DIGITAL INCLUSION OF POPULATION: ECONOMIC, SOCIAL, EDUCATIONAL DETERMINANTS IN THE COVID-19

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Centre of Sociological Research

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CONTENTS

INTRODUCTION…….. 7

1. THE DIGITAL INCLUSION CONCEPT: A RETROSPECTIVE OF DEVELOPMENT AND FEATURES AS AN OBJECT OF EVALUATION…… 12

2. DIGITAL INCLUSION DETERMINANTS……..... 42

3. THE COVID-19 INFECTION PANDEMIC INFLUENCE ON THE DIGITAL INCLUSION OF THE POPULATION…….. 75

4. ANALYSIS OF DIGITAL INCLUSION: GLOBAL CHARACTERISTICS AND UKRAINE TRENDS…… 100

5. THE NEED FOR ONLINE EDUCATION: THE CIVIC EDUCATION CASE……... 120

CONCLUSIONS…….. 134

REFERENCES …… 138

ANNEX 1. Internet Stats and Facebook Usage in Europe 2021 Mid-Year Statistics …… 159

INTRODUCTION

In the transition to the sixth technological mode and the associated application of both existing and new technologies of Industry 4.0 (Internet of Things, artificial intelligence, big data analytics, robotics, cloud computing, virtual and augmented reality, etc.), a significant potential is formed in increasing the competitiveness of the vast majority of economic sectors, the development of national economies, which will contribute to the achievement of the UN Sustainable Development Goals.

One of the critical determinants that allow these technologies to realize their full potential is the high level of digital inclusion of the population, as the availability of labour and consumers of digital services who do not have the necessary digital skills, as well as physical and material access to information and communication technologies and the Internet, incompatible with the digital economy.

Ensuring a high level of digital inclusion of the population is essential for society to realize the digital economy's full potential, supporting the integration of all citizens and removing barriers to information and services. It is because digital inclusion forms a set of economic, social, political, and institutional benefits of individuals, communities, and countries from free access and skills of using information and communication technologies and the Internet, which also should be measured.

At the individual level, access to information and communication technologies, the Internet and digital skills play a crucial role in ensuring the quality of life, which is emphasized in the Sustainable Development Goals. Significantly, digital inclusion increases employment opportunities; develops digital skills necessary for competition in the world economy; reduces social isolation by expanding communication opportunities; improves health opportunities

through online access to an increasingly digital health care system; provides access to public services, etc.

At the macro level, the digital inclusion of information and communication technologies helps create GDP and contributes to the country's economic development. Its high-level increases productivity in all spheres of economic activity, stimulates the development of new processes and products, increases wages and promotes the career development of employees who use them, increases the availability of collective services (health, education, public sector) and their efficiency, and vice versa..

At the mega-level, digital inclusion ensures the overcoming of economic and social inequalities between countries, contributing to the UN Sustainable Development Goals.

The need to ensure a high level of digital inclusion of the population has now increased significantly, given the pandemic of coronavirus infection COVID-19. In terms of physical distancing has led to the extensive and intensive introduction of digital technologies in all spheres of public life, the digital transformation of critical sectors of the economy and social sphere with extremely high dynamics of all elements.

In such conditions, for citizens who do not have digital access, both due to lack of technological and/or financial access to information and communication technologies and the Internet, and due to lack of digital skills, digital transformation significantly deepens digital and, consequently, social inequality.

To date, the world scientific community has conducted significant research, considering from one angle or another digital inclusion of the population, the factors that change its level, the relationship with key social and economic characteristics of society.

The fundamental principles of the study of the connection between digital gaps, digital inclusion, and factors influencing

them are laid in the works of foreign scientists, including Correa T., Hargittai E., Helsper E. J., Hilbert M., Mossberger K., Norris P. Van Deursen A. J., Van Dijk J. A., Wessels B., and others. Research by domestic scientists, in particular, Artyukhov A., Bozhenko V., Verney O., Dudynets L., Kozhin A., Leonov S., Novikov V., and others are devoted to this issue.

Despite significant scientific achievements on the research topic, many theoretical and applied problems remain unresolved. In particular, they were deepening the methodological principles of determining the digital inclusion level, patterns of dependence of the digital inclusion level on the most relevant determinants, including taking into account the type of digital divide, channels, and time horizons of the impact of digital inclusion on the economic, social and information security of national economies. Also, complementarity and convergent relationships remain unformalized in the chain "digital gaps – education – digital inclusion".

Given the above, the study of digital inclusion of the population, its economic, social, and educational determinants in the context of the COVID-19 pandemic is relevant. The obtained results will create a conceptual basis for developing a methodology for substantiating the place of digital inclusion of the population in the formation of intersectoral economic disparities in the impact on the state's economic, social, and information security regions.

The research topic is consistent with the introductory provisions of the project of the Organization for Economic Cooperation and Development "Going Digital" (2017-2022), the Concept of development of digital competencies until 2025 (approved by the Cabinet of Ministers of Ukraine 21.03.2021), takes into account the principles of organizational principles state policy of digital development, approved by the resolution

#56 of the Cabinet of Ministers of Ukraine “Some issues of digital development” from 30.01.2019, as well as priority areas of digital transformation for the period up to 2023, approved by the Cabinet of Ministers of Ukraine from 17.02.2021 № 365-p.

The monograph is prepared in the framework of research topics “Convergence of economic and educational transformations in the digital society: modelling the impact on regional and national security” and “Reforming lifelong learning in Ukraine to prevent labour emigration: a cooperative model of institutional partnership”, financed by the general fund of the state budget.

The study aims to develop a conceptual framework for establishing patterns of dependence of the level of digital inclusion of the population on the most relevant determinants, considering the type of digital divide in a pandemic crisis.

This goal necessitated the solution of the following tasks:

- to form the digital inclusion concept and to define its features as the object of estimation;
- to improve the methodological basis for determining the determinants of digital inclusion as the reasons that determine its actual level and trends;
- to deepen the theoretical foundations of defining concurrent relationships in the chain “digital gaps – education – digital inclusion”;
- to determine the features of the impact of the COVID-19 coronavirus pandemic on the digital inclusion of the population;
- to analyse the digital inclusion of the population at the global level (digital gaps between regions and countries) and digital gaps between individual strata of citizens within the country);
- to assess the needs for civic education online and identify current needs for civic education in this format, considering barriers to its development.

A three-stage approach was designed to achieve the objectives of the research. First was used the theoretical approach contains the systematic, logical, and comparative analysis and synthesis of scientific literature on concepts of digital inclusion and digital divides and their development with particular interest to their influence on the economic and non-economic indicators of the development of countries.

Secondly is statistical data analysis on the world trends in the digital inclusion and features of these processes in Ukraine. The study employs time-series data, specifically panel data.

Third, to explore the prospects for the development of civic education online, research methods such as desk-based (analysis of publications, reviews, social media), qualitative (focus groups, in-depth interviews), and quantitative (a sociological survey) were used.

The information and factual basis of the study are statistical, analytical, and research materials of international organizations in the field of digital transformation, digital inclusion and related aspects, reporting and analytical information of the State Statistics Service of Ukraine, results of domestic and foreign research in digital inclusion and digital gaps.

1. THE DIGITAL INCLUSION CONCEPT: A RETROSPECTIVE OF DEVELOPMENT AND FEATURES AS AN OBJECT OF EVALUATION

The study results show that the concept of digital inclusion has developed; its understanding has become more complex over time.

The analysis conducted using Google Trends showed that the dynamics and volatility of Internet users' search queries in digital inclusion research are significant with the existing time imbalances with a gradual increase in interest in this concept (Fig. 1.1).

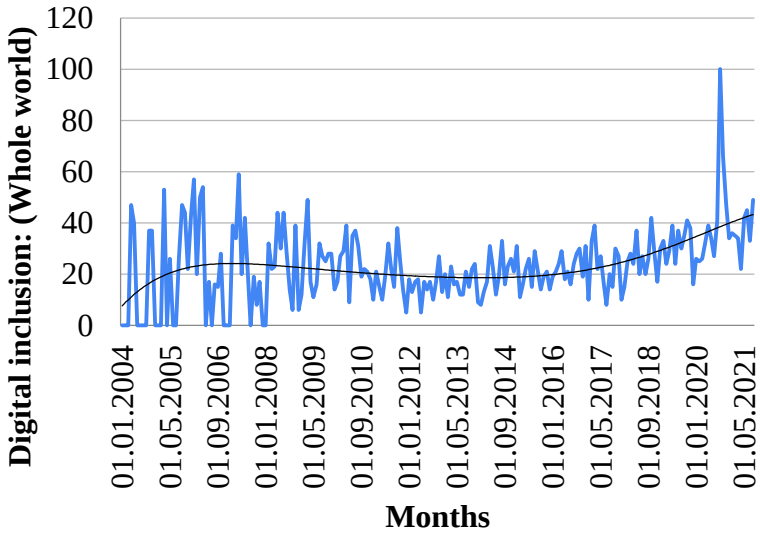

Fig. 1.1. Dynamics of Google search queries on the issues of digital inclusion in the world for the period 2005 – August 2021

Source: built by the authors using tools Google Trends (www.google.com/trends)

It should be noted that the most popular search topics related to digital inclusion are inclusive education (100), e-inclusion (42), financial inclusion (24), finance (20), and education (16), with topics such as popularity, which have grown the most in the last year are financial inclusion, finance, and education.

Geographically, digital inclusion issues have been of the most significant interest in the United Kingdom, Mexico, Argentina, Ecuador, Australia, India, the United States, and Spain.

In Ukraine, the topic of digital inclusion is currently not of sufficient interest, which, in addition to the number of search queries, is also confirmed by a small number of scientific publications on this topic.

Research on digital inclusion is mainly concerned with ensuring financial inclusion (Dudinets, & Verney, 2018 [1]; Esh, 2019 [2]; Frolova, 2021 [3], Kornivska, 2021 [4]), public management of local development (Kozhyna, 2020 [5, 6, 7]), training, including vulnerable categories (elderly, people with special needs) (Nosenko, 2016 [8]; Karkach, & Semigina, 2019 [9]).

In our opinion, it characterizes the low level of public interest in ensuring equal access of citizens to information and communication technologies and the Internet indirectly and the formation of skills for their effective use. In turn, this significantly reduces the positive effects of the digital economy and increases information and cyber threats. In view of the above, we believe that to develop a model for measuring the level of digital inclusion of the population, its connection with the indicators of the country's development, it is necessary to clarify its understanding as an object of evaluation.

As it was found out from the results of studying the works on this topic, the formation of the digital inclusion concept was the study of the digital divide, which was gradually transformed.

Dynamic analysis by Google Trends revealed that the search queries of Internet users in the field of research of the digital divide during the study period decreased (Fig. 1.2).

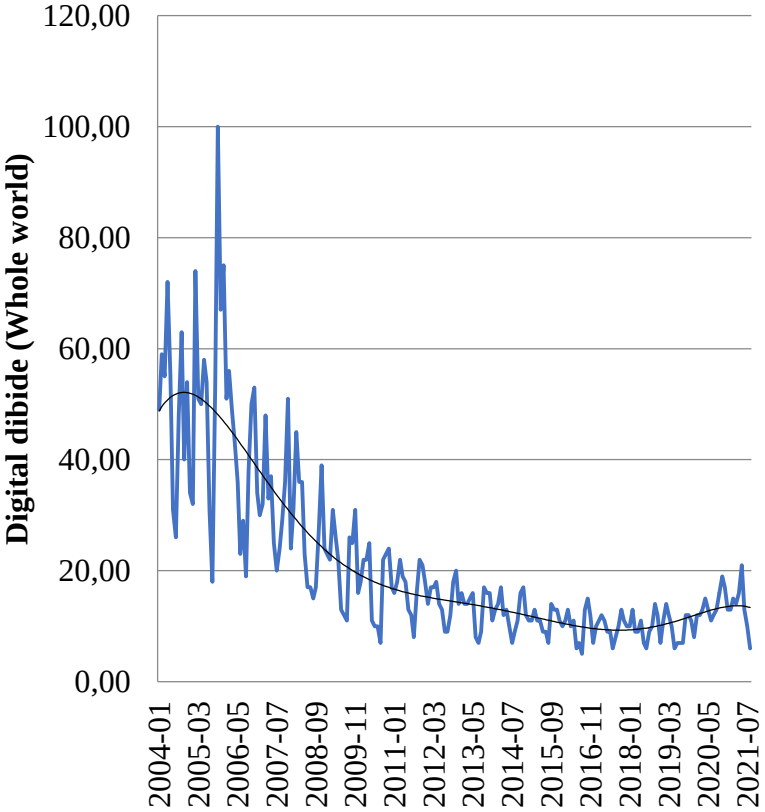

Fig. 1.2. Dynamics of Google search queries on the problems of the digital divide in the world for the period 2005 – August 2021

Source: built by the authors using tools Google Trends (www.google.com/trends)

At the same time, the seasonality of search queries was revealed during the research period.

We believe that this is due to the fact that in those countries that is most represented on the Internet; a significant part of the problems associated with bridging the digital divide has been resolved.

The digital divide is one of the most popular topics over the past year, including information, information and communication technology, and communication.

Geographically, the most interesting issues are the digital divide in low-income countries, primarily Africa and Asia – Fiji, Nigeria, Uganda, Jamaica, Zimbabwe, Kenya, South Africa, Tanzania and others.

In Ukraine, the current state of research on digital gaps can be assessed as initial, which is confirmed by both the number of search queries and a small number of scientific publications on this topic.

The results of the study show that at the initial stage of the study digital gaps were considered as inequalities in physical access to information and communication technologies and the Internet (Loader, & Keeble, 2004) [10]. This approach was based on the theory of technological determinism, according to which technology is the main trigger of change in society, when all other factors of change (social, economic) are considered secondary.

According to this approach, the digital divide was considered in the binary system of presence / absence of access to information and communication technologies and the Internet (van Dijk, 2006) [11]. According to him, if free access to these technologies is provided, the problem of the digital divide will be solved (Peter, & Valkenburg, 2006 [12]).

Reducing the digital divide within the theory of technological determinism has been ensured through physical access to digital technologies such as computers and the

Internet (Correa, 2008 [13]) in particular through government and community participation programs to expand access to digital services (Bailey, & Ngwenyama, 2009 [14]), because this approach determined that everyone has the same potential to use and benefit from digital technologies, provided they have free access to them.

According to the approach of technological determinism, the digital divide was quantified based on statistical indicators of access to information and communication technologies and the Internet, and digital inclusion was ensured through equal access of all categories of citizens, regardless of their socio-economic characteristics, to them (Srinuan, & Bohlin, 2011) [15].

At the initial stage, a separate area of research of the digital divide was the separation of the concept of material access to information and communication technologies and the Internet from the physical.

Van Deursen, & van Dijk (2019) note that content access includes all costs associated with the use of computers, connections, peripherals, software and services. Accordingly, having physical access (owning a particular digital device), the digital divide may occur due to a lack of resources to finance the overhead costs [16].

We agree with Norris (2001), who noted that the access gap has three aspects, including global (inequality in access to information and communication technologies and the Internet between countries), social (inequality in access to information and communication technologies and the Internet between different countries, strata of national society) and democratic (gap between those who use and those who do not use digital tools to participate in public life) [17].

Srinuan, & Bohlin (2011) [15] note that the problems of the digital divide were considered mainly at the individual level (34.4 %) and at the country level (33.3 %). A smaller part of

the research is devoted to digital gaps at the level of households (15.4 %), public sector organizations (10.8 %), private organizations (2.6 %), industry (2.1%) and small and medium enterprises (1.5 %).

This approach also examines the impact of access to information and communication technologies and the Internet on social stratification through the impact of the digital divide and digital discrimination.

It is determined that information and communication technologies and the Internet contribute to those citizens who already have access to other resources and not to citizens who did not have such resources (van Dijk, 2006) [11]. These digital gaps can exacerbate disparities between social groups, as information and communication technologies and the Internet provide easy access to information, are a tool needed to participate in a democratic society, and provide access to education, employment, trade, medicine, and so on.

Research in this area unequivocally confirms that citizens who have physical and material access to information and communication technologies and the Internet tend to have a higher level of education, higher incomes and professions with a higher status than those who do not have access to them.

Thus, the foundation of the concept of digital inclusion is the concept of digital divide as the presence of physical and material access to information and communication technologies and the Internet. Despite the gradual narrowing of the digital divide of this type in the world, for underdeveloped and developing countries, overcoming it remains quite relevant.

The International Telecommunication Union estimates that approximately 3.6 billion people do not have physical access to the Internet, and in Africa only 39.3 % of its inhabitants have access to the Internet, compared with 87.7 % of Europeans and 94.6 % of Americans.

At the same time, solving this problem is impossible without overcoming the problem of poverty in the context of sustainable economic development of the country and improving the living standards of citizens.

Further research has found that binary measurement of the use or non-use of information and communication technologies and the Internet within technological determinism is insufficient, as physical and material access to information and communication technologies and the Internet differs from access to information and digital services (van Dijk, 2003) [18], may occur even if access is available if citizens do not have the ability and adequate skills to use them (Newhagen, & Bucy, 2004) [19].

Researchers have identified the need to shift the focus from a simplified binary conceptualization of the digital divide as physical and material access to information and communication technologies and the Internet to a more advanced and sophisticated approach (Correa, 2008 [13]).

Based on this postulate, all further studies of the digital divide go beyond purely physical access to information and communication technologies and the Internet.

Further scientific work is developing in the direction of complicating the understanding of the concept of digital access, so determining the need for conscious use (Newhagen, & Bucy, 2004 [19]; van Dijk, 2003 [18], 2006 [11]; Hartviksen et al., 2002 [20]; Lim, 2002 [21]; Akhter, 2003 [22]; Brown, & Licker, 2003 [23]; Selwyn, 2003 [24], 2006 [25] end other).

Studies conducted by the above and other scientists have formed the basis for the allocation of the digital divide of the second level as a gap in skills and use. Thus, Hargittai (2001) noted that a distinction should be made between the gap in Internet access and the gap in skills needed to use it effectively (Hargittai, 2001) [26].

Van Dijk (2005) [27] argued that the problems of access to information and communication technologies and the Internet are gradually shifting from physical and material access to higher-level access, namely access to skills and use.

The author proposed to define digital skills not only as the ability to manage computers and network connections, but also as the ability to search, select, process and use information from a surplus of sources and the ability to strategically use this information to improve their position in society.

The scientist's approach formed the basis for a multilevel classification of digital skills.

Reilly (2010) [28], based on studies by Hargittai (2001) [26] and Correa (2008) [13], considers the second-tier digital divide as a production gap that separates consumers of online content from its producers.

According to him, new programs have allowed anyone with a computer and an Internet connection to be a content producer, but most user-generated content that is widely available on the Internet is created by a small proportion of users (Reilly, 2010) [28].

A separate area of research in the field of digital divide of the second level is the systematization of digital skills (Mossberger et al., 2003 [29]; Van Deursen, & Van Dijk, 2011 [30]; Van Deursen et al., 2016 [31]) primarily separating purely technical skills of users from higher level skills – informational and social.

The Tech Partnership Basic Digital Skills framework describes five basic digital skills that can be used to measure digital inclusion and the activities someone should be able to do to demonstrate each skill. These are:

- managing information: using a search engine to look for information, finding a website visited before or downloading or saving a photo found online;

- communicating: sending a personal message via email or online messaging service or carefully making comments and sharing information online;
- transacting: buying items or services from a website or buying and installing apps on a device;
- problem solving: verifying sources of information online or solving a problem with a device or digital service using online help;
- creating: completing online application forms including personal details or creating something new from existing online images, music or video.

Scientific papers often use the classification of digital skills developed by van Dijk, & van Deursen (2014) [32], which provides for their division into:

- operational skills, required to command media;
- formal skills, required to use the formal characteristics of media (e.g., chapters, a book's table of contents, television channels, and online hyperlinks);
- information skills, required to search, select, process, and evaluate information;
- communication skills, required to decode and encode messages, exchange meaning, manage contacts, and attract attention;
- content creation skills, required to create content of acceptable quality (e.g., text, photos);
- strategic skills, required to use (digital) media as a means for personal or professional goals and to improve one's position in society.

Van Deursen, & Mossberger (2018) [33] note that the need for information skills to search, select, process and evaluate information is constantly growing, as the diversity and virtually infinite amount of information on the Internet requires higher-level skills than just basic literacy, including skills problem

solving and critical thinking, especially in determining the veracity of information.

Researchers also emphasize that strategic skills are extremely important for working on the Internet. To obtain them, users must be critical, analytical and have a high level of information skills (van Dijk, & van Deursen, 2014 [32]; Van Deursen, & Mossberger, 2018 [33]).

In this context, the importance is growing data literacy as are "a component of information literacy that enables individuals to access, interpret, critically assess, manage, handle, and ethically use data" (Prado, & Marzal, 2013) [34].

In this study, we consider it appropriate to use the approach Sharma et al. (2016) [35].

Authors define digital literacy as the ability to use the Internet and new media in order to access and critically evaluate different formats and types of digital information to participate in the socio-economic activities of a community through digital content creation, communication, and exchange. We fully agree with the author's assertions that without digital literacy will digital divides (Sharma et al., 2016) [35].

Without aiming to improve the typology of digital skills, in this study we consider it appropriate to be based on the framework of digital competencies Brolpito (2018) [36], formed on the basis of Carretero, et al. (2017) [37], presented in table 1.1.

Table 1.1. Digital Competence Framework

Competence areas	Description	Competences
1.Information and data literacy	To articulate information needs. To search for and access data, information and content in digital environments, and to navigate between them. To create and update personal search strategies	1.1 Browsing, searching and filtering data, information and digital content 1.2 Evaluating data, information and digital content 1.3 Managing data, information and digital content
2.Communication and collaboration	To interact through a variety of digital technologies and to understand the appropriate digital communication means for a given context.	2.1 Interacting through digital technologies 2.2 Sharing through digital technologies 2.3 Engaging in citizenship through digital technologies 2.4 Collaborating through digital technologies 2.5 Netiquette 2.6 Managing digital identity
3.Digital content creation	To create and edit digital content in different formats, to express oneself through digital means.	3.1 Developing digital content 3.2 Integrating and re-elaborating digital content 3.3 Copyright and licences 3.4 Programming
4. Safety	To protect devices and digital content and to understand risks and threats present in digital environments. To know about safety and security measures and to have due regard for reliability and privacy	4.1 Protecting devices 4.2 Protecting personal data and privacy 4.3 Protecting health and well-being 4.4 Protecting the environment
5.Problem solving	To identify technical problems when operating devices and using digital environments, and to solve them (from troubleshooting to solving more complex problems)	5.1 Solving technical problems 5.2 Identifying needs and technological responses 5.3 Creatively using digital technologies 5.4 Identifying digital competence gaps

Source: Brolpito, 2018; Carretero S. et al., 2017.

Table 1.2. Main keywords that feature the proficiency levels

Levels in DigComp 1.0	Levels in DigComp 2.1	Complexity of tasks	Autonomy	Cognitive domain
Foundation	1	Simple tasks	With guidance	Remembering
	2	Simple tasks	Autonomy and with guidance where needed	Remembering
Intermediate	3	Well-defined and routine tasks, and straightforward problems	On my own	Understanding
	4	Tasks, and well-defined and non-routine problems	Independent and according to my needs	Understanding
Advanced	5	Different tasks and problems	Guiding others	Applying
	6	Most appropriate tasks	Able to adapt to others in a complex context	Evaluating
Highly specialise	7	Resolve complex problems with limited solutions	Integrate to contribute to the professional practice and to guide others	Creating
	8	Resolve complex problems with many interacting factors	Propose new ideas and processes to the field	Creating

Source: Carretero S. et al., 2017.

Thus, the second level digital divide focuses on the formation of such a level of digital skills that will provide the necessary level to bridge the second level digital gap and ensure digital inclusion on this basis. The formation of the required level of digital skills is necessary to ensure information security at the global, national and individual levels.

While studying the digital divide of the second level, scientists have determined that important determinants of its occurrence are the personal characteristics of Internet users, which shape the level of digital skills, goals and ability to benefit from the use of information and communication technologies and the Internet.

Van Deursen, & Van Dijk (2014) [38] defined that even with physical and material access, citizens, depending on the level of education, have a significant differentiation in the use of information and communication technologies and the Internet, while a higher level of education provides greater benefits from their use.

Based on a combination of digital gap concepts of the first and second levels, the definition formulated by the Organization for Economic Cooperation is based on: "the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard to both their opportunities to access information and communication technologies (ICTs) and to their use of the Internet for a wide variety of activities" [39] (OESD, 2006).

This approach emphasizes that to ensure the proper level of digital inclusion, it is necessary to bridge not only the digital divide of the first level – physical and material gaps in access to information and communication technologies and the Internet, but also the digital gap of the second level – the gap in digital skills.

It should be emphasized that the problem of bridging this digital divide is relevant for all countries, regardless of their level of development, while the problem of bridging the digital divide of the first level is currently more common in countries with economies in transition and developing countries. Thus, in 2018, 8 % of people in the UK (4.3 million people) had zero basic skills in working with digital technologies. An estimated

12 % (6.4 million adults) have limited digital skills (at least one of the basic digital skills is missing) (Serafino, 2019) [40].

Alhassan, & Adam (2021) [41] findings show, that the significant influence of ICT access on ICT use was not supported indicating that, access to ICTs is not a necessary condition for the use of ICTs. They agree with previous studies that have argued that, to ensure the use of ICTs, efforts should be made to improve the digital skills of individuals (Salinas, & Sánchez, 2009 [42]; Adam, et al., 2020 [43]) especially in developing countries where the level of digital literacy is low (Correa, & Pavez, 2016 [44]). We completely agree with scientists, that providing affordable access to ICTs will not be sufficient to increase the use of ICTs.

In view of the above, in contrast to the first-level gap, bridging this gap should be subject to regulatory influence by the state through the development of digitalization policy and its component such as digital education, including through the development of lifelong learning.

When developing strategies to bridge the digital divide of the second level, it is necessary to consider the characteristics of Internet users, which play a more important role in the use of information and communication technologies and the Internet than the characteristics of the network itself.

At the next stage of research, the discourse of the digital divide focused on the results of the use of information and communication technologies and the Internet. This concept in 2011 was called the digital divide of the third level (Wei, et al., 2011) [45]. Third-level divides relate to gaps in individuals' capacity to translate their Internet access and use into favourable offline outcomes (Van Deursen, & Helsper, 2015 [46]).

This type of digital divide arises when the possession of digital skills and the use of information and communication technologies and the Internet do not lead to economic, social

and cultural benefits (Stern, et al., 2009 [47]; Van Deursen, et al., 2016 [31]; Ragnedda, 2017 [48]).

This is due to the fact that even among users with unlimited access to information and communication technologies and the Internet, there are significant differences in the ability to attract digital resources to achieve specific offline goals (Fig. 1.3).

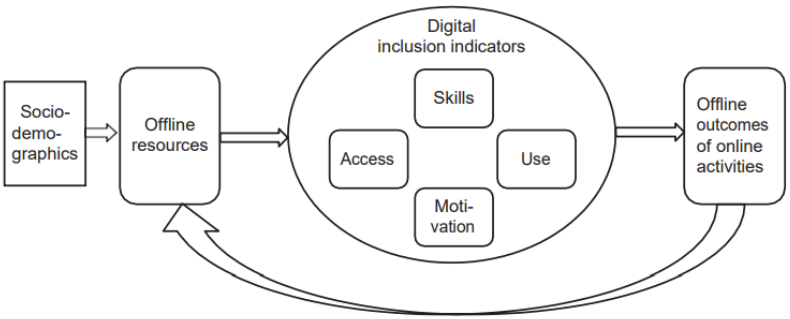

Fig. 1.3. A Model for Replications of Inequalities in a Digital Society

Source: Van Deursen, & Helsper, 2015

For example, those users who constantly convert Internet use to offline income can benefit from the feedback effect when available economic resources allow them to further develop their online skills, and vice versa (Van Deursen, & Helsper, 2015) [46].

Van Deursen, & Helsper (2015) [46] define the digital divide of the third level as a mismatch in revenues from Internet use among user groups that demonstrate generally similar use profiles and enjoy relatively autonomous and unimpeded access to computer technology and Internet infrastructure.

According to the above, the third level digital divide is based on the ability of users to use digital services wisely and consciously to obtain the corresponding benefits.

During the digitalization of society, which intensified in the context of the COVID-19 coronavirus pandemic, the number and complexity of digital services has increased significantly. Accordingly, citizens, communities and countries that are able to use them effectively receive significant advantages over those who are unable to use the existing potential of digitalization of society.

At the same time, individuals, communities and countries excluded from the digital society will gradually degrade in all spheres of public life, which in turn will deepen the already existing economic and social inequality.

Sanders (2020) accent, that the increasing use of the Internet for accessing key services – such as banking, government and council services – has implications for those who are not equipped, unable or unwilling to use them. Digital exclusion (including a lack of private or secure Internet access) impacts on peoples basic rights, and increasingly so as more move online by default [49].

In this study, we will build on the adaptation of the approaches of Van Deursen, & Helsper, 2015 [46], Ragnedda (2017) [49], as presented in table 1.3.

At the same time, along with the definitely positive results of the use of information and communication technologies and the Internet, there were a number of negative effects such as cybercrime, illegal hacking, hate speech and disinformation on the social media and smartphone, Internet or game addiction (van Dijk, 2020) [50], which should be adequately addressed.

Table 1.3. Tangible benefits of using the Internet

Outcomes	Benefits	Type of activity	Key areas
Economic	Economic	eCommerce	Ordering goods or services online
		Finance	Digital banking and finance
		Employment	Job searching; online labour markets; remote employment
			Having minimum levels of ICT competency as prerequisites for many jobs now
Social	Communication	Stay on social media	Meeting people, social interaction, and online dating
	Medical	eHealth services	Seeking health-related information; Interacting with health service providers: electronic interaction with patients or, among them including, but not limited to, making appointments and accessing and sharing medical records, in addition to the use of other resources available online to access health-related information and advice.
	Educational	Online education	Seeking educational information Education & lifelong learning
Political	Political	Realization of political rights	Political participation and online voting
Institutional	Institutional	eGovernment public services	Information about services and subjects of service provision; downloading and filling in electronic applications and other documents required to receive services; the possibility of submitting an application in electronic form, receiving by the subjects of the application information on the progress of their applications and by means of telecommunication - the results of the provision of services, payment for the service in electronic form

Source: developed by the authors based on Van Deursen et al., 2015; Ragnedda, 2017

According to van Deursen, & Mossberger (2018) [33] approach based on Staff (2015) [51], Rose, et al. (2015) [52], online security and privacy risks are magnified by the IoT, with the proliferation of connected devices providing more entryways for security risks such as cyber-attacks and denial of service attacks. More generally, the production of vast amounts of data calls into question some privacy issues (van Deursen, & Mossberger, 2018 [33]). Such information could be used to impact credit, employment, or insurability, as well, as for criminal purposes (Staff, 2015 [51]; van Deursen, & Mossberger, 2018 [33]).

Given the existing threats to Ukraine's national security generated in cyberspace, exacerbated by the hybrid war with the Russian Federation, increasing the level of digital inclusion by offsetting the negative effects of the use of information and communication technologies and the Internet is a crucial task.

In this study, to describe the negative effects of the use of information and communication technologies and the Internet, we propose to use the concept of information threats (cyber threats), which create a risk of information security of individuals, households, businesses, geographical areas, countries Figure 1.4.

Studies of the determinants of the digital gap of the third level allowed us to determine that they are almost identical to the determinants of the digital gap of the second level. Education and income, gender and marital status play an important role in its emergence.

The results of research DiMaggio, & Garip (2012) [53], Sparks (2014) [54], Robinson, et al. (2015) [55],van Deursen, & Helsper, 2015 [46] identified that higher socioeconomic status, higher educated level give more capital-enhancing opportunities, especially in the domains of economic commerce, institutional government, and educational.

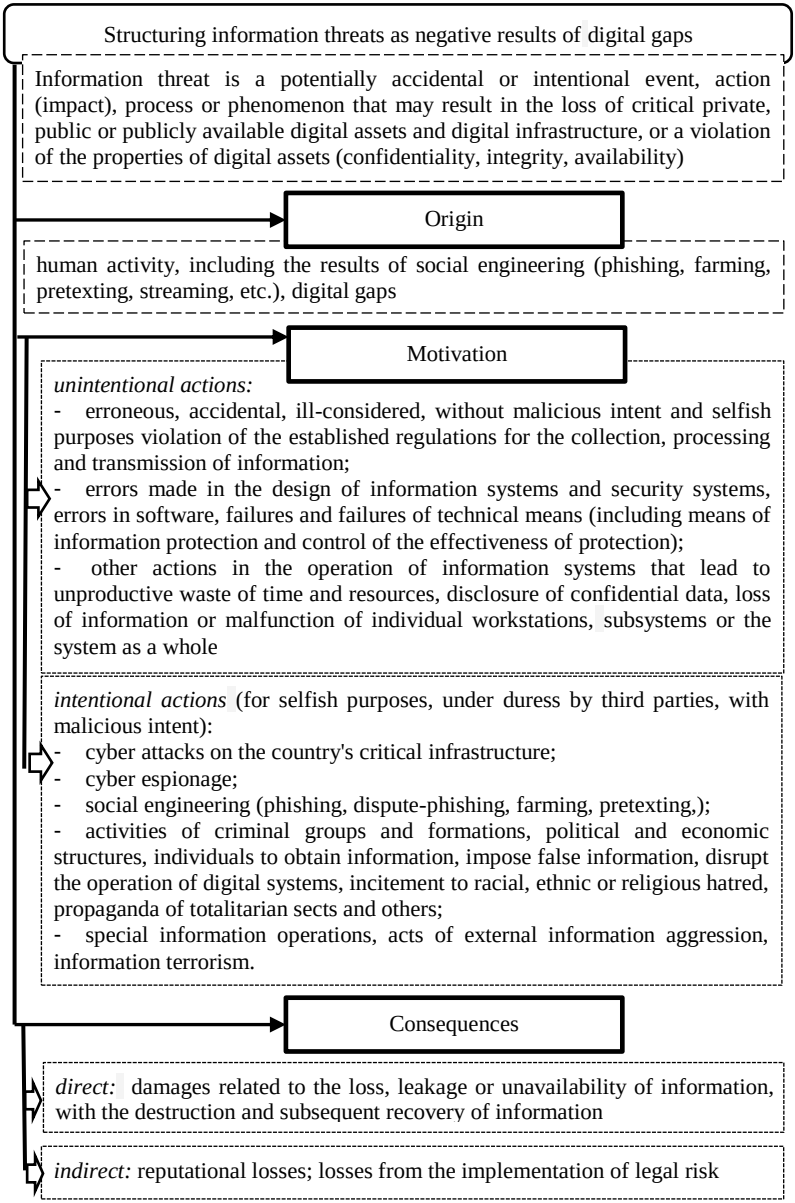

Fig. 1.4. The concept of information threat

Source: developed by the authors

This suggests amplification of traditional inequalities in outcomes similar to that proposed for inequalities in first- (i.e., access) and second-level (i.e., skills and use) digital divides (van Deursen, & Helsper, 2015 [46]).

Economic resources such as income and occupation are especially strongly related to economic outcomes and political and institutional outcomes rather than social and educational outcomes (van Deursen, & Helsper, 2015 [46]).

Researchers have unequivocally identified that education is a critical determinant of the effective and secure use and benefits of information and communication technologies and the Internet and will increase its importance for the development of appropriate digital skills and the ability to make strategic choices to protect confidentiality and security.

Some studies now highlight the fourth-level digital divide as the learning gap through elements such as learning levels, learning methods, and the learning process. It occurs when some people (regions, groups of people) develop and use new learning models more effectively than others. Particular attention in this context was given to studies of the impact of age on the level of digital inclusion (Olphert, & Damodaran, 2013 [56]). In this study, we consider it appropriate to base on the definition of Rallet, & Rochelandet (2007) [57], which defined digital divide as the separation between those subjects (individuals, social groups, regions, countries) who use ICTs efficiently and those who do not use them or use them inefficiently. The analysis relies not much on equipment and access but on the conditions of effective use, appropriation, and ICTs promotion besides excluded people.

The advantage of this approach is that it combines an understanding of all levels of the digital divide with an emphasis on the effective use of information and communication technologies and the Internet, and not just on material or physical access to them.

Summarizing the above in the context of our study, we identified that to bridge the digital divide requires effective convergence of educational and economic concepts, multiplexing, transmission, multichannel and multilevel impact of which is growing in the context of digitalization of society.

The role of education in bridging the digital divide, especially the second, third and fourth levels, must be transformed from a derivative (through meeting current socio-economic and social needs) to a defining one – as an intellectual trigger for institutionalizing future societal opportunities accelerated by growing cyber threats and security challenges.

Thus, we have determined that the vast majority of research on digital inclusion is based on discourses on the digital divide, which is seen as inequality in access to and use of information and communication technologies and the Internet.

There are differences in terms of access (first level of digital divide), digital skills and digital competences required to use the Internet competently (second level of digital divide), inequalities in the capacities to get the benefits from the access and use of the Internet (third level of digital divide), and learning divide (fourth level of digital divide).

The development of discourses on the digital divide, which is seen as inequality in access to information and communication technologies and the Internet, their use and benefits, has become the basis for the formation of the concept of digital inclusion. It was formally introduced in the Declaration of the Ministers of the European Union, signed in Riga on 11 June 2006, on both inclusive information and communication technologies and their use to achieve the broader goals of inclusion.

The 2006 Riga Declaration supports the priority of ensuring equal access to information and communication technologies and the Internet, as well as provides citizens with the

opportunity to develop relevant skills to use them, to fully participate in the digital society.

Given the important social role of digital inclusion, it is in the constant focus of international organizations, including the United Nations (UN), the Organization for Economic Co-operation and Development (OECD), the International Telecommunication Union (ITU) and others.

The modern interpretation of the concept of digital inclusion in the works of scientists gets different specifics, depending on the goal set by the researcher.

The most common approaches to defining a concept are those that focus on:

- the ability of a citizen or community to use information and communication technologies (Becker, et al., 2012 [58]);
- availability of free access and the possibility of safe and secure use of the Internet through various devices, such as computers, smartphones and tablets (physical and material aspects);
- ensuring that the ultimate goals of digital inclusion are achieved, as a rule, the participation of citizens and communities in various aspects of the digital society and the benefits thereof (Helsper, 2008 [59]; Wessels, 2010 [60]);
- prevention of digital divide and as a result of digital discrimination (inequality) (Pereira, 2010 [61]; Nosenko, 2016 [8]; Muñoz, et al., 2016 [62]);
- a specific type of civic or political activity to ensure an appropriate level of digital inclusion (Zacher, 2010 [63]; Rejas-Muslera, et al., 2011 [64]; Morato, et al., 2020 [65]).

Adamczyk, & Betlej (2021) [66] identified significant differences in the American and European understanding of problem of digital inclusion. According to their findings in the United States the phenomenon of digital exclusion is analysed as digital divide – systematic differences in access to and use of computers and the Internet between people of different

socio-economic status (education, income, occupation) at different stages of life, sex and different regions (Adamczyk, & Betlej, 2021). The European approach recognizes that digital exclusion is more than just a digital divide and that it is not only about differences in access, skills or usage, but about all that lead to social and economic exclusion (Betlej, 2017 [67]; Adamczyk, & Betlej, 2021 [66]). In turn digital inclusion refers to the effective participation of individuals and communities in all dimensions of the knowledge-based society and economy through access (also understood as removing barriers and facilitating use) and use of information and communication technologies (Betlej, 2017; Adamczyk, & Betlej, 2021 [66]). Digital inclusion also refers to the extent to which information and communication technologies contribute to equalize and promote participation in different spheres of social life (Adamczyk, & Betlej, 2021 [66]).

We believe that to achieve the objectives of the study it is advisable to use a European approach to understanding the concept of digital inclusion, as it will provide a methodology for justifying the place of digitalization of education and digital inclusion in the system of intersectoral economic imbalances in the context of economic, social and information security, regions.

To achieve the goals of the study, we consider it appropriate to use an approach that integrates all these approaches and emphasizes the ultimate goals of digital inclusion (Fig. 1.5).

Thus, the concept of digital inclusion can be defined as a characteristic of the development of a digital society in which all citizens, regardless of their personal characteristics, have access to information and communication technologies and the Internet and have the skills to use them, and therefore can participate and benefit from the digital society without the growth of information threats.

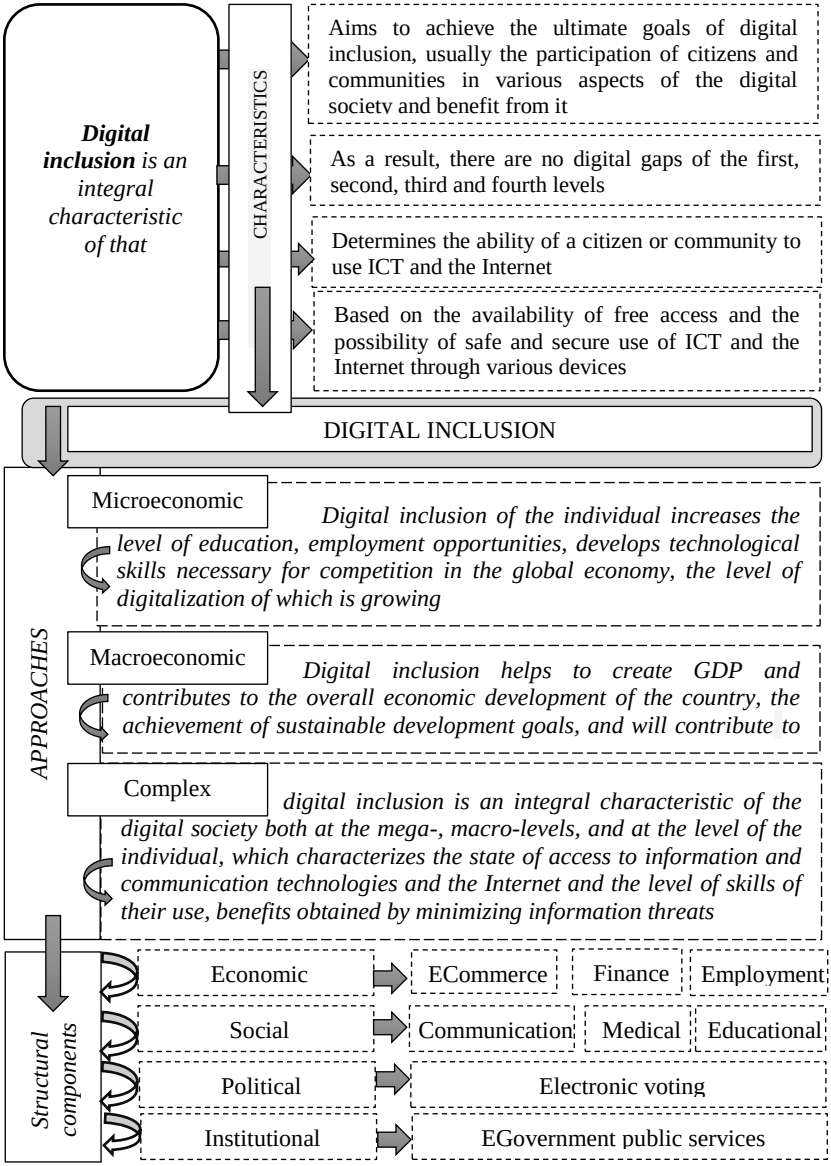

Fig. 1.5. Approaches to understanding the digital inclusion concept

Source: developed by the authors

The concept of digital inclusion is based on the discourse of digital inequality as a result of the digital divide of the first level, based solely on technological aspects, and digital gaps of the second, third and fourth levels, resulting from disparities in education, digital skills, methods and outcomes (opportunities and risks) use of information and communication technologies and the Internet.

The difficulty of interpreting the concept of digital inclusion is due to its complexity, as it is at the intersection, multilevel intersection of socio-political, technological, security and economic micro-, macro- and mega concepts and is associated with the concepts of digital literacy, digital divide, digital justice and digital equality.

According to the results of the study, we determined that in order to form an effective mechanism for measuring the level of digital inclusion, it is necessary to consider it according to the cycle "determinants of formation→features of use→results".

In this case, the determinants of the formation of the level of digital inclusion should be studied in depth by origin, nature, pattern of occurrence, intensity, degree of control, the possibility of forecasting and regulation.

The determinants of digital inclusion provide free access and the ability to use information and communication technologies and the Internet through a variety of devices such as computers, smartphones and tablets (physical, material and digital skills / digital literacy) confidently and securely.

Peculiarities of manifestation of digital inclusion determinants are offered to be considered and measured within the concept of digital gaps – i.e. to develop tools for quantification and evaluation of parameters that cause gaps of the first, second, third and fourth levels.

In this case, in an enlarged form, we propose to evaluate the following parameters:

- access divide (Access haves vs. Access have-nots) and as result technological inequality;
- skills divide (Skills haves vs. Skills have-nots) and as result educational inequality.

Having a digital device or accessing the Internet does not mean using it. The determinants of digital inclusion affect individuals' use of information and communication technologies and the Internet, which can be assessed both quantitatively and qualitatively.

The actual use of the Internet can be quantified using indicators such as time and frequency of use; the number and variety of programs used; connection type (narrowband or broadband use, etc.). It should be borne in mind that the above data may be unreliable, as they are usually obtained from user surveys.

From the point of view of ensuring the appropriate level of digital inclusion, the type and complexity (easy access, search, interactivity, intensive use, creation of own product, etc.) of the use of information and communication technologies and the Internet is also important.

It is believed that some online activities are more useful or profitable for Internet users than others. Some activities give users more opportunities and resources to advance in their careers, jobs, education and social status than others, which are mainly consumed or entertained (Mossberger, et al., 2003 [29]; van Dijk, 2005 [27]; Hargittai, & Hinnant, 2008 [68]). From the point of view of Bourdieu's theories of capital (1984), it can also be said that certain activities on the Internet allow users to accumulate more economic, social and cultural capital and resources than other activities.

The results of digital inclusion should be studied in depth by the remoteness of the consequences, their duration, nature (benefits / risks) and scale. It should be emphasized that the study of the effects of digital inclusion at the level of

individuals and countries, as well as at the global level, has been insufficiently studied.

Digital inclusion forms a set of economic, social, political and institutional benefits for individuals, communities and countries from free access and skills in the use of information and computer technologies and the Internet, which must also be measured.

At the individual level, access to information and communication technologies, the Internet, and digital skills play a key role in ensuring quality of life, as emphasized in Sustainable Development Goals. Digital inclusion provides opportunities for personal and professional growth through higher education, is a convenient way to gain knowledge, communicate with friends and family and access daily services (AlSayegh, et al., 2019 [69]).

It is also important that digital inclusion increases employment opportunities; develops technological skills necessary for competition in the world economy; reduces social isolation by expanding communication opportunities; Improves health opportunities through online access to an increasingly digital health care system, especially in the context of a coronavirus pandemic; providing access to public services, etc.

Alhassan, & Adam (2021) confirm that digital inclusion significantly influences the quality of life. This enhances their happiness and affords them the freedom to make life choices and thereby improving their well-being [41].

At the macro level, digital inclusion helps build GDP and contributes to the country's overall economic development [70].

A high level of digital inclusion, ensuring the effective and safe use of ICTs, leads to bring productivity gains to all economic activities, to stimulate the development of new processes and products, to increase wages and favour the career of workers who use them, to increase the accessibility to

collective services (health, education) and their efficiency, to enable individuals or organizations to extend their possibilities thanks to an easier access to information and even to democratize political life.

Epodoi (2003, as cited in Parsons, & Hick, 2008 [71]) states that ICT in education, government, environmental management, health, financial and private sectors has the potential to increase delivery of services and productivity in addition to raising living standards and transforming economies through development opportunities.

At the mega-level, digital inclusion will ensure the overcoming of economic and social inequalities between countries, which will contribute to the achievement of the Sustainable Development Goals.

In addition to the above, when identifying the essential features of digital inclusion as an object of evaluation, it is necessary considers a number of important, in our opinion, the circumstances described below.

First, digital inclusion as such cannot be seen as an end in itself, but should be a means of social change and is part of a broader concept of social inclusion that involves citizens and communities in various aspects of the digital society (socio-political aspect).

In view of this, its evaluation should take into account complex nonlinear convergent relationships that cannot be formalized using the traditional mathematical apparatus of clear logic and should use the latest methods used by specialists in behavioural economics – cognitive, causal, neural network modelling, etc.

Secondly, as mentioned above, digital inclusion is a complex multilevel phenomenon, so all its aspects that arise at the micro level (levels of individuals or individuals grouped by a certain typological feature), macro level (individual country levels) should be evaluated, intra-national disparities within

regions, rural and urban areas) and globally (within the OECD countries, between the industrialized countries and the less developed ones), as schematically shown in Figure 1.6.

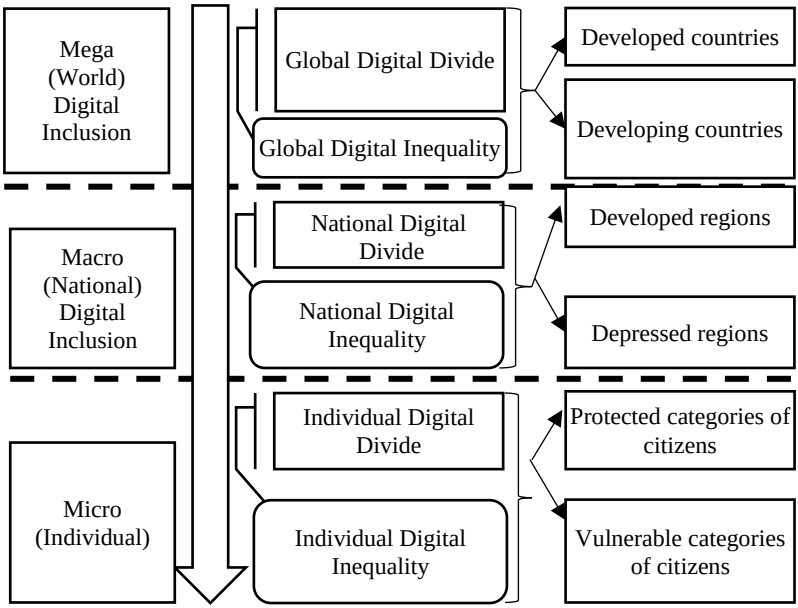

Fig. 1.6. Hierarchical approach to the digital inclusion concept

Source: developed by the authors

The level of digital inclusion in countries with economies in transition and in developing countries differs significantly from the level of digital inclusion in established economic systems in terms of characteristics, factors of formation and trends (global spatial aspect).

The level of digital inclusion may differ in different regions of the country, which may be a consequence of both unfavourable geographical conditions and low level of socio-economic development (local spatial aspect).

The results of a study by Reddick, et al. (2020) [72] demonstrate that the level of digital inclusion may differ not only in rural / urban areas but also in the intra-urban context in low-income areas, as they have significantly lower broadband access rates. The results of a study by Reddick, et al. (2020) demonstrate the importance of carefully studying the issues of social isolation of marginalized groups and the availability of broadband access within the city [72].

A significant number of determinants can lead to changes in the level of digital inclusion at the individual level, so to assess it should be developed specialized tools that take into account both quantitative and qualitative metrics.

In view of the above, the measurement of the level of digital inclusion should cover all hierarchical levels, which will allow obtaining the necessary analytical data for the application of regulatory tools that will ensure its increase to the target level.

Third, based on the variety of issues addressed in the context of increasing digital inclusion and key areas of digitization (economic, social, political and institutional), it should be measured using an appropriate integrated system of subsystems, highlighting its structural components, shown in Figure 1.6.

In view of the above, the measurement of digital inclusion should include both tools to determine its integrated level, covering all areas of digitalization of society, and have tools that determine the level of digital inclusion in a particular area of public life (e.g., digital financial or educational inclusion).

2. DIGITAL INCLUSION DETERMINANTS

Given the importance of ensuring digital inclusion for sustainable development, it is important to identify the determinants as the reasons that determine its actual level and trends. Digital inclusion is difficult because it is influenced by a large number of different forces and factors, which excludes the possibility of direct assessment and measures to influence it.

If we consider the determinants as the driving force, the cause of any process, phenomenon, the purpose of their study in the context of the formation of mechanisms and development of tools to increase the level of digital inclusion is:

- finding out the possibility of influencing the level of digital inclusion;
- determining the qualitative and quantitative impact on the level of digital inclusion;
- determining the possibility and ways to neutralize the impact of negative determinants;
- substantiation of the composition of measures to ensure the identification of opportunities and ways to enhance the impact on the level of digital inclusion of positive determinants.

The difficulty of studying the determinants of digital inclusion is that since there are a large number of such determinants, it is impossible to take into account and evaluate their entire set. Therefore, it is necessary to systematize the determinants of digital inclusion, which acts as an object of measurement and, as a result, the application of regulatory actions.

We propose to structure the determinants of digital inclusion according to the levels highlighted in the first section of the paper.

Much research has focused on macro-endogenous factors, the so-called forces that determine the level of digital inclusion (and, as a related phenomenon, the digital divide and digital inequality). According to Hsieh, et al. (2008) [73] force is a theoretical construction that is an influential mechanism of a higher order, which determines direct or indirect changes in the adoption and expansion of information and communication technologies and the Internet. They reflect the macro- and dynamic perspective and describe the factors that can change the quantity, quality and structural distribution of resources (meso-perspective) needed to access information and communication technologies and the Internet (micro-perspective) of citizens, groups of citizens or countries.

Forces promote or reduce digital inclusion and may involve a variety of socio-economic, political or cultural factors (Van Dijk, 2005 [27]).

The study found that in the context of assessing the level of digital inclusion, the most important are the socio-economic characteristics of countries and regions that may limit the motivation, skills and use of information and communication technologies and the Internet by citizens, groups or organizations. They indirectly measure digital inclusion, as they are potential triggers for the lag in the introduction of information and communication technologies, the development of the Internet and the emergence of digital gaps and digital inequality (discrimination).

Differences in socio-economic variables form the spatial aspect of digital inclusion, which is available both at the global (individual country level) and at the national (depressed regions, rural areas, individual urban areas, etc.) levels.

Researchers are actively researching the definition of social, political and economic determinants that determine the level of digitalization of society in general and digital inclusion in particular, especially in those geographical segments where

digital gaps are clearly identified (Ohemeng, & Ofosu-Adarkwa, 2014 [74]; Gilbert, & Masucci, 2020 [75]; Sujarwoto, & Tampubolon, 2016 [76]; Myovella et al., 2021 [77]).

Thus, Myovella et al. (2021) [77] determined that differences in demographic characteristics, as well as social, political and economic infrastructure, affect access to and use of information and communication technologies and the Internet. Researchers have shown that per capita GDP, gross capital, political stability, regulatory efficiency, and electricity infrastructure directly affect the digital divide. Moreover, GDP per capita, population growth, public consumption, open trade, and electricity infrastructure also indirectly affect the digital divide through spillover effects.

A fair amount of research is devoted to identifying the factors that influence the development and implementation of information and communication technologies and the Internet.

Xiaoming, & Kay (2004) [78] examined a number of factors that may have facilitated or hindered the Internet development in Asian countries. Their results show that GDP per capita, telecommunication infrastructure, urbanization and political stability correlate with Internet penetration in a country. In their opinion Internet development is more likely to be affected by economic factors rather than social and political factors [78].

Summarizing the scientific achievements, we systematized the predictors of digital inclusion as the appropriate characteristics of endogenous origin (Table 2.1).

Table 2.1. Characteristics of digital inclusion

Factors		Characteristics
Global		geographical location of the country; formation of specific attractiveness of regions for digitalization; dependence of economic growth on the level of economies of developed countries; dependence on the directions of economic policy of developed countries
Macro-level factors	Political	the type of power that prevails in the country, its stability and efficiency; the possibility of attracting support for digitalization policy from the state.
	Economic	achieved results and directions of economic development of the country. The key criteria are the level of GDP, GDP per capita, gross capital
	Social	social characteristics of the country's population that determine their ability and ability to use digital services. Important are: 1) indicators of the demographic component in terms of age, gender and regional structure of the population; 2) indicators of development of intellectual and social capital at the level of individuals and the country. The level of education within the population: literacy and school attendance; familiarity with computers; the number of schools, universities, training programs in computerizing; second language learning and practice (English in particular).
	Technological	level of development: 1) electricity infrastructure (important for underdeveloped countries); 2) reference (fixed infrastructure of broadband Internet access; mobile communication infrastructure and broadband access (3G, 4G, 5G); radio infrastructure (LoRaWan, etc.) for Internet of Things projects (sensors, sensors, etc.); radio infrastructure (primarily Wi-Fi) computing infrastructure (so-called cloud, or virtualized, infrastructure); cyber security infrastructure); 3) service infrastructure (identification and trust; open data; public services (e-government); e-commerce and e-business; life support; transaction processing, geoinformation infrastructure; industrial digital infrastructures); 4) infrastructure for attracting investments and access to capital for the implementation of digital transformation projects
Factors of the meso level	the level of digitalization of society as a whole and in its individual spheres (in interaction with the state, law enforcement agencies, between business entities, individual citizens). Criteria for the impact of these factors are the volume of demand and supply of digital services; market structure and saturation; affordability in terms of their value to the final consumer, etc.	

Source: Compiled by the authors.

All the determinants we have identified affect the level of digital inclusion to one degree or another, and the combination of minor factors can have a much greater impact than any one overriding factor. Studying their impact, in our opinion, will reduce the uncertainty of the environment. To do this, we have developed a classification that will analyse the main characteristics of certain factors (Table 2.2).

Table 2.2. Classification of factors-forces influencing digital inclusion

Indication	Types of factors
On the possibility of evaluation	Quantitative
By level of uncertainty	Qualitative
On the scale of influence	The degree of simplicity or complexity of the situation
By areas of influence	Factors that directly affect the level of digital inclusion Factors that indirectly affect the level of digital inclusion Factors of global world importance. Do not affect the level of digital inclusion
By time of exposure	Constant for a certain time interval; Temporary, manifested once, but have a significant impact on the level of digital inclusion
By the nature of the impact	Factors that positively affect the level of digital inclusion (stimulating factors) Factors that negatively affect the level of digital inclusion (factors - disincentives)
By potential impact	Extensive Intense
By type of digital divide	Factors forming the digital divide of the first level Factors forming the digital divide of the second level Factors forming the digital divide of the third level Factors forming the digital divide of the fourth level
By type of digital gap	Access gap Gaps in skills Gap in usage results The knowledge gap

Source: Compiled by the authors.

Digital inclusion macrofactors determine the quantity, quality and structural allocation of resources needed to access information and communication technologies and the Internet.

Micro-level determinants involve the definition of those features that characterize the individual characteristics of users of information and communication technologies and the Internet.

A significant number of studies have found that the level of digital inclusion through the parameters of access to information and communication technologies and the Internet, as well as the possibility of their active use is determined by demographic and socio-cultural and economic characteristics of individuals. They are the variables for assessing and establishing causal links between various indicators of social and economic development of communities and countries.

Among these characteristics, the key ones are income, education, race, gender, place of residence, age, availability of social support, variations in Internet use (leisure, study, work), political, religious, cultural and psychological barriers, etc. (Mun-cho, & Jong-Kil, 2001 [79]; McLaren, & Zappala, 2002 [80]; Judge, et al., 2006 [81]; Abdalhakim, 2009 [82]; Hilbert, 2010 [83], 2011 [84]; Jamil, 2021 [85]).

A number of scientific sources use the terms “vulnerable communities” or “marginalized communities” to define those groups of citizens who are excluded from the digital society for objective and / or subjective reasons. They are considered as groups of citizens who are socially excluded from using the Internet for various reasons, such as old age, physical or mental disabilities, lack of housing, poverty, inadequate education / lack of education. The digital divide among these vulnerable communities tends to be exacerbated by gender, race, ethnicity, and migration status.

Vulnerable communities in the context of digitalization also include residents of certain regions of the country (rural,

mountainous areas, remote areas, marginalized urban areas, etc.), who often face barriers to accessing information and communication technologies and the Internet.

In this context, the term “digital exclusion” is used to vulnerable citizens, individual communities, and countries as a socially disadvantaged state (in terms of education, qualifications, employment, specific social status, place of residence, etc.) due to lack of access, digital skills, motivation, tangible results from the use of information and communication technologies and the Internet (Plotychkina, 2020 [86]).

Consider the determinants of digital inclusion of the micro level in more detail.

Economic factors (variables), in particular, the level of income of an individual and the household to which he belongs, play a decisive role in ensuring the digital inclusion of an individual. Research and analytical reports confirm that in all countries of the world, regardless of their level of economic development, the level of digital inclusion in high-income populations is much higher than in low-income strata, which provokes economic digital divide and increases inequality in all its countries.

Parsons, & Hick (2008) [71] point out that many groups that comprise the populations living in poverty are unable to own a computer, and purchase the programs and tools to use it effectively, let alone have access to disposable income to connect to the Internet.

As indicated by Georgieva (2018) income and personal wealth are factors influencing the digital divide. Personal income is positively correlated to persistent digital technology infiltration rates, independent of age (Georgieva, 2018 [87]).

Results of research Mubarak, et al. (2020) support the hypotheses that incomes are positively related to ICT diffusion.

The findings statistically confirm that poverty is a leading cause of digital divide worldwide [88].

For example, in Australia in 2020, people in Q5 low-income households have a digital inclusion score of 43.8, which is 30.0 points lower than those in Q1 high-income households (73.8). Since 2014, this gap has been relatively constant – hovering between 29.9 and 30.9 points (Thomas, et al., 2020) [89]. In USA, households earning less than $20.000 have a broadband adoption rate of 62 %, those earning between $20.000 and $74.999 have an adoption rate of 83 %, and households earning more than $75.000 have an 85 % adoption rate.

Thus, the problem of digital inclusion among the poorest sections of the population, especially in low-income countries, cannot be solved without tackling poverty as such, and requires policy-making to ensure access to information and communication technologies and the Internet for these categories through appropriate social programs and stimulation of public initiatives and public-private partnerships.

Most studies use in-depth analysis of the impact of income on the level of digital inclusion and digital gaps using indicators of the distribution of total income by decile groups and differentiation of the main source of income (wages, social transfers, business income, property income, etc.).

As a separate component in this context scientists are analysing the employment gap. It is seen as the digital gap between employed people and those not in the labour force. For example, in Australia in 2020 is 13.5 points. This is wider than that recorded in 2014 (12.6 points) and in any of the intervening years.

Thus, the level and source of income of an individual has a decisive and multilevel impact on the level of digital inclusion. At the very least, they determine the emergence of the digital divide of the first level – the provision of physical and material access to information and communication technologies and the

Internet. In addition, these determinants largely determine the level of digital skills, variations in use and, as a consequence, the efficiency of digital technologies.

As example, employment in low-paid jobs (currently, or previously) can result in increasing concern about the cost of new technological devices that also produces an adverse effect on the ICT and Internet take-up (Friemel, 2016 [90]; Tan, & Chan, 2018 [91]).

To ensure digital inclusion, an individual's financial situation should be such as to provide for themselves and their dependents (if any):

- reliable access to Internet at adequate speeds;
- access to digital devices that meet the users' needs;
- access to digital skills training, technical support, and content, apps, and software.

It should be emphasized that the level of digital inclusion and the type of digital divide is determined what kinds of devices users can afford and maintain (Gonzales, 2016) [92], where they can access the Internet, e.g., whether they are depending on mobile data plans or access through an Internet service provider (Reisdorf, et al., 2020 [93]).

Correa, et al. (2020) [94] showed that mobile-only use does not necessarily lead to a more complete digital inclusion process because it was related to lower levels of skills and less diverse types of uses of the web compared to those people who also use the computer. They defined that the differences by access device partly occur because people have greater chances to develop skills when accessing the web through computers. Thus, the limited financial resources, those lead to access to the Internet exclusively through smartphones, although they increase the level of digital inclusion by bridging the digital divide of the first kind, do not provide bridging other digital gaps.

The level of costs associated with information and communication technologies and the Internet is important to ensure the proper level of digital inclusion. While the absolute cost of Internet data has one down, households are now spending more money on Internet services due to greater usage.

The line between information and communication technologies as a necessity and information and communication technologies as a luxury item is about $ 10 US per person per month or US $ 120 per year (West, et al. 2019) [95]. Since more than 40 % of the world's population lives on less than two US dollars a day, and about 20 % live on less than one US dollar a day (or less than 365 US dollars a year), these segments of income will have to spend a third their income (West, et al. 2019 [95]). In such conditions, it is indisputable that the level of income is decisive in the formation of digital gaps, and all types of inequality will only deepen.

According to the CAS (2018) [102] survey, two of the three most common barriers to respondents from using the Internet were financial; 18 % of respondents reported that broadband costs are a barrier; 17 % of respondents said that the cost of telephone and data transmission is a barrier.

An additional predictor that belongs to the group of economic, and affects the level of digital inclusion, is the availability and characteristics of housing. In this context, for an in-depth study of digital inclusion, differentiate between types of housing such as rented housing (public / social or private) or the availability of owned housing.

It should be noted that the homeless widely use information and communication technologies on the Internet; almost the same as the population that has housing, but their experience of use (and barriers) are different.

Thus, it has been determined that economic factors play a decisive role in shaping a certain level of digital inclusion, the

better the economic conditions of an individual, the higher the level of his participation in the digital society.

Based on the results of the study of works on the study of the determinants of digital inclusion, we found that the role of education in providing access, direction and efficiency of information and communication technologies and the Internet is actively discussed.

Education in the global context is seen as an area that determines the high level of digital inclusion, as it provides bridging the digital divide of the second, third and fourth levels beyond the technical perspective and easy access to information and communication technologies and the Internet; promotes their use with critical awareness (Freire, & Macedo, 2005 [96]).

In the transition to the sixth technological mode and the associated application of both existing and new technologies of Industry 4.0 (Internet of Things, artificial intelligence, big data analytics, robotics, cloud computing, virtual and augmented reality, etc.) requires the availability of labour and consumers of digital services who have the necessary digital skills, understand the risks associated with information and communication technologies and the Internet, and can use them effectively.

It should be borne in mind that the role of education in ensuring a high level of digital inclusion at the individual level is a multifaceted and multilevel concept.

Primary in this is the presence of users of education as such, which allows them to be included in all processes, including digital, in society. That is, literacy is a prerequisite for the use of information and communication technologies and the Internet. Lack or lack of education creates barriers for citizens to use information and communication technologies in everyday and social life.

The study by researchers at the National Centre for Social and Economic Modelling (NATSEM) found that, with all else being equal, educational attainment of an individual was a stronger predictor of having home computers and the Internet than income (Lloyd, R., & Hellwig, 2000 [97], as cited in McLaren, & Zappala, 2002 [80]). Individuals with a university education were 2.5 times more likely to have home access to the Internet than those without.

Vodoz, et al. (2007) found that individuals with high education levels are likely to adopt digital technologies faster than people with low or no education at all [98].

The role of education in the context of digitalization and ensuring a high level of digital inclusion is different – in countries with low levels of economic development the problem of overcoming illiteracy remains acute, in developed and transition economies where illiteracy is virtually overcome, there is a significant need for digital education, especially for vulnerable groups.

For example, in Bangladesh, the number of Internet subscribers, mobile and computer users, and literacy rates have increased significantly in recent years, but about a third of the population is illiterate (Islam, & Inan, 2021) [99]. Illiterate people are unable to use services based on information and communication technologies and are excluded from the digital society.

Thus, the task of ensuring the appropriate level of digital inclusion will require, first of all, the provision of basic education to this category of the population, and on this basis – the formation of the minimum required level of digital skills. With the active spread of digital technologies, it is possible that a semi-literate person will interact on the Internet, including content on the Internet in several languages, which in turn will increase human literacy in all these languages.

To ensure a high level of digital inclusion, education is a critical determinant of the effective and secure use and benefits of information and communication technologies and the Internet, and will increase its importance for the development of appropriate digital skills and the ability to make strategic choices for privacy and security.

Individuals, communities and countries benefit from the use of information and communication technologies and the Internet without increasing information risks, when they all have the skills to use them and a high level of digital literacy, i.e. the knowledge gap has been bridged. It should be borne in mind that the factors of access to information and communication technologies and the lack of digital skills required for their use are intensified due to interaction and interdependence.

The knowledge gap combined with the lack of material and technical resources at the level of an individual, community or country will only increase the existing economic and social disparities and information threats.

The language plays a unique role in the educational component of the determinants of digital inclusion. The importance of the language factor is because it is the basis for the transfer of information and knowledge. Given this, the ability to use the native language when using information and communication technologies and Internet access determines the level of access to new knowledge.

An analysis of w3techs.com found that about two-thirds of the world's website content was created in English, German, Russian, Spanish and French, with about 6,000 languages in the world. As an example, in Scotland, part of the older generation use Gaelic, which has limited language support online.

The language that currently dominates as the language of the Internet and software and hardware for computer and

telecommunications is English. The positive thing in this context is that its role is gradually declining. Thus, in the mid-1990s, 80 % of content was created in English, while in 2018 this figure dropped to 53.4%. Nevertheless, low level of English language skills can create fear in front of new technology, since most of the ICT, as well as many websites, are in English by default (Tan, & Chan, 2018 [91]).

The language determinant of digital inclusion may increase the vulnerability of users such as migrants, for whom language proficiency plays a key role in online activity, including political, economic, social activity primarily related to access to public, social and medical services, education, etc.

In view of the above, long-term state support for the development of the country's intellectual capital, which requires significant investment in education and the development of digital skills, is a mandatory requirement for increasing the level of digital inclusion. This includes the formation of a set of measures to improve the digital literacy of citizens through permanent partnerships with educational institutions, the creation of free online educational portals, as well as the introduction of incentives to encourage private initiatives to establish centers, courses, educational resources and more.

Educational institutions must be transformed into effective centers for the transfer of knowledge and technology to increase the digital inclusion of citizens and communities in order to combat information threats and information wars, ensure social stability, unity, cohesion and resilience of communities and the country as a whole.

Thus, education has a decisive influence on the level of digital inclusion of an individual. Primary in this is the presence of a certain type of education as such – the higher its level, the more actively the individual enjoys the benefits of information and communication technologies. At the same

time, special attention needs to be paid to the level of digital literacy of citizens as the ability to use digital technologies effectively and without the threat of increasing information risks.

An important determinant of the level of digital inclusion of an individual is his place of residence (urban-rural or infrastructural digital divide / inclusion). In this context, locations where some or all citizens have constant unequal access and ability to use information and communication technologies are studied.

Issues of digital exclusion on this basis are quite actively studied in the formation of general approaches to identifying and mechanisms for bridging the digital divide and assessing the digital inclusion level within countries and regions.

The main differences in digital inclusion are observed between urban and rural areas. Thus, researchers have found that despite the proliferation of Internet access and the achievement of high penetration rates in both developed and developing countries, the digital divide between cities and villages remains significant. (LaRose, et al., 2011 [100]; Correa, & Pavez, 2016 [44]; Salemink, et al., 2017 101). Worldwide, 72 % of households in urban areas have access to the Internet at home, almost twice as many as in rural areas (38%).

As an example, the use of the Internet is lower in rural Scotland than in the rest of the United Kingdom (CAS, 2018) [102]. 18 % of adults in the Highlands have never used the Internet, and 37 % of households in Scotland do not have a broadband speed of at least 10 MB.

Connectivity gaps in rural areas are severe in the least developed countries as Niger, Central African Republic, South Sudan, Chad, Burundi, Sierra Leone, Burkina Faso, Mali, where 17 % of the rural population live in areas with no mobile

coverage at all, and 19 % of the rural population is covered by only a 2G network.

The main differences between urban and rural areas that lead to the digital divide are the low level of digital infrastructure development (Park et al., 2019) [103], in particular, the insufficient pace of implementation and use of broadband Internet. Getting the most out of digital applications and information and communication technologies requires a high-speed Internet connection (Broadband Commission, 2017 [104]; UIT, 2018 [105]). Although a mobile broadband network covers all urban areas virtually, rural areas still have limited Internet access.

In addition to technological aspects, Internet access is cheaper and faster in urban areas than in the countryside. Higher numbers of skilled and knowledgeable workers are available for support in technical issues (Georgieva, 2018) [87].

In addition to differences in the digital inclusion level between cities and villages, digital gaps may occur in remote areas, stigmatized or marginalized areas, and war and conflict areas. Sanders (2020) [49] based on the Citizens Advice Scotland survey (2018) [102], showed that only 19 % of respondents from the most deprived areas were able to use a computer at all; 51 % of respondents living in the most deprived areas reported never using the Internet, in comparison to only 8 % of respondents living in the least deprived areas.

In a regional context, Internet penetration is limited to the denser and less distant areas for economic reasons – sufficient market size is required to take advantage of investments – and technical reasons, mainly the distance from the local central office to home tDSL technology.

In this respect, there are three different types of territories:

- towns which size and density justify private financing in specific broadband infrastructures (cable, optical fibers,

local radio loop) or which have broadband access via the telephone network (DSL technology) through competitive operators;

- "grey" areas with broadband access via only one operator, more often the incumbent operator. Their size and density are not sufficient enough to recoup private investments in alternative networks. Access is not the problem but the cost of this access due to lack of competition;
- rural areas are not served either by DSL technologies due to distance or lack of equipment or alternative technologies for lack of profitability (Rallet, & Rochelandet, 2007) [57].

Researchers in studying the causes of urban-rural or infrastructural digital identify factors that are directly related to the characteristics of the place of residence and contextual and individual characteristics (Correa, & Pavez, 2016) [44].

The main factors influencing the decline in digital inclusion in certain geographical regions are the lack of the necessary digital infrastructure and economic and educational resources (Correa, & Pavez, 2016 [44]). In rural areas, especially in the isolated, the level of poverty is higher, the level of education is lower (Correa, & Pavez, 2016) [44], and the outflow of the population is primarily young.

In addition, other factors need to be considered, including the motivation of citizens' needs, social and cultural contexts (Correa, & Pavez, 2016) [44].

Individual factors influencing the introduction of digital technologies in rural and remote communities include innovation, personal qualities and user motivation (Correa, & Pavez, 2016) [44].

Contextual factors include interpersonal networks and community characteristics (Correa, & Pavez, 2016) [44]. However, it is necessary to investigate the interaction of both aspects, especially how individual characteristics interact with the socio-cultural environment.

Correa T., Pavez I. (2016) [44] have identified the following contextual predictors that reduce the level of digital inclusion: geographical features that shape people's personalities and their attitudes to new experiences, including digital technologies; the age structure of the population and its aging, as the share of young people who are a relevant agent of socialization of technology decreases; features of economic activity do not encourage citizens to actively use digital technologies. It should be noted that the conclusions about the influence of the geographical factor are not unambiguous. If studies assess the impact of education and income, the impact of the geographical factor decreases. This provides a basis for concluding that geographical differences in the level of digital inclusion are a function of the basic socio-economic characteristics of the population of these regions, in particular, lower income, education and skills of the latter.

Therefore, in order to bridge the digital divide in the geographical context, it is necessary, in addition to overcoming purely technological infrastructure problems, to intensify educational activities to increase the level of digital literacy and the formation of digital skills.

A significant amount of research is related to the problems of digital inclusion, taking into account the age, especially of the elderly (age digital divide) (Loges, & Jung, 2001 [106]; Enoch, & Soker, 2006 [107]; Abbey, & Hyde, 2009 [108]; Berry, 2011 [109]; Ballano, et al., 2014 [110]; Neves, et al., 2018 [111]; Elena-Bucea, et al., 2020 [112]; Chen, et al., 2020 [113]; Safarov, 2020 [114]; Adamczyk, & Betlej, 2021 [66]).

The importance of taking this determinant into account is a consequence of the global trend of population aging in developed and developing countries. In addition, attention to this determinant is also explained by the fact that many predictors of digital inequality often accumulate in the elderly group, creating numerous cross-sectoral vulnerabilities.

It is widely believed that older people tend to have lower computer skills (although this is not always the case) and computer skills (although this is not always the case). In addition, the elderly may experience declining incomes due to retirement and deteriorating health due to a higher likelihood of chronic illness and disability (Gracia, & Herrero, 2009) [115].

The results of numerous studies confirm that the digital inclusion of this category is at a lower level compared to young people. Elderly people consistently account for the largest share of users who do not use the Internet (Serafino, 2019 [40]). The Citizens Advice Scotland survey (2018) [102] showed that of the respondents aged 65 to 79:

- 46 % have never used the Internet;
- 18 % have difficulty using a computer;
- 16 % cannot use a computer at all.

Van Deursen, et al. (2011) have established age have a negative influence on medium-related skills, however, there is a positive contribution to the level of content-related skills, meaning that older generations perform better than the younger. Unfortunately, they are impeded by their low level of medium-related skills in such a way that the actual result is negative [116].

It is clear that there are objective circumstances that reduce the involvement of older people in the digital society. As note Georgieva (2018) [87] older users are less familiar with the technology, and their ability to adopt new technology depends on their willingness, computer self-efficacy, and dependence on prior knowledge. They have lower confidence in their own cognitive abilities, often acting as a self-fulfilling prophecy when adopting new technologies (Georgieva, 2018) [87].

At the same time, the disadvantage of a significant number of studies in this area is that older people, who are considered the least prone to the use of technology (weak, dependent on care, with low socio-economic / educational environment), are

usually described as a single cluster (Neves, et al., 2018 [111]). At the same time, we fully agree with the conclusions of scientists that to identify the age determinant of digital inclusion without its in-depth study and taking into account other factors is impractical.

Adamczyk's (2016) [117] conclusion is important that this social stratum is characterized by a high degree of heterogeneity in health, intellectual and physical fitness between people aged 60-75 and a group of people aged 75-85 and the oldest, i.e. over 85 years.

The age between 60 and 75 (the so-called third age) is a period characterized by much greater activity, independence and ability to work than the fourth age (75-85 years), when dependence on others and the need for care appear much more often (Adamczyk, 2017 [118]). In the fourth age, the incidence of various somatic and mental diseases increases significantly, respectively, the digital divide is deepening.

Based on a representative survey in Switzerland (N = 1105), it is found that Internet use is strongly skewed in this age group leading to a partial exclusion of the old seniors (70+). Logistic regression shows that gender differences in usage disappear if controlled for education, income, technical interest, pre-retirement computer use and marital status. Furthermore, the social context appears to have a manifold influence on Internet use. Encouragement by family and friends is a strong predictor for Internet use, and private learning settings are preferred over professional courses. Implications for digital inequality initiatives and further research are discussed (Safarov, 2020) [114].

The positive impact of ICT use include better control over life, independence, reduced isolation and increased social connectedness to friends and relatives, higher access to electronic services (e-health, e-government), information and learning, positive physical and mental health outcomes, as well

as better chances to find employment or volunteering opportunities (Safarov, 2020) [114].

Thus, in general, age negatively affects the level of digital inclusion. Citizens of this category are particularly vulnerable to information risks, although they actively need access to digital services (government, social, medical, financial). Because of the above, such a component of the state's educational policy as adult education needs to be intensified in raising the level of digital skills of elderly citizens.

According to the study of digital inclusion and digital gaps, the presence of a gender determinant (digital gender gap) was determined. These issues are actively explored in the scientific literature (Liff, et al., 2004 [119]; Sørensen, & Lagesen, 2011 [120]; Hilbert, 2011 [121]; Roux, & Dalvit, 2014 [122]; Antonio, & Tuffley, 2014 [123]; Martínez-Cantos, 2017 [124]; Kuroda, et al., 2019 [125]; Mariscal, et al., 2019 [126]; Pawluczuk, et al., 2021 [127] and others) and is subject to state regulatory influence and public initiatives.

Bridging the existing gender digital divide is crucial in the global effort to achieve the United Nations Sustainable Development Goals: "to enhance the use of enabling technology, particularly information and communication technologies, to promote women's empowerment".

Research has shown that worldwide, especially in developing countries, women lag in access to information and communication technologies and the Internet, and the lower the penetration of the Internet in the country as a whole, the more significant the gap in its use by women compared to men.

Hilbert (2011) defined that fewer women access and use ICT due to their unfavourable conditions concerning employment, education, and income. When controlling for these variables, women become more active users of digital tools than men [121].

According to Mariscal et al. (2019), barriers to women's digital inclusion are the cost of devices and services, lack of connectivity, lack of access to a device, and low literacy and lack of digital skills. In several developing countries, the digital gender divide is due to socio-cultural factors such as gender-biased belief and value systems that impose restrictions on women's education and free mobility (for example, banned from using mobile phones) [126].

This turns the alleged digital gender divide into an opportunity: given women's affinity for ICT, and given that digital technologies are tools that can improve living conditions, ICT represents a concrete and tangible opportunity to tackle longstanding challenges of gender inequalities in developing countries, including access to employment, income, education and health services (Hilbert, 2011) [121].

Existing gender gaps in digital inclusion, if not adequately addressed, are likely to lead to gender inequalities in many other areas, including inequalities in labour markets and minor financial inclusion of women (Mariscal, et al., 2019) [126]. If existing digital divides are addressed, particularly in low and middle-income nations where the digital gender gaps are the largest; a leapfrogging process towards development could be experienced (Mariscal, et al., 2019) [126].

Thus, there is digital discrimination against women, but with an increase in their level of education, including through the active role of the state in digital education, this type of digital divide can be reduced.

Many researches have been done on the digital inclusion of people with disabilities (Dobransky, & Hargittai, 2006 [128]; Fox, 2011 [129]; Duplaga, 2017 [130]; Tsatsou (2020) [131]). People with physical disabilities include the chronically ill and the disabled, and HIV / acquired immunodeficiency syndrome. This population also includes people with chronic mental illness such as schizophrenia, bipolar disorder, major

depression, attention deficit/hyperactivity disorder, and people with a history of alcohol and / or substance abuse, and those who are suicidal or prone to suicide or homelessness.

People with poor self-rated health used Internet much less; and this relationship remained statistically significant even after taking into account other factors, such as gender, age, and marital status (Gracia, & Herrero, 2009 [115]). A similar tendency has been observed in relation to depression (Bauer, et al., 2017 [132]), social isolation, anxiety, and stress (Forsman, & Nordmyr, 2017 [133]).

In 2017, 56 % of adult Internet users were not disabled. Although the percentage of adults with disabilities who do not use the Internet has decreased, in 2018 it was 23.3% compared to only 6.0% of people without disabilities (Serafino, 2019). Ofcom data show that 47.7 % of respondents who are not Internet users have a long-term illness, disability, or physical weakness (Sanders, 2020 [49]).

If we consider disability as a single factor, it is clear that the higher the degree of disability and severe health problems, the lower the level of digital inclusion (Henshaw, et al. (2012) [134]; Gracia, & Herrero, 2009 [115]; Ofcom, 2015 [135]; Duplaga, 2017 [130]). Jaegar (2012) describes the Internet as "inherently unfriendly" to people with many types of disabilities, with barriers to access and use that depend on the type and degree of disability (Jaeger, 2012) [136].

The presence of a disability can have consequences that deepen the digital divide in this category, particularly the lack of financial resources or skills and tools that would allow them to take full advantage of access to information and communication technologies and the Internet (Duplaga, 2017) [130]. In addition, the digital divide of this category of citizens may be exacerbated by other types of deprivation, such as low socioeconomic status, dependence on family members, or social support (Duplaga, 2017) [130].

It should be emphasized that several determinants of digital inclusion (socio-demographic, economic, and professional) of people with disabilities correspond to the trends observed among the general population. The level of digital inclusion of people with disabilities has a positive effect on young age, living in cities, higher education, employment of others (compared to the self-employed, unemployed, retirees), and high level of income [130].

The main barriers to Internet access for people with disabilities, according to a study of the population with disabilities in the UK (Consumer Expert Group, 2009) [137], have been identified as low income or unemployment.

Professional status is an essential determinant of the use of the Internet by people with disabilities because of its relationship with economic status and the ability to access information and communication technologies and the Internet in the workplace (Consumer Expert Group, 2009) [137].

People with physical disabilities are often deprived of the ability to communicate online, as not all computers are adapted to the needs of the visually or hearing impaired, and only a small percentage of sites are equipped with audio programs for text or graphics.

Important individual characteristics that affect the level of digital inclusion are race, ethnicity, and migration status.

It should be emphasized that the impact of these features on scientists' research results is not always unambiguous.

Thus, Haight, et al. (2014) found that migrants have, on average, lower levels of education and income than nationals, which, combined with low levels of language proficiency, can lead to digital gaps and reduced digital inclusion [138].

Alam, & Imran (2015) defined there is a digital divide among refugee migrant groups and it is based on inequalities in physical access to and use of digital technology, the skills

necessary to use the different technologies effectively and the ability to pay for the services [139].

At the same time, some studies have found that migrant status can be a significant motivating factor for the development of information and communication technologies and the Internet (Acharya, 2016 [140]; Gonzalez, & Katz, 2016 [141]) as a tool of communication and compensation for the lack of social contacts in the process of assimilation.

Belonging to ethnic and national minorities is also a personal determinant that reduces the level of social inclusion. (Mesch, 2018) [142].

Research by Alvarez's (2003) [143] found that half of the lower IT access rates of African American's reflect lower incomes and levels of education, but that about half of the 20-point lower access by African American's still remains after these status and other demographic characteristics are taken into account.

White (90 %), Asian American (94 %), and Latino or Hispanic (86 %) households all have broadband adoption rates above the national average (84 %), but Black households have a lower adoption rate (82 %).

To ensure digital inclusion, special attention needs to be paid to those categories of citizens who are characterized by cross-combinations of the above determinants (gender, race, age, health problems, low income, etc.).

The generalization of the connections of macro- and microdeterminants of digital inclusion is presented in Figure 2.1.

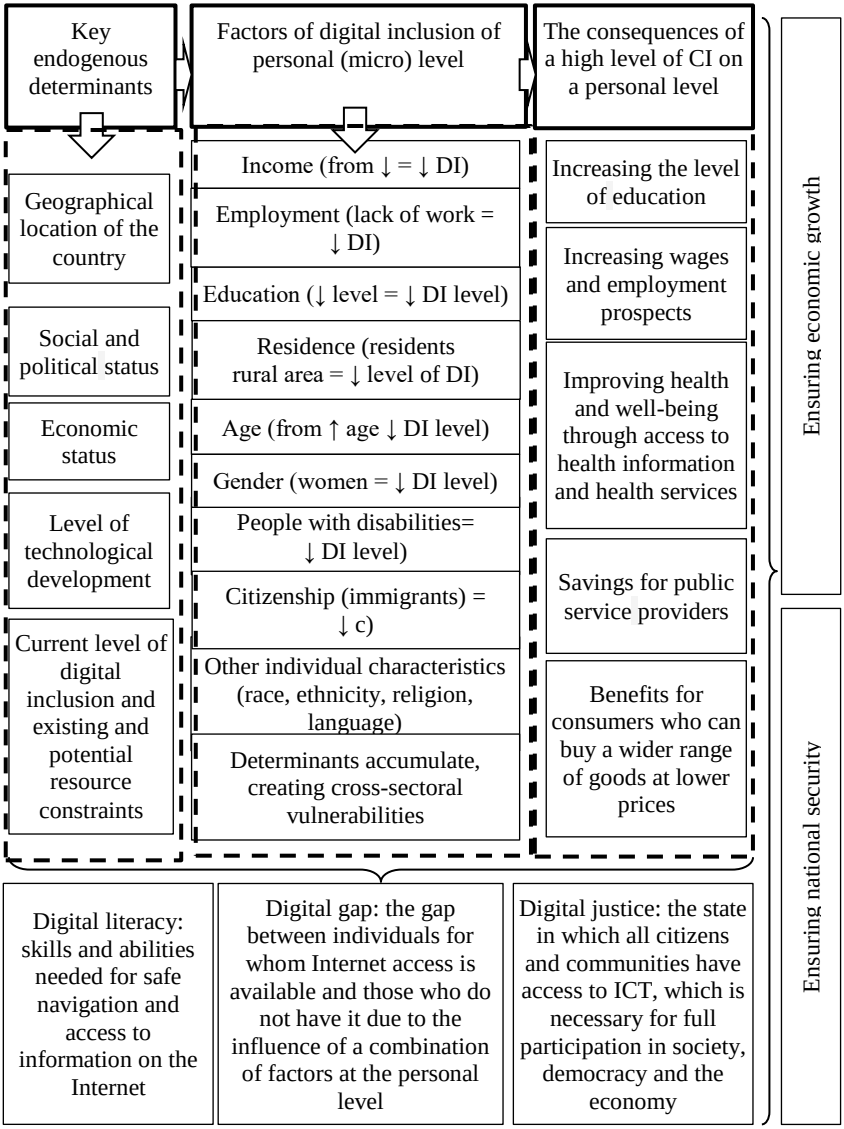

Fig. 2.1. The digital inclusion (DI) concept: macro- and micro-level determinants and key terms

Source: developed by the authors

In our opinion, the model of digital user profiles developed by Mariën, & Baelden (2015) is of interest [144].

The model includes eight user profiles that cover the entire continuum of digital inequality: digital outcasts, hopelessly undigital, digital fighters, smoothle digital, digital all-stars, unexpected digital masters, unexpected digital drop-outs, digital self-excluded.

Profiles are constructed according to social risk factors (income, education, participation, and agent). Researchers also included the impact of digital barriers (access, motivation, digital competences, flexible skills, autonomy, and social support). The model emphasizes that the effects of digital exclusion mechanisms go beyond socially and economically vulnerable groups [144].

The determinants described above affect the resources available to the individual – the theoretical construction of the meso-level, which includes financial, material, human resources and other assets that they can use to access information and communication technologies and the Internet. According to Van Dijk (2005) [27] approach, they include:

- material resources: funds and property that can be exchanged for equipment, services, and other items those provide access to information, communication technologies, and the Internet. For example, the availability of a laptop means material access, while the availability of funds for its purchase refers to the factor of material resources;;
- intellectual resources determine general literacy, knowledge and cognitive abilities that provide support for intellectual and motivational access to information and communication technologies and the Internet. For example, general literacy is a critical asset (intellectual resources) needed to understand online health materials (intellectual access);
- psychological resources – is the perception and attitude to information and communication technologies and the

Internet, such as self-efficacy, confidence and other psychological and subjective elements, which mainly contribute to motivational access;

- social resources include social capital or social identities that can be exchanged for different types of access. For example, if a citizen belongs to social networks on the Internet or outside it (social resources), he more often receives assistance in the use of information and communication technologies and the use of the Internet (social access);
- space-time resources are available time and space to support social access and the adoption of information and communication technologies and the Internet. Time and space are socially constructed factors that largely threaten the digital divide. For example, compared to those working in construction, those working in education have more time and opportunities to access information and communication technologies and the Internet;
- industry resources describe the resources provided by information and communication technology providers needed to support different access. These include product training and customer service;
- public resources determine the viability of broadband access, public digital services and similar infrastructure that supports resources and different types of access, especially material and intellectual.

These factors affect access to information and communication technologies and the Internet, which requires ownership of resources, rather than actions, so that the user can use them.

The problem of digital inclusion in this context is a consequence of the lack or limited access to a certain type of resource. In other words, access is defined as a theoretical construction that describes the micro-reasons for the adoption

of information and communication technologies, the Internet and as a result of digital inclusion (Van Dijk, 2005) [27].

According to research (Van Dijk, 2005) [27], access to information and communication technologies and the Internet is derived from material, intellectual, motivational and social access. As a rule, each of them requires the adoption of information and communication technologies and the Internet and possible digital inclusion. At the same time, it should be emphasized that access is a necessary (but insufficient) condition for digital inclusion.

Motivational access is defined as the desire to adopt and use information and communication technologies and the Internet through the acquisition, ownership and continuous learning or improvement of digital competencies. Motivation is often singled out as the most significant, sustainable and most difficult barrier to digital inclusion to overcome (Sanders, 2020 [49]).

At the same time, as the results of the study show, the issues of motivation for the use of information and communication technologies and the Internet are debatable. Thus, van Dijk (2005) [27] argues that the desire to have a computer and an Internet connection precedes physical and material access. Thus, many citizens excluded from the digital society do so for certain personal motivational reasons, rather than for lack of a particular type of resource. Grates et al. (2019) in the discussion on motivational access argue that the use of information and communication technologies and the Internet is usually a personal decision based on preferences and motivation [145].

According to the Sanders (2020) [49] the main reasons for demotivation are:

- this is not for me – individuals who do not see the need or benefits of using information and communication technologies and the Internet;

- I do not have the proper support to access the Internet, or use a digital device or program;
- It's too difficult – people who lack not only basic digital skills, but also an understanding of how the Internet works.

For example, the apparent complexity of using a device or a particular online service can demotivate citizens to use it. Several studies have concluded that lack of awareness of features and lack of interest in technologies of one kind or another lead to the fact that older people accept and use them to a lesser extent.

Research in the field of social psychology identifies problems of technophobia (fear of technology), computer self-efficacy (confidence in the individual's ability to use information and communication technologies and the Internet), and distrust of technologies that can repel the use of the Internet.

An important motivational barrier is the lack of trust both in information and communication technologies and the Internet in general, and in digital service providers, in particular (Beldad et al, 2010) [146].

To ensure an appropriate level of digital inclusion, it is necessary to create a set of incentives to overcome motivational barriers, in particular, developers of digital technologies and products should pay more attention to user characteristics, needs and preferences to increase their acceptability for all categories of citizens, regardless of personal characteristics. In addition, the educational community should support the development of digital skills in the use of devices and programs.

Assess the motivation of individuals to use information and communication technologies and the Internet is offered as an example in the following areas:

- Computers and technology give me more control over my life.

- I am interested in being able to access the Internet wherever I am.
- I go out of my way to learn everything I can about new technology.
- I find technology is changing so fast, it's difficult to keep up with it (negative).

Physical and material access determines the ownership of, or permission to use, various devices, such as computers, smartphones and tablets, Internet connections, and other technologies. Also the concept of material access comprises other types of access that are required to reach complete disposal and connections such as conditional access (subscriptions, accounts, and pay-per-view).

It should be noted that physical access is not equal to material access, which includes all costs associated with the use of computers, connections, peripherals, software and services. These costs, depending on the various characteristics and specifics of the use of information and communication technologies, can vary significantly. Accordingly, the availability of physical access does not exclude the situation that the individual will not have material access to information and communication technologies and the Internet.

According to this determinant is estimated: the availability of Internet access, places of Internet access (at home, at work, in school, in public institutions, etc.), the number of Internet products used by the individual. Recent studies have measured the digital divide not in terms of technological devices, but in terms of the existing bandwidth per individual (in Kbit/s per capita) (Mann, & Hilbert, 2020 [147]). The digital divide in Kbit/s is not monotonically decreasing, but re-opens up with each new innovation. For example, "the massive diffusion of narrow-band Internet and mobile phones during the late 1990s" increased digital inequality, as well as "the initial introduction

of broadband DSL and cable modems during 2003-2004 increased levels of inequality" (Mann, & Hilbert, 2020) [147].

This is because a new kind of connectivity is never introduced instantaneously and uniformly to society as a whole at once, but diffuses slowly. During the mid-2000s, communication capacity was more unequally distributed than during the late 1980s, when only fixed-line phones existed. The most recent increase in digital equality stems from the massive diffusion of the latest digital innovations (i.e. fixed and mobile broadband infrastructures, e.g. 3G and fiber optics FTTH) (Rouse, 2016) [148].

Thus, according to Rallet, & Rochelandet (2007) the determination of the material access is unstable as the Digital Divide notion is changing with the technology: it was initially necessary to measure the gaps in computer equipment rates, then in Internet connection rates, and nowadays in access rates to broadband networks [57];

1) used computer technology: personal computer or tablet computer in the household; mobile Internet technology or fixed Internet technology. At present, considerable attention in providing physical and material access is paid to smartphones as technologies that can potentially reduce the gap in digital access. Smartphones offer a more affordable way to access the Internet than computers, when using only simple applications that require a small amount of data. These digital devices are an effective alternative to bridging the digital divide for vulnerable groups and citizens of developing countries. However, it should also be borne in mind that smartphones cannot replace computers because they do not provide the benefits of using information and communication technologies and the Internet that provide computers due to the inability to use a number of modern programs;

2) relative expenditure, measured as the share of household income spent on Internet access (mobile phone, mobile broadband, and fixed broadband).

Intelligent access refers to the possession of direct intellectual abilities and digital literacy to support the adoption of information and communication technologies and the Internet.

Social access means having the necessary social identities, social relations or social conditions that are directly necessary for the adoption of information and communication technologies and the Internet (for example, membership in a library).

Forces, resources, and access are macro-, meso-, and micro-causes or factors that affect the digital divide (i.e., the causes of the digital divide). Forces can change the quantity, quality and structural distribution of resources that individuals have, which in turn shapes the access needed for digital inclusion or the adoption of certain technologies.

3. THE COVID-19 INFLUENCE ON THE DIGITAL INCLUSION OF THE POPULATION

Today, in addition to the traditional determinants of digital inclusion described in the previous section, the digital inclusion of the population is affected by the crisis caused by the current coronavirus pandemic (COVID-19) caused by SARS-CoV-2 (2019 – present) (pandemic crisis, COVID-19 crisis).

It is reasonable to define the features of its course and the consequences it had on public life to determine its impact on the digital inclusion of the population.

First of all, it should be stressed that COVID-19 is an extremely contagious infectious disease caused by severe acute respiratory syndrome coronavirus (SARS-CoV-2). Its spread has had a devastating impact on all the key development indicators of countries.

The direct impact of the pandemic is primarily deterioration in demographic indicators (increased morbidity and mortality). As of October 2021, there were 244.5 million reported cases and more than 4.9 million deaths worldwide as a result of the disease [149]. The pandemic is being defined as the most serious global health crisis since the Spanish influenza pandemic of 1918.

New waves of pandemics in most countries of the world, especially those with low levels of vaccination, are leading to a global health crisis and further deterioration of macro-development indicators.

In the context of the study, we are primarily interested in changes in economic and social indicators, which in turn determine the level of digital inclusion of the population.

When considering the impact of a pandemic crisis on factors of economic origin, we believe it is appropriate to draw on the Sanchez approach (2020) [150].

Table 3.1. Phases of the coronavirus crisis

THEME	PHASE 1	PHASE 2	PHASE 3
	Extreme anxiety and uncertainly	Continued uncertainly, but with some clues	Impact better understood: some signs of normalising
Market focus	The indiscriminate selling of risk assets and the hoarding of safe assets; Unprecedented market moves: panic; high volatility; bear market; liquidity premiums; Investors in a conflicted position of being too late to exit the market and too early to buy back in. ("Too late to exit and too early to enter") Expecting volatility and downside pressure	Elevated volatility A bottoming-out process and likely will accompanied by opportunities to capture market upside	A resumption of business activity and an increase in consumer consumption Normalized and favourable market conditions: low volatility; low interests rates; favourable sentiment and positioning
The response across of government and in the private sector	Social distancing, travel shutdowns, restaurant closures and working from home policies	Progress towards global containment of the coronavirus Success of government responses: health, monetary, fiscal	Monetary stimulus and fiscal policy package, monetary intervention to control the balance of payment and exchange rate, policy rate cut and total economic stimulus. Increased government debt burden

Source: Developed by the authors based on Sanchez, 2020

We agree with Sanchez (2020) that the COVID-19 pandemic has caused extreme uncertainty with a response to an event that was entirely unforeseen with high impact, what influenced all spheres of public life of the countries of the world. Herewith a black swan event, characterized by some observers as an "unknown unknown", occurred on a global scale.

The dynamics confirmed the unprecedented growth of uncertainty, the World Pandemic Uncertainty Index (WPUI) [151], as shown in figure 3.1.

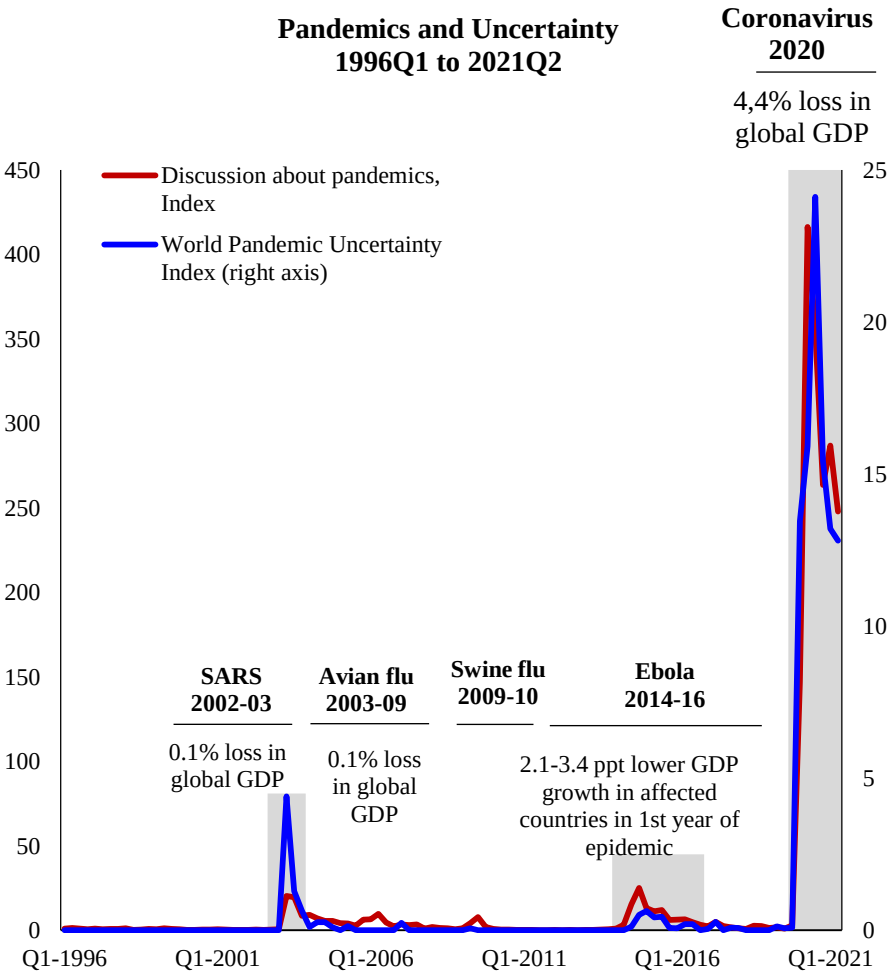

Fig. 3.1. Dynamics of the World Pandemic Uncertainty *Index (WPUI) for 1990-2020*

Source: Ahir, Bloom, & Furceri, 2018; https://worlduncertaintyindex.com/data/

The data in Figure 3.1 show the current ultra-high uncertainty level generated by the COVID-19 pandemic, which is three times higher than during the SARS epidemic and 20 times higher than during the Ebola epidemic during peak periods.

The pandemic uncertainty resulted in the increase in the global level of uncertainty determined by the World Uncertainty Index (WUI), which is clearly shown in Figure 3.2.

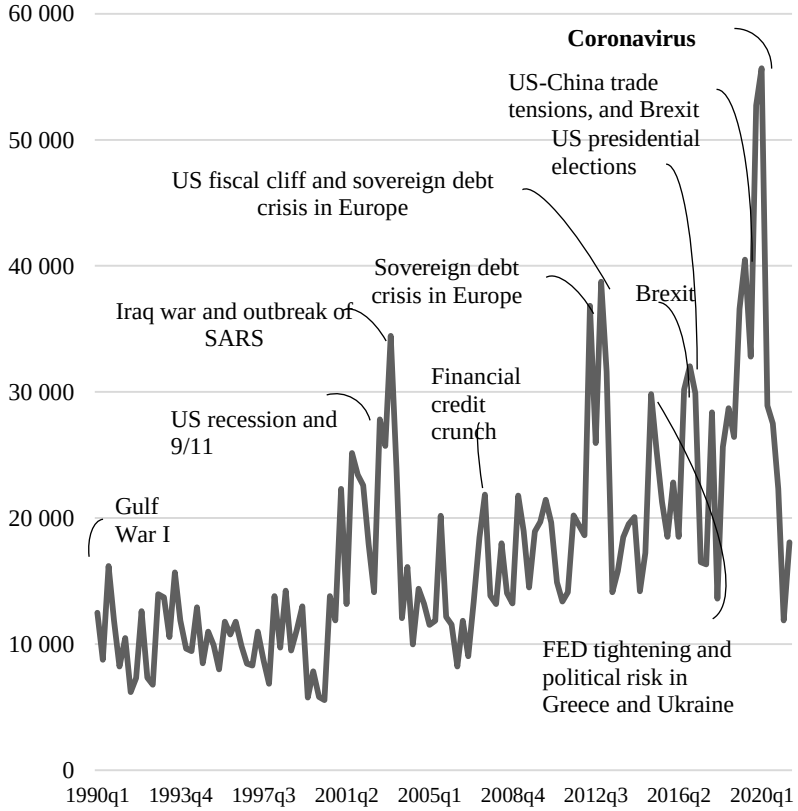

Fig. 3.2. Dynamics of the World Uncertainty Index (WUI) for 1990-2020

Source: https://worlduncertaintyindex.com/data/

These trends in the growth of the uncertainty level are reflected in the dynamics of the Global Economic Policy Uncertainty index (GEPU) [152] (Fig. 3.3).

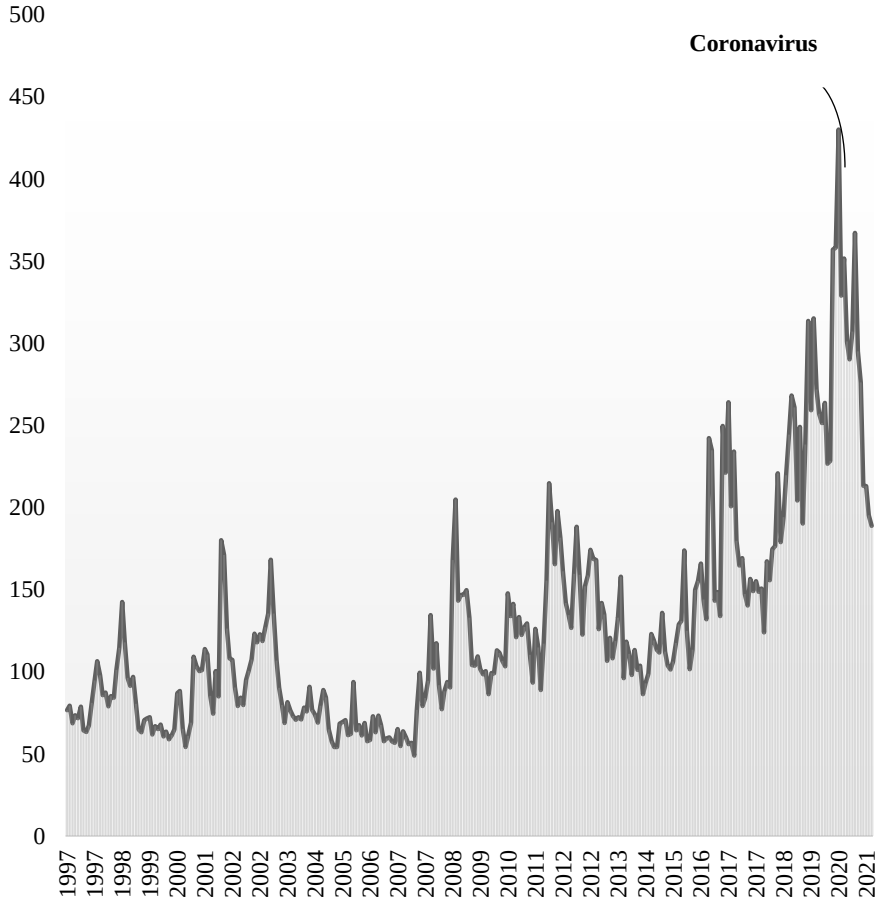

Fig. 3.3. Dynamics of the index of Global Economic Policy Uncertainty (GEPU) for 1990-2020

Source: Davis, S. J., 2016; https://www.policyuncertainty.com/global_monthly.html

Brodeur et al. (2021) [153] systematized the scientists' research to study the impact and relationship of the pandemic with increasing uncertainty.

Baker et al. (2020 [154], as cited in Brodeur et al. 2021) [151] defined that COVID-19 has led to massive spikes in uncertainty, and there are no close historical parallels. Using a real business cycle model, the authors find that a COVID-19 shock leads to a year-over-year contraction of GDP by 11% in fourth quarter of 2020. According to the authors, more than half of the contraction is caused by COVID-19-induced uncertainty Baker et al. (2020 [154], as cited in Brodeur et al. 2021) [153].

Altig et al. (2020) analyzed economic indicators for the US and UK before and during the COVID-19 pandemic (implied stock market volatility, newspaper-based policy uncertainty, Twitter chatter about economic uncertainty, subjective uncertainty about business growth, forecaster disagreement about future GDP growth, and a model-based measure of macro uncertainty). They defined that all of them show huge uncertainty jumps in reaction to the pandemic and its economic fallout. Wherein Altig et al. (2020) argued most indicators reach their highest values on record [155].

Thus, the pandemic crisis has caused an unprecedented rise in uncertainty. In our opinion, it happened due to:

- complex and multi-vector impact of the pandemic on the mega, macro- and micro-level of society, in which there are a significant number of nondeterministic relationships, and their factors and elements are not similar to each other;
- absence or lack of sufficient relevant information due to imperfect tools for collecting data on the characteristics of COVID-19, its impact on macroeconomic, political and social processes, methods of their analytical and forecasting processing, interpretation technologies, etc. This feature includes the limited time frame for the collecting and

processing the necessary data, given the rate of coronavirus disease spread. In this case, the analysis based on historical data in this case may be impractical. Baker et al. (2020, as cited in Brodeur et al. 2021) [153, 154], suppose that COVID-19 led to huge jumps in uncertainty, and there are no close historical parallels;

- weak structure due to the fact that the threats posed by the COVID-19 pandemic are difficult to formalize due to possible erroneousness, ambiguity, incompleteness and inconsistency of the source data and impact information; the complexity of the relationship between the elements and states of political, social and economic systems
- the difficulty, especially during the first phases of the pandemic crisis, assessing future developments, in terms of their implementation probability and the type of their manifestation, which leads to a critical decline in business expectations and consumer sentiment.

Uncertainty is an important factor that affects all systems (political, social, economic), in particular, leads to

- political crises, in particular, changes of governments, political protests, reduced efficiency of governments;
- macroeconomic transformations that may increase the risk of economic agents, in particular through macroeconomic shocks (changes in the economic agents' environment or the country's economy, uncertainty of market supply and demand, low predictability of market prices, declining personal consumption, etc., causing changes in fundamental macroeconomic indicators);
- social transformations related to the internal disorganization and loss of control over social structures and relations. Its consequences include social instability and growing tensions in society, materialized in citizens' distrust to each other, to public and political institutions, negative consumer sentiment, inflationary expectations, which can be a

catalyst for economic or political crisis in the country and deepen their manifestations.

Having studied the impact of the COVID-19 pandemic and measures to overcome it, we determined that as a trigger for most transformations, the introduction of a physical distancing policy can be identified. It provided for the abolition of mass events, the closure of educational institutions and the transition to distance education and distance work, restrictions on public transport, quarantine and / or isolation, official restrictions on the movement of people (Post, 2020) [156].

Along with other important triggers, it formed the basis for social, economic and digital change.

Coibion et al. (2020) used surveys to study the impact of lockdowns on realized and planned spending, income and wealth losses, macroeconomic expectations and approval ratings of political institutions. They defined a dramatic decline in employment and consumer spending as well as a negative outlook for the next few years, increased uncertainty, and lower mortgage payments being made [157].

Quarantine measures have worsened consumer sentiment and almost halted several industries' activities (tourism, retail, hotel and restaurant business, transport). As a result of quarantine, companies have reduced or frozen investments and production chains. The economic sectors related to consumer demand, retail trade and services, recover quickly. The recovery of the industry is uneven – the impact of quarantine for some sectors was more painful than for others.

The COVID-19 pandemic has led to an economic crisis due to short-term supply shocks (about 20% reduction in global growth in 2020-2021), direct negative short-term and long-term impact on consumer demand (about 80 % slowdown in global growth in 2020-2021), investment and employment. In the long run, it will cause long-term productivity losses, in particular due to skills erosion due to long-term unemployment and

declining education, and will form other significant structural changes. These factors have had a negative impact on global GDP. According to the IMF, in 2020, the world economy shrank by 4.4 %. According to IMF, it was the worst recession since the Great Depression of the 1930s [158].

The total cost of the COVID-19 according to the measuring of Yeyati, & Filippini (2021) [159], present in table 3.2, around 100 percent of GDP, is likely to be a conservative lower bound.

Table 3.2. Economic Cost of the Covid-19

Damages from COVID-19 (IMF WEO Apr-2021)	**As percentage of GDP***
Economic loss	
Lost 2021-30 Global GDP from COVID-19 (discounted at 0%)	48.03%
Total GDP loss 2020-30 (discounted at 0%)	54.68%
Total fiscal impulse	15.31%
Change in Gross Government Debt	7.30%
Statistical value of deaths related to Covid-19	
Total deaths related to Covid-19	2,828,146
Statistical value of a life (lower bound, in bn USD)	0.005
Education and human capital loss	
Lifetime loss in labour earnings for the affected cohort	12%

Source: Yeyati, & Filippini, 2021

Rungcharoenkitkul (2021) [160] defined that while the COVID-19 is truly a global crisis; the economic impact has also been highly differentiated across countries. This heterogeneity partly reflects different effectiveness in dealing with the pandemic, related to strengths of policy responses and weights societies attach to health and economic objectives. Countries moreover differ in their inherent vulnerabilities to the pandemic, e.g. dependence on tourism and services industries, population density, and compliance with government orders and so on. For countries hardest hit by the pandemic, economic damages have thus been extremely large,

in some cases surpassing even those of previous financial crises (Rungcharoenkitkul, 2021) [160].

The downturn was more pronounced in the poorest parts of the world (Noy et al. 2020) [161]. The IMF (2021) projects, that in 2024 the World GDP will be 3 % (6 % for low-income countries (LICs)) below the no-COVID scenario (Yeyati, & Filippini, 2021) [159]. The IMF points out the direct dependence of the rate and stability of further economic growth on the coverage of the population with vaccinations.

As a result, emerging markets are expected to suffer more due to slow vaccination.

The economic situation in the world and a particular country determines direct or indirect changes in the adoption and expansion of information and communication technologies and the Internet. The deteriorating economic situation due to the COVID-19 pandemic, especially in low-income countries, will negatively affect digital inclusion.

It is due to the fact that in conditions of limited resources, the development of digital infrastructure and measures to increase the digital literacy of the population may not be supported. At the same time, even before the pandemic crisis, these countries had insufficient levels of digital inclusion and significant digital gaps.

Thus, the deteriorating economic climate in countries due to the pandemic crisis has a negative impact on the environment for the formation of a high digital inclusion.

According to the previous section of the study, crossing the digital divide and high levels of digital inclusion at the micro-level are largely determined by economic factors, including the individual's income level and the household to which they belong and the availability of permanent employment.

The most damaging consequences of the pandemic crisis and the resulting economic recession in the context of digital inclusion have been a decline in real disposable household

income and rising unemployment with minimal new jobs. Some experts believe that it may be years before employment returns to pre-pandemic levels.

Yeyati, & Filippini (2021) [159] argue that the pandemic is having disproportional effects on the most economically vulnerable segments of the population. We completely agree with their statement, that the COVID-19 shock affected workers and labour income differently, depending on characteristics of the employees in terms of skills, occupation types, infrastructure (particularly, but not exclusively, those lacking connectivity), and type of contractual relations (particularly, informal and self-employed workers).

Brodeur et al. (2021) identified that the pandemic has caused a major shift toward work from home and away from positions involving F2F interactions with either the public or co-workers. Due to technological features and the nature of the services rendered, there are only a certain number of jobs that can be "feasibly" done from home and do not require F2F interactions [153].

Given that vulnerable groups often work in low-paid jobs with frequent contacts that cannot be done remotely, they are most affected by the constraints of the COVID-19 pandemic.

In low-paying occupations, as the COVID-19 crisis hit, hours worked fell by over 28 % across the OECD – 18 percentage points higher than the fall seen among high-paying occupations. Among those holding only a low level of education, the impact of the crisis on hours worked was nearly three times that experienced by those with a high level of education (OECD, 2021 [162]).

An unfavourable situation is when an individual worked in an informal economy or was self-employed since, in quarantine conditions, he usually lost income or did not have adequate social support. In 2020, the informal economy will employ more than 2 billion people (62 % of all workers in the world,

20 % of workers in Ukraine) (OECD, 2021) [162]. Informal employment accounts for 90 % of total employment in low-income countries, 67 % in middle-income countries, and 18 % in high-income countries (OECD, 2021) [162]. Women are more likely to be involved in informal employment in low- and middle-income countries and are often more vulnerable than men (Bonnet et al., 2019) [163].

Many vulnerable groups lack the necessary infrastructure (connectivity, access to digital devices) and / or skills for remote work.

According to the World Bank, per capita income lost in 2020 will not be fully recouped by 2022 in about two-thirds of emerging market and developing economies, including three-quarters of fragile and conflict-affected low-income countries. The most vulnerable groups – women, children, and unskilled and informal workers, have felt these adverse impacts hardest [164].

These data show that the pandemic crisis has negatively affected the citizens' income, especially among vulnerable categories.

As defined in the previous section, the low income of the population in combination with other personal determinants of digital inclusion (gender, age, source of income) negatively affects the level of use of information and communication technologies and the Internet by citizens.

Thus, summarizing the above, we concluded that the pandemic crisis has significantly affected the level of digital inclusion due to the economic determinant at the macro-level (due to deteriorating general financial situation in the country) and micro-level (due to loss/decrease in income and job loss).

At the same time, the pandemic may lead to an increase in digital inequality due to a powerful impact on vulnerable socio-demographic groups (low-skilled and/or less-educated workers, workers in the informal economy, women).

As we identified earlier, education is a critical factor for digital inclusion and reaping the full benefits of the digital society without increasing cyber risks.

The policy of physical distancing in a pandemic crisis has had a significant negative impact on education, especially for vulnerable people who, for some objective and/or subjective reason, have been excluded from the digital society at the pre-pandemic stage.

The pandemic brought significant education losses. Crucially, school closures posed a serious risk to human capital accumulation across the world, both in terms of effective hours of schooling and retention ratios (the increase in dropouts). Moreover, this cost is highly regressive, as richer countries and households were better equipped to cope with distancing restrictions and sacrificed fewer hours of school classes (OECD, 2020 [162]).

At a global scale, school closures affected 1.6 billion students at the peak of the pandemic (Reuge et al., 2021) [165]. On average, students missed 69 days of instruction in 2020 in LICs, compared with 46 days in emerging market economies and 15 days in advanced economies. Azevedo et al. (2021) estimate the lifetime loss in labour earnings for the affected cohort at $10 trillion – around 12 % of global GDP [166].

Thus, the lack of access to education as one of the key negative consequences of the COVID-19 pandemic will negatively affect the digital inclusion of the population and lead to long-term productivity losses.

The direct positive impact of the COVID-19 pandemic in the context of the research topic is that in the conditions of physical distancing, it caused the extensive and intensive introduction of digital technologies in all spheres of public life, digital transformation of key sectors of the economy and social sphere with very high dynamics of all elements (number of

providers and users of digital services, their volumes, the pace of implementation, etc.).

Reliable high-speed Internet is a key factor in ensuring that hospitals and health facilities access the global information networks and resources needed to fight the virus. Broadband connections are now also crucial for schools and businesses, allowing them to continue to provide basic services.

First of all, we should pay attention to the new areas of application of digital technologies directly related to the COVID-19 pandemic and measures to prevent its spread (CovidTech), the core solutions of which are artificial intelligence technologies (17.9 % of the total number of applications), wireless communication (15.4 %), robotics and sensors (4.6 %). These technology cases include in particular (Statista, 2020) [167].

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- mobile applications for tracking contacts and predicting the spread of the COVID-19 pandemic, based on artificial intelligence algorithms, with further transformation into medical services for citizens;
- mobile applications for health consulting, telemedicine tools, remote diagnostics and online doctor consultations, other remote formats of health facilities as part of the health care ecosystem for prevention, early diagnosis (e.g., symptom

screening) and citizens' engagement to local health services and emergency departments;

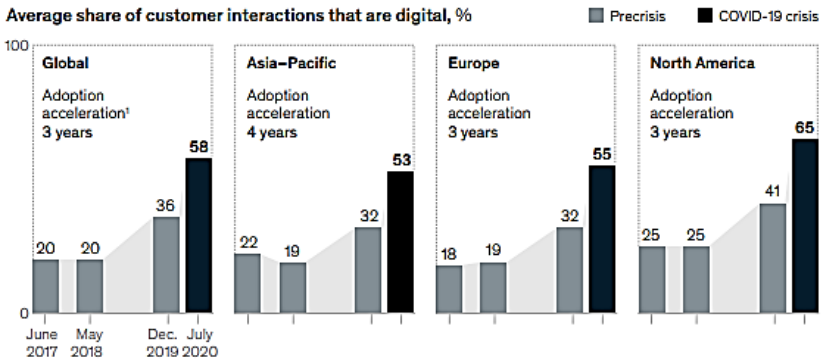
- new production technologies (in particular, 3D printing of protective equipment and medical equipment) and block chain (for example, for greater transparency of drug supply chains);
- technological solutions for urban spaces (for example, the use of Boston Dynamics robot dogs to maintain a safe distance in Singapore's parks, autonomous courier robots for food delivery, sterilization of premises, delivery of biomaterials from remote locations by drones, etc.)

Access to digital health and contact tracking services is particularly important for the population in the context of the COVID-19 pandemic. Lack of access to these products will endanger their lives and health.

The COVID-19 pandemic provoked work on some completely new projects and solutions in counteracting it and formed digital transformation vectors in all economic sectors. The sector of vital services has undergone a particularly profound digital transformation: education, e-government, data exchange and broadband, e-commerce, finance, personal data protection, etc.

Based on the results of the study McKinsey & Company (2020) [168], in terms of customer service they can be described as follows:

- acceleration of digitalization of customer interaction on the average for three years (Fig. 3.3):



* Years ahead of the average rate of adoption from 2017 to 2019.

Fig. 3.3. Affect the COVID-19 crisis on the digitization of customer interactions

Source: McKinsey&Company, 2020

Respondents notice three times more often than before the pandemic crisis that at least 80% of their customer interactions are digital in nature.

- a seven-year increase, on average, in the pace at which companies develop digital or digitally supported products (Fig. 3.4):

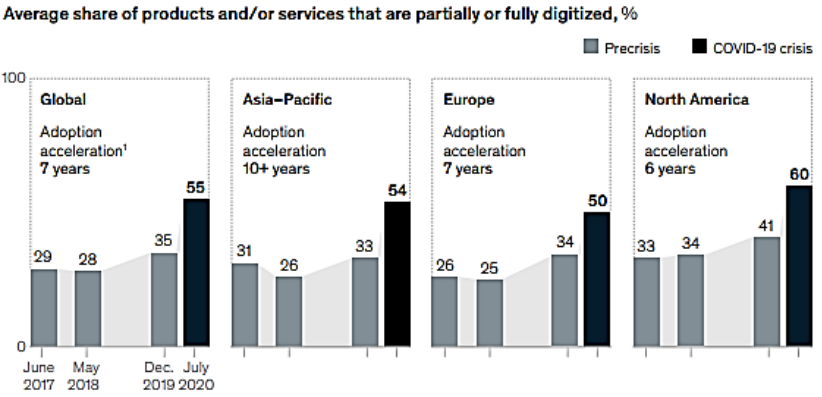


Fig. 3.4. Affect the COVID-19 crisis on the share of offerings that are digital in nature

Source: McKinsey&Company, 2020

Respondents also noted a change in customer needs: in terms of products – the demand for proposals that meet the new requirements for health and hygiene; in terms of supply – the priority of remote interaction (McKinsey & Company, 2020).

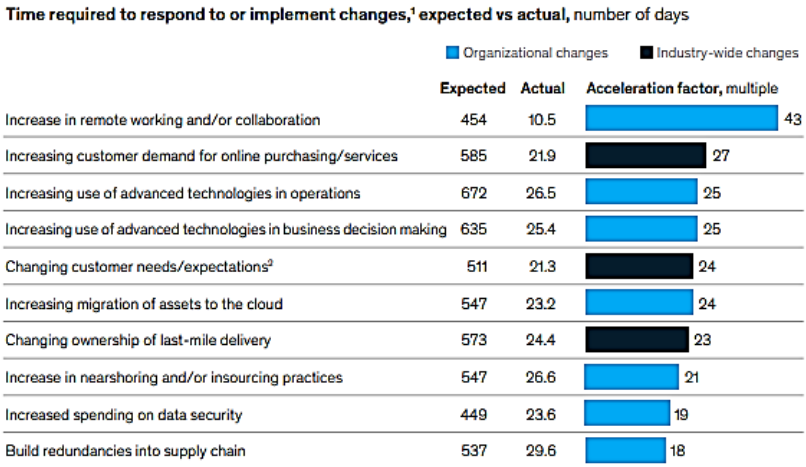
With the growing number of digitized and remote services, customers who do not have the necessary digital skills and physical and material access to information and communication technologies and the Internet are incompatible with the digital economy.

A significant number of citizens in all countries, including the highly developed, especially vulnerable categories, do not have access to digital devices or the necessary skills to use digital technologies. For such categories, access to basic services, which are currently implemented remotely, is complicated.

Digital technologies proved to be a key part of business solutions during the pandemic crisis. At the same time, more mature proven technologies intensifying in response to new socio-economic challenges in health and pharmaceuticals, financial and professional services were initially introduced (McKinsey & Company, 2020). In general, these changes have formed a tendency to merge digital and physical reality (the concept of “phygital”).

Under these conditions, most companies have significantly accelerated the digitization of basic internal operations (such as back office, production and R&D processes) and interaction in their supply chains (Fig. 3.5).

These data confirm that in most digitalization processes, companies acted 20-25 times faster than they had planned before the pandemic.



1 Respondents who answered "entry of new competitors in company's market/value chain" or "exit of major competitors from company's market/value chain" are not shown; compared with the other 10 changes, respondents are much more likely to say their companies have not been able to respond.

2 For instance, increased focus on health/hygiene

Fig. 3.5. Affect the COVID-19 crisis on digitalization of core internal operations and supply chain interactions

Source: McKinsey&Company, 2020

The most powerful breakthrough was in the introduction of remote work, where companies were moving 43 times faster than before the pandemic crisis, and all processes were transferred to remote work in an average of 11 days, while in the pre-crisis period, it would take more than a year (McKinsey & Company 2020).

Thus, the pandemic crisis has formed an entirely new landscape of the digital society, in which digital technologies are at the center of almost every business and social interaction. For example, as part of the British Digital Consumer Index 2020 on digital interaction during a pandemic, 80% of respondents said that digital technologies provided them with vital support. 37% of participants said they used

more digital technology than usual to maintain their health and well-being during quarantine.

A much higher digitalization of all public spheres to ensure digital inclusion requires bridging the digital divide of all kinds.

While the need for digital technologies has increased significantly, users may have faced significant limitations in the respective types of resources and access to information and communication technologies and the Internet.

There is no doubt that the deteriorating financial situation, especially of vulnerable populations due to the economic impact of the pandemic, could have affected their ability to purchase digital devices and pay for Internet access.

The situation is complicated by the closure of workplaces, schools and public spaces for low-cost or free connections that have become inaccessible due to quarantine measures regarding coronavirus inhibition. It means that many people did not have an alternative to accessing the Internet from home.

The Oxford Internet Survey has found that in general, many people use public access points for the Internet. For people on low incomes and with limited digital literacy, these spaces are vital. They not only provide free access but also offer opportunities for in-person knowledge exchange. However, the closure of cafés, restaurants, and libraries will disadvantage people who rely on free or low-cost public Wi-Fi to perform basic online tasks related to schooling, employment, housing, and benefits.

Accordingly, it led to a deepening of the digital divide of the first kind – the gap in access.

This digital divide was especially significant in the field of education. A document published by UNESCO notes the impact of this digital divide on education during the COVID-19 pandemic, which states that the transition to digital learning

eliminates “large numbers of students, exacerbating existing inequalities in education”.

Students from low-income families tend to have limited access to computers and other digital devices. For example, a June 2020 report from the Educational Assistance Fund states that school closures are likely to increase the success gap between children from vulnerable families and their peers.

The Commons Library Information Paper “Coronavirus and Schools: FAQ” (2020) cites data from a survey on differences in distance learning, which found that one in five students eligible for free school meals did not have access to a computer at home.

A survey of 7,000 teachers in April 2020 revealed that 15% of teachers in the poorest schools found that more than a third of their students did not have adequate access to a digital device at home, compared with 2 % in the richest schools. 12 % of teachers of schools for children with disabilities also said that more than a third of their students do not have adequate access to the Internet. Ofcom survey, conducted in January-March 2020, found that 9% of households with children did not have access to a laptop, desktop PC or iPad.

If students live in areas with no electricity or unsatisfactory Internet access, the digital access gap may be exacerbated by the residence factor. Thus, rural schools in many countries were not ready for distance education. There is a lack of technical means (computer equipment), conditions (availability of fixed Internet) and motivation of teachers to switch to a similar educational format.

Digital access gaps may occur due to increasing load on mobile and fixed broadband networks, especially in regions with underdeveloped networks.

The COVID-19 pandemic has exacerbated the existing digital skills gap, creating new inequalities since many people

do not have the required level of digital skills in the workplace or in schools lagging behind in the digitalization process.

The trend towards digitalization may have a “double impact” on vulnerable workers who lost their jobs during the pandemic and may not find it after it is completed due to accelerated automation and the introduction of digital technologies since they do not have the necessary skills.

For example, the Consumer Digital Index 2020 found that 37% of the UK workforce did not have the basic skills needed to behave safely and legally online.

These findings are confirmed by the survey results in the definition of the British Digital Consumer Index 2020 on digital interaction during a pandemic. 78% of respondents said the pandemic had increased the need for digital skills, 31 % had learned new digital skills for work-related purposes since the start of the lockdown, and 7 % could not access the Internet as much as they would like because they had no one to help.

At the same time, 230 million adults must have an at least basic digital skill, which is 70 % of the EU adult population, to ensure the effective use of information and communication technologies and the Internet, by 2025.

The situation was particularly complicated because the physical distancing policy applied in many countries significantly reduced access to social resources and, in some cases, did not assist in using digital services. A positive role, in this case, was played by the resources provided by information and communication technology providers needed to support different access. It includes product training and customer service.

However, individuals who have access but lack online security skills or cyber security knowledge may be more sensitive to cyber threats and cyber risks (misinformation, fraud, computer viruses, etc.).

Cybercriminals have adapted their tactics to what is happening in the world. The threats have changed since the situation with COVID-19 has changed, and people have sought to learn more about it. According to Microsoft's threats to endpoints, e-mail, accounts, data, and applications, the surge in attacks on COVID-19 was caused by the repurposing of known attacks that use the same infrastructure and the same malware but with new baits.

These aspects require citizens to have better digital skills and digital literacy. In their absence, the digital divide of the third level grows significantly.

Thus, accelerating the digital transformation, the pandemic crisis further widens the digital divide since lack of access to information and communication technologies and the Internet, lack of skills to use them in the physical distance often means no or significantly limited access to basic needs and provided services (state, educational, social, financial, medical services).

Before the COVID-19 pandemic, individuals excluded from the digital society were already at a disadvantaged position in using information and communication technologies and the Internet, digital services, including teleworking, job search, access to government, financial, and educational services, etc.

The negative effects of digital exclusion exacerbate and complicate other socio-economic problems caused by the pandemic crisis and may have long-term consequences that will perpetuate inequality and intergenerational poverty:

- lack of opportunity to use tracking programs, access to medical advice, medical appointments and, as a result, potentially negative health effects;
- lack of access to education in digital learning;
- lack of access to state and social services;
- complicating job search since those citizens who have less digital skills or do not have access to the Internet may not

have access to online employment services and job search and vacancy sites;

- lack of mental health support during social distancing through communication with friends and family, but also access to social security activities;
- difficulty in accessing and managing finances since banks stepped up online services;
- difficulty in the ability to obtain goods and services using online commerce.

Summarizing the above, we found that the impact of the pandemic crisis and the uncertainty on the level of digital inclusion and the digital divide is complex and multi-vector, direct and indirect, creating new opportunities and threats to be considered at the level of the individual, communities and countries as a whole.

Physical distancing measures in response to the COVID-19 pandemic have led to a significant digital transformation in the number of digital services, the transition to remote customer service, the digitalization of internal business processes, remote work and learning.

In the context of such significant digitalization, the conditions for ensuring the digital inclusion of the population have deteriorated.

The significant endogenous factors affecting digital inclusion are the deteriorating economic situation in countries and the world, which causes lower incomes and unemployment.

These changes have mainly affected countries with low economic development (at the macro level) and vulnerable groups with low incomes and/or education.

It has deepened the digital divide, especially for vulnerable groups. Therefore, universal access and affordability of high-quality connections must be a priority for all countries and that

all actors in the digital ecosystem must continue to coordinate their efforts to prevent the digital divide.

The COVID-19 pandemic has also exacerbated the existing digital skills gap, resulting in new inequalities, as many people do not have the required level of digital skills or are in the workplace or in schools lagging behind in the digitalization process.

It is recommended to bridge the access gaps [169]:

Financial aspects – providing affordable access to digital services:

- financial assistance packages to increase connectivity, information packages and subsidies for telecommunication services, rental of devices;
- use FinTech models and digital business models to support the most affected businesses and communities;
- organization of technical support hotlines
- consideration of attenuation for subscribers by the network operators, such as the possibility of zero tariff for certain services (for example, access to special information portals that provide information about COVID-19, as Vodafone has undertaken to do);

infrastructure aspects – increasing bandwidth, increasing the stability and security of networks and congestion management:

- traffic generation for network load management;
- formation of measures by regulatory authorities to eliminate bottlenecks by introducing best practices (e.g. predictable and cost-effective spectrum allocation, independent regulation and infrastructure sharing), use of emergency procedures to coordinate access to wholesale bandwidth;
- establishing international cooperation to eliminate "bottlenecks" outside the jurisdiction of regulatory authorities;
- development of country-specific guides for consumers on how to ensure a high quality connection during quarantine;

- formation of clear working anti-crisis plans by telecommunication network operators;

ensuring the digitization of critical areas of public life:

- connection of vital services and ensuring the continuity of public services for social protection;

ensuring an adequate level of security:

- supporting compliance with the social distancing principles while providing a vital opportunity to make connections
- increase the level of trust, security in the online environment.

Digital skills and lifelong learning are crucial to ensure digital inclusion, which forms the basis for sustainable growth, productivity and innovation and therefore is a key factor in a country's economic development.

Providing citizens with the necessary digital skills allows them to work more efficiently and use advanced digital technologies to meet personal needs, removes major barriers to reaping the benefits of digitalization without increasing cyber risks, and prevents labor market mismatches.

Bridging the skills gap requires the combined efforts of governments, companies, social partners, non-profits, and education providers to develop new training, hiring, or retraining programs to improve digital skills.

It is also necessary to form a comprehensive action plan in digital education to increase digital literacy, skills and capacity at all levels of education and training and for all levels of digital skills (from low to advance). Particular attention should be paid to digital education programs for vulnerable groups who are currently excluded from the digital society due to a lack of digital skills.

4. ANALYSIS OF DIGITAL INCLUSION: GLOBAL CHARACTERISTICS AND UKRAINE TRENDS

Without aiming for an in-depth study of digital inclusion and the digital divide, we consider it necessary to outline the main global trends in these processes and the features specific to Ukraine.

When examining the population's digital inclusion level, it is necessary to distinguish between the global digital divide (the digital divide between countries) and the internal digital divide (the digital divide between individual strata of citizens within one country).

The global digital divide results from social and economic inequalities between developed countries and countries with low levels of economic development.

Figure 4.1 shows the differential use of the Internet in countries around the world.

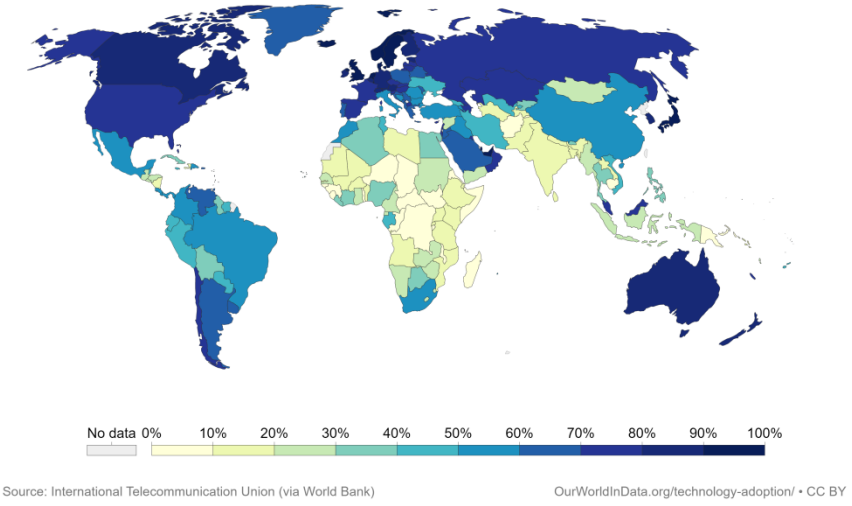


Fig.4.1. Internet use: global divide
Source: International Telecommunication Union

Academic synthesis and analysis confirm a persistent geographical spatial divide, with developed European and North American countries having significantly higher levels of digital population inclusion than less developed countries in Africa and much of Asia (Table 4.1).

Table 4.1. World Internet Users and 2021 Population Stats

World Regions	Population (2021 Est.)	Population % of World	Internet Users 31.03.2021	Penetration Rate (% Pop.)	Growth 2000-2021,%	Internet World %
Asia	4327333821	54.9	2762187516	63.8	2316.5	53.4
Europe	835817920	10.6	736995638	88.2	601,3	14.3
Africa	1373486514	17.4	594008009	43.2	13,058	11.5
Latin America/ Carib.	659743522	8.4	498437116	75.6	2658.5	9.6 %
North America	370322393	4.7	347916627	93.9	221.9	6.7
Middle East	265587661	3.4	198850130	74.9	5953.6	3.9
Oceania/ Australia	43473756	0.6	30385571	69.9	298.7	0.6
WORLD	7875765587	100.0	5168780607	65.6	1331.9	100.0

Source: https://www.Internetworldstats.com/stats.htm

Despite significant growth in Internet use worldwide, the data presented confirm that Internet penetration remains inadequate, especially in countries lagging in development.

This trend leads to deepening social and economic inequalities. In the face of a pandemic, the situation is even worse. Citizens without access to the Internet lose access to essential services, education, and additional opportunities.

Ukraine is among the countries with high Internet penetration, above the European level of 93.4% by the end of 2020 (Annex 1).

However, it should be emphasized that the digital divide is also present in the qualitative characteristics of the Internet.

According to Cable.co.uk's analysis, Western Europe dominates the global speed rankings; the region is home to eight of the ten fastest broadband speeds in the world. Internet speeds are also high in North America, at 71.68 Mbps.

Ukraine ranks 77th in the global ranking and second among the countries of the former Soviet Union.

North African countries offer the lowest average Internet speeds in the world (5.68 Mbps), while Western European countries combined have the highest average speeds (90.56 Mbps).

In 94 countries, the average speed of the Internet does not reach 10 Mbit/sec, which according to experts from the British telecom regulator Ofcom is the minimum required meeting the needs of a typical family or small business. However, this figure is lower than in 2020, when there were 109 such countries, indicating a significant speed improvement.

Thus, the digital divide is deepened not only by Internet access but also by its qualitative characteristics that determine the impact of its use.

An essential aspect of digital inclusion is the financial accessibility of information and communication technology and the Internet. As identified earlier, economic factors largely determine the ability and willingness to take advantage of digitalization.

According to Broadband Commission for Sustainable Development's target for 2025, entry-level broadband services should be made affordable in developing countries at a level corresponding to less than 2 per cent of monthly GNI per capita.

The International Telecommunication Union report 2020 (ITU, 2021) [170] finds that although ICT services continue to become more affordable worldwide, in the least developed countries, broadband services remain a luxury, affordable only to the most affluent. Furthermore, even where the 2 per cent

target has been met for a country as a whole, entry-level broadband services often remain unaffordable for the less affluent. Data shows that 40 per cent of the population with the lowest income could only afford entry-level mobile broadband services in 10 of the 66 developing countries for which data are available. It should be emphasized that the same spatial trends in inequalities in access and quality are present in the area of financial accessibility of the Internet.

So, in Europe, the benchmark mobile broadband basket was affordable for the entire population in 22 of the 40 countries covered. The bottom 40 per cent could afford it in 32 of the countries. Even in places where the basket was relatively more expensive (as Ukraine, for example), it did not exceed 4 per cent of the adjusted income (ITU, 2021) [170].

Wherein Ukraine currently offers the world's cheapest fixed-line broadband, with an average monthly cost of USD 6.41 per month. The average package cost (Global) is $78,14.

With its level of economic development, Ukraine's position forms a sufficient basis for the digital inclusion of its population. The country has a reasonably high level of Internet penetration at a low cost, including in comparison with the income level of the population.

In the Americas, the mobile broadband basket was affordable on average for the least affluent 40 per cent of the population in 4 of the 18 countries (Canada, Chile, Costa Rica, and the United States). The basket was affordable for at least half of the population in 8 of the 18 countries of the region. The bottom 10 per cent could not afford the basket anywhere in the Americas (ITU, 2021) [170].

Among the countries of Africa mobile broadband prices were affordable for the average consumer in four countries, for the bottom 40 per cent of the population in one country, and the top 40 per cent in ten countries. Entry-level fixed broadband prices were affordable for the average consumer in

one country, for the bottom 40 per cent in none of the countries, and for the top 40 per cent in two of the countries covered (ITU, 2021) [170].

Studies on various dimensions of digitalization are currently underway, seeking to assess their level comprehensively.

VPN service Surfshark has published its Digital Quality of Life Index 2020 (DQL) report, which examines the digital quality of life in different countries.

The DQL index includes the following critical criteria:

- the quality and affordability of mobile and wired broadband Internet access;
- the development and coverage of digital infrastructure;
- the development and availability of digital public services;
- the level of cyber security and user data security [171].

The visualization of the index results in Figure 4.2 confirms the link between the digital quality level and the economic development of countries and corresponds in general to Internet penetration rates [172].

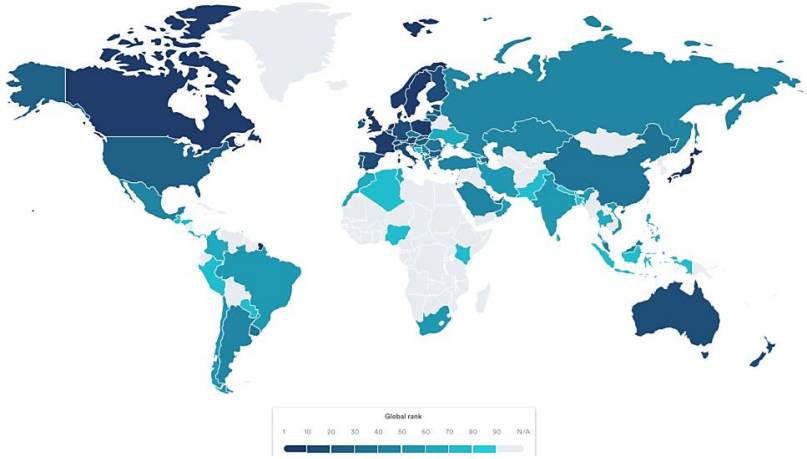


Fig.4.2. Digital Quality of Life index 2020

Source: Surfshark, 2021

The top 10 countries for digital quality of life include Denmark, Sweden, Canada, France, Norway, the Netherlands, the UK, Israel, Japan, and Poland. Honduras, Algeria, Pakistan, Nigeria, and Guatemala had the lowest DQL out of 85 countries surveyed.

Ukraine has risen 18 places to 47th out of 110 countries and demonstrates high scores in Internet accessibility (28th) and cyber security (25th) but poorer results in e-government (61st), e-infrastructure (42nd), and Internet quality (68th) [173].

Ukrainians only need to work 4 minutes to afford 1GB of mobile Internet and 1 hour and 40 minutes for the cheapest broadband package. By comparison, the global average is 6 hours for broadband and 10 minutes for 1GB of mobile Internet [173].

The Network Readiness Index (NRI) is valid for assessing the capacity of countries to take advantage of the opportunities offered by information and communication technologies. It seeks to better understand the impact of information and communication technologies on the competitiveness of nations and is a composite of four components [174]:

1) technology:

- access: the fundamental level of information and communication technologies in countries, including on issues of communications infrastructure and affordability;
- content: the type of digital technology produced in countries, and the content/applications that can be deployed locally;
- future technologies: the extent to which countries are prepared for the future of the network economy and new technology trends such as artificial intelligence and Internet of Things;

2) people:

- individuals: how individuals use technology and how they leverage their skills to participate in the network economy;
- businesses: how businesses use information and communication technologies and participate in the network economy;
- governments: how governments use and invest in information and communication technologies for the benefit of the general population;

3) governance:

- trust: how safe individuals and firms are in the context of the network economy. This does not only relate to actual crime and security, but also to perceptions of safety and privacy;
- regulation: the extent to which the government promotes participation in the network economy through regulation;
- inclusion: the digital divides within countries where governance can address issues such as inequality based on gender, disabilities, and socioeconomic status;

4) impact:

- economy: the economic impact of participating in the network economy;
- quality of Life: the social impact of participating in the network economy;
- SDG Contribution: the impact of participating in the network economy in the context of the SDGs – the goals agreed upon by the UN for a better and more sustainable future for all. The focus is on goals where ICT has an important role to play, including such indicators as health, education, and environment.

The data in Table 4.2 confirm global trends in the formation of technological inclusion as a prerequisite for digital inclusion.

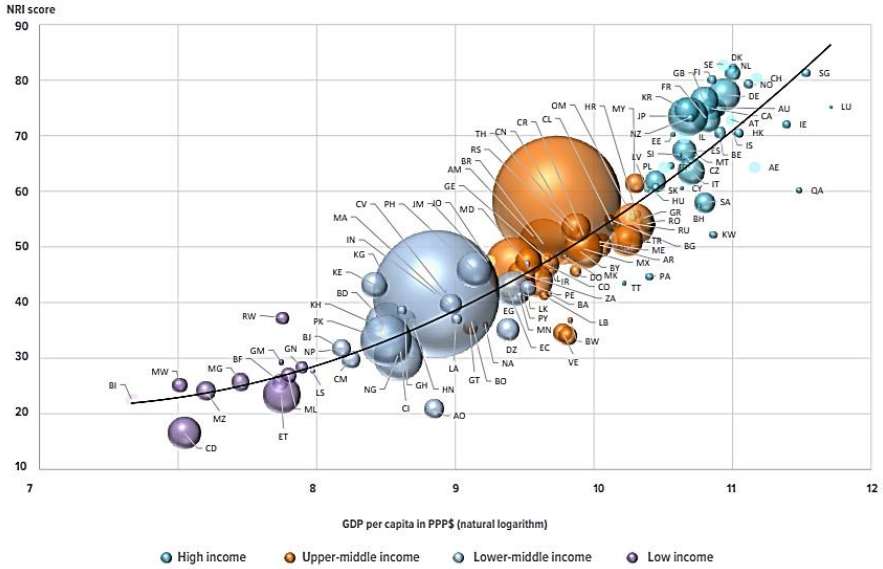
Table 4.2. The Network Readiness Index 2020

Country/ Economy	Overall rank and score		Pillars			
	NRI Rank	NRI Score	Technology	People	Governance	Impact
Sweden	1	82,75	83,82	78,07	88,88	80,23
Denmark	2	82,19	79,71	80,81	89,80	78,45
Singapore	3	81,39	76,16	77,86	83,35	88,17
Netherlands	4	81,37	83,81	73,45	89,47	78,75
Switzerland	5	80,41	85,67	70,02	85,04	80,93
Finland	6	80,16	78,24	78,19	88,61	75,59
Norway	7	79,39	75,23	73,88	91,30	77,14
United States	8	78,91	82,88	74,59	86,23	71,96
Germany	9	77,48	79,18	70,54	83,52	76,69
United Kingdom	10	76,27	78,34	69,69	82,65	74,40
	….					
Ukraine	64	49,43	41,51	48,87	58,19	49,16

Source: Dutta, & Lanvin, 2020

Europe is the leading region in the world. Africa (with only one country Mauritius (61) in the upper half) is the most sluggish region.

The significant conclusion of the Dutta, & Lanvin (2020) is that one of the most vital indicators of NRI performance is a country's income level. Figure 4.3 displays NRI score rises with income level. Hence, the top NRI performers are predominantly high-income economies, while the bottom NRI performers are mainly low-income economies, with lower-middle-income and upper-middle-income countries placed in between in the expected order [174].



* Note: GDP per capita is in PPP$ (natural logarithms). Either GDP per capita and population data (represented by the size of the bubbles) are for 2019 or the latest year available. The data are drawn from the World Bank's World Development Indicators database. The trend line is a polynomial of degree two (R2 = 0.86)

Fig.4.3. NRI score versus GDP per capita (PPP)

Source: Dutta, & Lanvin, 2020

Thus, we can conclude that the global digital divide remains a problem. Countries with insufficient economic development have fewer Internet users, and it is of much worse quality at a high price.

Consequently, to spread the use of information and communication technologies and the Internet, socio-economic problems must first be addressed, and, on this basis, a set of measures to expand the digital infrastructure and increase the population's digital skills must be put in place.

In addition to the global digital divide, the digital divide remains a problem at the local level – between regions of the country between rural and urban spaces (Table 4.3).

Table 4.3. Percentage of households with access to the Internet and computers, by urban / rural area, 2019, %

	Access to the Internet			Access to computers		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
By the level of countries development						
World	57,4	72,0	37,7	47,1	63,4	25,3
Developed	85,2	86,7	81,5	79,0	84,2	65,8
Developing	47,8	65,1	28,8	36,1	53,5	17,1
Least Developed Countries	16,3	26,3	11,8	7,2	16,5	3,0
Land Locked Developing Countries	26,6	48,7	16,3	16,8	36,6	7,5
Geographically						
Africa	14,3	28,0	6,3	7,7	17,0	2,2
Arab States	58,9	74,0	38,4	52,8	66,8	34,0
Asia & Pacific	53,4	70,4	37,0	41,1	60,2	22,5
CIS	76,4	80,6	66,4	65,4	72,1	49,6
Europe	85,0	87,7	77,9	77,7	82,4	65,6
The Americas	69,8	74,4	49,9	60,7	66,7	34,5

Source: ITU World Telecommunication/ICT Indicators database

Rallet & Rochelandet (2007) [57] defined that in developed countries, the differences between rural and urban areas come mainly from social disparities in terms of household income, education level, and so on. The smaller the geographical scale is, the higher the social matter is behind the digital divide. However, in the recent period, adoption rates tend to converge. The inequalities are now observed through the usages or the "second-level" divide.

As shown in table 4.4, network access remains a problem for developing countries and peripheral areas because insolvency and insufficient market size in less densely populated or poor areas. In developing countries or regions, the territorial discrimination by advanced networks is more

substantial because facilities are very likely to be concentrated in the biggest cities.

Table 4.4. Key information and communication indicators by urban / rural area (penetration rates, %)

	Urban						Rural					
	2015	2016	2017	2018	2019	2020	2015	2016	2017	2018	2019	2020
Population covered by at least an LTE/WiMAX mobile network (%)												
World	64,1	81,7	89,8	92,2	94,3	95,1	19,3	43,2	57,3	64,8	69,7	71,4
Developed	92,3	94,2	95,1	97,7	100,0	100,0	60,6	67,7	73,8	76,0	85,8	85,6
Developing	54,8	77,7	88,2	90,4	92,6	93,7	15,7	41,0	55,8	63,8	68,4	70,2
Least Developed	31,2	41,3	50,4	58,3	64,5	66,9	7,9	8,9	10,2	20,3	23,5	26,6
Land Locked Developing	35,7	51,4	63,9	72,8	82,3	84,4	2,3	4,6	7,6	14,1	19,3	24,7
Small Island Developing	49,4	58,1	67,7	70,1	76,8	76,7	12,0	12,9	26,1	31,1	35,1	35,5
Population covered by at least a 3G mobile network (%)												
World	96,6	98,2	99,2	99,4	99,6	99,4	57,1	68,2	74,3	80,1	84,2	84,8
Developed	98,4	100,0	100,0	100,0	100,0	100,0	78,4	82,4	83,5	84,0	89,3	89,1
Developing	96,0	97,7	99,0	99,2	99,4	99,2	55,2	67,0	73,5	79,8	83,8	84,5
Least Developed	87,0	89,8	96,9	99,3	99,3	99,3	37,4	48,4	53,0	57,6	61,6	64,1
Land Locked Developing	85,7	93,1	97,8	100,4	99,7	99,7	34,4	42,9	50,2	54,7	59,8	63,7
Small Island Developing	73,7	75,0	87,5	96,5	96,9	97,2	42,2	46,1	48,7	53,0	66,7	66,5
Population covered by a mobile-cellular network (%)												
World	99,9	100,0	100,0	100,0	100,0	100,0	88,9	89,8	91,3	91,8	92,7	92,5
Developed	100,0	100,0	100,0	100,0	100,0	100,0	93,0	93,5	94,0	94,0	98,3	98,3
Developing	99,8	99,9	100,0	100,0	100,0	100,0	88,5	89,4	91,1	91,6	92,2	92,0
Least Developed	99,1	100,0	100,0	100,0	100,0	100,0	80,0	81,0	80,8	81,8	82,4	83,1
Land Locked Developing	98,6	100,0	100,0	100,0	100,0	100,0	83,7	87,0	87,2	89,0	89,9	90,5
Small Island Developing	99,8	99,9	99,9	99,9	99,9	99,9	74,2	68,7	71,2	71,7	72,1	72,3

Source: ITU World Telecommunication/ICT Indicators database

Ukraine is also characterized by a digital divide between urban and rural areas.

According to the Ministry of Digital Transformation of Ukraine, 23 % of Ukrainian citizens living in villages and settlements do not have internet access due to the lack of high-speed fixed-line operators.

A study by the State Statistics Service on a sample survey of households participating in the Living Conditions Survey, the proportion of the population who reported using Internet services in rural areas in the past 12 months in 2018 was 47.8 % [175].

At the same time, the rate in urban areas was 70.1 %, with 74.9 % in large cities and 63.2 % in small towns. As we can see, Internet penetration trends by place of residence are in line with the global trends, with big cities taking the lead, while small towns and villages have significant digital divides.

This situation creates barriers to communication and access to digital services, remote work, education, etc.

In the era of COVID-19, which has led to an accelerated digital transformation requiring citizens to work, learn, and transact remotely, deploying digital infrastructure is a prerequisite for digital equity and justice.

Recognizing this as part of the Ministry of Digital Transformation's project "Internet Access in Ukrainian Villages", over 1 million Ukrainian citizens living in rural areas will receive high-speed Internet access by the end of 2021 (Ministry of Development of Communities and Territories of Ukraine, 2021) [176].

As found in previous sections of the study, there is a significant digital divide on the gender determinant.

Research has identified that women lag in accessing information and communication technologies and the Internet (Figure 4.4).

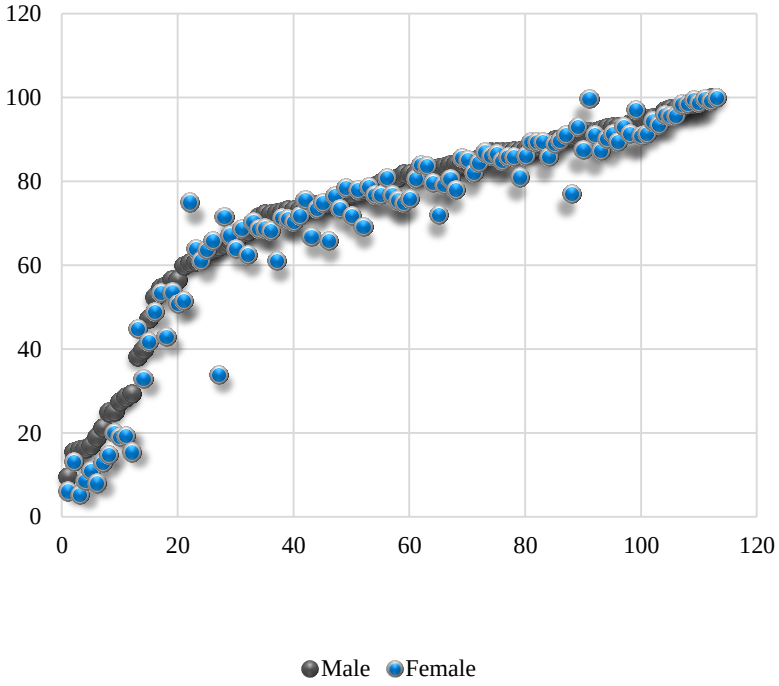


Fig. 4.4. Individuals using the Internet by gender, 2019
Source: ITU World Telecommunication/ICT Indicators database

The data presented confirm that women worldwide use the Internet less, with the lower the country's overall Internet penetration, the more significant the gap in use by women compared to men (Figure 4.5).

Women in low- and middle-income countries are, on average, 10 % less likely to own a mobile phone than men; with 184 million fewer women owning a mobile phone. Over 1.2 billion women in these regions do not use mobile internet (Mariscal et al., 2019) [126].

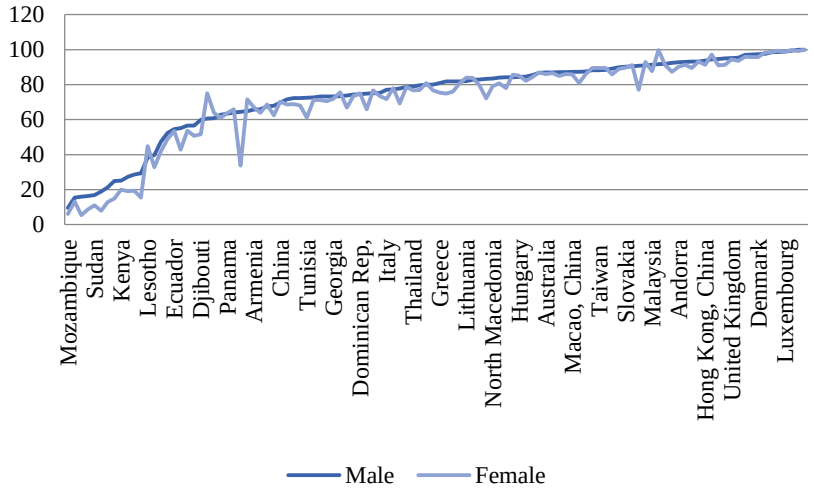


Fig. 4.5a Individuals using the Internet (from any location), by gender, 2019

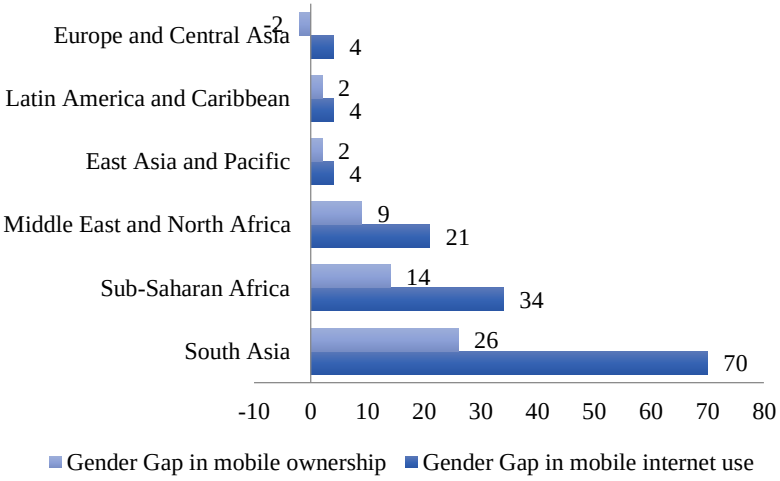


Fig. 4.5b The gender gap in mobile ownership and mobile Internet use, by region, 2019

Source: ITU World Telecommunication/ICT Indicators database

Gender problems often arise in societies where a woman is viewed as an incomplete subject of public life for religious or other convictions. As a result, women have significant barriers to using information and communication technologies, and they have no or limited economic resources.

In the case of Ukraine, in our opinion, the existing gender digital distribution – 68 % of women and 72 % of men use the Internet (data for 2019) – is mainly due to economic barriers and a lack of motivation and necessary skills rather than specific personal characteristics. These data are confirmed by a study by the State Statistics Service (2019) [175].

As identified earlier, bridging the digital age divide plays an essential role in digital inclusion, as shown Figure 4.6.

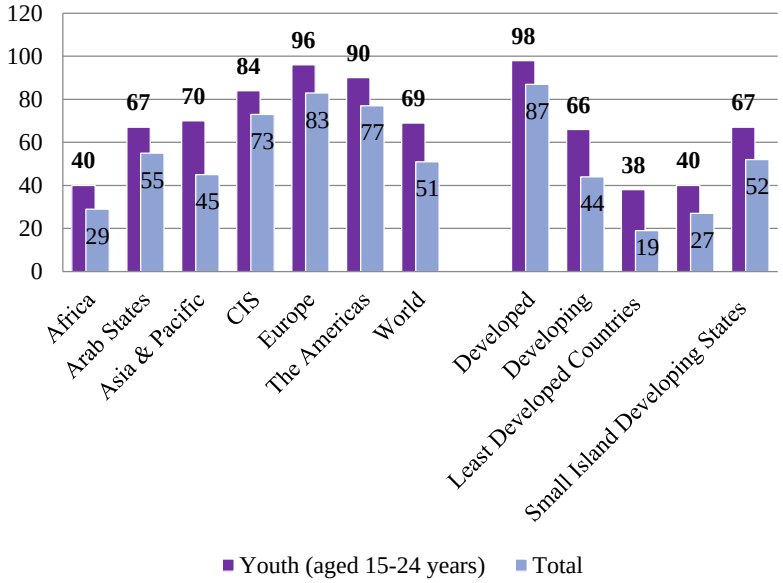


Fig. 4.6. Percentage of individuals using the Internet by age, 2019*Source: ITU World Telecommunication/ICT Indicators database*

Figure 4.6 shows that young people (aged 15-24 years) dominate Internet users regardless of geography and country-level of development.

According International Telecommunication Union (2020) in developed countries, virtually all young persons were using the Internet. In least developed countries, the overall share of people using the Internet is half of the corresponding share for young people, only 38 per cent of all youth [177].

Asia and the Pacific is the region with the highest youth/overall ratio, implying the potential for older age groups to catch up with younger ones in this region in their Internet use [177].

Ukraine is also characterised by global trends – the prevalence of Internet use among young people and a significant decline in older people (Figure 4.7).

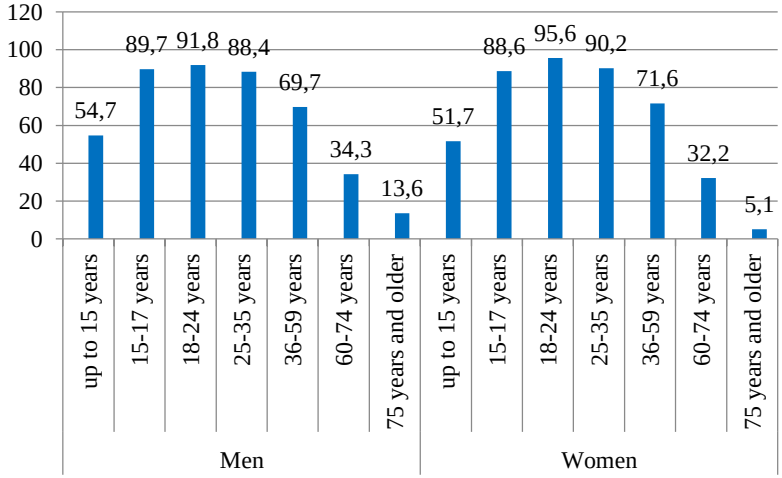


Fig. 4.7. Percentage of individuals using the Internet by age in Ukraine, 2018

Source: State Statistics Service of Ukraine, 2019

Significant digital gaps in older age groups widen digital and, as a result, social inequalities. In the era of COVID-19, the digital exclusion for this category of citizens may lead to significant negative consequences due to the lack of access to health, financial, social services online. Therefore, in our opinion, the efforts of public authorities should be focused primarily on the digital inclusion of the older age groups.

As identified earlier, digital inclusion is determined by economic factors, especially income, availability of work, and a number of dependents.

The distribution of households by decile (10 %) group according to the size of the average per capita equivalent total household income demonstrates that Internet penetration increases as income rises. In the first (lowest) group, Internet penetration is 46.8%, while in the tenth (highest) group, it is 85.7 % (State Statistics Service, 2019) [175].

Thus, despite the relative financial affordability of the Internet in the country, the low-income level does not allow material and technical access to it for a large part of the population.

Consequently, as for the world as a whole, to ensure digital inclusion for the poorest segment of the Ukrainian population, the task of bridging the digital divide of the first type - the access divide – is relevant.

As identified earlier, the skills gap has a significant impact on digital inclusion in addition to the access gap.

According to International Telecommunication Union (2020) [177], in 40 per cent of the countries for which data are available, less than 40 per cent of individuals reported having carried out one of the activities that compose basic skills in the last three months, e.g. sending an e-mail with an attachment. In 70 per cent of the countries, less than 40 per cent of individuals had done one of the standard skills components, such as creating an electronic presentation with presentation software.

In only 15 per cent of the countries had more than 10 per cent of individuals written a computer program using a specialized programming language in the last three months.

In Ukraine, entertainment and communications dominated the sectors at the end of 2018. Thus, downloading films, images, music, watching TV or videos, etc. accounted for 65 % of all activity. Internet/Volp telephone conversations (Skype, iTalk, webcam) accounted for 48.4 % and communication (hobbies) 48.9 %.

Based on the significant change in the digital environment due to the COVID 19 pandemic, we believe that the emphasis on the use of information and communication technologies and the Internet has changed towards distance learning and work and receiving a variety of online services.

In 2019, the Ministry of Digital Transformation of Ukraine conducted the first study of citizens' level of digital literacy. The highest score was given to communication and information skills – 75.3 % and 74.4 %, respectively. Problem-solving skills (55.6 %) and software skills (28.8 %) are low [178].

At the same time, 53 % of Ukrainians do not have a basic level of digital skills [178].

The study results revealed that citizens who do not have digital skills (15.1 %) belong to vulnerable citizens by their characteristics: old age, living outside regional centers or in villages, secondary special education, and unemployed. These citizens do not have access to the Internet, and they are entirely excluded from the digital society.

An above-average level of digital skills was demonstrated by 25.5% of respondents. The characteristics of this category are: young age (18-29 years old); residence in regional centres; higher or incomplete higher education; employed. They are connected to the Internet using several digital devices and use it for personal and work purposes.

The above results confirm the importance of the determinants of digital inclusion at the individual level highlighted earlier.

This context confirms the presence of the Matthew effect - with the accelerated pace of digital transformation, including those triggered by the COVID19 pandemic, gaps between social groups are widening, inclusiveness is decreasing, and discriminatory processes are intensifying.

The Matthew effect (a term first coined by American sociologist Robert Merton) is the phenomenon of unequal distribution of advantages, in which the party already in possession of them continues to accumulate and multiply them, while the other, initially limited, finds itself even more deprived and, therefore, less likely to continue to succeed.

In conclusion, we would like to emphasize that despite the significant increase in the penetration of information and communication technologies and the Internet into all spheres of public life, the level of digital inclusion of the population is far from the desired indicators. Digital inequality and discrimination persist at the global, local and individual levels (by age, gender, economic status, and other characteristics).

The trends of digitalization and the formation of digital divides in Ukraine generally correspond to the global ones, while at the moment, advantages have been formed, with the use of which the level of digital inclusion of the population can significantly increase.

At the heart of this is ensuring free access to information and communication technologies and the Internet through computers, smartphones, and tablets. Before an individual can use them effectively, the material and technical access divides must be closed. At the same time, as already mentioned, bridging the access divide is a necessary but not sufficient condition for digital inclusion. Individuals, communities, and countries receive all the benefits from using ICT and the

Internet without increasing information risks when they have the skills to use them and a high level of digital literacy, bridging the skills gap. It should be borne in mind that the factors of ICT accessibility and the lack of digital skills necessary for their use are intensified through mutual influence and co-dependency.

The skills gap, combined with a lack of material and technical resources at an individual, community, or country level, will only increase existing economic and social problems and information threats.

5. THE NEED FOR ONLINE EDUCATION: THE CIVIC EDUCATION CASE

With the spread of the COVID-19 pandemic, the entire education system has undergone a transformation towards a predominantly online format for learning. States have turned their attention to supporting these processes mainly for school and university education. While non-formal and, above all, civic education, which deals with many issues of people living together (civic participation, human rights, critical thinking, inclusion, etc.), which is especially important during the pandemic, has been left without adequate state support. The complexity of civic education is also due to the fact that it is more oriented towards live communication than professional education and there are not always educational needs for some topics of civic education that are demanded in an offline format.

Our task was to investigate the needs for learning knowledge and skills in the field of civic education in the online format. We also wanted to trace the relationship between the need for civic education and the meeting of this need using online formats. We wanted to determine which online formats/tools are preferred. In addition, we tried to find

out in which areas of civic education people cannot learn in online formats and what the obstacle are.

The region of the study: the Eastern Partnership countries of the European Union (Ukraine, Belarus, Moldova, Armenia, Georgia, Azerbaijan).

Research methods: desk research (analysis of publications, reviews, social media), qualitative research (focus groups, in-depth interviews), quantitative research (sociological survey).

The survey consisted of five main questions and three additional ones. The first question referred to the formed needs in civic education. By asking the second question, we wanted to ascertain whether the respondents were satisfied with their own already formed needs for civic education in the online format. In the third question, we asked about the online formats (tools) that are preferable to respondents. In the fourth question, we found out what needs in civic education could not be met online by respondents. In the fifth question, we asked about the barriers to meeting the needs in online civic education. The additional 3 questions determined the gender and age of respondents as well as their affiliation with the Eastern European Network for Citizenship Education (EENCE).

The first question was identified as follows: "What knowledge and skills in the field of civic education have you gained?". Let's understand the concepts that we have touched upon. The need is an internal state of a psychological or functional sense of a lack of something, which manifests itself depending on situational factors [179]. By knowledge and skills in the field of civic education, we understand a set of theoretical knowledge and practical competencies that make up the complex of civic education.

In the scientific literature and in practice, there are different approaches to the definition of civic education and civic competencies. In the headline of the survey we warned the respondents that by civic education we mean the process of developing skills, knowledge and values that are conducive to

active and responsible participation in public life. The question was posed in such a way that the respondents could rate each thematic area in civic education on a scale from 0 to 10 (where 10 is an acute deficit and 0 is a lack of need). We identified 9 such areas:

- human rights and freedoms;
- personal growth;
- communication;
- family formation;
- community formation and development;
- cultural / national identity;
- interaction with authorities;
- understanding the global context;
- environmental education.

We identified this structure, based largely on the structure of the courses of the Open University of Maidan [180] and supplemented by other sources [181], [182]. It is worth noting the content of each area and the statistics of respondents' answers in each of the areas.

Human rights and freedoms.

We understand this as the formation of respect for the honour and dignity of a person, for his rights and freedoms; knowledge of the Universal Declaration of Human Rights; ability to protect human rights and freedoms; legal literacy; legal awareness, including: acceptance of the principles of the rule of law, knowledge and awareness of one's own rights, ability and readiness to defend them in life.

The respondent had to assess the level of need for this set of knowledge and skills on a scale from 0 to 10. If the respondent had an acute need to study this area – he chose the mark "10" on the scale, if he did not feel any need in this area at all – he chose the mark "0" on the scale. Interpreting the answers of the respondents, we can assume that if a person experienced a strong need, but not an acute one, he chose marks in the range "7-9"; if a person experienced a moderate (average) need, he

chose marks in the range “4-6”; and if he felt a weak need, then he chose marks “1-3”.

According to the results of the survey, the respondents who defined their need in the field of “human rights and freedoms” as “acute” make up 20.2 % of the respondents. The respondents experiencing a “strong” need made up 30.3 % of the respondents. “Moderate” need was noted by 29.4 %. A “weak need” was noted by 18.3 % of the respondents. And the lack of need was indicated by 1.8 %. As a result, 79.9 % of respondents noted a moderate or high interest in the field of civic education “human rights and freedoms”.

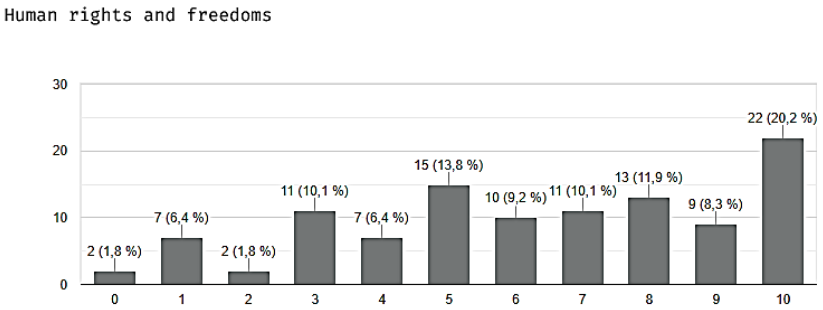


Fig. 5.1. Human rights and freedoms
Source: developed by the authors

Personal growth.

By this we mean interaction with personal goals / resources, critical thinking, media literacy, digital literacy, creative thinking, self-study / lifelong learning, strategic thinking, personal resource management (time management, personal finance management, etc.), motivation management, emotional intelligence, decision making in conditions of uncertainty, generating new ideas.

The respondents who defined their need for the area “personal growth” as “acute” make up 22.9% of the

respondents (the highest indicator among all areas). The respondents experiencing a strong need made up 43.1% of the respondents. A moderate need was noted by 22 %. A weak need was noted by 9.2 % of the respondents. The lack of need was noted by 2.8 %. As a result, 88 % of respondents noted that they have a moderate or high interest in such area of civic education as “personal growth”.

Communication.

For this area we collected the knowledge and skills that are responsible for the interaction of a person with another person: tolerance, the ability to conduct dialogue and discussion (to hear, listen, persuade, argue one’s case), confidence in public speaking, conflict management, facilitation and mediation skills, building a reputation and managing reputational risks, the ability to establish and maintain personal contacts and social connections, empathy.

The respondents who defined their need in the field of “communication” as “acute” make up 16.5 %. The respondents experiencing a strong need made up 33.9 % of the respondents. A moderate need was noted by 34 %. A weak need was noted by 12.9 % of the respondents. The lack of need was noted by 2.8 %. As a result, 84.4 % of respondents noted that they have a moderate or high interest in such area of civic education as “communication”.

Family formation (interaction within the family).

We understand this as such knowledge and skills as the ability to form and maintain strong social ties, responsible parenting / motherhood, safe sex, knowledge of genealogy (history of one’s family), understanding of gender roles in the family, knowledge of developmental psychology, the ability to manage the family budget.

The respondents who defined their need in the area of “forming a family” as “acute” make up 13.8 %. The respondents experiencing a strong need made up 29.3 % of the respondents. A moderate need was noted by 27.6 %. A weak need was noted by 20.2 % of the respondents. The lack of need

was noted by 9.2 % (the highest indicator among all directions). In total, 70.7 % of respondents noted moderate or high interest in this area of civic education.

Community formation and development.

This block includes the knowledge and skills that are responsible for human interaction in the community: leadership, teamwork, gender equality, minority rights, interaction during a pandemic, self-government and management of the shared resources, economic development of communities, social innovation, social mobilization, project management for the development of communities, fund-raising, development of social capital, social entrepreneurship, understanding the mechanisms of functioning of local self-government, active citizenship (activism).

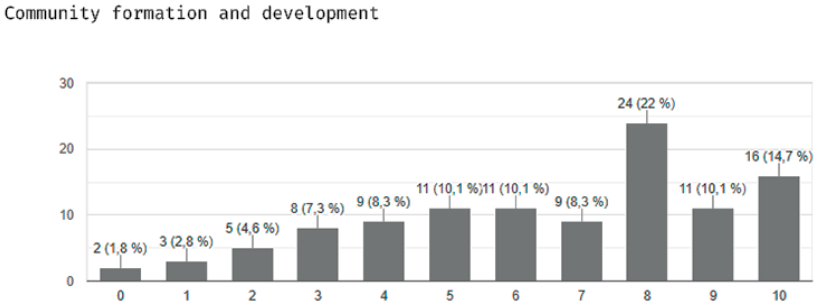


Fig. 5.2. Community formation and development
Source: developed by the authors

The respondents who defined their need in the field of "formation and development of communities" as "acute" make up 14.7 %. The respondents experiencing a strong need made up 40.4 % of the respondents. A moderate need was noted by 28.5 %. A weak need was noted by 20.2 % of the respondents. The lack of need was noted by 1.8 %. In total, 83.6 % of

respondents noted that they have moderate or high interest in this area of civic education.

Cultural / national identity.

We understand it as the knowledge and skills that ensure interaction with the cultural community (nation/people): understanding of national and cultural identity, the ability to preserve folk traditions, understanding the meaning of national memory and its impact on socio-political processes (knowledge of national history), patriotism.

The respondents who defined their need in this area as "acute" make up 12.8 % of the respondents (the lowest indicator among all areas). The respondents experiencing a "strong" need made up 33 % of the respondents. "Moderate" need was noted by 32.1 %. "Weak" need was noted by 17.4 % of the respondents. The lack of need was noted by 4.6 %. As a result, 77.9 % of respondents noted that they have moderate or high interest in the field of civic education "cultural/national identity".

Interaction with authorities.

This refers to the knowledge and skills that are responsible for the interaction of a person with authorities: understanding the state structure (legal institutions and their interaction), electoral participation, building transparent interaction, advocacy / lobbying, nonviolent resistance, change management, understanding of democratic views and values.

The respondents who defined their need in this area as "acute" make up 17.4 % of the respondents (the lowest indicator among all areas). The respondents experiencing a "strong" need made up 33 % of the respondents. "Moderate" need was noted by 32.2 %. "Weak" need was noted by 16.6 % of the respondents. The lack of need was noted by 0.9 % (the lowest indicator in all areas). In total, 82.6 % of respondents noted that they have moderate or high interest in the area of civic education "interaction with authorities".

Understanding of the world context.

We understand this as the knowledge and skills that help a person to interact with the world: cultural education, understanding the principles of sustainable development, building an information society, respect for other cultures and ethnic groups, knowledge of world history, understanding the context and mechanisms of international relations, intercultural communication.

The respondents who defined their need in this area as “acute” make up 20.2 %. The respondents experiencing a “strong” need made up 29.3 % of the respondents. “Moderate” need was noted by 33 %. “Weak” need was noted by 12.9 % of the respondents. The lack of need was noted by 1.9 %. In total, 82.5 % of respondents noted moderate or high interest in this area of civic education.

Environmental education.

For this group, we have collected the knowledge and skills that are responsible for interacting with nature: environmental protection, nature management, waste separation, humane treatment of animals.

The respondents who defined their need in this area as “acute” make up 15.6 %. Respondents experiencing a “strong” need made up 32.1 % of the respondents. “Moderate” need was noted by 34 %. “Weak” need was noted by 14.7 % of the respondents. The lack of need was noted by 3.7 %. In total, 81.7 % of respondents noted moderate or high interest in this area of civic education.

Summing up the answers to the first complex question, we can say that, on average, 79 % of respondents have a stable moderate or high interest in all areas of civic education offered in the survey. The greatest need is observed in the field of “personal growth” – 88 %, and the least expressed need was in the field of “family formation” – 70.7 %.

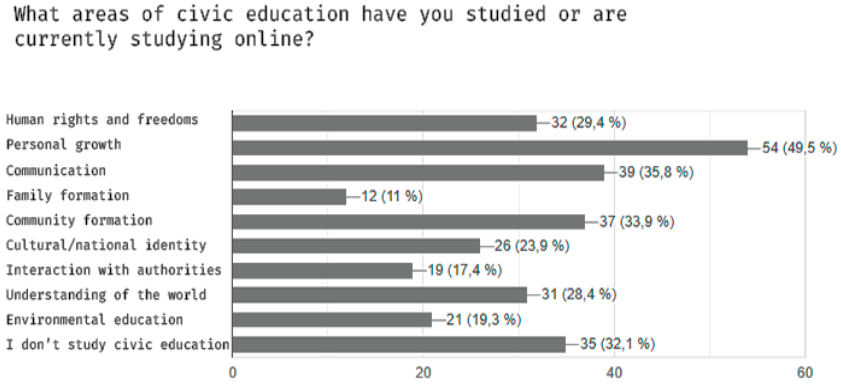


Fig. 5.3. What areas of civic education have you studied or are currently studying online?

Source: developed by the authors

The second question was: "What areas of civic education have you studied or are currently studying online? ". We found out how many respondents meet their needs in civic education in online format. 29.4 % of respondents answered that they meet their needs in the field of "human rights and freedoms". 49.5 % of respondents study online in the field of "personal growth". 35.8 % of the respondents obtain knowledge and skills in the field of "communication". Only 11 % study in the field of "family formation". 33.9 % of the respondents answered that they were studying the field of "formation and development of communities". 23.9 % of respondents study online in the field of "cultural/national identity". The field of "interaction with authorities" is studied by 17.4 % of respondents. The field of civic education "understanding the world context" is studied by 28.4 % of the respondents. 19.3 % of respondents study online in the field of "environmental education". 32.1 % answered "I don't study civic education online".

The third question was: “What online formats of civic education are more preferable for you?”. The respondents had to evaluate on a scale from 0 to 10 how suitable each of the online formats is for acquiring the knowledge and skills in the field of civic education: a score on a scale of “0” means that the format is not at all suitable, “10” – that the format is the most preferable. According to the logic of the answers, we can assume that the range of selected ratings 1-3 meant that the format was rather unsuitable than suitable; the range of 4-6 meant the format was rather suitable than unsuitable; and the range of 7-9 meant that the format was well suited for training. We asked the test subjects to evaluate 7 formats/tools of online civic education.

Video lecture is a recording of a lecture available on video hosting. This format is considered “most preferable” by 27.5 % of respondents. It was considered “quite suitable for training” by 36.8 %. 27.6 % of respondents think that the format is “rather suitable than unsuitable”. The format is considered “rather unsuitable than suitable” by 6.4 % of the respondents. Only 1.8 % of respondents believe that the format is “not at all suitable” for online learning. Summing up, we can say that the format of “video lecture” is considered suitable for online education by 91.8 % of respondents.

Streaming is a live broadcast with the possibility to ask questions in the chat. This format is considered “most preferable” by 18.3 % of respondents. It was considered “quite suitable for training” by 37.6 %. 28.5 % of respondents think that the format is “rather suitable than unsuitable”. The format is considered “rather unsuitable than suitable” by 10.2 % of respondents. 5.5 % of respondents think that the format is “not at all suitable” for online learning. Summing up, we can say that the format of “streaming” is considered suitable for online education by 84.4 % of respondents.

Massive open online course – course that includes: video and text materials for self-study; communication with the

teacher and fellow students in the online forum; testing the obtained knowledge; issuance of electronic certificates.

This format is considered the “most preferable” by 32.1 % of respondents. It was considered “quite suitable for training” by 39.5 %. 18.4 % of respondents think that the format is “rather suitable than unsuitable”. The format is considered “rather unsuitable than suitable” by 7.3 % of respondents. 2.8 % of respondents think that the format is “not at all suitable” for online learning. Summing up, we can say that 89.9 % of respondents consider the format of the “massive open online course” to be suitable for online education.

Video-conference (webinar, zoominar, etc.) – live broadcast (using programs such as Zoom, Skype, Google Meet and others) with the possibility to communicate with the lecturer. This format is considered “most preferable” by 19.3 % of respondents. It was considered “quite suitable for training” by 34.9 %. 31.2 % of respondents think that the format is “rather suitable than unsuitable”. The format is considered “rather unsuitable than suitable” by 8.3 % of respondents. 6.4 % of respondents think that the format is “not at all suitable” for online learning. Summing up, we can say that the format of “video conferencing” is considered suitable for online education by 85.3 % of respondents.

Online text materials – articles, research, text posts on social networks – are considered to be the “most preferable” by 19.3 % of respondents. It was considered “quite suitable for training” by 37.5 %. 34.9 % of respondents think that the format is “rather suitable than unsuitable”. The format is considered “rather unsuitable than suitable” by 6.4 % of respondents. 1.8 % of respondents think that the format is “not at all suitable” for online learning. Summing up, we can say that the format “text online materials” is considered suitable for online education by 91.8 % of respondents.

Animation – animated educational videos – is considered to be the “most preferable” by 13.8 % of respondents. It was considered “quite suitable for training” by 50.4 %. 22 % of

respondents think that the format is “rather suitable than unsuitable”. The format is considered “rather unsuitable than suitable” by 10.2 % of respondents. And 3.7 % of respondents think that the format is “not at all suitable” for online learning. Summing up, we can say that the “animation” format is considered suitable for online education by 86.1 % of respondents.

Graphic online materials – info graphics, electronic comics, memes, and banners – are considered to be the “most preferable” by 15.6 % of respondents. It was considered “quite suitable for training” by 45.9 %. 29.3 % of respondents think that the format is “rather suitable than unsuitable”. The format is considered “rather unsuitable than suitable” by 8.3 % of respondents. 0.9 % of respondents think that the format is “not at all suitable” for online learning. Summing up, we can say that the format of “graphic online materials” is considered suitable for online education by 90.8 %.

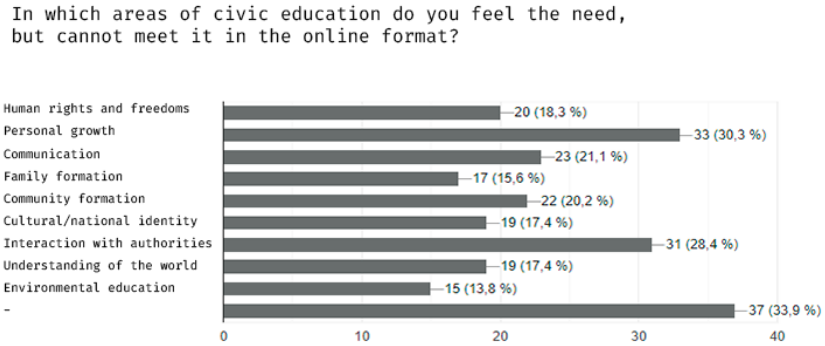


Fig. 5.4. In which areas of civic education do you feel the need, but cannot meet it in the online format?

Source: developed by the authors

The fourth question was: “In which areas of civic education do you feel the need, but cannot meet it in the online format?”.

The respondents had to indicate the areas in which they felt the need, but for various reasons they had obstacles to study these fields in the online format. 18.3 % of respondents experienced obstacles in the study of the field “human rights and freedoms” in the online format. 30.3 % of respondents indicated that they had obstacles in the study of the field “personal growth”, in the field of “communication” – 21.1 % of respondents, in the field of “family formation” – 15.6 %, in the field of “formation and development of communities” – 20.2 %, in the field of “cultural / national identity” – 17.4 %, in the field of “interaction with the authorities” – 28.4 %, in the field of “understanding of the global context” – 17.4 % and in the field of “environmental education” – 13.8 %. 33.9 % of respondents indicated that they did not experience any difficulties in studying any of the listed areas in online format.

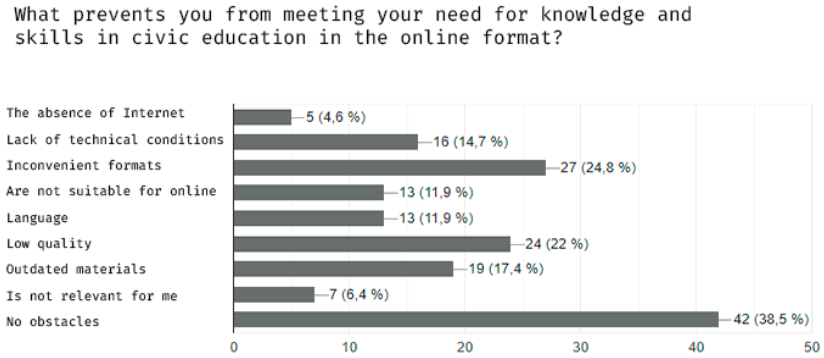


Fig. 5.5. What prevents you from meeting your need for knowledge and skills in civic education in the online format?

Source: developed by the authors

The fifth question was: “What prevents you from meeting your need for knowledge and skills in civic education in the online format?”.

Respondents could indicate one or more items, or indicate only the last one, if they do not experience obstacles in online civic education. “The absence of Internet (or the availability of Internet of insufficient quality)” was indicated as a problem by 4.6 % of respondents (it should be borne in mind that the survey was conducted in an online format). 14.7 % of respondents believe that the “lack of technical conditions for comfortable learning” is a serious obstacle. “Inconvenient online learning formats” are considered an obstacle by 24.8 % of respondents. 11.9 % of respondents believe that the “topics of interest are not suitable for online format”. 11.9 % of respondents noted that “there were no teaching materials in the language they spoke”. 22 % of respondents pointed to the “low quality of training materials”. “Irrelevance of training materials (outdated materials)” was noted by 17.4 % of respondents. The item “civic education is not relevant for me (no time or no interest)” was pointed to by 6.4 % of respondents. 38.5 % of respondents noted that they “had no obstacles” in obtaining the knowledge and skills of civic education in online format.

64.2 % of respondents indicated their gender as “female” and, accordingly, 35.8% indicated their gender as “male”. The age groups of respondents were distributed as follows: 7.3 % of respondents were under the age of 20 (generation Z), 33 % were aged 21-35 (generation Y), 49.5 % were aged 36-53 (generation X) and 10.1 % over the age of 53 (baby boomer generation).

28.4 % of respondents indicated that they were members of the Eastern European Network for Citizenship Education (EENCE). The survey was conducted online. A total of 109 respondents were interviewed.

CONCLUSIONS

The results of the study allowed us to draw the following conclusions.

We defined that ensuring a high level of digital integration of the population is essential for society to fully realize the digital economy's potential. Achieving this goal requires the digital inclusion of all citizens, regardless of their characteristics, in the digital society and removing barriers to access to information and digital services.

This is necessary because digital integration creates a set of economic, social, political, and institutional benefits for individuals, communities, and countries through the free access and skills to use information and communication technologies and the Internet.

The research results showed, because of the physical distancing measures introduced in response to the COVID-19 pandemic, there has been a significant digital transformation worldwide, with an increase in digital services, companies moving to remote customer service, digitalization of internal business processes, remote working and distance learning.

Because of the above, the need for digital inclusion of the population is only increasing, as the digital exclusion of citizens will exacerbate other socio-economic problems caused by the pandemic crisis (potentially negative impact on health in the absence of access to online and telemedicine; lack of access to education, public and social services, eCommerce, online banking; difficulty in finding a job and other).

Based on the above, it is necessary to develop mechanisms to increase the digital inclusion of the population. Wherein, digital inclusion cannot be seen as an end in itself. It should be a vehicle for social change and is part of a broader concept of social inclusion that involves citizens and communities in different aspects of the digital society.

We propose considering digital inclusion along the cycle "determinants of formation→features of use→results".

In our understanding, the digital inclusion concept is based on the digital divide discourse. It is conjunction:

- of a first-level digital divide based solely on technological aspects;
- of second, third, and fourth level digital divides due to disparities in education, digital skills, modes, and outcomes in the use of information and communication technologies and the Internet.

In a simplified form, we propose to consider there as:

- access divide (Access haves vs. Access have-nots) and, as a result, technological inequality;
- skills divide (Skills haves vs. Skills have-nots) and, as a result, educational inequality.

Based on the concept of the digital divide, we propose to consider the determinants of digital inclusion as:

1) forces is a theoretical construction that is an mechanism of a higher order, which determines direct or indirect changes in the adoption and expansion of information and communication technologies and the Internet. They reflect the macro- and dynamic perspective and describe the factors that can change the quantity, quality, and structural distribution of resources (meso-perspective) needed to access information and communication technologies and the Internet (micro-perspective) of citizens, groups of citizens or countries;

2) resources – the theoretical construction of the meso-level, which includes financial, material, human resources, and other assets that they can use to access information and communication technologies and the Internet;

3) access as a theoretical construction that describes the micro-reasons for the adoption of information and communication technologies, the Internet, and as a result of digital inclusion (motivational, intelligent, social, physical, and material access).

In the complex these represent the macro-, meso- and micro-causes or factors influencing the digital divide (i.e., the reasons why the digital divide occurs).

We have identified that a favourable economic environment and a high level of education are prerequisites for a high level of digital inclusion. These determinants are interlinked and mutually influence each other.

The economic environment in the global context determines the development of digital infrastructure and opportunities for digital capacity building. They also tend to determine the level of educational development.

Education in the global context is seen as a determinant of high levels of digital inclusion. It bridges the second, third and fourth level digital divides beyond the technical perspective and simple access to information and communication technologies and the Internet; it promotes their use with critical awareness.

Forces can change the quantity, quality, and structural distribution of individuals' resources, which shapes the access required for digital inclusion or the adoption of specific technologies.

This theoretical model is applicable as an analytical and measurement tool to address the real effects of digital inclusion, including on a country's information security.

We consider it appropriate to study the determinants of the formation of digital inclusion by their origin, nature, and pattern of occurrence, the intensity of action, degree of control, predictability, and regulation capability.

So far as digital inclusion is a complex multilevel phenomenon, all aspects should be evaluated comprehensively at the micro-level (individual or typological grouping level), macro-level (individual country level, intra-national disparities within regions, rural and urban areas), and global level (within the OECD countries, between the industrialized countries and the less developed ones).

It is essential to understand that determinant evaluation should consider complex non-linear convergent relationships that cannot be formalized by the conventional mathematical apparatus of rigorous logic. The latest methods used by behavioural economists – cognitive, causal, neural network modelling – should be applied to the evaluation.

The use of information and communication technologies and the Internet is proposed to be measured by quantitative indicators such as time and frequency of use, number and variety of programs used, type of connection (narrowband or broadband use).

The type and complexity of information and communication technology and Internet use (easy access, search, interactivity, intensive use, creation of own content, etc.) are suggested to be considered.

The results of digital inclusion of the population can be studied in depth by the remoteness of effects, their duration, nature (convenience/risk), and scale at micro, macro, and mega levels.

The study uses online civic education during a pandemic as an example.

In the context of the research topic, the high demand for information and computer literacy with a low supply of non-formal adult education courses is interesting.

So this is an area for further improvement in order to bridge the educational digital divide.

In an online format, civic education becomes more inclusive, but as the overall demand for such education decreases, vulnerable groups receive fewer educational offerings as a result, including in the area of digital literacy. Therefore, vulnerable groups are also at risk of digital exclusion in civic education, as in other socially and economically important areas.

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Annex 1

Internet Stats and Facebook Usage in Europe 2021 Mid-Year Statistics

EUROPE	Population (2021 Est.)	Internet Users, 31.12.2020	Penetration (%Population)	Users % in Europe
Albania	2,872,933	2,160,000	75.2 %	0.3 %
Andorra	77,355	73,101	94.5 %	0.0 %
Austria	9,043,070	7,920,226	87.6 %	1.1 %
Belarus	9,442,862	7,521,628	79.7 %	1.0 %
Belgium	11,562,784	10,857,126	93.9 %	1.5 %
Bosnia-Herzegovina	3,501,774	2,828,846	80.8 %	0.4 %
Bulgaria	6,988,739	4,663,065	66.7 %	0.6 %
Croatia	4,140,148	3,787,838	91.5 %	0.5 %
Cyprus	1,198,427	1,011,831	84.4%	0.1 %
Czech Republic	10,630,589	9,323,428	87.7 %	1.3 %
Denmark	5,775,224	5,649,494	97.8 %	0.8 %
Estonia	1,303,798	1,276,521	97.9 %	0.2 %
Faroe Islands	49,692	48,489	97.6 %	0.0 %
Finland	5,561,389	5,225,678	94.0 %	0.7 %
France	65,480,710	60,421,689	92.3 %	8.3 %
Germany	82,438,639	79,127,551	96.0 %	10.9 %
Gibraltar	34,879	32,939	94.4 %	0.0 %
Greece	11,124,603	8,115,397	72.9 %	1.1 %
Guernsey & Alderney	66,731	55,807	83.6 %	0.0 %
Hungary	9,655,361	8,588,776	89.0 %	1.2 %
Iceland	340,566	337,194	99.0 %	0.0 %
Ireland	4,847,139	4,453,436	91.9 %	0.6 %
Italy	59,216,525	54,798,299	92.5 %	7.5 %
Jersey	100,097	70,000	69.9 %	0.0 %
Kosovo	1,907,592	1,693,942	88.8 %	0.2 %
Latvia	1,911,108	1,663,739	87.1 %	0.2 %
Liechtenstein	38,404	37,674	98.1 %	0.0 %
Lithuania	2,864,459	2,603,900	90.9 %	0.4 %
Luxembourg	596,992	584,037	97.8 %	0.1 %
Malta	433,245	360,056	83.1 %	0.0 %
Man, Isle of	85,369	52,000	60.9 %	0.0 %
Moldova	4,029,750	3,067,446	76.1 %	0.4 %
Monaco	39,102	38,124	97.5 %	0.0 %
Montenegro	629,355	449,989	71.5 %	0.1 %

Netherlands	17,132,908	16,383,879	95.6 %	2.3 %
North Macedonia	2,086,720	1,652,056	79.2 %	0.2 %
Norway	5,400,916	5,311,892	98.4 %	0.7 %
Poland	38,028,278	29,757,099	78.2 %	4.1 %
Portugal	10,254,666	8,015,519	78.2 %	1.1 %
Romania	19,483,360	14,387,477	73.8 %	2.0 %
Russia	143,895,551	116,353,942	80.9 %	16.0 %
San Marino	33,683	20,270	60.2 %	0.0 %
Serbia	8,733,407	6,406,827	73.4 %	0.9 %
Slovakia	5,450,987	4,629,641	84.9 %	0.6 %
Slovenia	2,081,900	1,663,795	79.9 %	0.2 %
Spain	46,441,049	42,961,230	92.5 %	5.9 %
Svalbard & Jan Mayen	2,583	1,700	65.8 %	0.0 %
Sweden	10,053,135	9,692,227	96.4 %	1.3 %
Switzerland	8,608,259	8,066,800	93.7 %	1.1 %
Turkey	82,961,805	69,107,183	83.3 %	9.5 %
Ukraine	43,795,220	40,912,381	93.4 %	5.6 %
United Kingdom	66,959,016	63,544,106	94.9 %	8.7 %
Vatican City State	799	480	60.1 %	0.0 %
TOTAL EUROPE	829,173,007	727,559,682	87.7 %	100.0 %

Source: https://www.internetworldstats.com/stats.htm

Digital inclusion of population: economic, social, educational determinants in the COVID-19 era

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