Digital inclusion for social inclusion. Case study on digital literacy

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The aim of this research is to identify the differences in access to technologies and
digital skills of the population according to their socioeconomic characteristics
and to analyse the opportunities offered by new emerging learning environments
to promote the social inclusion of vulnerable groups. The digital divide is defined
as inequality in the access, use, or impact of information and communication
technologies (ICT), and, to address it, it is necessary to build on the conceptual
frameworks developed in research to date. This study seeks to 1) identify the main
difficulties in digital access and skills and 2) explore what the adoption, design,
development, and adaptation of emerging learning technologies mean for the
most disadvantaged groups. A quantitative, research design was used. The results
obtained show that there are differences in digital skills and access according
to education and income level. Different statistical analyses were used, such as
non-parametric tests and tests of association between variables. The survey was
carried out on a proportional sample of 400 people in La Rioja (Spain). Data was
collected through online and face-to-face surveys. A quantitative approach was
implemented in the first phase. In the second phase, students of the Social Work
degree programme, social work professionals, and users of the Senior Citizens'
Center (older adults) were included. The qualitative research is based on the
development of digital literacy, which seeks to test and provide new insights
into the use of innovative learning-teaching methodologies, with digital materials
(micro videos), to promote the use and knowledge of ICT as a means of bridging
social (as well as digital) divides.

KEYWORDS

digital divide, digital skills, digital literacy, media competence, social inclusion

1. Introduction digital literacy as a central component of social-digital inclusion

The extensive use of information and communication technologies and their
pervasiveness in all areas have led to asymmetric societal development. The Internet is highly
pervasive worldwide. However, its development presents different participation divides
between individuals and societies.

The concept of the digital divide has broadened, transcending the definitions of the
early 21st century that linked it mainly to access and availability of equipment. Today,
the multifaceted (Gorski, 2005) and multilevel (Van Deursen et al., 2017) nature of this
phenomenon, which is typical of advanced societies, is widely recognized. It relates to the
difference between people who have access to ICT and the tools to use them effectively and
those who do not. Factors related to digital skills, motivation, and education level, among
others, come into play in these differences.

The Internet, with its multiple applications and uses, is generating new forms of social interaction and participation, while at the same time generating other types of exclusion or impacting existing social inequalities. Hence the need to understand the factors associated with the digital divide, particularly in vulnerable sectors of the population. Breaking the digital-social divide also requires the development of digital literacy strategies adapted to the abilities of different population groups. In recent years, a number of experiences related to education (formal, non-formal, and informal) have been developed in online environments. In this new context, training based on micro-video tutorials is a rapidly developing product, aimed at reducing the participation divide for access to relevant information.

This study attempts to gain further insight into the different variables that are intertwined in the process of appropriation of information and communication technologies according to the conceptual model offered by Van Dijk (Motivational Access, Material Access, Skill Access, Usage Access) (Van Dijk, 2005) to understand the phenomenon of the digital divide, taking into account socioeconomic characteristics (education and income level). The preliminary results of a qualitative study of (non-formal) digital literacy as support and training for learners who want to learn and participate in online environments are also presented.

The first objective of this study is to identify the differences in access to technologies and digital skills of the sample population, taking into account the multiple aspects of ICT and their relationship to the concept of digital inclusion. We base our second study objective on the development of digital literacy, aiming to test and provide new insights into the use of innovative learning-teaching methodologies with digital materials (micro-videos) to promote ICT use and knowledge as a means of bridging social (as well as digital) divides.

The first part of this paper presents the conceptual framework, first highlighting the aspects of the digital divide and its link to the social divide and, second, digital literacy as a condition for social inclusion in digital environments. Subsequently, the methodology of the two research phases undertaken for the study is explained. Next, the results of the survey and the focus groups are presented. Finally, the main conclusions of the study are presented, highlighting the importance of advancing technological designs appropriate to the characteristics of the population.

1.1. Digital divide vs. social divide

The concept of the digital divide can be defined as the social inequality between individuals who draw benefit from Internet access and those that suffer negative consequences due to a lack of access (Newhagen and Bucy, 2004). The concept of the digital divide has evolved as the knowledge base about other inequalities implicated in the divide has expanded, referring not only to differences in access (quality, quantity, autonomy of use) but also to the type or level of skills (elements related to the medium and content), motivation (attitudes and reasons for using or not using the Internet) and the ways

individuals use the Internet (participating in and creating digital content) (Hargittai, 2001; Chen and Wellman, 2004; Goldfarb and Prince, 2008). On this basis, current research on the digital divide challenges the binary assumption that having (or not having) access to the Internet guarantees digital inclusion and incorporates sociodemographic variables and indicators such as age (Fokkema and Knipscheer, 2007), gender (Collado et al., 2008), race or ethnicity (Mori, 2011), education level (Robinson et al., 2003), or income (Dimaggio et al., 2004) into studies. The Internet and new technologies are a product whose distribution, at least initially, follows existing divisions of gender, class, and race (Van Dijk, 2005; Selwyn, 2006; Willis and Tranter, 2006).

There is a large body of literature and research that studies the link between the social and digital divide (Chen and Wellman, 2004; Hargittai and Dobransky, 2017). Authors such as Hargittai (2008) or Van Deursen and Van Dijk (2015) suggest that Internet use reproduces or accentuates existing social disadvantages and inequalities by differentiating users' opportunities, since the distribution of ICT like many other goods or services, does not reach the most disadvantaged population. Witte and Mannon (2010) focused their interest on showing that the nature of users' online activity was linked to the social, economic, and cultural relationships they establish in offline reality. Along these lines, authors such as Persaud (2001) showed that the knowledge divide is ten times larger than the income divide. Pearce and Rice (2013) showed that personal characteristics or social groups presented important differences in the use of the Internet and ICT; they revealed that users with higher status performed activities or tasks that allowed them to improve or maintain their opportunities in the offline reality too, while those with lower status used the Internet or ICT for entertainment and less capital-intensive activities. In line with this idea, Helsper (2012) argues that the value obtained from the Internet is inversely proportional to the ability to use the Internet and the way it is used.

The scientific community studying the digital divide takes a multilevel and multifaceted perspective, as well as an endemic approach in the sense that the Internet functions as a magnifier of existing stratification (Zhao, 2006). Thus, when inequality in society increases, the Internet tends to reinforce this tendency (DiMaggio and Garip, 2012).

Although research identifying differences between various segments of the population is mentioned above, over time studies have emphasized the increasing prevalence of the medium among the general population. Thus, some authors point out that in countries with high pervasiveness and extension rates, the Internet has become a basic requirement and a prerequisite for social inclusion (Cahoon, 1998; Van Deursen and Van Dijk, 2015). In this context, typical of the most advanced societies, the European Digital Competence Framework for Citizens (DIGCOMP) was developed to provide a tool to guide national strategies in pursuit of European citizens' appropriation of technologies (Kluzer and Pujol Priego, 2018). In line with the needs and problems of contemporary society, it is considered part of the 2030 Agenda (Organización de Naciones Unidas, 2015), and the Digital Agenda (Comisión Europea, 2010) implements projects to improve and promote the process of digital adaptation and transformation.

1.2. Digital literacy for social-digital inclusion

Today's "information and communication society" is undergoing a great digital transformation, in which the Internet and technologies have brought about substantial changes in various spheres, such as the economic, political, cultural, and relational, and in the resulting behavioral patterns (Méndez-Domínguez and Castillo de Mesa, 2021). Information and communication technologies have changed the way literacy is taught. The accelerated transition into applied use of digital media has become a challenge due to insufficient time, guidance and training. It demands new skills and expertise so that it can be used properly for its intended purpose, and benefit can be gained; this is why the concept of digital literacy has established itself as an innovative approach to accessing, acquiring and managing the information that surrounds us (Reddy et al., 2022a). Digital literacy refers to the action of raising awareness and equipping people with certain skills and knowledge so that they can master ICT.

According to Bawden and Robinson (2002), digital literacy is a factor of social inclusion because its main objective is to reach all people, whatever their status, gender, race, religion, or origin, and to enhance their quality of life. It implies being able to carry out "the necessary activities to ensure that all individuals and communities, including the most disadvantaged, have access to and use information and communication technologies" (Helsper et al., 2015).

Nevertheless, although digital inclusion does not directly imply social inclusion, digital inclusion has become a central component in the design of social policies for social inclusion.

For this reason, it has been included and addressed in education across curricula, teaching strategies and public policies (Reddy et al., 2022b). In this respect, at the level of social policy, the EU Digital Agenda launched by the European Commission (Comisión Europea, 2010) envisages the promotion of digital literacy, skills, and inclusion to reduce the digital divide.

Digital literacy is the key to adapting to the continuous and rapid changes brought about by digitisation, and this requires education to adapt to new learning and teaching environments through technologies (Pérez-Escoda et al., 2019). E-learning or social learning, as well as other digital resources or materials, emerge as innovative models and methodologies for open, flexible, and omnipresent learning and teaching (Bennett, 2014); however, studies on the development and conceptualization of digital literacy show the need to apply models or methodologies based on the circumstances and, especially with regard to: teachers, citizens in general, students, etc. (Bagozzi, 2007; Buchanan et al., 2013).

In this vein, training and learning possibilities extend to non-formal education and flexible education, where it is possible to connect from anywhere and do so from any type of device to access presentations, guides, tutorials, simulations, visual and interactive material, learning, practice material, etc. Non-formal education is characterized as something that is voluntary, accessible to all (Ilomäki et al., 2012), an organized process with educational objectives, participatory, focused on learning life skills and preparing for active citizenship, based on both individual and group learning with a collective, holistic and process-oriented approach, also based on experience and action, and organized according to of the needs of the participants (De Haan et al., 2002). Non-formal education refers to planned and structured programmes and processes of personal and social education. Non-formal education plays a significant role in developing digital skills, which are useful for personal and professional advancement and significantly increase the opportunity to join the labor market and thus employability (Anandarajan et al., 2000).

The intensive and extensive nature of using the Internet and ICT offers a professional and personal buttress to a way of life, which is not accessible to those with less capital (Van Dijk, 2005). In parallel, the uptick in the creation of professional (or not) digital content, including by the users themselves, and the evolution of digital platforms have resulted in new processes of social, personal, and professional development, allowing the development of learners' personalized skills with the support of new descriptive, interactive, demonstrative, practical, and illustrative methodologies (Bennett, 2014).

2. Data and methodology

The research was carried out in two phases with a dual approach to the object of study. On the one hand, a quantitative research design linked to the first objective was used. On the other hand, to achieve the second objective, a qualitative approach was used, which included the perception and meaning of the vulnerable groups under study. The material and methods used in each phase of the research are presented below.

2.1. Phase 1. Quantitative approach

In this phase, a study of the population was carried out using a structured questionnaire aimed at identifying the digital divide and digital skills in the population of La Rioja.

2.1.1. Participants

The letter K is the constant that depends on the pre-set confidence level. For a 95.5% confidence level, k = 2. The letter p defines the percentage of the population that possesses the characteristic of interest, while the letter q defines the proportion of the population that lacks the characteristic of interest. In both cases, the same probability is given for possessing or not possessing the characteristic. Finally, the letter referring to the sampling error of $+/-5$ estimated for the 95.5% confidence level. A non-probabilistic convenience sample was used in the study, considering the characteristics of the population over 18 years of age in the Autonomous Community of La Rioja (Spain). The sample size was calculated using the formula

$$n = (k^2 * p^2 * q^2)/e^2$$

to determine the minimum necessary sample size. A 95% confidence level and a $p = 0.05\%$ error were established. The Labor Force Survey (2nd Quarter 2021) was used to determine the potential participating population ($N = 264,500$ persons), from

TABLE 1 Demographic characteristics.

Variables	Categories	n	%
Age	18–30	17	4.2
	31–40	97	24.2
	41–50	200	50.1
	51 to 60	64	16.1
	Older than 61 years	22	5.4
Country of birth	Spain	350	87.4
	Foreign country	50	12.6
Sex	Male	107	26.7
	Female	290	72.6
	Missing	3	0.7
Level of education	Less than primary	10	2.5
	Primary	33	8.3
	Lower secondary education	140	35
	Upper secondary and post-secondary non-tertiary education	90	22.5
	Tertiary education	127	31.7
Household Income level	Less than 900 euros	65	16.1
	900–1,600 euros	89	22.4
	1,600–2,500 euros	89	22.3
	2,500–3,000 euros	53	13.2
	>3.000 euros	56	14.1
	Data not available	48	11.8

Source: own elaboration based on the microdata results from the research project "Social Impact of the Digital Divide in Society in the Autonomous Community of La Rioja".

which the minimum sample size was calculated as 400 persons. A proportional allocation was carried out using the CNE-2014 according to education level.[1]

Table 1 presents the characteristics of the sample, according to the variables of interest for the study:

2.1.2. Information collection technique

The questionnaire "Survey on equipment and use of information and communication technologies in households," prepared by the Instituto Nacional de Estadística (2020) was used as a reference. The topics included in the study were grouped into 6 blocks: (1) characteristics or composition of the population; (2) availability of equipment in the home; (3) skills related to digital information; (4) communication and collaboration skills; (5) digital creation skills; and (6) skills related to security and privacy.

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1 Illiterate persons and those with incomplete primary education= 10; Primary education= 33; 1st stage of Primary education and similar= 140; 2nd stage of Secondary education and similar= 90 and Higher education= 127. These quotas were met by the research team in the configuration of the sample.

2.1.3. Information collection procedure

The parents' associations of the educational centers of La Rioja and social entities working with people with low income and/or education levels were contacted. To collect the data, an e-mail was sent to these associations and entities requesting their participation in the research. The questionnaire was administered digitally, using the Microsoft forms tool, as well as in person at social entities that assist people receiving economic benefits and professional support in the field of social inclusion. This second strategy made it possible to overcome the digital divide bias in certain population groups.

Information collection was carried out between December 2021 and January 2022.

2.1.4. Analysis

The normality of the distribution of the dependent variables was examined using the Kolgomorov-Smirnov test with Lilliefors correction. All dependent variables reached a significance level of $p < 0.001$, showing that the data do not follow a normal distribution, which supports the choice of non-parametric tests. In this case, the Mann-Whitney U-test and the Kruskal-Wallis test were used to determine the differences between groups according to the number of groups tested. For each variable, partial E-squared and Cohen's coefficient (Cohen, 1988) were calculated to determine the effect size (<0.1-small effect; =0.3 medium effect; and >0.5 large effect). In addition, the chi-square test was applied and the p-value < 0.05 was used as a threshold to study differences between variables.

The authors used the G Power 3.1.9.7 program to test whether a comparison between the items of income level and education level is possible, following the work of Cohen (1988) and Paul et al. (2007). The values obtained for each of these variables and their respective items are all above 0.8.

2.2. Phase 2. Qualitative approach

In this second phase of the study, focus groups were carried out with three sectors of the population linked to social intervention with socially vulnerable groups.

2.2.1. Participants

Participants were selected in January 2023, seeking the discursive representativeness of people linked to the field of social intervention with people experiencing or at risk of exclusion. The strategic sample is made up of different age groups, geographical areas, and roles in social intervention. Three focus groups were formed.

Group 1. Social Work professionals with experience in different areas of intervention (primary care social services, social entities caring for people with disabilities, services linked to the socio-labor insertion of people experiencing or at risk of exclusion). The participants in the group ranged from 27 to 50 years old. A total of 8 people took part, 3 men and 5 women.

Group 2. Second-year Social Work students of the University of La Rioja, aged between 19 and 21 years old. A total of 12 people participated, 3 men and 9 women.

Group 3. Users of social programmes and services. The group was made up of people over 65 years of age from a rural area of La Rioja, who are undergoing some training related to computers and the use of ICT. A total of 13 people took part, 7 men and 6 women.

2.2.2. Data collection technique

The focus group technique was used. This is a qualitative technique that enables dialogue between participants based on specific stimuli (Silveira Donaduzzi et al., 2015). It makes it possible to capture the underlying discourse about the object of study and to understand the phenomena within their context from the perspective of the people who experience them (Bilbao Acedos et al., 2002).

2.2.3. Procedure

The focus groups were carried out in the second half of February 2023. The groups were run using a pre-established script. After the presentation of the research objectives, a first round of discussion was opened to find out about their experience following Van Dijk (2005) conceptual model (Material Access, Skill Access, Usage Access). The group of professionals was asked to differentiate between their personal and professional experiences. In the second part of the study, they were asked to try to carry out a task linked to a digital resource/service of the State Administration, in this case, to activate *Mi Carpeta Ciudadana* (My Citizen File). They were given an estimated time of 10 min to carry out the activity. Attitudes and behaviors toward the task were observed. Subsequently, a micro video (2 min) was presented, whose content and purpose was to show what the "My Citizen File" app is, how it works, and what it is used for. After viewing the video, they were asked to evaluate it as a digital learning/teaching resource. Finally, the micro video, the audiovisual characteristics, and the teaching methodology in the virtual environment were evaluated.

The focus groups lasted approximately 1 h and 30 min. The group of professionals and students was held at the facilities of the University of La Rioja and the group of service users was held at the Senior Citizens' Center in Arnedo (La Rioja).

2.2.4. Analysis

The content analysis was carried out based on information collected during the focus groups. The information was tabulated based on the areas explored in the study of the digital divide, the comments on the task experiment, and the evaluation of the educational micro-video.

3. Empirical results

This section presents the main results obtained in each of the phases of the study. The results of the quantitative approach are presented first, followed by the qualitative approach.

TABLE 2 Contingency coefficient according to demographic and socioeconomic variable.

	Level of education	Level of income
Age	0.199*	0.254*
Origin	0.163*	0.209*
Sex	0.193*	-

Source: Own elaboration based on the microdata results from the research project "Social Impact of the Digital Divide in Society in the Autonomous Community of La Rioja." *significance level $p < 0.001$.

3.1. Results of the quantitative study

The association between the variables under study was analyzed (Table 2).

The association between socio-demographic variables (age, sex, and country of origin) and socio-economic variables (level of education and income) was found, with a *p*-value of <0.005. The association between education level and the three socio-demographic variables is moderate. The association between education level and income is also moderate for age and origin; in this case, no association by gender was found.

Table 3 shows the proportion of the population according to the demographic and socioeconomic variables analyzed.

Younger cohorts have lower levels of education and lower levels of income. In terms of country of origin, foreigners in the sample have lower levels of education and income. Women in the sample score higher at the tertiary level of education.

The following subsections analyse the results obtained concerning the association between the variables of income level and education level with the different aspects related to the digital divide. The tables show the effect size according to Cohen's coefficient (Cohen, 1988). The effect is marked in dark green when the effect is medium and light green when it is small. Empty cells mean that there is no effect. No variable has a large effect (>0.5).

3.1.1. Dimension. Material access: equipment and type of internet connection

Physical access or connectivity was analyzed through the availability of different equipment and the type of Internet connection. The values shown in Table 4 indicate the existence of significant differences and associations between the equipment in the home and the socioeconomic variables.

There is a moderate association between education level and the availability of a computer and laptop at home. In addition, there is a moderate association between income level and the availability of computer and laptop equipment, tablet, and landline phone. The rest of the associations are weak.

Table 5 shows the percentage distribution of the Material Access variables according to the variables of educational attainment and household income level.

The results obtained point to inequalities in Material Access according to the variables of higher or lower educational attainment, as well as the household income threshold.

TABLE 3 Demographic and socioeconomic variables.

Demographic variables		Level of education			Level of income		
	%	Basic education or less	Upper secondary education	Higher education	<900 euros	900−2,500	Over 2,500 euros
		%	%	%	%	%	%
Age	18–30	7.1	2.2	1.6	6.1	5.1	0
	31–40	26.2	20.9	23.6	25.8	31.5	14.7
	41–50	46.4	47.3	57.5	45.5	48.3	54.1
	51–60	13.1	24.2	14.2	13.6	11.8	23.9
	+60	7.1	5.5	3.1	9.1	3.4	7.3
Country of birth	Spain	82	88.9	94.5	75%	88.2	95.4
	Foreign country	18	11.1	5.5	25%	11.8	4.6
Sex	Male	30.1	30	19.7	33.8	21.9	27.3
	Female	69.9	66.7	80.3	66.2	78.1	71.8
	Missing	0	3.3	0	0	0	0.9
N		183	90	127	65	175	109

Source: own elaboration based on the microdata results from the research project "Social Impact of the Digital Divide in Society in the Autonomous Community of La Rioja." The income variable has been regrouped into three relative brackets with household income, excluding the No Answer options from this analysis.

TABLE 4 Association according to connectivity variables and socioeconomic variables.

	Level of education		Level of income	
	Chi	CC	Chi	CC
Computer and laptop	46.649**	0.320	45.649**	0.320
Tablet	23.940*	0.238	45.649**	0.326
Mobile phone	28.004*	0.256	42.971**	0.312
Landline phone			16.423*	0.199
Fixed or mobile broadband connection	19.033*	0.149*	8.829*	0.149

Source: Own elaboration based on the microdata results from the research project "Social Impact of the Digital Divide in Society in the Autonomous Community of La Rioja." *significance level $p < 0.001$, **significance level $p < 0.005$.

3.1.2. Dimension. Skill access

The Skill Access dimension includes issues related to information handling and communication, especially related to operational skills. The values in Table 6 indicate an association between socioeconomic variables and some of the activities.

A moderate association is observed for the activity of receiving and sending e-mails according to education level, as well as for reading magazines and current affairs online according to income level. The remaining associations are weak. In this group of variables, the effect size is low, except for the first one for income level and the last one for both levels, which is moderate.

Table 7 shows the mean values for the skill access variables according to educational attainment and household income level, indicating the differences according to educational attainment and household income brackets.

The mean scores by education level are higher for all variables among those with higher education than those with basic or lower levels of education. The same trend is also observed by income level, between those with higher and lower incomes, except for the variable on using instant messaging.

3.1.3. Dimension. Usage Access (part I)

The Usage Access dimension refers to performing certain activities on the Internet and is observed through the behavior in the execution of certain tasks. Table 8 shows the association between the socioeconomic variables and the questionnaire items related to this dimension.

There is a moderate association between the level of education attained and "Accessing personal files in the health system," "Using e-banking," and "Selling goods or services." A moderate association was also found between household income and the variables "Sending official forms," "Downloading or printing official forms," and "Using e-banking." For most variables, the effect size is small, except for three variables related to educational attainment and two to income.

Average scores are somewhat higher among those with higher levels of education compared to those with basic or lower levels. The same trend occurs among those with higher income levels compared to the lowest income group (Table 9). In this case, the article "upload your own content through a sharing app" shows a slight higher mean score for the lower income group compared to the highest income group (2,373 vs. 2,262).

3.1.4. Dimension. Usage Access (part II)

In part II of Usage Access we measured the usefulness of the media for particular information, communication, transaction, or entertainment purposes that require greater ability, in relation to

TABLE 5 Distribution of connectivity variables according to socioeconomic variables.

Available equipment	Total	Level of education			Level of income		
		Basic education or less	Upper secondary education	Higher education	<900 euros	900–2,500	Over 2,500 euros
		%	%	%	%	%	%
Computer and laptop	71.4	61.7	80	79.4	44.6	71.5	89.9
Tablet	86.2	76	92.2	96.9	66.2	87.1	99.1
Mobile phone	60.8	47.5	73.3	76.9	35.4	57.5	79.6
Landline phone	97.9	96.7	98.8	99.2	100	97.8	100
2 Connection type							
Broadband fixed or mobile connection	97.3	95.6	97.8	99.2	92.9	98.3	99.1
N	400	183	90	127	65	179	109

Source: own elaboration based on the microdata results from the research project "Social Impact of the Digital Divide in Society in the Autonomous Community of La Rioja." The income variable has been regrouped into three relative brackets with household income, excluding the No Answer options from this analysis.

TABLE 6 Association according to skill access variables and socioeconomic variables.

	Level of education			Level of income		
	Kruskall-Wallis	Chi Squared	Eta	Kruskall-Wallis	Chi squared	Eta
Read magazines, news, and current affairs online	23.45**	24.54**	0.22	31.51**	45.60**	0.35
Searching for information about goods and services	14.09**	19.16*	0.18	6.74*	28.34**	0.22
Using instant messaging (WhatsApp, Messenger, Skype)	18.40**			12.92**	31.76**	0.24
Participate in social networks (Facebook, Twitter, Instagram)				17.55**	23.74**	0.20
Telephoning or making video calls over the Internet (WhatsApp, Messenger, Facetime)				6.38*	14.41*	0.11
Receiving or sending emails	80.34**	66.48**	0.39	39.83**	68.67**	0.39

Source: Own elaboration based on the microdata results from the research project "Social Impact of the Digital Divide in Society in the Autonomous Community of La Rioja." *significance level $p < 0.001$, **significance level $p < 0.005$.

part I and what people can do on the Internet and its different applications. Table 10 presents the association of the items in relation to socioeconomic variables.

The results obtained (see Table 10) point to the association between the level of education variable and the variables "Install programmes for the operation of the computer or Apps," "Create presentations or documents that include text, images, tables, or graphics," and "Limit access to their profile or content on social networks or shared storage." At the same time, there is a moderate association between the household income variable and the following variables: "Program in a programming language," "Use advanced Word or Excel functions such as sorting, filtering, graphing, or using formulas," and "Create presentations or documents that include text, images, tables, or graphs."

The remaining associations between the socioeconomic variables and the ability variables are weak. However, it should be noted that there is no association between level of education and the variables "Use basic Word, word processing or Excel functions" and "Use programmes to edit photos, videos, or audio files." Regarding income level, no association was found with the variables "Transferring files between computer and other devices

(digital cameras, mp3 or mp4 mobile phones)" and "Limiting access to your profile or content on social networks or shared storage."

The mean values are shown in Table 11 for the different items of the variables education level and household income.

As in the previous dimensions, it can be seen that people belonging to the higher education and income groups have higher average scores in all the items analyzed, except for the first item relating to "program in a programming language," which shows a slightly higher average in the basic level group (1.577 compared to 1.453).

3.2. Results of the qualitative study

The results obtained through the focus groups are presented below. Firstly, the assessment of the aspects related to the digital divide analyzed on the basis of participants' life experience is presented. The results obtained from the relevant discourse in each group analyzed are presented.

TABLE 7 Mean values for skill access variables, according to socioeconomic variables.

| | Level of education | | | | | | Level of income | | | | | |
| | Basic education or less | | Upper secondary education | | Higher education | | <900 euros | | 900–2,500 | | Over 2,500 euros | |
	M	DT	M	DT	M	DT	M	DT	M	DT	M	DT
Read magazines, news, and current affairs online	3.54	1.29	3.92	1.06	4.13	0.81	3.05	1.07	3.86	1.16	4.50	0.81
Searching for information about goods and services	3.37	1.18	4.13	0.97	4.19	1.26	3.59	1.30	3.98	1.02	3.76	1.27
Using instant messaging (WhatsApp, Messenger, Skype)	4.34	0.99	4.47	0.77	4.66	1.45	4.09	1.24	3.52	0.71	3.46	1.49
Participate in social networks (Facebook, Twitter, Instagram)	3.36	1.31	3.31	1.53	3.40	0.68	2.77	1.14	3.51	1.31	4.69	0.66
Telephoning or making video calls over the Internet (WhatsApp, Messenger, Facetime)	3.52	1.27	3.61	1.31	3.66	0.92	3.35	1.31	3.57	1.22	4.28	0.84
Receiving or sending emails.	3.58	1.12	4.30	0.96	4.49	0.81	3.26	1.28	4.08	1.00	4.25	0.89
N	183	90	127	65	179	109						

Source: Own elaboration based on the microdata resulting from the research project "Social Impact of the Digital Divide in Society in the Autonomous Community of La Rioja."

TABLE 8 Coefficient of association in usage access variables according to socioeconomic variables (part 1).

| | Level of education | | | Level of income | | |
	Kruskall-Wallis	Chi squared	Eta	Kruskall-Wallis	Chi squared	Eta
Send official forms (income tax return, taxes, medical or educational appointments in public centers, etc.)	61.322**	14.743	0.164	25.014**	57.540**	0.339
Download or print official forms	49.997**	30.845**	0.258	19.331**	59.963**	0.308
Obtain information from websites and government apps.	27.778**			11.747**	23.169*	0.240
Communicate with teachers or colleagues	32.911**	16.682*	0.168	8.451**	33.729**	0.268
Take an online course	72.944**	32.925**	0.213	7.858**	33.330**	0.233
Access personal files from the health system	16.617**	67.618**	0.376	17.049**	33.405**	0.225
Use Internet storage spaces (Google Drive, Dropbox)	13.871**	31.170**	0.247	9.806**	20.856*	0.216
Upload your own content (texts, photos, music, videos, or computer programmes) through an App to be shared		25.096**	0.232			
Use electronic banking	27.656**	52.723**	0.318	43.701**	70.988**	0.375
Sell goods or services	10.710**	55.946**	0.363			

Source: Own elaboration based on the microdata resulting from the research project "Social Impact of the Digital Divide in Society in the Autonomous Community of La Rioja." *significance level $p < 0.001$, **significance level $p < 0.005$.

3.2.1. Dimension. Material access

Access and connection to the Internet, as well as the availability of equipment, is high in all groups, although in their discourse older people allude to differences between the people around them. They highlight "*lack of interest on our part. Nowadays you have to be interested (...) I have friends my age and younger who say no, no, no, no*" (Female, 80 years old, G3). Also in rural areas, a discourse on the lack of coverage in certain municipalities emerges. Likewise,

they allude to the level of education as a factor in the access gap: "*It is not the same for people come from rural areas as it is for people who have gone to university*" (Male, 78 years old, G3).

In the group of professionals, there were differences in social service users' material access according to their economic situation. In low-income families it is common for teenage children to be given access to the Internet rather than other members of the family. In the focus group of students, there are hardly any

TABLE 9 Mean values for usage access variables, according to socioeconomic variables (part 1).

	Level of education						Level of income					
	Basic education or less		Upper secondary education		Higher education		<900 euros		900–2,500		Over 2,500 euros	
	M	DT	M	DT	M	DT	M	DT	M	DT	M	DT
Send official forms (income tax return, taxes, medical or educational appointments in public centers, etc.)	2.808	1.211	3.515	1.156	3.782	1.026	2.901	1.091	3.308	1.188	3.798	0.992
Download or print official forms	2.737	1.233	3.284	1.078	3.584	1.001	2.672	1.144	3.181	1.131	3.583	1.014
Obtain information from websites and government apps.	3.133	1.124	3.494	1.110	3.719	1.027	3.098	1.153	3.439	1.082	3.738	1.065
Communicate with teachers or colleagues	3.322	1.340	3.515	1.217	4.009	1.008	3.131	1.334	3.684	1.146	3.954	1.105
Take an online course	2.097	1.186	2.760	1.112	3.167	1.180	2.254	1.084	2.447	1.215	3.066	1.168
Access personal files from the health system	2.995	1.437	3.625	1.088	3.463	1.193	2.995	1.455	3.432	1.226	3.510	1.236
Use Internet storage spaces (Google Drive, Dropbox)	2.619	1.333	2.979	1.369	3.135	1.321	3.103	1.398	2.807	1.291	3.169	1.413
Upload your own content (texts, photos, music, videos, or computer programmes) through an App to be shared	2.386	1.262	2.206	1.224	2.250	1.141	2.351	1.406	2.373	1.203	2.262	1.197
Use electronic banking	3.282	1.406	3.905	1.140	3.966	1.112	3.292	1.463	3.707	1.151	4.179	1.049
Sell goods or services	1.836	1.030	2.278	1.106	1.990	1.110	1.861	0.888	1.965	1.080	2.129	1.155
N	183	90	127	65	179	109						

Source: own elaboration based on the microdata results from the research project "Social Impact of the Digital Divide in Society in the Autonomous Community of La Rioja."

differences in connectivity, all of them have data for Internet use and the vast majority have Wi-Fi Internet at home, except for one woman who commented "*I don't have Wi-Fi Internet at home because I live next to the beach and it doesn't work well, everyone has unlimited data and there's no issues…*" (Female, 20 years old, G2).

3.2.2. Dimension. Skill access

In the Skills Access dimension, the discourses show a continuous adaptation to the different tools that have become available. The use of the tools varies with age and with the area of use, as leisure tools or tools linked to studies and work. Each generation has incorporated different tools as they have found them useful in their daily lives. Professionals report usage more linked to entertainment activities and work. Students indicate their continuous use of the Internet, as one woman notes: "*It doesn't require us to make a great deal of effort to learn to use new technologies because we were born with them. It depends on the type of platform, we have greater ability and interest*" (Female, 19 years old, G2). Older people highlight the effort they have to make to keep up to date with the tools and the dependence they have on other people around them for certain procedures:

"*the children, it's mainly the children that do it*" (Male, 70 years old, G3).

The discourse of the group of professionals also highlights that they have observed differences in ability among service users. In some cases, some very skilled people use the Internet for everyday tasks, including job searches, and, in other cases, there are people with difficulties due to a lack of digital literacy. In fact, in many cases, in order to apply for benefits:

"*They prefer to make an appointment with the reference professional than do the process digitally*" (Female, 25 years old, G1).

This lack of ability is related in the discourses to barriers in carrying out certain formalities, such as those related to banking, finding a job, or applying for a financial benefit.

"*I find it very difficult. You go to the bank and they tell you, there's the cash machine, go to the machine*" (Male, 76 years old, G3).

An aspect related to ability that emerges in the discourse of older people refers to aspects related to physical health:

TABLE 10 Coefficient of association in the variables of usage access according to socioeconomic variables (part 2).

	Level of education			Level of income		
	Kruskall-Wallis	Chi squared	Eta	Kruskall-Wallis	Chi squared	Eta
Program in a programming language	61.322**	14.743	0.164	25.014**	57.540**	0.339
Use advanced Word or Excel functions such as sorting, filtering, graphing or using formulas	49.997**	30.845**	0.258	19.331**	59.963**	0.308
Use basic Word, word processing or Excel functions	27.778**	6.991	0.070	11.747**	23.169**	0.240
Use programs to edit photos, videos or audio files	32.911**	16.682*	0.168	8.451**	33.729**	0.268
Create presentations or documents that include text, images, tables or graphics	72.944**	32.925**	0.213	7.858**	33.330**	0.233
Install computer operating programs or Apps	16.617**	67.618**	0.376	17.049**	33.405**	0.225
Change the settings of any program, including operating system and security programs	13.871**	31.170**	0.247	9.806**	20.856**	0.216
Transfer files between the computer and other devices (digital cameras, mobile phones, mp3 or mp4)	1.376**	25.096**	0.232	4.147**	8.643	0.070
Create presentations or documents that integrate text, images, tables or graphs	27.656**	52.723**	0.318	43.701**	70.988**	0.375
Limit access to your profile or content on social networks or shared storage	10.710*	55.946**	0.363	3.700	5.404	0.085

Source: Own elaboration based on the microdata results from the research project "Social Impact of the Digital Divide in Society in the Autonomous Community of La Rioja." *significance level $p < 0.001$, **significance level $p < 0.005$.

> "*I have done courses, I have an interest, but retaining it...*" (Female, 80 years old, G3).
>
> "*I have done several computer courses. I have problems with my eyesight. I can't access a lot of things because of problems with my eyesigh*t" (Male, 79 years old, G3).

3.2.3. Dimension. Usage Access (part I)

In the section on Usage Access, different uses and differences according to the activity can be observed. In the professional field of social services and social intervention the use of technologies is developing progressively but slowly. The pandemic had an accelerating effect: "*the pandemic changed everything*" (Female, 50 years old, G1). Appointment reminders are starting to be sent by WhatsApp. In some cases, information mailing lists have been set up or video calls are conducted among families when they have a family member in a residential center. However, participants in the group of professionals consider that the development of technologies at this level is still limited compared to the technological progress observed in other fields.

They also mentioned the advantages of the Internet from a relational point of view for certain sectors of the population. For some people, the Internet is "*a tool for participation. Breaking isolation*" (Female, 50 years old, G1).

In the group of students, the discourse of the majority focuses mainly on the consumption of social networks such as Instagram, TikTok, Facebook, and Twitter. It also focuses on the use of instant messaging, "*we can talk to another person at any time of the day, no matter where they are*" (Female, 21, G2). They mention certain advantages, such as access to information, the ease of online communication, and the maintenance of social relations. However, they also point out some drawbacks of their use:

> "*there are times when I am with a friend and I feel that he is not listening to me because he is replying to a message from someone else, communication in this sense is lost*" (Male, 21, G2).
>
> "*Sometimes arguments arise via WhatsApp because misunderstandings occur, expressiveness is lost and the message is interpreted differently than if we were talking face to face*" (Female, 19, G2).

They also refer to the use of collaborative tools such as Google Drive for group work at university, Google Maps for traveling and/or searching or consulting information of all kinds, as well as for job searches. In fact, out of the 12 students, 4 of them are working women and 3 of them say that they have found a job thanks to the Internet.

For their part, in their discourse older people mention the use of the Internet and technologies for different purposes, "*I use it and it is very useful for what I know*" (Female, 80 years old, G3). There is a generalized use of the Internet for searching for information: looking for the time in another country, looking for information about other cities, "*when I travel abroad (...) looking for information on my mobile phone*" (Female, 80 years old, G3). "*News, recipes...*" (Female, 83 years old, G3).

Older people also mentioned other uses:

> "*Bizum for small payments*" (Female, 80 years old, G3).

videoconferencing is a topic commented on by several participants:

TABLE 11 Mean values for the usage access variables, according to educational level and household income variables.

| | Level of education | | | | | | Level of income | | | | | |
| | Basic education or less | | Upper secondary education | | Higher education | | <900 euros | | 900–2,500 | | Over 2,500 euros | |
	M	DT	M	DT	M	DT	M	DT	M	DT	M	DT
Program in a programming language	1.577	0.923	1.437	0.892	1.453	0.931	1.399	0.903	1.546	0.923	1.463	0.9714
Use advanced Word or Excel functions such as sorting, filtering, graphing, or using formulas	2.076	1.231	2.762	1.244	3.138	1.370	1.803	1.077	2.466	1.375	3.239	1.371
Use basic Word, word processing, or Excel functions	2.553	1.285	3.628	1.244	3.898	1.202	2.174	1.228	3.259	1.331	3.882	1.229
Use programs to edit photos, videos, or audio files	2.524	1.184	2.690	1.253	2.937	1.193	2.155	1.033	2.665	1.225	3.036	1.236
Create presentations or documents that integrate text, images, tables, or graphics	2.139	1.198	2.621	1.239	3.059	1.353	1.896	1.231	2.481	1.236	3.058	1.410
Install computer, operating programs, or apps	2.710	1.316	2.948	1.294	3.236	1.132	2.289	1.312	3.009	1.234	3.348	1.161
Change the settings of any program, including operating system and security programs	2.191	1.163	2.360	1.165	2.582	1.210	1.930	1.141	2.310	1.122	2.695	1.271
Transfer files between the computer and other devices (digital cameras, mobile phones, mp3 or mp4)	2.677	1.274	3.113	1.249	3.336	1.192	2.392	1.200	2.973	1.283	3.405	1.175
Create presentations or documents that integrate text, images, tables or graphs	2.139	1.198	2.621	1.239	3.059	1.353	1.896	1.231	2.481	1.236	3.058	1.410
Limit access to your profile or content on social networks or shared storage	3.003	1.388	3.373	1.339	3.492	1.385	2.804	1.417	3.189	1.446	3.452	1.338
N	183	90	127	65	179	109						

Source: Own elaboration based on the microdata resulting from the research project "Social Impact of the Digital Divide in Society in the Autonomous Community of La Rioja."

"*Being able to see your children, who are in another part of the world*" (Male, 82 years old, G3).

"*I have a sister in Switzerland, now almost every evening I talk to her by videoconference*" (Female, 83 years old, G3).

3.2.4. Dimension Usage Access (part II)

The aspect of trust in Usage Access appears throughout the discourse in different ways. In the professional group, problems with security on social networks are mentioned. There is trust in the security guarantee that many applications offer. However, they allude to the risks for certain vulnerable groups such as people with disabilities. In this sense, it is considered necessary to reinforce training in permissions settings and to warn of the risks related to images, profiles, and everything that social networks imply.

The issue of security and trust is related to personal discretion for distinguishing which spaces provide a guarantee of security. As the systems become more secure, the use of online shopping or sales also becomes more widespread.

The group of students express a certain insecurity as to the veracity of the information in online spaces and the difficulty of detecting Fake News.

"*The Internet is very good for doing homework and answering questions, but sometimes I don't know if the information I read or collect is correct*" (Male, 20, G2).

They focus on cyberbullying and the apparent freedom on the Internet and the lack of control of some platforms to stop it. "*They can create a false profile and attack other people with total impunity*" "*They can steal your identity or impersonate someone they are not*" (Female, 20, G2). On the other hand, many students referred to the control of mobile devices.

"*We are very controlled by the mobile*" (Female, 20, G2).

"*Now we use the Roomba at home, and I have read that algorithms allow map of our home to be created for cleaning purposes, but this information and data can be spied on by other people for robbery*" (Female, 21, G2).

In the group of older people, the lack of trust in online transactions related to banks immediately emerges. One of the participants points out a key aspect in this regard: "*they are afraid of doing it wrong. Banking is very delicate*" (Female, 83 years old, G3).

In the same vein, one of the professionals points out the barriers that some users face when carrying out digital procedures:

> "*They are afraid that if I do a lot of important transactions, and if I make a mistake, there is a risk of harming the family*" (Female, 50 years old, G1).

In addition, they are also aware of other risks inherent to social networks, such as sending photos, or even the trail that is left on the Internet through different devices:

> "*the issue of photos, delicate, complicated*" (Female, 81 years old, G3).
> "*the cleaning robots that are taking data from houses*" (Female, 83 years old, G3).

Or the sending of personalized advertisements linked to conversations at home. The issue of security also appears in relation to information:

> "*there has been a breakdown in differentiating what is true from what is not*" (Female, 50 years old, G1).
> "*People believe what the networks say*" (Female, 25 years old, G1).

Infoxication also has consequences for professional practice:

> "*they trust what they have seen on networks. And they come to the services saying 'I have seen a grant that you don't need to do anything for, request it for me*" (Female, 25 years old, G1).

The aspect of continuity in Usage Access appears often in the groups. In general, the increase in usage and frequency is highlighted. The Internet is present in everyday life:

> "*even to watch TV, through the Internet*" (Male, 38 years old, G1).
> "*We use it a lot and badly. You lose hours of sleep watching things that don't interest you*" (Female, 25, G1).
> "*The time goes by and I don't notice. The hours go by and I don't notice*" (Female, 80 years old, G3).

In the focus group of students, all of them reported using the Internet constantly. They verbalize that they are often and easily distracted by their mobile phones without being aware of the time they spend on them.

> "*I go to look at the time and when some time has passed, I've looked at the notifications on my mobile phone, but I don't know what time it is*" (Female, 19 years old, G2). "*We depend too much on the Internet and we waste a lot of time, in exams I find it twice as hard to concentrate as I did a few years ago*" (Female, 19, G2).

> "*If I spend too much time without looking at my mobile phone because I'm unable to, it makes me stressed*" (Female, 20 years old, G2).

3.3. Digital divide and e-learning

Once the dimensions of the digital divide had been reviewed with the participants in the groups, they were asked to download and access the My Citizen File application. The results of this experiment showed that most of the participants in the group of professionals and students were able to manage the application without help. In the group of older people, several needed support, first to access the centre's free Wi-Fi connection and then to download the App. None of them were able to access their file.

The last aspect addressed in the session was the evaluation of the micro-video as informative/educational content aimed at fostering digital literacy and breaking the digital divide.

The group of professionals recognize the interest in developing explanatory videos that should be simple and easy to follow and that are adapted to all people, following the foundations of Universal Design. They consider that people access technology when they find it easy and useful.

Videos should be easy to follow, with clear and accessible language ("*for a three-year-old child*").

> "*The language is not very accessible, the verbal expression is inadequate and the non-verbal expression is distant and impersonal. I think that this format is not suitable for the users that are seen in my service*" (Male, 35 years old, G1).

The effectiveness of videos made by people with similar characteristics to the target group is also mentioned. They feel more identified with the sender and the message.

In the group of students, only 2 out of 12 were familiar with the My Citizen File application, and of those 2, 1 had made use of it. Downloading the application took longer than estimated (10 min) because the vast majority did not have a digital certificate on their mobile phone. This made a key difference in access to and use of the application. Those who did not have a digital certificate had to access the application via a 24-h PIN (which requires downloading another application) or via a permanent password.

Only in one case (Male, 20 years old, G1) was there a problem downloading the My Citizen File app because the mobile device was not compatible.

Once the time had elapsed and the mobile app had been tested, the micro-video was viewed and commented on. All of the students commented that they usually consume digital content (tutorials) to obtain information rather than consulting a manual or written guide. "*I find micro-videos a good resource and in fact, I often use them*" (Female, 20 years old, G2).

> "*I find the videos entertaining and easy to watch, as they take up very little time. Besides, I think that nowadays this type of tool is more useful than typical brochures*" (Female, 21, G2 students).

Other comments refer to the format and the achievement of the objective of the video:

> "They serve to promote the use of technologies and encourage people not to despair in long processes, especially related to administration" (Male, 19 years old, G2).
> "I think the video is good because it is short and concise" (Male, 20 years old, G2).
> "They are useful, but sometimes insufficient, they assume that people have the key or the digital certificate to be able to download the first application" (Female, 21 years old, G2).

Finally, in the focus group of older people, none knew about the My Citizen File app. Problems with connection arose as soon as the time for downloading the mobile app began. The free public network of the Senior Citizens' Center changes the password of the Wi-Fi network every day. This creates a significant barrier to entry. The 10 min timeframe was insufficient, only 4 of the participants downloaded the application on their own, but none of them managed to access it. They did not know what a digital certificate was and obtaining keys, and downloading another application to obtain them, was unfeasible.

Afterward, the micro-video was viewed together and comments and opinions were collected:

> "I find it very entertaining, as it is visual I can get an idea of what it is like inside (referring to the application) as I have not been able to access it."

However, one woman expressed that it would be more useful if the steps taken in the video were reflected on the screen "to see exactly where to press" (Female, 82 years old, G3).

Other comments referred to the length of the video and speed of the video:

> "This girl talks very fast and I don't understand, I prefer instructions that guide me step by step, without rushing" (Male, 80 years old, G3).

All the older people said that the micro video was insufficient to be able to use the application, "it doesn't match reality" (Female, 79 years old, G3) "it seems so easy there that it makes us feel like idiots when we try to do it" (Male, 83 years old, G3).

4. Conclusions

The following results were obtained as a result of the research carried out. Firstly, with regard to the quantitative part, the following points stand out:

a) With regard to the dimension of physical access, there is a moderate association between both the level of education and level of income and the availability of computer equipment in the home. Moreover, in this case, there is also an association with other household equipment.

b) In terms of the Skills dimension, a moderate association is observed between level of education and the variable receiving and sending e-mails. There is also a moderate association with income level. There is also a moderate association with the variable of reading magazines and news online, as well as the other items, although with a weaker association.

c) The dimension Usage Access (part I) shows associations with most of the variables analyzed. Education level is associated with the variables access to personal files in the health system; e-banking and online shopping and selling. Income level is associated with variables related to the sharing of forms and e-banking.

d) With regard to the dimension Usage Access (part II), there are moderate associations between education level and the installation of computer programs or Apps, as well as creating presentations or documents that include images, tables or graphs, and limiting access to their profile on social networks. For the remaining variables the associations are weak or non-existent. In turn, income level is moderately associated with the variables of using programming language and advanced functions as well as creating documents that include text, images, tables and graphs.

The results of the qualitative part can be summarized as follows:

a) The participants' discourse shows high levels of access to technology in all groups. The professionals' discourse shows differences according to the profile of the user population. The group of older people refers to problems of coverage in certain rural areas, as well as lack of access due to lack of motivation.

b) In terms of digital skills, there is an ongoing adaptation to digital tools, which are being incorporated into everyday life, whether for work, leisure or business activities. The group of older people refers to the great effort required to adapt to new technologies, the gaps in participation and their dependence on other people to carry out certain tasks.

c) In addition, the use of technologies varies according to people's situations. The group of professionals alluded to the impetus provided by the COVID-19 pandemic to incorporate technologies into certain care procedures, although development is considered to be slow and limited. They recognize the relational value of technologies for certain population groups. The relational dimension is also present in the discourse of the other two groups. Among young people, social networks are emerging as sources of information and communication. This usage is also present in the discourse of older people, although with less use of social networks.

d) In terms of trust, the professionals' discourse alludes to problems arising from the security of social networks and risks to vulnerable people. Young people highlight insecurity about the truthfulness of information and infoxication (or intoxication from information overload). The group of older people highlight a lack of confidence when dealing with banking or carrying out digital procedures.

Finally, the following results are derived from the practical task:

a) The ability to solve the task was higher in the groups of professionals and students than in the group of older people. This shows the risk of a digital divide for this sector of the population.

b) Micro-videos as tutorials for self-learning certain applications should be simple and easy to follow and adapted to all people, with clear and accessible language. It may be helpful if they are produced by people with similar characteristics to the target group. And for certain sectors of the population, such as older people, these tools are not enough on their own, and more support is needed to prevent the digital divide.

Digitalization has brought improvements in citizens' quality of life. These include greater availability of information; new ways of interacting and communicating; empowerment of individuals; the possibility of accessing online services; increased and better access to public services; new forms of participation in and enhancing democracy; productive activity; development of creativity and innovation. However, it also generates new processes of social exclusion causing a social-digital divide and consequently digital illiteracy. In a hyper-connected society with a high degree of pervasiveness of mobile and broadband networks, the digital divide is linked to other factors such as lack of motivation or interest in learning that appear in the discourse as barriers to Internet access. This is especially worrying in vulnerable social groups, and in particular in older people and/or those with low education levels.

An important limitation of studies on the digital divide is that they focus on the user behavior of a small segment of the population, often professionals and university students. Selecting such population groups or segments may be appropriate depending on the research objectives, however, they limit the extent to which the findings can be extrapolated to the general population. In our work we have tried to alleviate this bias by including older people from rural areas, in order to have a more diverse sample. Likewise, this group supplements the information obtained through the quantitative stage, which had focused on the working-age population.

The results of the study provide insight into the needs or deficiencies of learners and the influence of individual socioeconomic characteristics as conditioning factors in mastering ICT. On this basis, tailoring ICT design to specific groups/segments/populations for the purposes of digital literacy is essential to reduce the digital and social participation gap.

Universal design must be applied to the technological field in all its dimensions in order to minimize access barriers resulting from inadequate adaptation of technologies to people's needs. This is especially relevant for certain population groups, particularly the vulnerable, such as the older adults, people with disabilities, people with low incomes or low education, etc. It is a matter of guaranteeing that technologies are able to adapt to people rather than the population to technologies that generate participation gaps.

A new landscape is emerging where technologies are an unquestionable reality and, therefore, digital literacy must be capable of facilitating access to the Internet and all that it entails in terms of its use for tasks, communication and information. This access to the Internet, in today's society and in the society of the future, is access to participation. To this end, online learning systems need to be inclusive and adapted to all sectors of the population, to prevent frustration or rejection when faced with the inability to understand new communication environments.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

Author contributions

The work was carried out collaboratively by the four authors, who jointly designed the research approach. PM-D and JC were in charge of the literature review. DC carried out the quantitative analysis. ER was responsible for the design and analysis of the qualitative part. The final text was written and revised by all the authors. All authors contributed to the article and approved the submitted version.

Funding

Acknowledgments

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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References

Anandarajan, M., Simmers, C., and Igbaria, M. (2000). An exploratory investigation of the antecedents and impact of internet usage: An individual perspective. *Behav. Inform. Technol.* 19, 1. doi: 10.1080/014492900118803

Bagozzi, R. P. (2007). The legacy of the technology acceptance model and a proposal for a paradigm shift. *J. Assoc. Inform. Syst.* 8, 4. doi: 10.17705/1jais.00122

Bawden, D., and Robinson, L. (2002). Promoting literacy in a digital age: approaches to training for information literacy. *Lear. Publish.* 15, 4. doi: 10.1087/095315102760319279

Bennett, L. (2014). Learning from the early adopters: Developing the digital practitioner. *Res. Learn. Technol.* 22, 21453–21466. doi: 10.3402/rlt.v22.21453

Bilbao Acedos, I., March Cerdá, J. C., and Prieto Rodríguez, M. A. (2002). Diez aportaciones del empleo de la metodología cualitativa en una auditoría de comunicación interna en atención primaria. *Rev. Española Salud Públ.* 76, 5.

Buchanan, T., Sainter, P., and Saunders, G. (2013). Factors affecting faculty use of learning technologies: Implications for models of technology adoption. *J. Comput. High. Educ.* 25, 1–11. doi: 10.1007/s12528-013-9066-6

Cahoon, B. (1998). Teaching and learning Internet skills. *New Direct. Adult Contin. Educ.* 78, 5–13. doi: 10.1002/ace.7801

Chen, W., and Wellman, B. (2004). The global digital divide–within and between countries. *IT Soc.* 1, 7.

Cohen, J. (1988). *Statistical Power for the Behavioural Sciences*. New York: Department of Psycology.

Collado, C. C., Fernández, J. M., and Cupeiro, S. V. (2008). "La e-inclusión y el bienestar social: una perspectiva de género," in *Ejemplar dedicado a: Retos y oportunidades para el sistema productivo español* 139–152.

Comisión Europea (2010). *Agenda Digital Europea. Dando forma al futuro digital de Europa.* Available online at: https://digital-strategy.ec.europa.eu/en (accessed February 2, 2023).

De Haan, J., Huysmans, F., and Steyaert, J. (2002). "At home in a digital world: Acquiring digital skills between home and school," in *The Hague: Social and Cultural Planning Agency.*

DiMaggio, P., and Garip, F. (2012). Network effects and social inequality. *Annu. Rev. Sociol.* 38, 93–118. doi: 10.1146/annurev.soc.012809.102545

Dimaggio, P., Hargittai, E., Celeste, C., and Shafer, S. (2004). "Digital inequality: From unequal access to differentiated use," in *Social Inequality* (Russell Sage Foundation), 355–400.

Fokkema, T., and Knipscheer, K. (2007). Escape loneliness by going digital: A quantitative and qualitative evaluation of a Dutch experiment in using ECT to overcome loneliness among older adults. *Aging Mental Health* 11, 496–504. doi: 10.1080/13607860701366129

Goldfarb, A., and Prince, J. (2008). Internet adoption and usage patterns are different: Implications for the digital divide. *Inf. Econ. Policy.* 20, 1. doi: 10.1016/j.infoecopol.2007.05.001

Gorski, P. (2005). Education equity and the digital divide. *AACE Rev.* 13, 3–45. Available online at: https://www.learntechlib.org/primary/p/6570/

Hargittai, E. (2001). Second-level digital divide: Mapping differences in people's online skills. *First Monday.* 7, e94. doi: 10.5210/fm.v7i4.942

Hargittai, E. (2008). "The role of expertise in navigating links of influence," in *The Hyperlinked Society: Questioning Connections in the Digital Age* (University of Michigan Press), 85–103. doi: 10.2307/j.ctv65sxn0.9

Hargittai, E., and Dobransky, K. (2017). Old dogs, new clicks: Digital inequality in skills and uses among older adults. *Canad. J. Commun.* 42, 195–212. doi: 10.22230/cjc.2017v42n2a3176

Helsper, E., van Deursen, A. J., and Eynon, R. (2015). "Tangible outcomes of internet use," in *From Digital Skills to Tangible Outcomes project report* (Oxford University Press).

Helsper, E. J. (2012). A corresponding fields model for the links between social and digital exclusion. *Commun. Theory.* 22, 4. doi: 10.1111/j.1468-2885.2012.01416.x

Ilomäki, L., Taalas, P., Lakkala, M., and Trifonas, P. P. (2012). "Learning environment and digital literacy," in *Learning the virtual life: Public pedagogy in the digital world,* ed. P. Trifonas (London: Routledge), 63–78.

Instituto Nacional de Estadística. (2020). *Ciencia y tecnología, sociedad de la información.* Available online at: https://www.ine.es/dyngs/INEbase/es/operacion.htm?c=Estadistica_C&cid=1254736176741&menu=ultiDatos&idp=1254735576692 (accessed October 15, 2022).

Kluzer, S., and Pujol Priego, L. (2018). *DigComp into Action: Get inspired, make it happen. A user guide to the European Digital Competence Framework.* Luxembourg: Publications Office of the European Union.

Méndez-Domínguez, P., and Castillo de Mesa, J. (2021). *Trabajo Social Digital Frente a la COVID-19.* Madrid: Aranzadi/Civitas 17–27. doi: 10.5944/comunitania.19.6

Mori, C. K. (2011). "'Digital inclusion': are we all talking about the same thing?" in *ICTs and sustainable solutions for the digital divide: Theory and perspectives* (IGI Global) 45–64. doi: 10.4018/978-1-61520-799-2.ch003

Newhagen, J. E., and Bucy, E. P. (2004). *Media Access: Social and Psychological Dimensions of New Technology Use.* London: Routledge.

Organización de Naciones Unidas (2015). *Objetivos de desarrollo sostenible. Objetivo 9: Construir infraestructuras resilientes, promover la industrialización sostenible y fomentar la innovación.* Available online at: https://www.un.org/sustainabledevelopment/es/ (accessed January 28, 2023).

Paul, F., Erdeler, E., Lang, A. G., Buchne, A., and Power, G. (2007). 3: A fleible statistical power analysis program for the social behavioral and bioemdical sciences. *Behav. Res. Methods.* 39, 2. doi: 10.3758/BF03193146

Pearce, K. E., and Rice, R. E. (2013). Digital divides from access to activities: Comparing mobile and personal computer Internet users. *J. Commun.* 63, 4. doi: 10.1111/jcom.12045

Pérez-Escoda, A., García-Ruiz, R., and Aguaded, I. (2019). Dimensions of digital literacy based on five models of development. *Cult. Educ.* 31, 2. doi: 10.1080/11356405.2019.1603274

Persaud, A. (2001). *The Knowledge Gap.* New York, NY: Foreign affairs 107–117. doi: 10.2307/20050068

Reddy, P., Chaudhary, K., Sharma, B., and Chand, R. (2022a). Talismans of digital literacy: a statistical overview. *Electr. J. E-Learn.* 20, 570–587. doi: 10.34190/ejel.20.5.2599

Reddy, P., Sharma, B., and Chaudhary, K. (2022b). Digital literacy: a review in the South Pacific. *J. Comput. High. Educ.* 34, 83–108. doi: 10.1007/s12528-021-09280-4

Robinson, J., DiMaggio, P. J., and Hargittai, E. (2003). New social survey perspectives on the digital divide. *IT Soc.* 1, 1–22.

Selwyn, N. (2006). Digital division or digital decision? A study of non-users and low-users of computers. *Poetics* 34, 273–284. doi: 10.1016/j.poetic.2006.05.003

Silveira Donaduzzi, D. S., Colomé Beck, C. L., Heck Weiller, T., Nunes da Silva Fernandes, M., and Viero, V. (2015). Grupo focal y análisis de contenido en investigación cualitativa. *Index Enferm.* 24, 71–75. doi: 10.4321/S1132-12962015000100016

Van Deursen, A. J., Helsper, E., Eynon, R., and Van Dijk, J. A. (2017). The compoundness and sequentiality of digital inequality. *Int. J. Commun.* 11, 452–473. Available online at: http://eprints.lse.ac.uk/68921/

Van Deursen, A. J., and Van Dijk, J. A. (2015). Toward a multifaceted model of internet access for understanding digital divides: An empirical investigation. *Inf. Soc.* 31, 5. doi: 10.1080/01972243.2015.1069770

Van Dijk, J. A. (2005). *The Deepening Divide: Inequality in the Information Society.* New York, NY: Sage publications. doi: 10.4135/9781452229812

Willis, S., and Tranter, B. (2006). Beyond the 'digital divide' Internet diffusion and inequality in Australia. *J. Sociol.* 42, 43–59. doi: 10.1177/1440783306061352

Witte, J. C., and Mannon, S. E. (2010). *The Internet and Social Inequalitites.* London: Routledge 89. doi: 10.4324/9780203861639

Zhao, S. (2006). Do Internet users have more social ties? A call for differentiated analyses of Internet use. *J. Comput. Med. Commun.* 11, 844–862. doi: 10.1111/j.1083-6101.2006.00038.x