

Does the Provision of Assistive Technology Increase Disability Employment?

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Article history:
Received: September 15, 2022
Revised: October 18, 2022
Accepted: December 6, 2022

Published online at
ijds.ub.ac.id

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Abstract

This paper examines various literatures regarding the relationship between the provision of assistive technology (AT) and workplace integration for people with disabilities (PwD). A systematic review was conducted to map existing literature using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework in the last ten years. This study reveals that AT has an enormous significance in the employment of PwD. However, the provision of AT as workplace accommodations is not always uncomplicated as three aspects mainly impact it: employers' perception, behaviours, and attitudes, accessibility of AT, and the role of vocational and rehabilitation agencies (VRAs). It is suggested that the provision of AT as workplace accommodations to increase disability employment should be supported collectively by society, with employers and the government as critical players. This study contributes to the perspectives of managers and the government by highlighting the roles they could carry out to create a more accessible provision of AT and an inclusive work environment.

Keywords: Assistive technology; Disability employment; PRISMA framework; Systematic review; Workplace accommodation

1. Research Background

Over the years, the issue of disability remains a perpetual, complex phenomenon that contributes to global employment inequality. A large percentage of people with disabilities (PwD), who account for approximately 15% of the world's population, live as the poorest of the poor because they are often barred from accessing the labour market and securing decent work opportunities (Adioetomo et al., 2014; Mitra et al., 2011; WHO & World Bank, 2011). Previous studies point out that PwD experience significant impediments to employment due to various reasons. For instance, PwD's low educational attainment and lack of training might limit job opportunities, impede career growth, and increase the risk of being unemployed (WHO & World Bank, 2011). Other barriers commonly faced by PwD, such as difficulties in accessing public services, such as safe housing, social support, healthcare, and social protection services, could also become causes which exacerbate unemployment and underemployment of PwD (Mitra et al., 2011). Furthermore, stereotypes, discriminations, and prejudices in society create a negative stigma which significantly contributes to even more alienation and injustice of individuals with disabilities (WHO & World Bank, 2011; Vornholt et al., 2017). At the institutional level, these kinds of stigmatization and discrimination might appear as

unethical organizational practices where a company disregards applicants with disabilities in the hiring process, belittles the ability of workers with disabilities in carrying out their tasks or tolerating workplace violence towards such employees (Kulkarni & Kote, 2013).

However, in recent years, the international community seems to have been raising concerns over promoting greater social inclusion of PwD, and there has been a paradigm shift in viewing disability (Vornholt et al., 2017). Initially, disability is viewed through the lens of a medical framework. This traditional paradigm, referred to as the medical model or individual model of disability, treats disability as an illness that needs medical interventions from doctors or medical specialists (Petasis, 2019). In other words, under this construct, individuals who have functional limitations are regarded as sick individuals who are unable to do 'normal' activities as most people do and, therefore, need a cure to be 'normalized' as much as possible or be separated for protection (Petasis, 2019).

The medical model of disability eventually received criticism, especially among disability scholars, activists, and communities, as it diminishes PwD's rights and full participation in society (Goering, 2015; Petasis, 2019). Consequently, a new paradigm, namely the social model of disability, was developed to challenge its predecessor (Oliver, 2013). The most prominent argument from this model stems from the idea that disability is the by-product of society's inadequacy in providing decent services and accommodations due to the failure to address the needs of PwD (Oliver, 2013; Petasis, 2019). In contrast with the medical model, which aims to 'fix' PwD, the social model advocates that it is the society that needs to eliminate environmental, economic, and social barriers to increase PwD's accessibility and social participation (Cameron & Suarez, 2017; Petasis, 2019).

The biopsychosocial model, which currently serves as the basis for the World Health Organization's International Classification of Functioning, Disability, and Health (ICF), was later developed to integrate the medical model and social models (World Health Organization, n.d.). This model acknowledges the interaction between an individual's health condition (i.e., physical and psychological) and social aspects as factors which affect the disability of an individual (Petasis, 2019). Therefore, this model views an individual's impairment as something medical experts should treat. However, at the same time, society also needs to eliminate discrimination and involve PwD by providing equal opportunities in social, economic, and political aspects (Mitra et al., 2011; Petasis, 2019).

Due to this change of paradigm, there is rising support for more PwD participation in society, especially after the United Nations' adoption of the Convention on the Rights of Persons with Disabilities (CRPD) in 2006, where 185 countries have become parties to the Convention through ratifications or accessions by May 2022 (Petasis, 2019; United Nations, n.d.-a). Regarding the employment context, Article 27 of the UNCRPD demands employers in all sectors to provide employment opportunities and facilitate reasonable

accommodation (United Nations, n.d.-b). Accordingly, various countries have made improvements and amendments concerning laws, policies, and regulations. Many aimed to reduce socioeconomic disparities and enable a more accommodating and inclusive society and environment for PwD (Kuznetsova & Bento, 2018).

To date, numerous studies also have investigated factors or enablers for the integration of PwD in the workforce. Among many factors, the availability of supportive accommodation in the workplace is one of the interventions which facilitates the participation of PwD in the labour market (Davis, 2005; Vornholt et al., 2017; Caron, 2020). Accommodation is a broad term for any arrangement in the work environment (e.g., in terms of communication, scheduling, job description, or physical adjustment) which enable employees to carry out their task productively (Davis, 2005). Additionally, in the context of employment of PwD, a reasonable accommodation also means workplace adjustments that result in equal employment benefits and opportunities for employees with disability (Simpson et al., 2017; Vornholt et al., 2017).

Among various kinds of workplace accommodation, assistive device, commonly known as assistive technology (AT), is one of the most frequently used accommodations, especially by individuals with sensory impairment (Linden & Milchus, 2014; Denny-Brown et al., 2015; Huang & Chen, 2015; Jetha et al., 2018). Devices or equipment that improves and aids an individual's functioning capabilities are categorized as AT, for example, wheelchairs or prostheses for individuals with mobility impairment and hearing aids for individuals with hearing impairment (Denny-Brown et al., 2015; World Health Organization, 2018). Aside from conventional AT, such as canes and spectacles, recent technological innovation also gives rise to the development of digital AT (DAT) and mobile AT (MAT), such as speech synthesizers and speech recognition tools (i.e., text-to-speech and speech-to-text technology), screen reader, and robotic white cane.

Much research around AT concerning PwD primarily focused on how such technologies can improve one's self-esteem and independence. However, there are relatively few studies specifically examining the role of AT in improving employment for PwD, although there seems to have been an increasing amount of literature around the topic in the past ten years. Hence, this study aims to examine existing literature regarding the significance of AT in workplace integration for PwD. Addressing the exclusion of PwD from the labour market is pivotal as it reflects the loss of potential gross national income (Gunawan & Rezki, 2022). Therefore, this article may provide insights to managers and policymakers regarding the arrangements needed to establish a more inclusive and accessible work environment for PwD. This paper is organized as follows. First, the subsequent section will introduce the methodology of the systematic literature review. Then, the next section will present the discussion and findings of the literature review. Finally, the conclusion section will follow afterwards.

2. Research Method

This study undertakes a systematic review of articles on the topic of assistive technology and disability employment. As there is a paucity of research on this topic, the systematic literature review (SLR) method, which essentially adopts the approach of carefully reviewing research results, was selected to help synthesize relevant, heterogeneous studies derived from multidisciplinary subjects (Rowley & Slack, 2004). Also, this method is particularly useful in providing a thorough summary of cases and best practices of disability employment in various countries. This study follows the data flow of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework throughout the systematic review process (Moher et al., 2009).

The first step is the search process, where relevant keywords were determined and selected to find relevant articles to the research topic. Based on this research topic, the search terms used were as follows: “assistive technology”, “assistive device”, “workplace accommodation”, “workplace accessibility”, “disability employment”, “employability”, “disabled workers”, and “disabled employees”. Using the Boolean operators to combine the keywords, the authors determined the following three search string combinations:

- (1) (("assistive technologies" OR "assistive technology") OR ("assistive device" OR "assistive devices")) AND ("workplace accommodation" OR "workplace accessibility")
- (2) (("assistive technologies" OR "assistive technology") OR ("assistive device" OR "assistive devices")) AND ("disability employment" OR employability)
- (3) (("assistive technologies" OR "assistive technology") OR ("assistive device" OR "assistive devices")) AND (("disabled workers") OR ("disabled employees"))

These search strings were tailored for Scopus and ProQuest databases as both are known for their coverage of a broad range of literature and high-impact journals. In the Scopus database, the keywords were searched within the article title, abstract, and keywords. As for ProQuest, a total of 15 databases were selected, including all business databases and several humanities databases (i.e., Canadian Business & Current Affairs Database: Social Sciences, Career & Technical Education Database: Social Sciences, India Database: Social Sciences, Research Library: Social Sciences, and Social Science Database). So basically, the search mainly focused on mapping existing literature on AT and its relations with disability employment in the field of business, management, economy, and social sciences.

All searches were limited to English, peer-reviewed journal articles only and in the span of ten years, from 2013 to 2022. The reason for the selection of this interval is due to the relatively slow growth of research and projects around technologies to support PwD, especially in workplace settings, despite the rapid technological innovation and development (Fuhrmann et al., 2018). Therefore, the authors decided to include a more

extended period limitation instead of limiting the search to a shorter period (e.g., five years).

Turning now to the subsequent steps of the SLR process, where inclusion and exclusion criteria were established, and a quality assessment was conducted to screen for the eligibility of the articles. Figure 1 exhibits the data extraction and screening process at every stage. As shown in Figure 1, the initial search queries from the two databases returned 2,820 articles in total. Then, after removing 56 duplicates, a total of 2,764 articles were screened using the pre-determined inclusion and exclusion criteria, which eventually resulted in 183 articles for quality assessment. In this stage, the titles and abstracts of the articles were scrutinized to ensure their quality and relevance. Sixteen articles were removed because the samples are the target group of the working-age population who are unlikely to participate in the labour market, for instance, under-age children, older people, and refugees. Seven others were excluded because manuscripts like a news bulletin or a cover of a journal were mistakenly labelled as scholarly journals. Also, this paper is not intended to use an umbrella review approach, so 19 articles were discarded as they are literature reviews, SLRs, or review papers. Finally, most articles (n=111) were eliminated due to their irrelevancies in business and management contexts. The topic of disability employment and AT are multifaceted subjects, and therefore, a search of the literature using the terms related to them often resulted in scattered literature viewed from the perspectives of other branches of knowledge, such as engineering, computer science, psychology, health, or education (Babu & Heath, 2017). Full scrutiny of each research paper was then carried out over 30 articles which are eligible for qualitative assessment. Fourteen more articles were removed due to irrelevant context, an unclear number of samples and methods, and incorrect extraction of an article outside the time period limitation.

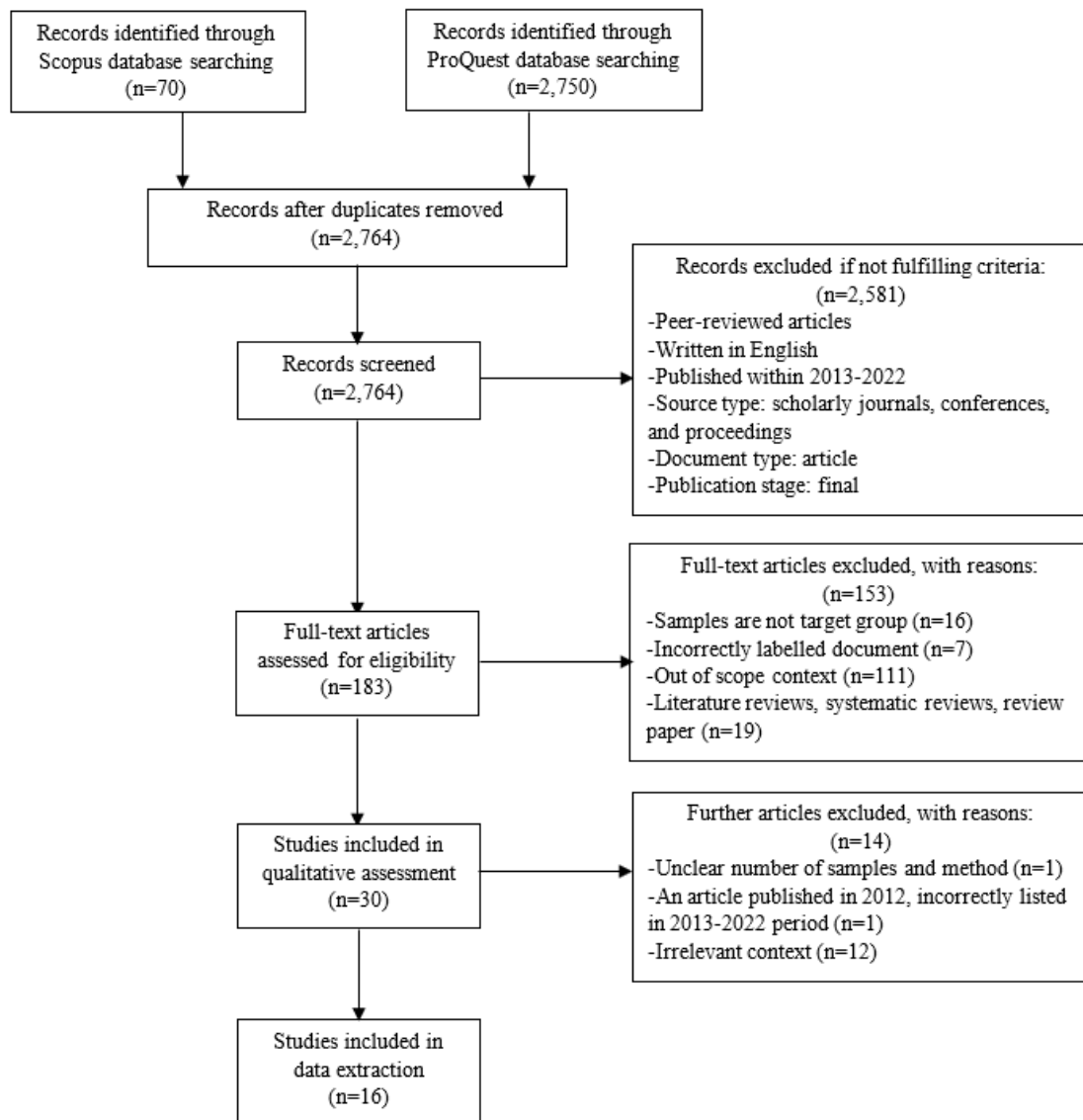


Figure 1. Data Extraction and Review Process

3. Results

Sixteen articles that fulfil the selection criteria and are deemed relevant eventually passed the screening process and were used as the base of the discussion in this section. The following table lists the literature obtained through the procedures above.

Table 1. Extracted Literature

Reference, Title, and Countries	Findings Related to Employers' Perception, Behaviors, and Attitudes	Findings Related to the Accessibility of AT	Findings Related to the Role of VRAs
<p>Suresh & Dyaram (2021)</p> <p>Diversity in disability: leaders' accounts on inclusive employment in the Indian context</p> <p>India</p>	<p>Disability types affect decision-makers' perspectives on employing PwD. Some factors determine the likelihood of PwD being employed in a company: 1). Company's knowledge about the type of disability; 2). Work characteristics; 3). Required accommodations based on the type of disability; 4). Accessibility of a company's infrastructure, 5). External pressures.</p>	<p>The accessibility of AT is likely to be impeded in cases where more investment for purchasing AT for a certain type of disability is forecasted.</p>	<p>Many NGOs partially take similar enabling roles as vocational agencies, which work with private companies to enable employment for PwD. These NGOs help PwD by providing work placement. A support system like this could aid employers in increasing familiarity with various types of disabilities and related workplace accommodations needed.</p>
<p>Dong et al. (2020)</p> <p>Differences in workplace accommodations request among college and high school graduates</p> <p>USA</p>	<p>Prior research suggested that PwD with lower education might be reluctant to request workplace accommodation due to employers' resistance. However, the result of this research does not show a significant correlation between the level of inclination among PwD with different educational levels and levels of support from workers, as well as employers' compliance in providing workplace accommodation.</p>	<p>The accessibility of AT is affected by an individual's level of education. There are cases where PwD with a high-school degree and lower are less likely to request workplace accommodation, especially in the form of AT.</p>	<p>The role of VR counsellors and professionals is crucial in preparing high school students regarding self-advocacy, communication skills, knowledge about their rights according to the law, and workplace procedures for requesting reasonable accommodations.</p>
<p>Oware & Mallikarjunappa (2020)</p> <p>Disability employment and financial performance the effect of technological innovation of listed firms in India</p> <p>India</p>	<p>Despite the evidence that consumers and stakeholders reward companies which employ PwD more than those which do not have social inclusion initiatives, decision-makers are still not likely to hire PwD.</p>	<p>The accessibility and use of AT for workers with disabilities could enhance their performance and ultimately could positively affect the company's financial performance.</p>	<p>Research implied that as enablers, the role of VRAs in training PwD in IT could benefit the financial performance of their future workplaces.</p>

<p>Aleksandarnova & Nenakhova (2019)</p> <p>Accessibility of Assistive Technologies as a Factor in the Successful Realization of the Labor Potential of Persons with Disabilities: Russia's Experience</p> <p>Russia</p>	<p>Employers have not actively sought to create inclusive workplaces for PwD. This is evident in cases where companies tend to procure AT with low quality. The national quota policy also fails to encourage employment rate for PwD because the fines are low. Consequently, employers prefer to spend the company's budget on paying fines rather than providing proper AT for workers with disabilities.</p>	<p>Regarding workplace accommodation, PwD need AT to access the environment from outside and within the workplace. However, increasing the accessibility of collective and individual AT remains a challenging issue in Russia.</p>	<p>In some countries like Russia, the provision of AT might be partially managed by State-appointed institutions. However, conservative professionals and counsellors in these organisations can also be a barrier for PwD in accessing modern AT. Consequently, this condition also affects the accessibility of proper AT for PwD.</p>
<p>Jetha et al. (2018)</p> <p>Supporting the Transition into Employment: A Study of Canadian Young Adults Living with Disabilities</p> <p>Canada</p>	<p>Some factors affect the likelihood of PwD in accessing workplace accommodation. These factors are: 1). Perceived cost of accommodation, 2). Inability to fulfil work tasks, 3). Negative attitude towards PwD. On the other hand, employers also experience a lack of information regarding strategies to support the needs of workers with disabilities, as these workers often have difficulties disclosing their disabilities to employers.</p>	<p>The provision of health benefits by employers is a potential strategy for integrating PwD in the labour market. In some way, the provision of health benefits could also increase the accessibility of AT in the workplace because such benefits might cover a certain kind of AT.</p>	<p>Young adults transitioning into the workplace often face difficulties in disclosing details of their disability to employers. VRAs and employers should devise strategies to address such an issue. For example, VRAs, partnering with employers, could create strategies within the workplace that could enhance communication channels between employees with disabilities and their managers to minimise accommodation barriers caused by a lack of disability disclosure.</p>
<p>Kuznetsova & Bento (2018)</p> <p>Workplace Adaptations Promoting the Inclusion of Persons with Disabilities in Mainstream Employment: A Case-Study on Employers' Responses in Norway</p> <p>Norway</p>	<p>While employers agreed on the importance of inclusive and equal treatment, this might not necessarily result in the active involvement of PwD in the workplace. While corporate policies address nondiscrimination and equality in general, accessibility standards and specific anti-discrimination policies are not covered or applied.</p>	<p>Employers' concerns over adaptation costs may hamper the provision of AT. Furthermore, this frequently affects decisions in hiring or retaining candidates or workers with disabilities in the workplace.</p>	<p>While the VRAs role is not much explored in this paper, it is implied that even though Nordic countries do not implement quota policies, public support in rehabilitation, vocational training, and job placement services is considerable.</p>

<p>Babu & Heath (2017)</p> <p>Mobile Assistive Technology and The Job Fit of Blind Workers</p> <p>USA</p>	<p>Employing blind workers might often be seen as costly and arduous because of the related working accommodations an employer needs to provide. However, MAT may lower the associated costs related to this. MAT also affects the perceived employability of blind workers as they are seen to be independent.</p>	<p>MAT could replace particular ATs as a vocational tool. Employers also see MAT as able to reduce the costs of workplace accommodations. Consequently, the provision and accessibility of MAT in the workplace might be easier than any other kind of AT. Moreover, the development of technology also increases the accessibility and availability of many types of MAT so that it would aid blind candidates in the hiring phase.</p>	<p>Adaptation to MAT is crucial to optimise the benefit of MAT concerning the employment of PwD. Hence, this is an area in which VRAs can work to increase the likelihood of employability for blind job seekers.</p>
<p>Dong et al. (2017)</p> <p>Barriers in Accommodation Process among Individuals with Visual Impairments</p> <p>USA</p>	<p>Employers who fail to address the reluctance of workers with visual impairment tend to forsake the workers' performance benefit and may spend more on training new employees, even though the worker with visual impairment may have the same skill set if appropriately trained.</p>	<p>Negative employers' attitude has been identified as one of the most significant factors that hamper employment for blind people and individuals with visual impairment. This is also a factor which impedes the likelihood of such workers requesting proper workplace accommodation and, therefore, affects its accessibility in the workplace.</p>	<p>The low number of requests for accommodation provisions may be rooted in the lack of general knowledge of these accommodations, both from the employers' and employees' sides. This lack of knowledge stresses the need for VRAs, especially those who work with blind workers or workers with visual impairment, to enhance this knowledge from both sides.</p>
<p>Simpson et al. (2017)</p> <p>Exploring the Costs of Providing Assistive Technology as a Reasonable Accommodation</p> <p>USA</p>	<p>Employers commonly view providing workplace accommodation for workers with disabilities as costly. This perspective and concerns often affect employers' decisions in hiring or retaining a particular candidate or worker.</p>	<p>Concerns over the cost of having to provide reasonable accommodation often burden employers who are not well-informed about the types and costs of accommodations or AT. Even though the evidence shows that the average costs of AT compared to other types of accommodation are not much different, these concerns could negatively impact the accessibility and provision of AT in the workplace.</p>	<p>The role of rehabilitation professionals is essential in becoming a bridge between employers and job applicants with disabilities, as they could negotiate terms related to the types and costs of accommodations that the applicants would need.</p>

<p>Ababneh (2015)</p> <p>Disabled employees in Jordanian public sector an exploratory study</p> <p>Jordan</p>	<p>A stereotypical perception which links a particular category of disabilities with a specific job exists among employers. Therefore, workers with disabilities are often assigned lower levels of tasks or positions.</p>	<p>The accessibility of AT is not explicitly explored in this study. However, this study implied that most low-level positions might not require employers to provide reasonable workplace accommodation. Hence, the level of satisfaction towards work facilities might be because most low-skilled jobs do not require special facilities or workplace accommodation.</p>	<p>The role of VRAs is not specifically explored. Nevertheless, this study implied that many NGOs are crucial in supporting PwD employment. Also, it is unclear who should provide vocational training for PwD to meet labour market standards. However, the study implied that employers partially take vocational guidance and rehabilitation for their workers.</p>
<p>Denny-Brown et al. (2015)</p> <p>Staying Employed: Services and Supports for Workers with Disabilities</p> <p>USA</p>	<p>In order to effectively meet their needs in terms of obtaining support and proper accommodation, PwD should seek employment in a workplace which values workers with disabilities. These kinds of workplaces often range from disability and advocacy NGOs, human service organisations, and companies that manufacture AT and other medical equipment.</p>	<p>AT is the most frequently used accommodation by PwD, especially for those with sensory impairment. There are numerous strategies to obtain AT, such as self-purchasing, relying on handmade AT, obtaining through employee benefit schemes, and obtaining funds from a particular NGO or state VRAs.</p>	<p>The State VRAs are institutions from which most PwD obtain their required equipment (mostly AT). Moreover, VRAs are also the ones who could disburse educational funds for PwD who are recipients of Supplemental Security Income (SSI) or Social Security Disability Insurance (DI).</p>
<p>Huang & Chen (2015)</p> <p>Employing People with Disabilities in the Taiwanese Workplace</p> <p>Taiwan</p>	<p>Employers show more significant concern regarding the employability of PwD during the selection and hiring phase compared to the placement stage. Identified barriers to PwD's career advancement are due to: 1). Work-appraisal-based, 2). The need for extra training and accommodation provisions, 3). The addition of roles and responsibilities which might be challenging to fulfil (e.g. frequent overseas travelling), 4). Low confidence of workers with disabilities.</p>	<p>It might be uncommon for employers in Taiwan to provide AT as a part of workplace accommodation. Workers with disabilities are often expected to obtain it by themselves. Employers usually provide common workplace accommodations: 1). Accommodation in terms of physical access, 2). Job modifications, and 3). Adjustments on work schedules.</p>	<p>VRAs have an essential role in creating a demand-side model placement where the labour needs of employers can be matched with pools of prospective employees with disabilities. It is mentioned that employers found vocational rehabilitation agencies as one of the associations which could effectively facilitate job applicants' selection and match them with available vacancies. This also highlights the importance of collaborations between employers and employment specialists in a VRA.</p>

<p>Johnston et al. (2014)</p> <p>Can assistive technology help people with disabilities obtain employment? An examination of overcoming barriers to participation in British Columbia, Canada</p> <p>Canada</p>	<p>Despite obtaining AT, AT could not create equal employment for PwD because the root cause of the problem is discrimination. Employers often view competitiveness as an essential character in hiring PwD. However, competitive may also mean employers often expect candidates with disabilities to accept lower wages than non-disabled candidates and less favourable shifts and benefits.</p>	<p>The existence of an initiative like EATI increases the accessibility of AT for PwD, especially in the hiring and selection stage. Because in this phase, employers usually do not provide them AT or other accommodation.</p>	<p>Canada's EATI Program aims to aid PwD in attaining employment. Such an intervention is said to increase the likelihood of PwD obtaining employment, but they do not necessarily help them find paid jobs. Instead, they only facilitate AT procurement process. But this initiative can help PwD demonstrate their abilities to potential employers in the selection process.</p>
<p>Linden & Milchus (2014)</p> <p>Teleworkers with Disabilities: Characteristics and Accommodation Use</p> <p>USA</p>	<p>From the employers' side, there is not yet a standard developed regarding the implementation of telework intended to reduce employment-related barriers for PwD. While telework may have numerous benefits for PwD and ease one's workplace integration, not many employers have positions dedicated to telework. Some others have specific policies regarding on-site and offsite shifts, and the remaining others opt to choose to allow remote work only for PwD who have a previous work history with the company before.</p>	<p>For PwD who telework, commonly used AT includes a range of specialised and customised furnishings, workstations, and computer input devices. Workers with disabilities who conduct telework are more likely to require and use AT. But the provision of a certain AT (e.g. AT which supports mobility) are expected to be obtained by the employees themselves because these kinds of AT might not be considered relevant for work purpose.</p>	<p>The role of VRAs is not explicitly explored. However, regarding the topic of teleworking for PwD, VRAs might become an advocate who could collaborate with employers to develop best practices concerning the implementation of remote work, which is intended to reduce employment-related barriers for PwD.</p>
<p>Kulkarni & Kote (2013)</p> <p>Increasing Employment of People with Disabilities: The Role and Views of Disability Training and Placement Agencies</p> <p>India</p>	<p>Employers are oblivious to the availability of VRAs services and continue doubting candidates with disabilities. However, some other employers might not necessarily be ignorant of such services, but they are uninformed of services offered by VRAs.</p>	<p>The accessibility of AT can increase with the active role of VRAs. Actively advocating and partnering with employers also heighten the accessibility of AT as VRAs can encourage employers to offer AT to agencies to help VRAs train candidates with disabilities.</p>	<p>VRAs are critical intermediaries connecting candidates with disabilities and their potential employers. However, while not many employers are aware of VRAs service, such agencies need to make further efforts in advocacy campaigns. Such an effort may help agencies reach employers to deepen their partnerships.</p>

<p>Wolffe et al. (2013)</p> <p>Working with visual impairment in Nigeria a qualitative look at employment status</p> <p>Nigeria</p>	<p>Discrimination and poor attitude from both employers and colleagues are listed as one of the most significant challenges for workers with visual impairment in retaining work. According to the respondents in the research, prejudices and negative attitude are common in workplace environments like this.</p>	<p>Many workplaces lack specialized equipment, particularly those which are related to AT. Out-of-date or inaccessible equipment, as well as inadequate assistance, becomes a frequently-mentioned employment-related barrier.</p>	<p>The role of training in disability-specific skills commonly carried out by VRAs (e.g., AT, career development, social interaction) significantly affects the long-term retention of work. It is argued that pre-employment skills training is crucial in increasing employment opportunity and retention of workers with visual impairment in the workplace.</p>
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As indicated in the previous section, research around the topic of disability employment and AT as workplace accommodation has been conducted in various countries. Most of these studies come from western countries, such as the United States and Canada, with only a few conducted in Asian and African countries. Disability is complex, and Caron (2020) suggested that the concept of disability, especially in relation to a workplace setting, might have different contexts in developed and developing countries. This difference might be due to various reasons, such as the nature of disabilities, society's perception, availability of public services, such as mental healthcare and rehabilitation center, enforcement of disability rights and protection laws, as well as a nation's tendency to adopt a certain kind of disability model. However, practices from different countries' perspectives would still be insightful for the application in organizations aiming to admit PwD to their workforce.

Regarding the research methods, there are an equal number of studies using mixed and qualitative approaches, with the remaining six using quantitative methods. Of all 16 studies, only three focus on visually impaired groups, while the remaining studies' samples are not specified to a particular type of disability. Hence, it is worth noting that the AT discussed in these studies might also be wide-ranging and vary in context.

4. Discussion

All 16 articles address the subject of workplace accommodation in a general sense, but four papers specifically discuss the application of AT in the workplace. All findings show mutual agreement on how proper support, in terms of common workplace accommodations, could promote the integration of PwD into employment. Similarly, in relation to AT, Aleksandrova and Nenakhova (2019) and Simpson et al. (2017) agreed that AT provision for PwD is crucial as such devices could aid and enhance their capabilities in performing tasks which otherwise would be hard to accomplish. A study by Dong et al. (2017) also shows that AT is the most needed workplace accommodation, especially for individuals with sensory impairment. This finding is consistent with that of Denny-Brown et al. (2015). They reported AT as the first in the rank of the most needed employment

support, followed by staff support, modified work schedule, and workstation accommodation.

In a study focusing on blind workers, Babu and Heath (2017) reported a common misconception that individuals with visual impairment are hindered in performing nearly all tasks. However, the researchers later found that utilizing AT, especially MAT, as a vocational tool was essential not only to aid the blind workers in performing their jobs but also to increase their perceived employability in the hiring process. The reason was that potential recruiters see such workers as more self-reliant and independent individuals. The result of this study seems to be consistent with another study by Johnston et al. (2014). The researchers found that the use of AT has enabled participants with various types of disabilities to do a range of previously difficult and almost impossible activities, such as sending emails, participating in conversations, and being involved in volunteer activities.

Therefore, the positive connections between the use of AT and PwD performance in workplace settings seem to exist. However, those findings contradict Jetha et al. (2018), who suggested that AT is not the most needed workplace accommodation for PwD. In their research, the researchers classified work accommodation into two types of accommodations: soft and hard. Soft accommodations are adjustments which “require non-physical adaptations to working arrangements”, such as flexible work schedules, job task modifications, and employee counselling (Jetha et al., 2018, p. 141). On the other hand, hard accommodations refer to the types of accommodations that require physical adjustment to the workplace settings, for example, workplace accessibility, AT, and modified transportation. Surprisingly, contrary to expectations, this study revealed that aside from health benefits, workers with disabilities opt for soft accommodations much more than hard ones.

Nonetheless, the researchers acknowledged that different types of impairment might have different requirements concerning workplace accommodation types. For example, individuals with sensory and mobility impairment might need hard accommodations more than those with cognitive impairment. The outcome of this research was in line with earlier studies conducted by the Canadian Apprenticeship Forum and the Canadian Council for Rehabilitation and Work in 2009 and 2017, respectively. According to these studies, the higher need for soft accommodations compared to hard types might be due to the financial considerations from the employers’ side. In other words, preference for soft accommodations might also be influenced by the workers’ hesitations to negotiate for hard accommodations, which often have a higher cost than the soft types.

Similarly, while Johnston et al. (2014) acknowledged the purpose of AT in supporting and enabling PwD to pursue their employment goals in line with Babu and Heath’s (2017) finding, a case study over Canada’s Equipment and Assistive Technology

Initiative (EATI) suggested a somewhat contradicting result. EATI is a program which aims to increase the likelihood of PwD in securing employment by facilitating AT provision. However, the study reported that only 25% of PwD managed to secure jobs within three months after receiving EATI assistance, implying that the provision of AT might not necessarily make it easier for PwD to enter the labour market.

Hence, the findings from these studies shed some light on three essential aspects in the realm of this topic that needs consideration: Employers' perception, behaviours, and attitudes toward recruiting PwD, accessibility of AT, as well as the role of vocational and rehabilitation agencies (VRA).

4.1 Employers' Perception, Behaviors, and Attitudes

Review on all 16 studies have shown that various countries face mutual dilemmas over the ineffective implementation of inclusive legislation and laws regarding disability employment. Evidence across the globe, both in developed and developing countries, shows that despite the imposition of a minimum quota policy, incentives, and monetary fines, the employment rate for PwD remains low (Ababneh, 2015; Huang & Chen, 2015; Jetha et al., 2018; Aleksandrova & Nenakhova, 2019; Caron, 2020; Suresh & Dyaram, 2021).

According to Jetha et al. (2018), of all barriers to employment that they had identified, one of the most significant barriers is the negative perception of PwD, especially from the employers' side. Other studies also support this idea and further suggest that employers have contradicting views towards the idea of hiring PwD. While most employers observed hold positive views over the importance of nondiscriminatory and inclusive treatment in the workplace, that might not necessarily translate into either positive recruitment decisions for applicants with disabilities or active inclusions of workers with disabilities in the workplace (Kulkarni & Kote, 2013; Ababneh, 2015; Huang & Chen, 2015; Kuznetsova & Bento, 2018). This evidence might explain why in Johnston et al.'s (2014) research the PwD hiring rate is lower than expected, even if the respective PwD have demonstrated themselves as capable, potential workers and have been provided with proper AT to which enable them to perform their tasks.

Employers' concerns over the cost of providing AT as a part of workplace accommodation might also be another factor discouraging them from hiring PwD (Jetha et al., 2018). These concerns arise because in most countries, by law, the provision of reasonable accommodation falls under the responsibility of employers (Vornholt et al., 2017). As suggested by Kuznetsova & Bento (2018) and Denny-Brown et al. (2015), due to the heterogeneity of an individual's disability, the provision of AT and other workplace accommodations might depend on each employee's functional needs. In other words, this kind of personalized adjustment could be relatively costly, depending on the arrangement. Moreover, in many countries, the existing laws or legislations may not specify the range of minimum reasonable AT that employers should provide. Therefore, this might often affect employers' decisions in hiring, retaining, and giving promotions to

PwD in the workforce due to having to reserve some amount of investment, which might result in more significant company expenditure.

Furthermore, research by Huang and Chen (2015) shows evidence of the tendency of employers to prefer PwD with a particular type of disability due to envisaged investment in relevant AT and other accommodation that needs to be provided. For instance, some employers might be more likely to hire individuals with learning impairment who require cheaper soft accommodation and less structural change than candidates with a sensory impairment who need AT (Jetha et al., 2018). This phenomenon is consistent with Suresh and Dyaram's (2021, p. 459) recent study, which stated that the type of workplace accommodation is one of the company's determinants in employing PwD, with people with hearing or mobility impairment seen as more "readily employable".

Interestingly, Simpson et al. (2017) had a contra argument which stated that the comparison of the average cost of AT and all other types of accommodation did not show any significant difference. The researchers also argued that the benefit the employers get from making proper workplace accommodations would outweigh its cost as employers would make financial and nonfinancial gains from retaining valuable employees, reducing hiring costs and increasing company diversity. Babu and Heath (2017) also support this view, especially in relation to MAT.

4.2 Accessibility of AT

Employers' views towards PwD, as discussed in the previous section, affect the likelihood of provision of workplace accommodation in the form of AT for workers with disability. Consequently, it would also impact PwD's accessibility to AT. Even though the World Health Organization (WHO) in 2018 denoted that the unmet need for AT is a global issue, studies focusing on the accessibility of AT show that PwD in high-income countries have better support and accessibility for various types of disability, if compared to that of low-and-middle-income countries.

However, the accessibility of AT in the workplace might also depend on several factors. The first one is the corporate culture in a particular country. For instance, in western countries such as Canada and USA, it is a common practice for companies to provide AT for employees with disability (Johnston et al., 2014; Linden & Milchus, 2014; Denny-Brown et al., 2015; Dong et al., 2017). Nevertheless, Huang and Chen (2015) show that in Taiwan, individuals are expected to acquire AT by themselves, despite the companies' policies stating that the provision of AT and other reasonable accommodations are imposed on the companies. Another factor which can decrease the accessibility of AT comes from the workers with disability themselves. Workers with disability often feel reluctant to request AT from their employers (Dong et al., 2017). Dong et al. (2017) identified that this reluctance could be rooted in several psychological factors, such as: 1). Feeling of being seen as a burden and incompetent, 2). Fear of facing

negative attitudes from employers, 3). Lacking the knowledge regarding what appropriate AT to request and the procedure to ask for one. Another research by Dong et al. (2020) also indicated that PwD with lesser education might be more reluctant to ask for the provision of AT than PwD who hold college education or higher.

The inaccessibility of proper AT provision in the workplace would consequently make workers with disability not able to fully demonstrate their abilities and fulfil their work tasks. Therefore, these workers are often placed in nonmanagerial, low-skilled or low-paid positions despite their innate skills and capabilities (Ababneh, 2015). On a positive note, recent technological innovations in AT development, especially in DAT and MAT, have provided broader access for PwD to AT. Studies by Babu and Heath (2017), Dong et al. (2017), Simpson et al. (2017), as well as Oware and Mallikarjunappa (2020) indicated that MAT could positively empower PwD and potentially decrease the cost of hiring assistants, such as sign interpreter of a sighted assistant. However, to date, studies regarding DAT and MAT are still emerging, and research might often have a small scope and is not applicable to workplaces employing workers with various types of disabilities. Nevertheless, it sheds light on the importance of equipping PwD with AT and its impact on the outcome of how they can work and how the managers perceive them, which in turn, on a larger scale, might be able to affect PwD's employability.

4.3 The Role of Vocational and Rehabilitation Agencies (VRAs)

Another critical aspect which can aid in the accessibility of AT and increase the likelihood of PwD employment is the role of vocational and rehabilitation agencies (VRAs). These agencies primarily act as agencies which offer services related to counselling, work-related skills training, and job placement (Kulkarni & Kote, 2013; Johnston et al., 2014). They also possess a role as intermediaries and advocates that bridge employers and potential workers (Kulkarni & Kote, 2013; Johnston et al., 2014). The role of intermediary comes when VRAs act as a point of contact for employers who wish to hire PwD and match them with suitable candidates. VRAs could also become advocates that negotiate terms with employers in a particular union in place of PwD to ensure the candidates and workers receive fair treatment and proper workplace accommodations.

Specifically, in terms of AT, these agencies will likely be the first environment where potential workers with disability are introduced to various AT and other supporting resources to assist them in their future workplaces (Simpson et al., 2017; Wolffe et al., 2013). VRAs also assist in providing AT, although in some countries, the provision could only cover a minor percentage of PwD who need them (Walker & Tebutt, 2022). Many of these agencies also offer services in facilitating PwD to secure subsidized or free AT through partnerships with the government and NGOs (Kulkarni & Kote, 2013). Some AT might require proper training, especially those built based on a specific technology, such as Apple's KNFB Reader and Digit-Eyes (Babu & Heath, 2017). Wolffe et al. (2013), in their research on the visually impaired in Nigeria, even emphasize that AT training is one of the most significant determinants of long-term work retention for PwD.

5. Conclusion and Implications

PwD exclusion from the labour market is a pressing matter because unemployed and underemployed PwD represent underutilized labour potentially boosting economic growth. The use of AT has a significant value in increasing employment for PwD. By utilizing AT, PwD can demonstrate their perceived employability and innate capabilities in the hiring phase and integration in the workplace. Being able to do this means that PwD have a better chance of securing higher-paid positions. However, depending on the disability type, accessibility could be a significant problem for PwD to use AT. In some cases, AT might even become an impediment which affects hiring decisions. Because from employers' perspective, requests for AT as workplace accommodation might be seen as excess expenditure, which often, deters the companies' decisions in hiring a candidate with specific disabilities. In that case, the role of a third party like VRAs is critical to aid the accessibility of AT and, eventually, the chance for PwD to obtain employment.

Still, despite its value in increasing the chance of employment, the use of AT alone is not the band-aid solution that guarantees employment success. Because even with the aid of AT, PwD are unlikely to have equal footing in the labour market as systemic discrimination and stigmatization remain. These issues are the complex and systematic one that needs the collaborative effort of all parts of society. However, the government and managers might be the key players who can significantly change the dynamics in the labour market to be more inclusive and accommodating for all.

For the government, it is imperative to prioritize law enforcement regarding disability employment, not only the restriction for compliance to the quota policy but also the provision of promised tangible incentives for compliant institutions. In many countries, the law imposes the provision of AT on employers. Hence, if employers are not incentivized more than its requirement to provide proper workplace accommodations for PwD, then the stigma that employing PwD puts more financial burden might persist. Consequently, the provision and accessibility of AT as workplace accommodation will be impacted. Furthermore, it would be more difficult for either new applicants to enter the workforce or workers to gain career advancement despite their fine performance.

On the institutional level, workplace discrimination and stigmatization remain as there is a mismatch between what the companies believe and the actual practice. Most often, even though a company's missions and policies have been moving towards the adoption of the biopsychological perspective, its practice and the perspectives of most employers in viewing PwD are still in the medical realm. That means PwD are often seen as people who always need help instead of capable people who can perform their job tasks well, given the right accommodation and environment. Therefore, changing this mindset, attitude, and behaviour is paramount to creating a more inclusive workplace.

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