

advancing
Social inclusion through
Technology
and
EmPowerment
(a-STEP)



A White Paper



a-STEP

ADVANCING SOCIAL INCLUSION THROUGH
TECHNOLOGY AND EMPOWERMENT

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Executive Summary

The European Commission's European Disability Strategy 2021-2030 has identified social exclusion as one of the grand challenges that people with disabilities in Europe are facing. People with disabilities are the most disadvantaged in society, exacerbating many inequity issues. For example, they may have limited access to basic education, significantly reducing their chances of obtaining meaningful and gainful employment in adulthood. The risks of social exclusion are even more challenging for autistic people.

Autism is a neurodevelopmental condition characterised by challenges in communication, social interaction, and restricted interests or repetitive behaviours. The prevalence of autism has increased by 200% over the past 20 years resulting in rising societal costs and impact. Despite the growing prevalence of autism, current support systems fail to fully address the needs of this population, leading to increased risks of poverty and social isolation.

Research has demonstrated that assistive technology (AT) can be a valuable tool in improving access to education and employment for people with disabilities. AT includes a range of devices, equipment, systems, apps, and other products, both high-end and low-end. Despite the technological advances in recent years, there are low rates of AT adoption throughout Europe by service providers, educators, employers and policymakers.

Cost Action CA19104, **advancing Social inclusion through Technology and EmPowerment (a-STEP)** is a pan-European consortium of 135 members from 35 countries. The COST Action is a multi-sectorial consortium of researchers, practitioners, service providers, educators, developers and people with disability. The COST was established to build an interdisciplinary, intersectoral pan-European and beyond, network which is dedicated to promoting the social inclusion and empowerment of the autistic community and their families.

a-STEP has (a) gathered the evidence-base for AT through a series of systematic reviews, (b) established a new framework of guidelines to promote best practices of AT applications within the education and employment sectors, (c) created a joint roadmap with the inclusion of autistic people, researchers, industry, and policy makers in the design and development of AT and (d) provided open-access resources for AT to enable users, caregivers and practitioners to make informed choices leading to appropriate uptake of AT.

AT can help to bridge the gap between social exclusion and social inclusion for autistic people. Building global capacity for AT will provide a unique opportunity to support independence, inclusion and the transition from education to employment for the autism community. To make this a reality, in this white paper, we present

recommendations under the following categories (a) financial recommendations, (b) policy recommendations, (c) research recommendations, (d) awareness raising, (e) recommendations for education and (f) recommendations for employment.

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1 Introduction

1.1 Background

The European Commission's European Disability Strategy 2021-2030¹ has identified social exclusion as one of the grand challenges that people with disabilities in Europe are facing. People with disabilities are the most disadvantaged in society, exacerbating many inequity issues. For example, they may have limited access to basic education, significantly reducing their chances of obtaining meaningful and gainful employment in adulthood. Globally, the employment rates of people with disabilities are much lower than those of their peers without disabilities. In addition to the socio-economic implications, social exclusion has a negative impact on self-esteem, mental health, and overall quality of life. Therefore, social inclusion is a crucial element of well-being for people with disabilities and a key objective of the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD)².

The risks of social exclusion are even more challenging for autistic people. Autism is a neurodevelopmental condition characterised by challenges in communication, social interaction, and restricted interests or repetitive behaviours³. Autistic individuals may have difficulty with social cues, struggle with changes in routine, and exhibit intense interests in specific topics. It is a spectrum condition, meaning that symptoms and severity can vary greatly among individuals. Autism is typically diagnosed in early childhood and requires personalised support and interventions tailored to each individual's unique strengths and challenges.

Autism is a global societal challenge. The prevalence of autism has increased by 200% over the past 20 years resulting in rising societal costs and impact. The most recent report by the Centre for Disease Control and Prevention (CDC) in 2023 revealed that 1 in 36 children are on the autism spectrum⁴. Many autistic students have unmet educational needs as they are not receiving the personalised support they require. This has caused higher rates of school dropouts and exclusion among autistic children compared to their peers without autism. For instance, in the UK, only 16% of autistic students attend tertiary education⁵. Consequently, the lack of education often leads to lower employment rates among the autistic population. Only 10% of autistic individuals in the EU are employed, as opposed to 47% of people with disabilities and 72% of people without disabilities⁶. Many individuals with autism find themselves in low-paying, unstable jobs putting them at a high risk for poverty and social exclusion.

Research has demonstrated that social inclusion is promoted through access to education and employment. Additionally, research has demonstrated that assistive technology (AT) can be a valuable tool in improving access to education and employment for people with disabilities (including autistic individuals). AT includes a range of devices, equipment, systems, apps, and other products, both high-end and



low-end. Access to appropriate AT is centrally important for disability policy as it is one of the concrete ways that barriers to participation in society can be overcome. Building global capacity for AT provision and applications will provide a unique opportunity to support social inclusion and independence of autistic people in society through the use of AT.

1.2 What is the COST Action and who has it tried to reach?

Cost Action CA19104, advancing Social Inclusion through EmPowerment and Technology (a-STEP) is a pan-European consortium of 135 members from 35 countries. The COST Action is a multi-sectorial consortium of researchers, practitioners, service providers, educators, developers and people with disability. The COST was established to build an interdisciplinary, intersectoral pan-European and beyond, network which is dedicated to promoting the social inclusion and empowerment of the autistic community and their families.

a-STEP has (a) gathered the evidence-base for AT through a series of systematic reviews (b) established a new framework of guidelines to promote best practices of AT applications within the education and employment sectors (c) created a joint roadmap with the inclusion of autistic people, researchers, industry, and policy makers in the design and development of AT, and (d) provided open-access resources for AT to enable users, caregivers and practitioners to make informed choices leading to appropriate uptake of AT.

1.3 What is the purpose of the White Paper?

AT can help to bridge the gap between social exclusion and social inclusion for autistic people. Building global capacity for AT will provide a unique opportunity to support independence, inclusion and the transition from education to employment for the autism community. Despite the technological advances in recent years, there are low rates of AT adoption throughout Europe by service providers, educators, employers and policymakers. The findings from our Delphi study highlighted the economic challenges surrounding funding and resource allocation is the primary barrier to the advancement of AT in Europe.



This paper will discuss the main challenges and barriers in accessing and utilising AT and will propose solutions. The paper will highlight the main findings from a-STEP as well as lessons learnt and recommendations. This paper will advocate for policy change as it is only by ensuring a strong policy foundation and enabling regulatory environment that the extraordinary enabling potential of AT can be realised.

1.4 Who is the Intended Audience?

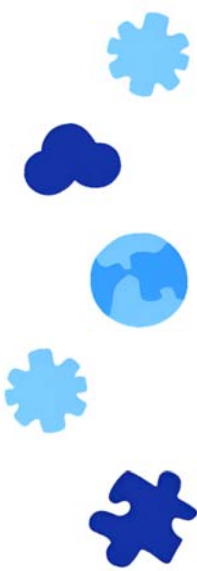
The paper seeks to engage and inform all stakeholders including policymakers, educators, service providers and the autism community.

2 AT and Autism


Research has shown that AT holds great potential to improve access to education, employment and the community for autistic individuals. Despite technological and scientific advancements in the past decade, adoption rates of AT remain low throughout Europe. On a global scale the World Health Organization has reported that only 10% of those who could benefit from AT actually have access to it⁶.

To remove barriers and to increase access and use of AT that respond to autistic user's needs there are a number of challenges that need to be addressed by concerted action.

2.1 AT Products and Availability

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- **Limited inclusion of autistic individuals in the design and development of AT:** A lack of user-centred/led design results in many tools being unsuitable for real-world needs or being not perceived as useful.
 - **High abandonment rates of AT devices:** Many autistic users thus discontinue using these tools due to poor design, lack of personalisation and support, and lack of effectiveness.
 - **Mismatch between technology and user needs:** Technologies often fail to align with the specific challenges faced by autistic individuals.
 - **Expense of high-end AT devices:** Costly devices, particularly those with advanced capabilities, remain inaccessible to many due to limited resources across regions and countries.
 - **Low technology-readiness in certain regions:** Some countries lack the infrastructure and capacity to develop and implement AT effectively.

2.2 Provision and Use

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- **Lack of interdisciplinary and cross-sectoral collaboration:** Insufficient coordination between technology developers, educators, service providers, and policymakers hampers the successful creation and adoption of AT tools.
 - **Inconsistent adoption by service providers, educators, employers, and policymakers:** The uneven uptake of AT across different sectors delays widespread implementation.

Lack of knowledge translation from research to practice: Innovations in AT research are not always successfully applied in real-world, community-based settings.

2.3 Wider Challenges

Rapid pace of technological advancements: Continuous change in the tech landscape can overwhelm developers and users, making it difficult to keep AT tools up-to-date and relevant.

Limited strategies for sustaining AT development: In many countries there is a lack of systematic public investment in AT innovation and development.

3 What are the opportunities provided by AT?

The United Nations Convention on the Rights of Persons with Disabilities (CRPD) specifically states that individuals with disabilities have the right to access inclusive **education**⁷. This means that individuals with disabilities (including autistic students) should be able to fully participate in the educational system alongside their peers without facing any discrimination or barriers. Additionally, the CRPD also emphasises the right to equal **employment** opportunities for persons with disabilities (including autistic individuals), ensuring that they have the chance to participate and contribute to the workforce on an equal basis with others. This not only promotes the empowerment and independence of individuals with autism but also serves to create more inclusive society. AT can provide a vital role in promoting the full inclusion in education and employment by providing tools and resources to enhance learning, productivity, and overall success.

3.1 Education

AT plays a vital role in improving educational outcomes for autistic students by addressing specific challenges and leveraging their strengths. Recent research has focused on creating inclusive learning environments and personalised educational experiences⁸. Educational institutions are increasingly recognising the unique learning styles and capabilities of autistic students. AT supports education in several key ways:

Communication Support

- **Augmentative and Alternative Communication (AAC) Devices:** Tools like the Picture Exchange Communication System (PECS) and other systems and strategies support language development and effective communication.
- **Speech-to-Text and Text-to-Speech Software:** Assists with reading comprehension and written expression.
- **Language Learning Apps:** Tailored to support autistic students in developing language skills at their own pace.



Social Interaction and Skills Development

- **Social Skills Apps:** Provide structured environments for practicing social interactions.
- **Virtual Reality (VR) Environments:** Simulate social situations for safe practice of interaction skills.
- **Emotion Recognition Software:** Helps students interpret facial expressions and body language.

Behaviour Management and Emotional Regulation

- **Visual Schedules and Timer Apps:** Help structure routines and manage transitions, reducing anxiety.
- **Behaviour Tracking Tools:** Allow educators and parents to monitor progress and adjust interventions.
- **Mindfulness and Relaxation Apps:** Support emotional regulation and stress management.

Academic Skills and Learning Support

- **Educational Software:** Offers personalised, adaptive learning experiences.
- **Interactive Whiteboards:** Facilitate engaging, multi-sensory lessons.
- **Subject-Specific Learning Apps:** Target areas like math, science, and language arts with autism-friendly approaches.
- **AI:** In this scenario of rapidly evolving technologies AI can be a precious ally for autistic people, if correctly applied in attentive educational systems.

Executive Functioning and Organisation

- **Digital Planners and Calendar Apps:** Help students manage assignments and deadlines.
- **Task Breakdown Tools:** Assist in organising complex projects into manageable steps.
- **Note-Taking Apps:** Support different learning styles with text, audio, and visual note-taking options.

Sensory Processing Support

- **Noise-Cancelling Headphones:** Reduce auditory distractions in the classroom.
- **Lighting Adjustment Tools:** Help manage visual sensitivities.
- **Sensory Break Apps:** Guide students through calming activities when overstimulated.

Collaboration and Group Work

- **Shared Digital Workspaces:** Facilitate teamwork and communication among students.
- **Collaborative Learning Tools:** Foster inclusive group participation.
- **Real-Time Captioning for Group Discussions:** Support students who struggle with auditory processing.

Assessment and Progress Monitoring

- **Adaptive Testing Platforms:** Adjust difficulty based on student responses.
- **Progress Tracking Apps:** Allow students, educators, and parents to monitor academic growth.
- **Portfolio Creation Tools:** Help showcase student work and achievements.

Transition Planning and Life Skills

- **Career Exploration Software:** Introduces students to potential career paths.
- **Life Skills Simulation Apps:** Provide practice for daily living tasks.
- **Goal-Setting and Self-Advocacy Tools:** Empower students to participate in their educational planning.

Support for Educators and Parents

- **Training Resources:** Provide guidance on implementing AT in educational settings.
- **Data Analysis Tools:** Help interpret student data to inform teaching strategies.
- **Communication Platforms:** Facilitate collaboration between educators, parents, and support professionals.

Remote and Hybrid Learning Support

- **Virtual Classroom Platforms:** Create structured online learning environments.
- **Asynchronous Learning Tools:** Allow students to engage with material at their own pace.
- **Digital Manipulatives:** Provide hands-on learning experiences in virtual settings.

Higher Education and Vocational Training

- **Accessible Online Course Platforms:** Ensure equal access to higher education opportunities.
- **Specialised Note-Taking Services:** Support students in lecture-based courses.

- **Vocational Skills Assessment Tools:** Help match students with suitable career paths.
- **Virtual Internship Platforms:** Provide work experience in controlled, supportive environments.

As AT continues to evolve, it promises to further personalise the educational experience, adapting in real-time to each student's changing needs. This dynamic approach to education not only benefits autistic students but also contributes to a more diverse, innovative, and inclusive society as a whole.

3.2 Employment

Recent research has highlighted the importance of overcoming barriers to employment for autistic adults. Employers are increasingly recognising the unique strengths that autistic individuals bring to the workplace, such as attention to detail, strong memory, and excellent problem-solving skills. AT plays a crucial role in supporting autistic individuals in the workforce, addressing challenges, and enhancing their unique strengths. Key areas where AT can make a significant impact include:

Job Search and Application Process

- **Online Job Platforms:** Specialised job boards and search engines tailored for neurodivergent individuals.
- **Job Matching and Placement Services:** AT solutions powered by algorithms and machine learning to match autistic individuals with jobs suited to their skills and preferences, ensuring a better fit and increased job satisfaction.
- **Interview Preparation:** VR simulations for practicing interview scenarios and developing social cues recognition.

Workplace Communication

- **Augmentative and Alternative Communication (AAC) Devices:** Supporting clear communication with colleagues and supervisors.
- **Email and Messaging Assistants:** AI-powered tools to help craft professional communications and interpret social nuances in written exchanges.
- **Real-time Captioning:** For meetings and presentations to aid in processing auditory information.

Task Management and Organisation

- **Digital Task Planners and To-Do Lists:** Helping prioritise and manage workloads effectively.

- **Time Management Apps:** Assisting with time allocation and reducing anxiety around deadlines.
- **Project Management Software:** Providing visual representations of project progress and timelines.

Sensory Regulation and Support

- **Noise-Cancelling Headphones:** Reducing auditory distractions in open office environments.
- **Lighting Control Apps:** Adjusting screen brightness and office lighting to manage visual sensitivities.
- **Sensory-Calming Apps:** Offering tools and techniques to manage sensory overload and maintain focus.
- **Adjustable Workplace Equipment:** Providing flexible seating, standing desks, and other ergonomic solutions to create comfortable work environments.

Social Interaction Support

- **Social Cue Recognition Software:** Assisting in interpreting facial expressions and body language during in-person interactions.
- **Networking Apps:** Facilitating professional connections in a structured, low-pressure digital environment.
- **Collaboration Platforms:** Providing alternative communication channels for team projects.

Skill Development and Training

- **E-Learning Platforms:** Offering courses on workplace skills tailored to autistic learning styles.
- **VR Job Training:** Simulating work environments for safe practice of job-specific tasks.
- **Adaptive Learning Software:** Personalising training content based on individual strengths and challenges.

Workplace Accommodations

- **Ergonomic Assessment Tools:** Ensuring comfortable and autism-friendly physical work setups.
- **Environmental Control Apps:** Managing office temperature, lighting, and other sensory factors.
- **Accessibility Features in Standard Software:** Utilising built-in tools in common workplace applications to enhance usability.

Performance Monitoring and Feedback

- **Self-Assessment Tools:** Helping autistic employees track their own performance and identify areas for improvement.
- **Feedback Interpretation Assistants:** AI-powered tools to help process and understand performance reviews and constructive feedback.
- **Goal-Setting and Progress Tracking Apps:** Visualising career development and celebrating milestones.

Remote Work and Telecommuting Support

- **Virtual Office Platforms:** Creating structured online work environments that mirror physical office spaces.
- **Video Conferencing Enhancements:** Tools to improve the remote meeting experience, such as background noise reduction and visual cue overlays.
- **Digital Collaboration Tools:** Facilitating teamwork and project management in remote settings.
- **Home Office Setup Assistance:** Guidance and tools for creating sensory-friendly home work environments.

Entrepreneurship and Self-Employment

- **Business Planning Software:** Assisting in the creation and management of business plans tailored to autistic entrepreneurs.
- **Customer Relationship Management (CRM) Systems:** Helping manage client interactions and social business aspects.
- **Financial Management Tools:** Simplifying bookkeeping and tax preparation for self-employed individuals.

By leveraging these assistive technologies, autistic individuals can overcome workplace challenges, showcase their unique talents, and thrive in their chosen careers. The increasing recognition of autistic strengths by employers, combined with the support of AT, is creating more inclusive work environments. This not only benefits autistic employees but also allows organisations to tap into a diverse talent pool, gaining valuable perspectives and skills that can drive innovation and productivity.



4 The a-STEP project

a-STEP conducted a range of activities aimed at evaluating and promoting accessible and sustainable AT across education and employment settings. a-STEP conducted the following activities:

- We synthesised current knowledge on AT applications through comprehensive **systematic reviews** to evaluate the effectiveness, appropriateness, feasibility and sustainability of existing AT.
- To ensure the best practice in the deployment of AT applications within the education and employment contexts a robust **framework of guidelines** was established.
- To ensure that all new AT is designed in collaboration with the autistic community we created a joint **roadmap** for the inclusion of users, research, industry and policymakers in the design, development and deployment of AT.
- We conducted a **Delphi study** to gain expert consensus on critical issues in relation to accessibility, affordability, and interdisciplinary collaboration.
- **Practice guidelines** have been developed that address ethical, regulatory, and policy considerations.
- To empower all stakeholders make informed decisions regarding AT adoption we created an **open resource repository platform**, providing open access to the full range of existing AT resources and applications (provide link to platform here). The platform also provides an open space for communication and ideas exchange among all stakeholders to encourage transfer and exploitation of new ideas and insights.
- **Educational materials** tailored for various audiences, including educators, healthcare professionals, developers, psychologists, and autistic users were developed.

To access our deliverables, please visit our webpage www.a-stepaction.eu.





5 Lessons Learnt and Recommendations

The findings of a-STEP have resulted in important findings and recommendations which are summarised below:

5.1 Financial Recommendations

- **Funding for AT:** Increase funding for AT infrastructure development and product distribution to ensure wider accessibility across Europe. Our action has shown that there is a huge disparity between and within countries.
- **Distribution Channels:** Establish consistent and efficient distribution channels to ensure timely access to AT for all individuals that might benefit from it. Our action shows that such access is inconsistent, and many individuals do not receive the individual and timely support they need.
- **Demand Consolidation and Price Reduction:** Consolidate demand for AT and implement price reduction strategies to increase accessibility and affordability. Our action shows that countries can bundle demand to decrease costs for individuals.
- **Address the lack of cohesive funding mechanisms** that leads to uneven access to vital technologies. Introduce structured investment strategies to support widespread distribution and reduce costs, making AT attainable for a broader demographic.

With increased funding mechanisms in place, we can now turn our attention to ensuring the timely and effective distribution of these technologies to those who need them most.

5.2 Policy Recommendations

While securing funding and ensuring access are crucial first steps, a supportive policy framework is essential to maintain the quality and safety of assistive technologies and guarantee their widespread adoption.

- **Effective Policies:** Establish effective policies to facilitate the rapid and widespread adoption of AT while maintaining quality and safety standards. Our action has established best practices guidelines that can serve as a starting point to assist countries establish national policies.
- **Advocate** for legislative environments conducive to establishing inclusive and supportive infrastructure for AT services to support the autistic community. Our action's systematic reviews have shown that AT can support the inclusion of autistic people to reach their full potential and that relevant and effective technologies, targeted to individual needs, help achieve this goal.
- **Harmonise AT Policies across the EU:** Develop and implement an EU-wide policy framework to ensure consistent standards, service provision, and funding mechanisms for AT. This policy should address gaps in current services and promote collaboration between member states to guarantee that

every autistic individual receives timely, effective AT support. Data collected through our action shows that lack of harmonisation across EU countries leads to unequal access and services for autistic individuals. Aligning policies will help create a more inclusive system throughout Europe.

- **Embed the CRPD Principles into National Policies and Budgets:** Ensure that the principles CRPD are fully integrated into national policies, legal frameworks, and budgeting processes. This requires allocating adequate financial to support the effective implementation of the convention at all levels of society. While the CRPD has been ratified in 173 countries, national policies and budgets need to support the implementation of the convention.
- **Adopt a-STEP's Joint Roadmap:** a-STEP developed a roadmap, with consensus from interdisciplinary stakeholders outlines short-term and long-term goals across key sectors: education, employment, social well-being, and independent living. Building upon the 5Ps Framework from the World Health Organization, it focuses on creating a people-centred assistive technology ecosystem. By addressing cross-sectoral needs, the roadmap aims to raise awareness and promote co-created methodologies that support independence and labour market integration.

5.3 Research Recommendations

Effective policies rely on a strong foundation of research. It is through collaborative, user-centred or led research that we can continue to improve the development and implementation of assistive technologies.

- **Foster Interdisciplinary Collaboration:** Our action demonstrated that cross-sector partnerships significantly strengthen AT development and implementation. Establish dedicated funding and collaborative platforms to incentivise interdisciplinary research networks involving researchers, practitioners, families, and developers.
- **Prioritise User-Centred Design:** a-STEP's systematic reviews highlighted the crucial importance of involving the autistic community throughout the research process. Ensure that future AT research incorporates autistic individuals' perspectives from conceptualisation to implementation and evaluation.
- **Develop Evidence-Based Accessibility Guidelines:** Our action identified a need for user-friendly guidelines specific to autistic people. Focus research efforts on creating and validating evidence-based accessibility standards for websites, desktop applications, and mobile apps tailored to autistic users' needs.
- **Broaden the methodological approaches:** a-STEP's findings emphasised that the research can consists of case studies with a small number of participants. Invest in systematic research efforts with robust research methodology aimed at evidence-based assessment of AT for the autistic community.



- **Use Open Access Knowledge Repositories:** a-STEP's open resource platform established a comprehensive, open-access repository for AT best practices, case studies, and successful implementations. The use of this platform will facilitate knowledge sharing and support the scalability of effective interventions.
- **Promote Pan-European Research Initiatives:** Our action highlighted the value of collaborative, cross-border research. Advocate for and participate in pan-European autism research projects that facilitate knowledge exchange, shared resources, and innovative approaches to AT development and implementation, building on a-STEP's successful collaborative model.
- **Investigate Emerging Technologies:** a-STEP identified potential in new technological areas. Direct research efforts towards exploring the applications of wearable devices, virtual and augmented reality (AR), and AI-driven personalisation in AT for autistic individuals.
- **Evaluate Long-Term Impact:** Our action revealed a lack of longitudinal studies. Conduct long-term research to assess the sustained effectiveness of AT interventions and their impact on autistic individuals' quality of life, educational outcomes, and employment prospects.

5.4 Awareness Raising

In addition to robust research, increasing public and institutional awareness of the benefits of AT is vital for breaking down stigma and fostering a more inclusive society.

- **Awareness-Raising:** Organise national awareness-raising programmes to prevent stigma and discrimination that autistic people suffer in some countries. Our action shows that raising awareness in relation to the full inclusion of autistic people is beneficial for both the autistic community and society in general.
- **Empathy and Diversity through Technology:** Help non-autistic individuals develop empathy, human rights awareness, and appreciation of diversity using technology and interactive games. Our action indicates that digital games are effective tools for engagement and motivation. This will promote an inclusive school, work, and social environment.
- **Implement National Digital literacy Training:** Implement training for autistic individuals and their support networks, utilising the digital competence frameworks developed by a-STEP to enhance AT adoption and reduce abandonment rates.

5.5 Recommendations for Education

As awareness grows, it becomes essential to equip educators and practitioners with the skills and tools they need to effectively use assistive technologies, ensuring that educational systems are inclusive and supportive.

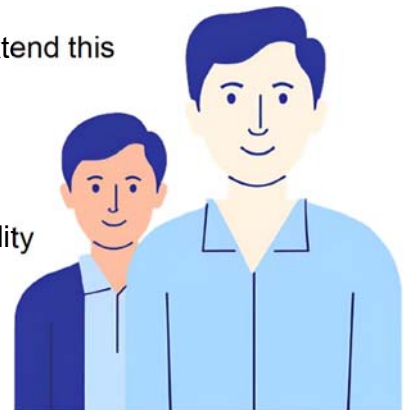
- **Training Programmes for Educators:** Invest in comprehensive training for practitioners and educators to support autistic individuals' learning. Focus on

matching AT with individual needs. Ensure continuous training for effective adoption and use of AT in enhancing autistic students' learning.

- **Expand AT Professional Pool:** Expand the pool of qualified AT professionals that work with autistic individuals. a-STEP has confirmed that the number of qualified professionals skilled in using AT when working with autistic people is insufficient.
- **Inclusive Education Systems:** Empower mainstream education systems to be more inclusive by incorporating AT tools that promote empathy among non-autistic peers. Our action indicates that integrating AT can significantly enhance participation.
- **Digital Games in Education:** Use digital games to address inequalities in education, increase social interactions, and improve specific educational skills in autistic children. Our action has shown that digital games can effectively improve specific academic and social skills in autistic individuals.
- **Evidence-Based AT Tools for learning:** Our action indicates that evidence-based AT tools are effective in teaching social skills. It is important to promote the use of AT in schools to help autistic learners develop these crucial life skills.
- **Co-design principle:** Integrate a-STEP's co-design principles and AT toolkits into educator training programmes to promote inclusive education systems and effective AT use in schools.

5.6 Recommendations for Employment

Building on inclusive educational practices, it is critical to extend this support into the workforce by leveraging AT to create job opportunities and provide necessary workplace accommodations for autistic individuals.



- **Vocational Training Programmes:** Ensure availability and accessibility of vocational training programmes designed to be inclusive for autistic individuals. Utilise ATs to accommodate different learning styles and sensory sensitivities. Our action highlights the effectiveness of AT in enhancing skills development for specific vocations.
- **Job Matching and Placement:** Provide AT solutions tailored to the specific skills, abilities, and needs of individuals with autism. Our action has highlighted that using AT for job matching and placement services are crucial for success.
- **Communication and Social Skills Training:** Organise training to support the development of communication and social skills using AT applications and tools essential for the success of autistic individuals in the workplace. Our action has shown that continuous training to develop communication and social skills using AT applications and tools is crucial for autistic individuals in the workplace.



- **Sensory Support:** Create sensory-friendly work environments for autistic people. Our action highlights the importance of providing sensory support to enhance comfort and productivity.
- **Remote Work Opportunities:** Support remote work opportunities for autistic people. Our action shows that AT can support independence and communication, making remote work more accessible.
- **Skill Development for Independent Living:** Encourage the use of AT for autistic individuals to support the development of soft and professional skills for independent living. Our action has shown that tailored AT effectively improves specific skills and can enhance engagement and motivation of autistic workers in the workplace.
- Develop **cross-sectoral transition support programmes** based on a-STEP's roadmap, facilitating the move from education to employment for autistic individuals through targeted AT solutions.

5.7 Technology and Development

Supporting autistic individuals in education and employment requires continued innovation in technology development. By prioritising user-centred, personalised solutions, we can ensure assistive technologies remain effective and adaptable to evolving needs.

- **Prioritise User-Centred and Personalised Solutions:** Develop AT with a strong focus on user-centred design. Involve autistic individuals, families, and caregivers throughout the design and testing processes. This approach ensures AT solutions meet individual needs, fostering greater usability and engagement.
- **Leverage Wearable and Immersive Technologies:** Promote wearable devices, VR and AR to enhance communication, independence and social skills for autistic individuals. These technologies offer safe, engaging environments for practicing real-world scenarios and building key skills. Our research shows that they provide novel ways to practice key skills in a safe environment.
- **Develop Digital Games for Educational and Social Development:** Invest in game-based learning tools that boost engagement, motivation, and skills. Training materials developed by our action show that digital games have proven to be effective in teaching social and academic skills, as well as promoting motivation. Game-based learning tools create a shared platform for both autistic and non-autistic individuals, fostering inclusivity and improving learning outcomes for all.
- **Create Accessible and Affordable Mobile Applications:** Design AT apps for mainstream platforms to boost affordability and accessibility. Leverage the ubiquity of mobile devices for widespread adoption. Our Delphi study shows this approach reduces cost barriers and extends AT benefits to more autistic users.

- **Ensure Interoperability of AT Devices:** Create AT solutions compatible with multiple devices and platforms to enhance accessibility and flexibility. Integrate AT products seamlessly with existing health, education, and communication systems to maximise impact.

6 Conclusion

In conclusion, the alarming rise in autism prevalence and the inadequacies in current support systems amplify the risks of poverty and isolation for those affected. However, the embrace of AT holds significant promise in mitigating these challenges, thereby enhancing access to education, employment, and broader societal participation. The efforts of the COST Action CA19104, through its comprehensive framework and collaborative approach, reflect a proactive commitment to empower autistic individuals and their families. By implementing the recommendations, outlined in this white paper, spanning financial, policy, research, and awareness-raising initiatives, as well as education and employment strategies, we can create a more inclusive society that recognises and nurtures the potential of every individual. With sustained commitment and collaboration across sectors, we can bridge the existing gaps and foster an environment where all members of the autism community thrive, ultimately contributing to a richer, more diverse society.



References

- [1] European Disability Strategy 2021-2030:
<https://ec.europa.eu/social/main.jsp?catId=1484&langId=en>
- [2] United Nations, Department of Economic and Social Affairs. Disability, Convention on the Rights of Persons with Disabilities – Articles. Accessed March 19, 2024. Available from: <https://www.un.org/development/desa/disabilities/convention-on-the-rights-of-persons-with-disabilities/convention-on-the-rights-of-persons-with-disabilities-2.html>.
- [3] American Psychiatric Association (2013). *DSM 5. Lake ST Louis: American Psychiatric Association.*
- [4] Centre for Disease Control and Prevention (2032).
<https://www.cdc.gov/autism/index.html>
- [5] National Autistic Society Education Report (2023):
<https://www.autism.org.uk/what-we-do/news/education-report-2023>
- [6] National Autistic Society Education Report (2023):
<https://www.autism.org.uk/what-we-do/news/education-report-2023>
- [7] United Nations, Disability, Convention on the Rights of Persons with Disabilities:
<https://www.un.org/development/desa/disabilities/convention-on-the-rights-of-persons-with-disabilities/convention-on-the-rights-of-persons-with-disabilities-2.html>.
- [8] Morash-Macneil, Johnson, & Ryan, 2018. *Journal of Special Education Technology*, 33 (1), 15-26