

The ARATA 'Making a difference with AT' Papers

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arata
participation through technology

ARATA (Australian Rehabilitation and Assistive Technology Association) is a non-profit membership organisation of practitioners and consumers passionate about enhancing the lives of people with disability (and people of all ages) through the best use of assistive technology.

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The AT Practitioners and the NDIS Project

Background

“Following in the footsteps of Medicare, an NDIS will make sure Australians with disability have access to the services they need to participate in society, no matter where they live or how they acquired the disability. An NDIS will involve fundamental changes to the way disability care and support is provided in Australia.” So said the Prime Minister and Federal Minister and Parliamentary Secretary responsible for disability services on 3 December 2011. Throughout 2012 the government has continued to push forward its commitment to the NDIS through:

- establishing the NDIS Advisory Committee drawn from key disability representatives from across Australia;
- negotiating with the states and territories on both the framework and the funding necessary for the ‘trial sites’ phase;
- allocating significant funding to undertake the implementation and the initial phases of the trial sites;
- establishing an Agency to coordinate the development of how this new system will effectively operate and then implement it.

Bringing ARATA expertise to bear

In late 2011, the Australian Rehabilitation and Assistive Technology (ARATA) Board made a decision to ensure that the combined expertise of the ARATA Membership – representing many of the key players in the area of assistive technology (AT) in Australia – would be presented to those involved in the NDIS development and implementation.

ARATA thus commissioned a consultancy team (Lloyd Walker, Gunela Astbrink, Natasha Layton and Michael Summers) to help develop background material and ARATA’s position statement on how NDIS should incorporate an effective AT system. The team is drawn from the sector itself with combined experience in AT of over 60 years in nearly all aspects – from design and

development, government policy, professional service delivery, and consumer experiences and challenges.

Since commencing in March 2011, the Team has consulted over 100 people in the field through individual discussions, focus groups and online interaction. We have also tried to maintain close links to those connected with the implementation of the NDIS to ensure this work is both appropriately targeted and answers the questions being asked (and even some yet to be asked). The work has been grounded in both practice and a robust review of the national and international literature on matters relating to AT and its use and delivery.

The ARATA 2012 Position Statement on AT and the NDIS was launched on 23 August 2012. This document encapsulates key elements that ARATA believes will be critical to achieving the most economic and effective delivery and use of reasonable and necessary AT across Australia. It forms the keystone of the research and consultation work of the last 9 months, and arguably reflects current ‘state of the science.’

This document collects the Background Papers and related materials that have been developed by the team as a resource that underpins the Position Statement. It is primarily targeted at those seeking to address the big questions associated with implementing the NDIS, but it will also have valuable information and insights for consumers, practitioners, suppliers, governments and others.

As ARATA has a long history of drawing on the expertise of its members to advance effective use of assistive technology, the material in this document is likely to grow and be revised as the organisation continues to provide expertise to policy makers as the NDIS unfolds.

Introduction to the ARATA “Making a difference with AT” papers



This compilation includes three sections: the overview documents, the four background papers (in the ‘Making a difference with AT’ series), and two foundational documents.

Overview Documents

The first table, *Soft-technology tasks in the NDIS AT pathway for consumers* provides a summary of the human elements (soft technologies) that are so critical to the success of the NDIS, including how they all link together and are coordinated and measured.

A Consumer’s Experience of the AT System - Flowchart that follows illustrates what the Project Team believes would be the process from beginning to end of a consumer seeking assistance from the NDIS for an AT solution.

Making a difference with AT Series

This series was developed to assist the key groups established by the Minister to advise on the implementation of the NDIS. Consequently the Team has deliberately focused on elements it understood would be of interest to the different agencies.

The Economic Potential of AT solutions draws on detailed research done in Victoria that involved eight diverse consumers to document their AT needs and costs. It includes a holistic economic cost (including assessment, training, maintenance and replacement) on a yearly basis to provide each AT solution. The report was provided through to the NDIS Advisory Group and the FaHCSIA NDIS Task Group by the economics consultants advising the government on NDIS issues at the time.

Expert Working Group Paper 1: Assessment and Eligibility provides background and important elements necessary for sound practice in the area of AT. Current science indicates that a focus on functional assessment (rather than diagnosis) is an important element of systems such as the NDIS and sound outcomes in AT draw on this work.

Expert Working Group Paper 2: Control and Choice reflects on the central importance of consumer controlled or directed delivery of services – including assistive technology and the services around its delivery and maintenance.

Expert Working Group Paper 3/4: Workforce and Quality deals with the challenges facing the Australian AT workforce, both in terms of career pathways and associated credentialing/certification but also in dealing with our dispersed population base and different environments of AT use. The paper also reflects on the importance of embedding a consumer directed, research and innovation linked quality improvement strategy into the NDIS.

Background Documents

Literature Summary: AT and AT Practitioners provides a summary of literature related to these series of papers, with an emphasis on literature that highlights approaches, techniques and systems that deliver better outcomes for consumers. The Team has a vast amount of literature it has reflected on and in some cases summarised and this can be provided if necessary.

AT glossary simply provides in one place a clear explanation of many of the jargon and terms used throughout our work, and often within the field itself. It can be helpful to understand where particular terms have come from and their current usage.

Appendices

The Appendices provide background on the Project Team and include the two documents published elsewhere for completeness:

Appendix A: The ARATA ‘AT Practitioners and the NDIS’ Project Team biographies

Appendix B: ARATA’s NDIS Policy Statement

Appendix C: Introduction to ARATA (the ARATA Flier)

Table 1: Soft-technology tasks in the NDIS AT pathway for consumers

Task	Best Practice	Who is responsible?	KPI's & Standards	Notes
		including NDIA, Disability Service Orgs, Service Providers, independent & mainstream providers	All services shall comply with National Disability Service Standards and UN Convention on the Rights of Persons with Disabilities, and all applicable national and state/territory legislation	
NDIS Tier 2 Information, referral, web services, community engagement for all people with disabilities and their carers				
Information	Information is available from multiple sources (across sectors, well-advertised, available to those who do not identify as aged / disabled / chronically ill)	NDIA (in consultation with ARATA, NAERA, ATSA, ILCs and others who relevant expertise and information) AT Sponsors (as defined by the TGA) may be best placed to provide bulk of AT product information	Information is fully accessible: Universally available Multiple formats Multiple languages Web Content Accessibility Guidelines (WCAG 2.0) Level AA (Cwlth Govt's mandatory requirement for govt depts. & govt agencies to be implemented by Dec 2014. Level A by Dec. 2012)	Commitment to cross-sector and cross-silo information platform based in WHO ICF
Need for AT? and Referral	Assessment for all potential 'Tier 3' candidates to include an initial simple low-cost assessment determining whether or not there is a need for AT If eligible for Tier 3, then case management process by NDIA needs to ensure more detailed AT assessments and services follow immediately If people need AT but are not eligible for Tier 3, referral to state/territory AT systems	NDIA	1 week from Tier 3 eligibility assessment to AT referral Everyone who needs AT is referred to an AT service/ provider/program for which they are eligible and are able to get timely access	How are people who don't get access to Tier 3, but who need AT going to get what they need? Alternatively, consideration should be given to having a single AT system that operates within both Tier 2 and Tier 3 of the NDIS. This would be more efficient and effective than having one AT system within the NDIS for Tier 3, and a multiplicity of state/territory AT programs to cover those who are not eligible/don't otherwise require Tier 3, but who require AT,



Task	Best Practice	Who is responsible?	KPI's & Standards	Notes
NDIS Tier 3 People receiving funding support from NDIS who require disability support and/or early intervention				
Initial AT assessment & prescription	<p>Skilled AT practitioner(s), consumers and suppliers collaborate on AT solution - AT devices, home modifications and vehicle modifications which take into account personal goals, lifestyle and environment.</p> <p>Utilising a suite of best-practice AT assessment tools and processes</p> <p>Depth and detail of assessment linked directly to complexity/risk/cost</p> <p>Capacity to prescribe innovative devices and solutions, in a way that is controlled and evaluated</p>	<p>Credentialed/ accredited AT prescribers – individuals and teams/organisations specialising in diversity of body structures & function issues of consumers</p> <p>Level of credentialing linked to complexity/ risk/cost of the AT solution</p>	<p>All prescribers and suppliers are accredited/credentialed</p> <p>Consumers and carers actively involved in making AT solution decisions (see National Disability Service Standards)</p> <p>Reviews/evaluations undertaken to test effectiveness of tools, processes and prescriber accreditation</p> <p>Ground outcome measures in consumers' goals</p>	<p>AT costs (hard and soft technology) factored into individual plans and budgets</p> <p>Relevant Australian and international research utilised to underpin best practice evidence base</p> <p>Currently no national credentials/accreditation systems exist for AT assessment/prescription, and no training/education curriculum to underpin credentialing/accreditation. How will this get done and who will fund its development?</p>
Funding	<p>Direct purchase of any and all AT purchases (including any required assessment/fitting/ trialling) if under \$1000/\$500/\$300 annually</p>	<p>Consumer, carer, professional, service provider</p>	<p>Monitor effectiveness through random sampling, including tracking outcomes to ensure that these low cost solutions are effective and appropriate</p>	<p>DVA uses a \$300 annual limit, investigation of the effectiveness and efficiency of this would help determine structure for this simple direct purchase component for NDIS</p>
	<p>Purchase via prescription if AT requirements exceed \$1000/\$500/\$300 annually</p>	<p>Credentialed prescribers with 2-3 levels of credentialing linked to funding authority which increases complexity/risk/cost of AT increases</p> <p>NDIA review of proposed AT solutions that exceed guidelines (should be the exception rather than the norm) utilising a Review Panel (including highly skilled and experience AT professionals and consumer)</p>	<p>Structural separation of prescription from supply to minimise conflicts of interest (but noting that effective solutions are a collaborative process between consumers, prescribers and suppliers)</p> <p>Routine monitoring of prescription practices systemically and initiate reviews if when problems arise (see for example NZ & Norway)</p> <p>Routine monitoring of cost effectiveness of AT devices regarding breakdowns, repairs and durability over time</p>	<p>Essential that usually prescription=funding to maximise efficiency of system and minimise delays and red-tape. This will require increasing levels of prescription/funding authority (and correspondingly higher levels of credentialing or accreditation) as risk/cost/ complexity of the AT solution increases</p> <p>Could link prescribing activities and related assessments/advice to professional indemnity insurance, so professionals are insured.</p>

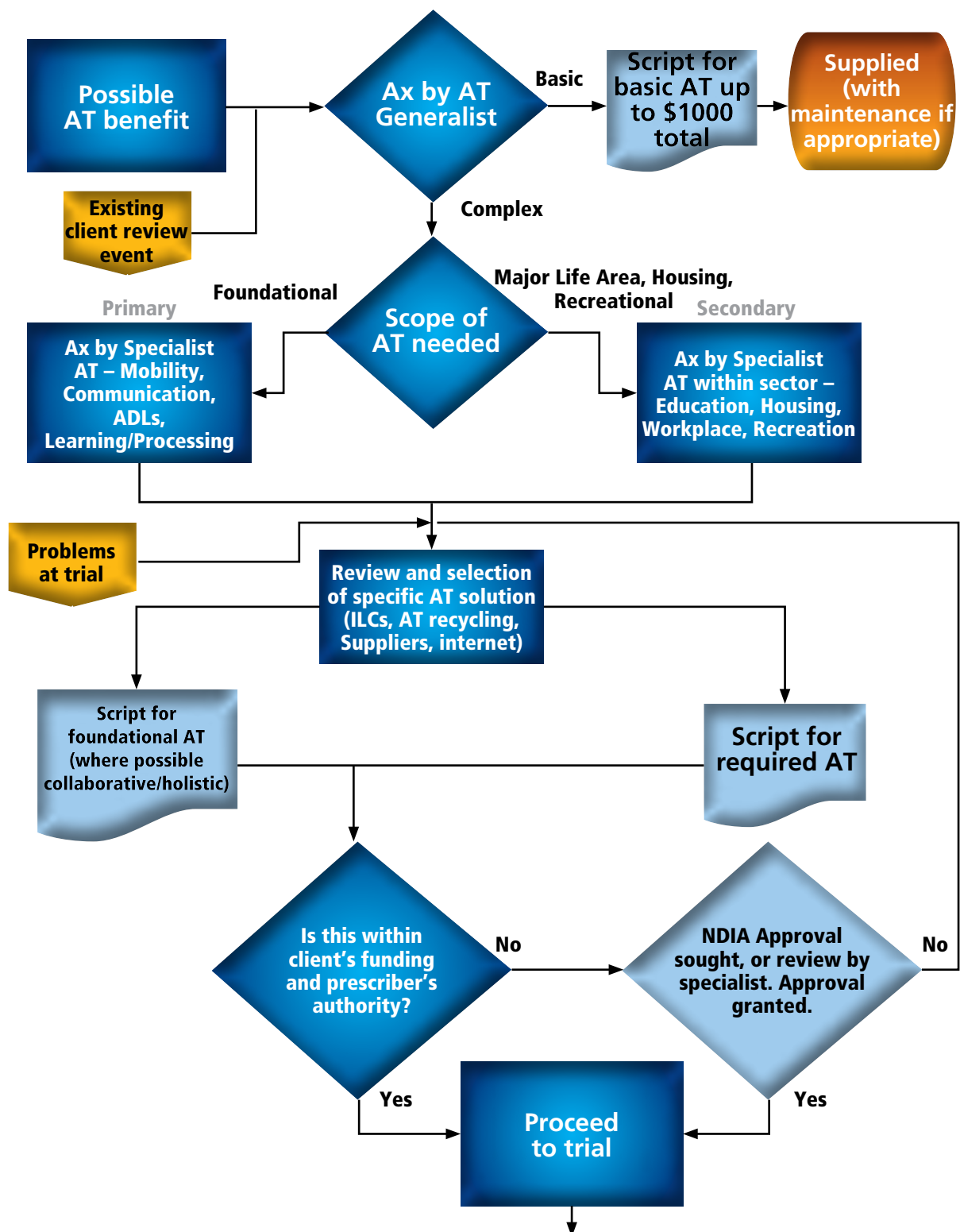
Task	Best Practice	Who is responsible?	KPI's & Standards	Notes
Trial (including progressive assessment, fitting, training, review/evaluation)	<p>In-home/in-community trial of prescribed AT solution including trial AT devices; device components for accurate trial.</p> <p>Access to appropriate level of technical skills based on complexity/risk/ cost of AT solution</p> <p>Initial training of person using the AT</p>	Credentialed/ authorised AT assessors and suppliers (not-for-profit, government and private, including ILCs)	<p>National average time between prescription and trial of 2 weeks, and maximum acceptable time of 6-8 weeks.</p> <p>KPIs regarding time between prescription and trial will need to vary depending on levels of complexity, customisation, costs, with longer time frames towards the top of the AT pyramid and very short (immediate provision) at the bottom of the pyramid</p> <p>All assessors and suppliers are accredited</p>	<p>Trialling is currently a significant hidden cost in most Australian AT systems regarding both the provision of actual devices for trial and the time AT professionals and AT suppliers spend on this stage of the process.</p> <p>Funding options include fees for trials, and "trial to buy", such as has occurred with some AT in SA</p> <p>Includes initial fitting/ customisation as required</p> <p>Currently no national accreditation of AT assessors or suppliers</p>
Provision (including fitting, customising, set-up and training)	<p>AT solution provided</p> <p>Fitting, customisation, set-up and training if and as needed</p> <p>Provision to include effective and cost-efficient arrangements for local support, maintenance and repairs</p>	<p>Accredited suppliers</p> <p>Accredited suppliers required to ensure spare parts and capacity for maintenance/repairs will be available over established/agreed reasonable lifespan of the AT device</p>	<p>Performance measured against appropriate KPIs regarding timing and delays.</p> <p>All suppliers accredited</p> <p>Regular review/evaluation to determine effectiveness and efficiency of provision arrangements, including 'lifetime' costs of AT devices incorporating maintenance, repairs and life-span</p> <p>Premature failures of AT devices results in automatic review to identify what went wrong (prescription, device, use...)</p>	<p>Different structures, processes and KPIs will be required for urban, rural and remote areas. What makes sense in urban areas is often ineffective and inefficient when population densities are lower</p>
Review	<p>Reviews at appropriate intervals of AT solutions in relation to changing needs, goals, circumstances and other changes in the overall service plan</p> <p>Review utilisation and effectiveness of new/ innovative devices and solutions</p>	NDIA in conjunction with the consumer, carer, AT prescribers, assessors and suppliers	<p>All plans include review timeframes and/or triggers, and these are adhered to</p> <p>Regular review/evaluation to determine effectiveness of review processes and structures</p> <p>Compare the structured use of new/innovative solutions to 'the usual' solution</p>	<p>This should include review of condition of equipment, fit, updating training, and consideration of different or additional AT solutions in light of changing needs and/ or new technologies</p>

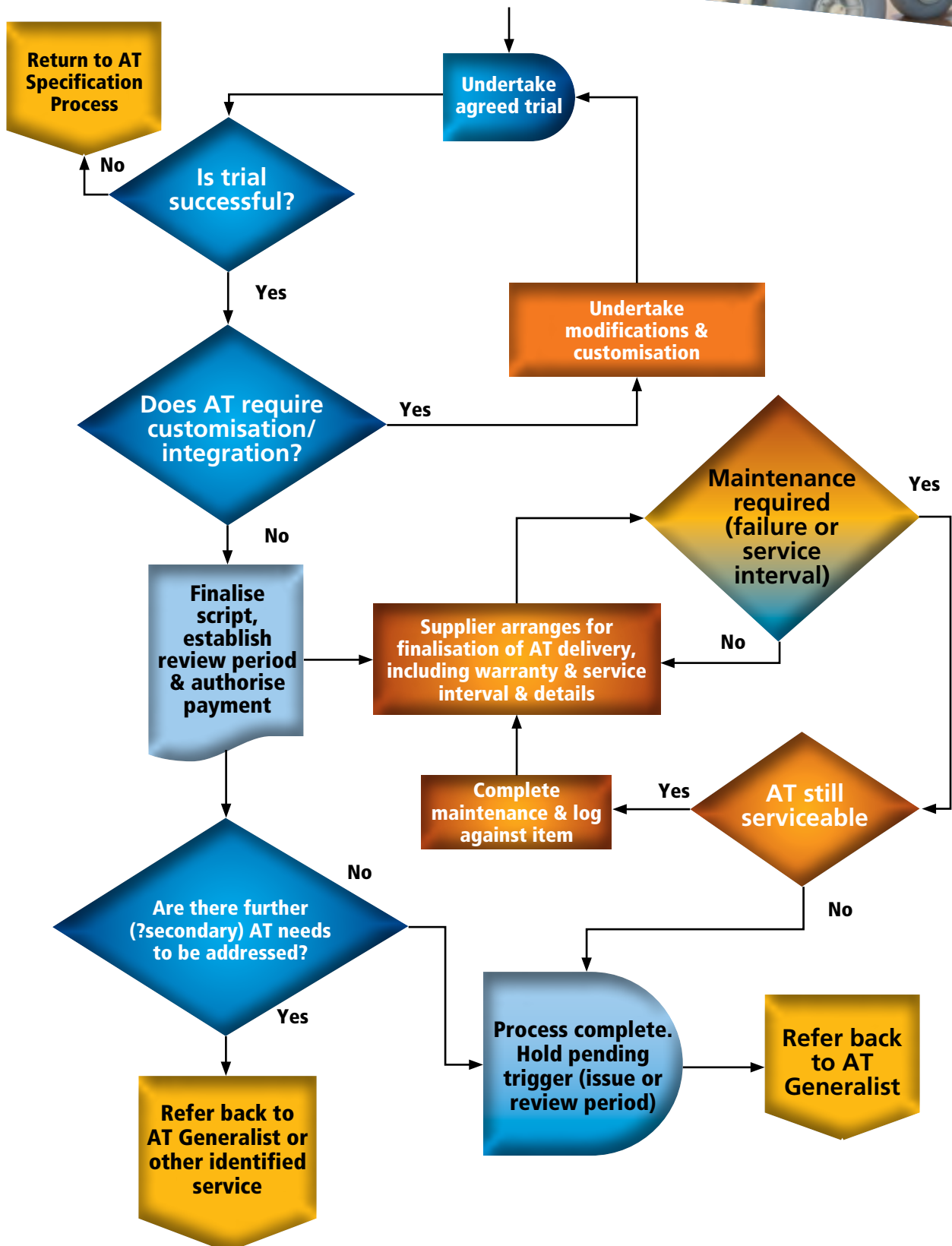


Task	Best Practice	Who is responsible?	KPI's & Standards	Notes
Maintenance and Repair	<p>Scheduled maintenance as required</p> <p>Timely repairs as required</p> <p>Loan of equipment while repairs and maintenance are being done</p>	<p>Accredited maintenance and repair suppliers</p>	<p>Qualified workforce</p> <p>Scheduled maintenance always done on time</p> <p>Repairs undertaken immediately, with equipment loans available</p> <p>Downtime for consumers monitored and managed based on a schedule of maximum downtime for different equipment types</p> <p>Public score-cards regarding device breakdowns/failures, and delays in maintenance and repairs</p>	<p>Rural and remote areas must be well serviced, and this may require different accreditation and KPI arrangements than in urban areas</p> <p>Identify basic AT training courses (Engineers Australia has a syllabus) that could be offered through TAFE etc. for technicians</p> <p>Investigate existing maintenance and repair KPIs in various Australian and international AT systems</p>
Evaluate processes, structures and outcomes	<p>Systematically evaluate consumer (and carer/ family) outcomes, and the related processes and structures that determine these</p> <p>Feed data into NDIA research work.</p> <p>Proactive evaluation of new/innovative approaches, devices, and services delivery structures and processes</p>	<p>NDIA and Inspector General</p> <p>All stakeholders, including consumers, carers, service providers, suppliers, professional bodies, academics etc.</p>	<p>National Disability Service Standards, UN Convention on the Rights of Persons with Disabilities, and key performance indicators</p>	<p>Involving people with disabilities directly in the design and delivery of evaluation efforts is essential</p> <p>Create capacity/foster innovation, e.g. via innovation competitions and 'prototype trialing' scheme</p>



A Consumer's Experience of the AT System - Flowchart





The economic potential of Assistive Technology solutions – *an introduction*

By Natasha Layton & Lloyd Walker



A paper in the ARATA
Making a difference with AT series

Key messages

1. Disability Supports (ref Box 2 in Productivity Commission's Disability Care & Support Report, 2011) are most effective at ensuring social inclusion and optimal function over time when provided in a tailored package (here called an AT solution). They have been underprovided based on funding 'silos' in the past, and there is evidence that substantial numbers of PWD have experienced under-provision to date.
2. AT solutions are only fully effective when soft technologies (prescription, assessment, adaptation/fitting, training, maintenance, repairs, reviews etc) are provided along with the hard technology (AT device). Poor solutions not only reduce effectiveness but can also generate negative health outcomes and injuries.
3. Investment in optimal AT solutions is demonstrated to offset other costs from a health and community services sector perspective, and to achieve multiple outcomes.
4. Figure 1 below demonstrates potential discounting across WHO ICF defined activity and participation domains. The AT device used (stand-up wheelchair) was selected as it is not currently on any State Equipment Funder lists due to its cost, yet has great potential for outcomes.
5. It is possible to identify actual costs (purchase of AT devices; home and vehicle modifications; paid support; downstream costs of unpaid support) and relate these to person-centred outcomes. The data below will illustrate this point, and is drawn from a Victorian sample of consumers, reported in Layton, N., Wilson, E., Colgan, S., Moodie, M. & Carter, R. (2010) The Equipping Inclusion Studies: Assistive Technology Use and Outcomes in Victoria. Melbourne, Deakin University.



"An assistive technology solution is defined as an individually tailored combination of hard (actual devices) and soft (assessment, trial and other human factors) assistive technologies, environmental interventions and paid and/or unpaid care" A.T.Collaboration (2009) www.at.org.au

The impact of AT across all of life

Figure 1



Figure 1 illustrates the impact to a user of a stand-up wheelchair across the WHO activity and participation domains.

- Cost approx \$17,000 (for a manual base) or \$28,000 (for a power base) which can be discounted across 8 life areas.
- **Specific cost-offsets:** eliminate need for kitchen modifications and purchase of standing frame; less personal support required (transfer).
- **Specific downstream costs avoided:** lower downstream risks for shoulder integrity due to decreased transfers.

Eight archetypal cases

These case studies were selected to illustrate the match of body function and structure variations to the WHO ICF domains. Eight research participants were selected on the basis of maximum variation, to explore the impacts and outcomes of a range of AT solutions. These cases included both genders, metro and rural dwellers, students, workers, volunteers, parents and retired individuals, ranging in age from 35 to 72 years.

Table 1 below describes the lives of these adult Australians with the AT solutions they have currently in place (note that similar work should also be undertaken for children and young adults). This analysis has costed their optimal AT solutions as defined by an expert panel of allied health AT practitioners. In the study an optimal solution was defined as achieving the 'best or most favourable' solution for the individual (ie no better option in terms of technology is available).

It should be noted that both study participants and the AT panel struggled to consider the full breadth of ICF domains, in particular the cultural, social and civic (CSC), and even the major life areas (MLA). Such areas have traditionally not been funded (CSC) or funded under very strict conditions (MLA).



Table 1

Introducing 8 representative cases across the WHO ICF body function and structures

Demographics
and incomeSeverity of
disability**CASE 1**

Ingrid is a busy volunteer with restricted hand function, severe involuntary movements, dysarthric speech and shoulder girdle degeneration. She uses a power wheelchair to travel to accessible areas within her regional community, but requires assistance to transfer and for personal care, provided by husband and paid supports. Ingrid lives with cerebral palsy. Ingrid requires 19 elements of AT solutions for optimal function and participation.

Body function and structures affected: voice & speech; neuromuscular; gastrointestinal

aged 45-64
married
rural
volunteer
(DSP)

severe

CASE 2

Ricky is a university educated young woman with multiple incapacitating chronic illnesses, which leaves her bedridden and supine, or at best elevated to no more than 30%. Ricky is rarely able to leave the home other than for medical appointments, in a power-recline wheelchair to manage her postural issues. Paid support is used for personal care and domestic tasks. She uses the computer for instrumental tasks such as banking, where possible. Her primary means of engagement with the world is via the internet, through the use of an extensive computer system, and with which she runs a small web business. Ricky needs 46 elements of AT solutions for optimal function and participation.

Body function and structures affected: mental functions; neuromuscular; metabolic; immunological

aged 25-44
single
inner city dweller
(DSP; ISP)

severe

CASE 3

Margaret has limited ability to change body position, secondary to restricted limb movement and strength wears a full orthotic jacket and boot to support her posture in her wheelchair, and uses a stick to reach and push household items as she cannot lift her arms. She travels widely on public transport, where environments are accessible. She is unable to transfer to the toilet without a disability support worker to assist with hoist transfers, therefore engages in careful management of her fluid intake in order to use the toilet at 7 am and 7pm during carer hours. Margaret lives with polio, post polio syndrome and the effects of ageing. Margaret needs 49 elements of AT solutions for optimal function and participation.

Body function and structures affected: voice & speech; neuromuscular; cardiovascular, respiratory, genitourinary; skin

aged 65-74
retired professional
PhD student
carer for elderly father
(DSP; ISP)

severe/profound

CASE 4

Lynne has multiple joint contractures, digit amputations and generalised weakness. She is a highly dedicated volunteer and parent. From her power wheelchair base, she uses accessible public transport, and lobbies to alter inaccessible venues and destinations. She has increasing difficulty unlocking and opening doors and reaching and using household appliances, and now cannot transfer into the family vehicle or caravan. Travel for leisure has been a key part of managing her husband's depression, and maintaining a lifetime hobby. Lynne has a diagnosis of arthrogryposis, and lives with incontinence. Lynne needs 22 elements of AT solutions for optimal function and participation.

Body function and structures affected: neuromuscular; sensory functions and pain; genitourinary; skin

aged 45-64
married
rural
volunteer
parent
(DSP)

moderate

NOTES: DSP – Disability Support Pension; ISP – Individualised Support Package, a form of direct payment used in Victoria

Table 1

Introducing 8 representative cases across the WHO ICF body function and structures

Demographics
and incomeSeverity of
disability**CASE 5**

Peter lives with the late effects of polio. He has generalized fatigue and weakness of the muscles of the arms and legs, as well as a past history of back and shoulder injuries and depression. Peter can ambulate with a stick and callipers, but environmental barriers such as uneven paving or stairs test his balance and endurance. He has respiratory difficulties, suffering from severely sleep disordered breathing at night. Peter is a highly dedicated volunteer, and parent, who accompanies his daughter to school daily with his power scooter. Peter requires 18 elements of AT solutions for optimal function and participation.

Body function and structures affected: voice and speech; respiratory and cardiovascular; mental functions; neuromuscular

aged 45-64
retired professional
volunteer
parent
(superannuant)

mild

CASE 6

Jenny lives with multiple sclerosis and the effects of ageing. She has severe muscular weakness, severe tremor in their upper limbs and a lack of sensation in her hands. Jenny is unable to correct her posture if she falls sideways or forwards, unable to eat or drink without some degree of assistance and can only manage physical tasks that require limited gross motor skills. Paid carers leave drinks with straws carefully positioned on the bench, and flexible support in the form of 30 min or 15 min visits enable Jenny to eat lunch. Jenny uses a power wheelchair with adapted controls to move around her unit and the local community where pavements allow as many areas are unpaved. She greatly enjoys her grandchild and contact with friends and neighbours. Jenny needs 42 elements of AT solutions for optimal function and participation.

Body function and structures affected: mental functions; voice and speech; sensory functions; respiratory; genitourinary; neuromuscular; skin and related structures

aged 65-74
outer suburban dweller
retired grandmother
(aged pension; ISP)

severe

CASE 7

Yanni has L1 paraplegia. He returned home less than six weeks prior to interview, following rehabilitation, with partial home modifications, a manual wheelchair on loan, and vehicle hand controls. Yanni is a man in his 50's who lives rurally in a split level home on a steep block. He works from home, and access to his office/printery is via a flight of stairs. Yanni requires 22 elements of AT solutions for optimal function and participation.

Body function and structures affected: structures of the nervous system; cardiovascular; genitourinary

aged 45-64
rural dweller
full-time worker
parent

moderate

CASE 8

Grace is a person who is both deaf and blind. Her interaction with the world is primarily tactile, and she is unable to access cultural and leisure materials/activities (eg music, television, radio). She lives with her cat, and studies at TAFE. Her home is modified with tactile indicators and environmental controls. Grace uses paid support workers for essential tasks such as shopping and answering snail mail, but where possible uses paid support for preferred tasks such as swimming and trips to visit her family. Grace's outcomes would significantly improve with provision of either additional support hours, or additional AT devices currently unfunded (tactile Braille-enabled mobile phone). This paper costed the latter scenario. Figure 2 below identifies the impact of this AT solution.

Body function & structures affected: sensory functions

aged 45-64
single
outer suburban centre
TAFE graduate
(DSP)

severe/profound

The impact of optimal AT

Figure 2



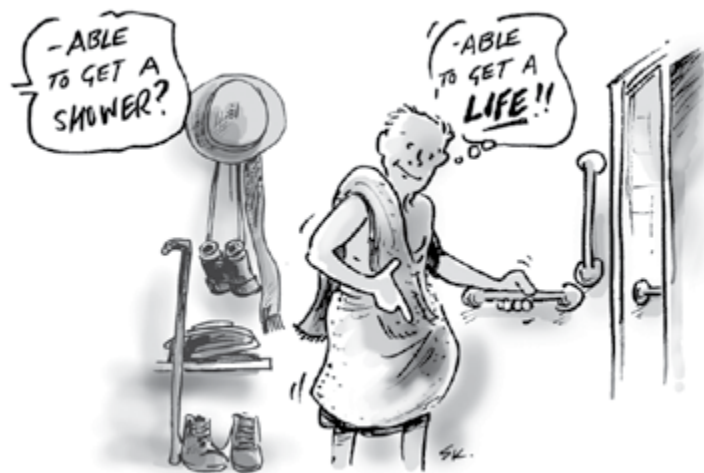
An example of the optimal outcome that can be achieved through appropriate AT is illustrated by an aspect of the AT specified for Grace (Case 8) who is both deaf and blind. This specialist AT can positively influence most of the ICF activity and participation domains as shown in Figure 2.

- Refreshable Braille device and mobile phone approx \$2,500 for Connie device and \$600 for Nokia phone.
- **Specific cost offsets:** increased capacity to make informed purchases due to increased choice and control as a consumer; increased options as a community-dweller, due to capacity to travel safely and independently.
- **Downstream cost savings:** support worker requirement minimised, autonomy and control maximised, with associated mental health benefits; support worker time freed for unmet need, eg swimming for fitness.

The cost

Detailed costing of nearly all the aspects of delivering optimal assistive technology has been undertaken for this paper. Table 2 below provides a summary of these costs for each case, described against the primary ICF domain targeted by the various AT solutions recommended.

To assist in comparison, Table 2 includes the cost of the identified paid attendant care costs (which would inevitably be higher under suboptimal AT provision), and also indicates the soft technology cost as a proportion of the AT capital cost. It should be clear that the soft technology cost is at an equivalent level to professional advice and assistance required for most capital investments.



The cost

Table 2		The annual cost (for capital and soft technology) to provide Optimal AT for each study participant to meet their needs														
ICF domains	CASE 1		CASE 2		CASE 3		CASE 4		CASE 5		CASE 6		CASE 7		CASE 8	
	Capital	Soft	Capital	Soft	Capital	Soft	Capital	Soft	Capital	Soft	Capital	Soft	Capital	Soft	Capital	Soft
Learning and applying knowledge	\$0	\$0	\$361	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
General tasks and demands	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$50	\$0
Communication	\$397	\$79	\$1,499	\$480	\$28	\$162	\$0	\$0	\$0	\$0	\$71	\$0	\$0	\$0	\$6,557	\$421
Mobility	\$2,083	\$143	\$3,180	\$137	\$2,046	\$51	\$14,037	\$244	\$1,455	\$128	\$2,829	\$91	\$6,438	\$217	\$158	\$1,398
Self-care	\$6,407	\$192	\$3,131	\$151	\$7,698	\$278	\$3,563	\$49	\$2,984	\$70	\$3,795	\$105	\$3,632	\$42	\$0	\$0
Domestic life	\$16	\$16	\$3,521	\$156	\$1,985	\$95	\$923	\$57	\$74	\$0	\$6,211	\$120	\$0	\$0	\$329	\$0
Major life areas	\$0	\$0	\$2,905	\$303	\$1,227	\$0	\$0	\$0	\$355	\$16	\$521	\$0	\$0	\$0	\$0	\$0
Community, social and civic life	\$0	\$0	\$37	\$0	\$18	\$0	\$6,772	\$42	\$0	\$0	\$126	\$0	\$987	\$87	\$0	\$0
TOTAL AT cost per year	\$8,903	\$430	\$14,633	\$1,267	\$13,001	\$585	\$25,295	\$392	\$4,868	\$214	\$13,554	\$317	\$11,056	\$346	\$7,093	\$1,820
Soft technology costs as % of capital cost		4.8%		10.0%		4.5%		1.6%		4.4%		2.3%		3.1%		25.7%
Attendant care (crossing domains)	\$26,126		\$29,392		\$27,513		\$14,423		\$0		\$19,634		\$0		\$60,060	

NOTE: See Appendix 2 for more detailed breakdowns of these figures

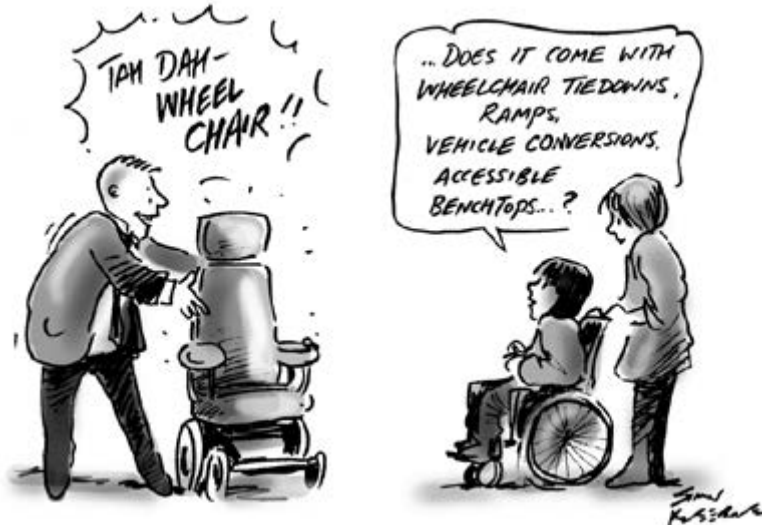
The initial costing tables were developed by Deakin University (Stephen Colgan, Associate Prof Marj Moodie and Prof Rob Carter), as part of the Equipping Inclusion Studies commissioned by the Aids and Equipment Action Alliance (AEAA). The economic tables in this document have extra data added and different breakdowns.

Critical extensions needed to this work

While the eight cases represent adults who illustrate the scope of the ICF domains they are certainly not comprehensive. This work needs to be extended to consider in a similar fashion:

1. Children and their special needs for growth and transition points (eg into school and between school levels and then to study/work).
2. Those users who have rapidly degenerating conditions or health.
3. People whose prime disability is an intellectual or cognitive disability.

Factors such as AT residual value (and the scope/value of AT reuse/recycling schemes) and differing types of AT (eg learning or general tasks domains) are likely to be more prominent for some of these cases.



Précis of evidence and conclusions

Analysis of evidence from these cases demonstrates:

1. Significant outcomes are possible in the areas of participation and satisfaction;
2. Difficulty (ie decrease in difficulty) is not a valid outcome area as consumers articulated a wish to achieve more with the same level of effort/ difficulty;
3. Timely soft technology application is critical to the achievement of outcomes;
4. Funding must cover the cost of soft technology, maintenance, and running costs, as well as appropriate depreciation of the devices themselves to allow for timely replacement. The critical costs for both soft technology and maintenance are a relatively minor component of the AT budget but have been overlooked in previous formulae and service provision. Cost effective AT provision requires all these costs be incorporated into NDIS;
5. In general, people with disabilities and professionals within the sector do not currently consider requirements for the community, social and civic domain (which includes recreation and spiritual activities) of the ICF since past and current schemes have not supported this key element of life at all;
6. Many of the soft technology costs stated are conservative since they represent the cost for an initial set up and training. Where timely and ongoing assistive technology provision is occurring, these initial costs can be discounted over much longer periods than just the service life of the initial AT device;
7. Much AT operates across many ICF domains. Assessment of success should thus be measured by participation in the higher level domains.



Appendix 1: Mapping WHO ICF body functions and structures to case participants

	WHO ICF body functions and structures	Representation across case participants
Domain 1	Mental functions	Cognitive issues
	Structures of the nervous system, eg spinal cord	Memory issues
Domain 2	Sensory functions and pain	Visual acuity deficits
	The eye, ear and related structures	Blindness and deafness
Domain 3	Voice and speech functions	Dysarthric speech
	Structures involved in voice and speech	Oral motor weakness
Domain 4	Functions of the cardiovascular, haematological, immunological and respiratory systems	Respiratory issues (physiological)
	Structures of the cardiovascular, immunological and respiratory systems	Respiratory issues (limited lung capacity)
Domain 5	Functions of the digestive, metabolic and endocrine systems	Gastrointestinal issues related to posture
	Structures related to the digestive, metabolic and endocrine systems	swallowing issues
Domain 6	Genitourinary and reproductive functions eg menstruation functions	Continence issues
Domain 7	Neuromusculoskeletal and movement-related functions	Athetosis
	Structures related to movement	Spinal lesion
		Neuromuscular junction disorder
Domain 8	Functions of the skin and related structures	Pressure care issues
	Skin and related structures	Parasthesia and impaired temperature regulation
		Amputation

Appendix 2: Annual costings across general sub-areas of the ICF domains

AT purpose descriptions	ICF domain	CASE 1		CASE 2		CASE 3		CASE 4		CASE 5		CASE 6		CASE 7		CASE 8	
		Capital	Soft	Capital	Soft	Capital	Soft	Capital	Soft	Capital	Soft	Capital	Soft	Capital	Soft	Capital	Soft
Learning	L	\$0	\$0	\$361	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Communication	C	\$397	\$79	\$1,499	\$480	\$28	\$162	\$0	\$0	\$0	\$0	\$71	\$0	\$0	\$0	\$6,557	\$421
Mobility	M	\$2,083	\$143	\$2,966	\$98	\$2,046	\$51	\$2,715	\$180	\$1,455	\$128	\$2,829	\$91	\$4,939	\$145	\$158	\$1,398
Transport	M	\$0	\$0	\$214	\$39	\$0	\$0	\$11,322	\$64	\$0	\$0	\$0	\$0	\$1,499	\$72	\$0	\$0
Food	SC	\$1,258	\$30	\$74	\$0	\$1,891	\$22	\$376	\$0	\$26	\$0	\$11	\$0	\$593	\$0	\$0	\$0
Hygiene	SC	\$5,149	\$162	\$333	\$30	\$4,044	\$96	\$2,602	\$31	\$1,351	\$21	\$2,527	\$61	\$2,998	\$27	\$0	\$0
Dressing	SC	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Health Tech	SC	\$0	\$0	\$42	\$0	\$1,246	\$127	\$0	\$0	\$1,607	\$49	\$0	\$0	\$0	\$0	\$0	\$0
Sleeping	SC	\$0	\$0	\$2,682	\$121	\$517	\$33	\$585	\$18	\$0	\$0	\$1,258	\$43	\$40	\$16	\$0	\$0
Household tasks	D	\$16	\$16	\$3,521	\$156	\$1,985	\$95	\$923	\$57	\$74	\$0	\$6,211	\$120	\$0	\$0	\$329	\$0
Processing / task management	GT	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$50	\$0
Education	MLA	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$16	\$0	\$0	\$0	\$0	\$0
Work	MLA	\$0	\$0	\$2,905	\$303	\$1,227	\$0	\$0	\$0	\$355	\$16	\$506	\$0	\$0	\$0	\$0	\$0
Community activity	CSC	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Recreation	CSC	\$0	\$0	\$37	\$0	\$18	\$0	\$6,772	\$42	\$0	\$0	\$126	\$0	\$987	\$87	\$0	\$0
Spiritual	CSC	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0

There is significant background data to this table:

- Each assistive technology (AT) recommended was individually costed; this table represents a summary.
- Although many items of AT impact across multiple categories above, each was allocated to the primary category that it affected.
- All lump sum costs (capital, soft technology initial cost, etc.) are depreciated against the service life of the AT (3% discount rate).
- Capital costs include: purchase cost, installation cost (both discounted over the service life), plus an annual maintenance cost.
- Soft technology costs are split into three categories: assessment and prescription (which would include fitting/customisation), training, and ongoing review. Hourly rate was set at \$95/hr.
- Attendant care cost was based on the rates from an average cost from Federal Carer Award. In 2010 this was \$17.89.
- The time allocated for professional involvement (soft technology) and care support, and the recommended assistive technology solution was specified by a specialist group of allied health practitioners. The purpose was to provide an optimal solution to achieve the 'best or most favourable' solution for the individual (ie no better option in terms of technology is available).

Expert Working Group Paper 1: Assessment and Eligibility

Lead Author: Natasha Layton

SCOPE OF SUPPORTS: Effective delivery of Disability Supports require comprehensive assessment, provision and evaluation, delivered in collaboration with consumers and in accordance with consumer focussed goals, by appropriately skilled practitioners.

ELIGIBILITY: Contemporary disability theory, the internationally recognised WHO International Classification of Disability, Functioning and Health (ICF) 2001, and the UN Convention on the Rights of Persons with Disabilities, recognise impairment as a part of human diversity, and disablement as brought about by barriers within society. Therefore eligibility for disability supports must focus on the functional impact of impairments within an individual's context and environment, rather than on diagnostic categories,

age, or other criteria.

ASSESSMENT: The NDIS will feature person-centered collaborative assessment (including self-report). This assessment must include consumer-goal setting tool structured against ICF; screening for person – task – environment fit; assessor familiar with and able to refer for broad range of disability supports; specialist assessors to ascertain underpinning / foundation activities (communication; mobility; personal and domestic ADL; learning / processing) and subsequent meta-level participations (specialist areas being housing; recreation; community access; workplace; education). Outcome frameworks to take into consideration economic offsets (downstream costs and cost offsets) as well as discounting across outcome areas; and be aligned to societal expectations as detailed in UN CRPD.





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16 August 2012

Assistive Technology Critical Pathway:		Best practice	Direct and indirect resources required	Societal resources required to make it happen
STEP 1 Identify need	Australians informed of potential supports to mediate impairment effects	Information is available from multiple sources (across sectors, well advertised, available to those who do not identify as aged / disabled / chronically ill)	Accessible gateway / portal to current AT (eg current ILCs)	Commitment to cross-sector and cross-silo information platform based in WHO ICF (ie not age or diagnosis focussed)
	STEP 2 AT practitioners assess for range of disability supports including hard and soft technologies	Information is fully accessible	Develop gateway to make funding sources clear and accessible (eg AEAA funding navigator)	Realign funding sources into back-end, so consumers enter single system
	Assessment	Skilled AT practitioner(s) and consumer collaborate on AT solution [AT Device (hard technology) + home modifications + personal support]	Services and/or teams specialising in diversity of body structures & function issues of consumers	Relevant Australian research to contribute to evidence base
	Set-up & trial	Resources available include trial AT devices; device components for accurate trial; access to technical skills; recognition of AT supplier resources.	Sufficient funds for timely provision of all elements of AT solution	Credentiailling program and ongoing education for AT practitioners
	Training	Capacity to trial and to train in consumers' home and other environments	Service flexibility provides single point of entry to multiple elements of AT solution	Back-end realignment of funding silos supports single point of entry into service systems across AT, home modifications, workplace modifications, education services, and personal support
	Follow-up evaluation, tailoring & sign-off	Service flexibility enables the AT practitioner / consumer dyad to make whole-of-life plans, including plans for review / replacement prior to current AT solution becoming obsolete	Targeted use of ancillary AT practitioners (eg assistants) to deliver soft technology elements	Establish action plan across duty holders (LGA; business; other) to address 'inclusive community environs' issues ie. built environment beyond BCA and AS1428
	Review/ reassessment		Support for R&D related to supply chain, including Australian and international standards development	High level policy commitment to sector-wide cost and outcome framework (ie calculate cost offsets and cost savings from health, RAC, disability)
	Outcomes			
STEP 3 Evaluate outcomes	Capture and evaluate outcomes for consumers; AT service and society	1. Evaluate consumer-defined outcomes instead of rehabilitation-focussed fragmented measures (eg safety; independence) RECOMMEND: WHO ICF; Consumer Priorities checklist; SCOPE outcomes framework 2. De-differentiate outcomes to align with whole population in line with human rights criteria (UN CRPD; NDS; social inclusion markers) 3. Realign economic evaluation tools for whole sector evaluation of costs and benefits. Re-validate tools for disability population eg AQoL		

Expert Working Group Paper 2: Control and choice

16 August 2012

Lead Author: Gunela Astbrink

Choice and control as key concepts are based on the UN Convention on the Rights of Persons with Disabilities¹ (see Appendix 1). These are restated within Australia's National Disability Strategy which aims to ensure people living with disability exercise 'choice and control over their lives'². The National Disability Insurance Scheme has a stated commitment to realising principles of choice and control (see Appendix 2) within a structure of what is reasonable and necessary³.

Key concepts

- Right of person with a disability to control their life goals and to have options in the level of support for delivery of AT solutions
- Right of person with a disability to the choice of AT that meets their reasonable needs to support their life goals

¹ United Nations (2006) *Convention on the Rights of Persons with Disabilities and Optional Protocol*. Geneva, United Nations.

² C'wealth of Australia (2011) *National Disability Strategy 2010-2020 "Personal and community support: Section 4.3"*

³ Productivity Commission (2011) *Disability Care and Support Final Report*. Canberra.

- Right of person with a disability to obtain information about a range of AT solutions and relevant training in chosen AT solution
- Responsibility of person with a disability to use AT in ways that are compatible with an inclusive community
- Responsibility of prescribers and suppliers of AT to work with and listen to persons with a disability to meet and maintain their life goals

Issues and pathways

A number of issues arise when analyzing the above concepts of consumer control and choice. These issues cover aspects such as the expertise of the consumer and the level of support needed, methods of working with the AT practitioner on finding the solution that is reasonable and necessary and the responsibility of both the consumer and the AT practitioner to ensure that the solution is in accordance with the consumer's life goals. Suggested pathways to balance these rights and responsibilities will assist to achieve realistic outcomes.

Issues	Suggested pathways
a. Consumers AND AT practitioners may have limited horizons re. supports or goals	Collaborative goal-setting tool at entry point* Evaluation of applicability of holistic AT solutions as against narrowly focused AT solutions meeting a single goal
b. Options for level of support of AT solutions based on consumer expertise	Evaluation of consumer's level of AT experience (based on goals / task / environment / personal factors as per clinical best practice and ICF).
c. Consumer choice over device selection and level of expert input	Guided by ICF outcome domains linked to ISO 9999 listing of available AT devices. Overlay 'reasonable and necessary' from clinical advisory group. Another option is an ongoing formula to review costs and benefits of each proposed AT solution.
d. Consumer choice over AT practitioner	Complaints mechanism available if unsatisfactory outcome achieved. Authoritative information sources available about AT professionals.
e. Consumer control over direct funds vs governance issues with reasonable and necessary expenditure	Initial goal-setting at entry point to offer 2-3 pathway choices (direct payment; circle of support mediated funds; provider) PLUS discretionary spend for repair maintenance and sundries
f. Consumer control over lifecycle and re-application timelines and procedures vs governance issues with reasonable and necessary expenditure	Initial goal-setting to set targets for review; responsive systems to re-entry initiated by consumer, circle of support or practitioners.

Note: * Entry point refers to 'Possible AT benefit' as per AT & NDIS Flowchart



Proposed action

ARATA proposes the setting up of a Charter of Rights and Responsibilities for Assistive Technology Solutions

The Charter would establish basic principles to underpin the access to and use of assistive technology for those who need it. It is important that while people with disabilities have rights under the Convention applying to assistive technology, as members of the community they also have responsibilities. The proposed Charter will seek

to incorporate these elements to achieve a just balance for all stakeholders. The Charter should be recognised and used by all levels of government and by suppliers of assistive technology. The document should be promoted extensively by disability organisations so that persons with a disability will use the Charter to better understand their rights and responsibilities.

APPENDIX 1

Consumer Choice within the UN Convention on the Rights of Persons with Disabilities

Guiding Principles:

(a) Respect for inherent dignity, individual autonomy including the freedom to make one's own choices, and independence of persons

(c) Full and effective participation and inclusion in society

Article 4 (General Obligations):

Section 1(h) To provide accessible information to persons with disabilities about mobility aids, devices and assistive technologies, including new technologies, as well as other forms of assistance, support services and facilities;

Article 20 (Personal mobility)

a. Facilitating the personal mobility of persons with disabilities in the manner and at the time of their choice, and at affordable cost;

b. Facilitating access by persons with disabilities to quality mobility aids, devices, assistive technologies and forms of live assistance and intermediaries, including by making them available at affordable cost;

c. Providing training in mobility skills to persons with disabilities and to specialist staff working with persons with disabilities;

d. Encouraging entities that produce mobility aids, devices and assistive technologies to take into account all aspects of mobility for persons with disabilities.

Article 26 Habilitation and rehabilitation

3. States Parties shall promote the availability, knowledge and use of assistive devices and technologies, designed for persons with disabilities, as they relate to habilitation and rehabilitation.

APPENDIX 2 Consumer Choice within the Disability Care and Support Report

Productivity Commission (2011) Disability Care and Support Final Report. Canberra.

Chapter 8 Who has the decision-making power?

Key points

- People should be given much greater power and choice in a new system, with the objective of giving people greater flexibility and control over their lives

— with the ultimate goal being greater wellbeing. Consumer choice is one aspect of power.

- There are strong rationales for a consumer choice approach, since people know their needs better than others, it can increase pressures on suppliers to perform, and people value choice in its own right. There are two broad ways of exercising consumer choice:



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- › At least over the medium run, the most important would be for consumers to be given an individualised package and to choose one or more service agencies to provide the supports in the package. People could switch providers if they did not meet their needs well. If they wanted, they could get support from intermediaries (Disability Support Organisations — DSOs) in making their choices.
- › For those who wish to and are able to, people

would be given the opportunity to cash out their package, and purchase their own supports ('self-directed funding'). People could obtain support from intermediaries to help them plan their package and/or to handle administrative tasks. People could employ the support workers they want (and when), and could trade off some services against others, but they could also choose to buy pre-packaged supports from specialist and mainstream providers (343)

APPENDIX 3

Excerpts from Focus Groups regarding Choice and Control

The following suggestions were made in the four focus groups run as part of this project.

- Finding and balancing the need for independence and right to choose with the support provided by professionals is crucial and requires flexibility in the system. Therefore, two levels of prescription and provisioning needed:
 - a. for the expert consumers who know what they need and wish to obtain AT themselves.
 - b. for persons who are best served through soft technology.
- The right to choose the OT and/or other health professional that a person can best work with is central to control and choice.
- Not every solution will meet everyone's needs. Important to consider individual needs.
- Maintenance and repair needs to be rapid.
- Soft technology to include support and training. Training related to the AT solution may need to be repeated on a regular basis.
- Key facts about a person to be stored as part of a national e-health record in the consumer's possession obviating the need for the consumer to re-tell their story to many different health professionals. Practitioner can then ask specific questions relevant to finding the optimal AT

solutions. Security and privacy aspects vital.

- Importance of strong information system on AT available in all parts of Australia to meet different cultural and linguistic needs as necessary. ILCs could extend their roles by facilitating the ordering of devices.
- Discretionary spending for small AT, initially set at \$1000 rising with CPI over time.

Key comments made:

- › parent described electing to 'change the OT' rather than 'change the prescription' when she felt the OT recommended the incorrect wheelchair.
- › who should have control over finances? Parent comments that self-managed funding is different from self-directed funding. Her son not able to self-direct but his circle of support (including parents) can help with this.
- › (some AT practitioners) Unwilling to have consumers to have access to range of gear without some prof input VS. recognising different levels of PWD knowledge AND (comment from person with a disability) usefulness of discretionary money to be spent as repair / maintenance / replacement kitty OR to avoid ATP wait lists.

Expert Working Group Paper 3: Workforce & Quality

Lead Author: Lloyd Walker

Assistive technology (AT) is a key element in achieving reasonable and necessary improvements to both activity and participation for people with disabilities. AT solutions are tailored suites of AT devices, environmental and task modifications, collaboratively developed by AT practitioners, users and their families. Most effective when prescribed together, AT solutions enable a wide range of outcomes including autonomy and independence in activities in the home, getting out and about in the community, communicating with others, and participation in education and employment and community activities. The NDIS promises the first holistic scheme to implement such solutions. Effective outcomes will depend on both the availability of professional advice and support ('soft technologies') and ongoing monitoring and innovation to ensure all aspects of the AT system are optimised where possible.

1 Availability of Information, Advice and Support

Assistive Technology has come a long way from some of the early mobility aids and adapted utensils to assist in feeding. Like other technologies, AT is both diverse and rapidly changing. Effective outcomes for end users depend on:

- a. excellent sources of information and user-friendly methods of information-sharing,
- b. good identification and assessment of needs and goals, and then
- c. appropriate matching of those needs with an integrated solution that will often include AT.

AT implementation should never be an afterthought or done in isolation. Those who prescribe and issue AT should have robust skills in both stakeholder consultation/liaison/support/guidance and a thorough understanding of the impact of AT (both positive and negative).

a) *Providing AT Users and Families With Access to Skilled AT Practitioners*

People with disabilities reflect the general population and live in capital city apartments, suburban settings and remote Indigenous communities of only five or six families. The skills required to deliver AT services (like most services for people with disabilities) will be quite different in these settings. Support services and the availability of specialist support also varies widely across the country. In cities, many AT practitioners have very large caseloads and receive little recognition of the work they do in AT prescription and delivery. With some notable exceptions, many practitioners working in rural and remote Australia are often at the early stages of their careers with limited experience of AT practice. At best many could be seen as AT generalists. In these early phases, it is essential that they be supported through networks and mentors who can assist as they develop skills and experience necessary for delivering high quality practice to all those they work with. Internationally, national systems that integrate local generalist assistance with regional secondary and national tertiary centres of expertise maximise the capacity to achieve good outcomes for people with disabilities in a way that is cost effective and efficient. Such a structure will permit a concentration of appropriate expertise where it can be most effective, both tackling the more challenging needs and solutions, but also providing support and advice to practitioners and consumers in the community.

This close collaboration between the regional/national centres and practitioners working in the community is critical to successful implementation of AT solutions. Many experienced practitioners acknowledge that even for quite complex needs, AT assessment and prescription in a centralised service without (at a minimum) active input from those in the person's home setting, often leads to substandard outcomes,

costly rework or even abandonment of AT. Assessment, training and implementation as close to the final setting of AT use is recognised as the ideal for many reasons. This requires the availability of AT practitioners throughout Australia, and AT funding arrangements must cover this provision of AT expertise and support at local, regional and national level to achieve cost effective and sound outcomes.

Over time experienced rural and remote based AT practitioners become experts in service provision for users living and working in these regions. They gain understanding of local culture, law and conditions and build trust as a member of the community in which they practice. NDIA delivered services should recognise the importance of this expertise for success in rural and remote settings with appropriate credentials and support systems for these rural and remote 'specialists.' They in turn should be able to readily draw on technical and clinical expertise when needed from several NDIS supported AT Centres of Excellence.

The NBN and other ICT based solutions offer great promise to help link the necessary expertise for consumer and professional education, but also for

achieving the most cost effective service delivery approach. The elements of information, education, and aspects of service delivery must be:

- a. developed to a high standard,
- b. appropriate from a cultural and delivery environment viewpoint,
- c. take account of the various skill bases and learning environments in the Australian AT sector, and
- d. monitored proactively to ensure relevance and effectiveness to the goals of good AT outcomes for NDIS clients.

Particularly for indigenous Australians, the ability to achieve successful activity and participation solutions on their home country is often critical to their longer term health, well being and success. These techniques should be developed to empower the end user and their closest available support network. The NDIS should incorporate a system that empowers and facilitates collaborative delivery of AT for end-users, drawing on appropriate multidisciplinary expertise with a focus on the individual's home, community and major life role environments.

b) AT Practitioner Training and Accreditation for the Sector

In Australia several disciplines have been actively involved in delivering AT solutions for many years, including audiologists, occupational therapists, physiotherapists, rehabilitation engineers, speech pathologists, vision consultants, prosthetists and orthotists. With few exceptions these professionals have only limited exposure to AT solutions and practice as part of their undergraduate training. AT practice is usually developed through postgraduate training, workshops and in-services, and/or on-the-job mentoring. End users (and government agencies) have almost no method to determine a practitioner's competency in AT except through word of mouth or direct experience of their performance. Internationally AT practitioners are expected to demonstrate competency (and gain a suitable credential) in order to provide advice to end users and have authority to prescribe.

ARATA is the key professional body operating across professions and inclusive of consumers. It has a strong track record in facilitating AT practice development in Australia and is committed to facilitating the development of a national AT Prescriber's Credentialling system. This process should take account of the different requirements for prescribing general AT and the specialist skills needed to find and deliver solutions to people with complex needs often requiring equipment customisation or custom manufacture. The NDIA can collaborate with the professional sector to work with consumer, government and industry bodies to develop a national credentialling system for practitioners that takes account of the diversity of delivery environments and the different levels of skill required to assure consumers and funding providers of quality information and practice.



Some minimum requirements for AT Practitioners would include:

- ethical conduct and an understanding of the fiduciary (trust) responsibilities of their role;
- demonstrated skills in interacting with and providing professional advice to people with disabilities and their families;
- training and experience in assistive technology practice and commitment to CPD to ensure currency of knowledge and skills;
- access to resources and support of relevance to their chosen area of AT practice;
- commitment to a collaborative, transdisciplinary approach to integrated AT solutions;
- sound communication skills (both verbal and written).

In the same way suppliers of AT should be required to demonstrate some minimum benchmarks of ethics and quality service. Industry groups such as ATSA have already prepared an example of such a code of conduct.

For suppliers some minimum requirements would include:

- ethical conduct and probity in financial practice;
- quality of product (including standards and other compliance);
- support and information to assist end-users and their chosen AT practitioner(s) in achieving an informed solution;
- service/maintenance packages as part of supply; and
- geographic guarantees (or arrangements) for support, including benchmarked response/resolution times for issues and stages of the process.

c) Respecting the Skills and Expectations of AT Users and Their Families

The pretext of the NDIS is user centred and controlled service delivery. ARATA is a strong supporter of user centred practice. AT provision can be a complex activity, in some ways similar to the purchase of a new vehicle. For some the new solution will be very similar to their previous arrangements and little support is required. By contrast a person or family who have to deal with the AT needs for the first time will generally require considerable support and assistance in both identifying their needs and then implementing an agreed solution (including trials, approvals, delivery, training and troubleshooting). This same level of support may be required following a significant change in disability status (deterioration or complication) or life role (transitioning from being a child/student to an adult/worker). Even so called 'expert users' can benefit from a discussion with a skilled AT specialist who can highlight recent technology changes or other aspects (both in disability progression and systemic changes) that the end-user may not be aware of – thus again achieving

the most effective solution.

The ideal situation would be a collaborative process between the end-user and their AT prescriber. Consumers can select an appropriate prescriber based on their credentials and their rapport. For low cost items (such as less than \$1000) the discussion may occur over the telephone for advice and guidance, since in many cases the end-user would be able to select and have funded their AT solution directly. For more complex solutions, prescribers should have delegated authority based on their credentials. As part of the consultation process, the prescriber would be able to authorise an end-user's request for purchase/supply even quite complex solutions and providing the end-user's NDIS funding is not overspent, the 'team' could progress through the trial/evaluation/issue/training phases. Purchases/supply would be through an 'accredited' supplier who has contracted with NDIA.



2 Quality & Innovation within the Systems & Technology

AT solutions are only as good as the available components (devices, adaptations) and processes. Good outcomes for end-users are generally based around the solid, collaborative partnerships between the end-user, their circle of support, and those they engage to provide professional and technical advice, training and support.

When this group is able to work within consistent and outcome focused funding and supply systems there is the greatest likelihood of achieving the end user's goals.

Apart from the practitioner and supplier requirements noted above, ARATA proposes that the national AT system include monitoring and innovation.

a) Evaluation that maintains quality and encourages innovation

There are well established performance and delivery criteria for the many elements that make up the AT process. Through ongoing participatory research and monitoring of outcomes and the contribution of services and practitioners, the NDIA can encourage early identification of innovative strategies, technologies and methods that either enhance outcomes for end-users, or contribute to greater efficiency and effectiveness of the system, or deliver both. The NDIA, services and practitioners themselves can then be proactive in take up of these tested approaches.

There are already some systems and techniques in place to achieve this. For products, research and development incubators (such as Flinders University's Medical Device Partnering Program and USQ-SAIL) already exist but have very limited support from governments and other agencies involved in AT procurement. Despite the reality that Australia has quite centralised procurement systems for much AT, there is little proactive commissioning of design and development projects (competitions) to produce AT solutions that more appropriately address problems encountered by Australian users (e.g. wheeled mobility for remote settings, transport solutions for those with severe disabilities etc). Several organisations (e.g. ARATA, ATSA, NCRE, ILCs Australia, AOPA and OT Australia) should work with the NDIA to establish a monitoring and evaluation regime, embedded within a participatory research approach, focused on:

- maintaining the integrity of the NDIS system,
- enhanced AT outcomes for end users, and
- optimised efficiency of NDIS and community resources.

Australian and International Standards exist now for many assistive technologies as a minimum benchmark and some procurement schemes take advantage of embedding these standards in their contracting requirements. Internationally though, some funding agencies have broadened the use of these techniques to evaluate quality control, life cycle differences and even strategies for fleet maintenance in AT – in all cases the focus has been on better outcomes for end-users and greater efficiency within the system. The NDIA should work with the NCRE, ILCs, Standards Australia and ATSA to develop and maintain standards relevant to AT in Australia, embedding such requirements within routine NDIA procurement practice, and establishing a 'product and technical innovation system' that helps prioritise and fund innovation, evaluation and research.

Glossary

AOPA – Australian Orthotists & Prosthetists Association

APA – Australian Physiotherapy Association

ARATA – Australian Rehabilitation & Assistive Technology Association

ATSA – Australian Rehabilitation Suppliers Association

ILC – Independent Living Centre(s)

NCRE – National Committee on Rehabilitation Engineering (part of Engineers Australia)

NDIA – National Disability Insurance Authority

NDIS – National Disability Insurance Scheme

OT Australia – Occupational Therapy Australia

SPA – Speech Pathology Australia

Literature summary: Assistive Technology and the AT practitioner



Lead author: Natasha Layton

1. Key Points

Assistive Technology is recognised as a key enabler of human participation, making ‘a real difference to choice and control in people’s lives’ (Priestley et al. 2009:39). As the UK Audit Commission identify,

‘The value of AT in alleviating dysfunctions and preventing health and social problems has also been demonstrated in a wide range of studies and literature reviews in the UK and overseas. A considerable body of evidence has been assembled... this accumulated pool of evidence is strong and growing stronger’ (Audit Commission 2004:18).

AT devices are most effective when provided in a tailored solution including home modifications, personal support and task redesign (Layton et al. 2010). AT practitioners are skilled professionals able to assess, recommend and evaluate assistive technology devices (AT devices). AT practitioners collaborate with consumers to tailor these supports to minimise the impact of disability upon everyday life (Smith 2002). AT practitioners hold expertise in evaluating the fit between an individual, the device, the environment, the task, and the individuals’ desired outcome (Scherer and Sax 2009; Waldron and Layton 2008). This skillset is termed ‘soft technology’ and is necessary to complement provision of ‘hard technology or the AT device itself (Cook and Hussey 2008)..An AT solution, therefore,

is an ‘individually tailored combination of hard (actual devices) and soft (assessment, trial and other human factors) assistive technologies, environmental interventions and paid and/or unpaid care (A.T. Collaboration 2009). Currently, Australia’s equipment funding schemes (FaHCSIA 2011) cover less than 10% of the AT device categories recognised in the Assistive Products for Persons with Disability (ISO 9999 2007).

AT practitioners are able to deliver significant outcomes through the application of AT and related supports. There is good evidence that AT delivers outcomes including preserved or increased independence in specific life areas; decreased functional decline and reduced hospital and residential care admissions; prevention of secondary medical complications; falls prevention, alleviation of carer burden; and quality of life (see outcomes literature review in (Layton et al. 2010). AT practitioner expertise is identified as necessary in order to achieve outcomes through the provision of AT devices and home modifications (Audit Commission 2004; Heywood and Turner 2007; Audit Commission 2002; AIHW 2006).

This literature summary contextualises AT in relation to other supports; discusses the issues of evidence; and identifies the role of the AT practitioner in effective delivery.

2. Strategies or interventions

Ways to manage and minimise the impact of disability upon life fall into several broad categories (Smith 2002). These comprise interventions to reduce the impairment or compensate for the impairment; redesign of life activities; use of assistive devices; redesign of life environments; and use of provision of personal care work, otherwise known as attendant care or support. Impairment-reducing and compensatory interventions

such as surgical intervention, rehabilitation programs and prosthetic training, are delivered primarily via health and rehabilitation settings at focal points in the impairment trajectory. The remaining strategies of assistive technology devices (AT), environmental interventions (EI) and personal care (PC), within the context of redesign of activities, are applicable throughout the lifespan. These strategies are the

primary means by which people with disabilities manage their situations and maximise their capacity to accomplish life tasks (Cook and Hussey 2008).

AT, EI and PC are therefore of critical importance in mediating the effects of impairment. The presence, absence, and 'fit' of these strategies is likely to profoundly impact upon both the experience of disablement and the achievement of outcomes.

Somewhat surprisingly then, the body of literature regarding AT, EI and PC is limited, particularly in relation to research upon interventions to reduce impairment. For example, a review of the contents pages of Archives of Physical Medicine and Rehabilitation in the decade 2001 – 2011 found that less than 10% of the original papers concerned AT, EI or PC, with over 90% focussed on therapeutic or surgical interventions, in line with the highly individualised perspective of the medical model.

3. Assistive Technology

3.1. Defining Assistive Technologies

AT can be broadly divided into devices and services. The World Health Organisation defines AT as, 'an umbrella term for any device or system that allows individuals to perform tasks they would otherwise be unable to do or increases the ease and safety with which tasks can be performed' p 10 (WHO 2001). An assistive device is further defined in the ICF as 'equipment that enables an individual who requires assistance to perform the daily activities essential to maintain health and autonomy and to live as full a life as possible' p173 (WHO 2001).

with a medical model positioning of the problem as within the individual, and in contrast to social model perspectives where dis-abling environments cause the experience of disability. Psycho-social perspectives encompass non-tangible environments, for example the societal milieu or attitudinal environment. These are captured within WHO ICF (WHO 2001) Chapter 2 (Natural environment and human-made changes to environment); Chapter 4 (Attitudes) and Chapter 5 (Services, Systems and Policies), and the language of environmental barriers and facilitators is designed to capture experiences across both tangible and non-tangible aspects of environments.

3.1.a) The technology chain

AT devices are necessarily used within an environmental context. The substantial relationship between AT and EI has been conceptualised as a 'technology chain' (AAATE 2003). For example, provision of AT devices such as a bathseat will not be required if the shower-over-bath is replaced with a stepless recess.

The barriers or facilitators presented by the environment will create or obviate the needs for any AT devices or aspects of personal support. However, the pragmatic realities of altering environments (permanency, cost, and the hurdles of multiple duty-holders in respect to structural or public alterations) have probably skewed current practice toward the introduction of AT devices (and care) targeted at modifying the capacity of the individual to interact with the environment, rather than the other way around. Unfortunately this is resonant

3.1.b) Hard and Soft Technologies

AT can also be usefully classified using Odor's concepts of 'hard and soft technologies' (Cook and Hussey 2008). Here, AT devices represent 'hard' technology, while related activities such as clinical advice, customising, and training represent 'soft' technology. Providing the actual device with relevant soft technology elements is identified as critical to outcomes (Scherer and Sax 2009). For example, successful matching AT devices such as environmental controls and wheelchairs to individuals, requires a comprehensive understanding of the hard technology (device) itself, and systematic application of soft technology (needs assessment, set-up, trial, training and follow-up) for optimal outcomes (Cook and Hussey 2008; McDonald 2010).



3.1.c) Range of AT Devices

Over 19,000 AT devices were listed as commercially available in 2011 (ABLEDATA) although not all are imported to Australia. The international taxonomy *Assistive Products for People with Disability* classifies assistive products according to their function, and includes generally available devices when they serve as assistive products for persons with disability (ISO 9999 2007) (Hoenig et al. 2007). Three levels of classification are offered, for example class 12 denotes assistive products for personal mobility, with 14 subclasses including walking products, cars, cycles, wheelchairs, transferring and turning; and additional divisions for example for powered wheelchairs, foot driven wheelchairs, and so on (ISO 9999 2007:7).

Devised with reference to the ISO 9999, the ICF also offers categorises devices, describing Products and Technology over twelve subchapters within of its Environmental Factors section (WHO 2001). Here, for example, Chapter 1 Products and Technology identifies 'Products and technology for personal indoor and outdoor mobility and transportation as a discrete subchapter coded e 120 (WHO 2001:173). Within this, the third level classification delineates General products and technology for personal indoor and outdoor mobility and transportation (e1200) including non-adapted buses, cars etc; and Assistive products and technology for personal indoor and outdoor mobility and transportation (e1201) including adapted or 'specially designed equipment.(WHO 2001:174).

3.1.d) AT Supply in Australia

For the AT user in Australia, available technology is more limited than this international listing would suggest, for several reasons. As Hansson describes,

The quality of life of people with disease or disability depends to a large extent on the availability of enabling technology. Decisions on such technologies are partly made in the healthcare sector, partly in other sectors of society (Hansson 2007:265).

The actual AT supply sector in Australia is 'small and fragmented, and dependent largely on imported product from overseas-based companies' (Hobbs et al. 2009:153). Design, manufacture and import of AT devices are ad hoc and subject to many systemic variables including market forces (Dong et al. 2006). The relatively small Australian market limits the range of products imported, and while AT users may be able to privately purchase products over the internet, some trade- and standards- related barriers do exist (ACD 2006). Also, while 'hard' technology can be obtained, the necessary 'soft' technologies of assessment and fit, customisation and training, usually provided by an experienced supplier or an AT practitioner, such as OT, physiotherapist, speech pathologist or rehabilitation engineer, are often absent in these instances (Waldron and Layton 2008).

3.1.e) When is Technology not 'assistive'?

It is actually difficult to determine any element of technology which is not 'assistive' as, by commonsense definition, assisting human function is the purpose of technology. It is important to identifying the scope and boundaries of terms such as technology, as meaning is embedded within terminology. Postmodern philosophy critiques the way in which technology, medicine and disability are socially constructed through words and categories (Foucault 1991). To draw a line around 'assistive technology' is potentially to identify AT for people with impairment as separate from that used by 'everyone else'. For example, the contemporary term assistive technology replaces 'technical aids' (ISO 9999 2007), invalid aids, medical appliances, and similar terms which link the device with incapacity (Cook and Hussey 2008). Narrow naming and framing of assistive technology is likely to cause potentially stigmatizing 'special' definitions, which run counter to the potential benefits of 'universalising' approaches to impairment.

In order to understand what drivers shape definitions, we need to understand the use to which definitions are

put, and the needs of those doing the defining. The scope of ISO 9999 is broad, as it intends to encompass all assistive products, especially produced or generally available, for persons with disability. Likewise, persons with disability are broadly defined as,

Person with one or more impairments, one or more activity limitations, one or more participation restrictions or a combination thereof (ISO 9999 2007:3).

Even so, this Standard has exclusions, specifically items used for the installation of assistive products, assistive products and instruments used exclusively by healthcare professionals, non-technical solutions such as personal assistance and guide dogs, financial support, implanted devices and medicines (ISO 9999 2007:1). The reason for a number of these exclusions is that they are dealt with in other Standards. Thus, while they may be useful strategies to mediate disability, procedural or historic structures govern their presence.

Definitional differences greatly affect what governments and private insurance will provide, and are frequently based upon custom and practice (Masso et al. 2008).

The scope of AT as defined by AT funders and health insurers is frequently restricted to items that are 'medically necessary', and this criteria itself is subject to interpretation by based upon the 'narrowest administrative definition of clinical need' (Barbara and Curtin 2008:58).

It is likely however that the definitions outlined above, fail to capture the perspective of the AT user,

From a grassroots disabled person's perspective, it does not matter what the technology is, just that it fits, works, and is useful... in other words, if the products selected require you to consider your disability issues first, then they are assistive technology – even if they are widely available, mundane, mass-market products. If you did not have a disability you would not have to think about these product features when you make your choices. When your disability is defining or narrowing your product choices and options, you are buying assistive technology, whether you are calling it that and whether it was designed to be AT (Litvak and Enders 2001:711).

4. Outcome Measures

The World Report on Disability (2011) list a number of issues in rehabilitation research (WHO 2011:119) :

1. There is no common taxonomy of rehabilitation measures.
2. Rehabilitation outcomes can be difficult to characterize and study given the breadth and complexity of measures. Rehabilitation often employs several measures simultaneously, and involves workers from different disciplines. This can often make it difficult to measure changes resulting from interventions, such as the specific outcomes from therapy compared to an assistive device where the two are used concurrently.
3. Few valid outcome measures for activity limitations and participation restrictions can be reliably scored by different health professionals within a multidisciplinary team
4. Sample sizes are often too small. The range of disabilities is extremely large, and conditions diverse. Rehabilitation measures are highly individualized and based on health condition, impairments, and contextual factors, and often the numbers of people within homogeneous groups that can be included in research studies are small. This may preclude the use of controlled trials.
5. The need to allow for participation of people with disabilities - in decision-making through the process of rehabilitation - requires research designs and methods that may not be considered rigorous under current grading systems.
6. Research-controlled trials, which require blinding and placebo controls, may not be feasible or ethical if services are denied for control groups..



4.1. Isolating AT as a variable

Hammel asks 'What's the outcome?' and contends that multiple variables complicate the measurement of assistive technology outcomes. Also, that by focussing assistive technology outcome measurement on just one level of impact at one static point in time, we can miss many other outcomes (Hammel 1996:97). Other authors concur, noting the effectiveness of AT may be masked by its pervasiveness and therefore invisibility, in the presence of other interventions,

Due to the common concurrent use of AT in rehabilitation intervention, if AT use is not documented or controlled within outcomes study research designs or by the instrumentation, the outcomes of any targeting intervention may be confounded by the contribution of AT in the overall assessment of the person's function, participation, or quality of life (Rust and Smith 2005:780).

The selection of outcome measures, indeed effectiveness of enablers is understood in terms of a range of different outcomes, influenced by the standpoint and horizon of the researcher. The rehabilitation process from a consumer perspective has been described by Goble as follows,

The functional capacity, or more often incapacity, of the disabled person is assessed using scales and tools that measure their performance against 'normative' standards. Programmes are then drawn up which aim to reduce the gap between the performance of the disabled individual and the normative standard as far as possible. Success is achieved when the professional expert judges that the performance of the individual has moved significantly in the desired direction. The programme will focus on whatever the expert professional regards as the particular functional deficit that is most significant in preventing the person from achieving independent functioning (Goble 2004:42-43).

Perhaps unsurprisingly, given the majority of published evidence is authored by health professionals working

within medical and rehabilitation settings, studies on the use and effectiveness of AT devices or adapted environments typically investigate one variable (such as a power wheelchair) in a homogenous population (such as adults with tetraplegia) and apply one or a set of quantitative outcome measures. Such evidence is 'partial' in scope insofar as overall life goals and outcomes are not addressed; conclusions are frequently limited due to the difficulty in managing confounding variables (other AT devices, personal factors and environments of use inevitably differ); have low generalisability (the more rigorous the call for homogeneity, the smaller the sample); and may fail to make the leap from efficacy (what works in perfect conditions) and effectiveness (what works in the real world)..Given this, substantially different methods may be required to fully evaluate the efficacy of AT and related enablers, in studies.



Meta category	Outcome Area	Tools and Authors
Specific body functions and structures	Function Independence	Functional Independence Measure FIM (UDS 1999) London Handicap Scale outcome measure for chronic disease (Harwood et al. 1994) The Craig Handicap Assessment and Reporting Technique (CHART) (Whiteneck et al. 1992) Problem Impact Rating Scale (PIRS) Preference based assessment of the quality of life of disabled persons (Persson et al. 2002). Community Integration Questionnaire (CIQ) (Willer et al. 1994)
Areas of activity or participation	Life Domains Frameworks	Activity & Participation Chapters WHO ICF (WHO 2001) Wilson Life Areas (Wilson 2006) Life habits (LIFE-H) (Noreau et al. 2002)
	Scales: Participation Satisfaction Difficulty	PAR-PRO: measure of home and community participation (Ostir et al. 2006) Functioning and Health Related Outcomes Module (FRHOM) (AIHW 2005)
Combined aspects of body structure & function; and activity & participation	Quality of Life	Quality of Life Core Domains (Shalock 2004; Shalock and Siperstein 1996) AQoL (Hawthorne et al. 1999)
	Health related quality of life measures	WHO QOL (WHO 1996) SF 36 (Ware and Sherbourne 1992) QALY& DALY (as reprised in (Banta and Ardine de Wit 2008)
	Objective and subjective measures of well-being	Subjective Wellbeing Index (Cummins and Lau 2006)
Evaluation of individual AT devices	Effectiveness of individual AT devices	PIADS Psychosocial Impact of Assistive Devices Scale (Jutai and Day 2002) QUEST Quebec User Evaluation of satisfaction with Assistive Technology (Demers et al. 2000; Demers et al. 2002) IPPA: individually prioritised problem assessment (Wessels et al. 2002)
	Economic impact of AT devices	SCAI Social Cost Analysis Inventory (Andrich 2002b)

4.2. Independence or interdependence?

A pervasive view in the rehabilitation literature relates to the seeking of independence

The equivocal nature of independence as a rehabilitation goal and an outcome measure will be explored in the interventions and outcomes section below, but is foreshadowed here to illustrate that, just

as technology use could result in a loss of personal contact with others as discussed in the ethics section; 'replacing' caregivers may impact on other needs of the person. Moving beyond notions of dependence and its binary opposite, independence, disability advocates currently adhere to a more nuanced view of partnerships, recognising the interdependence of both



parties (Waldron and Layton 2008).

During 2006, the Australian Institute of Health and Welfare (AIHW) undertook a review of therapy and equipment needs of people with cerebral palsy and like disabilities in conjunction with Cerebral Palsy Australia. Using literature review, focus group and archetypal client methods, the authors investigated the nature and extent of met, partially met and unmet need for therapies and equipment, and estimated the effects of provision in terms of functioning, participation, and reduced social costs. Noting that 'there is as yet little in the way of published studies on the effects of therapy and equipment provision' (AIHW 2006:179), the focus group findings nevertheless provided strong support for equipment provision as an enabling support. They concluded that,

Unmet need appears to be high... Long waiting times for therapy and equipment are a major concern, particularly in the light of focus group evidence that lack of timely access to appropriate therapy and equipment can exacerbate problems and result in greater future need for services (AIHW 2006:184).

Similarly, UK research identified poor performance of equipment services with regard to levels of unmet need and adequate funding, actually noting that providers may try to avoid discovering need that cannot be met, despite the consequence of potential pressure on acute services at a later point. They describe,

...the impact of home adaptations can be so dramatic that service users talked of their lives being transformed or prolonged by the restoration of independence, dignity and the removal of fear of accidents and of strained personal relations in the home. However information to service users and potential users can be poor (Priestley et al. 2009:42).

Several individual studies reinforce these findings for both the paediatric and older populations. Ryan et al (2009) introduced AT in the form of adaptive seating devices to young children with cerebral palsy, and elicited outcomes that extended beyond the individual child, 'Our results showed that the introduction of study devices had a significant positive effect on the lives of families who have children' (Ryan et al. 2009:31). They conclude,

Ultimately, children and their families will benefit from the availability of more efficient funding programs and clinical services for assistive technology devices, optimal assistive technology prescriptions, and improved technologies (Ryan et al. 2009:32).

Older Victorians and assistive device use were found to have 'relatively high levels of disability and therefore a relatively high reliance on equipment for safe and optimal function at home' (Smith et al. 2002:176). Additionally, the impact of multiple disabilities is acknowledged to increase the need for enablers (AIHW 2009).

4.3. Invisibility of AT in research: Naked Performance

As a discrete variable, AT has been absent from most disabilities studies (Watson and Woods 2005:103). That said, AT is likely to have been present, yet unaccounted for,

Due to the common concurrent use of AT in rehabilitation intervention, if AT use is not documented or controlled within outcomes study research designs or by the instrumentation, the outcomes of any targeting

intervention may be confounded by the contribution of AT in the overall assessment of the person's function, participation, or quality of life (Rust and Smith 2005:abstract).

...results indicate that rehabilitation and health outcomes instruments inconsistently consider AT as an intervention for people with disabilities. This inconsistency in scoring leads to muddled and

potentially invalid assessments of rehabilitation outcomes (Rust and Smith 2005:780).

Therefore, any study design must acknowledge the pervasive presence of AT and recognize when performance is 'naked' (Rust and Smith 2005).

4.4. Evaluating Enablers in the Real World

Refocussing attention as to the relevant user characteristics, environmental factors and device properties which determine whether a particular device will provide benefit to users in their everyday lives takes research into AT devices out of the laboratory and into the real world. Hoenig recommends four clinically important areas for device-based research:

1. the heterogeneity of device users, of the environments in which those devices are used, and of the devices themselves;
2. the dependency of empirical research on objective data for valid causal inference;
3. the need for detailed information to capture the interaction between the person, the device, and the environment in which it is used; and

4. the extent to which success or failure of AT is dependent on the personal perspectives of the individual using the device (Hoenig et al. 2007:160).

A number of authors and researchers come from occupational therapy, which has a particular conceptualization of outcomes as occupational performance (the capacity to carry out human occupation). A call for further research at the nexus of person – occupation – environment as mediated by enablers is described as follows:

As assistive technology and physical environmental interventions are not single measures in themselves but the parts of an ongoing transactional process influencing occupational performance, there is a great need for research in this area in order to fully understand the client's perception of that process in a wider sense (Ivanoff et al. 2006:115).

4.5. Interdependency of Outcomes

Support and interventions from services are key factors in the achievement of an individual's desired outcomes (Rabiee et al. 2005; AIHW 2006). Rabiee et al interviewed parents and children from 50 families and identified the hierarchical and interdependent nature of outcomes; repeated utility where the same support can contribute to the achievement of different outcomes; and the presence of 'outcome chains' which depend upon key enablers,

Achievement of some outcomes depends on other, more basic and intermediate outcomes having been

met first, creating 'outcomes chains'. For example, maximizing a child's communication ability opens doors to opportunities to socialize and be active. Conversely, barriers to achieving one outcome also inhibit the achievement of another outcome. Inaccessible environments and lack of equipment to support a child's mobility were frequently mentioned as important barriers impeding opportunities for socializing, being active, learning skills and promoting independence (Rabiee et al. 2005:485-486).



4.6. Societal Perspectives

No studies considered the impact of several devices or a wider suite of enablers upon overall life. This represents a significant evidence gap, as an economic perspective has the potential to capture opportunity costs eg. loss of capacity to earn superannuation due to caring role or due to AT user's lack of earning capacity (Drummond et al. 2005; Mooney and Scotton 1998) (Andrich 2002a).

Recent publications on the economic effectiveness of assistive technology provision, while not fulfilling the criteria of full economic evaluations, support the premise that taking a societal view of the complexity of people's individual circumstances enables realistic modelling of costs and cost offsets, and can capture the effectiveness of AT.

4.7. Comparative Studies across Enablers and across Outcome Types

Definitional issues can obscure evidence and limits the capacity for meta-analysis. For example, a recently released systematic review of the use of assistive technology by frail older people in Australia, classified environmental interventions as a subset of assistive technologies, along with Telecare and smart technologies (Connell et al. 2008). Conducted in 2008 for the Department of Health and Aging, this report found 'strong evidence that assistive technology can enable improved safety and reduced falls; reduced hospitalisation; improved independence, mobility and physical function; improved well-being and quality of life' (Connell et al. 2008:6). Concepts such as universal design remain difficult to isolate, particularly given assistive technologies and environmental interventions are effectively nested within broader environments, and therefore subject to the influence of universal and urban design. This is despite a call for research to take an outcomes approach in developing evidence to support the adoption of universal design, not least, 'because cost is usually the first argument used against adoption of universal design practices, a critical need is to understand and document the economic benefits of universal design' (Steinfeld 2010:16).

Notably absent from many studies was any commentary on the choices between, and impacts of, AT, EI, or PC in combination or in lieu of each other. It is likely that this is a study conceptualization issue, given that

study scope is often governed by policy or provision boundaries (Goodacre et al. 2008). A small amount of literature was found which addressed AT in lieu of other enablers. For example, one multi-professional research project into substituting and supplementing care with AT conclude there is a 'strong financial case for substituting and/or supplementing formal care with assistive technology' (Laragy 2009:130), while Andrich incorporates potential earnings over time on the part of carers in a social cost analysis, thereby calculating the point at which an AT device, replacing such care, becomes cost-neutral or cost-saving (Andrich and Caracciolo 2007). In this study, even the most costly devices evaluated (for example an in-home lift) proved cost-effective within several years, supporting arguments for early investment in AT devices. A number of potential non-tangible outcomes are described as follows,

There is also evidence to suggest that use of aids and equipment may result in improved quality of life for clients; for many the greater autonomy, privacy and self-sufficiency achieved is worth some residual difficulty in carrying out tasks independently compared to using personal care services (AIPC 2008:41).

5. AT solutions

These three strategies - assistive devices, environmental adaptations and personal care - bear particular relation to each other in that they represent tangible and interlinked supports. While they have generally been researched separately, some relationships between them are emerging. Studies into the impact of AT upon PC use demonstrate that AT, while potentially more costly in the short term, can substitute for personal care and represents a cost-effective investment for the medium to long term (AuditCommission 2002; Molenda 2006; Heywood and Turner 2007). Examples include provision of a mobile hoist to bring a two person transfer down to a one person assist; or provision of

a stairclimber to replace an assistant (Andrich 2002b). Likewise, a relationship exists between assistive technologies and environmental interventions and this has been described as a 'technology chain' (AAATE 2003). Here, accessible environs such as a stepless shower may eliminate the need for AT devices such as a shower stool. These enablers also have in common their application potential throughout the lifespan, across occupational roles and at multiple stages of a disease trajectory, unlike remediation strategies which apply during a narrow window of the rehabilitation process (Cook and Hussey 2008).

6. Model for Best Practice in AT Provision

To achieve the best AT outcomes, AT systems must recognise the perspectives of multiple players (consumer, AT practitioner, supplier, funder, maintenance, trainer, support people) along with multiple factors (person, lifestyle, task, AT device, environment) to be considered (Ben.Mortenson and Miller 2008) (Ripat and Booth 2005) (McDonald et al. 2007).

When the person with a disability has support necessary to pursue feasible assistive technology options, empowerment results. This requires a system of bringing together information that includes: equipment vendors, service and repair issues, funding sources, as well as training and support issues. Once the individual has access to this information, an informed decision making process can begin (Reed et al. 1995:32).

Soft technologies are critical factors in effectiveness of AT devices (assessment, set-up, trial in environments of use, customisation, training, sign-off, future planning etc) (Riemer-Reiss and Wacker 2000; Roelands et al. 2004; Steel and Gray 2009).

AT practitioners bring soft technologies to the consumer partnership (Waldron and Layton 2008). Best practice embeds soft technologies provided by appropriate AT practitioners within AT service delivery systems (CSIP 2006).

In conclusion, AT is an effective intervention to mediate the effects of impairment (Stineman and Lee Kirby 2002) (Priestley et al. 2009:40). AT is most effective when expert prescribers work in collaboration with consumer (Kraskowsky and Finlayson 2001).

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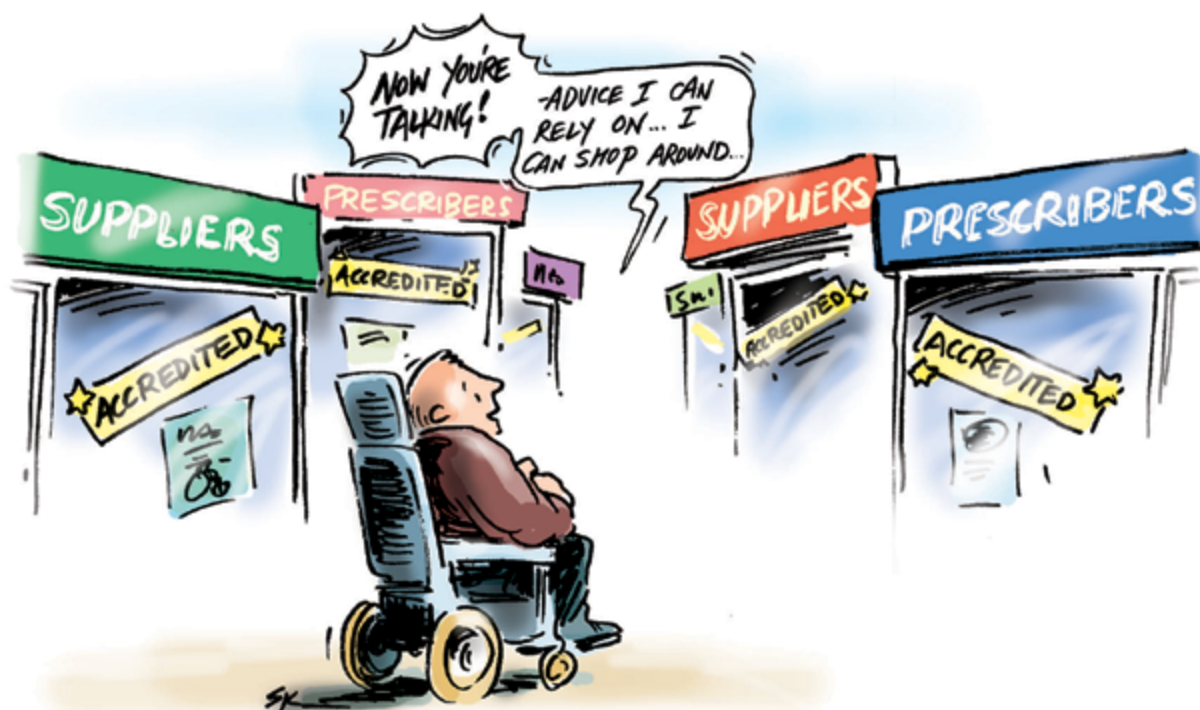
Assistive Technology (AT) Glossary

Person with disability	Person with one or more impairments, one or more activity limitations, one or more participation restrictions or a combination thereof' (p3) <i>ISO 9999 (2007) Assistive products for persons with disability — Classification and terminology. ISO</i>
Assistive Technology (AT)	<ul style="list-style-type: none"> • 'AT is an umbrella term for any device or system that allows individuals to perform tasks they would otherwise be unable to do or increases the ease and safety with which tasks can be performed' (p14) <i>World Health Organisation (2004) A glossary of terms for community health care and services for older persons. Geneva: WHO.</i> • 'any product (including devices, equipment, instruments, technology and software) especially produced or generally available, for preventing, compensating for, monitoring, relieving or neutralising impairments, activity limitations and participation restrictions' (p2) <i>ISO 9999 (2007) Assistive products for persons with disability — Classification and terminology. ISO</i> • 'equipment that enables an individual who requires assistance to perform the daily activities essential to maintain health and autonomy and to live as full a life as possible' (p173) <i>WHO (2001) International Classification of Functioning, Disability and Health, Geneva, World Health Organisation.</i> • "Any item, piece of equipment, product system, whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities." (http://www.section508.gov/index.cfm?fuseAction=AssistiveTechDevices) • "Assistive Technology is a term for any device, system or design, whether acquired commercially or off the shelf, modified or customised, that allows an individual to perform a task that they would otherwise be unable to do, or increase the ease and safety with which a task can be performed." (http://ilcaustralia.org.au)
Defining hard and soft technologies	'Hard technologies are readily available components that can be purchased and assembled into assistive technology systems. On the other hand, soft technologies are the human areas of decision making, strategies, training, concept formation, and service delivery. These aspects of technology, without which the hard technology cannot be successful, are much harder to obtain. Assistive technology services... are basically soft technologies' (p6) <i>Cook, A. & Hussey, S. (Eds.) (2008) Assistive Technologies: Principles and Practice, St. Louis, Mosby Elsevier.</i>
Making operational hard and soft technologies	<ul style="list-style-type: none"> • Hard technology refers to tangible devices. Soft technology comprises: • Information; assessment; trial; prescription; support; review (<i>Independent Living Centre Victoria, 2012</i>). • Needs assessment; set-up, trial, training, follow-up (p61) (<i>Waldron, D. & Layton, N. (2008) Hard and Soft Assistive Technology: defining roles for clinicians. Australian Occupational Therapy Journal, 55, 61-64.</i> • Proposed list of soft technology elements: <ul style="list-style-type: none"> › Information; referral; initial assessment and prescription; › funding; › trial (incl progressive assessment, fitting, training, review & evaluation); › provision (including fitting, customisation, set-up and training); › review; › maintenance and repair; › evaluation processes, structures and outcomes <p>(REF: draft Soft technology Tasks in the NDIS AT pathway for Consumers M Summers April 2012)</p>



An AT solution	<p>'An assistive technology solution can be defined as an individually tailored combination of hard (actual devices) and soft (assessment, trial and other human factors) assistive technologies, environmental interventions and paid and/or unpaid care (<i>AT Collaboration 2009</i> www.at.org.au)</p> <p>'for most individuals, a functional solution includes an integrated set of multiple technologies, environmental adaptations, and adaptive strategies for optimizing performance.... AT use may change over time given individuals' needs, the status or progression of the condition, and effects of aging and societal trends. AT may also have an impact on groups of people, not just an individual e.g. ergonomic interventions' (97) <i>Hammel, J. (1996) What's the outcome? multiple variables complicate the measurement of assistive technology outcomes. Rehab Management 9, 97-99.</i></p>
The AT industry	<p>[anyone who] uses, supplies, designs, recommends, funds or undertakes research into the assistive technologies. (<i>ARATA Productivity Commission submission 2010:1</i>)</p> <p>[includes] treating medical staff, allied health professionals, family carers, AT providers and funding institutions, government health authorities, insurers, and AT users. <i>Harris, F. and Sprigle, S. 2003. Cost Analyses in Assistive Technology Research. Assistive Technology. 15, 16-27</i></p>
AT models of practice	<p>Common elements are evaluation of:</p> <ul style="list-style-type: none"> › Individual (AT user) › task or occupation › device or intervention, › environment or milieu <ul style="list-style-type: none"> • Bain Assistive Technology System (Bain, B. K. & Leger, D. (1997) <i>Assistive Technology: An Interdisciplinary Approach</i>, USA, Churchill Livingstone. • Human–Activity Assistive Technology Model (Cook, A. & Hussey, S. (Eds.) (2008) <i>Assistive Technologies: Principles and Practice</i>, St. Louis, Mosby Elsevier) • Matching Person and Technology Model (Scherer, M. (1998) <i>The Scherer Milieu-Person-Technology Model: Matching people with technologies.</i>, New York, Webster) • Framework for the Conceptual Modelling of Assistive Technology Device Outcomes (2003). (Fuhrer, M. J., Jutai, J. W., Scherer, M. J. & Deyruyter, F. (2003) <i>A Framework for the conceptual modelling of assistive technology device outcomes. Disability and Rehabilitation, 25, 1243-1251</i>)

Common features of AT models which impact on AT uptake or abandonment	<p>Personal factors: age and diagnosis, client and family expectations; emotional maturity of client; whether the disability is acquired suddenly, progresses slowly, or is congenital.</p> <p>Device-related factors: device quality, appearance, availability of choice between devices, portability, weight, ease of use, presence of multiple devices.</p> <p>Factors related to the environment: social support; suitability of physical environment to device; opportunities within environment for use</p> <p>Factors related to the device market: trial, training, delivery, supply and support.</p> <p>Wessels, R., Djicks, B., Soede, M., Gelderblom, G. J. & Witte, L. D. (2003) <i>Non-use of provided assistive technology devices, a literature overview. Technology and Disability</i>, 15.</p> <p>Wessels, R., Dewitte, L. & Heuvel, W. V. D. (2004) <i>Measuring effectiveness of and satisfaction with assistive devices from a user perspective: an exploration of the literature. Technology and Disability</i>, 16, 83-90.</p> <p>Charness, N. and K. W. Schaie (2003). <i>Impact of Technology on successful aging. New York, Springer Publishing Company</i></p>
AT device parameters	<ul style="list-style-type: none"> • Low technology is inexpensive and easy to obtain, such as pen and paper communication boards or simple splints; versus high technology which is more complex to make and obtain, such as wheelchairs and computers • Minimal technology to augment function such as aids for food preparation, walking sticks and shower chairs, through to maximal technology to fully replace function such as prosthetic limbs or electronic communication device



Appendix A

The Project Team Consultants

The ARATA Project Team:
(front) Lloyd Walker, Gunela Astbrink
(rear) Michael Summers, Natasha Layton.



Dr Lloyd Walker BE(Hons), PhD (Bioeng) FIEAust CPEng(Biomed) RPEQ GAICD

Lloyd completed his PhD in biomedical engineering in Glasgow and has worked for over 20 years in the rehabilitation and academic fields in Australia. He has established and lead centres for assistive technology prescription and delivery in regional and metropolitan settings, including Australia's largest dedicated AT centre at NovitaTech (Adelaide). He has taught in engineering and occupational therapy schools and held adjunct Senior Lecturer positions at several Australian Universities. In 1998 he completed the development of a postgraduate multimedia based training program in assistive technology at James Cook University. He has lead much of Australia's standard's development in assistive technology (particularly wheelchairs) since 2004, and is currently convenor of two of the ISO wheelchair standards groups. He was a foundation

member of the Fremantle Collaboration formed in 2006 to explore the range of economic issues surrounding AT provision. As a person with a disability, he has a very close interest in the successful outcomes of the NDIS. Lloyd brings expertise in:

- assistive technology (AT) research and development
- AT business and service delivery
- organizational policy and government interaction/ negotiation
- policy and guidance document development
- cross disciplinary and ethical thinking issues
- governance, team leadership and project management (including international teams)

Gunela Astbrink BA PGDipLib

Gunela has worked on disability and technology issues for the past twenty years both in Australia and internationally. For the past ten years, she's been active in disability advocacy in information and communications technologies (ICT). A key role has been articulating policy directions to government,

regulators and industry based on the needs of member organisations as well as explaining in plain English to members of disability organisations about government policy and directions.

Gunela has a range of key skills in the policy and ICT fields including:

- diplomacy and strategy together with relationship-building to deliver enhanced policy.
- timely and effective responses to government inquiries and reviews
- experience on government and industry

commissioned working groups in the accessible ICT area

- skills in research and reporting that extends to extensive work with European Commission funded consortia.

Natasha Layton B App Sc (OT) M Health Sc (OT)

Natasha is an occupational therapist practicing, researching and teaching in the areas of assistive technology, disability, and outcomes. Her current PhD study concerns the costs and outcomes of assistive technology solutions. Specialising in mixed methods and participatory research, Natasha focuses on the nexus between research, policy and practice. Her publications and other dissemination activities are therefore tailored to a range of stakeholder audiences, and many have been co-authored with consumers. Natasha works on assistive technology policy and funding issues at Victorian, national, and international levels. She represents Occupational Therapy Australia on both DVA Rehabilitation Appliances Program Advisory Committee, and International Standards Organisation Technical Committee for Assistive Products for Persons with Disability (ISO 9999). She is recipient of the Yungaburra

Foundation Award for Leadership in Disability (2011), the ARATA Industry Award (2008), and OT Australia National Award (2006). Her expertise includes:

- Research scoping and practice (in particular novel approaches to inclusive research methodologies)
- Experience in AT practitioner and service models
- Optimal AT provision methods and outcomes
- Policy and professional representation issues, specifically position statements and other positioning strategies from a range of disciplines and countries
- Drafting of soft technology competencies
- Policy and advocacy activities (most notably through Victoria's Aids and Equipment Action Alliance through which she developed the Equipping Inclusion Study) at state and federal level

Michael Summers B App Soc Sci, M Soc Policy, PhD

Michael is a co founder of the National Aids and Equipment Reform Alliance, and its inaugural chair, and is the Senior Policy Advisor for ATSA (Assistive Technology Suppliers Australasia). He has worked in a variety of policy advocacy, research and evaluation, and tertiary teaching roles for over 20 years, and is currently an Honorary Associate at La Trobe University. Michael has run numerous successful policy campaigns in recent years, including the establishment of 'medical energy concessions' in NSW, QLD, SA and the quadrupling of the existing VIC concession, and incorporation of this issue in the federal government's carbon tax compensation for households. Michael's particular skills, knowledge and experience in relation to this ARATA project include:

- Policy development and implementation
- Intelligence gathering and analyses
- Policy networks
- Consultation and negotiation
- Excellent research and evaluation
- Writing
- A commitment to AT policy reform that delivers timely and effective support to consumers and their families consistently across Australia