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Hired by Artificial Intelligence: Digital Inclusion Practices for People With Disabilities

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ABSTRACT

Artificial intelligence (AI) rapidly advances across various industries, including healthcare, finance, education, robotics, entertainment, and commerce. Human resource (HR) management plays a crucial role in AI, helping employees feel valued and creative. However, AI-powered systems often neglect the needs of people with disabilities, who often face barriers in digital environments. This paper aims to investigate digital inclusion practices for people with disabilities in AI-driven human resource management systems. It proposes a heuristic evaluation method for software accessibility assessment based on international standards. The objectives include researching best practices for digital workplace inclusion, studying international standards for software accessibility, and researching AI-powered recruitment systems. An experiment assessed the accessibility of color schemes for people with color blindness.

Keywords: accessibility; artificial intelligence; digital inclusion; heuristic evaluation; human resource management

INTRODUCTION

Digital inclusion is a critical aspect of ensuring equal access and opportunities for all individuals, regardless of their socioeconomic status, geographic location, or abilities. It promotes social equity by reducing disparities in access to information, education, healthcare, and employment opportunities, contributing to poverty reduction, and enabling marginalized communities to participate more fully in society. Promoting the progress of minority and underrepresented communities worldwide is crucial for fostering inclusive societies and sustainable development. These communities, including ethnic minorities, indigenous peoples, and persons with disabilities, often face systemic barriers that hinder their social, economic, and political participation, and in particular their inclusion in the work environment.

The World Health Organization highlights individuals with disabilities as a key population of interest within these underrepresented communities. According to the World Health Organization (2023), there are 1.3 billion people with some form of disability, or approximately 16% of the world's population. One of the problems faced by people with disabilities is related to social determinants, such as exclusion from the work environment leading to unemployment, as well as gaps in formal social support mechanisms. In response to the social inequalities that are created for people with disabilities, the United Nations together with the World Health Organization created the United Nations Disability Inclusion Strategy (UNDIS), which aims to promote "sustainable and transformative progress on disability inclusion through all pillars of work of the United Nations" (World Health Organization, 2023). The document includes indicators that specify the core areas of responsibility of the United Nations, one of which is employment and specifically promoting the development of human resources-related policies/strategies in organizations including provisions to attract, recruit, retain, and promote the career development of employees with disabilities (United Nations, 2023d).

It is a matter of legal discussion whether information and communication technologies should also comply with the regulations specifying the rights of people with disabilities in their inclusion in the social environment. For example, the European Commission defines a European Pillar of Social Rights to build a more inclusive and fairer European Union, set out in twenty key principles (European Commission, 2021). It has 3 main categories: "Equal opportunities and access to the labor market"; "Fair working conditions" and "Social protection and inclusion". Two of the key principles are "Inclusion of people with disabilities" and "Access to essential services", which include digital communications (European Commission, 2021). The Convention on the Rights of Persons with Disabilities defines through Art. 9 the right of citizens with disabilities to equal access to "information and communications, including information and communication systems and technologies and to all other facilities and services open or intended for the general public, both in urban and rural areas regions' (United Nations, 2023c). The cited documents are far from the only ones that direct the attention of businesses to the construction of "digital bridges" through which to overcome the digital divide with vulnerable groups of society. They are a starting point that companies can use to include underrepresented communities digitally. As stated in Art. 9, para. 2.h. of the Convention on the Rights of Persons with Disabilities, must be committed at an early stage of the design, development, production, and distribution of financially accessible information and communication technologies to be accessible to people with disabilities at minimum cost. To implement the digital inclusion of people with specific needs in practice, accessibility standards, and recommendations must be strictly followed. Also, the digital products and services developed must be tailored to the specifics of the software and/or hardware equipment that these groups of people use when working with computers or mobile devices.

The digital inclusion of people with disabilities at the organizational level is crucial to ensure that people with special needs are integrated throughout the organization, supported by relevant policies and strategies, and driven by senior management (Global System for Mobile Communications Association, 2020). The Global System for Mobile Communications Association (2020) recommends that disability inclusion becomes part of the business strategy, including setting targets and KPIs to ensure appropriate team focus on inclusion, accessibility, and awareness, together with clear accountability structures to ensure the achievement of the goals. It is also recommended that training be provided to staff, ideally through people with first-hand experience, on (examples): disability-inclusive practices; disability confidence; the different challenges and barriers faced by clients with different disabilities; and how to reach more and improve services for customers with different disabilities. All this has an impact on the formation of HR policies and practices. They should be reviewed to ensure that people with disabilities are employed and retained; have access to training and personal development; and have opportunities to be promoted in the workforce, to have people with disabilities represented at every level of the organization.

In this regard, accessible human resource management software, in particular, used for hiring purposes, is crucial for promoting inclusivity, ensuring legal compliance, fulfilling corporate social responsibility, and fostering talent acquisition and retention. It removes barriers to access for individuals with disabilities, attracting a diverse pool of candidates and fostering a culture of inclusivity. Accessibility also helps companies comply with legal requirements and avoid potential litigation related to discrimination. It also enhances the user experience, providing a competitive advantage and enhancing brand loyalty. Therefore, implementing accessible human resource management hiring software is essential for creating a more equitable and inclusive environment.

In this study, we investigated the digital inclusion practices for people with disabilities by applying artificial intelligence-driven human resource management systems. **The paper proposes** a heuristic evaluation method for software accessibility assessment based on international standards. This research follows the United Nations' sustainable development goals 8 and 10, and especially Target 8.5 and Target 10.2. Their aims are related to achieving full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value (United Nations, 2023a), as well as empowering and promoting the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status (United Nations, 2023b).

The objectives of this study are:

- research on best practices for digital workplace inclusion of disabled people;
- study of international standards for software accessibility;
- research on AI-powered recruitment systems and specifically inclusive practices for people with disabilities.

As part of the evaluation process, an experiment was conducted with the accessibility of the color scheme for people with color blindness of two recruitment software. The **expected results** are related to deriving an assessment of the accessibility of AI systems for employment.

The research method is based on the Analytic Hierarchy Process (AHP) used to prioritize and classify alternatives based on a set of criteria. It is supposed to define the research objective, identify criteria and alternatives, construct a hierarchical structure, conduct pairwise comparisons, calculate priority weights, consistency checking, aggregate, and rank the alternatives. The research method constructs a hierarchy representing the overall objective of this study – accessibility evaluation the criteria are formed. Priority weights are calculated, and consistency checks are performed to ensure consistency. Then it is used to derive overall scores or rankings for the evaluation criteria. All details related to the research method are given in the section "Method".

LITERATURE REVIEW

AI for Digital Inclusion of People with Disabilities in the Workplace

In an era of rapid technological advancement, the importance of artificial intelligence is having a transformative effect on changing industries, economies, and overall people's daily lives. Artificial intelligence is the intersection of computer science, mathematics, and engineering, where machines are given the ability to learn, "reason" and adapt, mimicking and in some cases surpassing human intelligence due to the ability to process large data in a unit of time using significant computing power (Syed et al., 2020; Stafie et al., 2023; Jain et al., 2023).

AI is already impacting the development of various sectors, not only the IT industry, such as healthcare, finance, education, media, and communications. Its ability to analyze large data sets (Stoyanova, Vasilev, and Cristescu, 2021) and extract meaningful insights catalyzes efficiency, unlocking new areas of productivity and creativity. For example, in healthcare, AI is analyzing vast sets of medical data, accelerating disease detection, predicting outbreaks, and customizing treatment plans with a once unimaginable precision (Sharma & Kumar, 2023; Kumar et al., 2023; Benjamins et. al., 2023). AI is increasingly crucial to the functioning of financial ecosystems too. It is involved in assessing and detecting fraud, optimizing investment strategies, and strengthening financial decision-making (Jain, 2023; Shiyyab et al., 2023; Stefanov et al., 2022).

Underrepresented communities can benefit from AI through increased promotion, reduced discrimination, lowered barriers to entry, and improved job prospects (Božić, 2023). Even in areas with inadequate infrastructure, AI-powered platforms have the potential to expand access to legal assistance, financial services, healthcare, and education (Bekbolatova et al., 2024). Through the analysis of huge data sets, AI can also detect and mitigate systemic biases by identifying patterns of inequality in financing, housing, and hiring practices (Y. Li & Xiang, 2024). AI-driven entrepreneurship and automation platforms can open up new economic doors for marginalized communities (Ghauri et al., 2022) by promoting skill development, employment accessibility, and competitiveness in the digital economy. AI may also use data-driven insights to magnify the voices of underrepresented groups. AI can improve people with disabilities' communication, independence, and accessibility. People with limited mobility or vision problems can benefit from assistive technology such as speech-to-text software and voice recognition (Semary et al., 2024). While robotic assistive technologies can help with mobility, real-time communication can be more easily accessed with the help of AI-powered captioning and transcription services (Zdravkova et al., 2022). AI-powered smart home appliances might encourage increased autonomy by giving people with impairments greater advances over routine tasks (Chin et al., 2023).

Artificial Intelligence has the potential to improve augmentative and alternative communication technologies (Sennott et al., 2019), while Natural Language Processing can reduce complicated language and transform voice into more accessible formats (Shukla et al., 2023). The educational landscape is also undergoing a metamorphosis with the widespread adoption of AI, changing the teaching paradigm as well as collaborative teacher-student learning, intelligent tutoring systems, and personalized learning (Kamalov et al., 2023). AI is also used in automating existing educational assumptions and practices (Holmes et al., 2023). AI-based software can collect data on students' needs and identify helpful tools and strategies for them, making it more efficient than traditional teaching methods (Panjwani-Charani and Zhai, in press). This technology can also quickly adapt materials for students with different needs, saving time and effort. On the other hand, AI systems can perpetuate biases in education, potentially disadvantaging certain socio-economic groups and exacerbating existing inequities due to limited access to AI-based tools (Roy and Paul, 2023). Some ethical considerations surrounding AI's use in formative assessment have gained significant attention too, particularly in detecting gaps between the actual knowledge and the demonstrated one (Bedizel, 2023).

In the manufacturing sector interest in smart factories is growing which use AI as well to optimize production processes, reduce downtime, and ensure unparalleled precision in the creation of goods (Yao et al., 2017). It also finds application in adapting abstractly modelled planning domains to the characteristics of individual application cases (Heuss et al., 2023). AI revolutionizes manufacturing by developing intelligent machines, improving efficiency, reducing costs, and enhancing quality control (Balasubramanian, 2023). It also aids in predictive maintenance, identifying and addressing issues before they cause problems. AI integration in manufacturing faces challenges like data quality, interpretability, knowledge transfer, black-box nature, and safety-critical environments (Akhtar, 2024). The author states that the conservative industry, high-reliability requirements, and lack of IT expertise hinder widespread adoption.

Regardless of the advantages and disadvantages of using AI in each industry, there is one intersection where we see a research gap - the development of the human factor. Organizations are also using AI to improve human resource management (HRM), redefining HR experts' strategic roles and altering long-standing practices. AI is integrated into human resource management to automate time-consuming and repetitive tasks in the selection and recruitment of personnel when processing large data sets to improve efficiency, accuracy, and productivity (Abbot, 2023; Trivella, 2023). For example, according to research by Gartner, 76% of HR leaders believe that if organizations do not integrate AI solutions in HR management, they will experience a delay in success compared to those who have already integrated (Gartner, 2023). According to another study, 68% of hirers said they were "very hopeful" or "cautiously optimistic" about the impact of AI solutions on recruiting and how it can save them time (LinkedIn Talent Solutions, 2023). According to Gartner (2023), 52% of HR leaders are already investigating the potential problems that may arise in terms of data privacy, bias, and ethical concerns when applying AI in human resource management practices.

AI is also improving onboarding processes—for example, by automating tasks like running background checks, collecting benefits documents, and creating offer letter templates. AI in the hiring process can also help organize, print, and deliver all onboarding paperwork (Trivella, 2023). Personalized learning platforms and assistive technologies can be used to meet the needs of employees with disabilities, making onboarding materials and training sessions more accessible (Zamiri & Esmaeili, 2024). The same can be said for training documents—another time-consuming task when the HR team has to do it manually. Instead, AI-powered tools can ensure that all new employees receive copies of the documentation that describes company policies and sign-in information (Trivella, 2023). AI systems can also be used in recruiting candidates, who are virtually assigned some of the tasks of the potential position.

Some experts like Glen Cathy, a leader in recruiting and human resources technology, are certain that AI will disrupt the job market in all industries, and while it can help reach potential candidates, he believes that the involvement of the human factor is still important (Cathey, 2023). According to the specialist, the perception of candidates is different when they are faced with a human being who listens to them and shows interest than when they are faced with a robot. For example, Krasimira Karadzhova - a member of the management board of the Bulgarian Association for People

Management and a long-time HR specialist and manager, shared at an international scientific conference on human resources management that AI solutions have entered so actively into the practice of some companies during recruitment and selection of process that applicants' documents are not checked by a person, which hides the risk that qualified candidates are not selected because they have not structured their resumes following the structure of job advertisements (University of Economics – Varna, 2023). The specialist also expresses concern that to save time when processing applications, not a few HR specialists use unregulated AI solutions in their practice, which leads to the violation of personal data protection policies.

The opinions of specialists are divergent - from the full support of AI due to automation of often repeating labor-intensive and time-consuming tasks to complete denial due to displacement of the human factor from the workplace and its replacement by robotic solutions. For example, Trivella (2023) states in his article that 46% of companies face quite a few challenges in finding and attracting the right candidates for their open positions, including scanning resumes for specific traits. According to the data Trivella reports, the AI abstracts from applicant characteristics such as gender, for example, and other identifying information and makes decisions devoid of emotion and based solely on algorithms.

Companies wishing to employ people with disabilities face barriers that often make it almost impossible to provide not only an accessible workplace but adequate employment in general. Public employment services play a key role in many countries in matching companies with jobseekers, but often these services do not effectively cover disabled jobseekers. In addition to public employment services, in many countries, there are special services provided by non-profit organizations that offer employment for people with disabilities (International Labour Organization, 2023).

On the other hand, this type of automation of HR activities can lead to a negative opinion of the candidates about the companies. As CareerBuilder points out, 58% of candidates have a negative opinion of a company if they never get a response to their job application (CareerBuilder, 2015), which can be caused by their resumes not meeting the AI algorithms for recruiting and selecting candidates.

As the literature review above states, AI can significantly improve human resources practices by making them more inclusive and accessible for individuals with disabilities. By integrating AI-driven tools into HR processes, organizations can create a more equitable workplace, offering better opportunities for hiring, retention, and support for disabled employees (Organisation for Economic Co-operation and Development, 2023). AI can help mitigate unconscious bias in recruitment by focusing on candidates' skills and qualifications rather than personal characteristics. It can also improve job matching by analyzing job descriptions and candidates' profiles to match individuals with disabilities to positions that fit their skills and needs (Okatta et al., 2024). AI-driven chatbots or virtual assistants can guide applicants with disabilities through job applications, assisting with filling out forms, scheduling interviews, and answering questions in real-time (Albassam, 2023). AI-driven performance analytics can inclusively track employee performance, ensuring that evaluations are based on objective measures rather than subjective biases (Nyathani, 2023). Tailored career development plans can be created for employees with disabilities, promoting career advancement and long-term engagement. AI can also promote diversity and inclusion by analyzing communication patterns within the organization to detect potential biases or exclusionary language, fostering a workplace culture that is more welcoming for people with disabilities (Dwi & Hidayatullah, 2024). AI-powered productivity tools enable employees with disabilities to work remotely while maintaining a high workload (Rožman et al., 2023). Task delegation tools help distribute tasks based on each employee's strengths and workload capacity, making remote work accessible to all. People with persistent illnesses or disabilities can have more freedom thanks to personalized health monitoring devices that can measure vital signs and notify caretakers (Peyroteo et al., 2021). Health and well-being monitoring can be achieved through predictive analytics for health monitoring, which can predict when an employee might need additional support or medical leave (Alowais et al., 2023). AI chatbots and mental health platforms can provide immediate support for employees with disabilities (Balcombe, 2023), particularly those experiencing mental health challenges related to their condition.

Each of the listed advantages of AI human resource management systems is also indisputable from the point of view of HR professionals who have to process huge amounts of documentation when selecting candidates, conducting interviews, and hiring people. But there is also another point of view - of people with special needs, who often remain outside the labor market, especially in developing countries, mainly due to the presence of barriers - physical and digital. A completely possible scenario in recruitment and selection of personnel is that potential candidates with disabilities remain outside the circle of the selected due to the lack of accessibility of the AI tools with which they would have to send their resumes or conduct an employment interview. Despite the potential benefits, there are some challenges in ensuring that AI-driven HRM systems are fully inclusive for people with disabilities. For example, inaccessible interfaces, limited customization, and decision-making transparency are common issues which may not meet the specific needs of different disabilities. Additionally, AI systems often operate as "black boxes," making it difficult for candidates with disabilities to understand the decision-making process (Min, 2023). This lack of transparency can also make it difficult to appeal unfair rejections (Tsamados et al., 2021). Cognitive load can also be a challenge for individuals with cognitive disabilities, as navigating complex AI systems can be particularly difficult (Almufareh et al., 2023). Assessment challenges may not accommodate diverse skills and abilities, potentially leading to inaccurate evaluations. Additionally, HR personnel and hiring managers may not be adequately trained to understand the challenges faced by candidates with disabilities, leading to unintentional bias in how AI tools are utilized.

International Standards for Software Accessibility

Several main international organizations deal with the standardization of recommendations and guidelines for ensuring digital accessibility - the World Wide Web Consortium (W3C), the European Telecommunications Standards Institute (ETSI), and the International Organization for Standardization (ISO). Standards are essential to ensure accessible jobs for people with special needs. Table 1 contains a summary of international accessibility standards and guidelines, noting which user groups they target and whether they contain a formal method for assessing the accessibility of software.

Table 1 includes a non-exhaustive list of all existing standards and guidelines worldwide. Some countries maintain their accessibility policies at the national level. These are US Government Section 508 and ADA Standards for Accessible Design, Japanese Accessibility Standard JIS X 8341, Nordic Ministerial Council Guidelines for Computer Accessibility, Spanish Accessibility Standards UNE 139801 and UNE 139804, PAS 78: Guide to Good Practice in Commissioning accessible websites in the UK, Référentiel Général d'Accessibilité pour les Administrations (RGAA) in France, etc. They are applicable at the local level but are nevertheless based on international frameworks. Most of the standards and guides in Table 1 are aimed at a broad group of users to be as useful as possible to the general audience.

Table 1:
Accessibility Standards and Guidelines

Standard/ Guideline	Last version	Issuer*	Formal method	Target user group
WCAG 2.1	2018	W3C	No	sensory, cognitive, motor, speech disabilities
UAAG 2.0	2015	W3C	No	sensory, cognitive, motor, speech disabilities
ATAG 2.0	2015	W3C	No	auditory, cognitive, neurological, physical, speech, and visual disabilities
ISO 9241-171	2008	ISO	No	physical, sensory and cognitive impairments, elderly people, people with temporary disabilities
ISO/IEC 24751-1	2008	ISO	No	learners with disabilities and anyone in a disabling context
ISO/IEC Guide 71	2014	ISO	Yes,	older persons, children and persons with disabilities
ISO/IEC 30071-1	2019	partial		users with disabilities and older people
ISO/IEC 40500	2019	ISO	No	users with disabilities and older people
ETSI EG 202 116	2009	ISO	No	sensory, cognitive, motor, speech disabilities, allergies
ETSI ES 202 975	2015	ETSI	No	sensory, cognitive, motor, speech disabilities
EN 301 549	2021	ETSI	No	users with disabilities and older people
ETSI ES 200 381 – Parts 1 and 2	2012	ETSI, CEN, CENELEC	No	hearing impaired people

** Note. ISO - International Organization for Standardization, W3C - World Wide Web Consortium, ETSI - European Telecommunications Standards Institute, CEN - European Committee for Standardization.*

European accessibility standards are based on the Design for All approach, the main one of which is EN 301 549, which addresses the accessibility of information and communication technological products and services (European Commission, 2022). Only standard ISO/IEC 24751-1 targets learners with disabilities, while the others cover people with sensory, cognitive, motor, and speech disabilities as well as adult users (ISO, 2008b). ISO/IEC 71 is a standard development guide that contains basic accessibility principles adopted by other International Organization for Standardization's standards (ISO, 2014). A disadvantage of the standards is that they are updated at least every 5 years, and some even less often, which makes them outdated given the rapid development of information and technology.

Most standards support a variety of software and services, with WCAG serving web applications with the ability to adapt to mobile devices as well. The User Agent Accessibility Guidelines (UAAG) 2.0 targets user agents, while the Authoring Tool Accessibility Guidelines (ATAG) 2.0 targets "web-based or non-web-based applications that can be used by authors (alone or collaboratively) to create or modify web content for use by other people' (W3C, 2015a) or these are so-called 'authoring tools'. W3C standards and guidelines work with three levels of accessibility - level A, AA, or AAA and provide specific guidelines for the technical implementation of applications. In general, the International Organization for Standardization's standards provide general guidelines for improving digital accessibility, without the technical details of providing it. The exception is ISO 9241-171, which includes guidelines and practical examples for designing accessible software (ISO, 2008a). ISO/IEC 40500 endorsed WCAG 2.0 which is the same as the W3C guidelines (ISO, 2019b).

The European Telecommunications Standards Institute's standards are also aimed at multi-platform digital accessibility, as well as providing recommendations for optimizing the functionality, content, and vision of information and communication technological products and services for people with various disabilities. These standards maintain compatibility with ISO and W3C standards and guidelines. The European Telecommunications Standards Institute's standards do not offer a formal approach to accessibility assessment, but refer to ISO/IEC 17007:2009 "Conformity assessment — Guidance for the preparation of normative documents suitable for use in conformity assessment". The latter is aimed at evaluating regulatory documents, but its principles and recommendations can be adapted to software design as well.

However, it has raised concerns about potential discrimination against minority groups, particularly under regulations like the Americans with Disabilities Act and guidelines from the U.S. Equal Employment Opportunity Commission (2009). Discriminatory implications include bias in algorithms, opaque decision-making, and failure to accommodate disabilities (U.S. Equal Employment Opportunity Commission, 2022). To mitigate these risks, the same source states that organizations are adopting algorithmic audits, inclusive data practices, and human oversight. Regular audits help organizations understand and address biases in their AI systems before they lead to discriminatory practices (Murikah et al., 2024). Inclusive data practices involve incorporating diverse and representative training datasets to combat bias in AI algorithms (Chen, 2023). Human oversight is also advocated, as AI assessments should align with anti-discrimination laws (Chen, 2023).

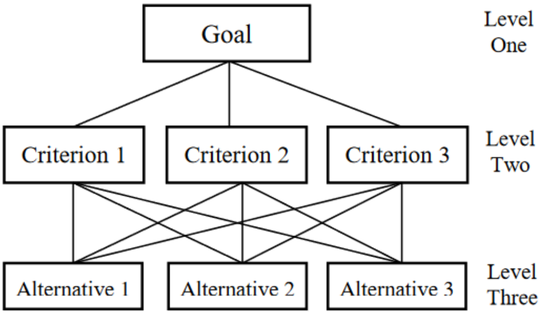
Critics argue that current approaches are limited by the evolving regulatory landscape, leading to gaps in oversight. Existing laws may not adequately account for the unique challenges posed by AI technologies, necessitating new frameworks specifically addressing AI (Sharma & Rozenshtein, 2024; Zaidan & Ibrahim, 2024). Additionally, the potential for new biases is a concern, as algorithms can develop new forms of discrimination based on how data is interpreted. Implementation challenges may also arise, particularly in large-scale HR operations (Dewar, 2024). Based on accessibility standards and guidelines we can suggest that they do not include a formal method for evaluating software products. There is a need to formulate accessibility evaluation criteria to serve in the evaluation of AI-powered systems.

RESEARCH METHOD

Instrument

Multi-criteria decision-making using the Analytic Hierarchy Process (AHP) has been conducted. It is a decision-making system with multiple criteria based on a hierarchical principle. Alternatives to the formulated criteria are formed and at each step, a nominal value is determined by creating a matrix of pairwise comparison judgment (Taherdoost, 2017). The method is carried out in three stages - determining hierarchy, setting priority and forming consistency. The hierarchy consists of goals, criteria, and alternative solutions to the problem (Figure 1). The priority of the formed pairs of criteria is between 1 and 9, with 1 meaning equal priority, 3 meaning gently prefer one element over another, and 9 meaning completely prefer (Siekelova et al., 2021). In this paper, we apply the AHP method as a proven effective method for multi-criteria decision-making.

Figure 1
Sample Hierarchical Tree (Taherdoost, 2017)



Setting priorities for the hierarchy using paired comparisons of each factor. It formed a comparison matrix with calculated weights, ranked eigenvalues, and consistency measures (index and ratio). The consistency index (CI) is calculated as (Beiragh, 2020; Czekster, 2019; Ilunga, 2015):

$$CI = \frac{\gamma_{max} - n}{n - 1}$$

where γ_{max} is the maximum eigenvalue of the comparison matrix.

The consistency ratio (CR) is calculated as (Beiragh, 2020; Czekster, 2019; Ilunga, 2015): where RI is a random consistency index.

$$CR = \frac{100\% * CI}{RI}$$

Design

We suggest 14 evaluation criteria (Table 2), based on our previous research (Nacheva, 2022) and studies of other authors (Martínez, Turró, Saltiveri, 2021). We propose that the criteria be divided into three groups: Sensory characteristics, Cognitive features, and Technical issues. Sensory comfort is associated with the use of appropriate shapes, sounds, positioning, orientation, sound, color, and size of graphical user interface elements. When considering software accessibility, interface elements cannot rely solely on spatial relationships, size, position, color, or sound. Some users with disabilities cannot perceive visual information, necessitating the provision of additional information to clarify anything that depends on the information.

The accessibility assessment criteria of the first group of **sensory characteristics** include a color scheme suitable for color blindness;

background and text contrast; ability to resize text; use of readable titles and labels; support for keyboard shortcuts for alternative access to content; gesture support on mobile devices; mouse pointer focus visibility via keyboard shortcut or as a permanent setting. Users with special needs may have impairments in cognitive functions, such as the areas of perception, memory, learning, attention, decision-making, and language abilities. Individuals' information processing ability is also related to mental speed - an essential characteristic of cognitive functioning. Examples of cognitive disabilities include conditions such as aphasia, autism, attention deficit disorder, dyslexia, dyscalculia, and memory loss.

Appropriate criteria for assessing accessibility in the **cognitive features** group are visibility and transparency of the system status; application of expected patterns and behavior of the software (following a typical user flow for the respective type of software); user control and freedom in adapting the software to the specific needs of users; consistency with imposed real-world conventions and international standards. Many people with disabilities face barriers to accessing the assistive technologies they need due to high costs, limited availability, lack of awareness, and inadequate training and support from government institutions or non-governmental organizations.

In the last group of **technical issues**, we offer the following criteria for assessing accessibility support for a multilingual user interface; assistive technology support according to the disability group; and productivity when operating machines with low technical parameters.

After applying the AHP method, several comparisons of the criteria were 91, and the consistency Ratio CR = 9.7%. The principal eigenvalue is 15.972 and the eigenvector solution is dome within 5 iterations and delta = 7.1E-8. These are the resulting weights for the criteria based on your pairwise comparisons.

The highest priority of the listed evaluation criteria is: Color - Blindness Friendly Color Scheme; Consistency and Standard; Assistive Technologies Support. Considering the suggested accessibility evaluation criteria, we suggest using local levels of support for each of the criteria, from 0 to 2, to calculate whether or not the software fulfils the criterion. Zero stands for non-fulfilment of the criterion, 1 - for weak fulfilment, and 2 - for fully meeting the criterion. The scores for each tool are obtained as the sum of the products of the criteria's priorities and their level of support equated to a base of 100.

Table 2:
AHP Ranking of Evaluation Criteria

Evaluation Criteria	Priority	Rank	(+)	(-)
Color -Blindness Friendly Color Scheme	9.0%	3	6.0%	6.0%
Contrast	2.1%	12	1.1%	1.1%
Text Resize	1.9%	13	1.0%	1.0%
Headings and Labels	1.6%	14	0.9%	0.9%
Keyboard Shortcuts	4.9%	6	2.9%	2.9%
Gestures Support	4.3%	9	1.8%	1.8%
Visible Focus	3.1%	10	1.5%	1.5%
Status visibility and transparency	5.5%	5	3.0%	3.0%
Expected Patterns & Behaviors	4.8%	7	2.6%	2.6%
User Control & Freedom	6.3%	4	3.4%	3.4%
Consistency and Standard	26.5%	1	13.1%	13.1%
Multilingual User Interface (UI) Support	2.8%	11	1.4%	1.4%
Assistive Technologies Support	22.5%	2	11.9%	11.9%
Performance	4.7%	8	2.5%	2.5%

RESULTS

AI-powered HR tools can be grouped into three categories: talent acquisition and recruitment, employee onboarding and training, and performance management and employee engagement tools. To choose the best AI HR management tool, HR professionals should evaluate the core organizational needs, integration capabilities with other company systems, ease of use, scalability, customization, data security, vendor reputation, user reviews, and the ability to conduct demonstrations. This ensures software is compliant and maximizes efficiency. Such AI HR tools are IBM Watson Talent Acquisition, Oracle HCM Cloud, Workday Human Capital Management, Lever, Greenhouse, SmartRecruiters, Manatal, Sloneek, Loxo, and more. Most of the ones listed offer testing after explicitly requesting a demo, free online registration is not provided. We have used Manatal and Sloneek for testing our evaluation criteria because they suggest free trials without preliminary demo booking. The two software were selected to test the proposed estimation method to see if the approach would be useful in practice.

Table 3 contains the results of the evaluation of the two HR tools according to the criteria defined by us.

Table 3:
Comparison of Evaluation Results

Evaluation Criteria	Priority	Manatal		Sloneek	
		Level	Points	Level	Points
Color -Blindness Friendly Color Scheme	0,090	0	0	0	0
Contrast	0,021	2	0,042	2	0,042
Text Resize	0,019	0	0	0	0
Headings and Labels	0,016	2	0,032	2	0,032
Keyboard Shortcuts	0,049	0	0	1	0,049
Gestures Support	0,043	2	0,086	2	0,086
Visible Focus	0,031	1	0,031	1	0,031
Status visibility and transparency	0,055	2	0,11	2	0,11
Expected Patterns & Behaviors	0,048	2	0,096	2	0,096
User Control & Freedom	0,063	2	0,126	2	0,126
Consistency and Standard	0,265	2	0,53	2	0,53
Multilingual User Interface (UI) Support	0,028	0	0	0	0
Assistive Technologies Support	0,225	1	0,225	1	0,225
Performance	0,047			1	0,047
		Total points	66.25		68.7

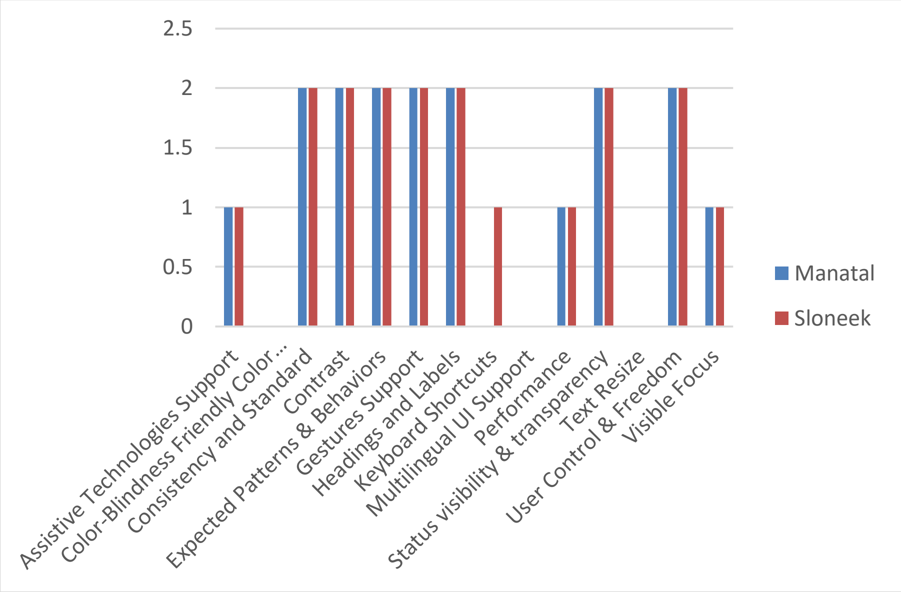
The labels on both systems are informative enough to guide users to the purpose of menus and functions. Text resizers or other user interface accessibility tools are not supported in either software. To better visualize the results, in Figure 2 expert assessments of accessibility levels are shown graphically. It can be seen that according to most of the evaluation criteria proposed in this paper, both tools are rated with maximum marks.

Table 3 compares Manatal and Sloneek, AI-driven HR systems, focusing on accessibility, user experience, and technical performance. Manatal scored 66.25 points, while Sloneek scored slightly higher at 68.7. Both systems are generally comparable, with Sloneek having a slight edge in user experience and accessibility. We have assessed that they partially or do not support only some of the criteria. These are related to color scheme accessibility, keyboard shortcut support, performance, text resizing, and visible focus. Their scores in accessibility features for Color-Blindness

Friendly Color Scheme are 0 points, with neither offering a color scheme that caters to color-blind users. This is a significant omission, as it impacts HR personnel and job applicants who may have difficulty distinguishing between colours used in buttons, icons, or status indicators.

Figure 2

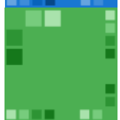
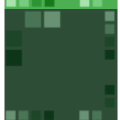
Comparison of rating levels of evaluation criteria



The colour schemes were tested by using Paletton.com's color blindness simulation. A deuteranomaly color blindness simulation was selected. According to Fakorede et al. (2022) deuteranomaly affects 5% of Northern European males and 0.35% of females, while worldwide, red-green color vision deficiencies affect 8% of males and 0.5% of females due to the X-linked inheritance pattern, with males having only one X chromosome. Manatal's color scheme uses one main color - blue (#1977D2), and supporting color green (#4caf50; #2E4D36), grey (#424242; #9E9E9E), orange (#F39100) and their nuances. In Table 4 a deuteranomaly simulation is included that is compared with the original colors from the color scheme.

The color blindness simulation of Manatal's color scheme reveals some challenges for users with deuteranomaly. The blue color retains its distinguishable status but appears muted, making it useful for actionable elements. The green color loses vibrancy and blends into the background, creating confusion for users. The dark green color becomes greyish, reducing visibility and impacting navigation.

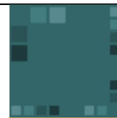
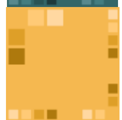
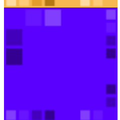
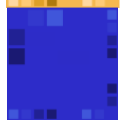
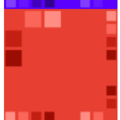
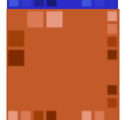
Table 4:
Color blindness simulation of Manatal's color scheme

Color code	Original color	Deuteranomaly simulation
#1977D2		
#4caf50		
#2E4D36		
#F39100		

The orange color becomes dull, diminishing its effectiveness as an attention-grabbing color. This alteration in color perception highlights the need for a more accessible color scheme. Users with deuteranomaly may struggle to complete tasks effectively if essential information is encoded in colors that do not contrast well for them. Recommendations include incorporating patterns and textures, adjusting the color palette, and engaging individuals with color blindness in usability testing. By adopting a more inclusive design approach, Manatal can enhance the user experience for all applicants, particularly those with color vision deficiencies.

Sloneek's main color for the UI is grey (#f2f2f2). There are UI elements in purple (#341258), green (#006e66), orange (#f7b851), blue (#5A00FF), and red (#E73F32). In Table 5 a deuteranomaly simulation is included that is compared with the original colors.

Table 5:
Color blindness simulation of Sloneek's color scheme

Color code	Original color	Deuteranomaly simulation
#006e66		
# f7b851		
#5a00ff		
#e73f32		
#341258		

The Sloneek's color scheme under deuteranomaly conditions reveals some accessibility challenges like Manatal. The color scheme of Sloneek could hinder the user experience for individuals with color vision deficiencies. The teal color remains distinguishable but may appear less saturated, while the yellow-orange color becomes dull and less effective in drawing attention to important elements. The purple color is lightened, making it less distinctive against certain backgrounds, and the red color maintains some distinctiveness but could blend in with similar tones, making it less effective for conveying urgent notifications. The dark purple color shifts to a greyish hue, making it difficult for users to interact with elements. We can suggest that improvements include enhanced contrast, avoiding sole reliance on color, and user testing with diverse groups to gain insights into usability issues and validate the effectiveness of the color scheme. By implementing these strategies, Sloneek can create a more inclusive platform, benefiting users with color blindness and contributing to a better overall user experience for all applicants, reinforcing the organization's commitment to diversity and inclusion.

Overall, the color schemes of both software are characterized by predominant grey and blue colors that do not change after simulation. Since color cannot be the only UI element that serves to communicate with users, the elements of both software mostly include icons to guide users to the purpose of the given element. Another weakness is that both systems scored 0 points for text resizing too, which could negatively affect users with visual impairments. Keyboard shortcuts in Sloneek made the platform more accessible for individuals with motor disabilities or those who prefer keyboard navigation. Both systems scored well in gesture support, accommodating a broader range of user preferences, especially for HR teams on the go or applicants accessing the system via mobile devices. However, they scored 1 point in assistive technologies support, which is critical for users with disabilities. Enhancing support for assistive technologies could provide significant benefits for HR personnel and applicants with disabilities. Both systems do not rely on additional software or hardware support for accessibility, but only on the built-in assistive technologies means of reading the screen and synthesizing speech, which is important for blind users. On the other hand, both systems support icons that conform to imposed conventions in the real world. The labels and instructions on both are also short, clear, and informative. The interface of both systems is maintained in English, which makes them unusable for non-native users.

Both Manatal and Sloneek systems scored 2 points in usability and user control, with clear headings and labels for easy navigation. They also scored 2 points in user control and freedom, allowing users to undo actions and navigate freely. Both systems followed standard patterns and behaviors, making the platform intuitive and easier to use. Consistency and standard were scored 2 points, indicating that they adhere to consistent design principles and functionality throughout the user experience. These features help HR teams and applicants find relevant information quickly and minimize confusion and errors. Overall, both systems provide a user-friendly and efficient platform.

Both Manatal and Sloneek platforms scored 2 points for status visibility and transparency, providing clear updates on application statuses for HR personnel and applicants. However, they did not offer multilingual UI support, which could limit inclusivity for non-native speakers. Despite this, both systems scored 1 point for performance, indicating efficiency and responsiveness. This ensures tasks are completed without lag or delays, and applicants can enjoy a fast and reliable application process.

Therefore, if we equate the points to a maximum base of 100, then both systems have approximately the same accessibility - slightly above average (taking 50% of the maximum points as the average base). Manatal and Sloneek are AI-driven human resource management systems that offer user control, transparency, and consistent design. Manatal is user-friendly due to its consistency, standard behaviors, and status visibility. However, it lacks essential accessibility features like color-blindness support, text resizing, and keyboard shortcuts, making it difficult for users with disabilities to fully engage with the platform. Sloneek has a slight edge over Manatal due to keyboard shortcuts and overall performance, making it more accessible and efficient. Both systems need to improve their accessibility features, particularly in color-blindness support, text resizing, and multilingual support, to create a more inclusive hiring process for people with disabilities.

On this basis, we can summarize that AI-driven human resource management systems have the potential to enhance digital inclusion for people with disabilities, making the hiring process more accessible, equitable, and efficient. The Analytic Hierarchy Process-based evaluation method that we proposed and applied in this paper is a structured approach used to assess AI-driven hiring systems. It provides a systematic framework for assessing various criteria, guiding HR professionals and organizations towards better hiring practices. Key evaluation criteria include color-blindness support, consistency and standard, and assistive technologies support. These criteria are crucial for ensuring accessibility, fairness, and overall effectiveness in the hiring process. The evaluation method facilitates informed decision-making by identifying which systems align best with accessibility goals. By prioritizing features that support applicants with disabilities, companies can create a more equitable hiring process and attract a broader talent pool. This continuous assessment fosters innovation and enhancements within AI-driven hiring technologies.

DISCUSSION AND CONCLUSIONS

The integration of artificial intelligence into human resource management could enhance digital inclusion. AI can improve recruitment processes by reducing biases and promoting diversity, identifying and eliminating biased language in job descriptions and candidate screening. It can also assist in skill-based transitions for employees by providing personalized career path suggestions and learning opportunities based on individual skill profiles. AI-driven human resource management systems can improve accessibility for employees with disabilities by creating accessible training materials and support systems. AI also plays a vital role in promoting digital equity by providing tools for digital navigators and inclusion practitioners. The symbiotic relationship between AI and human resource management is essential for fostering a digitally inclusive workplace where all individuals can thrive.

AI facilitates seamless onboarding for new hires. Chatbots and virtual assistants equipped with natural language processing capabilities provide immediate responses to queries, easing the transition. AI-driven tools also measure employee mood, offering analytics that infer analytics to improve engagement strategies and foster a positive workplace culture. By analyzing employee data, AI algorithms provide real-time feedback, identify skill gaps, and recommend personalized training paths. This not only promotes professional development but also aligns individual goals with organizational goals. On the other hand, AI HR tools can leave people with various disabilities out of reach for organizations due to poor accessibility.

In response to the set objectives of this research, we investigated best practices for digital workplace inclusion of disabled people and international standards for software accessibility for users with disabilities and older people. After analysis, we found that the standards do not offer a formal method for assessing the accessibility of software, including AI-powered systems. We also concluded that HR policies and practices of companies should be reviewed to ensure that people with disabilities are employed and retained when using AI-powered systems, the accessibility of which is still weak. As a result of our research, we proposed a multi-criteria decision-making method based on the Analytic Hierarchy Process for evaluating the accessibility of software systems applied to AI HR tools. The results of the evaluation of the two HR tools show that they partially support the priority criteria. This shows that AI systems are still being perfected and need to be adapted to the needs not only of HR specialists but also of employed persons with disabilities so that there are no prerequisites for discrimination or exclusion of persons. The evaluation method uses local levels of support (0 to 2) to provide quantifiable metrics to evaluate how well the software fulfils each criterion. This allows for a clear comparison between different systems, aiding HR professionals in selecting tools that best meet their needs and the needs of their applicants. The scoring system also facilitates accountability, as organizations can track the effectiveness of their chosen systems over time. The Analytic Hierarchy Process ranking of accessibility criteria is invaluable for assessing AI-driven hiring systems. By emphasizing key areas such as colour-blindness support, consistency, and assistive technologies, organizations can create a more inclusive hiring process that benefits both HR personnel and applicants. This structured evaluation framework promotes fairness, leads to a more equitable and accessible hiring landscape, and emphasizes the importance of quantifiable metrics and continuous improvement.

However, challenges include algorithmic bias, over-reliance on automation, lack of customization, and cost and technical challenges. Algorithmic bias can be unintentionally reinforced by AI systems not trained on diverse datasets, leading to atypical work histories or communication styles. Over-reliance on automation may lead to dehumanization, as candidates with disabilities may feel alienated or disadvantaged. Customization is also a challenge, as AI systems that cannot adapt may hinder rather than help. Cost and technical challenges may also pose challenges for smaller companies. Despite these challenges, AI can empower individuals with disabilities to fully participate in the workforce, but organizations must prioritize accessibility, transparency, and fairness when designing and implementing these systems.

The future scope of research is to expand the scope of research by investigating a wider range of AI systems used in HR processes. This will give a more detailed insight into the state of these systems in terms of the implementation of good practices for digital inclusion of people with disabilities. By adopting and promoting digital inclusion practices for disability communities, organizations and governments can work to create a more inclusive digital society where everyone has the opportunity to access a workplace and develop in a field.

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