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UNIVERSAL DESIGN

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> The universal design approach aspires to create spaces that are not just accessible or usable, but inclusive for everyone.
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> *– Authors*

Introduction

The United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) (2006) establishes that parties to the convention recognise persons with disabilities' right to work on an equal basis and that parties will promote the realisation of this right to work. To actively support increased employment, many workplaces will require upgrades enabling access and ensuring the building is a safe and inclusive place where people can focus on performing their work tasks well. When considering design for disability, it is worth keeping in mind that disability can be temporary or permanent and can be experienced at any stage of life, either gradually or suddenly. Disability is a natural part of human diversity, and people's lived experiences can provide valuable insights and rich creative opportunities for design.

There is a trend to create more inclusive workplaces (Moody et al., 2017), and as business owners seek to upgrade offices to welcome a diverse workforce, designers require skills and knowledge to ensure they can deliver high-quality spaces that are truly inclusive. Design to code compliance is not the same as quality (or even adequate) design. Disability advocates generally agree that high-quality outcomes result when inclusive design thinking is implemented from the very beginning of project conception and integral to the design process throughout (Boys, 2014; Mace, 1985) and that problems often come from assumptions made by designers about building users (Imrie, 1996; Reeve, 2019). To design for diversity, we need to be open-minded about the breadth of diversity in the population. For example, inclusive spaces might consider people with physical mobility or sensory disabilities, neurodiverse or psycho-social conditions, dexterity impairment and chronic illnesses, arthritis, ageing or post-surgery impairments. The principles of universal design (UD) can provide a framework to assist designers to develop these inclusive design skills and generate a greater understanding of diverse lived experiences.

This chapter explains the UD framework developed by the Center for UD in 1997, and how it differs from accessibility and usability. It breaks down each of the seven principles of UD (Connell et al.,

1997) in detail, showing how they could be applied in workplaces. The chapter concludes with reflections on some of the contemporary issues surrounding disability and inclusion that might bear relevance to a UD approach today.

What is universal design?

UD was initially conceived in the 1980s by architect Ronald Mace through his work in disability studies. Mace argued that the built environment is used by a diverse group of individuals of varied ages, abilities and identities and therefore should be designed to be usable by everyone, accommodating their differences. Mace and other experts established the Center for Universal Design (CUD) at North Carolina State University, where they focussed on the development of key principles of UD to assist and guide designers in the creation of inclusive places. In 1997 the CUD published the seven principles for UD: equitable use, flexibility in use, simple and intuitive use, perceptible information, tolerance for error, low physical effort, size and space for approach and use, along with guidelines for implementation (Connell et al., 1997). It is these seven principles that form the framework for UD explored here.

How does universal design differ from accessibility or usability?

The concepts of accessibility, usability and UD are representative of different world views regarding designing for disabilities, even though they are often used interchangeably. A key aspect of their difference is the association of these concepts with historical disability models (Jackson, 2018) and the consideration of individuals in their development and application. These considerations result in either objective or subjective approaches.

Accessibility is generally associated with the medical model of disability. It is premised on a largely objective approach, seeking compliance of an object or environment with official documents which are measured against norms[1] and standards (Iwarsson & Ståhl, 2003). Iwarsson and Ståhl (2003) argue that a key problem with this approach is that these norms have not been developed systematically and subsequently many are considered invalid. Hamraie's work (2017) shows that historically many of these norms or 'normates' were developed from idealised individuals, typically white, youthful and male; as such, they deal only with the capacities of the individuals from which these standards were developed and are not broadly representative.

The concept of usability is like accessibility but introduces a further component, the evaluation and subjective judgements of the performance of an object or space in use. The concept implies that the environment should be fit-for-purpose, usually described as the 'person-environment fit', and able to be optimally used by the target individual or group (Appel-Meulenbroek et al., 2019; Iwarsson & Ståhl, 2003). Common critiques of both accessibility and usability are that these approaches do not recognise issues beyond access or functionality. An accessible or usable adjustment may comply but can nevertheless be distressing to use and create psycho-emotional barriers to inclusion (Reeve, 2019).

While a key tenet of UD is to create products and environments that are usable, the concept is broader than that of usability. UD was borne out of the social model of disability and is premised on a more democratic, equitable approach to design. UD employs principles that encourage a change of mindset, assisting designers to use their creativity and ingenuity when designing for disabilities but also to consider the broadest possible range of users. For workers with undisclosed or invisible disabilities, the decision to disclose can be difficult even though disclosure is necessary to enable accommodations to be made (Prince, 2017). If a workplace employs UD principles in the design process and in operations, it may reduce the need for accommodations or adjustments.

UD seeks to enable designs that go beyond the minimum standards of access and functionality to create inclusive solutions for everyone.

Universal design in the workplace

This section explains the concept of UD in detail and how it applies to workplace design. By providing a detailed breakdown we endeavour to demystify the UD process and its principles often criticised as vague (Alterator et al., 2019). The incorporation of built-environment-specific descriptions and examples in workplace design can expand how we understand and include disability concerning spatial planning and design. The UD principles apply to assistive technology, tools, organisational or operational decisions, as well as the physical space of the workplace, and integration of this approach can benefit all workers (Harpur, 2019). In addition, the seven principles are not mutually exclusive, and a particular design solution may cover several of them. Appropriate design solutions can be multipurpose and multifunctional but can be used to make the workplace more suitable for all workers, including those with invisible or undisclosed disabilities.

Equity ensures that resources are distributed where needed, resulting in an equal outcome. An equitable work environment would ensure that everyone could perform their work equally well. This might mean that more thought is put into the design at the beginning, to plan for and support a broad diversity of workers. An equitable workplace would also be a place where everyone feels they belong and are included regardless of their ability. Such solutions can benefit all people, not

Figure 2.1   An inclusive reception desk for use by people of different heights or mobility.
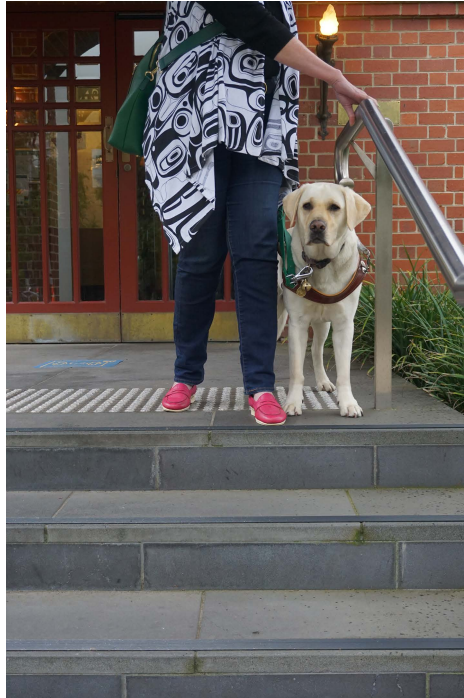
Credit: Gordon Howe

Figure 2.2   A blind person trying to use a handrail that is situated on the same side of their body as their guide dog. This is difficult and dangerous for the handler. Installing handrails on both sides of a stair gives the user options for descent.

Credit: Imogen Howe

only those with disabilities (Miralles et al., 2011). The principle of equitable use describes equity beyond issues of functionality or access to consider whether the design is appealing to all users. This may include ensuring that areas like accessible bathrooms, ramps and lifts are as beautiful and well-considered as their non-accessible counterparts. To make all design features equitable, think about ease of use, movement, beauty, privacy and dignity for all parts of the design.

Flexible use means that spaces or objects can be used in many ways. Creating a workplace that is flexible from the outset reduces the need for adaptations for employees and allows for flexibility if any employee's needs change (Pinna et al., 2020). For example, a handrail on both sides of a stair enables people to grab a rail on either side of the body. This helps people with one-hand bias or someone with a guide dog to grasp the rail. Such a minor consideration can make a remarkable difference to a person's everyday life by creating *ease* in acts of daily living, reducing the frustration or lost time experienced in trying to work around these restrictions or relying on others for assistance. This is important even in fire stairs to give people independence in their movement.

Workplaces usually contain several cues that indicate how they should be used. These can be harnessed to enable simple and intuitive use. Meeting rooms tend to be enclosed, acoustically protected spaces. Kitchens are typically smooth and easily cleaned. All spaces can be designed to make their use more intuitive. The logical proximity of uses can also assist with making workspaces simple and intuitive to use – for example, locating waste points near print rooms or kitchens. Consider some simple things you could include in the design that provide intuitive clues to

Figure 2.3 Airport wayfinding signage showing that signs can be simple and clear and often mostly pictorial.
Credit: Imogen Howe

Figure 2.4 A typical 'Norman Door' where the handle suggests it should be pulled to open, so a sign is
required to tell the user to push. Design for intuitive use could remove confusion.

Credit: Imogen Howe

navigate the space and indicate its use. These adjustments would help many employees, including newcomers, to learn where things are without needing to ask.

To be perceptible, information needs to be provided in several different formats, including audible, tactile and visual modes. To make a space legible, it requires one to consider how it might be understood, interpreted or navigated by people with different sensory requirements. Designs should

also be considered for how they enable or foster different methods of communication; for example, consider how contrast background colours might assist the legibility of sign language (Edwards & Harold, 2014) or whether permanent signage is legible against the substrate it is fixed to.

Figure 2.5 Students at the University of Melbourne (Yizhi Zhao, Zhilin Mo, Ziyue Zhou, Xinyi Zhang, Miki Ueda, Wenjie Sun) created tactile floor plans enabling the layout of their buildings to be understood by someone with low vision.

Credit: Imogen Howe

Figure 2.6 Illegible room signage and glare from lighting make for difficult navigation and uncomfortable work conditions. This signage is difficult to read against the background of the room.

Credit: Imogen Howe

Unexpected adjustments are bound to be required as workplaces evolve and our communities change. Therefore, it is essential to incorporate flexibility into your design, enabling it to accommodate retrofit solutions, adjustments or adaptations to meet changing needs.

Figure 2.7   Adjustable-height workstations allow for flexibility and tolerance for different user requirements.
Credit: Imogen Howe

Figure 2.8   Large rocker switches for lights and power outlets allow tolerance in use.
Credit: nkeskin

A workplace of low physical effort is easy to move about and use, but also does not contribute undue sensory stress or strain. This includes doors that can be easily opened with easy-grip handles or automation but also includes comfortable light levels and targeted acoustic treatments. These additional measures can make it easier for people to focus on their work. These distractions can often be designed out with attention to artificial lighting design, natural light control, and acoustic treatment as well as the functionality of doors, drawers, windows, blinds, locks and the like for people with low grasp or limited mobility. When applied to workplace design, this principle would ensure that workplaces are spacious enough to enable movement throughout the office, as well as within key areas, but also that furniture, fixtures and equipment are designed and installed to accommodate users of varied sizes and reach.

Forty years on – what can we add to universal design?

The global pandemic has impacted and changed workplaces across the globe. In many instances, workers were required to work from home and were unable to attend their regular workplace. This

Figure 2.9   Heavy doors like this can be difficult and tiring to open.
Credit: Imogen Howe

Figure 2.10   Vision Australia Headquarters, Kooyong. Clear sightlines and wide circulation spaces allow two people, or a person with a guide dog, to walk side by side.

Credit: Nicole Reed Photography

change exposed existing, but previously concealed, household inequalities, including internet connection and speed; workspace size (linked to dwelling size) and capacity to accommodate work; and workstation issues, including ergonomics and workplace equipment such as access to computers and phones (Adams-Prassl et al., 2020; Messacar et al., 2020). Where previously these physical and technological responsibilities were the employer's, including the provision and maintenance of space and equipment, as well as footing the bill for phone and internet services, suddenly the burden was placed on individual employees and their homes. For persons with disability, this was further complicated by being at high risk of COVID-19 infection due to the nature of disability support work. Isolation and segregation, an already fraught issue for this community, was also exacerbated (Bolisani et al., 2020). However, for many people, the change to work from home brought convenience by removing the struggle with daily commutes and spatial workarounds. As work was moved online, people had access to opportunities previously unavailable to them. With the ability to work from home, people could work at their own pace to manage energy levels and capacity to work, a major plus for many workers with chronic conditions or disabilities. While remote work has expanded opportunities for some people, we must recognise that providing work from home opportunities for people with disabilities does not equal inclusion or equity in the workplace. People with disabilities have a right to work from the office as well as a right to work from home, as we all do (Martel et al., 2021).

The concept of UD is now over forty years old. During this time, ideas about disability and inclusion have advanced. Since its introduction, many scholars and advocates have argued that the term 'universal design' is embedded in an outdated mode of thinking which relies on a belief that there may be or could be a 'universal' experience, rather than recognising and celebrating difference.

Scholar Aimi Hamraie provides an in-depth political-historical background of the critiques and contentions around UD. Hamraie (2016) identifies that some narratives that universalise difference feed into post-disability ideologies premised on the belief that through design and technology disability can be eliminated. Post-disability ideologies are highly problematic, as they are premised on ableist beliefs that a preferable life is one without disability. Such beliefs fail to recognise the value of disability or the unique cultural identities of disability communities, such as the Deaf community. Hamraie also argues that UD does not go far enough, as it fails to tackle this pervasive ableism embedded within society but also in our design processes and building codes. Historian David Gissen (2022) pushes instead for a 'practice of disability' as a more empowered way for people with disabilities to directly engage with the built environment, which he sees as a locus for constructing impairment and disability and challenging its spatial relationships (Gissen, 2022).

These concerns deserve careful attention, but they do not render UD irrelevant. Ensuring its ongoing relevance requires an agile and reflexive approach, to enable UD to evolve in response to the social-cultural advancements. Today, the United Nations promotes a twin-track approach to disability-inclusive development, combining both mainstream and targeted initiatives for people with disabilities (United Nations, 2019). This twin-track approach combines both the social model and human rights model approaches to disability. This might be a way forward for UD. A similar approach could be taken when implementing UD, recognising that it is only one tool in a suite of approaches to design inclusively for people with disabilities and that both mainstream and targeted solutions are required.

Conclusion

Despite earlier restrictions during the pandemic, offices have now mostly reopened to workers, and many businesses have introduced flexible work arrangements that allow employees to periodically work from home. These types of arrangements will likely be a permanent change to workplace operations for many businesses. Regardless of the perceived positives and negatives of flexible and work from home arrangements, it is now clear that efficient and productive work is not limited to office buildings in urban areas but can be networked across large territories that include the home as a fundamental part of the workplace. Research shows that diversity adds value to the workplace and that besides legal compliance, there are financial, productivity and cultural incentives to hiring and retaining people with disabilities (Lindsay et al., 2018). The number of workplace inclusion policies that are publicly available shows that employers recognise this value. UD is a way that employers can ensure their workplace is considered by people with diverse needs when seeking work (Leber et al., 2018).

The UD principles explained in this chapter can assist designers with the implementation of inclusive thinking in their designs. Implementing these principles early in the design process is inexpensive and can result in more flexible, sustainable buildings that benefit all users (Harpur, 2019; Pinna et al., 2020; Rostamiasl & Jrade, 2022). Armed with these principles, designers can confidently and creatively design high-performance, inclusive workplaces within and beyond the office.

Designing for disability in the workplace should not be a compliance-based box-ticking exercise. We must recognise the equal rights of people with disabilities, including their right to dignity, joy, high-performance and wellness in good design. By adopting an inclusive and open mindset, designers have the responsibility and opportunity to impact the everyday experience of individuals, to create a more equitable and just society where anyone can enjoy their work in a space where they feel they belong.

A 'high-performance' checklist for UD is provided here:

Principle	Description
THE SPACE IS DESIGNED TO BE EQUITABLE	• Entrances should be designed so that everyone can enter the building the same way. Minimise or eliminate changes in level (e.g. steps) by locating the lobby on grade or sloping the terrain to provide level access. • Reception counters must accommodate people of different heights and reach without the need to twist or strain. • Consider how to accommodate service animals in the space, including toileting areas and how to keep them close to a worker while off-harness to remove the need for prolonged restraint. • Bathrooms must be readily available. Many people who require an accessible bathroom can need it urgently. It should be easy to find and quick to access. An alternative option should be available if needed during maintenance or if occupied. • Accessible solutions should be dignified. A bathroom design should consider privacy and discretion. A ramp or lift should be as joyful to use as the stair. • Ramps and elevators can be beautiful too. Where a grand staircase is introduced, an equally beautiful lift or ramp must be introduced nearby.
THE SPACE IS DESIGNED FOR COMFORT, EFFICIENCY AND MINIMAL STRAIN	• Heavy doors can be difficult to negotiate and painful to move. Ensure doors are well hung with sufficient hinges to reduce their weight, do not require twisting or are automated. • Introduce clear, easy-to-read and consistent wayfinding signage. • Poor lighting design and glare can cause issues including sensory overload, eye strain, irritation and migraines. • Reduce reverberant, audible noise by introducing soft furnishings and acoustic surface treatments throughout the workplace. This is important for people who use text-to-speech or screen-reading software to complete their daily work (e.g. JAWS, Window Eyes).
THE SPACE IS DESIGNED FOR EASE OF USE AND MOVEMENT	• Circulation pathways should be generous to accommodate two people side by side (e.g. people using sign language to communicate), people with guide dogs, wheelchairs, scooters or other mobility devices. • Ensure there are clear sightlines on pathways or within the space to see people approaching when you cannot hear them. • Ensure that appropriate handles are installed for easy use on all doors, windows and drawers, including cabinetry. • Design cupboards, benches and desks to be used by people of different statures and mobility by making them adjustable or locating equipment at reachable heights. For example, install kettles or boiler taps instead of wall boiler units. Cups, plates, coffee, tea and snacks can be stored at a reachable height. • Provide sufficient storage and waste collection to ensure a clear and tidy space for approach and use is maintained.

Note

1 This touches on a key issue of discussion within disability studies and advocacy, which is the railing against the process of normalisation. It is generally understood within disability studies that normalisation is a reductionist notion that does not allow for difference or diversity, but instead perpetuates othering when a body does not conform to the norm and the construction of disability as deviation (Davis, 2017; Imrie, 1996). As such, accessibility is problematic and can only deal with limited aspects of the problems of exclusion within the built environment.

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