

Co-designing neuro-inclusive public interiors: a mixed-methods study on non-visible disabilities in Indonesia

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Abstract

In Indonesia, inclusive design for people with non-visible disabilities (NVD), such as those who are Deaf, have psychosocial conditions, autism/ADHD, dyslexia, intellectual disabilities, Down syndrome, and dwarfism, is still underutilized, even though accessibility is an essential part of interior architecture. Through case studies at PT Unilever's office, the Bundaran HI MRT Station, and the Taman Ismail Marzuki Library, selected for their varied public functions relevant to NVD users, this study investigates opportunities and barriers. A mixed-methods approach was used: descriptive statistics were used to analyze quantitative data from 49 NVD respondents (obtained through multiple-choice and Likert-scale questions); thematic analysis was used to analyze qualitative insights from 11 practitioners. The results show that although 66.7% of respondents use public areas almost every day, 58.3% feel uneasy or anxious in them. Confusing layouts, loud noises, a lack of directional signage (61.1%), the absence of quiet areas, excessively bright lighting, fixtures that are not adjustable for individuals with dwarfism, and inadequate priority seating are some of the main stressors. The majority of current practices focus on visible disabilities, ignoring the sensory, cognitive, and social aspects that are essential for NVD inclusion. By emphasizing NVD experiences and offering a practical framework grounded in IDEA principles (Inclusion, Diversity, Equity, Accessibility), this study contributes to the conversation in interior architecture. It also emphasizes the urgency of incorporating NVD considerations into building regulations, design education, and participatory processes, moving beyond mere compliance to meaningful, human-centered inclusivity in public spaces.

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INTRODUCTION

According to Statistics Indonesia [1], 22.97 million people in Indonesia have disabilities, accounting for about 8.56% of the nation's total population. Disabilities fall into two main categories: individuals with non-visible disabilities (NVD) have conditions that are not visible to the naked eye, such as hearing impairments (Deaf/Hard of Hearing/Deaf-mute), psychosocial disorders (depression, bipolar

disorder, dyslexia), developmental disorders (autism, ADHD), and intellectual disabilities (intellectual impairment, down syndrome, learning difficulties, and dwarfism) [2]. Mobility impairments (amputation, paralysis, post-stroke conditions) and visual impairments are examples of conditions that have obvious physical manifestations in people with visible disabilities (VD) [2].

WHO estimates that between 15 and 20 percent of people worldwide have a disability, and the majority of those individuals have NVD. Based on the WHO's global estimate that 70–80% of all people with NVD conditions go undiagnosed because they are not visible unless the sufferers themselves disclose them, it is estimated that 16–18 million people in Indonesia have NVD [3]. Because of this, their needs are frequently ignored, and barriers to public spaces persist, occasionally making it more challenging for them to access proper accessibility [4].

It is both a strategic opportunity and a challenge for interior architects to design spaces that cater to a variety of human needs, including those of individuals with NVD. By considering function, safety, cost, sustainability, and regulations as well as physical, psychological, and social aspects as crucial components, design not only defines physical form but also responds to human needs [5].

To meet the needs of individuals with NVD, sustainability and accessibility concerns are becoming increasingly important. To promote inclusivity, several design approaches have been developed, such as Universal Design (UD) [6], Deaf Space Design [7][8], Sensory Design [9], Inclusive Design (ID) [10], and Design for All [11]. Their use is still uneven, though, particularly when it comes to those who have NVD.

The Ministry of Public Works and Housing Regulation No. 14/PRT/M/2017 on Building Accessibility Requirements [12], which is a derivative of Law No. 8/2016 on Persons with Disabilities, ensures that all people with disabilities have accessibility rights, regardless of whether their condition is visible or invisible [9]. Protection from discrimination is universal and unaffected by one's visibility.

Critical Mapping of Existing Literature

There is still prejudice against people with visible disabilities, according to recent studies on ID in the built environment. According to a scoping review of 42 peer-reviewed articles published in architecture and disability journals between 2018 and 2024, 78% of the articles focus solely on mobility or visual impairments, primarily on features like tactile pathways, ramps, and lavatory accessibility [13]. There are only nine studies that look at NVD, and the majority of them are limited to specific conditions like autism or deafness [14] and comparative studies of various kinds of disabilities. Crucially, none use mixed-methods approaches that incorporate practitioner perspectives and user experiences,

especially in Global South contexts such as Indonesia.

There are still conflicts between the dominant frameworks at the theoretical level. Despite its widespread acceptance, Universal Design (UD) frequently adopts a "one-size-fits-all" approach that overlooks neurodiversity by assuming an "average user" [9]. On the other hand, although Inclusive Design (ID) acknowledges human variability, it is not yet fully operationalized in practice, particularly with respect to cognitive and sensory needs. Deaf space and other condition-specific models, on the other hand, offer useful spatial insights but are not scalable to handle other NVD categories. Theoretically, this fragmentation results in fragmented practice, where designers do not fully engage with the lived experiences of people with dyslexia, ADHD, or psychosocial conditions and instead rely on UD checklists.

The lack of an integrated, evidence-based framework that translates the diverse needs of NVD people into actionable interior design strategies for Indonesian public spaces, especially one co-created with users and firmly rooted in local regulatory and cultural contexts, leaves a critical gap. NVD continue to experience stigma and discrimination [4] because the public is unaware of their accessibility needs [15]. They actually have the same legal rights as those with VD, including the right to accessibility and public spaces free from discrimination [4].

Accessibility design is currently dominated by VD solutions like ramps, wheelchair-accessible restrooms, guiding blocks, and lifts [6]. On the other hand, low-sensory environments, stress-relieving spaces, and cognitively adaptive design are rarely given priority for NVD.

Current practices in Indonesia and much of the Global South remain strongly biased towards VD, with little integration of the social, cognitive, and sensory aspects required by NVD, even as ID is gaining more global attention [1][2]. Additionally, existing frameworks rarely include NVDs as co-designers from the start [3], which leads to solutions that are often tokenistic or out of step with actual user needs. By 1) centering individuals with NVD lived experiences in the design process through participatory methods, 2) proposing an IDEA-based, context-sensitive model for NVD-inclusive public spaces, and 3) encouraging mandatory ID curricula in architecture education, this research presents a structural intervention that fills in many of the gaps in current pedagogical practices [4][5]. This research presents inclusivity as a dynamic,

human-centered paradigm that must adapt to user diversity rather than oppose it, in contrast to earlier studies that treat accessibility as compliance-driven or solely focused on UD standards [6].

Interior Architecture with Inclusive Design

To bridge the gap between ID principles and users' actual experiences, this study employs an environmental psychology approach. The two primary theoretical frameworks employed are Gibson's theory of affordances [16] and the Stimulus–Organism–Response (S-O-R) model [17].

The S-O-R model states that physical environmental stimuli, such as spatial layout, lighting, acoustics, materials, and visual complexity, affect the organism (i.e., the user) [16]. These stimuli elicit mental and emotional responses, which in turn affect behavior. This is especially crucial for NVD, such as those who are Deaf, autistic, have ADHD, anxiety disorders, or sensory processing abnormalities, as they often exhibit heightened sensitivity to environmental stimuli. Overstimulating or disorganized environments that lead to social disengagement, stress, or cognitive exhaustion may limit access and participation.

However, research indicates that ID, defined holistically by the interconnected IDEA principles, remains underused in interior architecture practice. Major barriers include systemic and cultural issues, such as misconceptions about inclusive design, unconscious biases, an overly preoccupied professional mindset focused on personal experience, and inadequate or unverified legislative frameworks [18]. Furthermore, during construction, time and cost efficiency often take precedence over promises of inclusivity [19].

Research indicates that interior architects often design spaces based on their personal experiences rather than considering the needs of future users, particularly those with NVD [20]. Because of this, ID is frequently underappreciated as a proactive and adaptable strategy to human diversity. Moreover, it is rare for the design process to recognize NVD's expertise and life experiences as valuable resources [9]. Many designers rely on narrow, compliance-driven interpretations of accessibility laws as their primary source of guidance because they remain unclear about what ID actually entails [6]. Another sign that ID is rarely prioritized in the agendas of interior architecture projects is the absence of building design awards that expressly recognize inclusive approaches.

Practitioners often voice doubts about overlapping and sometimes contradictory accessibility regulations, despite the consensus that legislative standardization is required [21]. Therefore, rules by themselves cannot ensure that ID is applied effectively [9]. Many professionals still see ID as an administrative burden or a top-down limitation on their creativity, rather than as an opportunity for social justice and innovation. Incorporating inclusive principles into real-world projects is very challenging due to regulatory barriers and the lack of financial incentives or specialized funding [22].

Mandatory laws typically only establish minimal standards for physical accessibility. The real challenge is to push designers to go beyond these limitations and embrace a more all-encompassing approach to ID, one that considers not only the physical aspects of human experience but also its sensory, cognitive, emotional, and social components [23].

This study aims to explore the use of ID in public-space interior architecture, with a focus on NVDs' needs. It specifically examines how elements of spatial design can respond to the unique sensory, cognitive, emotional, and social aspects of NVDs experiencing these conditions. The research aims to identify gaps between ID principles and their practical implementation through contextual analysis at specific public service sites, such as PT Unilever, the Bundaran HI MRT station, and TIM Library offices, to develop evidence-based design recommendations that support the full and dignified participation of NVDs.

METHOD

This study employs a mixed-methods approach [24]. This study refers to three types of public service facilities as public spaces in addition to offering a more comprehensive understanding of IDEA principles: 1) office spaces (PT Unilever), 2) public transportation facilities (Bundaran HI MRT Station), and 3) cultural-educational facilities (TIM Library). Social interaction patterns, wayfinding systems, spatial layout, sensory accessibility, and user experience narratives from NVD are all included in the investigation's scope.

Using ID as a lens, the qualitative ethnographic component explores the context of interior architectural design. To gather information, key informants from academia, design, and architecture participated in in-depth, semi-structured interviews. The body of research on the following topics was used to create the interview guide: a) practitioners' attitudes, challenges, and motivations for implementing ID

in architectural practice; b) the integration of user experience data into interior architectural design processes; and c) the complex realities of interior architecture practice.

The primary objectives of the interviews were to identify challenges in interior architectural design processes and explore practitioners' ideas about inclusion, diversity, and equity, which, until theoretical saturation was reached, go beyond basic physical accessibility. Theoretical saturation was reached when recurring themes emerged in every response, indicating that no new, noteworthy themes emerged from additional interviews.

A synthesis session was conducted after every interview to determine when saturation was reached. These sessions focused on sample diversity, used coding, and mapped thematic content and emerging insights to capture user sentiments and opinions. To confirm theoretical saturation, a collective sense of lessons learned and important discoveries was plotted after the crystallization of key insights. This procedure, consistent with recognized procedures in previous studies, demonstrates that selecting informants with diverse backgrounds and relevant experience provides a solid foundation for in-depth analysis.

To explore more general ID concepts, eleven informants, including academics, designers, and architects, participated in a Focus Group Discussion (FGD). Each of the informants had a broad background in areas such as interior architecture, Deaf Space, UD, design for all, and more general interests in diversity and equity.

Figure 1 presents the integrated research framework, which consists of eight interconnected components: 1) phenomenon identification: the bias in inclusive design that primarily concentrates on VD, such as wheelchair users, visually impaired people using white canes, or people with physical disabilities, is the study's first phenomenon. 2) Theoretical foundation: ID theory [9] serves as the primary theoretical lens, emphasizing human variability and user participation in the design process. This is complemented by the S-O-R model [16] and Gibson's theory of affordances [17] to understand how environmental stimuli affect users with NVD. 3) Regulations: the study is grounded in Indonesia's legal framework, specifically Law No. 8/2016 on PwDs (articles 5 and 18 prohibiting discrimination and guaranteeing accessibility), Government Regulation No. 42/2020, and Ministerial Regulation of PUPR No. 14/2017. Despite these regulations, an implementation gap persists, with accessibility measures remaining focused on physical features rather than

addressing NVD needs. 4) Conceptual framework: the study operationalizes ID through IDEA principles, adapted to the Indonesian context. 5) Research methods: mixed methods approach: a) qualitative strand: ethnographic methods including in-depth interviews, field observations, and FGD, b) quantitative strand: structured surveys using Google Forms with Likert-scale items and accessibility audit checklists, and c) integration point: data convergence occurs during analysis through joint displays and triangulation matrices. 6) Data analysis: three analytical categories guide the investigation: (a) systemic and design challenges, (b) regulatory, design, and educational opportunities, and (c) perceptions of practitioners and respondents. 7) Conceptual model output: the application of NVD strategies grounded in the four IDEA principles is the research outcome. 8) Ultimate goal: to create genuinely inclusive public spaces that accommodate the full spectrum of human diversity, including NVD.

For each professional group (architects, designers, and academics), the interview questions were divided into three thematic areas: understanding, perspectives, and depth of knowledge of IDEA principles in the planning, design, and assessment of spaces intended for NVD users.

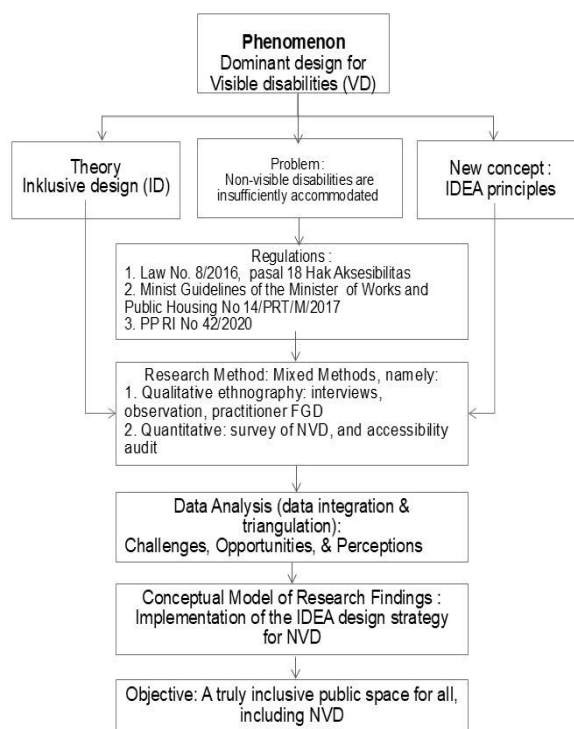


Figure 1. Research Framework Flow

Question clusters specifically addressed: 1) attitudes and approaches towards professional work practices; 2) knowledge and awareness of accessibility, ID, equal opportunity, and ensuring diversity among NVD users; 3) professional-stakeholder relationships, including awareness of IDEA principles; 4) difficulties encountered during the ID process; and (5) strategies to advance interior and architectural design towards full realisation of IDEA promoting inclusion, equity, diversity, and accessibility for all, including people with NVD users.

The eleven informants who took part in the FGD and in-depth interviews are listed in Table 1. The FGD took place from 10:00 AM to 12:15 PM on September 11, 2025. There were five male informants (n = 5) and six female informants (n = 6) in the entire sample.

The characteristics of 49 respondents in the ID group who completed the Google Form questionnaire are presented in Table 2. On the same day, but during a different session, that is, from 1:30 PM to 3:00 PM (WIB), the questionnaire was administered.

A variety of disabilities are represented in the distribution of respondents, including the following categories:

Table 1. Informants: practicing architects, designers, and academics

Sex	Profession	Institution/Association	Expertise
F	Architect	IAI Jakarta	Building design, design practice, authorship
M	Architect	IAI Central	Building design, design practice
M	Architect	IAI Semarang	Building design, design practice
F	Architect	Jakarta Public Works Dept.	Accessibility auditing, design practice
F	Architect	Jakarta Public Works Dept.	Accessibility auditing, design practice
F	Interior Designer	HDII Jakarta	Interior design, design practice
F	Interior Designer	HDII Jakarta	Interior design, design practice
F	Lecturer	Univ. of Indonesia (UI)	Researcher & lecturer in UD inclusive architecture students
M	Lecturer	Pembangunan Jaya (UPJ)	Researcher & lecturer in UD inclusive architecture students
M	Lecturer	Univ.Lancang Kuning (Unilak)	Researcher & lecturer in UD inclusive architecture students
M	Lecturer	Univ. Esa Unggul (UEU)	Researcher & lecturer in UD inclusive architecture students

Table 2. 49 Respondents of NVD are perceived as space users

Sex	Disability type	Age	Origin
F	Dyslexia	56	Bandung
F		46	Jakarta
F		48	Jakarta
F		38	Cirebon
F		55	Bandung
F	Grahita Intellectual	36	Jakarta
M		22	Jakarta
F		42	Bogor
M		17	Bogor
F		23	Jakarta
F		27	Jakarta
M		27	Jakarta
F		31	Jakarta
M	Psychosocial Disability	50	Jakarta
F		26	Jakarta
M		23	Depok
F		36	Jakarta
F		27	Bekasi
F	Dwarfism	37	Tangerang
M		33	Bekasi
F		42	Jakarta
M		32	Bekasi
F		41	Jakarta
F	Down syndrome	29	Jakarta
M		20	Jakarta
M		26	Jakarta
M		24	Jakarta
M		26	Jakarta
M		25	Jakarta
M		28	Jakarta
F	Deaf	27	Pekanbaru
F		31	Jakarta
M		27	Jakarta
M		33	Tangerang
F		43	Bekasi
F		36	Tangsel
F	Hard of Hearing (HoH)	24	Bekasi
F		42	Jakarta
F		22	Jakarta
F		27	Jakarta
M		23	Tangerang
M		31	Jakarta
F	Deaf-mute	24	Jakarta
F		31	Jakarta
F		31	Jakarta
F		34	Pekanbaru
M	Autism spectrum disorder	24	Jakarta
M		34	Bekasi
M		28	Jakarta
M		23	Cikarang

1) 14 respondents with mental disabilities: a) psychosocial disorders (n=5, 10.2%), b) dyslexia (n=5, 10.2%), and autism (n=4, 8.16%); 2) 15 respondents who had intellectual disabilities: a) Grahita (n=8, 16.3%), b) Down syndrome (n=7, 12.24%); 3) 15 respondents with hearing sensory disabilities: a) Deaf (n=6, 12.24%), b) Hard of Hearing (n=6, 12.24%), c) Deaf-mute (n=3, 12%), and 4) 5 respondents with dwarfism (10.2%).

This study used two data sources, qualitative interviews and quantitative questionnaires, as well as two complementary analytical techniques based on the information from both sources. According to Creswell's [24] mixed-methods framework, this strategy seeks to enhance the validity of the findings through methodological triangulation.



Figure 2 shows the atmosphere of the research grant FGD, which 49 NVD respondents and 11 informants attended



Figure 3. Practitioner informant group



Figure 4. Group of Respondents with Grahita Intellectual.



Figure 5. Group of Respondents with Autism



Figure 6. Group of Respondents with Dyslexia



Figure 7. Group of Respondents with Psychosocial Mental Health



Figure 8. Group of Respondents with Deaf/Hard of Hearing



Figure 9. Group of Respondents with Dwarfism

RESULTS AND DISCUSSION

Even though the three new thematic clusters: 1) work practices and design processes, 2) practitioner knowledge and awareness, and 3) prospects and challenges are in line with global conversations about ID, their specific manifestations in the Indonesian context emphasize distinct institutional, sociocultural, and spatial dynamics. Notably, despite the existence of national laws such as Law No. 8/2016 on Persons with Disabilities, official accessibility guidelines addressing NVD in public buildings remain woefully lacking. The lack of awareness among architects, interior designers, and facility managers exacerbates this regulatory gap, as evidenced by both FGD narratives and NVD survey responses. Cultural perceptions of disability, especially the stigma attached to mental health issues and the invisible nature of neurodivergence, also have an impact on how NVD move through public areas.

In both qualitative reports and quantitative survey data from Jakarta's dense urban environment, sensory overload from noise, crowding, and visual clutter emerged as a recurring concern. This presented unique challenges that are rarely documented in Western-centric literature. Based on Indonesian local realities, this study goes beyond universalist assumptions to propose context-sensitive design strategies that address the lived experiences of NVD users in quickly urbanizing Southeast Asian cities.

A key component of this study was conducting field observations at two public buildings: the TIM Library and Graha Unilever. The researcher's real experiences as an NVD were reflected in the observations, which were conducted using an ID evaluation checklist designed for NVD users and grounded in ID principles and international accessibility standards. Field research at the TIM Library and Graha Unilever reveals that both buildings lack ID features, despite being designed in a modern, attractive architectural style. There is insufficient acoustic infrastructure, a sensory-based evacuation system, and meeting spaces designed to accommodate NVD.

In an emergency, Deaf users are not alerted by visual cues such as flashing lights. Digital displays lack text and subtitles, making them inaccessible to deaf users. The majority of staff members at the TIM Library do not appear to have received any training in basic sign language (SL) communication, except for those who are proficient in SL. Additionally, there is no inclusive symbol-based visual signage at either facility.

These findings offer a tangible example of what are known as invisible barriers: buildings may appear modern, neat, and beautiful, but they do not satisfy communicative, sensory, and cognitive needs not only due to a lack of technical expertise but also because accessibility issues, particularly for NVD, have never been thoroughly examined, taught in academic curricula, or mandated by law. Therefore, rather than being the result of oversight, exclusion is the systemic outcome of an academic and policy environment that purposefully ignores human diversity.

Qualitative Data

Thematic analysis of academic practitioners, designers, and architects interviewed:

- a. There is a lack of public awareness and socialization regarding disabilities, particularly NVD. ID is still largely unknown to the general public. 1) The main problem is that professionals and the general public are not well-informed about NVD (e.g., dyslexia, autism, ADHD, mental health conditions). 2) Architects and designers frequently fail to consider the unique spatial and sensory requirements of NVD, which leads to exclusive design outcomes. 3) Suggested remedies include starting extensive public awareness campaigns through community outreach, workshops, training, and social media. Include specialized training and early disability education in elementary and secondary education. 4) Insufficient consideration of disability concerns in professional practice and education
- b. University curricula, syllabi, and semester-long learning modules should incorporate knowledge about disabilities. 5) Because ID is not routinely taught in academic programs, many architects and designers lack the fundamental training they need.
- c. Suggestions: include NVD-specific requirements and ID principles in architecture and interior design curricula. Incorporate people with disabilities as consultants, co-designers, or guest speakers in educational and creative contexts.
- d. There are regulations, but they are not always followed. Ministerial decrees, government regulations, and other rules are comprehensive, yet their implementation remains far from ideal. 1) An illustration of a new regulation: Ministry of PAN-RB regulation No. 11/2024 requires specialized signage and "quiet rooms" in public services; 2) field reality: widespread non-compliance is found in accessibility audits of public buildings (MRT, LRT, schools, and government offices).
- e. For instance, according to Informant 1's testimony, the Jakarta MRT only offers 60% comfort for wheelchair users. Public schools may offer accessible pathways, but they do not distinguish between the needs of people with VD and those with NVD.
- f. Facilities compassion: the need for a mentality and cultural change. Although there are not many facilities in Uzbekistan, people there actively lend a hand. Facilities in Singapore and Japan are extensive; an attendant is not required.
- g. The primary criticism is that there is too much focus on physical infrastructure at the expense of fostering an inclusive social culture. Main takeaway: Institutions lacking social empathy are useless. Social empathy needs to be fostered from an early age. Disability is a strength, not a liability. PwDs make significant and distinctive contributions to society.
- h. ID is an investment, not a cost. Architects should consider disability accommodations as investments rather than extra costs. A paradigm change is required: current design standards ignore human diversity in favor of an average user. For instance, autistic people are frequently very intelligent; this is not a sign of inability, but rather of our lack of understanding.
- i. People with dwarfism have trouble with high-placed facilities; people with autism and ADHD require calm surroundings; and deaf people require visual stimuli [25]. 1) Customized design methods are needed for NVD. 2) Visual access (captions, SL interpreters, and conspicuous signage) is needed for the Deaf/HoH [26]. 3) quiet areas and low sensory stimulation (soft lighting, low noise, simple furniture) are important for people with autism/ADHD. 4) dyslexia/dyspraxia: easily identifiable symbols and intuitive layouts. 5) mental health/anxiety: access to rest areas and safe spaces.
- j. Realistic restrictions: financial limitations, priorities, and technical terminology
- k. Budgets are tight, so we need to set priorities. Let us start with City Hall (informant 5). 1) Financial restrictions: take a step-by-step approach; start with high-priority public buildings (such as government buildings and hospitals) for accessibility audits and renovations. 2) excessively technical research language: to ensure usability by end users

and non-experts, Informant 1 suggests simplifying assessment and research language.

- I. Aesthetics and symbolism vs. functionality: still unbalanced; users frequently struggle to understand minimalist accessibility symbols (Informant 4). 1) A lot of accessibility symbols put aesthetics before usability, which makes them ambiguous or confusing to real users. 2) Design principle: In order for form and purpose to coexist, functionality and aesthetics must meet in the middle.
- m. Call to action from practitioners: specific suggestions: 1) start extensive media and workshop-based public education campaigns about NVD. 2) NVD and ID in curricula for higher education. 3) Audit public buildings in phases, beginning with high-priority locations. 4) Co-design: involve PwDs in the process of design and evaluation. 5) When creating guidelines, symbols, and research outputs, use clear, understandable language. 6) change perspective: human-centered investment replaces mandatory compliance.

Quantitative Data

Quantitative analysis of the respondents of the NVD perceived inclusive space users participants

1. ID respondents' experiences using public spaces.

The Google Form survey distributed to NVD participants was analyzed using descriptive statistics, including percentage computations [26][27]. The primary findings are as follows: a) The frequency of daily activity in public spaces: 66.7% of NVD respondents reported almost daily activities in public spaces; 19.4% reported using public spaces once or twice a week; 13.9% reported using them infrequently, and 0% reported never using them; b) Experiencing discomfort, anxiety, or difficulties in public settings.

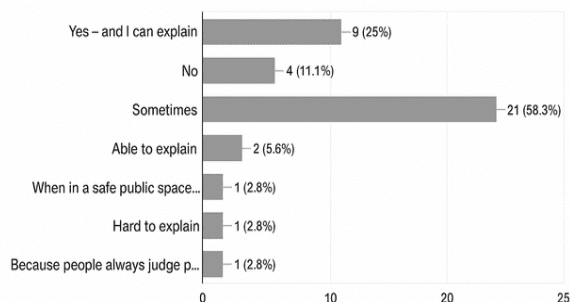


Figure 10. Perceptions of uncomfortable, inaccessible, and difficult activities in public Spaces by Respondents

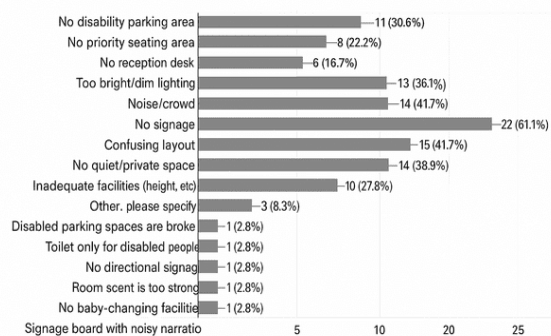


Figure 11. Factors Most Frequently Causing Respondents to Experience Inaccessibility or Discomfort in Public Spaces

According to 58.3% of NVD respondents, they occasionally feel uneasy, anxious, or run into issues when performing tasks in public settings.

According to NVD respondents, the following are the main causes of discomfort in public areas: 41.7% reported perplexing spatial layouts, excessive noise, or crowded environments, while 61.1% pointed to a lack of directional signage. 38.9% reported that there were no quiet areas; 36.1% said the lighting was too bright; 30.6% of respondents said there were no parking spaces reserved for NVD; 27.8% of respondents cited facilities that were not built to the proper height for dwarfism; 16.7% of respondents noted that there was no reception desks reserved for dwarfism, and 22.2% drew attention to the absence of priority seating in lobbies.

2. The opinions of respondents regarding the most crucial alterations or additions required to public spaces' interior architectural design to improve inclusivity for those with NVD.

To ensure greater inclusivity and responsiveness, the interior architectural design of public spaces should take into account several key recommendations informed by responses from 49 NVD participants.

- a. It is critical to acknowledge that cognitive diversity must be respected in design approaches because conditions like autism, Down syndrome, dyslexia, ADHD, deafness, and intellectual disabilities create barriers in built environments.
- b. Respondents stressed the importance of unambiguous visual guidance, including the use of color for zoning, large-letter and standard-font signage, high-contrast icons, and digital information boards or LED running text, especially in places such as train stations, airports, hospitals, libraries, and shopping centers. People who struggle to

- process verbal information, have anxiety, or have hearing impairments benefit from these features.
- c. There is a pressing need for sensory-distraction-free quiet areas that are appropriate for adults with psychosocial disorders as well as children with autism/ADHD. These areas ought to have noise-free surroundings and play rules based on symbols rather than just words.
 - d. Emergency communication and technology accessibility need to be enhanced. Examples include interactive digital maps, visual queuing systems in public service offices and hospitals, video intercoms in lifts, and visual alarms (flashing lights).
 - e. Spaces must be physically designed to meet specific needs, such as stairwells made of safe materials and well-lit restrooms accessible from the front of the building, priority seating for people with dwarfism, and user-friendly layouts that do not confuse people with spatial or cognitive orientation difficulties.
 - f. Human interaction remains essential; employees should be knowledgeable, receptive, and able to provide unbiased visual assistance or guidance. For slow learners, this entails using name tags and communicating clearly but slowly.
 - g. Several respondents recommended that inclusive public spaces be prioritized in key locations such as piers, terminals, and public service centers, and that design trials be conducted for NVD users before public spaces are formally opened.

By combining empathy, technology, and the IDEA principles, the proposed design not only functions well but also promotes a sense of safety, dignity, and understanding [29, 30, 31].

Respondents' most positive and negative experiences using public spaces in terms of accessibility design

According to respondents with NVD, empathetically designed public areas with clear visual cues are essential for producing satisfying user experiences. People can feel safe, independent, and respected in minimalist, monochromatic settings with high-contrast signage and clear color zoning, such as those at Soekarno-Hatta Airport Terminal 3, SCBD, and the Juanda Transjakarta bus stop. This is especially true when they are accompanied by understanding and accommodating staff who proactively anticipate needs, like providing priority pins or navigation assistance, even without being asked.

Negative experiences, however, continue to predominate. The lack of visual information boards (especially for emergency announcements or queuing systems), unclear directional signage, and confusing spatial layouts often left respondents disoriented in shopping centers, train stations, or museums (e.g., Monas and Dukuh Atas MRT). The absence of visual alerts, LED text displays, or SL-speaking staff frequently causes deaf people to feel anxious, panicked, and alone, even in emergencies like finding restrooms or hearing critical announcements.

There were also many reports of embarrassing and upsetting events, such as receiving reprimands for improper ablution, being misinterpreted when not answering vocal calls, or even being body shamed and having arguments over priority seating that people without disabilities took.

Physical amenities are still far from inclusive as well: restrooms that are inaccessible or have fixtures that are too high, reception desks and chairs that are too high for people with dwarfism, unclear evacuation routes, and a lack of quiet areas all add to the intimidating and draining atmosphere of public places. The sense of exclusion is further exacerbated by the lack of preparedness in establishments such as Samsat offices, police stations, and hospitals, where digital guidance or visual queuing systems are still unavailable.

Overall, a combination of well-trained human assistance, supportive technologies (such as digital maps, LED displays, and video intercoms), and clear design creates the most positive experiences. On the other hand, ignorance, indifference, and design practices that overlook physical, cognitive, and sensory diversity lead to the most negative experiences; ultimately, these practices not only restrict access but also deprive people of their humanity and dignity.

Respondents' perceptions or expectations about architects, interior designers, or future public space planners

The expectations of future public space planners, architects, and interior designers were high, according to 49 NVD respondents. 1) They first underlined that NVD and pertinent experts must be involved in the design process from the start, not just as consultants after the design is finished, but as active participants in joint forums whose results are disseminated to the community. 2) Public space design must specifically accommodate neurodiverse needs such as dyslexia, ADHD, and autism by

addressing cognitive, spatial, and sensory challenges. Large signage, high-contrast colors, visual symbols, and required quiet areas in each building are all part of this. 3) Physical amenities should be universally accessible: dual-height sinks and reception desks (for kids and people with dwarfism), truly accessible priority seating, lifts and escalators that are accessible to people with disabilities, and digital maps and LED text-based information systems to make sure that no one is left behind with schedules or queue numbers. 4) In addition to NVD, older adults, children, and pregnant women should also benefit from the expansion of supporting technologies and infrastructure, such as CCTV, visual alarms, video intercoms, and pictorial guides. 5) Human resources are still very important. Public servants need to be responsive, well-trained, and able to understand NVD's needs without bias. This includes having assistants who are aware of the psychosocial and sensory conditions. 6) Regulations and education must be reinforced. In addition to requiring ID methods in architecture and interior design programs, the public and private sectors should expedite the adoption of accessibility guidelines that account for NVD concerns by amending regulations and issuing operational circulars.

In conclusion, the participants emphasized that future public areas should not only be accessible but also comfortable for all people to use, regardless of whether their needs are apparent. Beyond being functional, these areas ought to become compassionate, serene, and stress-free settings where each person is respected, understood, and fully free to engage in social activities. With this vision, they believe that the architecture of the future is not only about form and aesthetics, but also about justice, empathy, and the courage to listen to voices long unseen and to manifest them in stone, steel, and light.

CONCLUSION

This study highlights that accessibility strategies focused solely on regulatory compliance are still insufficient to create truly inclusive public spaces. In Indonesia, although legal frameworks such as Law No. 8/2016 and the Ministry of Public Works and Housing Regulation No. 14/2017 protect the rights of people with disabilities, the implementation of ID in public spaces remains rudimentary and tends to focus solely on VD. As a result, people with NVD, including autism, dyslexia, psychosocial disorders, dwarfism, and hearing impairments, still feel marginalized, uncomfortable, and

anxious in spaces that do not accommodate their spatial, sensory, and cognitive needs.

Through a mixed-methods analysis involving 49 NVD participants and 11 key informants (architects, designers, and academics), the study reveals that facilities such as ramps and lifts alone are not enough to achieve true inclusivity. Design changes are needed to operationalize the IDEA principles: 1) inclusion must be realized by actively involving NVD from the earliest planning stages, rather than treating them as symbolic consultants or passive recipients. 2) Diversity demands neuro-inclusive spaces where layouts, lighting, signage, and acoustics consider neurodiversity and variations in sensory processing and cognition. Design must acknowledge that there is no average user. 3) Differentiated solutions are necessary for equity. For example, quiet zones for autistic individuals, visual cues for Deaf users, and adjustable-height counters for people with dwarfism are fundamental needs, not mere extras. 4) accessibility must broaden to include social, cognitive, and sensory aspects. Feelings of safety, understanding, and the ability to navigate spaces independently are better indicators of true accessibility than the mere presence of physical facilities.

Quantitative findings reinforce this urgency: over 40% of people with NVD experience sensory overload and confusion due to complicated layouts, 58.3% report anxiety in public places, and 61.1% cite a lack of directional signage as a major obstacle. These issues stem more from ignorance, outdated curricula, and discriminatory design practices rather than individual limitations.

To close these gaps, the study proposes nine transformative actions: a) Require ID education in architecture and interior design programs; b) Launch nationwide awareness campaigns about NVD; c) Enforce laws with audit criteria unique to ID; d) Prioritize sensory-friendly features such as quiet zones, visual guidance, and low-stimulus environments; e) Formalize co-design processes with NVD communities; f) Train public service employees in visual and empathetic communication; g) Simplify design guidelines and research language for broader accessibility; h) Balance functionality and aesthetics in symbols and signage; and i) Implement phased retrofitting, prioritizing high-traffic public buildings.

Ultimately, IDEA is not merely a checklist but a paradigm shift. Architecture must change its perspective from viewing disability as a problem to be solved to recognizing it as a source of creativity, value, and human diversity. The

architecture of the future is not just about form and aesthetics but about justice, empathy, and the courage to listen to voices long marginalized and to manifest them in real, tangible spaces.

The goal of inclusive design is not simply to make spaces accessible but to create spaces that truly feel like they belong to everyone.

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