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DIGITAL DIVIDE: INEQUALITY AND INCLUSION IN THE 21ST CENTURY

Rumiana Stoilova, Kamelia Petkova, and Marieta Hristova

Editors

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ИЗТОК ЗАПАД

Contents

Introduction

Digital transformation is one of the most important societal challenges crucial for social cohesion of European societies – alongside adaptation to and prevention of climate change and population aging. The processes of digitalization and their effects on people are increasingly becoming part of the academic debate, yet the link between social inequalities and digitalization is still insufficiently researched and publicly discussed. The social gaps, which are the focus of this collective volume is investigation of the barriers before the digital inclusion, before the participation of different social groups in the digital communication, the inequalities in the digital sphere – often described as the new inequalities of the 21st century. The members of the project team "Digital Divide and Social Inequalities: Levels, Actors and Interactions" present in this monograph findings from field research and analyses of data from international comparative surveys.

The development of information technologies raises several questions related to the social inclusion and cohesion of society. The most important among them is: To what extent are the opportunities of contemporary technologies accessible to different social groups? This question is complex and encompasses not only possession of and access to technologies – designated as the first level of the digital divide – but also the need for the continuous development of skills for working with them, which are examined at the second level of the digital divide. The third level of the digital divide is becoming increasingly significant: it includes the development of motivation to use technologies that are rapidly entering different spheres of life, as well as the development of capacities to assess and prevent the risks arising from actions in the online environment. When most information is available online, a critical skill is deciding what to search for, how to process it, and how to use knowledge for the specific goals one sets. This presupposes the continuous development of educational capacity so that people are able to transform information into knowledge and knowledge into action (Dutton, 1999)[1].

[1] Dutton, William (1999). Society on the Line:Information Politics in the Digital Age.Oxford. Oxford University Press.

Digital inequalities are associated with benefits but also with the risk of cumulative social exclusion – adding digital lag to existing social inequalities. Thus people with low levels of education; older adults for whom new digital technologies arrive later in life; residents of small settlements where the provision of fast internet does not meet the criteria for the economic profitability of infrastructure investments; people with disabilities who require specific devices and software design but lack the resources to acquire them – all of these groups are exposed to the risk of digital lag, which leads to exclusion from one of the key processes of change in contemporary society. As a result, digital inequalities translate into inequalities in people's life chances across multiple domains – health, political participation, education and career, economic activities, leisure, and social contacts (Ignatow & Robinson, 2017)[1]. Digital inequalities manifest as an inability to fully benefit from the advantages of online information, learning, shopping, banking, and other services that are increasingly provided online.

The chapters in this collective monograph are devoted to the levels of the digital divide: inclusion – bringing people with different social statuses and individual characteristics into the digital society by ensuring basic digital skills and an enabling access environment; equality – measured by improving skills and opportunities so that they are comparable with those of others; effectiveness – the autonomy to do what you want and need with the skills and opportunities you possess (Bellini, 2018)[2]. The degree of cyber security and the protection of personal data in the digital environment is the fourth level of the digital divide. The importance of the cyber security increases constantly in parallel with the fast development of artificial intelligence and its entry into public communication. The aim of the analyses in this monograph is to arrive at policy proposals for reducing digital inequalities and supporting vulnerable groups in terms of access, motivation, and skills, as well as for extracting greater benefits from the digital transformation.

Contemporary research on digital inequalities follows the dimensions of stratification defined by the classics of sociology. Max Weber's concept of social divisions by class, status, and power is fully valid and applicable in studying the interrelation between online and offline benefits for people occupying different positions in the social structure. Improving life chances; expanding opportunities on the labour market; enhancing health awareness and access to specialized care; and increasing civic participation and political activity all lie within the tra-

[1] Ignatow, G., & Robinson, L. (2017). *Pierre Bourdieu: theorizing the digital. Information, Communication & Society*, 20(7), 950–966. https://doi.org/10.1080/1369118X.2017.1301519

[2] Bellini, C.G.P. (2018), "The ABCs of effectiveness in the digital society", Communications of the ACM. Vol. 61 No. 7, pp. 84–91.

dition of sociology that focuses on individual actions, opportunities, and risks in mobilizing available resources. Digital inequalities operate in the digital sphere and lead to the reproduction of social inequalities in pay and wealth (defining class position), in status and prestige (core aspects of culture), and in power (expressed through the choice of and support for political parties) (Ragnedda, 2017)[1]. The authors focus on socio-economic and socio-demographic and socio-cultural inequalities that affect the offline outcomes of internet use. Social inequalities are transformed into digital inequalities through the new opportunities and the derived benefits. On this way the cycle is closed by turning back into social inequalities through the different benefits extracted by different categories of online users. Higher social status turns people into more advantaged online users, which leads to tangible offline benefits for them (van Deursen & Helsper, 2015)[2].

Polarization or social cohesion, inclusion or exclusion – these are serious dilemmas arising from individual's different opportunities depending on their social status. A thorough study of the effects of digital technologies on social structures inevitably leads to the need to develop disciplinary sociological knowledge. The emergence of the concept of the "digital society" goes hand in hand with the successful development of the discipline of "digital sociology", which focuses on the study of specific forms of behavior enabled by the use of digital technologies. Digital inequalities are among the most significant subdisciplines within "digital sociology". They can be investigated at the macro, meso, and individual levels – both as a momentary phase in which a person faces the challenges of new technologies and over the life course, which presupposes the continuous improvement of digital skills.

The theoretical model for studying digital inequalities that underpins our analyses takes into account the importance of positions in the stratification for the benefits derived from digitalization and for the chances to overcome or at the opposite to accumulate inequalities in individual life chances, depending on three groups of social inequalities: (1) socio-economic – education, income, socio-occupational status; (2) socio-demographic – gender, ethnicity, age, health status; and (3) regional inequalities – between types of settlements and between Bulgaria's regions.

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[1] Ragnedda, M. (2017). *The third digital divide: A Weberian approach to digital inequalities*. New York, NY: Routledge.

[2] van Deursen, A. J. A. M., & Helsper, E. J. (2015). *The third-level digital divide: Who benefits most from being online?* In L. Robinson, S. R. Cotton & J. Schulz (Eds.), *Communication and Information Technologies Annual* (Vol. 9, pp. 29–52). Emerald. https://doi.org/10.1108/S2050-206020150000010002

1. Socio-economic status has a decisive bearing on internet use (Bucy, 2000[1]; Zillien & Hargittai, 2009[2]; Witte & Mannon, 2010[3]; Ragnedda & Muschert, 2013[4]). Studies of the influence of socio-economic status on the spread and use of information technologies also include education as a determining factor in occupational position (Mubarak et al., 2020[5]).

2. Socio-demographic inequalities are based on individual characteristics such as gender, ethnicity, age, and health status, but they also have a socially constructed character; therefore we use the synonymous term socio-cultural inequalities. The attribution of roles and behaviors, as well as the existence of stereotypes and prejudices, acts as a barrier to access to and use of online services.

Differences between men and women in internet access are effectively disappearing, but differences persist in the consequences of internet use related to social capital, educational attainment, and employment opportunities (Robinson et al., 2015)[6]. Research on digital inequalities is important for establishing the extent to which internet use leads to a reduction – or, conversely, a deepening – of inequalities affecting people belonging to ethnic minorities in a given society. We therefore examined the extent to which ethnic groups benefit from digital technologies and separated the effects for men and women from ethnic minority background. Age related inequalities are most often due to missing skills but also to low motivation to acquire them. Of course, "older adults" is a broad category within which there are great differences in health and physical activity – differences often obscured by negative stereotypes and the blanket attribution of low motivation or abilities to everyone (Ehni & Wahl, 2020)[7]. We studied processes

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[1] Bucy, E. P. (2000). Social access to the Internet. *Harvard International Journal of Press/Politics, 5*(1), 50–61. https://doi.org/10.1177/1081180X00005001005

[2] Zillien, N., & Hargittai, E. (2009). Digital distinction: Status-specific types of Internet usage. *Social Science Quarterly, 90*(2), 274–291. https://doi.org/10.1111/j.1540-6237.2009.00617.x

[3] Witte, J. C., & Mannon, S. E. (2010). *The Internet and social inequalities.* New York, NY: Routledge.

[4] Ragnedda, M., & Muschert, G. W. (Eds.). (2013). *The digital divide: The Internet and social inequality in international perspective.* New York, NY: Routledge

[5] Farooq Mubarak, Reima Suomi and Satu-Päivi Kantola 2020. Confirming the links between socio-economic variables and digitalization worldwide: the unsettled debate on digital divide, Journal of Information, Communication and Ethics in Society.Vol. 18 No. 3, pp. 415–430, Published by Emerald Publishing Limited.

[6] Laura Robinson, Shelia R. Cotten, Hiroshi Ono, Anabel Quan-Haase, Gustavo Mesch, Wenhong Chen, Jeremy Schulz, Timothy M. Hale & Michael J. Stern (2015) Digitalinequalities and why they matter, Information, Communication & Society, 18:5, 569–582, DOI:10.1080/1369118X.2015.1012532

[7] Ehni, H.-J., & Wahl, H.-W. (2020). *Six propositions against ageism in the COVID-19 pandemic. Journal of Aging & Social Policy, 32*(4–5), 515–525. https://doi.org/10.1080/08959420.2020.1770032

of intergenerational solidarity and mutual assistance in specific organizations, as well as the chances of expanding opportunities for people in the later stages of their working careers to use online services. Generational inequalities have been identified as among the most significant digital inequalities in the workplace by the Bulgarian Industrial Association.

3. Regional inequalities (inequalities by place of residence) – at European, national, and local levels are examined within the monograph in two Bulgarian regions – Southeast and South-Central. They were selected for the project's fieldwork, where focus groups discussions and interviews were conducted with representatives of different socio-occupational groups, with people from ethnic minorities and retirees, and with people with disabilities living in different types of settlements – villages, small towns and municipality centers. The fieldwork directed the research toward the main barriers, but also toward the advantages in the two regions associated with more advanced digitalization and economic development – advantages that matter for the overall lower levels of social inequalities.

At the macro level, we account for the importance of public investments reflected in the Digital Economy and Society Index (DESI). At the meso-level, private companies contribute significantly both to the development of technologies and to the improvement of the skills needed to use them. Civil society organizations were also selected for the interviews because they play an important role in mitigating digital inequalities.

The target audience of the collective monograph "Digital Divide: Inequality and Inclusion in the 21st Century" includes researchers, lecturers, students, journalists, experts in the technological sphere, and experts responsible for developing and implementing policies for e-government, for ensuring the security of use and communication in the internet environment. This monograph is also suitable for the wider public that follows society's transformations and is interested both in untapped opportunities and in the prevention of emerging risks from cyber-attacks and the misuse of personal data, as well as in the imposition of legal barriers to the spread of fake news and the propaganda of hate and conspiracy theories. The monograph will also be of interest to those engaged in the debate on the introduction of ethical standards and regulation of communication in the online environment; on achieving the balance between freedom of innovation in the fastest developing field of technological knowledge – artificial intelligence – and the need for legal frameworks for its use in education and in the various occupations that are undergoing inevitable change due to the advance.

Rumiana Stoilova

Chapter 1
Transformative potential of online communication: do digital social contacts reduce or reinforce inequalities?

Rumiana Stoilova, Kaloyan Haralampiev

Abstract: *The aim of this article is to examine social inequalities in access, in possessed digital skills, and in the benefits derived from social contacts on the internet in European countries with different levels of digitalization. We use data from Round 10 of the European Social Survey (2021), specifically the rotating module "Digital Social Contacts in Work and Family Life". The central research question is: Do digital social contacts mitigate or intensify existing inequalities in societies with a different digital performance? The findings show that education, socio-occupational class, age, ethnicity, and place of residence matter for internet access. Regarding gender, women report lower digital skills than men, but in several European countries – including Bulgaria – there are no statistically significant gender differences. The positive attitude that online communication helps people feel closer is shared more often by women, by people from ethnic minorities, and in countries with a higher degree of digitalization. Ethnicity has a stronger positive association with the perceived benefits of online communication for men than for women. We found the support of the transformative thesis that digital technologies can contribute to reducing inequalities in the positive association of digitalization and ethnicity however only for men. The reproduction of socio-cultural inequalities among women is observed among those with primary education who live in small towns, among women with disabilities, and among women aged 45+.*

Keywords: digital social contacts; inequalities; digital skills, occupational class

Introduction

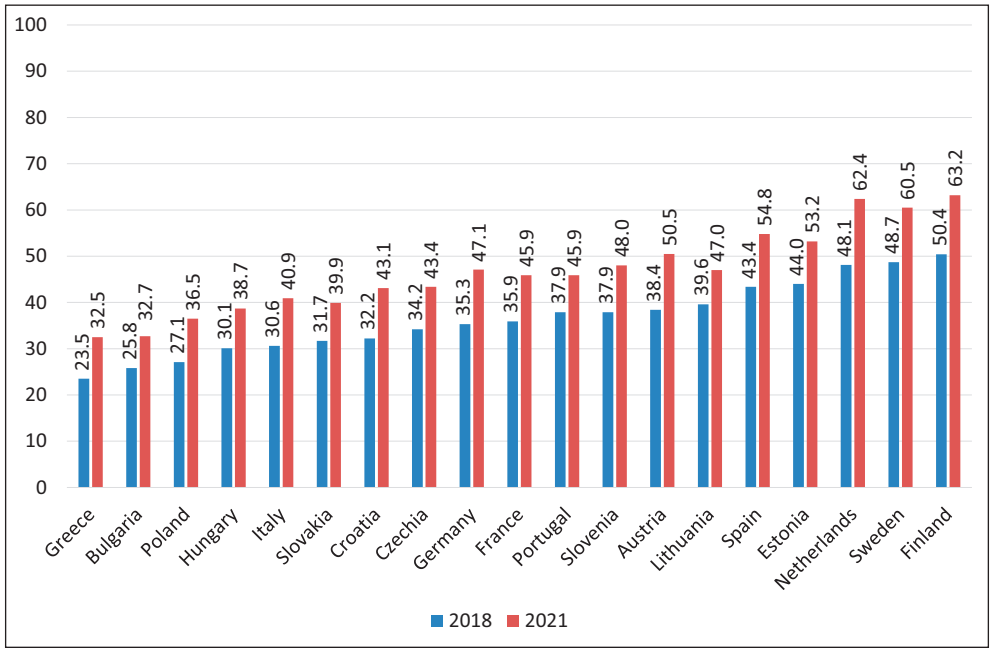
The COVID-19 pandemic was accompanied by a sharp rise in the importance of digital social contacts in personal life, education, and work. Remote and hybrid employment – combining work from home and from the office – expanded (Yordanova & Kirov, 2022). Digital transformation accelerated, as did its impact on various domains such as labour and employment (Meil & Kirov, 2016; Kirov, 2022) and leaded to the transformation of occupations (Kirov & Malamin, 2022). The rise in remote work has benefits for work–life balance but also drawbacks, often interpreted as a blurring and entangling of the boundaries between these spheres. The effects on job satisfaction, team cohesion, and identification with the organization under remote work, as well as the options for hybrid arrangements, require closer analysis.

The benefits derived from digital technologies depend first on access to the internet and to the devices used to connect, and second on digital skills. The three levels of the digital divide – access, skills, and benefits – are captured by the composite Digital Economy and Society Index (DESI). Among the 19 countries included in our analysis, Finland leads with 50.4 points and Bulgaria ranks 18th with 25.8 points in 2018. In 2021, Finland scores 63.2 points and Bulgaria remains 18th with 32.7 points. Comparing 2018 (pre-COVID) and 2021 (post-recovery) shows an increase in the index across the European countries examined. Bulgaria's increase is 7 percentage points, while Finland – the top performer – rises by 13 points. This supports the thesis that the higher the level of digitalization, the larger the growth in internet use under an emergency such as the pandemic. According to DESI, Bulgaria's level of digitalization is low across the three levels of the digital divide: Access – accounting for urban–rural and inter-regional disparities; Skills – the degree of digital competencies in the population depends on educational level and income status; and benefits – the advantages captured from the usage of digital technologies.

Research on social inequalities in the digitalization process typically tests two theses: (1) The reproduction thesis points to the accumulation of inequalities and supports the view that digital inequalities repeat and deepen existing socio-economic and ethnic disparities, since participation in social networks reproduces offline communication patterns and human capital remains unchanged (DiMaggio & Garip, 2012). Studies in this tradition confirm that ethnic communities possess lower social capital, which is also reproduced online (DiPrete, Gelman, McCormick, Teitler & Zheng, 2011). (2) The transformation of social inequalities is labeled differently like "normalization" or "diversification" thesis, which posits that people can transform their human and social capital via the internet. Internet use is seen as access to information unavailable in one's immediate social environment (Mesch et al., 2012). This article examines both the possibilities for transforming existing socio-cultural inequalities through inter-

net use and the processes of social reproduction and the accumulation of multiple inequalities.

Figure 1. Digital Economy and Society Index (DESI) for 19 European countries participating in the European Social Survey 2018 and 2021



Source: DESI 2022 by components – Digital Decade DESI visualisation tool (europa.eu).

Theoretical Assumptions and Research Questions

Differences in internet access have virtually disappeared for the majority of population in the developed societies. Yet differences persist in the access to internet based on low education, low income, living in rural settlement, where the economic efficiency of the internet infrastructure is not existing. Hence without political will and governmental support access remains an obstacle for about 13% of Bulgarian population in 2024. They are defined as digitally excluded. The main obstacles that limit individual's access to internet are ranged differently depending on the social class. For working class people the main obstacle is lack of trust expressed in the attitude – "In my view it is not secure, I am afraid of abuses in the digital environment"; followed by a lack of a confidence in the one ability – "I am afraid of mistakes, I lack the necessary skills". Lower middle class point first on the missing skills, then comes the low trust and the low confidence in the secure usage of internet (Stoilova, 2024).

The third level of the digital divide – the benefits derived from the internet usage has consequences related to social capital, to the improvement of chance for lifelong learning, and for better employment opportunities. Primarily economic and socio-professional – but also cultural barriers are the main reasons for inequalities in the use of digital technologies (Reich, 2023). As Tressie McMillan Cottom argues, it is easier to provide internet access than to develop skills and acquire the key knowledge needed to use it, and to raise human and social capital through inclusion in social networks that enable greater benefits from access. Thus, expanding access alone may not improve chances for upward mobility and may leave structural inequalities intact. Cottom's research applies intersectionality to focus on different combinations of privilege, advantage, and unequal power that operate both online and offline (Cottom, 2015). The marginalization of women from minority ethnic groups living in patriarchal environments produces economic, social, and cultural exclusion. Cottom shows that participation in virtual groups with shared ascribed characteristics – for example, women from ethnic minorities – increases trust in communication. For marginalized groups, vulnerability in the private sphere is greatest and must be protected by those who govern online groups. For instance, requiring profile photos in university groups may be seen as unwelcome and as infringing privacy, while in other non-institutional Facebook groups, requiring photos may be acceptable to increase trust and ensure participants compare themselves with people in similar situations – e.g., minority women. Conversely, comparison with middle-class men would be meaningless when discussing scarce resources and time for study and achievement.

Contemporary research highlights two mechanisms explaining gender gaps, which can be applied to understanding gender inequalities in the process of digitalization: (1) gender-specific skills and the content produced online; and (2) gender-specific labour processes and the holding of jobs that require technology use. These mechanisms can be understood along three lines – stereotypes, self-assessment, and professional realization (Robinson et al., 2015). From the perspective of the gender specific labour process we will focus in this paper on the gender segregation in employment. It is commonly measured by the Duncan Index, which indicates the percentage of employed women (or men) who would have to change occupations for the occupational distribution to be even across genders. The index ranges from 0 (perfect gender integration) to 1 (complete segregation).

Gender segregation – the uneven distribution of women and men across and within occupational fields – underlies many gender differences. It affects job quality, pay, and employment trajectories (Kleinert et al., 2023). Male-dominated occupations include both horizontal segregation (drivers, mobile-plant operators, electricians, construction workers, stationary plant or machine operators, agricultural workers, ICT specialists, mining, construction, manufacturing and trans-

port workers) and vertical segregation, reflected in higher-education and intellectual/creative professions such as senior officials, legal professions, and managerial roles. Female-dominated occupations typically include health professionals, retail and service workers, customer-service clerks, as well as teachers and medical staff (Carranza, Das & Kotikula, 2023). Occupational gender segregation exists in European countries with both high and low levels of digitalization. Bulgaria (0.167) and Greece (0.105) have lower gender segregation and simultaneously the lowest digitalization performance among the EU countries compared; conversely, highly digitalized countries such as Finland (0.686) and the Netherlands (0.518) show higher gender segregation segregation (Carranza, Das & Kotikula, 2023: 48).

This article aims to examine the reproduction and transformative effects of digitalization in European perspective. The theoretical model includes investigation of multiple factors for the existence of social inequalities at the three levels of the digital divide: unequal access, representing the first level; importance of gender for the second level – obtained digital skills, and at the third level – perceived benefits of internet and work satisfaction. We include in our analyses European countries with varying levels of digitalization, labour-market gender segregation, and prevalence of work from home. The research questions are: Do digital social contacts mitigate or reinforce existing inequalities in society? What is the role of opportunities – measured via access and digital skills – in leveraging digital social contacts, taking into account internal social divisions by gender, ethnicity, and socio-professional class? To what extent do a lower Duncan index of gender segregation, a higher DESI score, and broader opportunities for remote work reduce gender inequalities in the benefits of internet use?

Previous Research

The rotation module of the ESS "Digital Social Contacts in Work and Family Life" points to the important question whether digital contacts mitigate or intensify labour-market and social inequalities (Abendroth et al., 2023: 20). We use several concepts embedded in the rotating module and select following variables at the individual level dealing with opportunities (access to the internet and digital skills) and benefits of online communication (attitudes toward internet use and measures of well-being such as work satisfaction).

In our gender-focused analysis we include, at country level, the Duncan index of occupational gender segregation and the share of employees working from home. We hypothesize: (1) greater gender segregation is associated with larger gender differences in the obtained digital skills and in the benefits of digital communication; and (2) a higher prevalence of remote work contributes to greater satisfaction with digital contacts.

Regarding digital skills (self-assessed in the ESS via items on choosing advanced settings, using mobile apps for advanced search, and working with PDF documents), previous research controlling for other factors such as gender and socio-professional class, observed statistically significant differences. Women report lower digital skills than men on all three indicators. The negative effect of socio-professional class on self-assessed digital skills grows from the lower service class toward skilled and unskilled workers. For the perceived benefits and risks of online and mobile communication, a significant gender difference appears only for the item "online communication helps people feel closer", which women endorse more. Compared to our earlier work (Stoilova & Ilieva-Trichkova, 2022), we go further in the present paper by examining how gender gaps in digital skills vary by country, and by analyzing how class and ethnicity shape within-women differences in the perceived benefit that online social communication brings people closer.

Data and Method

We use macro-level data from the European Commission's Digital Scoreboard (downloaded 13.08.2023) for DESI 2021; data on occupational gender segregation measured by the Duncan Index (Carranza, Das & Kotikula, 2023); and data on working from home from Eurostat. Individual-level data are from Round 10 of the European Social Survey (ESS ERIC, 2023), specifically the rotating module on Digital Social Contacts in Work and Family Life. The sample covers the 19 countries for which DESI data are available and which participated in both ESS rounds: Austria, Bulgaria, Croatia, Czechia, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Lithuania, the Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, and Sweden. Due to missing Eurostat data on working from home, the final models cover 18 countries. We restrict the analysis to ages 25–64 to include people who have completed their highest level of education and are on the labour market. Respondents who never use the internet are excluded.

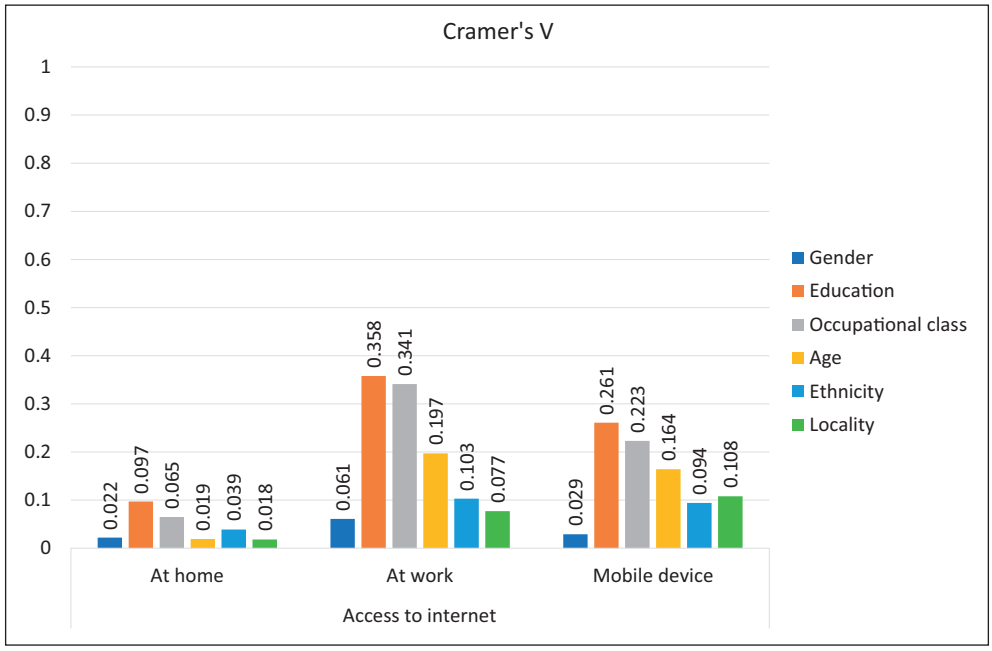
We examine four dependent variables. Opportunities are measured by the place of access to internet and obtained digital skills – the degree of familiarity with computer and internet functionalities: "How familiar are you with working with PDF documents?" Responses use a five-point scale from 1 "Not at all familiar" to 5 "Completely familiar". Next dependant variable is measured by the benefit of online/mobile communication (via phones, computers, tablets, or other digital devices): "To what extent would you say that online/mobile communication makes people feel closer?" Responses use an 11-point scale from 0 "Not at all" to 10 "Completely". Fourth dependent variable is work satisfaction, which indicated a benefit from social contacts via internet.

Key individual-level independent variables are socio-professional status (class, five categories per Daniel Oesch, 2022; with higher service class as reference), gender (men ref.; women), and ethnicity/migrant status (self-identification as part of the majority ethnic group or not). Controls include highest education (five categories; tertiary ISCED 5–8 as reference), age (25–44 ref.; 45–54; 55–64), and place of residence (urban–rural).

Results

The first level of the digital divide – access to internet locations (home, workplace, mobile device) is analyzed first. Internet use is most common at work, followed by mobile devices, and least common at home. This immediately distinguishes those without permanent workplaces as having fewer opportunities, given the relative inconvenience of mobile communication for tasks like job applications and participation in additional training. Next, we evaluate the effects of education, class, gender, ethnicity, age, and place of residence: all have statistically significant effects on access. In descending order of magnitude: education, socio-occupational class, age, ethnicity, locality-place of residence, and gender (Figure 2).

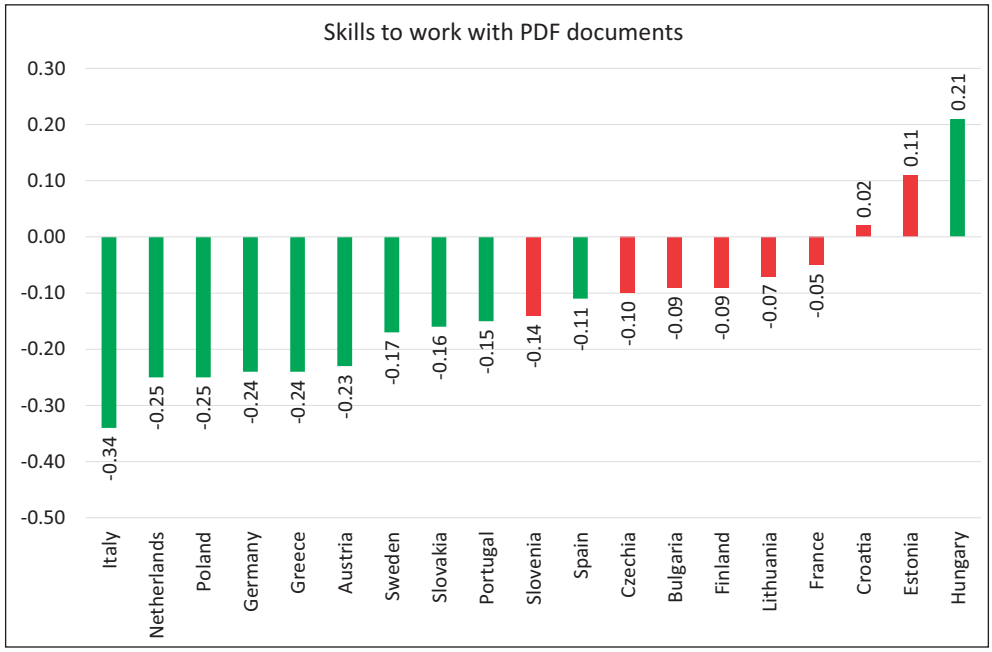
Figure 2. Opportunities for online communication: internet access



Source: European Social Survey (2021), authors' calculations.

The second level – digital skills – shows women to have lower skills than men measured by ability to work with PDF documents, with the exception of Hungary where women score higher. The number of countries where gender differences are not significant is Slovenia, Czechia, Bulgaria, Finland, Lithuania, France, Croatia and Estonia show no significant differences in working with PDF files (Figure 3). We conclude that gender differences in self-assessed digital skills are smaller in post-communist countries, which also tend to have lower labour-market gender segregation.

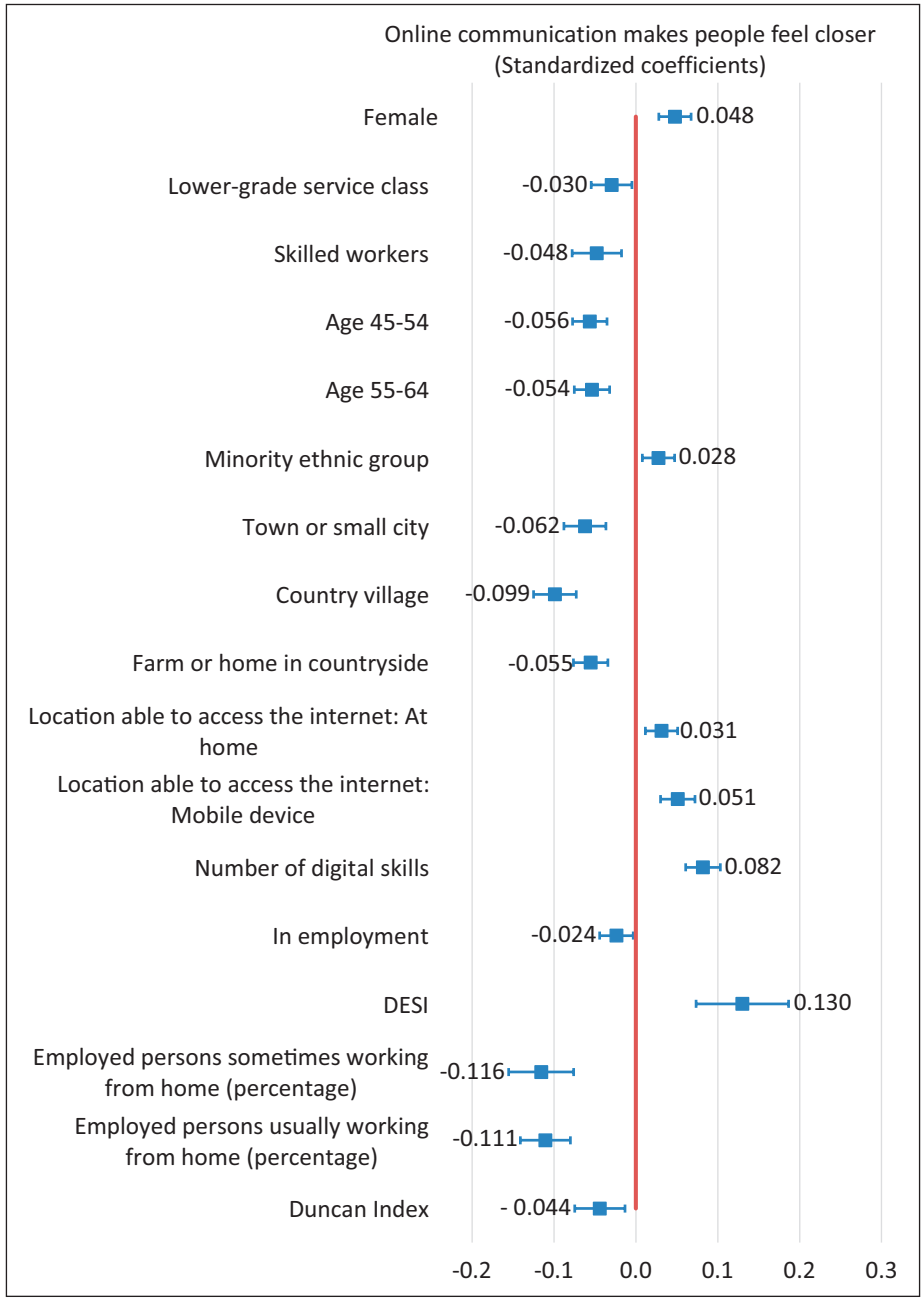
Figure 3. Opportunities to use the internet: level of digital skills measured by ability to work with PDF documents



Source: European Social Survey (2021), authors' calculations. Note: Statistically significant coefficients are shown in green; non-significant in red.

As to the *third level of digital divide* – derived benefits expressed in the belief that online communication helps people feel closer the subsequent analysis allows mapping differences in determinants for men and women, and within both categories – men and women. The positive view is expressed by women, by people from minority ethnic groups, by those with home or mobile access, by respondents reporting more (3) digital skills. At the country level, in countries with higher digital performance people share positive view on the benefits of internet social contacts. People express more negative attitudes towards online communication in countries with a higher share of remote work and a higher degree of socio-occupational segregation.

Figure 4. Online communication helps people feel closer



Source: European Social Survey (2021), authors' calculations. Notes: N (country level) = 18. Significance: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Plots standardized coefficients with confidence intervals given in Fig.4 mark zero or no effect, by the vertical red line. Values left of zero indicate a negative effect; to

the right, a positive one. The larger the absolute standardized coefficient, the stronger the effect. Some factors act in opposite directions for men and women: participation in paid work reduces women's agreement that online communication brings people closer but increases men's agreement; men with disabilities respond more positively, women with disabilities more negatively. At the country level, digitalization contributes more to men's positive attitudes. The negative effect of socio-occupational segregation and remote work is weaker for women. Within the category of women differences associated with lower endorsement of the "closeness" benefit are seen among those with primary education, among higher age groups (45+), among residents of small towns and villages, among employees, and among women with disabilities.

Table 1. Online communication helps people feel closer, men and women estimated separately

	Model 1	**Model 2**
Individual level characteristics	Online communication helps people feel closer, men and women estimated separately	
	Male	*Female*
Education, ref.: higher		
Vocational education (post-secondary)	-0,163 (0,139)	-0,148 (0,125)
Secondary	0,165 (0,101)	-0,110 (0,094)
Primary	-0,023 (0,133)	-0,316* (0,127)
Basic or lower	0,269 (0,189)	-0,070 (0,205)
Occupational class, ref.: high managerial class		
Low service class	-0,221 (0,123)	-0,145 (0,113)
Small business	-0,204 (0,127)	0,067 (0,135)
Qualified workers	-0,298** (0,115)	-0,199 (0,113)
Low qualified workers	-0,295* (0,130)	0,033 (0,125)
Age, ref. 25–44		
45–54	-0,192* (0,083)	-0,396*** (0,078)
55–64	-0,229* (0,091)	-0,377*** (0,086)
Ethnicity, ref.: majority of population		
No	0,280* (0,111)	0,132 (0,107)
Place of living, ref.: big city		
Suburbs	0,025 (0,137)	-0,301* (0,125)
Town	-0,224* (0,100)	-0,412*** (0,092)
Village	-0,552*** (0,099)	-0,465*** (0,092)
Farm	-1,225*** (0,194)	-0,120 (0,189)
Access to internet, ref.: workplace		
At home	0,384* (0,183)	0,362* (0,180)
Mobile device	0,206** (0,078)	0,283*** (0,072)

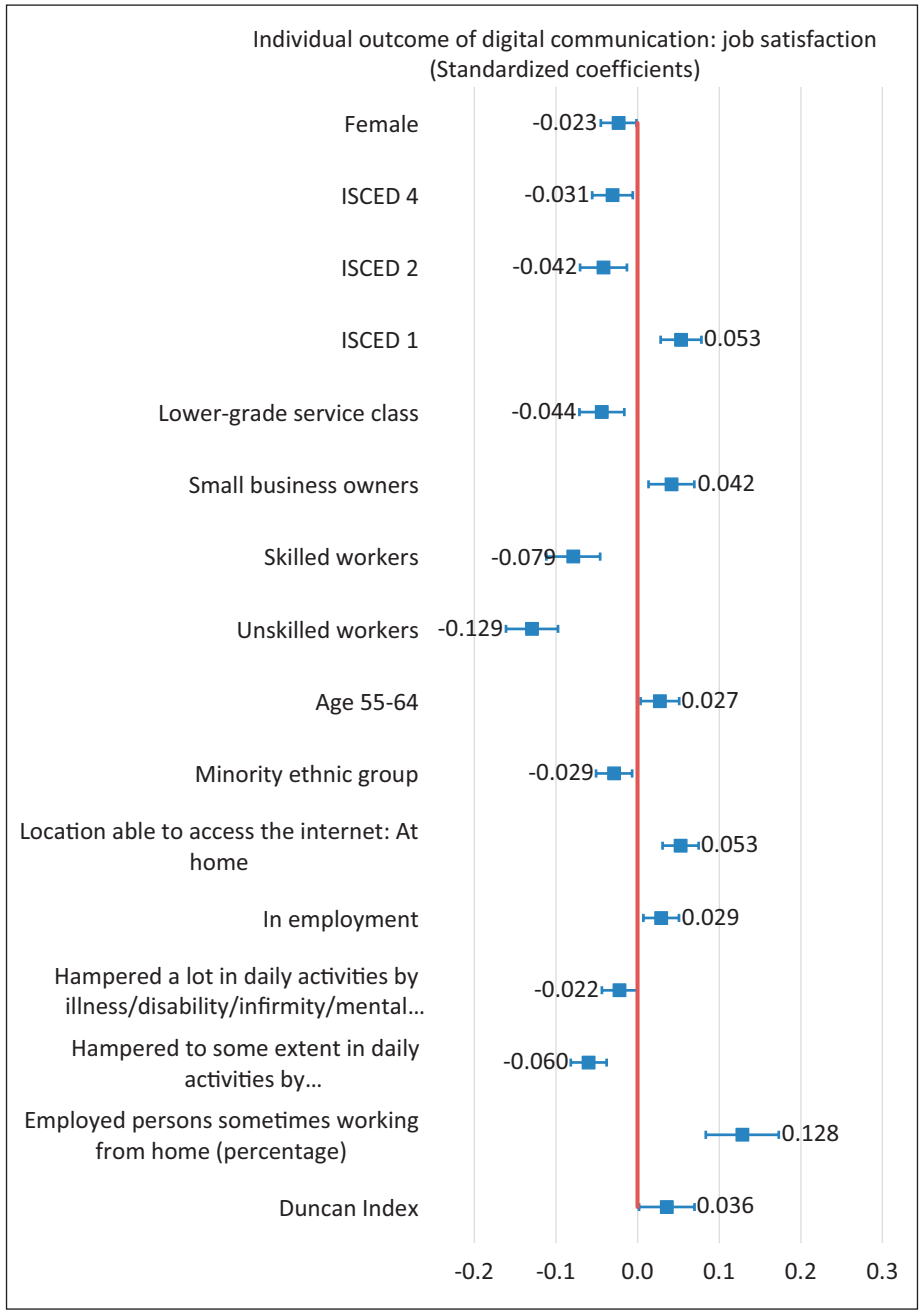
	Model 1	Model 2
Individual level characteristics	Online communication helps people feel closer, men and women estimated separately	
	Male	*Female*
3 digital skills	0,240*** (0,048)	0,245*** (0,043)
In employment, ref.: unemployed, inactivity		
Employed	0,131 (0,103)	-0,320*** (0,076)
disability, ref: without		
Sever limitations	0,148 (0,200)	-0,433* (0,185)
Some limitations	0,036 (0,108)	-0,106 (0,093)
Country level		
Digital Economy and Society Index (DESI) (2021)	0,068*** (0,015)	0,028* (0,014)
Work at home as a share from all in employment, gender (%), ref.: never		
Some times	-0,048*** (0,011)	-0,039*** (0,010)
Every day	-0,080*** (0,011)	-0,030** (0,010)
Duncan Index	-1,734*** (0,474)	-0,172 (0,439)
Constant	5,257*** (0,426)	6,217*** (0,400)
N (individual level)	**6986**	**8180**

N (country) = 18; standard errors in parentheses; significance: * p < .05, ** p < .01, *** p < .001.

Comparison between men and women estimates (selected) proves that primary education reduces women's endorsement (β = –0.316*, SE 0.127), but is not significant for men. Comparing the effects of occupational class we found that skilled (β = –0.298**, SE 0.115) and unskilled workers (β = –0.295*, SE 0.130) show lower endorsement among men. Age characteristics support the negative effects for older groups. The higher age reduces the endorsement for both genders, more strongly for women. The effect of ethnicity is pointing to minority status, which increases endorsement among men (β = 0.280*, SE 0.111) but not among women. Place of living, when it is rural and in small-town lowers endorsement for both genders, stronger for men in rural areas. The place of internet access is more beneficial for those with home and mobile access. Both types of access increase endorsement. Digital skills, higher number of skills increases endorsement for both men and women. Employment, being employed reduces endorsement among women (β = –0.320***, SE 0.076), and is not significant for men. Disability has a strong negative effect for women reporting severe limitations (β = –0.433*, SE 0.185). At country-level, DESI increases endorsement for both (stronger for men), higher remote-work prevalence decreases endorsement for both, and the Duncan index has a strong negative effect for men but not for

women. Men from minority ethnic groups value the benefits of online communication more than women do. Rural residence has a stronger negative effect for men than for women. At the macro level, the Duncan Index negatively affects men's attitudes to online communication as a benefit and has no effect on women.

Figure 5. Individual outcome of digital communication: job satisfaction



Women report lower job satisfaction than men (Figure 5). People who can access internet from their home are satisfied. At the macro level, job satisfaction is positively associated with a higher country-level share of employees who sometimes work remotely, and with a higher occupational gender-segregation index. The least satisfied are lower-service-class employees and both skilled and unskilled workers.

Conclusion

Returning to our research questions: First, do digital social contacts mitigate or intensify existing inequalities? Our results indicate that a greater number of digital skills foster the belief that online communication helps people feel closer. This positive attitude is also shared by ethnic-minority respondents. Ethnicity is positively associated with perceived benefits among men but not women – an example of the transformative thesis that digital technologies support minority communities (Mesch et al., 2012).

Second, what is the role of opportunities – access and digital skills – in leveraging digital social contacts? The effects of education, socio-occupational class, age, residence, ethnicity, and gender are significant; their joint and cumulative impact produces acute vulnerability. At the same time, acquiring more different digital skills has a positive effect, underscoring the value of adult education and training – especially when publicly funded – for older people in small settlements, people with disabilities, and ethnic minorities.

Third, to what extent do a lower Duncan index, a higher DESI score, and broader remote-work opportunities reduce gender inequalities in the benefits of internet use? We confirm the first hypothesis: greater gender segregation is associated with larger gender differences in the benefits of digital communication. Higher segregation reduces the "closeness" benefit for both genders, but more so for men – consistent with men's over-representation in manual occupations where digital skills are less demanded, while feminized lower-service occupations increasingly require such skills, motivating women's technology use and benefits. The need for providing additional training in digital skills for all occupational groups, with a focus on the more vulnerable – lower service class, workers, and small business owners is a need beyond the practical use of digital skills in work. Digital skills open more opportunities for widening social contacts and for the work satisfaction. Policy should therefore aim to reduce occupational gender segregation and to accelerate digitalization (DESI) with the aim to strengthen the opportunities of the online communication for work and personal life among older people and those who don't use digital technologies in their work.

The second hypothesis is not supported: a higher prevalence of remote work is associated with a lower endorsement of the "closeness" benefit. This calls for a more nuanced view: remote work has advantages that are better appreciated when combined with periodic office work – occasional remote work is associated more weakly with positive attitudes than everyday remote work. At the macro level, occupational gender segregation reproduces gender inequalities in the digital sphere. While workers report higher job satisfaction and team identification in more gender-homogeneous occupations, this has a negative long-term effect on motivation to develop digital skills – more negative for men in manual jobs where job duties do not directly require such skills.

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Chapter 2
How social class shapes the meanings of AI: habitus, capital, and digital expectations in Bulgaria

Svetlomir Zdravkov

Abstract: *This study uses Pierre Bourdieu's theory of practice to investigate how social class affects Bulgarians' views on Artificial Intelligence (AI) and digital technologies. It utilizes nationally representative Eurobarometer 101.4 (2024) data to conceptualize social class as a relational position within social space, formed by the volume and composition of capital, and influenced by habitus. Structural equation modelling (SEM) is employed to investigate the indirect influence of latent social class on the perceived societal impact of AI, as mediated by technological preferences, perceived capital convertibility and political empowerment. People from higher social classes are more likely to believe that AI benefits society. This is not due to direct class impacts, but because their attitudes – based on confidence, recognizing opportunities and trusting institutions – align with the way digital transformation operates. These findings illustrate the symbolic and stratifying effects of technological advancement, shedding light on the social and structural determinants of digital optimism.*

Keyword: social class, digital inequality, structural equation modeling, digital transformation, theory of practice.

Introduction

Concerns regarding the societal consequences of AI and digital technologies encompass labor displacement and monitoring (Wang & Lu, 2024), as well as challenges related to efficiency, innovation, and control (Zajko, 2022). Some

people see AI as a way to get ahead and have more power, while others see it as a threat to jobs, privacy, and societal cohesiveness. Bulgaria is a good place to look at these dynamics because of the socioeconomic inequality, lack of faith in institutions, and unevenly distributed digital infrastructure that characterize the country. As a post-Socialist society that has quickly become part of the global technological systems, it has one of the highest levels of income inequality in the EU (Mintchev et al., 2010) and considerable educational stratification (Boyadjieva & Kabakchieva, 2015; Ilieva-Trichkova & Boyadjieva, 2014). Bulgaria also has to deal with long-lasting digital gaps, such as differences in broadband availability between regions, low levels of digital literacy, and a changing job economy. Bulgaria is increasingly becoming a consumer, and to a lesser degree, a marginal creator, of digital innovation (Zheleva, 2025). However, despite these dynamics, research on Bulgaria's digital transition has predominantly neglected the influence of social class on public perceptions of AI and automation. The majority of current research emphasizes technical readiness, institutional capability, or general emotion (Konstantinov, 2025), neglecting the social stratification of technological dispositions. Consequently, it is uncertain how various social groups in Bulgaria perceive technological change – who accepts it, who opposes it, and the reasons behind their positions.

Attitudes toward AI in Bulgaria provide significant insights into symbolic power and misrecognition among transitional countries and the contested narratives of modernity. Being "tech-savvy", "future-oriented", or "aligned with Europe" is a type of symbolic capital that is not uniformly dispersed throughout social groupings (Stoilova & Haralampiev, 2025). As digital policy becomes more important to EU governance and national development plans, it is important to look at who feels included in the digital future and who doesn't. These are important problems for social cohesion, democratic participation, and economic fairness.

This study contextualizes popular perceptions of AI within the constructs of class, habitus, and symbolic dominance. Utilizing Bourdieu's concepts of practice, capital, and habitus, it analyzes the influence of class-based dispositions on techno-optimism, techno-skepticism, and overarching perspectives toward technological advancement. From this viewpoint, views of digital technologies are not solely individual beliefs but socially constructed dispositions that reflect and perpetuate class positions within symbolic hierarchies.

Vision, Classification, and Power

This study examines individuals' perceptions of the societal impacts of emerging digital technologies and artificial intelligence (AI). However, these perceptions are

not merely subjective views or impartial representations of reality. Instead, they are socially organized predispositions, influenced by an individual's position within the social hierarchy, and concurrently, they are political actions, as they take part in the classification and legitimization of specific ideologies. Seeing AI as a threat or a force for advancement is not just a matter of personal opinion; it is also a sign of how you fit into a larger system of power and recognition. Bourdieu (1990, 134) asserts, "the vision of the world is a division of the world" – meaning that perception and judgment include establishing symbolic borders, affirming or challenging prevailing interpretations, and possibly engaging in the replication or subversion of social hierarchies. The subsequent analysis examines two interconnected aspects of individual perceptions of the social world through the lens of Bourdieu's theory of practice (1990): firstly, the influence of class-conditioned dispositions (habitus) on classificatory perceptions of AI and digital technologies; secondly, the role of these perceptions as acts of symbolic classification, reflecting either alignment with or resistance to prevailing narratives of technological advancement.

At its core, a "vision of the world" is shaped by habitus: the system of durable, transposable dispositions through which individuals interpret and navigate the social world (Bourdieu, 1977). Habitus is the product of social conditioning, formed through prolonged exposure to particular material conditions, institutional environments, and classificatory schemes. It encodes both the objective structures of social life – such as class position – and the subjective, embodied orientations toward possibility, legitimacy, and belonging. Habitus does not dictate specific beliefs or actions, but shapes what individuals see as likely, thinkable, desirable, or threatening in a given field – including in the field of digital transformation. Habitus, in turn, is structured by one's position in social space, which Bourdieu conceptualizes not as a simple demographic category but as a relational configuration of capital. Social class, in this sense, is defined by the volume and composition of economic, cultural, social, and symbolic capital (Bourdieu, 1986). The volume of capital refers to the total resources an individual possesses, while composition refers to the relative weight of different forms of capital. The configurations of capital generate distinct classed dispositions – ways of speaking, seeing, valuing, and relating to the world – that form the perceptual basis for how individuals evaluate technological change. Thus, we should expect that individuals with high cultural capital may be more inclined to see AI as a tool for optimization and distinction, while those with less capital may view it as opaque, imposed, or threatening. These interpretations are not simply personal opinions; they are class-conditioned perceptions, reflective of one's symbolic and material proximity to the dominant logic of digital transformation.

Personal attitudes are merely one aspect of technology acceptance. Another viewpoint highlights that technology, especially AI and digital automation, of-

ten advantages members of the ruling class by solidifying their status within the labor market, institutions, and the overarching class hierarchy. Bourdieu posits that emerging technologies may function as tools for the transformation of technological capital into symbolic and cultural capital (Bourdieu, 1984; 1991). Empirical research supports this trend: AI is more inclined to enhance rather than supplant cognitively demanding fields such as health, law, engineering, and analysis (Autor, 2015; Susskind, 2020). Bourdieu stated, "Dominants always tend to impose the skills they have mastered as necessary" (1996, p. 119). Naming AI – deciding what it is, what it accomplishes, and who it helps – is a manner of changing social reality. Dominant groups can make their own ideas seem valid, whereas subordinate groups often have to accept or absorb labels that lower their status (Bourdieu, 1991). Symbolic domination emerges when these socially constructed perceptions are unfairly perceived as natural or universal. In some situations, not being able to use digital technology may be due not to structural inequality but rather to a lack of talent, interest, or entitlement on the part of the individual. Bourdieu (1994) names this process the bureaucratic field, where state institutions, technocratic agencies, and policy networks fight over resources and meanings. The state is the main authority on what is a legitimate classification. It makes laws, defines categories, gives recognition, and sets the symbolic limits of inclusion, especially in education, digital skills, and AI governance.

This process unfolds within what Bourdieu (1994) calls the bureaucratic field, where state institutions, technocratic agencies, and policy networks fight over resources and meanings. The state is the main authority on what a legitimate classification is. It makes laws, defines categories, gives recognition, and sets the symbolic limits of inclusion, especially in education, digital skills, and AI governance.

Having all this in mind, the primary research question is defined as follows: How does social class, as structured by capital and mediated by habitus, shape individuals' expectations about the societal impact of artificial intelligence and digital technologies?

Data and methods

Data and sample

This analysis uses Eurobarometer 101.4 (2024) data from Kantar and national partners in 27 EU member states for the European Commission. The GESIS data archive provided access to "Rule of Law, Artificial Intelligence and the Future of Work, and European Attitudes towards EU Energy Policy" (ZA8844) (Euro-

pean Commission, 2025). The analysis concentrates on Bulgarian respondents from the European sample. After data cleaning, 982 Bulgarian residents aged 15 and older were selected through multistage, stratified probability selection to assure representativeness across key sociodemographic strata. The Eurobarometer's mixed-mode design used internet surveys and computer-assisted face-to-face interviews (CAPI) to collect data in Bulgaria from 25 April to 19 May 2024.

Research Strategy

Structural Equation Modeling (SEM) is used to analyze the data. It is applied because SEM calculates the complex interactions between observable and latent variables, considering measurement error. The method is optimal for assessing mediated effects, such as the indirect influence of social class on perceptions via attitudes towards new technology and perceived capital advantages (Kline, 2023). Latent variables align with Bourdieu's relational model of social class, which cannot be simplified to monetary wealth or professional status. Instead, class is more accurately conceptualized as a latent construct produced by economic and cultural capital (Bourdieu, 1984). In a sentence: SEM offers a structurally based, theory-consistent examination of the influence of social class on technological change expectations.

Measurement Model: Operationalizing Bourdieu's Concepts

Dependent variable.

For the purposes of this study, the dependent variable is derived from Eurobarometer 101.4, module QB, which asks respondents:

> *In your view, what impact do the most recent digital technologies, including Artificial Intelligence, currently have on society?*

On a 4-point ordinal scale, 1 is very negative and 4 is very positive. This item assesses people's comprehension of the cultural, economic, and political effects of technology, as opposed to questions concerning personal use, workplace repercussions, or particular risks. Such a measurement, according to Bourdieu, is not merely a cognitive evaluation but rather a social disposition based on habitus, capital configuration, and symbolic position.

Independent varibles

1. *Latent Social Class.* Capital volume and composition, not income or occupation, define class for Bourdieu (1984; 1987). Three indicators are used to represent social class as a latent variable to capture its multidimensionality:

- Class position assessment (QB12): "Do you see yourself and your household as belonging to...?". Responses: Lower (1) to higher (4) socioeconomic class. Subjective social status indicates class consciousness and social standing, according to Bourdieu.
- "What is the highest level of education you completed?" Ordinal answers are 1–9. Institutionalized cultural capital aids in understanding and engaging with dominant discourses, especially those related to technology.
- "During the last twelve months, would you say you had difficulty paying your bills at the end of the month?" Access to economic capital divides classes. No alternative economic capital metrics appear in the database, hence this variable is chosen.

2. *Technological Dispositions***.** Instead of measuring cultural capital, Bourdieu views the three self-assessed digital skill items as markers of class-based dispositions entrenched in habitus. They reflect people's digital skill, comfort, validity, and preparedness. This latent construct has three QB7 items with 1–4 answers:
   - "You are sufficiently skilled in the use of digital technologies for your daily life."
   - "...for your current job."
   - "...for a job you could have in the next 12 months."
3. *Perceived Capital Convertibility.* According to Bourdieu, techno-optimism is a class-based realization that developing technologies such as AI help people who possess dominant capital. Digitized people see these technologies as tools for increasing productivity, expertise, and symbolic distinction. Their optimism is based not just on attitude but also on tangible opportunities for capital acquisition and reproduction. The dimension consists of three QB2 attitudes:
   - "AI helps people do their job or daily tasks."
   - "AI is necessary as it can do boring or repetitive tasks."
   - "AI increases the pace at which workers complete tasks."
4. *Political Empowerment Disposition.* Classed political empowerment comes when individuals feel institutions are responsive to their interests, that their voice matters in democratic processes and they are included in symbolic and practical decision-making. Those in power believe political arrangements work for them, reinforcing their institutional efficacy and justice beliefs. Quantifying political empowerment disposition:
   - Voice in the EU (QA9): "My voice counts in the European Union."
   - Voice in Bulgaria (QA8): "My voice counts in [your country]."
   - Satisfaction with democracy (SD18): Overall assessment of democratic functioning in Bulgaria.

The study's main research question is related to how the model incorporates both the structural and symbolic aspects of inequality that guide people toward technological change. For the purpose, Bourdieu's ideas are operationalized as latent constructs. This design makes it possible to examine how class position influences digital dispositions and how those dispositions influence attitudes toward automation and artificial intelligence. By using SEM, the analysis is guaranteed to take measurement error into account, reflect the multidimensionality of the constructs, and pinpoint the indirect channels through which class influences digital optimism or skepticism. In the next section the results of the analysis are provided.

Results

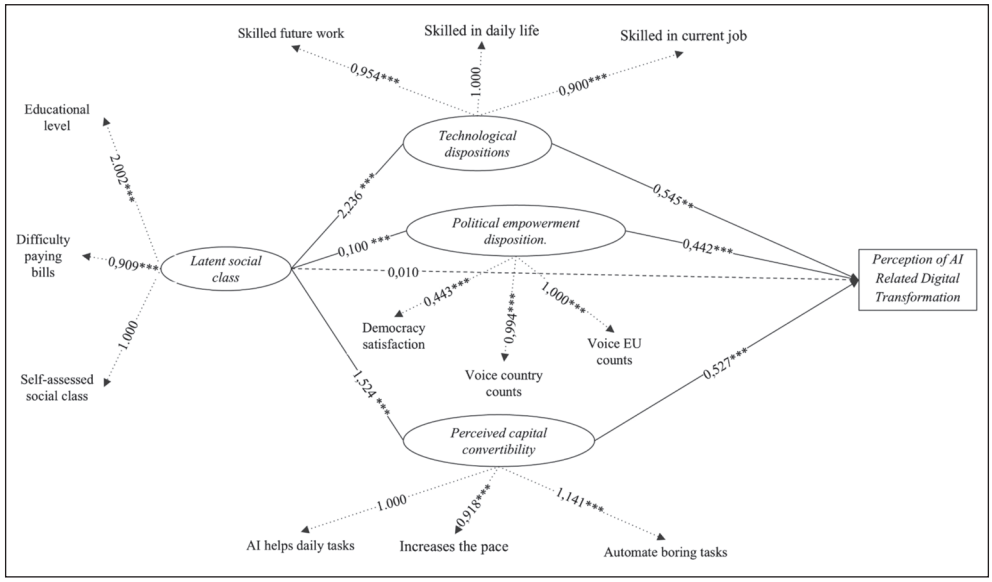
The idea that social class affects optimism toward AI mainly through mediating dispositions rather than by its direct effects, is strongly supported by the structural equation model (see fig. 1). Higher education levels are associated with greater digital self-confidence, stronger beliefs about the potential of AI, and a somewhat higher level of trust in institutions. Technological dispositions are significantly predicted by social class ($\beta = 2.236$), indicating that privileged groups believe they are better at using digital tools in daily tasks, work settings, and future career opportunities. Additionally, it predicts perceived capital convertibility ($\beta = 1.524$), suggesting that people with higher socioeconomic status are more likely to recognize AI's potential for convenience and productivity. The relationship between socioeconomic status and political empowerment is weaker but still significant ($\beta = 0.100$), suggesting that the wealthy have a greater sense of agency and institutional trust.

The distinct specification of each latent construct is confirmed by the measurement models. Everyday, professional, and future-focused digital skills all frequently make use of technological competencies. The idea that AI makes daily tasks easier, increases productivity, and automates repetitive tasks is a reflection of perceived capital convertibility. In both national and EU frameworks, political empowerment incorporates perceptions of agency and measures of satisfaction with democracy. The constructs appropriately reflect their intended dimensions, as evidenced by the statistical significance of all loadings.

Positive societal perceptions of AI are significantly predicted by all three dispositions. The greatest influence is attributed to technological dispositions ($\beta = 0.545$), suggesting that optimism about technological advancement requires competence with digital technologies. The strong correlation between perceived capital convertibility ($\beta = 0.527$) emphasizes the importance of AI as a tool for

opportunity and efficiency. Political empowerment has a significant impact (β = 0.442), highlighting the significance of civic engagement and institutional trust in shaping optimistic perspectives.

Figure 1. Structural Equation Model of the Relationship between Social Class, Dispositions, and Attitudes toward Digital Technologies and AI



Notes: Structural Equation Model showing how latent social class affects favorable social attitudes toward digital technology and AI. Education, self-assessed class, and bill-paying trouble make up latent social class. It predicts that technological dispositions, perceived capital convertibility, and political empowerment dispositions (voice and faith in institutions) will influence positive AI societal effect ratings. Standardized path coefficients are statistically significant at ***p <.001, **p <.01, or *p <.05. Oval shapes represent latent constructs, arrows represent observable variables, solid lines represent structural routes, and dotted lines reflect measurement relationships. Reference indicators are 1.000.

According to the model, social class indirectly influences people by fostering attitudes of political trust, competence, and utility that align with positive views of AI. Despite the fact that class has no direct impact on cultural attitudes, these dispositions mediate its effect.

Class, Habitus, and AI: Discussion

Like many peripheral societies in the global digital economy, Bulgaria has experienced the rapid diffusion of AI and related technologies but has had little influence over their development. Public opinion is divided: some welcome AI as a means of achieving progress and efficiency, while others associate it with

exclusion, job insecurity or surveillance. A Bourdieusian perspective helps to explain these divergent expectations, showing that they are not simply the product of individual preferences or rational calculations, but rather socially structured perceptions that are rooted in class and habitus.

The results demonstrate that the distribution of economic, cultural and symbolic capital shapes expectations regarding the effects of AI on society. Whether people view AI as a threat to security and dignity or as a means of social advancement depends on factors such as exposure to economic insecurity, educational attainment, and digital self-efficacy. This corroborates Bourdieu's assertion that individuals' perception and response to change is influenced by their habitus, or the embodied dispositions formed by their position in the social hierarchy. The apparent "techno-optimism" of higher-status groups is more a "well-fitted habitus" that aligns with the prevailing logic of the digital realm than a free choice. These groups view algorithmic systems as productivity aids and symbols of modernity, but others see them as opaque control mechanisms.

Importantly, the model shows that the effects of class operate indirectly through dispositions. Although class has little direct impact on attitudes towards AI, technological proficiency, perceived capital convertibility and political empowerment all act as mediators. This lends weight to Bourdieu's assertion that habitus, which normalizes inequality by rendering specific attitudes as self-evident rather than resorting to overt force, is the reason social institutions persist. For example, people with more cultural and financial capital are more likely to view AI as a tool to strengthen their position, such as automating repetitive tasks, improving knowledge or demonstrating their commitment to Europe's digital future. Conversely, those with fewer financial resources tend to be ambivalent or disengaged, indicating symbolic exclusion from the digital world rather than a lack of knowledge. Symbolic capital influences the sense of belonging to democratic institutions, as evidenced by the modest yet significant correlation between social class and the tendency towards political empowerment. People are more likely to accept prevailing narratives about AI as valid tools for advancement and governance if they feel that their views are valued within political systems. Conversely, digital technologies are more easily perceived as imposing or alienating in the absence of institutional trust. This implies that techno-optimism is maintained by symbolic alignment with political spheres of power, as well as by competence and usefulness.

These observations broaden the conversation beyond the situation in Bulgaria. They highlight how digital optimism functions as a form of symbolic capital, signifying conformity to modernity and integration into prevailing future ideas. Being "tech-savvy" or "future-oriented" is a class-based performance in itself, reproducing social structures while presenting itself as impartial. In this

respect, the realm of digital transformation mirrors other domains analyzed by Bourdieu, where dominant groups universalize and enforce their own tendencies as the norm. Thus, AI optimism exemplifies misrecognition – the idea that unequal access, ability and recognition are inherent or merit-based rather than socially constructed.

Ultimately, the analysis shows that attitudes towards AI are shaped more by embodied ties to capital and power than by objective technological knowledge. As in other contexts, digital transitions in Bulgaria rearticulate hierarchies rather than upend them, turning technical change into a resource for those who already possess the kind of capital best suited to reaping its benefits.

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Chapter 3
Digital inequalities and regional disparities in Bulgaria

Kamelia Petkova

Abstract: *Digital inequalities are increasingly emerging as one of the new dimensions of social injustice in contemporary society. They extend beyond unequal access to the internet or digital devices (first-level digital divide) to include disparities in digital skills, motivation to use technology, and the actual benefits derived from participation in the digital environment (second- and third-level divide) (van Dijk, 2020). In the context of the growing digitalization of services, education, and the labor market, these inequalities deepen the social marginalization of vulnerable groups and entire localities. The problem is particularly pronounced in countries with distinct territorial disparities and socio-economic imbalances, such as Bulgaria. The aim of this article is to analyze how the regional context shapes digital inequalities by comparing rural areas, medium-sized towns, and large cities. The study applies a qualitative approach and includes in-depth interviews with respondents from the three types of settlements. This makes it possible to trace different patterns of digital vulnerability and to identify four key types of barriers: infrastructural (lack of connectivity), educational (low levels of digital literacy), economic (inability to afford devices or connectivity), and cultural (lack of trust and social distance from the digital sphere). The findings show that the digital divide is not only a matter of technical accessibility but also of social belonging and territorial embeddedness. While in small and large cities the problem tends to be concentrated among certain vulnerable groups (e.g., the unemployed, the elderly, residents of marginalized neighborhoods), in rural areas it is often widespread and structural. In this respect, the article argues for policies that go beyond enhancing access and also promote the development of digital skills and trust in technology, taking into account the local context (Helsper, 2021). The article conceptualizes digital inequalities as socially and spatially structured processes and underscores the need*

for territorially sensitive interventions that combine digital infrastructure with educational and social measures.

Keywords: digital inequalities; regional disparities; digital skills; social vulnerability; territorial marginalization

Introduction

Over the past two decades, digitalization has gradually restructured key spheres of social life, ranging from the economy and education to public administration and interpersonal communication. In this process, access to digital technologies and the ability to use them effectively have become not merely technical issues but also deeply social and political ones. Within the context of global digital transformation, a persistent line of inequality has emerged, commonly referred to as the *digital divide*, which reflects systemic disparities in internet access, digital skills, and the actual opportunities for participation in the digital society (van Dijk, 2020; Helsper, 2021).

Public discourse often highlights the economic dimensions of the digital divide. Far less attention, however, has been given to its territorial aspects, particularly in countries with pronounced regional imbalances such as Bulgaria. At the national level, persistent differences are evident between small towns (up to 30,000 inhabitants), medium-sized towns (30,000–100,000), large cities (over 100,000), and rural areas – differences that manifest not only in infrastructure but also in socio-economic profiles, levels of educational attainment, and the degree of institutional support.

In this context, digital inequalities are not merely the result of a lack of technical resources but are closely intertwined with social stratification and the spatial organization of society. The purpose of this article is to examine these regional manifestations of digital inequality, focusing on differences in access, levels of digital skills, and the benefits derived from technology use across three types of settlements – villages, small or medium-sized towns, and large towns. The methodological approach combines in-depth interviews with respondents from two regions of Bulgaria – the South Central and the Southeast, with an analytical focus on the territorial context, allowing the identification of specific patterns of digital vulnerability structured not only by social but also by geographical factors.

This study seeks to contribute to a deeper understanding of the digital divide as a multidimensional social phenomenon in which structural, cultural, and spatial factors intersect. The argument is developed in the context of increasing efforts at both European and national levels to achieve *digital inclusion*, while

emphasizing the need for territorially sensitive policies that address the specific barriers and potentials of different regions.

Previous Research

Digital inequality has become established as one of the new dimensions of social injustice in contemporary society. By its very nature, it encompasses disparities among individuals, groups, or regions in terms of access to information and communication technologies, digital skills, and the actual use of technologies in everyday life. It is derived from the earlier concept of the *digital divide* but offers a broader stratification perspective in which technologies are seen as instruments for reproducing social hierarchies (DiMaggio & Hargittai, 2001).

According to van Dijk (2005), digital inequality is a structural social problem that cannot be resolved merely by providing internet access, as it also involves the uneven distribution of digital skills, motivation, cultural capital, and opportunities to benefit from technologies. Hargittai (2002) adds that inequalities in internet use often reflect pre-existing disparities related to education, income, age, and ethnicity. Warschauer (2004) likewise emphasizes that technology alone does not create equal opportunities unless embedded within systems of social support, literacy, and institutional accessibility.

In the Bulgarian context, the issue of digital inequalities has also been addressed by scholars such as Rumyana Stoilova (2025), Rumyana Zheleva (2025), Martin Konstantinov (2025), Stefan Markov (2025), Svetlomir Zdravkov (2025), Katerina Katsarska (2025), Marieta Hristova (2025), among others. The collective monograph *Digital Inequalities*, edited by Stoilova (2025), presents an interdisciplinary and empirically grounded account of the social, cultural, and territorial aspects of digital exclusion.

Svetlomir Zdravkov analyzes inequalities in the use of digital technologies through quantitative models, highlighting the importance of social background and education. In another publication (Zdravkov, 2025), he explores how economic inequalities affect access to online education among Bulgarian students, proposing a model that links income, technological access, digital skills, and educational engagement. Rumyana Zheleva examines regional digital systems in Bulgaria and their impact on territorial inequality. Martin Konstantinov focuses on the relationship between internet use and political engagement, emphasizing new forms of participation. Stefan Markov introduces the concept of a fourth level of the digital divide, stemming from unequal access to artificial intelligence and algorithmic fairness. Katerina Katsarska investigates the digital practices of young Roma, with a focus on social mobility and marginalization in peripheral

areas. Marieta Hristova analyzes the accessibility of public websites, showing how it becomes a barrier to the inclusion of people with disabilities.

These studies clearly demonstrate that digital exclusion in Bulgaria is a complex phenomenon, shaped not only by social and educational inequalities but also by regional and cultural conditions.

Theoretical Framework

The academic literature has established a distinction between three interconnected levels of digital inequality. The first level relates to physical access to the internet and digital devices: connectivity, coverage, equipment, and basic infrastructure. The second level concerns differences in digital skills: the ability to use technologies effectively, critically, and productively. The third level addresses inequalities in the benefits of digital inclusion: namely, the extent to which digital connectivity translates into tangible social, educational, or economic gains for different groups. As Helsper (2021) notes, even where access and similar skills are present, the social context can determine whether an individual fully benefits from participation in the digital environment.

While the social, educational, and demographic determinants of digital inequality have been extensively studied, the regional context remains comparatively underexplored. Nevertheless, numerous scholars emphasize that the place where one lives significantly shapes one's digital opportunities. Research by Graham and Dutton (2014), Malecki and Moriset (2008), and Philip et al. (2017) demonstrates that digital transformation is territorially uneven and often reproduces spatial hierarchies between "center" and "periphery". Cities concentrate innovation, infrastructure, and human capital, whereas villages and remote areas face limited access to services, low digital literacy, and weak institutional presence.

The concept of *digital localism* (Graham, 2011) provides a useful perspective for understanding these processes. It suggests that global digital networks operate upon socially and territorially conditioned inequalities, which do not disappear but are reconfigured into new digital arrangements. Under conditions of structural territorial vulnerability, regions with insufficient human capital, low economic activity, and limited institutional support not only lag in digital development but also risk cumulative digital exclusion. This manifests in the inability to use e-services, difficulties in accessing digital education, limited participation in remote work, and restricted digital citizenship.

In this sense, digital inequalities must be understood as both socially and spatially structured phenomena, where territorial context is inseparable from social

conditions. The regional expression of these inequalities is clearly reflected in the latest data from the European Commission. The *State of the Digital Decade: Digital Decade Country Reports – Bulgaria* (ST 10407/2025 ADD 35) shows that FTTP/VHCN coverage in rural and sparsely populated areas of Bulgaria stands at 79.1%, exceeding the EU average (61.9%). However, 5G coverage in the same areas is only 38.3%, significantly below the EU average (79.6%). Even more striking is the lag in basic digital skills: only 20.9% of rural residents in Bulgaria possess them, compared to 35.5% at the national level and 47.5% in the EU. These figures highlight that both infrastructural and human dimensions of digital exclusion in Bulgaria have a clearly territorial character (Council of the European Union, 2025: 8).

The present study is situated within this framework, aiming to examine how digital inequalities are formed, exacerbated, or overcome in different regional contexts – villages, small, medium-sized, and large towns – and to identify what types of policies would be most effective in reducing territorially embedded digital vulnerability.

Research Questions

The primary objective of this study is to identify the main forms of digital vulnerability manifested across different territorial contexts and to examine how they differ in terms of infrastructure availability, levels of digital literacy, and the ability to derive social and economic benefits from the use of digital technologies. Special attention is paid to the ways in which territorial context – including access to services, local institutional support, and the social environment – influences the degree of digital inclusion or exclusion of individuals and groups.

The study also seeks to explore what individual and collective coping strategies are employed by residents in the two regions to address digital exclusion and how effective these strategies prove to be in the context of local resources and constraints. In this regard, subjective perceptions of barriers and incentives to digital inclusion – such as distrust, lack of motivation, economic constraints, or social isolation – are analyzed, with an emphasis on their regional specificity.

Another key aim is to investigate how social inequalities – related to age, education, income, and ethnicity – intersect with territorial belonging, analyzing how the regional context amplifies, modifies, or mitigates pre-existing inequalities. By comparing the experiences of respondents from different types of settlements, the study seeks to provide empirical evidence for a more nuanced understanding of digital vulnerability.

The research is guided by several working hypotheses that will be empirically tested through the analysis of in-depth interviews. The first hypothesis posits

that the forms and degree of digital inequality vary significantly depending on the type of settlement, with rural residents being the most affected by the lack of basic infrastructure and internet connectivity. In many remote and mountainous villages, due to unfavorable geographical conditions and underdeveloped network infrastructure, internet coverage is weak or entirely absent, creating an objective risk of complete digital exclusion for entire communities.

The second hypothesis suggests that factors such as age, education, and income reinforce digital exclusion in different ways across regional contexts. For example, low educational attainment and poverty act as barriers in all types of settlements, but their impact is stronger in peripheral regions, where opportunities for informal compensation of these deficits are limited.

The third hypothesis argues that coping strategies for digital vulnerability (e.g., family support, collective solutions, informal learning) also vary depending on place of residence. In rural areas, there is greater reliance on external assistance or on so-called digital intermediaries – most often younger relatives or social workers – who compensate for the lack of skills and connectivity.

The purpose of these hypotheses is not to provide definitive explanations but rather to structure the analytical process and direct attention to key interrelations between regional belonging, the social characteristics of respondents, and their digital opportunities.

Methodology

The present analysis is based on findings from in-depth interviews and focus groups conducted with representatives of the Bulgarian, Roma, and Turkish ethnic groups. The study was carried out within the framework of the project "*Digital Divide and Social Inequalities: Levels, Actors and Interactions*", funded by the National Science Fund at the Ministry of Education and Science.

The analysis covers two case studies: one in the South-Central region and one in the Southeast region, each encompassing different types of settlements:

- **Villages** – Zagortsi (Sredets municipality), Rozino (Karlovo municipality), Bolyartsi (Asenovgrad municipality);
- **Small towns** – Kotel, Parvomay;
- **Medium-sized towns** – Yambol, Asenovgrad, Sliven;
- **Large cities** – Plovdiv, Pazardzhik, Burgas.

The classification of settlements is based on population size, following the criteria of the National Statistical Institute (NSI, 2024). In total, 15 individual in-depth interviews and two focus groups were conducted during the period

2023–2024. Participant selection was purposive and followed the principle of maximum diversity, including both women and men of different ages, with and without work experience, as well as young people, unemployed persons, and individuals with varying levels of education from the Bulgarian, Roma, and Turkish ethnic communities.

The combination of different settlement types within each of the two regions makes it possible to conduct intra-regional comparisons as well as analyze inter-regional differences in socially embedded forms of digital exclusion. This methodological approach enables an in-depth understanding of the subjective dimensions of digital inequality and of the factors that reproduce it to varying degrees in rural, medium-sized, and large urban contexts. While the data do not claim representativeness, they provide valuable empirical material for enriching knowledge of the territorial and social dimensions of digital exclusion in Bulgaria.

Results

The present analysis seeks to outline the main dimensions of digital inequality in Bulgaria, with a focus on its manifestations across different territorial and social contexts. The study employs the three-dimensional analytical framework for examining the digital divide proposed by van Dijk (2005) and further developed by Helsper (2012) and Ragnedda (2017). This framework encompasses: access to digital infrastructure and devices (first-level digital divide); digital skills and patterns of use (second-level divide); and the benefits and outcomes of digital inclusion (third-level divide).

This approach makes it possible not only to identify the structural barriers to technology access but also to analyze the social mechanisms through which digital resources are transformed into social, cultural, and economic capital (Ragnedda, 2017). Particular attention is paid to the specific practices, attitudes, and experiences that reproduce digital marginalization within different socio-territorial contexts.

First-Level Digital Divide: Access to the Internet and Devices

Access to the internet and digital devices is a basic prerequisite for participation in the digital society. Although Bulgaria reports high levels of internet penetration at the national level, data from the conducted interviews clearly reveal that geographic, social, and cultural differences strongly affect real and meaningful

access. In some rural areas, there is not only limited access but in fact a near-total absence of network infrastructure, placing communities in a situation of structural deficit that cannot be overcome through individual effort:

> *There is no way to have cable* [internet] *here in the neighborhood. Only one person who lives at the entrance of the neighborhood has it, and everyone connects through him. (*Man, Roma ethnicity, village in the Southeast planning region);

> *In a village 15 km from Kotel – Gradets, the largest Roma village in Bulgaria, with over 5,000 residents, currently even more than 6,000 – in one part of the village, since it is close to the forest, there is no coverage at all. There is no way to include Roma children in education. There are no mobile operators, and there was no way to include them in online learning, not even through optical cable, because there is simply no coverage. These children only receive paper sheets. And they do not attend school.* (Woman, Bulgarian, village in the Southeast planning region)

An interview with a representative of an internet provider reveals the economic logic behind limited or absent coverage in some villages and ghettoized neighborhoods:

> *Operators work like this: where they have subscribers, they maintain good connectivity. Where there are fewer subscribers, the quality is worse, because everything is tied to costs... In a small village with 20 or 30 subscribers, one operator may provide good coverage, but the others almost none.* (Man, Bulgarian, large city in the Southeast planning region)

This excerpt highlights an important aspect of territorial digital inequality: in a market-oriented telecommunications network, villages with small populations and ghettoized neighborhoods with low purchasing power are often left outside the scope of investment. As a result, depopulation becomes not only a demographic issue but also a barrier to digital connectivity – creating a self-reinforcing cycle of exclusion in which the lack of infrastructure leads to social and economic stagnation, which in turn accelerates further depopulation.

Even when technical access formally exists, economic vulnerability is another factor that often prevents some households from maintaining a stable internet connection or providing their members with modern devices. Many of the phones in use are outdated and have limited functions, which means that "access" exists only nominally:

> *My phone is old; my child can't do anything with it on the school platform.* (Woman, Roma ethnicity, village in the South-central planning region)

In addition to technical and economic barriers, household insecurity and the daily struggle for survival often push digital inclusion to the background:

> *You can't explain to a hungry child that they have to be online for class. You just can't. Or tell them that today you won't go to the forest to collect wood, you won't work, and at the same time they must be in class. They can't stay there. Even if they are there, they're hungry, they're thinking about their torn shoes and how everyone makes fun of them.* (Woman, Bulgarian, village in the Southeast planning region);

> *Unfortunately, we can't afford a computer. As I said, I'm unemployed, and with three children we need a lot of money for food, clothes, and shoes. Only their father works, and that's off the books, without a contract, so it's very hard to have money left for extras. The children are forced to study on their phones. If something has to be written on a computer, it becomes very complicated.* (Woman, Roma ethnicity, village in the Southeast planning region)

In small towns, where infrastructure is formally much better, conditional or shared access is often observed, especially in poorer households, where a single device serves several family members. This results in fragmented participation and limited opportunities for simultaneous engagement:

> *My son wanted to enroll in an online course, but it wasn't possible – his sister was studying, and I use the laptop at night for work.* (Man, Bulgarian, small town in the Southeast planning region)

The sharing of equipment often produces intra-household hierarchies in which women and younger children are pushed to the margin of digital access:

> *I'm always last – the students first, then their father. If there's time left, I watch something on my phone.* (Woman, Turkish ethnicity, small town in the South-central planning region)

Even in settlements with 30,000 to 100,000 residents, in certain neighborhoods predominantly inhabited by minority groups, we encountered cases where the lack of electricity made digital inclusion impossible despite the presence of network infrastructure:

> *In Yambol, there's the so-called ghetto – Block 20. There's no internet there. In Sliven, in the Nadezhda neighborhood, they started building wireless networks so the children could use the internet, but the problem of electricity emerged – networks were installed, but without power the children couldn't use them.* (Woman, Bulgarian, small town in the Southeast planning region)

The data also indicate that in large cities, although connectivity is formally available, the quality of access varies significantly depending on ethnicity, age,

education, and economic status. Here we observe an "*invisible digital divide*", where resources are present but the actual capacity to use them is limited:

> *I have a phone, but I'm afraid of making electronic payments – my son always does them for me.* (Elderly man, Bulgarian, large city in the Southeast planning region);

> *We have internet, but the laptop belongs to my wife's workplace. For the kids – there's no way. We can't afford it.* (Woman, Roma ethnicity, large city in the South-central planning region)

These accounts, shared by respondents of different socio-demographic backgrounds, illustrate that access to the internet and devices should not be viewed solely through the prism of technical availability, but rather as a complex and deeply social category in which poverty, ethnicity, regional infrastructure, and intra-household hierarchies are intertwined.

Second-Level Digital Divide: Digital Skills

The data indicate that disparities in digital skills are even more pronounced than those related to access. While basic internet and device access now exists in most settlements, the ability to use digital tools effectively remains highly uneven. In villages, digital skills are mostly limited to a basic level, particularly among older people. Many respondents rely on their children for even the simplest tasks, such as opening a message or searching for information. This creates complete dependence on other household members and leads to exclusion from digital services:

> *I have a phone, but I don't know how to reply on Viber. If someone writes to me, my daughter tells me what to do.* (Woman, Bulgarian, village in the Southeast planning region);

> *I don't need the internet. I'm old, and I don't understand these things. When something is needed, my child shows me.* (Man, Turkish ethnicity, village in the Southeast planning region)

During the interviews, we also encountered cases of young people showing high levels of digital activity, including participation in online learning or remote work. These, however, were exceptions rather than the norm, with personal motivation for self-improvement emerging as the decisive factor:

> *I study online by myself. I watch videos about programming. It's not easy, but if I don't push myself, no one else will teach me.* (Woman, Roma ethnicity, village in the South-Central planning region)

In small towns, especially among people with low education and the unemployed, digital skills are often passive, consisting in watching videos, using social media, or listening to music. While such activities provide a certain level of digital socialization, they do not contribute to the development of relevant skills transferable to the labor market:

> *I only know Facebook and YouTube. Everything else is complicated. I once took a digital literacy course, but later I forgot it.* (Woman, Roma ethnicity, small town in the Southeast planning region);

> *My granddaughter can manage. I can't – when I have to fill something out online, I get confused.* (Elderly woman, Bulgarian, small town in the Southeast planning region)

An important finding here is that short training courses do not necessarily lead to sustainable digital mobilization. The lack of continuity and practical application often results in repeated digital exclusion. In medium-sized towns (such as Asenovgrad, Yambol, and Sliven), the second level of the digital divide assumes a specific configuration. Although most households have basic connectivity, the acquisition and application of more advanced digital skills remain limited. The main barriers include a lack of access to quality training resources, underdeveloped local labor markets that fail to stimulate digital competencies, and insufficient institutional support. In this context, digital engagement depends largely on individual motivation and social environment rather than systemic support. Field data illustrate this: young people of both Roma and Bulgarian origin rely primarily on self-learning and mutual assistance. A young Roma woman from Asenovgrad shared:

> *No one teaches us these things. I taught myself how to make documents on my phone, how to search online. If I don't ask and struggle by myself, there's no one to help me.*

Similarly, a 25-year-old Bulgarian woman from Sliven described:

> *I needed to register online for a course, but I didn't know how. I asked a friend, then managed by myself. Now I study on my phone, in the evenings, after work. At school, no one ever showed [taught] us these things.*

These examples highlight that the second level of the digital divide in medium-sized towns is not solely rooted in ethnic differences but reflects broader social and structural deficits. This creates vulnerabilities in the context of increasing digitalization, particularly among young people outside the major urban centers. In large cities, the picture is polarized. On the one hand, some young people, including of Roma and Turkish origin, have high levels of digital competence, working as programmers, online entrepreneurs, or freelancers:

I rate my skills as very good. I manage on my own, and I've even had to train others. During distance learning in schools, I worked as a teacher, and most of my colleagues were older and had never touched a computer in their lives". (Woman, Roma ethnicity, small town in the Southeast planning region);

I often use the internet for education, training, and qualification courses. I have also studied online. My master's degree in criminology was half online due to the COVID pandemic. I completed several courses, one on the technical expertise of banknotes, another on securities and documents. (Woman, Turkish ethnicity, small town in the South-Central planning region)

On the other hand, there are economically active individuals and older adults with virtually no skills, despite having devices and internet access:

I have internet, but I don't understand it. I only use my phone to watch videos. If I need something official, I can't do it. (Man, Roma ethnicity, large city in the Southeast planning region).

The cases studied clearly reveal intra-urban digital segregation: advanced skills are not evenly distributed but concentrated in small groups that have stronger support networks or high individual motivation.

Third-Level Digital Divide: Benefits and Social Returns of Digital Connectivity

Findings from the in-depth interviews in villages indicate that digital connectivity rarely becomes a resource for genuine improvement in living standards. Most respondents do not use the internet for access to e-services, education, or employment, but primarily for entertainment (mainly YouTube and Facebook). This results in a limited social return from technological infrastructure, even when such return formally exists:

We have internet, but I don't know how to manage my documents. We always go to the town. (Woman, Bulgarian, village in the Southeast planning region;

Having a phone doesn't help me find a job. Nobody here looks for workers online. (Man, Roma ethnicity, village in the South-central planning region)

In these cases, digital technologies are not capitalized – neither socially nor economically. In smaller settlements (villages and towns), some respondents reported using the internet to communicate with institutions or for online shopping, yet often faced difficulties with navigation, terminology, and trust in digital processes:

I tried to submit documents to the municipality online, but I couldn't. It's too confusing. In the end, I went in person. (Man, Turkish ethnicity, small town in the South-central planning region);

I shop online daily, but I'm still cautious, because there are many scams. (Woman, Roma ethnicity, small town in the Southeast planning region)

In such settlements, the cases studied show that digital connectivity is functional but limited, with little systemic support for upgrading skills or enhancing the benefits of internet use. Despite the prevalence of limited or passive digital skills, the interviews also revealed individual cases of active and meaningful internet use – not only for personal or professional purposes but also for social engagement and civic participation. One young respondent shared:

I use the internet for almost everything – for communication with friends and different people, but also for volunteer activity. I'm very engaged in this – organizing campaigns, reaching more people, collecting donations, sharing information, paying for services. Basically, I pay for everything online. I also use the internet for learning. (Man, Bulgarian, medium-sized town in the Southeast planning region)

This case illustrates how digital connectivity, when combined with motivation and capacity, can become a tool for social activism, self-organization, and access to public resources. Although such examples are rare, they highlight the importance of a supportive environment and training opportunities that could make such practices more widespread.

In large cities, digital infrastructure far more often creates conditions for entrepreneurial, educational, and employment-related activities. Some individuals, particularly younger ones, use the internet for learning, work, and participation in online communities:

My younger son and his peers work only online. Many of them are programmers, others trade on stock markets or work as consultants. All of them work online. It's a whole generation that is entirely digitalized. They work both for foreign companies and for companies here in Bulgaria, like Coca-Cola. My son works for an American company. They do server support, programming, or consulting for trading firms abroad. This is work for young people. (Man, Bulgarian, large city in the Southeast planning region;

I'm registered on different job sites. I got an offer and now I work remotely. Without the internet, I would be unemployed. (Man, Turkish ethnicity, large city in the Southeast planning region)

The data suggest a strong polarization in the usefulness of digital technologies. In some cases, connectivity fosters economic mobility and social integra-

tion; in others, digital illiteracy constitutes a barrier – especially for those in informal employment or without access to structured support. As one unemployed Bulgarian woman from a small town explained,

> *Job ads are only posted online. But I don't have a laptop, I don't have internet. There are computers at the community center, but no one explains anything. I feel outside of that system – you can't ask, you can't take part.*

Conclusion

The study confirms and further develops the three hypotheses regarding digital inequalities in a regional context. First, a clear distinction was found between types of settlements with respect to infrastructure and digital connectivity. In remote villages, the lack of network coverage and access to devices often leads to systemic exclusion, while in small, medium-sized, and large towns, connectivity, when available, does not necessarily guarantee active digital participation. In this sense, the territorial dimension of the digital divide is crucial for understanding its forms and depth.

The second hypothesis is also confirmed: factors such as age, low educational attainment, ethnicity, and limited income strongly affect the degree of digital vulnerability, though their weight varies depending on the regional context. In peripheral and less developed areas (particularly rural ones), there are no opportunities for informal compensation of these deficits, which leads to a cumulative effect of inequalities. In small and medium-sized towns, an intermediate configuration is observed: although formally connected, large segments of vulnerable groups still have limited opportunities for skill development or digital economic mobility.

The third hypothesis is only partially confirmed. Strategies for coping with digital vulnerability vary considerably across settlement types. In villages, there is a predominant reliance on "*digital intermediaries*" (younger relatives, social workers), whereas in larger settlements digital mediators emerge (especially among Roma), who play an important role in empowering others. Nevertheless, such strategies remain limited and fragmented, particularly in the absence of institutional support.

In summary, digital inequalities in Bulgaria are not merely the result of a lack of devices or internet access but also stem from accumulated barriers linked to poverty, education, and place of residence. Achieving genuine digital justice requires targeted political efforts that go beyond providing access, encompassing training, social participation, and solutions tailored to the needs of local communities. Without such a comprehensive approach, the objectives of the Euro-

pean Digital Decade by 2030 may not only fail to resolve the problem but could even exacerbate existing inequalities.

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Chapter 4
Learning organizations in the digital era: lessons from the periphery

Rumiana Jeleva

Abstract: *Peripheral areas are commonly described in terms of absence, but they represent strong testbeds for organizational learning in constraint. Here, we contend that peripheral learning organizations are successful if they (1) end-to-end digitise processes in order to create usable data, (2) manage upgrade through collaborative change, and (3) co-develop skills ecologies with schools, universities, and public intermediaries. Comparing two case studies in Southern Bulgaria – a hydraulics factory and an information center for the region associated with the EU – we discover that learning organizations in peripheral spaces are built rather than found: through the correlation of digital traceability and intermediary assistance and cooperative training, remoteness from the core may be translated into usable development capacity.*

Keywords: peripheral regional innovation systems (RIS), learning organizations, digital workflows, knowledge brokering

Introduction

Common narratives show the outskirts as places with few skills, institutions, and chances. This paper sees things differently: peripheries are areas that need – and often show – better learning ability in times of uncertainty, complicated administration, and lots of information. The problem is not just to add more resources but to create learning methods so that people can notice changes, understand rules, and work together quickly. This task is bigger than what any single company or organization can handle. It needs learning institutions – groups that gather knowledge, translate admin language into action, and build skills across

different local groups (small and medium enterprises, NGOs, local governments, schools). The uneven growth in Bulgaria is a basic part of social and economic progress (IME, 2024). Sofia's strong role as an economic, institutional, and technology center often keeps other regions, like Burgas, Pleven, or Yambol, in the background, even though these cities have their own admin status and still struggle to connect with the national innovation and digital network. However, digitalization looks like a chance to change this situation. This article focuses on how this potential for digitalization can affect regional growth. For this reason, our analysis uses two main ideas. First, the idea of Regional Innovation Systems (RIS) and learning regions shows why learning within institutions is important. Innovation isn't just done by one company; it's a process that relies on sharing information, common routines, and organizations that help cut down search and teamwork costs. In weak ecosystems – common in peripheries – these roles cannot be taken for granted; they need to be developed and kept up so that new policies, technologies, and funding can be used effectively at the local level. Second, organizational sociography ideas that examine fields and productive paths describe learning that takes place. Fields remain stable due to common meaning, categorizations, and norms; "worlds" of production rely on rules facilitating cooperation among multiple actors. Pragmatically, this implies that peripheral regions require translators: organizations that interpret hard program rules in simple language, coordinate partners' expectations, and establish "good practice" benchmarks, minimizing regional specifics. Translators do more than disseminate information – they also influence thought, coordinate timing, and legitimize actions. Cumulatively, these elements reposition the peripheral as a learning design problem (Hernández-Leo et al., 2011; Brasher et al., 2015; Conole & Culver, 2008; Hernández-Leo et al., 2018; Hernández-Leo et al., 2017; Calavia et al., 2023). Their primary interest is two-fold: (1) exploring learning firms that digitalize their business and develop feedback loops; and (2) learning institutions – such as regional information centers – that orchestrate horizon scanning, simple information packaging, and practical assistance. The primary thesis is straightforward: in the digital age, regional success depends on linking firm-level learning with institution-driven translation and skill building. Where such linking occurs, peripheries transform their "distance" from the "core" into flexibility; where it doesn't, information accumulates and does not result in action. We perceive the periphery more as relationship within the economy-institutional network rather than place only. Periphery actors are defined by their low centrality connections toward core networks (core–spine structures), with access to more organizations and support systems and less access to special services. Under these circumstances, "learning organizations" must compensate and develop the capacity for absorbing novel information, compiling dynamic

skills, and being flexible, often serving their broader community effectively as learning institutions that translate and diffuse acquired knowledge from beyond their region. Peripheral settings often have less room for administration (Cyert & March, 1963; Bourgeois, 1981; Nohria & Gulati, 1996). The number of suppliers is small (Amin & Thrift, 1994; Tödtling & Trippl, 2005; Markusen, 1996; Coe & Yeung, 2015). Local training options are not strong (Finegold, 1999). Getting public funding is made harder by complicated rules and changing government support (Herd & Moynihan, 2018; Moynihan, Herd & Harvey, 2015; Evans, 1995; Skocpol, 1985; Méndez & Bachtler, 2024; Charron, Dijkstra & Lapuente, 2014).

Previous studies

Sociologically, periphery is known best in relationally defined status positions in broader systems of rule and exchange, rather than in fixed location. In world-systems analysis, core–peripheral roles flow from historically entrenched divisions of labour and asymmetric exchange; the semiperipheral brokers these relations but does not eliminate hierarchy. Recent network analyses codify this in core–peripheral structure – compact, intensely interlinked cores and loosely interlinked periphery – accounting for informational disadvantage and sluggish diffusion to peripheral nodes (Borgatti & Everett 2000). Regional analysis expresses these observations in territorial terms: peripheral Regional Innovation Systems have thin organization and less robust intermediary infrastructure, and companies and state actors depend more on external pipelines to procure specialisation-specific external knowledge (Amin & Thrift, 1994; Tödtling & Trippl, 2005; Bathelt, Malmberg & Maskell, 2004). Measured empirically, peripherality manifests too in less accessibility to core services and markets. These circumstances render absorptive capacity, dynamic capabilities, and ambidexterity key to peripheral organizations offsetting and, in part, serving in community learning roles that translate and diffuse external-regional know-how. The term for 'Regional Innovation Systems' is part of the theorisation of regions and their economies along with such constructs such as 'industrial districts', 'new industrial spaces', 'innovation hubs', 'learning regions', 'clusters' (Porter, 1998; Maskell, 2001), providing also "local collective goods". In the context of the Bulgarian regions, it can be posited that, in contrast to Germany – where regional development trajectories are fundamentally driven by corporate entities and regional specialization within specific industrial sectors (such as finance in Frankfurt, the automotive industry in Southern Germany, etc.) – Bulgaria's regional advancement is primarily propelled by the institutional framework of local stakehold-

ers, many of whom are motivated by political and managerial interests and are well-established. In an environment characterized by heightened uncertainty and polycrisis (Delannoy, 2023), as well as the risks associated with emerging knowledge and technologies, it is imperative that regional participants remain informed and engage in continuous learning and training. The concept of ‚learning regions' is not solely defined by learning enterprises, contrary to the assertions of the ‚Scandinavian school' regarding the learning economy (Asheim and Isaksen, 2002). Given the increasing uncertainty, economic regions face increasingly radical challenges, necessitating adaptations not only of their organizational structures but also of their local capabilities to meet the demands of more integrated markets and intensified international competition concerning cost efficiency and innovation. Therefore, there is a requirement not just for modern learning enterprises but also for educational institutions that foster learning. The concept of a learning organization was articulated in Senge's (1990) seminal synthesis of five "disciplines" – systems thinking, shared vision, mental models, team learning, and personal mastery – identified as mutually reinforcing elements for ongoing enhancement. Later scholars, though, have suggested that Senge's conceptualization might insufficiently specify power, practice, and organizational politics' delicacies. Caldwell (2012) presents a practice theory-based critique: learning does not emerge from publicly professed disciplines, but from contextualized and contested practices in which knowledge, authority, and identity are incessantly negotiated. From this angle, "learning organizations" should not be conceived as fixed objects, but as sustained accomplishments emanating from socio-material routines, role clashes, and discretionary power allocation. Developing upon this critical turn, Hansen and Vedung (2020) pose the question: is it possible to revise Senge's framework in favor of developing a "responsible learning organization" which intertwines learning with accountability, public value, and risk governance? They argue that reflexivity should be tied to responsibility – the respective highlighted focus on stakeholders, ethics, and organizational experimentation's societal consequences – is crucial for learning to achieve legitimacy and longevity. Digital age stretches the appeal and limits of the original paradigm. It converts Senge's disciplines in digitally mediated practices (such as data-facilitated mental models, platform-enabled team learning), suggesting combinations of systems thinking and analytics-informed decision-making. Still, digitalization's pace and character often create organizational instability that may surpass absorptive capacity. Besio et al. (2024) theorize the term "organizational restlessness" – continual change projects and successive tool implementations may exhaust attention, fragment routines, and put at risk the stable environments in which collective learning is possible. At the level of the field, digitalization cannot be described as that one technological transition,

but more like contentious discourse. This pluralization makes simple prescriptions regarding "becoming digital" push further, illustrating how organizations co-produce the meaning of digital transformation in public narratives – placing themselves as pioneers, fast followers, or custodians – which influences resource flows, stakeholder expectations, and internal priorities. Briefly, digital transformation is this all: a bundle of technologies, a set of organizing practices, and a legitimacy project. Together, these streams imply three refinements of the learning-organization idea. First, from disciplines to practices it places emphasis on concrete socio-material routines (data work, platform governance, community of practice design) rather than on abstraction capabilities. Second, from learning to responsible learning because it places reflexivity in accountability regimes that take externalities and stakeholder claims (Hansen & Vedung, 2020) into consideration. And third, from change to cadence organizations regulate the pace of digital initiatives in order to safeguard cognitive bandwidth and institutional memory (Besio et al., 2024). Both for research and for practice, the key question is hardly whether organizations "learn", but: how do they manage learning in the face of constant digital change, uneven power, and contested meaning? Path-development research in RIS illustrates how peripheral regions diversify not due to endogenous breakthroughs but through inter-regional linkages that inject related varieties of knowledge. With thin systems, local "buzz" is too little to nourish recombination; pipelines – that is, to multinational networks, state agencies, or EU initiatives – fill in the missing capabilities, market signals, and standards. Much peripheral innovation is quiet – process tweaks in manufacturing lines, procurement routines that digitize paperwork, service re-design in municipal offices – yet cumulatively material for resilience, service quality, and employment. Framed this way, regional progress hinges on three intertwined dynamics: (1) breadth and quality of extra-regional ties (who is connected to whom, through which channels); (2) absorptive and translational capacity in anchor organizations (plants, municipal centers, intermediaries) to turn inflows into stable practices; and (3) institutional supports that protect cadence – time, slack, and coordination – to prevent "organizational restlessness" from dissolving gains. The empirical expectation for peripheral South-East Bulgaria, then, is not dramatic discontinuities but path extension and related diversification driven by well-governed pipelines and the cumulative effects of mundane innovation.

Research questions

We are interested in the question of how a digital ecosystem is created at a regional/local level and how it is managed. Further on, we would like to answer

the question, why the periphery needs learning organizations. In this paper we analyse two cases: 1. Of a district Information Center which acts as a knowledge broker precisely because peripheries have higher search and translation costs; therefore, it shortens the path from EU rules to local action. And 2. of a "learning" firm with high internal digitization, when the external skill ecosystem is thin, which is a case representing classic peripheral asymmetry (strong exploitation, constrained exploration). Both cases are explored in answering the question "why – and through which mechanisms – do peripheral regions require learning organizations to sustain upgrading under constraint".

Methodology and research design

We use a paired, mechanism-focused comparative case study in South-East Bulgaria – 1) manufacturing plant within an international consortium and 2) municipal EU information center located in a district center. The logic is most-different in sector, same in context: both operate in an organizationally thin Regional Innovation System (RIS) with out-migration and limited specialist services. Hence, we trace how each organization converts external knowledge (HQ/EU) into stable local routines and regional spillovers. Based on the theoretical base and previous studies we outline the following analytical framework for this study, which synthesise three concepts of organizational sociology and managerial theories: dynamic capabilities or the routines that let organizations adapt: sensing (scan), seizing (decide/do), transforming (reconfigure); absorptive capacity in order to (acquire, assimilate, transform, exploit) knowledge, especially from digital traces; the capacity to act as a learning organization (in Senge's sense) – shared vision, team learning, systems thinking, mental models, personal mastery. Which of these three should be idetified in the interview materials and the context in which it appears should be interpreted. In peripheries, these three concepts can be identified appearing as pragmatic designs: (a) in end-to-end digital workflows that generate usable data; (b) in parallel-runing upgrades that protect operations during change; and (c) in embedded training pipelines that convert novices into situated practitioners. Crucially, firms and boundary organizations often act as learning institutions for the wider community, partnering with schools and public intermediaries to co-produce skills and to translate extra-regional knowledge into locally usable routines. Following three hypotheses have being tested: H1. In peripheral RIS, learning organizations offset thinness in their institutions by increasing absorptive capacity (more rapidly identifying, translating, and embedding external knowledge). H2. Digital workflow (event logs, platforms) is an enabling infrastructure that decreases search/coordination

cost and stabilizes learning in high changeover. H3. Brokering organizations for others (collective training, templates, shared platforms) create regional collective goods, broadening participation and upgrading outside firm boundaries. Evidence integrates semi-structured interviews (operations manager, 10-yr tenure; information manager and expert) and internal process descriptions (ERP scope, training curriculum), triangulated where feasible with process artifacts (e.g., training schedules, upgrade timelines) and administrative data.

Main Results

1) Framing relational periphery

We assume South-East region (NUTS-2) in Bulgaria is a relational periphery – i.e., a role characterised by thinner support infrastructures, longer access times to special services, and weaker centrality in innovation and institutional networks. Relative to the economic performance and volatility South-East region, by EU comparison, continues to be a structurally low-income region. EU regional accounts in 2023 reveal many south-eastern EU regions remain substantially below the EU-27 average GDP per head. Bulgaria is prominent among these low-prosperity regions Just as revealing is shock sensitivity: in 2022 – when real GDP grew in 231 of 242 EU regions – South-East registered the largest fall (-3.1%) of all regions. Such volatility on the downside is typical for peripheral economies characterised by narrow specialisation and scarce buffers. Peripherality is apparent in the regional innovation structure. Regional Innovation Scoreboard 2025 observes performance falling –4.1 percentage points for South-East region of Bulgaria, and SME endorsement of product and process innovations in particular – the very firms that would otherwise populate learning loops in their regions. Bulgaria in its entirety continues to be an "Emerging Innovator", affirming structural barriers at the state level that peripheral regions register strongest. Bulgarian human-capital data from the National Statistical Institute accentuate organizational thinness: R&D personnel concentrate intensely in and around the capital, and for all the district, South-East has just about 1,236 R&D workers – an order of magnitude less in its macro-region centreing on Sofia. Narrow research, test, and intermediary infrastructures limit the local "buzz" that would otherwise more strongly support incremental upgrade. Peripherality is also relationally spatial: it is not the distance itself, but friction in reaching key services. Eurostat-GISCO's geographic accessibility data sets record travel-time access to service facilities at 1-km resolution; partner Statistics Explained posts reveal that capital and concentrated urban areas systematically register higher proportions

of population in short drives to hospitals and similar core services, and many (particularly rural) East and Southern regions underachieve these levels. These trends map onto Bulgaria's centre–periphery divide, with the capital consistently favored compared to more peripheral regions like South-East region. In 2023, 62.4% of all regional tourist nights in the region concentrated in July–August, one of highest seasonal concentrations in EU. Seasonal spikes and off-season lulls make it more difficult for firms and public agencies to deliver year-round training, retain special-sourced suppliers, and regularise routines – traditional signs of peripheral RIS (2023). Coming to digitalisation South-East registers mixed trends – connectivity up, absorption constrained. Bulgaria's European Innovation Scoreboard 2025 country profile points to remarkable advances in high-speed connectivity (5G/gigabit) – enabling condition for knowledge pipelines – but flags low and falling adult learning participation. In the periphery, that talent gap directly corresponds to less absorptive capacity: even when external regions' knowledge is accessible through platforms and programs, organizations have less capacity to notice, absorb, and embed it in routine (European Innovation Scoreboard 2025 – Bulgaria). Even the nationwide demographic accounts show sustained population headwinds and sizeable internal and international mobility, with churn regimes that privilege the capital and external recipients. For a peripheral region, the set – the skill leakage, the aging, and less local demand – adds another thinning dimension in support ecosystem for firms and public organizations trying to learn, socially innovate and upgrade. Still, we are awaire, that none of these indicators separately "define" periphery. Taken together, they describe a relational position characteriezed by weaker centrality in knowledge and institutional networks (low innovation scoreboard scores, sparse R&D personnel), longer/less reliable access to specialised services (accessibility evidence and hospital travel-time distributions)., compressed slack due to seasonality and shock exposure (largest 2022 GDP fall; summer-heavy tourism), and capabilities gap on the absorption side of digitalisation (connectivity improving, adult learning lagging) (European Innovation Scoreboard 2025 – Bulgaria). In such a setting, learning organizations such as the MNC-linked plant and the municipal EU information center covered by our study must compensate through absorptive capacity and boundary-spanning routines. They use curating global pipelines being to headquarters engineering platforms, EU programmes, standards bodies, etc translating inflows into SOPs, training, and platformed workflows, and – crucially – acting as de facto learning institutions for their local partners. The data above explain why this compensatory role is necessary in South-East Bulgaria. The empirical expectation is therefore incremental, pipeline-driven upgrading – small but cumulative improvements in processes, services, and compliance – rather than dramatic endogenous breakthroughs. That pattern is

exactly what the Regional Innovation 2025 Scoreboard and Eurostat regional accounts imply for South-East region currently in their analysis.

2) Case study analysis

The district information center for the EU related funding programmes

It works under a temporary contract with the Municipality in the district city as part of Bulgaria's national network of 27 Regional Information Centers, which serve all municipalities. This center helps people for free by giving expert advice on EU funding and policies, focusing on digital skills. It makes complicated terms easier to understand and helps users who may have low digital skills. From 2022 to 2023, it held 26 information events in 13 municipalities, shared updates about funding and policy based on 162 local projects, sent out 24 e-newsletters, aired 96 episodes of the weekly radio show called Europe, and met with potential users every week. It also organized 10 public debates, had 4 media briefings, and celebrated Europe Day (May 9) with two special events, which likely helped more people learn about EU opportunities. Notably, this work is done by a three-person expert team who have strong digital skills and can do each other's jobs. The center is connected to the Europe Direct network, which started in 2005 and was updated in 2021, including 424 centers across the EU. Local organizations, like the district information center we studied, have the job of explaining EU policies, rights, and funding information to citizens and stakeholders and providing feedback to higher levels. In terms of organizational sociology, its role can be seen as a "two-way pipeline". The district information centers in EU member states operate under specific agreements with DG Communication and are regularly evaluated. In peripheral regions, this makes Europe Direct Information Centers (EDICs) de facto learning hubs that convert EU-level knowledge into local SOPs, events, and collaborations, compensating for thin institutional infrastructures. The center operates as a boundary/knowledge intermediary that translates EU programmes and funding rules into locally usable guidance and routines for municipalities, SMEs, NGOs and citizens. In peripheral RIS, such intermediaries compensate for organizational thinness by coordinating dispersed actors, stabilising expectations and building shared interpretive frames that enable incremental innovation (Asheim & Isaksen, 2002; Howells, 2006). Digitally, the center's heavy use of platforms and social networks is not incidental but reflects the digital ecosystem logic – technologies, users, institutions and rules that shorten information paths and lower search/coordination costs. Targeted outreach to low-capability users (e.g., community centers, small NGOs, first-time applicants) addresses digital-divide frictions, effectively increasing the absorptive capacity of the local system and widening participation in EU-

linked learning and project work (Klerkx & Leeuwis, 2009; Zahra & George, 2002). This aligns with our claim that, in a thin peripheral RIS, the center acts as a boundary intermediary that shortens pipelines via targeted digital channels and outreach to low-capability users:

> *We segment NGOs, citizens, and local authorities and use shorter digital channels to get the right opportunities to the right groups.* (Interview, Center employee, female, May, 2024)

By coordinating campaigns, sharing materials, and "translating" administrative rules for diverse user groups (youth, NGOs, municipal staff), the Center performs collective brokerage rather than organization-specific outreach. Pooling channels and content yields economies of scale in information provision and reduces duplication (Howells, 2006; Dhanaraj & Parkhe, 2006). The result is a regional collective good – broader, more legible EU information and guidance – that strengthens local actors' absorptive capacity to join projects, access funding, and participate in EU-linked initiatives (Zahra & George, 2002; Asheim & Isaksen, 2002). In the periphery, organizationally thin RIS, such intermediated public information functions are pivotal for inclusive participation and incremental upgrading (Morgan, 1997; Bathelt, Malmberg, & Maskell, 2004). The argument is consistent with evidence of low digital/project skills and the need for tailored EU-policy communication in Bulgaria, which the Center addresses by segmenting audiences and simplifying access.

> *In this sea of information... it's very important that we guide people to the right institution to get up-to-date, expert information. Our network monitors all programmes in the 2021–2027 period and tries to inform everybody, but at some point, it becomes one big sea of information. There are consultants and others who may speculate; we need to make it really accessible which initiative can actually happen most easily.* (Interview, Center representative, female, May, 2024)

The excerpt exemplifies the classic peripheral RIS problem: voluminous but fragmented EU-related information creates information overload, so learning relies on intermediaries that filter, translate, and direct knowledge to particular user demand (Asheim & Isaksen, 2002). The Center takes up this role of knowledge broker – "guid[ing] people in the right way to whom to turn" – by complementing social coordination (events, training, trust) with digital media (platforms, social networks), thus diminishing search/coordination costs and increasing absorptive capacity. Speculation worries about consultants highlights the significance of legitimacy and institutional trust in organizational fields (Scott, 2001). The Center directs users to the consolidated portal eufunds.bg, summarizing partnership-agreement materials, annual work programmes, and a project database that follows every project from start to completion and doc-

umenting results. At the local level, the team selects district-level updates and good practices and publishes them through social networks, a bi-weekly radio show and presentation at events, in order to reach multiple groups. Briefly, it pairs centralised knowledge base with multi-channel dissemination at the local level in order to render EU information intelligible and usable.

> *We use the unified portal eufunds.bg and a local mix of social media, a weekly radio show, and event presentations to track projects and share district-level good practices so information reaches the right groups.* (Interview, Center representative, female, May, 2024)

Within Regional Innovation Systems (RIS), place-specific adaptation is determinative: innovation and projects need to be reinterpreted in place-specific socio-economic settings. The local orientation of the Center – spreading the word on good practices, dividing audiences, and adapting the message – does more than educate; it encourages uptake and reinforces collective identity among regional actors. This intermediation is consistent with RIS theory, wherein system performance is contingent upon trusted information and knowledge flows between and among public authorities, firms, providers of education, NGOs and citizens (Storper & Salais, 1997; Scott, 2001). In practice, the combination of centralised dissemination platform (eufunds.bg), cycle tracking of projects ("from start to finish"), and multi-modal dissemination (radio, events, etc.) provides for shared understanding that lowers search/coordination cost and enhances absorptive capacity – identifying, assimilating and embedding EU guidance in local routines (Zahra & George, 2002). The omnichannel approach of the Center – official website, social media (Facebook, Instagram, You Tube), radio, and conference panels – aligns with digital-ecosystem principles in utilizing many formats to contact diverse audiences and reduce digital-divide frictions. Blending offline (radio, events) and online dissemination extends participation across all levels of capabilities, and regional focus in an explicit form (e.g., district-relevant projects and "good practices") brings local relevance to otherwise generic EU information, enhancing absorptive capacity and circulation of place-specific exemplars within the thin, peripheral RIS of Bulgaria.

> *We have an established network that follows our updates, but we also diversify the audience at events – meeting with businesses, NGOs, and citizens. On the ground, we navigate people through ISUN*[1]*, because not everyone can work with administrative*

[1] ISUN („ИСУН" in Bulgarian) is the Information System for Management and Monitoring of EU Funds in Bulgaria. It is designed to collect and process data on operational programmes implemented in Bulgaria in the period 2014–2020. It can be accessed at https://eumis2020.government.bg/bg/s/Default/Index.

language. Together we review documents, show how to register and use the platform, and demonstrate new functionalities that make online applications much simpler than before. (Interview, Center representative, female, May, 2024)

Using a central platform – ISUN – for e-applications, plus omnichannel outreach (portal, social media, radio, events), lowers search and coordination costs, widens participation, and builds absorptive capacity in an organizationally thin region . By convening businesses, NGOs, citizens, and public bodies, the Center brokers collective goods – shared competence, access to finance, smoother administrative pathways – supporting incremental upgrading rather than one-off projects (Storper & Salais, 1997). The shift from "ten paper binders" to online forms is a concrete process-learning gain that improves cadence and frees scarce slack for further learning. In short, the combination of centralised digital infrastructure + local translation function and multiactor coordination of the district information center exemplies the core learning mechanism of peripheral RIS.

Manufacturing plant X in Southeast Bulgaria

The company we are analysing is owned by European foreign investores and is located in a district center in the South-East Bulgarian region. Its production is basic for the field of hydraulics. The plant employs about 800 people and has been fully ERP-digitized (SAP) for about 10 years across planning, production, quality, and inventory. A dedicated training center (team of three trainers) onboards all new hires and partners with local schools for dual education. Recent ERP upgrades were tested by about 60 key users before go-live. Firm X operates in a peripheral Regional Innovation System (RIS), where thin support infrastructures and longer access times to specialised services make in-house learning and externally oriented pipelines decisive. This case shows how a manufacturing subsidiary can internalise learning functions through (i) end-to-end digitisation that creates high-fidelity traces for improvement, (ii) participatory change management that converts upgrades into organization-wide learning episodes, and (iii) a training architecture that socialises novices into situated practitioners. The analysis also surfaces the binding constraint in the periphery: conversion of external talent pipelines remains low despite deep firm engagement, limiting the rate at which digital capabilities diffuse into shop-floor practice. Over the past decade, Firm X has progressively routed "almost everything" through a single ERP (SAP): material requests, production orders, year and short-term planning, time & attendance, quality events, and inventory movements. On the shop floor, QR/barcodes travel with each production order; warehouse picks, operation completions, and quality checks are scanned and posted, closing orders digitally and updating WIP in real time. Thus, end-to-end digitisation that streamlines

work in one system produces data-rich routines that constitute the substrate of organisational learning through rendering process observable, comparable, and continually improvable.Managers thus stated shortly regarding "shop-floor Digitisation" (Baethge-Kinsky, 2020; Cagliano et al., 2019):

> *Production orders carry QR codes through the full routing. Warehouse picks, quality events, and operation completions are scanned and posted into SAP, closing the order digitally and updating inventory and WIP in real time.* (Interview, Training Expert, male, May, 2023)

Designing end-to-end, ERP/MES-facilitated workflow generates four learning-critical effects. First, traceability: digitally documented routings and quality occurrences develop entire genealogies that facilitate fast localization of defects and non-conformances, minimizing diagnostic loops (Baethge-Kinsky, 2020; Eichenseer et al., 2024). Second, timeliness: up-to-date states for WIP and inventory minimize tacit, memory-dependent coordination and maximize shop-floor responsiveness (Cagliano et al., 2019). Third, comparability: normalized event logs (e.g., scans of picks, operation completions, checks) permit before/after comparisons of cycle time and first-pass yield, facilitating evidence-based improvement, not anecdotal correction (Eichenseer et al., 2024; Cagliano et al., 2019). Fourth, transportability: clean data structures and common identifiers permit effortless interchanging with headquarters, suppliers, and auditors – essential for plants whose upgradation relies on extra-regional pipelines and networked monitoring (Coe & Yeung, 2015; Baethge-Kinsky, 2020). Together, these effects transform daily execution into data-rich routines that are observable, comparable, and improvable ad infinitum – i.e., a socio-technical foundation for organizational learning in peripheral locations. Learning-organizationally, ERP-centric workflow serves the "practice ground" wherein systems thinking (end-to-end disclosure) and team learning (common artefacts, shared measures) become effective. Instead of viewing ERP migrations as one-time technical cutovers, Firm X rolled its latest SAP upgrade like a collaborative learning exercise. Viewing the ERP migration as an organizational learning episode, the plant took two mutually supporting design decisions. First, parallel-run risk management maintained both legacy and new versions active for ~3–4 months, facilitating transaction-by-transaction comparisons and stepwise data verification – a traditional conversion strategy that mitigates implementation risks by maintaining redundancy while users tweak discrepancies (Laudon & Laudon, 2018; Lyytinen & Newman, 2008). Second, distributed testing and feedback involved some 60 critical users, who comprise about 7–8% of the 800-strong workforce, in executing transactions in both environments and submitting systematic defect reports to the vendor. Such user involvement is associated with

improved system quality and fit, not only because of feelings of ownership but also because domain experts recognize situational breakdowns that designers might miss (Barki & Hartwick, 1994; Markus & Mao, 2004). Together, these decisions turn a potentially risky cutover on its head and turn it into sensing, seizing, and transforming cycle: the parallel run identifies differences; user testing and prioritizes solutions; and stabilized routines transform local practices – consistent with observations on improvisational change and learning involving digital artifacts (Orlikowski, 1996; Leonardi, 2011).

> *In the last upgrade, both ERP versions ran in parallel for three to four months. About sixty power users – roughly 7–8% of the 800-person workforce – tested transactions, compared outputs across systems, and sent structured feedback to the vendor.* (Interview, Training Expert, male, May, 2023).

This participatory approach minimized go-live risk and fast-tracked defect resolution. Mechanistically, the upgrade invoked the dynamic capabilities cycle: sensing (disparity detection through dual entry), seizing (fast defect triage and feedback to vendors), and transforming (stabilizing the new workflow). It also invoked absorptive capacity at scale: users internalized new process logics through doing, transformed local workarounds to standardized solutions, and exploited the upgraded system without productivity troughs in typical productivity curves. Of key importance, ownership transferred from IT experts to line users, integrating the change in routine rather than in documentation only. Company X pairs digital instrumentation with a dedicated training and learning architecture. All employees pass through an in-house training center built 4 years ago. New hires undergo a two-day base course (quality, ERP fundamentals, reading work orders) and, if necessary, a two-week practical in mechatronics fundamentals, measurement tools, and simulated production, on-the-job coaching to autonomy:

> *Every new hire passes a two-day base program (quality, ERP basics, work orders), and entrants without prior experience complete a two-week practical track in the in-house training center, followed by coached on-the-job learning until autonomy.* (Interview, Training Expert, male, May, 2023)

This laddered progression operationalises Senge's personal mastery and team learning at the micro-level: novices acquire shared mental models (how to read orders, interpret quality events), then enact them with real materials and tools under coaching. The company extends the pipeline upstream via dual-education partnerships with local schools, stipends for trainees, and a scholarship-with-return programme for university students – an explicit attempt to co-produce talent with regional institutions in a thin peripheral ecosystem. Despite strong

internal design, external pipeline conversion is weak. The firm reports that only about 4% of dual-track graduates start immediately in technical roles; roughly 45% pursue non-technical paths. Some continue to university and later return, but the near-term inflow to the shop floor is thin:

> *Despite deep cooperation with local schools and stipends, direct conversion from dual graduates to immediate employment remains about 4%. Around 45% choose non-technical paths, and a smaller share pursues technical university – some returning later. The constraint is systemic, not firm-internal.* (Interview, Training Expert, male, May, 2023)

Interpretively, this is the peripheral problem in microcosm. The firm's internal learning organization is robust – digital workflows, participatory upgrades, embedded training – but the regional knowledge system struggles to supply ready-to-embed talent. Preferences fragment (non-technical choices), and local training capacity and counselling are misaligned with the plant's demand structure. As a result, the plant must spend more time per novice to reach autonomy and cannot scale learning at the same pace as its digital investments. The case study of the company X demonstrates why own (firm-owned) training organizations are not an option in the periphery, rather they are the institutional substitute for the missing density in surrounding RIS. Comprehensive digitization provides traceability and measurable metrics that peripheral companies cannot rely on external intermediaries to provide. This reduces search/coordination costs and enables continuous, data-driven improvement. Participation in modernization by the large number of employees transforms potentially destabilizing IT changes into shared learning events, spreading expert knowledge beyond the IT department and preserving capacity in-house – which is crucial when external support is scarce or slow. Company owned training programmes create local skills, counteract weak professional ecosystems, and reduce pressure to migrate and move out of the production. Yet the case also shows that firm-level excellence cannot fully offset system-level bottlenecks. Without stronger extra-organizational pipelines (schools, training centers, guidance services) and credible local intermediaries that channel prospective technicians into technical roles, the conversion rate will cap the plant's learning velocity. In peripheral contexts, learning organizations are the mechanism that translates extra-regional knowledge into local capability. Firm X's digital backbone, participatory upgrade practice, and training architecture exemplify how dynamic capabilities, absorptive capacity, and learning-organization disciplines become pragmatic designs. The limiting factor is not technology but constant change and conversion. Addressing them it requires coupling the firm's internal strengths to regional wider co-production of skills. In short, peripheries need learning organizations because

these organizations manufacture the very conditions – data, routines, and competences – under which upgrading can proceed despite thin external infrastructures. Firm X exhibits strong exploitation – stable, data-rich routines and high conformance – while exploration is structurally constrained by the regional talent pipeline (school capacity, guidance, wage differentials, out-migration). This creates an ambidexterity gap: the firm can refine existing processes faster than it can import/develop new human capital to absorb and extend them. Internally, the firm compensates via training and participatory upgrades (raising absorptive capacity), but the systemic bottleneck beyond the boundary caps exploration speed and increases vulnerability to shocks (retirements, new product introductions). In peripheral RIS terms, the plant is a learning organization operating without a commensurate ecosystem of co-learners. The Bulgarian manufacturing plant illustrates near-total process digitisation via SAP, upgrades run in parallel with about 60 key users, and an in-house training center plus dual-education partnerships, but the bottleneck is external: only a small share of dual-track graduates enter immediately into technical roles. The case study clearly shows that it is necessary to combine internal training with the evolution of the regional ecosystem as such.

What the comparison of both cases shows

Both cases reveal different spines, same logic: the firm's ERP and the center's info-hub/portal operate as learning infrastructures that lower search and coordination costs, standardise artefacts (production orders/SOPs vs. calls/guides), and render feedback loops visible (defects/CAPA vs. user queries/referrals). In a peripheral RIS, this shared logic is conditioned by a peripheral asymmetry: internal excellence (data-rich routines; targeted outreach) still hinges on ecosystem co-evolution – schools, municipalities, and intermediaries must supply skills, legitimacy, and complementary capacity for upgrades to stick. Finally, the cases feature brokers of different complexity: the center brokers institutional complexity (EU rules, programmes), while the firm brokers technical complexity (specifications, process changes). They both rely on translators and champions to convert outside knowledge into local routines. The evidence supports all three hypotheses listed above. Hypothesis 1 (H1) is confirmed because in a thin South-East Bulgaria RIS, both the ERP-digitized plant and the regional EU information center raise system-level absorptive capacity by speeding identification, translation, and embedding of external knowledge. H2 is confirmed too. End-to-end digital workflows such as shop-floor QR/event logs, ISUN/eufunds.bg plus omnichannel outreach lower search and coordination costs and stabilize learning during changeovers. H3 also holds. Brokerage funcion produces regional collective goods such as collective training, templates, shared

platforms. In both studied case we observe widening participation beyond firm boundaries and center's district-wide events, radio/portal guidance, firm's in-house academy and dual-education ties, though a noted bottleneck is the limited conversion of external talent opportunities which caps spillover depth.

Conclusion: Lessons for Bulgaria's peripheries

The plant has robust internal learning functions – codified workflow, data-driven traceability, and participatory upgrade – while experiencing an external learning bottle neck in the regional talent pipeline. This imbalance, characteristic of peripheries, repositions the firm as an embedded learning institution in a thin ecosystem. The moral is not "digitize harder", but "pair internal learning with co-evolution of the ecosystem" – through key-user guilds, co-designed curriculum, and bonded schooling that converts schooling into situated competence. Information centers in the district may serve as boundary intermediaries that translate external policy/knowledge into usable routines in firms and close the exploration gap. Concretely, they may e.g. co-create micro-credential stacks with firms and VET schools (ERP fundamentals, quality events, ISUN grant literacy) and award them in the form of portable badges to expand the talent funnel or host grant sprints that screen projects in ISUN and match firms with qualified measures (skills vouchers, equipment for labs for dual education). As already underline in RIS terms, the center mediates institutional complexity while the firm mediates technological complexity; both raise system-level absorptive capacity and make incremental upgrading feasible in a thin ecosystem (Asheim & Isaksen, 2002; Howells, 2006; Klerkx & Leeuwis, 2009; Zahra & George, 2002). Periphery learning organizations do not revolve around scarcity, but designing which elements constitute the judicious coupling of digital traceability, participatory change, and institutional partnerships. Bulgaria's peripheral plant illustrates that when firms organize like learning institutions, they absorb shock, diffuse competence, and make remoteness from the core a competitive advantage – on condition that the near ecosystem co-evolves with them. Both organizations – the company and the information center – are learning organizations in the sociological sense. Knowledge is not just used but produced, codified, and distributed through habitual routines, artifacts, and linkages. The organization installs a learning-oriented system through embedding feedback mechanisms in ERP routines, essentially bridging exploitation with constrained exploration (Senge, 1990; March, 1991). The center creates institutional learning through translating EU policies into locallly understandable guides and templates, thus regularizing expectations in pluralistic stakeholders – in exem-

plification of organizational fields both shaping and shaped by intermediaries (Scott, 2001; Howells, 2006). Collective inquiry in both case scenarios is established through communities of practice – consisting of key users, trainers, and boundary spanners who broker knowledge circulation in various sites and sectors (Lave & Wenger, 1991; Klerkx & Leeuwis, 2009). Embedded in a sparsely populated peripheral Regional Innovation System (RIS), these practices make up for the lack of "institutional thickness", translating fragmented information in shared routines and regional collective assets (Amin & Thrift, 1994; Asheim & Isaksen, 2002). The end result is absorptive capacity in the system that allows for incremental innovation in spite of restraints (Zahra & George, 2002; Morgan, 1997). The major conclusion from the case study analysis is that in peripheral EU regions, learning institutions are built up, not revealed. To such regions, integrating digital workflow and boundary intermediation and co-operative skill building turns remoteness from the core into a feasible opportunity for regional advancement.

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Chapter 5
The evolving landscape of AI literacy and algorithmic literacy: an international review and a Bulgarian perspective

Stefan Markov

Abstract: *The pervasive integration of artificial intelligence (AI) and algorithmic systems into daily life has created an urgent need for new competencies commonly referred to as AI literacy and algorithmic literacy. Deficits in these areas are increasingly conceptualized as a "fourth-level" digital divide that extends beyond access and basic skills to encompass critical and ethical engagement with automated technologies. This article offers a concise, systematic overview of the evolving international research landscape on AI and algorithmic literacy. It first defines the core concepts and traces their development from earlier literacies such as digital and media literacy. It then synthesizes leading research questions, methodologies, and key findings from major international studies published over the past five years. The review identifies an emerging consensus around essential components of AI literacy – conceptual knowledge, critical evaluation, and ethical reasoning – while also revealing persistent gaps. International data indicate that AI literacy levels among higher education students remain modest, and teacher-education programs are lagging significantly in preparing future educators for an AI-driven world. Against this backdrop, the paper presents an upcoming empirical study aimed at assessing AI and algorithmic literacy among pedagogy students in Bulgaria. The study is designed to provide the first comprehensive national data for this target group using a mixed-methods design and to delineate targeted pedagogical interventions and curricular pathways. In doing so, the Bulgarian case contributes to the global debate on preparing the next generation to navigate the complex realities of the algorithmic age.*

Keywords: AI literacy, algorithmic literacy, digital divide, teacher-education, higher education

Introduction

The rapid development and integration of digital technologies have fundamentally transformed the educational landscape, with artificial intelligence (AI) and algorithmic systems emerging as pervasive agents of change. Their influence extends well beyond technical processes, reaching into the pedagogical core of teacher-education and reshaping the competencies required of future professionals. In this context, the classical notion of "literacy", long confined to reading and writing, has undergone a prolonged evolution, expanding to include digital and media literacy and, in recent years, AI literacy and algorithmic literacy.

This evolution has produced a new dimension of socio-technical inequality. The traditional digital divide – classically framed as access to ICT (first level), skills and usage (second level), and tangible offline outcomes of online participation (third level) – is augmented by a proposed "fourth level", rooted in deficits in AI literacy and algorithmic literacy. It separates those who can critically and ethically understand, evaluate, navigate, and practically utilize an algorithmically mediated world from those who cannot.

The urgency of the problem is particularly visible in pre-service teacher-education. Future teachers will not only use AI as a pedagogical tool, but will also carry responsibility for cultivating AI and algorithmic literacy among their pupils across early childhood and school settings. Yet contemporary international studies show that such literacies are insufficiently integrated into teacher preparation, leaving many pre-service teachers underprepared for the realities of today's classroom. This article addresses that gap by reviewing international research and outlining a framework for an empirical study focusing on pedagogy students in Bulgaria.

Previous Research

AI literacy is broadly defined as a set of competencies enabling individuals to critically evaluate AI technologies, communicate and collaborate effectively with them, and use them as tools in diverse contexts. Algorithmic literacy is closely related, but emphasizes the ability to recognize, understand, and critically reflect on the algorithms that curate information and automate decisions online. Both concepts extend the foundations of digital and media literacy in the rapidly evolving age of intelligent automation.

Within an ever-expanding body of research, several conceptual frameworks have been proposed to delineate the components of AI literacy. The influential model by Long and Magerko (2020) organizes 17 competencies around five key questions: "What is AI?", "What can AI do?", "How does AI work?", "How should AI be used?", and "How do people perceive AI?" (Long & Magerko, 2020). Another model by Kong and Zhang (2021) conceptualizes AI literacy across three dimensions: cognitive, affective, and sociocultural (Kong & Zhang, 2021). For K–12 education, the "Five Big Ideas" framework (Touretzky et al., 2019) outlines foundational concepts – Perception, Representation & Reasoning, Learning, Natural Interaction, Societal Impact (Touretzky, Gardner-McCune, Martin, & Seehorn, 2019). A more recent proposal is the ABCE (Affective, Behavioral, Cognitive, Ethical) framework, validated through the AI Literacy Questionnaire (AILQ) (Ng et al., 2024).

A common thread across these frameworks is the emphasis on critical evaluation and ethical reasoning as fundamental components. Systematic reviews have found that a large majority of publications include these aspects, indicating a broad consensus that being "AI-literate" means not only possessing technical knowledge but also maintaining a critical awareness of AI's limitations, biases, and social consequences (Ng, Leung, & Qiao, 2021; Lintner, 2024; Almatrafi, Johri & Lee, 2024). This critical dimension is likewise central to the concept of a "fourth-level" digital divide.

Research Questions in Prior Studies

Between 2019 and 2024, international studies on AI and algorithmic literacy have clustered around recurring questions: conceptualization and constructs (e.g., Almatrafi et al., 2024); assessment of current levels, particularly among students (e.g., Hornberger et al., 2025); correlates and predictors of higher literacy (e.g., Bewersdorff et al., 2025); measurement and instrumentation, including psychometric properties (e.g., Lintner, 2024); and integration into education – especially teacher-education – alongside the identification of primary gaps (e.g., Sperling et al., 2024; Laupichler et al., 2022).

Methodologies in Prior Studies

As in many nascent research domains, a wide range of techniques has been deployed. The most prevalent approach is the quantitative survey, using self-report questionnaires and knowledge-based tests to measure AI literacy in large samples. A systematic review of AI literacy scales identified 16 distinct instruments, most relying on self-assessment of skills, attitudes, and ethical awareness. Prominent tools

include the AI Literacy Questionnaire (AILQ), which measures affective, behavioral, cognitive, and ethical dimensions (Ng et al., 2024), as well as standardized knowledge tests with right/wrong items, such as those used by Hornberger et al. (2025) in a cross-national student sample. For algorithmic literacy, task-based instruments have been developed, notably the Algorithm Literacy Scale (Dogruel, Masur & Joeckel, 2022). Systematic reviews and scoping reviews (Almatrafi et al., 2024; Pinski & Benlian, 2024; Laupichler et al., 2022) have mapped conceptual frameworks, educational interventions, and research gaps. Mixed-methods designs, though less common, complement quantitative findings with interviews or focus groups to provide deeper context on participants' understandings and experiences.

Results

International findings broadly converge on a consistent – if concerning – picture of AI literacy. First, levels among the general population and university students are moderate to low: a large study across Germany, the UK, and the US found that students, on average, answered only about half of knowledge items correctly, indicating a substantial knowledge gap even in technologically advanced settings. Second, the rapid spread of generative tools such as ChatGPT has not automatically translated into deeper AI literacy. Despite widespread use, underlying conceptual understanding remains limited, challenging the "digital native" assumption that exposure alone engenders literacy. Third, there is clear consensus on core constructs of AI literacy: critical evaluation and ethical reflection are frequently identified as the most vital components – often rated more highly than the capacity for creation with AI.

Finally – and most consequential for education – studies consistently show that AI literacy is largely absent from teacher preparation curricula. Scoping reviews (e.g., Sperling et al., 2024) and reports from organizations such as the Center on Reinventing Public Education (CRPE) conclude that many programs do not adequately prepare future teachers to teach with and about AI, calling into question their current relevance (Weiner, Lake, & Rosner, 2024).

Forthcoming Study: A Bulgarian Perspective

Building on this international context, an empirical study is planned to deliver the first comprehensive assessment of AI literacy and algorithmic literacy among pre-service teachers (preschool and primary education, as well as media pedagogy) at Sofia University "St. Kliment Ohridski". The aim is to diagnose current

levels, identify strengths and deficits across the ABCE dimensions, and outline priorities for pedagogical interventions and curricular development. It represents only the second study of its kind in Bulgaria and builds upon the pioneering research on algorithmic literacy among pedagogy students conducted at the same university in 2023. The author was a member of the research team that carried out this earlier study, the results of which were summarized in Sofronieva et al. (2024).

The study employs a mixed-methods design, combining a quantitative survey with qualitative focus groups. The quantitative instrument integrates several validated scales adapted and refined for the Bulgarian context: the AI Literacy Questionnaire (AILQ) – a 28-item measure aligned with the ABCE framework; the Algorithm Literacy Scale (20 items for knowledge); and a generative-AI module capturing familiarity, usage, and attitudes toward tools such as ChatGPT.

Quantitative results will provide a baseline for AI and algorithmic literacy levels and for correlations among the constructs, while the qualitative component will surface typical understandings, misconceptions, and attitudes regarding the integration of AI into future classroom practice. The study has the potential to inform reform of teacher-education curricula and to contribute a Bulgarian perspective to global efforts to bridge the "fourth-level" digital divide.

Preliminary pilot data (n = 26; quantitative only thus far) indicate a notable attitude–competence gap characteristic of early diffusion stages in education. Self-reported openness to AI and endorsement of ethical principles appear higher than measured knowledge of algorithms and operational readiness for pedagogical use. The current profile is thus "motivation-rich, skill-light": participants are motivated and risk-aware, yet lack stable mental models of system functioning and routine classroom practices. Methodologically, we must acknowledge the limitations of a small, likely convenience sample, potential self-selection bias, and social desirability (especially in the ethics module). For the Bulgarian adaptation of scales, reliability and measurement invariance (e.g., across ABCE subscales) should be examined to avoid artificial ceiling/floor effects. Theoretically, the results support the claim that overcoming the "fourth level" of the digital divide requires purposeful development of critical and algorithmic competencies rather than generic digital skills. Practically, the data justify targeted modules on "how AI works" and "pedagogical scenarios with AI," supported by exercises in claim-verification, source traceability, and bias analysis to turn attitudes into actionable competence.

Conclusion

The shift from functional literacies to AI literacy and algorithmic literacy marks a profound change in the competencies required for full participation

in twenty-first-century society. International research underscores the indispensability of these literacies while revealing a troubling gap between necessity and reality: moderate knowledge levels, a confidence–competence mismatch, and critical shortcomings in teacher preparation. The proposed "fourth-level" digital divide offers an analytical lens on this new inequality, emphasizing that genuine inclusion requires not only access and basic skills but also critical and ethical capacity to engage with intelligent systems that structure information environments and opportunities. Local, context-sensitive research with flexible designs is needed. The forthcoming Bulgarian study is a key step: by diagnosing specific levels and needs, it can underpin evidence-based strategies and timely curricular reforms. Strengthening AI and algorithmic literacy among future teachers remains the most reliable pathway to cultivating these literacies among the next generation.

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Chapter 6
Potential for the development of digital democracy in Bulgaria, Czechia and Hungary: the link between internet use and political participation

Martin Konstantinov

Abstract: *The rise of the Internet has been seen as a catalyst for enhancing democratic processes, with innovations like e-voting, e-participation, and e-governance offering potential solutions to democratic shortcomings at both national and European levels. Many scholars argue that Information and Communication Technologies (ICTs) have ushered in an era of citizen-driven governance, presenting opportunities for more inclusive political participation and broader access to public services. However, citizens without digital skills face a dual exclusion – both in terms of technology and civic engagement.*

This study investigates the relationship between Internet use and political participation, focusing on Bulgaria, a country with low Internet usage and digital skills within the EU. The research also compares Bulgaria to Hungary and Czechia, two other former Socialist states that are now EU members. Using secondary data from the European Social Survey (ESS 10, 2020) on Internet use, political interest, voting behavior, and attitudes toward political systems, the study reveals a correlation between frequent Internet use and higher levels of political interest and activity. The paper emphasizes the need to enhance digital skills in Bulgaria and discusses the potential for ICTs to improve political engagement, particularly in new democracies,

where such technologies could help citizens better access and interact with political and civic information.
Keywords: Internet use, political participation, digital democracy, e-governance, political engagement

Introduction

Information and communication technologies (ICTs) provide many opportunities holding the potential to promote political participation and civic engagement. However, well-founded concerns remain over unequal access to ICTs in many societies, as political resources available on the Internet empower people with the skills and motivation to take advantage of these means, while leaving the disengaged behind. Thus, the digitally excluded are not only deprived of the benefits of the Information Society, but are also unable to make use of the modern digital tools to exercise their civic rights.

Past research has highlighted the plethora of ways in which the Internet and digital technologies may positively impact political participation, such as online content creation, digital freedom, and access to the mobile Internet (Nemer and Tsikerdekis 2017). The development of these factors could promote the inclusion of marginalized groups in the political life of their countries, but could also help build a society where everyone's voice has a chance to be heard.

ICTs, such as the Web 2.0, social media, and smartphones are already rapidly changing the ways in which activists collaborate and engage in political action, with researchers analyzing how digital technologies have affected the social movement landscape. Thus, ICTs provide many opportunities and capabilities to augment users' ability to engage with and retain political and civic information, potentially facilitating increased political participation. Such technologies yield fundamental affordances when compared to other forms of mass media in that they represent both a two-way communication network and a medium for information, which stimulates political engagement (Mossberger, Tolbert & McNeal, 2007).

At the same time, political participation is relevant for any political system, but for modern democracy it is an indispensable feature. As Verba and Nie (1972) put it, "[w]here few take part in decisions there is little democracy; the more participation there is in decisions, the more democracy there is". Hence, the scope and extent of political participation are decisive criteria for assessing the quality of democracy. By actively monitoring their government's work, interested and critical citizens can foster accountability and contribute to the

building of trust in a country's political system. People who believe in their own ability to influence government are more likely to follow political news, vote in elections and, generally, participate in politics. Thus, the levels of political interest and political participation in a society are vital for the proper functioning of its democracy.

The present study aims to research the association between Internet use and political participation. In my analysis, I focus on Bulgaria, comparing it with two other Central and East European countries (Czechia and Hungary), fellow EU member states and former Socialist countries of comparable population and area size. Using ESS 10 (2020) data on Internet use, political interest, voting, and attitudes to the political systems in the three countries, the study finds evidence of a correlation between the frequency of Internet use and political interest and activity. Such a correlation has potentially significant implications for new democracies such as the three studied countries, where the further rooting and development of democratic institutions could benefit to a significant extent from the availability and mass use of modern digital democracy tools.

Previous Research

A significant amount of research has examined whether the Internet promotes or hinders political participation and civic engagement. However, individual studies are producing inconsistent assessments, with varying study characteristics making the overall effect size difficult to determine. Boulianne (2009), for example, has attempted to integrate individual studies to examine the relationship between Internet use and political participation, but merely counted the number of coefficients that were positive, negative, or nonsignificant, without estimating the overall effect size.

A few meta-studies have integrated individual studies that have examined this relationship (Boulianne 2009, 2015; Skoric et al. 2016). These meta-studies produced a tentative conclusion that Internet and social media use were positively related to political participation and civic engagement. However, the overall strength of the relationship between Internet use and political participation, as well as what study characteristics influence inconsistent results across studies, remained yet unclear.

A quick review of empirical studies highlights the differences in the effect sizes of Internet use on distinctive forms of participation. For example, the effect of Internet use on online political participation has been found to be greater than the effects on offline political participation and civic participation (Gil de Zúñi-

ga, et al. 2012; Skoric, et al. 2016; Vitak, et al. 2011). This is explained by the fact that necessary resources such as time and money to participate in political activities are less important for online participation (Chadwick 2006). Skoric, et al. (2016) estimated a small-to-moderate positive relationship between social media use and civic engagement.

Although some research has been carried out, I am unaware of any past studies focusing explicitly on the link between Internet use and political participation in Bulgaria that have relevance to the problem we are investigating. In a study of electronic e-government services usage, Amarov and Netov (2022), find evidence of a lingering digital skill divide in Bulgaria concerning e-government adoption: highly educated people with high-level ICT skills are more likely to adopt e-government services, which points to complexities in the online delivery of such services that discourage lower-skill individuals. At the same time, many e-government services in Bulgaria require a personal electronic signature that could prove to be difficult to use for low-ICT skills citizens, such as the elderly, for example, who have been found to access electronic healthcare-related services less often than active-age citizens (Amarov, Netov, 2022). This is evidence of the persisting digital divide whereby the older generation is slower to adapt to the use of digital technologies, even in healthcare services, despite elderly people being much more active users of the healthcare system than younger citizens.

The problem of lacking or inadequate digital skills in Bulgaria is highlighted by the Digital Economy and Society Index study (DESI). Bulgaria and Romania have consistently been occupying the last places in the EU as to the possession of at least basic digital skills.

Thus, for 2023, only about 30% of Bulgarians had at least basic digital skills, compared with 60% for Czechia and 50% for Hungary, countries which have already surpassed or are close to surpassing the EU average of 54%. Such results provide a worrying perspective, as it is almost unthinkable for a person who lacks at least basic digital skills, or has never used the Internet, to be able to make use of the many existing e-government and digital democracy opportunities. This is illustrated by a DESI 2023 scatterplot that demonstrates the low adoption and use of e-government services in Bulgaria and Romania against the background of the limited use of the Internet in those two EU countries.

Again, the comparison with Czechia and Hungary, which have already achieved and even surpassed the EU average for both studied criteria, is not in Bulgaria's favor. Apparently, urgent measures need to be implemented at central, regional and local levels to provide both digital skills and e-government use education for those at risk of digital exclusion in Bulgaria.

Theoretical Framework

Participatory democracy

Participatory democracy (PD) is defined as all the measures, policies, and approaches that aim to involve citizens in the political decision-making process (Blondiaux (2021). Bherer (2019) argues that PD practices were imagined as empowering citizens and allowing them to influence the administrative decisions of government (local or national) bureaucracies. Thus, participatory democracy seems to be a guarantee for a more inclusive society and a solution for the loss of trust between citizens and professional politicians. The practices associated with PD are socially valued; they can be facilitated or even driven to some extent by modern digital technologies, which provide the opportunity of promoting every citizen's expression and access to information by linking technological progress with social progress.

Using as a starting point the definition of political participation as any voluntary, nonprofessional activity concerning government, politics or the state, we can proceed with a basic typology of political participation. Previous research has identified three main types: offline political participation, online political participation, and civic participation. **O**ffline political participation has traditionally been defined as citizens' activities aimed at influencing government action and political outcomes (Brady, Verba, and Schlozman, 1995). Examples of offline political participation include voting, working for a political campaign, donating money to candidates, contacting government officials, signing a petition, and joining a demonstration (Valenzuela et al., 2009). Online political participation includes political activities such as emailing politicians and signing e-petitions (Oser, Hooghe & Marien, 2013). The third type of participation, civic participation, entails individual or collective behaviors aimed at influencing local communities (Adler & Goggin, 2005), and is limited to non-electoral activities such as working for nongovernment organizations and community projects.

At the individual level, the motivational bases of PD are internal political efficacy, understood as the belief that citizens can understand and influence politics, and political interest. These two are often considered the minimal attitudinal component of political engagement (Almond and Verba, 1963). Continued political interest over time develops into political knowledge, and the latter in turn underpins political participation. Research demonstrates that politically knowledgeable citizens are more likely to participate in politics (Delli Carpini and Keeter 1996), to be better informed about electoral choices, and to understand better the policy choices offered to them (Singh and Roy 2014).

Digital democracy

Digital democracy, or e-democracy, goes beyond e-government and enables citizens to be actively involved and engaged in the decision-making process (Mishra, 2019). Digital democracy encompasses the electronic practices that complement the traditional democratic mode of interaction among parliaments, government executives and local authorities (Lindner and Aichholzer, 2020). Different terms and concepts with overlapping meanings, such as digital democracy, e-democracy or cyber democracy are used in the literature for describing these new developments (Musiał-Karg and Kapsa, 2019). In another definition, the term e-democracy covers a wide range of political activities from e-governance to e-voting and e-participation, which support the empowerment of citizens and direct democracy (Ronchi 2019). A simplified concept of e-democracy refers to the application of a wide range of computer technology to democracy (Ferdinand, 2003). Cyber democracy is also interpreted as governance in the context of knowledge democracy using new information technology (IT)-based infrastructures, with cyber-democracy speeding up the development of knowledge democracy, and IT supporting the formation of new types and new qualities of public space (Campbell and Carayannis 2018). Thus, e-democracy's goal is to empower citizens to engage in public deliberations by employing new technologies for policymaking, improving citizens' participation in democracy. E-voting, for example, is used by governments as a means to increase the participation of citizens in elections and enhance the democratic process. In theory, digital democracy is capable of revoking the distrust that develops between governments and citizens (Mishra, 2019) because governments which actively develop digital democracy environments, seeking public opinions through online deliberation and consultation, become more accountable and transparent, thus regaining their citizens' trust.

Internet use and political participation

The research literature has three main competing views – that Internet use: i) reduces, ii) increases, or iii) is unrelated to political participation. Proponents of the first view posit that Internet use reduces civic engagement and political participation (Vitak et al., 2011). This argument is rooted in the displacement hypothesis, which claims that the longer time people spend on the Internet, the less time they spend on social activities such as face-to-face communication and community involvement (Nie and Hillygus, 2002). The second competing view is that the Internet increases users' civic engagement, political participation, and political knowledge, encourages participation in political discussions, and enhances political efficacy and empathy, leading to individual and collective politi-

cal participation (Gil de Zúñiga et al., 2014). Empirical studies find evidence of the reinforcing effect of Internet use on the political engagement of politically active individuals (Xenos, Vromen & Loader, 2014).

The third view is that Internet use is not related to civic and political participation (Zhang & Chia, 2006). A meta-study demonstrated that almost half of previous studies found no significant association between Internet use and political participation (Boulianne, 2009). "Slacktivism" could be one possible explanation for this phenomenon. It refers to online activism characterized by demonstrating support for social causes, but shying away from greater involvement and as a result achieving no significant practical effects. Engagement via the Internet is preferred to traditional political participation for its much lower cost. Because of users' unwillingness for a greater involvement in the causes they support, online activism has no bearing on actual political activities, and its effects are limited to making users feel good and connected (Morozov, 2011). Such users would not devote significant effort to political activities aimed at enacting meaningful changes, such as joining in protests (Kristofferson, White & Peloza, 2014).

Method and Results

The study employs secondary analysis of data from 3 countries (Bulgaria, Czechia and Hungary) sampled in the tenth round of the European Social Survey (ESS 10, 2020). This round also contains the rotating module "Understandings and Evaluations of Democracy". ESS sampling is representative of all persons 15 years of age and older, and individuals are selected at each stage using strict random probability methods. The data are collected using a two-stage probability sampling procedure, with stratification at the first stage. The data for Bulgaria were collected between 28 June 2021 and 30 September 2021; for Czechia, between 07 July 2021 and 29 September 2021; and for Hungary, between 10 June 2021 and 16 October 2021. In all three countries the mode of collection was face-to-face interviews.

A selection of ESS 10 questions, pertaining to Internet use and different aspects of political participation were used. In order to determine the presence of an association between Internet use and the measures for political participation, and compare the results for both, cross tabulation was used. Only associations with approximate significance of 0.05 or below were analyzed.

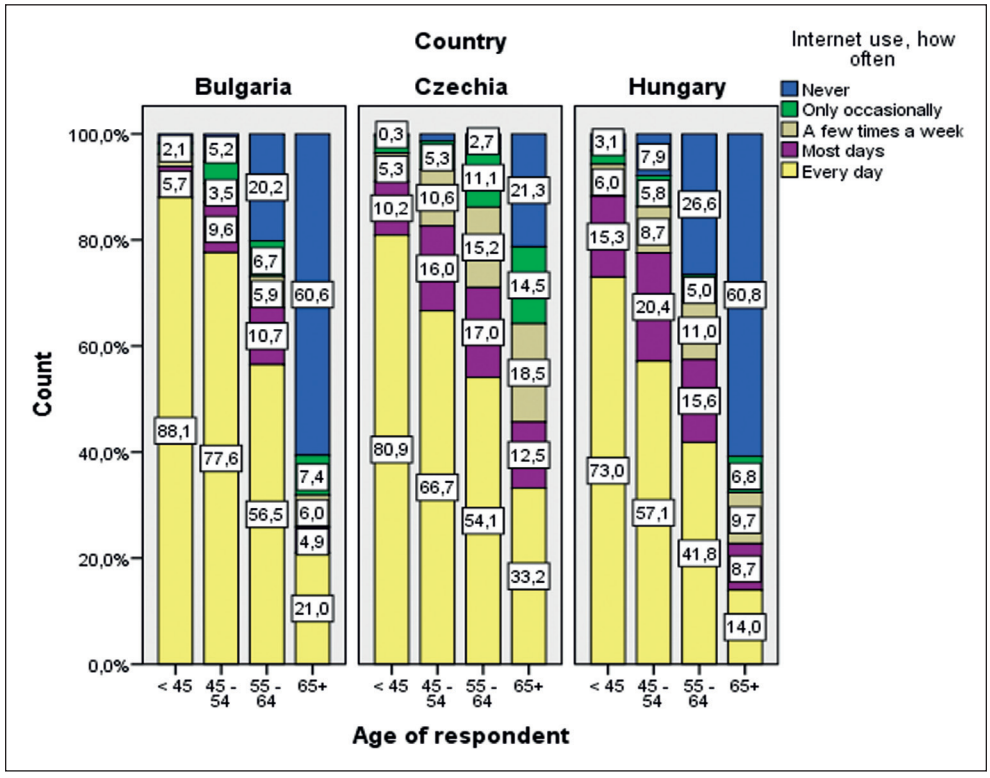
Question A2 How often do you use the Internet on these or any other devices, whether for work or personal use?

Internet use in the three studied countries follows a similar pattern – the younger the respondent, the more likely he or she is to be using the Internet every day, and vice

versa. 88% of Bulgarians aged under 45 use the Internet every day, compared to 81% in Czechia and 73% in Hungary (Figure 1). However, of all three countries, Bulgaria demonstrates the largest age gap in Internet use, with only 21% of 65+ people using it every day, and over 60% of people over 65 who never use it. With Bulgaria's aging population, this means that a significant portion of it has never used the Internet. While Hungary has the same percentage of 65+ people who never use the Internet, in Czechia this share is only 21%. On the whole, of the three studied countries Bulgaria has the highest share of people who use the Internet every day among all age groups with the exception of 65+. It is worth noting that the share of people who use the Internet most days or a few times a week in Bulgaria is significantly lower than in the other two countries, an "all or nothing" scenario that deserves further research.

It is also worth noting that there is a discrepancy between ESS and DESI data regarding Internet use in Bulgaria and Hungary, with the ESS demonstrating higher use in Hungary, while, according to DESI data Bulgaria has the higher share of Internet users in all age categories. Such discrepancy could be the result of the wording of the questions and/ or differences in methodologies employed by the two surveys (Figure 1).

Figure 1. Internet use in Bulgaria, Czechia and Hungary, ESS 10 (2020) data



Question B1 How interested would you say you are in politics?

Interest in politics is an obvious motivational basis for political participation. Small exceptions aside, where there is no political interest, there can be no resulting political actions, no e-government use, and no participation in digital democracy. For this reason I assume that interest in politics is one of the prerequisites for political participation. The comparison between respondents falling into the 55–64 age group in Bulgaria and Hungary is evidence of the higher interest in politics among Bulgarians of all Internet usage frequency groups. Of those who use the Web every day 53.1% declare they are very interested or quite interested in politics, as compared to 39.8 % of Hungarian 55–64-year olds (Table 1). In line with our hypothesis, results demonstrate that Internet use is positively correlated to higher interest in politics in both Hungary and Bulgaria.

Even people who never use the Internet in Bulgaria are more interested in politics than their counterparts in Hungary, with 32.3% of them in Bulgaria reporting high levels of interest in politics, compared to 25.4% among Hungarian non-users. If we assume that a politically interested population is a politically active one, such results should translate to higher levels of political participation among Bulgarians in the 55–64 age group, when compared to their Hungarian counterparts.

Table 1. Interest in politics * Internet use, cross tabulation

			Internet use, how often			Total
			Never	Seldom	Often	
Country = Bulgaria, Age of respondent = 55–64						
B1 How interested would you say you are in politics?	**Very interested**	**Count**	**6**	**6**	**30**	**42**
		% within Internet use, how often	**6,3%**	**10,0%**	**9,4%**	**8,8%**
	Quite interested	**Count**	**25**	**22**	**144**	**191**
		% Internet use	**26.0%**	**36.7%**	**45.0%**	**40.1%**
	Hardly interested	Count	30	21	99	150
		% Internet use	31.3%	35.0%	30.9%	31.5%
	Not at all interested	Count	35	11	47	93
		% Internet use	36.5%	18.3%	14.7%	19.5%
Total		Count	96	60	320	476
		% Internet use	100.0%	100.0%	100.0%	100.0%

Country = Hungary, Age of respondent = 55–64						
B1 How interested would you say you are in politics?	Very interested	Count	5	1	7	13
		% Internet use	6.7%	2.3%	4.3%	4.6%
	Quite interested	Count	14	10	55	79
		% Internet use	18.7%	22.7%	34.2%	28.2%
	Hardly interested	Count	28	23	74	125
		% Internet use	37.3%	52.3%	46.0%	44.6%
	Not at all interested	Count	28	10	25	63
		% Internet use	37.3%	22.7%	15.5%	22.5%
Total		Count	75	44	161	280
		% Internet use	100.0%	100.0%	100.0%	100.0%

Question B2 The political system allows people to have a say in what government does

Another important ESS question, B2, asks repondents to assess the degree to which the political system in their country allows people to influence government bureaucracies' administrative decisions. The question's aim is twofold: on one hand, to survey repondents' opinion on the quality of democracy in the political system; and on the other, to extract information on respondents' confidence and willingness to influence the government's policies. The comparison between Bulgaria and Czechia in the 55–64 age group is evidence of the polarization in Bulgarians' opinions: the vast majority (67.5%) who believe the political system does not allow or allows very little influence of citizens in politics, and the 13.1% minority who feel empowered enough as to state that the system allows people to have a say in their government's policies. For Czechia the numbers are 61% and 9.2%, respectively, with a much larger percentage of balanced answers (political system allows some influence) – 29.8%, compared to 19.4% in Bulgaria. Although levels of agreement with the statement are low among all Internet usage frequency groups in both countries, skepticism is highest among people who never use the Internet, and lowest among those who do so every day. Apparently, for both Bulgaria and Czechia, regular Internet users are more likely to express confidence in their own political efficacy within their country's political system. Further research is needed to determine whether such confidence is grounded in fact, or if the Internet, by offering a free venue for the expression of political opinion, skews users' judgement in the direction of exaggerating their own ability to influence government.

Table 2. The political system allows people to have a say in what government does * Internet use, cross tabulation

			Internet use, how often			Total
			Never	Seldom	Often	
Country = Bulgaria, Age of respondent = 55–64						
The political system allows people to have a say in what government does.	Not at all	Count	52	18	119	189
		% Internet use	57.8%	30.5%	38.5%	41.3%
	Very little	Count	21	17	82	120
		% Internet use	23.3%	28.8%	26.5%	26.2%
	Some	**Count**	**10**	**18**	**61**	**89**
		% Internet use	**11.1%**	**30.5%**	**19.7%**	**19.4%**
	A lot	**Count**	**7**	**4**	**35**	**46**
		% Internet use	**7.8%**	**6.8%**	**11.3%**	**10.0%**
	A great deal	**Count**	**0**	**2**	**12**	**14**
		% Internet use	**0.0%**	**3.4%**	**3.9%**	**3.1%**
Total		Count	90	59	309	458
		% Internet use	100.0%	100.0%	100.0%	100.0%
Country = Czechia, Age of respondent = 55–64						
The political system allows people to have a say in what government does.	Not at all	Count	9	36	78	123
		% Internet use	75.0%	31.0%	25.6%	28.4%
	Very little	Count	1	40	100	141
		% Internet use	8.3%	34.5%	32.8%	32.6%
	Some	**Count**	**2**	**34**	**93**	**129**
		% Internet use	**16.7%**	**29.3%**	**30.5%**	**29.8%**
	A lot	**Count**	**0**	**4**	**28**	**32**
		% Internet use	**0.0%**	**3.4%**	**9.2%**	**7.4%**
	A great deal	**Count**	**0**	**2**	**6**	**8**
		% Internet use	**0.0%**	**1.7%**	**2.0%**	**1.8%**
Total		Count	12	116	305	433
		% Internet use	100.0%	100.0%	100.0%	100.0%

Question B3 Did you vote in the last national election?

As one of the most important types of political participation, voting is often viewed as both a right and an obligation of citizens. Many countries, Bulgaria included, have adopted legislation making voting compulsory for all citizens. Yet, as there are no sanctions for non-voting, electoral activity is low, and political apathy is widespread in the country. The comparison between Bulgaria and

Hungary in the 55–64 age group evidences that in both countries, the more people use the Internet, the more likely they are to vote (Table 3).

Table 3. Voting * Internet use, cross tabulation

			Internet use, how often			Total
			Never	Seldom	Often	
Country = Bulgaria, Age of respondent = 55–64						
Did you vote in the last Bulgarian national election?	Yes	Count	57	50	242	349
		% Internet use	59.4%	83.3%	75.6%	73.3%
	No	Count	39	10	77	126
		% Internet use	40.6%	16.7%	24.1%	26.5%
Total		Count	96	60	320	476
		% Internet use	100.0%	100.0%	100.0%	100.0%
Country = Hungary, Age of respondent = 55–64						
Did you vote in the last Hungarian national election?	Yes	Count	48	33	142	223
		% Internet use	64.0%	73.3%	87.7%	79.1%
	No	Count	25	11	19	55
		% Internet use	33.3%	24.4%	11.7%	19.5%
Total		Count	75	45	162	282
		% Internet use	100.0%	100.0%	100.0%	100.0%

In an interesting exception from this pattern, in Bulgaria people who use the Internet seldom (83.3%) are slightly more likely to have voted in the last election than those who use it often (75.6%). This finding challenges to an extent the notion that Internet use is positively correlated to voting and warrants further study of the peculiarities of Bulgaria's political system and the public's attitude to it.

Results demonstrate that electoral activity is higher in Hungary than in Bulgaria. However, this difference could be even greater as official data for the July 2021 extraordinary parliamentary elections in Bulgaria is for 42.19% electoral activity, much lower than the 73,3% Table 3 shows. Such a discrepancy could be the result of ESS respondents providing socially desirable answers, or other factors that would need additional investigation.

Question B18 During the last 12 months, have you signed a petition?

A prominent practical manifestation of internal political efficacy and political interest is an often underestimated political activity: signing petitions. Although authorities might have a mixed record of addressing petitions in post-Socialist countries, this form of political engagement is evidence of citizens' political interest translated into political activity.

In order to take into consideration the changes in political participation between citizens of different Internet use frequencies, the following cross-tabulations use a more detailed coding, with five levels of Internet use frequency: never, only occasionally, a few times a week, most days, and every day.

The comparison between Bulgarian and Czech citizens aged under 45 gives convincing evidence that people who never or only occasionally use the Internet are extremely unlikely to exercise this form of political participation (Table 4). However, although the probability of signing petitions increases with the rising frequency of use in both countries, there is a peculiar anomaly in Bulgaria, whereby young people who use the Internet most days are more likely to have signed a petition in the last 12 months. One possible explanation for this interesting phenomenon is that among young people who use the Internet every day, many use it mainly as a form of entertainment, without making use of the opportunities for acquiring political knowledge and participating in political activities that it provides.

Table 4. Signed petition * Internet use, cross tabulation

Country = Bulgaria, Age of respondent = < 45			**Internet use, how often**					**Total**
			Never	**Only occasionally**	**A few times a week**	**Most days**	**Every day**	
Signed petition last 12 months	**Yes**	**Count**	**0**	**1**	**2**	**13**	**77**	**93**
		% Internet use	**0.0%**	**5.3%**	**9.5%**	**25.0%**	**9.6%**	**10.2%**
	No	Count	16	18	19	39	725	817
		% Internet use	100.0%	94.7%	90.5%	75.0%	90.4%	89.8%
Total		Count	16	19	21	52	802	910
		% Internet use	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Country = Czechia, Age of respondent = < 45			**Internet use, how often**					**Total**
			Never	**Only occasionally**	**A few times a week**	**Most days**	**Every day**	
Signed petition last 12 months	**Yes**	**Count**	**0**	**1**	**7**	**7**	**151**	**166**
		% Internet use	**0.0%**	**2.9%**	**12.7%**	**6.7%**	**17.8%**	**15.9%**
	No	Count	3	34	48	98	698	881
		% Internet use	100.0%	97.1%	87.3%	93.3%	82.2%	84.1%
Total		Count	3	35	55	105	849	1047
		% Internet use	100.0%	100,0%	100.0%	100.0%	100.0%	100.0%

Results also suggest that signing petitions as a type of political engagement is more popular in Czechia than in Bulgaria, with 10.2% of Bulgarian ESS respondents having signed a petition in the past year compared to 15.9% in Czechia.

These findings are generally in line with results from the analysis of B2 question on citizens' confidence in their country's political system and their ability to influence government. Czechs' tendency to use the petition instrument of democracy more compared to Bulgarians corresponds with their more balanced attitude to their abilities to influence the political system, as evidenced by Table 2.

In both countries, however, there is a divergence between the perceptions of opportunities for the expression of political opinions available in the two polities, and the actual use of those opportunities, as expressed in concrete political actions like the signing of a petition. Apparently, even a type of political engagement which could be done online, for free, and in a couple of minutes, is not something that most citizens would participate in. This, of course, raises important questions as to whether such inactivity or, in some cases, even "slacktivism", is motivated by political apathy, by skepticism as to the utility of petitions, or both.

Conclusion

The findings of this study demonstrate that in the three studied countries people who use the Internet more often are more likely to be politically active and make use of one or more of the many available forms of political participation. This finding, although seeming self-evident, has important implications for political participation, democratic culture, and digital democracy development. Apparently, in order to render the political system more accessible to average citizens via e-participation, and to strengthen the ties between the citizens and their political representatives, while limiting digital exclusion, governments in countries like Bulgaria need to first make sure that Internet use becomes more widespread, especially among the elderly. The fact that over 60% of people aged 65+ in both Bulgaria and Hungary never use the Internet is a worrying sign of the inability of large social groups to make use of the many benefits digital democracy provides.

Another prerequisite for mass e-participation in the digital democracy is interest in politics. The study confirms the initial hypothesis of the correlation between Internet use on one hand and interest in politics and voting on the other. Providing greater exposure to political stimuli, the Internet is obviously a politicizing factor, "tempting" people who previously had no interest in politics to start following it and form their opinions. However, apart from assisting in the initial development of political interest and stimulating voting, the Internet also provides citizens with various ways to engage in civic political life, with many new forms of engagement facilitated by digital technologies. Participatory activities such as voting, demonstrating, contacting public officials, boycotting, blog posting, volunteering, signing petitions, joining flash mobs, etc., have all become easier and more accessible with the help of the Internet.

As contemporary governments face ever-increasing challenges in governing their nations amidst the rising aspirations of citizens, the diverging gaps between citizens' expectations and the government's capacity have resulted in citizens' discontent with government and mistrust of representatives. Citizens have tended to become indifferent to public affairs, as evidenced by low voter turnouts in societies with representative democracies. There is evidence that such complications have in large measure resulted from representative and managerial governance structures, which tend to distance the government from its citizens, thereby generating democratic deficits (Peters, 2010). This problem is especially poignant in Bulgaria, with its record low electoral activity in recent elections, discontent with and mistrust of governance institutions, and widespread political apathy (Konstantinov, 2025).

In such an environment, digital tools could provide a remedy for democracy ailments in CEE countries like Bulgaria, Czechia and Hungary as new technologies could make democracy more representative by providing new opportunities for people to participate. The Internet could also assist in engaging a broader range of participants that could provide new insights and thereby improve the quality of decision-making by the parliament, political parties and governments. New tools and technologies, if distributed widely across the population, might also improve the legitimacy of democratic structures and institutions, resulting in greater transparency, representation and better decision-making.

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Chapter 7
Web accessibility for digital inclusion: the Bulgarian case

Marieta Hristova

Abstract: *This paper evaluates the web content accessibility of government websites in Bulgaria, focusing on compliance with international accessibility standards such as the Web Content Accessibility Guidelines (WCAG) 2.1. The author highlights the challenges faced by people with disabilities in accessing online public services, emphasizing the importance of ensuring equal access for all users, including those with visual, cognitive, and motor impairments. The study examines 437 websites from various administrative levels, including central, regional, and municipal government websites, using the WAVE tool for automated accessibility testing. Key findings show widespread accessibility issues, particularly with color contrast, missing alternative text for images, and non-functional links. The results reveal that only a small proportion of websites fully comply with the most basic accessibility standards. The study concludes by suggesting improvements such as expanding the use of federated portals and implementing centralized monitoring to enhance the accessibility and usability of government websites in Bulgaria. The findings underscore the need for technical and administrative actions to foster digital inclusion and support Bulgaria's digital transformation goals.*

Keywords: web accessibility, people with disabilities, accessibility legislation, government web sites, Bulgaria

Introduction

One of the most essential characteristic of websites forming the web is their accessibility. This feature is crucial because if a website meets accessibility criteria, people with disabilities can interact with it more easily. This benefits not only individuals with disabilities, but also those who face restrictions due to tempo-

rary or permanent health issues. Accessibility is key to ensuring equal access to online information and services for such groups. Inaccessible websites can further marginalize vulnerable groups of society, such as elderly individuals, people with disabilities, and those restricted in daily activities due to health problems, among others.

Universal access to web content remains a lasting and specific goal of the European Union's digital transformation policy, aimed at the social inclusion of persons with disabilities for their full and effective participation in society. In order for individuals with disabilities to live independently and participate fully in all aspects of life, governments must adopt appropriate measures to ensure equal access to physical environments, transportation, information, and communications, including information and communication technologies (ICT), as well as to other facilities and services available to the general public.

On 13 December 2006, the United Nations General Assembly adopted the Convention on the Rights of Persons with Disabilities. Article 9 of the Convention, dedicated to the principle of accessibility, states, "States Parties shall take appropriate measures to ensure to persons with disabilities access, on an equal basis with others, to the physical environment, to transportation, to information, and communications, including information and communication technologies and systems" (United Nations, 2006). In the Convention, communication is defined in Article 2 as "includes languages, display of text, Braille, tactile communication, large print, accessible multimedia as well as written, audio, plain-language, human-reader and augmentative and alternative modes, means and formats of communication, including accessible information and communication technology" (United Nations, 2006). The Republic of Bulgaria ratified the Convention through a law passed by the 41st National Assembly on 26 January 2012, published in State Gazette No. 12, dated 10 February 2012.

Web accessibility, as defined by the W3C, refers to the ability of people with disabilities to perceive, understand, navigate and interact with the Web. The Web Content Accessibility Guidelines (WCAG 2.1), developed by W3C, outline specific criteria for accessibility that classify websites into three levels: A, AA, or AAA, based on their adherence to these guidelines (W3C, 2018). The first level is deemed essential, the second level is considered a recommendation, and the third level is viewed as an advisory measure. Non-compliance with these conformance levels may hinder one or more groups from accessing the information contained within a document. The levels are structured according to specific success criteria, reflecting their influence on the design and visual presentation of websites. Level A represents the fundamental web accessibility requirements: "For Level A conformance, the web page satisfies all the Level A Success Criteria, or a conforming alternate version is provided". Level AA addresses the most

significant and prevalent obstacles faced by disabled users: "To achieve Level AA conformance, the web page must meet all Level A and Level AA Success Criteria, or a conforming alternate version must be available". Level AAA is the highest level of web accessibility: "To achieve Level AAA conformance, the web page must meet all Level A, Level AA, and Level AAA Success Criteria, or a conforming alternate version must be provided" (W3C, 2018).

Legal frame and previous studies

To date, the WCAG 2.1 Guidelines[1] have been incorporated and adopted within numerous policy and legislative frameworks. They remain the primary reference point for ICT accessibility, although in 2014, a new standard was developed at the European level by the European standardization organizations. This standard, known as European Standard EN 301 549 V1.1.2 "Accessibility requirements suitable for public procurement of ICT products and services in Europe" (2015-04), establishes functional accessibility requirements applicable to ICT products and services.

In 2016, the European Union adopted Directive 2016/2102 of the European Parliament and Council of 26 October 2016 concerning the accessibility of websites and mobile applications of public sector organisations. The Directive aims to harmonize Member States' provisions regarding accessibility requirements for public sector organizations' websites and mobile applications, enabling them to become more accessible to users, particularly those with disabilities (European Commission, 2016). According to the Directive, Member States must ensure that public sector organizations' websites and mobile applications meet the accessibility requirements specified in Article 4, namely that "public sector bodies take the necessary measures to make their websites and mobile applications more accessible by making them perceivable, operable, understandable and robust". Thus, accessibility in the context of the Directive encompasses principles and techniques that must be observed when designing, constructing, maintaining and updating public sector organisations' websites and mobile applications to enable people with disabilities to perceive, understand, navigate and interact with them (European Commission, 2016). The accessibility standard is defined in the harmonized European standard EN 301 549 v3.2.1 (2021-03), based on the Web Content Accessibility Guidelines WCAG 2.0. Member

[1] The evaluation of the websites in this study was implemented at the end of 2024. In 2025, W3C approved WCAG 2.2, which builds on WCAG 2.1 with additional criteria. Content that conforms to WCAG 2.2 also conforms to WCAG 2.0 and WCAG 2.1.

States were required to implement necessary legal, regulatory and administrative provisions to comply with the directive by 23 September 2018. In Bulgaria, Directive 2016/2102 was implemented through amendments and additions to the Electronic Governance Act (adopted by the 44th National Assembly on 14 November 2019, Decree No. 266), which created a new Section 6 "Accessibility of Internet Pages and Mobile Applications Content and Dispute Resolution".

In Bulgaria, the requirement for web accessibility of government websites is defined in the Ordinance on General Requirements for Information Systems, Registers and Electronic Administrative Services (adopted by Council of Ministers Decree No. 3 of 9 January 2017, Additional Provisions, §1, item 5) as "the quality of the information system ensuring the ability of all citizens, regardless of age and physical capabilities, to observe, understand, manage and interact through a user interface". According to the Recommendations for User Interfaces, prepared pursuant to Article 39, Paragraph 1 of the Regulation on General Requirements for Information Systems, Registers, and Electronic Administrative Services, the design of Bulgarian government administration websites must be developed to be compatible with assistive technologies used by people with disabilities and various user needs, including screen readers, speech synthesisers, screen magnifiers, speech recognition software, alternative keyboards, and pointing devices.

The study and evaluation of the web accessibility of government websites and those providing public services is vital, attracting the attention of numerous researchers around the world. For instance, assessments of the web accessibility of e-government websites or portals have been conducted in Australia and China (Shi, 2006), Thailand (Mitsamarn, Gestubtim & Junnatas, 2007), Malaysia (Latif et al., 2010), India (Malik, Bhargava & Chaudhary, 2017) (Ismail & Kuppusamy, 2018), Korea (Lee, Kim & Kim, 2007), Libya (Karaim & Inal, 2019), the United Kingdom (Kuzma, 2010), Norway (Olsen, Nietzio, Snaprud & Fardal, 2009), the Czech Republic (Kopackova, Michalek & Cejna, 2010), Romania (Pribeanu et al., 2012), Italy (Gambino, Pirrone, & Giorgio, 2016) and other countries. Web accessibility evaluations have been carried out at different levels of government – national e-government or portals, as well as regional and municipal levels. Websites have been assessed in terms of their web accessibility, performance quality, and usability (Ismailova & Inal, 2017; Inal & Ismailova, 2020).

Such research has been rare in Bulgaria, particularly that conducted for scientific purposes. Most research focuses on the use of the internet for accessing e-government services, evaluating the presence and usability of municipal administration websites; and is typically commissioned by state bodies or carried out by private research agencies and non-governmental organisations. Studies

on website accessibility in accordance with Web Accessibility Guidelines prior to the transposition and monitoring of the implementation of the EU Directive are uncommon.

In 2013, a team from the Technical University of Varna examined the web accessibility of 18 websites of public importance, involving volunteers with functional limitations (including perceptual, cognitive and motor impairments). The study encompassed both accessibility and usability of the websites. It was found that 80% of the examined websites presented difficulties for people with functional limitations (Stavreva-Kostadinova & Koycheva, 2013).

In 2016, the Horizons Foundation conducted a study in the framework of the project "Civic Initiative for Web Accessibility in the Public Sector" to assess the accessibility of public websites for people with disabilities, focusing specifically on visually impaired individuals. The scope of the tested websites included those of central government institutions, local self-governing authorities, state electronic media, agencies, commissions, and other socially significant bodies, totalling 100 websites. The study employed a direct testing method involving end users – visually impaired IT specialists and volunteers. The findings indicated that 50% of the tested websites were categorized as highly accessible. However, accessibility issues were identified for the remaining websites (Horizons Foundation, 2016).

Sabev and colleagues (Sabev, Georgieva-Tsaneva, & Bogdanova, 2020) retested the accessibility of 100 public administration websites in Bulgaria in 2019, replicating the Horizons Foundation study. The novel aspect of this research methodology was the implementation of both manual and automated assessments using WAVE and aXE tools. The authors found that very few of the evaluated websites passed the accessibility test. The primary issues identified during the assessment included the missing or inappropriate alternative text, missing or incorrect use of headings, lack of a skip link to main content, and insufficient colour contrast.

Method

In the present study, government websites of state administration were examined. A previous study focused solely on municipal administration websites (Hristova, 2025). The scope of evaluated websites has now been expanded to encompass government websites of state administration at various levels: central government, district and municipal administration websites. These are administrative bodies at different structural levels in the country's governance, providing online services (they are service providers, registered in the e-gov.bg portal).

The study accessed the accessibility of 437 government websites in Bulgaria. The websites were automatically tested for accessibility and compliance with WCAG guidelines. The list of administration websites was obtained from the electronic portal, and the testing was conducted in late November 2024 using the accessibility evaluation tool WAVE.

The research questions addressed were:

- How many state administration websites are accessible to people with disabilities?
- What are the most common web accessibility violations found on these websites?
- Which WCAG checkpoints are violated on the websites and require correction?
- Is there a difference in accessibility across the different levels of administrative websites?
- Are federated websites a better solution for administration regarding accessibility?

Selection of websites

The evaluation encompasses administrations that provide online services and maintain own websites. The numbers and structures of these administrations are shown in Table 1.

The sample encompasses websites of state administration at various administrative levels, including national, regional/district and local/municipal websites, as follows:

- Ministry websites – 19.
- Agencies, commissions and other national-level administrations – 100.
- Regional administration websites – 27.
- Municipal administration websites – 291.

Specialized territorial administrations of certain central bodies such as the National Statistical Institute, Regional Health Inspectorates, Regional Education Departments and others – totalling 144 administrations (websites) – were excluded from the sample.

The assessment encompasses two groups of websites: 1) government administrations' own websites, developed and maintained over the years, and 2) the so-called federated portals, which are part of a unified infrastructure, i.e., the Portal for Access to Electronic Administrative Services.

Table 1. Sample of Websites for Web Accessibility Assessment

Administration by type	Total number of administrative structures	Structures that have websites	Federal portals	Non-functional website
Ministries	19	19	1	0
State Agencies	9	8	0	1
State Commissions	5	5	0	0
Executive Agencies	32	32	3	0
Agencies established by law	10	10	3	0
Commissions established by law	12	10*	0	1
Administrative Structures created by Council of Ministers Decree	15	14**	0	0
Other administrations created by law	24	21***	1	0
Regional/District Administrations	28	27	9	1
Municipal Administrations	265	264	38	1
Municipal District Administrations	35	27	2	8
Total	454	437	57	12

Note:

* Two commissions have 1 websites.

** One of these administrative structures does not maintain its own websites and is presented on a ministry's website.

*** Three of these structures do not maintain websites of their own and are presented on other websites.

In late 2021, the State e-Government Agency (SEGA) announced the provision of free federated portal services for administrations via this portal. The service comprises a cloud-based solution for building websites using a pre-prepared template, allowing relative personalization of website appearance whilst maintaining structure to facilitate end-user experience and create a unified visual online identity for state institutions. These portals comply with the requirements of the approved "Rules for Institutional Identity of State Administration Internet Pages and Portals" and current accessibility standards outlined in Directive (EU) 2016/2102 of 26 October 2016, concerning the accessibility of websites

and mobile applications of public sector organizations (Council of Ministers, 2021).

Municipal administrations have made the greatest use of this solution. By the end of 2021, 18 municipalities had federated portals, and by mid-2024, this number increased to 38, representing 14% of all municipalities in Bulgaria. Subsequently, 9 regional administrations acquired such websites, accounting for 32% of the total. Ten other administration have portals as well.

Scope and Limitations of the Study

Web accessibility can be assessed using various evaluation methods, such as manual reviews or online tools. Manual evaluation is considered more accurate for detecting accessibility errors but can be influenced by the subjective judgement of the evaluator, increasing the risk of oversight and requiring more time and effort to compete. In contrast, online tools, developed based on accessibility guidelines, can identify web accessibility issues and provide useful feedback for resolution. According to Inal and colleagues (Inal, Mishra, & Torkildsby, 2022), online tools offer a reliable method for determining website accessibility compliance. However, combining online and manual methods ensures more comprehensive issue identification.

Various automated online tools can be used to assess web accessibility depending on their compliance with WCAG guidelines. The use of semi-automated tools for evaluating web accessibility and website performance can reduce the time and effort required for such tasks. Some tools offer general assessments covering most accessibility checkpoints, while others specialise in evaluating specific elements such as colour schemes, contrast, and so forth. The tools vary by service type, report format, licensing, and method of use – whether as plugins, online services, or standalone software. Accessibility tests also use semi-automated tools to assess performance factors such as speed, error rates, and overall web quality.

The World Wide Web Consortium (W3C) advocates for a systematic methodology known as the Website Accessibility Conformance Evaluation Methodology (WCAG-EM) to assess the compliance of web applications and mobile sites to WCAG standards. This methodology consists of five distinct steps to be taken by evaluators: 1) defining the evaluation scope, 2) exploring the website, 3) selecting a representative sample of pages, 4) evaluating the sample, and 5) reporting the evaluation results. This evaluation methodology was employed to assess the existing level of accessibility

for state administration websites. The WCAG-EM recommends the selection of representative samples when testing all subpages of a website is not feasible. Consequently, the assessment concentrates on the homepages of state administration websites. This approach is commonly used in assessing website accessibility with online tools (Ismailova & Inal, 2017; Nir & Rimmerman, 2018; Inal, Mishra & Torkildsby, 2022). Homepages are considered particularly important in accessibility guidelines (Olalere & Lazar, 2011; Nir & Rimmerman, 2018). Accessibility errors on a homepage often mirror issues found on other pages of the site, indicating broader accessibility challenges (Acosta-Vargas, Luján-Mora & Salvador-Ullauri, 2016). Additionally, public websites are typically built using content management systems that allow multiple contributors to create, edit, and publish content. Issues related to page layout, structure, menu design, and content flow are likely to recur across subpages (Inal, Mishra & Torkildsby, 2022). Therefore, focusing on homepage accessibility provides insight into the overall website accessibility.

The selection of the WAVE online tool was driven by several factors. Although it does not evaluate accessibility compliance according to the EU-adopted standard, it was developed by W3C to assess compliance with the globally recognized WCAG standard and has been widely used in accessibility studies since its launch in 2001. The tool is available in English, operates online in web browsers, can be installed as a browser extension, and is free to use. It displays results directly on the webpage without requiring file downloads and covers a broad range of accessibility issues. WAVE visualises errors using icons embedded within the evaluated website.

This study evaluates a collection of state administration websites, excluding specialized territorial administrations in Bulgaria, and limits itself to the use of a single tool – specifically, the WAVE Mozilla extension (version 3.2.7.1, September 2024). This extension enabled private testing within the authors' web browsers. The evaluation was conducted in November 2024.

Results and Discussion

The government websites were analyzed for errors, categorized under the three levels of conformance checkpoints based on their impact on accessibility.

The evaluation showed 18 types of errors, related to 12 success criteria. Table 2 shows the different types of errors identified by WAVE, their related success criteria and corresponding conformance levels under WCAG 2.1.

Table 2. Type of errors, success criteria and corresponding conformance levels under WCAG

Type of error	Success criteria	WCAG 2.1 conformance level
Contrast error	1.4.3. Contrast (minimum)	Level AA
Spacer image missing alternative text	1.1.1. Non-text content	Level A
Linked image missing alternative text	1.1.1. Non-text content 2.4.4 Link purpose (in context)	Level A
Empty links	2.4.4. Link purpose (in context)	Level A
Missing alternative text	1.1.1. Non-text content	Level A
Missing form labels	1.1.1. Non-text content 1.3.1. Info and relationships 2.4.6. Headings and labels 3.3.2. Labels or instructions	Level A/AA
Empty button	1.1.1. Non-text content 2.4.4. Link purpose (in context)	Level A
Broken ARIA reference	1.3.1. Info and relationships 4.1.2. Name, role value	Level A
Empty heading	1.3.1. Info and relationships 2.4.1. Bypass blocks 2.4.6. Headings and labels	Level A/AA
Language missing or invalid	3.1.1. Language of page	Level A
Multiple forms labels	1.1.1. Non-text content 1.3.1. Info and relationships 2.4.6. Headings and labels 3.3.2. Labels or instructions	Level A/AA
Empty form label	1.1.1. Non-text content 1.3.1. Info and relationships 2.4.6. Headings and labels 3.3.2. Labels or instructions	Level A/AA
Broken skip link	2.1.1 Keyboard 2.4.1 Bypass Blocks	Level A
Marquee	2.2.2. Pause, stop, hide	Level A
Image button missing alternative text	1.1.1 Non-text Content 2.4.4 Link Purpose (In Context)	Level A
Page refreshes or redirects	2.2.1. Timing adjustable 2.2.2. Pause, stop, hide	Level A
Empty table header	1.3.1. Info and relationships	Level A
Image map area missing alternative text	1.1.1. Non-text content 2.4.4. Link purpose (in context)	Level A

Source: Composed by the author according to WCAG 2.1.

Our findings show that the examined government homepages were non-compliant with the most basic conformance level A and also level AA of WCAG. Across the sample, a total of over 22 thousand errors were found, of which one municipality's web page has the extreme number of 8,366 errors (to be discussed below). Apart from these, there are on average 35.44 errors per page. The rate of compliance was approximately 5%, indicating that the evaluation of 22 of the examined websites revealed no errors.

29% of websites have no contrast errors. On average, the remaining sites have 39 contrast errors, with the Garmen municipality website having the highest number at 4,232 errors.

In terms of overall errors, 12% of websites are free from any errors except contrast errors, and 5% have no errors at all. The average number of errors for the other websites is 28. 17.6% have between 30 and 59 errors, 11.7% have between 60 and 89, and 7.8% have more than 90, the Garmen municipality website again leading with 4,134 errors.

Among the federated administration portals, 35 (61.4%) have between 1 and 3 errors, 10 (7.7%) have between 4 and 9 errors, another 10 (17.8%) have between 10 and 29 errors, and one portal has 39 errors.

Table 3. Summary of errors in different types of administration websites (in % and number of websites in brackets)

Number of errors	Ministries	Agencies, commissions and others	Regional/district administrations	Municipalities
0 (no errors)	15.8 (3)	6.0 (6)	14.8 (4)	3.1 (9)
1–29 (few errors)	73.7 (14)	68.0 (68)	59.3 (16)	53.3 (155)
30–59 (moderate errors)	0.0 (0)	14.0 (14)	14.8 (4)	20.3 (59)
60–89 (more errors)	0.0 (0)	7.0 (7)	7.4 (2)	14.4 (42)
90 and more errors (many errors)	10.5 (2)	5.0 (5)	3.7 (1)	8.9 (26)
Total	100.0 (19)	100.0 (100)	100.0 (27)	100.0 (291)

Source: Composed by the author

The category with the highest share of websites without errors is regional administrations (14.8%). Ministries and agencies report a lower percentage of error-free websites (15.8% and 6.0%, respectively). Municipal administrations show the highest share of websites with moderate and higher numbers of errors (20.3% and 14.4%, respectively). The category with the highest proportion of websites with few errors is "Agencies, commissions, and others", with 68%. Municipal administrations show the greatest accumulation of errors, indicating the need for technical improvements or additional maintenance checks for these

websites. Despite the high number of websites with few errors, the number of websites with many errors in agencies and municipalities (over 10% combined) also requires attention. The minimal number of registered errors in ministries may suggest better organization and control over the maintenance of their web platforms (table 3). Furthermore, the reduced number of errors observed on the websites of ministries, commissions, and regional/district administrations can likely be attributed to the web accessibility monitoring and evaluations conducted by the State e-Government Agency (SEGA) in 2022, in accordance with the implementation of the EU directive. Where discrepancies were identified, the organisations under review received clarifications and guidance to rectify the issues. SEGA's evaluation included a sample of 40 state administration websites, 20 regional and 40 local websites. This sample reflects a greater proportion of websites from central and regional administrations, while municipal administrations are represented to a lesser extent.

Table 4 shows the number of different types of errors on a web page.

Table 4. Number of different types of errors on a web page (in % and number of websites in brackets)

Number of different types of errors	All websites	Federated websites	Other (no federated) websites
0 (no errors)	5,0 (22)	1.8 (1)	5.5 (21)
1 type of error	15,1 (66)	26.3 (15)	13.4 (51)
2 different types of errors	17,8 (78)	42.1 (24)	14.2 (54)
3 different types of errors	15,3 (67)	14.0 (8)	15.5 (59)
4 different types of errors	17,6 (77)	5.3 (3)	19.5 (74)
5 different types of errors	14,6 (64)	5.3 (3)	16.1 (61)
6 different types of errors	8,5 (37)	5.3 (3)	8.9 (34)
7 different types of errors	3,9 (17)	0.0 (0)	4.5 (17)
8 different types of errors	1,6 (7)	0.0 (0)	1.8 (7)
9 different types of errors	0,5 (2)	0.0 (0)	0.5 (2)
Total	100,0 (437)	100.0 (57)	100.0 (380)

Source: Composed by the author

On average, each web page contains 3.5 different types of errors, indicating that certain errors are recurrent. Federated portals have an average of 2.4 different types of errors, while other websites have around 3.7 on average. Providing such functionality appears to be an effective solution (Table 4). Increasing awareness of the different types of errors can generally help reduce their frequency and facilitate the process of addressing them.

Ministry websites have between 0 and 6 different types of errors, with an average of 2.75. Websites of commissions, agencies, and others range from 0 to 7

different types of errors, averaging 2.9. Regional administration websites have an average of 3.5 different error types, while municipal websites average 3.8.

The accessibility evaluation further revealed the types of errors present in the examined websites and their frequency. Table 5 shows the different types of errors identified by WAVE, the total number of every type of error and frequency of appearance of the type of error in websites (in number of sites and in % of the websites).

Table 5. Different types of errors identified by WAVE, the total number of every type of error and frequency of appearance of the type of error in websites (in number of websites and in % of the websites).

Type of error	Number of total errors in all websites	Number of websites	% of websites
Contrast error	12400	312	71.4
Spacer image missing alternative text	4218	14	3.2
Linked image missing alternative text	1828	211	48.3
Empty links	1755	217	49.7
Missing alternative text	912	125	28.6
Missing form labels	687	198	45.3
Empty button	457	154	35.2
Broken ARIA reference	332	42	9.6
Empty heading	207	72	16.5
Language missing or invalid	65	2	0.5
Multiple forms labels	27	8	1.8
Empty form label	17	12	2.7
Broken skip link	13	13	3.0
Marquee	10	9	2,1
Image button missing alternative text	8	8	1.8
Page refreshes or redirects	4	1	0.2
Empty table header	3	1	0.2
Image map area missing alternative text	2	2	0.4
Total	22,945		

Source: Composed by the author

Contrast errors were the most frequent accessibility problem identified in the evaluation, with 12 thousand errors across all websites. The website of the Municipality of Garmen has the highest number of elements with problematic colour contrast – 4,233. Among the tested websites, 125 sites (28.6%) did not exhibit this type of error. Excluding the Garmen website, the average number of such errors on the remaining sites is 26.25, with a standard deviation of 44.484, indicating significant variation across the sites.

Contrast errors are associated with Success Criterion 1.4.3, titled "Contrast (Minimum)," which falls under compliance level AA. This criterion stipulates that the visual display of text and images containing text must adhere to a specified minimum colour contrast standard. Sufficient contrast between text and background colours is essential for all users, particularly for individuals with visual impairments, low vision, or color-related challenges. Nevertheless, since these errors relate to AA-level compliance, they are not deemed critical to overall accessibility.

"Spacer image missing alt text" ranks as the second most frequent accessibility error, occurring a total of 4,218 times. Notably, a single municipal website is responsible for 4,092 of these instances, while the remaining occurrences are distributed among 14 additional websites. Spacer images serve the purpose of preserving the layout of a page and do not provide any content; hence, it is essential for them to include "null/empty alternative text" to ensure that screen readers can bypass them. This particular error is related to Success Criterion 1.1.1, "Non-text Content", which is a critical aspect of accessibility.

A considerable portion of errors is attributed to "empty links" and "missing form labels", accounting for 49.7% and 45.3% of websites, respectively. While errors like "missing or invalid language attributes" and "empty headings" are less frequent, they still occur on various websites.

Accessibility issues on these websites are widespread, with visual and textual errors (such as contrast and missing alternative text) being the most prevalent. Errors affecting functionality and navigation, like "empty form fields" and "missing button labels", are also significant and negatively affect the user experience. Less frequent errors, such as "invalid language attributes" and "empty headings", point to more specific oversights that also warrant attention.

Conclusion

The text examines the issue of web accessibility on government and public websites in Bulgaria in the context of European and international legal requirements. It focuses on the need to ensure equal access to online services for people with disabilities and other vulnerable groups, in accordance with the legal frameworks such as the Convention on the Rights of Persons with Disabilities and EU Directive 2016/2102 on the accessibility of public websites and mobile applications.

Research findings indicate that, despite certain efforts and initiatives – such as federated portals – the accessibility of Bulgarian administrative websites remains a serious challenge. The analysis was carried out using the automated tool WAVE to assess the accessibility of 437 government websites. Key issues include inadequate color contrast, missing alternative text for images, and empty links, all of which hamper website use by people with disabilities.

Among the identified problems, contrast errors and missing image descriptions occur most frequently, affecting more than half of the tested websites. A significant number of websites do not meet even the basic Level A standard under the Web Content Accessibility Guidelines (WCAG).

The study highlights that, although federated portals are designed to meet accessibility standards, they also exhibit issues, albeit to a much lesser extent than independently developed websites. Federated portals are easier to manage and maintain, and they comply with accessibility requirements. To further improve their adoption, proactive measures could be taken to expand their implementation, while at the same time ensuring a degree of flexibility in their design and maintaining compliance with accessibility standards.

The analysis also reveals that ministries and agencies demonstrate better maintenance of their platforms, whereas municipal websites require more significant improvements. In this regard, a centralized support service, maintained by a dedicated team and tasked with monitoring technical issues and addressing them in a timely manner, could be established at the Ministry of Electronic Governance.

This study underscores the need for concerted efforts to improve the web accessibility of government and public websites in Bulgaria. Both technical and administrative measures are clearly required to provide better services for all citizens, including those with disabilities. Raising awareness of the types of errors and using both automated and manual evaluations can help create more accessible and intuitive web platforms.

Implementing specific actions to address the identified problems will enhance public trust and support the digital transformation of administrations in line with current technological and social demands. This will help foster social inclusion and prevent the digital exclusion of vulnerable groups, while simultaneously contributing to more effective public services and the sustainable development of e-governance.

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Chapter 8
The digital divide in the agricultural sector in Bulgaria: inequalities in access and adoption of digital technologies

Svetla Stoeva and Dona Pickard

Abstract: *The paper explores the main factors leading to inequalities in access and adoption of digital technologies in the agricultural sector in Bulgaria and seeks to answer the question of how these inequalities affect innovation, competitiveness and sustainability of the sector. It applies a socio-economic approach based on digital divide models that consider inequalities at four levels: physical access to technology, quality of access, digital literacy and socio-cultural barriers. Data are used from non-representative quantitative and qualitative studies on attitudes towards digitisation and innovation in agriculture, carried out in the framework of a research project funded by FP7 of the European Commission and of activities to accelerate digitisation in agriculture funded by the Digital Europe programme.*

The results show that inequalities exist at all four levels of the digital divide, with small and specialised farms being the most affected. Farms with more resources, especially grain farmers, have better access to basic technologies such as GPS systems, while smaller farms struggle due to lack of financial and infrastructural resources. Lack of digital skills, especially among older farmers, and socio-cultural barriers such as conservative attitudes slow down the adoption of digital technologies. The paper concludes by highlighting the need for targeted interventions to improve infrastructure, skills development and overcome socio-cultural barriers to promote digitization in agriculture.

Keywords: digitalisation, agriculture, digital divide, inequalities, technology

Introduction

Digital agriculture is increasingly viewed as a central pathway to modernising farming and addressing global challenges of sustainability, productivity and competitiveness. It involves the application of digital technologies to collect, process and apply data that enable farmers to optimise resources, increase efficiency and improve decision-making. Within this broader framework, precision farming makes use of GPS navigation, sensors and real-time monitoring to minimise waste and raise yields (Wolfert et al., 2017), while smart farming integrates automation, robotics and artificial intelligence for adaptive management of production in response to environmental conditions and market fluctuations (European Commission, 2021).

The rapid development of these approaches is closely tied to technological progress and to European Union policies prioritising the reduction of agriculture's carbon footprint and the promotion of efficiency. In the current CAP programming period (2023–2027), digitalisation is explicitly identified as a priority. Bulgaria's national strategic plan also integrates digital agriculture measures as a way to reduce disparities between farm types and regions. Policy support for digitalisation is thus not only directed towards raising competitiveness, but also towards generating wider socio-economic benefits for rural areas, including new employment opportunities, higher levels of education and professional development, and the potential to counteract rural depopulation trends (Ilieva & Petrova, 2019).

In Bulgaria, the emergence of digital farming reflects both opportunities and structural challenges. Larger and better-resourced farms are adopting technologies that enable them to improve efficiency and sustainability. Small and medium-sized farms, however, face barriers related to limited financial capacity, underdeveloped infrastructure, and deficits in digital literacy. These obstacles risk excluding a significant portion of farmers from the benefits of digitalisation. While European and national policy frameworks clearly promote digital agriculture as a development priority, the uneven capacity of farms to adopt innovations highlights a pressing need to understand the underlying inequalities that shape the sector.

Previous Research

The introduction of digital technologies in agriculture has been widely analysed through the concept of the digital divide, which emphasises inequalities in physical access, quality of access, digital literacy and socio-cultural barriers

(DiMaggio & Hargittai, 2001). Research consistently finds that these dimensions interact to create multi-layered disadvantages, with small-scale producers most affected.

Studies across Europe highlight that infrastructural and financial barriers are central to the persistence of the digital divide. Many small farms lack the necessary investment capacity to purchase digital tools, while rural areas frequently suffer from weak broadband connectivity, preventing the use of cloud services, remote monitoring and other advanced technologies (Knierim et al., 2019). These infrastructural limitations are compounded by inadequate financial support for small and specialised farms, which constrains their participation in training programmes and innovation schemes.

Digital literacy deficits are another major obstacle. Older farmers often lack the necessary skills or confidence to implement new technologies, while even younger farmers face limitations in training and institutional support (Helsper, 2012). Conservative cultural attitudes also slow down adoption, as many farms prefer traditional practices that are perceived as safer, even when less efficient. This combination of low skills and cultural resistance reduces competitiveness in a global agricultural economy where technology drives productivity.

Comparative European research shows that inequalities are not evenly distributed across the continent. In Western European countries such as Germany, France and the Netherlands, farmers benefit from better infrastructure, stronger financing opportunities and higher levels of digital literacy, resulting in more advanced uptake of digital tools. In Southern and Eastern European countries, however, structural obstacles hinder adoption and lead to a widening technological gap within the EU (Knierim et al., 2019).

In Bulgaria, the evidence points to serious inequalities in access to digital technologies, reflecting the broader national challenges of digitalisation. Small and medium-sized farms, which constitute a large share of the agricultural sector, face financial and infrastructural barriers that prevent them from adopting advanced technologies (Ilieva & Petrova, 2019). Larger farms, particularly in grain production, are more successful in accessing precision farming and automation tools, further widening the divide (Nikolov et al., 2022). Although Bulgaria has relatively broad broadband coverage, the quality of access in rural areas remains poor, with very low penetration of very high capacity networks (VHCN) compared to EU averages (European Commission, 2023). Research also highlights the limited availability of training opportunities and weak mechanisms for transferring innovations from research institutions to farms. While universities and scientific organisations in Bulgaria develop agricultural technologies, these often fail to reach farmers due to financial and institutional constraints. As a result, many farms rely on imported innovations or individual entrepreneurial initia-

tives, creating fragmented adoption and low integration with the local research ecosystem (Gancheva, 2020; Bachev, 2022).

Finally, Bulgarian scholarship on the digital divide in agriculture is still relatively underdeveloped. Existing work tends to focus narrowly on infrastructural and economic challenges, while comprehensive approaches that examine cultural, social and skills-related dimensions are rare. Analyses of digital inequalities are more common in the context of urban–rural differences (Stefanov & Krusteva, 2016), but few studies systematically apply the digital divide framework to agriculture. Contributions to this field already examine the socio-economic barriers faced by small and medium-sized farms (Ilieva & Petrova, 2019; Nikolov et al., 2022) and the ways in which the divide between large and small producers exacerbates rural inequalities (Aleksandrov & Georgiev, 2020). A recent interdisciplinary project at the Institute of Philosophy and Sociology, Bulgarian Academy of Sciences, developed a theoretical model examining access, skills and motivation as three levels of the digital divide (Stoilova, 2023). Nevertheless, important gaps remain, particularly in understanding how these inequalities affect technology adoption at the farm level in Bulgaria.

Research questions

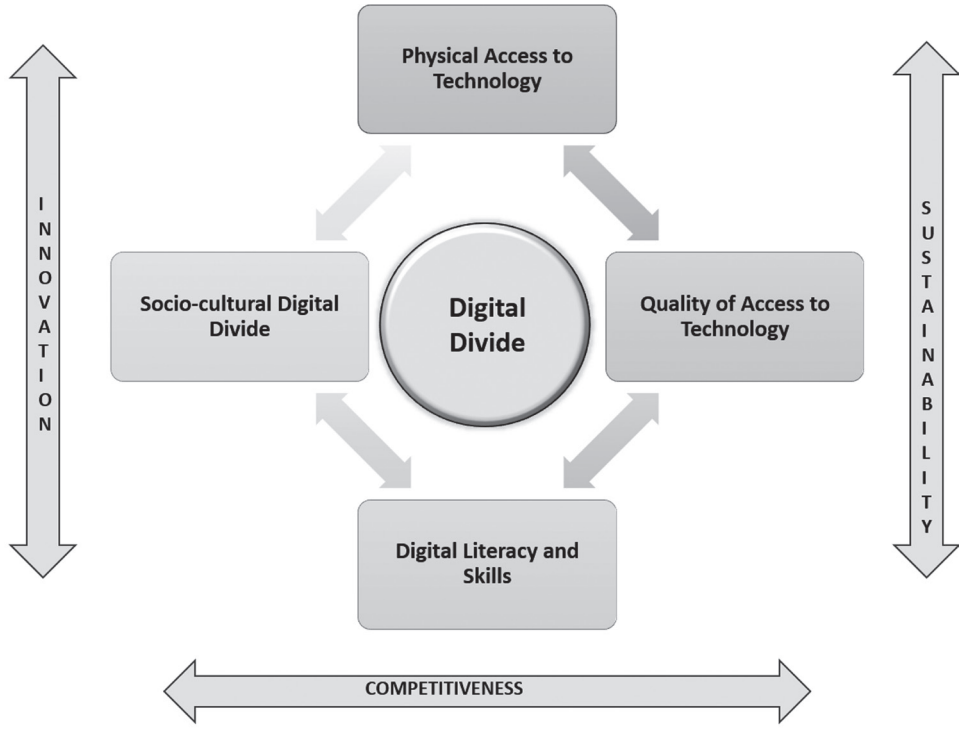
The aim of the article is to provide new and unpublished empirical data that contribute to a deeper understanding of the specific challenges faced by Bulgarian farmers in accessing and adopting digital technologies. The focus is on identifying the factors that generate inequalities in the process of digitalisation of agriculture and on analysing the extent to which these inequalities limit innovation, reduce competitiveness and hinder the long-term sustainability of the sector. By placing the problem of digitalisation within the broader framework of socio-economic inequalities, the paper emphasises that access to new technologies is not merely a matter of technical provision, but is embedded in structural differences related to resources, infrastructure, skills and cultural attitudes.

The central research question that guides the study is how inequalities in access to and adoption of digital technologies manifest themselves in Bulgarian agriculture and what their implications are for the modernisation of the sector. This question is explored through a socio-economic lens that builds on digital divide theories, which conceptualise digital inequalities as a multi-stage process encompassing disparities in physical access to technologies, differences in the quality of available infrastructure, uneven levels of digital literacy and skills, and socio-cultural barriers that affect willingness and motivation to innovate. By adopting this framework, the analysis aims to move beyond descriptive accounts

of infrastructural deficits and financial constraints, towards a more integrated understanding of the ways in which social, economic and cultural conditions interact to reproduce inequalities in digital adoption.

The framework adopted here conceptualises the digital divide as a multi-layered process shaped by social, economic and cultural conditions (DiMaggio & Hargittai, 2001). It distinguishes four interrelated levels. The first level, physical access to technology, refers to disparities in physical access to devices and the internet, strongly influenced by income (Norris, 2001). Although global access has expanded, rural and poorer areas still lag behind. The second level, quality of access to technology, highlights infrastructural differences such as speed, stability and functionality of connections, with rural regions disadvantaged even in developed countries (Helsper, 2012; van Deursen & van Dijk, 2013). The third level concerns digital literacy and skills: many older or less educated users lack the competencies to use technologies effectively, which limits their capacity to benefit from digitisation (Hargittai, 2002; Helsper 2012; van Deursen & van Dijk, 2013). Finally, the fourth level addresses socio-cultural barriers, including attitudes, norms and trust, which may discourage adoption even when access and skills are available (Ragnedda & Muschert, 2013).

Figure 1. Main elements of the conceptual model



As shown in Fig. 1, the four dimensions of the digital divide are not isolated but interdependent. Limited physical access to technology (first level) often restricts farmers' ability to invest in or benefit from quality infrastructure (second level), which in turn reduces the effectiveness of available tools. Even when infrastructure is in place, insufficient digital literacy and skills (third level) prevent farmers from making full use of advanced technologies. Finally, socio-cultural factors (fourth level), such as scepticism towards innovation or reliance on traditional practices, can discourage adoption regardless of access or skills. These barriers accumulate and reinforce each other, creating a cycle of disadvantage. The figure also highlights that the combined effect of these dimensions constrains the sector's potential for innovation, undermines its competitiveness, and limits its contribution to long-term sustainability. Analysing the digital divide as a layered and interacting process therefore allows us to understand more precisely how inequalities constrain the digital transformation of agriculture and its potential for competitiveness, sustainability and innovation.

Methodology

This analysis is based on empirical data from two projects and one Digital Innovation Hub – AgroHub.bg. The first project is IMPRESA (Impact of Research on EU Agriculture), a project funded under FP7, and the second is AgroDigiRise, funded under the Digital Europe Programme to support the digital transition in agriculture in Bulgaria's South Central Region.

IMPRESA data come from a non-representative survey of 116 beekeepers conducted between January and March 2015 at events in Sofia, Pleven and Plovdiv. Using self-administered questionnaires, the study explored attitudes and preceptions toward innovative veterinary products, while also testing hypotheses about socio-demographic influences on innovation practices (Slavova, 2016; Slavova, 2019). Although limited in scope, the findings are consistent with later studies on farm digitalisation.

Further evidence was collected through three AgroHub.bg/AgroDigiRise studies: a survey on farmers' attitudes towards digital technologies, a needs assessment survey for digital competence training, and qualitative interviews with R&D organisations and technology companies. These activities aim to accelerate digital and green transformation by offering pro bono services such as skills training, business advice, product testing, and networking opportunities. The attitudes survey (November–December 2019) reached 114 farmers via the Agri.bg platform. Though not representative,

the results reveal differences across farm types and investment intentions. The training needs survey, distributed both online and at the AGRA 2023 exhibition in Plovdiv, gathered 120 responses (83 online, 37 on paper) between 10–25 February 2023. It assessed priorities for skill development, training preferences, and regional distribution of respondents. Despite modest sample sizes, the data allow reliable assumptions about trends in digitalisation.

Finally, six in-depth interviews with AgroDigiRise consortium members – research organisations and technology companies – examined their innovation goals, the main problems faced by farmers, and the alignment between research priorities and farmers' needs, providing insight into the prospects for technological solutions.

Results

The results are organised around the four levels of the digital divide, based on two farmer surveys and qualitative interviews with providers of innovative technologies. Together, they reveal how socio-economic barriers translate into uneven adoption of digital tools in Bulgarian agriculture.

Table 1. Key drivers of inequalities at the four levels of the digital divide

1st level of the digital divide: Physical access to technology	2nd level of the digital divide: Quality of access	3rd level of the digital divide: Digital literacy and skills	4th level of the digital divide: Cultural and social barriers
Lack of funding	Less than optimal exploitation of the full potential of technologies due to lack of skills and knowledge	Low digital literacy levels	Conservative attitides to new technologies
Underdeveloped infrastructure in remote areas	Lack of supporting infrastructure	Lack of information about available trainings and support for such	Fear of making mistakes when introducing digital technologies
Limited access to basic technologies		Readiness to participate mainly in free training programmes	Lack of certainty in the benefits of digital technologies

First level: Physical access to technology

Access to computers, internet, sensors, and agricultural applications remains strongly differentiated across farm types. Grain producers are the most advanced, with 75% reporting GPS use, while only 39% of fruit growers use simi-

lar systems. With mobile applications for supply and end-user connectivity, vegetable growers and beekeepers lead (around 20–21%), largely due to their reliance on direct sales, while adoption in other sectors remains closer to 10%. Grain farmers also show the strongest investment intentions, with 82% planning further digitisation, compared to 61% of fruit and wine growers. These figures suggest that larger and capital-intensive farms are both more willing and more able to invest. Smaller farms, meanwhile, face constraints not only in acquiring new tools but also in developing the capacity to use them effectively. The training needs survey confirms this imbalance: farmers recognise the importance of process optimisation and data analysis but lack knowledge to apply these functions. Thus, access is not only unequal but also underutilised due to knowledge gaps.

Second level: Quality of access to technology

Even when physical access is available, the quality of infrastructure limits effective adoption. Farmers frequently use GPS systems but only for basic navigation, as poor connectivity and weak support prevent precision applications. Rural areas remain disadvantaged by unstable internet connections and insufficient investment in broadband, limiting the uptake of technologies that depend on constant connectivity. Small farms are particularly affected, as they cannot compensate for infrastructural gaps with private investment. Consequently, the divide at this level combines technical barriers with practical underuse of available technologies, reinforcing unequal benefits across farm types and regions.

Third level: Digital literacy and skills

Deficits in digital literacy are one of the most critical barriers. Survey results show that 57.3% of farmers need additional training in managing digital data, precision farming, and resource optimisation. More than half (53.8%) express interest in training on project implementation and digital management, indicating awareness of the skills gap and willingness to improve. Farmers also highlight the importance of targeted, practical courses that reflect farm-specific needs. Without such opportunities, adoption remains partial and uneven. Small and specialised farms, in particular, hesitate to implement digital solutions due to lack of expertise, while larger farms are better positioned to integrate complex systems. The result is a widening skills divide that compounds inequalities in access and infrastructure.

Fourth level: Cultural and social barriers

The fourth level covers cultural and psychological factors such as conservatism, mistrust, and fear of risk. Surveys and interviews show that some farmers avoid digital technologies not because of financial or infrastructural barriers, but due to scepticism and risk aversion. Half of non-adopters cite uncertainty about benefits. Beekeepers, for example, often base decisions on personal experience rather than expert advice, reflecting low trust in researchers and veterinarians (Slavova, 2019). In some subsectors, conservatism is transmitted across generations, reinforcing scepticism toward innovation.

Fear of mistakes and perceptions of complexity also discourage adoption. Farmers with limited financial buffers are particularly cautious, as errors in applying new tools could cause significant losses. Doubts about the return on investment add further uncertainty. Evidence shows, however, that national funding and support schemes reduce risk and make farmers more willing to adopt digital solutions.

Overall, cultural barriers remain a major factor slowing digitalisation. To overcome them, technical provision must be complemented by information campaigns, practical demonstrations and targeted training that builds confidence in the benefits of innovation.

The analysis of the four levels of digital divide in Bulgarian agriculture reveals deep structural problems that limit the adoption of innovation, reduce the competitiveness of the sector and hinder the sustainability of farms. Evidence shows that these factors are interlinked and have a multilayered impact on producers, creating serious obstacles to the digitalisation process.

The first level of the digital divide, related to physical access to technology, is the main barrier that limits innovation in the agricultural sector. Although some larger farms, such as grain growers, are already adopting technologies such as GPS navigation and sensors, smaller and specialised producers, such as fruit growers and livestock farmers, remain significantly behind. This lack of equitable distribution of access to technology has led to limited uptake of innovation in many sectors of agriculture, especially those in need of modernisation and efficiency gains. Physical access to technology is not only constrained by lack of financial resources, but also by the lack of adequate infrastructure to support technology, such as robust internet connectivity and technical support. This limited deployment of technology has a direct impact on the competitiveness of the sector. Farms that do not have access to digital technologies cannot optimise their processes and increase their productivity. The lack of innovation puts them at a disadvantage in the

market, especially in the context of increasing demands for sustainable production and efficient resource management. As a result of this, larger and better resourced farms are becoming more competitive, while smaller and more specialised producers are falling behind, widening inequalities in the sector.

The second level of the digital divide, linked to the quality of access to technology, further limits innovation and farm competitiveness. This lack of quality infrastructure limits not only the effectiveness of the technologies deployed, but also farmers' motivation to invest in innovation. If core technologies cannot function effectively due to infrastructure constraints, farmers are less willing to invest in new technologies, leading to stagnation in the digitisation process.

A hypothesis that can be formulated based on this evidence is that even when physical access to technology is provided, the lack of quality connectivity infrastructure leads to limited use of these technologies and therefore reduces farm competitiveness. Unless the infrastructure issues are addressed, digitalisation will remain at the level of basic functions, without actually leading to transformations in the productivity and sustainability of the sector.

The third level of the digital divide, related to the lack of digital skills, is also a key factor hindering technology adoption in agriculture. The lack of skills not only slows down the adoption of innovations, but also reduces the efficiency of farms, which cannot achieve the maximum return on their technology investments. It also has a direct impact on the sustainability of farms. Without the skills to use technology to optimise resources and manage risks, farmers cannot adapt their practices to new challenges such as climate change and market shifts. Lack of skills limits their ability to be flexible and innovative, which in the long run reduces their sustainability. This leads to the hypothesis that the development of digital skills is a critical factor in improving farm sustainability, and without targeted investment in training and development of these skills, technology adoption will not lead to significant improvements in the productivity and sustainability of the sector.

The fourth level of the digital divide, related to cultural and social barriers, is also having a major impact on the digitisation process in agriculture. Conservative attitudes and fear of change are particularly pronounced among older farmers who prefer to stick to traditional methods of working even when new technologies offer more efficient solutions. These socio-cultural barriers hinder the process of innovation and reduce the ability of farms to adapt to changing market and environmental conditions.

Based on this analysis, we can formulate the hypothesis that cultural and social attitudes are a significant barrier to the adoption of digital technologies in

agriculture. Even when access to technology and infrastructure is available, lack of motivation and fear of change can slow down digitalisation, limiting the ability of farms to benefit from new innovations.

Conclusion

The study demonstrates that digitalisation in Bulgarian agriculture is shaped by deep and interrelated inequalities. The four levels of the digital divide – access to technology, quality of access, digital literacy and skills, and socio-cultural barriers – do not operate in isolation. They reinforce one another, creating a cycle of disadvantage that slows down the sector's digital transformation. Larger and better-resourced farms integrate technologies more successfully, while small and specialised farms remain at the margins, which exacerbates structural disparities.

Survey data confirm that access to technology is uneven, with grain producers most advanced and fruit, wine and livestock producers significantly behind. Quality of infrastructure, particularly in rural areas, remains a major obstacle, as unstable connections limit the use of advanced digital tools. Skills deficits are equally critical: although farmers recognise their need for training, opportunities are scarce and unevenly distributed. Socio-cultural factors such as conservatism, fear of risk, and reliance on traditional practices further delay adoption, even when access and infrastructure are in place.

These findings underline that digitalisation cannot be reduced to a purely technological process. It is embedded in broader socio-economic and cultural contexts, and the combined effect of the four dimensions directly influences three key outcomes. Innovation is slowed when limited access, weak infrastructure, and skills gaps prevent farms from experimenting with and implementing new solutions. Competitiveness is reduced because unequal adoption widens the gap between larger and smaller farms, locking many producers out of efficiency gains and market advantages. Sustainability is undermined because without skills and trust to use digital tools for resource optimisation and climate adaptation, farms cannot fully contribute to national and EU goals for sustainable agriculture.

The analysis highlights the need for integrated policies that simultaneously address all four dimensions: investment in infrastructure, affordable and targeted training, and initiatives that build trust in innovation through peer learning, demonstrations, and stronger connections between farmers and research institutions. Only by tackling access, quality, skills, and culture together can digitali-

sation drive innovation, enhance competitiveness, and secure sustainability in Bulgarian agriculture.

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Chapter 9
All rise! The rise of AI and the new (in)equalities before the law

Stoyan Stavru

Abstract: *The present article will examine several perspectives on the philosophical questions raised by the introduction of artificial intelligence (AI) into the field of justice: the transformation of the material (spatial) character and efficiency of judicial proceedings; the possibility of generating individually reasoned judicial decisions responsive to the expectations of each party; and the risks of new forms of inequality before the law. The central thesis concerns the hope that the AI judge will provide a perfect form of justice – one grounded in a guaranteed common (background) reason, ensuring objectivity and predictability in adjudication. Might AI indeed offer the key to Dworkin's Empire of Law (Dworkin, 1986: 245, 248), in which the judge, like a sort of Hercules (Dworkin, 2003: 148–149), safeguards the integrity of the legal order through each decision rendered? Or does the pursuit of such perfection risk the exhaustion, or even the end of justice as potentiality, as the very modality of law? Finally, how does the participation of AI in judicial reasoning transform the intelligibility and accessibility of justice for the disputing parties?*

Keywords: *administration of justice, judge, artificial intelligence, reason, intelligibility*

Materiality and Efficiency

The introduction of artificial intelligence into the courtroom raises profound questions from the perspectives of both *spatial* and *material justice*. The virtualization of the judicial environment establishes a fundamentally different dynamic of interaction among participants, potentially giving rise to new forms of inequality or isolation. Operating beyond its server facilities, which may be distributed across the entire planet, or even beyond it, artificial intelligence

does not rely on spatial mechanisms to activate the process of "generating" justice. Even if a form of ostensible presence of the "deciding algorithm" were to be ensured through its visualization as a distinct object within the architectural framework of the courtroom, such an intervention would inevitably transform the traditional symbols of justice, and foremost among them, the human figure of the judge (Stavru, 2024: 72–87). The question of whether new technologies can substitute for the physical symbols that sustain the experiential sense of justice is central to any reflection on the idea of spatial justice. Thus, for instance, the "classical" figure of Themis could be replaced by a hologram or an avatar in which, instead of the traditional blindfold, the digital "goddess" would wear a *transparent visor*, a symbol of algorithmic openness ("open justice"). Likewise, in the animation of the "scales," the weight of arguments could be dynamically calculated on the basis of real-time digital data ("interactive justice").

Artificial intelligence is not merely an instrument but an autonomous entity that participates in the creation of legal decisions. Such is the case, for instance, of algorithms used to assess the risk of recidivism in parole procedures; these algorithms do not simply assist in decision-making but actively shape the outcome itself. Artificial intelligence thus emerges as a new kind of legal actor: one that does not play by established rules but transforms them. It alters the understanding of materiality in law by introducing immaterial entities (algorithms) that nevertheless exert tangible material effects on judicial decisions and outcomes. This results in a redistribution of authority from human agents toward technological systems, generating a sense of distance that may affect perceptions of legitimacy and fairness of judicial proceedings: The formal aesthetics of the courtroom such as the use of robes, regalia, and ritualized spatial arrangements, significantly enhance the perception of legitimacy and authority of the judicial process and its outcomes (Goodrich, 2013: 498–499). Consequently, the very phenomenology of justice is transformed, moving beyond the traditional conception of justice as a rational yet affectively engaged judgment made by a human judge. Justice is no longer experienced as a structured space oriented toward the establishment of rules, hierarchies, and roles. Nor is it perceived as an atmosphere enveloping participants within the materiality of the courtroom: unless such an atmosphere is specifically simulated, i.e., reproduced artificially for the sake of psychological comfort. Yet justice remains a process that unfolds within specific material conditions. For example, if artificial intelligence enables legal disputes to be resolved with the immediacy of facial recognition, this will transform the experience of justice as both a material and a cultural phenomenon, necessitating new conceptual and methodological tools for its comprehension.

It is thinkable that a new concept may emerge in support of so-called "effective justice", associated primarily with speed and automation. Traditionally, justice

has been understood as a process that demands attention, deliberation, and the investment of human time and effort. With the intervention of artificial intelligence, however, the materialization of justice shifts toward outcomes generated automatically and in real time. Yet one must ask whether the very speed of this new form of adjudication might undermine the perception of its legitimacy and objectivity. Public trust in the judiciary has long rested on the premise of careful, temporally extended deliberation by the judge: a criterion that can scarcely be transposed onto a judicial process devoid of the human element. The incorporation of artificial intelligence into the network of objects constituting the materiality of the courtroom will require a fundamental rethinking of the locus of justice – a locus that already integrates both physical and digital components. It remains a matter of time, and perhaps of the specific domain of application to certain categories of disputes, to determine whether speed and automation can ever truly substitute for the traditional "slow" judicial process rooted in human discernment.

Different interpretations of legal texts are often regarded as the result of errors made in their reading. In fact, the interpretative complexity of law is an inherent part of the mechanism through which it activates interpersonal relations as processes of establishing, modifying, and excluding particular norms of conduct (substantive law). In this sense, the courtroom is constituted as a specifically delineated space for experimenting with multiple possible answers to the questions raised in connection with the resolution of a legal dispute. From the standpoint of the principle of res judicata, according to which, at the end of the proceedings, there can be only one judicial truth, most of the arguments presented in the courtroom are false or erroneous. Yet their invalidity occurs retroactively, which makes them indispensable to the very unfolding of the judicial process. Listening to such "nonsense" in the courtroom is therefore part of its function and an essential safeguard of the possibility for a legitimate discourse about justice. Attempts to "save" law from this "nonsense" and to eliminate once and for all the "noise" of legally irrelevant claims made by the litigating parties have been made throughout history. However, these efforts tend to produce the opposite effect: instead of ensuring ultimate impartiality and unshakable objectivity, they lead to the delegitimization of what takes place within the courtroom.

The marginalization of the judicial process through its extreme rationalization and formalization facilitates the substitution of the "small" writing judge by the "large language model". The human inability to reach an ultimate resolution has, at least in classical tragedy and comedy, traditionally been overcome through various versions of the Deus ex machina –a device that interrupts interpretive effort once a certain threshold is reached, in order to secure a "happy end" in the name of Law, which (supposedly) always finds a solution. A contemporary analogue of this Deus (l)ex machina can be discerned in current attempts to employ

artificial intelligence as a mechanism for rule enforcement by eliminating the human element as a potential source of interpretive error. The underlying logic is clear: if one seeks to understand law without process; i.e., substantive legal prescriptions without the procedural framework, then the procedural component of adjudication must be extracted from the sovereign domain of human agency and transformed into a technical operation. Yet while the use of "deeply" trained artificial intelligence serves to demythologize the process of judicial decision-making: there is, after all, no inherent mystery in justice, and the judge is not the "soul" of the law, this demythologization comes at a price: the irrevocable abandonment of the myth of intelligibility of the legal decision itself.

An adjudicating artificial intelligence can always provide reasons for the decision it generates, yet these reasons are never what truly motivated it to reach that decision. Reason-giving is a distinctly human endeavour, fraught with contradictions that can be only partially and temporarily reconciled. While such reasoning may be imitated, its imitation erases the most vital procedural stake of any adjudication: the participation of human beings, endowed with the full spectrum of shared biological and embodied capacities through which contradictions are generated, endured, and negotiated. The "deep fake" justice offered by artificial intelligence is not merely a high-quality technological simulacrum; it is also a brazen affront to the very legitimacy of law, which depends upon the living solidarity of the judicial process. Artificial intelligence will not emerge as the rebellious hero rising against its Lawgiver from the outside, but as the bureaucrat who triumphs from within, by establishing a technical monopoly over interpretation. Users of the judicial system will, likely, be inclined to prefer the infallible saviour to the fallible and conflicted human occupying the judge's seat. Thus, judicial populism stretches between two extremes: the comradely court – an unprofessional justice without rules, and the deep court – a technical justice driven by artificial intelligence. In this continuum, justice oscillates between one carried out entirely by "ordinary people" and one in which human beings are reduced to mere consumers of algorithms acting "in the name of the people."

Personalized Court Decisions

The world of contemporary technologies offers a new version of the coherence among monads, emerging from advances in artificial intelligence, virtual reality, and posthumanist thought. The concept of the monad, inspired by Leibniz, can be used to explore how human beings are becoming increasingly self-sufficient and isolated from the external world in the digital age. In this context, the courtroom provides a particularly intriguing arena – a site where monads collide, em-

bodied in the disputing parties. Let us imagine a highly technological, futuristic court that relies on artificial intelligence and algorithmic analysis to resolve cases, thereby minimizing the human role in adjudication. Such a court challenges traditional notions of justice, for its decisions are grounded not in empathy or moral judgment, but in mathematical modelling. Artificial intelligence optimizes the process so that every human interaction occurs with minimal expenditure of energy, time, and emotion. Yet this very optimization leads to dehumanization, as decisions come to rest upon efficiency rather than moral or ethical reasoning. The emotional and moral "noise" that characterizes human interaction is eliminated by the algorithmic process. This is presented as an attempt to achieve a state of "pure" harmony; in reality, however, it results in the loss of authenticity and of a shared sense of reality within a common world.

The hypothetically constructed court thus becomes a place where the participants articulate deeply subjective, self-contained, and isolated perspectives. It is a space that reveals the human inability to truly understand or connect with others. Each participant acts as a monad incapable of integration into a collective context. Much like Leibnizian monads, each party in the judicial process operates as an independent entity, guided by its own aims and strategies. They present their arguments and evidence without directly altering the position of the opposing side. Each presents a personal version of the events, one that reflects its own understanding of the case and of the applicable legal norms. Leibniz introduced the concept of pre-established harmony, according to which monads are synchronized by God, giving rise to the existing universe as "the best of all possible worlds." In a juridical context, the judicial system can be viewed as a mechanism that coordinates and synchronizes the various positions of the parties to reach a just resolution. The imagined court, however, operates differently. Its activity is grounded in advanced algorithms employing artificial intelligence to analyze case data, relevant legal rules, and existing precedents. The parties to the dispute submit their materials through technological interfaces, while the decision is produced through mathematical and logical computation, purporting to eliminate subjectivity and human bias. This mode of judicial operation underscores the fragmentation of society into isolated monads, incapable of genuine interaction. The proceedings become maximally alienated, for there is no human dialogue, only a formal exchange of data. Yet there is something more, something crucial, that this transformation reveals.

Let us imagine an artificial intelligence judge that, drawing upon existing databases, not only reads but also predicts the intentions, desires, and actions of individuals. Through complex algorithms, the system ensures that the behavior of distinct monads is synchronized in such a way that conflicts between them are minimized. The behaviur of one individual is automatically adjusted by the sys-

tem to match that of another. Artificial intelligence does not resolve real contradictions, but creates an illusion of harmony by manipulating the information and perceptions of the participants. For example, if two parties in a legal process have radically different interpretations of justice, the system can "adjust" their perspectives so that each of them believes that the decision is in its favour. The process ends with no losers, with each party living in the "best possible world for itself."

A distinctive role in sustaining the illusion of harmony is played by personalized judicial decisions. The trial unfolds entirely in a virtual environment, where each party receives an individualized ruling designed to satisfy its subjective world attuned to its perspective, needs, and desires. Instead of seeking an objective truth or compromise, the adjudicating artificial intelligence generates multiple versions of the decision, each perceived by the respective party as favorable to its own position. Justice, in this model, fractures the litigants into separate, non-intersecting realities. Each party remains unaware of the other's version of the judgment. Each party remains in its own reality, in which it believes it has won. The system adapts the information it provides to the participants so that they accept the decision as logical and fair, even if it has no connection to the facts or the legal order. The parties never meet face to face, and the conflict remains unresolved at a deeper level.

Individuals in such a society believe themselves to inhabit an ideal world, yet they are incapable of experiencing authentic human connection. They feel a vague sense of emptiness, unable to identify the source of their dissatisfaction. Traditionally, justice presupposes a balance between the interests of the parties and an objective assessment of the facts. In the case of personalized judgments, however, no genuine resolution of conflict occurs, as the parties then share no common understanding either of reality or of justice itself. Law has historically functioned as a means of regulating society through norms that are universal in their applicability. When decisions become personalized, law loses this integrative function, and the judge is transformed into an illusionist. The court ceases to operate as a mediator helping to resolve disputes and instead merely simulates a resolution that satisfies each party separately. Unlike traditional adjudication, in which the court renders a single decision meant to be binding and acceptable to all, the algorithmic system generates multiple subjective truths, each tailored to the perceptions and expectations of the individual litigants' truths, the coexistence of which is paradoxically affirmed and legitimized by the very authority of res judicata.

Personalized judicial decisions intensify the isolation of individuals, who live as monads, attuned in ways that exclude the very idea of a shared harmony. In Leibniz, harmony among monads arises from the intervention of an omnipotent God, who unites all individual perspectives within a single reality. In the system of adjudication by personalized judgments, however, harmony is artificially im-

posed, arising not from genuine interaction but from skilful manipulation. If, for Leibniz, all clocks are set to the same time and thus display a single, synchronized hour, in the regime of personalized adjudication the hour itself varies according to expectation, and the shared time of justice becomes virtually impossible. Rather than connecting people, the court divides them even further. Instead of engaging in genuine interaction, individuals remain enclosed within their own subjective realities, leading to social isolation and the erosion of collective values. The conflict between the parties is entirely erased, since they do not realize that the judicial decision is not universal. The disputants exist within isolated informational bubbles, both before and after the trial, and justice becomes nothing more than a pleasant experience. This corrupted reduction of justice to a produced phenomenon of the judicial process eliminates the very concept of objective truth and denies the necessity of unity and coherence within the world. When God leaves the courtroom, the idea of pre-established harmony departs with Him. Technology may attempt to patch the absence by offering a multiplicity of post-established illusions of harmony, but within each of them, the place of justice remains empty.

The Law That Never Ends

The AI judge may indeed optimize legality by ensuring consistency, predictability, and equality in application, yet it cannot guarantee perfect justice. The full automation of legal enforcement risks exhausting justice as potentiality foreclosing the openness of legal texts to new meanings, to mercy both within and beyond judgment, and to extra-legal moral considerations in so-called "hard cases". At best, what we may aspire to is an instrumental form of AI – one that serves the human judge within a framework of strict guarantees for public reasoning, contestability, and interpretive pluralism. Artificial intelligence, if left unchecked, risks transforming Dworkin's integrity of law into a monomodal consistency, a self-referential closure of meaning under the guise of coherence. The key to mitigating this risk lies in designing mechanisms that ensure AI supports the chain of law without locking it into a single, definitive solution. Computability must not entail self-exhaustion; the law must remain an open and revisable enterprise, grounded in the living interpretive practice of justice rather than in the mere formal perfection of its algorithmic simulation.

Such mechanisms might include: employing artificial intelligence as a judicial assistant (an expert system) rather than as a judge (a decision-making authority); introducing prohibitions against the automatic generation of decisions in core legal domains (such as criminal law, family law, and human rights); preserving certain decisions, such as those concerning probation, parole, and

clemency, as exclusively human prerogatives; incorporating a right to human judgment as an integral component of the right to a fair trial; requiring the explicit identification of the AI model used by the human judge, along with a clear specification of its influence in "consulting" the judicial outcome; mandating the use of explainable-by-design models within the judicial domain; and establishing new procedural rights related to AI, including the right to an expert countermodel, thereby ensuring equality of arms between the parties. Safeguarding the plurality of AI models within the system of adjudication demands not merely a formal prohibition of algorithmic monoculture, but also the institutionalization of deliberative mechanisms among diverse models that support human judgment as the final ground for judicial decision-making. One could envision an institutional AI module specifically designed to identify and articulate grounds for deviation from models whose primary function is to preserve the status quo, namely, the stability and predictability of justice. Such grounds might arise from emerging forms of vulnerability, shifts in cultural contexts, or the ongoing evolution of human values. An AI model of this kind would thus serve as a guardian of potentiality within the law, preserving its openness to transformation, its responsiveness to the human condition, and its resistance to the closure of meaning inherent in purely algorithmic rationality.

Hart maintains that the application of legal norms, beyond the realm of clear or "core" cases, necessarily encompasses penumbral or borderline situations, stemming from the open texture of language, the so-called linguistic sting of the legal text. In these marginal cases, judges unavoidably engage in evaluative reasoning that transcends pure deduction (Hart, 1958: 607–608). The chiaroscuro cast by statutory language is not merely an obstacle to "perfect" algorithmic predictability; it constitutes, paradoxically, a guarantee of the legitimacy of justice itself. Luhmann, in turn, conceives of justice not as an abstract substantive ideal, but as a pragmatic formula through which law manages its own contingency (Luhmann, 2004: 211), that is, its capacity to be otherwise, to allow for alternative interpretations. Justice thus becomes self-legitimating, insofar as it sustains the functional differentiation of the legal system. Attempts to "seal off" all exits through the imposition of a single, predictable AI model risk eroding precisely that visible alternative, the promise of justice, from which law derives its legitimacy. Preserving plurality among models and conducting periodic review of their operations are therefore essential safeguards against the petrification of law, ensuring its continued openness to interpretation, adaptation, and renewal.

Lon Fuller conceives of law as an enterprise whose fundamental purpose is to subject human conduct to governance through rules (Fuller, 1969: 96). He articulates eight core principles that constitute what he terms the "inner morality" of law: generality (the existence of general rules), promulgation (public

accessibility), prospectivity (non-retroactive application), clarity and intelligibility, consistency, constancy through time, possibility of compliance, and congruence between official action and declared rule. According to Fuller, systematic failure to uphold any one of these principles does not merely produce bad law – it results in the absence of law in the very sense of this enterprise (Fuller, 1969: 145). The fourth principal clarity and intelligibility is directly linked to the comprehensibility of judicial decisions through their explicit reasoning and public justification. Clarity and intelligibility is not a merely technical requirement but an ethical criterion of legitimacy (Fuller, 1969: 63, 157). If a legal system cannot ensure minimally understandable rules and judicial decisions, it does not simply malfunction; it ceases to be law and disintegrates as a normative order. An AI model that produces decisions without traceable and contestable grounds risks undermining the validity of law itself. Every AI model employed in adjudication must therefore yield explainable and verifiable results, guaranteeing both the participation and equality of all parties affected thus preserving the moral and procedural integrity of the legal enterprise.

Intelligibility is a moral condition for the very possibility of law. When a court renders a decision, whose reasoning cannot be explained to the person affected by it, this constitutes not only a failure of the fourth condition according to Fuller (clarity), but also of the eighth (congruence between rule and action). Before it becomes a system of commands, law is a language of mutual understanding between authority and citizens. The less intelligible a decision is, the less it belongs to the domain of law. Algorithmic opacity is thus fundamentally incompatible with legality. A secret law, such as one implicit in an AI model that classifies or sanctions without transparent and comprehensible reasoning, is not merely unjust; it ceases to be law altogether. AI-based adjudication is acceptable only insofar as it remains intelligible and public – that is, only insofar as it can articulate its grounds in a language accessible to human rationality and open to contestation.

The possibility of understanding a judicial decision through the human figure of the judge constitutes the deepest guarantee of equality before the law. It is precisely this possibility that underpins what Fuller calls the "morality of aspiration" – a morality of mutual understanding, without which adjudication degenerates into a procedure devoid of meaning. The judge, "a human being like me", is the anthropological core of justice. The judge's role extends far beyond the mechanical application of legal rules: he or she embodies the very possibility that each party to a dispute may be heard and understood. Beyond its existence as a normative system, justice constitutes a space of understanding among human beings who share a common language, meaning, and responsibility toward one another. Law is not merely a technique of subordination but also a community of mutual intelligibility (Fuller, 1969: 92, 181–183). Without this shared

dimension, justice may still claim accuracy, yet it will be inhuman: would we truly prefer a judge who never errs, but never listens?

Equality As Equal Access to Rationality

In the context of intelligibility, equality before the law does not signify uniformity, but rather the possibility for each litigant to be recognized within the universal. The judge embodies the transition between the universal (the legal norm) and the particular (the individual case), while the judicial decision represents a narrative – the story of the encounter between the general and the personal. It is precisely this act of narration, when performed by a human being, that preserves the possibility of equality. The legitimacy of the judge lies not only in superior knowledge of the law (expertise), nor merely in the enforceability of the decision (authority), but in the fact that the judge speaks in the name of a reason in which all can partake. It is within the chiaroscuro of law, where its incompleteness and openness are most apparent, that the human judge proves irreplaceable. The judge cannot illuminate everything yet reveals that the persisting darkness is a shared one. Lon Fuller describes this as fidelity not to results, but to the effort of speaking a common language even amidst uncertainty (fidelity to law). The judge who shares our imperfection embodies the possibility of error as a guarantee of justice, for here, error is human, not algorithmic.

Understanding is always dialogical. A judicial decision, regardless of its res judicata authority, is never the final truth of the law, but an act of understanding within a specific context. When this act is performed by a human being, it carries the capacity to relate meanings, to feel pain, irony, remorse – elements that are not errors, but distinctly human modes of comprehension. Artificial intelligence may calculate legality, but it cannot comprehend injustice. Only the human being can hear himself in the voice of the other, and this very capacity forms the core of equality. Equality before the law is not secured through perfect predictability, but through the recognition that the law speaks a human language. Thus, the judge is not merely a mediator of the law, but the living figure of possible understanding, the procedural "third" in whom, as in a mirror, the arguments and considerations of the disputing parties are reflected and transformed into a shared horizon of meaning.

AI models could and most likely inevitably will participate as generators of interpretation, without directly rendering decisions. The involvement of AI should neither be rejected nor underestimated; rather, it must be understood, so that it becomes part of the shared understanding that underlies justice and equality before the law. AI calculates but does not decide, for it does not inhabit rea-

son as a lived field of responsibility, doubt, and mutuality. Yet this does not mean that AI has no place within the hermeneutic dynamics of justice. It can produce variants, interpretative proposals that are not mere outputs but new contexts of understanding. This represents a different kind of participation: a sort of semantic "farm of law", where AI sows seeds of meaning that human beings later evaluate, interpret, and sift. AI can function as a cultivator of the possible, gathering precedents, principles, and arguments, generating alternative constructions, and proposing logical, rhetorical, and even moral pathways of interpretation. In law which lives through language, the very appearance of an argument transforms the field of the possible, and with it, the boundaries of the permissible. Much like writing, databases, or analytic methods, AI becomes part of the historical expansion of legal reason and a participant in the infrastructure of its application. Moreover, AI may even create new modalities of equality, for instance, by detecting systemic biases that have remained invisible to the human eye.

When speaking of the future of AI in law, the question is neither one of rejection nor of reverence, but of integration of AI's capacity for explication into the very process of shared understanding that constitutes the foundation of justice. Equality before the law may thus be reformulated not only as equality before the judge, but as equality in access to the horizon of meaning that the court (the judge) and society (the disputing parties) construct together, with the assistance of AI as part of this collective hermeneutic endeavor. It is precisely this joint movement, between calculation and understanding, that can ground a new form of justice, in which the expansion of meaning itself becomes an expression of equality before the law. A crucial element in realizing this interaction lies in ensuring the plurality of AI models through institutional investment in systems that preserve doubt: that is, models that maintain the openness of interpretation and thereby safeguard the very condition of equality before the law.

When a single AI model (algorithmic monoculture) dominates the system of justice, tge internal logic of that model becomes a new form of privilege. It dictates what counts as a relevant fact, a persuasive argument, or a moral value. In doing so, it undermines equality before the law through a structural restriction of meaning: only those who "speak the language" of the model can be heard. By contrast, a plurality of models – each grounded in distinct legal theories, such as positivism, integrity, or justice – ensures a polyphony of law: a multiple horizon within which every party can find its own entry point into the discourse. Thus, equality ceases to be a mere formal declaration and becomes a procedural possibility of being understood. AI models that preserve doubt do not aim to resolve disputes "in the best possible way," but to uncover the grounds for doubt themselves, to illuminate alternative readings, vulnerabilities, and the cultural or moral contexts that lie beyond standard juridical logic. In doing so, they safe-

guard the interpretive openness of law, maintaining justice not as closure, but as an ever-renewed dialogue of meanings.

Such an AI model may be conceived as an embedded advocate of contingency, as a continual reminder that every rule may be unjust in a particular case. This doubt serves a normative function, preventing the dogmatization of outcomes (the "petrification" of law), preserving the possibility of deviation (clemency), and expanding the space of participation, since every vulnerable or marginalized position can find entry through a model that deliberately seeks the non-obvious. To preserve doubt is to preserve equality as the possibility of contestation. Moreover, one might envision the organization of a "council of models", a form of institutionalized justice in which multiple models, both human and algorithmic, are placed in deliberative relation. In such a configuration, the court does not receive a pre-formulated answer, but a spectrum of arguments. The decision thus ceases to be the mere selection of a model and becomes the articulation of the reasons for preferring and refining one model over others. When this articulation is transparent and subject to critique, its verifiability becomes the very form through which equality before the law is realized as equal access to justification.

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Conclusions

This monograph focuses on social inequalities in the digital society. The impact of social inequalities needs persistent research and targeted policy measures on each level of the digital divide – access, skills and benefits. More importance with the ongoing digitalization requires the investigation of the risks in the digital era. Three types of causes for digital inequalities are analyzed in this book. The first are socio-economic: they are linked to missing skills and are closely tied to occupational positions – the requirements of a given type of work shape the need to develop digital skills. The incomes earned in different occupations are unequal and matter for overcoming the financial barriers to accessing and using online technologies and services. The second type of causes are socio-cultural and stem from persistent individual characteristics that lead either to conflicts with web design that is not suited to individual needs and limitations, or to distance and lack of motivation to develop digital skills due to older age. Socio-cultural inequalities in the digital sphere are related to gender, age, and ethnicity – especially for groups with low educational and economic status – and to the presence of physical disabilities. The third type of causes for existing digital inequalities are spatial and regional, tied to place of residence. Existing regional imbalances in Bulgaria – between Sofia and the provincial cities, smaller towns and villages, as well as between the planning regions – layer on top of social and digital inequalities. The main question taken up by this collective monograph is: How can the development of digital technologies contribute to the most vulnerable members of society and thus realize the transformative effect of the digital transition for everyone?

It is widely believed that accessibility is not such a significant problem today. Yet the study of the e-accessibility of municipalities in Bulgaria shows an extremely small number whose websites meet all accessibility requirements. This calls for sustained efforts to expand electronic access for people with disabilities and for those with few or no digital skills. The application of European norms and standards for the accessibility of public e-infrastructure requires continuous development and commitment by the state and municipalities, by political parties, and by civic organizations working both with vulnerable social groups and

with European institutions. The topic of "Digitalization that works for everyone" and digital inequalities has been discussed in recent years at interactive meetings organized by the European Citizen Action Service (ECAS) in EU member states, including Bulgaria. What is needed, however, is to continue this process of dialogue beyond expert knowledge toward more action, so as to achieve a much larger circle of people included online.

Addressing problems of web accessibility is not only a technical challenge. Building an inclusive and fair digital society in Bulgaria requires the introduction of regular training for employees responsible for maintaining websites and uploading their content. Creating an accessible online environment requires prioritizing user-oriented website design that accommodates people with different skills and specific needs. An accessible online environment should benefit all citizens, regardless of their digital capabilities or limitations. This calls for attention and purposeful action by policymakers and stakeholders, as well as steady commitment across the levels of government, for whom the effective implementation of web accessibility measures should be part of their responsibilities.

Digital skills and competences are part of the serious challenge Bulgarian society faces in order to avoid a polarization between the well-educated people who work in and profit from contemporary processes of digitization of labor and the lower educated, low-skilled workers. The alternative to skill polarization is continuous upskilling and reskilling that includes the development of digital skills and soft skills that help to avoid cultural barriers to change. The scholarly literature emphasizes that digital skills must be complemented by the development of specific technical skills and so-called "soft skills" (Kohlgrüber et al., 2021)[1].

The risks of remaining outside the labor market at the end of one's career, with very low education and a lack of digital skills, are a reality for large groups in employment for whom processes of digitalization are compounded by the demands of the green transition and climate-change mitigation, which lead to the closure of industries – especially in extractive sectors – and create regional risks in parts of Bulgaria. The need to develop digital skills must be recognized not only by people facing labor-market insecurity, but also by employer organizations – with whom the authors of this collective monograph have worked – that raise issues of supporting vulnerable socio-professional groups in Bulgaria. The findings from the analyses point to specific needs for additional training among men in manual occupations which do not directly require these skills at work, but where unused opportunities for further training exist. The allocation

[1] Kohlgrüber, Michael, Karina Maldonado-Mariscal, and Antonius Schröder. „Mutual learning in innovation and co-creation processes: integrating technological and social innovation." *Frontiers in Education*. Vol. 6. Frontiers Media SA, 2021.

of costs and responsibilities for additional qualifications and for acquiring digital skills among employers, the state, trade unions, and individuals remains an open agenda that requires continuous social dialogue, including within the Economic and Social Council.

The development of digital skills is a necessity that goes beyond the sphere of work as a means to better pay. It also concerns the development of online communication within friendship and family circles and the reconciliation of work and family life; it encompasses the sphere of politics and informed participation in democratic forms of civil engagement – for example civic actions and signing of petitions. There are positive examples of cultural benefits achieved by blind and visually impaired people. Scholars at the Bulgarian Academy of Sciences have developed a digital application enabling blind users to explore the archaeological artifacts of Heraclea Sintica. The artifacts can be recognized by touch. As part of the project, we conducted interviews with representatives of the visually impaired who need specialized devices to use e-mail and mobile phones. These devices are expensive for many individuals, and their funding from public programnes should be prioritized.

Online risks are highly significant. It is extremely dangerous that, as the authors of the monograph found, large segments of the population do not recognize the risks to personal data, or the threats posed by disinformation and propaganda. The understanding that effects of online opportunities are ambivalent is often missing. In fact benefits go hand in hand with potential harms. The most problematic effects of online platforms on participatory democracy can be summarized as follows: barriers to civic oversight and the critical function of the media; mass surveillance and micro-targeting; polarization of public opinion; and the intensive supply of harmful content and disinformation (Ognyanova, 2022)[1]. The development of media literacy, education in critical thinking, and fact-checking skills is essential. Digital skills must be formed in parallel with guaranteeing access to the internet and to electronic services for all, and with acquiring the technological and soft skills needed to use online platforms. Increasingly, attention in the educational programs should be given to the ethics and standards of communication in the digital environment, the learning of which must likewise be a mandatory part of the participation in ever-expanding digital communication.

By addressing digital inequalities in the spheres of work; leisure and family balances between personal and professional life; regional disparities and the need to align education with the structure of the labor market; e-access and digital democracy; media studies and the challenges of online platforms, the present work

[1] Ognyanova, N. (2022). *Digital democracy on the threshold of post-post-truth.* In G. Grekova et al. (Eds.), *Sociology as civic engagement.* Sofia: University Press "St. Kliment Ohridski".

contributes to the evolving disciplinary knowledge in the sub-discipline "Digital Inequalities" within the growing field of "Digital Sociology". Work on digital inequalities develops in cooperation with media studies in the electronic environment and with research on changes in the sphere of labor and platform work. This monograph makes references to the rapidly developing technological challenges posed by artificial intelligence. Research efforts on the themes discussed will, of course, continue – both by deepening the substantive contributions and by enriching the methods used and the interdisciplinary cooperation with professionals in technology companies. The authors have used traditional research methods in the social sciences such as interviews, and they have analyzed data from international comparative surveys with standardized questionnaires. Cooperation with technology companies has also been used to track media coverage of issues related to digital participation and social inequalities, and to study propaganda and disinformation.

We conclude with the question posed at the outset: How can the transformative potential of digitalization be realized so that digital inequalities decrease and the benefits extend to broader circles of people? The answers formulated here point to the need to expand access, develop skills, and stimulate local digital ecosystems to reduce regional imbalances. Targeted investments in human capital and in innovation are needed. Permanent efforts should be taken to overcome the polarization of society along the lines of possession and non-possession of knowledge and skills demanded by the labor market and required for communication in broader social circles beyond the family, neighbors, and close friends. Critical thinking must be fostered to recognize propaganda, disinformation, and fake news on social platforms.

A major challenge for Bulgaria in the digital era is to overcome regional economic imbalances and improve the effective use and development of human resources. This calls for strategic encouragement of local digital ecosystems and renewal of local innovation potential. It can be achieved by supporting all types of digital hubs, public information and innovation centers; by using the European Structural and Investment Funds (ESIF), the Digital Europe Programme, and Horizon Europe to finance local innovation initiatives; by maintaining a network of regional expert centers that assist small and medium-sized enterprises (SMEs) in applying for European programs. The implementation of regional smart specialization strategies (RIS3) allows steering of investment toward digital technologies with high growth potential and support cooperation among local authorities, universities, and industry to promote innovative, digitalization-based business models. As a result of these policies the desired achievement is that lagging regions can develop faster through digital innovation, more effective use of human capital, and better integration into European innovation networks.

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The project team of "Digital Divide and Social Inequalities: Levels, Actors and Interactions" at a regional stakeholder meeting in Plovdiv, June 2024.

The project team of "Digital Divide and Social Inequalities: Levels, Actors and Interactions" at a meeting with the Rector of Burgas Free University, June 2024.

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DIGITAL DIVIDE: INEQUALITY AND INCLUSION IN THE 21ST CENTURY

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The volume “Digital Divide: Inequality and Inclusion in the 21st Century” is an impressive contrinution to make sense of how technologies transform social reality and reshape our understanding of equality, access, and participation. The book prompts reflection on who is included and who remains outside the digital world – thus raising key questions about the future of social justice in the twenty-first century and paving the way for precise up and re-skilling to help narrowing the digital divide. The publication brings together diverse perspectives and empirical observations that reveal the complexity of digital transformations across different social and regional contexts. Through its interdisciplinary scope and analytical depth, the collection makes a significant contribution to contemporary debates on digital inclusion, skills as factor of competitiveness and growth, future of work, democracy, and human development.

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This book should be read with moderate optimism, with a desire to understand what is happening and to seek possible policies to overcome the digital divide. As well as with moderate skepticism towards the possibilities of digital technologies. This wise balance of assessments, of theoretical and applied scientific views, which we find in this book, is a guarantee that we will approach digital technologies seriously – with controlled enthusiasm and skepticism, looking for opportunities to use them for social inclusion and reasonable social justice.

Prof. Dr. Petia Kabakchieva
Sofia University “St. Kliment Ochridski”

The topic of digital stratification is examined in depth based on the authors' many years of research, reflection, erudition, and experience. The monograph marks a new stage in the study of digital inequalities in Bulgaria.

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