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THE RURAL DIGITAL DIVIDE - RECOMMENDATIONS FROM A SCOPING REVIEW

ANCA-MARINA IZVORANU¹

Abstract

The digital divide can be determined by the gap between those people who are literate and have access to various information resources (such as the Internet) and those who do not have access to them. The COVID-19 pandemic highlighted the digital vulnerability of many rural citizens. Through this article, the author wants to identify and analyze the proposals in the literature to bridge the digital divide in the rural world. The global and national countryside, faced with a serious division, but with a great possibility of growth, must benefit from policies designed to increase access to the Internet and information. Online databases were used to identify scientific articles from which, after screening, certain key documents were selected. The results update the systematic analysis of articles published in the last five years on digital and rural development and also intend to provide various recommendations. A variety of political, social, educational, technical and economic issues were exposed, with an emphasis on rural populations. The conclusions consist of proposals that can be considered to bridge the rural digital divide.

Keywords: digital division, rural, systematic review

JEL classification: O18, P25

INTRODUCTION

Towards a digital society

The inevitable tendency to connect our daily lives with a multitude of digital technologies has started the development of information and knowledge gaps among the population in rural and urban areas (Selwyn, N., 2003). Increasing digitalization can be a factor in combating social exclusion, poverty and inequality in rural areas. In a society in a continuous digital and technical transformation, it is important to follow the direction of this development, so as not to accentuate the social gaps even more.

The Lisbon Strategy, set up at the European Council meeting in March 2000, was a starting point for the development of information and communication technologies (ICT), as only through it could the goals set for 2010 and „the EU to become the most dynamic and competitive knowledge-based economy in the world, capable of ensuring sustainable growth and development, as well as the best possible level and quality of employment, while ensuring social cohesion” (European Parliament, 2000). This information society project was based on the dissemination and use of information through ICT, advancing wider access to knowledge, in order to promote new ways and opportunities to take part in social life, increasing potential jobs, better and more, and the development of conditions for better prosperity and social cohesion (European Council, 2000).

Digital division and digital inclusion

The digital divide can be explained as the difference between individuals, regions and states in access to and use of information and communication technologies (Pejic, M., 2013). It consists of a difference in approach to technological tools and services, such as the Internet and devices, which generates some inequality of opportunity in meeting daily needs and improving living conditions. The concept of digital divide has gained momentum since 1995, when it was used in the US Department of Commerce's Falling through the Net report to express inequalities in access to information and communication technologies (Yu, L., 2011).

In its early forms of study, the digital divide has been closely linked to access to technology and the skills of using technology (Riggins, 2005). Subsequently, studies have shown interest in the skills of using technology - but at a more complex level, in the fields of education and trade. On the

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other hand, the concept of digital and social inclusion has been linked to the measures taken by a state government to spread the use of technology among the population (especially for those who do not yet enjoy this good or technology) (Spante, M., 2018). Social inclusion does not refer strictly to the connection of individuals, but to the use of technologies and factors that influence them.

MATERIALS AND METHODS

Identifying the Research Questions

Restricting mobility caused by the Covid-19 pandemic, together with accelerating the process of digitization of society will force citizens to actively participate in the intensive, continuous and even exclusive use of information and communication technologies (ICT). In the same direction, public authorities need to contribute to the development of various policies that minimize digital differences of any kind, including those of territorial origin, especially in rural areas. Such an approach will help reduce the inequality of citizens and territories in their participation in the information society.

The digital divide remains a global research topic, especially in rural or vulnerable areas. Thus, the analysis of the specialized studies that were elaborated regarding the rural digital division was the method used, being a research problem with a remarkable scientific and social relevance, considering, in particular, the current pandemic. (Mack, E., 2019).

The Covid-19 pandemic was a time of reporting in the scientific literature, focusing on equally important issues in social development, such as the availability of infrastructure for generating growth or dependencies between the subjects of the pandemic, the food system and the of the circular economy (Giudice, F., 2020).

The purpose of this research is to provide an overview of the recommendations made in the scientific literature in the five-year period 2017-2021 in order to bridge the digital divide in the European rural world, conducting a review of the purpose. From the selected documents, it is desired to clarify three research questions:

Q1: Which sectors does the literature propose in the action of overcoming the digital divide in rural areas?

Q2: What recommendations have been invoked in the literature?

Q3: Are there any proposals in the literature that may be applicable to the current situation?

The defined time frame is within the period of 2 years before the onset of the Covid-19 pandemic and 2 years after its onset, respectively the present time - October 2021.

From a relevant scientific perspective, the purpose review will allow to verify whether the research on the digital divide in the rural world has influenced the study of particular situations.

Identifying Relevant Studies

Four electronic databases, including Science Direct, Scopus, Web of Science, were used to identify relevant studies in this specific field of research. The keywords that guided the search could be classified into two groups, namely: (1) 'rural' and synonyms; (2) 'digital divide' and 'digital inclusion' and synonyms. Boolean connectors (AND / OR) were used to combine keywords and connect different groups. Although the subject of the digital divide is widespread among existing studies, its link to the subject of rural areas has only been recognized in recent years. Thus, as mentioned above, this purpose review limited its search to articles published in journals between 1 January 2017 and 1 October 2021, with the main focus on the use of ICTs among the rural population, with perspectives from the digital divide and inclusion. digital. The analysis identified the summaries of the articles in the mentioned databases - if they contained the search terms in titles, abstracts and keywords.

Study Selection. Inclusion and exclusion criteria.

For the selection of studies, criteria for inclusion and exclusion of specialized studies were submitted. First of all, all the studies from the aforementioned search were imported into EndNote and the multiplied articles and results such as: book reviews, editorials, comments were removed. Subsequently, the titles and abstracts were read to decide whether the articles meet the inclusion and exclusion criteria, as well as the purpose of this review. The review of the studies included articles written in English and published in full-text journals in electronic databases. The articles should be based on empirical studies, with a main focus on the digital divide and digital inclusion among rural individuals.

The language of the study was limited to English - due to the extra time that would be required to include articles in all possible languages. This review excludes book chapters, book reviews, reviews, and perspective. The review also excluded articles published by unrated sources. Articles that were not based on empirical studies were also excluded. Articles were removed if they were not related to the key concepts of the review or if the article was a systematic review or meta-analysis.

Table 1. Inclusion and exclusion criteria

Inclusion Criteria	Exclusion Criteria
Research papers published in academic journals or in proceedings of scientific conferences	Chapters edited in collective books
Published in the period of 2017–2021	Reviews
Written in English	Comments

Source: Author

Figureing the Data

The relevant data from each study were organized and abstracted to answer the research questions, as follows:

1. Characteristics of the study: names of authors, year of publication and location of the study.
2. Methods: methodology, study design and participants.
3. Factors: identified digital inclusion or digital gap in the study.
4. Outcome: Empirical findings and conclusion of the study related to the aims of this review.

Collating, Summarizing and Reporting the Results

With the data in the form of diagrams, a thematic analysis was then performed to sort and compare the articles, which helped to identify research gaps in the existing literature (Aronson, J., 1994).

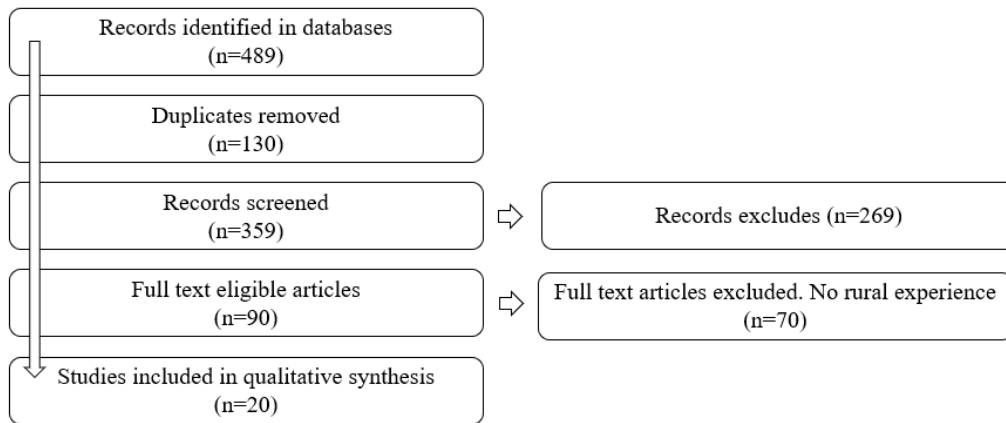
RESULTS AND RECOMMENDATIONS

On October 1, 2021, an exhaustive search was performed on the following reference bibliographic databases: Scopus, Web of Science, Science Direct. In order to build the optimal search equation, terms related to the digital divide, social inclusion and the rural world in English were searched and combined. The search for "digital divide" in title, abstract and keywords led to 489 documents: Web of Science (n = 125); Science Direct (n = 234); Scopus (n = 130). This high figure is an indicator of the existence of extensive terminological standardization. Then, in the results, articles written in English were searched to allow searching in databases in (Scopus, Web of Science, Science Direct). Subsequently, in the results obtained, the word "rural" was searched.

The results of the analysis of the specialized studies were exported to the EndNote reference management software: 130 duplicate elements were removed, leaving the sample at 359 references. An examination of the title and abstract studies was performed for selection. Two hundred and sixty-nine papers were excluded because the full-text papers were not identified in the EndNote program. Subsequently, an assessment of the degree of interest of the remaining 90 studies was performed, eliminating those that did not meet the objective of the study from the perspective of social sciences. As a final result, 20 studies were selected for qualitative synthesis. Figure 1 shows the stages of the

review decision process (identification, selection, eligibility and inclusion) in accordance with the PRISMA standard. (Esteban-Navarro, M.A., 2020)

Figure 1. FlowFigure of inclusion decisions.



Source: The Authors from PRISMA standard.

The 20 empirical studies included used various research methods and methodologies to treat the position of the rural in the digital divide in an era in a continuous digitalization. As shown in Table 2, ten publications used qualitative methods, including focus group interviews. The other ten studies used data analysis.

Table 2. Results of the methodology employed by the included articles

Author & Year	Title	Journal	Country	Methods	Research design
Kenichiro Onitsuka 2019	How social media can foster social innovation in disadvantaged rural communities	Sustainability	Japan	Qualitative	Semi-structured interview
Viviane Brito Nogueira, et al. 2021	Towards an inclusive digital literacy: An experimental intervention study in a rural area of Brazil	Education and Information Technologies	Brazil	Qualitative	Survey and semi-structured interview
Leon Tinashe Gwaka 2018	Digital technologies and youth mobility in rural Zimbabwe	Electronic Journal of Information Systems in Developing Countries	South Africa	Qualitative	Survey and semi-structured interview
V. K. Cik, D. Zagar and K. Grgic 2018	A framework for optimal techno-economic assessment of broadband access solutions and digital inclusion of rural population in global information society	Universal Access in the Information Society	Croatia	Quantitative	General population
R. Gallardo, L. B. Beaulieu and C. Geideman 2021	Digital inclusion and parity: Implications for community development	Community Development	USA	Quantitative	General population
J. F. Gu 2021	Family Conditions and the Accessibility of Online Education: The Digital Divide and Mediating Factors	Sustainability	China	Qualitative	Semi-structured interview
A. Dutta and H. W. Fischer 2021	The local governance of COVID-19: Disease prevention and social security in rural India	World Development	India	Qualitative	Semi-structured interview

Author & Year	Title	Journal	Country	Methods	Research design
H. Barrett and D. C. Rose 2020	Perceptions of the Fourth Agricultural Revolution: What's In, What's Out, and What Consequences are Anticipated?	Sociologia Ruralis	UK	Qualitative	Survey and semi-structured interview
H. R. Marston, R. Genoe, S. Freeman, C. Kulczycki and C. Musselwhite 2019	Older Adults' Perceptions of ICT: Main Findings from the Technology In Later Life (TILL) Study	Healthcare	Canada, UK	Qualitative	Survey and semi-structured interview
H. H. Han, J. Xiong and K. X. Zhao 2021	Digital inclusion in social media marketing adoption: the role of product suitability in the agriculture sector	Information Systems and E-Business Management	China	Qualitative	Survey
M. Dyba, I. Gernego, O. Dyba and A. Oliynyk 2020	Financial support and development of digital rural hubs in Europe	Management Theory and Studies for Rural Business and Infrastructure Development	Europe	Quantitative	Review of scientific articles
B. P. Alant and O. O. Bakare 2021	A case study of the relationship between smallholder farmers' ICT literacy levels and demographic data w.r.t. their use and adoption of ICT for weather forecasting	Heliyon	South Africa	Qualitative	Survey
T. Dlamini and S. Vilakati 2021	Remote and Rural Connectivity: Infrastructure and Resource Sharing Principles	Wireless Communications & Mobile Computing	South Africa	Quantitative	General population
G. Neagu, M. Berigel and V. Lendzhova 2021	How Digital Inclusion Increase Opportunities for Young People: Case of NEETs from Bulgaria, Romania and Turkey	Sustainability	Bulgaria Romania and Turkey	Quantitative	General population
L. Norris 2020	The spatial implications of rural business digitalization: case studies from Wales	Regional Studies Regional Science	UK	Quantitative	General population
J. James 2019	Confronting the scarcity of digital skills Among the poor in developing countries	Development Policy Review	Netherlands	Quantitative	General population
K. Onitsuka, A. Hidayat and W. H. Huang 2018	Challenges for the next level of digital divide in rural Indonesian communities	Electronic Journal of Information Systems in Developing Countries	Indonesia	Qualitative	Survey and semi-structured interview
M. F. Majeed, I. A. Abbasi, S. Ali, E. E. Mustafa, I. Hussain, K. Saeed, et al. 2021	From Digital Divide to Information Availability: A Wi-Fi Based Novel Solution for Information Dissemination	Wireless Communications & Mobile Computing	Pakistan	Quantitative	Collection of data, interpretation of data
C. Ievoli, A. Belliggiano, D.	Information and communication infrastructures and new business models in	European Countryside	Italy	Quantitative	Case studies

Author & Year	Title	Journal	Country	Methods	Research design
Marandola, P. Milone and F. Ventura 2019	rural areas: the case of molise region in Italy				
P. F. Guo, F. F. Zhang, H. Y. Wang and F. Qin 2020	Suitability Evaluation and Layout Optimization of the Spatial Distribution of Rural Residential Areas	Sustainability	China	Quantitative	Collection of data, interpretation of data

Source: Author

The results of the analysis of the literature from the last five years regarding the rural digital divide give the chance to obtain answers to the three questions proposed by the author in this paper. It should be noted, first of all, that the subject of the digital divide is being widely analyzed by researchers around the world, with emphasis on South Africa and China and especially in recent years, especially in the years leading up to the Covid-19 pandemic. Although there is a comprehensive analysis of all dimensions of the digital divide, most of the articles specialize in the technical or social side. In general, social studies focus on issues related to the use and exploitation of the Internet to promote personal and territorial development, rather than on the development of technical skills in ICT. In general, the literature covers all four aspects of the general environment of the rural digital divide: political, economic, social and technological. Moreover, most studies are not limited to explaining and analyzing the situation of a rural community or social group, but also propose specific intervention measures, which made possible the development of three recommendations, summarized in the conclusions section.

The analysis was divided into 3 main levels, as follows: recommendations related to access and connectivity; recommendations related to use of ITC; recommendations related to public policies.

Informations related to access and connectivity

- The study shows that to increase the overall number of users in rural areas and to reduce the existing digital divide, rural users should be encouraged to request broadband technologies and services compatible with their needs. (Cik, 2018)
- The challenge of providing connectivity to remote/rural areas will be one of the pillars for future mobile networks. To address this issue, in this paper, the authors present an infrastructure sharing and resource management mechanism for handling delay-sensitive workloads within a remote/rural site. Numerical results, obtained with real-world energy and traffic load traces, demonstrate that the proposed algorithm achieves mean energy savings of 51%. Also, the energy that can be saved decreases as the number of users connected increases, with a guarantee of serving more users as long the green energy is available (Dlamini, 2021).
- The study findings confirm that a device and internet access divide persists between urban and rural and that rural lags urban in resourcefulness and utilization. On internet use (IUS) specifically, while the difference is statistically significant as well, both urban and rural households used the internet in at least 11 different ways once monthly over the past year (Gallardo, 2020).
- According to the results of the study, among low-income households, the probability of having a personal computer was 1.64 times that of non-subsistence households. The probability of agricultural Hukou households having a computer was only 34.2% of that of non-agricultural Hukou households. In addition, when there was a computer, in low-income households, probability that children of agricultural Hukou households could access adequate resources for online education at home was only 39.5% of that of non-agricultural Hukou households (Gu, 2021).
- Empirical evidence obtained from the study show that DTs (digital technologies) create new opportunities for young people to explore unfamiliar places - e.g., through virtual mobilities (through social technologies) enabling them to save time and costs. Also, findings reveal that while

DTs have desirable affordances, they can also perpetuate social challenges such as inequality (Gwaka, 2018).

- The study has revealed a positive relation between the individual use of ICT facilities (access and effective utilization of high and low digital divide in a society). From the above descriptive analysis, Wi-Fi-BCDs (Wi-Fi-Based Content Distributors is a solar-based system that is used to deliver quality educational contents directly to classroom, library) affect students' motivation. Based on the observations of the respondents, the Wi-Fi-BCD enhances individual experience, develops digital skills to access ICT services, and makes learning fun. Moreover, the Wi-Fi-BCD enhances student interest and motivates them to learn new things (Majeed, 2021).
- The results of this analysis show that the NEET (Not in Education, Employment, or Training) population is a complex one but, especially in rural areas, tends to be often reduced to the issue of youth unemployment. It is very important to consider all of the that cause young people to be vulnerable. NEET analysis in relation to ICT must be studied because this may be one of the most important vulnerabilities that young people face in the digital age. According to the results of the analysis, the digital skill level of young people in the countries included in the social analysis of NEETs in rural areas is very low compared to the EU average but also compared to the urban environment of their own countries. Turkey is characterized by a lower level of digital skills of young rural NEETs compared to Bulgaria and Romania (Neagu, 2021).
- The study revealed the degree to which disadvantaged rural communities have adopted Facebook as an innovation throughout Japan and how the adoption was realized. The authors believe that these findings and implications are useful not only for Japan but also for other countries that are expected to mirror Japan in terms of experiencing serious aging and depopulation in rural areas in the future (Onitsuka, 2019).

Informations related to use of ITC

- The findings arising from this study highlight that agriculture is central to every rural and developing context's socio-economic development and that digital technologies have the opportunity to "revolutionize how rural communities secure and improve their livelihoods". Also, when examining the relation between ICT literacy levels and the demographic variables, significant negative associations were found between the ICT literacy levels and age as well as years of experience, while significant positive associations were found between ICT literacy levels and educational level. This means that the age and years of farming experience are negatively and inversely proportional to their ICT literacy proficiency, whilst their educational level is directly proportional to their ICT literacy proficiency (Alant et al, 2021).
- The study shows that the prioritization of 'big-tech' innovation pathways necessarily excludes other ideas from coming to the fore, including simpler measures such as improving advice provision to farmers, encouraging them to make better use of technology that they already have on the farm (e.g., weighing cattle more regularly, WhatsApp communication), or scaling up farmer-led innovations, including retrofitting (Barrett, 2020).
- The authors show that individual differences, including both age and gender, only play limited moderating roles in determining Chinese farmer's SMM (social media marketing) adoption intention and use. Age only positively moderates the relationship between behavioral intention and use, while all other hypothesized moderating effects are statistically insignificant. It confirms prior literature that older people tend to be more cautious when moving from technology adoption intention to actual usage. Similarly, gender only negatively moderates the relationship between social influence and behavioral intention, while all other hypothesize moderating effects are statistically insignificant. The result, consistent with prior literature, suggests that men are less likely to be affected by external referents than women when forming their technology adoption intention (Han, 2021).

- From the analyses of the case studies of this article, it emerges that the main impact of new technologies regards the organizational innovation reshaping all farm relations. A strong point in organizational innovations is their capability of valorizing farm products and processes, locally specific, and to reproduce in time natural resources from remote rural areas. The ICT-enable innovation, especially organizational, does not lead to a one-size-fits-all solution. The solutions seem to be territorially and human capital sensitive, based on needs and potentials of the respective territory and human capital they are able to mobilize. They should be supported by new or existing public territorial strategies that include the construction of digital infrastructure. (Ievoli, 2019)
- The authors demonstrate that the Digital Literacy Course-which was a research experiment-positively affected students 'scores in the logic assessment (Nogueira, 2020).
- From the results obtained, it should be accepted that there are strong gaps in Internet use even among digital natives in rural areas. We have to focus not only on developing infrastructure but also on educating those who were teenagers before the Internet was available and popular in the target areas. The age of digital natives should be defined differently according to the developmental stages of countries. Age also influences motivation, skills, and knowledge of the Internet among users. The next big challenge for future digital divide studies will be to foster motivation, skill, and knowledge leading to ideal usage of the Internet for communities. (Onitsuka, 2018)

Informations related to public policies

- India's lockdown has caused great disruptions of lives across the country, perhaps especially among the rural poor. With a warning of its imminent implementation of just four hours, it caused an immediate mass exodus of migrant workers back to their villages due to closure of all economic activities in urban areas. This caused two immediate problems for local authorities: (1) mitigating the spread of infection from urban centers to rural areas and (2) helping to deal with widespread economic fallout from loss of cash income and consequent food insecurity for a large proportion of the population that already lives close to the margin to begin with. The Ministry of Panchayati Raj in April 2020 launched an e portal called the eGram Swaraj. The portal is intended to digitalize the everyday functions of gram panchayats and also aid in preparing and sharing village development plans. This could also be used in times of Covid to share village level updates (Dutta, 2020).
- The digital potential of rural areas is developed within the Rural Renaissance call of the Horizon 2020 work program. Innovation and digital technology in rural areas are among the European priorities of the Smart Specialization Platform for Agri-Food. In accordance with European network for rural development (ENRD) forecast, EURO 24 from European funds will be spent on different priorities of rural hub development that makes nearly 16% of RD expenditures in 2020 (Dyba, 2020).
- The government should take measures, such as the transformation of rural residential areas, solve the problems of rural household registration, employment resettlement, and social security, and use urbanized rural residential areas as a reserved area for future urban development. (Guo, 2020)
- The authors suggest that Government agencies need to collect more detailed information on ICT use and ownership across all age cohorts, and not simply group all persons aged 65 years and older into the same age cohort. New questions may be added to existing surveys to reflect ICT and technological advances such as smart phones and mobile apps, and wearable health technologies to support age in place (Marston, 2019).
- Where ERDF funding has been used, the evidence outlines what can be achieved. This is both in terms of increasing broadband availability and supporting SMEs to integrate digital technologies into the business model. Crucially, the combination of these two aspects has the biggest impact for SMEs in less-developed or rural regions (Norris, 2020).
- The typical policy response to this problem is to provide more opportunities for poor people to learn the missing skills, mainly, but not only, in school. It is certainly true that in the absence of

such policy the growth of developing countries will be hindered and indeed may fall even further behind in the effective use of digital technologies. On the other hand, bringing about a sharp increase in the supply of digital skills will often be a lengthy and difficult process, especially among students with limited literacy and numeracy (James, 2019).

CONCLUSIONS

The limited access to the Internet is the main reason for the huge digital divide in the rural areas. This digital divide is quite visible in the case of children or older adults. Basic ICT skills and infrastructure are necessary for people to use ICT facilities. The availability of ICT infrastructure positively contributes to overcoming the digital divide. The problem with rural communities in third world countries and not only is the lack of access to information.

The results of the empirical study also show that governments need to provide aid to develop and support effective social and educational strategies among the population, with special treatment for vulnerable families in rural areas - who can enjoy equal access to information and communication technology. .

Thus, from the qualitative analyzes carried out with the help of systematic reviews, some recommendations will be offered, essential in the current crisis situations:

A1: Continuity of national and regional initiatives and policies.

R2: Running training and counseling actions

A3: Possibility of using available resources, such as those in rural libraries.

This paper is a starting point for the subject of digital division in vulnerable environments. A future paper will analyze the situation of internet access among the rural population.

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