

Assistive Technology in China: policy framework, service delivery, and industry development¹

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1. Introduction

Under the social model, disability is a societal creation (Barnes, 1991; M Oliver, 1996; Traustadóttir, 2009; Mike Oliver, 2013). Disability can be described as a “gap” between the individual’s capacity and the environment’s demand regarding functions. People with impairments (i.e., loss of or damage to a body part or body function, such as impaired mobility, sight, or hearing) will not necessarily be disabled. An impairment will not necessarily restrict a person’s social participation in daily life. However, disability arises when there is a gap between an individual’s capabilities and the way his/her environment is designed. The built environment, office equipment, or information and communication technology may for instance have failed to take into consideration the variation in capability or functional capacity in the population. A disability – or the “gap” – can be reduced by improving the person’s capabilities and/or by adjusting to the environment (NAV, 2017). In the first case, professionals with the aim to provide rehabilitation services or medical treatment to the individual person. In the latter case, policymakers will aim to change the environment either by designing the environment according to principles for universal design or by accommodating the environment in individual cases when the need arise. The provision

¹ The authors acknowledge the receipt of funding from the Norwegian Ministry of Foreign Affairs, under grant agreement CHN-19/004, and the European Union’s Horizon 2020 research and innovation programme under grant agreement No 870698. The opinions published in this paper reflects only the author’s view. Corresponding author: Biao He, Oslo Metropolitan University, Department of social work, child welfare and social policy, Oslo. Email: biaohe@oslomet.no.

of assistive technology to individuals with impairments is one common strategy to close the “gaps” to enable more people to participate as full members of society and avoid disabling barriers.

Assistive technology (AT) can be defined as “specially produced or generally available device, equipment instruments, or software” (ISO, 2007) that are a demonstrated facilitator of functioning for persons with impairments. Combining with other forms of assistance, AT can help overcome practical problems (NAV, 2017) and have the potential to close the “capability gap” between a persons’ capacities and the contextual barriers that prevent people from realizing their life goals (Buchanan & Layton, 2019).

China has about 85 million people with disabilities, out of which one-third has been estimated to need assistive technologies (X. Li & Wu, 2016). To meet the needs of AT from persons with disabilities and improve their life quality and social participation, China has included AT provision and the development of AT industry in the national legislation and development programs since the 1990s. During the last 30 years, China has developed a policy framework and service delivery system for the provision of AT. During the “13th Five-Year Plan” (2016-2020) period, China formulated the vision that “over 80 percent of the disabled adults (with disability certificate) and children can receive basic adaptive AT products and services by 2020.” (the State Council, 2016b) This vision calls for substantial strategies and urgent action to further strengthen the capacity of AT service delivery and improve the service delivery network and policy framework.

In this report, we will give an overview of the AT service delivery system in China. In Section 2 we describe in brief the Chinese context. In Section 3 we will present the policy framework, including the relevant legislation and official documents or guidelines that support the provision of AT and the development of the AT industry. In Section 4 we provide more

details about the AT service delivery system. In Section 5 we examine the advancement of the AT industry in China. In section 6, we discuss some limitations in AT provision in China so far. In Section 7 we conclude.

2. The Chinese context for the provision of AT

China has approximately 85 million population with disabilities (CDPF, 2016). It is difficult to present the current segments of different disabilities due to the lack of recent data.

However, available data suggests that by 2010 nearly 25 million had physical impairments, 22 million had hearing and speech impairments, 13 million were visually disabled while nearly 6 million were intellectually or cognitively impaired (China Disabled Persons' Federation, 2012). CDPF estimated that one-third of the 85 million persons with impairments need AT products and services. In 2015, of 26 million population with disability certificates, approximately 9 million had applied for assistive devices (CDPF, 2016). In addition to persons with disabilities, the demand for AT is increasing among the elderly. Aging to disability” among the elderly is a factor that stimulates the demand for assistive technologies in China (CRCA, 2014).

To meet the growing needs and ensure that more people in need benefit from the AT provisions, China has adopted various policy strategies to expand and improve the service network, widen the coverage of recipients, and improve the qualifications of professionals.

In 2011, 166 municipality-level and 794 county-level service providers (i.e., service center/station/point, and AT supplier) were responsible for providing AT products and services nationwide. By July 2016, the total amount of service providers above county-level reached 3000, tripling the figure from 2011. Meanwhile, 6 nation-level assistive technology resource centers have been set up during the “12th Five-Year Plan” period (2011-2015) (X. Li

et al., 2016).

With the expanding service delivery network, the number of AT products provided and the number of AT recipients has been increasing. Only in the “13th Five-Year Plan” period (2016-2020), the number of the recipient of AT has been more than doubled, from 1,3 million in 2016 to 3,1 million in 2019 (CDPF, 2017, 2020). More than 6 million AT products were provided during the “12th Five-Year Plan” (2011-2015), 3 times the figure in the “9th Five-Year” period (1991-1995) (CDPF, 2017). Efforts in various aspects that China has been making in the lastest decades may greatly account for these positive changes.

2. Current policy framework concerning AT in China

A comprehensive service delivery system and a vibrant industry largely depend on the legal and policy framework that structures these activities. Laws and administrative regulations provide a legal basis for the provision of assistive technology in China whilst relevant policies guide and direct the service delivery and the industry’s development.

First, the *Law of the Protection of Persons with Disabilities (LPPD)* specifies the public duty to provide persons with disabilities with assistive technologies. Article 20 of LPPD states that relevant government departments shall organize and support the research, manufacturing, supply, and repairment of AT products for persons with disabilities. Article 40 requires that all-level governments shall take actions to subsidize the provision of necessary AT products for persons with disabilities (National People’s Congress, 2008). Second, both article 38 of LPPD and article 13 of *Regulation on Employment for Persons with Disabilities* stipulate that the employer is responsible for providing an appropriate working environment and protection for the disabled employee and for adapting the equipment and facilities in the workplace, according to the physical condition of the disabled employee (The State Council, 2007; National People’s Congress, 2008). Further, article 55 of *Regulation on Education for*

Persons with Disabilities and Article 29 of LPPD require relevant departments to support the research, manufacturing, and provision of AT products and services for special education. Meanwhile, article 26 of LPPD specifies that special education institutions shall accommodate study places and facilities to individual needs (The State Council, 1994; National People’s Congress, 2008). In 2017, China adopted the *Regulation on Disability Prevention and Rehabilitation for Persons with Disabilities*, which provides more specific and related legal regulations concerning the provision of AT. For example, the regulation specifies the governments’ duty to subsidize the adaption of basic AT products (article 26), purchase services from the social enterprises to deploy in local communities (article 20), and financially support the research, development and application of AT (article 30) (the State Council, 2017).

In addition to the legal regulations, China has also issued a series of official guideline documents that normally present primary principles and goals, and specific strategies concerning the provision of AT and the development of AT industry. One of the important official documents is the “Five-Year Plan” developmental guidelines on disability affairs. It summarizes the achievements that China has attained in various policy areas in the previous 5 years and details specific goals and strategies for the upcoming 5-year period. For example:

- The “9th Five-Year Plan” specified the number of AT products China planned to supply (the State Council, 1996);
- The “10th” and “11th Five-Year Plan” aimed to establish “service stations”, enhance the supervision on the quality of AT products, promote the research and development of AT, and promote the use of appropriate and cheap devices (The State Council, 2001, 2006);

- The “12th Five-Year Plan” supported the development of the AT industry, structure a comprehensive adaption service delivery system, and the development of a multi-level service network (the State Council, 2011);
- The “13th Five-Year Plan” initiated the regional pilot of subsidizing the purchase of basic adapted AT products (the State Council, 2015).

Under such guideline documents as the “Five-Year Plan” programs, China Disabled Persons’ Federation (CDPF), normally together with the concerned ministries and departments, take responsibilities for adopting more specific policy measures in line with the more general policy goals:

- In the area of AT, for example, CDPF issued the document *Opinions Regarding Further Enhancing the Service of Assistive Devices for Persons with Disabilities* in 2006. This document specified goals both regarding the adaption rate – minimally reaching 50 percent by 2010 and 70 percent by 2015 and the service delivery – preliminarily establishing a province-municipality-county service delivery network for AT by 2010. This document also proposed the vision of gradually deploying service delivery to local communities, towns, and families, by 2015, and presented primary measures of enhancing professionals’ training, improving the service delivery system, standardizing the entry of service providers (China Disabled Persons' Federation, 2006);
- In 2016 CDPF, Ministry of Civil Affairs (MOCA), and other 4 ministries made *Implementation Plan on Promotion and Service for Assistive Technologies in the “13th Five-Year Plan” Period*, presenting measures to, e.g., improve the effectiveness of the working mechanism, subsidize the purchase of AT products, lift the qualification of talent teams, and advance the AT industry. Meanwhile, this document identified

funding sources for the provision of AT and required regular inspection and supervision on the implementations (CDPF, 2016);

- Additionally, CDPF and Ministry of Education (MOE) have collaboratively adopted such policies as Standards for Set-up of Middle-Level Special Vocational School and Construction Guidance on Special Education Resources Classroom in Ordinary Schools, to ensure the provision of assistive devices for students with disabilities in study place (CDPF & MOF, 2007; MOE, 2016).

Down to the local cases, both provincial and municipality-level governments further adapt the nation-level legislation and policies. As for the legislation, although provincial and municipality-level governments may have a localized version of the abovementioned national laws and regulations, primary principles and clauses are consistent with nation-level contexts. However, in many cases, the specific implements of policies at the provincial and municipality-level may widely vary. For example, in 2010 Shenzhen of Guangdong province released *Management Measures on Services of Assistive Technology for Persons with Disabilities* to introduce a subsidy policy for the provision of AT (SZFB, SZCAB, & SZHRSSB, 2010); Jiangsu Province carried out the local subsidy policy through the document *Interim Measures on Subsidizing the Adaption of Basic Assistive Devices for Persons with Disabilities* in 2016 (JDPF, 2016). Fujian, Ningxia, Beijing, Shanghai, and other provinces also have adopted similar local policy available. However, the target population, the amount of subsidy, the source of the grant, and the list of subsidized AT products and services vary considerably between the provinces. It has not been a uniform model from the nation-level governance.

Relevant legislation and policies consist of the policy framework that plays a fundamental role in the provision and development of AT. Relevant legislation and administrative

regulations provide lawful protection of the individual's right to receive necessary AT products and services and specify public responsibilities in the provision. Meanwhile, specific policies from multi-level governments direct the service delivery and industry's advancement in practice.

4. The AT service delivery system in China

4.1. Multi-level service delivery network: concerned sectors and division of responsibility

In practice, the AT service delivery system in China involves public authorities from the local-level governance (including township, community/street, and village), county-level governance, prefecture-level governance, and province-level governance. This province-prefecture-county-local structure makes up the AT service delivery network. Authorities from each level have corresponding responsibilities (see Figure 1).

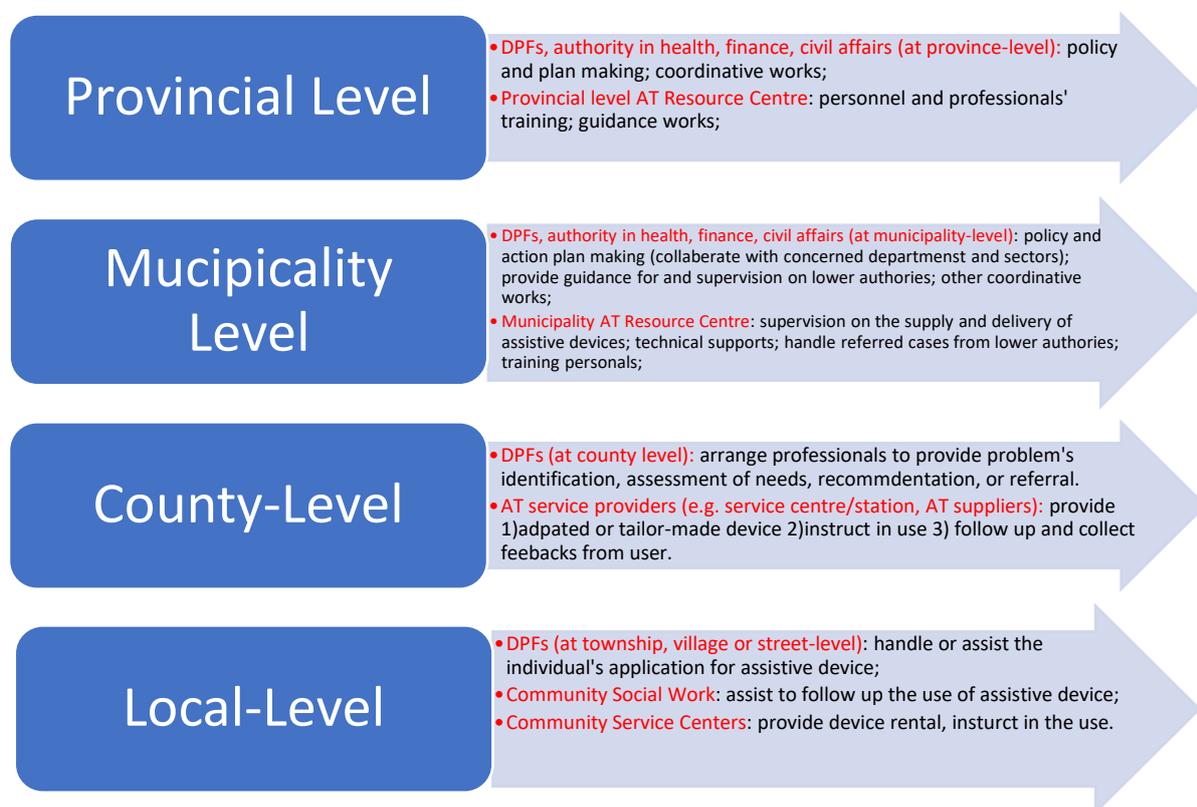


Figure 1: Multi-level Service Delivery System for AT

At the local level of governance, primary authorities participating in the provision of AT include the local DPFs, social workers, and community service centers for persons with disabilities. Local authorities have the responsibility to handle the individual's application for AT products and services, filtering qualified applicants and forwarding the valid application to upper-level authority. They are also responsible for following up the use of AT and report users' feedbacks to their superiors. In some cases, local authorities also provide AT rental services, instruction in the use of ATs, counseling, and investigate the demands for AT in their local areas.

The county-level authorities play a crucial role in the service delivery system. The county-level DPFs are responsible for arranging professionals/trained personnel to evaluate the individual's situation, after receiving the application from lower-level authority. The evaluation team accommodates an individual service plan with the assessment of the individual's functional impairment, rehabilitation goals, living environment, etc. In some cases, the county-level DPFs will have to refer persons with special needs to upper-level authority for closer evaluation.

The AT service provider (e.g., service center/agencies, or AT suppliers), is responsible for providing tailor-made AT products and following services basing on the evaluation report. Meanwhile, they must provide training and instruction in the use of AT to both the person with disabilities and their family members. Together with social workers, AT service providers are responsible for following up on the use and collecting feedback from users. The county-level authorities are also responsible for the reuse and recycling of the used AT products.

Prefecture-level authorities work as direct superiors over the county-level authorities. In many

cases, prefecture-level DPFs, together with public authorities in finance, health, and civil affairs, are responsible for regional policy and programs and provide guidance and supervision of the lower-level authorities' work. In addition, AT Resource Centers at the prefecture-level (hereinafter "prefectural ATRC") are responsible for planning, organizing, and implementing the provision of AT for the whole prefectural city, including its subordinate counties and local districts. Prefectural ATRC must organize personnel training, provide technical supports and guidance, control the entry of AT service providers, and so on. In some cases, prefectural ATRC is also responsible for assessing individuals referred by the county-level authority and delivering AT products and services in domains such as education, employment, sports, and rehabilitation.

The province-level and nation-level authorities are primarily responsible for adopting the policy- and action plans, and other coordinative works at the provincial or national level. Recently more province-level AT resource centers (hereinafter "provincial ATRC") have been established, for instance in Guangdong and Hubei. The provincial ATRC has a number of responsibilities, such as providing technical supports, guidance, personnel's training, inspection, and supervision, which are similar to prefectural ATRC, but for their respective province. In some cases (e.g., Zhejiang Province), the provincial ATRC is also responsible for practical assessments as individual situation evaluations and adaption services. Therefore, one may wonder whether the responsibilities of the one-level authority might overlap with those of the other. For example, it is not entirely clear in which situations the provincial ATRC, instead of the prefectural ATRC and county-level DPFs, should be responsible for the situation evaluation for the individual.

However, the "local-county-prefecture-province" service delivery network does not present a uniform structure for the entire China. Again, we need to consider regional differences. Some

cases may not involve local or county-level authorities in the service delivery (e.g., in Nanchong City, Sichuan Province, only the prefecture-level authority is directly responsible for the entire delivery process). The more specific public agencies involved at the same level of governance may also vary among the provinces. For example, as the prefecture-level authority, MATRC in Shenzhen of Guangdong Province has the same responsibility as the “Rehabilitation Hospital” in Ningbo of Zhejiang Province.

4.2. The delivery process of AT products and services

To be able to examine the practices in more detail, we have tried to layout the delivery process based on the practices of three relatively prosperous cities: the case of Ningbo, Shanghai, and Shenzhen (see Figure 2). This flow may not be applied to all provinces.

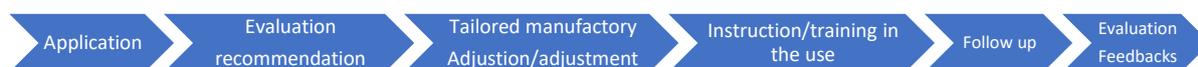


Figure 2: The delivery process of AT

AT service delivery starts with the application from the individual. The individual in need must submit the application with the required documentation to the local authorities (i.e., township or street-level DPFs or community commission). After a preliminary assessment of the required documents and qualification criteria, the local authorities forward the application to the county-level DPFs. The county-level DPFs will organize a personnel team to evaluate the user’s situation and needs. Based on the user’s impairment, personal expectations, the situation of the household environment, and other factors, the personnel team will provide suggestions on e.g., the type and the size of AT products, adaption and adjustment, and a training plan for the AT user.

Following the assessment of the application and professional recommendation, the AT service provider will manufacture and deliver the tailor-made product, with matching adaption and adjustment services. After delivery, the service provider will provide guidance and training to the user and their family members, to help the user adapt to the AT and inform the family members about basic knowledge on the use, repairment, and any precautions.

Then, together with the community social worker, the AT service provider will need to follow up on the use of the AT product. Personnel team and community social workers may require an assessment of whether the tailor-made device still works for the user as planned, or if any change or repairment for the current device is required. In the case that the current device does not meet the user's needs anymore, a re-evaluation and re-adaption service, or referral to upper-level authority, will be required.

4.3. Public procurement and supply of AT in China

In general, only provincial and prefecture-level authorities are responsible for the public procurement of AT. Through public procurement, public authorities announce requirements on e.g., bidder's qualifications, licenses and certificates, the amount, price, specification, and quality of products and services, and then select the dealers that fulfill the requirements and comply with the procurement framework. However, we should note two points here. First, within the same provincial area, both province and prefecture-level governance can be in charge of the procurement process. For example, Zhejiang Provincial DPF has made procurement agreements with a range of dealers, and AT products in these agreements consist of a list, as a "minimum coverage" of the AT provision for the entire province (ZDPF, ZCAB, ZDF, & HCZ, 2018); based on this provincial list, Ningbo of Zhejiang Province has added extra AT products through the prefecture-level public procurements, developing the local list that is eventually workable for Ningbo area (NDPF, NBCA, NMF, & HCN, 2019). Second,

the special authority responsible for public procurement widely vary among the provinces. For example, the DPFs in Beijing, Zhejiang, and Henan Province are responsible for making procurement frameworks. In Shanghai and Shenzhen however, this is a task for the prefectural AT resource center.

Under the procurement agreement, one may question who is responsible for ordering and delivering the necessary assistive devices, spare parts, and other services. In the cases of the Beijing and Zhejiang Province, Ningbo, and Shenzhen city, the procurement framework may include the purchase of an entire service package: The providers are required to be responsible for both the supply of the AT products and the provision of related services. For example, in 2019 Zhejiang DPF published the *Bidding Announcement for Basic Assistive Technology Products and Services for Persons with Disabilities*, to purchase 8099 hearing aids and matching services. Requirements for the bidders included 1) holding manufacturing license and quality certificate for products; 2) providing tailor-design, making, adaption and adjustment, and other follow-up services for users; 3) setting up service points/stations for all 11 municipality cities; 4) other requirements (CCGP, 2018). As we see, the providers are required to cover the entire supply chain whilst governmental agencies only need to follow up the invoice from the providers and control that they fulfill the procurement contract.

4.4. Public funding for the provision of AT in China

In 2010, China introduced financial subsidies for the provision of assistive technology for persons with severe impairments (the State Council, 2010). The target population of the subsidy policy has since the “13th Five-Year Plan” expanded to the entire group of persons with disabilities (Yang & Li, 2018). Later, China initiated the pilot of “co-paying the cost of a part of the AT products and services through social (medical) insurances (i.e., New Rural Cooperative Medical Insurance (NRCMI), Urban Employee Basic Medical Insurance

(UEMBI), and Urban Residents Basic Medical Insurance (URBMI)) (the State Council, 2016b). In 2018 China formally announced the establishment of a “rehabilitation aid system” for children with disabilities, providing them with necessary operations, AT products and services, and rehabilitation training for free of charge (the State Council, 2018). Altogether, these policy reforms have affected how China is funding the provision of AT.

Despite the regional differences, the funding sources for the AT provision mainly consist of social medical insurances, multi-level government budgets, and self-payment. Social medical insurances in China is the first-considered source to fund the use of AT products and services in practice. Recently, some provinces (e.g., Jiangsu, Guangdong, Hunan) have added such ATs as prosthetic devices, hearing aids, electronic cochlea as compensable medical services covered by social medical insurances. The second fund source is a combined budget with contributions from several levels of government. In some cases (e.g., in the “Rehabilitation Aid Scheme”) the government budget can be used to top up the compensation covered by the medical insurances, to ensure the free provision of AT for special groups (e.g., children with disabilities). Additionally, government budgets can be used to 1) purchase AT products for free distributions (e.g., for impoverished persons with disabilities) and 2) subsidize the personal purchase of AT products and services. Some local governments may subsidize the provision of AT via other resources, instead of governmental budgets. For example, Shenzhen subsidizes the provision of AT through the Welfare Lottery Fund (WLF) and the Employment Security Fund (ESF) (SZFB et al., 2010). Provinces like Jiangsu and Guangdong encourage other sectors in society to seek alternative sources of funding such as charity donations to support the provision of AT devices.

However, these abovementioned fund sources only compensate or subsidize personal costs for purchasing AT with a stipulated ratio. In other words, people still have to pay a considerable

fee for the part that neither medical insurance nor governmental subsidy covers, with out-of-pocket money (OOP, or direct payment). Therefore, OOP is a primary (or even the most dominant) method to fund the use of AT products and services.

Over time China has aimed to ensure the provision of AT by diversifying and combining private and public sources of funding. However, we know relatively little about whether the combination of different sources of funding manages to ensure sufficient provision AT to all population groups and in all regions or provinces. Under-developed areas normally face heavy financial burdens and local government budgets may not be a stable and powerful funding source.

5. Innovation in the Chinese AT industry

5.1. Policies to promote innovation and productivity in the AT industry

The considerable disabled and aging population in China suggests a high demand and a large domestic market for assistive technologies. However, the literature suggests that we find certain limitations, e.g., the lack of a comprehensive manufactory system, the weak innovative capacity, and the inefficient market supervision and management restrict the Chinese AT industry to catch the opportunities. Although the many clauses in current disability law and policies reflect China's intentions to support further development of the AT Industry, the country is missing more specific policy measures.

In an effort to foster a boost for the AT industry, China issued the document *Opinions on Accelerating the Development of Rehabilitation Assistive Devices* in 2016 (hereinafter *Opinion 2016*) (the State Council, 2016a). *Opinion 2016* formulates the goal that the output of the industry should surpass 700 billion Chinese Yuan; and that a number of world-class Chinese AT-related brands and industrial clusters should emerge and its share in the high-end

market should see a significant increase by 2020 (gov.cn, 2016). The document identified 4 primary objectives for the 2016-2020 period, including:

- improving the innovation capacity by, e.g., developing high-quality innovative research team and talents, establishing platforms for technological researches, and promoting the transfer between technological achievements and practical applications;
- promoting an upgrade of the industry by, e.g., constructing industrial parks, and research centers in regions that have advantages in financial capital, technology, and human capital (e.g., Yangtze River Delta and Zhu River Delta). As part of this ambition, the authorities have aimed to upgrade manufacturing systems that can benefit from where for high-techs such as web-based solutions, cloud computing, big data processing, industrial robots, and smart logistic. Chinese authorities have also promoted better and more cross-counties cooperation to achieve this goal;
- enhancing the AT supply industry by e.g., fostering and supporting a range of leading enterprises and industrial alliances; giving priority to the development of areas such as nursing aids for the elderly and persons with disabilities, special education and employment aids, medical rehabilitation technology for disabled children; supporting the application of artificial intelligence technology (AI), Virtual Reality (VR), and Machine-Human Brain interfaces in assistive devices;
- ensuring a sound market environment by adopting legal regulations to standardize the manufacturing, management, and service delivery of AT; improving the market supervision and ensuring trade in the market with the justification.

Besides, the government has required that the provinces and lower-level authorities adopt favorable policies concerning e.g., taxation, financial services for enterprises, and support to the development of AT industry (the State Council, 2016a).

With the high demand from the domestic market and policy support, statistics indicated that we see a growth of AT-related enterprises. Meanwhile, many labor-intensive enterprises have gradually transferred to become more technology-intensive (W. Li, 2018).

5.2. Regional and local policies to strengthen the AT innovation capacity

Responding to the national policy, a larger part of the province- and municipality-level authorities have issued local implementation plans. Shenzhen, for example, after discussing and collecting feedbacks from concerned government departments and public sector actors, experts and scholars, and the general public, adopted the *Implementation Plan for Accelerating the Development of Rehabilitation Assistive Device in Shenzhen* in 2018, including 6 major tasks, 24 detailed measures, and 26 key projects, which aims to support the development of AT industry in the local district (SZPG, 2018).

Under the policy's guideline, actions have been taken by local authorities in the latest years, for example:

- Yantai of Shandong Province encourages the establishment of innovative research platforms through subsidizing the institutions that contribute to the application of universal design, AI, 3D print, digital interface, wearable techniques, robotic nursing and bionic facilitates in AT products, with up to 10 million Chinese Yuan. Also, financial support is available for technology centers and laboratories that contribute to “smart manufacturing.” AT-related inventions recognized by nation and province, and national and international patents will also be prized (YPG, 2018).
- The Shenzhen of Guangdong Province aims to attract innovative talents in the AT area through favorable policies and has specific grant programs to support e.g., enterprises that develop such technologies as barrier-free motor and car, the foreign companies

that locate research centers in Shenzhen, and these fundamental, cutting-edge, core-technology projects (SZPG, 2018).

- In 2019 Qinhuangdao of Hebei Province held the China Rehabilitation Technology and Assistive Appliance Innovation Conference (CRATIC). CRATIC aimed to enhance the communication and collaboration across sectors such as universities, AT producers, and research institutions, with regard to such as the innovation of AT products, talent training, and so on (medmeeting.org, 2019).
- Other similar forums, include “the 5th China Rehabilitation Assistive Device Industry Summit”, and the “2019 Yangtze River Delta International Rehabilitation AT Industry Innovation Forum.”

Some technological achievements have been applied in practice. For instance, the Assistive Technology Resource Center (ATRC) of Gansu Province has applied computer aids (e.g., 3D printing and Rehabilitation Robotic Manufacturing Techniques for Prosthetic Socket) to the adaption of the transtibial prosthesis (gsfjzx.com, 2020). ATRC of Guangzhou Province, together with Zhongshan University and Guangzhou Liangtong Optical Research Institute, has developed and patented the product “Portable Intelligent Visual Aid” (gdfjzx.org.cn, 2020).

5.3. User Involvement: another source of innovation in AT

Many factors in practice also matter in the development and innovation in AT. User involvement, among other factors, has been given growing attention by both enterprises and scholars. Research in design and innovation in AT has demonstrated the need to involve the user in all the stages of the design process (Mallin, 2004, 2011; J. C. D. García et al, 2013). Empirically, it has been demonstrated that understanding user needs were crucial to successful innovation in industrial products (Rothwell, 1977). This conclusion may also apply to the AT. User-involvement in the design and product development, testing, and service delivery may

increase the likelihood of appropriate and effective use of AT products. which makes AT a more effective solution for persons with disabilities to increase, maintain or improve the functional capabilities (Martin, Martin, Stumbo, & Morrill, 2011; Borg et al., 2012).

However, the potential in user involvement is not always taken fully considered yet in reality. A Nordic study found that only 30 to 40 percent of the companies from Norway, Demark, and Finland reported that they “always involve users in the development process of AT” whilst this figure for Sweden was only 24 percent (Sandberg, Jensen, Flø, Baldursdottir, & Hurnasti, 2001).

So far, we have little evidence from China. The only data we have come across is that the Accessibility Research Alliance (ARA) involved users to improve and optimize the accessibility of the official website for Hainan Airlines (ARA, 2020). We assume that user involvement may be greatly considered in the AT service delivery. According to the service delivery system that we presented earlier, AT service providers must provide tailor-made products and services basing on the individual’s situation and needs and users must have a positive involvement and participation in the training. We will need more research to examine how and to what extent this is implemented in practice.

6. Limitations in AT provisions in China today

Instead of diving into deep analysis and discussion, here we briefly touch on the current limitations of AT in China.

Currently, China has no specific laws or administrative regulations to, e.g., monitor the trade of AT products in the market, standardize the design and manufacturing of AT, and identify the qualification of the AT service providers (Chen, 2011; X. Li et al., 2016). Additionally, the lack of a uniform policy framework nationwide leads to regional inequalities. For

example, persons with disabilities from different areas may not obtain the same level of financial support for purchasing AT products and services. Consequently, the opportunity for full social participation may not be equal between the provinces. Further, the current policy framework only provides low-degree security for the provision of AT due to the priority to “ensure the basic provision.” Also, most of free distributed AT products for, e.g., the impoverished person with disabilities, is still “one-size-fits-all”, which may not be usable for many with special needs; Meanwhile many people cannot afford more tailor-made AT products and services due to the limited coverage of their medical insurances and low level of subsidy for purchasing the AT. In consequence, many may be stuck in an embarrassing situation. Finally, the current policy framework only targets the population with a disability certificate (DC). There is also a high demand for AT from people without DC.

From the 12th “Five-Year Plan” period to the 13th, “lack of trained personnel and diverse range of services” has constantly restricted the AT service delivery system (Chen, 2011; Guo, Wu, Wang, & Jia, 2015; Yang et al., 2018). An effective solution to this problem is still missing. Additionally, despite the preliminarily-structured “province-municipality-county” delivery network, the provision of AT in rural areas and the local community is still underdeveloped (Chen, 2011; Guo et al., 2015). Furthermore, we have identified some uncertainties in the division of responsibilities in the service delivery system. For instance, in the case of Shenzhen, the authorities in finance, health, civil affair, and the DPF are jointly responsible for controlling the entry of At service provides whilst Shenzhen Assistive Technology Resource Center has the same duty. In other words, the division of responsibility in service delivery may not be sufficiently rigorous and there might be overlaps between different authorities’ responsibilities. Altogether, these problems may lower the effectiveness and efficiency of the current service delivery system.

Despite the document *Opinion 2016*, the AT industry and its innovation capability must be intensively improved, as Zhang Haidi, the chairman of CDPF, stated in 2019. She also claimed the output of AT industry in 2019 was around 43 million Chinese Yuan, close to the figure in 2015. Meanwhile, little evidence suggests any major breakthroughs in AT innovation. Factors such as weak innovation capacity, the small scale production of many AT enterprises, concentrating on low/middle-end products, have still restricted the AT industry to further develop (CDPF, 2019). However, we should note that it takes time to advance any industry. China needs to provide substantial policy support for the AT industry. Meanwhile, disability policies in other areas may also affect the progress in the AT industry. For example, a low subsidy level may prevent people from purchasing more expensive tailor-made AT products and services. In consequence, the lack of (potential) consumers may hamper the development of the high-tech segment of the AT market. Therefore, China may also want to consider how the broader disability and rehabilitation policy framework affect the AT provision. It will be interesting to see how China will adopt the AT-related policies in the upcoming “14th Five-Year Plan” program.

7. Summary and conclusion

The aging demographics in China are likely to result in higher demands for assistive technologies. However, the service delivery system and the manufacturing capacity will have to improve to effectively meet the increasing needs.

Since the 1990s China has made and is still making massive efforts to develop the policy framework, the service delivery system, and the AT industry. So far, the current policy framework has provided a relatively intensive legal basis to protect the individual’s rights to receiving necessary AT products and services and pushed public authorities to assume more responsibility. Meanwhile, the policy framework plays an important role in directing the

development of the AT industry and the advancement of the service delivery system. Additionally, China has gradually developed a multi-level service network that aims to expand the use of AT in a wider context. Cross-sector collaboration, division of responsibility, diverse fund sources, and holistic delivery process have contributed to a more systematic working mechanism. Also, a series of policies adopted by China recently is expected to speed up the AT industry. Local authorities are taking specific measures in cases of, e.g., improving the innovation capability and research and fostering the innovative talents and professionals.

Despite these efforts, there are still many gaps that need to be filled in the current policy framework. Such limitations as the region-based difference, low-level security, left-behind population in need may prevent the current policy framework from providing equal opportunities for social participation among individuals. Moreover, under the “province-municipality-county” service delivery network, rural areas and local communities may be excluded and the population in these areas may still not able to purchase or acquire necessary AT products and services. Meanwhile, the division responsibilities among authorities need to be clarified implicitly divided and other problems that may lower the efficiency of the working mechanism should also be aware of. In general, the size of AT enterprises is still relatively small. The innovation capacity needs to be improved. Currently the domestic AT industry is still reluctant to meet the increasing demands independently. However, the policy measures adopted in the upcoming “14th Five-Year Plan” are expected to further improve the AT in China in various areas.

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