A Human Rights Based Approach (HRBA) to Assistive Technology provision in Global Policy

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Abstract

Assistive technology (AT) is a human right, supporting meaningful participation for disabled people in society. However, systematic failures prevent equitable provision of AT globally. This chapter explores opportunities and challenges in developing a policy framework ensuring people have access to high-quality, affordable AT. We review broad challenges of healthcare technology access before assessing specific challenges of AT access. We make the case for AT as a human right and explore the application of this mindset within the Norway AT system. We detail how recent advances in policy have accelerated new data collection methods and tools, demonstrating AT need and impact at individual and societal level. Situating the discussion in the wider context of healthcare technology, which is expanding into mainstream consumer devices, we discuss how innovation and disability policy can improve the availability, affordability, and effectiveness of AT, thus increasing economic and social rates of return.

Key Words: Assistive Technology; Disability; Innovation; Global Health

1 Introduction

The 2006 United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) explicitly stated the Human Rights to which persons with disabilities are entitled. Assistive products (APs) and the services which provide them, collectively known as assistive technology (AT), are declared essential to the realization of these human rights (MacLachlan, Banes, et al., 2018; E. Smith et al., 2019). APs comprise a wide array of devices – hearing aids, eyeglasses, wheelchairs, prosthetics, or digital devices with accessible software; and when provided through services which can expertly assess and train the user, APs can increase an individual's quality of life (WHO, 2018b).

However, 90% of people who need APs do not have access, and many who have access have products which are inadequate for their needs or lack training to use their product. This

under-met need means people, particularly in low resourced settings, still live with a functional loss.

This need persists despite systematic attempts to expand the existing AT provision systems of most of the 177 UNCRPD signatories (E. Smith et al., 2019). Smith et al (2019) have analyzed Party UNCRPD reporting against the commitments to assess engagement by countries in developing and implementing AT policies which promote participation for persons with disability. The review found systems for AT provision existed but lacked evaluation. Without evaluation methods, we are unable to assess the efficacy of existing systems and determine which are best placed to fulfil the AT need and which are failing.

Since 2000, there has been a growing coherence of global initiatives in AT (their full history is given in (Layton et al., 2020). Following the ratification of the UNCRPD in 2008 and the publication of the World Report on Disability in 2011, the UN 68th general assembly requested the WHO to coordinate a global initiative for AT (2013). In 2014, the WHO Global Collaboration on Assistive Technology (GATE) was established, which has spearheaded a series of initiatives, for example, WHO Priority Assistive Products List (APL) and the WHO Great Summit, both in 2017. In 2018, the World Health Assembly passed a resolution on improving access to AT in its 71st session, which mandated the first Global Report on Assistive Technology to be published in 2022. In amongst this momentum, the AT2030 program was launched at the Global Disability Summit on the Queen Elizabeth Olympic Park in 2018.

The AT2030 program was developed by the Global Disability Innovation Hub in close collaboration with the WHO and partners. The launch of the program was announced alongside the formation of the ATscale Global Partnership for Assistive Technology (ATscale); the AT2030 program would test what worked in getting AT to people globally, with activity focused on low- and middle-income countries (LMICs). Learnings from the AT2030 program could then be leveraged and scaled up by ATscale to meet the Sustainable Development Goals (SDGs).

We review recent efforts to strengthen AT systems and leverage Human Rights-Based Approaches (HRBA) to promote fairer AT provision and increase AT access. We first outline the work of the GATE initiative's framework for analyzing AT systems. Then introduce the case study of Norwegian AT service delivery. Next, we explore current financing mechanisms for regulating AT access, highlighting existing pitfalls, and proposing strategies to better leverage innovation in the sector. We then focus on examining the learning from the AT2030 program in addressing "*the systematic failures [of the AT sector] which cause a mismatch in supply and demand, creating chronic and critical failures in provision of AT for disabled people globally*" (Holloway et al., 2018). We reflect on how an HRBA affects the ways in which global and national organizations and initiatives organize and campaign for change. We conclude with a discussion and the limitations of our enquiry.

2 The WHO GATE Initiative & a case-study of HRBA to AT

2.1 WHO GATE

The GATE initiative is a flagship program of the WHO on AT. It exists to advocate for and provide evidence to advance AT provision globally, and specifically through Universal Health Care (UHC). A first initiative of GATE was to advance the APL, which is equivalent to the WHOs essential medicines list. The list was the starting point of GATE attempting to standardize what Nation states should provide as a minimum for their citizens living with disabilities to fulfil their human rights.

The GATE initiative is a global collaboration which realized the complexity of providing AT. To improve access to assistive technology, GATE has developed the people-centered assistive technology ecosystem which describes the need to address the entire complexity of AT systems across a 5P's framework (Khasnabis et al., 2020). This framework is drawn from the UNCRPD and is reproduced in Figure 2.

At the centre are AT users and their support network. To ensure people get access, it is critical to have global and national policies, with associated data collection and financing structures to ensure that high-quality AT is affordable to all citizens through Universal Health Coverage (UHC) (WHO, 2018b). A person-centric policy approach – in keeping with a human rights-based approach – is essential to ensuring that products match users' needs.

Figure 1: WHO GATE 5P model of assistive technology. People surrounded by Products, Personnel and Provision, which then are surrounded by Policy, Universal Health Coverage, and the Convention on the Rights of Persons with Disabilities.

Policy is central in the 5P framework and enables the others, including the products themselves, the personnel to provide and train people to use the products, along with resilient and efficient provision systems.

2.2 The Right to AT: Case study of Norwegian Assistive Technology Service Delivery

Here, we demonstrate how this approach operates in practice, using the Norwegian assistive technology service delivery program, which we call the 'Norway Model,' as a case study. (Federici et al., 2016; Holloway, 2019a)The Norwegian AT service delivery system was piloted in 1977 (Sund, 2017). Development was driven by close collaboration between the Ministry of Health and Social Services (MoHSS), Disabled People's Organizations (DPOs), professional organizations, and the applied research agency SINTEF leading the process and harboring the secretariate of the Council for Assistive Technology. Development was also strongly rooted in a Nordic collaboration on service delivery models, involving testing and development of standards in the field of AT. This system is organically structured across the 5Ps framework.

2.2.1 Policy

From 1995, a uniform, public and national system for AT was in place in Norway, organized under MoHSS and, today, the Norwegian Labour and Welfare Administration (NAV). This system is based on principles of equal access nationally and is funded through the National Insurance. This is a rights-based system embodied in Norwegian law for individuals who meet the necessary criteria. NAV administers the funding and provides AT, maintenance, repair, and other services for free to improve functional capacity in everyday life and in the workplace.

2.2.2 Products

Practically, assistive products are part of a library where they are on loan and returned to the Assistive Technology Centers (ATC) when no longer in use or in need of replacement. Private suppliers compete to get their products into the assortment of NAV and the ATCs, located one in each of the 19 counties (prior to recent reform reducing the number of counties). On average, people are provided with three devices per person, which can be returned and up/down-graded as needed, leading to sustainable provision.

2.2.3 Provision

ATCs purchase APs based on the central tender system and distribute them to individuals and municipalities. The ATCs are responsible for AT for individuals with significant and permanent impairments, while municipalities/local authorities are responsible for funding and delivering AT in case of temporary disabilities and for residents at nursing homes. Municipalities also have a responsibility to determine need and follow-up after extradition,

regardless of whether the need is permanent or temporary, and refer to the ATCs when deemed to be appropriate after professional assessment. The ATCs provide guidance to the municipalities when required. While also funded through NAV, hearing services and orthopedic services are provided through hearing centers based at larger hospitals.

2.2.4 Personnel

Regional ATCs are staffed with relevant trained personnel (e.g. occupational therapists and physiotherapists) responsible for assessing the needs of users, recommending appropriate Ats, and ensuring that individuals have access to training and follow up services. Professionals at regional centers are also responsible to identify and refer those individuals who might need more specialized assistance that is unavailable within their local community. Personnel at national ATCs include professionals with expert knowledge of a broader variety of Ats across functional domains of vision, hearing, communication, mobility, self-care, and cognition.

The centrality of the individual is an essential feature of the Norway Model. The goal of the system is to ensure that the person is granted access to the products and services essential to the fulfillment of one's needs and aspirations. In this context, the importance of a collaborative assessment approach where users can discuss their daily needs and personal goals becomes essential. Finally, great emphasis is placed on making sure that equal levels of access are guaranteed to the individual regardless of their characteristics, financial status, and living environments.

2.2.5 Continuous Improvement

Different data systems keep track of the number and age of users of AT, types of AT the government offers, costs, processing times, delivery times, and more. A government-appointed expert committee delivered their report in February 2017 with the title: "A more effective and forward-looking AT service delivery system – for increased participation and coping" (Oslo, Ministry of Labour and Social Affairs, 2017). The title indicates participation as an overall goal for these services, based on the idea that this is beneficial for both the individual and society. The report was based on a comprehensive investigation of different aspects of AT services and seen in the light of other large reforms in the Norwegian health and welfare system during the last 10 – 15 years. The committee concludes that the current AT service delivery system needs adjustments but that the overall model should be maintained. The committee further concludes that good, timely access to appropriate assistive devices is a decisive factor for individuals with functional difficulties to live independent lives and participate in society – and this is, without doubt, beneficial for society i.e. offers value for money.

The case of Norway is exceptional, paralleled only by a similar system in Sweden. This Norwegian system (and its sibling in Sweden) is a well-developed and resourced national

approach with a consensus commitment to a public provision through a welfare system that supports its citizens. AT provision from an HRBA is a consensus approach. However, the Norway Model is not immediately transferable to all settings and is not perfect. A recent study has pointed out that user involvement in the service delivery process, while high on the agenda in the Norwegian service delivery system, is still in need of improvements (Pedersen et al., 2020). It also requires considerable amounts of infrastructure and a high level of government funding which in turn requires high levels of taxation. For a variety of reasons, this system may not be possible to transpose to another country, or it may require additional tools to help make the case internally for budgetary needs.

Finally, the Norway Model is built around a broader concept of a strong welfare state, which is prominent across Scandinavian countries (Baudin et al., 2020). In many countries across the globe, AT service delivery is based on a variety of systems ranging from private insurance schemes, partial subsidization, and consumer markets (ibid). In particular, as the boundaries between AT and mainstream technologies become blurred, defining an "optimal" model to ensure access to AT becomes an increasingly complicated (Holloway, 2019b; Holloway & Barbareschi, 2021). This blur is important to acknowledge within disability and has specific relevance to the AT agenda. When functions originally within the domain of specialized assistive products such as synthesized speech become integrated into mainstream technology, they become more accessible to general consumers. However, this carries the consequence of uneven provision across the public, with structural inequalities being further embedded into the lives of persons with disability (Alper, 2017). To understand how we make the case for AT, it is essential we zoom out from the specific issue of AT provision, understand how the levels of healthcare economics are driving the need for innovation, and consider the implications of more accessible (and uneven) product provision as mainstream product innovation increases.

3 Financing Healthcare & Healthcare Technology Innovation

The World Health Assembly directive on AT sets a mandate for the inclusion of AT in Universal Health Coverage (UHC) systems. UHC is an inspirational but feasible and measurable target of the Sustainable Development Goals to be achieved globally by 2030. To achieve this target, countries will need to ensure the equitable provision of AT through their respective healthcare systems. However, there is no universal health coverage roadmap; each country must develop its own and these will vary according to the country's health finance system.

Rwanda has provided universal eye care since 2010 by incorporating it into their national health system, including screening and provision of eyeglasses. However, this has not yet been expanded to other priority assistive products (AFB, 2013). In 2018, the Philippines incorporated benefit packages into the Philippine Health Insurance Corporation (PhilHealth) that targeted children needing orthotics or prosthetic devices, a wheelchair, glasses, and

hearing aids. In April 2019, PhilHealth announced its preparation to expand benefit packages to all people with disabilities, with premium contributions paid for by the government through alcohol and tobacco taxes (PhilHealth, 2019).

However, is often the case that UHC is not met for AT or met only with charitable intervention. Data from 2016 show that 37.8% of AT is provided by national health services and 29.8% is obtained through supporting providers in South Africa, Namibia, Malawi, and Sudan (Visagie et al., 2017). A 2020 survey found a mixture of organizations (government ministries, DPOs, and NGOs) in Malawi provide AT, mostly for free, but there is a strong reliance on donation. AT provision is thus uncoordinated, unsustainable, and not scalable (E. M. Smith et al., 2020). Although donations to AT fill a critical need, they sustain a fragmented marketplace. For example, there is evidence in the case of wheelchair provision this leads to uneven distribution of products, variable product and training quality, and inhibited government engagement in funding the products and services centrally (ATscale & AT2030, 2019).

3.1 The case for innovation

Healthcare expenses are considered a major concern globally, with an estimated 10% of global GDP going to health-related expenditures. Moreover, some high-income countries with aging populations and rising non-communicable diseases spend upwards of 20% of their GDP on the healthcare (WHO, 2018a). Health innovations in market-driven economies are seen as enabling increased access to health services and improved quality of health, yet simultaneously as the major contributor to rising healthcare costs. Thus, health technologies and innovations come under increased scrutiny and accountability to demonstrate added value in measurable health outcomes against delivery costs.

Yet, measuring the impact of health technologies and innovations has never been easy nor consistent (Banta & Jonsson, 2009). Many innovators have struggled to show the benefits of their innovations using traditional health technology assessment (HTA) models. HTA is an interdisciplinary process for synthesizing information concerning medical, social, financial, legal, and ethical issues related to introducing new health technology. However, too often due to time pressures and data issues, only financial and medical get reviewed (O'Rourke et al., 2020).

An HTA encompasses everything from public health programs to drugs and bionics to managerial systems, often categorized by their purpose (e.g. screening, prevention, rehabilitation) or stage of diffusion (e.g. experimental, established) (Clifford S. Goodman, 2014a). This makes HTA a very broad topic, beyond the scope of this chapter to fully explore. However, we summarize two standard approaches: integrative methods and economic analysis methods.

Integrative methods include systematic literature reviews, meta-analysis, modeling, and consensus development, with more details available in (Clifford S. Goodman, 2014b). Economic evaluations can include (1) Cost-effectiveness analysis which compares strategies with outcomes in units such as life years, (2) Cost-utility analysis which uses quality-adjusted life years (QALYs) or disabled-adjusted life years (DALYs), and (3) Cost-benefit analysis, which transforms the outcomes into monetary units for comparisons. Although these methods have historically been seen as robust methods of supporting decisions, they are all about the decision-making process in the later phases of the innovation process when the technology has been tested, and there is a data set to work with for the decision-making (Philips et al., 2006). Furthermore, such rationalized evaluations lack the nuance necessary to fully capture the complexities of disability within the social model context. (Mont, 2007).

Despite the challenges of individual measures, HTA continues to dominate the decision-making in most national health systems regarding the adoption of new health technology and innovations (Kim et al., 2021). It is within these contexts that AT provisions and budgets are set. Yet the application of HTA models can be long and complex and vary across and within health systems. This is particularly problematic for the case of AT, as services are spread across different medical domains, each with its awareness of AT. The definition of value is also not straightforward. Value is often expressed in narrow terms, such as the "best" health outcomes achieved in monetary metrics. Outcomes are equally problematic, with definitions such as changes in health ranging from specific health care investments to results of interventions that can range from clinical, self-report, and observation. All these factors mean that HTA models are increasingly being challenged. There is also the inability of LMICs to produce the necessary data and evidence to bring meaning to such an approach (Babigumira et al., 2016). The belief that money spent on one group within society means that another group either does not receive treatment or another valued resource is being challenged. This deficit perspective and approach is a long way from seeing health technologies and innovation as enabling the economy and creating growth within societies from innovation in health technologies.

Lastly, we need to approach changes to HTA systems and models with a view of enabling and supporting a global health ecosystem rather than a fractured array of national health systems working in silos. Consequently, given the dramatic increase in innovative therapies and medicines coupled with a patient-centric approach to health care, the proposed changes in how AT is striving to be viewed and enabled through different value measures, and a move away from being seen within the health assessment framework, could not be timelier. There is sufficient room for a spill-over effect from the work to reframe innovations in assisted technologies to assist the broader healthcare services and systems to grapple more disruptively with evaluating and enabling health innovations and technologies as well.

4 Learnings: A global framework for Disability Inclusion, being trialed through AT

4.1 AT and missions

AT must be based on new economic foundations that go beyond fixing market failures, focusing instead on shaping markets to unleash AT innovation dynamics (Albala et al., 2021).

Within the global health sector barriers in health access and delivery has been addressed by directing the marketplace (Albala et al., 2021). Market shaping can enhance market efficiencies, improve information transparency, and coordinate and incentivize the numerous stakeholders involved in supply- and demand-side activities including though: pooled procurement, de-risking demand, developing market intelligence reports, standardizing specifications, establishing pricing agreements, and improving service delivery and supply chains. An example can be found in the product narratives of the AT2030 program e.g. wheelchairs (ATscale & AT2030, 2019).

This work is complemented by a mission-led approach which takes a higher-level viewpoint of the economy and priorities of a government. The mission approach is based on theoretical and policy frameworks and toolkits that rely on the understanding that economic growth has not only a rate but also a direction (Mazzucato, 2016, 2018). A full vision of missions for AT is given by Albala and colleagues (Albala et al., 2021). Albala points to examples from the UK's All-Party Parliamentary Group for Assistive Technology which used assistive technology as an important component for addressing challenges and questions of an aging society, artificial intelligence, and the future of mobility.

Missions shape the direction of innovation by helping public, private, and third-sector actors make strategic investments across several fields, and by nurturing innovation and industrial landscapes to grow (Mazzucato, 2018). Missions can be used as a mechanism to focus research, innovation, and investments on solving crucial problems. With a strategic direction, missions enable new possibilities of bringing different actors to spur collaboration and help redefine what these cross-sector relationships can look like (ibid).

4.1.1 Value at a mission level

Providing AT to all that need it around the world would yield more than USD 10 trillion in economic benefits over the next 55 years (ATscale, 2020, p. 6). At a family level, the report estimates that over the lifetime of a single child in an LMIC, there would be a USD 100,000 increase in income (ibid). The report finds return on investment will have 'ripple effects' constituting a 9:1 return on investment in activities that strengthen and improve access to AT systems and products in LMICs, alongside an increase in over 1 billion Quality Adjusted Life Years (QALYs) (ibid). The value of AT as measured above already demonstrates a

compelling case for the provision of AT. However, these conventional methods based on cost-benefit analysis (CBA) narrowly define “benefit” according to standard health economic evaluation frameworks. These frameworks can fail to capture the full value that arises from AT service delivery, access, and user interactions. Therefore, the value could be higher still.

Taking a holistic view of the full value chain shows how investing in the Human Rights of AT creates numerous employment opportunities and innovation spillovers that will readily be recovered over the initial investment cost. In this sense, the AT innovation chain, from design to use, can be seen within its industrial ecosystem. AT enables human capability, but its value should be more accurately framed beyond the benefit to the individual; models should incorporate economic, individual, and societal growth.

In this direction, input-output and social network analysis of AT sectors provide helpful insights into the location and relevance of AT within the supply chains forming the whole of an economy (Oriol Valles Codina, 2022). This is especially true in the context of developing economies where many AT assessments within developed economies cannot be simply extrapolated. Interdependencies arise due to the existence of complementarities between industries at the level of investment and production activities. Due to these mutual relationships, a change in the production in one industry is transmitted to others through a multiplier effect (ibid). The chain of transmission can run from customer to supplier industries (backward linkages) or from supplier to user industries (forward linkages) (ibid).

AT industry actors are well-connected via many input-output linkages in production to the rest of the economy. AT and health-related sectors mainly occupy downstream positions in the value chains of their respective countries, especially catering to consumers of final goods while supplying from a wide range of industrial sectors (ibid).

To illustrate this, Indian manufacturing of hearing aids and ophthalmic goods features one of the highest upstream output multipliers among all Indian industries, as high as 307%, implying for each dollar invested, an extra $2.07 enters its supplying industries. In this context, upstream propagation of demand shocks induced by additional investment will dominate, spilling over the rest of the production ecosystem. Conversely, supply-led effects of investment on AT will especially benefit consumers, either as final or investment goods, by reducing their price. A downstream example is the Mexican manufacturing of medical equipment; although its output multiplier is relatively low (140%), it belongs to one of the most significant supplier industries in that economy and occupies a central position in its production ecosystem. Investment in Mexican manufacturing of medical equipment thus yields positive cost efficiencies in the whole economy (ibid). This shifts the argument of economic growth from that of the individual or their family to the overall growth in the economy.

4.2 Global Disability Inclusion: The mission

Since the London 2012 Paralympic Games, a model emerged that underpins the work of the Global Disability Innovation Hub and prompted the AT2030 program design. This model has recently been formalized and published by (Austin et al., 2021) and is shown in Figure 2.

Figure 2: Disability Inclusion Model (Austin et al, 2021)

This model of disability justice complements the mission-led approach, acting as a mechanism to develop and use large-scale initiatives (e.g. the Paralympics) to catalyze change already identified by community leaders. The HRBA for disability is founded on a 'nothing about us without us' approach which is essential not only from an ethical and rights standpoint but also from a pragmatic and implementation point of view. People with disabilities are the best people to articulate the needs of society to be disability-inclusive, and without these voices amplified to political leadership, subsequent work will struggle to succeed. Once steps one and two are achieved, clear missions are set with time-limited actions. This approach is akin to mission-setting. In the 12-step model, the multiple-level, bottom-up solutions are the starting point of the mission-setting process.

4.3 Strengthening and Valuing AT Systems

4.3.1 Data and tools to develop policy

Governments must holistically understand the prevalence of AT indicators, such as need and coverage, in their population, which means not equating an impairment prevalence to the

prevalence of need for a relevant AP, as this fails to capture the influence of context-specific factors on the effective use of APs (Boggs et al., 2019; Danemayer et al., 2022). The relationship between an individual and their APs is complex and unique, influenced by social needs, physical capacities, and environment. This key aspect of AP provision limits how its impact can be comprehensively assessed, as these highly individual factors must be anticipated and accounted for in a standardized way,

Collecting these data through rapid assessments (RAs) is a relatively new method of data collection that address several barriers to researching complex interventions like AT at the population-level. These standardized surveys typically train local staff as assessors; can be translated and conducted in different countries; and produce results that can be compared to inform a global understanding of the sector and used to scale marketplaces. . Current "assessments" for disability certification are not comprehensive measures of support needs. Even those moving away from medical diagnoses and impairment-based determinations to functional ones tend to miss data about AT, personal assistance, or other needs. If AT-specific data collection becomes part of a government's routinely collected administrative data, it becomes more sustainable and provides insight on the whole population applying for benefits. Of course, not all people who need AT apply for disability benefits. But if disability, health, and rapid assessments use the same tools, then the data will be harmonized and can be considered together.

The WHO developed the Assistive Technology Assessment (ATA) toolkit to enable governments to assess population-level needs and the capacity of the government to provide for these needs through current policies and systems (WHO, 2021). The toolkit aims to answer three key questions:

- What are the met and unmet population needs in terms of access to assistive technology? Answered though the rapid Assistive Technology Assessment (rATA)
- What is the country's capacity to meet the identified unmet need? Answered through the Assistive Technology Capacity Assessment (ATA-C)
- What is the impact of assistive technology on the people who use it? Answered through the Assistive Technology Impact Assessment tool (ATA-I)

The rATA is a household survey that, over and above other surveys, distinguishes AT data collection and the generation of AT indicators, which can be disaggregated by key demographic variables. Specific subsets of the data (for example, the total reporting dissatisfaction with AP services in a specific location) can be explored in-depth through individuals' open-ended responses within the rATA, and a follow-up study in the targeted area or population can be carried out to identify AT delivery system failures or bottlenecks. Investigating high under-met needs regarding a specific product (i.e. individuals who already have an AP report they are unable to effectively use it) demonstrates that APs are not universally useful and identifies important design implications. Patterns in these data can

indicate where AP designers may have overlooked specific populations, environments, and settings, which carry further implications for officials tasked with importing APs and developing accessible infrastructure. Currently, the rATA has been conducted in 35 countries, the results of which have supported the first WHO and UNICEF Global Report on AT (World Health Organization & UNICEF, 2022).

The ATA-C has been conducted as part of a Country Capacity Assessment (CCA) at the population level in Indonesia, Mongolia, Malawi, Liberia, Rwanda, Sierra Leone, Ethiopia, Uganda, and Nigeria, with Vietnam, Dominican Republic, and Bolivia in progress. A review of these investments found that completing this assessment led to a raised level of awareness of AT issues; a greater degree of coordination among AT actors in each country; and in most cases, the creation of new working groups across different government ministries and non-governmental partners to aid coordination (Bostian, 2020). In some countries, new policies have been developed because of completing the CCA with an associated budget, and in other countries, the findings are informing ongoing policy development (ibid).

4.3.2 One-Stop-Shop

The one-stop-shop model integrates four of the five P's of the WHO model and aims to create a single place where personnel can provide products to the people who need them through an innovative provision model. In collaboration with the Ministry of Health and partners, the WHO is piloting a one-stop-shop model in Tanzania and Tajikistan, including procurement of assistive products, workforce training, the establishment of referral mechanisms, and other related activities supporting the publishing and implementation of a manual on the one-stop-shop concept for access to assistive products from a community level and up. This model builds on the Norwegian Model and will be evaluated in due course through AT2030.

4.4 Developing user-centered innovations

Innovation in the design, development, and distribution of products and services plays a key role in increasing access to AT (R. O. Smith et al., 2018). Innovation can also produce significant economic and social value, not only to direct beneficiaries but to society at large through a ripple effect that comprises both tangible and intangible elements (Phillips, 2020). Still, entering the AT market can be incredibly challenging for many innovators and entrepreneurs due to a series of factors ranging from fragmented markets, high need but low demand for products, convoluted supply chains, and lack of direct links with potential users (MacLachlan, McVeigh, et al., 2018). Hence, capturing the value of AT innovation at every step, for both target users and stakeholders involved in the process of development and deployment, is crucial to nurture and scale-up innovations that are impactful as well as sustainable.

When launched in 2019 by UK aid, AT2030 aimed to nurture, promote, and scale disruptive innovations that could increase access to ATs. To achieve this goal, the GDI Hub team developed an ecosystem approach. It was first co-deployed in Kenya with local partners through Innovate Now, Africa's First AT Accelerator (www.atinnovvatenow.com), with the aim of expanding to similar contexts. Through the GDI Accelerate ecosystem of activities, now encompassing the AT impact Fund, Innovate Now, and Local AT Production Innovation, innovators and other stakeholders can harness the full value of ATs at an individual, business, and societal level (Holloway et al., 2019). Research on value and impact is embedded into all levels of the ecosystem and includes work with start-ups and early-stage ventures.

We have uncovered hidden value in the local production of AT. A 5-month research study with Motivation UK assessed the potential of using a combination of traditional and additive digital manufacturing to create bespoke manual wheelchairs in Kenya (Barbareschi, Sibylle Daymond, et al., 2020). The model attempted to overcome the challenges of importation by enabling local production of devices while leveraging digital tools to ensure the quality of the wheelchairs remained consistent (ibid). As well as being both feasible and acceptable, this approach delivered an increased sense of ownership, and users found the wheelchair more attractive as they were part of the design process, which reduced stigma attached to wheelchair use (currently a chief factor limiting demand for AT)T (Holloway et al., 2018). The skills acquired by providers in this project can be redeployed to enable the production of other types of mobility AT, or improve current wheelchair assessments (Barbareschi, Sibylle Daymond, et al., 2020).

Another example of hidden value generated by AT innovation is represented by the Ugandan company Wazi Vision, which produces affordable and sustainable eyewear and is supported by the Assistive Tech Impact Fund. Wazi Vision's manufacturing approach uses locally recycled plastic, which allows them to produce glasses that are significantly cheaper than imported models (20$ vs 150$). Second, the reliance on local resources enabled Wazi Vision to maintain production throughout the COVID-19 pandemic, avoiding the international supply chain disruptions. Finally, their Afrocentric branding focus drove them to invest in local calls for artists to design glasses that would suit the features and preferences of local customers. This decision has the potential to support local designers and artists, and create products that are more appealing and contextually appropriate, increasing their reach and decreasing the potential for stigma.

Both these examples show how innovation can improve the functionality and looks of the products or the systems used for service delivery of AT, whilst also increasing the potential reach and impact of AT more broadly.

4.5 Beyond Health: Consumerist Models

Mainstream technology is increasingly designed with digital accessibility, even specific conditions, in mind.. Digital accessibility ensures hardware and software are usable by as many people as possible. This blurs the lines between what is and what isn't AT as companies align with accessibility laws to gain increased competitive advantage (Holloway & Barbareschi, 2021). This brings the promise of increased availability with two challenges: equality of access and an over-dependence on product provision above the wider technology ecosystem which is necessary to provide adequate AT coverage.

A recent study exploring roles, expectations, and pitfalls of communication aids for people with speech and writing challenges delivered on an iPad for nonverbal children found that, whilst the AAC allowed for self-expression, they also enhanced social inequalities; higher-income parents were able to protect the device better (through purchasing of cases) and were better able to access resources to aid AAC use (Alper, 2017). There were also different social norms around the use of the device and 'screen-time.' The AAC device was used both for fun and communication; screen-time was more valued as it created meaningful and otherwise inaccessible social connections within the family.

This intermixing is not only in the digital domain. Devices like walking sticks or reading glasses are easily found in many high street shops, pharmacies, or online retailers. This individual out-of-pocket expenditure was demonstrated in the 2019 rATA pilot in Pakistan, finding 7.2% (of 62,723 respondents) used at least one AP and 90% paid for it out-of-pocket (Mallick, 2019). Technology advancements are making it more possible for individuals to purchase increasingly complex and expensive APs such as mobility scooters, motorized wheelchairs, or as discussed above, AACs (Andrich, 2016). This trend will lead to a larger proportion of assistive technology provision through a neoliberal model rather than an HRBA, yet this is consequential and not inevitable.

4.6 HBRA Appraisal

By shifting our mindset to one where AT is a critical component of healthcare coverage, we can develop missions and measurement tools which make a case for AT as a critical component of the economy more broadly. By developing programs using the 12-step model, the rights and voices of persons with disability are the drivers; they lead and control policies and programs affecting them. This ensures an HRBA is more easily embedded into the design and delivery of the policy program, a priority illustrated by tools developed by the WHO to help governments provide robust and affordable AT systems.

As an alternative approach to individual purchasing power being a driving force, governments could acknowledge technologies as they emerge as assistive. It is essential that training in the use of these products is incorporated into national budgets. This would prevent cases where people with disabilities are unable to use the mobiles when they are provided for example (Barbareschi, Holloway, et al., 2020). Training must be expanded to

teachers and caregivers. An excellent example of this provisioning model has been developed by the Kilimanjaro Blind Trust Africa as they roll out a new braille reader across Africa for use by children with visual impairments (Holloway & Barbareschi, 2021). The provisioning model includes teacher training, repair technicians, and child training. Beyond the financing of emerging products, governments can consider the need for accessible infrastructure, from inclusively designed public buildings such as schools and hospitals.

Whilst some will continue to advocate for a more neoliberal model (Andrich, 2016), we would concur with Andrich and colleagues that there will always be a need for intermediary assistive product delivery systems (Andrich, 2016), as this serves (1) the ethical agenda – it aligns with an HRBA and ensures a baseline of equality across the population, (2) financial agenda – bulk purchase enables reduced product costs, it also allows for recycling and repair which further reduces costs to the bursary and planet, (3) expertise agenda – allows for specialist expertise to aid in the AT matching process, complementing and not to the exclusion of the expertise of people with disabilities' experience, and (4) coordination agenda – ensures the provision of AT is integrated into a wider package of support for a person.

5 Limitations

There are several limitations in the chapter. The most obvious is that it draws heavily from one program, albeit a large one, to develop the framing. This is mitigated through the fact it is aligned and co-developed with the WHO and the relevant partners in scale. Second, due to space, we have chosen to focus on health, which also limits the chapter. Increasingly, AT is being developed and provided outside of health, especially within the digital space (Holloway, 2019a; Khasnabis et al., 2020). The education domain and inclusive education technology (ed-tech) are increasingly important and relevant within the UN system led by UNICEF. Third, AT is only usable when the environment and society are inclusive. Elements of AT2030 address these issues of inclusion in the built environment and the role of stigma in enabling inclusion. However, space did not allow for their inclusion here.

6 Conclusion & Recommendations

AT is essential to the realization of human rights for people with disabilities. Without AT, people are excluded from all elements of society. AT is a part of the wider healthcare technology sector into which it needs to integrate to allow for UHC to be achieved, and data is key to enabling this aim. Using an HRBA is essential to developing any AT policy. We demonstrate that by joining an HRBA with a mission-led approach, we can develop economies more generally and help build a case for AT within budgeting. The 12-step disability inclusion model is a way to develop programs and policies to ensure an HRBA is embedded into the whole process, from idea to assessment. Tools within the WHO ATA toolkit can help countries assess their ability to provide AT to satisfy a need. Finally, the

ripple effects of innovation can be measured at a micro level to help further support policies.

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