Analysis of the Current Usage and Demand of AD for PwVIB in Dongguan City

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Abstract. China currently has the world's largest population of people with visual impairments or blindness (PwVIB), yet their needs for assistive devices (AD) remain largely unmet. To help PwVIB better integrate into society, this study takes PwVIB in Dongguan City as the research subjects, collects data through questionnaire surveys, and analyzes the current usage status and needs of AD based on the data results. The findings reveal that PwVIB commonly face multiple challenges such as the high cost of AD, insufficient training resources, inadequate functional safety, and difficulties in meeting personalized needs. To address these issues, this study proposes the following recommendations: first, establishing a comprehensive welfare framework and improving employment support services; second, optimizing AD service systems to promote social integration; third, expanding training facilities and enriching training programs; fourth, enhance safety standards for AD and strengthen security assurance for PwVIB; and fifth, boost R&D investment in AD to address the diverse needs of PwVIB.

Keywords: People with visual impairments or blindness (PwVIB), Assistive devices (AD), Current use

1 Introduction

The World Health Organization (WHO) estimates that the number of people with visual impairments or blindness (PwVIB) globally is between 40 million and 45 million, of whom approximately 20 million reside in China. PwVIB demonstrate urgent demands for innovative advancements in assistive devices (AD) and enhanced service compatibility.[1] However, systemic delays in data feedback mechanisms for AD currently undermine their ability to meet the practical needs of this population. The 2024 National Two Sessions report explicitly proposed to promote the development of AD for PwVIB and enhance their sense of social inclusion, which fully demonstrates the nation's high-level attention and strong support for this community. Dongguan has actively responded to the national call by implementing the "Dongguan Measures for the Protection and Assistance of Persons with Disabilities." The regulation explicitly

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stipulates the provision of free basic AD tailored to their needs, streamlines application procedures, enhances service quality, and offers training on AD usage to facilitate better social integration for PwVIB. This study investigates the current usage status and existing challenges of AD among PwVIB in Dongguan, aiming to enhance their satisfaction with AD and related services, promote further advancements in AD and service delivery, and contribute to the building of a harmonious society.

2 Literature Review

2.1 Usage of AD for PwVIB

Visual AD are key tools for PwVIB to enhance their quality of life, participate in social activities, and even overcome poverty. Recent years have witnessed enhanced national prioritization of visual AD, leading to improved utilization among PwVIB. However, as Feng Jia et al.[2] demonstrate, while demand for AD among PwVIB remains urgent, systemic deficiencies—including fragmented service networks, inadequate rehabilitation provisions, and restrictive medical reimbursement policies—continue to impede the fulfillment of PwVIBs' needs. Meanwhile Shrinivas Pundlik et al.[3] notes that while traditional electronic vision aids and mobility devices like white canes appear widely recognized, empirical evidence supporting their successful adoption remains scarce, with AD demonstrating minimal functional impact for PwVIB. Paraskevi Theodorou et al.[4] highlights the critical demands of PwVIB for AD during mobility. Users particularly require devices capable of providing accurate real-time navigation information, featuring fluid natural voice interaction, and offering sufficiently simple operation for immediate usability. These issues starkly reveal the formidable challenges confronting the development of visual AD, underscoring an urgent need for governmental support to drive technological innovation. Such advancements are crucial for enhancing the quality of life for PwVIB and strengthening their capacity for social inclusion.

2.2 Factors Influencing the Use Of AD

In the era of big data, while significant progress has been made in visual AD, considerable challenges persist. Zhou et al.[5] observed that conventional AD primarily adopted a "physical fitting" paradigm. Currently, with the integration of Internet and artificial intelligence technologies, AD are undergoing a transformative shift toward precision adaptation, human-centered intelligence, and enhanced accessibility. However, Yao et al.[6] pointed out that the design of AD often deviates from the "human-centered" philosophy, failing to meet the physiological safety needs of PwVIB. Wang et al.[7] further demonstrate that China's visual AD suffer from multiple systemic deficiencies, including low adaptability, substandard quality experience, and inadequate emotional consideration. Mustufa Haider Abidi et al.[8] observe that navigation aids have transitioned from conventional white canes and tactile paving systems to sophisticated electronic devices incorporating sensors and feedback mechanisms, yet significant challenges persist regarding technical data integration, economic afforda-

bility, and user acceptance of PwVIB. Consequently, AD design must prioritize the needs of PwVIB to better address their practical requirements.

Through a comprehensive literature review, it is evident that China's AD sector for people with disabilities remains in an exploratory phase. Current research predominantly focuses on rehabilitation AD, with specialized studies on visual AD being particularly scarce. Building upon existing scholarship, this study specifically targets visual AD. Through field investigations, we identify prevailing challenges and propose targeted recommendations, aiming to advance the development of AD for PwVIB.

3 Empirical Analysis

3.1 Design of Questionnaires

In this text, a questionnaire survey was conducted to comprehensively collect information on the current status of the use of AD for PwVIB, the factors affecting them, and the degree of satisfaction. In designing the questionnaire, we drew on the mature scales available at home and abroad, and combined them with the actual situation of PwVIB to construct the questionnaire for this research. The questionnaire mainly covers four aspects: first, the basic information of PwVIB, including gender, age, occupation, monthly income and other elements; second, the current situation of the use of AD, including the length of time of use of AD, ways of understanding, channels of access, etc.; and third, the survey on the satisfaction with the use of AD for PwVIB, including the evaluation of AD and the satisfaction with the use of AD and so on.

Relying on the Dongguan Disabled Persons' Federation, the survey utilized a combination of both electronic and paper questionnaires to distribute questionnaires to PwVIB. To ensure that PwVIB can complete the questionnaire smoothly and accurately, a text-to-speech system was introduced to significantly enhance the accessibility and participation of the questionnaire. A total of 250 questionnaires were distributed in this survey, with 234 valid questionnaires collected, yielding a valid return rate of 93.6%. Statistical analysis revealed a Cronbach's α coefficient of 0.852 and a KMO value of 0.864, indicating that the survey demonstrates high reliability and validity.

3.2 Basic Information on PwVIB Interviewed

As shown in Table 1, the gender distribution in the surveyed sample exhibits a relatively balanced ratio between males and females. In the employment sector, PwVIB face significant challenges. Their career pathways are often limited in diversity, which creates substantial barriers to securing jobs that align with their capabilities, thereby severely constraining their social participation. Regarding income levels, a smaller proportion of PwVIB fall into the high-income category, with the majority concentrated in low-income brackets. This economic disadvantage not only directly impacts their ability to access and utilize AD but also profoundly diminishes their overall quality of life.

Table 1. Basic information of PwVIB.

Basic Information			Frequency	Percentages
Genders	Males	Under 18 years	7	3%
		18-40 years	39	16.74%
		41-60 years	57	24.03%
		60 years and over	15	6.44%
	Females	Under 18 years	5	2.15%
		18-40 years	40	17.17%
		41-60 years	51	21.89%
		60 years and over	20	8.58%
Occupation	Blind Massage Therapists		59	25.21%
	Chinese Medicine		4	1.71%
	Music Related Industry		6	2.56%
	Await Job Assignment		112	47.86%
	Otherwise		53	22.65%
Monthly income level	Less than RMB 3,000		103	44.02%
	RMB 3,001-5,000		104	44.44%
	RMB 5,001-7,000		18	7.69%
	More than RMB 7,000		9	3.85%

3.3 Current Status of Use Of AD

As indicated in Table 2, regarding the channels through which PwVIB acquire information about AD, nearly 80% of participants primarily rely on exchanges with disabled friend to obtain relevant knowledge, while family referrals also serve as a critical information source. In contrast, government initiatives and online platforms demonstrated limited outreach effectiveness in disseminating AD information. Concerning the acquisition channels for AD, online shopping, disability-focused communities, and government-provided allocations constitute the three primary channels. Although donations from social organizations accounted for a smaller proportion of acquisition pathways, their demonstrated potential in this domain merits attention. In terms of mobility AD, white canes and voice-guided navigation systems emerged as the most frequently utilized tools, with utilization rates reaching 97.14% and 91%, respectively. However, this high prevalence rate indirectly underscores the imited diversity in available traveling AD tailored to PwVIB.

Table 2. Current status of AD usage among PwVIB.

Current status of use of AD		Frequency	Percentages
Avenues for understanding	Disabled people's exchange of understanding	184	78.63%
	Government advocacy for understanding	89	38.03%
	Family referrals for understanding	136	58.12%

Acquisition channels	Web platform understanding	45	19.23%
	Otherwise	70	29.91%
	Online shopping platforms such as Taobao	115	49.15%
	Purchase from within the disabled group	183	78.21%
	Government distribution	133	56.84%
	Donations by social organizations	49	20.94%
	Otherwise	38	16.24%
Traveling AD	White cane	227	97.14%
	Voice-guided navigation	213	91%
	Otherwise	48	20.60%
	None	0	0%

3.4 Demand for AD

As revealed in Table 3, PwVIB face significant barriers during AD operation training, primarily scheduling conflicts affecting 81.97% of participants and geographic inaccessibility of training venues impacting 92.7%. Additionally, the lack of engaging training content emerged as a critical yet frequently overlooked issue. Regarding expectations for AD, safety compliance ranked as the paramount concern. Simultaneously, quality, prices, and functional performance were identified as key evaluation criteria. Notably, a substantial proportion of participants voiced explicit expectations for enhanced training on the operation of AD, improved after sales service, and expanded information accessibility channels.

Table 3. Demand for AD among PwVIB.

Demand analysis of AD		Frequency	Percentages
Training in operation of AD	Grassroots government services to be improved	22	9.44%
	Unreasonable scheduling	191	81.97%
	Unmet Needs for AD in Daily Life	9	3.43%
	Remoteness of training venues	216	92.70%
	Unattractive training contents	161	68.67%
	Otherwise	73	31.33%
Aspects that PwVIB expect to be enhanced by AD	Security	204	87.18%
	Prices	170	72.65%
	Performances	160	68.38%
	Quantity	181	77.35%
	Training on the operation of AD	99	42.31%
	Broadening access	65	27.78%
	After sales service	81	34.63%
	Otherwise	54	23.08%

3.5 Analysis of the Influence on PwVIB's Willingness to Use AD

To analyze factors influencing the willingness of PwVIB to use AD, a regression model was constructed with "Willingness to continue using AD" coded as a binary variable: 1 = willing, 0 = unwilling as the dependent variable. Four key Independent variables were included: price, quality evaluation, post-purchase support satisfaction, and operational training AD.

As demonstrated in Table 4, the regression coefficient for price was -0.073 ($p = 0.001 < 0.05$), indicating that a one-unit increase in the price of AD corresponds to a 0.073-unit decrease in the willingness to use them among PwVIB. Conversely, the regression coefficient for quality was 0.053 ($p = 0.001 < 0.05$), meaning that a one-unit improvement in device quality is associated with a 0.053-unit increase in usage intention. The coefficient for post-purchase support reached 0.035 ($p = 0.012 < 0.05$), suggesting that enhancing after-sales services by one unit significantly boosts usage willingness by 0.035 units. Most notably, operational training exhibited the largest coefficient ($\beta = 0.112$, $p = 0.012 < 0.05$), implying that each additional unit of training provision elevates usage intention by 0.112 units. Therefore, the provision of training on the operation of AD can increase the willingness of PwVIB to use AD. At the 5% significance level, all four variables—price, quality, post-purchase support, and operational training—demonstrate statistically significant linear relationships with usage intention. The comparatively larger effect size of operational training ($\beta = 0.112$) underscores its practical importance: implementing comprehensive training interventions could substantially improve AD utilization rates, thereby directly enhancing the quality of life for PwVIB.

Table 4. Regression results table.

Willingness to continue using AD							
Model	Beta	t	Constant	N	F	R2	P
Price	-0.073	-1.435	1.092	30	0.954	0.064	0.001***
Quality	0.053	0.977	1.096	30	0.954	0.064	0.001***
Post-purchase support	0.035	0.747	1.125	30	0.558	0.049	0.012
Operational training AD	0.112	2.488	1.09	30	6.188	0.162	0.006
N=234	R2= 0.242		F=118.574			P=.000b	

4 Conclusion

Conduct analysis of the survey data collected via questionnaires, the following conclusions are drawn regarding the current usage status and satisfaction levels of AD among PwVIB in Dongguan City:

4.1 The Pricing of Visual AD Remains Prohibitively High

PwVIB, as a low-income demographic, due to the limitations of visual impairment, confront formidable difficulties within the employment sector. They are mostly confined to low-skilled, low-paying jobs, whose monthly income is often inadequate to meet basic living requirements. The persistently high production costs of AD result in prohibitively elevated market prices, thereby exacerbating the financial burden on end-users. This issue transcends mere economic dimensions, significantly undermining their quality of life and creating formidable barriers to social inclusion.

4.2 Support Services for AD Require Substantive Enhancement

In the context of AD services for PwVIB, critical gaps persist, including the absence of professional and systematic service teams, this makes it difficult for the community to adequately meet the diverse needs of PwVIB. Simultaneously, a significant proportion of PwVIB report that existing AD fail to accommodate their personalized usage requirements. As a specialized agency for disability services, the China Disabled Persons' Federation (CDPF) urgently needs to substantially increase investment in AD services for PwVIB, expanding the coverage of services, to enhance the quality of service.

4.3 Insufficient Provision of AD Training Programs

The scarcity of training centres for the operation of AD at the present stage, and the distance between the place of training and the place of residence of PwVIB, this creates significant conflicts with the mobility convenience and scheduling needs of PwVIB. In addition, the content of the training is not sufficiently attractive to PwVIB, these factors collectively hinder PwVIB from participating in AD operation training programs. Furthermore, this situation severely constrains PwVIBs' awareness and understanding of AD, the negative impact on the improvement of the quality of life of PwVIB and their sense of social inclusion.

4.4 The Safety Performance of AD Has Become a Critical Focal Point

The safety of AD for PwVIB constitutes a critical determinant influencing both quality of life and personal safety outcomes. For example, should tactile mobility canes be ergonomically flawed, this may precipitate inadvertent falls or bodily harm during operational engagement with the device; should voice-assisted navigation systems manifest geospatial discrepancies or temporal data desynchronization, this may inadvertently divert users into hazardous zones, thereby escalating the risk of vehicular incidents. Therefore, Safety constitutes a paramount determinant in AD selection processes among PwVIB.

4.5 Difficulty In Matching the Supply of AD to the Demand

PwVIB exhibit diversified requirements for AD, a manifestation rooted in heterogeneous physiological and contextual profiles. Approximately 60-80% of PwVIB can enhance their quality of life through the utilization of AD. However, the adoption rate of AD among PwVIB in China remains comparatively low. A supply-side analysis reveals that the AD market for PwVIB is plagued by product uniformity and excessive homogenization, thereby failing to address the individualized needs of this population. An examination of supply-side dynamics demonstrates that the vision-assistive device market is characterized by monolithic product offerings and pathological homogeneity, consequently inadequately accommodating the bespoke requirements of PwVIB.

5 Suggestion

In light of current utilization patterns and satisfaction levels regarding AD among PwVIB, the following evidence-based recommendations are formulated:

5.1 Establishing a Comprehensive Welfare Framework and Improving Employment Support Services

To effectively address the dual challenges of inadequate monthly income and prohibitive AD costs among PwVIB populations, multistakeholder collaboration between governmental entities and civil society organizations becomes imperative. The government should establish targeted welfare policies to alleviate the financial burden of AD procurement for PwVIB. Meanwhile, strengthen and optimize the vocational service infrastructure, establish specialized vocational training institutions tailored for PwVIB, provide internship and employment opportunities specifically designed for them. Through dual pathways of policy support and skills empowerment, effectively increase income levels for PwVIB, facilitate their smoother social integration.

5.2 Optimizing AD Service Systems to Promote Social Integration

Communities, as the most immediate and fundamental units of engagement with PwVIB, the specific needs of PwVIB should be thoroughly researched. While ensuring the safety of AD, provision of accurately adapted AD for PwVIB, and provide guidance on its use. The Disabled Persons' Federation, as the specialized agency for disability services, there is a need to further enhance communication with PwVIB to explore their individual needs and provide customized AD solutions. At the same time, the Disabled Persons' Federation is constantly expanding its service capacity and coverage. Communities and disability associations should strengthen their collaboration and linkages, to build a comprehensive system of AD services and jointly promote the development of AD services for PwVIB, to promote the integration of PwVIB into society and enhance their sense of well-being in life.

5.3 Expanding Training Facilities and Enriching Training Programs

Relevant government departments may prioritize areas with high concentrations of PwVIB, expand AD training facilities. These AD training points can either rely on specialised training institutions or on community resource centres. Through the establishment of training points, provision of training courses and counselling services on AD for PwVIB, which can significantly reduce the travelling and time costs for PwVIB, provide them with more educational resources and professional support. This helps PwVIB persons to obtain appropriate education and training, to realise their full potential and to achieve personal self-development.

5.4 Enhance Safety Standards for AD And Strengthen Security Assurance for PwVIB

To protect the safety and rights of PwVIB, the community should attach great importance to the safety of AD for PwVIB. Manufacturers must strictly follow the relevant standards and norms to ensure that product quality and performance meet the requirements. At the same time, a wide range of activities should be carried out to disseminate knowledge on the safe use of AD by PwVIB, so as to enhance the awareness and ability of PwVIB in self-protection. By adopting a series of measures, to ensure the safety, reliability and stability of AD, providing enhanced safety features in AD empowers PwVIB to overcome daily challenges, improved quality of life.

5.5 Boost R&D Investment in AD To Address the Diverse Needs of PwVIB

To meet the diversified needs of PwVIB, manufacturers of AD should strengthen their market research, in-depth understanding of the actual needs and usage habits of PwVIB, use this as a basis for designing more targeted and individualised products. Meanwhile, R&D institutions must intensify technological innovation investments to advance the development of AD in the direction of intelligence, enhance product suitability and user experience. This not only helps to enhance the well-being and self-confidence of PwVIB, promoting their better integration into society, it can also promote social harmony and scientific and technological progress to a certain extent.

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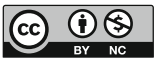
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