Evolving Trends in Communication Technology for Persons with Disabilities

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Abstract
The goal has been to conduct a global analysis of communication technology for people with disabilities. As a result, the purpose of this research is to categorize issues and concepts connected to the study of technological innovation. 6204 indexed papers from Scopus, issued by major publishers such as Springer, Emerald, Sage, MDPI, Taylor Francis, and ScienceDirect, were collected through descriptive analysis. The findings classified topics in the research of communication technology for people with disabilities into five categories: disability, disabled person, communication, adolescent, and education. Furthermore, it is linked to crucial concerns such as accessibility, quality of life, interpersonal communication, hearing impairment, and learning. This study implies how the conceptual findings of a study on communication technology for people with disabilities may assist in the development of a conceptual framework for future research. The study's limitation is that peer-reviewed publications were only acquired from the Scopus database. As a result, recommendations for future research necessitate the use of a comparative analytic approach, such as Scopus Databases and Web of Science (WoS).

Keywords: *communication; technology; disability; bibliometric*

Abstrak
Penelitian ini dilakukan untuk melakukan analisis global dari teknologi komunikasi untuk orang-orang dengan disabilitas. Tujuan penelitian ini adalah untuk mengkategorikan isu-isu dan konsep yang terkait dengan studi tentang inovasi teknologi. Analisis dilakukan pada 6204 jurnal yang diindeks dari Scopus, yang diterbitkan oleh penerbit utama seperti Springer, Emerald, Sage, MDPI, Taylor Francis, dan ScienceDirect, dikumpulkan melalui analisis deskriptif. Temuan ini mengklasifikasikan topik dalam penelitian teknologi komunikasi untuk orang-orang dengan disabilitas ke dalam lima kategori: disabilitas, orang dengan disabilitas, komunikasi, remaja dan aksesibilitas. Selain itu, penelitian ini terkait dengan isu penting lainnya seperti aksesibilitas, kualitas hidup, komunikasi interpersonal, gangguan pendengaran dan pembelajaran. Penelitian ini menyiratkan bagaimana temuan konseptual dari sebuah studi tentang teknologi komunikasi untuk orang-orang dengan disabilitas dapat membantu dalam pengembangan kerangka konseptual untuk penelitian masa depan. Pembatasan dari penelitian ini adalah bahwa publikasi *peer-reviewed* hanya diperoleh dari basis data Scopus. Akibatnya, rekomendasi untuk penelitian masa depan membutuhkan penggunaan pendekatan analisis komparatif lain, seperti *Scopus Database* dan *Web of Science (WoS).*

Kata kunci: komunikasi, teknologi, disabilitas, bibliometric

INTRODUCTION

As a researcher delving into the intersection of communication technology and disabilities, it's crucial to recognize the transformative potential such endeavors hold in enhancing the lives of individuals with diverse needs. Communication technology for persons with disabilities encompasses a broad spectrum of innovations aimed at mitigating barriers to communication, fostering inclusivity, and empowering individuals to participate fully in various aspects of life. Understanding the background of this research area involves acknowledging the historical and societal contexts that have shaped perceptions and approaches to disability. Historically, individuals with disabilities have faced significant challenges in accessing communication tools and resources, which has perpetuated

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marginalization and hindered their ability to engage effectively in society.

The emergence of communication technology has presented unprecedented opportunities to address these challenges. From the advent of basic augmentative and alternative communication (AAC) devices to advanced digital platforms and assistive technologies, there has been a remarkable evolution in the tools available to support communication for persons with disabilities. Moreover, research in this field extends beyond mere technological development. It encompasses interdisciplinary inquiries into human-computer interaction, accessibility standards, usability studies, and user-centered design principles. By integrating insights from fields such as psychology, sociology, and engineering, researchers aim to create communication technologies that are not only functional but also responsive to the diverse needs and preferences of users.

Furthermore, the proliferation of mobile devices, wearable technologies, and internet-based communication platforms has opened up new possibilities for enhancing accessibility and promoting social inclusion. From text-to-speech applications to gesture recognition systems and inclusive design frameworks, there is a growing emphasis on leveraging emerging technologies to create more inclusive communication environments.

Exposure to communication technology for persons with disabilities is related to adverse effects in several theories and concepts. *First*, assistive technology (AT) theory which explores how AT begins with design process, development, and implementation to support individuals with disabilities to perform functional devices. In recent years, physicians' technological choices for fulfilling the needs of people with disabilities have increased considerably. The increased capability of mainstream mobile technology (e.g., smartphones, and tablets) has created opportunities for fulfilling the demands of a larger segment of the worldwide disability population by developing application software. Universal design is increasingly making conventional items accessible to people with impairments. With advancements in specialized assistive technology, individuals with impairments may now satisfy their requirements more effectively than ever (Cook & Polgar, 2015). Second, the concept of Augmentative and Alternative Communication (AAC) involves devices and methods that help individuals with language or speech issues in terms of the communication process. AAC refers to a variety of methods and techniques used to improve the communication skills of kids and individuals with complicated communication requirements. It highlights the significance of tailoring AAC responses for specific requirements, as well as AAC's vital role in supporting social engagement, education, work, and health care. AAC emphasizes the need for clear communication within medical contexts to guarantee security for patients and outstanding care. In general, it is a vital resource for practitioners and caretakers striving to meet the communication requirements of persons with disabilities (Beukelman & Mirenda, 2013).

Furthermore, the digital divide theory investigates the disparity between individuals who have limited utilization of digital media and technology compared with those who do otherwise, alongside an emphasis on how this inequality affects people with disabilities who have access to communication tools. The digital divide idea emphasizes the enormous disparity between those who have disabilities and those without in terms of access to and usage of digital technology. This gap presents itself in multiple forms. People with disabilities frequently confront accessibility challenges, including the access and financial feasibility of adapting devices. Although physical accessibility is obtained, other hurdles linked to the usefulness of digital technologies might impede successful involvement. In addition, there is a gap in proficiency in digital technologies, with persons with disabilities frequently having fewer options for learning and education in digital competencies (Dijk, 2020). Lastly, the

social model of disability differs from the medical perspective of disabilities by emphasizing obstacles to society and biases that exclude persons with challenges. It highlights the importance of change in society for supporting people with impairments, notably using communication technology. The social model of disability is relevant to life experiences. Both impairment and environment are implicated in the experience of supporting the interactional conception of disability (Shakespeare, 2014).

Previous research has established that the text emphasizes that ICT is only a partial solution to social inclusion issues faced by people with disabilities. It highlights the importance of exposing disabilities in communication to fully realize the potential of ICT in addressing their needs. Society must change attitudes and work towards making the human and physical environment accessible, both in real and virtual spaces. Over-valuing technology can widen the digital divide and increase isolation for people with disabilities (Schreuer et al., 2014). A great deal of previous research into communication technology has focused on Individuals with developmental disabilities (SD) who face challenges in communication development and collaboration across various micro-environments. Policy implications include clarifying educational goals for communication among stakeholders in schools and homes (Wilder et al., 2015). ICT formed the central focus of a study (Konnerup, 2018) in which the author found that ICT and web-based community rehabilitation can benefit people with communication disabilities. It allows for self-expression and linguistic rehabilitation, transforming cognitive rehabilitation into a socio-cultural perspective. The virtual environment allows active participation, integrating formal and informal learning processes. Digital technologies can prompt language development, providing alternative voices and empowering learners with special challenges. This approach can help people with communication disabilities renegotiate their identity and communicate effectively.

However, despite these advancements, significant challenges persist. Issues such as affordability, interoperability, and equitable access remain barriers to realizing the full potential of communication technology for persons with disabilities. This indicates a need to understand the various perceptions of communication technology for persons with disabilities that exist in previous research. Additionally, there is a need for greater awareness and advocacy to ensure that the voices and experiences of individuals with disabilities are central to the design and implementation of these technologies. The research aims to explore communication technology for persons with disabilities, focusing on trends, challenges, and advancements in the field through a bibliometric analysis. In summary, the research background of communication technology for persons with disabilities is multifaceted, encompassing technological innovation, interdisciplinary collaboration, and a commitment to social equity and inclusion. By understanding this context, researchers can contribute meaningfully to the development of communication technologies that empower individuals with disabilities to communicate, connect, and thrive in an increasingly digital world.

METHOD

The best research strategy for achieving the goals of this study is a qualitative literature review study. This study's data came from an article that has received recognition on a global scale. Searching through a database is how data is collected (https://www. scopus.com/). One of the largest databases of citations and abstracts for the review literature, which includes academic journals, books, and conference proceedings, is Scopus (Yue, 2012). Open access and repository institutions were searched for in the Scopus database using the "Document Search" search option. The year of publishing, the organization that published it, the nation that published it, the name of the journal or publication, the kind

of document, and the research topic are then used to describe and analyze some data.

The data is transmitted in the RIS export file type for the sole purpose of delivering research mapping information. The collected information was subsequently exported by the researchers in (RIS) format. To visualize the bibliometric analysis of research progress based on the major issue regarding communication technology for persons with disabilities, then analyzed it using VOSViewer.

RESULT AND DISCUSSION

Trends in the Development of Research Studies on Communication Technology for Persons with Disabilities

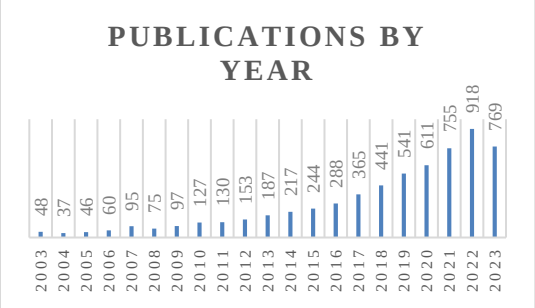

Figure 1. Publications by the year 2003-2023

Data collected by Scopus using VOSViewer, 2024

In the development of research in communication technology for persons with disabilities, overall, in the last five years, trends have a growth trend with more than 100 documents/year. Figure 1 shows the annual trend of publications related to communication technology for persons with disabilities. In this study, the data were taken from 2003 to 2023. The total number of data taken in the last twenty years was 6204. The data for 2003 there were 48 documents, 37 in 2004, 46 in 2005, 60 in 2006, 95 in 2007, 75 in 2008, 97 in 2009, 127 in 2010, 130 in 2011, 153 in 2012, 187 in 2013, 217 in 2014, 224 in 2015, 288 in 2016, 365 in 2017, 265 in 2017, 441 in 2018, 541 in 2019, 611 in 2020, 755 in 2021, 918 in 2022 and 769 articles in 2023.

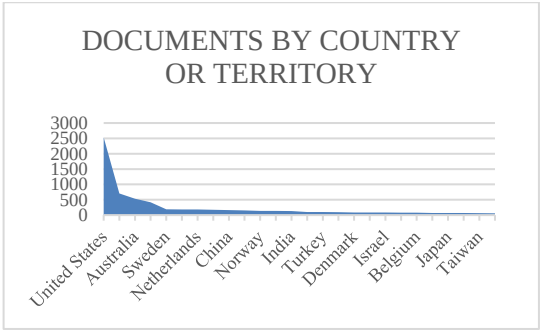

Figure 2. Documents by Country or Territory from 2003-2023

Data collected by Scopus using VOSViewer, 2024

From the findings in Figure 2, it can be seen that there are several documents regarding communication technology for persons with disabilities in various countries, including United States (2531), United Kingdom (705), Australia (534), Canada (417), Sweden (192), Spain (182), Netherlands (182), Germany (175), China (165), Italy (151), Norway (136), South Africa (136), India (133), New Zealand (102), Turkey (101), Finland (95), Denmark (86), South Korea (86), Israel (85), Ireland (81), Belgium (81), Malaysia (72), Japan (70), Indonesia (69), Taiwan (65) and Hongkong (58). There is a broad spectrum of research and applications aimed at enhancing the quality of life of people with disabilities.

There is a broad spectrum of research and applications aimed at enhancing the quality of life of people with disabilities. According to the categorization of communication technology for persons with disabilities in various countries is outlined in the sources mentioned below. The following is a classification of studies by country:

Table 1. Type of Classification of communication technology for persons with disabilities

Country	Type of Classification	Source
United States	New and emerging access technologies for adults with complex communication needs and severe motor impairments: State of the science	(Fager et al., 2019)
United Kingdom	Using ICT with people's special education needs: what the literature tells us	(Williams et al., 2006)
Australia	The mediating effect of information and communication technology usages on the Nexus between assistive technology and quality of life among people with communication disability	(Ali et al., 2020)
Canada	Shopping when you are deafblind: A Pre-Technology test of new Methods for Face-to-face Communication-Deafblindness and Face-to-Face Communication	(Vincent et al., 2021)
Sweden	Professionals and parents shared learning in blended learning networks related to communication and augmentative and alternative communication for people with severe disabilities	(Wilder et al., 2015)
Spain	Digital competence of university students with disabilities and factors that determine it. A descriptive, inferential, and multivariate study	(Cabero-Almenara et al., 2023)
Netherland	Communication partner training for SLT students: Changes in communication skills, knowledge and confidence	(Nikkels et al., 2023)
Germany	The global diffusion of social innovations an analysis of twitter communication networks related to inclusive education	(Schuster & Kolleck, 2020)
China	Inclusive communications in COVID-19: a virtual ethnographic study of disability support network in China	(Dai & Hu, 2022)
Italy	Technology-aided options for helping persons with multiple disabilities engage in communication behavior	(Lancioni et al., 2017)
Norway	The use and non-use of assistive technologies from the world of information and communication technology by visually impaired young people: a walk on the tightrope of peer inclusion	(Söderström & Ytterhus, 2010)
South Africa	Friendship experiences of young adults who use augmentative and alternative communication	(Dada et al., 2022)
India	English language teaching based on big data analytics in augmentative and alternative communication system	(Qian et al., 2022)
New Zealand	Teaching multi-step requesting and social communication to five autistic children using speech-generating devices and systematic instruction	(Sawchak et al., 2023)
Turkey	Library automation design for visually impaired people	(Yurtay et al., 2011)
Finland	Can the facilitated communication method support autistic people, according to facilitators opinions?	(Sipilä & Mättä, 2011)

Denmark	Telepresence robots for people with special needs: A systematic review	(Christensen et al., 2017)
South Korea	Social media use and well-being in people with physical disabilities: Influence of SNS and online community uses on social support, depression, and psychological disposition	(Lee & Cho, 2019)
Israel	Accessibility to information and communications technology for the social participation of youths with disabilities: A Two-way street	(Schreuer et al., 2014)
Ireland	Innovations for supporting communication: Opportunities and challenges for people with complex communication needs	(Smith, 2019)
Belgium	Blind faith in the web? Internet use and empowerment among visually and hearing impaired adults: a qualitative study of benefits and barriers	(Abeele et al., 2012)
Malaysia	Bridging the digital divide affecting persons with disabilities in Malaysia	(Ajrun, 2023)
Japan	A qualitative study on the function of information and communication technology utilization in teaching students with intellectual disabilities: Implications for techniques of teaching/job coaching	(Maebara et al., 2022)
Indonesia	Internet utilization by the students with visual impairment disabilities	(Hafiar et al., 2019)
Taiwan	Use of social media in uncovering information services for people with disabilities in China	(Wang et al., 2017)
Hongkong	Thinking styles and University self-efficacy among deaf, hard-of-hearing, and hearing students	(Cheng et al., 2016)

Visualization of the Research Development Map Network Communication Technology for Persons with Disabilities

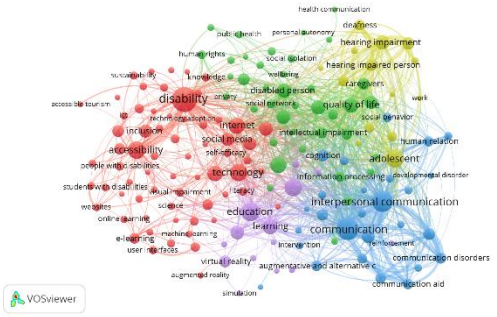

Figure 3. Network visualization by title from 2003-2023

Data collected by Scopus using VOSViewer, 2024

The visualization mapping results in Fig. 3 above show research on communication technology for persons with disabilities. By constructing a visualization network, overlay, and density using VOSViewer, bibliometric analysis was used to determine the network connecting subjects in 6204 papers that were downloaded from the Scopus database. There are nodes and edges in a bibliometric network that represent the strength of the link implied by distance. The correlation between nodes is more substantial depending on how close the distance among each of the nodes is. Communication and disability are intertwined since technology is a critical component of Information and Communication Technology. In the meantime, the acquisition of disability and technology have a strong connection. The VOS viewer analysis outcomes, which are displayed in the table below, can be used to visualize network title communication technology for persons with disabilities.

By default, the keywords disability, disabled person, communication, adolescent, and education are related to the keywords accessibility, quality of life, interpersonal communication, hearing impairment, and learning. The complete fill-in the title and abstract is organized into 5 clusters using VOSViewer. Each cluster from 1 to 5 is colored as follows: red, green, blue, yellow, and purple.

Table 2. Clusters' division and their items

Cluster 1 (65 items)	Access, accessibility, accessible tourism, artificial intelligence, assistive technology, augmented reality, behavioral research, computers, digital divide, digital inclusion, digital technology, disabilities, disability, disability studies, diversity, e-learning, education computing, educational technology, higher education, human-computer interaction, ICT, inclusion, inclusive education, information and communication technology, information technology, innovation, internet, intersectionality, knowledge, learning disabilities, learning systems, literacy, machine learning, media, mental health, mhealth, mobile phone, mobile technology, mobility, navigation, online learning, people with disabilities, perception, persons with disabilities, robotics, safety, science, self-efficacy, social inclusion, social media, social networking, special education, students with disabilities, sustainability, technological development, technology, technology adoption, universal design, usability, user interfaces, visual impairment, visually impaired, vulnerability, web accessibility, websites
Cluster 2 (34 items)	Caregiver, disabled person, empowerment, ethics, health care delivery, health care personnel, health communication, health personnel, health services, human rights, independent living, information processing, intellectual disability, intellectual impairment, medical information, participation, personal autonomy, policy, privacy, public health, quality of life, satisfaction, self-care, self-concept, self-help devices, social environment, social isolation, social justice, social network, social participation, social support, social work, telehealth, wellbeing
Cluster 3 (26 items)	Assessment, augmentative and alternative communication, cognitive defect, communication, communication aid, communication disorder, communication skill, computer program, developmental disorder, human relation, interaction, interpersonal communication, interpersonal relations, intervention, language, language disability, language therapy, motivation, reliability, social behavior, social interaction, software, speech disorder, speech therapy, verbal communication

Cluster 4 (14 items)	Adolescent, auditory rehabilitation, communication barrier, deafness, devices, emotion, health education, hearing impaired person, hearing impairment, hearing loss, rehabilitation, sign language, social stigma, work
Cluster 5 (14 items)	Awareness, computer interface, education, empathy, human experiment, learning, personal experience, reinforcement, simulation, smartphone, social skills, teaching, video game, virtual reality

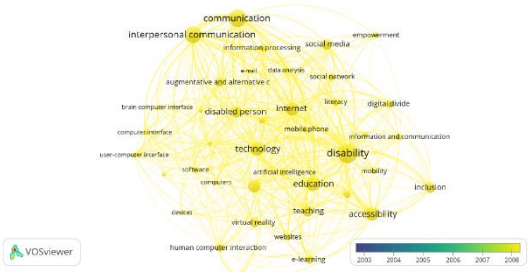

Figure 4. Overlay visualization title trend by the year 2003-2008

Data collected by Scopus using VOSViewer, 2024

Research on communication technology for people with disabilities in 2003-2005 in Figure 4 focused on themes related to technology, disability, and education. Some empirical research has been done with people with autism on the effect of technology in boosting literacy in general and spelling in particular. However, a study into the advantages has recently started. In addition, technology is a tool; it serves as a means to the aim of learning. Technology's influence is expanding beyond classroom integration to include curriculum infusion (Blischak & Schlosser, 2003; Jeffs, T., Morrison, W.F., Messenheimer, T., Rizza, M.G.m Banister, 2005).

Meanwhile, in 2005-2008, researchers began to discuss other themes such as inclusion, augmentative and alternative communication, and mobility. Proponents of the economic system admit that change will be gradual and that people with disabilities have limited faith that market forces will eventually produce accessible Information and Communication Technology (D'Aubin, 2007). To complement previous research, there is presently no proof that teaching children with autism how to use augmentative and alternative communication techniques will prevent them from speaking. Nevertheless, this comprehensive analysis implies that the observed improvements in speech production may differ between people and, even when they do, are often modest in size (Schlosser & Wendt, 2008).

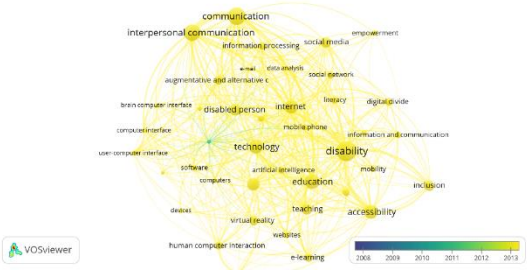

Figure 5. Overlay visualization title trend by the year 2008-2013

Data collected by Scopus using VOSViewer, 2024

Figure 5 displays research trends in 2008-2010, many researchers discussed themes related to computer programs, education, and information technology. This trend is in line with research findings which discuss that current evidence of the use of micro switch Voice Output Communication Aid (VOCA) technology combinations with people who have multiple disabilities show that caregiver-mediated stimulation opportunities may result from the VOCA, as an option for participants who have modest reactions to social attention only, and demonstrate the unmistakable support of university psychology students and post-graduate clinical trainees for the micro switch VOCA combination (Lancioni et al., 2009). Meanwhile using videoconferencing to

conduct functional analysis of challenging behavior and develop classroom behavioral support plans for students with autism research by (Machalicek et al., 2009) reinforce the education and information technology theme.

In the following years, 2011-2013, there were changes in trends in the themes of inclusion, accessibility, and education. Using data from previous case studies, the research highlights the topics of collaboration, access, procurement, and the continuous method of providing assistive technology. It discusses how ICTs can be used to support self-advocacy and inclusion, empower people with impairments, and combat misconceptions about disability (Ratliffe et al., 2012). Interestingly, there is still an absence of research in the field that emphasizes socially valid skills utilizing socially valid technologies, addresses the assistance required by both students with disabilities and others with disabilities, and involves natural communication partners (Fisher & Shogren, 2012).

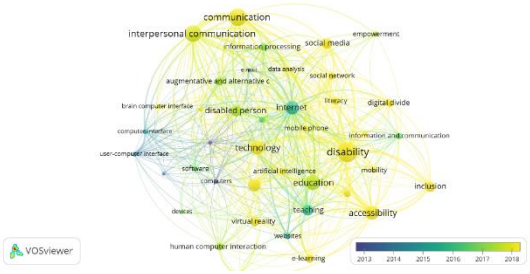

Figure 6. Overlay visualization title trend by the year 2013-2018

Data collected by Scopus using VOSViewer, 2024

In 2013-2104, research trends in communication technology for persons with disabilities mostly discussed websites, computer programs, and software. Research in terms of websites revealed that although full, entrenched universal access has not yet been realized, providing accessible e-government services has long been a governmental objective as seen in Figure 6. The gap between the implementation of the frequently ambiguous legal criteria and the realization of access for everyone is shown by the failure to develop accessible public websites (Easton, 2013). On the other hand, software theme research was shown by finding that over time, as long as the iPad solution kept the kid, teacher, and parent interested, the need for urging from a communication partner decreased. The case study demonstrates how a thorough access delivery strategy that mandates systematic training for students, teachers, educational assistants, and parents can enable the deployment of high-tech communication devices in classrooms for those with special requirements for communication (Desai et al., 2014).

Meanwhile, in 2015-2016, researchers focused on elaborating on information processing, information and communication, and teaching. Research related to information and communication found that the quality of the students' responses regarding the utilization of the platform for e-learning, the use of information system applications in administration, in the process of testing, and when interacting with the usability of the technology implemented was influenced by their prior experience using ICT. A few essential requirements that call for a more effective use of information systems, e-learning platforms, and ICT were found in the data gathered from the interviews (Bekteshi, 2015). In addition, the teaching themes research found that there were no technological variations in the impacts of the researcher or instructor, proving the effectiveness of the interventions. This finding supports the use of behaviorally based therapies in inclusive settings since it shows that teachers who are in charge of the regular education of children with ASD can carry out the intervention as successfully as researchers (Camargo et al., 2016).

In 2017-2018, research trends developed towards social media, assistive technology, and literacy. The use of social media in covering information services for people with disabilities in China produces research findings in the form that people with impairments typically have two types of

information needs: internal and external. Leisure, travel, and entertainment alongside assistive technology are the main internal demands. The primary external needs are those related to jobs, entrepreneurship, and life services (Wang et al., 2017).

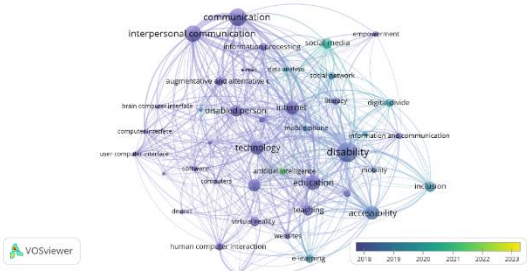

Figure 7. Overlay visualization title trend by the year 2018-2023

Data collected by Scopus using VOSViewer, 2024

Trends in research titles on communication technology for people with disabilities in 2018 in Figure 7 include themes related to technology, assistive technology, and augmented and alternative communication. Users of augmentative and alternative communication (AAC) engage in intricate sociolinguistic and cultural spaces. They are surrounded by spoken language groups, yet to take part as speakers in social interactions, they may use unusual communication methods, such as speech-generating systems that distinguish them as "other" (Smith, 2018). Meanwhile, in 2019, the themes that emerged were e-learning, accessibility, and social media. (Lee & Cho, 2019) emphasizes that demonstrated that using SNS and online communities was generally linked to improved well-being. This study not only increases our understanding of the context and well-being effects of participating in digital social interactions for individuals with physical disabilities, but it also supports the need to support and encourage, albeit cautiously, social media use among people with disabilities.

In the following year 2020, researchers focused more on data analysis, digital devices, and technology adoption. Research on how seniors and people with disabilities adapt a new technology, although it has been demonstrated that technology may be successfully incorporated into the lives of those with disabilities, many of them lack access to technology, such as a computer with an internet connection (Kyung & Park, 2020). To complete the previous research, in 2021-2023, a lot of research was carried out regarding the themes of artificial intelligence, mobile applications, and virtual reality. There is an obvious need to create a system that makes it easier for children with Intellectual Disabilities to communicate and receive health information, one that informs caregivers and educators, reduces errors, and ultimately enhances these people's academic achievement and standard of life (Kharbat et al., 2021). Also, the use of the social mobility orientation model and mobile application-based communication to address the issue of comprehending the college setting notion in the Special Education Department of undergraduate students for visually impaired students showed its validity (Pamuji & Surabaya, 2022). Lastly, IMercyVE, a specially created virtual reality software, provided participants with a novel experience and a unique way of learning that helped participants develop their capacities of empathy and showed that participants' empathy rose after using it (Wilding et al., 2023).

CONCLUSION

Within the past five years, there has been an apparent increase in the quantity of research conducted on communication technologies for people with disabilities, including over a hundred new publications published yearly. This study examines data from 2003 to 2023 and discovers the fact that there are several studies on communication technologies for people with disabilities in numerous nations. The study emphasizes the importance of understanding the multifaceted nature of communication technology for individuals with disabilities to empower them in a digital world. Given that technology is an

essential part of information and communication technology, the development of disability and technology are closely associated.

The study on communication technology for people with disabilities underlines the necessity of overcoming cost, interoperability, and equal access constraints. This study points out the persistent challenges such as affordability, interoperability, and equitable access that hinder the full potential of communication technology for persons with disabilities. It emphasizes the need to raise awareness and advocate for the inclusion of people with disabilities' voices and experiences in the design and deployment of these technologies.

Research trends have developed throughout time, with an emphasis on social media, assistive technology, literacy, and education. Understanding this diverse environment allows academics to make substantial contributions to the creation of communication tools that enable people with disabilities to interact, connect, and flourish in the digital age. Overall, this study strengthens the need for greater awareness, advocacy, and inclusion of individuals with disabilities in the design and implementation of communication technologies to address existing barriers effectively.

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