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Evaluation of Digital Skills Development Policies with the Examples of Netherlands, Sweden, and Germany

Didem KOCA [1]

Abstract

Despite no consensus on its definition in the literature, digitalization - essentially coined thanks to the widespread integration of digital technologies into everyday life - is likely to bring diverse impacts to each country. The inevitability of digital technologies in contemporary daily life forces almost every country to design different strategies to encourage its citizens to adopt digital skills. In this sense, the present study aims to draw attention to the increasing demand for digital skills with digital transformation processes in selected countries and scrutinize these countries' digitalization-specific policies and strategies. Accordingly, this case study focuses on three digitally competent European countries - the Netherlands, Sweden, and Germany - regarding their digital transformation processes and practices, strategies, and fundamental policies for improving their citizens' digital skills. In this regard, we can assert that each country bears different digital strengths. While Sweden has an advanced digital economy and has rapidly started to transition to an efficient knowledge economy, Germany has a relatively high supply of digital skills to satisfy the increased demand by an innovation-oriented industry. The Netherlands, on the other hand, shines out by ranking first in Europe as about 80% of its population aged 16 to 74 years adopt digital skills. This study synthesized several strategies and objectives by using exemplary examples from different countries in the realm of digital skills development. In general, this research suggests that the achievement of digitalization success is contingent upon establishing social acceptance of digital transformation and embracing human-centric approaches throughout the process.

Keywords: Digital Transformation, Digital Skills, Workforce, Education

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[1] Assistant professor, Nigde Omer Halisdemir University, Faculty of Health Sciences, Departments of Social Work, Nigde, Türkiye, dkoca@ohu.edu.tr, ORCİD: 0000-0001-5236-2677

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Dijital Becerileri Geliştirme Politikalarının Hollanda, İsveç ve Almanya Örnekleriyle Değerlendirilmesi

Didem KOCA [1]

Öz

Literatürde mütabık kalınan herhangi bir genel tanım bulunmamasına karşın esas itibarıyla dijital teknolojilerin günlük yaşama entegre edilmesi ile başlayan dijitalleşme süreci her ülkeyi farklı şekillerde etkilemektedir. Dijital beceri gerekliliğinin her birey için kaçınılmaz olduğu bilinci, neredeyse her ülkeyi farklı stratejiler geliştirmeye zorlamaktadır. Bu çalışmanın amacı, seçilen ülke örnekleri kapsamında; dijital dönüşüm süreçleri ile eş zamanlı olarak dijital becerilere olan artan talebe dikkat çekmek, söz konusu ülkelerin uyguladıkları politikaları ve stratejileri detaylı bir biçimde analiz etmektir. Araştırmada dijital becerilerin topluma kazandırılmasında öne çıkan Hollanda, İsveç ve Almanya ülkeleri incelenmiştir. Nitel çözümleme yaklaşımlarından biri olan örnek olay durum çalışması yöntemi kapsamında söz konusu ülkelerin, dijital dönüşüm süreçleri, bireylerin dijital becerilerinin geliştirilmesine yönelik uygulamaları, stratejileri ve temel politikaları bakımından analiz edilmiştir. Dijital dönüşüm kapsamında iyi uygulama örnekleri kategorisinde yer alan her bir ülke sahip olduğu farklı özelliklerle dikkat çekmektedir. İsveç, 'gelişmiş dijital ekonomi' statüsüne sahiptir. Ülke hızla etkin bir bilgi ekonomisine geçiş yapmaya başlamıştır. Almanya, dijital inovasyona yönelik bir endüstri ekseni tarafından üretilen yüksek talebi karşılamak için nispeten yüksek bir dijital beceri arzına sahiptir. 2021 yılında Hollanda ise 16 ila 74 yaş arası nüfusunun yaklaşık yüzde 80'inin dijital becerilere sahip olması nedeniyle Avrupa'da ilk sırada yer alması ile öne çıkmıştır. Bu çalışma, dijital becerilerin geliştirilmesinde iyi ülke uygulamalarının yardımıyla bazı temel strateji ve hedefleri bir araya getirmiştir. Genel olarak bu araştırma, dijitalleşme başarısının, dijital dönüşümün sosyal kabulünün sağlanmasına ve süreç boyunca insan odaklı yaklaşımların benimsenmesine bağlı olduğunu öne sürüyor.

Anahtar Kelimeler: Dijital Dönüşüm, Dijital Beceri, İşgücü, Eğitim

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[1] Dr. Öğret.Üyesi, Niğde Ömer Halisdemir Üniversitesi, Sağlık Bilimleri Fakültesi, Sosyal Hizmet Bölümleri, Niğde, Türkiye, dkoca@ohu.edu.tr, ORCİD: 0000-0001-5236-2677

Introduction

Digitalization is often described as the act and process of integrating digital technologies into daily life (Hagberg et al., 2016, p.696). Yet, the term digital transformation was coined only two decades ago in the study by Patel and McCarthy (2000) titled "Digital Transformation: The Essentials of e-Business Leadership." Later, Stolterman and Fors (2004, p.689) defined digital transformation as "changes that digital technologies entail or affect all aspects of human life." Then, the debates continued where the "human factor" would be located in the technology revolution. While some authors raised sharp predictions that there would be no need for humans in the new world order (Sachs and Kotlikoff, 2012; Brynjolfsson and McAfee, 2014), some signaled that the need for human resources would never fade in the process except for slight changes (Manyika, 2017; Wisskirchen, 2017; Harari, 2018; Wolter et al., 2015; Bonekamp and Sure, 2015). In other words, replacing manual dexterity with machines led to the transformation of the employees from "workers" to "operators." Nevertheless, the story was not that simple, and "workers" had to acquire new skill sets to survive in the labor market. In this regard, the concept of "digital skills" has begun to rise within skills attributed to the demands of the 21st century.

This research was designed as an explanatory case study (Davey, 2009). Creswell (2016, p.241) describes a case study as "a qualitative inquiry in which the researcher focuses on one or more cases bounded over time through in-depth data collection involving multiple sources of information (observations, interviews, audio-visuals, documents, and reports)." According to Gerring (2007), a case study is the in-depth study of a single case to expound on more similar cases. Further, we adopted the document analysis technique to collect and analyze the data. Ultimately, we descriptively analyzed the aspects of digital transformation in the Netherlands, Germany, and Sweden regarding their practices, strategies, and fundamental policies for improving their citizens' digital skills.

Focusing on only the mentioned countries may be shown as the only limitation of this study. Relying on our findings, we can assert that each country bears different digital strengths. While Sweden has an advanced digital economy and has rapidly started to transition to an efficient knowledge economy, Germany has a relatively high supply of digital skills to satisfy the increased demand by a digital innovation-oriented industry. On the other hand, the Netherlands shines out by ranking first in Europe as about 80% of its population aged 16 to 74 years adopt digital skills. Since the present study aims to draw attention to the increasing demand for digital skills with digital transformation and analyze digital-friendly policies and strategies of the said countries, we may claim that each strategy, roadmap, and policy for keeping up with digital transformation may differ by development level, demographic structure, and culture. Overall, the fundamental understanding of digital skills policies would be a remarkable milestone for every country in the digital transformation era.

This study descriptively explores the use of digital skills in selected countries with the help of multidimensional datasets. In addition, in the study policies and strategies for digital skills acquisition in the Netherlands, Sweden and Germany are discussed. In this context, the study "Which digital skills development policies are implemented in the Netherlands, Sweden and Germany?" focused on the question. Various studies have proved the digital skill levels of these countries.

Digital technologies play an essential role in the revival of the world economy in today's information society. This study brought together some key strategies and objectives with the help of good country practices in developing digital skills. Therefore, this study can serve as a guide in determining the ways to be followed in skill development.

In the first part of this study, literature research on digital skills is included. In the following section, digital skill dimensions in the Netherlands, Sweden and Germany are examined comparatively. Finally, strategies and policies related to the digital skill acquisition in question are included.

Literature Review

The concept of skill refers to the ability to perform tasks by settling problems with the help of relevant knowledge and proper qualifications. In the 21st century, the changing paradigm of information and technology has unlocked significant transformations in many domains of life. To put it another way, differentiating social life dynamics and information and technology-oriented developments have caused the differentiation of the skills and competencies one needs to acquire. Even though persisting skill sets were differentiated in the past to embody the spirit of the era, 21st-century skills seem more complex than those demanded in the past centuries. In this regard, national and international organizations have proposed different skill set categories for the 21st century (Koca, 2020, p.106). For example, the report titled "The Future of Education and Skills: Education 2030" by OECD (2019) calls the skills students should acquire in the 2030s "transformative competencies" within three groups: creating new value, reconciling tensions and dilemmas, and taking responsibility. Acquiring these skills is then thought to help students adapt to changing social and digital domains of life.

The idea of integrating education and technology may be considered an indispensable tenet of skill acquisition. Indeed, a study by the International Society for Technology in Education (ISTE) in 2016 set forth necessary skills in the use of educational technologies within six standards for students: empowered learning, digital citizenship, knowledge constructing, innovation, computational thinking, communication, and collaboration. These standards, designed by about 250 scholars from many countries, primarily aim to contribute to the skill-based classroom and curriculum contents.

The necessity of adopting digital technologies may be evident in working life the most. McKinsey (2018)'s study titled "Skills Shift Automation and The Future of The Workforce" claimed that automation would accelerate changes in workforce skills in the coming 15 years. While the demand for digital skills was 9% in 2002, the study expected it to rise to 16% by the end of 2030. Moreover, almost half of the companies included in the mentioned research were found to be ready to lead in shaping the future workforce and emphasize the necessity of collaborating with stakeholders in education. According to the European Commission, the demand for workers with digital expertise is increasing by about 4% per year (Berger and Frey, 2015), implying that rapidly transforming technology may lead many digital skills to be obsolete in a short time (e.g., coding skills are thought to become obsolete within a few years). Similarly, a European Center for the Development of Vocational Training (CEDEFOP,2012) study proposed that skills in information and communication technologies (ICT) are vulnerable to rapid obsolescence.

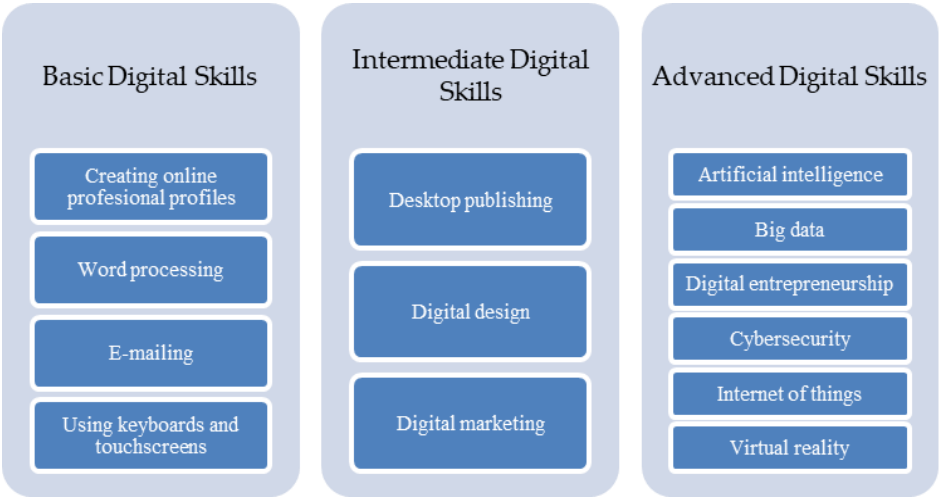
In addition, 16% of workers in Finland, Germany, Hungary, and the Netherlands were reported to no longer use their skills in the last two years (CEDEFOP, 2012). Therefore, employees may need to continuously acquire new skills to remain competitive, which makes it inevitable to embrace change, to embrace lifelong learning. As trends, such as globalization and advances in artificial intelligence, force changes in the demands of the labor market and skills, people need to place more emphasis on their ability to "learn to learn." OECD Skills Outlook (2017) indicated that employees' cognitive skills and readiness to learn matter in state-wise development and economic growth.

Kane et al. (2020) traced the demands for digital skills in industries as a consequence of the digitalization of professions. Accordingly, almost 80% of online job postings in 2018 demanded digital skills and knowledge. Yet, a significant difference might be highlighted considering the levels of vacancies. While 94% of postings for high-skill jobs required a robust competency in digital skills, it dropped to just 62% for low-skill jobs.

Accenture (2017) classified digital skills demanded in workplaces by occupations. Accordingly, he categorized the occupations as operators, technicians, engineers, and IT engineers. Therefore, the findings may then imply that the use of Industry 4.0 technologies would affect all employees in the production industry. Indeed, digital skills are demanded not only in engineering but also in intermediate operational and technical jobs. Thus, it can be asserted that employees always need to seek new skills involving flexibility, lifelong learning, and curiosity. On the other hand, despite the increasing demand for ICT specialists, a combination of skills to adapt employees to technological changes would be even more appraised. Therefore, acquiring creative, entrepreneurial, and technical skills that allow for a smooth transition from one occupation to another is becoming increasingly important (Berger and Frey, 2015).

The digital skills framework refers to digital competencies linked with different occupations and educational attainment so that a state and citizens can benefit from and contribute to the digital world. It is fundamentally designed to support service providers, organizations, and employers that offer training to guide citizens on the essential digital skills needed to act safely in a digital world (World Bank, 2021, p.8). While basic digital skills require being knowledgeable about how to use ICT or any digital tools (e.g., the ability to turn on the computer, use a mouse, or access the internet, as well as the ability to write an e-mail or prepare a resume) (Hecker and Loprest, 2019, p.2). Intermediate digital skills, on the other hand, cover skills such as Visual Basic macro programming or HTML and JavaScript-dependent web design (International Telecommunication Union, 2020, p.13). Advanced digital skills encompass a comprehensive understanding acquired through specialized programs, including advanced programming, machine learning, internet of things (IoT), networking, engineering, and hardware design. These abilities are typically imparted in higher education institutions but can also be obtained through professional experience and workforce skills development programs. Advanced abilities necessitate programming literacy, as the objectives, such as creating and programming novel digital tools and features, are beyond rudimentary or intermediate technological utilization (International Telecommunication Union, 2020). Figure 1 illustrates a categorization of digital skills into three levels: basic, intermediate, and advanced.

Figure 1: Continuum of Digital Skills



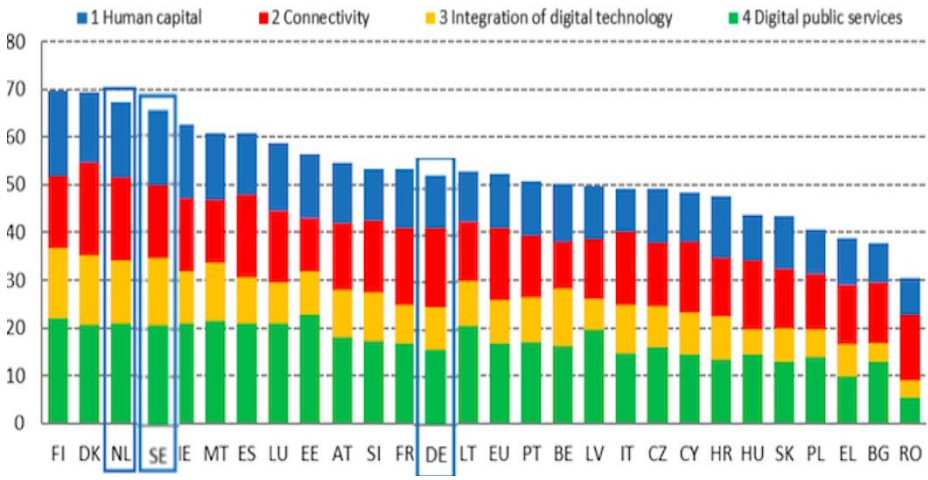
Adapted from: International Telecommunication Union (2020).

In a nutshell, digital technologies occupy our lives more and more, which naturally changes the way one accesses and uses information. Now, people seem to have to analyze complex data, think systematically, and make quick and accurate decisions. Moreover, people need to update their skills constantly to adapt to digital technologies widespread in their working lives. Yet, it should be noted that people need to be inclined to the right skills to be able to use digital technologies in a meaningful way and to catch new opportunities offered by these technologies (OECD, 2016). Thus, more emphasis should be placed on promoting basic and digital skills and higher-order thinking to enable one to participate in digital activities and adapt quickly to new occupations and skills needs. In the section below, we present our findings derived from various databases on the digital skills use in the Netherlands, Germany, and Sweden.

Dimensions of the Digital Skills Use in the Netherlands, Sweden, and Germany

The European Commission consistently monitors the digital advancements of its member states and has been annually publishing the Digital Economy and Society Index (DESI) since 2014. The study provides nation profiles that assist member states in identifying areas of significant action. Additionally, it includes thematic sections that offer an analysis at the EU level on significant digital policy areas, as depicted in Figure 2. Overall, DESI is measured by five main dimensions. The human capital dimension concerns citizens' internet use skills and experts' advanced skills, while the connectivity dimension covers indicators measuring the supply-demand of both fixed and mobile broadband technologies. The integration of digital technologies dimension consists of three sub-dimensions: digital intensity, adoption of selected technologies by enterprises, and e-commerce. Finally, the digital public services dimension includes e-government and open data policies (European Commission, 2022, p.5-8).

Figure 2: Digital Economy and Society Index (DESI) 2022 Ranking



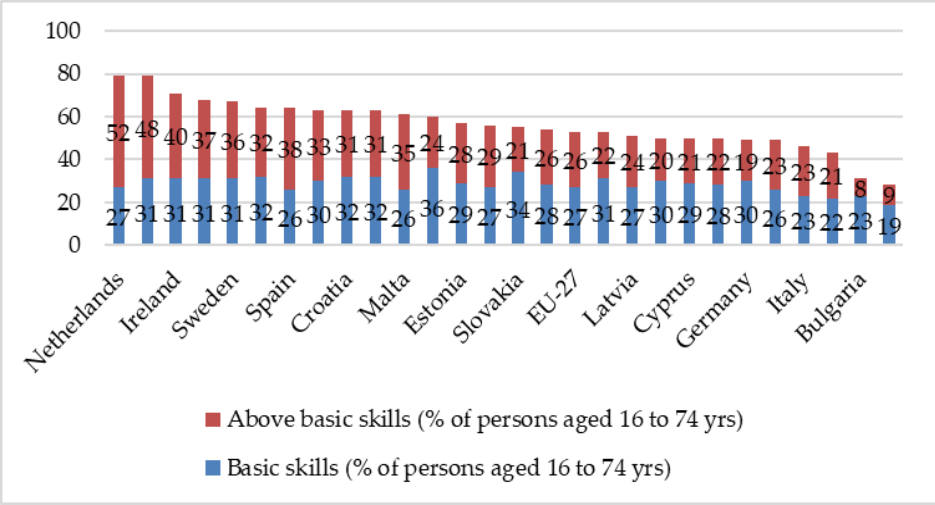
Source: DESI, 2022

According to the findings in DESI 2022, Germany has exhibited relatively considerable progress over the past five years (2017-2022) and now ranks 13th among 27 EU member states (DESI, 2022a). As the EU's largest economy, Germany's progress in digital transformation in the upcoming years seems critical to ensuring that the EU achieves its 2030 Digital Decade goals. In the same index, Sweden is mentioned for its remarkable digital performance, putting it fourth among the member states.

Sweden has achieved success in the digital transformation movement in the last few years and scores above the EU average. Yet, it regresses to ninth place and remains below the EU average in 5G coverage within the connectivity dimension. Indeed, Sweden scores 18% in 5G coverage of populated areas, well below the EU average (66%). Thus, it may be important that Sweden continues to improve its digital performance to remain the leading country in digital and contribute to the Digital Decade goals (DESI, 2022b). When it comes to the Netherlands, the findings reveal that it has also consistently been the best-performing country in the EU and continues to make progress in some key areas, granting it third place in DESI (DESI, 2022c).

Cross-country comparison of basic and above-basic digital skills seem to be guiding in digital skills use. In this sense, the Netherlands ranks first in surveys by the Dutch Central Bureau of Statistics (CBS) and Eurostat on the use of overall digital skills (computer, internet, software) in the EU-27 and the ICT use of households and individuals. Accordingly, about 80% of the Dutch population aged 16 to 74 years had basic or above-basic digital skills in 2021, compared to just 54% on average across the EU, which throws the Dutch almost a step beyond the European target of adopting 80 core competencies by 2030 (CBS, 2021). Compared to Finland, which drew with the Netherlands for first place, the digital skills of the Dutch seem above the basic proficiency level. The Dutch demonstrate the utmost proficiency in tasks such as sending and receiving e-mails, making internet calls, going online on social networking sites, and expressing opinions on social or political issues online (Rozing, 2022).

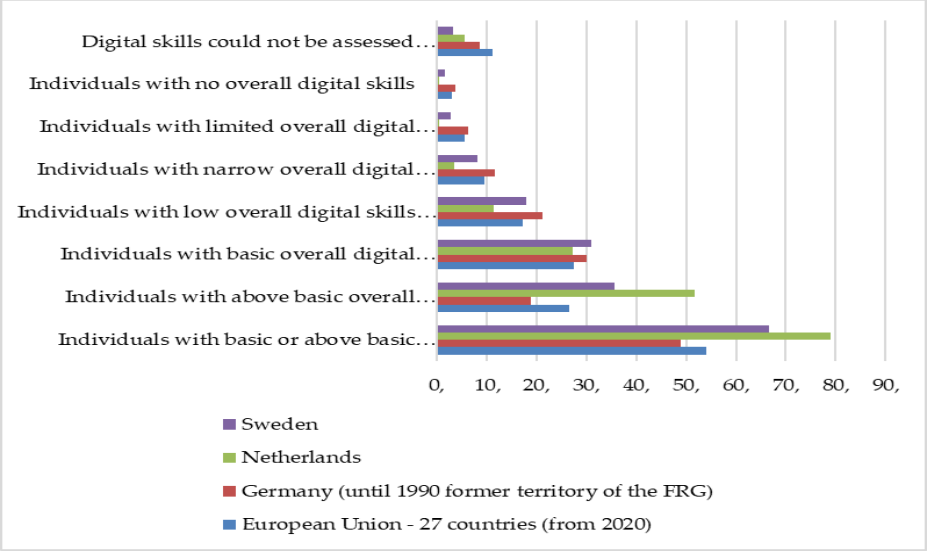
Figure 3: Overall Digital Skills in the EU-27, 2021



Source: Eurostat, 2021a

Sweden and Germany, both of which have scores below the average of the European Union, are positioned ahead of the Netherlands in the hierarchy of broad digital abilities that are considered basic or above-basic. Germany exhibits a notable 30% advantage over the Netherlands in terms of fundamental digital competencies. The Netherlands did better in the ranking of basic digital skills, following Finland, Ireland, Denmark, Sweden, Luxembourg and Spain. In addition, it is worth noting that Romania, Bulgaria, Poland, and Italy have performance levels that are significantly lower than the average of the European Union when it comes to basic skills throughout their respective populations (Figure 3).

Figure 4: Individuals' Level of Digital Skills (from 2021 onwards)



Source: Eurostat, 2021b

Individuals' level of digital skills (Figure 4) may be another key indicator of digital skills use in the Netherlands, Sweden, and Germany. Accordingly, the Netherlands shines out compared to the others in terms of basic and above basic general digital skills. Considering individuals with basic overall digital skills, while Sweden and Germany score above the EU average, the Netherlands remains at that average. It is also evident that Germany ranks first regarding citizens with low and narrow overall digital skills. In summary, Sweden, the Netherlands, and Germany have citizens with digital skills above the EU average. Indeed, the EU average of individuals whose digital skills cannot be evaluated since they have not been able to go online for three months is 11%, which is calculated to be quite high for the mentioned countries.

Table 1: Level of Internet Access – Households

GEO (Labels)	2012	2022	GEO (Labels)	2012	2022
European Union - 27 countries (from 2020)	74.54	92.52	**Netherlands**	93.55	98.28
Belgium	77.71	94.44	**Austria**	79.28	93.15
Bulgaria	50.92	87.31	**Poland**	70.49	93.33
Czechia	72.55	91.48	**Portugal**	61.02	88.15
Denmark	92.00	95.16	**Romania**	53.77	89.41
Germany (until 1990 former territory of the FRG)	85.50	91.41	**Slovenia**	73.94	92.60
Estonia	73.82	92.41	**Slovakia**	75.44	90.65
Ireland	81.09	:	**Finland**	86.80	97.59
Greece	53.58	85.49	**Sweden**	91.69	94.33
Spain	66.59	96.08	**Iceland**	94.60	:
France	80.00	92.53	**Liechtenstein**	:	:
Croatia	66.41	85.52	**Norway**	92.69	99.01
Italy	62.92	91.45	**Switzerland**	:	:
Cyprus	61.82	94.00	**United Kingdom**	86.80	92.74*
Latvia	68.68	91.39	**Montenegro**	54.99	80.96
Lithuania	60.12	87.71	**North Macedonia**	58.30	:
Luxembourg	93.08	97.64	**Albania**	:	:
Hungary	66.81	91.44	**Serbia**	:	83.24
Malta	76.70	93.39	**Türkiye**	47.20	94.15

*Retrieved from https://www.statista.com/statistics/553589/predicted-internet-user-penetration-rate-in-the-united-kingdom-uk/.
** Percentage of households with internet access at home. Any use of the internet is included. The population considered is between 16 and 74 years.

Source: Eurostat, 2022

Although internet access may be a fundamental means of improving one's digital skills, Van Deursen and Van Dijk (2019) argue that proper internet access at every home does not guarantee that everyone can enjoy such access to develop their digital skills. As shown in Table 1, 99.1% of Norway's population has internet access at home, followed by the Netherlands with 98.28%. The rate of household internet access is calculated to be 94.33% and 91.41% for the other focus-of-interest countries, respectively.

On the other hand, Table 2 presents the reasons for not having internet access at home

in the EU member countries. Accordingly, the most prominent reasons can be listed as follows: a belief that internet access is not needed, lack of necessary skills, high equipment costs, and high access costs. Each of the reasons explaining the lack of internet access applies to Germany, Sweden, and the Netherlands in descending order. On a global scale, the number of internet users increased from 410 million worldwide in 2000 to about 4.9 billion in 2021 and is expected to continue to grow in double digits (International Telecommunications Union, 2021).

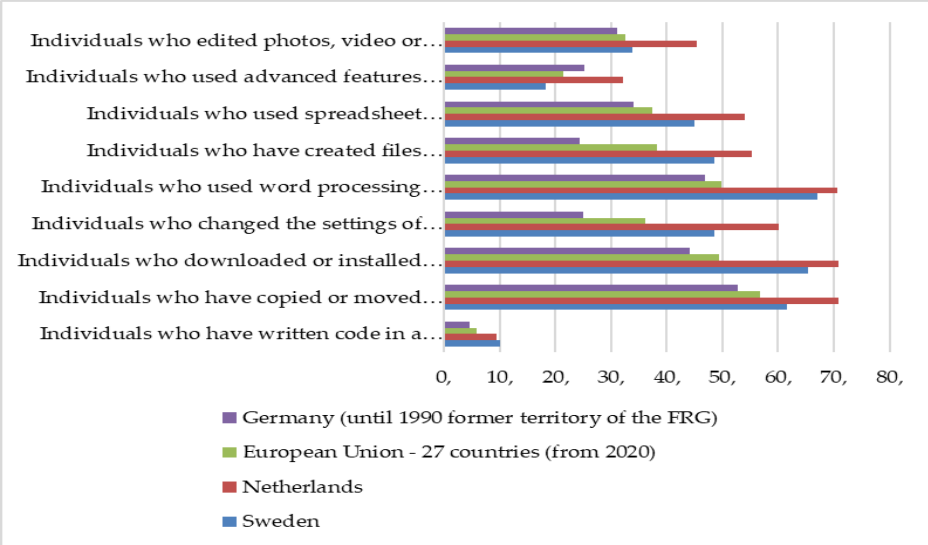
Table 2: Reasons for not having internet access at home (EU27)

Reasons for not having internet access at home (EU-27)	Germany	Netherlands	Sweden
Households without access to internet at home, because the access costs are too high (telephone, etc.)	1,45	0,45	0,58
Households without access to internet at home, because the access and equipment costs are too high	1,95	0,45	0,89
Households without access to internet at home, because of access elsewhere	0,78	0,06	0,43
Households without access to internet at home, because the equipment costs are too high	1,54	0,34	0,52
Households without access to internet at home, because access not needed (content is not useful, not interesting, etc.)	2,92	1,12	1,41

Source: Eurostat, 2019

Another prominent indicator in DESI is individuals' level of computer skills. In the given indicator, the Netherlands seems to be one step ahead of Germany, Sweden, and the EU average. In particular, the Netherlands performs better with 70% in the categories "individuals copying or moving files between folders, devices, or on the cloud," "individuals who downloaded or installed software or apps," and "individuals who changed settings of software, app, or device." On the other hand, the Netherlands is ranked second in the category "individuals who have written code in a programming language," following Sweden (Figure 5).

Figure 5: Individuals' level of computer skills (2021 onwards)



Source: Eurostat, 2021c

The indicators in Table 3 describe the use of mobile devices to access the internet on the move. Mobile devices in question often cover mobile phones (e.g., smartphones), portable computers (e.g., laptops and tablet computers), or any other mobile devices (PDAs and e-book readers) away from home or work. The internet era has revolutionized how people live, work, connect, and exchange information. In this sense, the use of internet-connected mobile devices can be considered an essential indicator when assessing individuals' digital skills use. Table 3 presents the indicator values in 2012 and 2022 to be able to demonstrate the stunning change in the use of digital technologies. Accordingly, the EU average of the indicator has increased more than twice (from 31.62% to 73.08%) between the mentioned years. While Sweden (70.8%) and Norway (74.47%) are among the countries with the highest indicator values in 2012, these values hit 93.48% and 93.34% for these countries, respectively. On the other hand, the said indicator values in 2022 are reported to be 89.07% and 76.96% for the Netherlands and Germany, respectively. Yet, Germany belongs the greatest difference in the indicator value between the said years.

Table 3: Individuals using mobile devices to access the internet on the move

GEO (Labels)	2012	2022	GEO (Labels)	2012	2022
European Union - 27 countries (from 2020)	31.62	73.08	Austria	44.96	81.80
Belgium	43.74	85.58	Poland	21.88	58.74
Bulgaria	12.52	64.41	Portugal	21.39	63.33
Czechia	:	72.53	Romania	7.26	69.74
Denmark	61.43	91.83	Slovenia	30.25	76.23
Germany (until 1990 former territory of the FRG)	31.09	76.96	Slovakia	37.67	70.69
Estonia	36.95	77.98	Finland	56.30	:
Ireland	51.11	84.47	Sweden	70.08	93.48
Greece	22.50	63.14	Iceland	59.73	87.56
Spain	38.37	86.77	Liechtenstein	:	:
France	43.38	81.08	Norway	75.47	93.34
Croatia	37.52	72.23	Switzerland	:	88.70
Italy	16.07	49.55	United Kingdom	63.37	88.37
Cyprus	24.54	79.47	Montenegro	33.74	71.43
Latvia	25.31	67.18	North Macedonia	17.28	73.67
Lithuania	17.25	69.95	Albania	:	68.01
Luxembourg	62.65	86.14	Serbia	:	62.20
Hungary	17.54	72.30	Türkiye	13.55	71.94
Malta	40.48	76.05	Bosnia and Herzegovina	:	56.75
Netherlands	54.98	89.07	Kosovo	:	78.94

Source: Eurostat, 2021d

In digital skills use, European countries are also compared by the digital skills gap index, which is measured relying on some digital-specific variables and is deemed important to be able to interpret the digital skills of individuals populated in the three countries.

Table 4: Digital Skills Gap Index 2021 (the Netherlands, Germany, and Sweden)

	NED	GER	SWE
Overall Score	7.2	7.1	7.3
Digital Skills Institutions	6.5	6.8	6.6
Digital Responsiveness	8.8	8.4	9.3
Government Support	6.4	6.2	6.9
Supply, Demand & Competitiveness	6.8	7.0	6.7
Data Ethics & Integrity	8.9	8.5	8.1
Research Intensity	6.1	5.4	5.5

Source: WILEY, 2021

Accordingly, the Netherlands, Germany, and Sweden have almost overlapping scores in the Digital Skills Gap Index 2021 (Table 4). Yet, Sweden has left the other two countries behind with 9.3 points in the digital responsiveness pillar. On the other hand, the Netherlands takes the lead in data ethics & integrity and research intensity pillars. Finally, Germany demonstrates its strength in the digital skills institutions and supply, demand & competitiveness pillars.

Strategies and Policies for Digital Skills Acquisition

Currently, the enhancement of individuals' digital competencies is a focal aspect of numerous educational initiatives implemented globally. Ensuring widespread and meaningful engagement with new technologies is a crucial component of government policy in numerous nations, as it serves to adequately equip society for the process of digital transformation (Schwab, 2016). Consequently, numerous nations globally are presently engaging in various endeavors aimed at cultivating and advancing citizens' capacity to utilize emerging technologies (Eynon, 2021; Helsper and van Deursen, 2015; Mansell, 2017). This section of the article deals with the strategies and policies adopted in the Netherlands, Sweden and Germany for the acquisition of digital skills.

The Netherlands

The Netherlands is renowned for its flourishing economy and high standard of living. Following a period of global economic crisis and prolonged slowdown, the Netherlands has experienced an acceleration in economic growth, with gross domestic product (GDP) surpassing its pre-crisis peak (OECD, 2022). The Netherlands boasts impressive employment and labor force participation rates while maintaining low unemployment rates in comparison to other countries on a global scale. The Dutch also enjoy a good quality of life with relatively low poverty rates and income inequality. The Netherlands

owes much of its success to actions it has taken in the past to nurture a highly skilled population.

Given the profound economic and social transformation that the Netherlands is currently undergoing, skills will be one of the key elements in the future. Technological developments in areas such as digitalisation, robotics and nanotechnology are reshaping the way people communicate, consume and work. Moreover, a proficient population with ample opportunities, encouragement, and drive to maximize their abilities will be imperative to tackle future challenges and capitalize on potential opportunities because the composition of Dutch society is evolving due to the aging population and growing immigrant population.

Skills are central to the Netherlands' capacity to thrive in an increasingly interconnected and rapidly changing world (OECD, 2017, p.21). Currently, the Netherlands ranks third in the DESI - an index for measuring the level of digitalization across EU nations (DESI, 2022d). Furthermore, it is regarded as one of the leading EU nations with the largest proportion of the population proficient in digital skills (e.g., the use of the internet, computers, and software) (Eurostat, 2021a). In this section, we seek relevant practices implemented in the Netherlands to reveal how it has attained its success in digitalization and what it does to enhance its citizens' digital skills.

It can be claimed that the Netherlands strategically planned and achieved its digital transformation through a set of specific policies. An excellent illustration would be the "*Dutch Digitalization Strategy 2021*," recognized as one of the Netherlands' most notable digitalization strategies. The report provided delineates the Dutch methodology for disseminating and embracing digitalization within the societal domain. It also highlights the nation's focal points, including artificial intelligence (AI), data science pertaining to social matters and economic advancement, digital engagement and competencies, digital governance, digital connectivity, and digital fortitude (Ministry of Economic Affairs and Climate Policy of Netherlands, 2021). Actions covered within the strategy include:

- *Digital skills for citizens:* The strategy emphasizes coping with digitalization (promoting citizens' developing their digital skills), creating digital awareness, and facilitating the use of digital services for all.

- *Digital skill for the workforce:* The proposed strategy entails implementing various measures to foster the acquisition of new digital skills in light of evolving job roles and responsibilities. These measures include the initiation of pilot projects through training and employment help desks, with the goal of cultivating a culture of continuous learning within small and medium enterprises (SMEs). Additionally, the strategy involves the exploration of a personalized digital portal that provides tailored training opportunities, as well as the establishment of more adaptable adult education programs.
- *Digital skills for ICT professionals:* Various organizations, including information institutions, educational entities, government agencies, and businesses, are working to increase their pool of ICT professionals and knowledge. There are intended efforts to foster collaboration between the business sector and the education domain through

targeted programs such as the Technology Agreement, human capital agendas, and the Smart Industry action program. The strategy additionally underscores the importance of cultivating a coherent methodology to enhance the retention rate of international students in the Netherlands.

- *Digital skills in education:* Educators, school administrators, and leaders enhance their practices through collaborative learning with one another and external partners. Thus, the strategy highlights structural measures for increasing digital literacy among students and teachers, providing access to digital learning resources, creating a future-ready infrastructure, and digitalization ethics in education.

The Netherlands has also introduced various training programs and projects to contribute to individuals' digital skills acquisition. For example, to expand the *Make IT Work* project, Amsterdam University of Applied Sciences (AUAS) and Nederland ICT are structurally working together to transform highly educated job seekers without an ICT background into ICT professionals. In this sense, AUAS and Nederland ICT collaborate to attract candidates and companies across the Netherlands. In addition, specific feedback on the curriculum to ensure that it aligns with their current demands for talent. Make IT Work makes it possible for highly educated people without a specific IT background to pursue an IT position and start working immediately (Make It Work, 2022). Besides, the European Commission has awarded the project as a "good practice" to make Europe digitally literate (Dutch Digitalisation Strategy, 2019, p.32).

Funded by over 80 organizations, the *Dutch EdTech Foundation* is dedicated to developing innovative solutions for the future of education. The foundation primarily aims to fortify the Netherlands' position in the digital world, attract talent, and encourage foreign investment by focusing on novel methods, tools, skills, and environments for teaching and learning in the 21st century. The foundation sets its vision to make lifelong learning accessible to everyone and scalable. It is then seen as a great potential both globally and in the Netherlands since the global EdTech investment is on the way to 50% growth (Dutch Edtech, 2021, p.3).

"*Give IT Door*," on the other hand, introduces the young to IT by allowing professionals to talk about their experiences in youth organizations. It offers practical education to secondary schools and gives a hand to the young on the way to digital literacy and career opportunities available in the ICT sector (hcaict.nl). More specifically, the program invites ICT professionals as guest lecturers in secondary schools to share their experiences about working in the ICT industry or discuss specific topics like big data, cybersecurity, and programming. The program's success can be attributed to the fact that over 250 schools have submitted applications for guest lectures (Dutch Digitalisation Strategy, 2019, p.29).

The "*TOMAS*," whose name is inspired by the initials of the words "talent development, match, and select," is a project designed to match the right skills with the right jobs. The primary objective of the TOMAS initiative is to establish a connection between the availability of retraining opportunities, further education programs, and talent development needs in order to bridge the gap between supply and demand. One of the primary goals of this project is to tackle the frequent problem of skill mismatch in the job market, with the aim of ensuring appropriate alignment between individuals' skill sets and the positions they are recruited for. The TOMAS platform offers a

comprehensive overview and facilitates access to many talent initiatives within the Amsterdam Metropolitan Area, encompassing the geographical region spanning from Haarlem to Hilversum and from Uitgeest to Uithoorn. It embodies more than 120 programs for training, retraining, and talent development, most of which focus on the technology sector (TOMAS, 2022).

Digital learning, or the digitization of education, will undoubtedly affect the knowledge and skills teachers need, which is needed to be addressed by schools. Moreover, digital skills education has become mandatory in primary school curricula since 2020. In this sense, the Netherlands implements a national training program called "*Digital Teacher*" (Digileerkracht), which aims to enhance the digital skills of primary school teachers by integrating programming and computational thinking into their teaching (Dutch Digitalisation Strategy, 2019, p.29).

Digicampus is a digital public service application in the Netherlands. Logius, TU Delft, ICTU, and NLdigital have launched Digicampus since discovering that the implementation of innovative ideas for public services often lags behind due to the fragmented nature of the innovation environment in the country. The goal is to utilize the innovation capacity of the Netherlands to implement innovative ideas and technological advancements with greater speed and efficiency. Digicampus adopts a mission-driven innovation approach (Mazzucato, 2016) focused on allocating more control over citizens' data and digital identities, making public services more proactive and inclusive, and transforming government.

Sweden

Sweden has become one of the top countries in spreading and utilizing digital technologies. Its capability to adopt digital transformation is believed to be the primary factor behind its impressive economic growth in recent times. Undoubtedly, the Swedish economy boasts the most substantial proportion of added value originating from the information and communication technology (ICT) sector compared to other member countries of the Organisation for Economic Co-operation and Development (OECD). Furthermore, Sweden has consistently positioned itself within the upper echelon of nations globally in terms of exporting ICT services, ranking among the top ten. Swedish companies have been able to elevate their position in global production value chains by utilizing digitization and prioritizing high value-added services (OECD, 2018a, p.13). The country has rapidly transitioned to an efficient knowledge economy, resulting in its status as an "advanced digital economy." The relevant reports document that while about half of the Swedish population has advanced digital skills, one-third adopt basic digital skills (Thelen, 2019). It also has the second highest number of ICT experts and problem-solving capacity among OECD countries (DESI, 2022a).

The pandemic has accelerated Sweden's transition to online activities, and the government has started to promote investments to expand broadband coverage to rural areas. However, the share of higher education graduates remains limited in ICT and data analysis, hindering the dissemination of big data analytics and restricting companies' digital and data-driven innovation. In Sweden, the share of commercial research and development (R&D) expenditures in the GDP is among the highest among OECD countries; yet, it is not the case for ICT expenditures, which may be because security breaches undermine trust in ICT tools and potentially slows their widespread adoption (OECD, 2021). With the ultimate goal of providing its citizens with digital

skills, Sweden focuses on the following practices.

Sweden's information society plan has a notable historical background that can be traced back to the 1980s, during which digital awareness initiatives were initiated. However, the first complete strategy that can be regarded as a significant milestone is "A Digital Agenda for Sweden," which was officially adopted in 2011. The primary objective of this strategy is to enhance the representation of young individuals, with a special focus on girls and young women, in the enrollment of ICT-related majors and programs within educational institutions at both the secondary and tertiary levels. Additionally, the approach emphasizes the importance of cultivating business and organizational abilities beyond the scope of higher education institutions, adult education programs, and digital learning in secondary schools. In 2015, the paper titled "A Digital Agenda for Sweden - ICT for Everyone" was revised, placing increased emphasis on the imperative for individuals of working age to acquire and maintain strong digital competencies in order to secure employment or sustain their current positions. The Swedish Innovation Strategy, published in 2012, strongly emphasises the development of digital skills within the workforce. This focus is intended to foster innovation, creativity, and entrepreneurship throughout an individual's lifetime, highlighting the importance of continuous learning (Ministry of Enterprise, Energy, and Communications, 2014).

Sweden believes in the need to digitalize education as the primary means to provide individuals with digital skills. The "*National Digitalization Strategy for the School System*," implemented in 2017, strives to equip children, students, and young people with high digital competence. Thus, it ultimately aims to improve knowledge, equal opportunity, and access to technology (Digital Skills & Jobs Platform, 2021). In 2018, Sweden witnessed the establishment of a multi-stakeholder partnership focused on skills acquisition and lifelong learning, the "*Digital Skills and Jobs Coalition*." The coalition's objectives include raising interest in informatics among young people and women and taking part in implementing the national strategy to digitalize the Swedish school system. The coalition is also considered among the milestones in Sweden to achieve its ultimate goal of becoming the best country in digitalization. Besides, it has engaged in a pilot project with universities to offer courses to re-skill professionals. In addition, the coalition and its partners are poised to support Sweden's immigration and integration policy to attract foreign talent to fill the digital skills gap (Nesta, 2018).

According to the Swedish National Digitalization Council (2017), its primary purpose is to facilitate the adoption of the Swedish government's digitalization plan, which is founded upon five key objectives: digital competence, digital innovation, digital security, digital infrastructure, and digital management. The primary objective of the plan is to facilitate Sweden's ability to seize the opportunities presented by the digital economy, while also ensuring that all Swedish citizens possess the necessary skills and resources to cultivate and utilize their digital competencies (Government Offices of Sweden, 2017).

The *e-Skills Council* has been established to eliminate the skills gap in the Swedish ICT sector. Key stakeholders in e-skills acknowledge the persistent and high demand for ICT professionals possessing the necessary skills to cater to the fast-changing needs of employers (Empirica, 2014). Hence, a significant objective of the e-Skills Council, overseen by IT&Telekomföretagen (2017), an association representing companies in the

IT sector, is to establish collaborative initiatives aimed at meeting the enduring demand for e-skills in both the commercial and public sectors. The authors of the study, Gekara et al. (2020), have conducted extensive research on the supply and demand of ICT practitioner skills in Sweden since 2010. This research has involved in-depth interviews and group discussions with various stakeholders, including human resource managers, employment agencies, and representatives from universities and educational institutions (p. 37). An initiative of the Swedish Agency for Government Employers, *Skills360* aims to bring together the entire labor market (government, business, academia, start-ups, and associations) to collectively tackle the challenges posed by digitalization. The stakeholders work to find ways to deliver relevant skills to today's labor market and to raise awareness of how inclusion can be achieved to give everyone access to digital skills. The Skills360 Hackathon, on the other hand, represents one of several initiatives designed to enhance public officials' digital skills and to lay the foundation for training public officials in data analytics (OECD, 2018a, p.8).

Germany

Germany is internationally recognized as one of the leading global economies, boasting a diverse range of technologically advanced industries such as complicated business services and mid- to high-tech manufacturing. Nevertheless, according to the Digital Economy and Society Index (DESI, 2019), Germany has continuously obtained relatively low to moderate rankings. Furthermore, Germany is currently encountering a more gradual implementation of cloud and big data technologies, which are widely recognized as crucial for fully harnessing the potential of the internet. Thus, it seems urgent for Germany to improve its infrastructure for digital skills acquisition (OECD, 2018b).

Data plays a crucial role in facilitating digital transformation, data analytics, data-driven innovation, artificial intelligence, and advancements in Germany's manufacturing processes. In addition, the enhancement of lifelong learning opportunities and the proactive anticipation of skills requirements are crucial factors for Germany's capacity to harness the digital transition. Germany is situated among the nations that own a proportion of employment opportunities that surpass the average, which are at a heightened risk of being automated. For this reason, Germany should recognize the need for innovations in many domains, which entails equipping students with problem-solving, basic ICT, and social skills through the education system and adapting the curriculum to meet changing skill requirements and to guide students accordingly (Digital Skills & Jobs Platform, 2022). Fortunately, Germany has started to take steps to close its digital skills gap with the help of the practices below.

The Digital Strategy 2025, which BMWi initiated, aims to provide guidance for the cultivation of talents and acquisition of skills necessary for effectively utilizing innovative technologies to facilitate the realization of a technologically advanced Germany. One of the key aims of digital education is to ensure its availability throughout all stages of life. The development and maintenance of a strong national skills base that connects vocational education, higher education, and the workplace is identified as a crucial priority in Germany's efforts to transition towards an intelligent knowledge society, as outlined in the Digital Strategy 2025 (2016). The strategy encompasses a range of actions that seek to not only facilitate the German economy's ability to adapt to emerging challenges but also to secure its dominant position in terms

of both quality and technology in the forthcoming years. This will be achieved by integrating traditional competitive advantages with state-of-the-art technology, contemporary methodologies, and targeted support initiatives.

The main objectives under the digital education pillar of the strategy can be listed as follows (Jakopsone, 2022):

- Every school student will have a basic knowledge of information science, how algorithms work, and programming by 2025. To achieve this objective, relevant subjects need to be incorporated into the curricula of primary and secondary education, teacher education, and continuing education.
- By the year 2025, Germany is expected to emerge as a prominent frontrunner in the realm of digital infrastructure within the field of education.
- Workplaces will be the number one place to acquire cutting-edge IT knowledge by 2025.

By the year 2025, it is anticipated that all educational institutions that receive public funding will ensure the availability of crucial teaching materials through online platforms.

The *Berufsbildung 4.0* initiative is a governmental program through which the government attempts to respond to the evolving skills needs in the vocational education and training system (VET). For the sake of this program, the government has established vocational training centers. Berufsbildung 4.0 also includes digital skills training for teachers (Hutfilter et al., 2018, p.30). The government generally holds the belief that enhancing the overall employability skills, namely cognitive skills, of the workforce can provide favorable consequences for the long-term learning of digital skills. The underlying reasoning behind this assertion is that employees with higher levels of expertise are more likely to effectively take advantage of the chances available for enhancing or acquiring new skills in the digital domain (Hutfilter et al., 2018, p.35). Now, Germany has a demand for about 700,000 people with digital skills and further interdisciplinary education requirements for more than 2 million (McKinsey & Company, 2018, p.11). In this sense, it is essential for the Bundesagentur für Arbeit to expand its existing tools, constantly analyze the accelerating demands of the labor market, and communicate these developments to the public. Moreover, to satisfy such demands and requirements, educational and career institutions should adjust their practices for future-required skills and design corresponding curricula and courses (McKinsey & Company, 2018, p.11).

In the future, it is predicted to be even more critical for Germany to integrate IT and media literacy in general and vocational schools, which highlights the significance of the Berufsbildung 4.0 initiative. The initiative attempts to take the following measures to ensure that VET is future-proof, attractive, and competitive:

- *Skilled Worker Training for a Digital World:* This research project delves into various professions from a digitalization standpoint and endeavors to pinpoint the areas where the training requirements of skilled workers are evolving at an early stage (BMBF, 2022).

- *Digital Media in VET:* The objective of this measure is to enhance the modernization and effectiveness of VET while also promoting digital media literacy through its integration into vocational and continuing education (BMBF, 2022).
- *The Digital Change Q4.0 Initiative*: The Federal Ministry of Education and Research supports developing and testing tailor-made qualifications for VET staff to prepare them for digital change (BMBF, 2022).

In 2019, the *Digital Pact for Schools* was established to enhance the digital infrastructure of schools in Germany. In this regard, school administrators are now responsible for securing the functioning of this infrastructure (Homrich, 2020). In the German context, the allocation of educational responsibilities lies primarily with the federal states. However, both the Federal Government and the federal states acknowledge the collaborative nature of addressing digitization in schools. Hence, the Digital Pact for Schools has witnessed a notable surge in investment, reaching a substantial sum of 6.5 billion Euros, as the Federal Government allocates considerable financing to the federal states. Funding is utilized, as an illustration, to acquire digital gadgets for educators and enhance the information technology infrastructure within educational institutions. In addition, schools can furnish digital devices to underprivileged children through this program (The Federal Government, 2021a).

Another practice is the *Stadt-Land-DatenFluss* - a learning application. This application ultimately aims to teach people of all ages to be confident data users by explaining the way new data-driven technologies work and how to stay informed about with whom their data are shared, and how to protect confidential data (The Federal Government, 2021b). Another example of digital learning policies may be the *School Cloud* application. The program facilitates the convenient and widespread access of digital teaching and learning content for students and educators, regardless of their location or educational institution. It has been significantly expanded and made available to all students during the pandemic (BMBF, 2018).

Discussion and Conclusion

In this study, the policies and strategies of the Netherlands, Sweden and Germany to provide digital skills to individuals are discussed with the help of multidimensional data sets. One could argue that Germany has made significant progress in its digital transformation journey, particularly over the past five years. Yet, despite being the largest economy in the EU, Germany still falls behind its competitors in digital transformation (inhuntworld, 2023). It is apparently not caused by any financial crisis but may be due to various infrastructure gaps, lack of motivation to adapt to innovation, negative approach to new technologies, or the lack of high-skilled staff. It is evident that Germany requires an all-encompassing digital overhaul considering its status as the leading industrial nation in Europe. The majority of German companies are willing to switch from IT to AI but need help with several obstacles, such as a shortage of skilled talent, difficulties integrating technology, and limited access to data. As emphasized in the Digital Strategy 2025, Germany centers “human” at the heart of its initiatives for a digital society. According to the ZEW (2023) - a research company -, data sovereignty is considered critical by 90% of companies in the knowledge economy and 84% of manufacturing companies in Germany.

Germany also falls behind its competitors in digital skills teaching. Indeed, German

schools have remained slower to adopt digital skills education than US schools over the past decade due to the influence of commercial actors and concerns about data protection. Yet, the pandemic has significantly amplified the pressure for reform in Germany (Hartong, 2021). A parent-report survey by Citrix (2020) during the pandemic revealed Germany ranked last compared to six other countries (Australia, UK, Italy, Canada, Mexico, and Singapore), with only one in ten students (10%) reporting no problems with distance education during the pandemic. Apart from such reasons, various statistical data also confirm Germany's poor performance in the DESI compared to its competitors (DESI, 2022). For example, Eurostat (2019) reveals that German citizens are hesitant to digitally manage administrative proceedings with public authorities even if public services are accessible with sufficient digital infrastructure (Digital Government Factsheet, 2019). In addition, structural insufficiencies, lack of high-speed internet, the inefficiency of federal and state governments, and the reluctance of Mittelstand companies to change their traditional working methods may be shown as other reasons for the slow digital adaptation in Germany (Reuters, 2018).

Policies for digital skills development have officially been voiced for the first time in Germany in the Digital Strategy 2025. The development of the digital infrastructure in the education sector and the updated curricula to enable students to acquire digital skills are important indicators of these policies. Another step to improve Germany's digital education infrastructure may be the introduction of the *Digital Pact for Schools* project, which attracts significant financial investments.

In this study, another focus-of-interest country is the Netherlands. Compared to Germany and Sweden, the Netherlands holds a robust position in acquiring and using digital skills. According to the data by the CBS and Eurostat, the Netherlands ranks first on the use of overall digital skills (computer, internet, software), which may imply that the Netherlands enjoys a tech-savvy workforce in its digital ecosystem and digital infrastructure (CBS, 2021; Eurostat, 2021a). It is also the case in the DESI indicators (DESI, 2022). The Netherlands has legalized its commitment to socially prepare for the digital future with the *Dutch Digitalization Strategy*.

The Netherlands does also not leave unanswered the talent needs of technology-oriented large companies for their growth. The Eurostat data shows that the Dutch population outperforms other European nations regarding digital skills, including proficiency in the internet, computer, and software use. Such skills are particularly introduced to the Dutch citizens by the Ministry of Economic Affairs and Climate Policy of the Netherlands. It should also be noted that there are a wide variety of training programs in private and public sectors for digital skills acquisition in the Netherlands compared to Sweden and Germany. Accordingly, Mendix (2021) shows that 77% of Dutch employees are willing to acquire new digital skills.

Despite being described as an "advanced digital economy," Sweden remains one step behind the Netherlands in the 2022 DESI. Although Sweden's efforts to embrace digital technologies are a noteworthy driver of its economic growth, it should take other initiatives to make digital technologies available to small enterprises and contribute to employees' digital skills (OECD, 2018c). Besides, Sweden performs better among OECD countries regarding the prevalence of internet use and the adoption of digital technologies in households and workplaces. Sweden's first comprehensive strategy was "*A Digital Agenda for Sweden*," adopted in 2011 (earlier than the Netherlands and

Germany). It focuses mostly on formal education and aims to increase the proportion of the young – particularly girls and young women – enrolling in ICT-related majors and programs in schools and higher education, implying that Sweden, like the others, relies on education as a primary means to ensure social acceptance of digital transformation.

It is prudent to assert that a hot topic in the agenda of the programs implemented in these countries for initiating digital transformation is that digital skills should be introduced to citizens through education. Overall, our findings imply that ensuring a social acceptance of digital transformation or every human-centric step toward such a transformation inevitably brings success in digitalization. Therefore, one critical tenet of digital transformation is "human." In this sense, it does not seem possible for countries to go through a successful digital transformation process without ensuring that citizens acquire essential digital skills. Skill development policies applied to individuals should be prepared by taking into consideration the technological, social and technical changes in today's world. It should not be forgotten that technological change does not affect only one field, but triggers change in every field with its multidimensional structure.

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