

Metaverse-Based Simulation For Accessible Job Application Processes Among Women With Visual Impairments

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Abstract— Women with visual impairments (VI) continue to face persistent discrimination and structural barriers to employment, reflected in high inactivity rates and limited access to equitable recruitment processes. Negative employer perceptions, inaccessible information, ineffective communication practices, and poorly adapted physical environments contribute to systematic exclusion. A four-stage methodological framework was implemented. First, a multidimensional contextual analysis was conducted, considering age and educational level. Second, statistical analyses were performed to identify significant associations. Third, a metaverse-based process model was designed to support accessible information management and effective communication. Finally, a functional simulation was developed. The findings reveal statistically significant associations between age and optimism about the future, as well as moderate-to-high effect sizes related to perceptions of inclusion and attitudes towards technology. Educational level shows a strong association with self-perceived personal value and satisfaction with institutional support. A comparative analysis with generative AI tools indicates that the proposed metaverse model offers a more comprehensive set of accessibility and communication functionalities for job applications and interviews. The results underscore the need for structured dialogue protocols, mobility assistance mechanisms, and proactive workplace design strategies. While generative AI tools provide partial support, the metaverse-based approach enables an integrated simulation of recruitment, mobility, and workplace accessibility. This study presents a novel technology-driven framework that promotes both technological and cultural awareness to reduce communicational, physical, and procedural barriers in employment contexts. The proposed model provides a robust foundation for future inclusive recruitment initiatives.

Keywords— Visual impairment; employment barriers; metaverse; accessibility; effective communication.

I. INTRODUCTION

Vision impairment is not confined to a specific life stage and may result from illness, accidents, or age-related conditions. The United Nations Sustainable Development Goals, particularly Goal 8, emphasize the need for inclusive employment policies that promote decent work for people with disabilities [1]. However, progress remains limited.

Globally, at least 2.2 billion people experience vision impairment or blindness, with a disproportionate impact on women, older adults, and populations in low- and middle-income countries [2]. Vision impairment is strongly associated with socioeconomic disadvantages, including reduced educational attainment and limited access to employment.

Previous research shows that employers frequently rely on unfounded assumptions regarding productivity and adaptability when evaluating candidates with visual impairments, reinforcing exclusionary practices [3]. For blind women, these barriers are

intensified by gender norms, inadequate transport, and lack of workplace accommodations [4].

Transforming inaccessible environments and dismantling attitudinal barriers is a complex challenge that does not yield simple solutions. Research consistently shows that blind women experience compounded disadvantage due to the intersection of gender and disability, resulting in higher levels of social exclusion and reduced employment opportunities [5]. These challenges are often intensified in regions where cultural norms and structural inequalities restrict women's education and professional advancement.

Employers frequently discriminate against candidates with disabilities based on unfounded assumptions regarding productivity, absenteeism, or required accommodation. Such negative mental models in educational and workplace settings significantly limit access to employment and contribute to persistent poverty. Studies indicate that individuals with visual impairments are often perceived as among the least employable compared to those with other forms of disability [3].

Additionally, recruitment processes often lack sensitivity to both gender and disability. For example, offering employment opportunities that require relocation without providing adequate support may discourage blind women from accepting otherwise suitable positions [4]. These practices reinforce structural exclusion rather than promote inclusion.

Employment barriers can be classified as structural or individual. Structural barriers arise from social, institutional, and economic conditions that restrict access to employment regardless of individual qualifications, while individual barriers relate to personal characteristics or circumstances that hinder job acquisition even in supportive environments.

Precarious working conditions have also contributed to shortages in personal assistance services, which play a crucial role in supporting individuals with disabilities in accessing information, mobility, and daily activities [6]. From a theoretical standpoint, the social model of disability attributes exclusion not to individual impairments but to societal structures and attitudes that fail to accommodate diversity.

The task of Critical Disability Theory (CDT) is to analyze disability as a cultural, historical, relative, social, and political phenomenon. Traditionally, disability studies have intersected with frameworks addressing other marginalized social positions, such as feminism, critical race theory, and queer theory. The value of CDT lies in its challenge to societal attitudes and assumptions that physical and mental differences can be ignored; it directly confronts these issues by centering the voices of people with disabilities [7].

Within this context, disruptive technologies such as artificial intelligence (AI) and the metaverse offer new opportunities to address longstanding accessibility challenges. However, ethical considerations, bias mitigation, and inclusive design remain essential to ensure that technological innovation does not reinforce existing inequalities [8].

[9] argue that "workplaces, employers, and members of the work environment must be prepared to facilitate the proper inclusion of persons with disabilities... Since this is not the case, there is a high level of unemployment among this segment of the population, as the conditions for their entry into the labor market are not appropriate." Job vulnerability and labor informality generate significant psychosocial distress [10]. Blind women experience dual and intersecting forms of discrimination based on both gender and disability, placing them in a catch-22 situation [4].

This study addresses several critical barriers: inaccessible work environments, limited employment opportunities, negative employer attitudes toward blind women, inadequate accessible transportation, and sexual harassment. Moreover, women's longer life expectancy places them at increased risk of developing age-related eye conditions, while

individuals living in rural areas face a higher likelihood of distance-vision impairment, thereby compounding existing disadvantages.

A. Disruptive Technologies

The ethical use of Artificial Intelligence (AI) involves ensuring diversity within the field, upskilling disadvantaged populations, incorporating ethics into training programs, researching the social and ethical implications of AI, and establishing institutional and national frameworks for the fair and transparent use of data. These issues provide significant scope for both research and advocacy. Concurrently, education and training institutions must reflect on their own deployment of AI and their curricula to ensure they are ethical, fair, inclusive, and aligned with investments in sustainable development [8]. While powerful for analysis, prediction, and clustering, the application of data analytics—encompassing both small and big data—can yield poor or biased outcomes if the underlying human and contextual factors are not well understood. Historically, predictions have often been compromised by biases stemming from poorly designed data. The application of artificial intelligence (AI) in developing vision aids for visually impaired individuals has demonstrated considerable potential to enhance quality of life by improving users' capacity to navigate, interact with, and perceive their environment more independently [11].

Consider the needs of a woman with a visual impairment: she requires employment and possesses relevant qualifications. However, even with suitable qualifications, she may remain unaware of when positions are advertised. Should she apply successfully, she is likely to be rejected on the basis of her impairment. Furthermore, even if approved for an interview, she may face significant barriers in arriving punctually and performing effectively.

Whilst much discourse on AI focuses on strategies to address skills shortages in high-skilled roles, discussions concerning the impact of digitalization on medium- and low-skilled jobs remain limited. In practice, however, labor markets are experiencing gradual polarization between high- and low-skilled occupations. A trend is emerging towards both the 'hollowing-out' of mid-level skills and a demand for new competencies among workers with intermediate skill levels. The transformation of middle-skill tasks will be twofold. First, repetitive tasks are likely to be automated, a trend already evident in roles characterized by routine-oriented work and predictable environments that machines can easily replicate.

[12] describes a chatbot utilizing voice recognition for input and speech for output, making it accessible for visually impaired users. Such applications can serve as useful tools for providing information, assistance, and emotional support, thereby enhancing the learning experience for blind students. Future applications could include educational assistance, navigational aid, personal support, and facilitating social interaction.

According to [13], visual impairment significantly impacts quality of life, often more profoundly than other chronic conditions. Patients with low vision frequently report impaired quality of life and greater challenges in home care. Although technologies like screen readers help, they may not be suitable for all users. Chatbots present a promising alternative by delivering personalized, practical information and social support. Consequently, there is a compelling rationale to explore the potential of tools like ChatGPT to aid visually impaired individuals.

On one hand, accessibility technologies such as Be My Eyes and Envision have integrated Generative AI (GenAI) capabilities to assist blind users by answering visual questions. On the other hand, at this critical juncture of an AI-driven world, it is imperative to understand GenAI adoption among blind individuals—a demographic still significantly underrepresented in many professions and higher education—to ensure they receive

equitable opportunities to benefit from these emerging technologies [14].

In [15] note that, while several studies have examined the general adoption of AI-powered assistive technologies (AIATs) and their impact on student success in higher education, empirical research specifically focusing on the use of AIATs by visually impaired and blind students in this context remains scarce.

According to [16] a haptic application is designed to improve mobility for visually impaired people. Traditionally, individuals with visual impairments have navigated their environment using tactile methods such as their hands or a cane. As technology and artificial intelligence advance, new tools are emerging to aid the navigation of visually impaired individuals.

When an algorithm yields more accurate predictions for men than for women, it may result in qualified women being overlooked for job opportunities. Distinct fairness concepts in machine learning, such as equalized odds and predictive parity, employ different criteria to ensure algorithmic predictions maintain comparable accuracy across demographic groups [17].

B. Metaverse

[18] argues that “the issues facing marginalized groups in metaverses are derived not simply from technology restrictions, but can trace their origins much further back, and are interdisciplinary in nature”.

As noted by [19] a growing number of tools are emerging to create avatars, enabling users to represent and express themselves in the metaverse. This could have substantial positive impacts on the daily lives of people experiencing various forms of vulnerability in the offline world, with applications in fields such as medicine, science, education, art, and social movements. The metaverse may help users fulfil fundamental human needs and exercise human rights, such as freedom of movement, expression, and association, particularly in contexts where realizing these rights is more challenging.

According to [20], the “Metaverse is an integrative ecosystem of virtual worlds offering immersive experiences to users that modify pre-existing experiences and create new value from economic, environmental, social, and cultural perspectives”. Similarly, [21] state that “The creation of hyper-realistic, digital, immersive environments can shape digital twins, virtual twins and 3D immersive experiences that generate novel interactions between people, technology and spaces. Often described as a fully immersive and interactive space, the Metaverse offers users the opportunity to explore, create, and participate in diverse activities”.

[22] observe that Virtual Reality (VR) has grown in popularity, particularly with the release of affordable headsets, with many users engaging in social interaction via these platforms. Despite this popularity, VR platforms remain largely inaccessible for blind and low vision (BLV) users. However, an AI guide could serve as an effective tool for exploring social VR by: “(1) visually interpreting the environment, (2) navigating the user to specific places or objects, (3) adding audio beacons to objects, and (4) changing its form to suit the user’s needs”.

The central research question guiding this study is:

How can the metaverse and other disruptive technologies contribute to reducing employment-related barriers for women with visual impairments?

II. METHODOLOGY

The objective of this study is to develop a metaverse-based model designed to reduce communication-related employment barriers for women with visual impairments by redesigning recruitment and interview processes through accessible digital environments.

A four-stage methodological framework was applied: Multidimensional contextual analysis, Statistical data analysis, metaverse process model design, and simulation development.

A. Multidimensional Context Analysis

Table 1 presents multidimensional factors related to psychosocial, educational, emotional, and technological dimensions were analyzed in relation to age and educational level. These factors were organized into belief-based categories to examine structural and individual barriers to employment.

TABLE I MULTIDIMENSIONAL FACTORS FOR WOMEN WITH VISUAL IMPAIRMENTS

N°	Belief and Multidimensional Factor	Belief Dimensions	S	Variables: Age Educational Level – (EL)	
			Terms		
1	Lifestyle / Perception of Equal Opportunities	10	1-10		EL
2	Support Mechanisms / Employer	9	11-19	Age	EL
3	External Support	3	25-27	Age	EL
4	Association Membership / Contact with Others	2	28-29		EL
5	Level of Protection / Discrimination	7	30-36	Age	EL
6	Technical Education / Higher Education	3	37-39	Age	
7	Family Work Environment / Attitude Towards Work	4	40-43	Age	EL
8	Emotional Well-being	7	44-50	Age	EL
9	Accessibility Technology	2	54-55	Age	EL
10	Disposition for Independent Learning	3	58-60	Age	EL
	TOTAL		60		

Table 2 presents the constructed associations for analyzing the nominal variable Age. This includes established multidimensional factors, such as age-based discrimination or transportation difficulties, alongside less-recognized factors including negative employer perceptions, a lack of legal awareness or compliance, and biases related to educational attainment. Supportive factors are also identified, such as affiliation with advocacy associations, self-awareness of abilities, willingness to leverage new opportunities, and commitment to educational improvement.

TABLE 2 ASSOCIATION FOR THE NOMINAL VARIABLE: AGE

N°	Belief Dimensions	or the Age Variable (Survey Item)
1	26	The State enforces the General Law for Persons with Disabilities – Law 29973.
2	31	When I apply for a job, interviewers treat me the same way they treat people without disabilities.
3	32	I live in a society that marginalises [people like me].
4	39	Knowing my skills has allowed me to find work.
5	45	I am optimistic about my future.
6	47	I have learned to accept myself with my flaws and virtues.
7	54	I prefer to spend money on other necessities before spending it on using a computer.
8	55	I am interested in participating in a knowledge-upgrading program before applying for a job.

An additional key multidimensional factor is Level of Education. Associated factors, including the desire to conduct research, commitment to learning, and willingness to share perspectives, are detailed in Table 3.

TABLE 3. ASSOCIATIONS FOR THE NOMINAL VARIABLE: EDUCATION LEVEL

N°	Belief Dimensions	Associations for the Education Level Variable (Survey Item)
1	1	Given the same qualifications for a job, they will always choose someone else over me.
2	8	I can only work in a company near my home.
3	25	I am satisfied with the State's support for women with visual impairments.
4	28	I enjoy sharing common tasks with other people.
5	36	Vocation is important when looking for a job.
6	43	I find it difficult to make friends at work.
7	48	I consider myself a valuable person.

8	51	I would say I am a person eager to learn how to work with technological tools.
9	54	I prefer to spend money on other necessities before spending it on using a computer or laptop.
10	59	I wish to participate in a research program that helps women with disabilities improve their working conditions.

B. Data Analysis

and the Kruskal–Wallis test with epsilon-squared as an effect size measure. Data preprocessing included cleaning, transformation, and imputation strategies adapted to missing data proportions [23].

The following imputation strategy was implemented:

- Variables with <5% missing data: Numerical variables were imputed using the median, and categorical variables using the mode.
- Variables with 5–10% missing data: Imputation was performed using the k-Nearest Neighbors algorithm (kNN, k=5).
- Nominal variables: An initial kNN imputation was followed by imputation with the mode. Categories were standardized, the variable was cleaned, and finally, Likert-scale variables were imputed.

C. Metaverse Model Development and Simulation

Based on the analytical results, a metaverse-based model was designed to address accessibility, communication, and mobility challenges. A functional simulation was developed using realistic spatial scaling, navigational aids, AI-driven dialogue systems, and assistive technologies to replicate real-world recruitment and workplace scenarios.

III. RESULTS

A. Statistical Associations

TABLE 4. STATISTICAL ASSOCIATIONS FOR THE AGE VARIABLE

Nº	n_total	chi2	df	p_chi2	cramers_v	supuestos_chi2	H_kw	p_kw	epsilon2_kw
26	22	19.09722	16	0.2637	0.1811	>20% <5	9.951976	0.04124	0.2834
31	22	24.12972	16	0.0867	0.3216	>20% <5	9.075850	0.05923	0.2417
32	22	19.78472	16	0.2301	0.2060	>20% <5	6.991400	0.13634	0.1424
39	22	16.94306	16	0.3893	0.0504	>20% <5	6.534543	0.16263	0.1207
45	22	29.07143	16	0.0235	0.4157	>20% <5	10.37321	0.03459	0.3035
47	22	21.56349	16	0.1579	0.2596	>20% <5	6.384160	0.17224	0.1135
	22	20.88734	16	0.1829	0.2406	>20% <5	11.74175	0.01938	0.3687
55	22	18.45119	16	0.2981	0.1540	>20% <5	10.00829	0.04029	0.2861

As shown in table 4, the analysis reveals statistically significant associations between age and optimism about the future, in addition to moderate-to-high effect sizes in perceptions of inclusion and attitudes toward the use of technology. These findings suggest that demographic variables influence expectations and confidence regarding employment opportunities.

Consequently, age appears to influence attitudes towards technology, employment expectations, and perceptions of inclusion. The associated effect sizes range from moderate to high, being particularly notable in perceptions of social acceptance, optimism, and future confidence. The next analysis is about educational LEVEL in Table 5.

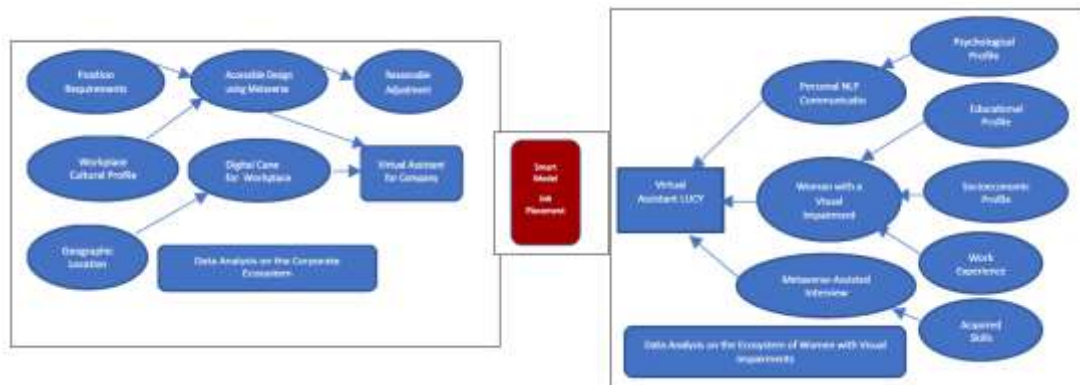
TABLE 5. STATISTICAL ASSOCIATIONS FOR THE EDUCATION LEVEL VARIABLE

Nº	n_total	chi2	df	p_chi 2	cram ers_v	supues tos_chi 2	H_kw	p_kw	epsilon2_ kw
1	22	9.5129 63	8	0.300 9	0.168 6	>20% <5	3.7271 39	0.15512	0.0822
8	22	10.511 11	8	0.231 0	0.231 3	>20% <5	3.3717 64	0.18528	0.0653
25	22	30.538 10	16	0.015 4	0.439 8	>20% <5	6.4513 51	0.16788	0.1167
28	22	16.958 33	16	0.388 3	0.052 5	>20% <5	6.5262 68	0.16314	0.1203
36	22	13.485 19	16	0.637 0	0.000 0	>20% <5	6.6191 43	0.15744	0.1247
43	22	10.592 59	8	0.225 9	0.235 7	>20% <5	3.4892 17	0.17471	0.0709
3	22	24.403 70	8	0.002 0	0.634 4	>20% <5	3.7235 79	0.15539	0.0821
51	22	14.972 22	8	0.059 7	0.406 9	>20% <5	4.9532 92	0.08402	0.1406
54	22	14.245 44	16	0.580 4	0.000 0	>20% <5	8.3511 11	0.07953	0.2072
59	22	10.164 81	8	0.253 6	0.211 7	>20% <5	5.1294 20	0.07694	0.1490

Educational level showed a strong association with self-perceived personal value and satisfaction with institutional support, indicating that education plays a central role in shaping perceived employability among women with visual impairments.

B. Metaverse Model

Figure 1 presents the Metaverse model process and functionality. The framework is bifurcated into two core components. The left segment outlines a process designed to preemptively address accessibility requirements and remediate typically inaccessible workplace environments. Its primary technological element is Metaverse conversion, supplemented effectively by a digital cane to facilitate navigation both in urban settings and within corporate premises, thereby implementing reasonable adjustments. The right segment features the virtual assistant LUCY, developed for women with visual impairments. This tool enables users to construct a detailed profile and connects them directly to company recruitment procedures [24]. To validate Metaverse Model relevance and completeness, a comparative analysis was conducted using contemporary AI tools.

FIGURE 1. METAVERSE MODEL PROCESS AND FUNCTIONALITY.

Source: Own elaboration

C. Validation of the Model Using AI

Generative AI was employed to identify optimal AI-based recommendations, which were then compared against the proposed metaverse model. The resulting benchmarking analysis, presented in Table 6, demonstrates that the metaverse model offers a more comprehensive set of functionalities. Specifically, it is better equipped to facilitate the full spectrum of effective communication needs for women with visual impairments.

Comparative benchmarking demonstrated that, while generative AI tools provide isolated accessibility features, the proposed metaverse model offers a more comprehensive and integrated set of functionalities. These include communication support, mobility assistance, environmental awareness, and recruitment simulation within a unified framework, see Table 6.

TABLE 6. RECOMMENDATIONS FOR GENERATIVE AI vs. FUNCTIONS OF THE METAVERSE MODEL

	Recommendations / Functions	Copilot	ChatGPT	Gemini	Deepseek	Metaverse model
1	Enabling accessible telework modalities by mitigating barriers related to mobility, transportation, or physical infrastructure.	X	X	X	X	X
2	Providing assistive technologies, such as optimized screen readers, voice assistants, haptic navigation systems, 3D audio interfaces, and avatar-based.	X	X	X		X

3	Promoting equitable recruitment processes through bias reduction and more objective competency assessment.	X	X	X		X
4	Facilitating the development of global professional networks that transcend geographical.	X	X	X		X
5	Identifying speakers and their spatial location to enhance social navigation and participation in virtual environments.			X	X	X
6	Simulating the operation of machinery or warehouse tasks using haptic feedback systems (e.g., vibrational cues).			X		
7	Providing real-time descriptions of graphics, presentation slides, or nonverbal cues during video conferences.				X	
8	Delivering audio-descriptive guidance for technical training or real-world tool utilization.				X	X
9	Psychological profiling to understand user emotional states and adaptation needs.					X
10	Educational and socioeconomic					X

	profiling to assess virtual work suitability and accessibility requirements.					
11	Navigation assistance through digital cane simulation or wayfinding technologies.					X

D. Simulation

The environment designed using a realistic scale (1 unit = 1 metre) to ensure accurate human proportions and fluid navigation. Physical colliders were implemented on walls, furniture, and interactive objects, and NavMeshes were generated to enable autonomous pathfinding for non-playable characters (NPCs). Modelling of the main building and its interiors was carried out using ProBuilder, a tool which allowed for the creation of custom geometries, narrow corridors, and confined spaces simulating the lack of ergonomics in overcrowded offices.

Materials were applied using PBR (Physically Based Rendering) textures downloaded from the Unity Asset Store, ensuring realistic reflections and shading. Lighting was baked to optimize overall performance.

1) Environments and Scenarios: The mini virtual city, in Figure 2, comprises a grid-based street layout, generic buildings, pavements with signage, trees, and urban furniture (benches, lampposts, bins). Pedestrian and vehicular traffic were simulated using cyclic animations and predefined NPC routes, generating a dynamic environment.

FIGURE 2. METAVERSE MINI VIRTUAL CITY.



Source: Own elaboration

Also, for be aware about how go to work, it was created and Built streets, roads, and highways, establishing routes that simulate daily commutes within a real city. This activity is key for the future implementation of assisted navigation systems and mobility assessments within the virtual environment. See figure 3.

FIGURE 3. SIMULATE DAILY COMMUTING PATTERNS WITHIN A REAL URBAN ENVIRONMENT



Source: Own elaboration

Figure 4 presents the main building contains three floors, with a central office where interviews take place. Workspaces are designed with desks and narrow aisles, reflecting overcrowding and a lack of adaptations for individuals with mobility or visual impairments. Environmental details were added: filing cabinets, lamps, active screens, pictures, and decorative plants, also he main entrance of the company is shown in Figure 5.

FIGURE 4. METAVERSE MODEL OF THE COMPANY'S MAIN BUILDING.



Source: Own elaboration

FIGURE 5. COMPANY ENTRANCE.



Source: Own elaboration.

Figure 6 shows meeting spaces were designed and integrated within the building, representing common areas for workplace interaction. These spaces allow for the analysis of social and communicative dynamics that are part of the work environment and that can influence the experience of a person with a visual impairment.

FIGURE 6. MEETING SPACES AT COMPANY.



Source: Own elaboration.

Figure 7 presents the interior of the company hall, illustrating not only the spatial layout but also the furniture and other elements that may contribute to workplace accidents.

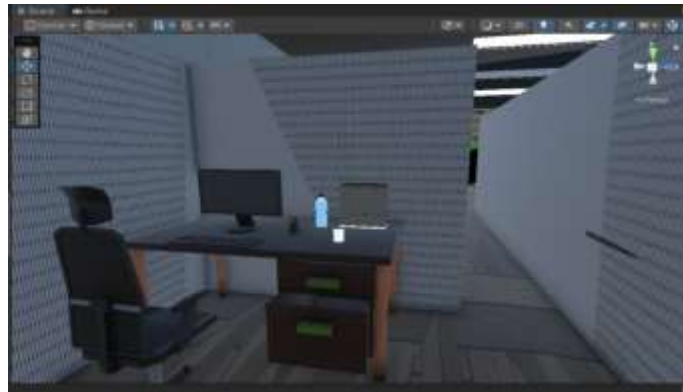
FIGURE 7. INSIDE COMPANY



Source: Own elaboration.

A semi-private space was created within the office, featuring a central table, opposing chairs, and a computer connected to the AI system. This environment is used for the conversational simulation between the virtual interviewer and the candidate (a blind worker), See figure 8.

FIGURE 8. SEMI PRIVATE SPACE.



Source: Own elaboration

Characters were sourced from free Asset Store packages and configured using the Animator Controller. Basic animations were applied: writing, conversing, walking, and subtle gesturing, integrated via Blend Trees for smooth transitions. The main character represents a woman with a visual impairment. She was modelled with a white cane, a slow-walking animation, and a restricted navigation path reflecting environmental obstacles. Her behavior was controlled using a NavMeshAgent, combined with custom scripts to avoid collisions and trigger events for reflective or narrative dialogue lines.

2) Dynamics and Interaction Mechanics: As shown in figure 9, the simulation allows the user to: Explore the environment in third-person or free-camera mode, Initiate conversations with characters via proximity triggers, participate in an interview by responding via text or voice, Observe the mobility challenges of the blind worker in real time.

FIGURE 9. METAVERSE MODEL MOBILITY WOMAN WITH VI.



Source: Own elaboration

Interactions were managed with C# scripts, which detect collisions, trigger sound events, and launch conversational AI modules. Comparative accessibility features were also included, demonstrating how minor modifications to spatial design could improve the worker's experience.

3) AI and Voice Integration: One of the project's most innovative components is the integration of conversational artificial intelligence models via Convai, a Unity-compatible platform. Each character has a customized dialogue profile, defining their tone, role, and

vocabulary. The AI interviewer can formulate questions, analyze responses, and provide feedback.

The voice system combines: Text-to-Speech (TTS) to convert AI-generated text into natural human-like speech (male and female voices, adjustable in pitch and pace), Speech-to-Text (STT) allowing the user to speak into a microphone for the AI to process their response, and Lip Sync, which synchronizes lip movement with audio using Oculus LipSync. The result is a fluid and natural dialogue simulating a real interview, with response variations based on user choices or character performance.

4) Lighting and Atmosphere: A mixed lighting system was used, combining directional light for the sun and point lights for interiors. Global Illumination and Reflection Probes helped create depth and realism. Indoors, emissive materials were used to simulate fluorescent lighting, alongside bloom effects and occlusion culling to enhance visual immersion.

The soundscape includes layers of ambient noise (telephones, keyboards, conversations, air conditioning), balanced dynamically using Unity's Audio Mixer. Sounds of the cane, footsteps, and collisions serve to emphasize the mobility challenges of the blind character.

5) User Experience: The final outcome is an interactive simulation combining visual realism, social narrative, and artificial intelligence technology, resulting in an immersive experience with an educational purpose. The user can comprehend, both visually and aurally, the accessibility limitations present in traditional work environments, while interacting with virtual characters representing different perspectives within the workspace. The integration of conversational AI served to humanize digital interaction, offering a credible and reflective job interview simulation.

IV. DISCUSSION

Accessibility issues are associated with factors such as low self-confidence, depression, indifference, abuse, and violence, among others [29].

Architectural and technological barriers, as well as a lack of awareness and sensitivity on the part of society in general, contribute to the exclusion and marginalization of blind people. These difficulties not only affect their quality of life and well-being, but also represent a loss for society as a whole, depriving it of the potential and contributions that these people could make if they were given the necessary support and inclusion [30].

These elements include secondary labor market; racial discrimination; immigrant status; gender discrimination; lack of jobs; transportation; neighborhood/location; and general structural factors. Traditionally, people with visual impairments explored their environment either with their hands or with a cane. As technology and artificial intelligence evolve, we are discovering new tools that can help guide people with visual impairments.

The World Health Organization [2] states that in a global society predicated on the ability to see, vision impairment has far-reaching consequences for individuals, their families, and carers. It is also the third leading cause among all impairments for years lived with disability. Furthermore, the societal burden of vision impairment and blindness is substantial, particularly in terms of its impact on employment.

For Peru and Sri Lanka, the survey data makes it possible to compare the hourly earnings of self-employed workers with and without disabilities. Although the findings presented here may not apply to all countries, they serve to illustrate the disability gaps in income from self-employment that can be observed around the world. In both countries, self-employed workers with disabilities tend to earn incomes that are at the lower end of the national hourly employment income distribution. [25].

Women with disabilities are among the most vulnerable and marginalized groups. They experience intersecting discrimination based on both gender and impairment, which

frequently results in exclusion from potential employment opportunities and an inability to earn an income. Most studies indicate that women with visual impairment face a higher likelihood of unemployment and tend to receive lower salaries [5].

Social Interaction and Independence: Communication skills are crucial for social interaction and independence. Visually impaired adults actively seek opportunities to engage with others, whether it's in educational settings, workplaces, or social gatherings. Effective communication fosters their independence and integration into society [26].

As noted by [19], "The metaverse will also provide people with new solutions for remote working, learning, training, socializing, and entertainment, and will take intimacy and other forms of human-machine interaction even further than the world wide web"

[3] observes that employer attitudes towards individuals with visual impairment (VI) as employees are often negative. However, interventions and processes designed to improve employer knowledge and understanding of VI, and to demonstrate how people with VI can contribute successfully in the workplace, may improve both attitudes and hiring behaviors.

The metaverse is advancing rapidly, and its definition will continue to evolve as designers, engineers, researchers, policymakers, users, and other community members develop a greater understanding of its potential benefits and inherent challenges. Crucially, accessibility is key not only to ensuring all individuals have the opportunity to experience a barrier-free digital world but also to democratizing access to new experiences and social interactions for those who may have limited opportunities. Primary considerations include defining the metaverse, exploring its opportunities, and undertaking narrative and educational efforts to promote a clear, honest, and inclusive vision of an acceptable metaverse for all [21].

A related concern is that "social inequalities would be reinforced and accelerated by the metaverse, due to the digital divide. Certain groups – particularly those in the Global South, rural areas, and many women – will have limited opportunity to become meta-users because of the cost of the required hardware and software, or indeed due to a lack of internet access altogether" [21].

In [18] notes that "If modern metaverses have stopped offering open-source tools to alter reality, such as those seen in Active Worlds, they instead provide a vibrant economy where individualism can be purchased, and those with the requisite skills can participate in this economy."

Consequently, a technical framework is needed to support diverse activities. [22] propose an "AI guide to make it an effective tool for exploring social VR," with functions including: "(1) visually interpreting the environment, (2) navigating the user to specific places or objects, (3) adding audio beacons to objects, and (4) changing its form to suit the user's needs." Furthermore, as [27] warn, "progress towards greater equality is slow and stalling; without appropriate action, the academic and career success of generations of blind and partially sighted people will continue to be at risk."

The results confirm that employment barriers faced by women with visual impairments are not solely technological but deeply embedded in social attitudes and institutional practices. Consistent with previous studies, age and educational level significantly shape perceptions of inclusion, self-worth, and future employment prospects [5], [3].

The metaverse-based model extends existing assistive technologies by enabling holistic simulation of recruitment and workplace environments. Unlike isolated tools such as screen readers or chatbots, the model integrates communication, mobility, and spatial design, aligning with principles of universal design and accessibility [29].

Nevertheless, the findings also highlight structural risks associated with advanced technologies, particularly the digital divide. Without institutional commitment and policy support, metaverse-based solutions may exacerbate inequalities rather than mitigate

them [21].

V. CONCLUSIONS

This study demonstrates that a metaverse-based model can serve as an effective tool for reducing employment barriers faced by women with visual impairments. By integrating accessible communication protocols, mobility assistance, and inclusive workplace simulations, the model addresses both structural and procedural sources of exclusion.

The proposed framework offers practical value for organizations seeking to redesign recruitment and workplace environments through a universal design approach. Beyond its technological contribution, the model promotes cultural awareness, empathy, and reflection on accessibility as a core organizational responsibility.

Future research should examine the application of this model across dialogue protocols, disability groups, and employment contexts, and advance the design of empathetic AI systems capable of dynamically adapting to users' emotional and cognitive states.

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