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Digital Dawn: Technology's Role in Empowering Visually Impaired Students in India Post-Marrakesh Treaty

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ABSTRACT

The Marrakesh Treaty, according to this article, is helping create and distribute digital content, such as text, audio, Braille and large-print books, by allowing for the creation and distribution of copyrighted content in accessible formats without the permission or involvement of the original rights holders. The book famine has always existed, but the Marrakesh Treaty has pumped water into this desert as the treaty helps improve the educational content and resources available to the visually impaired. The Marrakesh Treaty is available to any country to become a part of international law, and also if they choose to do so. India with about 50 per cent (27 million) of the world's visually impaired population benefits immensely from the Treaty as it hopes to remove the gap between the abilities of the visually impaired to pursue educational and employment opportunities. It is important to strike a balance in order to create environments that are conducive to the living and work conditions of the visually impaired here in Kerala the Accessible India Campaign works to create a more accessible India for the visually impaired and introduces policies that enforce greater accessibility and reasonable accommodations in education, employment, sports and public life following the Rights of Persons with Disabilities Act 2016. The majority of visually impaired students in India attended so-called 'blind schools' designed to isolate the visually impaired and distance them from the general population. They were not given the same tools as sighted students and were unable to communicate in the same ways. Reading and writing were taught using abugida or abjad writing systems such as traditional Braille. Now, technological advancements such as Braille displays, screen readers and text-to-speech software are allowing visually impaired students to ensure that they have better access to educational and professional opportunities.

Keywords: Marrakesh Treaty, Visually Impaired, Digital Accessibility, Rights of Persons with Disabilities Act 2016, Screen Readers, Braille Displays, Audio Books.

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I. INTRODUCTION

The Marrakesh Treaty (officially the ‘Marrakesh Treaty to Facilitate Access to Published Works for Persons Who Are Blind, Visually Impaired, or Otherwise Print Disabled’) marks a fundamental advancement in international law for the rights of the visually impaired and their access to print material. Formulated under the auspices of the World Intellectual Property Organization (WIPO) – an agency of the United Nations – it was finalized and adopted on 27 June 2013, and officially came into force on 30 September 2016 after having been ratified by the desired number of countries. India, taking solid steps towards the rights of the visually impaired, was not only one of the earliest signatories to the treaty, but also the first country to ratify them – on 24 June 2014.

One key goal of the Marrakesh Treaty is simply to address book famine – the extreme shortage of books and other printed materials in mature formats such as Braille, audio books and large print. Prior to the Treaty, it was estimated that fewer than 10 per cent of all published works had been converted to mature formats that could be accessed by visually impaired readers. This extreme information desert unduly prevents millions of visually impaired around the world, especially in developing nations, from accessing education, culture and general information.

It allows for the manufacture and international exchange of accessible format copies of works protected by copyright without any reprisal by the copyright holder. The value of this provision, crucial to facilitating greater access to educational materials, books and scientific publications, is found in its power to remove any sense of illegitimacy from the possibility of print-disabled people producing and sharing copies of copyrighted works. Through a legal structure that legally obliges its signatories to bring into existence national laws designed to fulfill its mandate, the treaty aims to empower a perennial minority group to better arm itself in confronting the educational, vocational and public life challenges it faces.

In India, which has the second largest number of visually impaired people in the world, the treaty could be transformative. Its imminent entry into force could make it easier for visually impaired students to attend university and – because of that possibility, and many others – give them access to 1,000 times as much reading material as was ever available to them previously. The treaty will create a genuinely more accessible world. Compliance with it will make inroads toward a just world for work.

Furthermore, the Marrakesh Treaty complements and furthers other constitutional and legal provisions in India protecting disabled people’s rights, like the Rights of Persons with Disabilities Act 2016, which specifies the right to accessibility, the right to personal mobility,

the right to reasonable accommodation, and the right to access to information for disabled persons. By encouraging access to printed materials, the treaty complements these other legal safeguards and supports the moral obligations the country owes its disabled citizens.

Discussing the effects of Marrakesh Treaty in India, especially post ratification, one encounters not just a legal accomplishment but one of the prime pillars of the social revolution that seeks to bring the rights of the visually impaired community into the mainstream through the transformative power of empowering technology. In this regard I will further delineate how this traditional concept of serving the disabled students has an impending revolution through the power of technological education – what I call the ‘Digital Dawn’.

II. OVERVIEW OF THE MARRAKESH TREATY

Although framed as a treaty aimed at increasing access to published works for the print- disabled (and called the Marrakesh Treaty), its broad and open permissions to circumvent copyright law to increase access have a profound effect on education by enabling the widespread use of digital technologies. Among its central provisions, works post-production, and pre-publication do not qualify; the Treaty applies only once a text is fixed. What makes the Treaty so exciting for education is the fact that it now allows the creation, usage, distribution and cross-border exchange of accessible format copies of protected works without having to seek permission from the copyright holder. It is a paradigm shift that not only increases the volume of accessible materials but also highlights the crucial role of digital solutions in the delivery of those materials.

Another type of accessible format copy is a digital version of the work that can be read with electronic technologies like text-to-speech software or Braille displays, or through screen readers that interpret digital text and speak it aloud. Digital formats are inherently more easily modified and re-distributed, a functionality of particular importance to educational materials in the diverse linguistic environment of India. the Treaty sets aside longstanding hurdles that copyright law was erecting for such reproduction of accessible material within the educational setting. This enables a faster and more widespread uptake of digital technologies to meet educational needs.

1. India’s Commitment: Ratification and Beyond

India not only ratified the Marrakesh Treaty early, but even helped to define its early policy. When India became the first country to ratify the Treaty on 24 June 2014, it made a loud statement in favor of the rights of persons with disabilities. Early ratification showed that the Indian government was taking up the challenge of the problems visually impaired people had

in collecting and enjoying reading materials and literature.

After ratification, it was seen in India's efforts to promote technologies and practices that enable the Treaty's provisions. On various occasions, the government held discussions with voluntary organisations, academia and technology companies to leverage digital solutions to ensure educational content is available to students who are blind. By recruitment varying supporters, they have been able to ensure that the Treaty provides as benefits as possible, as quickly as possible.

2. Impact on Legislation: Facilitating Digital Education

Soon after the Marrakesh Treaty was ratified, India amended its copyright law to provide access to works for the disabled in accordance with the Marrakesh Treaty. The Copyright (Amendment) Act, 2012 substantially amended the existing Copyright Act, 1957, and inserted provisions to enable the creation of accessible works under the treaty obligations. Any person can convert works into accessible formats provided that the creation is not for commercial purposes and only for persons with disabilities.

The changes also emphasise the role of digital in this context by noting, as part of the definition of conversion of works into accessible formats, that this includes 'computer access to inaccessible works that are converted to digital format, effective as of 25 April 2013, and made compatible with assistive technologies. It expressly includes digital braille, audio books and software rendering text to speech. In this way, the legalized acts of educators, nonprofits and corporations — i.e. educational content being provided in accessible digital formats — could enable even more educational advancements via digital means.

Similarly, these changes are legally enforced by the Rights of Persons with Disabilities Act, 2016, which mandates the government and private institutions to provide inclusivity in education services and accessible formats. Further, it also requires 'accelerating the development of technology' for the education of persons with disabilities. Such laws provide a legal basis for the use of digital technologies in education for the blind – they not only encourage, but create an imperative for adoption.

As a result, the legislation post-Treaty ratification has been geared towards providing a barrier-free enabling environment for the use of digital technology for education for persons with visual disabilities – and that is why it matters legally. The legal framework acted as a basis on which technological systems could be built and deployed so that 'all persons with visual disability in India may be assured of their participation, on an equal basis with others, in educational establishments and inaccessible' It's rare to find a direct linkage between law and technology

in legal literature. But that's the whole point: global and local statutes make it clear and easy to hire your next designer, developer, pirate or saint.

III. LEGISLATIVE FRAMEWORK IN INDIA

In India, the legal framework in place, before ratification of the Marrakesh, for the rights of the physically challenged, of whom the visually challenged form a major percentage, was primarily embodied in the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995. This was a pioneering try by the Parliament at creating a comprehensive legal regime for the purpose of improving the lot of the disabled by guaranteeing for them a sense of dignity and self-worth, and attempting to bring them to par with the able-bodied in a manner that confers on them a fair sense of equality. The Act, amongst other things, required the government to undertake several steps aimed at providing opportunities for education and integration of persons with disability. It covered several categories of disability, but was vague on the specific right to accessible formats of books or notes or other study materials.

Secondly, under the Copyright Act, 1957, while the Act specifically addressed the reproduction of copyrighted works, it did not include reasons and provisions that would have enabled making accessible formats for disabled persons. This meant that organisations and institutions interested in converting printed works into Braille or audio formats for the visually impaired, were forced to contend with major legal and practical restrictions, which meant that adaptations required a judicious balancing of the interests of the blind, the general reading public, as well as the actual copyright owners. In the absence of legislative encouragement of making conversions, availability of educational and literary materials for the visually handicapped was severely restricted.

The entry into force of the Marrakesh Treaty required several official amendments to the nuances of Indian copyright law and other disability rights laws. Especially important was the selection of a special section of the Copyright Act by the Copyright (Amendment) Act 2012 (an act passed prior to India's ratification of the treaty but aligned with its soon-to-emerge provisions) that expressly authorized making reproductions or adaptations of works in various alternative formats (such as Braille, audio and digital) to facilitate access to persons with disabilities, without having to obtain licenses from copyright owners.

This legal development was a significant landmark, not only because it was the first legal development directly to respond to the book famine by eliminating legal barriers to accessible educational materials, but because it set the stage for more robust compliance once the

Marrakesh Treaty is ratified in the United States, ensuring that the law would support the treaty's purpose from the start.

Furthermore, the Rights of Persons with Disabilities Act, 2016 (replacing the 1995 Act and incorporating the UNCRPD), was enacted shortly after ratification, expanding the definition of disability and including explicit provisions to improve access in public institutions, transport and information and communication technology, and to improve learning environments through appropriate technologies, providing a stronger legal backing for digital accessibility.

1. Current Digital Accessibility Laws

There is no mention in Indian law of digital accessibility specifically, but in the years following the Marrakesh Treaty, a call for digital accessibility has entered Indian statutes. For example, section 41 of the Rights of Persons with Disabilities Act, 2016 now requires: that the appropriate Government take effective measures and provide appropriate facilities for physically challenged persons with disabilities to enable them to know, acquire and impart learning in areas of education, training or employment by offering courses in accessible formats, by providing appropriate technology in means of communication and by ensuring their participation in cultural activities. This has tremendous consequences for educational institutions, who must now provide textbooks and other materials used by students in formats accessible to visually impaired students.

In addition to these regulatory provisions, the government of India has issued several digital accessibility policies recently. The National Policy on Universal Electronic Accessibility (2013) states that the 'elimination of discrimination against disability' must be the fundamental tenet of the Digital India agenda, while announcing a shift to an 'Accessible digital infrastructure. It enunciates principles for standardisation, specification and promotion of accessible electronic and information technology in terms of development, use and maintenance.

Moreover, the Department of Empowerment of Persons with Disabilities has prepared guidelines for e-governance that require all Indian Government websites to comply with Web Content Accessibility Guidelines (WCAG) 2.0 Level AA. This means that the digital resources put out by the Government of India are accessible to all persons with disabilities, including all those who are blind or with low vision. such nativity in a country that is called the land of education and yoga adds insult to injury! Education websites and online resources are especially important for all visually impaired students because educational institutions are the locus of all our academic lives.

In combination, these laws and regulations form a strong legal foundation promoting inclusion

of educational technology practices for blind students in achieving the potential of the Marrakesh Treaty by empowering students to learn using digital tools.

IV. TECHNOLOGY IN EDUCATION FOR THE VISUALLY IMPAIRED

With these kinds of tools, students' access to the information needed for success in the classroom becomes far improved as technology closes the gap between what a blind student can do and what the curriculum requires.

- **Screen readers:** These are software programs that allow blind users to 'read' the text displayed on a computer monitor with a speech synthesizer or Braille device. Examples of screen-reader software are JAWS (Job Access with Speech), NVDA (Nonvisual Desktop Access), and Voiceover – a screen-reading feature provided on Mac devices. With the introduction of screen reading, formerly inaccessible computer and internet technology suddenly became available to blind students, rocketing the number of visually impaired people able to perform research, complete assignments and work in other online learning environments.
- **Braille displays:** Braille displays are electronic devices that interface with computers or smart phones and display Braille characters by raising or lowering systems of pins in Realtime as the information on the screen changes. This makes Braille displays essential for Braille readers to decode written information independently.
- **Audio Books:** The invention of audio books is a really important feature towards visually impaired students because they record books which can be used by those with visual impairment. The people who can allow such students to listen to books are people who has the ability to record such audio and those who has computer programming skills because they can use text-to-speech. Audio books are important source of material for those who want to learn, especially those who are in literature and the humanities, because most of time, we really have to read lots of materials..

1. Integration in Schools

Integration of assistive technology in educational institution is an imperative because it is necessary for inclusion in the education of the visually impaired. In India, the schooling-university system is increasingly acknowledging the benefits of these assistive technologies among the blind.

Colleges and schools have started installing screen readers and Braille displays in schools' computer labs to enable blind students to use computers and surf the web. Libraries are

obtaining audio books and also subscribing to digital services that will enable them to offer blind people accessible books and academic papers. Some schools are also acquiring Braille printers to produce materials in Braille, enabling all students to use laboratory handouts and printed textbooks.

Integration of these technologies in curricula can also be facilitated by training of teachers, teaching them how to work with assistive technologies, or how to modulate their own teaching styles to benefit students who are sighted. After all, if teachers are not trained on the usage of the technologies they want to integrate, it can lead to inefficient use, or use that does not benefit the student it was intended for.

2. Government and Private Sector Initiatives

Both government and private sectors have been encouraging the use of technology to help and educate blind children. Many more programs and projects have been taken place to support the implementation and development of assistive technology.

Government Programmes: Indian government have been at the forefront in providing e-accessibility to the disabled, by implementing a series of policies and programmes, including the Accessible India Campaign (Sugamya Bharat Abhiyan), the flagship programme of the Department of Empowerment of Persons with Disabilities to make India accessible for people with disabilities with regard to the built environment, transportation and ICTs. The government also have provided subsidies to the cost of these necessary devices, and have allocated funds to ensure that special schools could buy supplementary equipment.

The Rights of Persons with Disabilities Act, 2016 also stipulates how educational institutions should be technology-enabled to make them accessible. India's Digital India programme, too, contains several provisions focusing on making digital resources accessible to people with disabilities.

Piecemeal Private Sector Initiatives: A number of big technological companies and startups are pushing boundaries of innovation in the area of assistive technologies. Microsoft and Google developed some of the most commonly used accessibility tools that are in-built into a number of their products and include screen-readers, text-to-speech converters and accessibility checkers. Many startups, which will be the focus of my future pieces, are developing products aimed at India's cultural specificities like mobile applications that aid in navigation or converts text to speech in multiple Indian languages.

These joint initiatives from the government and the private sector are important for establishing a sustainable friendly environment with broader accessibility for visually impaired students to

help them overcome their limitations and become college and professional graduates as well.

V. CASE STUDIES AND IMPLEMENTATION

A number of successes of the use of technology in education for the visually impaired students in India underscore the power of assistive technologies to make a difference.

Case Study: National Association for the Blind (NAB), Delhi

NAB have developed several technologies that enable the fulfilment of many students' essential needs for learning in classrooms, conducting e-learning (using computers for learning purposes) and studying for various subjects. Screen reading software means that campuses can readily adopt e-learning; Braille displays allow students to use computers; text-to-Braille conversion and printed text-to-audio conversion systems that all students at all levels of education can use to significantly improve their educational attainment. This is a modern-day approach and a step forward to greater student independence.

Case Study: Ramakrishna Mission Blind Boys' Academy, Kolkata

In this way the residential school for the blind has been able to provide an appropriate, full-range educational environment for its blind students. Technology has enabled to improve its computer laboratory with the latest screen reading software, scanners and Braille printers making available large quantities of texts for curricular as well as extracurricular purposes. A partnership with technology companies has trained teachers on new technologies for the blind so young people can benefit deeply from the use of technology.

These case studies show that linking all three parts of the infrastructural, training and content-access puzzle in technology-mediated education for the blind can be very effective.

1. Challenges Faced

Thus, despite the enormous success of CRISPR-based gene-editing technologies, all sorts of institutional impediments arise in their attempted application in actual animals and people.

a) Resource Allocation

Weaknesses in resources, funding and human resources is another big issue. In many educational institutions, technology of the classroom is outdated and this is often not addressed due to limited funds. Learning is being hampered due to no access to updated technology.

b) Training and Awareness

Another critical issue is the availability of trained personnel who can use and teach with such tools. Professional development for educators needs to become a sustained effort when these

tools and technologies are adopted. Finally, there is often insufficient understanding on the part of educational administrators about the educational value of using assistive technologies, which can sometimes hamper an administration's decision making about the adoption of the technology.

c) Accessibility of Content

Yes, technology can enable certain types of material to become available, but not all educational materials are available in accessible formats. In particular, learning materials for higher education and many professional courses, where specialized content is created, is often difficult to access without CCTV, text scanners and assistance from a human tutor.

2. Comparative Analysis

It is appropriate to contrast India's strategy for incorporating technology for education of blind students with the approaches adopted in countries such as the United States and the United Kingdom.

a) Policy and Funding

In the US, legal safeguards such as the Americans with Disabilities Act (ADA) and the Individual with Disabilities Education Act (IDEA) offer a robust legal framework that mandates the provision of accessible educational materials and technologies. The funding and enforcement mechanisms associated with these acts offer significant leverage in making schools accountable to the mandates. In the UK, similar safeguards are associated with the Equality Act 2010 and specific education grants to support disabled students' allowances for the use of technology..

b) Innovation and Private Sector Involvement

Unlike India, both the US and the UK derive significant benefits from the fact that the development and implementation of educational technologies for the disabled is a largely private sector initiative, involving close collaboration between companies and non-profits with schools and universities, complemented by venture philanthropy and corporate social responsibility initiatives that are largely absent in India.

c) Community and Stakeholder Engagement

Another is having disabled students and communities lead the conversations about what kind of technology should be used in education. In many countries such as the UK, student unions and registered disability rights organisations help to advocate for better resources and support, so things are be done correctly and effectively.

These comparisons point to ways for India to be more ambitious in pursuing these goals: with better legal enforcement, larger budgets, more responsive involvement of the private sector, and more proactive efforts by the community to get involved. A clear way emerges, then, of using technology to greater effect in order to better provide the most disabled students with the opportunity to receive a better education.

VI. ROLE OF THE JUDICIARY

Courts have been especially central to establishing the contours of law governing digital accessibility for the blind in light of legislative developments following the Marrakesh Treaty. Through judicial pronouncements, courts clarify and recast extant law, as well as create precedents on which policymaking and implementation hinge. In this section, we turn to pivotal case laws and recent orders that have defined law on digital accessibility for the blind in India.

Union of India v. National Federation of the Blind, a landmark ruling of the Supreme Court of India, is one of the judicial decisions that explicitly spells out the need for accessibility of digital assets: It is directed to the petitioner that all its websites, including the website for seat availability in railway among others, should be made accessible, in accordance with the guidelines for public sector bodies provided by the Web Accessibility Initiative (WAI) of the World Wide Web Consortium (W3C). There's no doubt, then, about the necessity to make digital assets accessible, in particular those digital programmes that are delivered by the government itself. This necessitates government's responsibility to deliver to this important requirement. This new access precedence is now also extending to digital user interfaces, across all public institutions such as schools and universities.

The verdict in this case also underscores the wider principles of digital accessibility – that it is a right rather than a mere facilitator in access, that it is an inherent, constitutional right under Article 21 of the Constitution of India that 'secures to all persons ... the right to life and personal liberty'. Since the judgment, public and private institutions have been self-evaluating and taking measures to make their digital assets accessible.

These new judgments, on the other hand, both echo and extend some of the legal notions of digital access enunciated a decade ago. Building on these previous judgments, the Delhi High Court adjudicated in 2019 on the digital accessibility divide of higher educational institutions by mandating the Indian Institute of Technology (IIT) Delhi to provide the course curriculum of its BTech programme to visually impaired students in accessible formats (the primary judgment is available here). The Court affirmed that obligations under the Rights of Persons with Disabilities Act, 2016 applied to an educational institution such as an IIT, and also

reinforced the need for attention to digital accessibility for higher education specifically.

The other one is the judgment of the Madras High Court of 2020, which addressed the question of accessibility of online platforms hosting examinations. In this case, the court had directed the National Testing Agency (NTA) to make sure that ‘All platforms used for online testing of the students who suffer from one or other kind of disability (including visually challenged) are accessible so that they are not deprived of equal opportunity by any means.’ This is an important judgment, since it moves well beyond informational content available online and catches within its ambit interactive platforms that are being increasingly used for the purpose of testing students.

Collectively, they’re beginning to expand the conversation about digital accessibility, to make good on the assertion that accessibility is not a ‘bonus’, but a legal mandate, one that must be programmed into digital infrastructure from the very beginning. Over and over again, by rendering judgments that expand access, the court is working to ensure that people with visual impairments will have the right to participate in the digital life of education and civil society.

VII. CONCLUSION

The story of technology enriching blind and other visually impaired students in India becoming routine since the Marrakesh Treaty, was predicated on a strong legal regime and key judicial interventions. The Marrakesh Treaty introduced international standards that India adopted, translating them into significant changes in national law, reinforcing disabled persons’ rights.

Significant disparity in the possibilities for education among visually impaired students has been reduced by tailored assistive technologies, especially by screen-readers, Braille displays and audio books, which are now widespread in schools and universities, and have significantly improved both the learning possibilities and outcomes of visually impaired students. Private sector and governments have been facilitating and funding the spread of these technologies.

It continues to face challenges in terms of resource allocation, teacher training, or the more systemic trade-off pertaining to ending the monopoly of advance and sighted reading – where learners needing and using braille now compete for accessible digital content – yet to be fully addressed vis-à-vis all learners who rely on advanced reading methods like print-braille. The role of the judiciary has persisted as an important barometer to ensure that the right to digital access is given legal substance and that its promulgation obliges ongoing improvements in policy and practice.

Although the current emerging trend bodes well for the future of digital education of the visually

impaired in India, it requires greater action and innovation. The development of technology will gradually usher in new tools and techniques that are better suited for educating visually impaired students. Artificial intelligence and machine learning have greater potential in developing more intuitive and accessible educational tools. The further development of digital infrastructure around the Digital India project offers opportunities for reworking educational paradigms for the blind.

Yet for them to be useful, such innovations have to be designed inclusively and made widely available. Research into technologies, coupled with robust training programmes for teachers and school leaders, will need to continue. Preventing the need for expensive retrofitting later means that any new technology or digital educational content should be up to the job from the outset.

However, to help realizing the potential of digital education for BLIND students, it is essential to do the following:

- Policymakers need to further streamline and implement policies that require digital and educational tools to be accessible, and provide adequate budgetary support to do so.
- Schools require more accessible technologies woven through their curricula and infrastructure as well as continuing training for faculty and staff to increase sensitivity and comfort working with blind students.
- Technology Designers Develop educational technologies so that they are fit for learners of all types. This entails, among other things, ‘designing for all’ and collaborating with visually impaired users in the design process so that the new technology is a good fit.

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