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Digital Divide and Human Resource Inequalities: A Dynamic Policy Strengthening Human Resource Effectiveness

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Abstract

In the era of digital transformation and the inexhaustible march of technology, the debate around the «digital divide» has engulfed the world of science and politics. But beyond the broader concept of the digital divide, what deserves to be examined more thoroughly are its consequences in the field of Human Resources (HR) and their effectiveness in the workplace. This paper aims to bring to the fore a completely original framework of research interest, since it focuses on the relationship between the digital divide and inequalities in human resources. Here, it is examined how the inequality in access and use of digital technologies affects the effectiveness of HR in a business environment. Through this innovative approach, we tried to highlight the dynamic component that technological progress shapes in the context of human resources and their management. In addition, a comprehensive analysis of how inequalities in this area affect the performance of organizations and the achievement of their goals is offered. Through this work, it is proposed to give a new dimension to the debate about the role of technology in the management of human resources and the effectiveness of businesses in the era of digital transformation.

Keywords: *Digital Divide, Digital Skills, Soft Skills, Organizational Culture, Human Resources*

To begin with literature review Di Prima & Ferraris examine how digital transformation affects HR departments in businesses. They focus on how digitization is changing the nature of work and the working environment, affecting how employees interact with each other, the information they use, and their expectations of their employers. They highlight the significant changes resulting from digitization in HR management, with the availability of new data and technologies enabling HR departments to make more thorough and efficient decisions. The authors emphasize the need to develop new skills in the field of human resources in order to take full advantage of the opportunities offered by digital transformation. Overall, their study provides a constructive and critical analysis of how digitization affects the role of HR departments and suggests practical approaches to address the new challenges brought about by this evolution (Di Prima & Ferraris, 2024).

Then, the research of Adeola Olusola Ajayi-Nifise et al. (2024) examines the digital transformation in the banking industry and the importance of human resources in this process. This review highlights the need for change management and the cultivation of 'digital' talent in the banking sector. In the context of digital disruption, banks are redefining their business models and looking for ways to implement emerging technologies in order to remain competitive. The role of HR emerges as critical in this process, as it involves organizing change, fostering a culture of innovation and creating a talent pool with digital knowledge. Change management and digital talent cultivation are emerging as critical aspects of digital transformation in the banking industry. HR teams play a central role in designing and implementing training programs to upskill staff, empowering them to adapt to the evolving digital environment. Ultimately, the research highlights the need for HR strategies that focus on developing the digital skills needed to propel the industry into the future of the digital economy (Adeola Olusola Ajayi-Nifise et al., 2024).

The importance of human capital management and HR technologies for the transition to digital economy was studied by Zhang et al. (2024). Their research highlights the importance of adapting organizations to rapid technological change, developing skills to work in digital environments and supporting a culture of innovation and continuous learning. They analyze the changes occurring in HR management approaches due to digitization and examine new tools and technologies that improve staff effectiveness. The effects of digital innovations on corporate culture, motivation, and employee development are also explored. They then propose recommendations for adapting management strategies to the needs of the digital age with the aim of ensuring the sustainable development of organizations and maintaining their competitiveness. Using scientific methods, such as theoretical generalization and data analysis, the research tries to highlight critical trends and challenges that HR professionals face in new economic conditions (Zhang et al., 2024).

The research of Dreković et al. (2023) examines the relationship between Industry 4.0 technology and effective human resource management (HRM) in the context of the digital transformation of companies. The research focuses on the need to optimize and automate processes through Industry 4.0 technology, which leads to new business models. The research highlights the interdependence between Industry 4.0 technologies and human resources management (HRM), underlining the need for new operating models in the field of human resources that correspond to the demands of modern technologies. In particular, the authors focus on organizational management strategies, such as change management, agile organizations, and talent management. Through use cases, the benefits of Industry 4.0 technology are presented and the role of HR in digital transformation is examined, as well as changes in HRM and HR practices (Dreković et al., 2023).

An important aspect captured in the literature is the recognition of factors associated with the digital divide, such as access to technology, its use and the availability of education. In addition, several studies examine how inequalities in human resources affect employee performance and innovation in firms (Zulu et al., 2023).

In particular, some research points to the importance of differentiating approaches to human resource management, considering the different needs and skills of employees. In addition, potential strategies to reduce inequalities in human resources are highlighted, such as promoting education and creating work environments that encourage diversity and equality (Kareem & Mijbas, 2019).

In addition, there is strong interest in how digital and human resource inequalities affect the effectiveness of organizations. Studies highlight the relationship between these factors and the financial performance of companies, while proposing innovative approaches to improve the effectiveness of human resources in the era of digital transformation (Colding et al., 2024; Stuss, 2023).

Overall, the literature review in the ScienceDirect online database provides a comprehensive and diverse picture of the research field of digital inequality, human resource inequalities, and human resource effectiveness, offering valuable suggestions for future research and practical interventions in the field.

Digital inequality refers to the difference in access, use, and skills in Information and Communication Technology (ICT) between different groups of people or populations. It represents an important type of social inequality in the digital age (Jin & Deng, 2024).

Digital inequality is examined along several dimensions, including access to ICT infrastructure (such as Internet connection and computers), skills and understanding of technology, digital service guaranteed and delivered, and digital intuition and expressiveness.

The digital divide has evolved alongside the evolution of technology. Initially, the lack of access to computers and the Internet led to inequality in access to information and educational resources. As technology evolves, new forms of digital inequality emerge, such as the gap in skills and digital literacy. At the same time, digital inequality has begun to be addressed through programs and policies to promote digital inclusion and education (Bowen & Morris, 2019).

Technology use in the workplace is not uniform and faces multiple forms of inequality. By analyzing the diffusion of technologies in the workplace, we can identify differences based on demographic and social characteristics (Colás-Bravo et al., 2021; Dreković et al., 2023).

- a) First, access to technology is influenced by many factors, such as economic status, education, geographic location, and social environment. Teams with limited access to technology often struggle to achieve business and professional goals.
- b) Second, the difference in skills and familiarity with technology affects its use in the workplace. Employees with advanced technology skills are more likely to use it effectively and benefit more from its capabilities.

Access to technology is critical to work performance and success. Employees who have access to and use innovative technologies can experience improvements in productivity, efficiency, and innovation in their work.

However, lack of access to technology can lead to social isolation and limited career opportunities. Therefore, ensuring equal access to technology is important to creating a work environment that promotes equality and well-being (Jin & Deng, 2024).

The development of skills and knowledge is a critical factor for successful access and integration in the modern workplace. However, inequalities in skills and knowledge development are evident and multifaceted (Fischer et al., 2020).

Inequalities in access to educational resources are often due to differences in economic status, region of residence, and culture. Those with more resources often have access to better education and learning environments that promote the development of digital skills.

In addition, the lack of adequate educational resources in some communities or regions can lead to a digital divide, where some have limited access to technology and digital platforms, while others have rich educational resources at their disposal (Tabrizi et al., 2019).

Continuing education is essential to address inequalities in skills and knowledge development. The provision of educational programs and resources must be accessible and equitable for all social groups, thus promoting lifelong learning and professional development (Stuss, 2023).

Also, measures should be taken to train people in sectors most affected by technological developments, thus promoting equal opportunities and sustainability in the labor sector.

Human resources are the foundation of any organization's success and competitiveness. The relationship between human initiative, capabilities, and organizational effectiveness is synthetic and influenced by many factors (Kareem & Mijbas, 2019).

Human resources include the employees of the organization, with their various skills, abilities, and experiences. It is the people who determine the course and achievement of the organization's goals. Therefore, the development, management, and utilization of these resources is crucial for effectiveness.

Human initiative and employee capabilities are critical factors for efficiency. The ability of people to offer innovative ideas, take initiative and respond flexibly to change is a key asset for the organization.

The effectiveness of organizations is the result of the coherent action of human resources with human initiative and capabilities. Organizations that invest in the development of their employees, encourage them to develop initiative and utilize their abilities, usually demonstrate higher levels of efficiency and innovation (Kareem & Mijbas, 2019).

Therefore, the strategic management and utilization of human resources with an emphasis on initiative and capabilities is a key element in ensuring the long-term success and competitiveness of organizations.

The research questions generated by the literature review focus mainly on the cause of inequalities in human resource performance. After all, the digital divide is a broad term that largely incorporates causes created by factors affecting entrepreneurship. Many of these causes may exist in the internal environment of the firm, while others exist in the external environment of the firm, micro and macro (Mikalef et al., 2019).

Based on the literature review, the first and main research question relates to the existence of inequalities in HR due to the lack of digital skills. The lack of digital skills is very often presented as the main reason for the underperformance of HR. Nowadays, most companies have the possibility to purchase up-to-date digital equipment (PCs, laptops, Pads etc.); however, the HR are not able to use this equipment to the full extent (Leonardo et al., 2023). Therefore, a first research question is formulated as follows:

RQ1: The digital skills of the HR of the enterprises are related to the reduced utilization of digital equipment.

Another important factor is also related to age. It is now evident and appears in many articles in the literature review that age is an important factor that slows down HR performance. There are significant studies that demonstrate companies with an increased digital divide. Those that have tried to train their HR have found themselves facing issues that were primarily related to reduced performance even in the seminar dimension. After all, innovation, as well as new technologies face considerable resistance to being learned by HR over 50 in the EU. This is an issue that most companies will have to address as the EU population is ageing at a geometric rate and technological developments are constantly multiplying (Kolding et al., 2018; Leal-Rodríguez et al., 2023).

RQ2. Age is a significant factor that is associated with reduced digital skills in HR.

A third equally important factor affecting HR inequalities is the concept of Organizational Culture. Unlike the above two research questions which were purely due to initiatives that HR had to take, the concept of Organizational Culture is purely related to its adoption by the company itself. Micro and small enterprises rarely adopt Organizational Culture and focus more on management issues. However, this is seen as a major mistake as it prevents uniformity in addressing issues that arise in HR management and is directly related to reduced HR performance (Almeida, 2024; Salomão Filho et al., 2023). Therefore, the third research question is formulated:

RQ3. The adoption of Organizational Culture is a factor that intensifies HR inequalities.

The methodology for this work was based on the creation of a questionnaire based on the findings of the literature review. The questionnaire consists of two parts, the general one focusing on demographic data and the specific one focusing on six categories that create a digital divide while affecting HR. The general part included five questions that during the statistical analysis were correlated with the sub-variables of the specific part. In the specific part, each of the six categories consists of five important questions that act as variables to widen or narrow the digital divide and HR inequalities. In total, the questionnaire consists of 35 different variables.

Categories	Category's Description
C1	Company's Engagement to Digital Transformation
C2	Importance and Impact of Organizational Culture

C3	Company's Engagement to HR management Techniques
C4	Importance and Impact of Digital Skills
C5	Importance and Impact of Soft Skills
C6	Importance and Impact of Hard Skills

Table 1: Category's Description

The questionnaire was designed to be completed electronically and all questions are formatted on a 5-point Likert scale. It was formatted and distributed via link from the Survey Monkey tool (www.surveymonkey.com) to senior managers of European companies. The completion of the questionnaire was accompanied by an on/off type question, where the participant's status was checked. If someone was simply an employee, then it was not possible to continue with the completion of the questionnaire. All questions were compulsory to be completed and in case a question did not have any of the options, the questionnaire could not be submitted. The survey period was from October 2023 to December 2023. A total of 250 responses were collected and the response rate to the questionnaires was low at around 7 percent. The statistical analysis that followed included methods of descriptive statistics and correlation analysis.

Initially, a reliability test of the questionnaire was carried out based on Cronbach's Alpha. The reliability index was in the range of 0.819 indicating very good reliability. Since the questionnaire in its specific part consists of six subcategories, a validation factor analysis was carried out as a statistical method for each of its subcategories. In this way, each category has a representativeness of 50% of the variance of the questions that make up the category. A Kaiser Meier Olkin (KMO) test was subsequently conducted to test the adequacy and sphericity of the sample (Tibeica et al., 2024). The KMO test proved to be adequate for each individual category since it was greater than 60%.

Summary Table of Validating Factor Analysis			
	KMO	Bartlett's	% explained variance
Questions C1	0.79	0	64.23%
Questions C2	0.86	0	88.35%
Questions C3	0.74	0	69.74%
Questions C4	0.89	0	92.36%
Questions C5	0.73	0	70.22%
Questions C6	0.71	0	69.20%

Table 2: Summary Table of Validating Factor Analysis

In particular, for C2 (Importance and Impact of Organization Culture) and C4 (Importance and Impact of Digital Skills), the KMO index is significantly higher compared to the other four categories. This practically means that the questions-variables that make up these categories show significant clustering accuracy. Finally, Bartlett's index tends to 0 for all categories indicating that the variances are similar across all groups.

In the descriptive analysis, it is worth emphasizing the combined analysis of the age of the respondents and the type of enterprise they work in. In our research sample, it is important to emphasize that senior managers in the Information Technology (IT) and Software Development sector are usually younger than in the Manufacturing & Engineering sector. Also, in the Healthcare & Pharmaceuticals, Manufacturing & Engineering, and Retail & Consumer Goods sectors, the majority of respondents were over 45 years old. This practically affects their responses on Digital Skills. In contrast to these businesses, in the Technology sector, as well as in the Banking sector, we see that the majority of the executives are less than 45 years old. Clearly the integration of technology in Information Technology (IT) & Software Development and Finance & Banking (e.g., Fintech) influences the sample and individual survey responses.

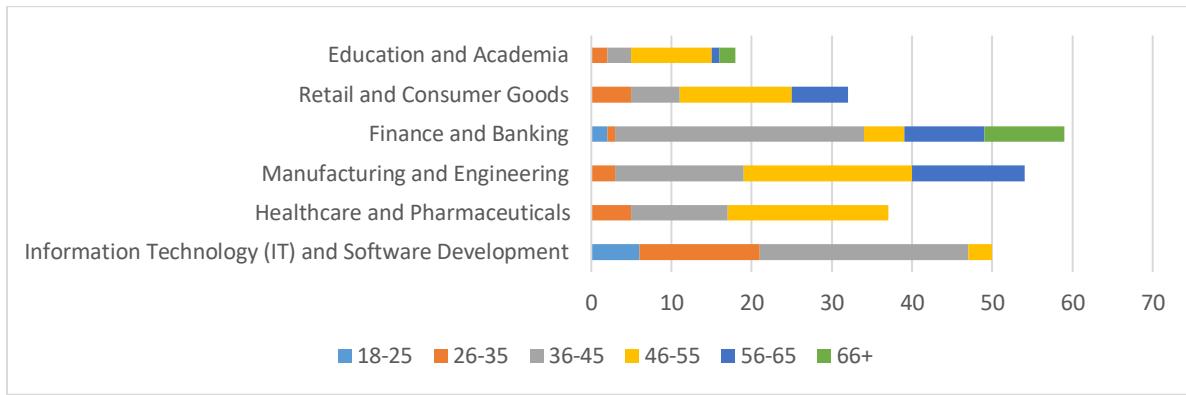


Figure 1: Participants' Combination of Age and Industry Sector

A more specific analysis was then carried out by creating a cross tab table with Pearson's correlation analysis for each category. In this analysis, three significant and strong correlations were created between the categories. More specifically, in Figure 2 we can see a strong positive correlation between categories C2-C3 with a correlation of 0.8, categories C2-C4 with a correlation of 0.89 and finally between categories C3-C4 with a correlation of 0.79. Basically, with a detailed look we can see that variables C2 (Organizational Culture) and C4 (Digital Skills) are more strongly correlated than the other variables in terms of digital divide. Therefore, the individual questions in the above categories also contribute more significantly in relation to the creation of HR disparities. This is also supported by the literature review. The adoption of Organizational Culture is considered one of the most important elements in creating inequalities as the equal management of HR is one of the factors that make up Organizational Culture. As far as Digital Skills are concerned, these are a highly significant factor in creating not only digital inequalities within the company but even in the social life of individuals (Bowen & Morris, 2019; Hinterhuber et al., 2021).

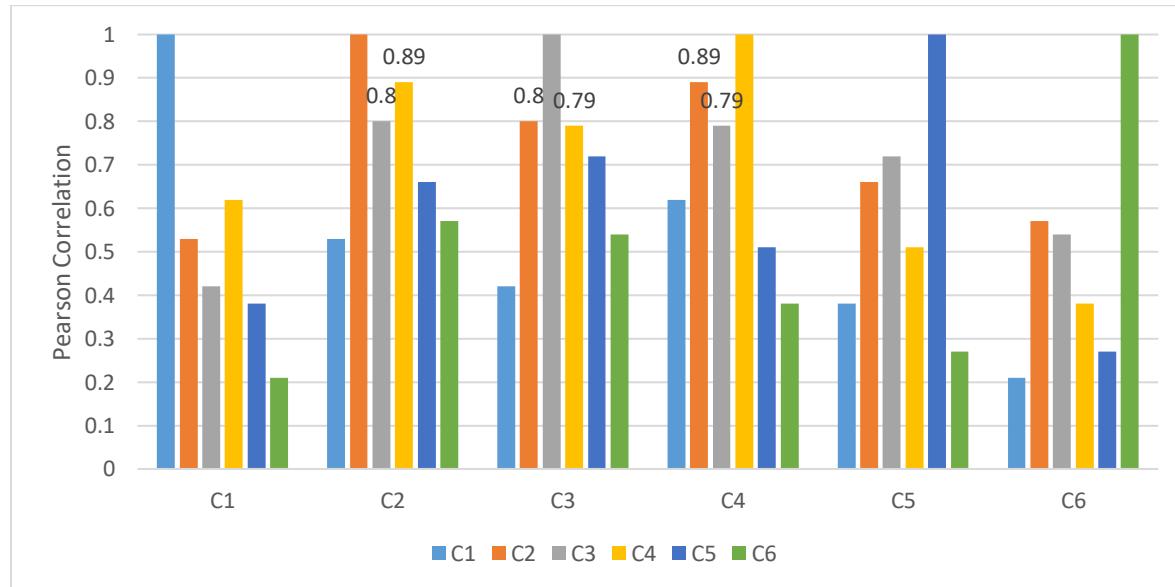


Figure 2: Pearson's Correlation Analysis of questionnaire categories

In the more detailed analysis of the individual questions, there is a clear confirmation of the relevant research questions. Already, the majority of the individual respondents considered that a lack of digital skills was very highly correlated (82%) with a reduction in equipment use. Practically in sectors, such as Finance and Banking and Information Technology (IT) and Software Development, increased digital skills are crucial in order the employee to be able to integrate more directly and perform to an increased degree in daily tasks. According to the respondents, the picture is similar in Education and Academia Sector, which was not to be expected, as traditional teaching methods are even now used extensively in many countries around the world (Colás-Bravo et al., 2021).

An equally important element is that respondents have to a very large extent, more than 95%, linked age to digital skills. After all, it is obvious that younger age groups obviously have more digital skills than older age groups. However, there is a very important debate in the literature about ways to strengthen the digital skills of older people. Solutions, such as special training

seminars, ongoing support for problem solving, and practice through computer games are solutions that many companies have adopted to a significant extent (Tabrizi et al., 2019).

On the other hand, for the digital divide and thus for inequalities, according to respondents, hard skills play a lesser role. Skills related to degrees, diplomas, and seminars come in second place. Skills are no longer sufficient to be certified with forms but instead should be usable in the job itself. In many EU countries, seminars beyond three years are no longer accepted, and a university degree is no longer the only factor in recruitment. In general, human resource departments have for years been involved in the multi-faceted assessment of employees and do not focus with blinders on the existence of formal qualifications alone (Adeola Olusola Ajayi-Nifise et al., 2024).

The effects of the digital divide undoubtedly have a significant impact on HR, causing inequalities. These inequalities have a direct impact on the efficiency and effectiveness of the company, forcing it to adopt various practices, the main ones being the relocation of its headquarters, price increases, changes in its organizational structure, etc. However, modern companies, through their HR departments, are adopting dynamic policies to increase their efficiency. This efficiency is tailored to the specific needs of HR. Consequently, companies are trying to adopt the following strategies (Salomão Filho et al., 2023; Zhang, 2016; Ziomek, 2021):

1. Education and training: Providing access to educational resources and training programs is critical to developing digital skills and enhancing employee performance. Ensuring equal access to these resources for all workers, regardless of gender, age or social status, is essential.
2. Promoting diversity: Recognizing and promoting diversity in the workplace helps to create an environment that encourages innovation and creativity. Organizations can adopt policies that promote diversity and inclusive hiring to create a more representative workforce.
3. Managing the digital divide: Managing the digital divide is central to enhancing HR effectiveness. Organizations need to invest in policies and practices that ensure that digital skills are accessible to all workers and that there are no digital gaps due to gender, ethnicity or other social factors.
4. Continuous evaluation and adaptation: Organizations must conduct continuous evaluation of their human resource development programs and policies in order to adapt to developments and ensure equal access and opportunities for all.

Addressing human resource inequalities and enhancing HR effectiveness through managing the digital divide are critical to creating a more equitable, innovative, and humane work environment that will enhance the performance and success of organizations.

However, it should be clear and understood that the role of the state is equally important in this process. The state, through society itself, should help to address the inequalities that are created in human resources and should do its utmost to better prepare citizens to adapt more easily to the new technologies and thus, acquire digital skills more easily and in a shorter period of time. States, mainly located in Northern Europe and Scandinavia, have adopted similar policies, and the EU has created appropriate tools, such as the Digital Competence Framework for citizens to self-assess their digital skills. Other strategies proposed for the state's contribution to strengthening the effectiveness of human resources and reducing inequalities are (Leal-Rodríguez et al., 2023; Salomão Filho et al., 2023; Zhang, 2016):

- Better levels of education, most importantly the introduction of VET in general education.
- Supporting and encouraging innovation and research in order to make concepts and processes more human resource friendly.
- The development of substantial structural reforms in areas of everyday life in order to familiarize citizens through their social activities with modern technology.
- The creation of tax policies that are friendly to the easier adoption of technology (e.g., a reduced VAT rate on the purchase of cutting-edge technologies) in order to give people time to make a smoother transition to modern technology.
- The adoption of social inclusion and equality practices & policies in new technologies without barriers related to gender, origin or other beliefs.

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