

## Global need of Assistive Product and Assistive Technology for Individuals with Intellectual Disabilities: A Review

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### Abstract

*The concept of Assistive Technology (AT) has become increasingly widespread in education. Assistive technology play an instrumental role in setting the global roadmap for improving access to assistive technology for everyone, everywhere. We present a framework for understanding the complex interaction between intellectual disability, health and wellbeing, and assistive technology. The main objective of this paper focuses on conducting a systematic review of studies regarding the impact of global need of assistive product and assistive technology for individuals with intellectual disabilities. AT is recognized by the World Health Organization (WHO) to enhance functioning, independence, and autonomy and ultimately promote well-being for people living with disabilities. With the digitalisation of societies, the everyday lives and occupations of individuals are changing, becoming more reliant on digital solutions. The development of digital assistive technology (DAT) also offers opportunities for people with disabilities to access, interact, and pilot the digital world. In order to achieve the above, a review of relevant empirical studies published WHO & UNICEF- Global Report on Assistive Technology, WHO- Assistive Product list, WHO- Priority Assistive Product and Persons with Disabilities (Divyangjan) in India - A Statistical Profile : 2021, NATIONAL LIST OF ESSENTIAL ASSISTIVE PRODUCTS (NLEAP), 2023 was carried out. Findings of this study include that the use of Assistive Technologies is successful in increasing the inclusion and accessibility of students with disabilities, although barriers such as teacher education, lack of information or accessibility are found.*

**Keywords:** Special Education, Assistive Technology, Assistive Product, Intellectual disability, World Health Organization, Health Science, Digital Assistive Technology, Information and Communication Technology

### INTRODUCTION

Electronic and Information Technology is at the heart of this revolution in learning opportunities for disabled students because they are the basis of assistive technology. In the United States, assistive technology (AT) was defined and encoded into law as part of various disabilities protections designed to equalize education.

Assistive technology enables and promotes inclusion and participation, especially of persons with disability, aging populations, and people with non-communicable diseases. The primary purpose of assistive products is to maintain or improve an individual's functioning and independence, thereby promoting their well-being. They enable people to live healthy, productive, independent and dignified lives, and to participate in education, the labour market and civic life. Assistive technology is of fundamental importance for persons with permanent or temporary functional difficulties as it improves their functional ability, and enables and enhances their participation and inclusion in all domains of life. Assistive technology is a key enabler for people of all ages and with all kinds of functional difficulties (e.g. cognition, communication, self-care, hearing, mobility or vision) in all areas of life.

According to the World Intellectual Property Organization (WIPO), the term “assistive technology” refers to a broad range of technologies and goods, from relatively simple gadgets like a walking stick or reading glasses to sophisticated, high-tech systems like assistive robots or soft-ware that recognizes gestures or emotions.

According to the Assistive Technology Industry Association (ATIA), any tool, piece of equipment, piece of software, or product used to enhance, maintain, or strengthen the functional capacities of individuals with disabilities is known as assistive technology.

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According to the International Organisation for Standardisation's (ISO9999 (2022)) standard on assistive products, assistive technology is any item that was produced with a specific focus on serving the needs of people with disabilities or that is generally available and used by or for people with disabilities.

According to the United Nations Educational, Scientific and Cultural Organization (UNESCO), anything that is utilized to enhance, maintain, or improve the functional capacities of people with impairments is considered assistive technology.

President Bill Clinton's Assistive Technology Act (1998), it was defined in a way that is consistent with the development and use of assistive technologies around the world: "Any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities. AT service is directly assisting an individual with a disability in the selection, acquisition, or use of an assistive technology device."

## **Disability Prevalence in the World**

The World Report on Disability estimates that more than one billion persons in the world or about 15% of the world's population live with some form of disability, of which 80% reside in developing countries. Out of this population, an estimated 2 to 4% of those aged 15 years and older have significant difficulties in functioning. Studies indicate that this number is likely to be considerably higher than reported due to underreporting of disability prevalence in many countries, inconsistency in the definitions of disabilities internationally (e.g. focus on impairment vs. functionality) and the nature of the data collection tool itself. Finally, the number of people who experience disability will continue to increase because of demographic and epidemiological transitions, with global ageing bearing major influence on disability trends. At the same time, the prevalence of disability is higher for vulnerable groups such as women, those in the poorest wealth quintile, and older people. This is especially true for those in developing countries.

According to the 2011 census, India is home to 26.8 million persons with disabilities i.e. 2.21% of the total population in the country and a majority (69%) of them live in rural India. Among the persons with disabilities, 56% are males and 44% are females. Those with a disability in movement, hearing and seeing constitute the highest percentage of the group - 20%, 19% and 19% respectively. The number of disabled persons is highest in the age group of 0-19 years (29%, 7.8 million) 79 making a focus on primary and higher education essential.

The legal framework for disability in India is provided by Rights 80 of Persons with Disabilities Act, 2016, a comprehensive rights based legislation with detailed provisions for representation, 81 access, and reasonable accommodation. Within the education context, the 86th Amendment Act, 2002 introduced the right to education as a new fundamental right (Article 21A) operationalized through the consequential enactment of the Right of Children to Free and Compulsory Education (RTE) Act, 2009. It provides free and compulsory education to all children between the ages of 6 and 14 years, including 82 persons with disabilities. The RTE (Amendment) Act, 2012 further brought all categories of children with disabilities (defined by disability legislations) within its purview.

The RPWD Act, 2016 provides for inclusive education and notes that it must be imparted with due consideration to most appropriate modes and means of communication including suitable modifications in the curriculum and examination system. Within India, there are 3 modes of education offered to children with disabilities - mainstream schools, home-based education and through special schools. The RPWD Act, 2016 also defined inclusive education for the first time in country and has brought the concept of reasonable accommodations and necessary supports within the legal domain. RPWD Act, the number of disabilities covered has been increased from 7 to 21.

The New Education Policy 2020 for its part recognizes the importance of creating enabling mechanisms for persons with disabilities in both school and higher education and acknowledges that the use of technology for online and digital education should address concerns of equity.

## Status of Persons with Disabilities in India

Unfortunately, persons with disabilities continue to be under-represented in education, with 45% of persons with disabilities unable to read or write, 13% completing secondary education and only 5% being graduates and above; 25% of children with disabilities between 5-19 years do not go to any educational institution. Among those who get further marginalized are children with multiple disabilities and those living with mental illness. Data reflects that 54% of children with multiple disabilities and 50% of the children with mental illness have never attended educational institutions. Government data reflects that children with disabilities are the largest group of children who have dropped out of school. While the overall literacy level in the country stands at 74.04%, statistics reflect that only 55% of the total population of persons with 86 disabilities is literate.

## Terminology and Common Understanding of Assistive Technology Products

Assistive products may be physical products such as wheelchairs, spectacles, hearing aids, prostheses, walking aids or continence pads; or they may be digital, occurring in the form of software and apps that support interpersonal communication, access to information, daily time management, rehabilitation, education and training etc. They may also be adaptations to the physical environment, for example portable ramps or grab-rails.

Any external product (including devices, equipment, instruments or software), especially produced or generally available, the primary purpose of which is to maintain or improve an individual's functioning and independence, and thereby promote their well-being. Assistive products are also used to prevent impairments and secondary health conditions.

WHO estimates that today 2.5 billion people need one or more assistive products with a global ageing population and rise in non-communicable diseases, this number will rise beyond 3.5 billion by 2050, with many older people needing two or more products as they age. The World Health Organization (WHO) is introducing the Priority Assistive Products List (APL). The APL is the first stage of implementing a global commitment to improve access to assistive products – the Global Cooperation on Assistive Technology (GATE). The APL includes 50 priority assistive products, selected on the basis of widespread need and impact on a person's life

**ISO** :An assistive product is any product (including devices, equipment, instruments and software), specially produced or generally available, used by or for persons with disability for participation; to protect, support, train, measure or substitute for body functions/structures and activities; or to prevent impairments, activity limitations or participation restrictions.

The ISO classification of assistive products covers about 650 types of assistive products. Priority assistive products that are highly needed, an absolute necessity to maintain or improve an individual's functioning and which need to be available at a price the community/state can afford.

## NATIONAL LIST OF ESSENTIAL ASSISTIVE PRODUCTS (NLEAP) - 2023

The National List of Essential Assistive Products (NLEAP) of 380 APs was compiled by the National Expert Committee (NEC) under the Indian Council of Medical Research (ICMR) for people with functional impairments. This list includes assistive products for all age groups. In particular, special attention should be given for Paediatric APs, which will be different in size, shape, design etc. The list of assistive products has been developed after extensive deliberations with experts, stakeholders and end-users.

S.NO.	ASSISTIVE PRODUCT	ICF- BODY FUNCTION	DISABILITY	DESCRIPTION/TYPES	RATIONALE
1	Hearing Aids	Hearing function	Hearing	Digital hearing Aids with necessary accessories like batteries	To aid in hearing in sensori-neural hearing loss
2	Visual Aids	Visual function	Visual, Self-care	Spectacles - Low vision, long distance, short distance, filter and protection	To aid in comprehending situations for the weak eyesight/ persons with visual impairments
			Visual	Optical/Digital magnifier	To aid in comprehending situations for the weak eyesight/persons with visual impairments
3	Wheelchairs	Power of all muscles of the body	Locomotor	Manual Wheelchair-Bimanual Propulsion	Accessible and adaptable and can be steered by occupant itself as well as sports/recreation/Leisure activities
				Manual Wheelchair-Push Type	Accessible and needed for transport with help of the care-giver
				Manual Wheelchair-Single side Propulsion	Accessible and adaptable and can be steered by occupant itself as well as sports/recreation/ Leisure activities
4	Walkers and Rollators	Gait pattern function	Locomotor	Walkers/Walking frames	For elderly with mild physical/ locomotor/mobility impairment
				Rollators	Used in case of Advanced/severe physical/locomotor/impairment
5	Canes for Visually Impaired	Visual Function	Visual, Self-care	Cane- White/Red/ Ultrasound/Laser	To aid in comprehending situations for the weak eyesight/blind patients
6	Canes or Sticks for Locomotion	Gait pattern function	Locomotor	Quad Cane	For more stability
				Walking Cane/Stick	For elderly as easy mobility aid
7	Crutches	Gait pattern function	Locomotor	Crutches - Axilla	For providing support and stability for individuals with temporary mobility impairments
				Crutches - Elbow	For enhanced stability and weight distribution for individuals with long-term mobility challenges
8	Orthosis	Stability of several joints	Locomotor	Cervical Orthosis - Soft/ rigid	Used in cervical spine injury which should be managed at tertiary level
				Off-loader knee Orthosis	Used in knee osteoarthritis

9	Prosthesis	Mobility of several joints	Locomotor	Trans-tibial Prosthesis	Surgical management can be done at Tertiary Care Healthcare settings. Proper fitting and use by the professionals of the prosthesis is required/Rehabilitation can be done at CHC level
10	Therapeutic Footwear	Mobility	Locomotor	Therapeutic footwear	Required for the care of foot in patients with chronic diseases as well Locomotor/Mobility
11	Braille	Seeing function	Visual	Braille Reading material	To aid in comprehending situations for the weak eyesight/blind patients
		Learning and understanding function		Braille Display	To aid in comprehending situations for the weak eyesight/blind patients
12	Tactile and Audio Signages	Seeing function	Visual	Tactile and Audio Signages	To aid in comprehending situations for the weak eyesight/blind patients
13	Portable Ramps	Gait pattern function	Locomotor	Portable Ramps	Should be available for easy transfer and movement
14	Tricycles	Power of all muscles of the body	Locomotor	Manual Tricycle	Required for advanced mobility for long distance or workplace as well as sports/recreation/Leisure activities
				Powered Tricycle	Required for advanced mobility for long distance or workplace
15	Phone	Seeing function	Visual	Smart Phone with modification – Visual	To aid in comprehending situations for the weak eyesight/persons with visual impairments, as well as hearing impairment
		Hearing function	Hearing		
		Higher level cognitive function	Self care	Simplified mobile phone – Cognition	To be used by the older persons
16	Cochlear Implants	Hearing function	Hearing	Cochlear Implants	To aid in hearing in sensori-neural hearing loss (SNHL)
17	Deaf-Blind Communicators	Communication	Communication, Self-care	Deaf-Blind Communicators	Used for accustomed ways of communication
18	Rail Bars and Bedside guards	Gait pattern function	Locomotor	Rail and Grab Bars	Needed for balance and support
		IADL (Instrumental Activities of Daily Living)	Self care	Bedside Guards	Helpful/act in preventing the falls
19	Modified Commode Chair	Power, tone of limbs, stability of lower limbs	Self care	Commode Chair	Helpful/act in preventing the falls
20	Fall Detectors	IADL	Cognitive, Self-care	Fall Detectors	Useful during activities of daily living (ADL)
21	Incontinence Products	Urinary incontinence	Self care	Incontinence Products, Absorbents	They are crucial for the self-care among older persons and patients in ICUs

**The World Health Organization (WHO) has identified many barriers to accessing assistive technology worldwide, to include:**

Lack of awareness often drives low uptake, compounded by an absence of information on the types and availability of assistive products.

High costs due to over-priced assistive products and associated service delivery cost.

Limited physical and geographical access puts assistive technology out of reach for many potential users.

Inadequate product range, quantity, quality and suitability can make assistive products unavailable, unsafe, ineffective and even abandoned.

Procurement and delivery challenges delay and reduce access.

Capacity gaps exist in the assistive technology workforce with shortage of workforce with adequate knowledge on assistive technology and lack of trained personnel.

Low policy profile and lack of legislation lead to the low prioritization of assistive technology, and legislation that fails to cover people with all types of functional difficulty.

Lack of funding and investment for the strengthening of national assistive technology systems exists in many countries, alongside disparities in funding levels by programmes.

Fragmentation of the assistive technology sector, including between professions, user groups, funding and provision mechanisms.

Socio demographic barriers hinder equitable universal access to assistive technology.

**The Global Need and recommendations for Assistive Technology**

2030 Agenda for Sustainable Development The 2030 Agenda for Sustainable Development (adopted by all United Nations Member States in 2015) and its 17 Sustainable Development Goals (SDGs) pledge to “leave no one behind”, in particular people with functional difficulties who need access to assistive technology to be able to equally contribute to reaching the goals in an equitable manner. However, the UN Flagship Report on Disability and Development, Realization of the Sustainable Development Goals by, for and with persons with disabilities, reports that the status of people with disabilities lags behind in relation to most SDGs. Discrimination and stigma, issues around accessibility to physical and digital environments and content, and lack of access to assistive technology and essential services are some of the identified barriers. Within this context, a global increase in awareness of the need for quality, affordable, and reliable assistive products is evident. Ensuring the concept of universal health coverage (UHC) includes access to assistive products and services – without financial hardship for people – is therefore an important strategy contributing to sustainable development that is inclusive, effective and cost-beneficial. It aligns well with SDG target “Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all.”

WHO Global strategy and action plan on ageing and health 2016–2020 as well as in the Decade on Healthy Ageing 2020–2030: Plan of action. The Decade of healthy ageing baseline report states that: “Access to affordable, appropriate and quality assistive technology is fundamental for maintaining and improving older people’s functional ability, including mobility.” It further lists the provision of assistive technology to facilitate mobility as an important area of action. Other WHO initiatives acknowledging the importance of assistive technology include the Rehab 2030 Programme. One of its priority areas for action is: “Building comprehensive rehabilitation service delivery models to progressively achieve equitable access to quality services, including assistive products, for all the population, including those in rural and remote areas.”

The following ten overarching recommendations are intended to guide countries and other stakeholders progressively in their work to improve access to assistive technology, in accordance with their commitments under the UN Convention on the Rights of Persons with Disabilities and to achieve the Sustainable Development Goals (SDGs).

## Regional and Global Collaborations on the Development of Recommendations

**Recommendation 1:** Improve access to assistive technology. An integrated approach to assistive technology provision involves all key development sectors – particularly health, education, labour and social services – ensuring that the needs of all users and potential users are met. Such provision can be included into essential health services (for example, ear and hearing care, rehabilitation, and services for older people and people with communicable and non-communicable diseases, including neglected tropical diseases) and education at all levels. A broad range of stakeholders including government

**Recommendation 2:** Ensure that assistive products are safe, effective and affordable

**Recommendation 3:** Enlarge, diversify and improve human resource capacity.

Where needed, special efforts should be made to go beyond a focus on traditional assistive technology professionals, to build the capacity of available human resources at municipal, community and/or primary health care levels – this includes nurses and midwives, pharmacists, health workers, community-based rehabilitation workers, other allied workforces, and expert users and family members. The WHO Training on Assistive Products (TAP) and other similar materials can be used for training of the workforce.

**Recommendation 4:** Actively involve users of assistive technology and their families. Users should be seen as partners in assistive

**Recommendation 5:** Increase public awareness and combat stigma. Awareness about assistive technology and its uses and benefits should be raised to increase public understanding and political support, and to reduce stigma. Governments, users' organizations, professional associations, media, social and cultural associations (especially in sports) are examples of actors that can run campaigns to change negative attitudes towards the use of assistive products. Successful users, including para-athletes, are good role models for mitigating stigma and improving access.

**Recommendation 6:** Invest in data and evidence based policy. Knowledge is essential to raise public and political. The WHO assistive technology assessment tools can be used to get real data on the national assistive technology situation and context. To develop evidence-based legislation and strategies, and to plan, monitor and evaluate comprehensive programmes

**Recommendation 7:** Invest in research, innovation and an enabling eco system. Advanced materials science, artificial intelligence, digital technologies and new service provision models are creating new opportunities for the assistive technology sector to become more effective in reaching everyone, everywhere.

**Recommendation 8:** Develop and invest in enabling environments. Assistive technology and enabling environments complement each other, and access to one is often a prerequisite for using the other. Enabling environments are not only about accessible and inclusive physical and virtual environments, but also services and systems, support, relationships and attitudes.

**Recommendation 9:** Include assistive technology in humanitarian responses. AT has the potential to mitigate the consequences of fragility, conflict and violence. In the context of humanitarian crises, access to assistive technology improves the quality of life, safety and protection of people with newly inflicted or pre-existing functional difficulties. Evidence suggests that the provision of assistive technology during conflict – and inclusive humanitarian responses – will increase community ownership, stability, and support peace-building processes in post-conflict situations. All stakeholders responsible for humanitarian responses, including governments, aid agencies, development organizations and civil society, should therefore include assistive technology provision in humanitarian plans and responses within and outside their countries

**Recommendation 10:** Provide technical and economic assistance through international cooperation to support national efforts. International cooperation to support efforts to improve access to assistive technology is essential to reducing inequality and progressively achieving universal access to assistive technology, and is mandated in the UN Convention on the Rights of Persons with Disabilities (Article 32). Access to assistive technology should therefore be an integral part of international cooperation. It must involve governments,

international or regional organizations, the private sector and civil society, and especially organizations representing users and potential users. Measures of cooperation should include technical or economic assistance in areas such as research, policies, regulations, fair pricing, market shaping, product development, technology transfer, manufacturing, procurement, supply, service provision and human resources.

“Considering the vast potential of technology to improve the lives of persons with disabilities and to contribute to the implementation of the Convention, as well as the role of persons with disabilities in designing, developing and producing ICTs, wider access to technology among persons with disabilities should be considered a priority. It is crucial to reduce the gaps in access to technology, digitalization and ICTs between persons with and without disabilities and to invest in assistive technology.” Source: Technology, digitalization and information and communications technology for the empowerment and inclusion of persons with disabilities.

## **Conclusion and Summary of the Recommended Way Forward**

The design, manufacturing and distribution of products are key parts of the assistive technology lifecycle. This process has many challenges, but worldwide may have many more opportunities. The WHO GREAT Summit allows us to consider these opportunities and plan forward about how assistive technology research and development, as well as distribution, might be effectively promoted, administered and implemented in the world communities of designers, researchers, manufacturers and distributors. Here are a few product related statements to stimulate future dynamic discussions on a global level on a variety of topics and issues. We must think innovatively to generate new cadres of assistive technology designers, small businesses, manufacturers, and distributors. All areas of the globe have unmet AT needs, but they differ depending on climate and geography, available personnel and finances, policy directives, and so on. Assistive products must address the needs of the ageing population since the functional decline and activity limitations often come with age. Prevention and public health strategies must meet the needs of the ageing population. We need to think about different contexts for AT use and the deployment of different professionals/perspectives to enable and optimize the use of assistive products. Interdisciplinary and Trans. disciplinary research is needed with imperative user involvement/influence. We need to train people with disabilities to create and maintain some, and in a few cases, most of their AT, including their needed and desired modifications. Assistive product systems require new levels of expertise and methods for assuring appropriate levels of knowledge and skills have been acquired for all stakeholders of assistive product systems.

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