital format is known as digitalization. Instead of using physical documents or analogue methods, this can entail using computers, software, and other digital technologies to store, process, and communicate information electronically. Digitalization has several advantages, including enhanced efficiency, convenience, and accessibility, and it may be applied to a variety of fields, including business, education, healthcare, and government. Additionally, it can promote the development of new channels for interaction and cooperation as well as the production of new goods and services (Dufva and Dufva, 2019; Swain and Panda, 2009). The digitalization can make information more accessible and easier to share, streamline and automate processes, enable new forms of communication and collaboration, creation of new products and services etc. (Gorenšek and Kohont, 2018).

1.2.1 Digital infrastructure

Digital infrastructure refers to the hardware, software, and network resources that enable the use of digital technologies in various settings, including businesses, organizations, and households. Some examples of digital infrastructure's component include (Ekudden, 2020): servers, networking equipment, data centres, cloud computing, internet connectivity etc. Digital infrastructures are essential for the functioning of digital society and is used in various applications, including communication, entertainment, education, healthcare, finance, and government. However, they, respectively importance of their components, are also constantly evolving and improving (Henfridsson and Bygstad, 2013). This includes advances in hardware, such as faster and more powerful processors and storage devices, as well as improvements in software and networking technologies, such as new programming languages and protocols that enable more efficient and effective communication, service provision, and especially data transfer (Ekudden, 2020; Henfridsson and Bygstad, 2013).

During Covid-19, businesses were encouraged to shift towards digital infrastructures. Trends emerging in today's technological revolution are that digital infrastructure is shifting to the edge, where business leaders are starting to comprehend the value of data. Edge computing enables businesses to analyse data closely and gain efficient insights. Introducing newer forms of infrastructure in the digitized era gives businesses the potential to overpower the limitations of traditional, legacy platforms (Cao et al., 2020). Digital infrastructures have shifted toward

a developer's perspective on the organization's technological choices. Businesses are increasingly eager to migrate to hybrid and multi-cloud setups. They may now handle both cloud-based and on-premises settings at the same time. More significantly, businesses can guarantee that their systems are modernized in a timely and cost-effectively (DinCloud, 2022).

1.2.2 Digital economy

The digital economy refers to the economic activities and processes that are enabled by digital technologies, such as the internet, mobile devices, and other forms of Information and Communications Technologies (ICT). It includes a wide range of industries and sectors, including e-commerce, digital media, online education, financial services, and many others. The digital economy has transformed the way people and organizations buy, sell, and interact with each other, as well as the way they produce, distribute, and consume goods and services. It has also created new opportunities for innovation, entrepreneurship, and economic growth (Bukht and Heeks, 2017; Sturgeon, 2021).

It has emerged as a result of the modern economy's technological structure changing, which presents both substantial benefits and potential challenges. Economic interactions have changed qualitatively as a result of this process. For example, Sturgeon (2021) emphasize the importance of modularity, open innovation, and platforms. Businesses should focus on innovation and market positioning by accumulating, accessing, and analysing large amount of data. Other benefits of the digital economy include removing of geographical restrictions and creating alternative commercial platforms, lowering costs, emerging of new innovative business practises etc. (Bukht and Heeks, 2017; Stavytskyy et al., 2019). To compare countries in this area, various rankings and indices have also appeared over the years (Stavytskyy et al., 2019).

The global economy, including the digital sector, has been significantly impacted by the Covid-19 pandemic. The pandemic has disrupted numerous traditional corporate operations, but it has also sped up the use of digital technologies in a number of sectors. The rise of remote employment and online education has been among the pandemic's most obvious effects on the digital economy (Zhang et al., 2022). Other sectors of the digital economy, such as e-commerce industry, digital media and entertainment, have also seen an increase in demand. Overall, the pandemic has shown how crucial digital technology and the digital economy are for enabling businesses and individuals to continue operating and communicating with one another despite physical separation (Pandey and Pal, 2020).

1.2.3 Digital government

The term digital government refers to the use of ICT to enhance citizen engagement, boost transparency, and improve the delivery of government services. The implementation of electronic systems for the collection and management of government data, the use of online platforms for communication and collaboration within the government, and the use of websites, mobile apps, and social media to provide information and services to the general public are all examples of digital government initiatives (United Nations, 2020). Digital government can improve the efficiency and effectiveness of government operations and increase transparency and accountability. It can also make it easier for citizens to access government services and information and improve the overall citizen experience. However, it is important to support creation of governance structures that will help to involve people in decision-making processes (Erkut, 2020).

Digital government initiatives have played a significant role in responding to the Covid-19 pandemic. Digital technologies have been used in various ways to deliver health care and other essential services, facilitate communication and collaboration among government agencies and other stakeholders, and provide information and resources to the public (United Nations, 2020). Some examples of digital government initiatives during Covid-19 include (United Nations, 2020): 1) online portals and mobile apps for tracking the spread of the virus and providing updates to the public; 2) electronic systems for the collection and management of data on Covid-19 cases, hospital capacity, and other important metrics; 3) websites and social media platforms for providing information on prevention measures, testing locations, and other resources; 4) virtual platforms for telemedicine, allowing patients to access medical care remotely; 5) online tools for facilitating communication and collaboration among government agencies and other stakeholders, such as video conferencing and project management tools.

1.2.4 Digital inclusion

The term digital inclusion describes the initiatives taken to guarantee that all people and communities have access to and are capable of making meaningful use of digital technologies and the internet. This entails having access to reasonably priced and dependable technology and internet connections, as well as the required abilities and information to use these technologies efficiently. Promoting digital inclusion is crucial because access to these resources can have a big impact on a person's capacity to engage fully in society. The internet and other digital technologies have become essential elements of modern life. For instance, the internet can offer

access to knowledge and resources that can enhance the quality of life, as well as opportunities for education, employment, healthcare, and social connections (Reisdorf and Rhinesmith, 2020).

There are many challenges to achieving digital inclusion, particularly for marginalized or low-income communities. These may include economic barriers, lack of infrastructure, and limited access to digital literacy education. However, governments, non-profit organizations, and other groups can address these challenges through initiatives such as providing low-cost internet access, offering digital literacy training, and increasing the availability of affordable devices (Musungwini et al., 2022). In the EU, data inclusion refers to the efforts to ensure that all individuals and organizations within the EU have equal access to and are able to use data and data-related resources, including data infrastructure, data services, and data-driven innovations. This includes not only access to data, but also the ability to understand and use data effectively. By promoting data inclusion, the EU aims to foster a more inclusive and innovative society, in which all individuals and organizations can participate fully in the digital economy (European Commission, 2022b).

According to Ragnedda and Mutsvairo (2018), the concept of digital inclusion has been viewed as a crucial strategy for understanding the need of giving poor populations access to technology and the means of learning how to use it. People become members of the information society by virtue of the multiple behavioural changes that using technology alone brings about in individuals or social groups. But in order to enjoy these advantages, one must master essential digital abilities, such as discovering and exploiting digital resources and building a digital identity that grants access to a variety of platforms and devices (Blažič and Blažič, 2020).

However, the Covid-19 pandemic's social isolation forced elderly individuals to create a new form of communication known as online. The arrival of the Covid-19 pandemic coincided with the emergence of new hazards that mostly affected the elderly due to their unequal access to, use of, and ownership of telecommunications and ICT, making them the leaders of a more pronounced digital divide (Moore and Hancock, 2020). In this way, digital literacy is essential to the advancement of society today. In order for the elderly to fully accept and use technology, it is essential that they acquire digital skills (Chetty et al., 2018).

1.3 TECHNOLOGY ACCEPTANCE FOR A DIGITAL SOCIETY

The 21st century has seen fast technological advancements and digitization, and adoption of new technology has become more vital for contemporary cultures. As technology continues to

evolve, it is becoming increasingly vital for societies to understand the importance of embracing and accepting the new technology. Technology acceptance is the process of understanding, adopting, and integrating technology into everyday life. Understanding technology in general and how it may be used to enhance everyone's life are equally important. Understanding and adopting the latest digital technologies is one of the most crucial components of technology acceptance (Venkatesh et al., 2003). This involves being aware of how digital technology may enhance our lives in several spheres, including entertainment, education, healthcare, and communication. It's also crucial to be aware of the possible risks posed by digital technology, such as security risks, privacy issues, and abuse possibilities (Teo, 2011).

A theoretical model that explains how people come to accept and use a new technology is called the Technology Acceptance Model (TAM). The TAM asserts that if people see technology as useful and user-friendly, they are more likely to accept and utilise it. A person is less likely to accept technology, however, if they believe it to be pointless or difficult to use. The theory holds that if people use technology more regularly, they will begin to see it as helpful and easy to use, which can motivate them to continue doing so. The TAM has greatly influenced how scholars and practitioners approach and examine the adoption and usage of technology (Godoe and Johansen, 2012).

One of the TAM's most significant effects has been to reorient research and practice away from technological aspects and towards the importance of human factors in deciding technology acceptance and use. The TAM has contributed to bringing attention to the significance of building technologies that are simple to use and that match the requirements and goals of users by acknowledging that perceived utility and perceived ease of use are significant drivers of technology adoption. The TAM has also had practical effects on the creation and promotion of new technology. Businesses and organizations may create and promote technologies that are more likely to be accepted and utilized by their target audiences by understanding the elements that affect technology acceptance (Dagada, 2005; Godoe and Johansen, 2012; Teo, 2011).

2 DIGITAL SOCIETIES AND RELATED ASPECTS

2.1 CHARACTERISTICS AND REQUIREMENTS OF DIGITAL SOCIETIES

In the modern world, digital societies are increasingly becoming the future of global economy. The digital age has revolutionized the world and opened up innumerable possibilities for the citizens of many countries. With the rise of digital technologies, businesses, governments, and individuals are all looking to take advantage of digital societies' opportunities. Countries that have successfully adopted digital technologies have seen an improved economic performance, increased access to services, and improved quality of life. As such, there is a need to identify the criteria by which countries can be selected as digital societies. There is no one-size-fits-all approach to this selection process, as each country has unique characteristics and requirements (APC, 2022; OECD, 2023). That said, there are several key criteria to consider when measuring digital societies.

The first aspect that characterizes most of the digital societies is the presence of a robust digital infrastructure. This includes a reliable and secure network, high-speed internet access, and a wide range of digital services and applications. Furthermore, digital societies should have a robust digital literacy rate among their citizens, allowing the population to take full advantage of digital technologies. There should be a supportive policy framework. This includes supporting legislation and regulatory frameworks and incentives to incentivize the adoption of digital technologies. Furthermore, digital societies should have a good track record of innovation and technology development, as this improves their ability to compete in the global market (Dwivedi et al., 2011; Perriam and Carter, 2021).

Another aspect to consider is the presence of a strong digital economy. This includes the presence of a robust, competitive, and efficient digital economy that encourages the development of new digital services and applications. Furthermore, digital societies should have high levels of entrepreneurship, as this allows for creation of innovative products and services. Also, the presence of a strong digital culture is one of the requirements on a digital society. This includes the presence of a culture that values digital technologies and encourages its citizens to use digital technologies (Dufva and Dufva, 2019; OECD, 2023).

The prevalence of digital technologies is also important in determining whether a country is a digital society. This includes the presence of digital tools, such as computers, smartphones, and tablets, as well as the prevalence of digital services, such as online banking and online

shopping. Additionally, the country must have a wide range of digital applications, such as e-commerce, e-learning, and digital health. The adoption of digital tools is also key to becoming a digital society. This includes using digital tools in everyday life, such as banking, shopping, and communication. Additionally, the country must have a culture that is open to and accepting of digital tools and technologies. Finally, the availability of digital resources is essential for developing digital societies. This includes the availability of digital content, such as educational materials, public data, and research, as well as the availability of digital services, such as cloud computing and data storage (Dwivedi et al., 2011; Perriam and Carter, 2021).

With the ever-increasing prevalence of technology and the internet, countries can become digital societies that prioritize digital technology, infrastructure, and innovation. By meeting these criteria, countries have the potential to become digital societies and reap the rewards of the digital age. Such countries can develop and implement digital initiatives leading to greater economic prosperity, improved public services, and increased access to educational and other resources (APC, 2022; OECD, 2023).

2.2 DIMENSIONS AND INDICATORS OF DIGITAL SOCIETIES

There are several frameworks and dimensions/indicators that are used to characterize the development of the digital economy and/or society. Some of the most common frameworks include:

- The Digital Economy Index developed by the World Economic Forum (WEF). The WEF's Digital Economy Index is a composite index that measures the digital maturity of economies around the world. It covers a wide range of indicators, including the availability of digital infrastructure, the use of digital technologies by businesses and consumers, and the impact of digital technologies on economic growth and productivity.
- The Digital Readiness Index developed by the Economist Intelligence Unit (EIU). The EIU's Digital Readiness Index is a composite index that measures the readiness of countries to adopt digital technologies. It covers a wide range of indicators, including the availability of digital skills, the regulatory environment for digital businesses, and the level of investment in digital infrastructure.
- The Digital Economy and Society Index (DESI) that was developed by the European Commission in 2014. The DESI is a composite index that measures the impact of digital technologies on society. It covers a wide range of indicators, including the use of digital

technologies by citizens, the impact of digital technologies on employment, and the level of trust in digital technologies.

- The Digital Transformation Index developed by the McKinsey Global Institute (MGI). The MGI's Digital Transformation Index is a composite index that measures the impact of digital technologies on businesses and economies. It covers a wide range of indicators, including the use of digital technologies by businesses, the impact of digital technologies on productivity, and the level of investment in digital technologies.
- The Global Information Technology Report developed by the World Bank. The World Bank's Global Information Technology Report is an annual report that assesses the development of the ICT sector around the world. It covers a wide range of indicators, including the availability of ICT infrastructure, the use of ICT by businesses and consumers, and the impact of ICT on economic growth and development.

Note that the choice of framework will depend on the specific purpose of the analysis. For example, a government agency might use a different framework than a business or a research organization. It is important to note that the digital economy is a complex and evolving phenomenon. As a result, it is difficult to develop a single framework that can adequately capture all of its dimensions/indicators. However, the frameworks discussed above, and dimensions/indicators discussed below provide a useful starting point for understanding the digital economy and its impact on society.

The most widely used, especially in the EU context, is the DESI, which is a composite index that measures the digital performance of the EU's Member States (Sevgi, 2021). It provides a comprehensive assessment of how well each country is progressing in terms of their digital transformation and integration of digital technologies. The DESI is published annually by the European Commission as a part of the Digital Single Market Strategy (Bánhidi et al., 2020; Bruno et al., 2023; Imran et al., 2022; Kuzovkova et al., 2019; Stavytskyy et al., 2019).

Thus, for the purposes of this thesis, dimensions/indicators of the DESI are described more in detail. This index comprises of four dimensions. It should be also noted that this index was firstly introduced in 2014 but its dimensions and corresponding indicators changed over the years, especially regarding modern trends in ICT and the aims to build fast, available, secure, and sustainable digital infrastructures for the provision of digital public services for citizens and businesses. The following are the dimensions/indicators used to measure the digitalization of a society by the DESI:

1. Human capital.
2. Connectivity.
3. Integration of digital technology.
4. Digital public services.

2.2.1 Human capital

One way of measuring the success of a digital society is through the concept of human capital. Human capital is the combination of a person's abilities, knowledge, and experience. It indicates a nation's economic power and a society's capacity to develop and maintain a digital infrastructure. It is measured through metrics such as the level of education and the availability of skills and expertise (Samans et al., 2017).

An educated and skilled population is essential for a digital society to reach its full potential. As such, investing in human capital should be at the heart of any digital society. Investing in human capital means providing access to quality education, training, and skills development opportunities for all members of society. This encourages the acquisition and development of the necessary skills and qualifications needed to succeed in the digital economy, such as coding, data literacy, and digital literacy (Iordan et al., 2022).

Furthermore, it is essential to ensure that human capital development is inclusive. This means providing access to quality education and training opportunities to everyone, regardless of their socio-economic background. This includes providing access to resources such as technology, digital literacy training, and career guidance. Ultimately, investing in human capital is essential to the success of a digital society. It is the foundation on which digital infrastructure and digital services are built, and it is an important measure of the success of a society's digital transformation. A digital society may provide its residents with a more equitable and prosperous future by investing in human capital (Iordan et al., 2022; Samans et al., 2017).

2.2.2 Connectivity

Today, connectivity is an essential indicator of a digital society. It is the driving force behind our digital transformation, enabling us to interact with one another, share information, and access services. Without connectivity, digital societies would cease to exist. Connectivity can come in various forms, including physical infrastructure, such as fibre optic cables and wireless networks, and virtual infrastructure, such as the internet and other cloud-based services. By

measuring connectivity, we can understand how individuals, businesses, and governments can access, exchange, and share data (European Commission, 2022a; ITU, 2022).

In a digital society, connectivity is essential to ensure everyone can access the same information, participate in the same activities, and benefit from the same opportunities. This includes access to education, medical services, and other essential services. In addition, connectivity also allows for the development of new technologies and services, which can significantly impact people's lives. Connectivity is also a crucial factor in economic development. A country with good connectivity can attract foreign investment and create jobs. This, in turn, leads to increased economic growth and prosperity. It is clear that connectivity is a key indicator of a digital society and is essential for countries to achieve social and economic progress. Despite the fact that many nations have achieved great strides in connection, much work remains. Governments, businesses, and individuals must work together to ensure that everyone can benefit from the opportunities that come with a digital society (European Commission, 2022a; ITU, 2022; Lynn et al., 2022).

2.2.3 Integration of digital technology

The integration of digital technology is a critical indicator of a digital society. It has become increasingly necessary in our modern, interconnected world to ensure that digital technology is embraced and utilized to its fullest potential. In a digital society, digital technology plays an important role in all aspects of life. Organizations can create a more efficient and streamlined workflow by integrating digital technology into existing systems (United Nations, 2021). Integrating digital technology into existing systems also allows for greater collaboration. Additionally, digital technology can allow organizations to access and share information more quickly and easily. The integration of digital technology is also important for the preservation of culture and traditions (European Commission, 2022a).

Finally, digital technology can be used to provide citizens with access to information, services, and resources. This allows citizens to become more engaged and empowered in their communities, giving them the knowledge and tools they need to make informed decisions and contribute to their societies. By utilizing digital technology to its fullest potential, organizations can create more efficient and effective systems, collaborate more effectively, preserve culture and traditions, and provide citizens with access to information and resources. In doing so, digital technology can help to create a more connected, informed, and empowered society (European Commission, 2022a; United Nations, 2021).

2.2.4 Digital public services

In today's digital age, digital public services are becoming a key indicator of how advanced a society is in terms of its digital infrastructure. Digital public services offer citizens access to a wide range of services that would otherwise be unavailable. This includes online banking, filing taxes, accessing government information, paying bills, and much more (Bertot et al., 2016).

Digital public services not only provide citizens with greater access to the services they need but also help reduce administrative costs and provide better quality service. Furthermore, they are becoming increasingly important in providing citizens with greater access to the services they need to participate in the digital economy. The availability of digital public services is also a measure of a society's commitment to digitalization. A society that can provide citizens with easy and convenient access to the services they need is one that is well on its way to becoming an advanced digital society. Digital public services can help spur economic growth and development, as well. For example, digital public services can provide an easy and efficient way to pay taxes, which can stimulate economic activity and help to create jobs. Additionally, digital public services can give citizens access to government information, which can help them make better decisions and provide businesses with access to new markets and opportunities (Bertot et al., 2016; European Commission, 2022a).

Finally, digital public services can be seen as a reflection of how society values digital technology. A society that values digital technology is likely to invest in developing digital public services and will be more likely to have a thriving digital economy. Digital public services are a key indicator of a digital society. They reflect a society's commitment to digitalization, and they can help spur economic growth and development. Governments need to invest in digital public services if they want to create an advanced digital society (Lindgren et al., 2019). Finally, it should be noted that digital public services are part of the e-government framework. The EU published its e-government benchmark report every year since 2001 and the area of e-government is one of the most important dimensions of the digital society for the relationships between citizens and/or businesses and governments.

3 DATA ANALYSIS AND COMPARISON OF SELECTED COUNTRIES

3.1 RESEARCH METHODOLOGY AND DESIGN

A secondary data gathering strategy was used to analyse and compare and the countries in order to accomplish the stated aim. Collecting information that is already out there is referred to as secondary data collecting. The information gathered has passed the requisite statistical analysis and is not the researcher's property. Regularly, these data were obtained from unique sources and after that made freely open. In other words, secondary data are data that have as of now been gotten by another party.

The dimensions and indicators of each chosen country were compared using Microsoft Excel in the pre-, during, and post-covid eras. Comparative analysis refers to the description and justification of similarities and differences in events or outcomes across broad social scales, such as regions, countries, communities, and cultures. This concept considers traditions from anthropology, sociology, political science, comparative history, and psychology, as well as cross-cultural and sociological analysis and psychological analysis (Smelser, 1973). The study is based on reports, dimensions, and indicators from the DESI developed by the European Commission to measure and track the digital performance of the EU Member States.

3.1.1 Research instrument and data collection

The DESI was chosen as a source of secondary data because 1) it provides a comprehensive assessment that coverts multiple dimensions of the digital economy and society of a country's digital performance; 2) uses a standardized framework allowing for consistent comparisons across different EU Member States; 3) it is designed to support evidence-based policymaking in the EU and the recommendations for policy planning can obtained by this way; 4) it is updated annually and provides data which enable to analyse trends and changes in digital performance over time; and 5) it allows for comparative analysis across different countries. The data and reports were already validated and standardized by the European Commission; hence, the DESI is found reliable and appropriate for this thesis.

The data were collected directly from the official website of the European Commission which can be accessed at <https://digital-agenda-data.eu/datasets/desi/> and the respective reports then at <https://digital-strategy.ec.europa.eu/en/library>. The data period consisted of 2017-2022. The data was analysed using the DESI - Compare countries progress and Microsoft Excel. The unit of measure of the DESI is weighted score (0 to 100).

3.1.2 Selection of countries and objectives of the analysis

For the selection of concrete countries, we chose the approach that includes the best performers in given areas, so we can learn from the achievements, improvements, and best practices of these countries and provide recommendations for countries which lag behind in respective dimensions and indicators. By analysing the results from the 2022 edition of the DESI, we chose the following countries to analyse and compare: Finland, Denmark, Netherlands, and Sweden.

Considering the aim of this thesis and the question: Did Covid-19 affect the dimensions and indicators and the development of digital societies in selected countries?, we defined the following objectives for the analysis and comparison of selected countries:

1. Analysis and comparison of digital societies in Finland, Denmark, Netherlands, and Sweden pre Covid-19.
2. Analysis and comparison of digital societies in Finland, Denmark, Netherlands, and Sweden during Covid-19.
3. Analysis and comparison of digital societies in Finland, Denmark, Netherlands, and Sweden post Covid-19.

3.2 ANALYSIS OF COUNTRIES USING MAIN DIMENSIONS

For the pre Covid-19 era, Figure 1 displays data from 2018 for all dimensions of the DESI. Finland, Sweden, Denmark, and Netherlands had the most advanced digital economies in 2018.

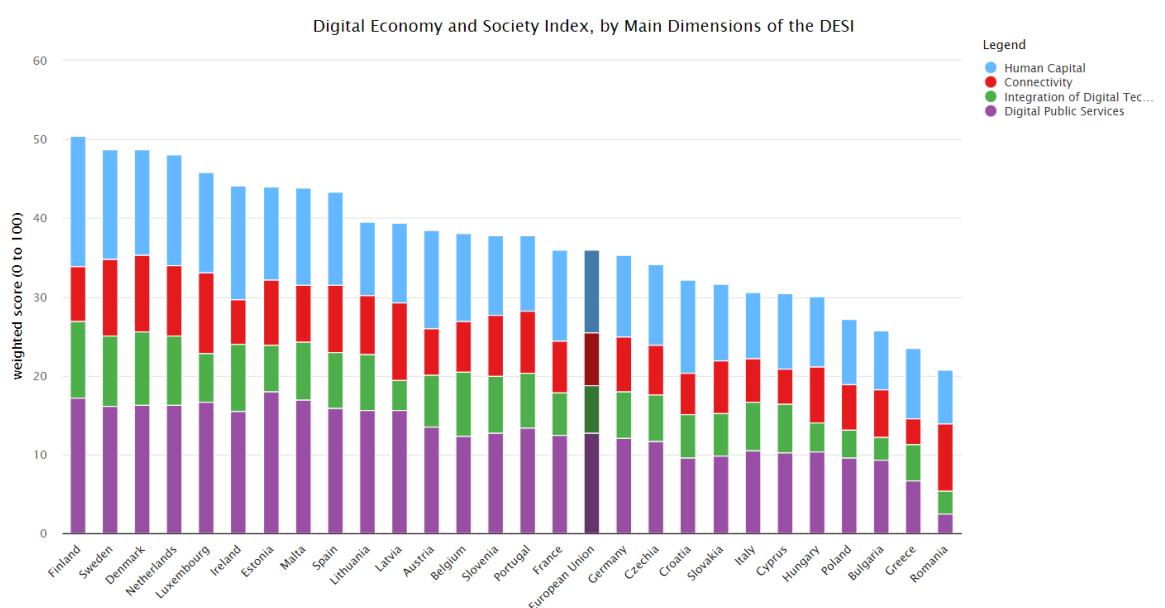


Figure 1. Main dimensions of the DESI in 2018. Source: European Commission, Digital Scoreboard.

Figure 2 shows more detailed information about selected countries in 2018. We can conclude that the scores for human capital and digital public services were the most important for the digital society, i.e., they contribute most to the overall score of the index.

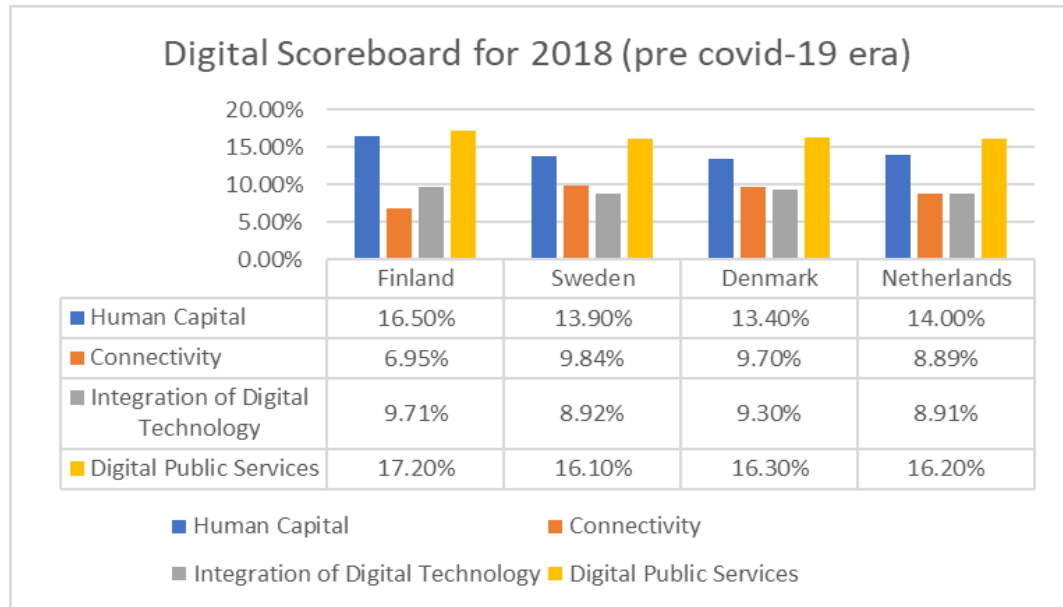


Figure 2. Main dimensions of the DESI for selected countries in 2018. Source: own processing.

In 2020, which was the first year that was affected by the Covid-19 era, Finland, Denmark, Sweden, and Netherlands have the most advanced digital economies accordingly, followed by Malta, Luxembourg, and Ireland, see Figure 3. It can be seen that those four countries improved their scores. So, we can conclude that the year 2020 was not affected by the Covid-19. We can assume that it is because the digital projects are usually a long-term process.

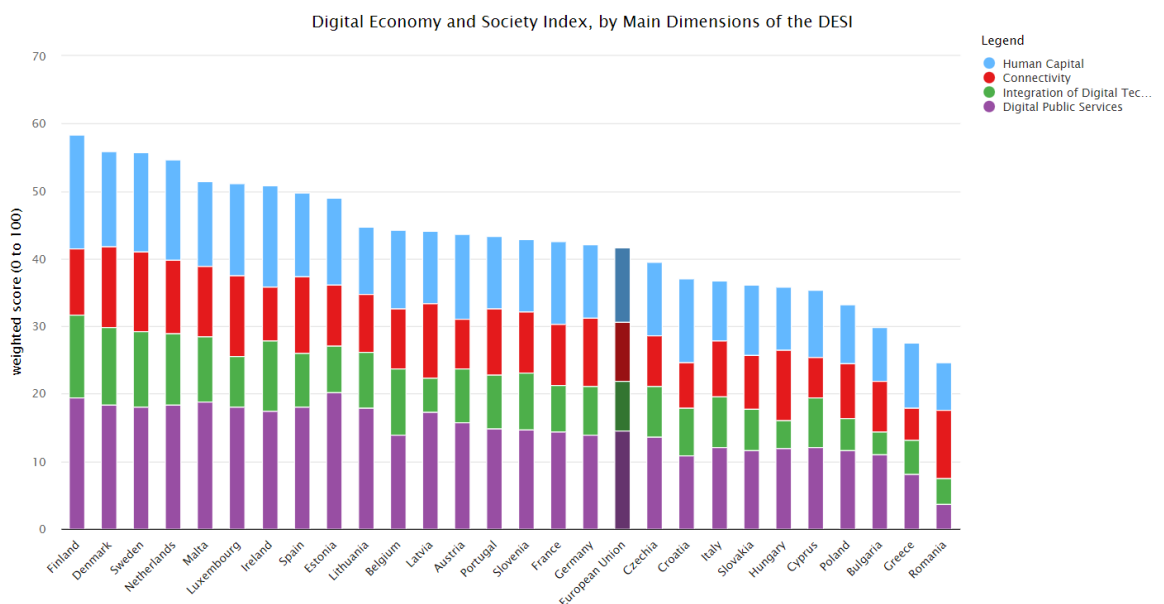


Figure 3. Main dimensions of the DESI in 2020. Source: European Commission, Digital Scoreboard.

Figure 4 shows more detailed information about selected countries in 2020. A growing importance for connectivity and integration of digital technology can be identified here compared to 2018.

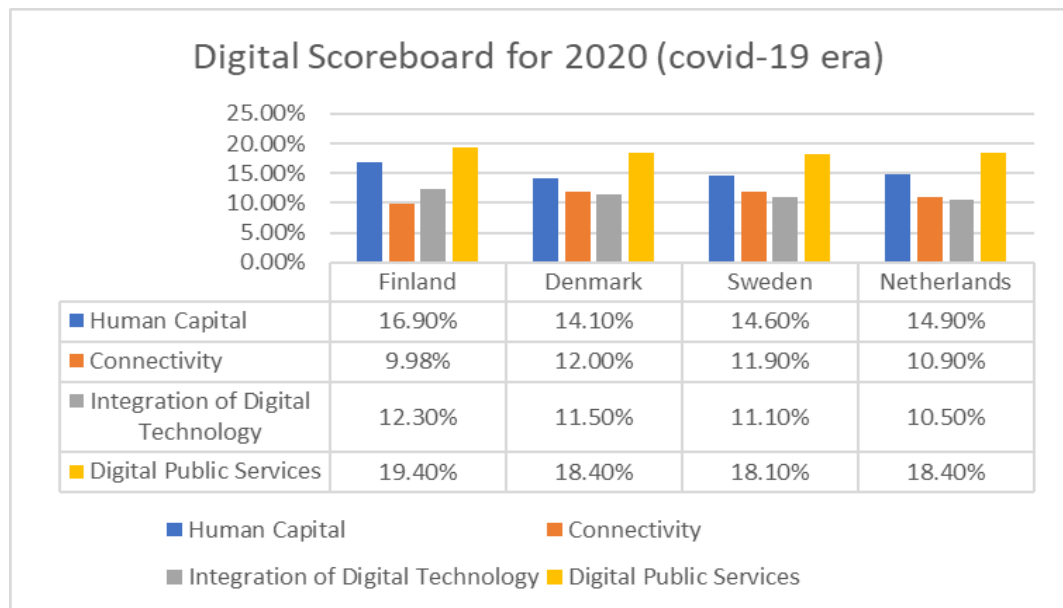


Figure 4. Main dimensions of the DESI for selected countries in 2020. Source: own processing.

Figure 5 visualizes data from 2022, which can be considered as part of the post Covid-19 era. Compared to the values from previous years, we can see that the performance of most of the Member States of the EU improved again. We can conclude that the Covid-19 pandemic did not affect the development and improvements in digital societies in these countries.

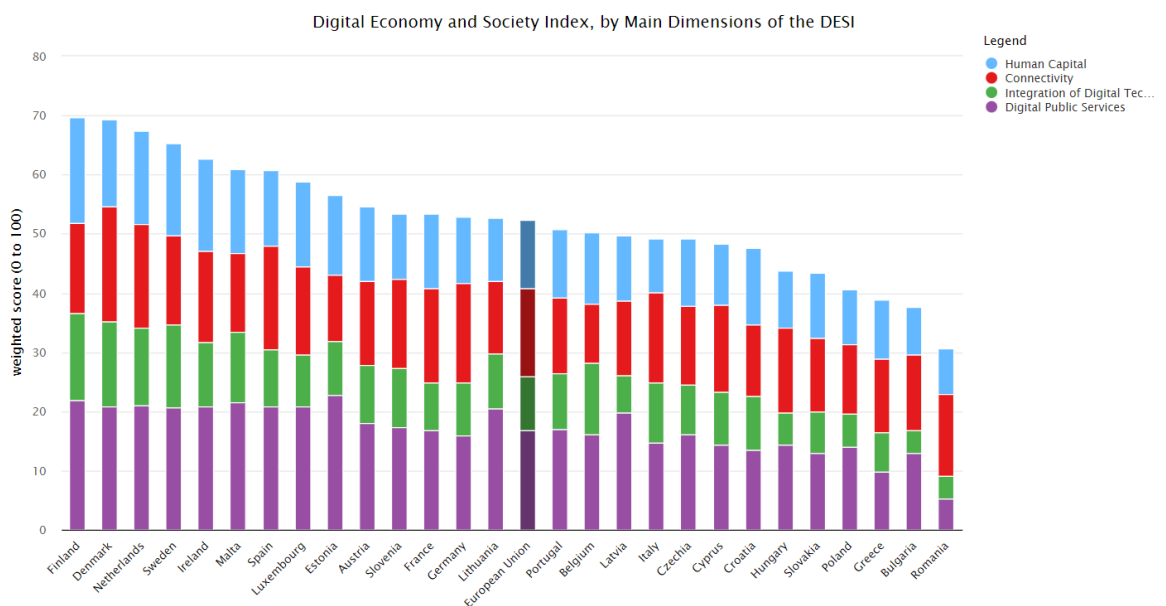


Figure 5. Main dimensions of the DESI in 2022. Source: European Commission, Digital Scoreboard.

Figure 6 then presents more detailed information about selected countries in 2022. The growing importance of connectivity and integration of digital technology can be seen here again.

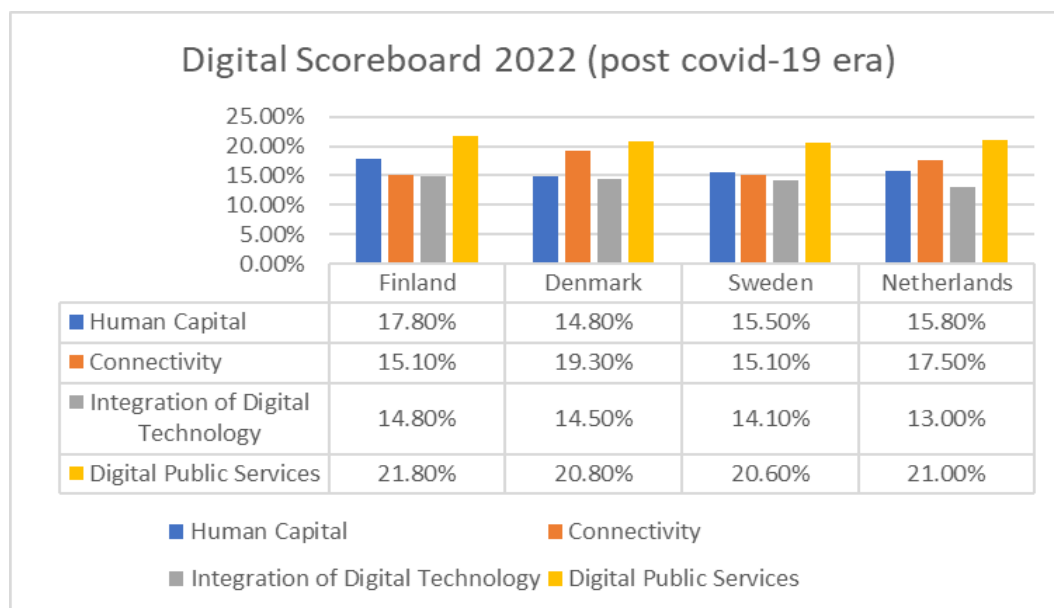


Figure 6. Main dimensions of the DESI for selected countries in 2022. Source: own processing.

Hence, we can analyse the four most advanced digital societies that can be seen in Figures 2, 4, and 6. Finland ranked first in the DESI 2022, followed by Sweden, Denmark, and Netherlands. These four countries have consistently been among the top performers in the EU since 2018. In 2019, 2020, and 2022, Finland excelled in human capital, integration of digital technology and digital public services. It had the highest share of ICT specialists, Science, Technology, Engineering and Math (STEM) graduates and internet users in the EU. It also had high levels of online banking, e-commerce and e-government use among businesses and citizens.

In 2019, Sweden was the leader in connectivity and use of internet. It had the highest broadband coverage, speed and take-up in the EU. It also had high levels of online entertainment, social media and cloud computing use among individuals and enterprises. In 2021, Denmark was strong in integration of digital technology and digital public services. It had the highest share of Small and Medium-sized Enterprises (SMEs) selling online, using social media, and adopting cloud services in the EU. It also had high levels of e-government availability and use, as well as open data maturity. In 2022, Netherlands was strong in connectivity. It also had high levels of online entertainment, social media and cloud computing use among individuals and enterprises.

3.3 COMPARISON OF COUNTRIES USING SUB-DIMENSIONS

In this section, ten sub-dimensions, i.e., concrete indicators of the DESI are used to analyse and compare selected countries between 2017 and 2022.

3.3.1 Statistical analysis for selected countries

First, we used the secondary data to calculate several statistical measures for each country for the period 2017-2022. Tables 1, 2, 3, and 4 present average, minimum, maximum, and standard deviation values for each country. The number in the first column of every table represents:

1. Human capital by Internet user skills.
2. Human capital by advanced skills and development.
3. Connectivity by fixed broadband take-up.
4. Connectivity by fixed broadband coverage.
5. Connectivity by mobile broadband.
6. Connectivity by broadband price index.
7. Integration of digital technology by digital intensity.
8. Integration of digital technology by digital technology for businesses.
9. Integration of digital technology by e-commerce.
10. Digital public services by e-government.

Based on the findings presented in tables below we can conclude that Finland has the highest average scores. By analysing the standard deviation values, we can state that Finland improved most in the following indicators over the years: connectivity by mobile broadband, integration of digital technology by digital technology for businesses, and digital public services by e-government. Denmark improved significantly in connectivity by mobile broadband. Overall, we can identify improvements in digital infrastructures and connectivity in all these countries, so we can recommend to other countries to focus on improving of these indicators. Because if countries will have fast and available digital infrastructures, they can provide suitable digital public services.

Table 1. Statistical measures of the DESI's indicators for Finland. Source: own processing.

FINLAND										
Indicator	2017	2018	2019	2020	2021	2022	Average	Max.	Min.	St. dev.
1.	35.40	35.80	36.70	37.20	37.60	38.60	36.88	38.60	35.40	1.181
2.	29.30	30.10	29.00	30.30	32.90	32.80	30.73	32.90	29.00	1.710
3.	3.20	2.50	3.10	3.22	3.52	4.46	3.33	4.46	2.50	0.646
4.	9.97	10.00	9.96	14.10	14.90	15.20	12.36	15.20	9.96	2.630
5.	8.60	8.60	15.50	15.50	21.30	33.70	17.20	33.70	8.60	9.410
6.	6.61	6.65	6.70	6.71	6.53	7.21	6.74	7.21	6.53	0.242
7.	6.08	7.26	8.14	8.83	10.30	11.60	8.70	11.60	6.08	2.012
8.	23.90	26.40	29.60	34.00	37.30	41.40	32.10	41.40	23.90	6.680
9.	4.43	5.14	5.14	6.14	5.88	6.16	5.48	6.16	4.43	0.692
10.	64.00	68.90	72.60	77.60	82.50	87.40	75.50	87.40	64.00	8.709

Table 2. Statistical measures of the DESI's indicators for Denmark. Source: own processing.

DENMARK										
Indicator	2017	2018	2019	2020	2021	2022	Average	Max.	Min.	St. dev.
1.	30.00	30.40	31.20	31.60	31.90	32.70	31.30	32.70	30.00	0.992
2.	23.40	23.30	23.70	24.80	25.60	26.50	24.55	26.50	23.30	1.310
3.	6.47	7.49	7.67	8.84	10.10	11.00	8.60	11.00	6.47	1.715
4.	16.60	17.50	17.90	21.70	22.10	22.50	19.72	22.50	16.60	2.657
5.	9.07	9.07	12.70	12.70	35.30	39.10	19.66	39.10	9.07	13.738
6.	4.65	4.68	4.72	4.76	4.69	4.39	4.65	4.76	4.39	0.132
7.	5.81	6.95	7.81	8.49	9.89	11.10	8.34	11.10	5.81	1.932
8.	22.10	23.40	25.90	29.40	34.40	37.60	28.80	37.60	22.10	6.191
9.	7.38	6.81	7.45	8.00	8.79	9.24	7.95	9.24	6.81	0.922
10.	60.04	65.10	63.30	72.40	77.20	82.40	70.07	82.40	60.04	8.711

Table 3. Statistical measures of the DESI's indicators for Sweden. Source: own processing.

SWEDEN										
Indicator	2017	2018	2019	2020	2021	2022	Average	Max.	Min.	St. dev.
1.	29.50	29.90	30.60	31.00	31.30	32.10	30.73	32.10	29.50	0.948
2.	24.50	25.70	25.90	27.50	28.50	29.90	27.00	29.90	24.50	2.003
3.	6.56	8.66	9.29	12.00	11.80	12.00	10.05	12.00	6.56	2.252
4.	15.60	16.80	18.30	19.50	20.30	20.50	18.50	20.50	15.60	1.979
5.	8.50	8.50	10.90	10.90	16.30	20.90	12.67	20.90	8.50	4.939
6.	5.31	5.35	5.38	5.33	5.92	6.75	5.67	6.75	5.31	0.576
7.	6.61	7.85	8.97	9.51	11.00	12.40	9.39	12.40	6.61	2.095
8.	20.40	20.80	22.60	27.10	32.00	35.50	26.40	35.50	20.40	6.268
9.	6.77	7.07	7.70	7.76	7.39	8.33	7.50	8.33	6.77	0.553
10.	59.10	64.40	68.30	72.40	77.20	82.40	70.63	82.40	59.10	8.509

Table 4. Statistical measures of the DESI's indicators for Netherlands. Source: own processing.

NETHERLANDS										
Indicator	2017	2018	2019	2020	2021	2022	Average	Max.	Min.	St. dev.
1.	35.90	36.40	37.40	37.80	38.30	39.30	37.52	39.30	35.90	1.245
2.	18.90	19.80	20.50	21.60	22.30	23.90	21.17	23.90	18.90	1.811
3.	10.10	10.60	11.10	11.40	10.10	11.70	10.83	11.70	10.10	0.674
4.	12.00	12.10	12.10	19.30	19.60	20.80	15.98	20.80	12.00	4.320
5.	8.77	8.77	8.73	8.73	28.10	31.90	15.83	31.90	8.73	11.039
6.	4.03	4.06	4.10	4.14	4.84	5.69	4.48	5.69	4.03	0.668
7.	5.32	6.41	7.23	7.86	9.19	10.40	7.74	10.40	5.32	1.848
8.	22.20	20.40	26.30	27.80	31.20	34.60	27.08	34.60	20.40	5.350
9.	5.06	5.19	5.44	6.51	6.48	7.10	5.96	7.10	5.06	0.842
10.	60.00	64.90	69.30	73.50	79.40	84.20	71.88	84.20	60.00	9.027

3.3.2 Human capital by Internet user skills

Human capital by Internet user skills is an indicator that measures the level of digital skills among internet users in a country. Human capital by Internet user skills is calculated based on two sub-indicators: basic user skills and above basic user skills. Basic user skills are defined as the ability to use software to edit documents or spreadsheets, to communicate via email or social networks, or to browse the internet for information. Above basic user skills are defined as the ability to use more advanced software or online tools, such as creating a website, using online banking, or programming.

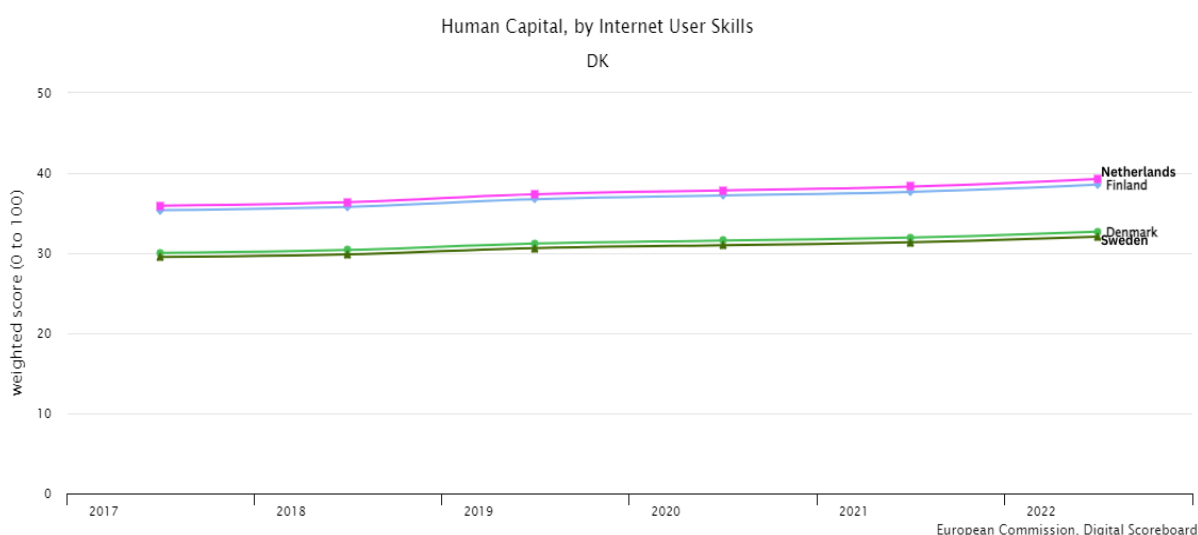


Figure 7. Results for selected countries for Internet user skills between 2017 and 2022. Source: European Commission, Digital Scoreboard.

The values in Figure 7 show that all four countries made progress in terms of human capital over the past few years. However, there is still some variation between the countries. The factors

that could have contributed to this is the level of investment in education and training. Netherlands and Finland invested in education and training; this may have helped them to achieve higher scores in terms of human capital. Another factor is the cultural attitudes towards technology may also play a role. Denmark, Finland, and Netherlands are all known for their innovative cultures, and this may have helped to create a more favourable environment for the adoption of digital technologies.

Countries with a high level of human capital are better able to adopt new technologies and innovate. This can lead to economic growth and improved living standards. Figure 7 also shows that there is still room for improvement in terms of human capital in Sweden. If Sweden want to remain competitive in the global economy, they will need to invest more in education and lifelong learning.

3.3.3 Human capital by advanced skills and development

Human capital by advanced skills and development is an indicator that measures the level of advanced digital skills and the availability of digital learning opportunities in a country. Human capital by advanced skills and development is calculated based on two sub-indicators: ICT specialists and STEM graduates. ICT specialists are defined as workers who have the ability to develop, operate and maintain ICT systems and applications. STEM graduates are defined as students who have completed tertiary education in science, technology, engineering, or mathematics.

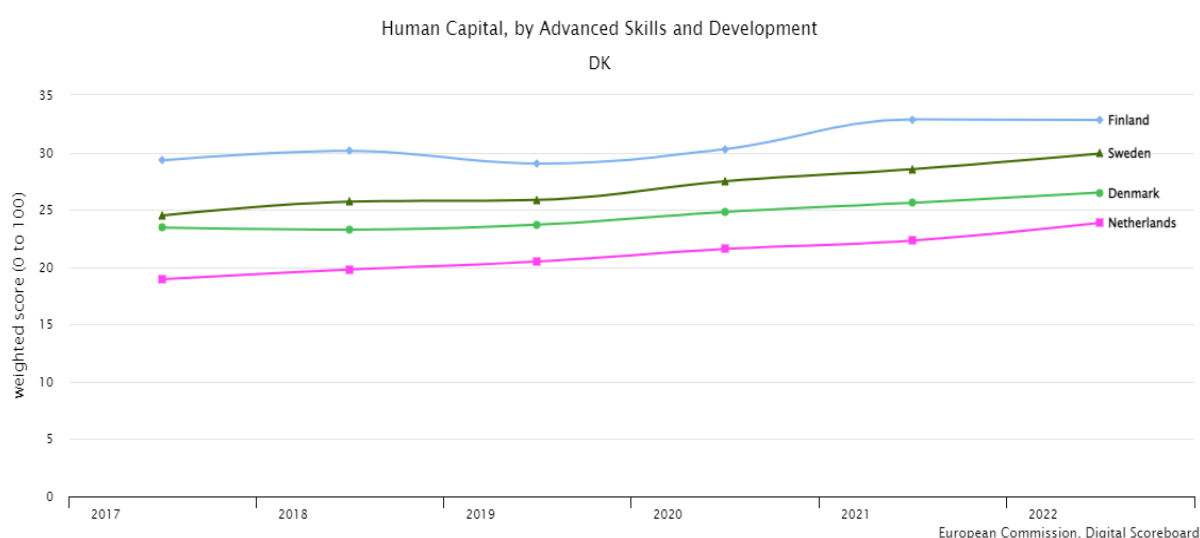


Figure 8. Results for selected countries for advanced skills and development between 2017 and 2022.

Source: European Commission, Digital Scoreboard.

The values in Figure 8 show that all four countries have made progress in terms of advanced skills and development over the past few years. However, there is still some variation between the countries. Finland has the highest score, followed by Sweden, Denmark, and Netherlands. There are a number of reasons why the percentage for all four countries have increased over time. One reason is the increasing use of digital technologies in everyday life (especially since Covid-19 era). Another reason is the growing availability of digital education and training opportunities. The increasing importance of digital skills in the workplace is also likely playing a role.

3.3.4 Connectivity by fixed broadband take-up

Connectivity by fixed broadband take-up is an indicator that measures the percentage of households that have access to high-speed internet services through technologies such as fibre, cable, or Digital Subscriber Line (DSL). This indicator reflects the level of digital development and inclusion in a country or region, as well as the availability and affordability of broadband infrastructure. Figure 9 presents the progress among the selected countries and Sweden and Denmark improved the most.

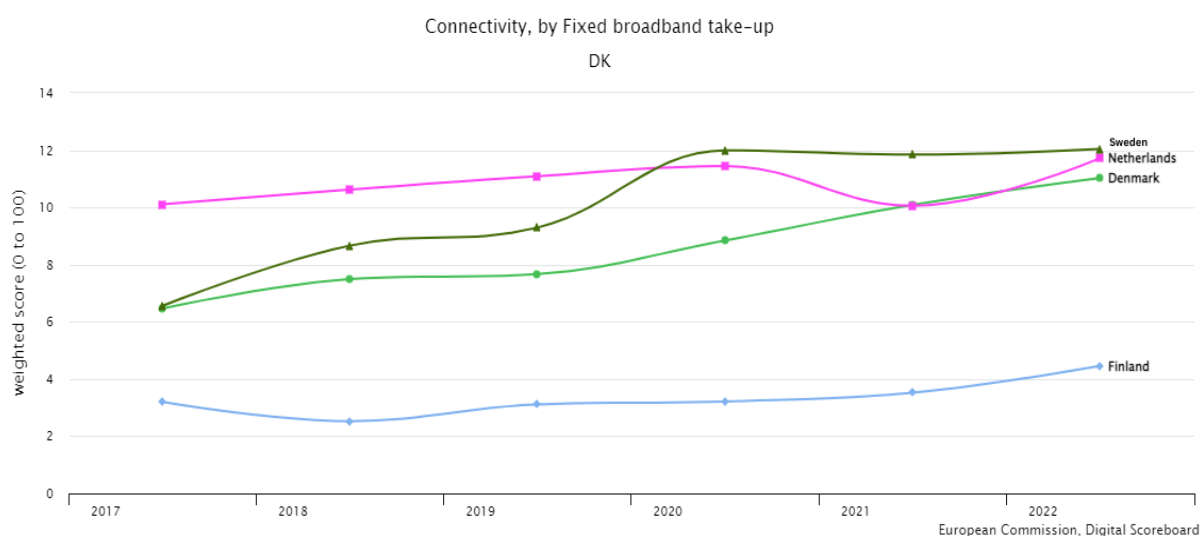


Figure 9. Results for selected countries for fixed broadband take-up between 2017 and 2022. Source: European Commission, Digital Scoreboard.

3.3.5 Connectivity by fixed broadband coverage

Connectivity by fixed broadband coverage is an indicator that measures the percentage of population or households that have access to fixed broadband networks, such as fibre, cable, or DSL. This indicator reflects the level of digital infrastructure deployment and availability in a country or region, as well as the potential for digital inclusion and development. Figure 10

displays the values for the countries and all of them improved significantly in 2020. It can be expected that this is due to the Covid-19 pandemic.

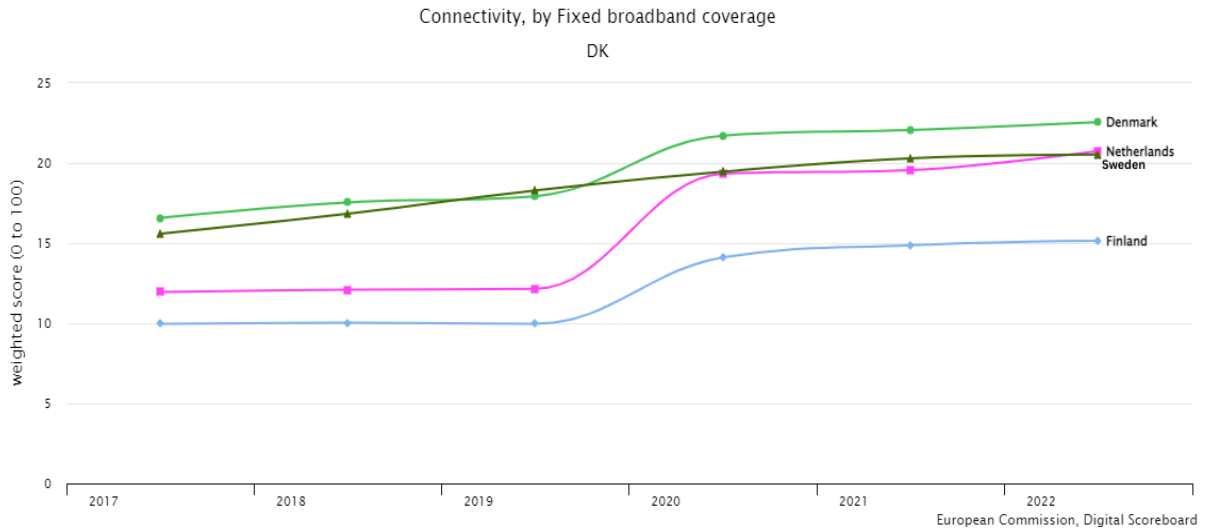


Figure 10. Results for selected countries for fixed broadband coverage between 2017 and 2022.

Source: European Commission, Digital Scoreboard.

3.3.6 Connectivity by mobile broadband

Connectivity by mobile broadband is an indicator that measures the percentage of population or households that have access to mobile broadband networks, such as 3G, 4G or 5G. It reflects the level of wireless digital infrastructure deployment and availability in a country or region, as well as the potential for mobile internet access and use. Figure 11 shows the progress among the countries and there are significant improvements for all of them. Those improvements are most likely related to the Covid-19 and increased use of mobile phones by citizens.

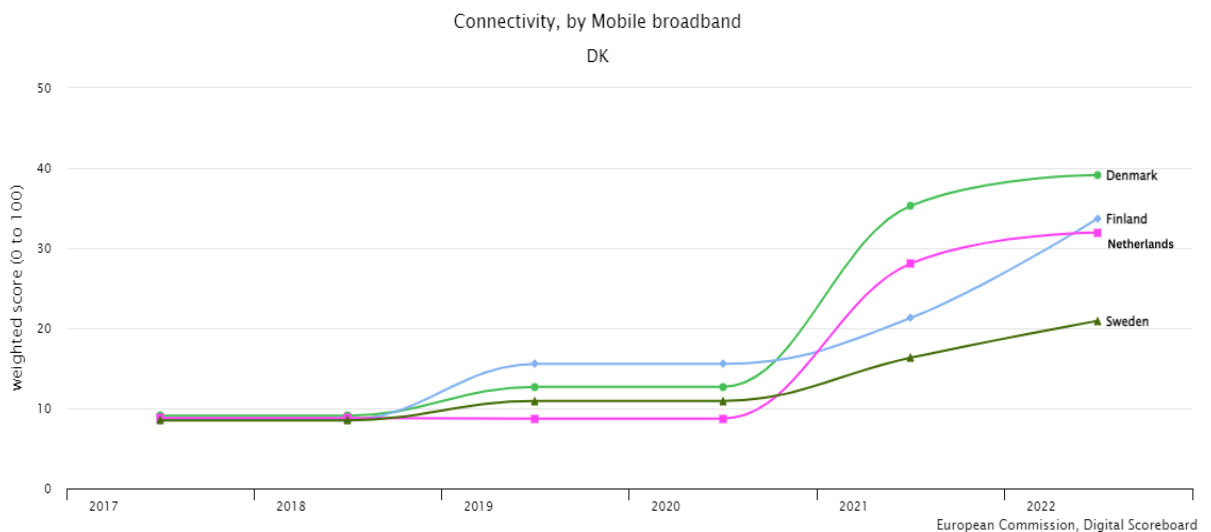


Figure 11. Results for selected countries for mobile broadband between 2017 and 2022. Source:

European Commission, Digital Scoreboard.

3.3.7 Connectivity by broadband price index

Connectivity by broadband price index is an indicator that measures the affordability of broadband services in a country or region, relative to income levels and purchasing power. This indicator reflects the level of competition and regulation in the broadband market, as well as the impact of broadband prices on digital inclusion and development. Figure 12 shows the progress of stable or slightly increasing/decreasing prices.

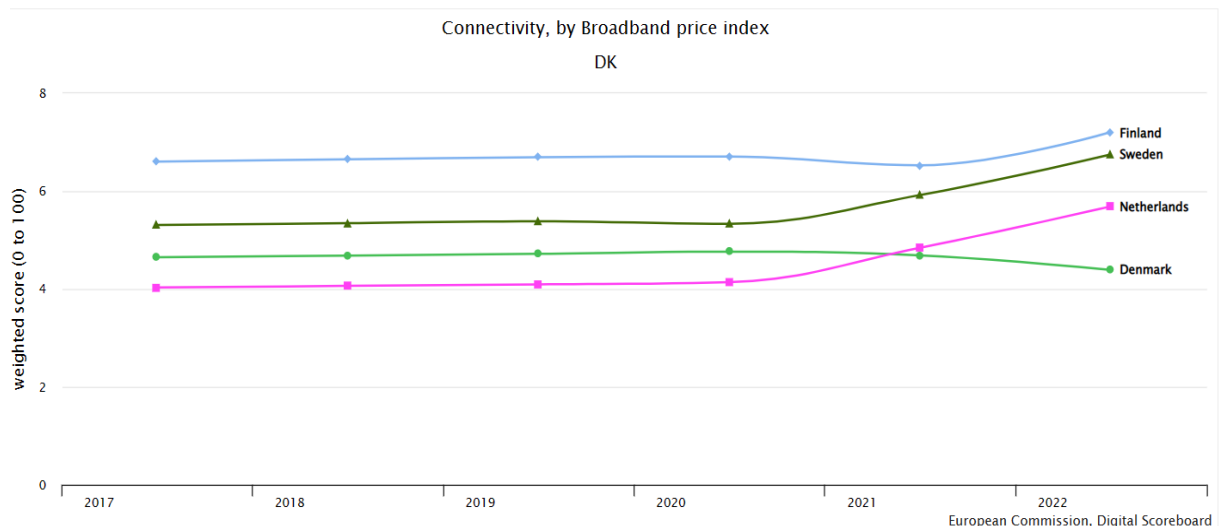


Figure 12. Results for selected countries for broadband price index between 2017 and 2022. Source: European Commission, Digital Scoreboard.

Overall, values for the connectivity dimension show that all four countries have made progress over the past few years. However, there is still some variation between the countries. As you can see, all four countries have seen their connectivity rates increase over the past years. There are a number of reasons why the connectivity rates for all four countries have increased over time. One reason is the increasing availability of high-speed internet. Another reason is the decreasing cost of high-speed internet. Also, the increasing importance of broadband for work, education, and entertainment is also likely playing a role. These results suggest that there is still work to be done to ensure that all households have access to high-speed internet.

3.3.8 Integration of digital technology by digital intensity

Integration of digital technology by digital intensity is an indicator that measures the extent to which enterprises use digital technologies to improve their products, services, and processes. This indicator reflects the level of digital transformation and innovation in a country or region, as well as the potential for competitiveness and growth. Figure 13 illustrates that there was a steady growth in the values of this indicator from the period 2017 to 2022.

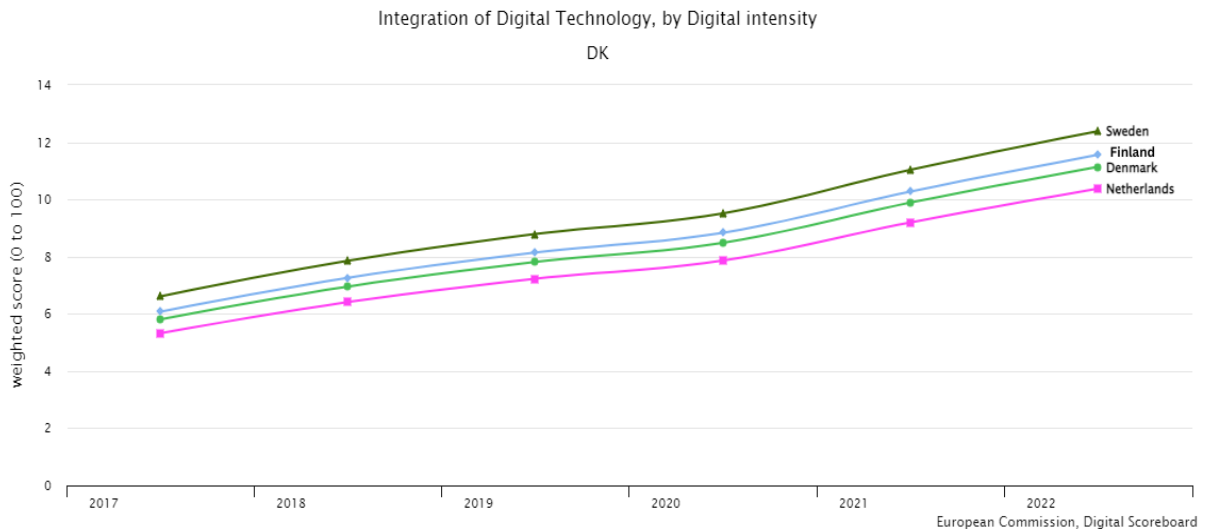


Figure 13. Results for selected countries for digital intensity between 2017 and 2022. Source: European Commission, Digital Scoreboard.

3.3.9 Integration of digital technology by digital technology for businesses

Integration of digital technology by digital technology for businesses is an indicator that measures the extent to which enterprises adopt and use digital technologies to create new or enhance existing business models, products, services, and processes. This indicator reflects the level of digital innovation and transformation in a country or region, as well as the potential for competitiveness and growth. Figure 14 displays a steady growth of integration.

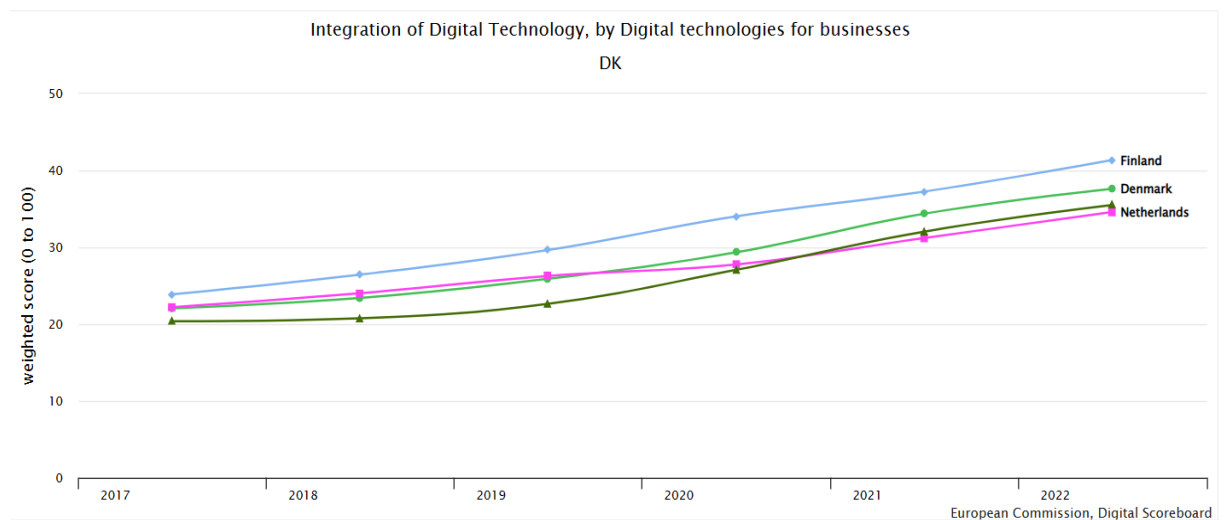


Figure 14. Results for selected countries for digital technology for businesses between 2017 and 2022. Source: European Commission, Digital Scoreboard.

3.3.10 Integration of digital technology by e-commerce

Integration of digital technology by e-commerce is an indicator that measures the extent to which enterprises use digital technologies to sell their products or services online, either domestically or internationally. This indicator reflects the level of digital commerce and trade in a country or region, as well as the potential for market expansion and customer satisfaction. Figure 15 shows a steady growth of e-commerce.

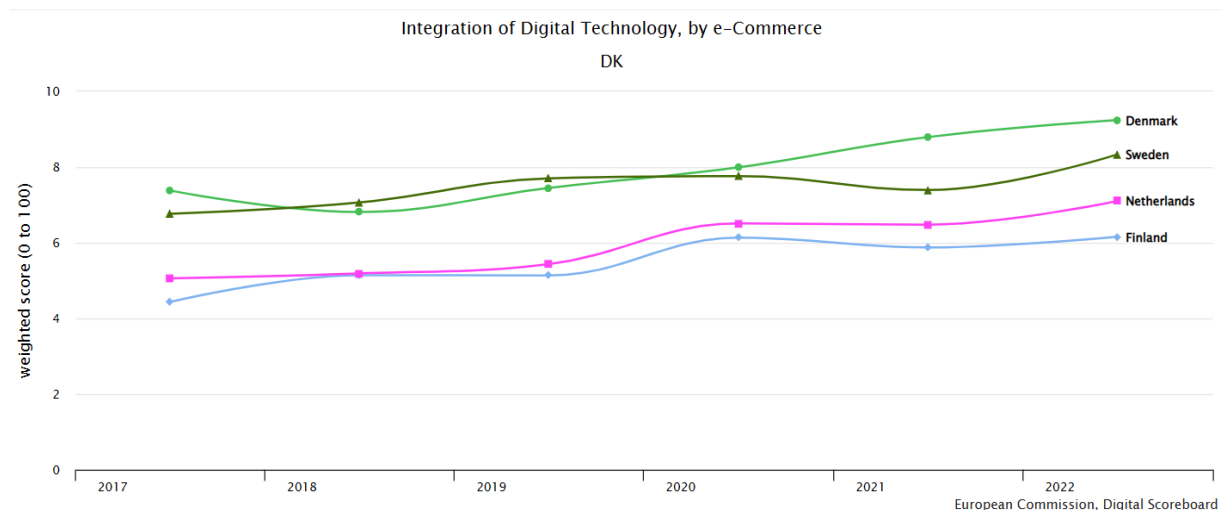


Figure 15. Results for selected countries for e-commerce between 2017 and 2022. Source: European Commission, Digital Scoreboard.

Overall, the indicators of the integration of digital technology measure the extent to which digital technologies are used in businesses and ecommerce. As seen in the figures, they show that all four countries have made progress in integrating digital technologies in recent years. However, there is a clear difference between the countries in terms of their digital integration. As seen, Sweden and Denmark are the most digitally advanced countries. The results also showed that the pace of progress has increased in recent years. This may be due to the Covid-19 pandemic. There is a lot of progress in integrating digital technologies, but there is still a long way to go.

3.3.11 Digital public services by e-government

This indicator deals with the extent to which digital technologies are used in public services, i.e., digital public services that are included in the e-government benchmarking framework by the EU. There are services for citizens and services for businesses. Figure 16 presents a steady growth in availability of digital public services.

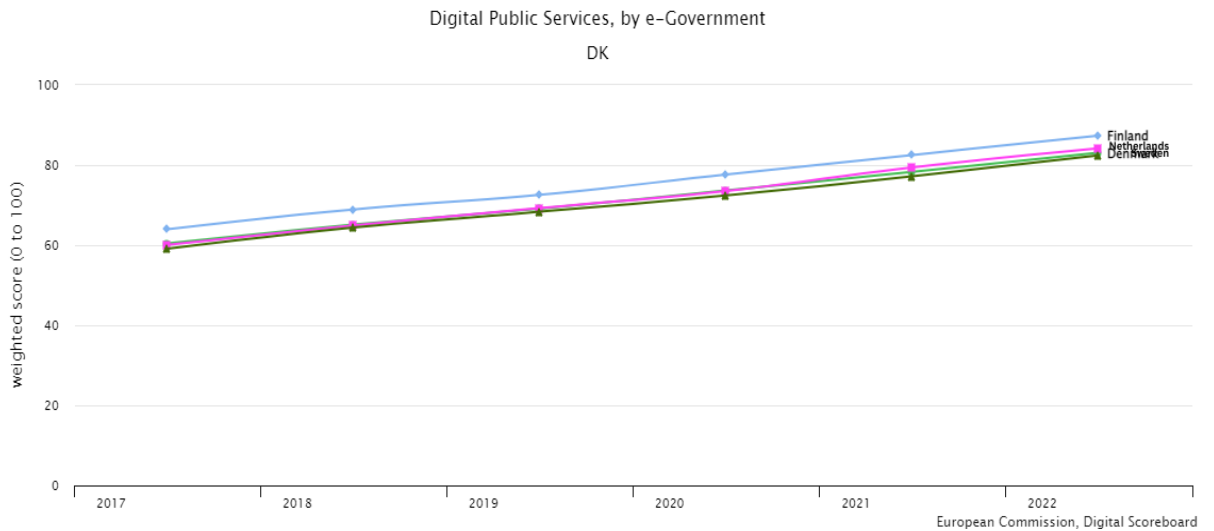


Figure 16. Results for selected countries for e-government between 2017 and 2022. Source: European Commission, Digital Scoreboard.

The e-government sub-dimension measures the extent to which public services are available online. The data shows that all four countries have made progress in integrating digital technologies in their public services and making them available online in recent years. However, there is a clear difference between the countries in terms of their e-government percentages as the pace of progress has increased in recent years; this may be due to the Covid-19 pandemic. Netherlands and Finland are the most advanced countries in terms of e-government.

4 RESULTS AND DISCUSSION

This chapter deals with the summary of findings, recommendations, and discussion towards improving the current state of digital societies in other countries based on the findings identifying in this thesis.

In this thesis, we analysed and compared the digital societies of four countries in the EU between 2017 and 2022. The focus here was the adoption of digital technology in the countries before, during and after the Covid-19 era. These four countries amongst other European countries have always adopted digital technologies, but then, there was a huge increase due to Covid-19. And even after Covid-19 era, there is still an increase of digital technology adoption. Thus, we can conclude that the Covid-19 pandemic did not affect the digital societies in selected countries. We can assume that in some areas such as online digital skills, e-commerce, digital public services etc. there are evident improvements that were boost by the pandemic and circumstances with which citizens and businesses were confronted.

In conducting the analysis, we found that the quick rise in the use of digital technologies for remote work, information sharing, and communication during Covid-19 highlighted the significance of digital infrastructure and the need for citizens from all backgrounds and cultures to have access to their data in order to create a better digital society. We also noticed that there are two major factors that can contribute to less use of digital technologies: citizen access to connectivity (broadband) and age groups, which can ultimately limit access of citizens to information (when there is less connectivity and information sharing, it makes it less of a digital society because these two major factors make up a digital society) and highlighted the gap in access to technology between those who have it and those who don't.

In 2018, 97% of Europeans had access to fixed broadband, while 80% of residents in the continent had fast internet (at least 30 Mbps). 58% of Europeans have access to ultrafast broadband, as assessed for the first time by DESI (at least 100 Mbps). Based on the average coverage of each mobile telecom operator in each nation, 4G mobile networks reached 91% of the EU's population. One-third of all houses in Europe have at least 30 Mbps, and 75% of them have fixed broadband subscriptions. Digital technologies were being used by European firms as well. When compared to the previous years' DESI reports, this included employing a business program for electronic information exchange, issuing electronic invoicing, or interacting with clients and partners on social media. Public services were also modernized and made digital.

These values grew in 2019 as Covid-19 got underway. The adoption of digital technology increased more. This included employing business software for electronic information exchange, cloud computing, or interacting with clients and partners on social media. Finland and Denmark are where this tendency is most developed. Finland scored the highest in digital public services, followed by a tie between Denmark and Netherlands.

For 2020 which was the Covid-19 era, there was a significant increase in the integration of digital technology, digital public services, and connectivity which was as a result of the increase in digital conversation and services, the citizens had to learn and adapt to the digital world. For instance, for Connectivity, Denmark was leading with 12.00% as compared to the previous year which was 10.80%. Which shows that there was an ultrafast broadband connection that became increasingly more common during Covid-19. All of this points to the Covid-19 era, as there was little physical interaction amongst citizens excepts amongst family members who stayed in one house. That is, Covid-19 intensified the use of public and private online services, putting pressure on the capacity of digital connectivity networks.

For 2021 and 2022, more percentage of households had access to the internet, and there became more internet users as seen in the comparison graphs in this thesis. Increased internet users ultimately calls for more demand and supply of fixed and mobile broadband.

When compared to previous years, there have been significant differences in the level of digitalization. That is Covid-19 affected the digital infrastructure, digital economy, and digital government of each country. All of these changes also rested on the kind of policies and cultural inclusion put in place by the government of each country as their priorities varied in all the years that's why for each dimension, the percentages also varied. Hence, considering cultural, economic, and political contexts is key in building digital societies. The Covid-19 pandemic has accelerated the shift towards digital societies and highlighted the need for robust and reliable digital infrastructure. Lastly, to build a more robust digital society, policymakers should not leave out inclusivity as it is also one of the main driving factors of digitalization.

Overall, Denmark, Finland, Netherlands, and Sweden have all evolved into digital societies in recent years especially after Covid-19. This is due to a number of factors, including the widespread adoption of digital technologies, the development of digital infrastructure, and the government's commitment to digitalization.

One of the most significant factors observed in the evolution of these countries into digital societies is the widespread adoption of digital technologies. In all four countries, a lot of people

have access to the internet and use digital devices on a daily basis. This has led to a number of changes in the way people live and work. For example, people now shop, bank, and communicate online. They also use digital devices for entertainment, education, and healthcare.

The government's commitment to digitalization is also a key factor in the evolution of these countries into digital societies. In all four countries, the government has made a concerted effort to promote the use of digital technologies in public services and the economy. This has led to a number of initiatives, such as the development of online government services and the promotion of digital skills training. One, thing remains, as digitalization grows, there's a need to address the digital divide.

The evolution of Denmark, Finland, Netherlands, and Sweden into digital societies has been a positive development. These countries are now at the forefront of the digital revolution and are well-positioned to reap the benefits of digitalization in the years to come. Thus, we can recommend learning from their approaches in the respective areas and improve the current state as well as accelerate the development of the digital society.

CONCLUSIONS

The aim of the bachelor thesis was to analyse and compare digital societies in selected countries, focusing on dimensions and indicators such as human capital, connectivity, integration of digital technology, digital public services etc. The related questions then explored the different approaches and aspects that form the digital society; characteristics, requirements, dimensions, and indicators used to analyse the digital society; and the impact of the Covid-19 pandemic on the development of digital societies in selected countries. All these questions are successfully answered by this bachelor thesis.

The theoretical background provides a definition of the digital society, emphasizing its reliance on digital technologies and the role they play in various aspects of life. It also discusses the concept of digital societies as a result of the digital revolution and the swift advancement of technology, highlighting the global nature of the information society and its impact on economic and sociocultural development. The theoretical background explores the importance of information infrastructure, economy, government, and inclusion in the development of digital societies. Finally, technology acceptance models for digital societies are explored.

The next chapter covers the topic of digital societies and related aspects, i.e., especially their characteristics, requirements, dimensions, indicators, and approaches to assess and evaluate the current state and progress of the digital society. In this regard, the DESI is introduced and described.

The main part of the thesis has examined and compared the digital societies of four EU countries between 2017 and 2022, with a particular focus on the adoption of digital technology before, during, and after the Covid-19 era. The analysis and comparison of selected countries revealed that the rapid increase in the use of digital technologies during the pandemic underscored the importance of digital infrastructure and the need for universal access to data, contributing to the development of a better digital society. The thesis identified two major factors that can hinder the adoption of digital technologies: access to connectivity and age groups. Limited connectivity and information sharing can create a digital divide, limiting citizens' access to information and hindering the development of a digital society.

The findings also revealed that European countries, including the four studied, have made significant progress in terms of digitalization. In 2018, a large percentage of Europeans had access to fixed broadband and fast internet, and digital technologies were being widely used by businesses and public services. The adoption of digital technology further increased in 2019,

and during the Covid-19 era in 2020, there was a significant surge in the integration of digital technology, digital public services, and connectivity. This shift was driven by the need for online services and remote work due to the pandemic. The subsequent years, 2021 and 2022, saw a continued increase in household internet access and the number of internet users, indicating a growing demand for fixed and mobile broadband. The level of digitalization varied between countries, influenced by their cultural, economic, and political contexts and priorities.

Denmark, Finland, Netherlands, and Sweden emerged as leaders in digitalization, evolving into digital societies due to their widespread adoption of digital technologies and government commitment to digitalization. These countries have positioned themselves at the forefront of the digital revolution and are well-prepared to reap the benefits of digitalization in the future.

Overall, this thesis emphasized the importance of robust and reliable digital infrastructures and connectivity, as well as the need for inclusive policies that address the digital divide. The thesis recommends that the governments of these countries continue to invest in digital infrastructure and digital skills training in order to mitigate these challenges and ensure that everyone has access to the benefits of digitalization. To build a more resilient digital society, policymakers should prioritize inclusivity and ensure universal access to digital technologies. The Covid-19 pandemic has accelerated the shift towards digital societies, and it is crucial to continue fostering digitalization to drive economic growth, improve public services, and enhance the quality of life for all citizens.

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