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Identifying Future Trends in AI-Driven Assistive Technologies: Insights from a National Delphi Survey of Stakeholder Perspectives

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Abstract

Advancements in assistive technologies (ATs), particularly those powered by Artificial Intelligence (AI), have significantly enhanced the quality of life and independence of individuals with various disorders, thus fostering progress in education, employment, social engagement and well-being. Despite these advancements, significant challenges remain in the implementation of such technologies in various domains, emphasizing the necessity for deeper exploration of their future development. This study examines the future trends and perspectives of ATs, providing valuable insights from a national context and comparing the results with those of international Delphi research. Using a two-round Delphi method, we engaged a panel of 23 experts from Bulgaria, representing disability organizations, academia and practice. Ten future-oriented projections were assessed, while participant demographics and attitudes toward ATs were also analyzed. The survey's statistical findings indicate a moderate consensus among the Bulgarian experts. They demonstrate cautious optimism about the use of ATs, especially AI-driven technology, for individuals with disabilities. The results are similar with those of the international study, with only few differences, highlighting the shared perspectives of experts at both national and international levels. The research offers valuable insights into emerging trends in AI-driven ATs and provides valuable knowledge for policymakers, researchers and developers seeking to align innovation with the expectations of diverse stakeholders.

Keywords: assistive technologies; AI; Delphi survey; disabilities; perspectives

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1. Introduction

Assistive Technologies (ATs) encompass a variety of products, services or systems created to assist individuals with disabilities in performing specific tasks. By promoting independence, ATs enable people with disabilities to access education, secure employment and fully participate in society. With the development of Artificial Intelligence (AI), the field of ATs has advanced considerably. By utilizing algorithms and data-driven insights, AI enhances the capabilities of assistive tools, making them more efficient and effective than before and expanding their potential applications.

ATs, particularly those integrated with AI, hold promise for creating more personalized, adaptive and user-centered solutions that can better address the diverse needs of

individuals with disabilities. At the same time, the fast development of AI raises important questions regarding the accessibility and affordability of such technologies. Understanding both the opportunities and challenges of integrating AI into ATs is therefore critical for guiding future research, policy and practice.

1.1. ATs for People with Disabilities

According to the World Health Organization (WHO), assistive technology products are related to "products that maintain or improve an individual's functioning and independence, thereby promoting their well-being" [1]. The Organization [1] also states that ATs encompass the skills, knowledge, systems and services necessary for their effective delivery. This comprehensive approach is clearly illustrated in WHO's 5P model, which positions the individual at the center, surrounded by four key components: policy, products, provision and personnel [2].

Similarly, the Convention on the Rights of Persons with Disabilities (CRPD) underscores States Parties' obligations to promote research, development and availability of accessible and affordable technologies, and to ensure that persons with disabilities have access to relevant information and support [3]. Article 20, for example, outlines the measures that States Parties are expected to take to enhance personal mobility, including facilitating access to ATs, while article 32 focuses on the significance of fostering international cooperation to support national initiatives in achieving the goals and objectives of this Convention. Some of the measures included refer to "providing, as appropriate, technical and economic assistance, including by facilitating access to and sharing of accessible and ATs, and through the transfer of technologies". As we can see, the CRPD emphasizes the development, availability and accessibility of ATs, ensuring that persons with disabilities have access to relevant information and support.

Building on this, MacLachlan et al. [4] highlight the significant role ATs can play in enhancing access to education and employment, thereby improving overall well-being and fostering social inclusion and quality of life.

1.2. ATs and Education

In terms of education, the UNESCO–Weidong Group project on "Leveraging ICT to Achieve Education 2030" emphasizes that information and communication technologies should be utilized to enhance education systems, improve knowledge sharing, expand access to information, support high-quality and effective learning, and enable more efficient service delivery [5]. In this context, AT can play a key role in improving communication and enhancing the academic performance of individuals with various disabilities. AT can also enhance cognitive skills and help manage challenging behaviors. It has the potential to boost an individual's self-esteem and strengthen the teacher–student relationship. The use of AT can benefit individuals by supporting the development of their academic, social and employment skills [6]. A number of studies report the positive effects of AT on students' academic performance and improved learning [7–9]. In their 2019 systematic review on the use of AT for students with disabilities in higher education, McNicholl et al. [10] identified four key themes: AT as a promoter of academic engagement, barriers to effective ATs use that can impede academic participation, the transformative potential of AT from a psychological standpoint, and ATs as a catalyst for enhanced participation. ATs, including Socially Assistive Robots (SARs), are progressively being used to enhance communication skills in children and adolescents [11]. A systematic review of the findings suggests that the proper use of ATs significantly improves the inclusion of students with disabilities. Many studies [9,12] have emphasized the importance of proper training for teachers in using ATs programs. Byrd and Leon [13] identified three main barriers to the use of specialized

ATs for students with disabilities: limited availability and accessibility of ATs, high costs and insufficient funding, and inadequate training in using virtual devices and platforms. Other studies confirm similar obstacles, such as inadequate teacher education, insufficient information or accessibility challenges [14].

1.3. ATs and Employment

Regarding employment, a systematic review [15] was conducted to evaluate the evidence supporting the use of AT in the workforce. The search criteria included individuals with cognitive disabilities, the use of an AT tool or device and participation in vocational training or active employment. AT interventions showed favorable results in job performance, including higher accuracy and task completion rates, as well as increased independence and the ability to generalize skills. According to one of the latest Eurostat datasets, "Disability Employment Gap by Level of Activity Limitation and Sex" (2021), the dataset reported a disability employment gap of 23.1% in the EU, with a stable trend observed from 2014 to 2021. It revealed that 16.1% of people with disabilities were inactive and not seeking employment due to their own illness or disability, while 11.4% were inactive due to caregiving responsibilities. Additionally, 19.8% of individuals aged 16 and over with no activity limitations were at risk of poverty or social exclusion, compared to 30.6% of those with some or severe activity limitations [16]. Using 2017–2021 American Community Survey and 2014 Survey of Income and Program Participation data, together with data from the 2012, 2019 and 2021 Current Population Survey (CPS) Disability Supplements, the authors in [17] observed that nearly all types of impairments and activity limitations are associated with lower employment rates and earnings, with mobility impairments particularly affecting employment and cognitive impairments leading to lower earnings. From 2012 to 2021, about 10% of workers with disabilities received accommodations, and 3–4% received equipment-based accommodations, with slight increases over this period. Occupations with higher rates of disability accommodations saw more disability employment growth, but the disability pay gap did not decrease significantly in these fields. The findings in [18] reinforce the idea that sustainable ATs can play a crucial role in empowering persons with disabilities, especially in improving their employment opportunities in the Kingdom of Saudi Arabia. Moreover, the results suggest that it is important for governments and other stakeholders to regularly evaluate the use of those technologies in the workplace and take steps to enhance their accessibility, affordability and usability. A recent scoping review discussed employment-related ATs for autistic individuals using eight databases and relevant references, and articles from peer-reviewed studies published between 1998 and 2022 [18]. The results indicated that few studies focused on job performance or retention. The majority of ATs were used passively, with minimal training or involvement from users. The authors recommend active learning, thorough methodologies and interdisciplinary collaboration to enhance the use of AT in the workplace.

Despite the potential of ATs, significant challenges persist in its implementation for different disorders. Key issues include accessibility concerns, such as high costs, lack of training and insufficient customization. Additionally, there is often inadequate training for caregivers and educators, leading to improper or underutilized technology. A major problem is the mismatch between the needs of these populations and the design of AT products, which results in technology abandonment. Many devices are developed without enough input from end-users or professionals, making them less suited to the specific challenges of the disorders. This highlights the need for more inclusive design processes involving participatory research. Finally, while technological advancements offer new solutions, their long-term sustainability and support remain uncertain, especially in resource-limited regions [19].

Based on the explored concepts, this Delphi study seeks to address the following primary Research Question (RQ):

- RQ1: What are the expectations regarding the implementation of ATs by 2030 in Bulgaria according to experts?

It also aims to answer several additional Research Questions (RQs), including the following:

- RQ2: What trends are considered most desirable by experts on a national level in the field of ATs to support the social inclusion of people with disabilities?
- RQ3: How do experts view the medium-term impact of using ATs on the social inclusion and quality of life of people with disabilities?
- RQ4: What challenges do experts identify in the implementation and adoption of ATs for people with disabilities?

Although ATs have advanced considerably, barriers related to accessibility, cost and usability remain. Such challenges often lead to limited adoption or even abandonment of these technologies, highlighting the need for inclusive approaches in their design and deployment. In this context, the present study employs a national Delphi survey to explore expert views on the future trends of AI-driven ATs in Bulgaria, providing evidence from a national setting while also contributing to the international research in this area.

2. Materials and Methods

2.1. The Delphi Method

The Delphi technique is a structured method for making predictions by gathering the collective insights of a group of experts. The questionnaire employed in this study is the first author's contribution and is grounded in the Delphi technique. This method follows a structured process for forecasting, drawing on the collective expertise of a panel of specialists. It facilitates the coordination and management of a structured discussion among experts and is based on four key principles: anonymity, iterative rounds, controlled feedback and statistical group responses [20]. In recent decades, the Delphi method has played an essential role in shaping best practice guidelines, particularly in contexts where research is limited or logistical barriers are present [21]. Beiderbeck et al. [22] offered valuable perspectives on the wide array of opportunities for utilizing data gathered through the Delphi method, encouraging researchers across different fields to undertake such studies and possibly expanding the method's areas of use.

We used a two-round sequential Delphi approach. A diverse group of national experts, including specialists from disability organizations, academia and practice, was selected. To explore future developments in ATs, a previous study [19] conducted a conceptualization workshop to guide projection creation. Experts from the same stakeholder groups collaborated to generate an initial list of 28 projections across five categories: politics, education, technology, employment and society. These projections were then reviewed and ranked, and the top 10 highest-ranked projections were selected for inclusion in the Delphi study. Building on international Delphi research [19], the current study used those projections to explore the perspectives of Bulgarian specialists on future trends in AI-driven ATs to gain insights on a national level. The survey was distributed online, and responses were first checked for completeness to ensure that each participant completed all tasks. Data processing and analysis were performed using Python, version 3.11 and its libraries, including calculations of expected probability, consensus measures and Likert-scale summaries for desirability and impact. Visualizations were used to support the interpretation of the results. To calculate consensus among experts, it was necessary to account for the fact that the three dimensions—expected probability, desirability and impact—were measured on different scales. Expected probability was recorded in 10% intervals ranging from 0% to

100%, while desirability and impact were measured on a seven-point Likert scale. To make these values directly comparable, we applied MinMax scaling from the Scikit-learn Python library, which transforms each variable to a standard range between 0 and 1. After normalization, a consensus score was calculated for each projection by averaging the three scaled values. This allowed us to combine the dimensions consistently, ensuring that no single dimension disproportionately influenced the consensus measure and enabling a correct assessment of expert agreement across all aspects. The projections can be seen in Table A1. Table A2 shows the participants' age, gender, academic degree, stakeholder group and level of expertise. For better visualizations in the current paper, we used the short versions of the statements. To increase the practical value of the Delphi projections, it is essential to link each of them with concrete implications for policy and design. The dimensions which were measured in the study were expected probability (from 0 to 100%), desirability (a seven-point Likert scale ranging from 1 = not desirable at all to 7 = very desirable) and impact in case of occurrence (a seven-point Likert scale, ranging again from 1 = not impactful at all to 7 = very impactful). Participants were also allowed to write comments for each projection, including text boxes to justify their assessments. In the second round, participants were given the opportunity to revise and modify their initial evaluations after the first round. We then analyzed the results using the Python programming language and its libraries. The study took place between April 2023 and December 2023. While Delphi surveys usually focus on long-term predictions (i.e., over 10 years), we tried to understand the trends and the medium-term impacts, as these insights would provide valuable practical input. The deadline for evaluating the potential realization of each projection was set for the end of 2030.

2.2. Selection of Stakeholders

In this national survey, our goal was to gain insights into potential trends in the domain of ATs and to involve different stakeholder groups. The ideal number of members for a Delphi group is a topic of debate. While some researchers recommend a group size of 15 to 30 members for highly homogeneous groups and 5–10 members for heterogeneous groups [23], we included 23 participants in our study. This number balances diversity and expertise as our panel consisted of highly knowledgeable representatives from the relevant stakeholder groups, which is a key condition for Delphi research. Experts were considered knowledgeable if they held academic qualifications and had at least three years of practical experience in the field of ATs, disability services or related domains, and representative if they were drawn from diverse stakeholder groups, including academia, practitioners or disability organizations. Some authors also state that a Delphi panel may include anywhere from fifteen to over sixty experts, depending on the study design [24]. Nevertheless, they emphasize that it is essential to select participants who have sufficient knowledge in their respective field and are willing to engage in multiple rounds of questions on the same topic [24]. Participants in our study were selected based on having at least three years of experience in the field of disabilities, ensuring an appropriate level of expertise. The participants' ages ranged from 25 to 63, with most (9 experts) falling within the 35–44 age group.

Consensus among the experts was assessed using predefined thresholds. Responses regarding desirability and impact if the event occurs were rated on a 7-point Likert scale, while responses regarding the expected probability were rated on a scale from 0 to 100%. Agreement was classified as follows: $\geq$75% of participants endorsing an item indicated high consensus, 50–74% indicated moderate consensus, and <50% indicated low consensus. Most Delphi studies do not specify a consensus threshold in advance and the reported range for accepted agreement is quite broad (50–97%). Across the studies, the median

threshold commonly considered indicative of high consensus is 75% agreement among participants [25].

An open link was shared with the participants via email, allowing each expert to enter their email address as a unique identifier. During this phase, participants were informed about consent and anonymity, with clear explanations that their email address would serve solely as an identifier for reviewing their previous responses at a subsequent phase. This study has met the ethical standards for scientific research involving human participants, ensured participant anonymity, and has received Ethics Commission's approval for implementation.

2.3. Implementation of the Delphi Survey

The online format of our study provided stakeholders with the flexibility to complete the questionnaire at their convenience. Additionally, participants were able to review the evaluations of other experts after finishing the survey, allowing them to reassess and adjust their scores, which is a key feature of Delphi studies [19].

The first round took place from April 2023 to August 2023, while the second round ran from September 2023 to December 2023. A total of 23 participants from various cities across the country agreed to take part. To ensure clarity on the process, we provided a detailed explanation of the Delphi study via informed consent procedures.

3. Results

To enhance clarity regarding future trends explored in this Delphi study, the findings are organized in alignment with the research questions outlined in the Introduction. The results are presented alongside critical analysis and discussion.

3.1. What Is the Expected Probability of the Proposed Scenarios Becoming Reality by 2030 for People with Disabilities by Experts on a National Level?

An essential element of a typical Delphi survey involves estimating the likelihood of specific scenarios occurring in the near future. In our study, these anticipated outcomes were associated with various dimensions of ATs, including education, society, service provision, employment and politics. All were considered within the context of the year 2030, offering valuable insights into emerging future trends in the use of ATs. As illustrated in Figure 1, all projections have an overall likelihood exceeding more or less 50%, which reflects a generally moderate optimism by Bulgarian stakeholders about their potential realization by 2030. In particular, projection 4, "By 2030, personalized/multilingual devices with Artificial Intelligence (AI) will have been developed so that vision-impaired people can read and generate written texts" and projection 9, "By 2030, there will be trainings for people in public services on how to address a person with Autism Spectrum Disorder (ASD)" have probabilities over 65%. This indicates that Bulgarian experts view multilingual and personalized devices as feasible and achievable by 2030. The stakeholders also expect growth in professional development opportunities within the public service and education field. Moderate probabilities for the other projections indicate ongoing uncertainties, highlighting the need for strong policy, training and inclusive design to achieve meaningful progress. The results are comparable to the ones of international Delphi research [19].

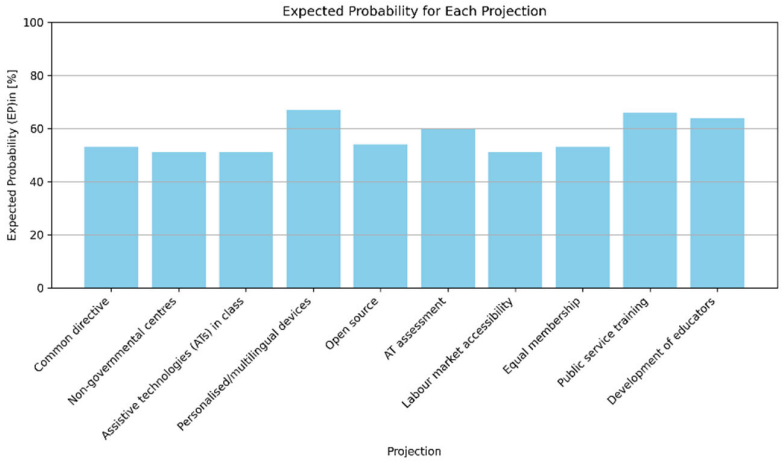


Figure 1. Graphical representation of the expected probability by the Bulgarian experts in the study (N = 23). Source: authors' elaboration.

3.2. What Trends Are Considered Most Desirable by Experts on a National Level in the Field of ATs to Support the Social Inclusion of People with Disabilities?

Figure 2 shows the desirability levels of the trends related to AT. Desirability has been assessed via a 7-point Likert scale. It can be seen that the levels of this dimension across all projections exceed five out of seven, indicating relatively high desirability. These levels are similar to the ones reported by the European stakeholders in the international Delphi study [19]. The projection with the highest desirability (exceeding six) in the national survey was projection 10—"By 2030, the use of ATs is included in the professional development of educators in mainstream schools". In second place is projection 9 (with desirability of six)—"By 2030, there will be trainings for people in public services on how to address a person with ASD". These results suggest that the specialists do hope the use of ATs will be included in the professional development programs of teachers in each school across the country, as well as among professionals in public services. As a whole, ATs are considered beneficial in supporting the social inclusion of people with disabilities. Bulgarian experts strongly value ATs for education, public services and social inclusion, emphasizing teacher training and service capacity as essential to effective adoption. These priorities emphasize the need to acquire AT skills in professional development.

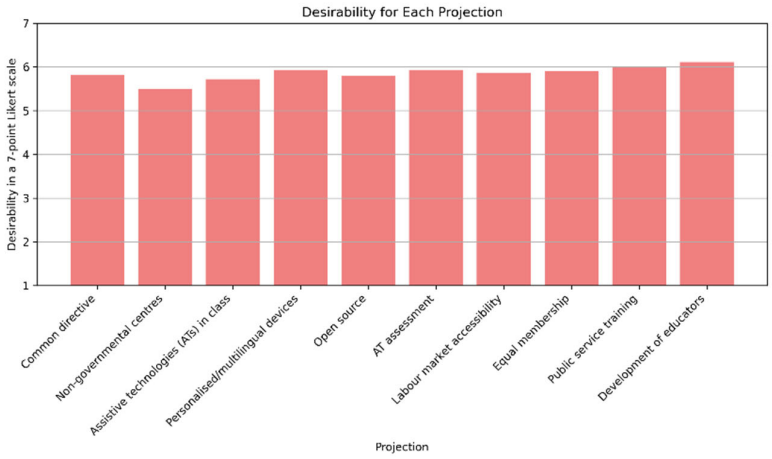


Figure 2. Graphical representation of the expected desirability of the proposed scenarios on a national level (N = 23). Source: authors' elaboration.

3.3. How Do Experts View the Medium-Term Impact of ATs on the Social Inclusion and Quality of Life of People with Disabilities?

Figure 3 illustrates the likely medium-term impact of ATs in the proposed scenarios. The projections with the highest impact in case of occurrence (around six out of seven) are projection 6—"By 2030, service providers/practitioners will be able to conduct comprehensive assessments for appropriate AT according to the specific needs of people with disabilities" and projection 10—"By 2030, the use of ATs is included in the professional development of educators in mainstream schools". The findings indicate that the experts believe it is crucial for practitioners to be able to perform evaluations to ensure appropriate ATs are matched to the relevant disabilities. According to the experts, ATs' adoption depends not only on technology but also on the capacity of professionals to apply it appropriately. The specialists also think that educators should receive training to effectively use ATs. Generally speaking, the levels of impact are similar to those of desirability. This correlation indicates consistency that reinforces the respondents' views on the potential benefits of ATs on the social inclusion and quality of life of people with disabilities. The findings highlight the importance of aligning technological advancement with the professional development of educators to fully realize the promise of assistive technologies.

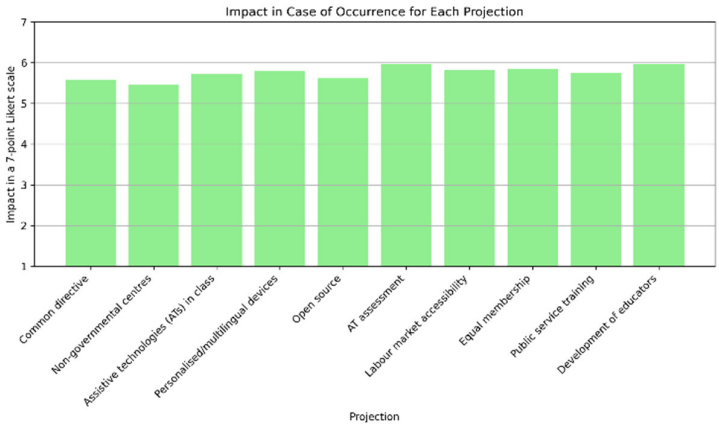


Figure 3. Graphical representation of the expected impact of the proposed scenarios on a national level (N = 23). Source: authors' elaboration.

3.4. What Challenges Do Experts Identify in the Implementation and Adoption of ATs for People with Disabilities?

Another part of the current study examined potential challenges that might prevent the scenarios discussed in the ten projections from becoming a reality. These challenges were categorized as political, economic, technological and social. The economic challenges were viewed as the most essential barriers according to the respondents. They were the most prominent for projection 3—"By 2030, each European school has developed a methodology for using AT in class", projection 4—"By 2030, personalized/multilingual devices with Artificial Intelligence (AI) will have been developed so that vision-impaired people can read and generate written texts", projection 5—"By 2030, AT will be based on open source hardware and software making it accessible to users and caregivers" and projection 10—"By 2030, the use of ATs is included in the professional development of educators in mainstream schools". The findings suggest that factors such as high costs, economic instability and unequal resource allocation could impact the development and distribution of ATs in different contexts. Economic issues were the most significant ones in the international Delphi study as well [19]. Political challenges are the next most frequent challenges. This means that political cooperation is essential for the realization of the scenarios outlined in the projections. Technological challenges were seen as the least significant across most of

the projections, indicating that while technology is not a major barrier, success will depend heavily on sustained funding, policy alignment and societal engagement. The results are summarized in Figure 4 below.

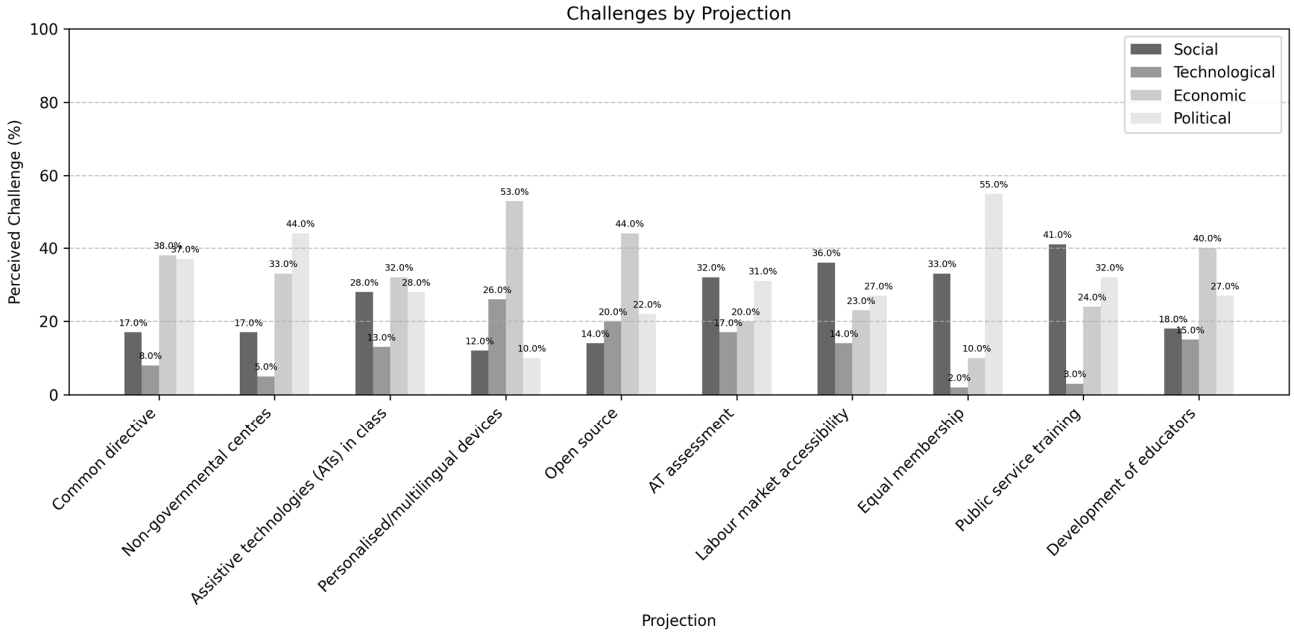


Figure 4. Graphical representation of the challenges identified by Bulgarian experts in the study (N = 23). Source: authors' elaboration.

3.5. What Is the Level of Consensus Score Across the Projections?

We tried to assess whether the aforementioned results are consistently relevant across all projections in terms of the three dimensions—expected probability, desirability and impact in case of occurrence. The results are presented in Table 1.

Table 1. Consensus score among the participants (N = 23). Source: authors' elaboration.

Projection—Short Version	Consensus Score
1. Common directive	0.284
2. Non-governmental centers	0.000
3. ATs in schools	0.294
4. Personalized/multilingual devices	**0.783**
5. Open source	0.321
6. AT assessment	**0.756**
7. Labor market accessibility	0.442
8. Equal membership	0.517
9. Public service training	**0.773**
10. Development of educators	**0.938**

The results in Table 1 show the mean score for each projection. As it can be seen, the projection with the highest consensus score in terms of expected probability, desirability and impact is projection 10 (0.938)—"By 2030, the use of ATs is included in the professional development of educators in mainstream schools". This strong agreement among the Bulgarian experts could be due to a common understanding of education's importance. Education is widely regarded as essential for both global and local community, and enhancing educator capabilities is seen as a long-term investment in society and overall economic growth. The other projections with a high level of consensus have similar scores (around 0.7). These are projection 4—"By 2030, personalized/multilingual devices with Artificial

Intelligence (AI) will have been developed so that vision-impaired people can read and generate written texts", projection 6—"By 2030, service providers/practitioners will be able to conduct comprehensive assessments for appropriate AT according to the specific needs of people with disabilities" and projection 9—"By 2030, there will be trainings for people in public services on how to address a person with ASD". The experts believe in the value of personalized devices with AI which could assist people with visual impairments. The participants also are optimistic that practitioners will be trained in how to choose appropriate AT based on the special needs of people with disabilities. In addition, the stakeholders think that the people in public services will be trained in how to address a person with ASD by 2030 to a great extent. The results are similar to the ones in the international Delphi study, except for two, related to the establishment of NGO centers on which the European stakeholders reached a consensus.

4. Discussion

The current national Delphi study examines mid-term future trends in AT within a national context. The survey addressed the primary Research Question—"What are the expectations regarding the implementation of ATs by 2030 in Bulgaria according to experts?" In response to RQ1, the study reveals moderate optimism in the mid-term. Experts showed strong confidence in the realization of the scenarios related to the personalized devices and training for public service personnel. These scenarios received probability ratings above 60%, suggesting a general expectation that technological and policy advancements will foster significant progress.

Regarding RQ2—"What trends are considered most desirable by experts on a national level in the field of ATs to support the social inclusion of people with disabilities?"—the study found that the projections were considered relatively desirable, especially the scenarios related to educator development and public service training. The overall consistency in desirability ratings across the participants indicates a shared recognition of the vital role ATs play for people with disabilities.

In terms of RQ3—"How do experts view the medium-term impact of using ATs on the social inclusion and quality of life of people with disabilities?"—the survey indicated an overall optimistic perspective. The results are comparable to the scores for desirability. This alignment between desirability and impact points to a shared belief among the stakeholders that the suggested initiatives are not only appealing but also capable of delivering essential benefits for people with disabilities. Here, the most impactful scenarios could be the ones associated with the AT assessment and the development of educators in mainstream schools. The relatively high impact scores suggest that the stakeholders recognize the potential of ATs to enhance the social inclusion and the quality of life of these populations.

As for the final RQ4—"What challenges do experts identify in the implementation and adoption of ATs for people with disabilities?"—the results indicate that the biggest challenges for the proposed scenarios becoming reality are political and economic. By comparison, technological barriers were viewed as relatively minor, with the majority of experts emphasizing that the key to successful AT implementation lies in overcoming economic, political and social challenges.

Consensus among participants is a crucial component of any Delphi study, and this was clearly evident across all ten projections in relation to the three key dimensions —expected probability, desirability and impact. Notably, the highest levels of agreement were found in projections related to educator development, public service training, personalized devices and AT assessment, highlighting a common understanding of the significance of these aspects in the field of AT. These results reflect a shared stakeholder belief that prioritizing key initiatives in those domains is essential for achieving meaningful progress

in the adoption of ATs. Luckily, these findings on expert consensus align with ongoing national efforts to expand access to assistive technologies. For example, the Bulgarian government has launched a project to provide over 2000 individuals with permanent disabilities access to high-tech assistive devices. Under this initiative, recipients will receive certificates enabling them to select appropriate aids from a list of approved suppliers[1].

To increase the practical value of our Delphi study, it is essential to present practical implications for policy and design. Building on the findings, the Table 2 below links each projection with concrete policy and design recommendations. These implications provide practical guidance for planning and implementation efforts across education, employment, technology and social inclusion.

Table 2. Practical implications for each projection. Source: authors' elaboration.

Projections—Long Version	Practical Implications
1. By 2030, all European national ministries of education, public health, social welfare and labor have established a common directive for access to ATs in each school.	Developed cross-sectoral national guidelines for ATs provision in education, health, welfare and labor.
2. By 2030, non-governmental centers in each European country will work closely with healthcare and rehabilitation service providers at the municipal level.	Established formal partnership frameworks between NGOs and municipal rehabilitation/health services.
3. By 2030, each European school has developed a methodology for using ATs in class.	Funded pilot programs and created practical toolkits to help teachers integrate ATs in classroom,
4. By 2030, personalized/multilingual devices with AI will have been developed so that vision-impaired people can read and generate written texts.	Funding by governments for universal design and AI-driven ATs, including multilingual features,
5. By 2030, ATs are based on open-source hardware and software making it accessible to users and caregivers.	Open-source AT platforms through EU/national investment.
6. By 2030, service providers/practitioners will be able to conduct comprehensive assessments for appropriate ATs according to the specific needs of disabled people.	Established certified AT assessment training.
7. By 2030, the digital labor market (e.g., remote, freelance, or online work) is fully accessible for people with ASD and/or intellectual disabilities.	Provision of tailored digital skills training for people with ASD/ID.
8. By 2030, people with disabilities are equal members in policy discussions in each European country.	Mandate representation quotas in policymaking bodies.
9. By 2030, there will be training for people in public services on how to address a person with ASD.	Mandatory ASD-awareness training for public service workers.
10. By 2030, the use of ATs is included in the professional development of educators in mainstream schools.	Accredited national ATs professional development courses into teacher training programs.

5. Conclusions

In summary, the national Delphi study suggests a generally hopeful perspective on the future of ATs by 2030. Experts expect significant advancements, particularly in areas such as customized devices, educator training and enhancements in public services. There is strong agreement that these initiatives have the potential to positively impact the lives of people with disabilities. While technology-related issues are considered less problematic, the main challenges identified are political and economic. Overcoming these barriers will be crucial to realizing the full potential of AT in the years ahead.

Limitations and Future Directions

Although this Delphi study offers important insights into the future trends and challenges related to ATs, several limitations must be acknowledged. Firstly, the survey was

not fully accessible to all potential participants, particularly those with various neurodevelopmental disabilities. These issues may have limited stakeholder perspectives and, as a result, the scope of the results. In addition, the sample size of the current Delphi research was not large. While the participants were highly knowledgeable, the limited number of experts could affect the generalizability of the findings to broader populations. Moreover, the current study was conducted on a national level, and its emphasis was largely on the Bulgarian context. This focus may restrict the applicability of the findings to other regions, as variations in cultural, economic and political factors could shape how ATs are perceived and implemented worldwide. Yet, comparisons with the international Delphi study were made. As a result, it was observed that the findings were similar, indicating that the opinions and perspectives of Bulgarian experts align with the broader European context. Future research should aim to address these limitations. Including national perspectives from other countries could reveal whether the trends and challenges identified are comparable or context-dependent. Furthermore, accessibility of such studies to underrepresented groups could enhance the comprehensiveness of future trends in AT. Addressing these gaps will be essential for developing a more inclusive understanding of AT and their potential to improve the lives of diverse populations.

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Data Availability Statement: The basic data of this research includes strict ethical approvals and sensitive aspects that make it impossible to make it publicly available in an open way.

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Abbreviations

The following abbreviations are used in this manuscript:

AT	Assistive Technology
AI	Artificial Intelligence
WHO	World Health Organization
CRPD	Convention on the Rights for Persons with Disabilities
NGO	Non-Governmental Organization

Appendix A

Table A1. List of projections in the Delphi study. Source: authors' elaboration.

Projections—Long Version	Projections—Short Version
1. By 2030, all European national ministries of education, public health, social welfare and labor have established a common directive for access to AT in each school.	Common directive
2. By 2030, non-governmental centers in each European country will work closely with healthcare and rehabilitation service providers at the municipal level.	Non-governmental centers
3. By 2030, each European school has developed a methodology for using AT in class.	ATs in schools
4. By 2030, personalized/multilingual devices with AI will have been developed so that vision-impaired people can read and generate written texts.	Personalized/multilingual devices
5. By 2030, AT is based on open-source hardware and software making it accessible to users and caregivers.	Open-source
6. By 2030, service providers/practitioners will be able to conduct comprehensive assessments for appropriate AT according to the specific needs of disabled people.	AT assessment
7. By 2030, the digital labor market (e.g., remote, freelance, or online work) is fully accessible for people with ASD and/or intellectual disabilities.	Labor market accessibility
8. By 2030, people with disabilities are equal members in policy discussions in each European country.	Equal membership
9. By 2030, there will be training for people in public services on how to address a person with ASD.	Public service training
10. By 2030, the use of ATs is included in the professional development of educators in mainstream schools.	Development of educators

Table A2. Demographic characteristics of the participants.

Age	Gender	Nationality	Degree	Group	Expertise in ATs
25–34	Female	Bulgaria	Doctorate degree	Academia	Intermediate
55–64	Female	Bulgaria	Doctorate degree	Academia	Expert
55–64	Female	Bulgaria	Doctorate degree	Academia	Advanced
35–44	Female	Bulgaria	Doctorate degree	Academia	Beginner
25–34	Female	Bulgaria	Doctorate degree	Academia	Intermediate
25–34	Female	Bulgaria	University degree	Practitioner	Intermediate
55–64	Female	Bulgaria	University degree	Disability Organization	Novice
35–44	Female	Bulgaria	University degree	Practitioner	Advanced
45–54	Female	Bulgaria	University degree	Practitioner	Intermediate
35–44	Female	Bulgaria	University degree	Disability Organization	Intermediate
55–64	Female	Bulgaria	Doctorate degree	Academia	Intermediate
25–34	Female	Bulgaria	Doctorate degree	Practitioner	Intermediate
35–44	Female	Bulgaria	Doctorate degree	Academia	Advanced
25–34	Female	Bulgaria	University degree	Academia	Advanced

Table A2. *Cont.*

Age	Gender	Nationality	Degree	Group	Expertise in ATs
45–54	Female	Bulgaria	Doctorate degree	Academia	Expert
35–44	Female	Bulgaria	University degree	Practitioner	Advanced
25–34	Male	Bulgaria	Prefer not to say	Academia	Intermediate
45–54	Female	Bulgaria	University degree	Disability Organization	Beginner
35–44	Female	Bulgaria	Doctorate degree	Academia	Expert
35–44	Female	Bulgaria	University degree	Practitioner	Beginner
45–54	Female	Bulgaria	Doctorate degree	Practitioner	Beginner
35–44	Female	Bulgaria	University degree	Academia	Beginner
25–34	Female	Bulgaria	University degree	Practitioner	Beginner
25–34	Female	Bulgaria	Doctorate degree	Academia	Intermediate
55–64	Female	Bulgaria	Doctorate degree	Academia	Expert
55–64	Female	Bulgaria	Doctorate degree	Academia	Advanced
35–44	Female	Bulgaria	Doctorate degree	Academia	Beginner
25–34	Female	Bulgaria	Doctorate degree	Academia	Intermediate

Notes

[1] https://www.bta.bg/en/news/919395-2000-plus-bulgarians-with-disabilities-to-receive-high-tech-assistive-devices (accessed on 28 August 2025).

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