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Review

A Systematic Review on Assistive Technology Terminologies, Concepts, and Definitions

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Abstract

This study examines the diversity of terminologies associated with assistive technology (AT), a crucial field that promotes autonomy and inclusion for people with disabilities. Although the wide use of assistive technology is observed in the literature, a variety of terms are often used interchangeably, which hinders research, technological development, and the formulation of public policies. In this sense, this systematic review aimed to identify, categorise, and analyse the diversity of terms used to describe AT in the scientific literature, contributing to greater conceptual clarity and supporting structured and interdisciplinary development in the field. A comprehensive search was conducted in July 2024 across the Scopus, Web of Science, and PubMed databases, covering publications from 1989 to 2024. Eligible studies were peer-reviewed journal articles in English that conceptually defined at least one AT-related term. The selection process followed the PRISMA 2020 guidelines and included studies from Q1 and Q2 journals to ensure academic rigour. A total of 117 studies were included out of 11,941 initial records. Sixteen distinct terms were identified and grouped into five clusters based on semantic and functional similarities: Cluster 1—Technologies for assistance and inclusion. Cluster 2—Functional assistive devices. Cluster 3—Assistive interaction interfaces. Cluster 4—Assistive environmental technologies. Cluster 5—Assistive systems. A complementary meta-analysis revealed geographic and temporal trends, indicating that terms such as "assistive technology" and "assistive device" are globally dominant. In contrast, others, like "enabling technology," are more context-specific and emerging. The findings contribute theoretically by providing a structured framework for understanding AT terminology and practically by supporting the design of public policy and interdisciplinary communication.

Keywords: assistive devices; assistive solutions; assistive systems; assistive technologies; human activity assistive technology; inclusive design

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1. Introduction

Various devices, products, and services have been designed to assist people with varying disabilities [1,2]. These devices range from tangible tools to technological solutions, allowing individuals to overcome barriers and achieve greater autonomy in everyday activities [3,4]. In addition, these tools have evolved significantly, incorporating discoveries and digital advances that have expanded the possibilities of inclusion [5,6].

Studies on these devices have been conducted over time, with intensified efforts in the 1980s to assist post-war veterans [7,8]. The Technology-Related Assistance for Individuals with Disabilities Act, introduced in the US, and which introduced one of the first official definitions of assistive technology (AT), was passed in 1988, with subsequent reauthorizations in 1994 and a revision in 1998 [9]. Initially, research focused on physical and mechanical devices; however, with the advancement of computer technologies, people also began using software, applications, and other digital solutions [10,11]. This progress transformed the way people with disabilities interact with their environment, providing new opportunities for communication, mobility, and independence [3,12].

It can be observed from the literature that different terms refer to AT, some referring to similar concepts, while others outline new trends in this field of research. The term AT is conceptualised as technologies designed to improve the functionality and autonomy of people with disabilities [13,14], particularly when their design employs strategies that promote user-centred product development [15]. The World Health Organization (WHO) defines assistive technology as products, equipment, devices, resources, methodologies, strategies, practices, and services that aim to promote the functionality and participation of people with disabilities or reduced mobility [16]. Another term used in this area is assistive products, which, according to the ISO 9999:2022 standard, a person uses to optimise functioning and reduce disability, but which require the assistance of another person to operate [17]. The WHO defines assistive products as devices, equipment, instruments, or software that help individuals with disabilities or functional limitations to perform activities, participate in society, and maintain their well-being [16].

Another common term in the literature is assistive devices (ADs), representing devices such as prostheses, wheelchairs, and hearing aids [8,18] that assist people with disabilities. Ambient assistant living (AAL), on the other hand, refers to technologies integrated into residential environments to promote autonomy and safety for people with disabilities [19,20]. This is evident in the fact that these and other identified terms are often used interchangeably to refer to issues related to AT. However, it is observed that the densest, most recognised, and most cited term is AT, as it encompasses both physical devices and digital solutions, as well as service provision.

Given this, this article is motivated by the growing integration and development of AT in supporting society's full, inclusive, and sustainable development. Thus, given the diverse and sometimes interrelated terms and concepts [21], these innovations also underscore the need to understand these various terms, concepts, and definitions—both traditional and emerging—that inform the development of AT.

This article aimed to analyse and categorise the different terms used to describe AT based on their similarities and specific purposes, contributing to a conceptual understanding and structured consistent scientific development. The methodology adopted combines a systematic literature review (SLR) with a meta-analysis, enabling the identification of trends in the use of the most frequently recurring terms and their temporal evolution.

This research aims to contribute to scientific research related to AT by highlighting the scope and specificities of the terms used and identifying evolutionary trends in the concepts that support each term in this area. By grouping the terms and highlighting their uses from a temporal and geographic perspective, it will be possible to contribute to the development of more inclusive AT and public policies that promote accessibility and autonomy and improve the quality of life for end-users of these ADs.

The rest of the article is organised into sections: Section 2 describes the methodological procedures in detail; Section 3 provides the terms and definitions; Section 4 presents the geographical and temporal analysis; Section 5 discusses and compares the findings; and Section 6 presents the conclusions and future perspectives.

2. Methodological Procedures

Three types of analysis were carried out to deepen the understanding of the use and evolution of AT-related terminologies. First, a term analysis grouped similar terms and provided a conceptual framework. Second, a temporal analysis identified trends and shifts in the use of certain terms over the decades. Third, a geographic analysis explored regional variations in terminology usage. These insights aim to support the standardisation of concepts and inform future research and public policy development in the field of AT [22,23].

In the second phase of the study, a complementary frequency-based analysis—referred to here as a "meta-analysis"—was conducted to identify patterns in the use of terms over time and across geographical regions. Only articles that provided both the term and its definition were included in this analysis. The analysis involved counting the occurrences of each term and mapping them by year and region using Excel. No statistical models, heterogeneity analyses, or synthesis software were applied, as the analysis was descriptive. From the 117 selected studies, 16 terms related to AT were identified. These were categorised into five semantic–functional clusters. The categorisation was based on semantic and functional similarities derived from the definitions provided by the studies. These phases are discussed in more detail in Sections 2.1 and 2.2.

2.1. Systematic Literature Review

This article adopted the SLR methodology to identify, evaluate, and synthesise the terms addressed in the literature [24,25]. The search terms were defined through a preliminary literature review, utilising terms related to the area of assistive technologies and those used in previous research on this theme [15,26]. Boolean operators (AND, OR) were used to combine these keywords, which were searched in both singular and plural forms from their stems. The search was conducted in July 2024 in the Scopus, Web of Science, and PubMed databases. These databases were selected for their multidisciplinary scope and relevance to the topic. The search included peer-reviewed articles published between 1989 and 2024, written in English, and indexed in journals classified as Q1 or Q2. Filters applied included article type (excluding reviews, editorials, and conference abstracts), language (English), and research areas directly related to AT, such as rehabilitation, geriatrics, neurosciences, engineering, computational sciences, economics, and multidisciplinary sciences focused on accessibility and inclusion. Table 1 shows the search terms and filters.

Only articles from Q1 and Q2 journals were searched. It was not necessary to use risk-of-bias assessment tools. The data extracted from the included articles were organised in Microsoft Excel spreadsheets. Each record contained fields for the article title, authors, journal, quartile, year, country, and the AT term(s) with corresponding definitions. Duplicates and incomplete records were removed during this process.

To prepare the data for synthesis, terms were grouped based on semantic and functional similarities using an inductive approach grounded in conceptual analysis. This grouping process led to the formation of five distinct clusters, which served as the basis for further thematic organisation.

For visual presentation, frequency counts of term occurrences were calculated across the entire sample. The results were displayed using bar charts, temporal line graphs (term usage over time), and geographic distribution maps, which were generated using Microsoft Excel and visual design tools. These visualisations were used to identify temporal trends and regional patterns in the use of AT-related terminology.

No additional variables were collected, and no contact was made with the study authors to retrieve missing information.

Table 1. Search filters utilised in databases.

Database	Scopus, Web of Science (WOS) and PubMed
Publication year	1989–2024
Document type	Articles
Language	English
Subject areas	Rehabilitation; Computer Science; Engineering; Public Environmental Occupational Health; Psychology; Geriatrics Gerentology; Health Care Sciences Services; Neurosciences Neurology; Social Sciences Other Topics; Science Technology Other Topics; Social Issues; Psychiatry; Medical Ethics; Orthopedics; Communication; Robotics; Surgery; Government Law; Materials Science; International Relations; Medical Informatics; General Internal Medicine; Sociology; Ophthalmology; Audiology Speech Language Pathology; Biomedical Social Sciences; Business Economics; Nursing; Pediatrics; Operations Research Management Science; Mathematical Computational Biology; Otorhinolaryngology; Architecture; Obstetrics Gynecology; Public Administration; Radiology Nuclear Medicine Medical Imaging; Research Experimental Medicine; Respiratory System; Urban Studies; Mechanics; Telecommunications; Social Works; Economics; Political Science; Transportation; Education Special; Family Studies; Industrial Relations Labor; Health Policy Services; Management; Instruments Instrumentation; Green Sustainable Science Technology; Environmental Studies; Multidisciplinary Sciences; Business Finance.
Keywords	"assistive technology" OR "assistive device" OR "self-care technology" OR "assistive user interface" OR "ambient assistant living" OR "work assistance" OR "adaptive work" OR "assistance system" OR "supportive Technology" OR "inclusive technology" OR "assistive solution" OR "adaptive technology" OR "auxiliary equipment" OR "personal assistance tool" OR "accessible interface tool" OR "enhanced living environment" OR "occupational support" OR "customized employment" OR "aid system" OR "enabling technology" OR "flexible technology" OR "self-help device".

As this is a conceptual and terminological review, rather than a synthesis of clinical outcomes or intervention effects, several items of the PRISMA 2020 checklist are not applicable. Specifically, no outcomes were predefined or measured (Item 10a), no effect estimates were calculated (Item 12), and no statistical synthesis, sensitivity analyses, or assessments of heterogeneity, reporting bias, or certainty of evidence were performed (Items 13f, 14, 15, 16b, and 17–22). The objective of this review was to categorise and analyse the terminology related to AT in the literature, which does not involve comparative effectiveness or risk-of-bias considerations typically required in quantitative SLRs.

The selection and review process was conducted independently by three authors. Disagreements were resolved through consensus. No automation tools were used beyond Mendeley for reference management.

From the initial search, a total of 11,941 records were identified across three databases: Scopus (n = 10,526), PubMed (n = 1276), and Web of Science (n = 139). After removing 4450 duplicate records using Mendeley reference manager, 7491 records remained for screening.

During the screening phase, titles and abstracts were evaluated to identify mentions or potential mentions of AT-related terms and their definitions. As a result, 7145 records were excluded, and 346 reports were sought for full retrieval. Of these, 77 articles could not be retrieved, resulting in 269 full-text articles assessed for eligibility.

In the eligibility phase, 97 articles were excluded for not meeting the journal quartile requirement, 52 lacked a conceptual definition, 45 did not present any AT-related term, 18 were technical or engineering-focused papers without conceptual treatment, and 2 were

excluded due to a lack of access to the full text. Table 2 presents the criteria used to exclude articles during the eligibility phase.

Table 2. Criteria used as reasons for excluding articles in the eligibility phase.

Reason	Criteria
Reason 1	Journal not classified as Q1 or Q2
Reason 2	Lack of a conceptual definition of the term
Reason 3	Did not present an AT-related term
Reason 4	Article with technical or engineering focus without conceptual treatment
Reason 5	Lack of access to the full text

Finally, 117 studies met the inclusion criteria. These studies presented at least one AT-related term along with a clear conceptual definition and were included in the review. The PRISMA flowchart describing the selection process is presented in Figure 1.

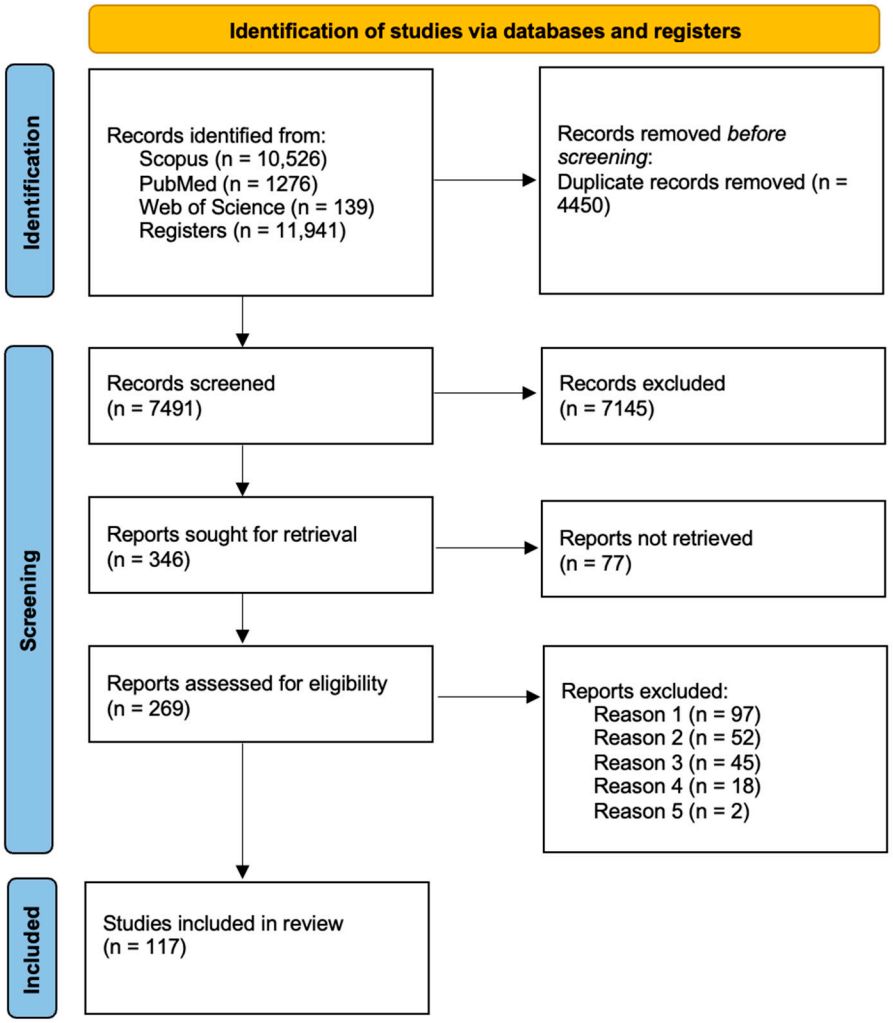


Figure 1. PRISMA procedures.

The methodological procedures are divided into two main phases, following the PRISMA 2020 guidelines for SLRs to ensure rigour and transparency throughout the process. In the first phase, an SLR was carried out to identify, select, and evaluate scientific articles that address terminologies associated with AT. This phase enabled the collection and categorisation of the main terms mentioned in the literature.

2.2. Meta-Analysis

From the SLR, the 16 terms identified to describe different aspects of AT were grouped according to semantic and functional similarity, considering the descriptions provided by the authors. Thus, the existence of five clusters of main terms was proposed. This analysis identified the most recurring terms and their geographic distribution, in addition to mapping the temporal trends in the use of these terms. The following analyses were conducted.

Term analysis focused on identifying and categorising the main terms in the literature related to AT. This analysis allowed the terms to be grouped into clusters based on their semantic and functional similarities, providing a conceptual framework that facilitates understanding. Temporal analysis investigated the frequency of use of the terms over time. This analysis was essential for identifying emerging trends and changes in the adoption of specific terminologies, revealing how the field has evolved and which concepts have gained greater relevance at different periods. Geographic analysis explored the distribution of the terms in different regions worldwide. This approach was undertaken to highlight regional and contextual variations in the use of terminology, thereby evidencing the contributions of different countries to the advancement of the AT area.

These analyses were carried out to provide a deeper and more structured understanding of the use and evolution of AT-related terminologies. The results contribute to standardising concepts, guiding future research, and informing the formulation of public policies that consider the field's regional and temporal specificities.

3. Terms and Definitions

Table 3 presents the 16 terms identified in the term's column. These 16 terms were grouped by analysing the root and semantic similarity, assessed based on the concepts detailed by the authors. The names given to the clusters were based on the main characteristics observed from the clustered terms and the clustered terms themselves. The groupings are not intended to create new concepts and definitions, but rather to guide the discussions presented below, identifying ongoing trends and emerging topics in related themes. In this sense, the first column presents the proposal for grouping the 16 terms into five main clusters. The right-hand column presents the source references for each term.

Table 3. Clusters, terms, and references.

Cluster	Terms	References
1—Technologies for assistance and inclusion	Assistive Technology	[27–102]
	Electronic Assistive Technology	[39,40,44,103]
	Adaptive Technology	[76,95,104]
	Appropriate Assistive Technology	[77,82,95,98,105]
	Self-Care Technology	[106]
	Enabling Technology	[107–109]
	Assistive Solutions	[30,34,47,50,85,90,96,107,110,111]
2—Functional assistive devices	Assistive Device	[28,31,32,34,35,37–39,41–44,46–48,50,53–55,60,62–64,68,70,71,73–75,77,79,82–91,94,96,98,99,101,107,111–133]
	Self-Help Device	[28,33,74]
3—Assistive interaction interfaces	Human Activity Assistive Technology (HAAT)	[64,134]
4—Assistive environmental technologies	Ambient Assistant Living	[110,135]
	Enhanced Living Environments	[136]
5—Assistive systems	Aid Systems	[73,90]
	Assistance Systems	[49,64,120,128,137–140]
	Supportive Technology	[141]

The analysis and categorisation of the 16 terms related to AT into five main clusters highlight the diversity and complexity of this constantly evolving field [142]. The clusters reveal different approaches and solutions to meeting the needs of people with disabilities or reduced mobility. By grouping the terms by similarity, it was possible to identify connections between concepts and explore how each cluster contributes to expanding accessibility, autonomy, and social inclusion [27,102]. Next, each cluster will be discussed in detail, highlighting its contributions, practical examples, and challenges in the field.

Cluster 1: Technologies for assistance and inclusion. The terms grouped in this cluster refer to AT as drivers that collaborate to promote social inclusion, offering integrated tools to improve accessibility and user autonomy [28,33]. Examples include accessibility applications, such as real-time translators for people who are deaf, or screen-reading software [33,41,44]. These technologies connect users to educational, cultural, and professional opportunities. However, they face challenges such as high development and distribution costs, as well as a need for standardisation [48,113]. These limitations underscore the need for investments in public policies that foster the development of accessible and sustainable technologies that benefit users across diverse socioeconomic contexts [54,57].

Cluster 1 encompasses terms such as AT, electronic assistive technology, supportive technology, and enabling technology, highlighting broad technologies that promote accessibility and inclusion [27,58,59,76,77,103,107]. The literature highlights its importance in empowering users and allowing greater independence and quality of life. For example, the concepts of appropriate assistive technology and assistive solutions underscore the importance of culturally relevant and economically viable solutions [30,34,76,82]. In addition, self-care technology is emerging as a trend that enhances user autonomy in managing their health and well-being [106]. Thus, it is possible to see that the terms that integrate this cluster reflect a comprehensive vision in conceptual terms, emphasising AT applicable in multiple social and economic contexts to support the inclusion and accommodation of users and their support network within society in general.

Cluster 2: Functional assistive devices. The terms that comprise this cluster refer to technologies such as motorised wheelchairs, orthotics, and hearing aids that directly address users' specific needs [48,113,114]. They are widely recognised for improving mobility, communication, and independence [33,53]. Despite their positive impact, these devices present significant challenges [121,122]. The lack of access in remote regions, the high costs of customisation and maintenance, and the difficulty in adapting to different user profiles are important barriers [47,48]. Overcoming these limitations requires innovation in design and materials, as well as subsidy policies, to ensure greater accessibility [50,117].

ADs and self-help devices represent specific solutions for individual needs [28,31]. These devices, such as wheelchairs, hearing aids, and prosthetics, are intended to provide direct functional assistance by improving mobility, communication, and social interaction [32,34]. The literature emphasises their impact on rehabilitation and education, demonstrating their effectiveness in overcoming physical and sensory barriers [35,37–39,74]. This group focuses on practical applications, emphasising the use of technologies to meet specific user requirements. Thus, it focuses on developing, producing, and using devices that increase users' level of independence in a wide range of activities.

Cluster 3: Assistive interaction interfaces. This cluster conceptually encompasses solutions to connect the user to the technologies [134]. Recent advances include voice commands, adaptive screens, and virtual assistants [134]. These models have made the experience more intuitive and personalised, especially on mobile devices and integrated systems [64]. However, usability remains challenging, particularly for older individuals and those with multiple disabilities [64]. Investments in user-centred design, with accessible and culturally adapted interfaces, are key to expanding the impact of these technologies [134].

The main term of this cluster is human activity assistive technology (HAAT), which addresses the interaction between the user, the technology, and the environment [134]. This theoretical model aims to understand how users interact with ADs in their daily activities [64]. The literature emphasises that intuitive and adapted interfaces increase user adoption and satisfaction, contributing to the success of technological solutions [64,134]. Thus, conceptually, the term has been used to present trends that include advances in user-centred design, highlighting the importance of accessible and efficient user experiences.

Cluster 4: Assistive environmental technologies. The concepts underlying the terms that comprise this cluster represent a significant evolution in the integration of technologies in physical space [133], such as smart homes equipped with sensors and robotic assistants to assist with daily tasks [110,134]. These technologies can potentially transform the daily lives of people with disabilities, promoting independence and safety [135]. However, to ensure wider and more inclusive adoption, barriers such as high implementation costs and cultural resistance to automation must be overcome [134].

The terms that make up this cluster and represent these trends are enhanced living environment and AAL [134,135]. Therefore, this cluster reflects the integration of technologies into physical environments, creating smart spaces that promote continuous accessibility. Studies in this category explore technologies such as sensors, the Internet of Things (IoT), and automation, highlighting how they can transform homes and public spaces into more inclusive environments. Compared to the other clusters, this cluster encompasses technologies with a strong evolutionary tendency. Still, it also faces several challenges related to costs, scalability, and interoperability [110,134,135].

Cluster 5: Assistive systems. The concepts of the terms that comprise this cluster address essential elements for promoting inclusion [90,140]. Tools such as accessibility software, ergonomic devices, and adaptation programs have increased the productivity and participation of people with disabilities in the labour market [49,120]. However, the widespread adoption of these tools still faces obstacles, such as prejudice, a lack of training, and the absence of clear organisational policies, which compromise the potential of these technologies [64]. In this sense, government incentives and corporate awareness programs can help overcome these barriers [136,138,140].

Focused on the occupational context, this cluster includes terms such as aid systems, assistance systems, and supportive technology. Conceptually, these terms also propose ways to explore tools and strategies for overcoming workplace ergonomic and social barriers, promoting accessibility and productivity [90,139,140]. The literature also highlights that these terms promote effective inclusion in the labour market, such as specialised software and ADs [73,128,137,139,140].

The proposed clusters present clear differences in scope, approach, and applicability. 'Cluster 1—Technologies for assistance and inclusion' groups terms that highlight broad and versatile technologies, while the terms in 'Cluster 2—Functional assistive devices' address a more practical bias, focusing on specific devices. 'Cluster 3—Assistive interaction interfaces' encompasses terms and concepts with a theoretical and highly technological bias, exploring human–technology interaction and its potential benefits for people with disabilities. 'Cluster 4—Assistive environmental technologies' broadens the discussion to include the physical environment in assistive technologies, improving the user experience in their relationship with technologies. 'Cluster 5—Assistive systems' emphasises the occupational context, seeking to establish a link between work environments and technologies that can favour the performance of people with disabilities, promoting their inclusion in the workplace. The intersections reveal that many devices and technologies can be used in multiple contexts, from daily activities to work. This diversity underscores the

complexity of the research area and highlights significant opportunities for integration and collaboration among the various fields.

4. Geographical and Temporal Analysis

Analyses were conducted from the research's geographical and temporal perspectives to explore the diversity and evolution of trends related to AT-related terminologies.

4.1. Geographical Analysis

The geographic analysis of the terms is illustrated in Figure 2, demonstrating that research involving technologies for assistance and inclusion, as well as functional assistive devices, appears more frequently in the articles included in the SLR. More specifically, because the terms AT and AD are more widely used and applied in a generic sense to refer to these technologies, they become conceptually linked to this area of research in a more general way.

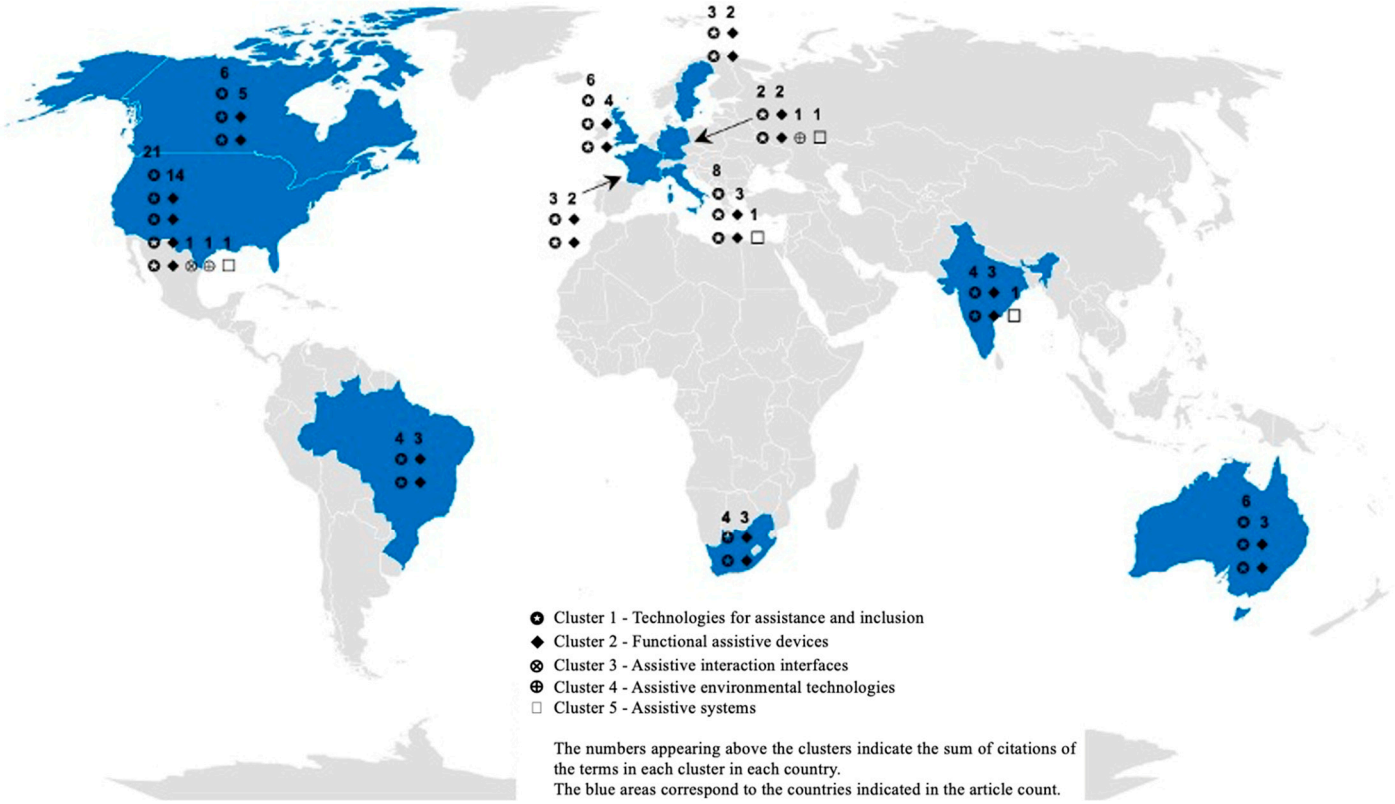


Figure 2. Geographic analysis.

The USA, Italy, and Canada are the top three countries when considering searches related to the terms associated with the five proposed clusters. However, the searches involving the first two clusters had a higher number of articles with different origins.

Research involving assistive interaction interfaces, intelligent environments, and assistive environmental technologies is currently limited to Germany and the USA. In contrast, the searches for assistive systems and adaptive solutions come from only four countries. This highlights an important gap that warrants exploration.

The analyses showed that the countries depicted in the figure adopt a multifaceted research approach within a scope that exposes the technological bias in question, aiming for solutions that promote inclusion in diverse contexts and effectively integrate technologies. Additionally, the geographic analysis emphasises the necessity to expand research efforts in countries across Asia, Africa, and Latin America.

Some points draw attention and should be commented on, such as articles in the USA, UK, and Australia, which frequently refer to terms related to "assistive solutions" as tools designed to improve inclusion and accessibility. In the USA, Canada, Germany, and South Africa, articles on themes related to "appropriate assistive technology" refer to devices that efficiently and personally meet each user's specific needs. Authors from the USA, Italy, India, and primarily Germany study themes related to "assistance systems" to create models and systems with specific configurations that can provide personalised support with greater safety and efficiency. These systems will be able to serve users in a targeted manner, providing solutions that cater to the specific needs of individual users based on their indicated requirements.

4.2. Time Analysis

Figure 3 presents the temporal analysis of the frequency of use of the terms that comprise each of the five proposed clusters, showing how the terminology has evolved and diversified over the decades.

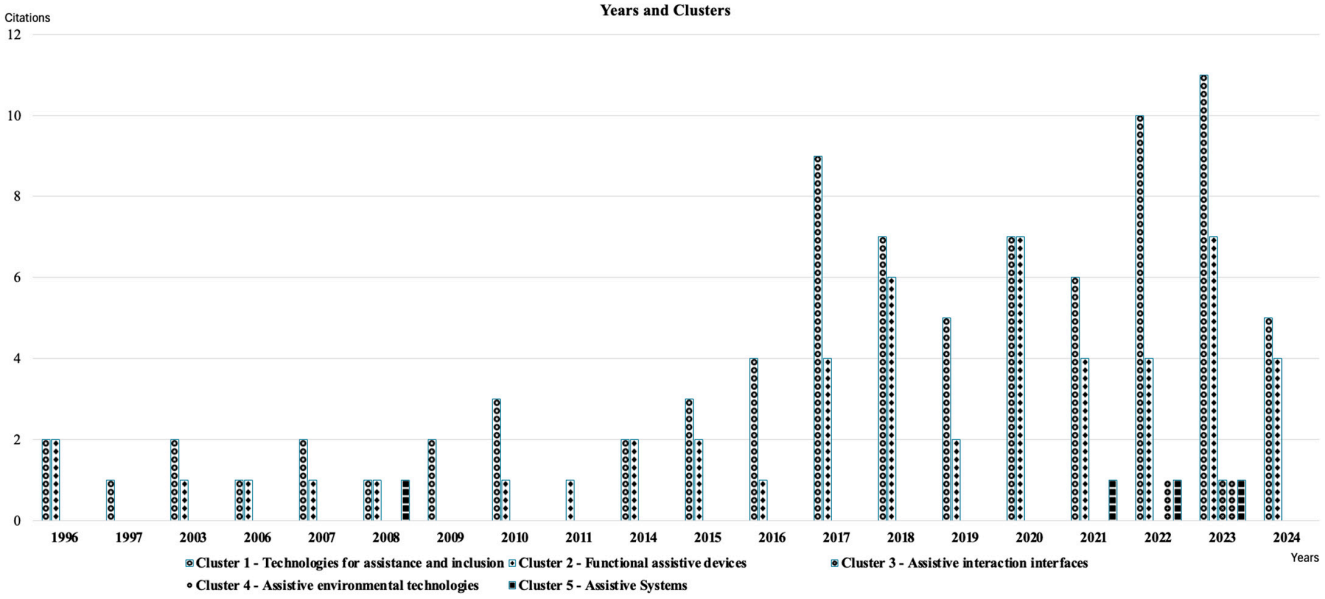


Figure 3. Temporal evolution of the terms.

There is a greater number of citations and definitions of terms classified in Cluster 1—Technologies for assistance and inclusion and Cluster 2—Functional assistive devices throughout the period analysed, with a considerable increase in the number of works from 2017 onwards. In the context of this research, Cluster 3—Assistive interaction interfaces appears only in 2023, whereas Cluster 4—Assistive environmental technologies appears in both 2022 and 2023. The terms referring to Cluster 5—Assistive systems appear intermittently between 2008 and 2023. With this reduced number of publications on these topics, some research gaps can be highlighted regarding AT in proposing intelligent and adaptable environments composed of assistive systems adapted to the needs of people with disabilities.

Taking the temporal analysis to the scope of the terms themselves, the first terms identified were AT and AD, which emerged in 1996. AT is from the Cluster 1—Technologies for assistance and inclusion cluster, and its use experienced consistent initial growth but a significant drop between 2006 and 2012. This period may reflect a saturation of the term or the search for more specific concepts in the literature. From 2014 onwards, the term AT resumed use, suggesting that it remains relevant as an overarching concept to describe

technologies aimed at accessibility. On the other hand, ADs, which are from Cluster 2—Functional assistive devices, also introduced around the same time, only started gaining popularity in 2003 and reached a prominent position in 2024. This can be explained by the increasing focus on practical and tangible devices, such as wheelchairs, prosthetics, and hearing aids, as technological advancements have allowed for greater customisation and functionality. Another important term in this cluster that emerged in 2017 is the self-help device, which describes devices that assist individuals in performing daily tasks while also empowering them to have greater control and independence.

Cluster 1—Technologies for assistance and inclusion has two more terms with high scientific relevance; appropriate assistive technology, which was first mentioned in 2006, has demonstrated intermittent use. This characteristic may suggest that the term is associated with specific contexts, such as the cultural and economic adequacy of AT in developing countries. This approach is crucial for ensuring that technologies are effective and accessible in diverse contexts. However, its intermittency suggests its use is limited due to niche research and practice. The other is assistive solutions, which emerged in 2007 and has fragmented usage patterns with notable peaks. This term is generally associated with integrated and systemic technological solutions, such as software and digital platforms, which have gained relevance as AT expands beyond physical devices.

Assistance systems, related to Cluster 5—Assistive systems, first appeared in 2014. The recent growth in their use may be related to the rise of smart and connected technologies, such as sensors and the Internet of Things (IoT), which are essential for automating assistive environments.

A more recent term, which comprises Cluster 3—Assistive interaction interfaces, HAAT, indicates a growing trend toward specific and conceptual technologies. The HAAT conceptual model is designed to analyse, develop, and evaluate the use of AT in human interaction contexts, emphasising a more interdisciplinary theoretical approach.

These trends indicate a growing specialisation and diversification of terminology in AT, reflecting technological advancements and the need to cater to specific contexts and populations. The increase in new specialised terms highlights the area's maturity and the importance of monitoring its impact in practice, such as by formulating public policies and developing more accessible and functional devices. The temporal variations suggest that certain terms may be driven by external factors, such as regulatory frameworks, scientific and technological advances, or even socio-cultural debates. As this research proposes, this evolution reinforces the need for terminological standardisation to improve interdisciplinary and global communication in AT.

5. Discussions and Comparisons

The clusters of AT-related terminologies identified and analysed in this study present different approaches, reflecting the field's diversity and complexity. Next, the scope and specificity of each cluster are discussed, based on the main characteristics and differences between them, highlighting their levels of coverage and specificity. Furthermore, ongoing trends and emerging topics identified from this review are highlighted.

5.1. Scope Versus Specificity

Figure 4 illustrates the relationships and intersectional themes between the five clusters of AT-related terminologies.

Cluster 1—Technologies for assistance and inclusion serves as the foundation for all the others, representing more diverse and specific areas that intersect to meet various demands, ranging from physical devices to smart environments and occupational solutions. The first covers terms such as AT and enabling technology. These provide the basis for

specific technologies, such as physical devices, interactive models, intelligent environments, and occupational solutions.

Cluster 2—Functional assistive devices focuses on custom physical devices that integrate with Cluster 1-wide technologies, utilise Cluster 3-specific interfaces, connect to Cluster 4 smart environments, and have occupational applications in Cluster 5.

Cluster 3—Assistive interaction interfaces addresses interactive models, such as the HAAT model, that connect physical devices (Cluster 2), adaptive solutions (Cluster 5), and smart environments (Cluster 4), highlighting their theoretical role in user-centred design.

Cluster 4—Assistive environmental technologies focuses on smart environments, such as automated homes, that connect to broad technologies (Cluster 1), physical devices (Cluster 2), interactive models (Cluster 3), and tailored occupational solutions (Cluster 5).

Finally, Cluster 5—Assistive systems emphasises adaptive solutions in occupational and everyday contexts, integrating with broad technologies (Cluster 1), physical devices (Cluster 2), interactive interfaces (Cluster 3), and intelligent environments (Cluster 4). This intersection between the clusters reflects the field's interdisciplinarity, promoting advances in design, accessibility, and technological inclusion.

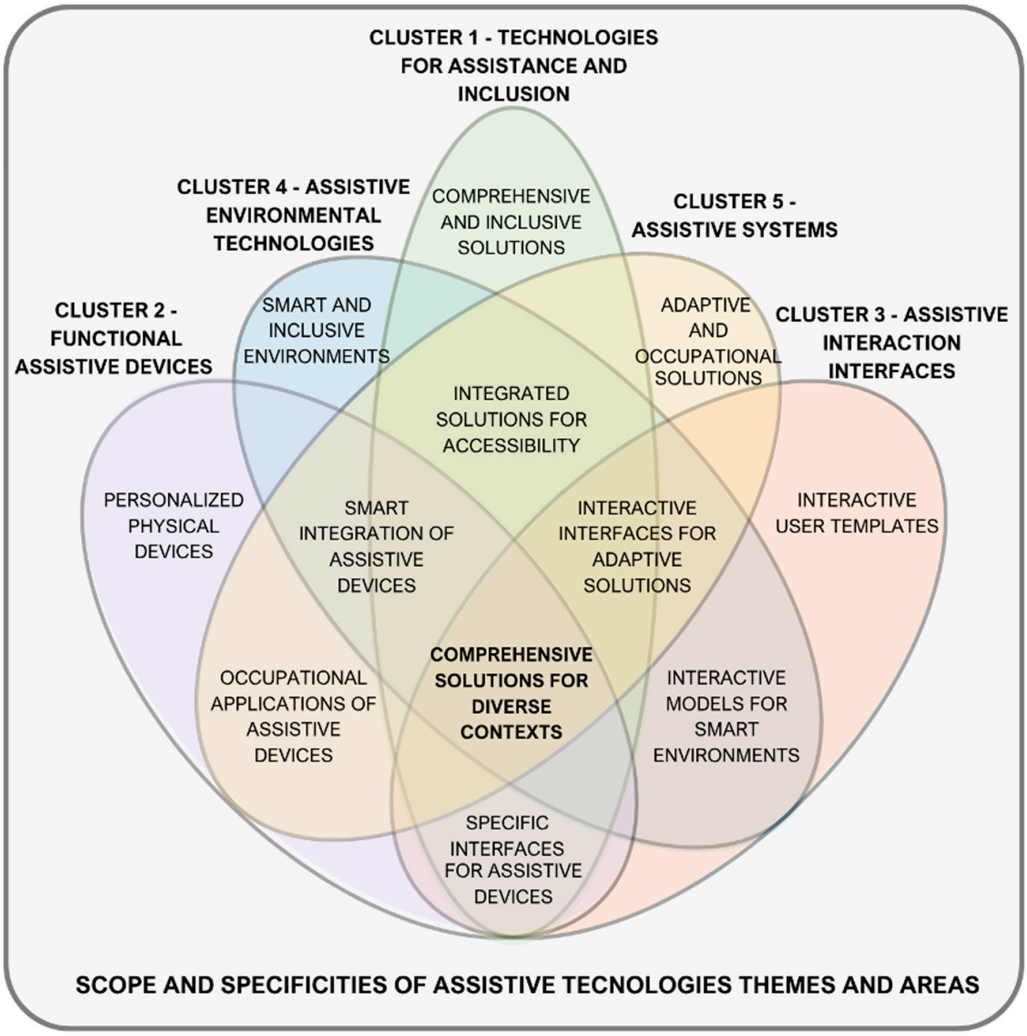


Figure 4. Analysis of relationships between AT clusters.

5.2. Ongoing Trends and Emerging Topics

Based on geographic and temporal analyses, as well as discussions about the scope and specificity of terms and clusters, a diagnostic analysis of the themes related to these

research areas was developed. In this sense, the main current trends and emerging topics suggested are presented below:

- Comprehensive and inclusive solutions for various contexts: Progress in AT has been steady and continues as a persistent trend, offering solutions that foster inclusion for people with disabilities. These advancements have begun to incorporate emerging technologies to develop inclusive solutions across various areas, utilising interfaces with ADs to deliver enhanced user experiences.
- Integrated solutions for accessibility and inclusion: A trend is emerging in considering enabling technologies and assistive solutions in an integrated manner, with assistive systems that account for the environment in which users are situated, utilising intelligent technologies to develop models and conceptual solutions.
- Adaptive solutions for occupational contexts: The increasing concern about integrating AT users into the job market underscores the growing need for adaptive solutions to support these individuals in the work environment. To this end, there is a trend toward integrating functional ADs with assistive systems, support technologies, and interactive interfaces, providing users with a better experience and a more inclusive perception of the job market.
- Interactive models of user-centred smart environments: With the advancement of smart technologies such as sensors, the Internet of Things, the cloud, big data, virtual reality, and others, there is already a trend towards inserting these into interactive models centred on the user and that consider this user as part of the environment, providing not only an experience of inclusion and accessibility but going further, offering all possible technological support to provide the desired independence and autonomy.

6. Conclusions

This article aimed to analyse and categorise the different terms used to describe AT based on their similarities and specific purposes, contributing to a conceptual understanding and structured, consistent scientific development. Through a detailed review of the literature, 16 terms were identified, which were later classified into five distinct clusters: Cluster 1—Technologies for assistance and inclusion, Cluster 2—Functional assistive devices, Cluster 3—Assistive interaction interfaces, Cluster 4—Assistive environmental technologies, and Cluster 5—Assistive systems.

The results of this study offer significant theoretical, practical, and social contributions. Theoretically, the proposed clusters facilitate a more integrated and comprehensive view of the concept of AT, contributing to structured and consistent standardisation in future studies. The classification guides researchers, developers, and public policy managers in identifying and prioritising technologies that best meet the needs of end users and the specific demands of each application context. The insights the research provided compel society to promote the more conscious and effective use of AT. With terminological standardisation, communication can be more effective and efficient, favouring communication between countries and sectors. In addition, the more effective use of AT, as addressed in the article, can expand social inclusion, autonomy for people with disabilities, and equity in access to essential technologies, thereby strengthening public policies and community initiatives aimed at accessibility.

However, this study has some limitations. The proposed classification was based on the available literature, which may need to fully reflect emerging practices or perspectives in AT. Additionally, the analysis was limited to academic sources and did not include reflections from users or professionals directly involved in the development and use of these technologies. Another limitation of this research is the absence of the terms “assistive product” and “technical aid” among the search keywords used in the database searches,

which may have influenced the results related to the generated terms, concepts, and clusters, as well as the observed trends. Furthermore, the suggested ongoing trends and emerging topics may not reflect the full range of research possibilities on these topics due to the scope and format of the SLR of this research.

It is suggested that future research explores empirical methods, such as interviews and case studies, to complement and validate the identified clusters. It would also be interesting to investigate how different terminologies influence the adoption and dissemination of AT in varied global and cultural contexts. Furthermore, this research approach could be expanded by considering the importance of the topic in healthcare settings and in communicating with individuals commonly marginalised by technology and healthcare infrastructure.

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