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The Illusion of Inclusion;

Exploring the Paradox of Simulations and Simulation Toolkits in [Inclusive] Design

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Abstract

Simulation toolkits have become ubiquitous within the design industry, purportedly fostering inclusion by offering a glimpse into diverse lived experiences (Cardolo, C. and Clarkson, J., 2010). This paper critically examines the potential pitfalls of relying on such simulations, questioning whether they inadvertently perpetuate the illusion of inclusion. While the noble intention is to accommodate a broad spectrum of needs, the current limited and singular understanding and application of these tools poses a looming danger of inadvertently upholding an ableist approach, and leading to unintentional exclusion. The research elucidates instances where simulations may go awry, exploring their overarching impact on the communities they aim to represent and their role in shaping prevailing narratives (Silverman, 2015). The paper emphasises the influential power of narratives and delves into their connection with psychosocial inclusion. Introducing a personal dimension, the paper incorporates a brief auto-ethnographic section where the author shares their own experiences with disability simulations. This firsthand account adds depth to the exploration, offering insights into the potential disparities between simulation intent and the nuanced reality of lived experiences. The article adopts a double lens of lived experience and disciplinary expertise to capture insights and

investigate issues and discuss the issues. In conclusion, the paper offers a concise summary of suggestions, serving as a guide for future designers aiming to navigate the complexities of simulation toolkits while genuinely advancing psychosocial inclusion.

Keywords

Simulations Simulation Toolkits, Psychosocial Inclusion/ Exclusion, Narratives of Disability, Lived-Experience.

1. Introduction

Design wields the influential power to shape not only our interactions and behaviour but also the very philosophy of inclusion itself. As a conduit of embodiment and material culture, design plays a pivotal role in moulding numerous human interactions and experiences. Consequently, it can either inherently facilitate accessibility and inclusivity or, conversely, perpetuate exclusivity and inequity 'by design'.

In the realm of design, a significant shift towards embracing the principles of Equality, Diversity, and Inclusion (EDI) has been taking shape. Alongside this shift, a new array of tools and simulations has emerged. Referred to as simulations/ simulation toolkits, empathy toolkits, or inclusive design toolkits, we will use the term 'simulations/simulation toolkits' in this paper for simplicity.

These simulation toolkits have emerged as instruments to foster inclusivity and create designs that resonate with a broader range of individuals (Cardolo, C. and Clarkson, J., 2010). They come in various forms, such as SimSpecs, gloves simulating arthritis, and even full-body suits that replicate the effects of ageing, to name a few. The underlying intention behind these tools is commendable:

to help designers walk in the shoes of those with different conditions, fostering a more empathetic, inclusive design process (Cardolo, C. and Clarkson, J., 2010). As a result, the field of inclusive design has dedicated significant attention to the study of physical accessibility, functionality, usability, and physical comfort. This focus has been particularly pronounced in relation to two key dimensions: age and physical ability.

However, as with many well-intentioned endeavours, there is a paradox at play. The very tools designed to facilitate understanding and inclusivity may, in certain instances, perpetuate exclusion and inadvertently contribute to an ableist deficit-based narrative (Silverman,2015).

In the pages that follow, we will explore the complex relationship between simulation toolkits and unintended exclusion, examining the intricate dynamics at play, considering both the benefits and pitfalls of their usage. Our goal is not to discourage the use of simulation toolkits, but rather to promote a nuanced understanding of their implications and to propose strategies for their responsible and inclusive application.

2. Mapping the Landscape of Simulation Toolkits

This section serves as a map, guiding us through both the well-trodden paths of widely recognized tools and the uncharted territories of lesser-known simulations and immersive experiences. This paper selectively showcases specific types of simulation toolkits, focusing on age and ability. As a non exhaustive review, it does not cover simulations beyond these categories, such as pregnancy simulations. By surveying this landscape, we aim to gain a deeper understanding of the tools that designers have at their disposal.

2.1 University of Cambridge Gloves and Glasses Simulating Physical Limitations

Image 1.1 University of Cambridge Engineering Design Centre Simulation Gloves and Glasses

Among the most prominent and widely recognized simulation toolkits in the world of design, we find a set of gloves and glasses developed by researchers at the University of Cambridge's Engineering Design Centre (Hosking, Cornish, Bradley, Clarkson, 2015). They are a powerful call to action, imploring designers to reconsider the usability and accessibility of their products (Hosking, Cornish, Bradley, Clarkson, 2015). The underlying intention is to instil a sense of empathy (Cardolo, C. and Clarkson, J., 2010)., encouraging designers to walk in the shoes, or in this case, wear the gloves and glasses, of those struggling with reduced grip ability (e.g arthritis) and reduced vision.

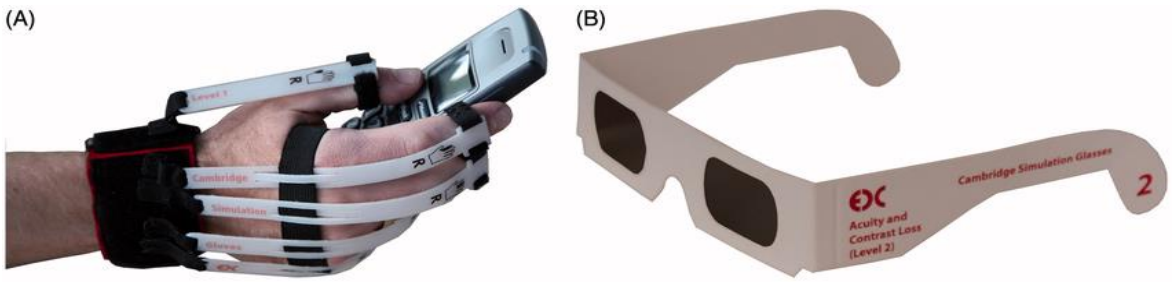

Image 1.2 ***University of Cambridge Engineering Design Centre Simulation Gloves and Glasses***

2.2 University of Cambridge Exclusion Calculator

Offering a quantitative dimension to the pursuit of inclusivity, The Exclusion Calculator serves as a practical and data-driven instrument for designers. This calculator was developed as part of the ID-3 Inclusive Design Consortium run by the Centre for Business Innovation, and is based on UK population data from 1997 (*Cambridge* Engineering Design Centre, 2017). This freely available version of the exclusion calculator allows designers to assess a specific task.

2.3 Age Simulation Tools - GERT and Ford's Third Age Suit

In this example, we will explore two tools simulating age-related impairments: GERT, the Age Simulation Suit, and Ford's Third Age Suit.

Image 1.4: Ford's Third Age Suit - Designing with Seniors in Mind

Similarly, automotive giant Ford has embraced the concept of empathy in design by developing the "Third Age Suit". This toolkit is dedicated to designing cars with seniors in mind, ensuring that vehicles are not only functional and aesthetically pleasing but also considerate of the unique needs and experiences of older individuals (Pultarova, 2023) . The Third Age Suit replicates the physical and sensory changes associated with ageing, simulating age-related impairments such as reduced mobility, vision issues, and diminished dexterity.

GERT - Age Simulation Suit

From the opacity of the eye lens to the narrowing of the visual field, high-frequency hearing loss, head mobility restrictions, joint stiffness, loss of strength, reduced grip ability, and diminished coordination skills, GERT provides a comprehensive and immersive simulation of the physical and sensory challenges that often accompany ageing as shown in the image below (Timm, Spaderna, Rodermund, Lohr, Buettner, Berndt, 2020).

Image 1.3: GERT Age Suit

2.4 Sensory Simulations: SimSpecs

Image 1.5: Optima, Set of 6 Simulation Spectacles

Manufacturers like Connect offer simulation spectacles (sim specs) designed to replicate various conditions such as retinal degeneration, loss of vision, and reduced visual acuity, aiming to raise awareness of visual impairment (Connect Design, 2023). It is noteworthy that a fairly large range of manufacturers produce simulation spectacles, considering them among the most commonly utilised and readily available simulation tools, extending beyond design settings. They are even available on platforms such as Amazon rather than specialist retailers (See Image 1.6)

They have a specific focus on replicating a diverse range of symptoms of conditions that cause visual impairments. This is in contrast to the simulation glasses developed by the University of Cambridge, which provide a more general simulation of fading visual acuity through the use of foggy glasses. SimSpecs provides

simulations for a range of visual impairments, including hazy vision, left/right side vision loss, loss of binocular vision, retinal degeneration, reduction of visual acuity, tunnel vision, cataracts, horizontal diplopia, birdshot uveitis, and severe sight loss, restricting visibility to only light projections (Connect Design, 2023). Importantly, these simulations cover symptoms that can arise from a variety of different conditions. Additionally, other manufacturers offer simulation glasses specifically labelled with certain conditions rather than general symptoms. Among the commonly simulated conditions are Glaucoma, Cataracts, Macular Degeneration, Retinitis Pigmentosa, and Diabetic Retinopathy (see image below).

Image 1.6: Simulation Spectacles found on Amazon

Digital alternatives also exist, essentially functioning as filters. An illustration of this is the See Now Sight Simulator, utilising Google Maps to depict familiar locations through the lens of conditions

such as cataracts, glaucoma, and retinopathy (Clarke, K., 2017). The simulator allows users to adjust the severity of the displayed issues, showcasing the diverse diagnoses and experiences associated with vision loss. Additionally, the Sight Simulator provides on-screen information about the specific condition being viewed.

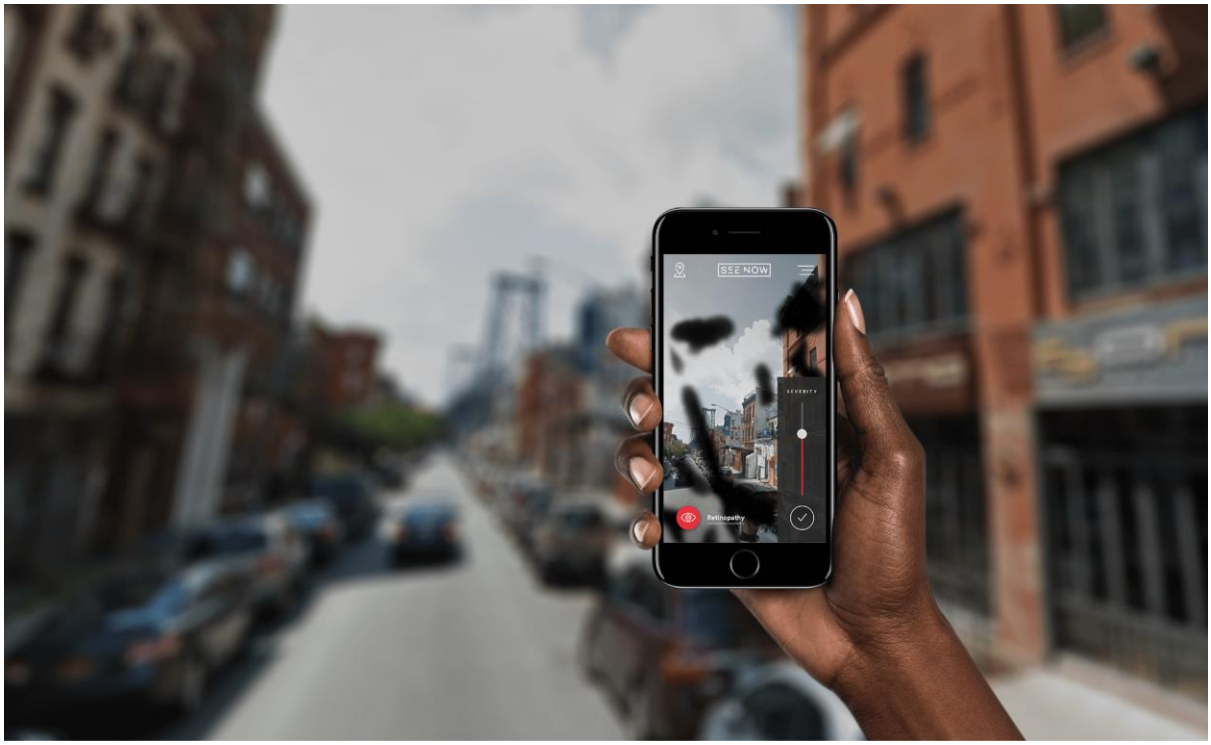

Image 1.7: See Now Sight Simulator

2.5 Neurodiversity simulations: The Harvard University Dyslexia Simulator

It is worth noting that simulations of neurodivergence and mental health conditions are less commonly used compared to the examples mentioned earlier. Typically, such simulations take the form of videos illustrating the experience visually. For instance, there are numerous videos simulating overstimulation to portray the autistic experience (National Autistic Society, 2017). An exception is The Harvard University dyslexia simulator, available on GitHub, which employs code created by Swedish web developer

Victor Widell (Harvard University, 2012). This tool alters text by keeping the first and last letters of each word constant while jumbling up the middle letters, replicating the visual experience of dyslexia. Originating from Widell's dyslexic friend, who described letters swapping in and out of place, the code can be applied to any web page to simulate the dyslexic reading experience.

Immersive Experiences

Many of these simulations focus on emulating the physical constraints, encompassing not only simulations of physical impairments like limited mobility but also those simulating sensory and psychological experiences. The exploration of emotional, psychological, and socially influenced factors is more likely to be found in the realm of immersive experiences. To illustrate, a few examples of immersive experiences are explored here.

2.6 Notes on Blindness- Into Darkness (VR experience)

The highly acclaimed narrative VR experience, "Notes on Blindness," takes participants on an emotional journey into a world devoid of sight, drawing inspiration from the real-life account of John Hull's experience with sight loss (Colinart, A., 2016). In 1983, after a gradual decline in vision over several decades, John Hull lost his sight completely (Colinart, A., 2016). Seeking to comprehend the profound changes in his life, he began documenting his journey on audio cassettes. These authentic diary recordings serve as the foundation for an interactive non-fiction narrative, providing a cognitive and emotional insight into the experience of blindness. The narrative unfolds through a distinctive combination of storytelling, art direction, and a graphical universe, enhanced by features like movement tracking,

spatialized sound, and interactive controls. The work is produced by Ex Nihilo and Arte France in collaboration with Archer's Mark, with Novelab Audiogaming as the executive producer (Colinart, A., 2016).

Image 1.8: Notes On Blindness- Into Darkness

2.7 Within Reasonable Accommodation

The installation "Within Reasonable Accommodation" by Stephen Lapthisophon, exhibited at Gallery 400, University of Illinois in 2002, challenged the public's response to accommodation policies for disabled individuals (Cachia, A., 2016). Lapthisophon strategically incorporated various elements such as ladders, sculptural intrusions, cardboard boxes, electrical cords, walkers, architectural details, images, signage, and obstacles to influence how visitors navigated the gallery space (Cachia, A., 2016). By reversing the typical access privileges, Lapthisophon empowered the disabled subject and placed the non-disabled figure in the minority, aiming to evoke empathy from the audience.

Image 1.9: Within Reasonable Accommodation, Gallery 400

This concept of reversing an environment, shifting from accessible to inaccessible for the mainstream, resonates with Finkelstein's short story depicting an "upside-down world"—a community organised and run by wheelchair users (Finkelstein, 1988). Disabled installation artists often explore this idea, making a powerful statement about their rights to accessibility and aligning with philosophies like the design model of disability.

2.8 Chaos

E&H LAB, a French creative agency specialising in corporate social responsibility, collaborated with MassiveMusic to create CHAOS, an immersive initiative exploring mental health complexities. Located at Saint-Lazare railway station within a brain-shaped dome, CHAOS portrays daily life navigation for individuals with mental illnesses through experiences involving shifts in darkness, electricity, and light, along with changes in speed, rhythm, and mood (Little Black Book, 2019). The integration of music and visuals enhances the immersive character, illustrating diverse

emotional states—from calmness to turmoil (Little Black Book, 2019).

Note

The examples in sections 2.9, 2.10 and 2.11 represent the author's personal endeavours in articulating both their own and others' lived experiences, mainly in the form of installations, experiments and education resources. Although not on the same scale as the previously mentioned examples, they offer conceptual and philosophical relevance. These instances experiment with a blend of simulation and immersive experience methods, aiming to contribute to the discourse surrounding disability narratives and design inclusion.

2.9 Daring Into Darkness

This exploration sought to convey the lived experience of blindness to a fully sighted audience using both an immersive experience (non-visual) and a graphic narrative (visual). Drawing inspiration from Merabet and Alvaero Pascual-Leone's studies (Pascual-Leone, Amedi, Fregni, Merabet, 2005; Merabet, Swisher, McMains, Halko, Amedi, Pascual-Leone, Somers, 2007; Pascual-Leone, Obretenova, Merabet, 2011) which revealed cognitive changes after five consecutive days of sensory deprivation, the artist, already familiar with visual impairment, conducted an eight-day experiment of complete sight deprivation through blindfolds. The insights from this experiment informed the creation of the installation "Whispering Walls" and the immersive exhibition "Daring Into Darkness", both expanding on the findings of the initial study.

"Daring Into Darkness" aimed to challenge the stigmatised perception of blindness, prompting a conversation about how

visually impaired individuals perceive the world and what we can learn from their perspective. This effort was motivated by a desire to shift away from deficit-based narratives surrounding visual impairment and instead educate people about alternative ways of seeing and navigating life. The exhibition was showcased as part of the Royal College of Art Degree Show in 2017.

2.10 Colour Embodied

Colour Embodied, a Friday Late event at the National Gallery during the Monochrome season, creatively explored alternative colour perception experiences. Comprising a talk, workshop, and pop-up exhibition, the initiative focused on non-visual and embodied aspects of colour perception as a culturally learned behaviour tied to pattern recognition. The talk provided scientifically grounded insights into colour perception, particularly within visually impaired individuals, while an interactive workshop allowed participants to test their pattern recognition in relation to colour perception. Blindfolded visitors categorised objects on a table based on tactile inputs and other sensory cues, demonstrating the brain's role in vision. This event aimed to shift away from deficit-based perceptions of individuals with visual impairments by showing how much of visual processing really happens in your brain as opposed to your eyes.

2.11 How We See

This 18-month design research project, conducted in collaboration with the Royal National Institute of Blind People (RNIB) and the Helen Hamlyn Centre of Design at the Royal College of Art, aimed to break the stigma and reshape the representation of individuals with invisible disabilities. Inspired by the RNIB's viral video #How

I See, the project, titled How We See, resulted in various resources for both internal and external use by the RNIB:

RNIB Volunteer Pack on 'How We See':

- **Materials for visually impaired volunteers to conduct school sessions on sight loss. Addresses misconceptions about blindness, confusing language, and stereotypes.**

'How We Sense' Resource:

- **Designed for teachers to integrate relevant topics on sensory diversity and sight loss into various subjects (Science, English, Maths, and PSHE). Includes lesson plans aligned with the school syllabus and uses immersive experience activities to maximise student engagement.**

RNIB Briefing on Disability Narrative:

- **Informed by project findings, this resource offers guidelines for a contemporary, human-centred disability narrative. A shift from traditional, deficit-based communication to more timely and inclusive approaches.**

While the simulations and simulation toolkits explored in this section seem to hold significant promise for designers to craft products and environments that consider a diverse range of user experiences (Cardolo, C. and Clarkson, J., 2010), the paradox emerges: even with the best intentions, the intersection of empathy and exclusion through simulations can leave a shadow (Flower, Burns, Bottsford-Miller, 2007).

3. An Illusion of Inclusion - How Things Go Wrong

This section aims to scrutinise the challenges and potential pitfalls associated with the utilisation of simulation toolkits in design. It will explore scenarios where well-intentioned efforts to promote empathy, paradoxically result in a form of exclusion that may not be immediately apparent (Silverman, 2015; Wright 1978), leading to what could be termed an "illusion of inclusion". Understanding mentalities around inclusion, user experience and disability becomes paramount in unravelling and understanding the complexities that may underlie the pitfalls of simulation toolkits.

3.1 Understanding (Psychosocial) Inclusion: Beyond Physical Barriers

In the realm of design, the pursuit of inclusion has traditionally centred on the removal of physical barriers, with a primary focus on tangible, concrete accessibility measures (Kille-Speckter, Nickpour, 2022). While addressing these barriers is undoubtedly a crucial facet of the inclusive design process, it is equally important to recognize that genuine inclusion extends far beyond the realm of physical impediments. Simulation toolkits, while invaluable for fostering awareness of physical limitations, can inadvertently perpetuate the "illusion of inclusion" when they fail to address the intricate psychosocial dimensions of design exclusion. To fully appreciate the holistic experience of users, designers must extend their understanding beyond the physical dimensions of inclusion.

Psychosocial inclusion is characterised by the psychological, sociological, cultural and value-related barriers that contribute to design exclusion (Nickpour and Jordan 2012; Lim and Nickpour, 2016; Lim, Giacomin, and Nickpour, 2020). Psychosocial inclusion

plays a pivotal role in determining the success of any inclusive design endeavour. It underscores the reality that for many individuals facing exclusion, the social and psychological factors can often present more significant barriers than the physical obstacles (Nickpour and Jordan 2012; Lim, Giacomin, and Nickpour, 2020; Shakespeare, 2013). Unfortunately, these psychosocial factors are frequently underrepresented or entirely overlooked in the development and application of simulation toolkits. In the pursuit of empathetic design, it is essential to recognize that the experience of exclusion or inclusion is not solely determined by the absence or presence of physical barriers. Rather, it is a multifaceted interplay of emotional well-being, social connectedness, psychological comfort, and cultural relevance. It is this complex interweaving of psychosocial factors that often dictates the level of inclusivity achieved by a design (Nickpour and Jordan 2012; Lim and Nickpour, 2016; Lim, Giacomin, and Nickpour, 2020).

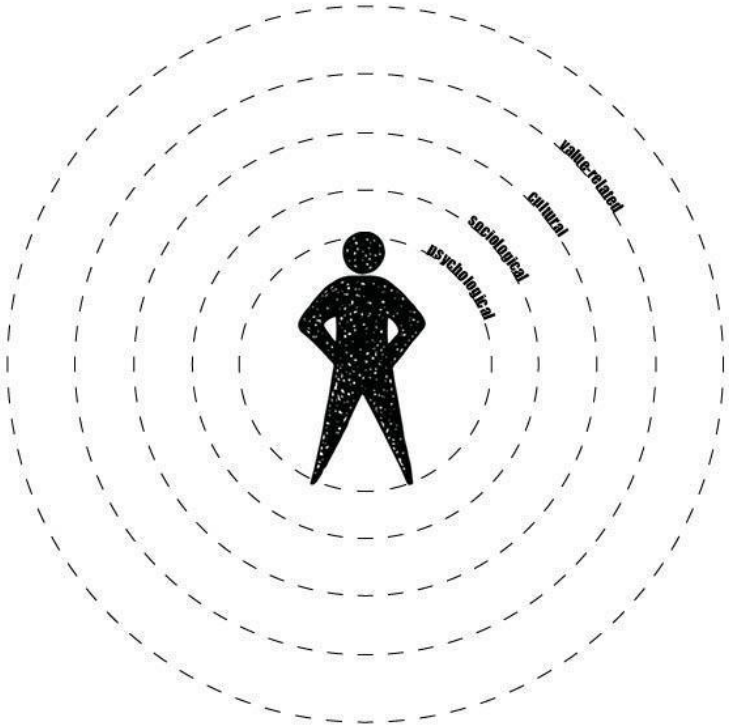

Image 2.1: Layers of psychosocial inclusion

To foster inclusivity, a solid understanding of essential user experience principles is indispensable. A thorough exploration of user experience and the foundations of good design is imperative for achieving psychosocial inclusion in design. Conventional adaptations, like non-integrated ramps and other accessibility go-to's, prompt inquiries into their impact on social interactions and the risk of creating divisions among users.

3.2 Understanding User Experience: Beyond Accessibility and Functionality

Regardless of whether our design targets the mainstream or a niche audience, the foundation of good design can be further explored in consideration of the hierarchy of design needs (as shown below in the UX Hierarchy of Needs) which draws inspiration from Maslow's hierarchy of needs (Anderson, S. P., 2011). By adhering to the layers of functionality, reliability, usability, convenience/ proficiency, pleasure, and meaning, we ensure that our designs not only meet their intended purpose but also resonate with users on a profound and meaningful level. This approach transcends the mere aesthetic or functional aspects, emphasising a comprehensive understanding of the diverse layers that contribute to a successful and inclusive design experience. This evolved hierarchy underscores that successful design necessitates addressing each layer comprehensively (Anderson, S. P., 2011), reinforcing the argument for psychosocial inclusion by acknowledging the multifaceted aspects of user experience beyond mere physical functionality.

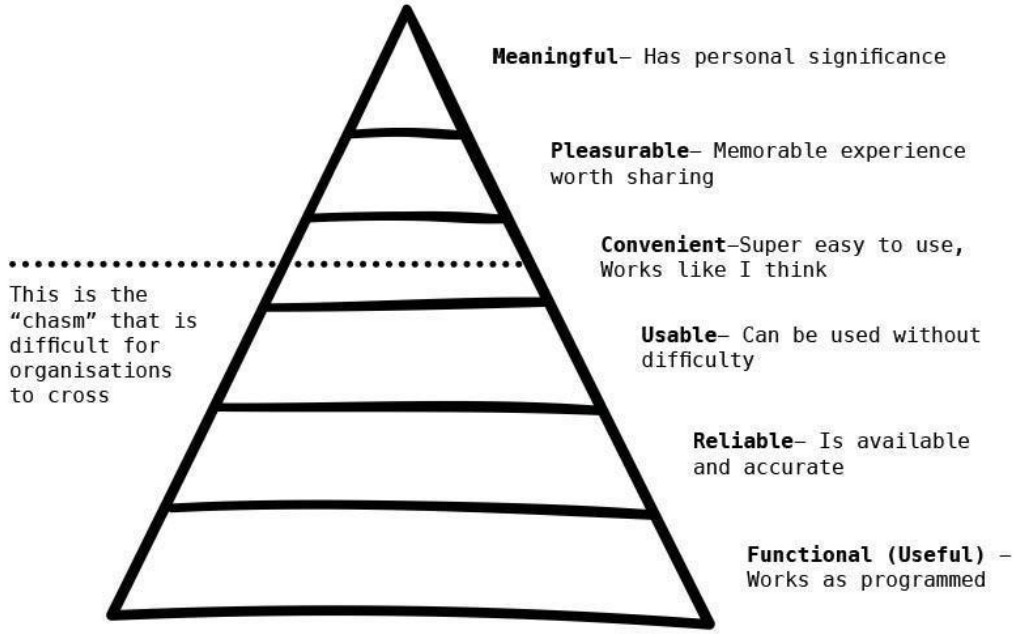

Image 2.2: UX Hierarchy of Needs

Continuing with this line of thinking, the principles outlined in the book "Emotional Design" by Don Norman further reinforce the connection between the hierarchy of design needs and psychosocial inclusion. Norman explores the concept of three distinct levels of experience, each corresponding to different levels of design. The first level, Visceral Design, operates on a subconscious, immediate reaction to sensory stimuli (Norman, D. A., & Ortony, A.,2003). For instance, encountering a landfill elicits an instinctive negative response, while the anticipation of a luxury car exhibition evokes positive, anticipatory feelings (Norman, D. A., & Ortony, A.,2003). The second level, Behavioral Design, correlates with the usability and convenience layer, delving into the practical and meaningful aspects of user experience during product use—focusing on how it feels, looks, etc (Norman, D. A., & Ortony, A.,2003). Norman's concept underscores that achieving meaningful design necessitates passing through the visceral design test, mirroring the layered approach of the design

hierarchy. The third level, Reflective Design, aligns with the pleasure and meaning layers, emphasising experiences beyond initial use, such as associations, familiarity, and retrospection, that influence long-term perceptions (Norman, D. A., & Ortony, A.,2003). This nuanced dimension echoes the psychosocial inclusion argument, highlighting the significance of understanding the overall user experience, including emotional, social, and cultural aspects, to create designs that resonate inclusively with users.

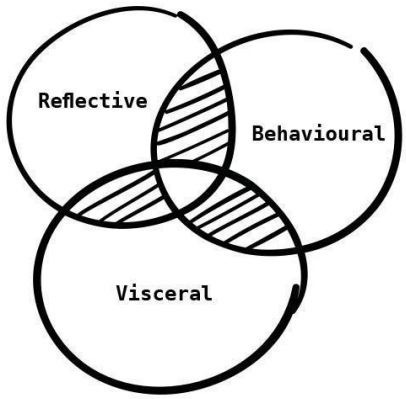

Image 2.3: Donald Norman's Three Levels of Design

As we unravel the multifaceted layers of design inclusion and user experience, it becomes evident that the pursuit of inclusivity demands a comprehensive understanding beyond the tangible. This sets the stage for our exploration of (disability) narratives, which wield significant influence on shaping perceptions and, ultimately, impacting lives (Shakespeare, 2013).

3.3 The Power of Narrative: Shaping Disability Narratives and Impacting Lives

Narratives, as conduits of human experience, are powerful tools that shape our understanding of the world (Bruner,1991). They

influence the way we perceive others, construct our identities, and navigate the complex terrain of disability. In the realm of design and empathy, narratives play a crucial role in both reflecting and moulding our attitudes toward disability (O'Sullivan and Nickpour, 2022).

There is no singular narrative of disability, but rather a rich tapestry of diverse stories, each offering a unique perspective on what it means to live with a disability. These narratives are not just stories but also integrations of experiences, beliefs, and societal constructs. They wield the power to elevate or disempower, to inspire or marginalise (Kille-Speckter and Nickpour, 2022). To truly understand and appreciate the multifaceted nature of disability, we must examine the narratives that surround it. Therefore, narrative analysis holds considerable promise in the field of design, fostering a deeply humanised design process by cultivating empathy, enriching multi-sensory conceptualisation and visualisation, and facilitating holistic designing (Danko, 2006, p.1).

Within the sphere of disability narratives, two predominant models emerge: the Medical Model of Disability and the Social Model of Disability. These models provide distinct frameworks through which society comprehends disability and subsequently informs the design process. It is critical to recognize the impact these models have on individuals' lives and their experiences. In addition to these widely recognised models, we will also delve into lesser-known but equally impactful models of disability such as the Design Model of Disability, and an extensive chronological list of existing models of disability for reference, offering a comprehensive understanding of the evolving narratives surrounding disability.

3.3.1 The Medical Model of Disability

The Medical Model of Disability traditionally views disability as a personal deficit, an inherent flaw within the individual. It places the focus on the individual's impairments and shortcomings, often framing them as medical issues to be treated or fixed (Guffey and Williamson, 2020). This model tends to pathologize disability, emphasising medical diagnoses and interventions to bring individuals in line with the "norm" (Guffey and Williamson, 2020).

This enthusiasm for disabilities being fixed - particularly through advanced technology - is still reflected nowadays in phenomena such as techno-ableism (Kille-Speckter and Nickpour, 2022). Simulations, by replicating physical limitations, may inadvertently reinforce this deficit-oriented perspective, mirroring the approach of pathologising disability and seeking solutions that compare individuals with a perceived "norm." Consequently, examining the alignment between simulations and the Medical Model of Disability highlights the potential implications of simulation tools in perpetuating a deficit-focused narrative around disability.

3.3.2 The Social Model of Disability

In contrast, the Social Model of Disability shifts the narrative from individual deficits to societal barriers (Shakespeare, 2013). It posits that disability is not solely an intrinsic condition but is exacerbated by societal structures, attitudes, and physical environments that do not accommodate diverse needs. This model emphasises that disability is as much a result of environmental and societal factors as it is of individual impairments. It is a narrative that focuses on empowering individuals by removing societal barriers to their participation and inclusion.

3.3.3 The Design Model of Disability

The emerging design model of disability challenges traditional perspectives by asserting that disability is a result of design shortcomings within a given space leading to individuals being disabled by design (Guffey and Williamson, 2022; Hendren, S., 2020; Kille-Speckter and Nickpour, 2022).

The design model of disability introduces a paradigm shift by emphasising the critical role of designed spaces in shaping the experiences of individuals with disabilities (Hendren, S., 2020). In this model, disability is not an inherent trait of an individual, nor is it solely a consequence of societal attitudes or structures. Instead, disability is viewed as a product of the interaction between an individual and the designed environment (Hendren, S., 2020). This perspective underscores the significance of creating inclusive and accessible designs that cater to a diverse range of abilities.

The design model encourages a proactive approach, urging designers to anticipate potential challenges and eliminate barriers before they become impediments.

3.3.4 An overview of Models of Disability

In addition to the narratives presented through the outlined models of disability above, a chronological list of disability models, along with their commonly understood narratives, is provided below (Kille-Speckter and Nickpour, 2022).

Disability Model	Language keywords	Details
The Religious Model of Disability	***Sin, shame, act of god, divine punishment***	**Oldest model of disability, punishment by God(s)**

The Moral Model of Disability	***Sim, moral, spiritual, belief***	**Morally responsible for their own disability (mid 1800)**
The Eugenic Model of Disability	***normal/abnormal, fit/unfit, undeserving, inferior***	**Theory of eugenics, being fit or unfit physically**
The Biomedical Model of Disability	***Biology, impairment***	**Dominant in the western World, focus on biological factors only**
The Biopsychosocial Model of Disability	***Undeserving, unwilling, lazy***	**Developed by private health insurance in US and UK, responsibility on disabled person**
The Medical Model of Disability	***Cure, treatment, disease, care***	**Disease or trauma to be cured**
The Professional Model of Disability	***Impairment, limitation, improvement, treatment, patient***	**Related to medical model, perspective of experts**
The Charity Model of Disability	***Tragedy, itty, shame, victim***	**Disabled people as victims of circumstance**
The Economic Model of Disability	***Socio-economic, impairment, assessment, productivity, (un)employment***	**Personas inability to work/ being a productive member of society**
The Identity Model of Disability	***Minority, disability as identity, membership***	**Disability as a positive identity**
The Social Model of Disability	***Social construct, phenomenon, integration, rehabilitation***	**Phenomenon which is socially created**
The Affirmation Model of Disability	***Normalisation, deinstitutionalization, disability pride, social***	**Critique of the charity/tragedy model, disability as an everyday occurrence which is neither negative nor positive**

	identity, impairment, arts, non-tragic, diversity	
The Minority Model of Disability	***Experience, normalisation, social barriers, imposed, impaired***	**Sociopolitical,social barriers and negative attitudes imposed on individuals**
The Market Model of Disability	***Identity minority, economic, user, market, empower***	**Minority rights and consumerist model, disabled people as stakeholders and consumers**
The New Radical Model of Disability	***Disabled person, rights, disability justice,intersectionality, social justice, crip, mad (reclaimed)***	**Does Not distinguish between impairment and disability**
The Spectrum Model of Disability	***Mankind, function, reduction, operation, disability***	**Disability on a sensory spectrum of humankind**
The Relational Model of Disability	***Built environment, normalisation, diversity, support, deinstitutionalization***	**Normalising access and social inclusion**
The Socially Adopted Model of Disability	***Ableism, environment, limitations, society***	**Limitations of able-bodied society, social barriers**
The Empowering Model of Disability	***Empower, individual, choice, treatment***	**Professionals as service providers**
The Legitimacy Model of Disability	***Value-based,membership, collaboration***	**Disability as a value based determination**
The Human Rights Model of Disability	***Human rights, social justice,independence, voices, discourse,***	**Human rights based and anti-discrimination (1980s)**

discrimination

Many of the existing narratives surrounding disability can be characterised as ableist, stigmatising, reductive, and in themselves disabling (Shakespeare, 2013). It is therefore vital to appreciate the implications of these narratives on individuals' lives and experiences (Silverman, Gwinn, Van Boven, 2015). To break down these narratives and cultivate empathy, designers must be attuned to the general consensus of disability narratives and work to challenge and redefine them.

3.4 Lived-Experience Insights: Exploring Simulations of Disability

The journey toward genuine empathy in design is a multifaceted endeavour, and one of the most enlightening perspectives can be found in the lived experiences of individuals who face the unique challenges of disability on a daily basis (Silverman,2025).

In this subsection, we embark on an autoethnographic exploration of the short and long term impact that simulations and empathy toolkits have had on the author, who has lived-experience of a visual impairment. It sheds light on the nuances and intricacies of experiencing one's own disability through the lens of a simulation. This lived-experience narrative serves as a testament to the multifaceted nature of empathy in design, a reminder that achieving true empathy requires an appreciation of the personal, emotional, and psychological dimensions.

The narrative will now transition to a first-person perspective, allowing for a descriptive and reflective exploration of key aspects of the author's experience.

"My journey with simulations began at the age of 16 when I was diagnosed with Stargardt's disease. The condition predominantly affects my central vision, resulting in blind spots within my field of vision, which has significant implications for colour perception and detail recognition.

My very first encounter with simulations occurred while I was still in school. A charity supporting individuals with sight loss organised a 'day of empathy' to explain my condition to my fellow students. They handed out simulation glasses specifically designed to replicate the experience of Stargardt's disease, and tasked the students with performing various activities while wearing these glasses. It was an attempt to provide them with insight into my daily challenges.

From the perspective of the students who participated, the simulation glasses were received like a game; something fun to play with. There was an element of curiosity and novelty as they navigated their surroundings with altered vision. However, it also unintentionally turned into an exercise of pity, as they struggled to cope with the limitations imposed by the simulation glasses.

I myself wanted to try the simulation glasses and was shocked how unrealistic the simulation was. As previously mentioned, I have blind spots in my central vision, however they are not actually visible for me as my brain in a sense, fills in the blanks like a live streaming optical illusion. Nor do I experience any notably visible effect of my sight loss such as blurriness. However, the simulation glasses are very literal in their interpretation of certain effects such as black splotches on the glasses representing the blind spots. The activities the students were asked to perform and struggled with, were also not things I struggled with, perhaps because you quickly adapt when you actually live with a specific

condition. It certainly did not feel like it was accurately representing my experience, my difficulties, or my needs.

I was absolutely devastated after this experience, as my peers confirmed that having my disability was something to pity me for. Essentially making me feel less than. This, if anything, made me feel more excluded as it highlighted the rift between mine and their experience. There was no element of empowerment, empathy, or even real understanding but rather I felt hopeless and weighted down by the stigma I was now facing. This encounter in response shaped my coping strategies and marked the beginning of my understanding of the social implications of being labelled as disabled. For many years after, I felt uncomfortable disclosing my disability to others, instead hiding it fairly effectively, because I did not want to experience the inevitability of being reduced to my disability. Because I have an invisible disability, I could camouflage but this also meant I would not ask for the help I needed but stubbornly pressed on without tools that could have been helpful. It did not help that a lot of tools designed for accessibility do not fulfil the criteria outlined previously in the UX hierarchy of needs. These objects of disability (Guffey and Williamson, 2022) made me feel like I was drawing attention to my limitations, highlighting my differences, and inviting others to stigmatise and pity me.

Being a researcher and practitioner in the field of inclusive design, I have since come across many forms of simulations of disability and have observed a similar pattern when it comes to how it shapes people's perception of disability and continues a deficit-based narrative. I have since used my frustrations with this initial experience of simulations to explore ways to communicate my and others' lived- experience in a way that is not focussed on physical limitations alone."

3.5 A closer look at Simulations of Disability: Critical Analysis

This experience with SimSpecs mirrors many of the challenges that can arise when simulations are used, either in an educational context or within the design industry. This example demonstrates how simulations can, in some cases, create a divide between those simulating a disability and those who genuinely experience it (Silverman, Gwinn, Van Boven, 2015) and serves as a reminder that the use of simulations should be approached with care and consideration.

Thankfully, when designers use these tools, it is often not in the presence of individuals affected by the simulated conditions. However, the impact on the able-bodied designers remains the same. The potential for simulations to perpetuate exclusion and ableism, even unintentionally, underscores the need for a critical examination of their role in the design process.

Simulations of sight loss, such as the one detailed earlier, are also frequently employed beyond the design context. They serve educational purposes, enlightening school children about disabilities, and providing training for professionals working with the disabled (Flower, Burns, Bottsford-Miller, 2007). Consequently, it is crucial to note that the described experience is not unique to the author; its potential pitfalls have long been recognised and actively critiqued by disability activists (French, 1992; Maurer, 2012; Willoughby & Duffy, 1989). Furthermore, experimental psychologists have recently brought attention to these concerns as well (Silverman, 2015). However, not many critical perspectives on simulations and simulation toolkits have been documented in papers from within design.

While studies suggest that simulations can enhance empathy by tapping into how individuals anticipate their own reactions in similar situations (Clore & Jeffery, 1972; Van Boven, Loewenstein, Dunning, & Nordgren, 2013), it's essential to recognize potential drawbacks, particularly for the group being "represented." Many challenges faced by people with disabilities stem from social interactions laden with narratives of pity and paternalism (Ferguson, 2001; Fiske, Cuddy, Glick, & Xu, 2002; Nario-Redmond, 2010; Omvig, 2002; Wright, 1983). Placing excessive emphasis on physical factors tends to divert attention from the substantial impact of social barriers and discrimination, which often only become apparent gradually over time (French, 1992).

Disability simulations often adopt an "outsider-driven" approach, appealing to non-disabled individuals seeking a glimpse into the disability experience. However, disability activists, often considered "insiders," raise concerns that these simulations may portray their experience in a biased manner and are not an accurate representation of their lived-experience (Silverman, 2015).

Contrary to the belief that participants in disability simulations are gaining insights into the reality of disability, the experience often mirrors the initial encounter with a disability, not the prolonged experience of living with one. While the onset of a disability can indeed be traumatic, individuals tend to adapt over time, employing alternative techniques, building support networks, and focusing on unaffected aspects of their lives (Ubel, Loewenstein, & Jepson, 2005).

Participants in disability simulations frequently report feelings of frustration and distress, even if they overall rate the activity positively. For instance, after a blindness simulation, participants

expressed loneliness, fear, and helplessness as "new insights gained into the life of the disabled" (Wilson & Alcorn, 1969, p. 305-6). In contrast, individuals with long-term disabilities consistently report high levels of happiness and quality of life (e.g., Albrecht & Devlieger, 1999; Bonanno, Kennedy, Galatzer-Levy, Lude, & Elfstom, 2012; Quale & Schanke, 2010). Therefore, the negative sentiments often experienced in simulations diverge significantly from the actual emotions reported by individuals with disabilities.

"*Simulations cannot capture the nuances and long-term effects. Consequently, simulations can give the mistaken impression that the entirety of being disabled is marked by loss, frustration, and incompetence*" (Silverman, 2015)

Due to this concern, scholars in the field of disability studies have warned that simulations may inadvertently give participants a misleading impression of the realities of living with a disability. According to Wright (1978) "t*he main danger of role-playing is that the essence of life of people with a disability will be perceived in negative terms*" (p. 182).

In summary, this section extensively examines the intricacies of inclusion, extending the discussion beyond physical barriers and functionality. Through a thorough exploration of disability narratives, including a detailed analysis of lived experience with disability simulations, the complexities and potential shortcomings in the pursuit of authentic inclusion come to light. Navigating through these challenges, the following section will delve into strategies and considerations for fostering a more inclusive and balanced approach in the realm of design for inclusion.

4. The way forward; acknowledging the tensions and navigating the polarities

In light of the identified pitfalls in simulation toolkits discussed earlier, this section aims to explore mentality shifts, points for discussion and proactive measures for designers. The focus is on overcoming challenges within our design practice and devising innovative strategies going forward.

4.1 Simulation vs Immersion

In a preceding section, we explored the landscape of simulation toolkits and immersive experiences, underscoring the diverse approaches to representing lived experiences. The stark contrast between simulations and immersive experiences lies in their purpose and nature (Cardolo, C. and Clarkson, J., 2010); the former is designed to be measurable, replicable, and function-focused, while the latter is abstract, interpretation-based, and intended to provoke thought rather than serve a functional role in a user testing scenario.

While the contextual divergence between these two branches is understandable, there is potential for cross-pollination of ideas. Simulations aim to foster empathy and yield actionable insights (Cardolo, C. and Clarkson, J., 2010), yet simplifying lived experience within current measurable formats, as discussed earlier, comes with inherent drawbacks (Silverman, 2015). It prompts the question of whether simulations could benefit from departing from singular, measurable formats and instead embrace the complexity inherent in psychosocial dimensions, narratives, and a more diverse range of experiences. Examining potential lessons from immersive experiences that could enhance

simulation toolkits for increased effectiveness in fostering inclusion and understanding of lived experience. Here are several key aspects that simulations could consider adopting:

1. ***Complexity and Nuance:*** **Embracing the multifaceted dimensions of psychosocial factors - the interplay of emotional, social, psychological, and cultural factors (Nickpour and Jordan 2012; Lim and Nickpour, 2016; Lim, Giacomin, and Nickpour, 2020), diverse narratives, and a range of experiences that reflect the intricacies that individuals with disabilities navigate daily, could enhance the authenticity of simulations.**
2. ***Storytelling and Narrative Frameworks:*** **Storytelling and narrative frameworks can engage audiences emotionally and intellectually. Incorporating these elements into simulations could create a more immersive and empathetic learning environment that fosters a deeper connection to the subject (as seen in the example of *Notes on Blindness*, see 2.6).**
3. ***Diverse Representation:*** **Simulations benefit from broader representation of disabilities and lived experiences, ensuring a more accurate portrayal of the disability spectrum and avoiding pitfalls of oversimplification that leads to the perpetuation of stigmas stereotypes (Ferguson, 2001; Fiske, Cuddy, Glick, & Xu, 2002; Nario-Redmond, 2010; Omvig, 2002; Wright, 1983).**

By embracing complexity, leveraging storytelling, and ensuring more diverse representation, simulations have the potential to elevate their effectiveness and offer a more nuanced and inclusive perspective on disability.

4.2 Psychosocial simulations?

Exploring the development of simulations that encompass psychosocial dimensions presents a challenging yet promising avenue. While the inclusion of psychosocial dimensions undoubtedly increases the complexity of the simulation, it aligns with the evolving understanding of disability and the multifaceted nature of user experiences (Nickpour and Jordan 2012; Lim and Nickpour, 2016; Lim, Giacomin, and Nickpour, 2020). Considerations could be given to whether simulations could be designed to explore psychosocial dimensions individually, allowing for a nuanced examination of factors such as social interactions, emotional well-being, and cultural relevance.

Moreover, existing platforms like *The Exclusion Calculator* by the University of Cambridge (see 2.2) could explore the integration of factors related to psychosocial inclusion. This may involve highlighting potential psychosocial implications of introducing questions that prompt users to consider the broader dimensions of disability experiences. Embracing psychosocial dimensions within simulations not only aligns with a more comprehensive understanding of disability, but also opens up opportunities for richer, more empathetic design insights that go beyond the limitations of purely physical simulations.

4.3 Learning from other disciplines

For the purpose of problem solving (Cardolo, C. and Clarkson, J., 2010), designers often gravitate towards functionality, leveraging simulations to efficiently address specific challenges within constrained timeframes. This tendency is further accentuated by adherence to established requirements that may take precedence over creative experimentation.

However, this adherence to known methods and standards can lead to a certain level of stagnation, limiting the potential for true innovation and the discovery of alternative approaches.

Lessons from other disciplines:

1. **Inclusive performance arts actively embrace exploration and experimentation, pushing the boundaries of traditional practices. Embracing a mindset that values exploration over rigid adherence to established norms could potentially offer a pathway to the evolution of simulation methodologies or even the emergence of viable alternatives.**
2. **Critical disability studies often advocate for a shift from deficit-based perspectives to capability-based thinking reflecting approaches found in the social and design model of disability. Designers can learn to focus on the strengths and capabilities of users, celebrating diversity and leveraging it as a source of innovation rather than viewing it as a set of limitations.**
3. **Similarly, social science emphasises the importance of understanding intersectionality - the interconnected nature of social categorisations. Designers can learn to consider the intersectionality of user identities, recognizing that individuals possess multiple dimensions that influence their experiences and needs.**

All three disciplines underscore the importance of greater holistic understanding and exploration of inclusion. By drawing inspiration from these disciplines, the field of design has the potential to evolve beyond conventional practices, fostering a more inclusive, empathetic, and innovative design landscape.

4.4 Lived Experience

Continuing this exploration, it becomes evident that educational activities addressing disability should not merely simulate or replicate experiences but actively integrate the lived experiences of individuals (Silverman, 2015). This approach, as highlighted, involves projects grounded in the recorded experiences of disabled people or direct engagement with those who have first-hand knowledge. Instead of fixating on limitations, the focus should shift towards a more enlightening exploration of how differences shape interactions, workarounds, and preferences. This approach not only provides a richer learning experience but also contributes to a more comprehensive understanding of the diverse aspects of lived experience such as disability.

Furthermore, the inclusion of more lived-experience designers and researchers is not just beneficial but pivotal for fostering a truly inclusive design landscape. Drawing from the unique insights and perspectives of individuals with lived experiences of disability adds authenticity and depth to the design process and ensures that the resulting designs are more attuned to the real needs and nuances of individuals. Embracing lived-experience designers and researchers reflects a commitment to genuine inclusion and positions them as integral contributors to the evolution of inclusive design practices.

5. Conclusion: Empathy in Design - A Call to Do Better

In exploring simulation toolkits, the complexities and nuances of inclusion become evident. These tools have the potential to foster understanding but also create a complex paradox, resulting in an "illusion of inclusion". As we conclude, reflection on lessons to be learned prompts consideration of improvement.

So, how can we do better?

1. ***Expand Understanding of Inclusion:*** **It is essential to broaden the narrative of empathy in design to encompass psychosocial dimensions, considering psychological, sociological, cultural and value related factors (Nickpour and Jordan 2012; Lim and Nickpour, 2016; Lim, Giacomin, and Nickpour, 2020).**
2. ***Challenge Ableist Narratives:*** **Actively challenging and redefining ableist narratives of disability, shifting the focus from individual deficits to societal barriers and in some cases design shortcomings (Guffey and Williamson, 2022; Hendren, S., 2020; Kille-Speckter, Nickpour, 2022, Shakespeare, 2013).**
3. ***Critical Application of Simulations*****: Simulations and simulation toolkits should be used thoughtfully and critically. Designers should be aware of the potential pitfalls and complexities they may introduce (Silvermann,2015). It is crucial to avoid the "illusion of inclusion" and strive for a genuine understanding of diverse experiences.**
4. ***Embrace Lived-Experience:*** **Lived-experience insights offer a unique vantage point. These insights should be embraced to guide the development and application of simulations and empathy toolkits, ensuring their effectiveness and relevance (Silvermann,2015).**
5. ***Continual Learning*****: Inclusion in design is an ongoing journey. Designers, educators, and individuals alike must continually learn, adapt, and evolve their understanding of empathy, inclusivity and disability, for example by looking at insights from other disciplines.**

In conclusion, the pursuit of empathy in design is a multifaceted endeavour that demands attention to psychosocial dimensions,

the reshaping of narratives, critical application of simulations, a commitment to embracing lived experiences and expanding the boundaries of our existing practice. By doing better, we can bridge the gap between the "illusion of inclusion" and genuine inclusion, fostering a more empathetic and inclusive design landscape for all.

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