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AI Impacts on Social Inclusion of People with Disabilities and Older Adults in the Labour Market

Impactos da IA na inclusão social de pessoas com deficiência e idosos no mercado de trabalho

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Abstract

Purpose: This study investigates the influence of Artificial Intelligence (AI) on the social inclusion of people with disabilities and older adults in the labour market, identifying both the opportunities created by AI-enabled technologies and the risks they pose to accessibility, fairness, and participation in employment.
Methodology/approach: A narrative review synthesises academic literature, policy analyses, and empirical evidence to assess how AI systems, digital platforms, and assistive technologies shape labour market inclusion for marginalised groups.
Research, Practical & Social implications: Findings show that AI can improve accessibility, provide personalised support, and broaden employment opportunities. Nonetheless, significant challenges persist, including digital divides affecting disadvantaged groups, limited digital literacy, and algorithmic biases that may reinforce ableism and ageism. Inclusive design, equitable technological access, and supportive welfare frameworks are essential. The study underscores the need for policymakers, employers, developers, and community organisations to adopt ethical and inclusive AI practices.
Originality/value: The research offers an interdisciplinary, socially oriented contribution by integrating perspectives from AI ethics, accessibility, and labour market inclusion, identifying key gaps and future research avenues.
Keywords: artificial intelligence; PWD; social inclusion; people with disabilities; older adults

Resumo

Propósito: Este estudo analisa como a Inteligência Artificial (IA) influencia a inclusão social de pessoas com deficiência e Longevos no mercado de trabalho, identificando tanto as oportunidades proporcionadas por tecnologias baseadas em IA quanto os riscos associados à acessibilidade, à equidade e à participação laboral.
Metodologia/abordagem: Adota-se uma revisão narrativa destinada a sintetizar literatura acadêmica, análises de políticas públicas e evidências empíricas, permitindo uma avaliação abrangente dos efeitos de sistemas de IA, plataformas digitais e tecnologias assistivas sobre a inclusão laboral de grupos marginalizados.
Implicações práticas e sociais: Os resultados indicam que a IA pode ampliar a inclusão ao favorecer acessibilidade, suporte personalizado e novas oportunidades de emprego. Entretanto, persistem desafios relevantes, como desigualdades digitais, baixo letramento digital e vieses algorítmicos que reforçam capacitismo e etarismo. O estudo evidencia a necessidade de práticas éticas e inclusivas por parte de formuladores de políticas, empregadores e desenvolvedores, bem como da ampliação da acessibilidade digital.
Originalidade/valor: A pesquisa contribui ao integrar perspectivas interdisciplinares de ética em IA, acessibilidade e inclusão laboral, apontando lacunas e direções para investigações futuras sobre emprego equitativo mediado por IA.

Palavras Chaves: inteligência artificial; inclusão social; PcD, pessoas com deficiência; longevos

Introduction

The integration of Artificial Intelligence (AI) into the labour market has become a critical area of scholarly investigation, particularly in relation to their effects on the social inclusion of people with disabilities and older adults. As societies increasingly depend on digital tools for daily activities and employment, it is essential to understand how these technologies can either facilitate or impede social inclusion. This research examines the interaction between digital technologies and the labour market, emphasising the need to address the digital divide, enhance digital literacy, and promote inclusive design in technology development.

The digital divide, characterised by disparities in access to technology, availability of resources, and digital skills, presents substantial barriers to inclusion for PWD and older adults. These populations often face distinct challenges, including age-related changes and varying levels of digital proficiency, which can restrict their engagement with the digital economy (Kebede et al., 2022; Liddle, 2023). Occupational therapists are well-positioned to play a central role in addressing these challenges by advocating for inclusive technologies and supporting the development of digital skills within these groups (Liddle, 2023). Furthermore, the impact of welfare regimes on digital inclusion underscores the significance of policy environments in shaping access to technology and employment opportunities. Nations with more inclusive welfare systems typically demonstrate better outcomes in digital engagement for older adults, highlighting the necessity of supportive policies that foster equitable access (Alexopoulou et al., 2022). As the digital landscape continues to evolve, the enhancement of digital literacy emerges as a necessary factor in promoting social integration. By improving the digital competencies of older adults, there is potential to facilitate intergenerational cooperation and understanding, thereby enriching the workforce (H. Park et al., 2022). However, it is critical to recognise that without careful implementation, AI may exacerbate existing inequalities.

Therefore, ongoing consideration of the diverse needs of PWD and older adults, alongside the socio-political contexts that influence digital engagement, is essential to ensuring that these technologies contribute positively to social inclusion within the labour market. The rapid integration of Artificial Intelligence (AI) into the labour market presents both opportunities and challenges for the social inclusion of people with disabilities (PWD) and older adults. The complexity of this issue necessitates a comprehensive understanding of how AI influence social inclusion within the labour market. In this sense, the research question of the

study is "How do Artificial Intelligence (AI) impact the social inclusion of people with disabilities (PWD) and older adults in the labour market?".

The primary objective of this study is to conduct a comprehensive narrative review of existing literature to explore and critically analyse the impacts of Artificial Intelligence (AI) on the social inclusion of people with disabilities (PWD) and older adults in the labour market. The study aims to identify key factors, such as the digital divide, digital literacy, and welfare regime policies, that influence the extent to which these technologies can either facilitate or hinder social inclusion. By synthesising current knowledge, the study seeks to provide insights and recommendations for enhancing the design, implementation, and policy frameworks of AI to promote equitable and inclusive participation in the labour market for PWD and older adults. The following sections investigate into the significance of this inclusion from multiple perspectives, underpinned by recent research findings.

Theoretical development

The increase in life expectancy is a complex phenomenon shaped by an array of factors, including advancements in healthcare, lifestyle modifications, genetic determinants, and improvements in educational attainment. These factors collectively contribute to the extension of human lifespan, often accompanied by better health and reduced levels of disability. Firstly, exercise plays an important role in promoting long-term health and extending life expectancy. Research conducted on the model organism *Caenorhabditis elegans* has demonstrated that regular physical activity enhances mitochondrial function, improves nervous system health, and increases resistance to neurodegenerative diseases. These benefits are attributed to the expression of specific genes, such as the extracellular superoxide dismutase gene SOD-4, which is essential for maintaining improvements in health span (Driscoll, 2022). Secondly, concerning reduction in disability and chronic conditions, longitudinal studies conducted in England have revealed an increase in disability-free life expectancy (DFLE) among older adults, even in the presence of chronic conditions. This suggests that although individuals may still develop long-term conditions, they are living longer without considerable disability. The decline in cognitive impairment prevalence and improvements in the management of conditions such as coronary heart disease have contributed to these positive trends (Bennett et al., 2022).

Thirdly, about genetic factors and longevity, genetic research has uncovered specific mutations that can reduce the risk of diseases such as Alzheimer's and enhance the likelihood of longevity. For instance, a "nonsynonymous" mutation in the **PLCG2** gene has been associated with a decreased risk of several dementias and an increased probability of extended lifespan (van

der Lee et al., 2019). Finally, rising levels of educational attainment have played a substantial role in increasing life expectancy. Education influences health behaviours and access to healthcare, leading to lower mortality rates. Studies conducted in Italy, Denmark, and the United States have demonstrated that changes in educational structure account for a considerable portion of life expectancy gains, underscoring the importance of education as an indirect health policy measure (Luy et al., 2019). Although these factors collectively contribute to enhanced life expectancy, it is essential to acknowledge the persisting disparities. For instance, cognitive impairments remain a challenge, and not all populations benefit equally from these advancements. Addressing these disparities is essential to ensuring that the gains in life expectancy are equitably distributed across different demographic groups.

Barriers and Opportunities for Social Inclusion of PWD and older adults in the Labour Market Amidst AI-Driven Digital Transformation

The social inclusion of people with disabilities (PWD) within the labour market is important for fostering economic independence, enhancing social integration, and advancing equality. Such inclusion not only benefits individuals with disabilities but also enriches workplaces and society at large by harnessing diverse talents and perspectives. Inclusion within the labour market enables PWD to achieve economic independence, thereby reducing their reliance on social protection systems. This is particularly knowing in low- and middle-income countries, where access to financial services and employment opportunities can markedly improve the livelihood outcomes for PWD (Hunt et al., 2022). Furthermore, social inclusion within employment settings plays a critical role in dismantling stereotypes and biases, thereby promoting a more equitable society. It encourages the development of inclusive policies and practices that benefit all employees, rather than solely those with disabilities (Bailey et al., 2022).

Regarding barriers and opportunities of social inclusion, the evolving nature of work, particularly in the context of digital transformation, presents both challenges and opportunities for PWD. Although the advent of AI in digital environment may create certain barriers, they simultaneously offer new avenues for employment, provided PWD are equipped with the requisite skills (Jetha et al., 2023). In industries such as construction, there is a pressing need for innovative employment pathways and the reduction of biases within recruitment practices to facilitate the inclusion of PWD. This necessitates cross-sector collaboration and the adoption of inclusive norms and practices (Bailey et

al., 2022). Moreover, employment constitutes a vital component of health and development for PWD, as it fosters community participation and enhances overall well-being. Tools such as the Child Community Health Inclusion Index underscore the importance of creating environments that support the active participation of PWD in both community and work settings (Yejong Yoo et al., 2023). Therefore, the inclusion of PWD within the labour market is essential, it is equally important to address the broader systemic barriers that impede their participation. This involves improving accessibility within urban environments and ensuring that policies are not only inclusive but also effectively implemented. The Capability Index study highlights the necessity for policymakers to consider environmental accessibility and individual capabilities when planning urban projects (Azmoodeh et al., 2023). Addressing these broader issues can further augment the social inclusion of PWD in the labour market and beyond.

Likewise, the social inclusion of older adults within the labour market is essential for fostering economic stability, enhancing individual well-being, and promoting societal cohesion. Such inclusion not only addresses the challenges associated with an ageing population but also capitalises on the potential of older adults as valuable contributors to the workforce. Older adults can substantially contribute to the economy through entrepreneurship, yet they are frequently marginalised in policy discussions. In Finland, for example, government programmes have largely overlooked older entrepreneurship, portraying older adults as a challenging segment of the workforce rather than as potential entrepreneurs. This neglect limits the economic contributions that older adults could make if supported by more inclusive policies (Kupiainen et al., 2023). Social participation, including involvement in the labour market, exerts a positive influence on the physical and mental health of older adults. Socioeconomic status, mediated by social participation, impacts health outcomes, underscoring the importance of engaging older adults in social and economic activities to improve their overall well-being (Y. Zhang et al., 2022).

On the other hand, the digital divide represents a barrier to the social inclusion of older adults in the labour market. Public libraries in the United Kingdom have played a critical part in mitigating this gap by providing digital skills training, which is vital for older adults to engage effectively in a digitalised economy. Such initiatives not only enhance digital literacy but also build confidence and facilitate broader social inclusion (Casselden, 2023). Moreover, the degree of digital inclusion among older adults varies across European countries, shaped by differing welfare state regimes. Nations with universalistic welfare systems tend to achieve higher levels of digital inclusion, which is fundamental for enabling older adults to access labour market opportunities and public services (Alexopoulou et al., 2022). While the inclusion of older

adults within the labour market is advantageous, it is imperative to address the barriers they encounter, such as age-related stereotypes and digital exclusion. Policies should aim to create supportive environments that recognise the diverse capabilities of older adults, ensuring they are not only included but also empowered to thrive in the labour market.

The SDGs, Sustainable Development Goals (United Nations, 2024) addressing the social inclusion of persons with disabilities (PWD) and older adults in the labour market are centred on reducing inequalities and promoting inclusive economic growth. These goals underscore the necessity of creating equitable opportunities for all individuals, irrespective of their physical abilities or age, to participate fully in the workforce. The SDG 8, Decent Work and Economic Growth, seeks to promote sustained, inclusive, and sustainable economic growth, alongside full and productive employment and decent work for all. This goal is directly pertinent to the inclusion of PWD and older adults in the labour market, as it advocates for equal access to employment opportunities and the assurance of fair wages (Jetha et al., 2023). The evolving nature of work, particularly with the rise of digital technologies, presents both challenges and opportunities for PWD. It is essential to ensure that these individuals possess the necessary skills and access to secure work arrangements to facilitate their inclusion in the labour market (Jetha et al., 2023). Additionally, the SDG 10, Reduced Inequalities, focuses on reducing inequalities within and among countries, emphasising the need for policies that foster the social, economic, and political inclusion of all individuals, regardless of age, gender, disability, race, ethnicity, origin, religion, or economic status (Mirzoev et al., 2022). This goal highlights the importance of creating inclusive urban environments that address the needs of vulnerable populations, including PWD and older adults, ensuring that they are not excluded from socio-economic advancements (Mirzoev et al., 2022).

At last, the SDG 11, Sustainable Cities and Communities, aims to make cities inclusive, safe, resilient, and sustainable. This goal includes ensuring access to adequate, safe, and affordable housing and basic services, as well as the upgrading of slums, all of which have an impact on the social inclusion of PWD and older adults (Mirzoev et al., 2022). Urban planning that prioritises the needs of these groups can greatly enhance their integration into the labour market by providing accessible transportation and infrastructure (Mirzoev et al., 2022). In summary, these SDGs offer a framework for promoting social inclusion, challenges remain in their implementation. The absence of comprehensive data and the necessity for cross-disciplinary approaches to address the intersectionality of issues faced by PWD and older adults are big obstacles. Furthermore, global sustainability strategies often overlook perspectives from the Global

South, which can impede the development of inclusive policies that cater to a wide array of needs (Collste et al., 2023).

The Impact of AI on Labour Markets: Opportunities and Challenges for Social Inclusion of PWD and Older Adults

In this environment, Artificial Intelligence (AI) are globally reshaping labour markets, exerting diverse impacts across various regions and sectors. These technologies influence job displacement, creation, and transformation, affecting both the demand and supply sides of labour markets. The impacts are complex, involving alterations in occupational structures, wage distribution, and worker well-being. AI can lead to job displacement, particularly in occupations where tasks are highly automatable. In developing countries such as Lao PDR and urban Viet Nam, workers in specific occupations face the risk of displacement due to AI, necessitating adaptation to new roles or acquisition of new skills (Carbonero et al., 2023). Conversely, digitalisation can generate new employment opportunities, particularly in digital professions. In Ukraine, digitalisation has given rise to new roles and the potential for remote work, which has played a stabilising role in the labour market during crises such as the pandemic and war (Barash & Petrova, 2022).

The integration of AI into production processes alters task allocation between humans and machines, thereby influencing wage distribution and industry dynamics. Market competitiveness and barriers to entry can shape these outcomes, affecting the labour share and wage inequality (Dawid & Neugart, 2023). The dynamic task-based model illustrates that automation can lead to shifts in industry output and wage distribution, with heterogeneous effects depending on workers' skill levels and firms' wage policies (Dawid & Neugart, 2023). Beyond that, AI's impact on mental health is considerable, particularly in the manufacturing sector. In China, AI has been shown to improve the mental health of manufacturing workers, especially those with lower skill levels and from older generations. The work environment plays a mediating role in enhancing these positive effects (Wei & Li, 2022). Enhancing the work environment can amplify the beneficial impacts of AI on workers' mental health, underscoring the importance of supportive workplace conditions in the digital age (Wei & Li, 2022). Thus, AI present opportunities for job creation and improved worker well-being, they also pose challenges such as job displacement and increased inequality. The effects vary across different regions and sectors, highlighting the need for tailored policy responses to harness the benefits while mitigating the risks associated with these technological advancements.

In that regard, Artificial Intelligence (AI) possess the potential to influence the social inclusion of individuals with disabilities (PWD) and older

adults within the labour market. These technologies may exert both beneficial and adverse effects, impacting accessibility, employment opportunities, and social equity. Concerning the positive Impacts, the digital technologies, including smartphone applications and virtual reality, have the capacity to promote health and extend the independent living of older adults. These tools can enhance mobility, mental health, and cognitive functions, thereby improving the capacity of elderly individuals to engage in the labour market (De Santis et al., 2023). In the same way, AI facilitate health monitoring and disease prevention, assisting older adults in maintaining their health and remaining active within the workforce. This includes the utilisation of wearable devices and other technologies to monitor health metrics and provide timely interventions (De Santis et al., 2023). At least, by enhancing digital competence and offering communication platforms, digital technologies can mitigate social isolation among older adults, fostering a sense of community and support that is vital for workforce participation (De Santis et al., 2023).

Regarding Negative Impacts, AI systems frequently reflect societal biases, including ageism, which can result in discrimination against older adults in the labour market. This bias may be evident in hiring algorithms that favour younger candidates or in workplace technologies that are not designed with older users in mind (Chu et al., 2022). Moreover, access to digital technologies is not uniform, and disparities in digital literacy can exacerbate existing inequalities. Older adults and PWD may encounter difficulties in accessing and effectively utilising these technologies, thereby restricting their employment opportunities (De Santis et al., 2023). Furthermore, the use of digital technologies for health monitoring raises ethical issues pertaining to data collection and privacy. These concerns may discourage individuals from adopting such technologies, potentially excluding them from the benefits these innovations offer (De Santis et al., 2023; Moro, 2023).

In conclusion, while AI present promising opportunities for enhancing the social inclusion of PWD and older adults within the labour market, they also pose real challenges. Addressing issues such as digital ageism, the digital divide, and ethical concerns is essential to ensuring that these technologies contribute positively to social equity and inclusion. The following discussion delineates these impacts in greater detail

Method

This study employs a narrative review methodology to explore the impacts of Artificial Intelligence (AI) on the social inclusion of people with disabilities (PWD) and older adults in the labour market. The narrative review approach was chosen due to its ability to synthesise existing literature, providing a comprehensive background and highlighting the significance of recent developments in this field (Paré & Kitsiou,

2017). A thorough search of relevant literature was focused on studies published in peer-reviewed journals across the academic databases SCOPUS and Web of Science. The search terms included combinations of keywords such as "artificial intelligence," "AI," "social inclusion," "labour market," "PWD," "people with disabilities," and "older adults." The search strategy was deliberately broad to capture a wide range of perspectives and findings over a five-year period (2019 to 2024). Data were extracted from the selected articles, focusing on key themes such as accessibility, employment opportunities, digital equity, and ethical concerns. The analysis aimed to synthesise the findings in a manner that elucidates both the positive and negative impacts of AI on the target populations. The selection of information was subjective, guided by the need to emphasise the value of specific viewpoints that contribute to the broader understanding of social inclusion in the labour market.

The findings from the reviewed literature were synthesised to provide a nuanced understanding of how AI influence the social inclusion of PWD and older adults in the labour market. The narrative review structure allows for the presentation of a balanced discussion that recognises the potential benefits while also addressing the challenges and risks associated with these technologies. The results are presented in a thematic format, highlighting areas where further research is needed and offering insights for policymakers and practitioners working towards inclusive labour market practices (Paré & Kitsiou, 2017). This narrative review does not seek to generalise the findings but rather to provide a detailed and interpretative synthesis of the existing literature, offering a foundation for future research and practical interventions in the field.

Discussion

The integration of Artificial Intelligence (AI) into the labour market presents both threats (Table 1) and opportunities (Table 2) for the social inclusion of people with disabilities (PWD) and older adults. While these technologies can enhance accessibility and create new employment prospects, they also risk exacerbating existing inequalities if not implemented inclusively.

Threats of PWD and older adults' inclusion in the labour market

A prominent threat (*Table 1*) to social inclusion is the digital divide, which disproportionately affects older adults and PWD. Many individuals within these groups lack access to essential technologies or the skills required to utilise them effectively, leading to exclusion from digital job markets and services. This divide is particularly pronounced in regions with less supportive welfare regimes, where older individuals are more reliant on fa-

milial support rather than state-provided services (Alexopoulou et al., 2022; Liddle, 2023). Another threat is the exclusion from technology design, when mainstream technologies often fail to consider the diverse needs of all potential users, resulting in exclusion. The absence of inclusive design in AI systems can create barriers for PWD and older adults, who may find these technologies inaccessible or difficult to navigate (Liddle, 2023). Moreover, the mental health challenges are important threat to consider the shift to digital platforms can intensify feelings of isolation and exacerbate mental health issues among older adults, especially those with limited digital literacy. This can further hinder their participation in the digital economy (Maguire & Chen, 2023).

The digital divide poses a challenge to the inclusion of persons with disabilities (PWD) and older adults in digital labour markets and services, particularly in regions with less supportive welfare systems. This divide is characterised by a lack of access to essential technologies and insufficient digital skills, which exacerbates social and economic exclusion. Older adults and ethnic minorities, such as Russian-speaking migrants in Finland, face substantial barriers in accessing digital services due to the absence of electronic identification (e-ID), which is critical for secure authentication to digital platforms. Factors including age, economic hardship, and language barriers contribute to this exclusion (Kemppainen et al., 2023). Moreover, the digital divide is also evident in the varying levels of internet access and digital literacy among older adults. For example, older Korean Americans with probable dementia demonstrated unfamiliarity with technology, hindering their engagement with digital platforms (Min et al., 2022).

Table 1: Threats of PWD and older adults' inclusion in the labour market with AI

Threat	*Description*	*Reference*
1. Digital Divide	Lack of access to essential technologies or digital skills, leading to exclusion from digital labour markets and services, especially in regions with less supportive welfare regimes.	(Alexopoulou et al., 2022; Liddle, 2023)
2. Exclusion from Technology Design	Mainstream technologies often fail to consider the diverse needs of all users, resulting in barriers for PWD and older adults due to the absence of inclusive design in AI systems.	(Liddle, 2023)
3. Mental Health Challenges	The shift to digital platforms can exacerbate feelings of isolation and mental health issues among older adults, particularly those with limited digital literacy, further	(Maguire & Chen, 2023)

hindering their participation in the digital economy.

Source: developed by the authors

The COVID-19 has further underscored these disparities, as digital technologies have become central to accessing services and employment opportunities. The following sections explore key aspects of this issue. The pandemic has intensified reliance on digital technologies, thereby exacerbating pre-existing digital inequalities. Older adults and those in rural areas have been particularly affected due to limited internet access and digital skills, which are essential for participating in digital labour markets and accessing services (Borda et al., 2022). Furthermore, the rapid transition to digital healthcare during the pandemic highlighted persistent challenges in digital access and literacy among the elderly and ethnic minorities, underscoring the need for targeted interventions to bridge this divide (Litchfield et al., 2021). The digital divide is more pronounced in regions with less supportive welfare regimes, where limited infrastructure and support for digital inclusion result in greater exclusion of vulnerable populations from digital labour markets and services (Borda et al., 2022; Litchfield et al., 2021).

Mainstream technologies frequently fail to accommodate the diverse needs of all users, particularly people with disabilities (PWD) and older adults, largely due to the absence of inclusive design in AI systems. This exclusion can create substantial barriers, yet recent research underscores the significance of participatory and co-design methods in addressing these challenges. By involving end users in the design process, technologies can become more inclusive and effective. Engaging autistic individuals in the design process necessitates a deep understanding of their unique needs and preferences. Effective participatory design involves building relationships, developing relevant skills, and providing structured support. This approach values participants as equal partners, ensuring that their needs are respected and thoroughly integrated into the design process (Maun et al., 2024). Moreover, older adults stand to benefit much from co-design processes, as illustrated by the development of a medication plan prototype. Remote co-design, facilitated by frameworks like the Double Diamond, enables older adults to contribute their perspectives, thereby enhancing patient safety and fostering a more inclusive design environment (Holmqvist et al., 2023). And, in the context of physical activity programs, co-design strategies such as digital literacy training and personalised exercises have been identified as necessary for engaging older adults. These strategies help to reduce barriers, ensuring that the technology is both accessible and adaptable to their needs (Villa-García et al., 2023).

For older adults with cognitive impairments, technology-assisted arts

activities can enhance well-being. However, many devices remain in the prototyping stage, highlighting the need for further development and greater participant involvement in the design process to ensure these technologies meet diverse needs (MacRitchie et al., 2023). Advancing beyond user-centred design to a society-centred approach can further enhance inclusivity. This involves considering the broader social context and empowering society to contribute to the design of health technologies, ensuring that they are more inclusive and effective in supporting health and well-being (Niess, 2022). Even while these approaches show promise, challenges remain in fully integrating diverse user needs into mainstream technology design. Continued research and development, coupled with a steadfast commitment to inclusive practices, are essential to overcoming these barriers and creating technologies that effectively serve all users.

Opportunities of PWD and older adults' inclusion in the labour market

However, digital technologies offer opportunities (*Table 2*) for remote employment and telehealth services, which can be particularly beneficial for PWD and older adults. These technologies facilitate flexible working arrangements and provide access to healthcare, thereby reducing physical barriers to participation (Liddle, 2023; Maguire & Chen, 2023). Moreover, collaborative technology development, engaging PWD and older adults in the co-design of digital tools can lead to more inclusive technologies. This participatory approach ensures that the unique needs of these groups are considered, enhancing their ability to engage with digital platforms (Liddle, 2023). At least, faith-based organisations can play a key part in supporting older adults and PWD by providing digital literacy training and creating inclusive community spaces. These organisations can help bridge the gap between technology and its users, fostering greater inclusion (Britt et al., 2023). Furthermore, the potential for AI to enhance social inclusion is considerable, it is imperative to address the digital divide and ensure that these technologies are designed with inclusivity in mind. This necessitates a collaborative effort from policymakers, technology developers, and community organisations to create an equitable digital landscape.

The potential of Artificial Intelligence (AI) to enhance social inclusion for persons with disabilities (PWD) and older adults is considerable, offering tools that can improve autonomy, well-being, and connectivity. These technologies, encompassing intelligent personal assistants, digital health tools, and sociable robots, each play a distinct role in fostering social inclusion within these groups. Intelligent personal assistants (IPAs) such as Google Home have demonstrated their capacity to enhance autonomy and well-being among individuals with visual impairments and intellectual disabilities. These tools fa-

cilitate access to information and entertainment, thereby enhancing social participation and mitigating feelings of isolation, particularly during periods of social distancing, such as the COVID-19 pandemic (van Wingerden et al., 2023).

The application of IPAs in residential care settings has shown improvements in well-being, indicating their potential for broader application in promoting social inclusion for PWD (van Wingerden et al., 2023).

Table 2: The opportunities of PWD and older adults' inclusion in the labour market with AI

Opportunity	*Description*	*Reference*
1. *Remote Employment and Telehealth Services*	Digital technologies enable flexible working arrangements and provide access to healthcare, reducing physical barriers to participation for PWD and older adults.	(Liddle, 2023; Maguire & Chen, 2023)
2. *Collaborative Technology Development*	Involving PWD and older adults in the co-design of digital tools ensures that their unique needs are considered, leading to more inclusive technologies and enhancing their engagement with digital platforms.	(Liddle, 2023)
3. *Support from Faith-Based Organisations*	These organisations can offer digital literacy training and create inclusive community spaces, helping bridge the gap between technology and its users and fostering greater inclusion.	(Britt et al., 2023)
4. *Potential of AI to Enhance Social Inclusion*	With efforts to address the digital divide and design technologies with inclusivity in mind, AI and digital tools can enhance the social inclusion of PWD and older adults.	(Britt et al., 2023; Liddle, 2023; Maguire & Chen, 2023)

Source: developed by the authors

Digital health technologies, including telehealth and tele-exercise programmes, have seen increased adoption to counteract the negative impacts of social isolation among older adults. These technologies enable older adults to maintain independence and improve their physical and mental health through virtual exercise programmes and health monitoring (Ho & Merchant, 2022). The use of digital health tools among older adults with cancer has notably increased during the COVID-19 pandemic, underscoring their importance in maintaining health and social connectivity. However, disparities in access and utilisation persist, influenced by factors such as age, race, and socioeconomic status (Zhou et al., 2023). Sociable robots are proposed as

companions for older adults, particularly during pandemics, to combat social isolation and loneliness. These robots provide companionship and interaction, which are vital for mental health and social inclusion (Jecker, 2021). The design of sociable robots seeks to offer a sense of companionship without supplanting human interaction, addressing concerns related to privacy and the authenticity of relationships (Jecker, 2021).

Mainstream smart technologies, such as smartphones and smartwatches, are increasingly utilised to support the economic sustainability of adult social care and to enhance well-being. These technologies have the potential to extend beyond risk management and actively support social inclusion by providing access to information and facilitating communication (Hamblin, 2022). To address inequalities and enhance the effectiveness of these technologies in promoting social inclusion, a person-centred approach to technology use, supplemented by investment in comprehensive support services, is recommended (Hamblin, 2022). Although AI hold great promise for enhancing social inclusion among PWD and older adults, it is essential to address the ethical, social, and economic challenges associated with their use. By fostering inclusive design and addressing barriers to adoption, these tools can contribute to the well-being and social participation of vulnerable populations.

The implementation of AI in health and social care presents ethical, social, and economic challenges, particularly for people with disabilities (PWD) and older adults. Ethical concerns include the potential for biased AI systems that exacerbate health inequalities, as many technologies are developed using data that reflect societal biases, including ageism (Chu et al., 2022). Socially, older adults often face underrepresentation in clinical trials and digital health interventions, which can hinder their access to beneficial technologies (Health, 2023). Economically, the costs associated with implementing AI tools may not be justified if they do not adequately address the needs of these populations (Litchfield et al., 2023). A nuanced understanding of the diverse needs of PWD and older adults is essential for fostering true social inclusion, as it can guide the development of equitable, accessible AI solutions that prioritize their unique requirements (Ford et al., 2023; Griffin et al., 2024). This approach not only enhances participation but also ensures that technological advancements contribute positively to their quality of life.

AI promoting social inclusion of people with disabilities (PWD) and older adults

Artificial intelligence (AI) can be categorized into several types, each with distinct influences on the social inclusion of people with disabilities (PWD) and older adults. These types include chatbots, intelligent personal assistants, socially assistive robots, and digital technologies. *Table 3* presents

Each type offers unique benefits and challenges in promoting social inclusion for these groups.

Table 3: Types of AI that promote social inclusion for PWD and older adults

Types of AI	*Benefits and challenges*
Chatbots	Chatbots, like CapacitaBOT, are used as educational tools to enhance social skills among people with intellectual disabilities. They facilitate real-life situation training, promoting social inclusion by improving communication abilities and reducing isolation, especially during crises like COVID-19 (Mateos-Sanchez et al., 2022).
Intelligent Personal Assistants (IPAs)	IPAs, such as Google Assistant and Siri, integrated with IoT, help PWD control home appliances through voice commands. This technology enhances independence and accessibility, although it requires internet connectivity and struggles with unstructured commands (Ali et al., 2023).
Socially Assistive Robots (SAR)	SARs, including conversational robots, support older adults and dementia patients by promoting mental health and independence. They offer companionship and assist in daily activities, although long-term trust and clinical translation remain challenges (Lima et al., 2022). Robots like Pepper in care facilities provide novel activities and social interaction, enhancing quality of life but also raising concerns about user autonomy and ethical implications (Blindheim et al., 2023; Haltaufderheide et al., 2023).

Source: developed by the authors

AI chatbots promote social inclusion for persons with disabilities (PWD) and older adults by enhancing engagement and reducing feelings of isolation. For instance, the EBER chatbot utilizes a familiar medium—background news—augmented with voice interactions, effectively bridging the digital divide for elderly users (Garcia-Mendez et al., 2021). Additionally, chatbots can mimic human conversational strategies, such as empathy, which is essential for engaging older adults with mild cognitive impairment, thereby improving their social connectedness and potentially delaying cognitive decline (Yuan et al., 2023). However, the responsible use of these technologies is essential to mitigate ethical risks and ensure they enhance social care without compromising well-being (Emmer De Albuquerque Green, 2024) Furthermore, implementing diversity, equity, and inclusion safeguards in chatbot design can help address biases and ensure equitable access for all users (Abdel-

halim et al., 2024). Overall, these technologies represent a promising avenue for fostering social inclusion among vulnerable populations (de Arriba-Pérez et al., 2021).

Intelligent Personal Assistants (IPAs) enhance social inclusion for persons with disabilities (PWD) and older adults by facilitating communication, autonomy, and access to information. For instance, IPAs like Google Home have been shown to improve well-being and social participation among individuals with visual impairments and intellectual disabilities, particularly during periods of social isolation, such as the COVID-19 lockdowns (van Wingerden et al., 2023). Additionally, the development of tailored IPA systems, such as the IRON system, allows users to control home appliances through natural language processing, accommodating both structured and unstructured commands (Ali et al., 2023). Furthermore, initiatives like the EBER chatbot leverage familiar media to engage elderly users, thereby reducing the digital divide and enhancing their information search capabilities (Garcia-Mendez et al., 2021). These technologies not only address functional needs but also promote social connections, ultimately improving the quality of life for these vulnerable populations (Jain et al., 2023; Qi & Wu, 2024).

Socially Assistive Robots (SARs) play a fundamental role in promoting social inclusion for people with disabilities (PWD) and older adults by enhancing their autonomy, facilitating social interactions, and addressing age-related barriers. Research indicates that older adults' acceptance of SARs is influenced by factors such as performance expectancy, robot self-efficacy, and digital belongingness, which can mitigate ageism and robot anxiety (L. Zhang, 2024). Furthermore, participatory design approaches that involve users in the development process have proven effective in tailoring SAR functionalities to meet the specific needs of older adults, thereby increasing long-term adherence and utility (Iglesias et al., 2024; Olatunji et al., 2024). Observational studies reveal that interactions with SARs can foster positive emotions and communication among elderly individuals, particularly in group settings, which enhances their social engagement (Rettinger et al., 2024). Additionally, the perceived sociability of robots correlates strongly with trust, further encouraging their use in daily activities (Kadylak et al., 2023). Overall, SARs represent a promising avenue for fostering social inclusion and improving the quality of life for PWD and older adults.

Moreover, the reliance on sociable robots and intelligent personal assistants can influence feelings of isolation among people with disabilities (PWD) and older adults. Socially assistive robots, such as the Paro seal robot, have been shown to enhance social interaction and improve mood, potentially alleviating feelings of loneliness in individuals with dementia

(Bevilacqua et al., 2023; Fardeau et al., 2023). During the COVID-19 pandemic, increased loneliness led to a greater willingness to engage with robots, suggesting that these technologies can serve as effective social partners for those feeling socially excluded (Penner & Eyssel, 2022). Furthermore, the acceptance of social robots is linked to perceived enjoyment and trustworthiness, which are central for fostering social connections (Fracasso et al., 2022). Overall, integrating these technologies into care practices may help mitigate isolation and enhance the quality of life for PWD and older adults (Miller, 2023).

Although AI technologies contribute to social inclusion, they also present challenges such as ethical concerns, user autonomy, and technological barriers. Addressing these issues requires interdisciplinary collaboration and user-centred design to maximize benefits for PWD and older adults. AI-driven hiring algorithms often perpetuate biases against older adults and persons with disabilities (PWD) by embedding ageist stereotypes and discriminatory practices within their design and data. These algorithms can reflect societal biases, leading to exclusionary outcomes that neglect the needs and experiences of older populations, a phenomenon termed AI ageism (Chu et al., 2022; Stypinska, 2023). Factors contributing to this bias include the use of biased datasets, the invisibility of older adults in AI discourses, and the lack of transparency in algorithmic decision-making (Kelan, 2024; Kelly-Lyth, 2021). To promote fairness and inclusion, it is essential to implement rigorous data protection assessments, ensure diverse stakeholder involvement in AI development, and adopt inclusive design principles that consider the varied needs of older adults and PWD (Boot, 2022).

Moreover, the integration of artificial intelligence (AI) into the labour market has profound implications for ableism, frequently exacerbating existing inequalities while simultaneously offering potential remedies. The impact is complex, encompassing issues of accessibility, bias, and disparities in digital skills. This response examines these dimensions, emphasising both the challenges and opportunities presented by digital technologies in addressing ableism. Digital technologies frequently overlook the needs of all users, resulting in exclusion, particularly for individuals with disabilities. The absence of inclusive design in mainstream technologies can exacerbate the digital divide, disadvantaging those with disabilities within the job market (Liddle, 2023). The notion of "data ableism" illustrates how technological advancements impose ability expectations that marginalised groups may struggle to meet, thereby entrenching their exclusion from digital spaces and opportunities (Charitsis & Lehtiniemi, 2023). AI systems, including those used for assessing professional skills, can exhibit biases that different sub-groups experience unequally. For example, AI employed in evaluating surgical skills has demonstrated biases that may unfairly influence the assessment of surgeons, poten-

tially impacting their career opportunities (Kiyasseh et al., 2023). Mitigating these biases is essential for ensuring equitable treatment across diverse groups. Strategies such as providing visual explanations for AI decisions can aid in reducing bias and enhancing system performance (Kiyasseh et al., 2023).

Nonetheless, Digital technologies also present opportunities for reducing ableism, to improve accessibility and inclusion. For instance, augmented reality applications that control prostheses can enhance the adaptability and acceptance of assistive devices, thereby supporting individuals with disabilities in the workplace (Sanchez-Rocamora et al., 2023). Occupational therapists play a decisive role in advocating for and designing inclusive technologies, which can help bridge the digital divide and promote occupational justice (Liddle, 2023). In this process, it is very important to pay attention to digital skill disparities. The transition to online job searching highlights the importance of digital skills. However, digital inequality means that not all individuals have equal access to these skills, potentially impeding job prospects for those with lower levels of digital literacy (Karaoglu et al., 2022). Digital technologies can perpetuate ableism by reinforcing existing inequalities, they also have the potential to foster greater inclusion if designed and implemented with thoughtfulness. Addressing digital skill disparities and ensuring inclusive design are critical steps in mitigating the adverse impacts of AI on ableism in the job market.

The incorporation of artificial intelligence (AI) within the labour market carries consequences for ageism, especially regarding older adults. These technologies have the potential to both exacerbate and alleviate age-related biases, thereby influencing employment opportunities and societal perceptions of older workers. AI systems frequently mirror societal biases, including ageism, due to the data on which they are trained. This can result in older adults being unfairly disadvantaged in employment contexts where AI is utilised for hiring and performance evaluations (Chu et al., 2022). Reinforcing existing cycles of injustice against older adults AI can perpetuate digital ageism (Chu et al., 2022). In this sense, the digital divide represents an obstacle for older adults, affecting their ability to engage with emerging technologies in the workplace. This divide is shaped by factors such as internet usage, self-efficacy, and social connectedness(J. R. Park & Feng, 2023). Machine learning models have been employed to predict and address the digital divide, highlighting the necessity for targeted interventions to enhance digital literacy among older adults (J. R. Park & Feng, 2023).

Despite the potential advantages of digital technologies, older adults often encounter reluctance and financial barriers to adoption. These challenges can restrict their participation in technology-driven job markets. Initiatives such as the Healthy Ageing Promotion Program for You (HAPPY) illustrate that with adequate support, older adults can improve their digital skills

and confidence, thereby potentially mitigating ageism within the job market (Ho & Merchant, 2022). But the transition towards automation and digital technologies can result in job displacement, disproportionately affecting older workers in routine-intensive occupations. This displacement can lead to elevated rates of unemployment, disability, and even mortality within this demographic. Research conducted in Norway highlights the long-term risks associated with technology-induced job loss, emphasising the need for policies that support older workers in transitioning to new roles (Bratsberg et al., 2022). In summary, AI pose challenges related to ageism, they also offer opportunities for empowerment if older adults receive the requisite resources and support. Addressing the digital divide and promoting inclusive technology adoption are central for mitigating age-related biases and enhancing the participation of older adults in the evolving job market.

To effectively enhance social inclusion for persons with disabilities (PWD) and older adults, critical concerns must be addressed, including accessibility, user-centred design, and the mitigation of biases in AI technologies. The digital divide remains a barrier, as many individuals face challenges in accessing and utilizing digital technologies, which can exacerbate exclusion (Liddle, 2023). Engaging marginalized populations in the design and implementation of AI systems is essential to ensure that these technologies meet their specific needs and do not perpetuate existing biases (Lillywhite & Wolbring, 2022) Furthermore, the development of intelligent personal assistant systems that can understand both structured and unstructured commands is vital for improving interaction with home appliances (Ali et al., 2023). Addressing data ableism is also vital, as it highlights the exclusion of individuals who do not meet certain digital ability expectations, thereby reinforcing marginalization (Charitsis & Lehtiniemi, 2023). Ultimately, fostering participatory approaches in technology design can lead to more inclusive solutions that empower PWD and older adults (Lima et al., 2022).

Table 4: Strategies to Bridge the Digital Divide

Strategies	*Description*
Improving Digital Literacy	Initiatives to enhance digital literacy among older adults are necessary. This includes providing training programs that focus on basic digital skills and the use of AI technologies (Corti et al., 2024; Martins Van Jaarsveld, 2020). Designing Inclusive Technologies: AI systems should be designed with the needs of older adults and PWD in mind, incorporating features like speech-based interfaces and explainable AI to improve usability and accessibility (Islam & Chaudhry, 2023).
Hybrid Solutions	Combining online and offline strategies can ensure that older adults are not excluded from digital services. This includes setting up support systems that facilitate both digital and in-person interactions (Xie et al., 2020). Addressing Intersectional Inequalities: Recognizing the intersectionality of multiple identities, such as race, gender, and social status, can help tailor interventions that address the specific needs of diverse groups within the older adult population (Liu, 2021).
Telemedicine and Health Equity	Implementing telemedicine with a focus on health equity can help reduce disparities in healthcare access for older adults and PWD (Samuels-Kalow et al., 2021).

Source: developed by the authors

The digital divide impacts the ability of persons with disabilities (PWD) and older adults to benefit from AI technologies. This divide is characterized by disparities in access to technology, digital literacy, and the ability to utilize digital tools effectively. Older adults, in particular, face challenges due to age-related biases in AI systems, which can perpetuate digital ageism and limit their engagement with technology (Chu et al., 2022). The COVID-19 pandemic has further highlighted these issues, as older adults have struggled to access digital solutions designed to mitigate the pandemic's effects, exacerbating social isolation and limiting access to healthcare (Martins Van Jaarsveld, 2020; Petrovčič et al., 2022). To bridge this gap, several strategies can be implemented, as presented on Table 4.

However, though these strategies offer pathways to reduce the digital divide, challenges remain. The persistence of social inequalities and the

rapid pace of technological advancement can hinder efforts to achieve digital inclusion. Moreover, the financial and infrastructural resources required to implement these solutions effectively are hurdles that need to be addressed (Charitsis & Lehtiniemi, 2023; Petrovčič et al., 2022). People with disabilities (PWD) and older adults face financial barriers in adopting AI technologies, primarily due to economic stress exacerbated by the COVID-19 pandemic. These barriers include high costs of technology, lack of financial support, and limited access to affordable digital resources, which contribute to their exclusion from the labour market (Chłoń-Domińczak & Holzer-Żelażewska, 2022; Liddle, 2023). The phenomenon of data ableism further marginalizes these groups, as they often do not meet the ability expectations set by digital norms, leading to discrimination in automated systems (Charitsis & Lehtiniemi, 2023). Additionally, older adults frequently encounter challenges related to digital skills and confidence, which hinder their engagement with technology (Kebede et al., 2022). The intersection of these financial and technological barriers not only limits their participation in the workforce but also perpetuates a cycle of economic disadvantage (Trainum et al., 2023). Addressing these issues requires targeted interventions to enhance digital literacy and accessibility (Liddle, 2023).

CONCLUSION

The primary objective of this study was to assess the impact of Artificial Intelligence (AI) on the social inclusion of people with disabilities (PWD) and older adults in the labor market, with a particular focus on both the opportunities and challenges presented by these technologies. The study's findings demonstrate that while AI and digital technologies offer significant potential benefits, such as enhanced accessibility, improved health monitoring, and the creation of new employment opportunities, they also present notable risks. These risks include the exacerbation of existing inequalities, especially through the digital divide and the perpetuation of biases within AI systems, which can reinforce discrimination, including ageism and ableism.

AI can play an important role in facilitating social inclusion by offering tools that improve autonomy and connectivity for PWD and older adults. Examples include intelligent personal assistants and socially assistive robots, which help reduce social isolation and enhance well-being. However, the successful deployment of these technologies depends heavily on inclusive design practices and their equitable implementation, ensuring that they do not disproportionately disadvantage vulnerable populations. Policymakers, technology developers, and community organizations must work together to guarantee that AI developments foster

equity and accessibility in a fair and balanced manner.

The findings of this study point to significant opportunities, such as AI's ability to improve accessibility and offer new avenues for employment for PWD and older adults. This includes flexible work arrangements and technologies that support independent living, health monitoring, and mental well-being. Technologies such as virtual assistants and wearable health devices have demonstrated their capacity to reduce social isolation and promote better physical and cognitive health for older adults. Furthermore, involving PWD and older adults in the co-design of these technologies ensures that their unique needs are considered, thus fostering greater social inclusion and engagement.

However, several challenges must be addressed. AI systems often reflect existing societal biases, such as ageism, which can disadvantage older adults and PWD in hiring processes and workplace technologies. The digital divide remains a significant barrier to full participation, as many individuals in these groups lack the digital literacy and access necessary to benefit from AI and other digital technologies. Ethical concerns surrounding AI, such as data privacy and the potential for surveillance, also raise issues regarding trust and adoption, especially among vulnerable populations.

This study acknowledges certain limitations. It is based on a narrative review of existing literature, which limits the ability to generalize the findings. Moreover, the rapidly evolving nature of AI technologies may influence the relevance of the study's conclusions over time. Additionally, much of the current research focuses on developed countries, leaving a gap in understanding how these technologies impact PWD and older adults in developing regions.

Future studies should adopt a longitudinal approach to examine the long-term effects of AI on PWD and older adults. This approach would provide deeper insights into how these technologies evolve and their lasting impact on social inclusion. There is also a need to explore the intersectionality of age, disability, race, and other social factors to gain a better understanding of how AI affects different demographic groups within the labour market. Such research could lead to more tailored and inclusive policy recommendations. Finally, further research should investigate the effectiveness of specific interventions, such as digital literacy programs and inclusive design initiatives, in mitigating the adverse impacts of AI on PWD and older adults.

In conclusion, while AI presents promising opportunities to enhance the social inclusion of PWD and older adults, it is essential to address issues such as digital ageism, the digital divide, and ethical concerns to ensure that these technologies contribute positively

to social equity and inclusion. A concerted effort by policymakers, technology developers, and community organizations will be necessary to prioritize inclusive design, bridge the digital divide, and enhance digital literacy, ultimately cultivating a more equitable labour market that includes PWD and older adults.

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