

# Accessibility for all: embracing digital transformation with universal design

July 2024



# Foreword

Persons with disabilities constitute a significant portion of the global population, yet they often face numerous barriers that impede their access to education, employment, healthcare, and social participation. These barriers are not merely physical but also social and attitudinal, rooted in longstanding misconceptions and prejudices. It is crucial to dismantle these barriers through comprehensive and inclusive policies, innovative practices, and a societal shift towards greater acceptance and understanding.

Empowerment involves ensuring that people with disabilities have equal access to opportunities and are actively included in all aspects of life. This includes accessible infrastructure, adaptive technologies, inclusive education systems, digital access, and workplaces that celebrate diversity.

The Constitution of India ensures equality, freedom, justice, and dignity for all individuals, implicitly promoting an inclusive society for everyone, including persons with disabilities. The Rights of Persons with Disabilities Act, 2016, marks a significant legislative achievement in India, aimed at empowering and including individuals with disabilities.

In India, the Department of Empowerment of Persons with Disabilities (DEPwD), Ministry of Social Justice & Empowerment (MoSJE) initiated the 'Accessible India Campaign', a nationwide flagship campaign designed to improve the accessibility of the built environment, transport systems, and the information and communication ecosystem.

India is rapidly emerging as a prominent manufacturing hub for assistive devices, driven by competitive manufacturing costs, a skilled workforce, and supportive government policies such as the 'Make in India' initiative. With a growing demand for innovative healthcare solutions, India's capability to produce cost-effective and high-quality assistive technologies is positioning it as a key player in the global market. This sector's growth not only meets domestic needs but also offers significant export potential, underscoring India's role in advancing accessibility and healthcare innovation worldwide.

As we delve into the strategies, stories, and solutions for empowering persons with disabilities, let us be guided by empathy, respect, and a shared vision of a world that truly leaves no one behind. Together, we can build a future where every person, regardless of ability, has the opportunity to shine and contribute to the tapestry of human achievement.



**Mr Deepak Sood**  
Secretary General,  
ASSOCHAM



# Executive summary

Disability in India presents both a challenge and an opportunity for the nation to embrace inclusivity and create a universally accessible infrastructure. With over 26 million people living with disabilities, according to the 2011 Census of India, the country has a significant portion of its population that requires thoughtful integration into the social and economic fabric.

The importance of inclusivity in India cannot be overstated. Social inclusion ensures that individuals with disabilities have equal opportunities to participate in all aspects of life, including education, employment, and cultural activities. This approach not only upholds the rights of disabled individuals but also enriches the community with diverse perspectives and talents.

Creating a universally accessible infrastructure is a multifaceted endeavor. It involves the removal of physical barriers in public spaces, such as buildings, transportation systems, and urban environments, to allow for seamless mobility and access. Equally important is the digital accessibility of information and services, which requires websites and applications to be designed with assistive technologies in mind, enabling those with visual, auditory, or cognitive impairments to engage with digital content.

The Government of India has taken strides towards inclusivity with the Rights of Persons with Disabilities Act (RPWD) 2016, which aligns with the United Nations Sustainable Development Goals (SDGs). The Act emphasizes non-discrimination and full participation, signaling a commitment to creating an environment where people with disabilities can thrive.

However, legislation alone is not enough. It must be accompanied by public awareness, education, and the active involvement of both public and private sectors. Investments in accessible infrastructure are investments in the nation's future, as they foster an inclusive society where every individual can contribute to the economy and culture.

This report thoroughly examines the need for a holistic strategy to achieve Universal Accessibility in India, which entails a detailed and varied plan covering every facet of life for individuals with disabilities.

Disability in India is a pressing issue that calls for a concerted effort to build a socially inclusive and universally accessible infrastructure. By doing so, India not only stands to empower millions of its citizens with disabilities but also to strengthen its social cohesion and economic vitality for all.

# 1

## What is meant by “disability”?

Disability is the most widely accepted term for a condition that interferes with an individual's ability to perform key life activities.

The United Nations defines it as a “social” concept, the result of a mismatch between someone’s abilities and the environment. This definition contrasts with the medical model of disability that defines it as a health condition.

As these abilities change throughout our lives, anyone can acquire a visible or nonvisible disability at any time.

According to global research, 80% of disabilities are acquired between the ages of 18 and 64 – their prime working years.



## What are the most common types of disability?



### **Mobility**

Includes limb loss or disability, manual dexterity, and disability in coordination with different organs of the body. Mobility disability could be permanent.



### **Neurodivergent or cognitive learning**

Neurodivergent refers to people with atypical cognitive processing, e.g., autism, dyslexia, dyspraxia, attention deficit hyperactivity disorder (ADHD), etc.



### **Psychiatric or socio-emotional or mental health**

Psychiatric disabilities cover a wide range of conditions, including anxiety disorders, bipolar disorders, post-traumatic stress disorder (PTSD), etc.



### **Chronic health conditions or illnesses**

Chronic health conditions that last one year or more and require ongoing medical attention.



### **Sensory**

Involves any of the five senses - sight, hearing, touch, smell and taste. The two main types of sensory disability are related to hearing, vision, or both. Such disabilities affect access to visual or auditory information.



## **The Big Gap India Story**

According to Census 2011, there are **people with disabilities** in India who constitute **2.21 percent of the total population**.

Out of the total population of persons with disabilities, approximately 15 Mn are men and 11.8 Mn, are women.

These include persons with visual, hearing, speech and loco-motor disabilities, mental illness, mental retardation (intellectual disabilities), multiple disabilities and other disabilities.

**About 36% of the people** with disabilities are working, of which 47% are male 23% are female.

The literacy rate among people with disabilities is around 55%, compared to the national average of 74%.

Children with disabilities have a lower school attendance rate, with **only about 61% of disabled children attending school**.

Among the workers with disabilities, **31% constitute agricultural laborers**.

**50 percent** of the disabled population in the age group of **15–59 years** is working whereas **4% of children with disabilities** in the age group **below 14 years** are working.



## UN on disability inclusion and India's commitment towards UNCRPD



The United Nations (UN) has been a strong advocate for the rights and inclusion of persons with disabilities, emphasizing the importance of their full participation in society. One of the key international instruments in this area is the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), which was adopted on 13 December 2006, and came into force on 3 May 2008

The UNCRPD is a comprehensive human rights treaty with the purpose of protecting the rights and dignity of persons with disabilities. It covers various aspects of life, including accessibility, personal mobility, health, education, employment, and participation in political and public life. The Convention also calls for the protection of persons with disabilities from discrimination and the promotion of their full inclusion in society.

India was one of the early signatories of the UNCRPD and ratified it on 1 October 2007. By ratifying the Convention, India has committed to enacting laws and policies that align with the principles of the UNCRPD and to report regularly on its progress in implementing the rights of persons with disabilities.

India's commitment to disability inclusion is reflected in several initiatives, including:

<b>Rights of Persons with Disabilities Act, 2016</b>	Act replaced the earlier Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995. It expanded the list of recognized disabilities and aligned Indian law more closely with the UNCRPD. The Act provides for the rights of persons with disabilities and their full participation in society.
<b>Accessible India Campaign (Sugamya Bharat Abhiyan)</b>	Launched in 2015, this campaign aims to make government buildings, public transport, and information and communication technology accessible to persons with disabilities.
<b>Inclusive Education</b>	Government has taken steps to ensure that children with disabilities can access education alongside their peers in regular schools, with the necessary support and accommodations.
<b>Employment</b>	Provisions for quotas in public sector employment for persons with disabilities, as well as incentives for the private sector to hire persons with disabilities.
<b>National Action Plan for the Rights of Persons with Disabilities</b>	Plan outlines various measures to implement the UNCRPD, including awareness-raising, capacity-building, and the development of inclusive policies and programs.

India's commitment to the UNCRPD also involves collaboration with civil society organizations, disabled people's organizations, and other stakeholders to ensure that the rights of persons with disabilities are protected and promoted. The country continues to work towards creating an inclusive society where persons with disabilities can live with dignity and have equal opportunities to contribute to the nation's development

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## Bridging the big Indian gap

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Despite India's commitment to the UNCRPD and the implementation of various laws and initiatives, there are still significant challenges and gaps in the country with respect to disability inclusion.

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There is a lack of meaningful employment and social engagements for the people with disabilities. Furthermore, rural areas remain highly affected, accentuated by general poverty considerations and poor access to health services.

While improving vocational training and employment opportunities for persons with disabilities is a critical element for enhancing the quality of life for individuals with disability and their families, there are also substantial gains for the larger economy.





**Key issues faced in India include:**



**Social stigma and discrimination**

Persons with disabilities often face social stigma and discrimination, which can limit their opportunities for education, employment, and social interaction.



**Lack of accessibility**

Public infrastructure, transportation, and information technology are often not fully accessible, which hinders the mobility and independence of persons with disabilities.



**Inadequate implementation of laws**

While progressive laws exist, their implementation is often lacking due to limited awareness, insufficient resources, and inadequate enforcement mechanisms.



**Limited educational opportunities**

Children with disabilities may not have access to inclusive education due to a lack of trained teachers, appropriate teaching materials, and accessible school infrastructure.



**Employment challenges**

Persons with disabilities have lower employment rates compared to the general population, often due to discrimination, lack of accessible workplaces, and inadequate vocational training.



**Healthcare barriers**

Access to healthcare can be challenging for persons with disabilities, especially in rural areas, due to physical barriers, communication barriers, and a lack of specialized services.



**Inadequate data**

There is a lack of comprehensive and reliable data on persons with disabilities, which hampers the formulation of effective policies and programs.



**Economic vulnerability**

Persons with disabilities are more likely to experience poverty due to limited income opportunities and higher costs associated with their disabilities.

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## India moving towards universal accessibility

A 360° approach is required for enabling Universal Accessibility in India, that would involve a comprehensive and multi-faceted strategy that encompasses all aspects of life for persons with disabilities. This approach would aim to create an inclusive society where individuals with disabilities have equal access to opportunities and can participate fully in all areas of life.

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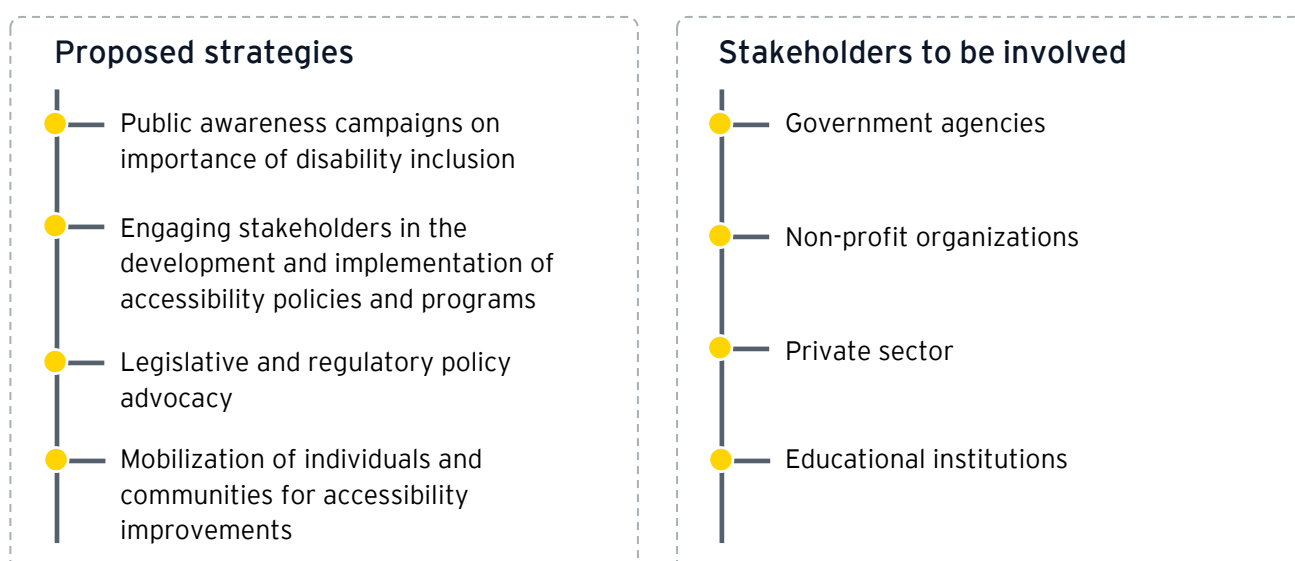


<b>Healthcare accessibility</b>	Telehealth solutions, accessible healthcare facilities, medical equipment and mental health accessibility
<b>Inclusive education</b>	Adaptive learning technologies, accessible educational materials, and inclusive classrooms
<b>Employment and workplace inclusion</b>	Assistive technology, adaptive equipment, communication aids, corporate policies, and initiatives
<b>Universal design and digital accessibility</b>	Universal architecture, adaptive living spaces, WCAG compliance, accessible digital content
<b>Accessible solutions</b>	Adaptive devices, AI-enabled devices, accessible transportation, accessible smart homes, sports equipment

Implementing this comprehensive approach requires collaboration between government agencies, the private sector, civil society, and persons with disabilities themselves. It will also require serious interventions with respect to policy and advocacy efforts in promoting accessibility and ensuring that individuals with disabilities can fully participate in society.

It is a continuous process that demands commitment, innovation, and a willingness to adapt to the evolving needs of individuals with disabilities.

## Key strategies for improving accessibility in India



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## Healthcare accessibility

Ensuring healthcare accessibility for individuals with disabilities is crucial for promoting equitable health outcomes and improving the overall quality of life. Individuals with disabilities often face physical, communication, and attitudinal barriers when seeking healthcare. Many countries have laws and regulations, such as the Americans with Disabilities Act (ADA) in the United States, that require healthcare facilities to provide equal access to individuals with disabilities.



### Telehealth solutions

- ▶ **Virtual consultations:** Telehealth platforms provide remote access to medical consultations, reducing the need for physical travel, which can be challenging for individuals with mobility impairments. Features such as video calls, instant messaging, and remote monitoring tools allow for continuous healthcare management and follow-up care from the comfort of one's home.
- ▶ **Accessibility features:** Telehealth applications incorporate accessibility features like screen readers, voice commands, and customizable interfaces to cater to users with visual, hearing, or cognitive impairments. Platforms that are compliant with Web Content Accessibility Guidelines (WCAG) ensure better usability for individuals with disabilities.

- ▶ **Remote diagnostic tools:** Devices like portable ECG monitors, blood pressure cuffs, and glucose meters can be connected to telehealth systems, enabling real-time health data transmission to healthcare providers. AI-driven diagnostic tools can assist in interpreting medical data and providing preliminary assessments, facilitating timely medical intervention.



## Accessible healthcare facilities

- ▶ **Physical accessibility:** Healthcare facilities should have wide, unobstructed pathways, ramps, and elevators to accommodate wheelchairs and other mobility aids. Accessible entrances, reception areas, restrooms, and patient rooms ensure that individuals with physical disabilities can navigate the facility independently.
- ▶ **Sensory accessibility:** Clear signage with braille and tactile elements, auditory signals, and high-contrast visual cues help individuals with visual or hearing impairments. Quiet rooms and sensory-friendly spaces can support patients with autism, sensory processing disorders, or anxiety disorders by providing a calming environment.
- ▶ **Inclusive design features:** Adjustable examination tables, accessible medical equipment, and patient lifts ensure that healthcare providers can offer care to patients with various disabilities comfortably and safely. Accessible communication systems, such as video relay services for the deaf and hard of hearing and language translation services, cater to a diverse patient population.




## Medical devices and equipment

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By leveraging telehealth solutions, designing inclusive healthcare facilities, and developing specialized medical devices, we can significantly enhance healthcare accessibility for individuals with disabilities. These efforts promote health equity and empower disabled individuals to lead healthier and more independent lives.





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Accessible mental health services for people with disabilities are also critical in ensuring overall well-being and quality of life for people with disabilities, promoting their full participation in society. It involves a multi-faceted approach that includes adapting physical spaces, leveraging digital tools, and equipping mental health professionals with the necessary skills and knowledge.

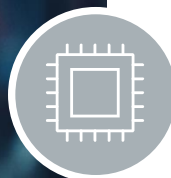
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**Telehealth services:** Platforms like BetterHelp and Talkspace offer online therapy sessions that can be more accessible for individuals with physical disabilities or those living in remote areas. Online support groups provide a platform for individuals to share experiences and receive peer support from the comfort of their homes.



**Mobile apps:** Applications such as Headspace, Calm, and Moodpath offer meditation guides, mood tracking, and cognitive behavioral therapy (CBT) exercises that can be tailored to the needs of individuals with disabilities. These apps should incorporate accessibility features, such as screen readers, voice commands, and customizable interfaces to accommodate users with various disabilities.



**Wearable technology:** Wearables like the Apple Watch and Fitbit can monitor physiological indicators of stress and anxiety, prompting users to take preventive actions. Devices that provide biofeedback can help individuals manage stress and anxiety through real-time data on their physiological state.



**Online resources and education:** Platforms like Mental Health America and the National Alliance on Mental Illness (NAMI) provide educational resources and self-help tools that are accessible online. Offering webinars and online workshops on mental health topics ensures that individuals with disabilities can access information and support regardless of their location.

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## Inclusive education

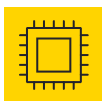
As the second largest country in the world in terms of population, one of India's competitive assets is its human capital. UNICEF reported that about 135.5 million children and adolescents live in urban slums or peri-urban areas and are equally deprived as those living in rural areas in access to basic social services, including quality education.

Poor quality teaching and learning practices have been identified as key challenges in the education system, alongside the low school attendance rate due to child marriage, child labor and various reports of abuse. These challenges affect vulnerable groups, such as children with disabilities, compounded by various inaccessibility issues, ignorant attitudes and practices towards disability, among other factors.

Despite these challenges, India remains committed to affirming the rights of all children to quality education, including children with disabilities. Inclusive education refers to an education system that includes all students, and welcomes and supports them to learn, whoever they are and whatever their abilities or requirements.







## Adaptive learning technologies

Adaptive learning technologies customize educational experiences to address the distinct needs of students with disabilities, thereby improving their learning outcomes and engagement. Key innovations include:

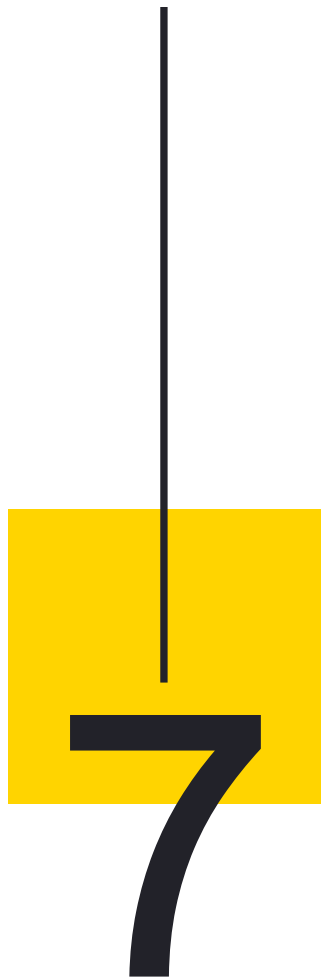
- ▶ **Assistive software and applications:** Tools like Dragon NaturallySpeaking and Kurzweil 3000 assist students with reading difficulties and writing impairments by converting text to speech and vice versa. Applications like Bookshare provide access to a vast library of accessible books for students with visual impairments or reading disabilities.
- ▶ **Interactive learning tools:** Technologies that create immersive learning experiences, can help students with cognitive impairments and make them understand complex concepts through visual and hands-on interaction.
- ▶ **Personalized learning platforms:** Platforms like DreamBox and Smart Sparrow use artificial intelligence to adapt lessons to the individual learning pace and style of each student, providing personalized support and feedback.



## Creating accessible educational materials

Creating an inclusive educational environment involves ensuring that both physical spaces and learning materials are accessible to all students. Effective strategies include:

- ▶ **Accessible educational materials:** When developing educational materials, it is essential to apply Universal Design Learning (UDL) principles to accommodate various learning preferences and abilities. This ensures that content is accessible in multiple formats (text, audio, video). Additionally, for visually impaired students, printed materials in Braille or large print ensure they have equal access to resources.
- ▶ **Classroom design:** Using adjustable desks and chairs can help accommodate students with physical disabilities. In addition, designing classrooms with wide aisles and clear pathways is crucial for enhancing mobility, particularly for those who use wheelchairs. Furthermore, the creation of quiet areas and sensory rooms is a significant step towards supporting students with sensory processing disorders or autism.
- ▶ **Assistive devices:** Ensuring students with hearing impairments can access hearing aids and Frequency Modulated (FM) systems - devices that enhance auditory input. Additionally, providing tools like communication boards and devices for non-verbal students can help them communicate effectively.



## Employment and workplace inclusion

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Creating inclusive workplaces is essential for ensuring equal employment opportunities for individuals with disabilities. This involves integrating accessible technologies, adopting inclusive practices, and implementing supportive policies and programs.

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### Accessible workplace technologies and tools

- ▶ **Assistive technology:**
  - ▶ **Screen readers and magnifiers:** Software like JAWS and ZoomText assists employees with visual impairments by converting text to speech or enlarging on-screen content.
  - ▶ **Speech recognition software:** Programs like Dragon NaturallySpeaking enable individuals with physical disabilities to control computers and input text using voice commands.
- ▶ **Ergonomic and adaptive equipment:**
  - ▶ **Ergonomic furniture:** Adjusted to different heights and positions supports employees with mobility or posture-related issues.
  - ▶ **Alternative input devices:** Tools such as trackballs, joystick mice, and one-handed keyboards accommodate various physical abilities, allowing for more comfortable and effective computer use.

▶ **Communication aids:**

- ▶ **Hearing assistance technology:** Devices like hearing loops, amplified telephones, and real-time captioning systems support employees with hearing impairments.
- ▶ **Augmentative and Alternative Communication (AAC) devices:** Tools such as communication boards and speech-generating devices assist employees with speech or communication difficulties.



## Effective strategies for creating inclusive work environments

- ▶ **Inclusive recruitment and hiring practices:**
  - ▶ **Bias-free job descriptions:** Writing clear, concise, and inclusive job descriptions that focus on essential skills and qualifications, avoiding unnecessary physical requirements.
  - ▶ **Accessible application processes:** Ensuring that job applications and recruitment websites are accessible to people with disabilities, including compatibility with screen readers and other assistive technologies.

▶ **Workplace accommodations:**

- ▶ **Reasonable accommodations:** Providing necessary modifications or adjustments, such as flexible working hours, remote work options, and accessible workspaces, to support employees with disabilities.
- ▶ **Personalized support plans:** Developing individualized accommodation plans in consultation with employees and ensuring their specific needs are met effectively.

▶ **Inclusive workplace culture:**

- ▶ **Disability awareness training:** Conducting regular training sessions for all employees to raise awareness about disability issues, promote inclusivity, and reduce stigma.
- ▶ **Employee Resource Groups (ERGs):** Establishing ERGs for employees with disabilities to provide peer support, networking opportunities, and a platform for advocacy within the organization.





## Policies and programs

### ▶ **Legislative frameworks:**

- ▶ **Americans with Disabilities Act (ADA):** The act is a US legislation that prohibits discrimination against individuals with disabilities in all areas of public life, including employment, and requires employers to provide reasonable accommodations.

- ▶ **Equality Act 2010 (UK):** Act is a legislation that protects individuals from discrimination based on disability and mandates reasonable adjustments in the workplace.

### ▶ **Government and non-government programs:**

- ▶ **Vocational rehabilitation services:** Programs that provide training, education, and support to help individuals with disabilities prepare for, obtain, and retain employment.

- ▶ **Supported employment programs:** Initiatives that offer job coaching, placement services, and on-the-job support for individuals with disabilities to ensure successful employment outcomes.

### ▶ **Corporate policies and initiatives:**

- ▶ **Diversity and inclusion policies:** Formal policies that commit to hiring and supporting employees with disabilities, ensuring their inclusion in all aspects of the workplace.

- ▶ **Accessibility audits and improvements:** Regularly assessing workplace accessibility and making necessary improvements to remove barriers and enhance the work environment for all employees.

### ▶ **Incentives for employers:**

- ▶ **Tax credits and financial incentives:** Programs like the Work Opportunity Tax Credit (WOTC) in the U.S. provide financial incentives to employers who hire individuals with disabilities.

- ▶ **Recognition and awards:** Initiatives that recognize and reward organizations for their commitment to disability inclusion, encouraging best practices and innovation in creating inclusive workplaces.

By integrating accessible workplace technologies, adopting inclusive best practices, and implementing supportive policies and programs, organizations can foster an inclusive environment that empowers individuals with disabilities to thrive in the workplace. This not only benefits employees, but also enhances organizational diversity, innovation, and overall performance.



## Universal design and digital accessibility

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Universal design in architecture is a critical concept that aims to create environments that are inherently accessible to all people, regardless of age, ability, or status in life. It emphasizes inclusivity and aims to eliminate barriers through thoughtful design and planning.

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### Principles of universal design in public and private spaces

- ▶ **Equitable use:** Design features that are useful and accessible to individuals with diverse abilities. For example, ramps and elevators alongside stairs ensure equal access for wheelchair users and those with mobility impairments.
- ▶ **Flexibility in use:** Spaces and features that accommodate a wide range of preferences and abilities. For instance, Adjustable-height countertops in kitchens cater to seated and standing users.
- ▶ **Simple and intuitive use:** Design that is easy to understand regardless of the user's experience, knowledge, language skills, or concentration level. Clear signage with visual and tactile elements can help aid individuals with visual impairments or cognitive disabilities.
- ▶ **Perceptible information:** Use design elements that communicate necessary information effectively to all users. This includes tactile paving for those with visual impairments and audible announcements in public spaces.

- ▶ **Tolerance for error:** Design that minimizes hazards and the adverse consequences of accidental or unintended actions. Rounded corners on furniture and slip-resistant flooring can reduce risks for everyone, especially those with mobility impairments.
- ▶ **Low physical effort:** Spaces and features designed to be used efficiently and comfortably with minimal fatigue. Lever-style door handles, for example, require less effort to operate than traditional doorknobs.
- ▶ **Size and space for approach and use:** Sufficient space and appropriate arrangement for approach, reach, manipulation, and use, regardless of body size, posture, or mobility. Wide hallways and doorways accommodate wheelchairs and walkers.

## International use cases

### The Sainsbury Centre for Visual Arts, UK:

Renowned for its universal design principles, this museum features wide hallways, tactile floor markings, and accessible galleries with adjustable lighting and height-appropriate displays.

### The Edge, Amsterdam, Netherlands:

A sustainable office building with universal accessibility featuring adaptable workspaces, inclusive meeting rooms with hearing loops, and accessible communal areas.

### The Centre for Autism and Neurodevelopmental Disorders, California, US:

Designed with input from individuals with autism and their families, it includes calming sensory spaces, visual schedules, and clear way-finding systems to support users with sensory sensitivities.

Universal design facilitates social integration and interaction among all members of the community. This can lead to a more cohesive and supportive society. The challenge of creating spaces that are accessible to everyone can drive innovation in materials, technology, and design practices. This can lead to new solutions that improve the quality of life for all users.





## Innovations in adaptive living spaces

- ▶ **Modular and flexible design:** Adaptive housing units that can be easily modified to accommodate changing needs, such as adjustable shelving, removable partitions, and convertible furniture.
- ▶ **Smart home integration:** Integration of smart technologies like voice-activated controls, automated lighting and temperature systems, and remote monitoring devices that enhance independence and accessibility for residents.
- ▶ **Sustainable and accessible urban planning:** Urban developments that prioritize accessibility through barrier-free pathways, inclusive parks and recreational areas, and accessible public transportation systems.
- ▶ **Advanced materials and construction techniques:** Use lightweight and durable materials and prefabricated components to streamline construction processes and facilitate the creation of accessible structures.

Universal design in architecture not only improves accessibility but also enriches the built environment by promoting diversity, inclusion, and user-friendly spaces for everyone. By incorporating these principles and innovations, architects and designers can create environments that foster independence, safety, and quality of life for all individuals, regardless of their abilities or limitations.

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However, in today's world, going digital is the key. Digital accessibility ensures that websites, apps, and other digital content are usable by everyone, including individuals with disabilities. Enhanced digital accessibility is not just a technical requirement; it is a matter of social equity and inclusion. It contributes towards overall socio-economic development of the country by promoting inclusive and accessible healthcare services, education and job opportunities for all. By committing to digital accessibility, organizations can reach a wider audience, improve the user experience for everyone, and demonstrate social responsibility.

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While most organizations provide digital experiences that are compliant with respect to legally defined disabilities, this does not mean that those experiences accommodate people with other barriers. In fact, those compliant solutions often do not meet basic usability expectations.



## Accessible websites and online applications

Web Content Accessibility Guidelines (WCAG), developed by the World Wide Web Consortium (W3C), provides a set of guidelines for making web content more accessible to people with disabilities. The guidelines have three levels of conformance: A (minimum), AA (recommended), and AAA (highest). Most organizations aim for at least AA compliance to ensure a broad range of accessibility.



## Principles under WCAG

Perceivable information and user interface components such as text alternatives for non-text content, captions for videos, and adaptable content.

Operable and understandable user interface components and navigation for all.

Robust content that may be interpreted reliably by a wide variety of user agents, including assistive technologies.



### Tools to test digital accessibility

**Automated testing tools:** Tools like Axe, WAVE, and Lighthouse can automatically scan websites and apps for common accessibility issues, providing a quick overview of areas that need improvement.

**Manual testing:** Manual testing by accessibility experts and users with disabilities is essential for identifying issues that automated tools may miss, such as the usability of a site with a screen reader or the logical flow of keyboard navigation.

**User testing:** Involving users with disabilities in the testing process ensures real-world usability and helps identify practical barriers.



### Assistive technologies for digital accessibility

#### Screen readers

JAWS, NVDA, and VoiceOver read aloud the text displayed on a screen, enabling visually impaired users to navigate digital content.

#### Screen magnifiers

ZoomText enlarges the content on the screen for users with low vision.

#### Speech recognition software

Dragon NaturallySpeaking allow users to control their computers and input text using voice commands.

#### Alternative input devices

Switches, adaptive keyboards, and eye-tracking systems enable users with physical disabilities.



### Accessibility evaluation tools

#### Axe

Open-source accessibility testing tool that integrates with browsers and developer tools to identify and fix accessibility issues.

#### WAVE

Web accessibility evaluation tool that provides visual feedback about the accessibility of web content by injecting icons and indicators into the page.

#### Lighthouse

Open-source, automated tool for improving the quality of web pages, which includes accessibility audits.



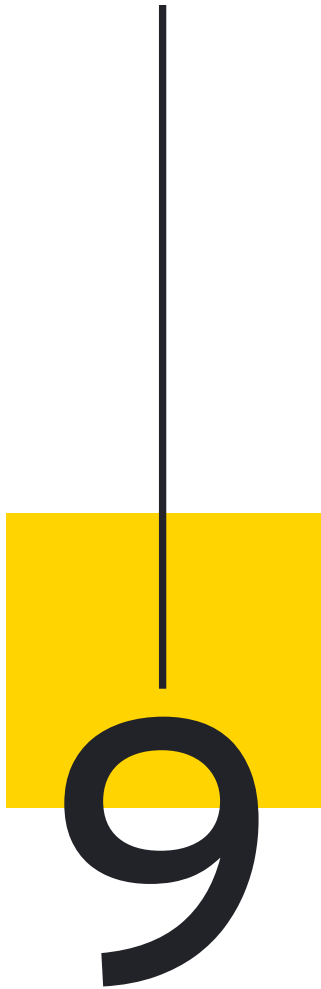
### Development frameworks and libraries

#### ARIA (Accessible Rich Internet Applications)

Set of attributes that define ways to make web content and web applications more accessible to people with disabilities. ARIA roles, states, and properties can help make dynamic content more accessible.

#### React Accessible Components

Libraries and components that help developers build accessible React applications by providing pre-built accessible UI elements.



## Other accessible and assistive solutions

Accessible solutions for empowering disabled people involve creating environments, tools, and services that enable individuals with disabilities to live independently, participate fully in society, and access the same opportunities as others.



### Smart mobility aids

#### **Smart canes**

Integrated with sensors and sonars, allowing visually impaired individuals to detect obstacles above waist level

#### **Motor-driven and smart wheelchairs**

with advanced features like single joystick steering and obstacle detection

#### **Foot braces**

Ankle-foot orthoses (AFOs) and functional foot orthoses (FFOs) for improved mobility

#### **Smart prosthetic limbs**

with osseointegration that establishes a direct skeletal link with prostheses.

#### **Exoskeletons**

wearable robotic devices designed to assist people with mobility impairments.



## Adaptive communication devices

- ▶ **Augmentative and Alternative Communication (AAC) Devices**
  - ▶ Facilitating expressive and receptive communication, ranging from simple picture boards to high-tech speech-generating devices like Proloquo2Go and Tobii Dynavox.
- ▶ **Brain-Computer Interfaces (BCIs)**
  - ▶ Establishing a direct communication link between the brain's electrical activity and external devices, enabling users to control robotic arms, computer cursors, and communication systems using brain signals.

AI and machine learning in assistive technology have enhanced accessibility and customization in assistive technology such as AI-enabled hearing aids suppressing background noises with enhanced conversational sounds. AI models have personalized systems and experiences to each user's needs and fine-tuning assistive systems for individual use. AI systems adjust their behavior in response to changing data, enabling ongoing improvement and customization.



## Adaptive communication devices

Accessible transport is about making transport systems and services more straightforward for people to use. It is necessary to consider the types of impairment or disability experienced by individual passengers, as well as the barriers that the system causes for people with those impairments.

- ▶ **Accessible ride-sharing services:** Emerging mobility solutions like ridesharing and micro transit also present opportunities to enhance accessibility. Some key innovations include:

### Wheelchair accessible vehicles (WAVs)

- integrated into rideshare fleets to provide on-demand transportation for passengers with mobility needs

### Partnerships between rideshare companies and disability organizations

- to create customized booking and service delivery for passengers with disabilities

### Training programs for ride-sharing drivers

- on disability etiquette, proper vehicle assistance techniques, and the operation of accessibility features in vehicles

- ▶ **Autonomous vehicles and accessibility:** As autonomous vehicle technology continues to evolve, there's potential to enhance accessibility in transportation further:
  - ▶ Incorporating universal design principles into the development of autonomous vehicles
  - ▶ Enabling voice-activated controls to facilitate independent operation for passengers with mobility or dexterity impairments
  - ▶ Implementing sensor-based technologies to assist passengers with visual impairments in navigation and obstacle detection
  - ▶ Integrating remote assistance features to allow passengers with disabilities to communicate with operators or support staff during their journey



## Accessible smart homes

Accessible smart homes utilize technology to empower individuals with disabilities, enhancing their independence and quality of life. Key aspects of accessible smart homes include home automation systems, smart devices designed for accessibility, and integration of voice-activated technology.



### Customizable control interfaces

including options for larger buttons, touchscreens with adjustable sensitivity, and voice commands.



### Automated accessibility features

such as smart lighting, automated door openers, and motorised window blinds.



### Safety and security

enhancements like motion sensors, video doorbells with two-way communication, and emergency alert systems.

## Other smart home devices:

### Smart appliances

- equipped with voice commands or touch-screen interfaces for easy operation

### Personal care assistants

- AI-powered personal assistants to manage

### Accessibility apps and interfaces

- allowing remote control and monitoring of smart home devices

Voice-activated technology may be integrated with various aspects of smart homes including lighting, temperature control, entertainment systems, and security features to operate easily for individuals with limited mobility or dexterity to control their environment independently.

Advances in Natural Language Processing (NLP) technology also allow smart devices to understand and respond to natural language commands, improving user interaction and accessibility. There is an ongoing research and development in voice recognition and AI technologies aim to improve further accuracy, responsiveness, and inclusivity of voice-activated systems in smart homes.

Accessible smart homes are instrumental in promoting independence, safety, and comfort for individuals with disabilities. By leveraging home automation systems, smart devices, and voice-activated technology, these innovations enable greater autonomy and quality of life, facilitating a more inclusive living environment for all residents.



## Sports and recreation

Accessible sports and recreational activities are crucial for the physical, mental, and social well-being of individuals with disabilities.

### ► Adaptive sports equipment:

#### Wheelchair sports

Specially designed sports wheelchairs are used in basketball, rugby, tennis, and racing

#### Handcycles and adaptive bikes

Allow individuals with lower limb impairments to participate in cycling

#### Sit-Skis and monoskis

Equipped with a seat mounted on skis and are used with outriggers for balance

#### Prosthetic limbs for sports

Running blades for track and field events or specialized limbs for swimming and other sports

#### Adapted balls and equipment

Adapted balls with bells inside used for visually impaired athletes, allowing them to locate the ball through sound

- ▶ **Accessible recreational facilities and parks:**
  - ▶ **Designing accessible recreational facilities**
    - ▶ Facilities designed with universal accessibility.
    - ▶ Accessible restrooms and changing areas equipped with grab bars, adjustable benches, and wheelchairs
    - ▶ Inclusive and accessible playgrounds with sensory play areas
- ▶ **Swimming pools with lifts and ramps**
  - ▶ **Accessible parks and outdoor spaces**
    - ▶ Paved paths and trails to accommodate wheelchairs, walkers, and strollers
    - ▶ Adaptive recreation programs with equipment, offering adaptive kayaking, fishing, and hiking tours

By focusing on adaptive sports equipment and programs, designing accessible recreational facilities and parks, and promoting inclusivity within sports organizations, we can create a more inclusive environment that encourages active participation and enjoyment of sports and recreation for individuals with disabilities.



## Travel and tourism

Accessible travel and tourism continue to evolve, driven by innovative solutions and a growing awareness of the needs of travelers with disabilities. By providing accessible accommodations, services, and activities and leveraging technology and adaptive equipment, the travel industry is opening new horizons for everyone. These efforts not only enrich the travel experiences of individuals with disabilities but also promote inclusivity and equality in tourism.



### Assistive technology

- Navigation apps like Wheelmap and AccessNow help travellers find accessible locations and services



### Translation devices

Assisting travelers with hearing impairments or language barriers



### Virtual Reality (VR) tours

Pre-travel VR exploration and enhanced experiences enabling immersive way to plan and enjoy

## International success stories:

### Barcelona, Spain

- ▶ **Public transport:** Metro stations and buses have ramps, elevators, and tactile paving for the visually impaired.
- ▶ **Tourist sites:** Major attractions like La Sagrada Familia and Park Güell offer accessible entrances, pathways, and facilities.
- ▶ **Beach accessibility:** The city's beaches provide accessible walkways, amphibious chairs, and assistance services for disabled visitors.

### Sydney, Australia

- ▶ **Transportation:** The city's public transport system includes accessible trains, buses, ferries, and audio and visual information systems.
- ▶ **Attractions:** Iconic sites like the Sydney Opera House and Taronga Zoo have accessible tours and facilities.
- ▶ **Accommodations:** A wide range of accessible hotels and services cater to the needs of disabled travelers.



# 10

## Recommendations for a better future

The report underscores the critical importance of digital accessibility as a social imperative and a strategic opportunity for inclusivity and socio-economic development. It highlights the efforts of organizations and governments to enhance digital access for persons with disabilities who often face barriers in healthcare, education, and employment. Compliance with the Web Content Accessibility Guidelines (WCAG) is identified as a foundational step, with many entities aiming for Level AA to accommodate a broader user base.

Assistive technologies such as screen readers, speech recognition software, and alternative input devices are emphasized as key to improving digital experiences for individuals with disabilities. The report also notes the use of evaluation tools like automated testing tools and manual user testing to ensure effective accessibility.

The report touches on the role of development frameworks and smart technology, including AI, in creating accessible user interfaces and personalizing experiences. It extends the discussion of accessibility to physical environments, mentioning advances in transportation, housing, sports, and tourism that support greater mobility and independence for disabled individuals.

India's commitment to the Sustainable Development Goals (SDGs) is reflected in its initiatives like the Rights of Persons with Disabilities Act (RPWD) 2016, which promotes non-discrimination and inclusivity. The country's efforts in education, healthcare, employment, and infrastructure are geared towards creating a more inclusive society.

**To further advance disability inclusion and universal accessibility, the following steps are recommended:**



#### **Enhance legal compliance**

Strengthen the enforcement of existing laws and policies to ensure that accessibility standards are met across digital and physical spaces.



#### **Promote assistive technologies**

Encourage the development and dissemination of affordable and innovative assistive technologies to support the diverse needs of individuals with disabilities.



#### **Foster public-private partnerships**

Collaborate with private sector entities to leverage resources and expertise in creating inclusive environments and technologies.



#### **Expand education and training**

Offer education and training programs to build awareness and skills related to accessibility.



#### **Improve infrastructure**

Continue to invest in the development of accessible infrastructure in public spaces, transportation systems, and housing.



#### **Encourage inclusive employment**

Implement policies and programs that support the employment of individuals with disabilities.



#### **Support research and innovation**

Invest in research to explore new ways of enhancing accessibility.



#### **Engage communities**

Involve individuals with disabilities and community organizations in the planning and implementation of accessibility initiatives.

By focusing on these areas, India can make significant strides towards fulfilling its SDG commitments and fostering an inclusive society.

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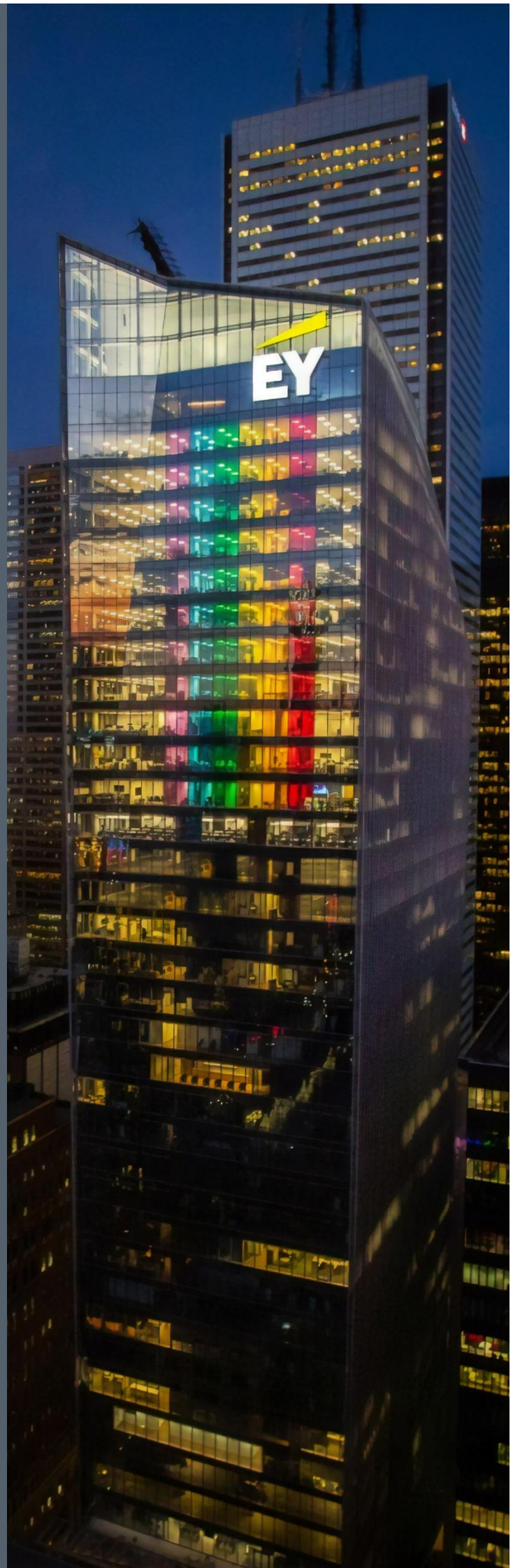
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The Associated Chambers of Commerce & Industry of India (ASSOCHAM) is the country's oldest apex chamber. It brings in actionable insights to strengthen the Indian ecosystem, leveraging its network of more than 4,50,000 members, of which MSMEs represent a large segment. With a strong presence in states and key cities globally, ASSOCHAM also has more than 400 associations, federations and regional chambers in its fold.

Aligned with the vision of creating a New India, ASSOCHAM works as a conduit between the industry and the Government. The Chamber is an agile and forward-looking institution, leading various initiatives to enhance the global competitiveness of the Indian industry, while strengthening the domestic ecosystem.

With more than 100 national and regional sector councils, ASSOCHAM is an impactful representative of the Indian industry. These Councils are led by well-known industry leaders, academicians, economists and independent professionals. The Chamber focuses on aligning critical needs and interests of the industry with the growth aspirations of the nation.

ASSOCHAM is driving four strategic priorities – sustainability, empowerment, entrepreneurship and digitization. The Chamber believes that affirmative action in these areas would help drive an inclusive and sustainable socio-economic growth for the country.

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