Chapter

Bridging the Digital Divide: A Human Rights-Based Approach to Digital Literacy and Equity in the EU

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Abstract

Digital literacy is essential for meaningful participation in society, extending beyond technical skills to encompass critical competencies such as data privacy and online information navigation. However, current policies often prioritize infrastructure expansion over digital education, leading to increased digital vulnerability. A legally grounded, literacy-focused strategy is crucial for closing the digital gap and ensuring equitable digital participation. This chapter investigates the digital divide through a legal and human rights-based lens, exploring the intersection of digital rights, literacy, and equity. It addresses key questions: What are individuals' evolving digital rights in the digital era? What core digital literacy skills are necessary to exercise these rights? And how can legal and policy frameworks shape effective and inclusive digital literacy training programs? It employs a theory-building methodology to build a human rights-based framework to mitigate digital exclusion. The framework critically examines international and European Union (EU) digital rights legislation, evaluates state and corporate obligations, and advocates for regulatory approaches that integrate digital literacy as a fundamental right.

Keywords: digital divide, digital literacy, digital rights, digital equity, legal framework

1. Introduction

The term digital divide has been commonly used to refer to the gap between individuals who have access to information and communication technologies (ICTs) and those who do not [1]. Initially, this divide was presented as an "access divide" in the early 1990s, primarily concerning access to the Internet [1]. This type of divide is observed as a binary distinction between those connected to the Internet and those who are not. It is now referred to as the first level of the digital divide, focusing on access to ICTs [2].

With the expansion of the Internet connection in many Western countries, having a connection is no longer the only barrier to benefiting from the Internet. As broadband and digital device access become more prevalent, the research agenda of the digital divide has expanded to the differences among Internet users [3]. That is, to what extent can they use digital technologies and resources in ways that are of the most interest to them and the most useful to their particular needs? The digital divide goes beyond the issues of access to ICTs and also includes issues of inequity affecting people who either lack skills and opportunities to access ICTs or who are in a less equal position to use them [4]. In some cases, people with low digital literacy gain access and enter the "haves" in ICTs but feel confused about using them and, further, show reluctance to the use of digital technologies [5]. As Internet adoption has grown globally, the paradigm has shifted from access to skills and meaningful engagement. Merely having access to digital tools does not ensure their effective use, particularly for individuals who lack digital literacy or face other barriers [6]. Hence, while the medium has spread to a majority of the population, the need for digital literacy is highlighted, which has become part of the second level of the digital divide [7].

Over time, the traditional digital divide (access divide) evolved into a "learning divide" and a "content divide" [8]. This concept gradually expanded to include divides in ICT skills, physical access, motivation, and the purpose of use [9]. These dimensions highlight that the digital divide extends beyond mere access to technology, encompassing factors such as the opportunity to use ICTs (physical), motivation and confidence (psychological), and practical skills [10]. Gradually, the digital divide is often conceptualized across three levels: access to digital technology (first level), skills and use of technology (second level), and the benefits derived from technology (third level) [11].

While the focus has shifted from access disparities to disparities in skills and usage, vulnerable groups, in particular, are more likely to experience nonuse of digital services due to a lack of skills rather than a lack of access [3]. This shift underscores the importance of analyzing the digital divide in terms of how ICTs are used [12] and the varying capacities of individuals from different socioeconomic backgrounds to leverage these technologies [13]. While the gap in Internet access has narrowed, disparities in usage and skills remain significant concerns in the digital era [14].

Addressing these challenges requires targeted education and training for both individuals and professionals [15, 16]. Closing the gap of the digital divide requires both access and improvement of the digital literacy of individuals and groups for meaningful social practices [14]. This chapter conducts theory-building research to propose a human rights-based framework that bridges the gap of the digital divide during digital transformation. It analyzes both international and EU policies to explore the human rights involved in digital literacy development and digital inclusion. The framework will help different stakeholders tackle the real needs of different population groups, based on which they can apply specific digital inclusive measures to bridge the gap and ensure digital equity.

2. Digital transformation and digital literacy

Digital transformation has shown rapid development in various sectors, including commerce [17], healthcare [18], education [19], government services [20], and employment [21]. While there seems to be no escape from the digital landscape, the move to digitalization has created a digital divide between people who have

broadband access and the skills and motivation to effectively use digital technologies and those who do not [22].

Research also highlights other dimensions of the digital divide, such as the education divide, socioeconomic divide, and learning divide [23, 24]. Factors contributing to these disparities include age, education, employment, income [25], ethnicity/race [26], gender [27], sexual orientation [28], geographical location, and disabilities [29]. While the process of digitalization seems to be inevitable, the digital divide is closely tied to broader social inequalities, which involve the unequal distribution of opportunities, resources, and privileges across different social groups. As access to ICTs becomes increasingly essential, the digital divide has emerged as a human rights and social justice issue. In 2016, the United Nations (UN) declared Internet access a human right, integral to the exercise of freedom of opinion and expression and critical for enabling affordable and inclusive education [30].

As discussed above, communication infrastructure is the first level to address digital inequality nationally, regionally, and internationally [2]. Although access is the first step to reducing the digital divide, having equal digital literacy, skills, and awareness to use digital technology is equally important [10]. This section will explore the characteristics of digital transformation and the requirements to realize it from different levels. Besides, it addresses the significant role of digital literacy in the effective use of digital technologies, the empowerment of individuals, and a better user experience of digital technologies in the digital environment.

2.1 Requirements of digital transformation

2.1.1 Digital access and digital infrastructure (accessibility)

Traditionally, digital infrastructure refers to broader access to hardware, software, or the broadband Internet. In a narrow sense, digital infrastructure means the infrastructure based on the evolution and development of new information technologies against the background that data has become the key factor of production [30]. It covers communication infrastructure represented by broadband, the Internet of Things, and the Industrial Internet and technology infrastructure represented by cloud computing, blockchain, artificial intelligence, and other data-driven technologies. In addition, besides the general characteristics of infrastructure, digital infrastructure also includes the application of advanced technologies, which are highly technical and professional [31]. It aims to ensure equal distribution of digital resources and information for various purposes, including employment, education, and social services.

In recent years, there has been a witnessed focus on ICT infrastructure development, requiring not only physical resources of digital technologies, including cables, satellites, devices, and Internet providers, but also adequate electricity. A series of international organizations have addressed the equal accessibility of the Internet and digital technologies, including the Broadband Commission for Sustainable Development, formed by UNESCO, the International Telecommunication Union (ITU), and the Organization for Economic Cooperation and Development (OECD). However, broadband access in rural areas is more costly than in urban areas, which undermines the competition among ICT operators [4]. Private companies lack the incentives to drive rural deployment of broadband, resulting from higher costs of infrastructure and lower profits. As a result, it requires the support from the public sector to support broadband deployment in these areas to narrow the digital access divide [32], which has been shown in many countries [33].

2.1.2 Digital participation and digital literacy (availability)

Compared to digital access, digital participation focuses more on the availability of digital technologies and their correct use. It indicates the ability not just to access digital infrastructure but also to utilize it in their daily and social life [5]. In the context of an increasingly digitalized society, it is essential to consider the requirements for individuals to participate in digital, social, and democratic life [34]. The notion of digital participation emphasizes the meaningful use of digital technologies for resource acquisition, communication, and interaction [35]. It enhances the ability of individuals to effectively engage with their affairs and the external society, including but not limited to social welfare, democratic processes, benefiting from e-governmental platforms, and innovative activities in technologies.

Meaningful participation in the digital era requires specific skills and knowledge for citizens to function in society. However, the current approach to digital services has a narrow assumption that all users already possess standard digital skills like literacy, numeracy, and basic digital competence to participate effectively. This rigid framework failed to accommodate the diverse digital realities of different population groups, including various accessibility and skill levels, different ways they engage with technologies, awareness and attitudes toward technologies, and individual needs. It leads to the significant exclusion of those who do not fit the predefined mold. As a result, the design of the digital system should adapt to the diversity of population groups, ensuring accessibility and availability for all rather than privileging only those who meet the benchmarks.

According to UNESCO's definition, digital literacy is defined as the "awareness, attitude, and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyze, and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, to enable constructive social action; and to reflect upon this process" [36].

From the definition, we can find that digital literacy is transversal to many different activities in people's daily lives. It is about the confident, critical, and creative use of digital technologies to achieve goals related to work, learning, leisure, and participation in society. It is a set of social competencies associated with interacting with a range of digital technologies for self-development in the digitalized society. Basic digital literacy is not derived technologically but is derived from social participation practices in the digital environment. Hence, digital literacy not only includes basic IT skills and knowledge about the information society but also indicates the awareness, attitudes, and perspectives toward digital technologies and the interconnected society.

2.1.3 Digital security and digital protection (acceptability and quality)

Digital security, also known as cybersecurity, aims to create a safe and healthy digital environment by safeguarding data, digital assets, and systems from unauthorized access, use, disclosure, disruption, modification, and destruction [37]. In the digital era, digital security is an elementary requirement for industry and society [38]. It is a cornerstone of trust and operational integrity in the digital environment.

Digital security includes two important aspects: network security and data security. In general, it means that the information is not tampered with in the computer

network environment. With proper technical and administrative measures, the network system can run smoothly while ensuring the confidentiality, integrity, and availability (known as CIA) of network data [38]. While digital security has been acknowledged as an essential requirement of digital transformation, it exposes many new risks during the development and deployment of digital technologies:

First, data leakage and data misuse are serious issues in the digital system. The cases of illegal collection of personal information are frequent, including unauthorized access to computer systems, ignorance of human rights, and excessive data collection. Data leakage and data misuse occurred frequently in many countries, leading to great losses to the industry's assets and reputation [39]. In addition, both individuals and the public suffered from privacy exposure and harassment fraud. Some data leakage even threatened social stability and public security. Hence, it is essential to prevent data leakage for data security.

Second, the content security risks are also obvious. The widespread use of digital platforms has enhanced the ability of individuals to search for information, communicate, and participate in democratic processes in their daily lives. However, the exposure to large amounts of information in public cyberspace also brings digital security risks. The dissemination of harmful content, including hate speech, child pornography, and terrorist content, threatens both private and public security. The spread of misinformation also provokes fears and confusion among citizens and affects their attitude toward industries, governments, and civil societies [40]. As there is an urgent need for the regulation of online content for the safety of both private and public sectors, governments and companies should strive for safety and security, even though 100% safety usually cannot be guaranteed. Many countries have codified that governments have the duty of care to provide a safe and secure society, but it is not clear whether this extends to the online environment, considering the balance with other human rights such as freedom of expression. However, having explicit norms for minimum levels of online safety and security is essential for the quality and acceptance of online services, guaranteeing users' online experience and their trust in online products and service providers.

Third, infrastructure security risks spill over, resulting in the design of the system. While the application of information systems and digital devices is extending to almost every part of life, the key network infrastructure will become the battlefield in the future. Cyberattacks and cybercrimes not only steal personal information but also undermine the confidentiality and integrity of public infrastructures such as transportation, energy, and security systems. With the high velocity and volume of data, the risk could be more disruptive than traditional attacks.

2.2 Digital literacy and core competencies

Digital literacy builds upon the concept of the digital divide, indicating the ability to utilize the Internet and digital technologies. This concept came out when people realized that simple access to ICTs was not sufficient to acquire needed information or services; one needs knowledge, abilities, and skills as well [41].

Digital literacy refers to the ability to locate, evaluate, and use digital information. It also encompasses the ability to deal with and make meaningful use of the amount of information one receives online. One significant component of digital literacy is known as information literacy, which entails the ability to find, evaluate, and use information effectively. In addition, the ability to absorb and create content is also a component of digital literacy [42].

UNESCO (2011) defined digital literacy as a set of basic skills required for working with digital media, information processing, and retrieval [43]. It enables them to make use of the information they find to meet their needs by evaluating the available information. Digital literacy also enables individuals' participation in social and professional life by creating and sharing knowledge and developing a wide range of professional skills. It provides an individual with the capacity to achieve other valued outputs in life in the digital era. As more and more areas of knowledge are acquired from digital media, digital literacy also becomes a significant foundation for individuals to shape the process of lifelong learning successfully [43].

Digital literacy involves more than simply using a digital device or software; it is a multidisciplinary concept that expands to a large variety of abilities, including cognitive, sociological, and emotional skills for effective function in the digital environment [44]. It includes the understanding of the benefits and risks of advanced ICTs, equitable and affordable access to advanced digital technologies and resources, and opportunities to benefit from educational, economic, and social opportunities through these technologies.

2.2.1 Critical digital literacy: Navigating misinformation

Digital literacy also requires people to have critical thinking about the large scale of information and protect themselves from disinformation, including misleading and false information. Disinformation has become a main challenge online, and it has become more evident during COVID-19, when a massive amount of information about the virus was spread and made it difficult for people to find trustworthy sources and reliable guidance [45].

Critical digital literacy is also called information literacy, which refers to the ability to search, receive, evaluate, analyze, and create digital content. It includes a set of abilities requiring individuals to recognize what information is needed and have the ability to locate, evaluate, and use needed information effectively [46]. Hence, it includes the ability to research, critical thinking, and communication [45]. Information literacy empowers people in their daily lives to seek, evaluate, use, and create information to achieve their personal, social, educational, and professional goals. It is closely related to self-development, freedom, and prosperity when information-literate people can access this information about their health, environment, education, and work to make decisions about their lives critically [45].

2.2.2 Data privacy and security awareness

Besides the accessibility and availability of digital technologies, there is also a need to address the safety and security of the digital environment. Research also found the tension between the right to participate in the digital environment and the right to be protected [47]. This has been witnessed when the General Data Protection Regulation (GDPR) [48] was adopted in the EU in 2016. The right to personal data protection is regarded as a fundamental right in the EU while balancing with other fundamental rights concerning the principle of proportionality. The GDPR introduced a range of rights for EU citizens in terms of the processing of their personal data, aiming to ensure their control over their personal data in the EU.

Besides the protection of personal data, many countries also addressed the protection of individuals from harmful content online, including illegal content and misinformation. The EU published the Digital Service Act (DSA) [49], which aims

to regulate online intermediaries to prevent illegal and harmful activities, as well as the spread of disinformation online. The DSA creates a fair and open online platform for all users while guaranteeing the protection of their fundamental rights, such as privacy and freedom of expression.

In addition, with the widespread application of data-driven technologies in people's daily lives, personal data has become a significant resource for technological innovation, scientific research, policymaking, and other areas. It is also crucial for individuals to develop the literacy to know the value of their personal data. Many online products and services are provided for free. However, companies offering the products and services are then allowed to access, collect, and process their users' data on some occasions and even sell and trade this data [50]. Although users may expect that "for free" is not really free and that their data is being processed under their "free consent," it is rarely transparent or can be complicated for individuals to know how the data processing is done. Although there is plenty of literature on the value of personal data, there is a need to raise awareness among people of the value of their personal data.

2.2.3 Civil engagement in digital spaces

Digital technologies also bring new opportunities to broaden participation in civic and political processes. The application of e-government has played a significant role in improving the relationship between people and government by increasing the transparency and accountability of the public decision-making process. Besides, e-participation offers an opportunity to engage marginalized population groups and rebalance power relationships in policy areas [51]. Digital participation also serves as an effective way of knowledge transfer by governments with the application of data analytics through the decision-making process. Governments have an easier way to provide and distribute information and consultation opportunities to relevant stakeholders through digital platforms. Besides, online discussion and submission in an anonymized format enabled governments to hear the voices of different groups who find it difficult or risky to express their opinions.

To facilitate civic engagement in the e-government project, governments need to require policies that support ICT infrastructure development, improve citizens' digital skills, provide essential online content and space, and provide detailed guidance for citizens on involvement in decision-making. Digital literacy, as a critical factor for effective e-participation, has increasingly shown its significance in recent years. Digital skills and literacy shape an individual's digital experience, which contributes to their ability to overcome the fear of using digital devices and services or navigating the digital space effectively, safely, and creatively. Hence, digitally literate citizens will have a stronger willingness and capacity to engage with digital technologies and contribute to the e-government project.

3. Digital literacy as a human right: A legal foundation

In 2016, the United Nations General Assembly declared access to the Internet as a basic human right, emphasizing that "access to Internet facilities vast opportunities for affordable and inclusive education" while allowing individuals to "exercise their right to freedom of opinion and expression" [52]. This Declaration indicates the importance of the Internet and digital technologies in people's daily lives, including gaining access to resources, education, healthcare, and jobs, among others. We see

that access to broadband and digital resources is becoming a necessity instead of just a convenience. The digital divide is not merely a societal or ethical issue but has become a human rights issue [15].

3.1 The evolution of digital rights in international law

3.1.1 UN human rights frameworks and digital inclusion

The United Nations has called for the adoption of a global digital rights framework based on human rights law [53]. It aims to achieve equality, safety, freedom, and dignity for everyone in the digital era, ensuring that all people can enjoy these rights online. The framework supports equal access to information, opportunities, and social participation while providing equal protection from persecution, discrimination, and abuse. In addition, it promotes equal respect for privacy, identity, and self-expression. The framework presents nine core principles for the digital environment:

Universal and equal rights [53]. This principle is based on international human rights law, stating that digital rights must apply to everyone without discrimination. All individuals must be treated equally, regardless of gender, race, disability, or other identity. Digital technologies must be designed fairly to prevent bias and inequality. This principle also calls for legal protections for vulnerable groups such as women, LGBTQ+ people, and ethnic minorities to prevent digital exclusion and harm.

Personal safety and data privacy [53]. This principle protects the right to privacy and the protection of the personal data of individuals. It ensures that people have control over their own information and are protected from surveillance, exploitation, and cyber violence. Governments and companies have the responsibility to prevent abuse, support international investigations, and offer remedies to victims of harm online.

Digital self-determination [53]. This principle protects individuals' freedom to define their identities in the digital environment. It calls for freedom from unfair influence by algorithms. It also promotes transparency in automated decision-making and bans judicial rulings based on digital profiling. Besides, it introduces human rights assessments for new technologies to ensure that they are being developed and deployed in a legal and ethical way.

Digital Access for All [53]. This principle regards access to affordable Internet as a basic right. It focuses on reducing digital inequality, especially for rural and low-income communities. To achieve this, this principle supports policies that promote inclusive technology design that tackles the needs of different populations, such as tools for people with disabilities and services in minority languages.

Freedom of expression and association [53]. This principle defends the right to speak and organize freely online by limiting harmful content, including hate speech, disinformation, and child exploitation. Any restriction must be lawful, necessary, and fair. It must not silence women, activists, or marginalized groups under the excuse of "security." Platforms are obliged to prevent harmful practices like online harassment that prevent people from participating in public life.

Secure, stable, and resilient networks [53]. This principle states that everyone deserves safe and reliable Internet access. It calls for strong cybersecurity and protection from data breaches, surveillance, and service disruptions. This will be a multi-stakeholder task that involves governments, companies, civil societies, and other groups. Key steps include privacy by design, limiting unlawful surveillance, and holding companies accountable for users.

Linguistic and cultural diversity [53]. This principle supports the right to use minority languages and keep cultural traditions alive online. It addresses digital diversity and encourages the use of multilingual platforms and public information in local languages.

Universal standards and regulations [53]. This principle calls for strong human rights laws to guide the digital environment. The social and environmental effects of digital tools must be checked and reduced. Feminist and inclusive values should be embedded in new technologies. Companies must take responsibility for the protection of their users and prevent harm, including data abuse and biased algorithms.

Good digital governance [53]. This principle calls for fair and democratic control of the Internet. Multiple stakeholders are involved in decision-making, including civil society and affected communities. Also, good digital governance requires open and clear policies and legal ways to respond to digital rights violations. The framework recommends victim-focused justice systems, diverse leadership, and global cooperation for better governance practices.

The UN's proposed digital rights framework is a comprehensive response to the growing importance and attention of human rights in the digital environment. It emphasized current issues concerning universal access, privacy, safety, equality, and freedom, while also tackling pressing concerns including algorithmic bias, digital exclusion, and online harms. The framework helps ensure the value of dignity, equality, and participation by grounding digital rights in established human rights law. In addition, it not only focuses on individual rights but also considers systemic and structural factors, including infrastructure, governance, and corporate accountability. Inclusive measures are also considered to respect cultural, linguistic, and gender diversity. Furthermore, it goes beyond technical issues to address the ethical and social dimensions of digital transformation.

However, despite the ambition and clarity of the framework, it still faces several challenges in implementation. While the framework provides universal principles, it lacks legal force unless adopted in national law or international agreements. The levels of commitment to human rights vary in different countries, especially in terms of data privacy and digital freedom. Diverging regulatory models could hinder a unified global approach. Besides, the implementation of the principle of "Digital Access for All" requires substantial investment in digital infrastructure, especially in low-income and rural areas. Additionally, access to digital infrastructure cannot guarantee the effective and meaningful use of digital products and services. As digital technologies are expanding to people's daily lives, the education and training for digital literacy should be addressed for effective use, awareness, and confidence of individuals [9]. The success of this framework depends on the cooperation among various stakeholders, including

policymakers (political will and regulatory innovation), industries (human rights protection by design), and civil society (engagement in digital accessibility, availability, and acceptability).

3.2 EU policies on digital rights and digital literacy

3.2.1 Putting individuals at the Center of Digital Transformation

In the EU, the European Parliament, the Council, and the Commission have proposed the joint Declaration on Digital Rights and Principles for the Digital Decade [54]. The Declaration serves as a comprehensive guide for the EU's digital transformation while ensuring it remains human-centric, inclusive, and aligned with fundamental rights. It acknowledged the significant impact of digital technologies on people's lives, including the quality of life, economic growth, and sustainability [54]. In addition, it addressed the challenges that digital transformation brings to democratic societies, economics, and individuals and stated that digital transformation should not entail the regression of rights. Hence, the Declaration outlines the EU's vision of human-centered digital transformation, ensuring that digital transformation upholds European values (e.g., democracy, equality, and sustainability) and fundamental rights (including but not limited to data protection, privacy, nondiscrimination, and gender equality) both online and offline. It also addressed several principles such as consumer protection, technical and net neutrality, trustworthiness, and inclusiveness.

The Declaration addresses that digital transformation should "put people at the center" to achieve this goal. It aims to strengthen a framework that benefits every individual in the EU by ensuring responsible and diligent action by all stakeholders in the digital environment [54]. The framework emphasizes inclusion by guaranteeing affordable and high-speed digital connectivity, digital education, training, and skills, and digital public service for all individuals in the EU. It also safeguards freedom of choice in interaction with algorithms and AI systems, choosing online services in a fair digital environment. It also upholds participation online, guaranteeing the freedom of expression and information in a trustworthy, diverse, and multilingual online environment. Lastly, safety, security, and empowerment are prioritized, with commitments to individual control over data and protection and empowerment of children and young people [54]. Furthermore, the EU promotes sustainability, addressing eco-friendly digital products and responsible digital services. The Declaration also proposed several core principles of digital rights in the EU, including:

> *People at the Center of Digital Transformation* [54]. Digital technologies must prioritize fundamental rights, democracy, and ethical governance over commercial interests. They should serve societal well-being and promote a humanistic approach globally, ensuring that both public and private actors act responsibly. Key methods include promoting transparency in algorithmic decision-making and holding corporations accountable for harmful content. In addition, the Declaration also commits to promoting these values globally to position the EU as a leader in human rights-based digital governance.
>
> *Solidarity and inclusion* [54]. The Declaration also mandates universal access to affordable, high-speed Internet while upholding net neutrality. It addressed

disparities in digital literacy, targeting 80% basic digital skills among adults by 2030, with special attention to marginalized groups, e.g., rural populations and people with disabilities. This principle also addresses workers' rights in the digital space, including the right to disconnect and protection against surveillance. Furthermore, it ensures seamless digital public services by improving the interoperability of personal data across the EU, such as cross-border e-health records (European Health Data Space, EHDS) [55] and a standardized EU digital identity.

Freedom of choice [54]. This principle protects an individual's autonomy and freedom in a safe digital space. It demands transparency in the AI system to prevent manipulation. To ensure fair competition in the digital space, this principle also aligns with the Digital Market Act (DMA) [56], providing users the freedom of choice to switch online platforms without lock-in effects. Besides, this principle addresses protection against illegal content online (e.g., hate speech) with the balance of freedom of expression, as outlined in the Digital Service Act (DSA) [49].

Participation in the digital public space [54]. The Declaration encourages and supports the engagement of citizens to ensure the diversity of a vibrant digital democracy. This principle combats disinformation and algorithmic bias, requiring platforms to disclose content moderation policies. Besides, it protects journalistic independence and calls for inclusive design to ensure vulnerable groups' voices online. Also, it addressed the application of digital civic tools to enhance participation.

Safety, security, and empowerment [54]. This principle prioritized the security of the digital space through robust cybersecurity measures and strict data protection rules. It highlights the safeguarding of vulnerable groups, including age-appropriate content filters for children and young adults, and the prohibition of predatory surveillance. The Declaration also guarantees data subjects' rights over their data, enabling users to enhance their control over their data while ensuring data sharing among data holders.

Sustainability [54]. This principle promotes energy-efficient technologies, circular economy practices, and transparent labeling of products' carbon footprints to minimize environmental harm. It encourages the application of digital technologies for sustainability, such as AI-driven energy grids, while balancing the environmental costs of data centers and e-waste.

The Declaration reflects the EU's ambition and commitment to balance digital innovation with human rights protection and ensure that the digital era upholds democracy, equality, and sustainability. It puts individuals at the heart of policy-making by integrating digital transformation with human rights, democracy, and ethical governance. It corresponds to European values such as freedom, equity, and solidarity. A core strength of the Declaration is the comprehensive scope, covering a wide range of areas including online safety, digital literacy, digital participation, algorithmic transparency, and environmental sustainability. In addition, the Declaration acknowledges both opportunities and risks of digital transformation and proposes legal and ethical frameworks to ensure the right use of digital technologies.

The inclusion of key EU laws, such as the DSA [49], DMA, and the EHDS, reflects the EU's intention to create a harmonized digital space with strong accountability mechanisms. Furthermore, the Declaration calls for inclusive policies to ensure equal access to broadband digital public services and digital skill-building systems, especially for vulnerable population groups. It indicates the ambition of the EU to make it a global benchmark for legal and ethical digital transformation.

While the EU has the ambition for its digitalization, the full realization of the EU's digital principles remains difficult. The realization of universal access and digital literacy across the EU is still challenging, considering barriers faced by people in rural areas, low-income populations, and people with disabilities [32]. They continue to have difficulties due to infrastructure gaps, affordability, and lack of tailored training and services [34]. Hence, the efforts to meet the goal of 80% digital skills among adults by 2030 will require substantial investment in education, training, and outreach, based on the different needs of different population groups. Besides, the balance between fundamental rights protection and market regulation remains a sensitive issue [57]. The regulation of online content always raises concerns about interference with freedom of expression and censorship [58]. The distinction between harmful and illegal content remains vague, such as hate speech and misinformation, not only challenging content regulation but also affecting individuals' awareness and attitudes toward this content and their human rights [58]. Lastly, implementation may vary across EU member states depending on resources, legal structures, and political will. Without consistent EU standards and oversight, this process will lead to new fragmentation, as was shown in previous legislation. Strong governance, citizen engagement, and regular assessment are necessary to ensure that digital transformation truly serves individuals at the center and does not leave anyone behind [33].

3.2.2 EU digital education plan

In response to the growing importance of digital skills in people's daily lives, particularly highlighted by the COVID-19 pandemic, the EU adopted the EU Digital Education Action Plan (2021–2027) on 30 September 2020 [59]. The plan outlines two core priorities: building a high-performing digital education system in the EU and enhancing digital skills and competencies [54]. It aims to enhance the accessibility, quality, and inclusion of digital education systems across the EU.

The plan calls for a strong digital education ecosystem that improves Internet connectivity in schools, increases access to digital tools and services, and develops a system to support digital learning [59]. It emphasized the role of teachers and educators in digital transformation by supporting their professional development and digital teaching skills. It stressed the integration of digital education into teacher training programs and also provided a platform, the European Digital Education Hub, for the sharing of resources, research, and good practices.

In terms of digital skills and competencies, equity and inclusion are addressed as two fundamental principles of the plan. The plan addressed the significance of digital literacy for life in the digital environment, stating that all EU citizens should be educated about how digital technologies impact well-being and how technology systems work [59]. Digital competence is recognized as one of the key competencies for lifelong learning, involving confident, critical, and responsible use of and engagement with ICTs for learning, work, and participation in society.

In the EU, being digitally competent is recognized as both a necessity and a right. However, digital skills and digital literacy across Europe remain low, with 44% of EU

citizens having an insufficient level of digital skills, while more than a third of the EU labor force lacks the basic digital skills required in most jobs [59]. As a result, the plan sets a target that at least 80% of adults should have basic digital skills by 2030 [59]. To achieve this goal, the plan highlights the need to close the digital divide issue by ensuring that all learners, regardless of age, income, location, or ability, can access and benefit from digital education [59].

Besides the accessibility and digital literacy training, the action plan also promotes ethical and responsible use of digital technologies. It emphasized transparency in the use of artificial intelligence in education, the protection of personal data, and the safe use of online tools. It calls for ethical guidelines and safeguards to ensure that all learners' rights are protected while technologies do not exacerbate bias or exclusion.

The European Digital Competence Framework for Citizens (DigComp) provides a framework with digital competence descriptors for all levels of learners concerning their personal development, employment, and social inclusion for lifelong learning [60]. This literacy is instrumental in understanding the opportunities and risks of digital technologies for the safe and meaningful use of digital technologies in their daily activities. Hence, basic digital skills should be developed among all population groups to enable them to engage in society as active citizens, use public services, and exercise their basic human rights.

The education plan emphasized the importance of a basic understanding of new and emerging technologies among EU citizens. It will enable them to engage with technologies safely, critically, and positively. However, there are still some major challenges during the implementation. One major challenge is the digital divide issue within and among EU member states. Though infrastructure development is not the major issue now, the first level of the digital divide still exists in rural or low-income areas. Continuous investment should be provided for reliable Internet connectivity, digital tools, and basic infrastructure to ensure full participation in digital learning. In addition, while teachers and educators are essential to delivering high-quality digital education, many of them also lack basic digital skills and confidence. Some educators are not familiar with digital tools and services or lack the awareness and practice of data protection. Concerns over data privacy and security grow without clear training and guidance for educators, especially for the education of children. Lastly, the plan promotes lifelong learning for all individuals in the EU. However, participation in lifelong learning remains low, especially among certain vulnerable groups, including older people, low-skilled workers, and people with disabilities. More targeted measures and options should be provided to tackle the needs of these population groups to avoid the plan being an empty promise.

3.3 A human rights-based framework for digital literacy

Both the United Nations (UN) and the European Union (EU) aim to balance the protection of fundamental rights with the advancement of digital transformation. Their respective frameworks emphasize human dignity, individual autonomy, and social inclusion during technological innovation. Digital transformation must prioritize people's real needs and promote governance of digital environments that are grounded in human rights principles and serve the public good.

Both frameworks also recognize the risks that digital technologies pose to certain population groups. Some groups face higher levels of harm online, such as children, persons with disabilities, and ethnic or linguistic minorities. The UN and EU propose clear steps to protect these groups from digital harms, including online harassment, algorithmic bias, and systemic discrimination.

In addition, the UN and the EU call for affordable Internet access and digital literacy programs to reduce the digital divide, particularly for underserved populations such as rural residents and low-income communities. To fix this, they emphasize the importance of inclusive design in digital platforms and services, highlighting the need for linguistic and cultural diversity to ensure equitable access. Individuals should have the freedom to choose digital services and interact with them in their preferred language.

Three key digital rights are interconnected and shape their approach: provision, participation, and protection. The right to provision ensures access to digital tools and infrastructure; the right to participation guarantees individuals a voice in the digital space; and the right to protection safeguards individuals from harm. Together, these rights form a comprehensive framework for digital inclusion and equity (**Table 1**).

3.3.1 Right to provision

The right to provision refers to the entitlement of individuals and communities to receive essential goods and services to survive and have a dignified life [61]. It encompasses the sharing and distribution of resources, entailing the right to possess, receive, or access specific resources and services. This right is recognized by several key instruments, including the Universal Declaration of Human Rights (UDHR) [62] and the International Covenant on Economic, Social and Cultural Rights (ICESCR) [63].

Traditionally, the right to provision has covered access to food, healthcare, and social protection. In the context of a digital society, this right increasingly intersects with digital technologies and extends to equal access to digital goods, facilities, and services. Discussions around digital rights now often include the right to Internet access. However, in the digital era, the right to provision goes beyond connectivity—it includes the broader conditions needed to meaningfully access and use digital products and services. The right to provision also aligns with the following principles:

- Universal access: The UN's Digital Access for All and the EU's Solidarity and Inclusion principles say that everyone should have fast and low-cost Internet. This helps people in rural areas, those with low income, and people with disabilities.

- Inclusive design: The UN's principle on language and culture says digital tools should work for many languages and cultures. This helps stop the control of

The right	Right to provision	Right to participation	Right to protection
Human rights involved	Right to information Right to education Social security and social assistance...	Right to personal development Freedom of information Right to privacy Cultural, religious, and linguistic diversity...	Right to privacy Right to data protection Right to be protected from harmful contents...
Key principles	Universal access Nondiscrimination Inclusive design Reliable infrastructure	Self-determination Free expression Democratic governance	Privacy and safety Nondiscrimination Accountability

Table 1.
The human-right-based framework for digital equity.

English and Western systems. The EU also supports systems that work together, like shared digital health records across countries.

- Reliable infrastructure: The UN wants networks that are safe, strong, and able to recover from problems. The EU wants these systems to be better for the environment, like using less energy in data centers.

A right to digital resources serves as a base for other human rights, including the right to education, employment, freedom of expression, and participation in the democratic process [34]. In most developed countries, access to the Internet and digital resources is not a big issue. However, the accessibility of digital resources varies among different population groups in society [15, 22] for different reasons [64]. The digital world cannot be fair if people face material limits. The right to provision calls for Internet for everyone, tools for people with special needs, and systems that are strong and safe. Without these, unfair gaps in school, work, and public life will stay the same. Governments should spend more on Internet access, support many languages, and use green technology so that everyone can join in.

3.3.2 Right to participation

The right to participation refers to the ability of individuals to take part in social, cultural, and political life by expressing themselves and engaging in collective decision-making. In the digital era, this right includes access to and use of digital technologies to participate in public affairs, contribute to democratic processes, and exercise human rights in digital spaces. Through this, individuals are able to manage their digital identities, make independent choices, and engage in public life without unjust interference. The right to participation also aligns with the following principles:

- Self-determination: The UN emphasizes the importance of individuals' control over their digital presence. The EU supports this through the principle of freedom of choice, which enables users to switch between digital platforms more easily, especially under regulations like the Digital Markets Act.

- Free expression: The UN defends the right to free speech while warning that some safety measures may be used to justify censorship—often targeting women and activists. The EU addresses this by working to prevent disinformation while also safeguarding press freedom.

- Democratic governance: The UN calls for digital governance that includes multiple stakeholders, not just private companies. Similarly, the EU encourages transparency and public involvement, such as requiring platforms to explain how their systems operate, as outlined in the Digital Services Act.

Digital platforms often replicate real-world inequalities, excluding certain voices and reducing individuals to data points. The right to participation seeks to address this by supporting user control, protecting free speech, and enabling involvement in digital policymaking. This requires transparent rules for content regulation, inclusive mechanisms for civic engagement, and clear limits on the power of large technology companies. Participation is not only about using the Internet—it is also about who has the opportunity to shape its development.

Governments must respect and uphold this right for all people. This includes ensuring access to information, the right to be heard, and the right to education. In this context, digital skills and literacy are essential. Individuals must have the knowledge and ability to navigate the digital world effectively and safely.

3.3.3 Right to protection

The right to protection ensures that individuals are not exposed to harm in digital environments. It involves protecting people from practices—whether societal or individual—that may endanger their rights, safety, or well-being [65]. These rights highlight the urgent need to extend human rights frameworks to address new risks created by digital technologies, which can undermine the security of digital spaces.

Governments have a duty of care to foster safe and trustworthy digital environments. They are responsible for adopting measures that prevent third parties from violating digital rights, especially in areas such as data protection and privacy. The right to protection also aligns with the following principles:

- Privacy and safety: The United Nations emphasizes that personal data should only be used with informed consent and must be protected from surveillance. The European Union also prohibits the use of spyware and enforces special protections for children in online spaces.

- Nondiscrimination: According to the UN, digital technologies must be accessible and fair to all. The EU holds platforms and companies accountable for digital harm, using content moderation rules to prevent bias and abuse.

- Accountability: The UN calls for binding international standards to protect human rights online. The EU enforces compliance with such standards, including the General Data Protection Regulation (GDPR), which imposes fines on organizations that fail to respect users' data rights.

Digital technologies can cause widespread harm—for instance, through biased artificial intelligence or unjustified surveillance. The right to protection responds by requiring strong privacy safeguards (such as encryption), banning harmful practices (such as biometric profiling), and ensuring avenues for redress. Without robust regulation, technology can deepen social inequalities—examples include discriminatory hiring algorithms or deepfake videos used to harass individuals. Therefore, legal systems must treat digital harm with the same seriousness as harm that occurs offline.

4. Policy gaps and the need for a literacy-centered approach

4.1 Infrastructure vs. education: The imbalance in current policies

It is crucial to manage considerable investments in digital infrastructure for equal digital access. However, policies primarily focused on ICT infrastructure development do not guarantee that all population groups utilize these investments effectively [34]. Education and training on digital literacy are as important as infrastructure development. It will raise awareness of the benefits of digital technologies to overcome the challenges of technophobia and reluctance to engage with modern technologies.

The attention to digital skills development is still insufficient due to difficulties in defining and measuring digital literacy. It also includes the awareness, attitude, and ability to use digital devices for communication, expression, and social action in life situations [16]. Many countries lack systems to track learning outcomes or measure progress on digital literacy.

Besides, as described in the human rights framework, the right to protection not only obliges governments and digital service providers to take measures for safeguarding the fundamental rights of users. It is equally important to educate individuals to use digital technologies in a legal and ethical way. That is, while users are protected in the digital environment from the interference of third parties, they should also mind their online behaviors to respect other people's and organizations' interests and rights. However, the awareness of respecting and protecting human rights remains low among both individuals and service providers.

4.2 Benefiting from digital transformation as a right rather than an obligation

Digital exclusion will lead to social exclusion, where a lack of information and ICTs negatively impacts personal, economic, and political capabilities [66]. Individuals and population groups are not able to participate in the democratic process without the ability and control over modern technologies. Besides access to ICT and digital resources without discrimination, everyone should have equal opportunity to interface effectively with technologies through universal broadband access and by means of digital literacy training when needed. The training and education of digital literacy not only include the basic guidance to use digital tools and resources but also the detailed guidance for the legal, ethical, and safe use of them [66]. This requires education on appropriate ways to obtain, assess, and use the needed information in the digital environment; the awareness of the value of digital technologies and personal information; the realization of the digital rights of users themselves; and the right behaviors and practices to protect users themselves and other people in the digital environment.

However, providing equal access to ICT and opportunity for training does not mean that everyone should be forced to adapt to the social change accordingly. Digital inclusion is a dynamic concept that applies differently to different population groups, based on their digital divide levels and real needs. For individuals who lack access to digital technologies, digital inclusion could offer a pathway to obtain or expand their access to digital resources. For people who are unable to use these resources effectively, it involves training and education to develop their digital skills and understanding. In addition, for people who lack awareness of appropriate behavior and their digital rights in the digital environment, digital inclusion also means safeguards that protect individuals from harmful content and the misuse of their personal data by third parties. Human dignity and autonomy are emphasized during this process to ensure the freedom of individuals in their daily lives. This will be a long-term project to apply the inclusive measures step by step among all population groups. However, it is undoubtedly worth the time and investment, as one of the core values of digital technologies is to benefit the common good of all individuals.

In a word, digital inclusion does not mean forcing those who are left behind to catch up with technological progress. Instead, it is a right instead of an obligation for individuals to use digital technologies. Technological innovation and digital transformation must focus more on underserved groups and tackle their real needs to ensure they have equal opportunities to benefit from digital transformation. These groups should be considered

carefully during the design and implementation of digital technologies. For example, Internet content should respond to users' diverse needs by incorporating more visual materials and offering content at suitable levels of readability.

5. Conclusion: Toward equitable digital participation

Digital inclusion is a dynamic concept that reflects the diverse needs of different population groups. It refers to strategies that provide access, services, training, or opportunities to reduce the digital divide. Digital inclusion is a human rights-based project that tackles the real needs of different population groups in the digital environment. It aims to bridge the gap among different groups and realize their digital rights at risk, including the right to provision (for people who lack access to digital infrastructure), the right to participation (for people who lack digital skills and literacy to use digital technologies effectively), and the right to protection (for people who need general or extra protection from others in the digital environment).

Public policy should ensure equal access to digital goods and services for all population groups, guaranteeing the fair distribution of digital infrastructure and resources for their life and personal development. In terms of digital literacy, everyone should be offered to receive education and training easily, whenever needed, regardless of their level of interest in participating in the digital environment. This approach respects individual dignity and autonomy while also maximizing opportunities to empower people to benefit from digital transformation.

In addition, all stakeholders must work to protect fundamental rights, especially the rights to personal data, privacy, and freedom of expression. Ethical and social consequences must be examined to ensure that digital transformation results in genuine benefits for all members of society. Future research could focus on measuring digital literacy and the digital divide across different population groups, identifying the urgent need of vulnerable groups to achieve digital equity, and exploring practical measures to address these needs. This will ensure that no one is left behind in the inevitable process of digital transformation.

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