Life Span and Disability XVIII, 1 (2015), 41-74

Successful assistive technology service delivery outcomes from applying a person-centered systematic assessment process: a case study

Stefano Federici[1], *Fabrizio Corradi*[2], *Fabio Meloni*[3], *Simone Borsci*[4], *Maria Laura Mele*[5], *Saveria Dandini de Sylva*[6] & *Marcia J. Scherer*[7]

Abstract

Background: The assistive technology assessment (ATA) process developed by Federici and Scherer in 2012 provides professionals with guidelines for effective outcomes in assistive technology (AT) selection and assignment process with the aim to match a person with AT. Purpose: This paper has sought to verify the effectiveness of the ATA process model through its application in a centre for technical aids in severe motor disability cases. Method: The ATA process was applied to a case study of a 6.5-year-old female child with cerebral palsy during a

Received*: April 22, 2014;* Revised*: February 28, 2015;* Accepted*: March 7, 2015*

[1]Department of Philosophy, Social & Human Sciences and Education, University of Perugia, Perugia, IT. E-mail: stefano.federici@unipg.it;
[2]Leonarda Vaccari Institute for Rehabilitation Integration and Inclusion of Persons with Disabilities, Rome, IT. E-mail: fabrizio.corradi@gmail.com;
[3]Department of Philosophy, Social & Human Sciences and Education, University of Perugia, Perugia, IT. E-mail: fa.meloni@gmail.com;
[4]Imperial College of London, National Institute for Health Research, Diagnostic Evidence Cooperative group of London, UK. E-mail: simone.borsci@gmail.com;
[5]Department of Philosophy, Social & Human Sciences and Education, University of Perugia, Perugia, IT. E-mail: marialaura.mele@gmail.com;
[6]Leonarda Vaccari Institute for Rehabilitation Integration and Inclusion of Persons with Disabilities, Rome, IT. E-mail: presidenza@leonardavaccari.it;
[7]The Institute for Matching Person and Technology, Webster, NY, USA. E-mail: IMPT97@aol.com;

Correspondence to: Prof. Stefano Federici, Department of Philosophy, Social & Human Sciences and Education, University of Perugia, Piazza G. Ermini 1, 06123 – Perugia, IT; e-mail: stefano.federici@unipg.it; Tel.: +39 347 3769497.

The authors declare they have no conflicts of interests to be disclosed.

period of three years. The process consisted of three 12-monthcycles of AT assessment, matching, and assignment. The first cycle focused on the evaluation of the user's requests and the assistive solution assessments, while the last two cycles focused on the post-assignation follow-up, and re-evaluation of the previous solutions by fine-tuning AT assignations. Results: After several multidisciplinary team meetings and an environmental evaluation, the child was provided with an E-Tran, a scanning system utilizing Clicker software, a new postural system, and eye-tracking system solution. The ATA process model guided the centre's professionals and the user's milieu to better analysis and comprehension of the user's needs. The effectiveness of the ATA process was highlighted by the user's improvement in autonomy, social integration and communication, and in oculi-motor and postural control. Conclusions: This case study highlights how a multidisciplinary and user-focused assessment process is effective over time. The roles of the psycho-technologist and the psychologist throughout the phases of the ATA process emerged as fundamentally important to reach an effective outcome in an ATA process.

Keywords: Assistive technology; Service delivery; Psycho-technologist; Psychologist; Matching person and technology; ICF-CY; Case study.

1. Introduction

As pointed out by Lancioni and colleagues, there are two large groups of people with disability who may particularly benefit from assistive technology (AT):

> "(a) students with combinations of motor or sensory-motor and communication disabilities and typical or nearly typical level of intellectual functioning, and (b) persons with severe/profound intellectual disabilities or combinations of motor or sensory-motor impairment and intellectual disabilities or consciousness disorders" (Lancioni, Sigafoos, O'Reilly, & Singh, 2013, p. 2).

Currently, many assistive solutions have been proposed to improve the quality of life of people with disability. Current assistive solutions are based on low-tech devices, such as non-electronic tablets and boards, see for example the E-Tran (*eye transfer*) communication board, or high-tech electronic/electric devices which can be used, for instance with only a single body gesture as an input controller, e.g., a microswitches or gaze-based interfaces (Lancioni & Singh, 2014).

The state of the art literature on intellectual and developmental disabilities shows growing attention to the evolution of ATs for fostering autonomy, participation, and rehabilitation for persons with special education and communication needs. An example of an assistive solution designed to meet the special need of persons in developmental age with a combination of motor or sensory-motor and communication disabilities was recently proposed by Stasolla and colleagues (Stasolla, Caffo, Picucci, & Bosco, 2013). Specifically, the authors developed an assistive solution that combines microswitches with a computer-aided set-up for helping individuals in developmental age to communicate their needs by choosing items along a series of subsequent steps that are hierarchically structured.

The Assistive Technology Assessment (ATA) process is a model developed by Federici and Scherer (2012b) with the contribution of 55 scholars from five continents, offering a sequential set of assessments for matching a person with assistive technology (AT) to professionals with different areas of expertise in specialized service delivery in rehabilitation technology (Scherer, 2002, 2005; Corradi, Scherer, & Lo Presti, 2012; Federici & Scherer, 2012a) .

The ATA process models the functioning process of centers for AT evaluation and provision independently of the model for local or national service delivery systems. The ATA process borrows a user-driven working methodology from the Matching Person and Technology (MPT) model of Scherer (Scherer, 1998; Corradi *et al.*, 2012, p. 52). Furthermore, the ATA ideal model embraces the ICF bio-psycho-social model promoted by the *International Classification of Functioning, Disability and Health* (ICF; WHO, 2001), aiming at the best combination of ATs to promote the customer's personal well-being (for an extensive explanation of the ATA process model, see: Federici & Scherer, 2012b; Federici, Scherer, & Borsci, 2014).

One of the main features of the ATA process is the twofold perspective of its flow. In fact, it can be read both from the user or from the perspective of AT service delivery (Federici, Scherer, *et al.*, 2014). Since the ATA process is a user-driven process, any activity of AT service delivery must find correspondence with a user action and vice-versa. The ATA process model is built on five pillars from disability studies and rehabilitation research:

1. *The bio-psycho-social model proposed by the ICF*. All the dimensions affecting the user's functioning (health condition and contextual factors) must be evaluated when analyzing the user's request and choosing the appropriate assistive solution.
2. *The MPT model*. This model overcame the traditional dyadic and one-way assessment process which involves the user in the AT selection only after the assignation. Following this more advanced model, three factors (i.e., the person, the milieu/environment, and the technology) must be considered as a part of the whole process when selecting the most appropriate AT solution.
3. *The definition of an assistive solution.* This was proposed by the Association for the Advancement of Assistive Technology in Europe (AAATE) in 2003 as follows: "Overcoming a disablement may involve something more than just a device, it often requires a mix of mainstream and assistive technologies whose assembly is different from one individual and another, and from one context to another. We may label it assistive solution" (AAATE, 2003, p. 2).
4. *The definition of psycho-technologist*: the psycho-technologist is an expert in psychology, AT, and human factors. The role of psycho-technologists includes analyzing and evaluating the interaction between users and technology by taking into account

the psychological and cognitive components of the interaction. In contrast with the psychologist, the psycho-technologist primarily focuses on the technological side of matching the person with technology and is less oriented to the clinical and psychological dimensions of the user's interactions.

5. *The role of the psychologist*. The psychologist in an AT service delivery process, as an expert in human factors, provides appropriate psychological evaluation or precise clinical intervention with the users and/or their significant human context over the course of the whole AT assignment process. Investing in personal factors represents an important turning point for a successful match between person and technology (Meloni, Federici, & Stella, 2011; Meloni, Federici, Stella, Mazzeschi, Cordella, Greco *et al.*, 2012).

The present article is a continuation of two previous ones (Federici, Corradi, Meloni, Borsci, Mele, Dandini de Sylva *et al.*, 2014; Federici, Scherer, *et al*., 2014) where a cross-cultural comparison of AT service delivery systems and the application of the ATA process model adopted by the Leonarda Vaccari Institute of Rome was discussed. The purpose of this study was to verify the effectiveness of the ATA process model through its application in an AT Service Delivery centre to Arianna, a 6.5 year-old female child, with a dystonic component as an outcome of cerebral palsy from birth, attending a three-year AT assessment process.

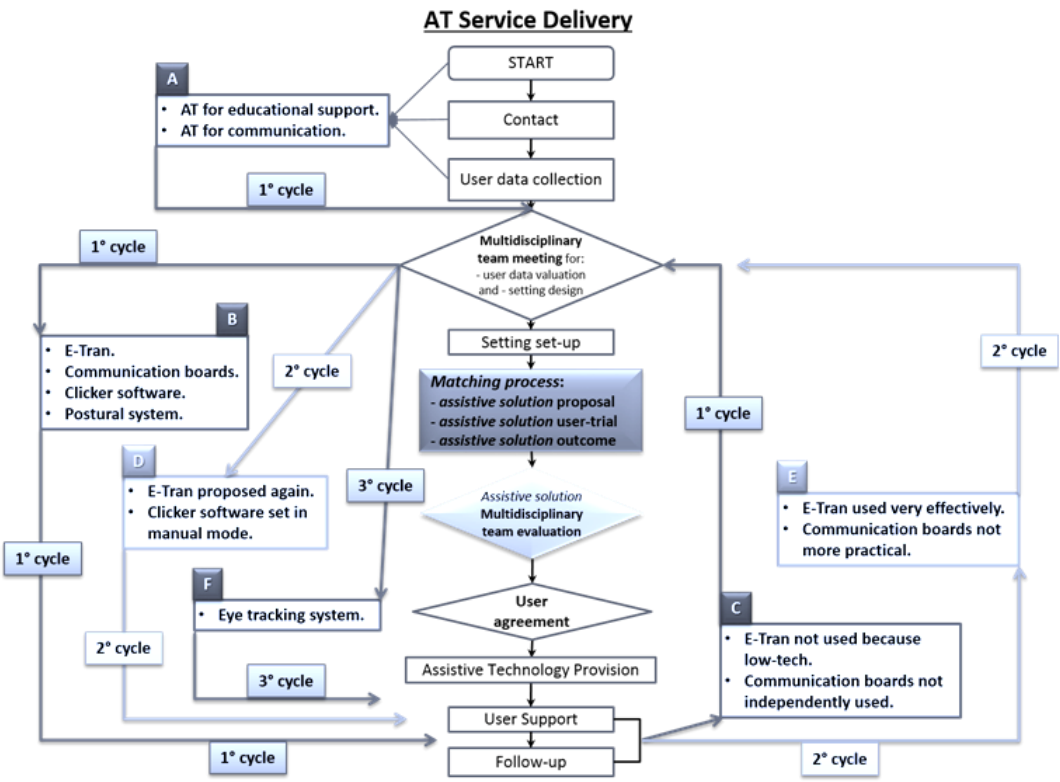
2. Method: A Rehabilitation Technology Case Study

In the present work, a case study will illustrate the ATA process in practice, leading the user and the multidisciplinary team of the service deliverer to an assistive solution. The case report will be mainly focused on the roles of the psycho-technologist (Federici, Corradi, Mele, & Miesenberger, 2011; Miesenberger, Corradi, & Mele, 2012) and of the psychologist (Meloni *et al*., 2011; Meloni *et al*., 2012) within the phases of the AT Service Delivery process (Federici & Scherer, 2012b). The following case study describes a three-year AT assessment process carried out at the Leonarda Vaccari Institute (Federici, Corradi, *et al*., 2014). During this period, three cycles of the ATA process were performed as shown in Figure 1. Six steps (from A to F) are temporally sorted around the flow chart of the AT Service Delivery process (Federici, Corradi, et al., 2014), synthesizing the main issues related to the assessment's steps: the two user requests in

step A of the first cycle; the assistive solutions proposed by the multidisciplinary team in each cycle at steps B, D, and F; and the follow-up regarding the first and second cycle in steps C and E. In Table 1, for each cycle the sequence of events is listed regarding the ATA process applied to Arianna pointing out the professionals' interventions, the user's features and achievement, and the AT assigned. The period of time is specified for each cycle.

Before starting the AT assessment, during phase A (Fig. 1), the parents were required to provide to the Institute Arianna's clinical and observational data and medical history. As observational data the parents were suggested to video-record (about 10 minutes) Arianna's behavior in family and school contexts.

Figure 1 - *ATA process cycles*



The flow chart depicts the three cycles of the ATA process for Arianna's case. In the middle of the figure the AT Service Delivery process (Federici, Corradi, et al., 2014) for each cycle is drawn. Each cycle has a duration of about 12 months. In step A of the first cycle, the two user's requests are reported. In steps B, D, and F the assistive solutions proposed by the multidisciplinary team in each cycle are summarized. Finally, in steps C and E the outcome of the follow-up regarding the first and second cycles are displayed.

2.1. Case description from clinical data and medical history

Arianna was 6.5 years old when she was brought by her parents in 2008 to the Institute Leonarda Vaccari, with a diagnosis of severe spastic quadriplegia with a dystonic component as outcomes of cerebral palsy from birth (Table 1). Arianna was very interested in objects that were presented to her and she attempted in all ways to reach and grasp them, but was unable to implement the action due to the presence of significant dystonia. With regard to visual and perceptual functions, specific strategies and a specific interaction with her were used in order to evaluate her abilities. In particular, the symbols of Hyvärinen (circle, square, sweetheart, and cottage) were used (Hyvärinen & Jacob, 2011). The child had good visual acuity (OD = 9~10/10 Dpt; OS = 10/10 D.; OU = 11/10 Dpt)[8] and a normal color sense, sensitivity to contrast and field of vision. Moreover, the child managed to perceive and locate objects in both the proximal and distal distance, with good ability to fix and track. She moved voluntarily within the room using a motorized wheelchair.

At the time of the observations, Arianna had difficulty in separating herself from her mother, crying and calling for her repeatedly when her mother left. Arianna had excellent cognitive resources, appearing to be very communicative and participatory in the environment. She used adequate and appropriate augmentative and alternative communications, both by request and declaratively, being able to communicate complex moods and affection with a motivated and contextual smile, responding to closed questions "yes" with anti-flexion of the head, and "no" with slight lateral movements of the head side to side. She demonstrated understanding of requests, thus the operator could always explain what he or she was about to do and ask her what she preferred.

The mother contacted the Institute inquiring about an evaluation to determine technological strategies and assistance to enhance Arianna's communication. Both parents signed an informed written consent, before starting the assessment process at the Leonarda Vaccari Institute, also explicitly accepting to participate in the present study with the participation of the University of Perugia.

[8] OD = *Oculus Dexter* (right eye); OS = *Oculus Sinister* (left eye); OU = *Oculus Uterque* (both eyes); Dpt = diopter.

Table 1 - *Case description according to the WHO's international classification of diseases (ICD-9 and ICD-10), individual functioning (ICF-CY), and Vineland's measures of adaptive behavior*

ICD-9: International Statistical Classification of Diseases and Related Health Problems, 9th Revision (WHO, 1977)
&
ICD-10: International Statistical Classification of Diseases and Related Health Problems, 10th Revision (WHO, 1992)

ICD-9		ICD-10	
Congenital quadriplegia	G80.0	Congenital quadriplegia	G80.0

ICF-CY: International Classification of Functioning, Disability and Health Children and Youth Version (WHO, 2007)

Body functions		Body structures		Activities and participation		Environmental factors	
b114.1	Orientation functions	s110.8	Structure of brain	d140.30	Learning to read	e310+4	Immediate family
b140.0	Attention functions	s730.4	Structure of upper extremity	d145.30	Learning to write	e320+4	Friends
b144.0	Memory functions	s750.4	Structure of lower extremity	d310.30	Communicating with receiving-spoken messages	e325+4	Acquaintances, peers, colleagues, neighbors and community members
b167.1	Mental functions of language			d330.44	Speaking	e330+4	People in positions of authority

Vineland Adaptive Behaviour Scales (Sparrow, Balla, & Cicchetti, 1984)

Domain	*Raw Score*	*Equivalent Age*	*Subdomain*	*Raw Score*	*Equivalent Age*
Communication	70	1-9	Receptive	46	2-9
			Expressive	15	< 1-6
			Written	9	3-10
Daily Living Skills	40	1-8	Personal	28	< 1-6
			Domestic	0	< 2-2
			Community	12	2-9
Socialization	65	1-11	Interpersonal relationships	34	< 1-6
			Play and leisure time	25	1-6
			Coping skills	6	1-3
Motor Skills	8	< 1-6	Gross	6	< 1-6
			Fine	2	< 1-6

2.2. ATA Process First Cycle

2.2.1. First Multidisciplinary Team Meeting for Data Evaluation and Setting Design

At the first multidisciplinary team meeting (Fig. 1 and Tab. 2), the psycho-technologist chaired the team, coordinated the professionals' interventions and wrote the meeting's report. The other participants included the psychologist, the pediatric specialist in AT, the developmental neuro-psychometrician, the occupational therapist, the orthopedic technician, the physiatrist, the architect, and the engineer.

According to the psychologist's report, two requests were made to solve activity limitations and participation restrictions in two specific milieus: home with family and school. The psychologist summarized the two requests as follows (Figure 1 and Table 2, step A):

- Identification of ATs that allow Arianna to keep up with the school's curriculum.
- Checking the use of Augmentative and Alternative Communication (AAC) strategies adopted by the family without an expert consult and, eventually, including a new AT for communication to facilitate daily communication with a variety of children and adults.

The psychologist showed Arianna's functional profile and diagnosis to the team, restructured according to the ATA process matching model, and summarized her individual functioning under the lens of the bio-psycho-social model.

Arianna's functioning regarding health and personal factors. Arianna, 6.5 years old, was attending the first grade in primary school, following a curriculum for students with special needs. Her prognosis was favorable regarding reading and writing. She used, when requested, a book with pictures to tell about her experiences and a binder with figures, pictures, and icons for communicating. She adequately and clearly expressed "yes" and "no" with head and eye movements. She pointed grossly with her right fist, because of her low muscle and gaze control. For communicating, Arianna used a code of facial mimicry and gaze shared by the caregivers but not understandable to unfamiliar people. From the documentation gathered, she was described as intelligent, motivated, lively, cheerful, attentive, and very communicative.

Arianna's functioning regarding environmental factors. There was an absence of a rehabilitation team of reference. The parents, networked with

the school, were the developers of the AAC intervention. The milieu was careful in respecting Arianna's time and manners, facilitating activities appropriate in content and form, and was available to work for the inclusion of alternative strategies for communication and education. The mother played the role of "interpreter" of the code of communication (gaze and facial mimicry) used by Arianna. The milieu showed high expectations with respect to the insertion and use of ATs by Arianna.

Arianna's predisposition to technology use. The Survey of Technology Use (Federici, Corradi, Lo Presti, & Scherer, 2009) tool provided evidence that Arianna generally seemed happy at home and school; easy-going; expressive/outgoing; impatient; motivated; sticks to a task; flexible; curious; and cooperative.

Arianna's functioning regarding technological factors. She used the following AACs: notebook with her experiences, binder with figures, pictures, and icons created by the family via *Boardmaker*® (by Mayer-Johnson). To move around, Arianna used an electric wheelchair, with joystick control and adapted yoke, walking stroller, and a pediatric postural mobility stroller. The *Matching Assistive Technology and Child: MATCH* (Federici *et al.*, 2009) assessment tools provided evidence of Arianna's good predisposition to the use of ATs.

The multidisciplinary team entrusted the psycho-technologist to check which ATs and/or alternative strategies to adopt to facilitate autonomous communication by Arianna (i.e., without the necessary interpretation of her mother), and for supporting scholastic learning in relation to the current situation of the child and her environment. With regard to ATs, the psycho-technologist proposed the following possible solutions to the multidisciplinary team (Fig. 1 and Tab. 2, step B):

ATs for communication:

- E-Tran (eye transfer). The eye gaze communication board, E-Tran, allows for rapid communication with a facilitator. The E-Tran, a transparent Plexiglas board with alphanumeric and icon labels applied, would initially be arranged with the same images as Arianna's binder, with figures, pictures, and icons. Such a solution was proposed because of her very marked involuntary movements, which prevented the use of the upper limbs in a functional way, but showed the presence of sufficient head control and preserved visual functionality.
- Communication boards reorganized. Arianna's current binder would be reorganized by easily searchable topics and be integrated by

printing new necessary images through the use of the *Boardmaker*® *Software* already in her use.

AT for learning and independent living:

– Automatic scanning system. The system consists of a *Jelly Bean* switch (2.5 inches by AbleNet), a *MultiKey* (by Auxilia) adapter to connect the switch to the computer, and the *Clicker software* (by Crick Software), adaptable according to needs by Arianna's schoolteachers, set to automatically scan. Through automatic scanning, Arianna can experience the computer for simple tasks that require control of time, in turn getting practice in seeing herself as a subject "that can make it alone" (independence). This would be a temporary solution to bridge the gap between the current use of the fist with the communication board and the novelty of the computer. It minimizes the cognitive workload through simple activities and games, giving her the possibility of her first autonomous management of the tools provided.

AT for improving posture and mobility:

– After watching the video produced by Arianna's mother on the main activities of her daily life (see above), the physiatrist found an inadequate posture system was in use. Therefore, the psycho-technologist provided suggestions to the multidisciplinary team in order to individualize a modular and customized postural system that could improve her posture, integrating and supporting the AT for learning and communication. The physiatrist and the orthopedic technician, on the basis of the user's needs and indications provided by the psycho-technologist, proposed the *Junior postural system by Jenx* as the best postural solution. The system allows for active postures to perform all operations necessary to use the ATs assigned with minimal effort and maximum performance.

Therefore, with respect to the user's requests, the psycho-technologist submitted to the multidisciplinary team AT solutions of a high-tech type for learning as well as low-tech type for communication. The assistive solution process initially started by maintaining the user's current system and then, gradually continuing to modify the overall system because it supports and integrates the new AT for learning and communication.

At the end of the meeting, the multidisciplinary team assigned to the psycho-technologist suggested the set-up of the assessment setting for the matching evaluation. At the same time, given that the new postural system integrated with AT for learning and communication foresaw an environmental impact, the engineer and the architect were charged with

providing a more accurate evaluation of Arianna's context of use. This environmental assessment process (Federici, Corradi, *et al.*, 2014) would be activated if the user accepted the proposals during the matching process.

Matching Process: Proposal, User-Trial, and Outcome of the Assistive Solution. At the matching process, Arianna, her mother, her school teachers, and the multidisciplinary team were in attendance. During the user-trials, the physiatrist and the orthopedic technician tested the postural system, and the psycho-technologist and the occupational therapist tested the ATs. The engineer and the architect checked the need for environmental modification and adaptation with the mother and the teachers. The psycho-technologist coordinated the trials and wrote the meeting report about the outcome of the matching process. The psychologist observed interactions between Arianna and her mother, and between Arianna and her school teachers, both in the test phase of the postural system and the AT matching tests. He also checked directly with the child, through simple gestural communication and observation of postural, gestural, and paralinguistic elements, regarding the level of satisfaction with each AT match.

The physiatrist and the orthopedic technician tested the *Junior postural system by Jenx*. It was fitted and customized by the orthopedic technician under the supervision of the physiatrist. The matching test for the AT postural system was evaluated very positively, because the system allows for active postures to perform all operations necessary with minimal effort and maximum performance.

Then the psycho-technologist and the occupational therapist tested the ATs for communication, learning, and independent living. The psycho-technologist reported the following outcomes and judgments on the matching process for each AT tested:

- *About the E-Tran*, Arianna immediately understood the E-Tran mode of use, controlling eye movements in a precise and fast way, although an excessive speed of shifting between different targets was detrimental to message clarity. She showed the ability to lengthen the time of eye fixation upon request; sometimes she put into action several attempts to accompany the eye fixation with her fist (the method adopted to indicate the icons on her communication boards). The matching test was evaluated very positively.
- *About the reorganized communication boards*, Arianna showed an adequate understanding of the symbols and their functions, highlighting difficulties in browsing the boards and in identifying the location of the target symbol/image. She had dysmetria with her right

fist in the indication gesture. The matching test was evaluated positively.

– *About the scanning system Clicker software*, Arianna understood well the mode of use, although she was not able to independently manage it with reference to time and presented difficulties maintaining pressure on the sensor in a consistent manner. She had dysmetria in reaching for the sensor. The matching test was evaluated positively.

The psychologist noted that:

– Arianna seemed excited mainly by the E-Tran and quickly demonstrated the ability to assume good mastery of it. The child seemed to be aware of the potential of E-Tran, which can probably satisfy both her need for greater autonomous communication and her desire to interact with a greater number of people. Both her mother and her schoolteachers seemed to positively consider the appreciation and ease of use of the tool by Arianna. The psychological evaluation of this matching test was highly positive. Arianna was deeply engaged and enthusiastic with the technology, because she saw in the use of the E-Tran a chance to facilitate communication with others.
– As far as the other two tools were concerned - the reorganized *communication board* and the *scanning system Clicker software* - Arianna encountered several difficulties (in browsing the board and identifying the location of target symbols/images for the communication board, being dependent on others for use of her AT, and difficulties in maintaining pressure on the sensor for the scanning system) as reported by the psycho-technologist. Those limitations indicated a requirement for a longer period of mutual adaptation. Nevertheless, her mother and schoolteachers appreciated the educational potential of both technologies. The potential of this AT match was strongly positive in spite of the critical issues regarding a greater commitment by the family and the schoolteachers. Finally, some customized refinements of the tools are likely to be made later to better facilitate their use.

The engineer and the architect analyzed Arianna's house and classroom based on all three environmental dimensions: accessibility, usability, and sustainability (Mirza, Gossett Zakrajsek, & Borsci, 2012). The analysis was carried out using maps of the environments, by looking at a video of Arianna's daily activities, and by inviting her schoolteachers to describe the position of Arianna's desk in the classroom. This qualitative analysis suggested that the two environments (house and classroom) had no

accessibility problems, whereas two warnings about the classroom environment were reported by professionals: the first one concerned the fact that Arianna could use the *Clicker software* only in a safe and well illuminated space (usability), and the second concerned proximity to an electrical outlet to provide energy to Arianna's systems (sustainability). At the end of this analysis, the professionals suggested an onsite analysis of the relationship between Arianna and the ATs in the classroom environment.

2.2.2. Second Multidisciplinary Team Meeting for the Assistive Solution Proposal

At the second multidisciplinary team meeting, the psycho-technologist chaired the meeting, coordinated the professionals' interventions and wrote the meeting report. The other participants included the psychologist, the pediatric specialist in AT, the developmental neuro-psychometrician, the occupational therapist, the orthopedic technician, the physiatrist, the architect, and the engineer. Based on the psycho-technologist's report on the matching process outcomes, the multidisciplinary team believed they had identified the best assistive solution to propose to the user among the ATs tested. They issued the following recommendations.

- *About the E-Tran*, Arianna should make constant use of it, even though it was a novelty for her, learning how to use it and discovering its communicative potential, with the aim of facilitating faster communication than the current system allowed.
- *About the reorganized communication boards*, they should be used in a more familiar and quiet communicative setting (rather than in the school) after reorganizing the actual boards and inserting a "content index" board. Moreover, inserting the symbol "there isn't a symbol" using the Boardmaker® Software was suggested. The team did not consider the communication boards as an optimal solution, but given that at the moment, it was the most rewarding communicator for the user and was already known from the milieu, supporting and allowing Arianna's participation and initiative communicative, it should be maintained.
- *About the scanning system Clicker software*, it should be uploaded in the school with teaching units identical to class content. Arianna should initially be supported using the automatic scanning system and then, gradually, reduce the need for support with the aim of autonomous management.

– *About the Junior postural system by Jenx*, it should be adapted by placing a sensor for automatic scanning on the outside right of the system. Initially, during computer activities, Arianna's left arm should be anchored, with the aim of creating a point of stability and limiting the dystonic component. Subsequently, the child should be supported in looking for her own strategy in order to exclude external constraints to the left arm.

The psychologist invited the multidisciplinary team not to overlook some points of weakness that emerged during the matching test: the objective difficulties of the child in relation to the most technologically advanced tools; and Arianna's difficulties with the technological tools, coupled with the enthusiasm from the mother, could contribute to maintaining a strong relational dependence of the child on the mediation of the mother. The markedly technological component of the *communication board* and the *scanning system* could be a main factor for the integration of Arianna within the class. Moreover, these signs reassured schoolteachers about the difficulty of holding together the class group as learning advances. At the same time, the team should actively promote the use of the E-Tran at this stage that is less technological but of greater help for Arianna to achieve greater communicative autonomy. In this particular case, a change too quickly to the most advanced technological tools could be a "double-edged sword": the price of greater integration, for example at school, may be the maintenance of prolonging dependence on the mother or adults in general.

The environmental evaluation, starting from the warning of the qualitative analysis, was carried out by professionals as a performance analysis of Arianna in interaction with (i) the *scanning system Clicker software* (ICF-CY code = e1251) by using the postural system in the classroom, (ii) the electrical wheelchair adapted with an joystick and cloche (ICF-CY code = e1201). This test was performed with Arianna sitting (i) at her usual desk, in a central position, and (ii) in a new desk position. The new position of the desk was selected by professionals for the following reasons: (1) it was more peripheral from the centre of the classroom and closer to the wall (but still not isolated) than the usual desk of Arianna, reducing the possibilities that her schoolmates could accidentally damage the system; (2) it had a higher level of illumination than the central position (ICF-CY code = e2400); and (3) it was close to an electrical outlet (ICF-CY code = e1501). Arianna's time of performance was assessed by using 5 different tasks for each trial; the time performance measured at the

centre (*M* = 14.46 s; *DS* = 5.55 s) was used by professionals as a comparative index of performances. The findings obtained were as follows:

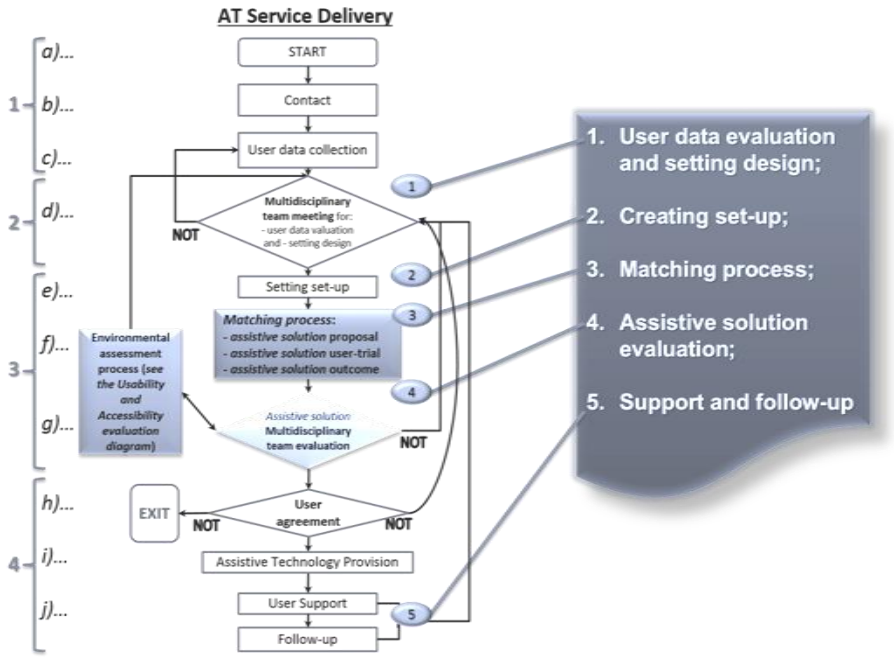
- When the *scanning system Clicker software* was tested in a central position, Arianna's interaction was very slow (*M* = 23.53 s, *DS* = 4.68 s). The scanning system in this position was not considered by professionals as a facilitator (ICF-CY code = e1251+0) as well as the electrical wheelchair (ICF-CY code = e1201+0); the low illumination and the distance from the socket unit acted as severe environmental barriers (ICF-CY codes = e2400.3 and e1501.3).
- When the *scanning system Clicker software* was tested in a peripheral position, Arianna seemed more comfortable, due to the optimal level of illumination. Nevertheless, she was not driven to control her hand movements by the electrical wheelchair (*M* = 21.49 s; *DS* = 2.09 s). In that case, the illumination and the access to the sockets acted as facilitators (ICF-CY codes = e2400+4 and e1501+4) whereas the electrical wheelchair and the *scanning system Clicker software* still had not properly supported Arianna (ICF-CY codes = e1251+0 and e1201+0).

Finally, Arianna was invited to test the *scanning system Clicker software*, sitting in the *Junior postural system* previously tested in the centre. This test was only run with the desk in the new peripheral position. With the use of this kind of postural system, the time of Arianna's performances were very close to her performances at the centre (*M* = 15.11 s; *DS* = 2.07 s). At the end of this test, Arianna was administered via E-Tran the device scale of the QUEST 2.0 (Device = 28; Services = 16; Average Satisfaction = 3.17). The interaction with the *scanning system Clicker software* was self-evaluated as satisfactory (*M* = 3.11; *DS* = 0.44). At the end of their report, the engineer and the architect proposed that the *scanning system Clicker software* could be used as a complete facilitator (ICF-CY code = e1251+4) only when associated with the *Junior postural system* tested at the centre (ICF-CY code = e1151+3). They also recommended the use of the *postural system* in the house in order to optimize Arianna's skills in the use of the complex systems of interaction and to reduce the effort of her interactions in the home environment.

User agreement. The user, together with her parents and schoolteachers, were convened (Figure 2, phase 4, step [h]) by the psychologist. At the meeting, the psycho-technologist was present too. First of all, the psychologist invited the user and her caregivers to express their opinions on the ATs tested in the matching process. Arianna showed curiosity and

enthusiasm about the solution proposed whereas the mother and the schoolteachers expressed positive evaluations about the ATs proposed and seemed to have higher expectations, particularly for the *scanning system Clicker software*. Then, the psychologist warned the mother and the schoolteachers that given that to date Arianna had never been exposed to any assistive information technology, this poor user experience could affect the use of the AT assigned (*scanning system*). Therefore, the path to independence in communication and learning would involve a progressive acquisition of new skills such as 'waiting-for-your-turn' during a conversation, a greater ability to 'do by herself', in an average time that would be evaluated in the following meetings and in the follow-up support. Then, the psycho-technologist explained each AT suggested by the multidisciplinary team and the recommendations for use. Finally, the psychologist and the psycho-technologist scheduled a meeting for training and support in the use of the assistive solution.

Figure 1 - *The psycho-technologist's actions in the AT Service Delivery flow chart according to the ATA process model (Federici, Corradi, et al., 2014). Button numbered signs show the steps of participation for the psycho-technologist's intervention*



User Support and Follow-up. For twelve months, the user support (Figure 2, phase 4, step [j]) for AT training and the E-Tran customization was activated immediately after Arianna was provided with the ATs and postural system (Figure 2, phase 4, step [i]). At the end of the twelve months, a follow-up meeting was scheduled in which Arianna, her mother, and the schoolteachers took part along with the psychologist and the psycho-technologist. The psycho-technologist chaired the meeting and wrote the meeting report. With regard to each AT assigned it emerged that (Figure 1, step C):

- The *E-Tran* was not used at home and scarcely at school because it was viewed as "low-tech".
- The *Communication boards* were used spontaneously by the user in all environments. Arianna's classmates played the role of facilitators. It was reorganized according to the recommendations received, including many new symbols and figures with considerable increase in volume. Issues remained regarding Arianna's independent management of the tool.
- The *scanning system Clicker software* was fully managed independently. It was used at home for adapting Arianna's preferred books and at school for creating personalized learning units.
- The *postural system* addressed the issues posed by the environment and the needs of the user in relation to the use of technological aids.

The psychologist found that the lack of use of the E-Tran, because of the preference for high-tech tools, even though they might require greater expertise in technology use and training, demonstrated the central role that the everyday life context had in the use of the tools by Arianna. Nevertheless, as prefigured during the second multidisciplinary meeting, discontinuation of the E-Tran resulted as a consequence of Arianna's maintaining strong dependence on her mother for her communicative needs, since maternal mediation was required for the use of the most advanced technological tools. Therefore, whereas Arianna's mother did not declare any need for change in the assistive solution provided, at most complaining of the low "technological attractiveness" of the E-Tran, school teachers however expressed the need to gradually reduce supporting Arianna in the use of tools.

The psycho-technologist's global evaluation stressed the opportunity to re-propose the E-Tran and to continue the use of the *scanning system Clicker software* to achieve greater autonomy. Given the outcome of the follow-up, the psycho-technologist scheduled a new matching process with

the user and convened the multidisciplinary team in order to describe the new situation.

Table 2 - *First cycle synoptic summary of the ATA process. In the first column, steps A, B, and C refer to the flow chart of Figure 1*

	Actions of the AT Service Delivery Centre	Professionals of the multidisciplinary team involved	Actions by Arianna
	Contact and Data collection (1° month)		
Step A	– Parent request: – AT educational support; – High-tech systems for communication. – User's collection data (clinical data and medical history): – Diagnosis: Severe spastic quadriplegia with a dystonic component resulted from cerebral palsy. – ICD-9/10: G80.0. – ICF-CY: b114.1; b167.1; s110.8; s730.4; s750.4; d140.30; d145.30; d310.30; d330.44; e310+4; e320+4; e325+4; e330+4. – Vineland's sub-domains under the typical score of developmental age: Expressive communication; Personal and Domestic Daily Living Skills; Interpersonal Relationships; Coping Skills; Gross and Fine Motor Skills. – Good visual acuity. – Video of the Arianna's behaviour in family and school contexts.		– Use of facial expressions recognizable by caregivers and relatives but not by outsiders. – Arianna pointed with her fist roughly because of low muscle control. – She was equipped with an electric wheelchair with a postural system for independent mobility. – Parents were required to fill out the SOTU.
	First Multidisciplinary Team Meeting (1° month)		
Step B	– Analysis of the user's requests. – Analysis of the functional profile and diagnosis. – Analysis of the individual functioning specifically with regard to technological device solutions and environmental factors (family and school). – AT proposal for matching	– Architect – Engineer – Neuro-psychometrician – Occupational therapist – Orthopedic technician – Pediatric specialized in AT developmental – Physiatrist – Psychologist – Psycho-technologist	The SOTU score highlighted good predisposition for technology use.

process: E-Tran, communication boards, Clicker software, and postural system.		
	Matching process (1° month)	
– AT proposal to the user. – User-trial. – Proposal and execution of environmental evaluations (family and school).	– Architect – Engineer – Occupational therapist – Orthopedic technician – Physiatrist – Psychologist – Psycho-technologist	– *E-Tran*: Control of eye movements in a precise and fast way. – *Communication boards*: Adequate understanding of the symbols and their functions; difficulties in browsing and in identifying target locations. – *Clicker software*: Good understanding of the mode of use; Incapacity to manage independently with reference to time and difficulties in maintaining pressure on the sensor in a consistent manner.
	Second Multidisciplinary Team Meeting (2° month)	
– Analysis of the environmental evaluations. – <u>Recommendations to give to the user</u>: – *E-Tran*: Increasing the use. – *Communication boards*: Reserving the use in a more familiar and quiet communicative setting; Addition of symbols by the means of the Boardmaker® software. – *Clicker software*: Keeping updated with the school teaching units identical to class contents. – *Postural system*: Placing a sensor for automatic scanning on the outside right of the system.	– Architect – Engineer – Neuro-psychometrician – Occupational therapist – Orthopedic technician – Pediatric specialized in AT developmental – Physiatrist – Psychologist – Psycho-technologist	
	User agreement (2° month)	
– Team's proposal and user's acceptance of AT matched. – Instructions for each single device used. – Recommendations: Warning parents of excessive expectations on the most technologically	– Psychologist – Psycho-technologist	– User manifested enthusiasm and curiosity about ATs proposed. – Arianna's caregivers expressed higher expectation about Clicker software.

	advanced AT (Clicker software).		
	User support and follow-up (12° month)		
Step C	– *12-month-user-support* after the AT provision. – *Follow-up* meeting after 12 months of AT assigned use: Proposal of a new ATA cycle process to fine-tune the first (cycle) AT assignations.	– Psychologist – Psycho-technologist	– *E-Tran*: Never used at home and scarcely at school because it was viewed as too "low-tech". – *Communication boards*: Used spontaneously by the user in all environments. Issues remained relating to Arianna's independent management of the tool. – *Clicker software*: Fully managed independently. – *Postural system*: Addressed the environmental issues and met the needs of the user in relation to the use of technological aids.

2.3. ATA Process Second Cycle

2.3.1. Third Multidisciplinary Team Meeting (after the first Follow-Up) for User Data Evaluation and Design of the Assessment Setting

At the multidisciplinary team meeting after the first follow-up (Figure 2, phase 2, step [d]; Table 4, step D), the psycho-technologist chaired the team, coordinated the professionals' interventions and wrote the meeting report. The other participants included the occupational therapist and the psychologist, in charge of the report about Arianna's new request. This meeting aimed to reach greater autonomy with the high-tech tools.

With regard to AT use, the psycho-technologist proposed to the multidisciplinary team the same technological solutions already assigned to Arianna with just the variation of the manual scan of the *Clicker software* instead of the automatic one, given the excellent performance achieved, in order to foster greater control and speed, and enhance the user's independence (Figure 1 and Table 3, step D). Then, the multidisciplinary team charged the psycho-technologist with establishing the set-up for the matching evaluation with the same tools of the previous evaluation with the only change in the *Clicker software*, now set to automatic instead of manual scan, and with the exclusion of the systems of posture since it did not require any new evaluation.

Matching Process after the first Follow-Up: Revision of the Assistive Solution in Use. At the matching process of the second cycle (Figure 2, phase 3, step [f]), Arianna, her mother, and her schoolteachers were present, as well as the psychologist, the psycho-technologist, and the occupational therapist. The latter two professionals tested the ATs for communication, learning, and independent living. The psycho-technologist reported the following outcomes and judgments on the matching process for each AT tested:

- *About the E-Tran*, albeit the pointing with eyes symbols on the Plexiglas was clear and respected the time reading of the communication partner, Arianna had difficulty keeping the phrase in mind with only the vocal feedback of the interlocutor (who utters aloud the phrase when the user is composing it by pointing with the eyes symbols on the E-Tran).
- *About the communication boards reorganized*, nothing significant was noted.
- *About the scanning system Clicker software*, set in manual mode, Arianna understood its new scanning functioning and was able to control upper limb movements functional to the management of the two switches.

2.3.2. Fourth Multidisciplinary Team Meeting (after the first Follow-Up) for Revision of the Assistive Solution

At the fourth multidisciplinary team meeting, the psycho-technologist chaired the meeting, coordinated the professionals' interventions and wrote the meeting report. The other participants included the psychologist and the occupational therapist. On the basis of the psycho-technologist's report on the matching process after the follow-up, the multidisciplinary team identified the best assistive solution, proposing to change the ATs in use with the following recommendations:

- *About the E-Tran*, to increase the use of E-Tran in all contexts of life with the aim of promoting more training to use and to write what was communicated by Arianna in order to allow a visual cue to associate with hearing (temporary facility).
- *About the communication boards reorganized*, to continue in the same manner of use.
- *About the scanning system Clicker software*, to encourage practice with the new manual mode setting, using activities already known by

Arianna. To use software for educational activities already known and the alphabetic keyboard on the screen with the aim to improve the speed of performance and reduce the need for self-corrections.

User Agreement to the Assistive Solution Revised. The new system proposed with the recommendations about Arianna's AT use was accepted by the child, her mother, and the schoolteachers. At the same time, new support and training were scheduled with the family for monitoring the E-Tran and the *scanning system Clicker software* on manual modality use and supporting the creation of new communication boards.

User Support and Follow-up (2). Support meetings were carried out for another twelve months (Figure 2, phase 4, step [j]), after which a follow-up meeting was scheduled with Arianna, her mother, and the schoolteachers along with the psychologist and the psycho-technologist. The latter chaired the meeting and wrote the meeting report. With regard to each AT assigned, it emerged that (Figure 1 and Table 3, step E):

- The *E-Tran* was used very effectively with three customized supports: letters divided into groups, 0–9 numbers and mathematical symbols, punctuation.
- The *Communication boards* were used very little, due to poor handling and practicality since, over time, the binder became too large.
- The *manual scanning system Clicker software* was managed independently, but with critical issues (speed and number of errors) related to user's motor function conditions. It was mainly used in educational contexts for phrases with verbs and nouns. The video keyboard was used with difficulty in timing and in the number of errors. The boards were rarely used for communication.
- The *Junior postural system* still continued to meet the needs of the user well.

The psychologist found that Arianna expressed her desires with greater determination and, because of the gradual process of social integration, began to deal with milieus – either family or school – contexts that were no longer willing to recognize her status of "uniqueness" too easily. Arianna, as far as possible, was poised to become a child like any other child. Therefore, the opportunity to further integrate the use of different tools and to try to introduce the most technologically advanced solutions emerged. From a clinical point of view, the psychologist found that while Arianna seemed to be more independent from the mother in her communication, the mother expressed a depressive feeling of "loss" regarding the special – affectively

and communicatively – dyad that she'd had with Arianna in the past. The mother ceased to be the only interpreter of Arianna's needs and wishes, and the latter was able to forge strong emotional relationships with many more people.

The psycho-technologist's global evaluation highlighted the possibility of proposing a high-tech communication system for communication and learning. Given the outcomes of the follow-up evaluation, the psycho-technologist scheduled a new matching process with the user and convened the multidisciplinary team in order to describe the new situation.

Table 3 - *Second cycle synoptic summary of the ATA process. In the first column, steps D and E refer to the flow chart of the Figure 1*

	Actions of the AT Service Delivery Centre	Professionals of the multidisciplinary team involved	Actions by Arianna
	Third (after the Follow-Up) Multidisciplinary Team Meeting (13° month)		
Step D	– Confirmation of the same technological solutions already assigned in the 1° cycle. – Variation of the manual scan of the Clicker software instead of the automatic one.	– Occupational therapist – Psychologist – Psycho-technologist	
	Matching Process after the Follow-Up (13° month)		
	– AT proposal to the user. – User-trial.	– Occupational therapist – Psychologist – Psycho-technologist	– *E-Tran*: Arianna seemed to have difficulties in keeping the phrase in mind with only the vocal feedback of the interlocutor. – *Clicker software*: Arianna understood the new scanning functioning thanks to the manual mode.
	Fourth (after the Follow-Up) Multidisciplinary Team Meeting (14° month)		
Step E	– <u>Recommendations to give to the user</u>: – *E-Tran*: Increasing the use in all contexts of life. Encourage to write what is communicated to allow a visual cue associated with the hearing (temporary facility). – *Clicker software*: Practicing the new manual mode setting and improve the use of the alphabetic on-screen	– Occupational therapist – Psychologist – Psycho-technologist	

keyboard to enhance the speed of performance and reduce the need for self-corrections.		
User agreement (14° month)		
– Team's proposal and user's acceptance of AT matched.	– Psychologist – Psycho-technologist	– Arianna positively accepted the proposed changes.
User support and follow-up (24° month)		
– *12-month-user-support* after the AT provision. – *Follow-up* meeting after 12 months of AT assigned use: Proposal of a new ATA cycle process to fine-tuning the second (cycle) AT assignations.	– Psychologist – Psycho-technologist	– AT use – *E-Tran*: Substantial increase of use. – *Communication boards*: Used scarcely because of poor handiness. – *Clicker software*: Managed independently, but with critical issues (speed and number of errors) related to user's motor function conditions. – Individual functioning – *Motor*: Improvement in eye gaze control for pointing at symbols. – *Communication*: Respecting the control of social communication time. – New requests – Better *integration* among devices. – A *high-tech solution* for improving independence, communication speed, and access to digital information. – *Psychological counseling*: Arianna's mother reported a depressive feeling of 'loss' due to the increasing independence of daughter.

2.4. ATA Process Third Cycle

2.4.1. Fifth Multidisciplinary Team Meeting (after the second Follow-Up) for User Data Evaluation and Setting Design

At a multidisciplinary team meeting after the second follow-up, the psycho-technologist chaired the team, coordinated the professionals' interventions, and wrote the meeting report. The other participants included

the occupational therapist and the psychologist in charge to report about Arianna's new requests. These were: (1) more tool integration, (2) more advanced technology for autonomy, and (3) more psychological support in the mother-daughter relationship.

According to the psychologist's report on the follow-up meeting, the milieus of Arianna now appeared more harmonized and Arianna's integration process in the school context was good enough. At this stage, it was certainly possible to encourage greater integration of the ATs or, if possible, a "unification", focusing on the most technologically advanced solutions. At the same time, in order to safeguard the mother-daughter relationship, the welfare of both and the good progress achieved by Arianna, the psychologist suggested a path of brief counseling (6 months) to the mother to refocus some of the issues of her emotional and existential dimensions.

Since Arianna in the last twelve months had acquired an effective ability to control eye gaze for pointing at symbols, the psycho-technologist proposed to the multidisciplinary team to upgrade the E-Tran with a high-tech solution for improving independence, communication speed, and access to digital information (Figure 1 and Table 4, step E). Therefore, the E-Tran could be destined to be usable just for easy and fast communicative exchanges. Then, the multidisciplinary team charged the psycho-technologist with the set-up (Figure 2, phase 3, step [e]) for the matching evaluation with several eye tracking hardware and software types.

Matching Process after the second Follow-Up: Upgrade of ATs in Use. At the matching process after the second follow-up, Arianna, her mother, and her schoolteachers were present, as well as the psychologist and occupational therapist. The psycho-technologist coordinated the trials and wrote the meeting report about the outcome of the matching process. The psychologist observed that the child seemed comfortable with the eye tracking system; her mother and schoolteachers showed appreciation of the characteristics and potential of the high-tech system.

The psycho-technologist and the occupational therapist tested two eye-tracking systems. The psycho-technologist reported the following outcomes and judgments on the matching process for each AT tested:

– *About the eye-tracking systems*: The *Eye Tech TM3* (by Eye Tech Digital Systems) with software *The Grid* (by Sensory Software International), the *iAble-MyTobii* (by SrLabs srl and Tobii Technology) with the software *The Grid*, and the *Erica System* with the *LifeMate Software Suite* (by Eye Response Technologies) were

tested. Arianna understood the systems' functioning well and used the custom grids made from the alphabetic keyboard and from iconic tables. She enacted strategies of self-control and self-correction of written words. She properly managed space, speech synthesis, and the combined use of alphabetic and numeric keyboards, and autonomously paused the system when needed. Arianna corrected her own posture when reminded by the professional and independently recalibrated the laser eye pointer.

2.4.2. Sixth Multidisciplinary Team Meeting (after the second Follow-Up) for the Eye Tracking System Solution

At the sixth multidisciplinary team meeting (Figure 2, phase 3, step [g]), the psycho-technologist chaired the meeting, coordinated the professionals' interventions, and wrote the meeting report. The other participants included the psychologist and the occupational therapist. On the basis of the psycho-technologist's report on the matching process after the second follow-up, the multidisciplinary team identified the best assistive solution, proposing to change the ATs in use with the following recommendations:

- *About the E-Tran*, it should be kept for fast communication exchange, at least until Arianna is fully autonomous in the use of the eye tracking system.
- *About the eye tracking system*, Arianna can use any of the tested eye tracking systems for enriched and more complex communication than with E-Tran. Autonomy management was suggested with the need for oversight. When Arianna is well trained in the use of eye tracking, its use in the school curriculum was recommended. The management software of the eye tracking should be opened and customizable, to meet Arianna's changing needs over time (e.g., The Grid by Sensory Software International).

User Agreement to the Assistive Solution Revised. The new system proposed with the recommendations regarding Arianna's AT use was accepted by the child, her mother, and schoolteachers. At the same time, new support and training were scheduled with the family in order to adopt the eye tracking as the only AT for communication and learning by the next school year.

User Support and Follow-up (3). Meetings of support were carried out for another twelve months (Figure 2, phase 4, step [j]) after which a follow-up meeting was scheduled in which Arianna, her mother, and the

schoolteachers took part along with the psychologist and the psycho-technologist. The latter chaired the meeting and wrote the meeting report.

The psychologist found that the relationship between mother and child, at the end of the counseling path, seemed to be evident. The mother explored the ambivalence of her desires – greater autonomy and well-being of Arianna, on the one hand, and the need to feel needed and "unique" on the other – and could accept living with these two seemingly contradictory tendencies, as long as she could recognize and sometimes distance herself from Arianna. The process of Arianna's autonomy could now begin its path without relational obstacles.

The psycho-technologist stressed the importance of continuing to support both the family and the schoolteachers to increase the use of eye tracking. Therefore, he provided regular support appointments with Arianna, the family, and the schoolteachers. Between meetings, further support was carried out at a distance, gradually integrating assistive solution identified in upgrades and customizations that may be needed during the course of learning and communicative autonomy of Arianna.

Ending the ATA process. The psycho-technologist verified that all the ATs assigned were in use and met the user's and milieu's needs. In particular, with regard to Arianna's functioning, improvement in eye gaze and postural control and an improvement of communication quality, given that she learned to respect the control of social communication time were ascertained. Also, the factors of participation improved with the assistive solutions provided. Arianna experienced greater autonomy and better social integration. At this point, the psycho-technologist on behalf of the Leonarda Vaccari Institute proposed ending the evaluation process since it was well accepted by the utilizer and her family.

Table 4 - *Third cycle synoptic summary of the ATA process. In the first column, step F refers to the flow chart of the Figure 1*

	Actions of the AT Service Delivery Centre	Professionals of the multidisciplinary team involved	Actions by Arianna
	Fifth (after the second Follow-Up) Multidisciplinary Team Meeting (25° month)		
Step F	– Analysis of the new user's requests. – AT proposal for matching process: To upgrade the E-Tran, destined for easy and fast communicative exchange, an eye tracking	– Occupational therapist – Psychologist – Psycho-technologist	

system was discussed. – Proposal of brief psychological counseling for Arianna's mother.		
Matching process (25° month)		
– AT proposal of an eye tracking system. – User-trial: EyeTech TM3, and iAble-MyTobii, and the Erica System were tested.	– Occupational therapist – Psychologist – Psycho-technologist	User – The user was comfortable with the eye tracking system, enacting strategies of self-control and self-correction of written words. Caregivers and schoolteachers – Appreciation of the characteristics and potential of the high-tech system.
Sixth (after the Second Follow-Up) Multidisciplinary Team Meeting (26° month)		
Recommendations for the user: – *E-Tran*: For a faster communicative exchange. – *Eye tracking system*: Its use in the school curriculum was recommended after a training period.	– Occupational therapist – Psychologist – Psycho-technologist	
User agreement (26° month)		
– Team's proposal and user's acceptance of AT matched.	– Psychologist – Psycho-technologist	– Arianna positively accepted the eye tracking system. – Arianna's mother accepted the psychological support.
User support and follow-up (36° month)		
– *12-month-user-support* after the AT provision. – *Follow-up* meeting after 12 months of AT assigned use. – *Ending the ATA process*.	– Psychologist – Psycho-technologist	AT use – All ATs assigned were in use and met the user's and milieu's needs. Individual functioning – *Motor*: Improvement of eye gaze and postural control. – *Communication*: Respecting the control of social communication time. – *Participation*: Improvement of autonomy and social integration; Maturation of the parental relationships also due to at the mother's acceptance of Arianna's autonomy.

3. Conclusions

The ATA process model guided the professionals of the Leonarda Vaccari Institute AT Service Delivery centre and the user's milieu to a better analysis and comprehension of the user's needs. Moreover, the effectiveness of the ATA process was highlighted by the user's improvement of autonomy, social integration and communication, and oculi-motor and postural control. The case of Arianna stressed the role of the psycho-technologist and the psychologist in a multidisciplinary team within an ATA process.

The psycho-technologist is an expert in the relationship between the person and technology and, in particular, in identifying the best available assistive solution for a specific person in a particular context of life. The psycho-technologist evaluates the interaction between person and technology by following a user-AT-milieu holistic model, as in the MPT model (Scherer, 1998, 2005), that is to say, he or she is an expert in assistive solutions. As shown in Arianna's case, the psycho-technologist assumed the role of coordinator of the multidisciplinary team, he or she was responsible for the appropriateness of matching and follow-up assessments over time. Furthermore, the psycho-technologist distinguishes him/herself from the professional role of the psychologist in AT service provision, since the latter focuses on personal factors, human relationships and communication, connecting the "bio", "psycho" and "social" components affecting the ATA process, whereas the former may not be a clinical/dynamic psychologist, even though he or she has a background in psychology, especially in rehabilitation (Federici, Scherer, *et al.*, 2014).

The psychologist provides an appropriate psychological evaluation and a precise clinical intervention with the user and/or their significant human context over the course of the whole AT assignment process. A well-designed AT assessment process must primarily guarantee room for the expression of users' subjective dimensions and the assessment of their human resources.

Arianna's case shows the contribution of the psychologist in identifying the personal factors of the user, observing and evaluating her behavior, and taking into account the dynamics of family relationships and the relationships between different professionals within a multidisciplinary team.

Finally, Arianna's case highlights how a comprehensive evaluation involving key professionals over multiple points in time can yield benefits

above and beyond functional gains. While the time involved in conducting such a thorough assessment and involving a multidisciplinary team may seem to lack efficiency, such an investment can actually save time in the long run by avoiding the need to go back and retrofit a device or gather key information that was missed. Recent empirical evidence as stated by Federici and Borsci (2014) interviewing 558 Italian users of four National Healthcare System's AT Service Delivery centers, support the idea that investing in the quality of AT delivery processes, by reshaping the pathways in tune with the ATA model, may significantly decrease the likelihood of AT non-use – from more than 24% to 12% (Federici & Borsci, 2011, 2014). When patients received an AT through a user-oriented processes of service delivery, they experienced more benefits from the AT, experienced less problems in daily use, and perceived a better post-assignation support from the AT service delivery centers. The increase of both, the end-users overall experience with the AT and relationship with the centre, results in a reduced percentage of AT non-use. Although ATA process model shows promise for: (1) reducing the likelihood of AT non-use; (2) improving the overall relationship between users and professionals; and (3) increasing the effectiveness and the quality of a delivery process, the economic and social value of abandonment decrease can vary according to different contexts (e.g., private or public healthcare systems).

References

AAATE (2003). AAATE position paper: A 2003 view on Technology and Disability. Retrieved Jun 30, 2014, from http://www.aaate.net/

Corradi, F., Scherer, M. J., & Lo Presti, A. (2012). Measuring the Assistive Technology Match. In S. Federici & M. J. Scherer (Eds.), *Assistive Technology Assessment Handbook* (pp. 49-65). London, UK: CRC Press. doi:10.1201/b11821-5

Federici, S., & Borsci, S. (2011). The use and non-use of assistive technology in Italy: A pilot study. In G. J. Gelderblom, M. Soede, L. Adriaens & K. Miesenberger (Eds.), *Everyday Technology for Independence and Care: AAATE 2011* (Vol. 29, pp. 979-986). Amsterdam, NL: IOS Press. doi:10.3233/978-1-60750-814-4-979

Federici, S., & Borsci, S. (2014). Providing Assistive Technology: The perceived delivery process quality as affecting abandonment. *Disability and Rehabilitation: Assistive Technology*, 1-10. doi:10.3109/17483107.2014.930191

Federici, S., Corradi, F., Lo Presti, A., & Scherer, M. J. (2009). The Adaptation and Use of the Italian Version of the *Matching Assistive Technology and CHild* (MATCH) Measure. In P. L. Emiliani, L. Burzagli, A. Como, F. Gabbanini & A. L. Salminen (Eds.), *Assistive Technology from Adapted Equipment to Inclusive Environments: AAATE 2009* (Vol. 25, pp. 562-566). Amsterdam, NL: IOS Press. doi:10.3233/978-1-60750-042-1-562

Federici, S., Corradi, F., Mele, M. L., & Miesenberger, K. (2011). From cognitive ergonomist to psychotechnologist: A new professional profile in a multidisciplinary team in a centre for technical aids. In G. J. Gelderblom, M. Soede, L. Adriaens & K. Miesenberger (Eds.), *Everyday Technology for Independence and Care: AAATE 2011* (Vol. 29, pp. 1178-1184). Amsterdam, NL: IOS Press. doi:10.3233/978-1-60750-814-4-1178

Federici, S., Corradi, F., Meloni, F., Borsci, S., Mele, M. L., Dandini de Sylva, S., & Scherer, M. J. (2014). A Person-Centered Assistive Technology Service Delivery Model: A Framework for Device Selection and Assignment. *Life Span and Disability, 17* (2), 175-198.

Federici, S., & Scherer, M. J. (2012a). The Assistive Technology Assessment Model and Basic Definitions. In S. Federici & M. J. Scherer (Eds.), *Assistive Technology Assessment Handbook* (pp. 1-10). Boca Raton, FL: CRC Press. doi:10.1201/b11821-2

Federici, S., & Scherer, M. J. (Eds.). (2012b). *Assistive Technology Assessment Handbook*. Boca Raton, FL: CRC Press. doi:10.1201/b11821

Federici, S., Scherer, M. J., & Borsci, S. (2014). An ideal model of an assistive technology assessment and delivery process. *Technology and Disability, 26* (1), 27-38. doi:10.3233/TAD-140402

Hyvärinen, L., & Jacob, N. (2011). *What and How Does This Child See?: Assessment of Visual Functioning for Development and Learning*. Moscow, RU: Vistest.

Lancioni, G. E., Sigafoos, J., O'Reilly, M. F., & Singh, N. N. (2013). *Assistive Technology: Interventions for Individuals with Severe/Profound and Multiple Disabilities*. New York, NY: Springer. doi:10.1007/978-1-4614-4229-5_0

Lancioni, G. E., & Singh, N. N. (Eds.). (2014). *Assistive Technologies for People with Diverse Abilities*. New York, NY: Springer. doi:10.1007/978-1-4899-8029-8_0

Meloni, F., Federici, S., & Stella, A. (2011). The Psychologist's Role: A Neglected Presence in the Assistive Technology Assessment Process. In G. J. Gelderblom, M. Soede, L. Adriaens & K. Miesenberger (Eds.), *Everyday Technology for Independence and Care: AAATE 2011* (Vol. 29, pp. 1199-1206). Amsterdam, NL: IOS Press. doi:10.3233/978-1-60750-814-4-1199

Meloni, F., Federici, S., Stella, A., Mazzeschi, C., Cordella, B., Greco, F., & Grasso, M. (2012). The Psychologist. In S. Federici & M. J. Scherer (Eds.), *Assistive Technology Assessment Handbook* (pp. 149-177). Boca Raton, FL: CRC Press. doi:10.1201/b11821-11

Miesenberger, K., Corradi, F., & Mele, M. L. (2012). The Psychotechnologist: A new profession in the Assistive Technology Assessment. In S. Federici & M. J. Scherer (Eds.), *Assistive Technology Assessment Handbook* (pp. 179-200). Boca Raton, FL: CRC Press. doi:10.1201/b11821-12

Mirza, M., Gossett Zakrajsek, A., & Borsci, S. (2012). The Assessment of the Environments of Use: Accessibility, Sustainability, and Universal Design. In S. Federici & M. J. Scherer (Eds.), *Assistive Technology Assessment Handbook* (pp. 67-81). Boca Raton, FL: CRC Press. doi:10.1201/b11821-6

Scherer, M. J. (1998). *Matching Person & Technology. A Series of Assessments for Evaluating Predispositions to and Outcomes of Technology Use in Rehabilitation, Education, the Workplace & Other Settings*. Webster, NY: The Institute for Matching Person & Technology, Inc.

Scherer, M. J. (Ed.) (2002). *Assistive Technology: Matching Device and Consumer for Successful Rehabilitation*. Washington, DC: American Psychological Association.

Scherer, M. J. (2005). *Living in the state of stuck: How technologies affect the lives of people with disabilities* (4th ed.). Cambridge, MA: Brookline Books.

Sparrow, S. S., Balla, D. A., & Cicchetti, D. V. (1984). *Vineland Adaptive Behavior Scales*. Circle Pines, MN: American Guidance Service.

Stasolla, F., Caffo, A. O., Picucci, L., & Bosco, A. (2013). Assistive technology for promoting choice behaviors in three children with cerebral palsy and severe communication impairments. *Research in Developmental Disabilities, 34* (9), 2694-2700. doi:10.1016/j.ridd.2013.05.029

WHO (World Health Organization) (1977). *ICD-9: International Statistical Classification of Diseases and Related Health Problems, 9th Revision* (Vol. 1-3). Geneva, CH: WHO.

WHO (World Health Organization) (1992). *ICD-10: International Statistical Classification of Diseases and Related Health Problems, 10th Revision* (Vol. 1-3). Geneva, CH: WHO.

WHO (World Health Organization) (2001). *ICF: International Classification of Functioning, Disability and Health*. Geneva, CH: WHO.

WHO (World Health Organization) (2007). *ICF-CY: International Classification of Functioning, Disability and Health – Children and Youth Version*. Geneva, CH: WHO.